N00174.AR.001097
NSWC INDIAN HEAD
5090.3a

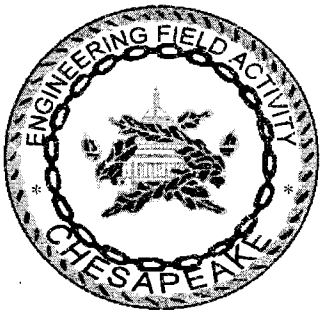
FEASIBILITY STUDY REPORT SITE 57 VOLUME 2 - APPENDICES NSWC INDIAN HEAD MD
5/1/2002
TETRA TECH

Feasibility Study Report

Site 57 - Former Drum Loading Area

Indian Head Division
Naval Surface Warfare Center
Indian Head, Maryland

VOLUME II- APPENDICES



Engineering Field Activity Chesapeake
Naval Facilities Engineering Command
Contract Number N62467-94-D-0888
Contract Task Order 0805

May 2002

TETRA TECH NUS, INC.

APPENDIX A

2001 FIELD FORMS

A.1 BORING LOGS

A.2 WELL CONSTRUCTION SHEETS

A.3 WELL COMPLETION REPORTS

A.4 WELL DEVELOPMENT SHEETS

A.5 SOIL SAMPLE LOG SHEETS

A.6 GROUNDWATER SAMPLE LOG SHEETS

A.7 CHAIN OF CUSTODY FORMS

A.8 GROUNDWATER LEVEL MEASUREMENTS

A.9 SURVEY DATA

A.1 BORING LOGS

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: NSWC INDIAN HEAD
PROJECT NUMBER: N7129 CTO 245
DRILLING COMPANY: CHESAPEAKE GEOSYSTEMS
DRILLING RIG: HSA TRUCK MOUNT

BORING NUMBER: S57SB016
DATE: 8/23/01
GEOLOGIST: BOB BALKOVEC
DRILLER: AARON E

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**
	1					BR + REDDISH	SILTY SAND W/		0-.5' @ 1403	0.0			
	2						ASPHALT + CINDERS			0.0			
	3												
	4												
	5	2 / 6				YELLOW +	SILTY CLAY W/	CL	4-5 @ 1413	0.0			
3" S-1 1416	6	4 / 2	/ 2"			LT GRAY	T-SAND + GRAVEL		S57SBDUP04	0.0			
	7												
	8												
	9	2 / 4			SOFT +	OL	SILTY CLAY	CL		0.0			
S-2 1417	10	2 / 3	6" / 2"		MOIST	GREEN	T-GRAVEL		8-10' @ 1420	0.0			
	11												
	12												
	13												
	14												
	15												
	16												
	17												
	18												
	19	30 / 46			V. DENSE	GRAY	MED SAND			0.0			
3" S-3 1439	20	50/1	13" / 13"		WET	↓			18-20' @ 1440	0.0			
				TD. 20'			SEE SOIL BORINGS						
							S57SB018 + S57SB021						
							FOR COMPLETE						
							LITHOLOGIC DETAILS						

* When rock coring, enter rock brokeness.

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

Remarks: HSA TO 18' W/ 2-3" SPOONS + 1-2"

Drilling Area Background (ppm): 0.0

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

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: NSWC INDIAN HEAD
PROJECT NUMBER: N7129 CTO 245
DRILLING COMPANY: CHESAPEAKE GEOSYSTEMS
DRILLING RIG: HSA Truck Mount

BORING NUMBER: S57SB017
DATE: 8/23/01
GEOLOGIST: BOB BALKOVIC
DRILLER: AARON E.

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	MATERIAL DESCRIPTION: Color	MATERIAL DESCRIPTION: Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	1								0-5' @ 1245				
	2								S57SB01P02				
	3												
	4												
	5	1 / 2			LOOSE	LT-BROWN	CLAY W/SAND	CL	4-5' @ 1251	0.0			
S1 1250	6	1 / 2	15" / 2"		WET	YELLOW BR	T-GRAVEL	CL		0.0			
	7												
	8												
	9	8 / 9			V. STIFF	LT	SILTY CLAY W/	CL		0.0			
S2 1300	10	12 / 10	6" / 2"		MOIST	GRAY	T-GRAVEL		8-10 @ 1304	0.0			
	11												
	12												
	13												
	14												
	15	40 / 40			VERY DENSE	YELLOW	MED-COARSE SAND	GW		0.0			
S3 1310	16	50 / 13	15" / 15"		WET	LT GRAY	W/ SOME CLAY	↓	14-16 @ 1312	0.0			
	17												
	18												
	19	12 / 15			DENSE	YELLOW	CLAYEY, MED SAND	SC		0.0			
S4 1322	20	18 / 21	22" / 2"		WET	LT GRAY		SP	18-20 @ 1325	0.0			
							SEE S57 BORING						
							S57SB018 FOR						
							COMPLETE LITHOLOGY						

* 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: HSA TO 18' W/ 4 SPOONS

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

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: NSWC INDIAN HEAD
PROJECT NUMBER: N7129 CTO 245
DRILLING COMPANY: CHESAPEAKE GEOSYSTEMS
DRILLING RIG: HSA TRUCK MOUNT

BORING NUMBER: SS7SB018
DATE: 8/23/01
GEOLOGIST: BOB BALKOVEC
DRILLER: AARON E.

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**	Drillers' BZ**
	1	7 / 14			DENSE +	BROWN	SAND W/ GRAVEL	SM	0-5 @ 0930	0.0			
S1 0930	2	21 / 24	15" / 0"		SOFT	↓	F. ORGANICS	OL	SS7SS01801	0.0			
	3	6 / 8			STIFF	YELL BR	SILTY CLAY W/ GRAVEL	CL		0.0			
S2 0940	4	6 / 3	1" / 2"		↓	GR	↓	↓		0.0			
	5	3 / 2			STIFF	YELL BR	SILTY CLAY W/	CL	4-5 @ 0950	0.0			
3" S3 0946	6	6 / 7	1.5" / 2"		MOIST	BROWN	F. SAND + GRAVEL	SP		0.0			
	7	2 / 2			SOFT +	↓	SILTY CLAY	CL		0.0			
S4 0956	8	2 / 3	1" / 2"		MOIST	↓	F. SAND	↓		0.0			
	9	3 / 5				GRAY	SILTY/CLAYEY SAND	SC		0.0			
S5 1000	10	9 / 8	1" / 2"			↓	W/ F. GRAVEL	SM	8-10 @ 1001	0.0			
	11	6 / 8				BROWN	SILTY SAND W/	SM		0.0			
S6 1004	12	9 / 12	1" / 2"			YELL BR	F. GRAVEL	↓		0.0			
	13	6 / 9			DENSE		SAND + GRAVEL	GC		0.0			
S7 1013	14	40 / 50/3	1.5" / 2"				W/ SILTY + CLAY	CM		0.0			
	15	50/0		?			O RECOVERY		UNABLE TO SAMPLE	0.0			
3" S8 1018	16	0	0"						16-16'	0.0			
	17	12 / 21			DENSE	GRAY +	MED SAND W/	SP	HARD DRILLING @15'	0.0			
3" S9 1027	18	25 / 50/3	21" / 21"			YELL BR	F. SILTY + CLAY	SM	16-18 @ 1030	0.0			
	19	9 / 18			MED DENSE	↓	↓	↓		0.0			
S10 1037	20	16 / 17	20" / 2"			↓	↓	↓	18-20 @ 1035	0.0			
				T.D. 20'									

* When rock coring, enter rock brokeness.

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

Remarks: HSA-0 18' w/ 10 spoons 7-7" 3-3"

Drilling Area Background (ppm): 0.0

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

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME:	NSWC INDIAN HEAD	BORING NUMBER:	S57SB019
PROJECT NUMBER:	N7129 CTO 245	DATE:	8/23/01
DRILLING COMPANY:	CHESAPEAKE GEOSYSTEMS	GEOLOGIST:	BOB BALKOVEC
DRILLING RIG:	HSA TRUCK MOUNT	DRILLER:	AARON E

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**
	1	2 / 4				BROWN	SILT + SANDY GRAVEL	GM	0-.5 @ 1114	0.0			
-1 1112	2	5 / 5	1' / 2'			GRAY		GW		0.0			
	3												
	4												
	5	2 / 2			SOFT	YELLOW			4-5' @ 1120	0.0			
1119	6	1 / 3	1.5' / 2'		↓	LT. GRAY	SILTY CLAY	CL		0.0			
	7												
	8												
	9	3 / 50			V. DENSE	GRAY	CLAYEY SILT W/	ML		0.0			
S-3 1123	10	3	6" / 4"		↓	↓	T. GRAVEL		8-10' @ 1125	0.0			
	11												
	12												
	13												
	14												
	15	6 / 21			HARD +	YELLOW	GRAVEL W/ SOME	GC		0.0			
S-4 1139	16	21 / 40	4" / 2'		WET	LT. GRAY	CLAY + SAND	↓	14-16' @ 1142	0.0			
	17												
	18												
	19	8 / 16			DENSE -	LT. GRAY	MED SAND W/	SP		0.0			
S-5 1152	20	21 / 25	20" / 2'		WET	YELLOW	T-CLAY + SILT	↓	18-20 @ 1155	0.0			
						&	SEE S57SB018 FOR						
							COMPLETE LITHOLOGY						

* 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 __X__ Well I.D. #: ______

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: NSWC INDIAN HEAD
PROJECT NUMBER: N7129 CTO 245
DRILLING COMPANY: CHESAPEAKE BIOSYSTEMS
DRILLING RIG: DPT 420 RIG

BORING NUMBER: SS7SB20
DATE: 8/15/01
GEOLOGIST: B. BALKOVEC
DRILLER: AARON E

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	MATERIAL DESCRIPTION: Color	MATERIAL DESCRIPTION: Material Classification	USCS*	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	1								0-.5' @ 0826	0.0	0.0		
	2									0.0			
	3												
	4		3.5' / 4'									0.0	0.0
	5								4.5' @ 0824				
	6												
	7												
	8		3.5' / 4'									0.0	0.0

* 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): 0.0

Remarks:

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

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: NSWC INDIAN HEAD
PROJECT NUMBER: N7129 CTO 245
DRILLING COMPANY: CHESAPEAKE GEOSYSTEMS
DRILLING RIG: DPT. ATV R67

BORING NUMBER: S57SB24
DATE: 8/14/01
GEOLOGIST: BOB BALKOVEC
DRILLER: BUD SEILER + BRIAN VANDORN

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**
	1					BLK	TOP 3" CINDERS + ASPHALT	GW	0.5' @ 1642	0.0	0.0		
	2					LT BR	33" SILTY CLAY + GRAVEL	GC					
	3							GC					
S-1 1640	4		3' / 4'									0.0	0.0
	5					LT BR	TOP 6" SILTY CLAY + T.		4-5 @ 1648	36.1			
	6						GRAVEL			27.2			
	7					LT. BR	BOTT 3' SILTY CLAY	CL		19.4			
S-2 1646	8		3.5' / 4'			GRAY				102.			
	9						2' SILTY CLAY			81.3			
	10								8-10 @ 1700	47.3			
	11								FIELD DUP	29.1			
S-3 1655	12		3.5' / 4'			[illegible]	SAND + GRAVEL	GW	REFUSAL @ 13' w/DPT	30.2		0.0	0.0
	13	7 / 50								0.0			
S-4 1458	14	9	4" / 4"						UNABLE TO SAMPLE	0.0			
	15	8 / 10				GRAY	MED-COARSE SAND	SW	12-14'	0.0			
S-5 1510	16	18 / 24	19" / 2'			YELL BR	T- GRAVEL		14-16' @ 1515	0.0			
	17	9 / 18					FINE-MED SAND	SP		0.0			
S-6 1520	18	18 / 15	1' / 2'				T-SILT			0.0			
	19	14 / 12								0.0			
S-7 [illegible]	20	1 / 10	1.5' / 2'						18'-20' 1530	0.0			
				T.D. 20'									

* 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 X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: NSWC INDIAN HEAD
PROJECT NUMBER: N7129 CTO 245
DRILLING COMPANY: CHESAPEAKE GEOSYSTEMS
DRILLING RIG: DPT. ATV R67 + HSA

BORING NUMBER: S57SB22
DATE: 8/14/01
GEOLOGIST: BOB BALKOVEC
DRILLER: BUD SAZLER / BRIAN VAN DORN

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**
	1					BLK	TOP 3" BLACK CINDERS + ASPHALT	GW		20.6	0.0		
	2					LT	BOTT 2'9" SILTY CLAY	CL	0.5' @ 1349	4.4			
	3					BR	W/ T-COARSE SAND			0.0			
S-1 1347	4		4'						4-5' @ 1400	0.0		1.4	0.0
	5						TOP 6"			0.0			
	6				SOFT-WET		BOTT 21" SILTY CLAY		MOIST @ 6'	0.0			
	7									0.0			
S-2 1350	8		27" / 4'						8-10 @ 1410	0.0		0.0	0.0
	9				WET	LT	SAND + GRAVEL	GW		0.0			
	10					BR	T-CLAY			0.0			
	11					+ WHITE				0.0			
S-3 1355	12		23" / 4'							0.0			
	13						TOP 4" SAND + GRAVEL			0.0			
	14					BR +			12-14 @ 1420	0.0			
	15					LT	M. SAND	SP		0.0			
S-4 1415	16		3' / 4'			GRAY			REFUSAL @ 17' W/ DPT	0.0			
	17	12 / 9				LT. GRAY	TOP 6" SAND + GRAVEL	GW	S-5 COLLECTED W/	0.0			
8/15/01 HSA S-5 1408	18	16 / 24	2' / 2'			+ BROWN	BOTT 1.5' MED SAND	SP	SPLIT SPOON	0.0			
	19	12 / 17				LT GRAY	TOP 7"	SP		0.0			
S-6 1415	20	19 / 21	20" / 2'			GRAY	SANDY SILT T-CLAY	ML	18-20 @ 1420	0.0			
				T.D. 20'			DPT'D TO 16' (REFUSAL @ 17')						
							HSA TO 18' SPOONED TO 20'						

* 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: DPT TO 17' HAD REFUSAL
HSA FROM 16'-18' SPOONED 16-20'

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

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: NSWC INDIAN HEAD
PROJECT NUMBER: N7129 CTO 245
DRILLING COMPANY: Chesapeake Geosystems
DRILLING RIG: [illegible] RG7

BORING NUMBER: S57SB23
DATE: 8/14/01
GEOLOGIST: Bob Balkovec
DRILLER: Bud Sazier

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**
	1					Blk	Clay, Some Sand &	GC	0-.5 @ 1600	0.0	0.0		0.0
	2					Gray	Gravel						
	3												
S-1 1557	4		40" / 4'										
	5					Lt.	Silty Clay w/	GC	Reddish	0.0		0.0	0.0
	6					Br	T. Coarse Sand & Gravel		4-5' @ 1605				
	7												
S-2 1603	8		2' / 4'										
	9				Soft	Gray	Clay w/ Some Silt	CL		0.0			
	10								8-10' @ 1612				
	11					Gray	Coarse Sand & Gravel	GW					
S-3 1610	12		33" / 4'			White							
	13						Top 1' Coarse Sand & Gravel T. Clay			0.0		0.0	0.0
S-4 1620	14		1.5' / 2'			Gr-Lt Br	Bott 6" Med Sand	SP	12-14' @ 1625				
				T.D. 14'									

* 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):

Remarks:

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

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: NSWC INDIAN HEAD
PROJECT NUMBER: N7129 CTO 245
DRILLING COMPANY: CHESAPEAKE GEOSYSTEMS
DRILLING RIG: D.P.T ATV RG7

BORING NUMBER: S57SB024
DATE: 8/15/01
GEOLOGIST: Bob Balkovec
DRILLER: Aaron E.

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**
	1					LT	TOP 18" SAND + GRAVEL	GW	0-.5' @ 0910	11.2			
	2					BR	T- SILT + CLAY	↓		10.1			
	3					LT	ROOT 8" SILTY CLAY W/	CL		7.0			
S-1 0905	4		39" / 4'			BR	T- GRAVEL	↓		4.1			
	5						SILTY CLAY W/ GRAVEL	GC	4-5' @ 0920	0.0			
	6						↓			↓			
	7												
S-2 0915	8		[illegible] / 4'			↓	↓	↓		↓			
	9					LT	SAND + GRAVEL	GW		0.0			
	10					BR	T- CLAY		8-10' @ 0930				
	11												
S-3 0925	12		2'4" / 4'			↓		↓	S-4 0' RECOVERY W/	↓			
	13	3 / 1				LT	SAND + GRAVEL	GW	DPT TRY SPLIT SPOON				
S-4 1613	14	2 / 1	1" / 2'			BR	T- CLAY		UNABLE TO SAMPLE				
		2 / 2							12'-14'				
S-5 1620	16	1 / 1	1" / 2'			↓	↓	↓	OR 14'-16'				
				TD 16'									

* 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: DPT TO 16' 0 RECOVERY 12'-16'
HSA TO 12 SPOON 12-14 1" RECOVERY
HSA TO 14 SPOON 14-16' 1" RECOVERY

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

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: NSWC INDIAN HEAD
PROJECT NUMBER: N7129 CTO 245
DRILLING COMPANY: CHESAPEAKE GEOSYSTEMS
DRILLING RIG: D.P.T. ATV RG7

BORING NUMBER: S57SB025
DATE: 8/15/01
GEOLOGIST: BOB BALKOVEC
DRILLER: AARON E

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**
	1					BLK	TOP 4" ASPHALT	GW	0.5' @ 0945	71.2	0.0		
	2					[illegible]	BOTT [illegible] SILTY SAND +	GM		0.0			
	3					BROWN	GRAVEL			0.0			
S-1 0942	4		3' / 4'				↓	↓		0.0		0.0	0.0
	5						F SAND W/ SOME CLAY	SP	4.5' @ 0955	0.0			
	6												
	7												
S-2 [illegible]	8		1[illegible]" / [illegible]			↓	↓	↓		↓			
	9					GRAY	SILTY CLAY W/	CL		0.0			
	10						SAND + GRAVEL		8-10' @ 1000				
	11												
S-3 [illegible]	12		15" / 4"			↓	↓			↓		0.0	0.0
	13				VERY		SILTY CLAY W/ F SAND		V. WET	0.0			
S-4 [illegible]	14		2' / 2'		SOFT	↓	+ T- GRAVEL	↓	12-14' @ 1007	↓	↓		
				TD [illegible]									

* 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 X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: NSWC INDIAN HEAD
PROJECT NUMBER: N7129 CTO 245
DRILLING COMPANY: CHESAPEAKE BIOSYSTEMS
DRILLING RIG: D.P.T. ATV R67

BORING NUMBER: SS7SB026
DATE: 2/15/01
GEOLOGIST: BOB BALKOVEC
DRILLER: ARMAND E

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**
	1					REDDISH	CLAYEY SAND + GRAVEL	GC		2.0	0.0		
	2					BROWN							
	3												
S4 1120	4		18" 4'									0.0	2.0
	5									0.0			
	6												
	7								RED BRICK FRAG				
S-2 1124	8		1' 4'				PLUG OF GRAVEL TO TOP OF SAMPLE		FOR RECOVERY				
S-3 1133	9		1' 4'			LIGHT BROWN	CLAY w/ SAND + GRAVEL		8-9' @ 1135	0.0	0.0		
				T.D. 9'									

* 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): ____

Remarks: ____

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

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: NSWC INDIAN HEAD
PROJECT NUMBER: N7129 CTO 245
DRILLING COMPANY: CHESAPEAKE GEOSYSTEMS
DRILLING RIG: HSA TRUCK MOUNT

BORING NUMBER: S57SB027
DATE: 8/2/01
GEOLOGIST: BOB BALKOVEC
DRILLER: AARON E

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**
	1	2 / 6				BR	SANDY SILT W/ T-CLAY	GM / ML	0-.5 @ 1112	0.0			
S-1 1110	2	8 / 7	1' / 2'			↓	- GRAVEL						
	3	2 / 9											
S-2 1112	4	4 / 4	14" / 2'			↓	↓	↓		↓			
	5	1 / 2			V. SOFT	GRAY	SILTY CLAY W/		4.5 @ 1125	0.0			
S-3 1122	6	1 / 2	20" / 2'		+ WET	↓	T-GRAVEL			0.0			
	7	5 / 9			V. STIFF	GRAY	SILTY CLAY	CL		0.0			
S-4 1129	8	15 / 11	22" / 2'		+ SL. MOIST	↓				0.0			
	9	6 / 6			V. STIFF	LT GRAY	SILTY CLAY			0.0			
S-5 1134	10	10 / 13	20" / 2'		+ SL MOIST	YELLOW	MOTTLED		8-10' @ 1136	0.0			
	11	4 / [illegible]			V. STIFF	LT GRAY	TOP 17" SILTY CLAY	↓		0.0			
S-6 1145	12	15 / 18	20" / 2'		↓	YELL OR	DOTT. 5" SANDY SILT	ML		0.0			
	13	5 / 13			DENSE +		V.F. SAND, SILTY			0.0			
S-7 1152	14	19 / 23	22" / 2'		SL. DRY	↓	↓	↓	12-14 @ 1155	0.0			
	15	8 / 13					V.F. SAND SILTY	ML		0.0			
S-8 1200	16	19 / 23	21" / 2'		↓		↓	SP		0.0			
	17	10 / 13			DENSE		CLAYEY F. SAND / SILT	SC		0.0			
S-9 1213	18	14 / 31	2' / 2'		↓	↓		ML	16-18 @ 1215	0.0			
	19	2 / 6			DENSE	LT. GRAY	MED. SAND	SP	V. WET	0.0			
S-10 1300	20	19 / 20	2' / 2'		+ WET	↓	↓			0.0			
	21	16 / 26			V. DENSE	LT GRAY	MED SAND			0.0			
S-11 1318	22	18 / 35	20" / 2'		↓	YELL OR		↓		0.0			
	23	5 / 4			DENSE +					0.0			
S-12 1327	24	12 / 28	20" / 2'		WET	↓	↓	↓		0.0			
	25	13 / 20					MED SAND						

* When rock coring, enter rock brokeness.

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

Remarks: HSA TO 30' SPOONS 15

Drilling Area Background (ppm): 0.0

Converted to Well: Yes X No ____ Well I.D. #: S57TW015

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: NSWC INDIAN HEAD
PROJECT NUMBER: N7129 CTO 245
DRILLING COMPANY: CHESAPEAKE GEOSYSTEMS
DRILLING RIG: HSA TRUCK MOUNT

BORING NUMBER: S57SB027
DATE: 8/21/01
GEOLOGIST: BOB BALMORE
DRILLER: AARON E.

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**
S-13 1345	26	24 / 41	15" / 2'			LT GRAY	FINE SAND TO SILTY FINE SAND	SM		0.0			
	27	10 / 9					TOP 6" SILTY FINE SAND			0.0			
S-14 1400	28	8 / 17	22" / 2'				BOTT 16" = SANDY SILT	ML		0.0			
	29	7 / 12					TOP 4" FINE SANDY SILT			0.0			
S-15 1435	30	21 / 17	20" / 2'			GRAYISH BROWN	BOTT 18" SANDY SILT + CLAY	CL		0.0			
				TD 30'									
							INSTALLED S57TW015 8/21/01						
							@ 30' TD						
							SCREENED FROM 25-30						
							SAND TO 17'						
							BENT TO SURFACE						
							1" WELL 8" BOREHOLE						
							INSTALLED S57TW014 8/21/01						
							@ 9'						
							SCREENED FROM 4-9'						
							SAND TO						
							BENT TO						

* 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 X No ____ Well I.D. #: S57TW015

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: NSWC INDIAN HEAD
PROJECT NUMBER: N7129 CTO 245
DRILLING COMPANY: CHESAPEAKE
DRILLING RIG: HSA TRUCK MOUNT

BORING NUMBER: S57SB028
DATE: 8/16/01
GEOLOGIST: BOB BALKOVEC
DRILLER: BRIAN VAN DORN

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**
	1	3 / 3			M. STIFF	[illegible]	SILTY CLAY	CL	0-.5' @ 1047	0.0	0.0		
S-1 1045	2	5 / 9	1" / 2"		↓	[illegible]	↓	↓		0.0			
	3	7 / 6			M. DENSE	[illegible]	F. SAND T-SILT	SP		0.0			
S-2 1050	4	8 / 7	1.5" / 2"		↓	[illegible]				0.0			
	5	6 / 8			[illegible]	[illegible]			4-5' @ 1057	0.0			
S-3 1056	6	9 / 10	20" / 2"		[illegible]	↓	↓	↓	S57SBDUP02	0.0			
	7	15 /			[illegible]		F. SAND T-SILT	SP		0.0			
S-4 1104	8	[illegible] / 14	21" / 2"		[illegible] WET	↓		↓		0.0		[illegible]	[illegible]
	9	7 / 12				LT	MED. SAND	SP		0.0			
S-5 1110	10	17 / 20	20" / 2"			GRAY		↓		0.0			
	11	18 / 17			DENSE	[illegible]	FINE - MED. SAND	SP		0.0			
S-6 1120	12	16 / 21	22" / 2"		↓	[illegible]	↓	↓	10-12 @ 1121	0.0			
	13	3 / 18			DENSE	GRAY	MED - SAND	SP	[illegible]	0.0			
S-7 1125	14	23 / 24	2" / 2"		↓	↓	↓	↓	[illegible] @ 1127	0.0			
	15	12 / 20			DENSE					0.0			
S-8 1132	16	20 / 20	20" / 2"		↓	↓	↓	↓		0.0			
	17	13 / 19			DENSE /		MED. SAND	SP		0.0			
S-9 1140	18	25 / 4/5	23" / 2"		V. DENSE	↓	↓	↓		0.0			
	19	10 / 18			DENSE	GRAY BRN	TOP 5" MED SAND	SP	WET	0.0			
S-10 1148	20	17 / 16	20" / 2"		↓	↓	[illegible] 15" FINE [illegible]	ML	18-20 @ 1150	0.0		[illegible]	[illegible]
	21	7 / 7			V. STIFF	GRAY	F. SANDY SILT	ML	S57SBDUP03	0.0			
S-11 1154	22	11 / 14	15" / 2"		↓	BR		↓	MOIST	0.0			
	23	7 / 7			V. STIFF	LT	F. SANDY CLAY		DRY SPOON	0.0			
S-12 1204	24	9 / 10	23" / 2"		↓	BR	↓			0.0			
	25	6 / 12			V. STIFF	[illegible]	F. SANDY CLAY			0.0	↓		

* 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): 0.0

Remarks:

Converted to Well: Yes X No ____ Well I.D. #: S57TW017

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: NSWC INDIAN HEAD
PROJECT NUMBER: N7129 CTO 245
DRILLING COMPANY: CHESAPEAKE GEOSYSTEMS
DRILLING RIG: HSA TRUCK MOUNT

BORING NUMBER: S57SB028
DATE: 8/16/01
GEOLOGIST: BOB BALKOVIC
DRILLER: BRIAN VAN DORN

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**
S-13 1214	26	14 / 14	2" / 2"		V. STIFF	[illegible]	F-SANDY CLAY	CL		00	00		
				TD: 26'									
							INSTALLED TW @ 23'		8/16/01				
							SCREENED FROM 13'-23'						
							1" WELL, SAND TO 12'						
							BENTONITE TO SURFACE						
							8" BOREHOLE						
							OFFSET ' AND INSTALLED		8/17/01				
							A TW @ 10'						
							SCREENED FROM 5'-10'						
							1" WELL, SAND TO						
							BENTONITE TO SURFACE						
							8" BOREHOLE						

* 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): 00

Remarks: TW @ 23'
TW @ 10'

Converted to Well: Yes X No ____ Well I.D. #: S57TW017

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: NSWC INDIAN HEAD
PROJECT NUMBER: N7129 CTO 245
DRILLING COMPANY: Chesapeake Geosystems
DRILLING RIG: HSA
BORING NUMBER: S57SB029
DATE: 8/17/01
GEOLOGIST: Jennifer Wellman
DRILLER: Brian Van Dorn

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*	Drillers BZ**
	1	5/15					top 4" asphalt						
S-1	2	15/	17"/2'		loose Sand	Lt. brown	silty-sand w/gravel	GM		0	0		
	3	11/13			medium dense sand	yellow orange	clay-silt w/gravel	CC					
S-2	4	12/13	16"/2'							0	0		
	5	8/9			loose Sand	light brown	fine sand-silt w/gravel trace clay	GM					
	6	10/8	16"/2							0	0		
	7	5/10			Loose / Med Sand	reddish brown	silty clay w/ gravel and sand	CC		0	0		
	8	15/9	11'/2"										
	9	5/8											
	10	20/15	15"/2"		dense sand	reddish brown	silty clay w/gravel & sand	CC		0	0		
	11	1/1			very loose sand	olive gray	very loose sand						
	12	1/1	10"/2"				clayey-silt w/ trace sand	ML					
	13	28/15			med. dense sand	olive gray	silty-sand w/gravel		very loose gravel sand-	0	0		
	14	10/8	0/2"					GM					
	15	6/16			very dense sand		medium-fine sand-			0	0		
	16	20/31	18"/2"					SP					
	17	2/8			Dense sand	lt. brown	medium-coarse sand			0	0		
	18	17/26	23"/2"				w/ traces clay	SP					
	19	18/20			very dense sand	lt gray	silty-medium to fine sand			0	0		
	20	35/35	19"/2"					SP					
	21	7/7			Dense sand	yellow-brown	silty sand						
	22	12/20	17'/2'					SM					
	23	5/8			Medium Dense sand	green gray	top 14 inches clayey sand						
	24	12/15	23"/2'				grading into a sandy-clay	SC					
	25							ML					

* 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 X No

Well I.D. #: S57TW019

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: NSWC INDIAN HEAD
PROJECT NUMBER: N7129 CTO 245
DRILLING COMPANY: Chesapeake Geosystems
DRILLING RIG:

BORING NUMBER: SS7SB029
DATE: 8/17/01
GEOLOGIST:
DRILLER: Brian VanDorn

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	MATERIAL DESCRIPTION: Color	MATERIAL DESCRIPTION: Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	25	7/13			Dense	green-brown	Sandy-clay						
	26	20/22	24"/2'		sand	mottle		CL					
	27												
	28		2'										
	29												
	30		3'										

* 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): [ ]

Remarks:

Converted to Well: Yes X No

Well I.D. #: SS7TW019

Tetra Tech NUS, Inc.

BORING LOG

Page ___ of ___

PROJECT NAME: NSWC INDIAN HEAD
PROJECT NUMBER: N7129 CTO 245
DRILLING COMPANY: CHESAPEAKE
DRILLING RIG: MOBILE RIG B-61

BORING NUMBER: SS7SB30
DATE: 8-24-01
GEOLOGIST: FRED W RAMSER
DRILLER: ARRON E.

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**	Drillers BZ**
S-1 955		6/12			STIFF		YEL BRN CLAY + SILT TR	ML	DRY TR ROOT [illegible]	90			
	2	3/4	1.5/2.0				F-g SAND MOTTLED		TR GRAVEL				
S-2 1000		8/16			MED DENSE		SILT + F-g SAND TR CLAY	SC	MOIST	12			
	4	9/12	2.0/2.0				MOTTLED YEL BRN						
S-3 1005		7/7					AS ABOVE	SC	MOIST	10	0	0	0
	6	9/12	2.0/2.0				TR M-g SAND		SS7SB30 0103 4-6'				
S-4 1010		1/5			V FEW STIFF		PALE YEL BRN	CL	MOIST	10	0	0	0
	8	6/10	2.0/2.0				SANDY CLAY TR SILT		TR GRAVEL WEATHERED ROOTS				
S-5 1015		4/9			MED DENSE		f-g SAND + SILT TR CLAY	SM	3" SPOON BARREL COLLECTED	2	0	0	0
	10	12/24	2.0/2.0				↓		SS7SB30 0103 8-10				
S-6 1022		12/[illegible]			MED DENSE		YEL-ORG BRN MOTTLED	SP	LNF —	0	0	0	0
	12	13/14	2.0/2.0		↓		↓ SAND TR GRAVEL + SILT						
S-7 1025		10/[illegible]					SAND		[illegible]				
	14	[illegible]/37	0.5/2.0						WOOD IN SAND				
S-8 1045		8/9			MED DENSE		GREY SAND F-g	SP	COLLECTED SS7SB30 0303 14-16	0			
	16	12/21	2.0/2.0				TR F g						
S-9 1054		12/12					AS ABOVE						
	18	12/24	2.0/2.0										
1100 S-10		10/10					AS ABOVE						
	20	24/[illegible]	2.0/2.0										
1111 S-11		4/4			MED STIFF		OLIVE GREY CLAY + SILT	CL	MOTTLED ORG	0			
	22	7/8	2.0/2.0						PLASTIC CONFINING LAYER				
S-12 1145		12/13			STIFF		OLIVE GREY CLAY		3" SPLIT SPOON COLLECTED				
	24	15/20	2.0/2.0				↓		SS7SB30 0403 22-24				

* 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): ____

Remarks: 2" SPLIT SPOONS x (10)
3" SPLIT SPOONS x (2)

Converted to Well: Yes ____ No X Well I.D. #: SS7SB30

Tetra Tech NUS, Inc.

BORING LOG

Page ___ of ___

PROJECT NAME: NSWC INDIAN HEAD
PROJECT NUMBER: N7129 CTO 245
DRILLING COMPANY: CHESAPEAKE GEO SYSTEMS
DRILLING RIG:

BORING NUMBER: S57SB31
DATE: 8-24-01
GEOLOGIST: FRED WRAMSER
DRILLER: ARRON E.

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**
S-1 800		9/6					NO RECOVERY						
	2	9/9	0.0/2.0										
S-2 805		3/3			LOOSE	YEL BRN	MED TO COARSE SAND TR GRA. TR SILT	SP		0	0	0	0
	4	3/2	1.0/2.0										
S-3 [illegible]		1/1			VERY SOFT/		DARK YEL BRN MED SAND	SP	SATURATED				
	6	1/1	[illegible]		LOOSE		W/TRACE SILT + CLAY [illegible]		COLLECTED S57SB0310103				
S-4 812		WOH			?		NO RECOVER						
	8	1/1	0.0/2.0		↓		NO RECOVERY						
S-5 818		3/6			MED DENSE		PALE YEL BROWN SILTY F-g SAND	SP	3" SPOON COLLECTED				
	10	8/12	2.0/2.0		↓		TR GRA		S57SB0310203				
S-6 824		14/16					NO RECOVERY						
	12	20/47	0.0/2.0				YEL BROWN SAND		[illegible]				
S-7 831		11/9			MED DENSE		YEL BROWN SAND	SP					
	14	9/9	0.8/2.0										
S-8 840		11/21			MED DENSE		LT YEL BROWN SAND MOTTLED 1" SILT @ 15'	SP	COLLECTED S57SB0310303				
	16	24/28	2.0/2.0				↓						
S-9 855		6/9			LOOSE		YEL BRN SAND						
	18	18/19	2.0/2.0		MED STIFF		MOTTLED BRN GREY YEL BRN SILT + CLAY TR [illegible]	ML	MED PLASTIC				
S-10 900		1/10					LT BRN [illegible] CLAY TR SILT GRADED DOWN TO SILTY		3" SPOON, GOOD CONE LAYER				
	20	10/12	1.5/2.0				f.g. SAND @ 19.5'		COLLECTED S57SB0310403				
									FOR CHIEF + GEO TECH				

* 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): ____

Remarks: 2 x 3" DIA SPLIT SPOONS
8 x 2" DIA SPLIT SPOONS

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

Tetra Tech NUS, Inc.

BORING LOG

Page ___ of ___

PROJECT NAME: NSWC INDIAN HEAD
PROJECT NUMBER: N7129 CTO 245
DRILLING COMPANY: CHESAPEAKE
DRILLING RIG: MOBILE B-61

BORING NUMBER: S57SB32
DATE: 8-24-01
GEOLOGIST: FREDWRAMSEY
DRILLER: ARRON E

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**
							DK BRN SAND + GRAVEL		ROOT MASS				
	2						TAN BROWN SAND - GRAVEL		↓				
					LOOSE		GREY SAND		WET	2	0	0	0
	4						↓		AUGERED TO 4'				
S-1 1300		2/2			?		NO RECOVERY		SATURATED SPOON	5	0	0	0
	6	2/2	2.5		?								
1305 S-2		1/2			SOFT		MOTTLED YEL BRN + GREY SILT + CLAY	ML	S57SB32-0103	4	0	0	6
	8	4/7	1.5/2.0										
1315 S-3		5/5			STIFF		MOTTLED YEL BRN	CL	3" SPOON	0	0	0	0
	10	7/8	2.0/2.0				GREY CLAY & SILT		S57SB32-0305				
S-4 1325		2/2			MED STIFF		AS ABOVE			0	0	0	0
	12	4/6	0.0/2.0										
S-5 1335		4/7			STIFF		MOTTLED CLAY MARSH YEL BRN	CL		0	0	0	0
	14	5/7	0.5/										
S-6 1335		2/2			SOFT		AS ABOVE		COLLECTED S57SB32-0303	0	0	0	0
	16	2/2	1.5/2.0				TRACE SAND						
S-7 1345		2/3			STIFF					0	0	0	0
	18	7/8	0.5/2.0										
1345		2/4			STIFF		AS ABOVE		COLLECTED	0	0	0	0
	20	6/12	1.0/2.0				TRACE SAND & GRAVEL		S57SB32-0405				
									3" SPLIT SPOON				
	22												

* 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): ____

Remarks: 2 x 3" SPLIT SPOONS
6 x 2" SPLIT SPOONS

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

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: NSWC INDIAN HEAD
PROJECT NUMBER: N7129 CTO 245
DRILLING COMPANY: CHESAPEAKE GEOSYSTEMS
DRILLING RIG: HSA TRUCK MOUNT

BORING NUMBER: SS7MW020
DATE: 8/22/01
GEOLOGIST: BOB BALKOVIC
DRILLER: AARONE

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**
	1	20/8					2" TOP SOIL + ROCK			0.0			
S-1 1128	2	0/0	2"/2							0.0			
	3	/.					0 RECOVERY						
S2 1124	4	/.	0/8"							0.0			
	5	1/1			V. SOFT + WET	OLIVE GRAY	CLAYEY SILT W/	ML		0.0			
S3 1127	6	1/1	5"/6"		WET	GRAY	SOME ROOTS			0.0			
	7	1/1					CLAYEY SILT W/			0.0			
S-4 1130	8	2/2	18"/		↓	↓	TRACE SAND	↓		0.0			
	9	1/1			V. SOFT + WET	OLIVE GRAY	TOP 3" CLAYEY SILT	ML	VERY WET @ 9'	0.0			
S-5 1133	10	1/4	8"/		LOOSE	LT GRAY	BOTTOM 5" MED SAND	SP		0.0			
	11	22/26			V. DENSE		4" MED-F SAND	SP		0.0			
S-6 1139	12	25/36	4"/		+ WET	↓	↓	↓		0.0			
	13	8/10			M. DENSE + WET	LIGHT YELLOW	TOP 1' MED SAND	SP		0.0			
S-7 1149	14	12/8	18"/6"		V. STIFF MOIST	ORANGE	SILTY CLAY (CONFINING LAYER)	CL	HIGH PLASTICITY	0.0			
				T.D. 14'									
							INSTALLED WELL						
							T.D. 14'						
							SCREENED FROM 4-14'						
							SAND TO 3'						
							BENT TO 1'						
							2" WELL						
							9" BOREHOLE						

* 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): [ ]

Remarks: _____

Converted to Well: Yes X No _____ Well I.D. #: SS7MW020

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: NSWC INDIAN HEAD
PROJECT NUMBER: N7129 CTO 245
DRILLING COMPANY: CHESAPEAKE GEOSYSTEMS
DRILLING RIG: HSA TRUCK MOUNT

BORING NUMBER: S57TW021
DATE: 8/20/01
GEOLOGIST: BOB BALKOVEC
DRILLER: AARON E.

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**
	1	2 / 5			M. DENSE	BLK	TOP 7" TOP SOIL			0.0	0.0		
S-1 1539	2	6 / 14	14" / 2'		+ DRY	YELL OR	BOTT 7" F-SAND + GRAVEL	GW		0.0			
	3	18 / 21			V DENSE	↓	↓	↓		0.0			
S-2 1543	4	25 / 32 / 5	15" / 23"		+ DRY	↓	↓	↓		0.0			
	5	15 / 22			↓	↓	↓	↓		0.0			
S-3 1553	6	43 / 25	13" / 2'		↓	↓	↓	↓		0.0			
	7	18 / [illegible]			DENSE +	YELL OR	F-M SAND W/ SOME SILT	SM	WET @ 7'	0.0			
S-4 1605	8	[illegible] / [illegible]	14" / 2'		WET	LT GRAY	+ T-GRAVEL	↓		0.0			
	9	13 / 8			M. DENSE	↓	MED-SAND W/ T-SILT	SP		0.0			
S-5 1610	10	11 / 14	16" / 2'		+ WET	↓	+ T-GRAVEL	↓		0.0		0.0	0.0
	11	8 / 19			V. DENSE	YELL OR	MED SAND	SP		0.0			
S-6 1615	12	23 / 29	17" / 2'		+ WET	LT GRAY + RED	W/ CLAYBALL	↓		0.0			
	13	11 / 6			M. DENSE	LT GRAY	TOP 8" MED SAND	SP		0.0			
S-7 1625	14	[illegible] / 14	20" / 2'		M DENSE	YELL OR	BOTT 1' CLAYEY SAND	SC		0.0			
	15	7 / 12			M. DENSE	YELL OR	TOP 16" CLAYEY SAND	↓		0.0			
S-8 1637	16	15 / 15	2' / 2'		HARD	YELL GRAY	BOTT 8" CLAY T-SAND	CL	CONFINING LAYER?	0.0			
	17	1 / 1			HARD	↓	TOP 4" ↓ (FINE SAND)	CL	CLAY LENSE	0.0			
S-9 1648	18	14 / 20	2' / 2'		DENSE	LT GRAY	BOTT 20" MED SAND	SP	VERY WET.	0.0			
	19	2 / 10			DENSE +	↓	TOP 16" MED SAND	↓		0.0			
S-10 1656	20	12 / 24	2' / 2'		V-WET	↓	BOTT 8" FINE SAND	↓	DECREASE IN GRAIN SIZE	0.0		0.0	0.0
	21	14 / 16			DENSE +	LT	FINE SAND	SP		0.0			
S-11 1707	22	19 / 30	20" / 2'		WET	GRAY	↓	↓		0.0			
	23	6 / 6			V-DENSE	↓	TOP 20" F. SAND	SP		0.0			
S-12 1722	24	31 / 50	2' / 2'		↓	YELL OR	BOTT 4" MED SAND	↓	COARSER GRAINS	0.0	↓		
	25			TD 25'			& SPLIT SPOON STUCK IN AUGERS						

* 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): 00

Remarks:

Converted to Well: Yes X No ____ Well I.D. #: S57TW021

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: NSWC INDIAN HEAD
PROJECT NUMBER: N7129 CTO 245
DRILLING COMPANY: CHESAPEAKE GEOSYSTEMS
DRILLING RIG: HSA TRUCK MOUNT

BORING NUMBER: S57TW021
DATE: 8/20/01
GEOLOGIST: BOB BALLOUVE
DRILLER: AARON E.

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	MATERIAL DESCRIPTION: Color	MATERIAL DESCRIPTION: Material Classification	USCS *	PID/FID Reading (ppm): Remarks	PID/FID Reading (ppm): Sample	PID/FID Reading (ppm): Sampler BZ	PID/FID Reading (ppm): Borehole**	PID/FID Reading (ppm): Driller BZ**
S13 1758	26		0 / 2'				0 RECOVERY V. TZUM FORMATION						
	27												
S.14	28		2'										

* 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): [ ]

Remarks: HSA TO 25' SPOONED TO 26'

Converted to Well: Yes X No _____ Well I.D. #: S57TW021

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: NSWC INDIAN HEAD
PROJECT NUMBER: N7129 CTO 245
DRILLING COMPANY: CHESAPEAKE BIOSYSTEMS
DRILLING RIG: HSA TRUCK MOUNT

BORING NUMBER: S57MW022
DATE: 8/22/01
GEOLOGIST: BOB BALDOVEZ
DRILLER: AARON E.

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**
	1						TOPSOIL W/ ORGANICS	TOPSOIL		0.0			
	2									0.0			
	3									0.0			
	4									0.0			
	5									0.0			
	6									0.0			
	7						CLAY W/ TRACE GRAVEL	CL		0.0			
	8									0.0			
	9									0.0			
	10									0.0			
	11						CLAY W/ TRACE ORGANICS	OH		0.0			
	12									0.0			
	13						TOP 15" CLAY W/ ORG	OH		0.0			
S57 1002	14						BOTTOM F. SAND W/ WOOD FIBERS	SP		0.0			
				14' TD.			+ CLAY	SC					
							INSTALLED WELL						
							TO 14'						
							SAND TO 3'						
							BENT TO 1'						

* 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 X No _____ Well I.D. #: S57MW022

Tetra Tech NUS, Inc.

BORING LOG

Page 1 of 1

PROJECT NAME: NSWC INDIAN HEAD
PROJECT NUMBER: N7129 CTO 245
DRILLING COMPANY: CHESAPEAKE GEOSYSTEMS
DRILLING RIG: HSA TRUCK MOUNT

BORING NUMBER: S57SB033/MW033
DATE: 8/22/01
GEOLOGIST: BOB BALKOVEC
DRILLER: AARON E

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**
	1	5/10			V. DENSE	YELL OR	SAND + GRAVEL [illegible]	GM		0.0	0.0		
S-1 1425	2	18/20	10" / 2'		↓	↓	↓	↓		0.0			
	3	20/47			V. DENSE	YELL OR	TOP 15" SAND + GRAVEL	GW		0.0			
S-2 1430	4	25/16	17" / 2'		HARD	YELLOW BROWN	BOT 7" CLAY (MOTTLED)	CL		0.0			
	5	10/12			V. STIFF	YELL OR	TOP 6" SILTY CLAY	CL		0.0			
S-3 1434	6	13/16	20" / 2'		↓		BOT 14" CLAYEY SILT	ML		0.0		0.0	0.0
	7	2/4			SOFT	LT BRN	SILT + CLAY	CL	SAMPLE 7'	0.0			
S-4 1439	8	10/8	18" / 2'		V. STIFF	↓	SILT + CLAY	ML	MOIST	0.0			
	9	3/5			V. STIFF ↓	LT GRAY	SILTY CLAY	CL		0.0			
S-5 1445	10	9/11	2' / 2'		MOIST	YELLOW	↓	↓		0.0			
	11	8/15			DENSE ↓	↓	F. MED SAND	SP		0.0			
S-6 1450	12	14/20	20" / 2'		MOIST	↓		↓	10-12 @ 1457	0.0			
	13	8/16			DENSE ↓	GRAY	MED SAND	SP		0.0			
S-7 1456	14	15/20	22" / 2'		WET	↓	↓	↓		0.0			
	15	10/15			DENSE ↓	YELL OR	SILTY MED SAND	SM		0.0			
S-8 1502	16	21/25	22" / 2'		WET	LT GRAY				0.0		0.0	0.0
	17	10/21			DENSE ↓	↓				0.0			
S-9 1511	18	22/25	18" / 2'			GRAY	↓	↓		0.0			
	19	5/15				↓	MED SAND	SP		0.0			
S-10 1520	20	17/20	20" / 2'		↓	↓	↓	↓		0.0	✓		
				TD 20'			INSTALLED WELL 20' TD						
							SCREENED FROM 10-20						
							SAND TO 7.5'						
							BENT TO 4.5'						
							2" WELL 9" BOREHOLE						

* 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 X No

Well I.D. #: S57MW033

Tetra Tech NUS, Inc.

BORING LOG

Page ___ of ___

PROJECT NAME: NSWC INDIAN HEAD
PROJECT NUMBER: N7129 CTO 245
DRILLING COMPANY: CHESAPEAKE
DRILLING RIG: B-57

BORING NUMBER: CPT01 PILOT HOLE
DATE: 8/30/01
GEOLOGIST: FRED W RAMSEY
DRILLER: ARRON E.

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	MATERIAL DESCRIPTION: Color	MATERIAL DESCRIPTION: Material Classification	USCS *	PID/FID Reading (ppm): Remarks	PID/FID Reading (ppm): Sample	PID/FID Reading (ppm): Sampler BZ	PID/FID Reading (ppm): Borehole**	PID/FID Reading (ppm): Driller BZ**
							YEL BRN TO						
							ORG BRN SAND						
	5						+ GRAVEL TO						
							~15', 15-22' IN						
							GRAVEL 15-22'						
							SANDY CLAY						
	10						TR GRAVEL						
							22'-25'						
							TD @ 25'						
	15												
	20												
	25												

* 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): ____

Remarks: 3¼ HSA, NO SPOONS, PILOT HOLE FOR CPT RIG. CPT RIG ENCOUNTERED REFUSAL @ 16'

Converted to Well: Yes ____ No X Well I.D. #: CPT 01 PILOT

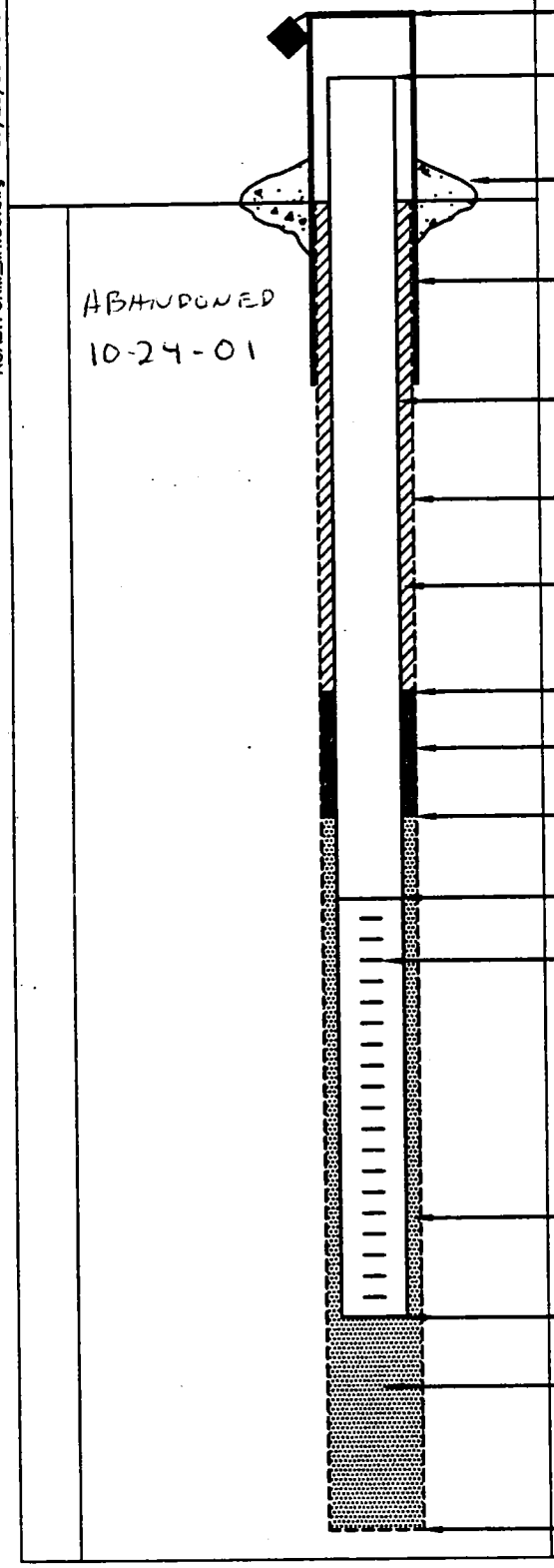
A.2 WELL CONSTRUCTION SHEETS

WELL NO.: SS7TW014

Tetra Tech NUS, Inc.

OVERBURDEN
MONITORING WELL SHEET
STICK-UP

PROJECT NWSC INDIAN HEAD	LOCATION SITE 57	DRILLER AARON E.
PROJECT NO. N7129	BORING SS7SB027	DRILLING METHOD HSA
DATE BEGUN 8/22/01	DATE COMPLETED 8/22/01	
FIELD GEOLOGIST BOB BALKOVEC		DEVELOPMENT METHOD PUMP
GROUND ELEVATION 42.51	DATUM NGVD 29	



ELEVATION/HEIGHT OF TOP OF SURFACE CASING: /

ELEVATION/HEIGHT OF TOP OF RISER PIPE: /

TYPE OF SURFACE SEAL: BENTONITE

I.D. OF SURFACE CASING: NA
TYPE OF SURFACE CASING: NA

RISER PIPE I.D.: 1"
TYPE OF RISER PIPE: PVC

BOREHOLE DIAMETER: 8"

TYPE OF BACKFILL: NA

ELEVATION/DEPTH TOP OF SEAL: 10

TYPE OF SEAL: BENTONITE

DEPTH TOP OF SAND PACK: 3'

ELEVATION/DEPTH TOP OF SCREEN: 14'

TYPE OF SCREEN: PVC

SLOT SIZE x LENGTH: 0.10 x 5'

I.D. OF SCREEN: 1"

TYPE OF SAND PACK: SILICA SAND
20-40 SIEVE SIZE

ELEVATION/DEPTH BOTTOM OF SCREEN: 19'

ELEVATION/DEPTH BOTTOM OF SAND PACK: 18'

BACKFILL MATERIAL BELOW SAND: SILICA SAND

ELEVATION/DEPTH OF HOLE: 20'

ACAD:FORM_MWSU.dwg 07/20/99 INL

WELL NO.: SS7TW015

OVERBURDEN
MONITORING WELL SHEET
STICK-UP

Tetra Tech NUS, Inc.

PROJECT NSWC INDIAN HEAD	LOCATION SITE 57	DRILLER AARON E.
PROJECT NO. 07139	BORING SS7SB027	DRILLING METHOD HSA
DATE BEGUN 9/21/01	DATE COMPLETED 9/21/01	
FIELD GEOLOGIST BOB BALKOVEC		DEVELOPMENT METHOD PUMP
GROUND ELEVATION 42.71	DATUM NGVD 29	

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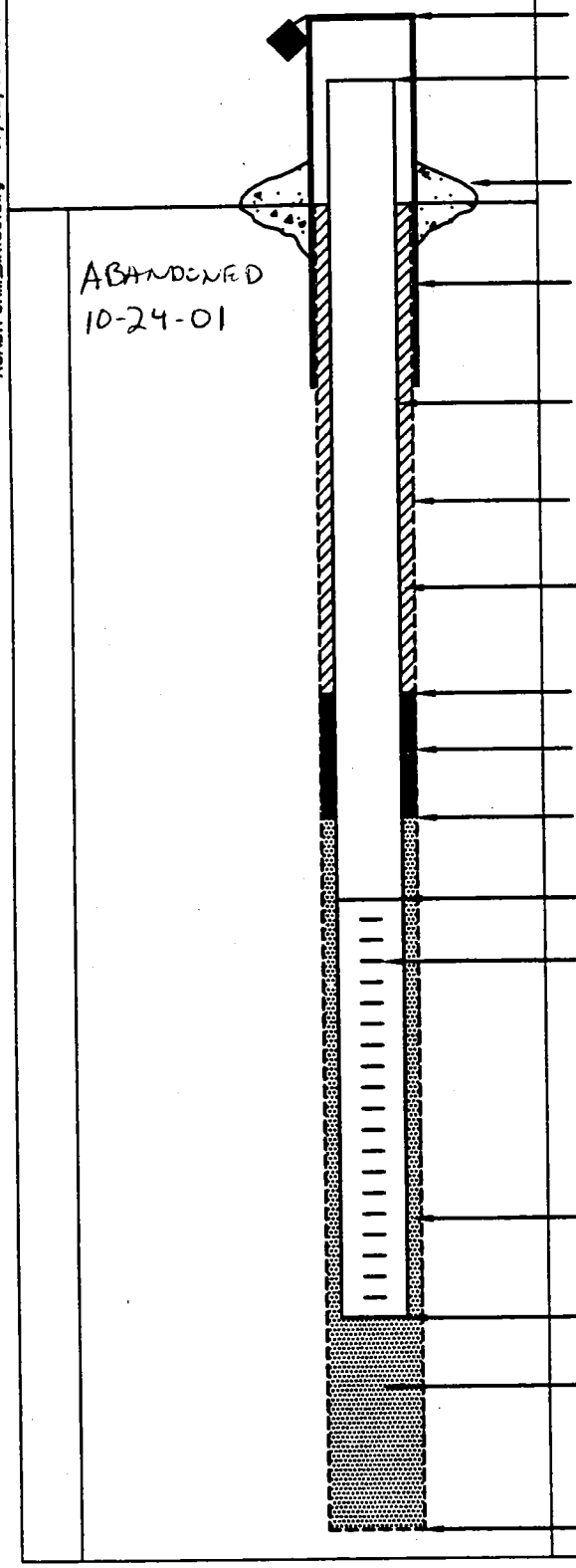

ELEVATION/HEIGHT OF TOP OF SURFACE CASING: /

ELEVATION/HEIGHT OF TOP OF RISER PIPE: /

TYPE OF SURFACE SEAL: BENTONITE

I.D. OF SURFACE CASING: NA
TYPE OF SURFACE CASING: NA

RISER PIPE I.D.: 1"
TYPE OF RISER PIPE: PVC

BOREHOLE DIAMETER: 8"

TYPE OF BACKFILL: NA

ELEVATION/DEPTH TOP OF SEAL: 10

TYPE OF SEAL: BENTONITE

DEPTH TOP OF SAND PACK: 17'

ELEVATION/DEPTH TOP OF SCREEN: 25'

TYPE OF SCREEN: PVC

SLOT SIZE x LENGTH: 0.10 x 5'

I.D. OF SCREEN: 1"

TYPE OF SAND PACK: SILICA SAND
20-40 SIEVE SIZE

ELEVATION/DEPTH BOTTOM OF SCREEN: 30'

ELEVATION/DEPTH BOTTOM OF SAND PACK: 32

BACKFILL MATERIAL BELOW SAND:
NA

ELEVATION/DEPTH OF HOLE: 30

WELL NO.: S57TW016

Tetra Tech NUS, Inc.

OVERBURDEN MONITORING WELL SHEET STICK-UP

PROJECT NSWC INDIAN HEAD	LOCATION SITE 57	DRILLER BRIAN VAN DORN	
PROJECT NO. N7129	BORING S57SB078	DRILLING METHOD HSA	
DATE BEGUN 8/17/01	DATE COMPLETED 8/17/01		
FIELD GEOLOGIST BOB BALLOVEC		DEVELOPMENT METHOD PUMP	
GROUND ELEVATION 37.83	DATUM NGVD 29		

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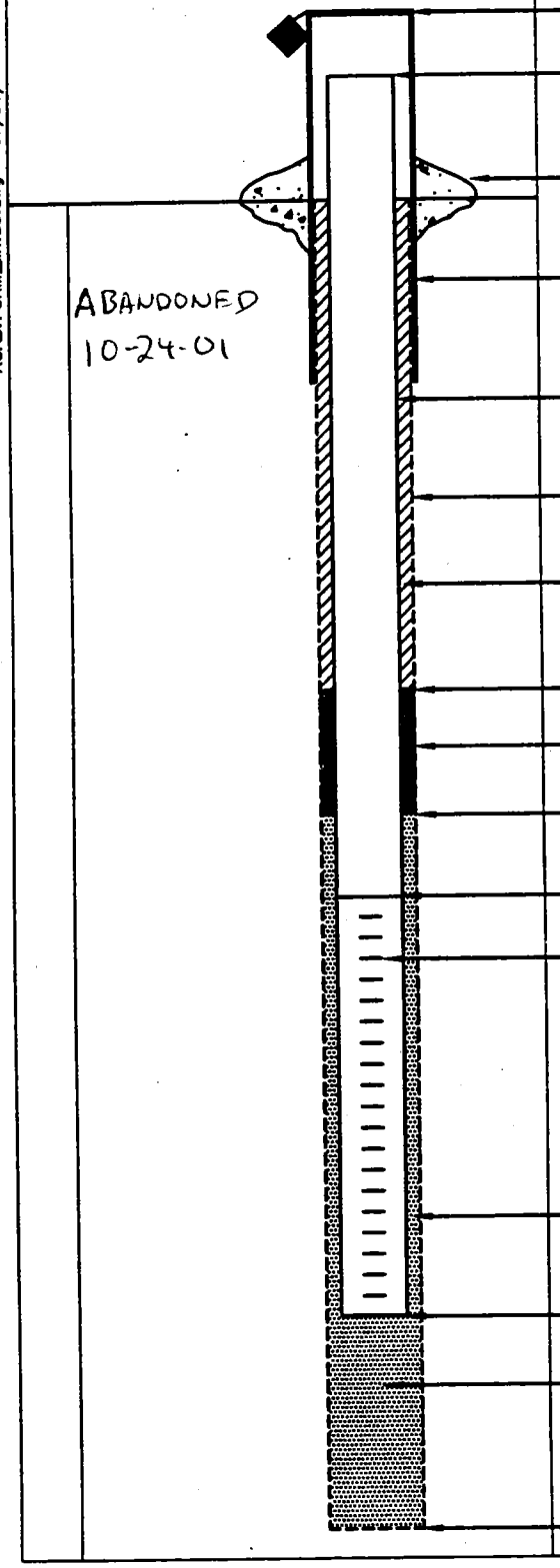


ELEVATION/HEIGHT OF TOP OF SURFACE CASING: 1'

ELEVATION/HEIGHT OF TOP OF RISER PIPE: 1.2'

TYPE OF SURFACE SEAL: BENTONITE

I.D. OF SURFACE CASING: NA

TYPE OF SURFACE CASING: NA

RISER PIPE I.D.: 1"

TYPE OF RISER PIPE: PVC

BOREHOLE DIAMETER: 8"

TYPE OF BACKFILL: NA

ELEVATION/DEPTH TOP OF SEAL: 10'

TYPE OF SEAL: BENTONITE CHIPS

DEPTH TOP OF SAND PACK: 4'

ELEVATION/DEPTH TOP OF SCREEN: 15'

TYPE OF SCREEN: PVC

SLOT SIZE x LENGTH: 0.10 x 5'

I.D. OF SCREEN: 1"

TYPE OF SAND PACK: SILICA SAND
20-40 SIEVE SIZE

ELEVATION/DEPTH BOTTOM OF SCREEN: 110'

ELEVATION/DEPTH BOTTOM OF SAND PACK: 110'

BACKFILL MATERIAL BELOW SAND: NA

ELEVATION/DEPTH OF HOLE: 110'

WELL NO.: S57TW017

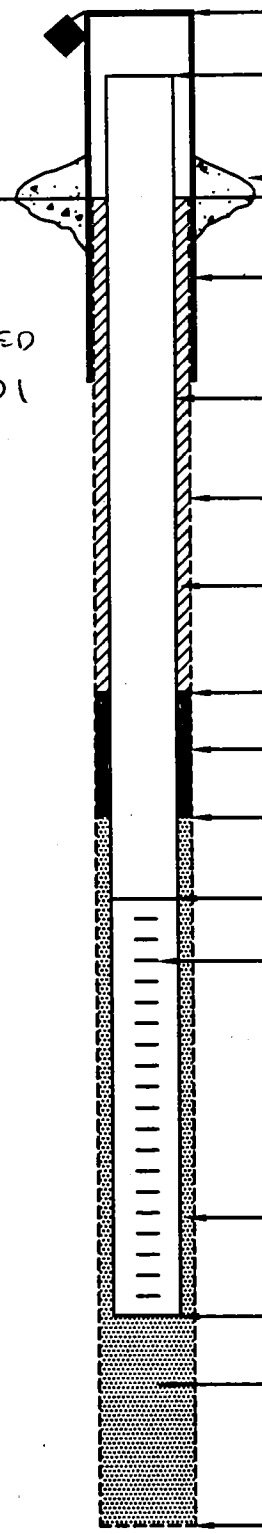
Tetra Tech NUS, Inc.

OVERBURDEN MONITORING WELL SHEET STICK-UP

PROJECT NSWC INDIAN HEAD
PROJECT NO. N7129
DATE BEGUN 8/16/01
FIELD GEOLOGIST BOB BALKOVEC
GROUND ELEVATION 34.78

LOCATION SITE 57
BORING S57SB028
DATE COMPLETED 8/16/01
DATUM NGVD 29

DRILLER BRIAN VAN DORN
DRILLING METHOD HSA
DEVELOPMENT METHOD PUMP



ABANDONED
10-24-01

ELEVATION/HEIGHT OF TOP OF SURFACE CASING: /
ELEVATION/HEIGHT OF TOP OF RISER PIPE: /2'
TYPE OF SURFACE SEAL: BENTONITE
I.D. OF SURFACE CASING: NA
TYPE OF SURFACE CASING: NA
RISER PIPE I.D.: 1"
TYPE OF RISER PIPE: PVC
BOREHOLE DIAMETER: 8"
TYPE OF BACKFILL: NA
ELEVATION/DEPTH TOP OF SEAL: /0'
TYPE OF SEAL: BENTONITE CHIPS
DEPTH TOP OF SAND PACK: 11'
ELEVATION/DEPTH TOP OF SCREEN: /13'
TYPE OF SCREEN: PVC
SLOT SIZE x LENGTH: 0.10 x 10'
I.D. OF SCREEN: 1"
TYPE OF SAND PACK: SILICA SAND 20-40 SIEVE
ELEVATION/DEPTH BOTTOM OF SCREEN: /23'
ELEVATION/DEPTH BOTTOM OF SAND PACK: /24
BACKFILL MATERIAL BELOW SAND: SAND 20-40 SIEVE
ELEVATION/DEPTH OF HOLE: /24'

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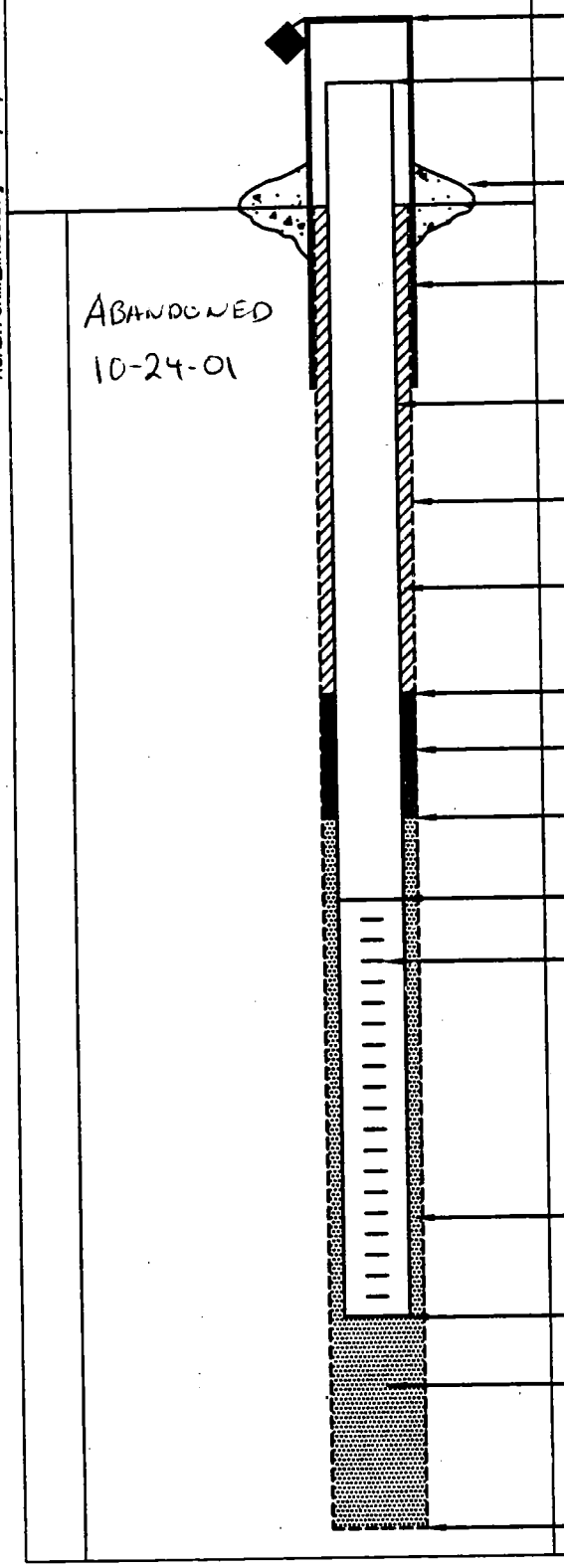
WELL NO.: SS7TW018

Tetra Tech NUS, Inc.

OVERBURDEN
MONITORING WELL SHEET
STICK-UP

PROJECT NSWC INDIAN HEAD	LOCATION SITE 57	DRILLER AARDVARK	
PROJECT NO. N7184	BORING SS7SB034	DRILLING METHOD HSA	
DATE BEGUN 8/20/01	DATE COMPLETED 8/20/01		
FIELD GEOLOGIST BOB BALKOVEC		DEVELOPMENT METHOD PUMP	
GROUND ELEVATION 30.71	DATUM NGVD 29		



ELEVATION/HEIGHT OF TOP OF SURFACE CASING: 1

ELEVATION/HEIGHT OF TOP OF RISER PIPE: 1.5'

TYPE OF SURFACE SEAL: BENTONITE

I.D. OF SURFACE CASING: NA
TYPE OF SURFACE CASING: NA

RISER PIPE I.D.: 1"
TYPE OF RISER PIPE: PVC

BOREHOLE DIAMETER: 8"

TYPE OF BACKFILL: NA

ELEVATION/DEPTH TOP OF SEAL: 10'

TYPE OF SEAL: BENTONITE CHIPS

DEPTH TOP OF SAND PACK: 7'

ELEVATION/DEPTH TOP OF SCREEN: 19.5'

TYPE OF SCREEN: PVC

SLOT SIZE x LENGTH: 0.10 x 5'

I.D. OF SCREEN: 1"

TYPE OF SAND PACK: SILICA SAND
20-40 SIEVE SIZE

ELEVATION/DEPTH BOTTOM OF SCREEN: 14.5'
15'

ELEVATION/DEPTH BOTTOM OF SAND PACK: 15'

BACKFILL MATERIAL BELOW SAND:
SAND

ELEVATION/DEPTH OF HOLE: 15

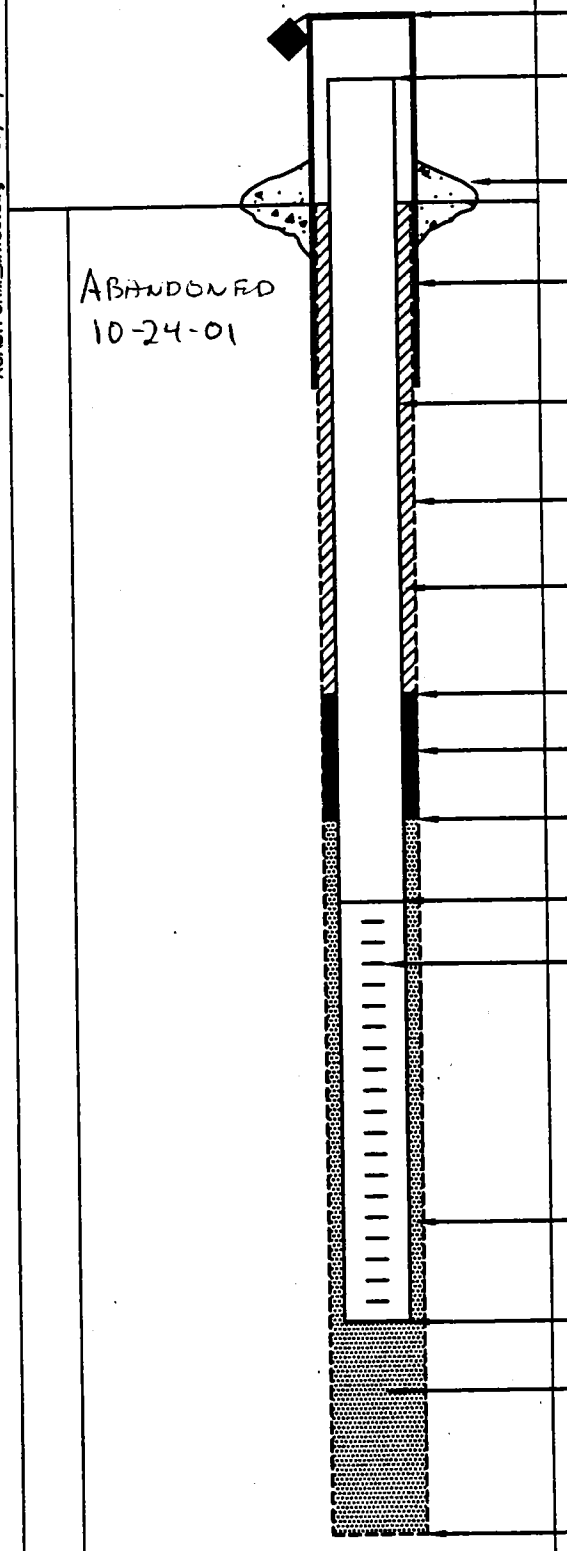
ACAD:FORM_MWSU.dwg 07/20/99 INL

WELL NO.: S57TWD19

OVERBURDEN MONITORING WELL SHEET STICK-UP

Tetra Tech NUS, Inc.

PROJECT NUSWC INDIAN HEAD	LOCATION SITE 57	DRILLER BRIAN VAN DORN	
PROJECT NO. N7129	BORING S57SB029	DRILLING METHOD HSA	
DATE BEGUN 8/17/01	DATE COMPLETED 8/17/01		
FIELD GEOLOGIST BOB BALKOVEC		DEVELOPMENT METHOD PUMP	
GROUND ELEVATION 30.64	DATUM NGVD 29		



ELEVATION/HEIGHT OF TOP OF SURFACE CASING: /

ELEVATION/HEIGHT OF TOP OF RISER PIPE: /1'

TYPE OF SURFACE SEAL: BENTONITE

I.D. OF SURFACE CASING: NA

TYPE OF SURFACE CASING: NA

RISER PIPE I.D.: 1"

TYPE OF RISER PIPE: PVC

BOREHOLE DIAMETER: 8"

TYPE OF BACKFILL: NA

ELEVATION/DEPTH TOP OF SEAL: /0'

TYPE OF SEAL: BENTONITE CHIPS

DEPTH TOP OF SAND PACK: 14.5'
(NATURAL COLLAPSE FROM 17.5'-14.5')

ELEVATION/DEPTH TOP OF SCREEN: /19'

TYPE OF SCREEN: PVC

SLOT SIZE x LENGTH: 0.10 x 5'

I.D. OF SCREEN: 1"

TYPE OF SAND PACK: SILICA SAND
20-40 SIEVE

ELEVATION/DEPTH BOTTOM OF SCREEN: /24'

ELEVATION/DEPTH BOTTOM OF SAND PACK: /2

BACKFILL MATERIAL BELOW SAND: NA

ELEVATION/DEPTH OF HOLE: /24'

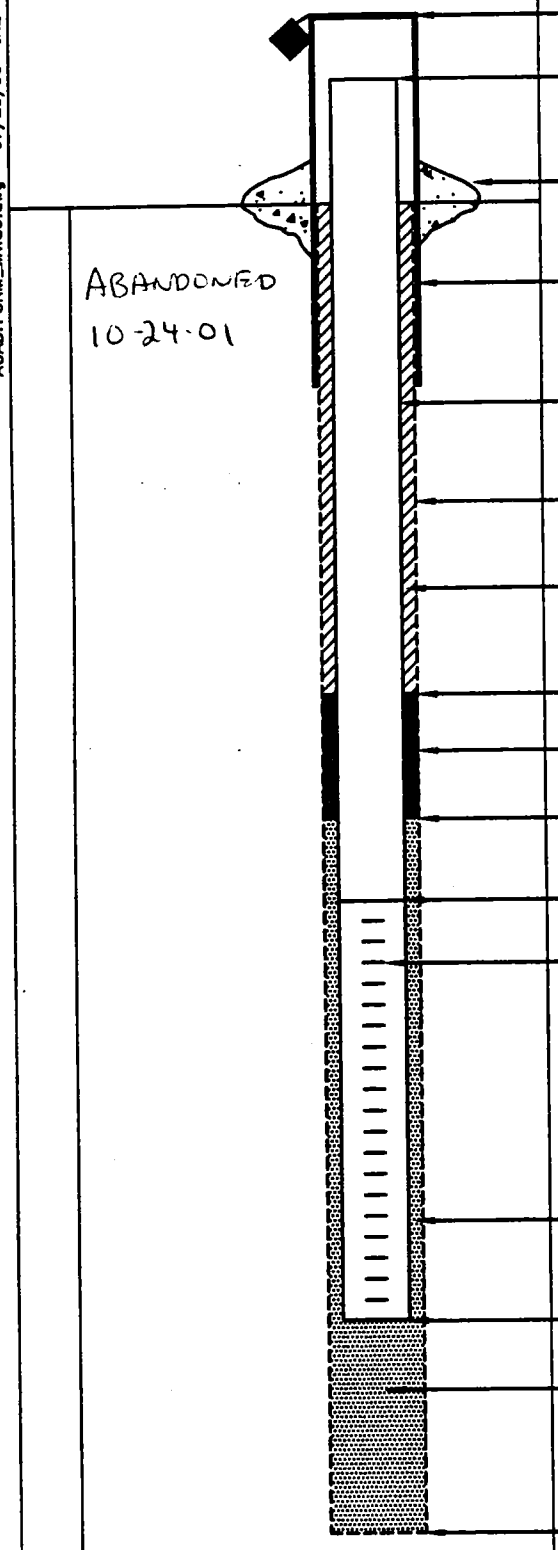
ACAD:FORM_MWSU.dwg 07/20/99 INL

WELL NO.: SS7TW021

Tetra Tech NUS, Inc.

OVERBURDEN
MONITORING WELL SHEET
STICK-UP

PROJECT NSWC INDIAN HEAD	LOCATION SITE 57	DRILLER AMOUNT	
PROJECT NO. N7429	BORING SS7TW021	DRILLING METHOD HSA	
DATE BEGUN 8/30/01	DATE COMPLETED 8/31/01		
FIELD GEOLOGIST BOB BALKOVEC		DEVELOPMENT METHOD PUMP	
GROUND ELEVATION 9.84	DATUM NGVD 29		



ELEVATION/HEIGHT OF TOP OF SURFACE CASING: /

ELEVATION/HEIGHT OF TOP OF RISER PIPE: /1'

TYPE OF SURFACE SEAL: BENTONITE

I.D. OF SURFACE CASING: NA
TYPE OF SURFACE CASING: NA

RISER PIPE I.D.: 1"
TYPE OF RISER PIPE: PVC

BOREHOLE DIAMETER: 8"

TYPE OF BACKFILL: NA

ELEVATION/DEPTH TOP OF SEAL: /0

TYPE OF SEAL: BENTONITE CHIPS

DEPTH TOP OF SAND PACK: 4'

ELEVATION/DEPTH TOP OF SCREEN: /9'

TYPE OF SCREEN: PVC

SLOT SIZE x LENGTH: 0.10 x 5'

I.D. OF SCREEN: 1"

TYPE OF SAND PACK: SILICA SAND
20-40 SIEVE SIZE

ELEVATION/DEPTH BOTTOM OF SCREEN: /14'

ELEVATION/DEPTH BOTTOM OF SAND PACK: /15'

BACKFILL MATERIAL BELOW SAND:
NATURAL MATERIAL TO 11'
BENTONITE TO 15'

ELEVATION/DEPTH OF HOLE: /25'

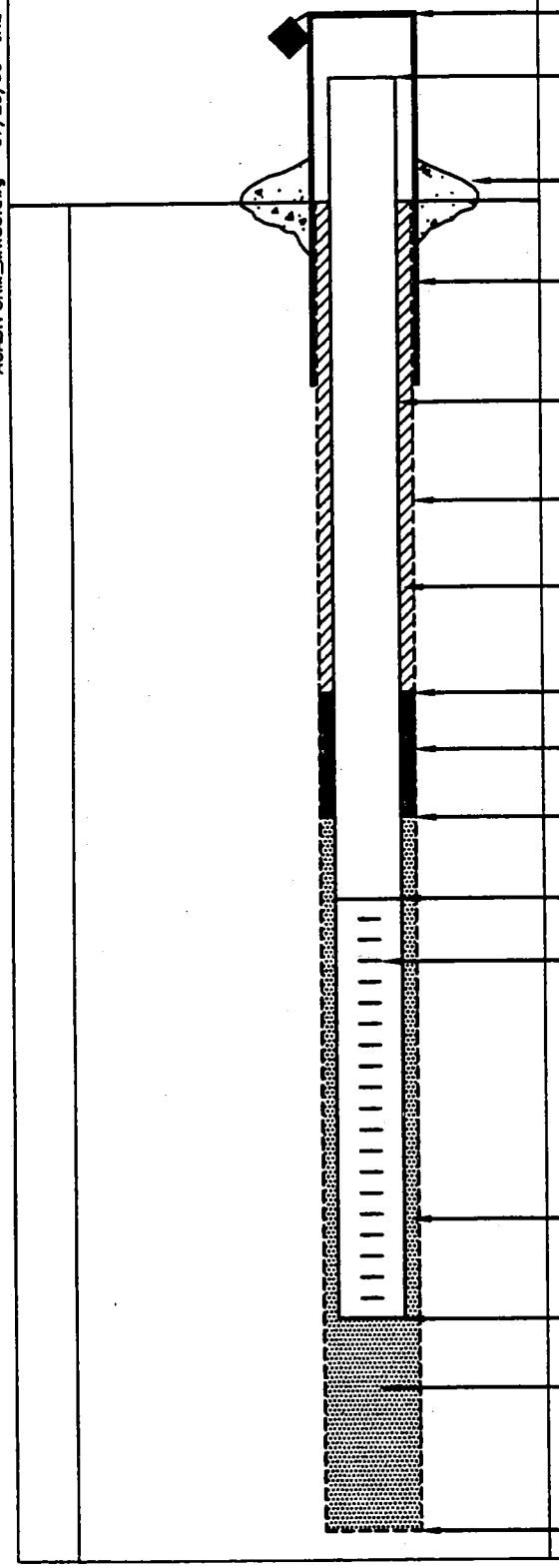
ACAD:FORM_MWSU.dwg 07/20/99 INL

WELL NO.: SS7MW020

OVERBURDEN
MONITORING WELL SHEET
STICK-UP

Tetra Tech NUS, Inc.

PROJECT NISWC INDIAN HEAD	LOCATION SITE 57	DRILLER AARON E	
PROJECT NO. N7179	BORING # SS7MW020	DRILLING METHOD HSA	
DATE BEGUN 8/22/01	DATE COMPLETED 8/22/01		
FIELD GEOLOGIST BOB BALKOVIC		DEVELOPMENT METHOD PUMP	
GROUND ELEVATION 10.39	DATUM NGVD 29		



ELEVATION/HEIGHT OF TOP OF SURFACE CASING: 13.75/3.36

ELEVATION/HEIGHT OF TOP OF RISER PIPE: 13.31/2.92

TYPE OF SURFACE SEAL: CEMENT W/ POSTS

I.D. OF SURFACE CASING: 6"
TYPE OF SURFACE CASING: BLK STEEL

RISER PIPE I.D.: 2"
TYPE OF RISER PIPE: PVC

BOREHOLE DIAMETER: 9"

TYPE OF BACKFILL: CEMENT

ELEVATION/DEPTH TOP OF SEAL: 9.39/1'

TYPE OF SEAL: BENTONITE PELLETS

DEPTH TOP OF SAND PACK: 3'

ELEVATION/DEPTH TOP OF SCREEN: 6.39/4'

TYPE OF SCREEN: PVC

SLOT SIZE x LENGTH: 0.10 x 10'

I.D. OF SCREEN: 2"

TYPE OF SAND PACK: SILICA SAND 20-40 SIEVE SIZE

ELEVATION/DEPTH BOTTOM OF SCREEN: -3.61/14'

ELEVATION/DEPTH BOTTOM OF SAND PACK: -3.61/14'
BACKFILL MATERIAL BELOW SAND: NA

ELEVATION/DEPTH OF HOLE: -3.61/14'

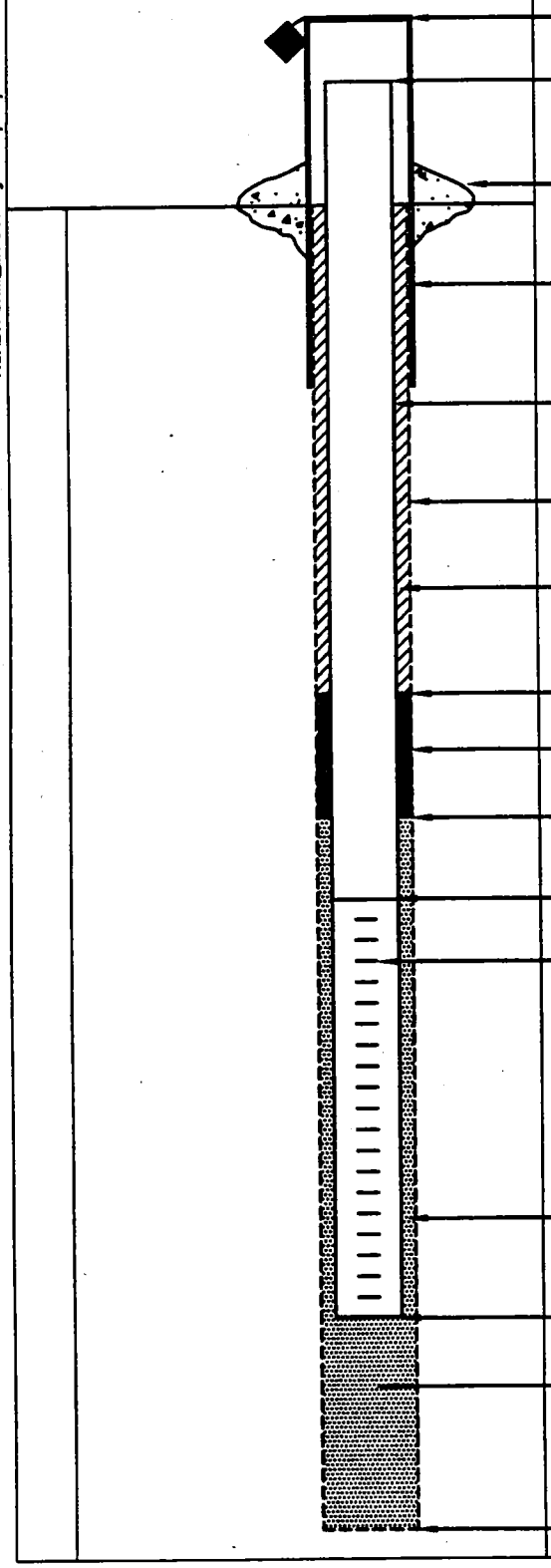
ACAD:FORM_MWSU.dwg 07/20/99 INL

WELL NO.: SS7MW022

Tetra Tech NUS, Inc.

OVERBURDEN
MONITORING WELL SHEET
STICK-UP

PROJECT NUSWC JOHNSTON HEAD	LOCATION SITE 57	DRILLER AARON E
PROJECT NO. 017129	BORING SS7MW022	DRILLING METHOD HSA
DATE BEGUN 8/22/01	DATE COMPLETED 8/22/01	
FIELD GEOLOGIST BOB BALKOVEC		DEVELOPMENT METHOD PUMP
GROUND ELEVATION 8.11	DATUM NGVD 29	



ELEVATION/HEIGHT OF TOP OF SURFACE CASING: 10.60/2.49

ELEVATION/HEIGHT OF TOP OF RISER PIPE: 10.09/1.98

TYPE OF SURFACE SEAL: CEMENT W/ POSTS.

I.D. OF SURFACE CASING: 6"
TYPE OF SURFACE CASING: BLK STEEL

RISER PIPE I.D.: 2"
TYPE OF RISER PIPE: PVC

BOREHOLE DIAMETER: 9"

TYPE OF BACKFILL: CEMENT

ELEVATION/DEPTH TOP OF SEAL: 7.11/1'

TYPE OF SEAL: BENTONITE PELLETS

DEPTH TOP OF SAND PACK: 3'

ELEVATION/DEPTH TOP OF SCREEN: 4.11/4'

TYPE OF SCREEN: PVC

SLOT SIZE x LENGTH: 0.10 x 10'

I.D. OF SCREEN: 2"

TYPE OF SAND PACK: SIZED SAND 20-40 SIEVE SIZE

ELEVATION/DEPTH BOTTOM OF SCREEN: -5.89/14'

ELEVATION/DEPTH BOTTOM OF SAND PACK: -5.89/14'
BACKFILL MATERIAL BELOW SAND: NA

ELEVATION/DEPTH OF HOLE: -5.89/14'

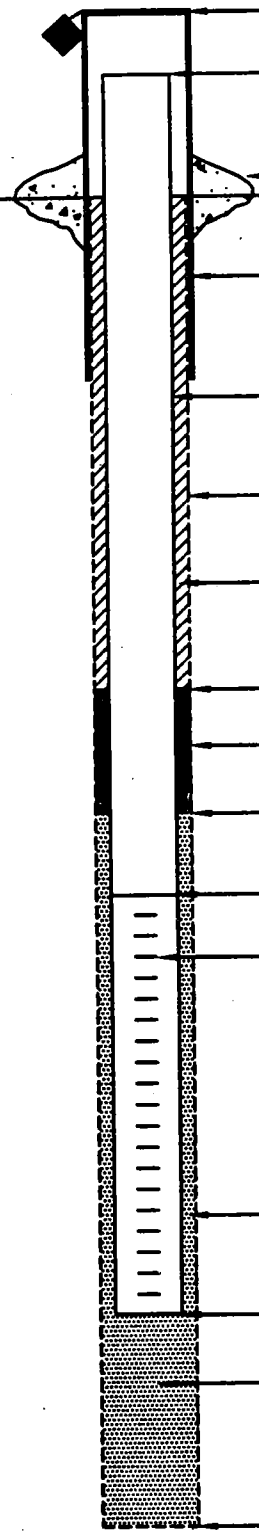
ACAD:FORM_MWSU.dwg 07/20/99 INL

WELL NO.: S57MW023

Tetra Tech NUS, Inc.

OVERBURDEN MONITORING WELL SHEET STICK-UP

PROJECT NSWC Indian Head	LOCATION Site 57	DRILLER Aaron E.
PROJECT NO. N7129	BORING S57SB033	DRILLING METHOD HSA
DATE BEGUN 8/22/01	DATE COMPLETED 8/22/01	
FIELD GEOLOGIST Bob Balkovec		DEVELOPMENT METHOD
GROUND ELEVATION 37.44	DATUM NGVD 29	



ELEVATION/HEIGHT OF TOP OF SURFACE CASING: 41.03/3.59

ELEVATION/HEIGHT OF TOP OF RISER PIPE: 40.54/3.1

TYPE OF SURFACE SEAL: CEMENT w/ POSTS

I.D. OF SURFACE CASING: 6"

TYPE OF SURFACE CASING: BLK STEEL

RISER PIPE I.D.: 2"

TYPE OF RISER PIPE: PVC

BOREHOLE DIAMETER: 9"

TYPE OF BACKFILL: CEMENT

ELEVATION/DEPTH TOP OF SEAL: 32.94/4.5'

TYPE OF SEAL: BENTONITE PELLETS

DEPTH TOP OF SAND PACK: 7.5'

ELEVATION/DEPTH TOP OF SCREEN: 27.44/10'

TYPE OF SCREEN: PVC

SLOT SIZE x LENGTH: 0.10 x 10'

I.D. OF SCREEN: @ 2"

TYPE OF SAND PACK: Silica Sand 20-40 Sieve Size

ELEVATION/DEPTH BOTTOM OF SCREEN: 17.44/20

ELEVATION/DEPTH BOTTOM OF SAND PACK: 17.44/20

BACKFILL MATERIAL BELOW SAND: NA

ELEVATION/DEPTH OF HOLE: 17.44/20'

ACAD:FORM_MWSU.dwg 07/20/99 INL

A.3 WELL COMPLETION REPORTS

B 1 2484 (MDE USE ONLY)

STATE OF MARYLAND
PERMIT TO DRILL WELL
please print or type

CH – 94 – 4176
fill in this form completely

Date Received (APA)

OWNER INFORMATION

Naval Surface Warfare Center
Last Name Owner First Name

Indian Head Division
Street or RFD

Indian Head, Maryland 20640
Town State Zip

DRILLER INFORMATION

michael W. Huber M W D 336
Driller's Name License No.

CHESAPEAKE GEOSYSTEMS, INC.
Firm Name

6720 Ft. Smallwood Rd Balto., MD 21226
Address

Signature Date

B 2 WELL INFORMATION

APPROX. PUMPING RATE (GAL. PER MIN.) NA

AVERAGE DAILY QUANTITY NEEDED (GAL. PER DAY) NA

USE FOR WATER (CIRCLE APPROPRIATE BOX)

- D DOMESTIC POTABLE SUPPLY & RESIDENTIAL IRRIGATION
- F FARMING (LIVESTOCK WATERING & AGRICULTURAL IRRIGATION
- I INDUSTRIAL, COMMERICIAL, DEWATERING
- P PUBLIC WATER SUPPLY WELL
- (T) TEST, OBSERVATION, MONITORING Geoprobe
- G GEO-THERMAL

APPROXIMATE DEPTH OF WELL 20 FEET

APPROXIMATE DIAMETER OF WELL 2 NEAREST INCH

METHOD OF DRILLING (circle one)

BORED (or Augered) JETTED Jetted & DRIVEN
AIR-ROTary AIR-PERcussion ROTARY (Hydraulic Rotary)
CABLE REVerse-ROTary DRive-POINT
other

REPLACEMENT OR DEEPENED WELLS
(CIRCLE APPROPRIATE BOX)

- (N) THIS WELL WILL NOT REPLACE AN EXISTING WELL
- Y THIS WELL WILL REPLACE A WELL THAT WILL BE ABANDONED AND SEALED
- S THIS WELL WILL REPLACE A WELL THAT WILL BE USED AS A STANDBY-CONTACT LOCAL APPROVING AUTHORITY FOR POLICY ON STANDBY WELLS
- D THIS WELL WILL DEEPEN AN EXISTING WELL

PERMIT NUMBER OF WELL TO BE REPLACED OR DEEPENED (IF AVAILABLE)

Not to be filled in by driller (MDE OR COUNTY USE ONLY)

APPROP. PERMIT NUMBER G

PERMIT No. CH – 94 – 4176

B 3 LOCATION OF WELL

Charles
COUNTY

SUBDIVISION

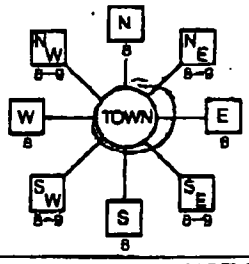
SECTION LOT

Indian Head
NEAREST TOWN

MILES FROM TOWN (enter 0 if in town) 0 M I

B 4

DIRECTION OF WELL FROM TOWN (CIRCLE BOX)



Hersey Road
NEAR WHAT ROAD

ON WHICH SIDE OF ROAD (CIRCLE APPROPRIATE BOX)

DISTANCE FROM ROAD

ENTER FT OR MI

TAX MAP: 20 BLK: 8 PARCEL

NOT TO BE FILLED IN BY DRILLER
HEALTH DEPARTMENT APPROVAL

Charles 01-14187-W(M)
COUNTY NAME COUNTY NO.

STATE SIGNATURE INSERT S

DATE ISSUED 8-24-01 8-24-02
CO SIGNATURE EXP. DATE

NORTH GRID 274 000 EAST GRID 751 000

SHOW MAJOR FEATURES OF BOX & LOCATE WELL WITH AN X

SOURCES OF DRILLING WATER
1.
2.
3.

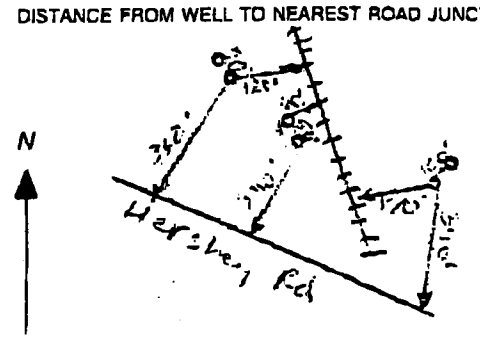
WRITE THE BOX NUMBER FROM THE MAP HERE

E 751,000

N 274,000

X
000
000

DRAW A SKETCH BELOW SHOWING LOCATION OF WELL IN RELATION TO NEARBY TOWNS AND ROADS AND GIVE DISTANCE FROM WELL TO NEAREST ROAD JUNCTION

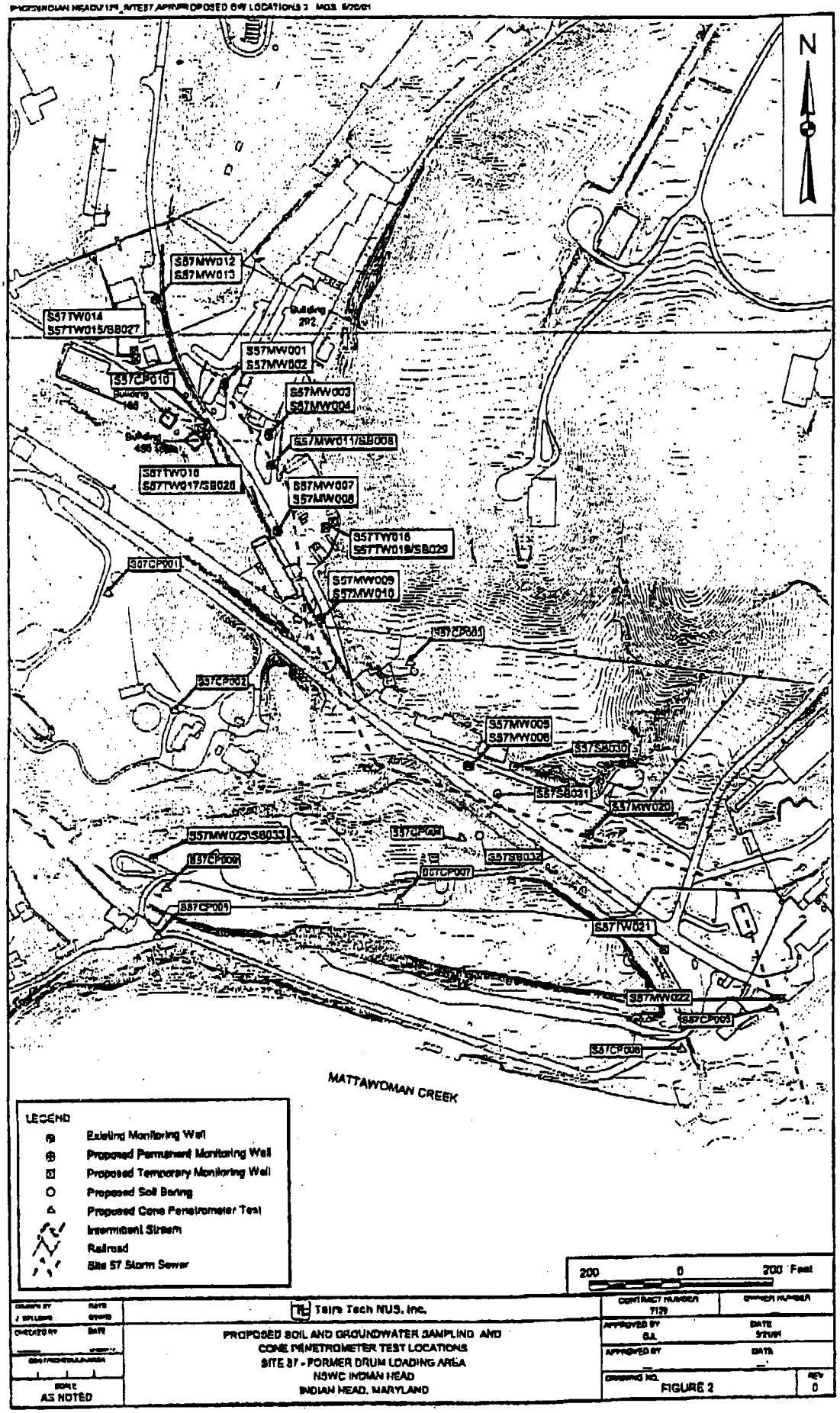


SPECIAL CONDITIONS
NOTE - APPROVING AUTHORITIES SHOULD USE SEPARATE SHEET IF NEEDED.

DENV-Permit 97

DRILLER

NOV-16-2001 15:56 PANASONIC 4107895029 P.02/22



NOV-16-2001 15:57 PANASONIC 4107895029 P.03/22

WELL COMPLETION REPORT

(THIS NUMBER IS TO BE PUNCHED IN COLS. 3-6 ON ALL CARDS)

FILL IN THIS FORM COMPLETELY
PLEASE TYPE

COUNTY NUMBER 01-14187-W(M)

ST/CO USE ONLY
DATE Received MM DD YY

DATE WELL COMPLETED: MM 08 DD 21 YY 01

Depth of Well: 30 (TO NEAREST FOOT)

PERMIT NO. FROM "PERMIT TO DRILL WELL": CH - 94 - 4176

OWNER Naval Surface Warfare Center (7th)
STREET OR RFD Indian Head Division TOWN Indian Head, MD 2640
SUBDIVISION ____ SECTION ____ LOT ____

WELL LOG

Not required for driven wells

STATE THE KIND OF FORMATIONS PENETRATED, THEIR COLOR, DEPTH, THICKNESS AND IF WATER BEARING

DESCRIPTION (Use additional sheets if needed)	FEET FROM	FEET TO	Check if water bearing
rip rap, sand and gravel	0	6	
grey/lite olive brown silt and sand	6	3	
grey sand some gravel	8	14	
pale yellow sand trace silt	14	16	
black/yellow and brownish grey sand	16	23	
greenish grey sand, trace silt and clay	23	30	
water @ 6'			

NUMBER OF UNSUCCESSFUL WELLS: none

WELL HYDROFRACTURED: YES [Y] NO [N]

CIRCLE APPROPRIATE LETTER
- A A WELL WAS ABANDONED AND SEALED WHEN THIS WELL WAS COMPLETED
- E ELECTRIC LOG OBTAINED
- P TEST WELL CONVERTED TO PRODUCTION WELL

I HEREBY CERTIFY THAT THIS WELL HAS BEEN CONSTRUCTED IN ACCORDANCE WITH COMAR 26.04.04 "WELL CONSTRUCTION" AND IN CONFORMANCE WITH ALL CONDITIONS STATED IN THE ABOVE CAPTIONED PERMIT, AND THAT THE INFORMATION PRESENTED HEREIN IS ACCURATE AND COMPLETE TO THE BEST OF MY KNOWLEDGE.

DRILLERS LIC. NO.: M W 0 3 3 6
Michael W. Ruhe
DRILLERS SIGNATURE
(MUST MATCH SIGNATURE ON APPLICATION)

LIC. NO.: M ___ D ___

SITE SUPERVISOR (sign. of driller or journeyman responsible for sitework if different from permittee)

GROUTING RECORD

WELL HAS BEEN GROUTED (Circle Appropriate Box): YES [Y] NO [N]

TYPE OF GROUTING MATERIAL (Circle one)
CEMENT [CM] BENTONITE CLAY [BC]
NO. OF BAGS 12 NO. OF POUNDS 1,128
GALLONS OF WATER 72
DEPTH OF GROUT SEAL (to nearest foot)
from 0 ft. TOP to 23 ft. BOTTOM
(enter 0 if from surface)

CASING RECORD

casing types insert appropriate code below:
- [ST] STEEL
- [CO] CONCRETE
- [PL] PLASTIC
- [OT] OTHER

MAIN CASING TYPE	Nominal diameter top (main) casing (nearest inch)	Total depth of main casing (nearest foot)
PL	1	25

OTHER CASING (if used) — EACH CASING

diameter inch	depth (feet) from	to

SCREEN RECORD

screen type or open hole, insert appropriate code below:
- [ST] STEEL
- [BR] BRASS BRONZE
- [HO] OPEN HOLE
- [PL] PLASTIC
- [OT] OTHER

DEPTH (nearest ft.) — EACH SCREEN

		from	to
1	PL	25	30
2			
3			

SLOT SIZE 1 010 2 ____ 3 ____

DIAMETER OF SCREEN 1 (NEAREST INCH)

GRAVEL PACK IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX 60

from	to
23	30

MDE USE ONLY (NOT TO BE FILLED IN BY DRILLER)
T (E.R.O.S.) W Q
TELESCOPE CASING | LOG INDICATOR | OTHER DATA

C 3 NA

PUMPING TEST

HOURS PUMPED (nearest hour) ____

PUMPING RATE (gal. per min.) ____

METHOD USED TO MEASURE PUMPING RATE ____

WATER LEVEL (distance from land surface)

BEFORE PUMPING ____ ft.

WHEN PUMPING ____ ft.

TYPE OF PUMP USED (for test)
- [A] air
- [P] piston
- [T] turbine
- [C] centrifugal
- [R] rotary
- [O] other (describe below) Tempora Monitor
- [J] jet
- [S] submersible

PUMP INSTALLED

DRILLER INSTALLED PUMP (CIRCLE) (YES or NO): YES NO

IF DRILLER INSTALLS PUMP, THIS SECTION MUST BE COMPLETED FOR ALL WELLS.

TYPE OF PUMP INSTALLED PLACE (A,C,J,P,R,S,T,O) IN BOX 29. ____

CAPACITY: GALLONS PER MINUTE (to nearest gallon) ____

PUMP HORSE POWER ____

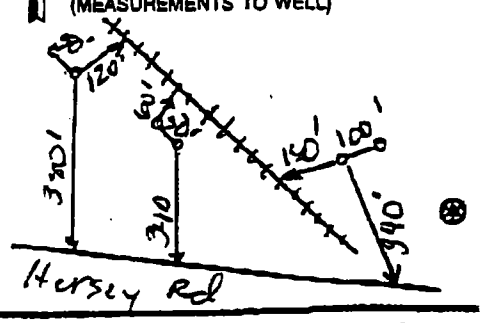
PUMP COLUMN LENGTH (nearest ft.) ____

CASING HEIGHT (circle appropriate box and enter casing height)
- [+] above LAND SURFACE
- [−] below

00 (nearest foot)

LOCATION OF WELL ON LOT

SHOW PERMANENT STRUCTURE SUCH AS BUILDING, SEPTIC TANKS, AND /OR LANDMARKS AND INDICATE NOT LESS THAN TWO DISTANCES (MEASUREMENTS TO WELL)



ORIGINAL STATE
PANASONIC
NOV-16-2001 15:57
4107895029 P.04/22

MARYLAND DEPARTMENT OF THE ENVIRONMENT, WATER MANAGEMENT ADMINISTRATION
2500 BROENING HIGHWAY, BALTIMORE, MARYLAND 21224, (410) 631-3784

WATER WELL ABANDONMENT-SEALING REPORT FORM

SUBMIT COPIES OF COMPLETED FORM TO:

- COUNTY ENVIRONMENT AGENCY (contact MDE, WMA if address needed)
- WELL OWNER
- MDE, WATER MANAGEMENT ADMINISTRATION, WELL PROGRAM

DATE WELL ABANDONED: 08/29/2001 (month/day/year)

* PERMIT NUMBER OF ABANDONED WELL (if any) CH — 94 — 4176

* PERMIT NUMBER OF REPLACEMENT WELL — —

* PERSON ABANDONING WELL: Aaron Eichelberger

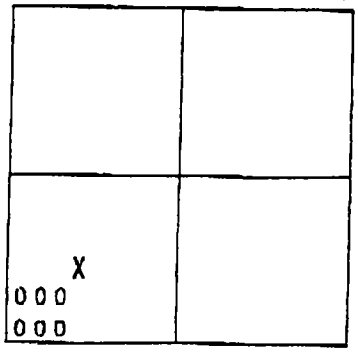
WELL DRILLERS LICENSE NUMBER: AWD 709

CIRCLE: MWD/MSD/MG

* OWNER'S NAME: Naval Surface Warfare Center

* WELL LOCATION:
COUNTY: Charles
NEAREST TOWN: Indian Head
TAX MAP 20 BLOCK 8 PARCEL
SUBDIVISION:
SECTION: LOT:
NEAREST ROAD: Hersey Road

MARYLAND GRID COORDINATES
E 751,000
BOX NUMBER
N 274,000



SHOW WELL LOCATION BY X WITHIN BOX

Tmp 014

* TYPE OF WELL BEING ABANDONED:

_____ DRILLED _____ JETTED
__X__ BORED/AUGUERED _____ HAND DUG
_____ OTHER (specify) _____

* USE CODE:

_____ DOMESTIC _____ MUNICIPAL/PUBLIC
_____ IRRIGATION _____ INDUSTRIAL
__X__ TEST/OBSERVATION

* TYPE OF CASING:

_____ STEEL __X__ PLASTIC
_____ CONCRETE _____ OTHER (specify)

* SIZE OF CASING: 1 INCHES IN DIAMETER

* DEPTH OF WELL: ~~15~~ 10 FEET DEEP

* WAS ANY CASING REMOVED? __X__ YES _____ NO
if yes, length removed, in feet: 2

* WAS CASING RIPPED OR PERFORATED? ~~X~~ YES __X__ NO

LOG OF SEALING MATERIAL

MATERIAL	FEET FROM	FEET TO
Bentonite-Cement Slurry	0	~~15~~ 10

Michael W. Kuhn 336 MWD/MSD/MGD

SIGNATURE MASTER WELL DRILLER OR SUBCONTRACTOR

NOV-16-2001 15:58 PANASONIC 4107895029 P.05/22

MARYLAND DEPARTMENT OF THE ENVIRONMENT, WATER MANAGEMENT ADMINISTRATION
2500 BROENING HIGHWAY, BALTIMORE, MARYLAND 21224, (410) 631-3784

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WATER WELL ABANDONMENT-SEALING REPORT FORM

****

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* COUNTY ENVIRONMENT AGENCY (contact MDE, WMA if address needed)
* WELL OWNER
* MDE, WATER MANAGEMENT ADMINISTRATION, WELL PROGRAM

DATE WELL ABANDONED: 08/29/2001 (month/day/year)

* PERMIT NUMBER OF ABANDONED WELL (if any) CH — 94 — 4176

* PERMIT NUMBER OF REPLACEMENT WELL — —

* PERSON ABANDONING WELL: Aron Eichelberger

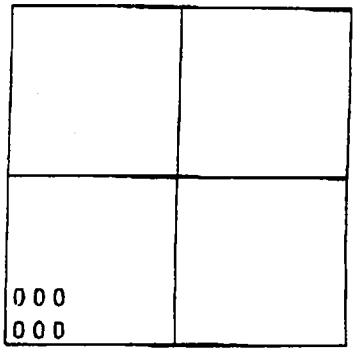
WELL DRILLERS LICENSE NUMBER: AWD 709

CIRCLE: MWD/MSD/MG

* OWNER'S NAME: Naval Surface Warfare Center

* WELL LOCATION:
COUNTY: Charles
NEAREST TOWN: Indian Head
TAX MAP 20 BLOCK 8 PARCEL
SUBDIVISION:
SECTION: LOT:
NEAREST ROAD: Hersey Road

MARYLAND GRID COORDINATES
E 751,000
BOX NUMBER
N 274,000 <



SHOW WELL LOCATION
BY X WITHIN BOX

TMP 05

* TYPE OF WELL BEING ABANDONED:

_____ DRILLED _____ JETTED
__X__ BORED/AUGUERED _____ HAND DUG
_____ OTHER (specify) _____

* USE CODE:

_____ DOMESTIC _____ MUNICIPAL/PUBLIC
_____ IRRIGATION _____ INDUSTRIAL
__X__ TEST/OBSERVATION

* TYPE OF CASING:

_____ STEEL __X__ PLASTIC
_____ CONCRETE _____ OTHER (specify)

* SIZE OF CASING: 1 INCHES IN DIAMETER

* DEPTH OF WELL: 30 FEET DEEP

WAS ANY CASING REMOVED? __X__ YES _____ NO
if yes, length removed, in feet: 2

* WAS CASING RIPPED OR PERFORATED? ___ YES __X__ NO

LOG OF SEALING MATERIAL

MATERIAL	FEET	
	FROM	TO
Bentonite-Cement Slurry	0	30

Michael W. Kuhn 336 (MWD)/MSD/MGD

SIGNATURE-MASTER WELL DRILLER OR SUPERVISING SANITARIAN | LICENSE # | CIRCLE ONE | DATE

NOV-16-2001 15:58 PANASONIC 4107895029 P.06/22

MARYLAND DEPARTMENT OF THE ENVIRONMENT, WATER MANAGEMENT ADMINISTRATION
2500 BROENING HIGHWAY, BALTIMORE, MARYLAND 21224, (410) 631-3784

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WATER WELL ABANDONMENT-SEALING REPORT FORM

****

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* COUNTY ENVIRONMENT AGENCY (contact MDE, WMA if address needed)
* WELL OWNER
* MDE, WATER MANAGEMENT ADMINISTRATION, WELL PROGRAM

DATE WELL ABANDONED: 08/29/2001 (month/day/year)

* PERMIT NUMBER OF ABANDONED WELL (if any) CH — 94 — 4176

* PERMIT NUMBER OF REPLACEMENT WELL — —

* PERSON ABANDONING WELL: Aaron Eichelberger

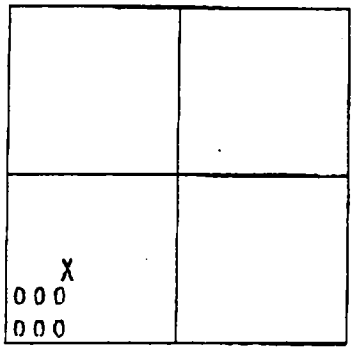
WELL DRILLERS LICENSE NUMBER: AWD 709

CIRCLE: MWD/MSD/MC

* OWNER'S NAME: Naval Surface Warfare Center

* WELL LOCATION:
COUNTY: Charles
NEAREST TOWN: Indian Head
TAX MAP 20 BLOCK 8 PARCEL
SUBDIVISION:
SECTION: LOT:
NEAREST ROAD: Hersey road

MARYLAND GRID COORDINATES
E 751,000
BOX NUMBER <
N 274,000



SHOW WELL LOCATION BY X WITHIN BOX

TMP016

* TYPE OF WELL BEING ABANDONED:

_____ DRILLED _____ JETTED
__X__ BORED/AUGUERED _____ HAND DUG
_____ OTHER (specify) _____

LOG OF SEALING MATERIAL

MATERIAL	FEET FROM	FEET TO
Bentonite-Cement Slurry	0	10

* USE CODE:

_____ DOMESTIC _____ MUNICIPAL/PUBLIC
_____ IRRIGATION _____ INDUSTRIAL
__X__ TEST/OBSERVATION

* TYPE OF CASING:

_____ STEEL __X__ PLASTIC
_____ CONCRETE _____ OTHER (specify)

* SIZE OF CASING: 1 INCHES IN DIAMETER

* DEPTH OF WELL: 10 FEET DEEP

* WAS ANY CASING REMOVED? X YES _____ NO
if yes, length removed, in feet: 2

* WAS CASING RIPPED OR PERFORATED? _____ YES X NO

Michael W. Kuhn 336 (MWD)/MSD/MGD

SIGNATURE, MASTER WELL DRILLER OR SUPERVISING SANITARIAN LICENSE # CIRCLE ONE DATE

NOV-16-2001 15:58 PANASONIC 4107895029 P.07/22

MARYLAND DEPARTMENT OF THE ENVIRONMENT, WATER MANAGEMENT ADMINISTRATION
2500 BROENING HIGHWAY, BALTIMORE, MARYLAND 21224, (410) 631-3784

****

WATER WELL ABANDONMENT-SEALING REPORT FORM

****

SUBMIT COPIES OF COMPLETED FORM TO:

- COUNTY ENVIRONMENT AGENCY (contact MDE, WMA if address needed)
- WELL OWNER
- MDE, WATER MANAGEMENT ADMINISTRATION, WELL PROGRAM

DATE WELL ABANDONED: 08/29/2001 (month/day/year)

* PERMIT NUMBER OF ABANDONED WELL (if any) CH — 94 — 4176

* PERMIT NUMBER OF REPLACEMENT WELL — —

* PERSON ABANDONING WELL: Aaron Eichelberger

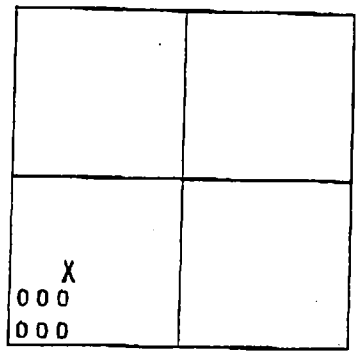
WELL DRILLERS LICENSE NUMBER: AWD 709

CIRCLE: MWD/MSD/M

* OWNER'S NAME: Naval Surface Warfare Center

* WELL LOCATION:
COUNTY: Charles
NEAREST TOWN: Indian Head
TAX MAP 20 BLOCK 8 PARCEL
SUBDIVISION:
SECTION: LOT:
NEAREST ROAD: Hersey Road

MARYLAND GRID COORDINATES
BOX NUMBER
E 751,000
N 274,000



SHOW WELL LOCATION BY X WITHIN BOX

TMP017

* TYPE OF WELL BEING ABANDONED:

_____ DRILLED _____ JETTED
__X__ BORED/AUGUERED _____ HAND DUG
_____ OTHER (specify) _____

* USE CODE:

_____ DOMESTIC _____ MUNICIPAL/PUBLIC
_____ IRRIGATION _____ INDUSTRIAL
__X__ TEST/OBSERVATION

* TYPE OF CASING:

_____ STEEL __X__ PLASTIC
_____ CONCRETE _____ OTHER (specify)

* SIZE OF CASING: 1 INCHES IN DIAMETER

* DEPTH OF WELL: 26 FEET DEEP

WAS ANY CASING REMOVED? _X_ YES _____ NO
if yes, length removed, in feet: 2

* WAS CASING RIPPED OR PERFORATED? _____ YES _X_ NO

LOG OF SEALING MATERIAL

MATERIAL	FEET FROM	FEET TO
Bentonite-Cement Slurry	0	26

Michael W. Kuhn 336 MWD/MSD/MGD

SIGNATURE-MASTER WELL DRILLER OR SUPERVISING SANITARIAN LICENSE # CIRCLE ONE DATE

NOV-16-2001 15:59 PANASONIC 4107895029 P.08/22

MARYLAND DEPARTMENT OF THE ENVIRONMENT, WATER MANAGEMENT ADMINISTRATION
2500 BROENING HIGHWAY, BALTIMORE, MARYLAND 21224, (410) 631-3784

****

WATER WELL ABANDONMENT-SEALING REPORT FORM

****

SUBMIT COPIES OF COMPLETED FORM TO:

* COUNTY ENVIRONMENT AGENCY (contact MDE, WMA if address needed)
* WELL OWNER
* MDE, WATER MANAGEMENT ADMINISTRATION, WELL PROGRAM

DATE WELL ABANDONED: 08/29/2001 (month/day/year)

* PERMIT NUMBER OF ABANDONED WELL (if any) CH — 94 — 4176

* PERMIT NUMBER OF REPLACEMENT WELL — —

* PERSON ABANDONING WELL: Aaron Eichelberger

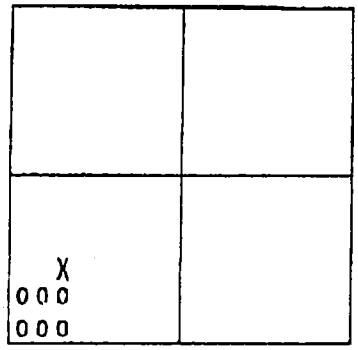
WELL DRILLERS LICENSE NUMBER: AWD 709

CIRCLE: MWD/MSD/M

* OWNER'S NAME: Naval Surface Warfare Center

* WELL LOCATION:
COUNTY: Charles
NEAREST TOWN: Indian Head
TAX MAP 20 BLOCK 8 PARCEL
SUBDIVISION:
SECTION: LOT:
NEAREST ROAD: Hersey road

MARYLAND GRID COORDINATES
E 751,000
BOX NUMBER
N 274,000 <



SHOW WELL LOCATION BY X WITHIN BOX

FMP 018

* TYPE OF WELL BEING ABANDONED:

_____ DRILLED _____ JETTED
_X_ BORED/AUGUERED _____ HAND DUG
_____ OTHER (specify) _____

LOG OF SEALING MATERIAL

MATERIAL	FEET FROM	FEET TO
Bentonite-~~XXXXX~~ Cement Slurry	0	26

* USE CODE:

_____ DOMESTIC _____ MUNICIPAL/PUBLIC
_____ IRRIGATION _____ INDUSTRIAL
_X_ TEST/OBSERVATION

* TYPE OF CASING:

_____ STEEL _X_ PLASTIC
_____ CONCRETE _____ OTHER (specify)

* SIZE OF CASING: 1 INCHES IN DIAMETER

* DEPTH OF WELL: 26 FEET DEEP

* WAS ANY CASING REMOVED? _X_ YES _____ NO
if yes, length removed, in feet: 2

* WAS CASING RIPPED OR PERFORATED? ___ YES _X_ NO

Michael W. Kuhn

336 MWD/MSD/MGD

NOV-16-2001 15:59 PANASONIC 4107895029 P.09/22

MARYLAND DEPARTMENT OF THE ENVIRONMENT, WATER MANAGEMENT ADMINISTRATION
2500 BROENING HIGHWAY, BALTIMORE, MARYLAND 21224, (410) 631-3784

WATER WELL ABANDONMENT-SEALING REPORT FORM

SUBMIT COPIES OF COMPLETED FORM TO:

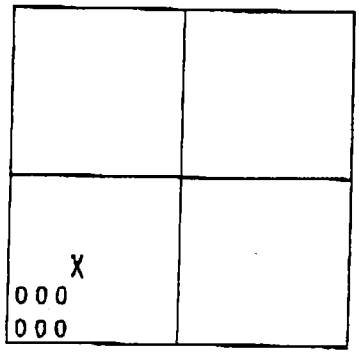
- COUNTY ENVIRONMENT AGENCY (contact MDE, WMA if address needed)
- WELL OWNER
- MDE, WATER MANAGEMENT ADMINISTRATION, WELL PROGRAM

DATE WELL ABANDONED: 08/29/2001 (month/day/year)

- PERMIT NUMBER OF ABANDONED WELL (if any) CH — 94 — 4176
- PERMIT NUMBER OF REPLACEMENT WELL — —
- PERSON ABANDONING WELL: Aaron Eichelberger
- WELL DRILLERS LICENSE NUMBER: AWD 709
- CIRCLE: MWD/MSD/MG
- OWNER'S NAME: Naval Surface Warfare Center
- WELL LOCATION:
  COUNTY: Charles
  NEAREST TOWN: Indian Head
  TAX MAP 20 BLOCK 8 PARCEL ____
  SUBDIVISION: ____
  SECTION: ____ LOT: ____
  NEAREST ROAD: Hersey Road

MARYLAND GRID COORDINATES
BOX NUMBER E 751,000
N 274,000 <——

X 000 000	



SHOW WELL LOCATION BY X WITHIN BOX

TMP 019

- TYPE OF WELL BEING ABANDONED:
  ____ DRILLED ____ JETTED
  X BORED/AUGUERED ____ HAND DUG
  ____ OTHER (specify) ____
- USE CODE:
  ____ DOMESTIC ____ MUNICIPAL/PUBLIC
  ____ IRRIGATION ____ INDUSTRIAL
  X TEST/OBSERVATION
- TYPE OF CASING:
  ____ STEEL X PLASTIC
  ____ CONCRETE ____ OTHER (specify) ____
- SIZE OF CASING: 1 INCHES IN DIAMETER
- DEPTH OF WELL: 15 FEET DEEP
- WAS ANY CASING REMOVED? X YES ____ NO
  if yes, length removed, in feet: 2
- WAS CASING RIPPED OR PERFORATED? ____ YES X NO

LOG OF SEALING MATERIAL

MATERIAL	FEET FROM	FEET TO
Bentonite-Cement Slurry	0	15

Michael W. Huber 336 MWD/MSD/MGD

SIGNATURE-MASTER WELL DRILLER OR SUPERVISING SANITARIAN LICENSE # CIRCLE ONE DATE

DENV 828 JULY 1992

NOV-16-2001 15:59 PANASONIC 4107895029 P.10/22

B 1 2482 (MDE USE ONLY)

STATE OF MARYLAND
PERMIT TO DRILL WELL
please print or type

CH - 94 - 4178
fill in this form completely

Date Received (APA)

OWNER INFORMATION

Naval Surface Warfare Center
Last Name Owner First Name

Indian Head Division
Street or RFD

Indian Head, MD 20640
Town State Zip

DRILLER INFORMATION

Michael W. Huber M W D 336
Driller's Name License No.

CHESAPEAKE GEOSYSTEMS, INC.
Firm Name

6720 Ft. Smallwood Rd Balto., MD 21226
Address

Signature Date

B 2 WELL INFORMATION

APPROX. PUMPING RATE (GAL. PER MIN.) NA

AVERAGE DAILY QUANTITY NEEDED (GAL. PER DAY) NA

USE FOR WATER (CIRCLE APPROPRIATE BOX)

- D DOMESTIC POTABLE SUPPLY & RESIDENTIAL IRRIGATION
- F FARMING (LIVESTOCK WATERING & AGRICULTURAL IRRIGATION
- I INDUSTRIAL, COMMERICIAL, DEWATERING
- P PUBLIC WATER SUPPLY WELL
- T TEST, OBSERVATION, MONITORING
- G GEO-THERMAL

APPROXIMATE DEPTH OF WELL 20 FEET

APPROXIMATE DIAMETER OF WELL 2 NEAREST INCH

METHOD OF DRILLING (circle one)

BORED (or Augered) JETTED Jetted & DRIVEN
AIR-ROTary AIR-PERcussion ROTARY (Hydraulic Rotary)
CABLE REVerse-ROTary DRive-POINT
other

REPLACEMENT OR DEEPENED WELLS
(CIRCLE APPROPRIATE BOX)

- N THIS WELL WILL NOT REPLACE AN EXISTING WELL
- Y THIS WELL WILL REPLACE A WELL THAT WILL BE ABANDONED AND SEALED
- S THIS WELL WILL REPLACE A WELL THAT WILL BE USED AS A STANDBY-CONTACT LOCAL APPROVING AUTHORITY FOR POLICY ON STANDBY WELLS
- D THIS WELL WILL DEEPEN AN EXISTING WELL

PERMIT NUMBER OF WELL TO BE REPLACED OR DEEPENED (IF AVAILABLE)

Not to be filled in by driller (MDE OR COUNTY USE ONLY)

APPROP. PERMIT NUMBER G

PERMIT No. CH 94 4178

B 3 LOCATION OF WELL

Charles
COUNTY

SUBDIVISION

SECTION LOT

Indian Head
NEAREST TOWN

MILES FROM TOWN (enter 0 if in town) 0 M

B 4

DIRECTION OF WELL FROM TOWN (CIRCLE BOX)

N NW NE W TOWN E SW SE S

Hersey Road
NEAR WHAT ROAD

ON WHICH SIDE OF ROAD (CIRCLE APPROPRIATE BOX)

NORTH N W WEST E EAST S SOUTH

140
DISTANCE FROM ROAD

ENTER FT OR MI FT

TAX MAP: 20 BLK: 8 PARCEL

NOT TO BE FILLED IN BY DRILLER
HEALTH DEPARTMENT APPROVAL

Charles 01 14189 W(M
COUNTY NAME COUNTY NO.

STATE SIGNATURE INSERT S

DATE ISSUED 8-24-01 8-24-02
CO SIGNATURE EXP.

NORTH GRID 274 000 EAST GRID 751 000

SHOW MAJOR FEATURES OF BOX & LOCATE WELL WITH AN X

SOURCES OF DRILLING WATER
1.
2.
3.

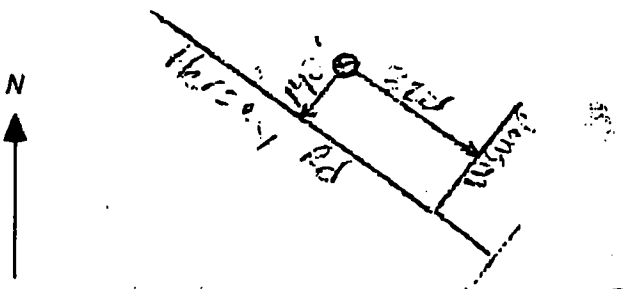
WRITE THE BOX NUMBER FROM THE MAP HERE

E 751,000

N 274,000

X
000
000

DRAW A SKETCH BELOW SHOWING LOCATION OF WELL IN RELATION TO NEARBY TOWNS AND ROADS AND GIVE DISTANCE FROM WELL TO NEAREST ROAD JUNCTION



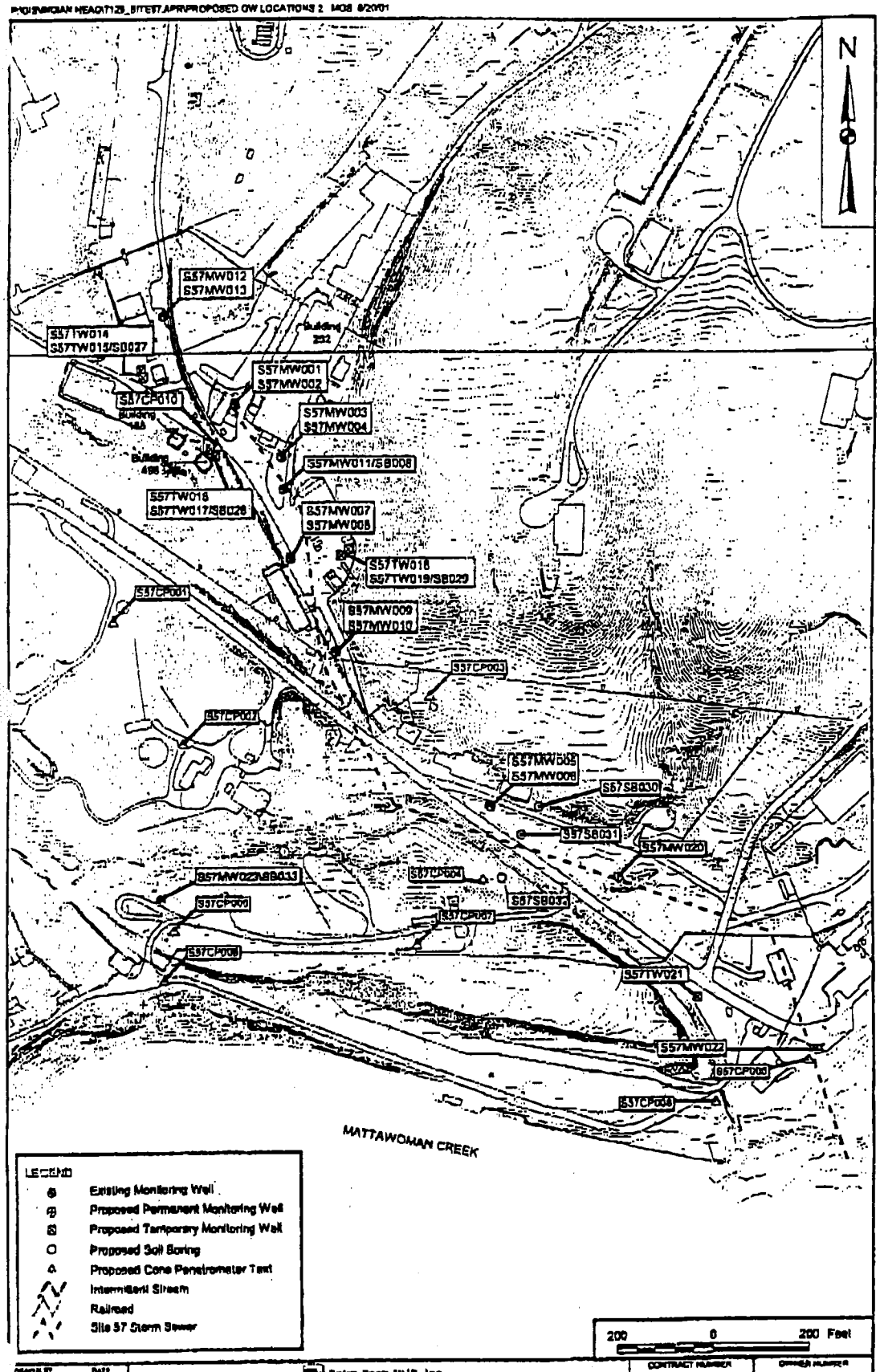
SPECIAL CONDITIONS
NOTE - APPROVING AUTHORITIES SHOULD USE SEPARATE SHEET IF NEEDED

DENV-Permit 97

DRILLER

NOV-16-2001 16:00 PANASONIC 4107895029 P.11/22

P:\GIS\INDIAN HEAD\7129_SITE57.APR\PROPOSED GW LOCATIONS 2 MOD 8/20/01



DRAWN BY / CHECKED BY	DATE / SCALE	Tetra Tech NUS, Inc.	CONTRACT NUMBER 7129 / OWNER NUMBER
		PROPOSED SOIL AND GROUNDWATER SAMPLING AND CONE PENETROMETER TEST LOCATIONS SITE 57 - FORMER DRUM LOADING AREA NSWC INDIAN HEAD INDIAN HEAD, MARYLAND	APPROVED BY GJL / DATE 9/21/01
			APPROVED BY / DATE
	AS NOTED		DRAWING NO. FIGURE 2 / REV 0

(THIS NUMBER IS TO BE PUNCHED IN COLS. 3-6 ON ALL CARDS)

FILL IN THIS FORM COMPLETELY PLEASE TYPE

COUNTY NUMBER 01-14189-W(M)

ST/CO USE ONLY
DATE Received MM DD YY

DATE WELL COMPLETED MM 08 DD 22 YY 01

Depth of Well 14 (TO NEAREST FOOT)

PERMIT NO. FROM "PERMIT TO DRILL WELL" CH 94 4178

OWNER Naval Surface Warfare Center (7th)

STREET OR RFD Indian Head Division TOWN Indain Head, MD 20640

SUBDIVISION SECTION LOT

WELL LOG

Not required for driven wells

STATE THE KIND OF FORMATIONS PENETRATED, THEIR COLOR, DEPTH, THICKNESS AND IF WATER BEARING

DESCRIPTION (Use additional sheets if needed)	FEET FROM	FEET TO	check if water bearing
yellow gravel with some sand silt	0	2	
Dark sand and XXXXX gravel	2	8	
yellow/brown clayey sand	8	10	
yellow/brown sand and gravel	10	XX 14	
water @ 12'			

NUMBER OF UNSUCCESSFUL WELLS: none

WELL HYDROFRACTURED yes N no

CIRCLE APPROPRIATE LETTER
- A A WELL WAS ABANDONED AND SEALED WHEN THIS WELL WAS COMPLETED
- E ELECTRIC LOG OBTAINED
- P TEST WELL CONVERTED TO PRODUCTION WELL

I HEREBY CERTIFY THAT THIS WELL HAS BEEN CONSTRUCTED IN ACCORDANCE WITH COMAR 26.04.04 "WELL CONSTRUCTION" AND IN CONFORMANCE WITH ALL CONDITIONS STATED IN THE ABOVE CAPTIONED PERMIT, AND THAT THE INFORMATION PRESENTED HEREIN IS ACCURATE AND COMPLETE TO THE BEST OF MY KNOWLEDGE.

DRILLERS LIC. NO. M W 3136

DRILLERS SIGNATURE (MUST MATCH SIGNATURE ON APPLICATION)

LIC. NO. M D

SITE SUPERVISOR (sign. of driller or journeyman responsible for sitework if different from permittee)

GROUTING RECORD

WELL HAS BEEN GROUTED (Circle Appropriate Box) yes X no N

TYPE OF GROUTING MATERIAL (Circle one)

CEMENT (C M) BENTONITE CLAY (B C)

NO. OF BAGS 6 NO. OF POUNDS 564

GALLONS OF WATER X 42

DEPTH OF GROUT SEAL (to nearest foot)

from 0 TOP ft. to 2 BOTTOM ft.

(enter 0 if from surface)

CASING RECORD

casing types insert appropriate code below

(S T) STEEL (C O) CONCRETE (P L) PLASTIC (O T) OTHER

MAIN CASING TYPE	Nominal diameter top (main) casing (nearest inch)	Total depth of main casing (nearest foot)
PL	2	4

OTHER CASING (if used)

EACH CASING	diameter inch	depth (feet) from	to

SCREEN RECORD

screen type or open hole insert appropriate code below

(S T) STEEL (B R) BRASS BRONZE (H O) OPEN HOLE (P L) PLASTIC (O T) OTHER

C 2

EACH SCREEN	DEPTH (nearest ft.)		
1	PL	4	14 XX
2			
3			

SLOT SIZE 1 010 2 3

DIAMETER OF SCREEN 2 (NEAREST INCH)

GRAVEL PACK IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX 68

from	to
2	14

MDE USE ONLY (NOT TO BE FILLED IN BY DRILLER)

T (E.R.O.S.) W Q

TELESCOPE CASING LOG INDICATOR OTHER DATA

C 3

NA

PUMPING TEST

HOURS PUMPED (nearest hour)

PUMPING RATE (gal. per min.)

METHOD USED TO MEASURE PUMPING RATE

WATER LEVEL (distance from land surface)

BEFORE PUMPING ft.

WHEN PUMPING ft.

TYPE OF PUMP USED (for test)

A air P piston T turbine C centrifugal R rotary O other (describ below) J jet S submersible Monitor

PUMP INSTALLED

DRILLER INSTALLED PUMP (CIRCLE) (YES or NO) YES NO

IF DRILLER INSTALLS PUMP, THIS SECTION MUST BE COMPLETED FOR ALL WELLS.

TYPE OF PUMP INSTALLED PLACE (A,C,J,P,R,S,T,O) IN BOX 29.

CAPACITY: GALLONS PER MINUTE (to nearest gallon)

PUMP HORSE POWER

PUMP COLUMN LENGTH (nearest ft.)

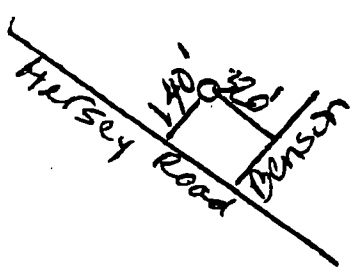
CASING HEIGHT (circle appropriate box and enter casing height)

(+) above (−) below LAND SURFACE

00 (nearest foot)

LOCATION OF WELL ON LOT

SHOW PERMANENT STRUCTURE SUCH AS BUILDING, SEPTIC TANKS, AND /OR LANDMARKS AND INDICATE NOT LESS THAN TWO DISTANCES (MEASUREMENTS TO WELL)



DENV-CR97 ORIGINAL - STATE

MW-2D

NOV-16-2001 16:01 PANASONIC 4107895029 P.13/22

B 1 2485 SEQUENCE NO. (MDE USE ONLY)

STATE OF MARYLAND
PERMIT TO DRILL WELL
please print or type

STATE PERMIT NUMBER
CH – 94 – 4175
fill in this form completely

Date Received (APA)
8 MM DD YY 13

OWNER INFORMATION
Naval Surface Warfare Center
15 Last Name Owner First Name 34
Indian Head Division
36 Street or RFD 55
Indian Head, Maryland 20640
57 Town 70 State 72 Zip 76

DRILLER INFORMATION
MichaEL W. Huber M W D 336
Driller's Name 76 License No. 81
EMEA Chesapeake Geosystems, Inc.
Firm Name
6720 Ft. Smallwood Ropad Balto., MD 21226
Address
Signature Date

B 2 WELL INFORMATION
APPROX. PUMPING RATE (GAL. PER MIN.) NA (8–12)
AVERAGE DAILY QUANTITY NEEDED (GAL. PER DAY) NA (14–20)

USE FOR WATER (CIRCLE APPROPRIATE BOX)
- [D] DOMESTIC POTABLE SUPPLY & RESIDENTIAL IRRIGATION
- [F] FARMING (LIVESTOCK WATERING & AGRICULTURAL IRRIGATION
- [I] INDUSTRIAL, COMMERICIAL, DEWATERING (22)
- [P] PUBLIC WATER SUPPLY WELL
- [T] TEST, OBSERVATION, MONITORING
- [G] GEO-THERMAL

APPROXIMATE DEPTH OF WELL 20 (24–28) FEET

APPROXIMATE DIAMETER OF WELL 2 NEAREST INCH

METHOD OF DRILLING (circle one)
BORED (or Augered) JETTED Jetted & DRIVEN
(30) AIR-ROTary AIR-PERcussion ROTARY (Hydraulic Rotary)
(37) CABLE REVerse-ROTary DRive-POINT
other

REPLACEMENT OR DEEPENED WELLS
(CIRCLE APPROPRIATE BOX)
- [N] THIS WELL WILL NOT REPLACE AN EXISTING WELL
- [Y] THIS WELL WILL REPLACE A WELL THAT WILL BE ABANDONED AND SEALED
- (39) [S] THIS WELL WILL REPLACE A WELL THAT WILL BE USED AS A STANDBY-CONTACT LOCAL APPROVING AUTHORITY FOR POLICY ON STANDBY WELLS
- [D] THIS WELL WILL DEEPEN AN EXISTING WELL

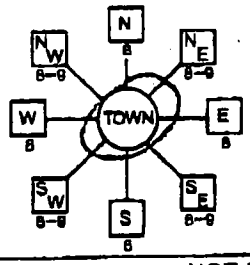
PERMIT NUMBER OF WELL TO BE REPLACED OR DEEPENED (IF AVAILABLE) (41–52)

Not to be filled in by driller (MDE OR COUNTY USE ONLY)

APPROP. PERMIT NUMBER _ _ _ _ _ G _ _ _
PERMIT No. CH_ 94_ 4175 (70 71 72 73 74 75 76 77 78 79)

B 3 LOCATION OF WELL
Charles
8 COUNTY 21
23 SUBDIVISION 42
SECTION (44–46) LOT (48–50)
Indian Head
52 NEAREST TOWN 71
MILES FROM TOWN (enter 0 if in town) 0 M (73–78)

B 4
1 2
DIRECTION OF WELL FROM TOWN (CIRCLE BOX)



Hersey road
11 NEAR WHAT ROAD 30

ON WHICH SIDE OF ROAD (CIRCLE APPROPRIATE BOX)

34 37
DISTANCE FROM ROAD
ENTER FT OR MI (38–39)

TAX MAP: 20 BLK: 8 PARCEL

NOT TO BE FILLED IN BY DRILLER
HEALTH DEPARTMENT APPROVAL

Charles 01-14186-W(01)
COUNTY NAME COUNTY NO.
STATE SIGNATURE INSERT S (41)
DATE ISSUED 06-24-01 06-24-02
43 MM DD YY 48 CO SIGNATURE EXP. DATE
NORTH GRID 274 000 (50–55) EAST GRID 751 000 (57–63)

SHOW MAJOR FEATURES OF BOX & LOCATE WELL WITH AN X

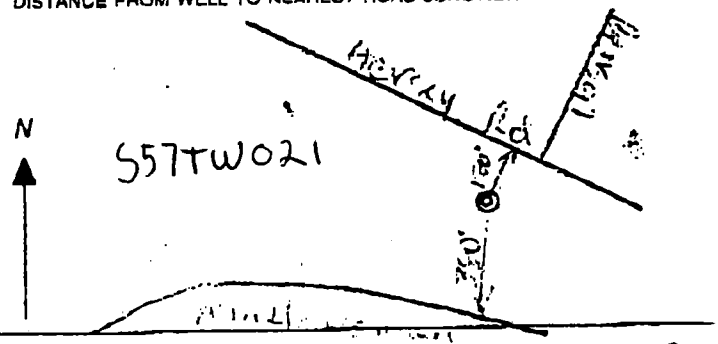
SOURCES OF DRILLING WATER
1.
2.
3.

WRITE THE BOX NUMBER FROM THE MAP HERE

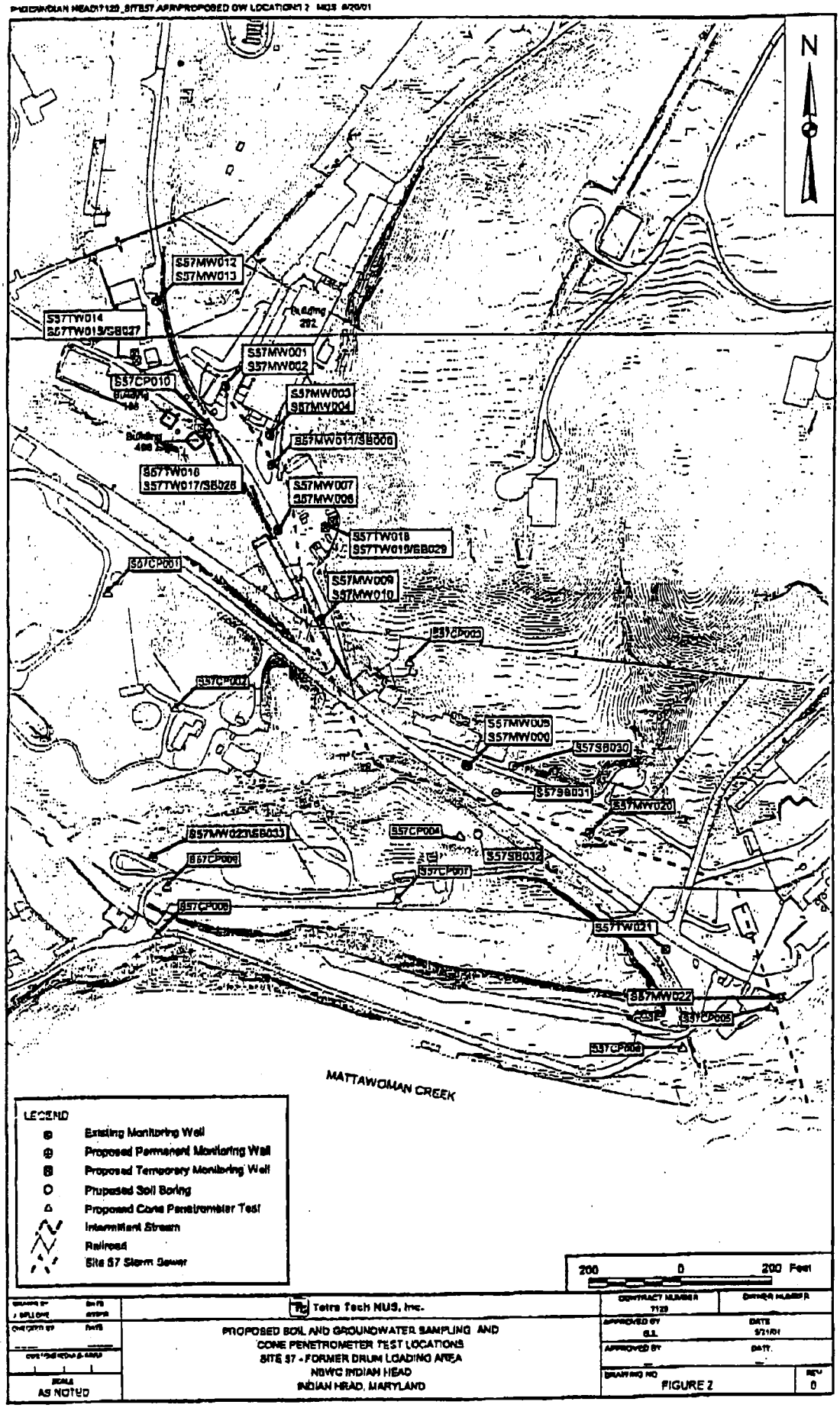
E 751,000
N 274,000

X
000
000

DRAW A SKETCH BELOW SHOWING LOCATION OF WELL IN RELATION TO NEARBY TOWNS AND ROADS AND GIVE DISTANCE FROM WELL TO NEAREST ROAD JUNCTION



SPECIAL CONDITIONS
NOTE - APPROVING AUTHORITIES SHOULD USE SEPARATE SHEET IF NECESSARY -



NOV-16-2001 16:02 PANASONIC 4107895029 P.15/22

(THIS NUMBER IS TO BE PUNCHED IN COLS. 3-5 ON ALL CARDS)

FILL IN THIS FORM COMPLETELY PLEASE TYPE

COUNTY NUMBER 01-14186-W(M)

ST/CO USE ONLY DATE Received mm dd yy

DATE WELL COMPLETED mm 08 dd 20 yy 01

Depth of Well 14 (TO NEAREST FOOT)

PERMIT NO. FROM "PERMIT TO DRILL WELL" CR - 94 - 4175

OWNER Naval Surface Warfare Center (7th)

STREET OR RFD Indian Head Division TOWN Indian Head, MD 20640

SUBDIVISION SECTION LOT

WELL LOG

Not required for driven wells

STATE THE KIND OF FORMATIONS PENETRATED, THEIR COLOR, DEPTH, THICKNESS AND IF WATER BEARING

DESCRIPTION (Use additional sheets if needed)	FEET FROM	FEET TO	check if water bearing
yellow gravel with some sand and ~~XXXXX~~ silt	0	2	
dark sand and gravel	2	8	
yellow/brown clayey sand	8	10	
yellow/brown sand and gravel	10	14	
water @ 12'			

NUMBER OF UNSUCCESSFUL WELLS: none

WELL HYDROFRACTURED yes [Y] no [X]

CIRCLE APPROPRIATE LETTER

- A A WELL WAS ABANDONED AND SEALED WHEN THIS WELL WAS COMPLETED
- E ELECTRIC LOG OBTAINED
- P TEST WELL CONVERTED TO PRODUCTION WELL

I HEREBY CERTIFY THAT THIS WELL HAS BEEN CONSTRUCTED IN ACCORDANCE WITH COMAR 26.04.04 "WELL CONSTRUCTION" AND IN CONFORMANCE WITH ALL CONDITIONS STATED IN THE ABOVE CAPTIONED PERMIT, AND THAT THE INFORMATION PRESENTED HEREIN IS ACCURATE AND COMPLETE TO THE BEST OF MY KNOWLEDGE.

DRILLERS LIC. NO. M W D 2 3 6

Michael W. Huber

DRILLERS SIGNATURE (MUST MATCH SIGNATURE ON APPLICATION)

LIC. NO.: M __ D ____

SITE SUPERVISOR (sign. of driller or journeyman responsible for sitework if different from permittee)

GROUTING RECORD

WELL HAS BEEN GROUTED (Circle Appropriate Box) yes [X] no [N]

TYPE OF GROUTING MATERIAL (Circle one)

CEMENT [C M] BENTONITE CLAY [B C]

NO. OF BAGS 6 NO. OF POUNDS 564

GALLONS OF WATER 36

DEPTH OF GROUT SEAL (to nearest foot)

from 0 ft. TOP to 7 ft. BOTTOM

(enter 0 if from surface)

CASING RECORD

casing types insert appropriate code below

[S T] STEEL [C O] CONCRETE [P L] PLASTIC [O T] OTHER

MAIN CASING TYPE	Nominal diameter top (main) casing (nearest inch)	Total depth of main casing (nearest foot)
PL	1	9

OTHER CASING (If used)

EACH CASING	diameter inch	depth (feet) from	to

SCREEN RECORD

screen type or open hole — insert appropriate code below

[S T] STEEL [B R] BRASS BRONZE [H O] OPEN HOLE [P L] PLASTIC [O T] OTHER

C 2

EACH SCREEN	DEPTH (nearest ft.)		
1	PL	9	14
2			
3			

SLOT SIZE 1 010 2 ____ 3 ____

DIAMETER OF SCREEN 1 (NEAREST INCH)

GRAVEL PACK IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX 68	from	to
	7	14

MDE USE ONLY (NOT TO BE FILLED IN BY DRILLER)

T (E.R.O.S.) W Q

TELESCOPE CASING ____ LOG INDICATOR ____ OTHER DATA ____

C 3

NA

PUMPING TEST

HOURS PUMPED (nearest hour) ____

PUMPING RATE (gal. per min.) ____

METHOD USED TO MEASURE PUMPING RATE ____

WATER LEVEL (distance from land surface)

BEFORE PUMPING ____ ft.

WHEN PUMPING ____ ft.

TYPE OF PUMP USED (for test)

- [A] air
- [P] piston
- [T] turbine
- [C] centrifugal
- [R] rotary
- [O] other (describe below) Temporar Monitori
- [J] jet
- [S] submersible

PUMP INSTALLED

DRILLER INSTALLED PUMP (CIRCLE) (YES or NO) YES (NO)

IF DRILLER INSTALLS PUMP, THIS SECTION MUST BE COMPLETED FOR ALL WELLS.

TYPE OF PUMP INSTALLED PLACE (A,C,J,P,R,S,T,O) IN BOX 29. ____

CAPACITY: GALLONS PER MINUTE (to nearest gallon) ____

PUMP HORSE POWER ____

PUMP COLUMN LENGTH (nearest ft.) ____

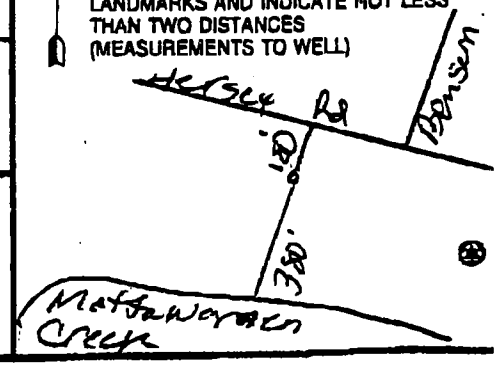
CASING HEIGHT (circle appropriate box and enter casing height)

[+] above [-] below LAND SURFACE

00 (nearest foot)

LOCATION OF WELL ON LOT

SHOW PERMANENT STRUCTURE SUCH AS BUILDING, SEPTIC TANKS, AND /OR LANDMARKS AND INDICATE NOT LESS THAN TWO DISTANCES (MEASUREMENTS TO WELL)



DENV-CR87 ORIGINAL-STATE

Temp021

NOV-16-2001 16:02 PRNASONIC 4107895029 P.16/22

MARYLAND DEPARTMENT OF THE ENVIRONMENT, WATER MANAGEMENT ADMINISTRATION
2500 BROENING HIGHWAY, BALTIMORE, MARYLAND 21224. (410) 631-3784

WATER WELL ABANDONMENT-SEALING REPORT FORM

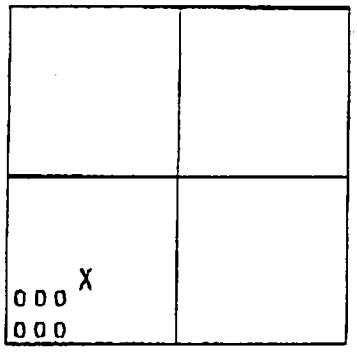
SUBMIT COPIES OF COMPLETED FORM TO:

- COUNTY ENVIRONMENT AGENCY (contact MDE, WMA if address needed)
- WELL OWNER
- MDE, WATER MANAGEMENT ADMINISTRATION, WELL PROGRAM

DATE WELL ABANDONED: 08/29/2001 (month/day/year)

* PERMIT NUMBER OF ABANDONED WELL (if any) CH — 94 — 4175
* PERMIT NUMBER OF REPLACEMENT WELL — —
* PERSON ABANDONING WELL: Aaron Eichelberger
WELL DRILLERS LICENSE NUMBER: AWD 709
CIRCLE: MWD/MSD/MG
* OWNER'S NAME: Naval Surface Warfare Center
* WELL LOCATION:
COUNTY: Charles
NEAREST TOWN: Indian Head
TAX MAP 20 BLOCK 8 PARCEL
SUBDIVISION:
SECTION: LOT:
NEAREST ROAD: Hersey Road

MARYLAND GRID COORDINATES
BOX NUMBER
E 751,000
N 274,000 <



SHOW WELL LOCATION BY X WITHIN BOX

Tmp 021

* TYPE OF WELL BEING ABANDONED:

_____ DRILLED _____ JETTED
__X__ BORED/AUGUERED _____ HAND DUG
_____ OTHER (specify) _____

LOG OF SEALING MATERIAL

MATERIAL	FEET FROM	FEET TO
Bentonite-Cement Slurry	0	14

* USE CODE:

_____ DOMESTIC _____ MUNICIPAL/PUBLIC
_____ IRRIGATION _____ INDUSTRIAL
__X__ TEST/OBSERVATION

* TYPE OF CASING:

_____ STEEL __X__ PLASTIC
_____ CONCRETE _____ OTHER (specify)

* SIZE OF CASING: 1 INCHES IN DIAMETER
* DEPTH OF WELL: 14 FEET DEEP
* WAS ANY CASING REMOVED? X YES _____ NO
if yes, length removed, in feet: 2
* WAS CASING RIPPED OR PERFORATED? ___ YES X NO

Michael W. Kuhn (MWD) MSD/MGD 336
SIGNATURE-MASTER WELL DRILLER OR SUPERVISING SANITARIAN LICENSE # CIRCLE ONE DATE

NOV-16-2001 16:03 PANASONIC 4107895029 P.17/22

B 1 2483 — SEQUENCE NO. (MDE USE ONLY)

STATE OF MARYLAND
PERMIT TO DRILL WELL
please print or type

STATE PERMIT NUMBER: CH – 94 – 4177 (fill in this form completely)

Date Received (APA) ____ 8 MM DD YY 13

OWNER INFORMATION

Naval Surface Warfare Center (15 Last Name Owner First Name 34)

Indian Head Division (36 Street or RFD 55)

Indian Head, MD 20640 (57 Town 70 State 72 Zip 76)

DRILLER INFORMATION

Michael W. Huber — M W D 336 (Driller's Name 76 License No. 81)

CHESAPEAKE GEOSYSTEMS, INC. (Firm Name)

6720 Ft. Smallwood Rd Balto., MD 21226 (Address)

Signature ____ Date ____

B 2 WELL INFORMATION

APPROX. PUMPING RATE (GAL. PER MIN.): NA (8 12)

AVERAGE DAILY QUANTITY NEEDED (GAL. PER DAY): NA (14 20)

USE FOR WATER (CIRCLE APPROPRIATE BOX)

- [D] DOMESTIC POTABLE SUPPLY & RESIDENTIAL IRRIGATION
- [F] FARMING (LIVESTOCK WATERING & AGRICULTURAL IRRIGATION
- 22 [I] INDUSTRIAL, COMMERICIAL, DEWATERING
- [P] PUBLIC WATER SUPPLY WELL
- [T] TEST, OBSERVATION, MONITORING
- [G] GEO-THERMAL

APPROXIMATE DEPTH OF WELL: 20 FEET (24 28)

APPROXIMATE DIAMETER OF WELL: 8 2 NEAREST INCH

METHOD OF DRILLING (circle one)

BORED (or Augered) — JETTED — Jetted & DRIVEN

30 AIR-ROTary — AIR-PERcussion — ROTARY (Hydraulic Rotary)

37 CABLE — REVerse-ROTary — DRive-POINT

other ____

REPLACEMENT OR DEEPENED WELLS
(CIRCLE APPROPRIATE BOX)

- [N] THIS WELL WILL NOT REPLACE AN EXISTING WELL
- [Y] THIS WELL WILL REPLACE A WELL THAT WILL BE ABANDONED AND SEALED
- 39 [S] THIS WELL WILL REPLACE A WELL THAT WILL BE USED AS A STANDBY-CONTACT LOCAL APPROVING AUTHORITY FOR POLICY ON STANDBY WELLS
- [D] THIS WELL WILL DEEPEN AN EXISTING WELL

PERMIT NUMBER OF WELL TO BE REPLACED OR DEEPENED (IF AVAILABLE) 41 ____ 52

Not to be filled in by driller (MDE OR COUNTY USE ONLY)

APPROP. PERMIT NUMBER ____G____

PERMIT No. CH – 94 – 4177 (70 71 72 73 74 75 76 77 78 79)

B 3 LOCATION OF WELL

Charles (8 COUNTY 21)

23 SUBDIVISION 42

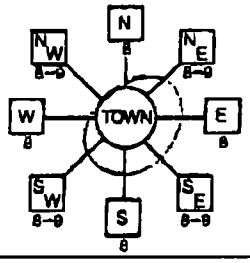
SECTION (44 46) LOT (48 50)

Indian Head (52 NEAREST TOWN 71)

MILES FROM TOWN (enter 0 if in town): 0 M (73 76 77 78)

B 4

1 2 DIRECTION OF WELL FROM TOWN (CIRCLE BOX)



Hersey Road (11 NEAR WHAT ROAD 30)

ON WHICH SIDE OF ROAD (CIRCLE APPROPRIATE BOX)

34 60 37 DISTANCE FROM ROAD

FT (ENTER FT OR MI 38 39)

TAX MAP: 20 BLK: 8 PARCEL ____

NOT TO BE FILLED IN BY DRILLER
HEALTH DEPARTMENT APPROVAL

Charles — 01-14188-Y(M (COUNTY NAME / COUNTY NO.)

STATE SIGNATURE ____ INSERT S → 41

DATE ISSUED 8-24-01 (43 MM DD YY 48) — CO SIGNATURE — EXP. DATE 8-24-02

NORTH GRID 274 000 (50 55) EAST GRID 751 000 (57 63)

SHOW MAJOR FEATURES OF BOX & LOCATE WELL WITH AN X

SOURCES OF DRILLING WATER
1.
2.
3.

WRITE THE BOX NUMBER FROM THE MAP HERE

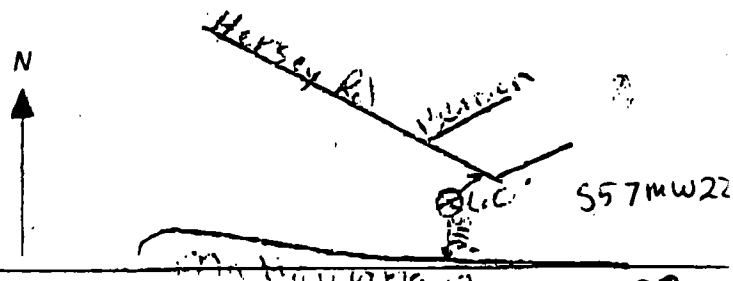
E 751,000

N 274,000

X

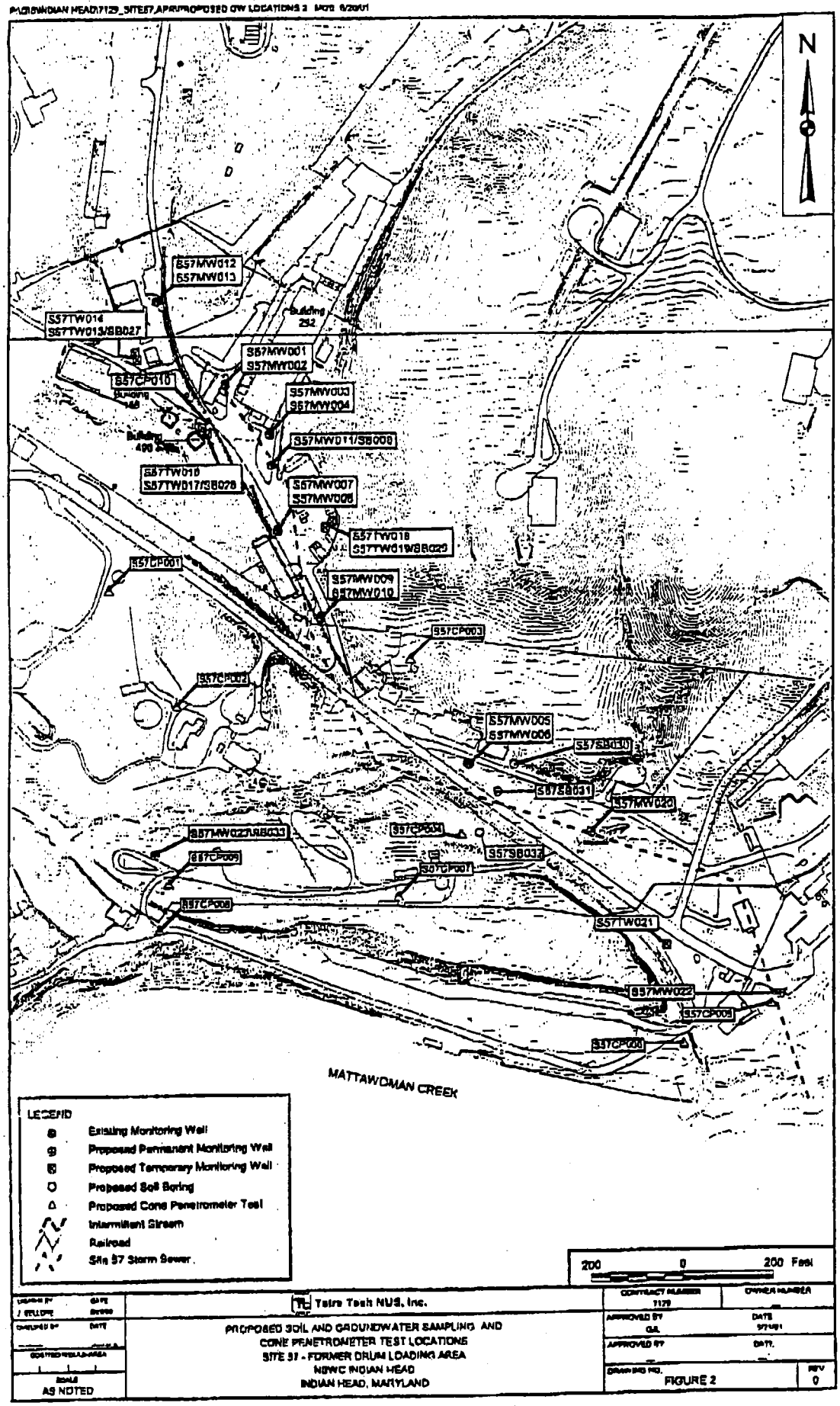
000
000

DRAW A SKETCH BELOW SHOWING LOCATION OF WELL IN RELATION TO NEARBY TOWNS AND ROADS AND GIVE DISTANCE FROM WELL TO NEAREST ROAD JUNCTION



SPECIAL CONDITIONS

NOTE - APPROVING AUTHORITIES SHOULD USE SEPARATE SHEET IF NEEDED.



NOV-16-2001 16:04 PANASONIC 4107895029 P.19/22

WELL COMPLETION REPORT

FILL IN THIS FORM COMPLETELY
PLEASE TYPE

45 DAYS AFTER WELL IS COMPLETED.

(THIS NUMBER IS TO BE PUNCHED IN COLS. 3-6 ON ALL CARDS)

COUNTY NUMBER: 01-14186-W(M)

ST/CO USE ONLY
DATE Received MM DD YY

DATE WELL COMPLETED: MM 08 DD 20 YY 01

Depth of Well: 14 (TO NEAREST FOOT)

PERMIT NO. FROM "PERMIT TO DRILL WELL": CH - 94 - 4175

OWNER: Naval Surface Warfare Center (7th)
STREET OR RFD: Indian Head Division TOWN: Indian Head, MD 20640
SUBDIVISION: SECTION: LOT:

WELL LOG

Not required for driven wells

STATE THE KIND OF FORMATIONS PENETRATED, THEIR COLOR, DEPTH, THICKNESS AND IF WATER BEARING

DESCRIPTION (Use additional sheets if needed)	FEET FROM	FEET TO	check if water bearing
yellow gravel with some sand and ~~XXXXX~~ silt	0	2	
dark sand and gravel	2	8	
yellow/brown clayey sand	8	10	
yellow/brown sand and gravel	10	14	
water @ 12'			

NUMBER OF UNSUCCESSFUL WELLS: none

WELL HYDROFRACTURED: yes [Y] no [N]

CIRCLE APPROPRIATE LETTER
- A A WELL WAS ABANDONED AND SEALED WHEN THIS WELL WAS COMPLETED
- E ELECTRIC LOG OBTAINED
- P TEST WELL CONVERTED TO PRODUCTION WELL

I HEREBY CERTIFY THAT THIS WELL HAS BEEN CONSTRUCTED IN ACCORDANCE WITH COMAR 26.04.04 "WELL CONSTRUCTION" AND IN CONFORMANCE WITH ALL CONDITIONS STATED IN THE ABOVE CAPTIONED PERMIT, AND THAT THE INFORMATION PRESENTED HEREIN IS ACCURATE AND COMPLETE TO THE BEST OF MY KNOWLEDGE.

DRILLERS I.D. NO. M W [illegible] 3 6

DRILLERS SIGNATURE
(MUST MATCH SIGNATURE ON APPLICATION)

LIC. NO.: M __ D ____

SITE SUPERVISOR (sign, if driller or journeyman responsible for sitework if different from permittee)

GROUTING RECORD

WELL HAS BEEN GROUTED (Circle Appropriate Box): yes [X] no [N]

TYPE OF GROUTING MATERIAL (Circle one)
CEMENT [C M] BENTONITE CLAY [B C]

NO. OF BAGS 6 NO. OF POUNDS 364
GALLONS OF WATER 36
DEPTH OF GROUT SEAL (to nearest foot)
from 0 ft. TOP to 7 ft. BOTTOM
(enter 0 if from surface)

CASING RECORD

casing types insert appropriate code below: [S T] STEEL [C O] CONCRETE [P L] PLASTIC [O T] OTHER

MAIN CASING TYPE	Nominal diameter top (main) casing (nearest inch)	Total depth of main casing (nearest foot)
PL	1	9

OTHER CASING (if used)

EACH CASING	diameter inch	depth (feet) from	to

SCREEN RECORD

screen type or open hole, insert appropriate code below: [S T] STEEL [B R] BRASS BRONZE [H O] OPEN HOLE [P L] PLASTIC [O T] OTHER

C 2

EACH SCREEN		DEPTH (nearest ft.)	
1	PL	9	14
2			
3			

SLOT SIZE 1 010 2 ____ 3 ____

DIAMETER OF SCREEN 1 (NEAREST INCH)

GRAVEL PACK IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX 68	from	to
	7	14

MDE USE ONLY
(NOT TO BE FILLED IN BY DRILLER)
T (E.R.O.S.) W Q

TELESCOPE CASING ____ LOG INDICATOR ____ OTHER DATA ____

C 3 NA

PUMPING TEST

HOURS PUMPED (nearest hour) ____

PUMPING RATE (gal. per min.) ____

METHOD USED TO MEASURE PUMPING RATE ____

WATER LEVEL (distance from land surface)

BEFORE PUMPING ____ ft.

WHEN PUMPING ____ ft.

TYPE OF PUMP USED (for test)
- [A] air
- [P] piston
- [T] turbine
- [C] centrifugal
- [R] rotary
- [O] other (describe below) Temporar Monitori
- [J] jet
- [S] submersible

PUMP INSTALLED

DRILLER INSTALLED PUMP (CIRCLE) (YES or NO): YES (NO)

IF DRILLER INSTALLS PUMP, THIS SECTION MUST BE COMPLETED FOR ALL WELLS.

TYPE OF PUMP INSTALLED PLACE (A,C,J,P,R,S,T,O) IN BOX 29. ____

CAPACITY: GALLONS PER MINUTE (to nearest gallon) ____

PUMP HORSE POWER ____

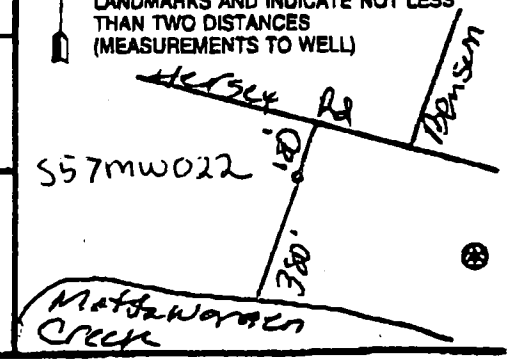
PUMP COLUMN LENGTH (nearest ft.) ____

CASING HEIGHT (circle appropriate box and enter casing height)
- [+] above
- [-] below

LAND SURFACE

00 (nearest foot)

LOCATION OF WELL ON LOT
SHOW PERMANENT STRUCTURE SUCH AS BUILDING, SEPTIC TANKS, AND /OR LANDMARKS AND INDICATE NOT LESS THAN TWO DISTANCES (MEASUREMENTS TO WELL)



B 1 | 2481 | SEQUENCE NO. (MDE USE ONLY)

STATE OF MARYLAND
PERMIT TO DRILL WELL
please print or type

STATE PERMIT NUMBER: CH – 94 – 4174
fill in this form completely

Date Received (APA)

OWNER INFORMATION

Naval Surface Warfare Center
Last Name | Owner | First Name

Indian Head Division
Street or RFD

Indian Head, Maryland 20640
Town | State | Zip

DRILLER INFORMATION

Michael W. Huber — M W D — 336
Driller's Name | License No.

CHESAPEAKE GEOSYSTEMS, INC.
Firm Name

6720 Ft. Smallwood Rd Balto., MD 21226
Address

Signature | Date

B 2 WELL INFORMATION

APPROX. PUMPING RATE (GAL. PER MIN.): NA

AVERAGE DAILY QUANTITY NEEDED (GAL. PER DAY): NA

USE FOR WATER (CIRCLE APPROPRIATE BOX)

- [D] DOMESTIC POTABLE SUPPLY & RESIDENTIAL IRRIGATION
- [F] FARMING (LIVESTOCK WATERING & AGRICULTURAL IRRIGATION
- [I] INDUSTRIAL, COMMERICIAL, DEWATERING
- [P] PUBLIC WATER SUPPLY WELL
- [T] TEST, OBSERVATION, MONITORING
- [G] GEO-THERMAL

APPROXIMATE DEPTH OF WELL: 20 FEET

APPROXIMATE DIAMETER OF WELL: _____ NEAREST INCH

METHOD OF DRILLING (circle one)

BORED (or Augered) | JETTED | Jetted & DRIVEN
AIR-ROTary | AIR-PERcussion | ROTARY (Hydraulic Rotary)
CABLE | REVerse-ROTary | DRive-POINT
other

REPLACEMENT OR DEEPENED WELLS
(CIRCLE APPROPRIATE BOX)

- [N] THIS WELL WILL NOT REPLACE AN EXISTING WELL
- [Y] THIS WELL WILL REPLACE A WELL THAT WILL BE ABANDONED AND SEALED
- [S] THIS WELL WILL REPLACE A WELL THAT WILL BE USED AS A STANDBY-CONTACT LOCAL APPROVING AUTHORITY FOR POLICY ON STANDBY WELLS
- [D] THIS WELL WILL DEEPEN AN EXISTING WELL

PERMIT NUMBER OF WELL TO BE REPLACED OR DEEPENED (IF AVAILABLE): _ _ – _ _ – _ _ _ – _ _ _ _

Not to be filled in by driller (MDE OR COUNTY USE ONLY)

APPROP. PERMIT NUMBER: _ _ _ _ _ G _ _ _

PERMIT No. CH – 94 – 4174

B 3 LOCATION OF WELL

Charles
COUNTY

SUBDIVISION

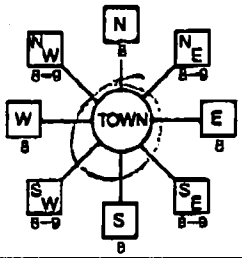
SECTION | LOT

Indian Head
NEAREST TOWN

MILES FROM TOWN (enter 0 if in town): 0 M

B 4

DIRECTION OF WELL FROM TOWN (CIRCLE BOX)



Hersey ER Road
NEAR WHAT ROAD

ON WHICH SIDE OF ROAD (CIRCLE APPROPRIATE BOX)

DISTANCE FROM ROAD: 560 FT
ENTER FT OR MI

TAX MAP: 20 BLK: 8 PARCEL: _____

NOT TO BE FILLED IN BY DRILLER
HEALTH DEPARTMENT APPROVAL

Charles — 01-14185-4(M)
COUNTY NAME | COUNTY NO.

STATE SIGNATURE: _____ INSERT S

DATE ISSUED: 8-24-01 — EXP. DA: 8-24-02
CO SIGNATURE

NORTH GRID: 275 000 — EAST GRID: 751 000

SHOW MAJOR FEATURES OF BOX & LOCATE WELL WITH AN X

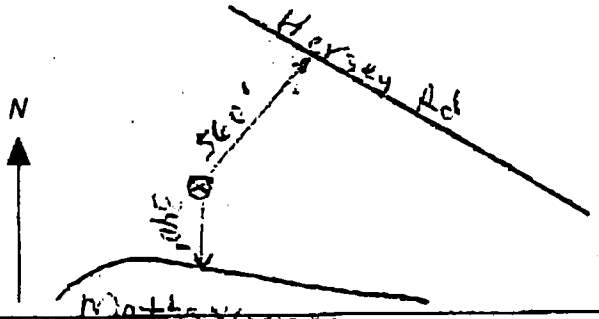
SOURCES OF DRILLING WATER
1.
2.
3.

WRITE THE BOX NUMBER FROM THE MAP HERE

E 751,000
N 274,000

X
000
000

DRAW A SKETCH BELOW SHOWING LOCATION OF WELL IN RELATION TO NEARBY TOWNS AND ROADS AND GIVE DISTANCE FROM WELL TO NEAREST ROAD JUNCTION

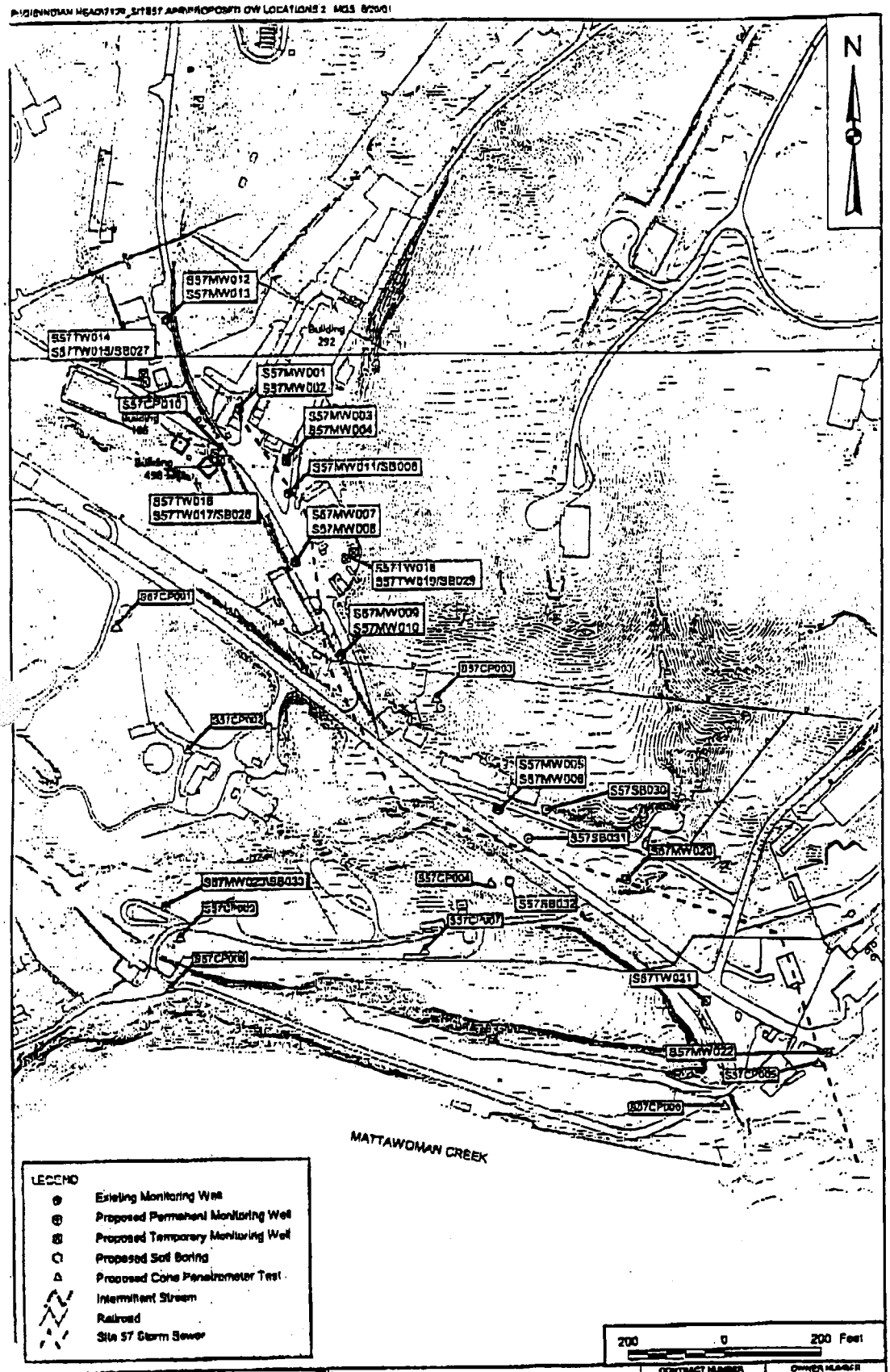


SPECIAL CONDITIONS
NOTE: APPROVING AUTHORITIES SHOULD USE SEPARATE SHEET IF NEEDED

MW23

DRILLER

NOV-16-2001 16:05 PANASONIC 4107895029 P.21/22



Tetra Tech NUS, Inc.

PROPOSED SOIL AND GROUNDWATER SAMPLING AND CONE PENETROMETER TEST LOCATIONS
SITE 57 - FORMER DRUM LOADING AREA
NSWC INDIAN HEAD
INDIAN HEAD, MARYLAND

AS NOTED

FIGURE 2

REV 0

(THIS NUMBER IS TO BE PUNCHED IN COLS. 3-5 ON ALL CARDS)

FILL IN THIS FORM COMPLETELY PLEASE TYPE

COUNTY NUMBER

PERMIT NO. 01-14185-W(M)

FROM "PERMIT TO DRILL WELL" CH - 94 - 4174

ST/GO USE ONLY
DATE Received MM DD YY

DATE WELL COMPLETED MM 08 DD 22 YY 01

Depth of Well 20 (TO NEAREST FOOT)

OWNER Navel Surface Warefare Center

STREET OR RFD ~~Indian Head Division~~ TOWN ~~Indian Head, MD 20640~~

SUBDIVISION SECTION LOT

WELL LOG

Not required for driven wells

STATE THE KIND OF FORMATIONS PENETRATED, THEIR COLOR, DEPTH, THICKNESS AND IF WATER BEARING

DESCRIPTION (Use additional sheets if needed)	FEET FROM	FEET TO	check if water bearing
Yellow/brown gravel, sand, silt and clay	0	12'	
lite gray sand and gravel	12	14	
lite grey sand trace silt and clay	14	20	
water @ 12'			

NUMBER OF UNSUCCESSFUL WELLS: none

WELL HYDROFRACTURED yes [Y] no [N]

CIRCLE APPROPRIATE LETTER

A A WELL WAS ABANDONED AND SEALED WHEN THIS WELL WAS COMPLETED

E ELECTRIC LOG OBTAINED

P TEST WELL CONVERTED TO PRODUCTION WELL

I HEREBY CERTIFY THAT THIS WELL HAS BEEN CONSTRUCTED IN ACCORDANCE WITH COMAR 26.04.04 "WELL CONSTRUCTION" AND IN CONFORMANCE WITH ALL CONDITIONS STATED IN THE ABOVE CAPTIONED PERMIT, AND THAT THE INFORMATION PRESENTED HEREIN IS ACCURATE AND COMPLETE TO THE BEST OF MY KNOWLEDGE.

DRILLERS LIC. NO.: M [illegible]

DRILLERS SIGNATURE (MUST MATCH SIGNATURE ON APPLICATION)

LIC. NO.: M __ D ___

SITE SUPERVISOR (sign. of driller or journeyman responsible for sitework if different from permittee)

GROUTING RECORD

WELL HAS BEEN GROUTED (Circle Appropriate Box) yes [Y] no [N]

TYPE OF GROUTING MATERIAL (Circle one)

CEMENT [CM] BENTONITE CLAY [BC]

NO. OF BAGS 6 NO. OF POUNDS 564

GALLONS OF WATER 42

DEPTH OF GROUT SEAL (to nearest foot)

from 0 ft. TOP to 8 ft. BOTTOM

(enter 0 if from surface)

CASING RECORD

casing types insert appropriate code below

[ST] STEEL [CO] CONCRETE [PL] PLASTIC [OT] OTHER

MAIN CASING TYPE	Nominal diameter top (main) casing (nearest inch)	Total depth of main casing (nearest foot)
8 PL	2	10

OTHER CASING (if used)

EACH CASING	diameter inch	depth (feet) from	to

SCREEN RECORD

screen type or open hole insert appropriate code below

[ST] STEEL [BR] BRASS BRONZE [HO] OPEN HOLE [PL] PLASTIC [OT] OTHER

EACH SCREEN		DEPTH (nearest ft.)	
C 2	1	PL 10	20
	2		
	3		

SLOT SIZE 1 010 2 ___ 3 ___

DIAMETER OF SCREEN 2 (NEAREST INCH)

GRAVEL PACK IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX 68

from	to
8	20

MDE USE ONLY (NOT TO BE FILLED IN BY DRILLER)

T (E.R.O.S.) W Q

TELESCOPE CASING | LOG INDICATOR | OTHER DATA

C 3 NA

PUMPING TEST

HOURS PUMPED (nearest hour)

PUMPING RATE (gal. per min.)

METHOD USED TO MEASURE PUMPING RATE

WATER LEVEL (distance from land surface)

BEFORE PUMPING ft.

WHEN PUMPING ft.

TYPE OF PUMP USED (for test)

[A] air [P] piston [T] turbine [O] other (describe below)

[C] centrifugal [R] rotary

[J] jet [S] submersible Monitorir

PUMP INSTALLED

DRILLER INSTALLED PUMP (CIRCLE) (YES or NO) YES ~~NO~~

IF DRILLER INSTALLS PUMP, THIS SECTION MUST BE COMPLETED FOR ALL WELLS.

TYPE OF PUMP INSTALLED PLACE (A,C,J,P,R,S,T,O) IN BOX 29.

CAPACITY: GALLONS PER MINUTE (to nearest gallon)

PUMP HORSE POWER

PUMP COLUMN LENGTH (nearest ft.)

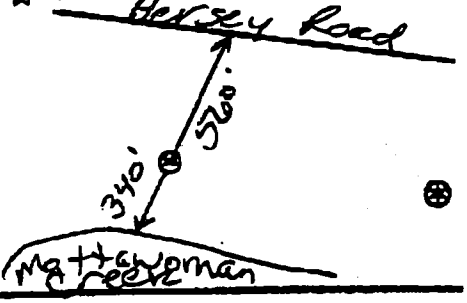
CASING HEIGHT (circle appropriate box and enter casing height)

[+] above [-] below LAND SURFACE

00 (nearest foot)

LOCATION OF WELL ON LOT

SHOW PERMANENT STRUCTURE SUCH AS BUILDING, SEPTIC TANKS, AND /OR LANDMARKS AND INDICATE NOT LESS THAN TWO DISTANCES (MEASUREMENTS TO WELL)



DENV-CRW7 ORIGINAL-STATE

MW-23

NOV-16-2001 16:10 PANASONIC 4107895029 P.01/01

A.4 WELL DEVELOPMENT SHEETS

Tetra Tech NUS, Inc.

MONITORING WELL DEVELOPMENT RECORD

Well: SS7TW015 Depth to Bottom (ft.): 32.90 Responsible Personnel: Jennifer Wellman
Site: SS7 Static Water Level Before (ft.): 8.97 Drilling Co.: Chesapeake GeoSystems
Date Installed: 8/22/01 Static Water Level After (ft.): 19.56 Project Name: Indian Head
Date Developed: 8/22/01 Screen Length (ft.): 5FT Project Number: 7129
Dev. Method: Pump Specific Capacity: N/A
Pump Type: Peristaltic Casing ID (in.): 1" PVC

Time	Estimated Sediment Thickness (Ft.)	Cumulative Water Volume (Gal.)	Water Level Readings (Ft. below TOC)	Temperature (Degrees C)	pH	Specific Conductance (Units mS/cm)	Turbidity (NTU)	Remarks (odor, color, etc.)
1001e	2in	~~3.5~~	8.97					thick - brown
1011e		3.5	11.94					" "
1021e		7.0	17.20					" "
1031e		10.5	19.01					" "
1041e		14.0	19.55					" "
1051e		17.5	19.56					" "
1101e		21.0	19.56					thinner - brown
1111e		24.5	19.57	20.95	5.46	0.125	>2000	" "
1121e		28.0	19.57	20.82	5.40	0.122	>2000	" "
1131e	0	31.5	19.57	20.85	5.42	0.121	>2000	" "

Tetra Tech NUS, Inc.

MONITORING WELL DEVELOPMENT RECORD

Well: S57TW016
Site: S57
Date Installed: 8/17/01
Date Developed: 8/20/01
Dev. Method: Pump
Pump Type: Peristaltic

Depth to Bottom (ft.): 11.92
Static Water Level Before (ft.): 7.92
Static Water Level After (ft.): 8.33
Screen Length (ft.): 5 ft
Specific Capacity: NA
Casing ID (in.): 1" PVC

Responsible Personnel: Jennifer Wellman
Drilling Co.: Chesapeak Geosystems
Project Name: Indian Head Site 57
Project Number: 7129

Time	Estimated Sediment Thickness (Ft.)	Cumulative Water Volume ~~(Gal.)~~ L	Water Level Readings (Ft. below TOC)	Temperature (Degrees C)	pH	Specific Conductance (Units ____)	Turbidity (NTU)	Remarks (odor, color, etc.)
1700	—	~~250mL~~ SCW	07.91	start	purge	—	—	brown 250mL/min
1710	2 in	2.5L	08.20	22.19	6.54	0.097	170	murky
1720	↓	5.0L	08.22	21.32	6.57	0.096	50	clear
1730	↓	7.5L	08.26	21.22	6.51	0.099	160	cloudy
1740	↓	10.0L	08.29	21.26	6.46	0.101	170	Cloudy
1750	0 in	12.5L	08.33	21.15	6.47	0.102	33	clear

Tetra Tech NUS, Inc.

MONITORING WELL DEVELOPMENT RECORD

Page ___ of ____

Well: S57TW017 | Depth to Bottom (ft.): 24.95 | Responsible Personnel: Jennifer Wellman
Site: Site 57 | Static Water Level Before (ft.): 8.12 | Drilling Co.: Chesapeake GeoSYSTEMS
Date Installed: 8/16/01 | Static Water Level After (ft.): 8.44 | Project Name: Indian Head Site 57
Date Developed: 8/20/01 | Screen Length (ft.): 10.0ft | Project Number: 7129
Dev. Method: Pump | Specific Capacity: NA
Pump Type: Peristaltic | Casing ID (in.): 1 inch

Time	Estimated Sediment Thickness (Ft.)	Cumulative Water Volume (Gal.) L	Water Level Readings (Ft. below TOC)	Temperature (Degrees C)	pH	Specific Conductance (Units S/cm)	Turbidity (NTU)	Remarks (odor, color, etc.)
1428			8.12					Start development
1438	2.10	3.0L	8.39	18.17	5.60	0.241	+2000	dark brown
1448		6.0L	8.41	17.65	5.41	0.139	+2000	light brown/yellow
1458		9.0L	8.44	17.62	5.37	0.133	+2000	light brown
1508		12.0L	8.44	17.81	5.36	0.126	160	cloudy
1518	↓	15.0L	8.44	17.55	5.37	0.126	100	cloudy
1528	0.10	18.0L	8.44	17.50	5.39	0.127	37	clear

Tetra Tech NUS, Inc.

MONITORING WELL DEVELOPMENT RECORD

Well: SS7TW18 Depth to Bottom (ft.): 15' Responsible Personnel: FRED W. RAMSER
Site: SITE 57 Static Water Level Before (ft.): 10.49 Drilling Co.: CHESAPEAKE GEOSYSTEMS
Date Installed: 8-20-01 Static Water Level After (ft.): 10.52 Project Name: SITE 57 FS EHDIV
Date Developed: 8-21-01 Screen Length (ft.): 5' Project Number: 7129
Dev. Method: PERISTALTIC PUMP Specific Capacity: N/A
Pump Type: " " Casing ID (In.): 1"

Time	Estimated Sediment Thickness (Ft.)	Cumulative Water Volume (Gal.) ℓ	Water Level Readings (Ft. below TOC)	Temperature (Degrees C)	pH	Specific Conductance (Units ____)	Turbidity (NTU)	Remarks (odor, color, etc.)
1100	—	—	10.49	—	—	—	—	
1110	—	2 ℓ	11.52	19.95	4.60	0.352	>999	
1120	—	4 ℓ	11.82	19.85	4.65	0.338	500	
1130	—	6 ℓ	11.95	19.82	4.67	0.335	10	NO ODOR

Tetra Tech NUS, Inc.

MONITORING WELL DEVELOPMENT RECORD

Well: 557TW019~~01~~PVC
Site: Site 57
Date Installed: 8/17/01
Date Developed: 8/21/01
Dev. Method: Pump
Pump Type: ~~Peristaltic~~

Depth to Bottom (ft.): 25.05 ft
Static Water Level Before (ft.): 10.56
Static Water Level After (ft.): 11.79
Screen Length (ft.): 5ft
Specific Capacity: NA
Casing ID (in.): 1" PVC

Responsible Personnel: Jennifer Wellman
Drilling Co.: Chesapeak Geosystems
Project Name: ~~7129~~ Indian Head Site 57
Project Number: 7129

Time	Estimated Sediment Thickness (Ft.)	Cumulative Water Volume (~~Gal.~~) L	Water Level Readings (Ft. below TOC)	Temperature (Degrees C)	pH	Specific Conductance (Units ____)	Turbidity (NTU)	Remarks (odor, color, etc.)
1016	—	—	10.56	—	—	—	—	start purge
1026	—	2.0L	11.73	—	—	—	—	
1036	—	4.0L	11.79	—	—	—	—	

Tetra Tech NUS, Inc.

MONITORING WELL DEVELOPMENT RECORD

Well: 57mw20 | Depth to Bottom (ft.): 17.65 | Responsible Personnel: Jennifer Wellman
Site: 57 | Static Water Level Before (ft.): 10.26 | Drilling Co.: Chesapeake Geosystems
Date Installed: 8-22-01 | Static Water Level After (ft.): 15.72 | Project Name: Indian head
Date Developed: 8/28/01 | Screen Length (ft.): 10ft | Project Number: 57
Dev. Method: Pump | Specific Capacity: NA
Pump Type: Whale | Casing ID (in.): 2" PVC

Time	Estimated Sediment Thickness (Ft.)	Cumulative Water Volume (Gal.)	Water Level Readings (Ft. below TOC)	Temperature (Degrees C)	pH	Specific Conductance (Units ms/cm)	Turbidity (NTU)	Remarks (odor, color, etc.)
1130	—	15gal		22.2	6.19	0.15	~~999~~	- Depth to water can not
1200	—	25gal	10.46	22.3	6.19	0.13	~~999~~	be measured - 2nd
1205	2IN	30gal	11.99	22.0	5.9	0.11	996	whale pump - blocked
1210	|	35gal	13.35	22.0	5.9	0.10	990	well
1215	|	38gal	14.46	21.0	5.7	0.11	316	
1220	|	40gal	15.27	21.0	5.5	0.12	286	
1225	|	43	15.54	22.0	5.5	0.12	256	
1230	|	47	15.53	22.0	5.5	0.12	176	
1240	↓	50	15.55	21.0	5.4	0.10	283	
1245	0IN	55	15.72	21.0	5.5	0.12	296	

Tetra Tech NUS, Inc.

MONITORING WELL DEVELOPMENT RECORD

Well: SS7 mw 22
Site: Site 57
Date Installed: 8-22-01
Date Developed: 8/28/01
Dev. Method: Bail/Pump
Pump Type: whale

Depth to Bottom (ft.): 180
Static Water Level Before (ft.): 9.03
Static Water Level After (ft.): 9.24
Screen Length (ft.): 10ft
Specific Capacity: NA
Casing ID (in.): 2" PVC

Responsible Personnel: Jennifer Wellman
Drilling Co.: Chesapeake Geosystems
Project Name: Indian Head
Project Number: 7129

Time	Estimated Sediment Thickness (Ft.)	Cumulative Water Volume (Gal.)	Water Level Readings (Ft. below TOC)	Temperature (Degrees C)	pH	Specific Conductance (Units mS/cm)	Turbidity (NTU)	Remarks (odor, color, etc.)
0855	—	7gal	*	19.2	5.41	195	+2000	* Water level can not be measured second pump in the way
0905								
1240	- well has poor water production - have bailed approximately 8 gallons - with no more sand coming up on baler - Have purged for 2¾ hours. Water has cleared up - Well is considered develop. - Was able to hand bail the well dry - Had to wait at least 30minutes for any kind of recovery		~~0~~	~~20.3~~	~~6.13~~	~~1.90~~	~~761~~	
1045		25gal	0	23.3	6.13	1.90	761	

Tetra Tech NUS, Inc.

MONITORING WELL DEVELOPMENT RECORD

Well: 57MW23
Site: Site 57
Date Installed: 8-22-01
Date Developed: 8/28/01
Dev. Method: Bail/Pump
Pump Type: Whale

Depth to Bottom (ft.): 23.5
Static Water Level Before (ft.): 14.95
Static Water Level After (ft.): 14.60
Screen Length (ft.): 10'
Specific Capacity: NA
Casing ID (in.): 2" PVC

Responsible Personnel: Jennifer Wellman
Drilling Co.: Chesapeake Geosystems
Project Name: Indian head
Project Number: 7129

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.)
1355	—	7 ~~5~~ 0		19.0	5.6	0.55	168	clear
1400	0	10		19.0	5.1	0.56	176	clear
1405	|	13		18.0	4.8	0.57	46	
1410	|	15	15.55 *	17.0	4.8	0.55	14	
1415	|	17	15.57 *	17.0	4.7	0.56	11	
1420	|	20	15.58 *	18.0	4.6	0.57	11	
1425	|	23	15.59 *	17.0	4.5	0.57	10	
1430	↓	26	15.59 *	17.0	4.6	0.55	10	
1435	0	30	16.00*	17.0	4.5	0.56	10	
* ~~water level~~		Drill cut PVC casing - app 6 inches					shorter during	
		development reading needs to have 6 inches added						
		to make water level comparible to initial						

A.5 SOIL SAMPLE LOG SHEETS

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129

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

Sample ID No.: ~~[illegible]~~ S57SS0160103
Sample Location: S57SB016
Sampled By: B BALKOVEC
C.O.C. No.: 41518

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

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 8/23/01 Time: 1403 Method: DISPOSABLE TROWEL Monitor Reading (ppm): 0.0	0-.5'	BROWN + REDDISH	SILTY SAND W/ ASPHALT + CINDERS

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
TCL VOCs	(1) 4 oz. Jar	✓	
Arsenic	(1) 4 oz. Jar	✓	
Arsenic, CEC, & pH	(1) 4 oz. Jar	–	
CEC & pH	(1) 4 oz. Jar	–	
Arsenic, TOC, CEC, & pH	(1) 4 oz. Jar	–	
TOC, CEC, & pH	(1) 4 oz. Jar	–	
TOC & pH	(1) 4 oz. Jar	–	
Moisture content, Grain size, Specific gravity, Bulk density	Gallon Ziplock Bag	✓	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s): Robert Balkovec

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129

Sample ID No.: S57SB01601W3
Sample Location: S57SB016
Sampled By: B. BALKOVEC
C.O.C. No.: 41519

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

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

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 8/23/01	4-5'	YELLOW ORANGE & LIGHT GRAY	SILTY CLAY W/ T- SAND + GRAVEL
Time: 1413			
Method: SPLIT SPOON			
Monitor Reading (ppm): 0-0			

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
TCL VOCs	(1) 4 oz. Jar	✓ -2	
Arsenic	(1) 4 oz. Jar	-	
Arsenic, CEC, & pH	(1) 4 oz. Jar	✓ -2	
CEC & pH	(1) 4 oz. Jar	-	
Arsenic, TOC, CEC, & pH	(1) 4 oz. Jar	-	
TOC, CEC, & pH	(1) 4 oz. Jar	-	
TOC & pH	(1) 4 oz. Jar	-	
Moisture content, Grain size, Specific gravity, Bulk density	Gallon Ziplock Bag	✓ (1)	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	S57SBDUP04

Signature(s):

Robert Balkovec

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129

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

Sample ID No.: S57SB01607303
Sample Location: S57SB016
Sampled By: B. BALKOVEZ
C.O.C. No.: 41519

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

GRAB SAMPLE DATA:

Date: 9/23/01	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 1420	8'-10'	OLIVE GREEN	SILTY CLAY W/ T. GRAVEL
Method: SPLIT SPOON			
Monitor Reading (ppm): 0.0			

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
TCL VOCs	(1) 4 oz. Jar	✓	
Arsenic	(1) 4 oz. Jar	—	
Arsenic, CEC, & pH	(1) 4 oz. Jar	—	
CEC & pH	(1) 4 oz. Jar	—	
Arsenic, TOC, CEC, & pH	(1) 4 oz. Jar	—	
TOC, CEC, & pH	(1) 4 oz. Jar	—	
TOC & pH	(1) 4 oz. Jar	—	
Moisture content, Grain size, Specific gravity, Bulk density	Gallon Ziplock Bag	—	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

Robert Balkovez

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129

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

Sample ID No.: S57SB0160303
Sample Location: S57SB016
Sampled By: B Balkovic
C.O.C. No.: 41519

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

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 8/23/01 Time: 1440 Method: SPLIT SPOON Monitor Reading (ppm): 0.0	18'-20'	GRAY	MED. SAND

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
TCL VOCs	(1) 4 oz. Jar	✓	
Arsenic	(1) 4 oz. Jar	—	
Arsenic, CEC, & pH	(1) 4 oz. Jar	—	
CEC & pH	(1) 4 oz. Jar	✓	
Arsenic, TOC, CEC, & pH	(1) 4 oz. Jar	—	
TOC, CEC, & pH	(1) 4 oz. Jar	—	
TOC & pH	(1) 4 oz. Jar	—	
Moisture content, Grain size, Specific gravity, Bulk density	Gallon Ziplock Bag	✓	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD —

Duplicate ID No.:

Signature(s): Robert Balkovic

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129

Sample ID No.: S57SS017SW03
Sample Location: S57SB017
Sampled By: B BALKOVEC
C.O.C. No.: 15736

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

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

GRAB SAMPLE DATA:

Date: 8/23/01 Time: 1245 Method: DISPOSABLE TROWEL Monitor Reading (ppm):	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
	0-.5'	BROWN + RED	SILT + SANDY GRAVEL

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
TCL VOCs	(1) 4 oz. Jar	1 -2	
Arsenic	(1) 4 oz. Jar	-2	
Arsenic, CEC, & pH	(1) 4 oz. Jar	-	
CEC & pH	(1) 4 oz. Jar	-	
Arsenic, TOC, CEC, & pH	(1) 4 oz. Jar	-	
TOC, CEC, & pH	(1) 4 oz. Jar	-	
TOC & pH	(1) 4 oz. Jar	-	
Moisture content, Grain size, Specific gravity, Bulk density	Gallon Ziplock Bag	-	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD —

Duplicate ID No.: S57SSDUP02

Signature(s):

Robert Balkovec

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129

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

Sample ID No.: S57SB0170103
Sample Location: S57SB017
Sampled By: B. BALKOVEC
C.O.C. No.: 15736

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

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 8/23/01 Time: 1251 Method: SPLIT SPOON Monitor Reading (ppm): 0.0	4-5'	YELLOW ORANGE + LIGHT GRAY	CLAY W/ SAND + GRAVEL

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
TCL VOCs	(1) 4 oz. Jar	✓	
Arsenic	(1) 4 oz. Jar	✓	
Arsenic, CEC, & pH	(1) 4 oz. Jar	–	
CEC & pH	(1) 4 oz. Jar	–	
Arsenic, TOC, CEC, & pH	(1) 4 oz. Jar	–	
TOC, CEC, & pH	(1) 4 oz. Jar	–	
TOC & pH	(1) 4 oz. Jar	–	
Moisture content, Grain size, Specific gravity, Bulk density	Gallon Ziplock Bag	–	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
–	

Signature(s): Robert Balkovec

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129

Sample ID No.: SS75B017D303
Sample Location: SS75B017
Sampled By: B. BALKOVEC
C.O.C. No.: 15736

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

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

GRAB SAMPLE DATA:

Date: 8/23/01	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 1304	8-10	LIGHT GRAY	SILTY CLAY W/ T GRAVEL
Method: SPLIT SPOON			
Monitor Reading (ppm): 0.0			

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
TCL VOCs	(1) 4 oz. Jar	✓	
Arsenic	(1) 4 oz. Jar	—	
Arsenic, CEC, & pH	(1) 4 oz. Jar	—	
CEC & pH	(1) 4 oz. Jar	—	
Arsenic, TOC, CEC, & pH	(1) 4 oz. Jar	—	
TOC, CEC, & pH	(1) 4 oz. Jar	—	
TOC & pH	(1) 4 oz. Jar	—	
Moisture content, Grain size, Specific gravity, Bulk density	Gallon Ziplock Bag	—	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): Robert Balkovec

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129

Sample ID No.: SS75301703
Sample Location: SS75301
Sampled By: B. Balkovec
C.O.C. No.: 15736

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

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

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 8/23/01			
Time: 1312	14-16'	Yellow Orange / Light Gray	Med-Gravelly Sand w/ some Clay
Method: Split Spoon			
Monitor Reading (ppm): 0.0			

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
TCL VOCs	(1) 4 oz. Jar	✓	
Arsenic	(1) 4 oz. Jar	—	
Arsenic, CEC, & pH	(1) 4 oz. Jar	—	
CEC & pH	(1) 4 oz. Jar	—	
Arsenic, TOC, CEC, & pH	(1) 4 oz. Jar	—	
TOC, CEC, & pH	(1) 4 oz. Jar	—	
TOC & pH	(1) 4 oz. Jar	—	
Moisture content, Grain size, Specific gravity, Bulk density	Gallon Ziplock Bag	—	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): Robert Balkovec

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129

Sample ID No.: SS75B0170403
Sample Location: SS75D017
Sampled By: B. BALKOUSKE
C.O.C. No.: 41518

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

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

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 8/23/01	18-20'	YELLOW ORANGE & LT GRAY	CLAYEY, MED SAND
Time: 1325			
Method: SPLIT SPOON			
Monitor Reading (ppm): 0.0			

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
TCL VOCs	(1) 4 oz. Jar	✓	
Arsenic	(1) 4 oz. Jar	–	
Arsenic, CEC, & pH	(1) 4 oz. Jar	–	
CEC & pH	(1) 4 oz. Jar	–	
Arsenic, TOC, CEC, & pH	(1) 4 oz. Jar	–	
TOC, CEC, & pH	(1) 4 oz. Jar	–	
TOC & pH	(1) 4 oz. Jar	–	
Moisture content, Grain size, Specific gravity, Bulk density	Gallon Ziplock Bag	–	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
–	

Signature(s):

Robert Balkouske

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129

Sample ID No.: SS7SS0T80103
Sample Location: SS7SB018
Sampled By: B. BALKOVEC
C.O.C. No.: 15740

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

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

GRAB SAMPLE DATA:

Date: 8/23/01	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 0930	0-5'	BROWN	SILT + SAND W/ GRAVEL
Method: DISPOSABLE TROWEL			T-ORGANICS
Monitor Reading (ppm): 1.0			

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
TCL VOCs	(1) 4 oz. Jar	✓-2	
Arsenic	(1) 4 oz. Jar	✓-2	
Arsenic, CEC, & pH	(1) 4 oz. Jar	-	
CEC & pH	(1) 4 oz. Jar	-	
Arsenic, TOC, CEC, & pH	(1) 4 oz. Jar	-	
TOC, CEC, & pH	(1) 4 oz. Jar	-	
TOC & pH	(1) 4 oz. Jar	-	
Moisture content, Grain size, Specific gravity, Bulk density	Gallon Ziplock Bag	-	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	SS7SSDUP01

Signature(s):

Robert Balkovec

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129

Sample ID No.: SS7SB018003
Sample Location: SS7SB018
Sampled By: B. BALKOVEC
C.O.C. No.: 15740

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

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

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 6/23/01	4-5'	YELLOW ORANGE + LT. GRAY	SILTY CLAY W/ F-SAND + GRAVEL
Time: 0950			
Method: SPLIT SPOON			
Monitor Reading (ppm): 0.0			

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
TCL VOCs	(1) 4 oz. Jar	✓	
Arsenic	(1) 4 oz. Jar	—	
Arsenic, CEC, & pH	(1) 4 oz. Jar	✓	
CEC & pH	(1) 4 oz. Jar	—	
Arsenic, TOC, CEC, & pH	(1) 4 oz. Jar	—	
TOC, CEC, & pH	(1) 4 oz. Jar	—	
TOC & pH	(1) 4 oz. Jar	—	
Moisture content, Grain size, Specific gravity, Bulk density	Gallon Ziplock Bag	✓	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): Robert Balkovec

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129

Sample ID No.: S57SB018 0303
Sample Location: S57SB018
Sampled By: B. BALLOUZ
C.O.C. No.: 15740

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

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

GRAB SAMPLE DATA:

Date: 4/23/01	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 1001	8-10	LIGHT GRAY	SILTY/CLAYEY SAND W/ T- GRAVEL
Method: SPLIT SPOON			
Monitor Reading (ppm): 0.0			

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
TCL VOCs	(1) 4 oz. Jar	✓	
Arsenic	(1) 4 oz. Jar	—	
Arsenic, CEC, & pH	(1) 4 oz. Jar	—	
CEC & pH	(1) 4 oz. Jar	—	
Arsenic, TOC, CEC, & pH	(1) 4 oz. Jar	—	
TOC, CEC, & pH	(1) 4 oz. Jar	—	
TOC & pH	(1) 4 oz. Jar	—	
Moisture content, Grain size, Specific gravity, Bulk density	Gallon Ziplock Bag	—	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD

Duplicate ID No.:

Signature(s):

Robert Ballouz

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129

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

Sample ID No.: SS75B018038
Sample Location: SS75B018
Sampled By: B BALKOVEC
C.O.C. No.: 15740

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

GRAB SAMPLE DATA:

Date: 8/23/01	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 1030	16-18'	LIGHT GRAY & YELLOW/R.	MED. SAND W/ T-STIFF CLAY
Method: SPLIT SPOON			
Monitor Reading (ppm): 0.0			

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
TCL VOCs	(1) 4 oz. Jar	✓	
Arsenic	(1) 4 oz. Jar	—	
Arsenic, CEC, & pH	(1) 4 oz. Jar	—	
CEC & pH	(1) 4 oz. Jar	✓	
Arsenic, TOC, CEC, & pH	(1) 4 oz. Jar	—	
TOC, CEC, & pH	(1) 4 oz. Jar	—	
TOC & pH	(1) 4 oz. Jar	—	
Moisture content, Grain size, Specific gravity, Bulk density	Gallon Ziplock Bag	✓	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

Robert Balkovec

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129

Sample ID No.: SS75B018 0403
Sample Location: SS75B018
Sampled By: B BALLOUE
C.O.C. No.: 15740

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

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

GRAB SAMPLE DATA:

Date: 8/23/01	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 1055	18-20	YELLOW BROWN LIGHT GRAY	MED. SAND W/ T. SILT + CLAY
Method: SPLIT SPOON			
Monitor Reading (ppm): 0.0			

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
TCL VOCs	(1) 4 oz. Jar	✓	
Arsenic	(1) 4 oz. Jar	—	
Arsenic, CEC, & pH	(1) 4 oz. Jar	—	
CEC & pH	(1) 4 oz. Jar	—	
Arsenic, TOC, CEC, & pH	(1) 4 oz. Jar	—	
TOC, CEC, & pH	(1) 4 oz. Jar	—	
TOC & pH	(1) 4 oz. Jar	—	
Moisture content, Grain size, Specific gravity, Bulk density	Gallon Ziplock Bag		

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

Robert Ballouee

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129

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

Sample ID No.: S57SB0190103
Sample Location: S57SB019
Sampled By: B BALKOVEC
C.O.C. No.: 15740

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

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 8/23/01 Time: 1114 Method: SPLIT SPOON Monitor Reading (ppm): 0.0	0-.5	BROWN + RED	SILT + SAND W/ GRAVEL

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
TCL VOCs	(1) 4 oz. Jar	✓	
Arsenic	(1) 4 oz. Jar	✓	
Arsenic, CEC, & pH	(1) 4 oz. Jar	–	
CEC & pH	(1) 4 oz. Jar	–	
Arsenic, TOC, CEC, & pH	(1) 4 oz. Jar	–	
TOC, CEC, & pH	(1) 4 oz. Jar	–	
TOC & pH	(1) 4 oz. Jar	–	
Moisture content, Grain size, Specific gravity, Bulk density	Gallon Ziplock Bag	–	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): Robert Balkovec

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129

Sample ID No.: SS7SB0190103
Sample Location: SS7SB019
Sampled By: B BALLOUER
C.O.C. No.: 15740

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

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

GRAB SAMPLE DATA:

Date: 8/23/01	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 1130	4-5'	YELLOW OR + LIGHT GRAY	SILTY CLAY
Method: SPLIT SPOON			
Monitor Reading (ppm): 0.0			

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
TCL VOCs	(1) 4 oz. Jar	✓	
Arsenic	(1) 4 oz. Jar	✓	
Arsenic, CEC, & pH	(1) 4 oz. Jar	—	
CEC & pH	(1) 4 oz. Jar	—	
Arsenic, TOC, CEC, & pH	(1) 4 oz. Jar	—	
TOC, CEC, & pH	(1) 4 oz. Jar	—	
TOC & pH	(1) 4 oz. Jar	—	
Moisture content, Grain size, Specific gravity, Bulk density	Gallon Ziplock Bag	—	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	

Signature(s):

Robert Ballouer

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129

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

Sample ID No.: S57SB0140203
Sample Location: S57SB014
Sampled By: B Balkovec
C.O.C. No.: 15740

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

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 8/23/01 Time: 1125 Method: SPLIT SPOON Monitor Reading (ppm): 0.0	8-10'	GRAY	CLAYEY SILT W/ T-GRAVEL (VERY DENSE)

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
TCL VOCs	(1) 4 oz. Jar	✓	
Arsenic	(1) 4 oz. Jar	–	
Arsenic, CEC, & pH	(1) 4 oz. Jar	–	
CEC & pH	(1) 4 oz. Jar	–	
Arsenic, TOC, CEC, & pH	(1) 4 oz. Jar	–	
TOC, CEC, & pH	(1) 4 oz. Jar	–	
TOC & pH	(1) 4 oz. Jar	–	
Moisture content, Grain size, Specific gravity, Bulk density	Gallon Ziplock Bag	–	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): Robert Balkovec

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129

Sample ID No.: SS75B290303
Sample Location: SS75B29
Sampled By: B BALKOVEC
C.O.C. No.: 15736

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

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

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 8/23/01	14-16'	YELLOW ORANGE & LIGHT GRAY	GRAVEL W/ SOME CLAY & SAND
Time: 1142			
Method: SPLIT SPOON			
Monitor Reading (ppm): 0.0			

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
TCL VOCs	(1) 4 oz. Jar	✓	
Arsenic	(1) 4 oz. Jar	—	
Arsenic, CEC, & pH	(1) 4 oz. Jar	—	
CEC & pH	(1) 4 oz. Jar	—	
Arsenic, TOC, CEC, & pH	(1) 4 oz. Jar	—	
TOC, CEC, & pH	(1) 4 oz. Jar	—	
TOC & pH	(1) 4 oz. Jar	—	
Moisture content, Grain size, Specific gravity, Bulk density	Gallon Ziplock Bag	—	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD —

Duplicate ID No.:

Signature(s):

Robert Balkovec

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129

Sample ID No.: S575B090403
Sample Location: S575B014
Sampled By: B. BALKOVEC
C.O.C. No.: 15736

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

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

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 5/23/01	18'-20'	YELLOW BROWN & LIGHT GRAY	MED SAND W/ T-CLAY & SILT
Time: 1155			
Method: SPLIT SPOON			
Monitor Reading (ppm): 0.0			

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
TCL VOCs	(1) 4 oz. Jar	✓	
Arsenic	(1) 4 oz. Jar	—	
Arsenic, CEC, & pH	(1) 4 oz. Jar	—	
CEC & pH	(1) 4 oz. Jar	—	
Arsenic, TOC, CEC, & pH	(1) 4 oz. Jar	—	
TOC, CEC, & pH	(1) 4 oz. Jar	—	
TOC & pH	(1) 4 oz. Jar	—	
Moisture content. Grain size, Specific gravity, Bulk density	Gallon Ziplock Bag		

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	

Signature(s):

Robert Balkovec

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129

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

Sample ID No.: S57SS0200103
Sample Location: S57SB020
Sampled By: B. Balkover
C.O.C. No.: 15758

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

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 8/15/01 Time: 0876 Method: DPT Monitor Reading (ppm): 0.0	0-.5'	Black + Brownish Red	Silty Clay w/ Cinders + Gravel

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
TCL VOCs	(1) 4 oz. Jar	–	
Arsenic	(1) 4 oz. Jar	✓	
Arsenic, CEC, & pH	(1) 4 oz. Jar	–	
CEC & pH	(1) 4 oz. Jar	–	
Arsenic, TOC, CEC, & pH	(1) 4 oz. Jar	–	
TOC, CEC, & pH	(1) 4 oz. Jar	–	
TOC & pH	(1) 4 oz. Jar	–	
Moisture content, Grain size, Specific gravity, Bulk density	Gallon Ziplock Bag	–	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	

Signature(s): Robert Balkover

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129

Sample ID No.: SS7SB02W0103
Sample Location: SS7SB02D
Sampled By: B BALKOVET
C.O.C. No.: 15758

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

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

GRAB SAMPLE DATA:

Date: 8/15/01	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 0834	4-5'	GRAY-BROWN	SILTY CLAY W/ T- GRAVEL
Method: DPT			
Monitor Reading (ppm): BKG 21.7			

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
TCL VOCs	(1) 4 oz. Jar	–	
Arsenic	(1) 4 oz. Jar	✓	
Arsenic, CEC, & pH	(1) 4 oz. Jar	–	
CEC & pH	(1) 4 oz. Jar	–	
Arsenic, TOC, CEC, & pH	(1) 4 oz. Jar	–	
TOC, CEC, & pH	(1) 4 oz. Jar	–	
TOC & pH	(1) 4 oz. Jar	–	
Moisture content, Grain size, Specific gravity, Bulk density	Gallon Ziplock Bag	–	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
–	

Signature(s):

Robert Balkovet

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129

Sample ID No.: S57550210103
Sample Location: S57SB021
Sampled By: B. BALLOWE
C.O.C. No.: 15754

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

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

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 5/14/03	0-.5'		
Time: 1643			
Method: DPT			
Monitor Reading (ppm):			

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
TCL VOCs	(1) 4 oz. Jar	✓	
Arsenic	(1) 4 oz. Jar	✓	
Arsenic, CEC, & pH	(1) 4 oz. Jar	~	
CEC & pH	(1) 4 oz. Jar	~	
Arsenic, TOC, CEC, & pH	(1) 4 oz. Jar	~	
TOC, CEC, & pH	(1) 4 oz. Jar	~	
TOC & pH	(1) 4 oz. Jar	~	
Moisture content, Grain size, Specific gravity, Bulk density	Gallon Ziplock Bag	~	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
~	~

Signature(s):

Robert Ballowe

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129

Sample ID No.: SS75B0210203
Sample Location: SS75B021
Sampled By: B. Balkcom
C.O.C. No.: 15754

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

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

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 9/14/01	4-5'		
Time: 1648			
Method: DPT			
Monitor Reading (ppm):			

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
TCL VOCs	(1) 4 oz. Jar	✓	
Arsenic	(1) 4 oz. Jar	—	
Arsenic, CEC, & pH	(1) 4 oz. Jar	—	
CEC & pH	(1) 4 oz. Jar	—	
Arsenic, TOC, CEC, & pH	(1) 4 oz. Jar	✓	
TOC, CEC, & pH	(1) 4 oz. Jar	—	
TOC & pH	(1) 4 oz. Jar	—	
Moisture content, Grain size, Specific gravity, Bulk density	Gallon Ziplock Bag	✓	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): Robert Balkcom

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129

Sample ID No.: SS75B021203
Sample Location: SS75B021
Sampled By: B. BALKOVEC
C.O.C. No.: 15754

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

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

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 5/14/01	8-10		
Time: 1700			
Method: DPT			
Monitor Reading (ppm):			

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
TCL VOCs	(1) 4 oz. Jar	2	
Arsenic	(1) 4 oz. Jar	"	
Arsenic, CEC, & pH	(1) 4 oz. Jar	"	
CEC & pH	(1) 4 oz. Jar	"	
Arsenic, TOC, CEC, & pH	(1) 4 oz. Jar	"	
TOC, CEC, & pH	(1) 4 oz. Jar	"	
TOC & pH	(1) 4 oz. Jar	"	
Moisture content, Grain size, Specific gravity, Bulk density	Gallon Ziplock Bag	"	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:	Signature(s):
	0010003 SS75FD021101	

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129

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

Sample ID No.: S57SB0210303
Sample Location: S57SB021
Sampled By: B. BALKOVEC
C.O.C. No.: 15761

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

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 5/15/01 Time: 1515 Method: SPLIT SPOON Monitor Reading (ppm): 0.0	14-16	GRAY + YELLOW RANGE	MED - COARSE SAND W/ T-SILT

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
TCL VOCs	(1) 4 oz. Jar	✓	
Arsenic	(1) 4 oz. Jar	—	
Arsenic, CEC, & pH	(1) 4 oz. Jar	—	
CEC & pH	(1) 4 oz. Jar	—	
Arsenic, TOC, CEC, & pH	(1) 4 oz. Jar	—	
TOC, CEC, & pH	(1) 4 oz. Jar	✓	
TOC & pH	(1) 4 oz. Jar	—	
Moisture content, Grain size, Specific gravity, Bulk density	Gallon Ziplock Bag	✓	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD —

Duplicate ID No.: —

Signature(s): Robert Balkovec

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129

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

Sample ID No.: S57SB0210403
Sample Location: S57SB021
Sampled By: B. BALKOVIC
C.O.C. No.: 15761

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

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 8/17/01	18-20		
Time: 1530			
Method: Split Spoon			
Monitor Reading (ppm): 0.0			

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
TCL VOCs	(1) 4 oz. Jar	✓	
Arsenic	(1) 4 oz. Jar	—	
Arsenic, CEC, & pH	(1) 4 oz. Jar	—	
CEC & pH	(1) 4 oz. Jar	—	
Arsenic, TOC, CEC, & pH	(1) 4 oz. Jar	—	
TOC, CEC, & pH	(1) 4 oz. Jar	—	
TOC & pH	(1) 4 oz. Jar	—	
Moisture content, Grain size, Specific gravity, Bulk density	Gallon Ziplock Bag	—	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129

Sample ID No.: SS7SS220103
Sample Location: SS7SB22
Sampled By: B. BALKOVEC
C.O.C. No.: 15755

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

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

GRAB SAMPLE DATA:

Date: 8/14/01	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 1349	0-.5'	BLK. & LT. BROWN (REDDISH)	SLTY CLAY W/ T- COARSE SND & CINDERS
Method: DPT			
Monitor Reading (ppm): 30-5			

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
TCL VOCs	(1) 4 oz. Jar	✓	
Arsenic	(1) 4 oz. Jar	✓	
Arsenic, CEC, & pH	(1) 4 oz. Jar	—	
CEC & pH	(1) 4 oz. Jar	—	
Arsenic, TOC, CEC, & pH	(1) 4 oz. Jar	—	
TOC, CEC, & pH	(1) 4 oz. Jar	—	
TOC & pH	(1) 4 oz. Jar	—	
Moisture content, Grain size, Specific gravity, Bulk density	Gallon Ziplock Bag	—	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	

Signature(s):

Robert Balkovec

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129

Sample ID No.: SS7SB220103
Sample Location: SS7SB22
Sampled By: B. BALKOVEC
C.O.C. No.: 15755

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

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

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 8/14/01			
Time: 1400	4-5'	LT. BROWN (REDDISH)	SLTY CLAY W/ T- COARSE SAND
Method: DPT			
Monitor Reading (ppm): 0.0			

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
TCL VOCs	(1) 4 oz. Jar	✓	
Arsenic	(1) 4 oz. Jar	–	
Arsenic, CEC, & pH	(1) 4 oz. Jar	–	
CEC & pH	(1) 4 oz. Jar	–	
Arsenic, TOC, CEC, & pH	(1) 4 oz. Jar	–	
TOC, CEC, & pH	(1) 4 oz. Jar	✓	
TOC & pH	(1) 4 oz. Jar	–	
Moisture content, Grain size, Specific gravity, Bulk density	Gallon Ziplock Bag	✓	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD

Duplicate ID No.:

Signature(s):

Robert Balkovec

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129

Sample ID No.: SS75B220203
Sample Location: SS75B22
Sampled By: B. Balkovec
C.O.C. No.: 15755

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

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

GRAB SAMPLE DATA:

Date: 8/14/01	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 1410	8-10	LT. BROWN (REDDISH)	SAND & GRAVEL, SOME SILTY CLAY
Method: DPT			
Monitor Reading (ppm): 0.0			

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
TCL VOCs	(1) 4 oz. Jar	✓	
Arsenic	(1) 4 oz. Jar	—	
Arsenic, CEC, & pH	(1) 4 oz. Jar	—	
CEC & pH	(1) 4 oz. Jar	—	
Arsenic, TOC, CEC, & pH	(1) 4 oz. Jar	—	
TOC, CEC, & pH	(1) 4 oz. Jar	—	
TOC & pH	(1) 4 oz. Jar	—	
Moisture content, Grain size, Specific gravity, Bulk density	Gallon Ziplock Bag	—	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	

Signature(s): Robert Balkovec

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129

Sample ID No.: SS7SB220303
Sample Location: SS7SB22
Sampled By: B. BALLMOVER
C.O.C. No.: 15755

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

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

GRAB SAMPLE DATA:

Date: 8/14/01 Time: 1420 Method: DPT Monitor Reading (ppm): 0.0	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
	12-14'	BROWN + LT. GRAY	F-SAND W/ GRAVEL

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
TCL VOCs	(1) 4 oz. Jar	✓	
Arsenic	(1) 4 oz. Jar	~	
Arsenic, CEC, & pH	(1) 4 oz. Jar	~	
CEC & pH	(1) 4 oz. Jar	~	
Arsenic, TOC, CEC, & pH	(1) 4 oz. Jar	~	
TOC, CEC, & pH	(1) 4 oz. Jar	✓	
TOC & pH	(1) 4 oz. Jar	~	
Moisture content, Grain size, Specific gravity, Bulk density	Gallon Ziplock Bag	✓	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
~	

Signature(s):

Robert Ballmover

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129

Sample ID No.: SS75B022403
Sample Location: SS75B039
Sampled By: B. BALKOVEC
C.O.C. No.: 15761

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

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

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 8/15/01	18'-20'	GRAY	MED SAND W/ SANDY SILT T-GRAY
Time: 1420			
Method: A SPLIT SPOON			
Monitor Reading (ppm): 0.0			

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
TCL VOCs	(1) 4 oz. Jar	✓	
Arsenic	(1) 4 oz. Jar	"	
Arsenic, CEC, & pH	(1) 4 oz. Jar	"	
CEC & pH	(1) 4 oz. Jar	"	
Arsenic, TOC, CEC, & pH	(1) 4 oz. Jar	"	
TOC, CEC, & pH	(1) 4 oz. Jar	"	
TOC & pH	(1) 4 oz. Jar	"	
Moisture content, Grain size, Specific gravity, Bulk density	Gallon Ziplock Bag	"	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD | Duplicate ID No.:

Signature(s): Robert Balkovec

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129

Sample ID No.: SS7SS0230W3
Sample Location: SS7SB023
Sampled By: B. BALKWILL
C.O.C. No.: 15755

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

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

GRAB SAMPLE DATA:

Date: 8/14/01	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 1600	0-.5'	BLACK & GRAY	CLAY, SOME SAND & GRAVEL
Method: DP7			
Monitor Reading (ppm): 0.0			

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
TCL VOCs	(1) 4 oz. Jar	✓	
Arsenic	(1) 4 oz. Jar	—	
Arsenic, CEC, & pH	(1) 4 oz. Jar	—	
CEC & pH	(1) 4 oz. Jar	—	
Arsenic, TOC, CEC, & pH	(1) 4 oz. Jar	—	
TOC, CEC, & pH	(1) 4 oz. Jar	—	
TOC & pH	(1) 4 oz. Jar	—	
Moisture content, Grain size, Specific gravity, Bulk density	Gallon Ziplock Bag	—	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	

Signature(s):

Robert Balkwill

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129

Sample ID No.: S57SB0230103
Sample Location: S57SB023
Sampled By: B. BALKOVEC
C.O.C. No.: 15755

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

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

GRAB SAMPLE DATA:

Date: 9/14/01	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 1603	4-5'	LIGHT BROWN	SILTY CLAY W/ TRACE COARSE SAND & GRAVEL
Method: DPT			
Monitor Reading (ppm): 0.0			

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
TCL VOCs	(1) 4 oz. Jar	✓	
Arsenic	(1) 4 oz. Jar	✓	
Arsenic, CEC, & pH	(1) 4 oz. Jar	✓	
CEC & pH	(1) 4 oz. Jar	✓	
Arsenic, TOC, CEC, & pH	(1) 4 oz. Jar	✓	
TOC, CEC, & pH	(1) 4 oz. Jar	✓	
TOC & pH	(1) 4 oz. Jar	✓	
Moisture content, Grain size, Specific gravity, Bulk density	Gallon Ziplock Bag		

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD — Duplicate ID No.: —

Signature(s):

Robert Balkovec

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129

Sample ID No.: SS7SB0230203
Sample Location: SS7SB023
Sampled By: B. Balthrop
C.O.C. No.: 15755

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

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

GRAB SAMPLE DATA:

Date: 10/24/01	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 1612	8-10'	Gray	Clay w/ some Silt
Method: DPT			
Monitor Reading (ppm): 0.0			

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
TCL VOCs	(1) 4 oz. Jar	✓	
Arsenic	(1) 4 oz. Jar	—	
Arsenic, CEC, & pH	(1) 4 oz. Jar	—	
CEC & pH	(1) 4 oz. Jar	—	
Arsenic, TOC, CEC, & pH	(1) 4 oz. Jar	—	
TOC, CEC, & pH	(1) 4 oz. Jar	—	
TOC & pH	(1) 4 oz. Jar	—	
Moisture content, Grain size, Specific gravity, Bulk density	Gallon Ziplock Bag	—	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD

Duplicate ID No.:

Signature(s):

Robert Balthrop

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129

Sample ID No.: SS7SB0230303
Sample Location: SS7SB023
Sampled By: B. BALKOVEK
C.O.C. No.: 15754

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

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

GRAB SAMPLE DATA:

Date: 9/14/01	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 1625	12-14'	GRAY, LT. BROWN & WHITE	COARSE SAND & GRAVEL T- CLAY
Method: DPT			
Monitor Reading (ppm): 0.0			

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
TCL VOCs	(1) 4 oz. Jar	✓	
Arsenic	(1) 4 oz. Jar	—	
Arsenic, CEC, & pH	(1) 4 oz. Jar		
CEC & pH	(1) 4 oz. Jar	—	
Arsenic, TOC, CEC, & pH	(1) 4 oz. Jar	—	
TOC, CEC, & pH	(1) 4 oz. Jar	—	
TOC & pH	(1) 4 oz. Jar	—	
Moisture content, Grain size, Specific gravity, Bulk density	Gallon Ziplock Bag	—	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	

Signature(s):

Robert Balkover

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129

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

Sample ID No.: S57SS0240103
Sample Location: S57SB024
Sampled By: B BALKOVEC
C.O.C. No.: 15758

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

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 8/15/01 Time: 0910 Method: DPT Monitor Reading (ppm): 11.3	0-.5'	BLACK + LT. BROWN	SAND + GRAVEL T-SILT + CLAY.

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
TCL VOCs	(1) 4 oz. Jar	✓	
Arsenic	(1) 4 oz. Jar	—	
Arsenic, CEC, & pH	(1) 4 oz. Jar	—	
CEC & pH	(1) 4 oz. Jar	—	
Arsenic, TOC, CEC, & pH	(1) 4 oz. Jar	—	
TOC, CEC, & pH	(1) 4 oz. Jar	—	
TOC & pH	(1) 4 oz. Jar	—	
Moisture content, Grain size, Specific gravity, Bulk density	Gallon Ziplock Bag	—	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	

Signature(s): Robert Balkovec

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129

Sample ID No.: SS7SB0240103
Sample Location: SS7SB024
Sampled By: B. BALKWILL
C.O.C. No.: 15758

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

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

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 8/15/01	4-5'	LIGHT BROWN	SILTY CLAY W/ GRAVEL
Time: 0920			
Method: DPT			
Monitor Reading (ppm): 0.0			

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
TCL VOCs	(1) 4 oz. Jar	✓	
Arsenic	(1) 4 oz. Jar	–	
Arsenic, CEC, & pH	(1) 4 oz. Jar	–	
CEC & pH	(1) 4 oz. Jar	–	
Arsenic, TOC, CEC, & pH	(1) 4 oz. Jar	✓	
TOC, CEC, & pH	(1) 4 oz. Jar	–	
TOC & pH	(1) 4 oz. Jar	✓	
Moisture content, Grain size, Specific gravity, Bulk density	Gallon Ziplock Bag		

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
–	

Signature(s):

Robert Balkwill

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129

Sample ID No.: SS75B02402003
Sample Location: SS75B024
Sampled By: B. Bulkovec
C.O.C. No.: 15758

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

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

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 8/15/01			
Time: 0430	8-10	LIGHT BROWN	SAND - GRAVEL, T CLAY
Method: DPT			
Monitor Reading (ppm): 0.0			

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
TCL VOCs	(1) 4 oz. Jar	✓	
Arsenic	(1) 4 oz. Jar	—	
Arsenic, CEC, & pH	(1) 4 oz. Jar	—	
CEC & pH	(1) 4 oz. Jar	—	
Arsenic, TOC, CEC, & pH	(1) 4 oz. Jar	—	
TOC, CEC, & pH	(1) 4 oz. Jar	—	
TOC & pH	(1) 4 oz. Jar	—	
Moisture content, Grain size, Specific gravity, Bulk density	Gallon Ziplock Bag	—	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	

Signature(s):

Robert Bulkovec

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129

Sample ID No.: SS75S025 0103
Sample Location: SS75S025
Sampled By: B. BALKOVEC
C.O.C. No.: 15758

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

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

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 8/15/01	0-.5'	BLACK & REDDISH BROWN	ASPHALT & SILTY SAND & GRAVEL
Time: 0945			
Method: DPT			
Monitor Reading (ppm): 71.7			

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
TCL VOCs	(1) 4 oz. Jar	✓	
Arsenic	(1) 4 oz. Jar	–	
Arsenic, CEC, & pH	(1) 4 oz. Jar	–	
CEC & pH	(1) 4 oz. Jar	–	
Arsenic, TOC, CEC, & pH	(1) 4 oz. Jar	–	
TOC, CEC, & pH	(1) 4 oz. Jar	–	
TOC & pH	(1) 4 oz. Jar	–	
Moisture content, Grain size, Specific gravity, Bulk density	Gallon Ziplock Bag	–	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

Robert Balkovec

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129

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

Sample ID No.: S57SB025U103
Sample Location: S57SB025
Sampled By: B Balkovec
C.O.C. No.: 15761

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

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 8/15/01 Time: 0455 Method: DDT Monitor Reading (ppm): 0-0	4-5'	REDDISH BROWN	F-SAND W/ SOME 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
TCL VOCs	(1) 4 oz. Jar	✓	
Arsenic	(1) 4 oz. Jar	–	
Arsenic, CEC, & pH	(1) 4 oz. Jar	–	
CEC & pH	(1) 4 oz. Jar	–	
Arsenic, TOC, CEC, & pH	(1) 4 oz. Jar	–	
TOC, CEC, & pH	(1) 4 oz. Jar	–	
TOC & pH	(1) 4 oz. Jar	–	
Moisture content, Grain size, Specific gravity, Bulk density	Gallon Ziplock Bag	–	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): Robert Balkovec

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129

Sample ID No.: SS75B02502003
Sample Location: SS75B025
Sampled By: B BALKOVEC
C.O.C. No.: 15761

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

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

GRAB SAMPLE DATA:

Date: 8/15/01	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 1000	8-10'	GRAY	SILTY CLAY W/SAND & GRAVEL
Method: DPT			
Monitor Reading (ppm): 0.0			

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
TCL VOCs	(1) 4 oz. Jar	✓	
Arsenic	(1) 4 oz. Jar	—	
Arsenic, CEC, & pH	(1) 4 oz. Jar	—	
CEC & pH	(1) 4 oz. Jar	—	
Arsenic, TOC, CEC, & pH	(1) 4 oz. Jar	—	
TOC, CEC, & pH	(1) 4 oz. Jar	—	
TOC & pH	(1) 4 oz. Jar	—	
Moisture content, Grain size, Specific gravity, Bulk density	Gallon Ziplock Bag	—	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	

Signature(s): Robert Balkovec

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129

Sample ID No.: SS75B02S0303
Sample Location: SS75B02S
Sampled By: B. BALKOVEC
C.O.C. No.: 15761

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

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

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 8/15/01			
Time: 1007	12-14'	GRAY & REDDISH BROWN	SILTY CLAY W/F. SAND & T. GRAVEL
Method: DPT			
Monitor Reading (ppm): 0.0			

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
TCL VOCs	(1) 4 oz. Jar	✓	
Arsenic	(1) 4 oz. Jar	—	
Arsenic, CEC, & pH	(1) 4 oz. Jar	—	
CEC & pH	(1) 4 oz. Jar	—	
Arsenic, TOC, CEC, & pH	(1) 4 oz. Jar	—	
TOC, CEC, & pH	(1) 4 oz. Jar	—	
TOC & pH	(1) 4 oz. Jar	—	
Moisture content, Grain size, Specific gravity, Bulk density	Gallon Ziplock Bag		

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	

Signature(s):

Robert Balkovec

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129

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

Sample ID No.: S57SB0260103
Sample Location: S57SB026
Sampled By: B. BALKOVEC
C.O.C. No.: 15761

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

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 8/15/01	8-9'	Reddish Brown + Gray	Clay w/ Sand + Gravel
Time: 1135			
Method: DPT			
Monitor Reading (ppm): n-0			

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
TCL VOCs	(1) 4 oz. Jar	—	
Arsenic	(1) 4 oz. Jar	—	
Arsenic, CEC, & pH	(1) 4 oz. Jar	—	
CEC & pH	(1) 4 oz. Jar	—	
Arsenic, TOC, CEC, & pH	(1) 4 oz. Jar	—	
TOC, CEC, & pH	(1) 4 oz. Jar	—	
TOC ~~[illegible]~~ (80)	(1) 4 oz. Jar	✓	
Moisture content, Grain size, Specific gravity, Bulk density	Gallon Ziplock Bag	—	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): Robert Balkovec

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129

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

Sample ID No.: 57SS0270103
Sample Location: S57SB027
Sampled By: B BALKOVEC
C.O.C. No.: 41515

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

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 8/21/01 Time: 1112 Method: SPLIT SPOON Monitor Reading (ppm): 0-0	0-5	BROWN	SANDY SILT W/ T. CLAY & GRAVEL

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
TCL VOCs	(1) 4 oz. Jar	✓	
Arsenic	(1) 4 oz. Jar	✓	
Arsenic, CEC, & pH	(1) 4 oz. Jar	✓	
CEC & pH	(1) 4 oz. Jar	✓	
Arsenic, TOC, CEC, & pH	(1) 4 oz. Jar	✓	
TOC, CEC, & pH	(1) 4 oz. Jar	✓	
TOC & pH	(1) 4 oz. Jar	✓	
Moisture content, Grain size, Specific gravity, Bulk density	Gallon Ziplock Bag	✓	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	

Signature(s): Robert Balkovec

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129

Sample ID No.: SS7SB027-0103
Sample Location: SS7SB027
Sampled By: B BALKOVEC
C.O.C. No.: 41515

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

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

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 8/21/01	4-5	GRAY	SILTY CLAY W/ GRAVEL LOOSE, SOFT
Time: 1105			
Method: SPLIT SPOON			
Monitor Reading (ppm): 0.0			

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
TCL VOCs	(1) 4 oz. Jar	✓	
Arsenic	(1) 4 oz. Jar	✓	
Arsenic, CEC, & pH	(1) 4 oz. Jar	✓	
CEC & pH	(1) 4 oz. Jar	✓	
Arsenic, TOC, CEC, & pH	(1) 4 oz. Jar	✓	
TOC, CEC, & pH	(1) 4 oz. Jar	✓	
TOC & pH	(1) 4 oz. Jar	✓	
Moisture content, Grain size, Specific gravity, Bulk density	Gallon Ziplock Bag	✓	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

Robert Balkovec

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129

Sample ID No.: SS7SB027 0203
Sample Location: SS7SB027
Sampled By: B. BALKOVEC
C.O.C. No.: 41515

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

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

GRAB SAMPLE DATA:

Date: 8/24/01	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 1136	8-10	LT. GRAY & YELLOW ORANGE	SILTY CLAY W-STIFF MOTTLED
Method: SPLIT SPOON			
Monitor Reading (ppm): 0.0			

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
TCL VOCs	(1) 4 oz. Jar	✓	
Arsenic	(1) 4 oz. Jar	—	
Arsenic, CEC, & pH	(1) 4 oz. Jar	—	
CEC & pH	(1) 4 oz. Jar	—	
Arsenic, TOC, CEC, & pH	(1) 4 oz. Jar	—	
TOC, CEC, & pH	(1) 4 oz. Jar	—	
TOC & pH	(1) 4 oz. Jar	—	
Moisture content, Grain size, Specific gravity, Bulk density	Gallon Ziplock Bag	—	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

Robert Balkovec

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129

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

Sample ID No.: SS7SB027-0303
Sample Location: SS7SB027
Sampled By: B. BALKOVIC
C.O.C. No.: 41515

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

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 8/24/01	12-14	LIGHT BROWN & YELLOW ORANGE	SANDY SILT
Time: 1155			
Method: SPLIT SPOON			
Monitor Reading (ppm): 0.0			

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
TCL VOCs	(1) 4 oz. Jar	✓	
Arsenic	(1) 4 oz. Jar	"	
Arsenic, CEC, & pH	(1) 4 oz. Jar	"	
CEC & pH	(1) 4 oz. Jar	"	
Arsenic, TOC, CEC, & pH	(1) 4 oz. Jar	"	
TOC, CEC, & pH	(1) 4 oz. Jar	"	
TOC & pH	(1) 4 oz. Jar	"	
Moisture content, Grain size, Specific gravity, Bulk density	Gallon Ziplock Bag	"	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): Robert Balkovic

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129

Sample ID No.: SS7SB027003
Sample Location: SS7SB027
Sampled By: B. BALKOVEC
C.O.C. No.: 41515

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

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

GRAB SAMPLE DATA:

Date: 8/21/03	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 1215	16-18	LIGHT GRAY & YELLOW ORANGE	CLAYEY F SANDY SILT
Method: SPLIT SPOON			
Monitor Reading (ppm): 0.0			

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
TCL VOCs	(1) 4 oz. Jar	✓	
Arsenic	(1) 4 oz. Jar	—	
Arsenic, CEC, & pH	(1) 4 oz. Jar	—	
CEC & pH	(1) 4 oz. Jar	—	
Arsenic, TOC, CEC, & pH	(1) 4 oz. Jar	—	
TOC, CEC, & pH	(1) 4 oz. Jar	—	
TOC & pH	(1) 4 oz. Jar	—	
Moisture content, Grain size, Specific gravity, Bulk density	Gallon Ziplock Bag	—	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	

Signature(s):

Robert Balkovec

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Page 1 of ___

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129

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

Sample ID No.: S57SS0280103
Sample Location: S57SB028
Sampled By: B. BALKOVEC
C.O.C. No.: 15759

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

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 8/16/01 Time: 1047 Method: SPLIT SPOON Monitor Reading (ppm): 0.0	0-.5	YELLOW ORANGE + LT. GRAY	SILTY CLAY

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
TCL VOCs + e e.	(1) 4 oz. Jar	✓	
Arsenic	(1) 4 oz. Jar	–	
Arsenic, CEC, & pH	(1) 4 oz. Jar	–	
CEC & pH	(1) 4 oz. Jar	–	
Arsenic, TOC, CEC, & pH	(1) 4 oz. Jar	–	
TOC, CEC, & pH	(1) 4 oz. Jar	–	
TOC & pH	(1) 4 oz. Jar	–	
Moisture content, Grain size, Specific gravity, Bulk density	Gallon Ziplock Bag	–	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): Robert Balkovec

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129

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

Sample ID No.: SS7SB028 0103
Sample Location: SS7SB028
Sampled By: B. BALKOVE
C.O.C. No.: 15754

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

GRAB SAMPLE DATA:

Date: 8/15/01	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 1057	4-5'	LIGHT BROWN YELLOW ORANGE	FINE SAND W/ TRACE SILT
Method: SPLIT SPOON			
Monitor Reading (ppm): 0.0			

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
TCL VOCs	(1) 4 oz. Jar	2	
Arsenic	(1) 4 oz. Jar	-	
Arsenic, CEC, & pH	(1) 4 oz. Jar	-	
CEC & pH	(1) 4 oz. Jar	-	
Arsenic, TOC, CEC, & pH	(1) 4 oz. Jar	-	
TOC, CEC, & pH	(1) 4 oz. Jar	-	
TOC & pH	(1) 4 oz. Jar	-	
Moisture content, Grain size, Specific gravity, Bulk density	Gallon Ziplock Bag	-	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
___	SS7SBDUP02

Signature(s): Robert Balkovec

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129

Sample ID No.: SS7SB028U203
Sample Location: SS7SB028
Sampled By: B. DALLMER
C.O.C. No.: 15759

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

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

GRAB SAMPLE DATA:

Date: 5/16/01	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 1121	10-12'	GRAY + YELLOW/OR.	F-M SAND.
Method: SPLIT SPOON			
Monitor Reading (ppm): 0.0			

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
TCL VOCs + e.e	(1) 4 oz. Jar	5	
Arsenic	(1) 4 oz. Jar	"	
Arsenic, CEC, & pH	(1) 4 oz. Jar	"	
CEC & pH	(1) 4 oz. Jar	"	
Arsenic, TOC, CEC, & pH	(1) 4 oz. Jar	"	
TOC, CEC, & pH	(1) 4 oz. Jar	"	
TOC & pH	(1) 4 oz. Jar	"	
Moisture content, Grain size, Specific gravity, Bulk density	Gallon Ziplock Bag	"	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:
MS/MSD
Duplicate ID No.:

Signature(s):
Robert Balkerer

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129

Sample ID No.: 557SB07S0303
Sample Location: 557SB07S
Sampled By: B. BALKOVEC
C.O.C. No.: 15759

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

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

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 4/16/01			
Time: 1127	12-14'	GRAY & YELLOW ORANGE	MED SAND
Method: SPLIT SPOON			
Monitor Reading (ppm): 0.0			

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
TCL VOCs	(1) 4 oz. Jar	✓	
Arsenic	(1) 4 oz. Jar	~	
Arsenic, CEC. & pH	(1) 4 oz. Jar	~	
CEC & pH	(1) 4 oz. Jar	~	
Arsenic, TOC, CEC, & pH	(1) 4 oz. Jar	~	
TOC, CEC, & pH	(1) 4 oz. Jar	~	
TOC & pH	(1) 4 oz. Jar	~	
Moisture content, Grain size, Specific gravity, Bulk density	Gallon Ziplock Bag	~	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD ~ Duplicate ID No.: ~

Signature(s): Robert Balkovec

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129

Sample ID No.: S57SB02804O3
Sample Location: S57SB028
Sampled By: B. BALKCOM
C.O.C. No.: 15759

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

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

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 5/16/01	18-20'	GRAY + LIGHT BROWN (REDDISH)	MED FINE SANDY SILT (MOTTLED)
Time: 1150			
Method: SPLIT SPOON			
Monitor Reading (ppm): 10.7			

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
TCL VOCs	(1) 4 oz. Jar	2	
Arsenic	(1) 4 oz. Jar	-	
Arsenic, CEC, & pH	(1) 4 oz. Jar	-	
CEC & pH	(1) 4 oz. Jar	-	
Arsenic, TOC, CEC, & pH	(1) 4 oz. Jar	-	
TOC, CEC, & pH	(1) 4 oz. Jar	-	
TOC & pH	(1) 4 oz. Jar	-	
Moisture content, Grain size, Specific gravity, Bulk density	Gallon Ziplock Bag	-	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	S57SBDUP03

Signature(s): Robert Balkcom

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129

Sample ID No.: SS75S024QW3
Sample Location: SS75B079
Sampled By: B. Bulkeley
C.O.C. No.: 15756

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

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

GRAB SAMPLE DATA:

Date: 8/17/01	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 1100	0-.5'	Light Brown + Black	Silty Sand w/ Gravel & Asphalt
Method: Split Spoon			
Monitor Reading (ppm): 0.0			

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
TCL VOCs	(1) 4 oz. Jar	✓	
Arsenic	(1) 4 oz. Jar	—	
Arsenic, CEC, & pH	(1) 4 oz. Jar	—	
CEC & pH	(1) 4 oz. Jar	—	
Arsenic, TOC, CEC, & pH	(1) 4 oz. Jar	—	
TOC, CEC, & pH	(1) 4 oz. Jar	—	
TOC & pH	(1) 4 oz. Jar	—	
Moisture content, Grain size, Specific gravity, Bulk density	Gallon Ziplock Bag	—	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

Robert Bulkeley

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129

Sample ID No.: SS75B039 0103
Sample Location: SS75B039
Sampled By: B BALKOVEC
C.O.C. No.:

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

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

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 8/17/01	4-5'	LIGHT BROWN	SANDY SILT W/ GRAVEL, TRACE CLAY
Time: 1110			
Method: SOLID SPOON			
Monitor Reading (ppm): 0.0			

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
TCL VOCs	(1) 4 oz. Jar	✓	
Arsenic	(1) 4 oz. Jar	—	
Arsenic, CEC, & pH	(1) 4 oz. Jar	—	
CEC & pH	(1) 4 oz. Jar	—	
Arsenic, TOC, CEC, & pH	(1) 4 oz. Jar	—	
TOC, CEC, & pH	(1) 4 oz. Jar	—	
TOC & pH	(1) 4 oz. Jar	—	
Moisture content, Grain size, Specific gravity, Bulk density	Gallon Ziplock Bag	✓	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

Robert Balkovec

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129

Sample ID No.: SS75B0740703
Sample Location: SS75B079
Sampled By: B. BALKOVEC
C.O.C. No.:

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

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

GRAB SAMPLE DATA:

Date: 8/17/01	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 1132	10-12	OLIVE GRAY	CLAYEY SILT W/ TRACE SAND
Method: SPLIT SPOON			
Monitor Reading (ppm): 0.0			

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
TCL VOCs	(1) 4 oz. Jar	✓	
Arsenic	(1) 4 oz. Jar	✓	
Arsenic, CEC, & pH	(1) 4 oz. Jar	✓	
CEC & pH	(1) 4 oz. Jar	✓	
Arsenic, TOC, CEC, & pH	(1) 4 oz. Jar	✓	
TOC, CEC, & pH	(1) 4 oz. Jar	✓	
TOC & pH	(1) 4 oz. Jar	✓	
Moisture content, Grain size, Specific gravity, Bulk density	Gallon Ziplock Bag	✓	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

Robert Balkovec

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129

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

Sample ID No.: S57SB02Q0303
Sample Location: S57SB029
Sampled By: B BALKOVEC
C.O.C. No.:

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

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 8/17/01 Time: 1210 Method: SPLIT SPOON Monitor Reading (ppm): 0.0	20-22	YELLOW ORANGE	SILTY SAND

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
TCL VOCs	(1) 4 oz. Jar	✓	
Arsenic	(1) 4 oz. Jar	—	
Arsenic, CEC, & pH	(1) 4 oz. Jar	—	
CEC & pH	(1) 4 oz. Jar	—	
Arsenic, TOC, CEC, & pH	(1) 4 oz. Jar	—	
TOC, CEC, & pH	(1) 4 oz. Jar	—	
TOC & pH	(1) 4 oz. Jar	—	
Moisture content, Grain size, Specific gravity, Bulk density	Gallon Ziplock Bag	—	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): Robert Balkovec

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129

Sample ID No.: SS38039 0403
Sample Location: SS38039
Sampled By: B. BALLOUER
C.O.C. No.:

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

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

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 8/17/01	24-26'	GREENISH BROWN	F. SAND & CLAY, VERY STIFF
Time: 1220			
Method: SPLIT SPOON			
Monitor Reading (ppm): 2.0			

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
TCL VOCs	(1) 4 oz. Jar	✓	
Arsenic	(1) 4 oz. Jar	—	
Arsenic, CEC, & pH	(1) 4 oz. Jar	—	
CEC & pH	(1) 4 oz. Jar	—	
Arsenic, TOC, CEC, & pH	(1) 4 oz. Jar	—	
TOC, CEC, & pH	(1) 4 oz. Jar	—	
TOC & pH	(1) 4 oz. Jar	—	
Moisture content, Grain size, Specific gravity, Bulk density	Gallon Ziplock Bag	—	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	

Signature(s):

Robert Ballouer

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129

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

Sample ID No.: S57SB03D0103
Sample Location: S57SB03D
Sampled By: B Balkovec
C.O.C. No.: 15762

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

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 8/24/01 Time: 1005 Method: SPLIT SPOON Monitor Reading (ppm): 10.0	4-6	LT. BROWN & LT. GRAY	SILTY SAND T-CLAY (MOTTLED)

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
TCL VOCs	(1) 4 oz. Jar	1	
Arsenic	(1) 4 oz. Jar	–	
Arsenic, CEC, & pH	(1) 4 oz. Jar	–	
CEC & pH	(1) 4 oz. Jar	–	
Arsenic, TOC, CEC, & pH	(1) 4 oz. Jar	–	
TOC, CEC, & pH	(1) 4 oz. Jar	–	
TOC & pH	(1) 4 oz. Jar	–	
Moisture content, Grain size, Specific gravity, Bulk density	Gallon Ziplock Bag	–	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): Robert Balkovec

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129

Sample ID No.: SS7SB030203
Sample Location: SS7SB030
Sampled By: B BALKOVEC
C.O.C. No.: 15762

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

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

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 8/24/01	8-10	YELLOW BROWN MOTTLED GRAY	SAND & SILT
Time: 1015			
Method: SPLIT SPOON			
Monitor Reading (ppm): 8			

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
TCL VOCs	(1) 4 oz. Jar	MS	
Arsenic	(1) 4 oz. Jar	-	
Arsenic, CEC, & pH	(1) 4 oz. Jar	-	
CEC & pH	(1) 4 oz. Jar	-	
Arsenic, TOC, CEC, & pH	(1) 4 oz. Jar	-	
TOC, CEC, & pH	(1) 4 oz. Jar	-	
TOC & pH	(1) 4 oz. Jar	2	
Moisture content, Grain size, Specific gravity, Bulk density	Gallon Ziplock Bag	1	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	FD SS7SB04P06

Signature(s):

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129

Sample ID No.: SS7SB03 0303
Sample Location: SS7SB03
Sampled By: B BALKOVEC
C.O.C. No.: 15762

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

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

GRAB SAMPLE DATA:

Date: 8/24/09	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 1045	14-16	LIGHT GRAY	MED. SAND
Method: SPLIT SPOON			
Monitor Reading (ppm): 0.0			

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
TCL VOCs	(1) 4 oz. Jar	✓	
Arsenic	(1) 4 oz. Jar	✓	
Arsenic, CEC, & pH	(1) 4 oz. Jar	✓	
CEC & pH	(1) 4 oz. Jar	✓	
Arsenic, TOC, CEC, & pH	(1) 4 oz. Jar	✓	
TOC, CEC, & pH	(1) 4 oz. Jar	✓	
TOC & pH	(1) 4 oz. Jar	✓	
Moisture content, Grain size, Specific gravity, Bulk density	Gallon Ziplock Bag		

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD

Duplicate ID No.:

Signature(s):

Robert Balkovec

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129

Sample ID No.: SS7SB03D0403
Sample Location: SS7SB03C
Sampled By: B BALKCOM
C.O.C. No.: 15763

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

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

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 8/24/01	22-24'		
Time: 1145			
Method: SB7 SPOON			
Monitor Reading (ppm): 0.0			

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
TCL VOCs	(1) 4 oz. Jar	3 COLLECTED ONLY 1 SAMPLE	
Arsenic	(1) 4 oz. Jar	1	
Arsenic, CEC, & pH	(1) 4 oz. Jar	1	
CEC & pH	(1) 4 oz. Jar	1	
Arsenic, TOC, CEC, & pH	(1) 4 oz. Jar	1	
TOC, CEC, & pH	(1) 4 oz. Jar	1	
TOC & pH	(1) 4 oz. Jar	1	
Moisture content, Grain size, Specific gravity, Bulk density	Gallon Ziplock Bag	1	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:
MS/MSD

Duplicate ID No.:

Signature(s):
Robert Balkcom

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129

Sample ID No.: SS75SB031U1U3
Sample Location: SS75SB031
Sampled By: R BALKUVE
C.O.C. No.: 15762

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

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

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 8/24/01	4-6	DK YEL BRN	SAND TR SILT
Time: 807			
Method: SPLIT SPOON			
Monitor Reading (ppm): 0.0			

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
TCL VOCs	(1) 4 oz. Jar	3	
Arsenic	(1) 4 oz. Jar	-	
Arsenic, CEC, & pH	(1) 4 oz. Jar	-	
CEC & pH	(1) 4 oz. Jar	-	
Arsenic, TOC, CEC, & pH	(1) 4 oz. Jar	-	
TOC, CEC, & pH	(1) 4 oz. Jar	-	
TOC & pH	(1) 4 oz. Jar	-	
Moisture content, Grain size, Specific gravity, Bulk density	Gallon Ziplock Bag		

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD

Duplicate ID No.:

Signature(s):

Robert Balkcom

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129

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

Sample ID No.: S57SB0310203
Sample Location: S57SB031
Sampled By: B BALKOVIC
C.O.C. No.: 15762

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

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 5/24/01 Time: 0878 Method: SPLIT SPOON Monitor Reading (ppm):	8-10	YELLOW BROWN	SILTY, FINE SAND

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
TCL VOCs	(1) 4 oz. Jar	✓ 2	
Arsenic	(1) 4 oz. Jar	–	
Arsenic, CEC, & pH	(1) 4 oz. Jar	–	
CEC & pH	(1) 4 oz. Jar	–	
Arsenic, TOC, CEC, & pH	(1) 4 oz. Jar	–	
TOC, CEC, & pH	(1) 4 oz. Jar	–	
TOC & pH	(1) 4 oz. Jar	✓ 2	
Moisture content, Grain size, Specific gravity, Bulk density	Gallon Ziplock Bag	✓ (1)	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD —

Duplicate ID No.: S57SBD4P05

Signature(s): Robert Balkovic

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129

Sample ID No.: SS75B0310303
Sample Location: SS75B031
Sampled By: B BALLOUEZ
C.O.C. No.: 15762

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

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

GRAB SAMPLE DATA:

Date: 9/24/01	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 0840	14-16	YELLOW BR.	SAND.
Method: SPLIT SPOON			
Monitor Reading (ppm): 0.1			

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
TCL VOCs	(1) 4 oz. Jar	✓	
Arsenic	(1) 4 oz. Jar	–	
Arsenic, CEC, & pH	(1) 4 oz. Jar	–	
CEC & pH	(1) 4 oz. Jar	–	
Arsenic, TOC, CEC, & pH	(1) 4 oz. Jar	–	
TOC, CEC, & pH	(1) 4 oz. Jar	–	
TOC & pH	(1) 4 oz. Jar	–	
Moisture content, Grain size, Specific gravity, Bulk density	Gallon Ziplock Bag	–	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	

Signature(s): Robert Ballouez

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129

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

Sample ID No.: SS75SB031-0403
Sample Location: SS75SB031
Sampled By: B BALKOVEC
C.O.C. No.: 15762

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

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 8/24/01	18-20'	LIGHT YELLOW BROWN - LT BRN	CLAY + SILT
Time: 0900			
Method: SPLIT SPOON			
Monitor Reading (ppm): 0.0			

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
TCL VOCs	(1) 4 oz. Jar	3 (MS/MSD)	
Arsenic	(1) 4 oz. Jar	-	
Arsenic, CEC, & pH	(1) 4 oz. Jar	-	
CEC & pH	(1) 4 oz. Jar	-	
Arsenic, TOC, CEC, & pH	(1) 4 oz. Jar	-	
TOC, CEC, & pH	(1) 4 oz. Jar	-	
TOC & pH	(1) 4 oz. Jar	1	
Moisture content, Grain size, Specific gravity, Bulk density	Gallon Ziplock Bag	1	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD

VOC's

Duplicate ID No.:

Signature(s):

Robert Balkovec

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129

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

Sample ID No.: S57SB0320103
Sample Location: S57SB032
Sampled By: B BALKOVEC
C.O.C. No.: 15763

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

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 8/24/01 Time: 1305 Method: SPLIT SPOON Monitor Reading (ppm): 0.0	6-8'	YELLOW BROWN + LIGHT GRAY	SILT + CLAY (MOTTLED)

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
TCL VOCs	(1) 4 oz. Jar	✓	
Arsenic	(1) 4 oz. Jar	✓	
Arsenic, CEC, & pH	(1) 4 oz. Jar	✓	
CEC & pH	(1) 4 oz. Jar	✓	
Arsenic, TOC, CEC, & pH	(1) 4 oz. Jar	✓	
TOC, CEC, & pH	(1) 4 oz. Jar	✓	
TOC & pH	(1) 4 oz. Jar	✓	
Moisture content, Grain size, Specific gravity, Bulk density	Gallon Ziplock Bag	✓	

OBSERVATIONS / NOTES:

* UNABLE TO SAMPLE 4-6' 0 RECOVERY

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): Robert Balkovec

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129

Sample ID No.: SS7SB03202O3
Sample Location: SS7SB032
Sampled By: B BALKOVET
C.O.C. No.: 15763

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

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

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 8/24/01	8-10'	YELLOW ORANGE SLT. GRAY	CLAY W/ T. SAND
Time: 1315			
Method: SPLIT SPOON			
Monitor Reading (ppm): 0-0			

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
TCL VOCs	(1) 4 oz. Jar	/	
Arsenic	(1) 4 oz. Jar	-	
Arsenic, CEC, & pH	(1) 4 oz. Jar	-	
CEC & pH	(1) 4 oz. Jar	-	
Arsenic, TOC, CEC, & pH	(1) 4 oz. Jar	-	
TOC, CEC, & pH	(1) 4 oz. Jar	-	
TOC & pH	(1) 4 oz. Jar	/	
Moisture content, Grain size, Specific gravity, Bulk density	Gallon Ziplock Bag	/	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	

Signature(s):

Robert Balkovet

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129

Sample ID No.: S57SB032023
Sample Location: S57SB032
Sampled By: B. BALMER
C.O.C. No.: 15763

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

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

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 8/24/01			
Time: 1335			
Method: SPLIT SPOON	14-16'	YEL BRN GRFY	CLAY W TR f-y SAND
Monitor Reading (ppm): 0.0			

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
TCL VOCs	(1) 4 oz. Jar	1	
Arsenic	(1) 4 oz. Jar	-	
Arsenic, CEC, & pH	(1) 4 oz. Jar	-	
CEC & pH	(1) 4 oz. Jar	-	
Arsenic, TOC, CEC, & pH	(1) 4 oz. Jar	-	
TOC, CEC, & pH	(1) 4 oz. Jar	-	
TOC & pH	(1) 4 oz. Jar	-	
Moisture content, Grain size, Specific gravity, Bulk density	Gallon Ziplock Bag	-	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD

Duplicate ID No.:

Signature(s):

Robert Balmer

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129

Sample ID No.: SS7SB032040303
Sample Location: SS7SB032
Sampled By: B BALKWILL
C.O.C. No.: 15763

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

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

GRAB SAMPLE DATA:

Date: 4/24/01	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 1345	18-20	LT BROWN & LIGHT GRAY	SILTY, CLAY W/ SOME GRAVEL
Method: SPLIT SPOON			
Monitor Reading (ppm): 0.0			

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
TCL VOCs	(1) 4 oz. Jar	1	
Arsenic	(1) 4 oz. Jar	-	
Arsenic, CEC, & pH	(1) 4 oz. Jar	-	
CEC & pH	(1) 4 oz. Jar	-	
Arsenic, TOC, CEC, & pH	(1) 4 oz. Jar	-	
TOC, CEC, & pH	(1) 4 oz. Jar	-	
TOC & pH	(1) 4 oz. Jar	1	
Moisture content, Grain size, Specific gravity, Bulk density	Gallon Ziplock Bag	1	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD

Duplicate ID No.:

Signature(s):

Robert Balkwill

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129

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

Sample ID No.: S57SB0330103
Sample Location: S57SB033 MW023
Sampled By: B. BALKOVEC
C.O.C. No.: 15737

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

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 8/22/01 Time: 1457 Method: SPLIT SPOON Monitor Reading (ppm): 0.0	10-12'	YELLOW ORANGE	FINE MED SAND

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
TCL VOC'S + ETHYL ETHER	(1) 4 OZ JAR	✓	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): Robert Balkovec

A.6 GROUNDWATER SAMPLE LOG SHEETS

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129 CTO 245

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

Sample ID No.: S57MW0010103
Sample Location: S57MW001
Sampled By: J Wellman
C.O.C. No.: 15760
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color Visual	pH Standard	S.C. mS/cm	Temp. °C	Turbidity NTU	DO mg/l	ORP (m/V)	TDS
Date: 8/15/01								
Time: 1121								
Method: Peristaltic Pump	Clear	5.78	0.089	21.8	0.27	3.20	155	0.06

PURGE DATA:

	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	ORP	Flow Rate
Date: 8/15/01								
Method: Peristaltic Pump								
Monitor Reading (ppm): —								
Well Casing Diameter & Material Type: 2" PVC								
Total Well Depth (TD): 26.25				See Low Flow Purge Data Sheet				
Static Water Level (WL): 7.44								
One Casing Volume(gal/L): 6.321								
Start Purge (hrs): 0916								
End Purge (hrs): 1121								
Total Purge Time (min): 125								
Total Vol. Purged (gal/L): 12.5								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL Volatiles	HCl / 4°C	(2) 40 ML VIALS	2
Cadmium, Chromium, and Iron	HNO_3 / 4° C	(1) 500mL Poly	1
COD and TOC	H_2SO_4 / 4° C	(1) 120 mL Poly	1
Chromium (Hexavalent)	4° C	(1) 500mL POLY	1
Dissolved Gases	4° C	(3) 40 mL Vial	3
Hardness	HNO_3 / 4° C	(1) 500 mL Poly	1
Ferrous Iron	4° C	(1) 1L Poly	1
Misc. Anions	4° C	(1) 1L Poly	1
Sulfide	NaOH / 4° C	(1) 500mL POLY	1
Alkalinity & TSS	4° C	(1) 1L Poly	1
Alkalinity, BOD, DOC & TSS	4° C	(1) 1L Poly	
Carbon Dioxide	4°C	1-500mL Poly	1

OBSERVATIONS / NOTES:

* Chromium (Hexavalent) has 24 hr Hold Time

Total Dissolved Iron 4°C HNO_3 1-500mL Poly 1

Circle if Applicable:

MS/MSD

Duplicate ID No.:

Signature(s): Jennifer C. Wellman

Tetra Tech NUS, Inc.

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: NSWC INDIAN HEAD
PROJECT NUMBER: N7129 CTO 0245

WELL ID.: 557MW001
DATE: 8/15/01

Time (Hrs.)	Water Level (Ft. below TOC)	Volume (mL) (gal/L)	Flowrate (mL/min)	pH (S.U.)	Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celsius)	ORP (mV)	TDS ( )	Notes:
0916	7.44	—	100mL	start purge →							→
0921	7.64	500	100mL	6.53	0.175	178	4.80	21.7	-20	0.10	
0926	7.85	1000	100mL	6.56	0.159	80.7	3.55	21.6	-20	0.10	
0931	7.88	1500	100 mL	6.54	0.161	48.6	3.57	21.6	-18	0.11	
0936	7.90	2000	100mL	6.57	0.155	27.2	3.52	21.5	-18	0.10	
0941	7.90	2500	100mL	6.59	0.151	18.5	3.37	21.6	-15	0.10	
0946	7.95	3000	100mL	6.63	0.148	10.47	3.35	21.2	-12	0.10	
0951	7.97	3500	100mL	6.63	0.144	8.73	3.31	21.1	-11	0.09	
0956	8.00	4000	100mL	6.64	0.140	7.07	3.30	20.9	-3	0.09	
1001	8.04	4500	100mL	6.59	0.133	6.77	3.31	20.7	8	0.09	
1006	8.05	5000	100mL	6.33	0.121	6.02	3.30	20.8	45	0.09	
1012	8.05	5500	100mL	6.27	0.120	3.05	3.31	20.9	53	0.08	
1016	8.04	6000	100ml	6.14	0.109	2.37	3.25	20.8	80	0.07	
1021	8.04	6500	100	6.11	0.111	2.25	3.29	21.1	84	0.07	
1026	8.03	7000	100	6.05	0.109	2.11	3.26	21.2	91	0.07	
1031	8.03	7500	100	6.00	0.107	1.32	3.28	21.3	106	0.07	
1036	8.02	8000	100	5.95	0.100	0.81	3.24	21.3	116	0.07	
1041	8.01	8500	100	5.92	0.105	1.07	3.27	21.6	114	0.07	
1046	8.02	9000	100	5.93	0.098	0.66	3.29	21.7	118	0.06	
1051	8.02	9500	100	5.83	0.091	0.29	3.29	21.6	140	0.06	
1056	8.02	10000	100	5.82	0.091	0.05	3.27	21.4	140	0.06	
1101	8.02	10500	100	5.79	0.089	0.56	3.22	21.5	148	0.06	
1106	8.03	11000	100	5.79	0.088	1.41	3.22	21.3	151	0.06	
1111	8.03	11500	100	5.78	0.088	0.72	3.22	21.4	153	0.06	
1116	8.03	12000	100	5.77	0.089	0.15	3.23	21.7	155	0.06	
1121	8.03	12500	100	5.78	0.089	0.27	3.20	21.8	155	0.06	

SIGNATURE(S): Jennifer C. Wellman

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129 CTO 245

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

Sample ID No.: S57MW002010
Sample Location: S57MW002~~010~~3 PR
Sampled By: JCW
C.O.C. No.: 15760
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color Visual	pH Standard	S.C. mS/cm	Temp. °C	Turbidity NTU	DO mg/l	ORP (m/V)	TDS
Date: 8/15/01								
Time: 1515								
Method: Peristaltic Pump	Clear	6.56	0.172	24.4	1.92	3.26	53	0.11

PURGE DATA:

	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	ORP	Flow Rate
Date: 8/15/01								
Method: Peristaltic Pump								
Monitor Reading (ppm):								
Well Casing Diameter & Material Type: 2" PVC								
Total Well Depth (TD): 14.32				See Low Flow Purge Data Sheet				
Static Water Level (WL): 7.97								
One Casing Volume(gal/L): 4.0								
Start Purge (hrs): 1355								
End Purge (hrs): 1515								
Total Purge Time (min): 80								
Total Vol. Purged (gal/L): 8.0L								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL Volatiles	HCl / 4°C	(2) 40 ML VIALS	2
Cadmium, Chromium, ~~and Iron~~	HNO_3 / 4° C	(1) 500mL Poly	1
COD and TOC	H_2SO_4 / 4° C	(1) 120 mL Poly	1
Chromium (Hexavalent)	4° C	(1) 500mL POLY	1
Dissolved Gases	4° C	(3) 40 mL Vial	3
Hardness	HNO_3 / 4° C	(1) 500 mL Poly	1
Ferrous Iron	4° C	(1) 1L Poly	1
Misc. Anions	4° C	(1) 1L Poly	1
Sulfide	NaOH / 4° C	(1) 500mL POLY	1
Alkalinity & TSS	4° C	(1) 1L Poly	1
Alkalinity, BOD, DOC & TSS	4° C	(1) 1L Poly	
Carbon Dioxide	4°C	(1) 500mL Poly	1

OBSERVATIONS / NOTES:

* Chromium (Hexavalent) has 24 hr Hold Time

Dissolved Iron (Total) HNO_3/4°C (1) 500mL Poly 1

Circle if Applicable:

MS/MSD

Duplicate ID No.:

Signature(s): Jennifer C. Wellman

Tetra Tech NUS, Inc.

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: NSWC INDIAN HEAD
PROJECT NUMBER: N7129 CTO 0245

WELL ID.: SS7 MW002
DATE: 8/15/01

Time (Hrs.)	Water Level (Ft. below TOC)	Volume mL ~~(gals)~~	Flowrate (mL/min)	pH (S.U.)	Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celsius)	ORP (mV)	TDS ( )	Notes:
1355	7.97		100ml	-start		purge					
1405	8.12	1000mL	100mL	6.42	0.203	26.5J	5.41	25.4	51	0.13	
1415	8.55	2000mL	100	6.44	0.201	21.3	5.28	24.8	53	0.13	
1425	8.62	3000	100	6.49	0.198	~~4.73~~ 1553	4.73	24.6	41	0.13	
1435	8.62	4000	100	6.53	0.187	9.35	3.94	25.0	35	0.12	
1445	8.63	5000	100	6.53	0.180	6.84	3.55	24.6	36	0.12	
1455	8.65	6000	100	6.55	0.177	4.36	3.35	24.4	40	0.12	
1505	8.65	7000	100	6.56	0.175	2.62	3.29	24.5	47	0.11	
1515	8.65	8000	100	6.56	0.172	1.92	3.26	24.4	53	0.11	

SIGNATURE(S): Jennifer C. Wellman

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129 CTO 245

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

Sample ID No.: 557MW0030103
Sample Location: 557MW003
Sampled By: Jennifer Wellman
C.O.C. No.: 157164
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color	pH	S.C.	Temp.	Turbidity	DO	ORP	TDS
Date: 8-16-01	Visual	Standard	mS/cm	°C	NTU	mg/l	(m/V)	
Time: 1030								
Method: Peristaltic Pump	Clear	5.29	0.014	20.7	0.04	3.43	258	0.04

PURGE DATA:

	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	ORP	Flow Rate
Date: 8-16-01								
Method: Peristaltic Pump								
Monitor Reading (ppm):								
Well Casing Diameter & Material Type: 2" PVC								
Total Well Depth (TD): 24.35				See Low Flow Purge Data Sheet				
Static Water Level (WL): 8.82								
One Casing Volume(gal/L): 6.3								
Start Purge (hrs): 0820								
End Purge (hrs): 1030								
Total Purge Time (min): 130								
Total Vol. Purged (gal/L): 13								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL Volatiles	HCl / 4°C	(2) 40 ML VIALS	4
Cadmium, Chromium, and Iron	HNO_3 / 4° C	(1) 500mL Poly	2
COD and TOC	H_2SO_4 / 4° C	(1) 120 mL Poly	2
Chromium (Hexavalent)	4° C	(1) 500mL POLY	2
Dissolved Gases	4° C	(3) 40 mL Vial	6
Hardness	HNO_3 / 4° C	(1) 500 mL Poly	2
Ferrous Iron	4° C	(1) 1L Poly	2
Misc. Anions	4° C	(1) 1L Poly	2
Sulfide	NaOH / 4° C	(1) 500mL POLY	2
Alkalinity & TSS	4° C	(1) 1L Poly	2
~~Alkalinity~~, BOD, DOC ~~& TSS~~	4° C	(1) 1L Poly	2
CO_2	4°C	1-500mL Poly	2

OBSERVATIONS / NOTES:

* Chromium (Hexavalent) has 24 hr Hold Time

Fe(dissolved) HNO_3/4°C 1-500 mL Poly 2

Circle if Applicable:

MS/MSD	Duplicate ID No.:
/	557mwDUP01

Signature(s): Jennifer C. Wellman

Tetra Tech NUS, Inc.

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: NSWC INDIAN HEAD
PROJECT NUMBER: N7129 CTO 0245
WELL ID.: SS7MW003
DATE: 8/16/01

Time (Hrs.)	Water Level (Ft. below TOC)	Volume mL (gal/L)	Flowrate (mL/min)	pH (S.U.)	Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celsius)	ORP (mV)	TDS ( )	Notes:
0820	8.82	—	100	START PURGE							
0830	8.99	1000	100	5.25	0.075	6.83	5.15	20.8	247	0.05	
0840	8.99	2000	100	5.29	0.0662	3.61	3.69	20.6	252	0.04	
0850	8.99	3000	100	5.29	0.0666	5.24	3.63	20.6	255	0.04	
0900	8.99	4000	100	5.30	0.0664	9.11	3.53	20.5	258	0.04	
0910	9.00	5000	100	5.29	0.0664	6.52	3.50	20.5	260	0.04	
0920	9.01	6000	100	5.29	0.063	6.37	3.52	20.5	261	0.04	
0930	9.02	7000	100	5.28	0.063	4.87	3.51	20.5	262	0.04	
0940	9.02	8000	100	5.28	0.062	4.17	3.53	20.5	261	0.04	
0950	9.02	9000	100	5.28	0.0665	3.44	3.52	20.5	262	0.04	
1000	9.02	10000	100	5.27	0.061	3.06	3.52	20.6	261	0.04	
1010	9.02	11000	100	5.28	0.064	2.54	3.50	20.6	261	0.04	
1020	9.02	12000	100	5.29	0.069	3.11	3.52	20.7	259	0.04	
1030	9.02	13000	100	5.29	0.064	4.25	3.43	20.7	258	0.04	

SIGNATURE(S): Jennifer C. Wellman

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129 CTO 245

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

Sample ID No.: SS7MW00401O3
Sample Location: SS57MW004
Sampled By: J Wellman
C.O.C. No.: 15764
Type of Sample:
[X] Low Concentration
[ ] High Concentration

SAMPLING DATA:

Date: 8/16/01	Color	pH	S.C.	Temp.	Turbidity	DO	ORP	TDS
Time: 1605	Visual	Standard	mS/cm	°C	NTU	mg/l	(mV)	
Method: Peristaltic Pump	Clear	1.49	0.140	22.5	0.78	3.26	168	0.09

PURGE DATA:

Date: 8/16/01	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	ORP	Flow Rate
Method: Peristaltic Pump								
Monitor Reading (ppm): —								
Well Casing Diameter & Material								
Type: 2" PVC								
Total Well Depth (TD): 16.15				See Low Flow Purge Data Sheet				
Static Water Level (WL): 8.80								
One Casing Volume(gal/L): 4.9								
Start Purge (hrs): ~~0825~~ 1425								
End Purge (hrs): 1605								
Total Purge Time (min): 100								
Total Vol. Purged (gal/L): 10L								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL Volatiles	HCl / 4°C	(2) 40 ML VIALS	6
Cadmium, Chromium, and Iron	HNO_3 / 4° C	(1) 500mL Poly	3
COD and TOC	H_2SO_4 / 4° C	(1) 120 mL Poly	3
Chromium (Hexavalent)	4° C	(1) 500mL POLY	3
Dissolved Gases	4° C	(3) 40 mL Vial	9
Hardness	HNO_3 / 4° C	(1) 500 mL Poly	3
Ferrous Iron	4° C	(1) 1L Poly	3
Misc. Anions	4° C	(1) 1L Poly	3
Sulfide	NaOH / 4° C	(1) 500mL POLY	3
Alkalinity & TSS	4° C	(1) 1L Poly	3
~~Alkalinity~~, BOD, DOC & ~~TSS~~	4° C	(1) 1L Poly	3
CO_2	4°C	1-500mL Poly	3

OBSERVATIONS / NOTES:

* Chromium (Hexavalent) has 24 hr Hold Time

Dissolved Iron HNO3/4°C 1-500mL Poly 3

Circle if Applicable:

~~MS/MSD~~ Duplicate ID No.:

Signature(s):

Jennifer C. Wellman

Tetra Tech NUS, Inc.

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: NSWC INDIAN HEAD
PROJECT NUMBER: N7129 CTO 0245

WELL ID.: S57MW004
DATE: 8/16/01

Time (Hrs.)	Water Level (Ft. below TOC)	Volume (gal/L)	Flowrate (mL/min)	pH (S.U.)	Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celsius)	ORP (mV)	TDS ( )	Notes:
1425	8.80	—	100mL	—	start	purge					
1435	8.91	1000	100	6.60	0.165	9.72	6.31	23.0	190	0.11	
1445	8.96	2000	100	6.57	0.164	8.15	4.54	23.0	163	0.11	
1455	9.01	3000	100	6.55	0.164	3.60	4.14	23.0	163	0.11	
1505	9.03	4000	100	6.54	0.161	3.21	3.77	23.4	163	0.10	
1515	9.05	5000	100	6.54	0.158	2.48	3.70	23.0	164	0.10	
1525	9.07	6000	100	6.54	0.154	1.52	3.68	23.1	168	0.10	
1535	9.07	7000	100	6.52	0.151	1.43	3.45	23.0	166	0.10	
1545	9.08	8000	100	6.51	0.148	1.23	3.32	22.7	166	0.10	
1555	9.08	9000	100	6.50	0.149	0.95	3.26	22.6	167	0.09	
1605	9.08	10000	100	6.49	0.140	0.78	3.26	22.5	168	0.09	

SIGNATURE(S): Jennifer C. Wellman

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Page___ of ___

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129 CTO 245

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

Sample ID No.: S57MW0050103
Sample Location: S57MW005
Sampled By: Jennifer Wellman
C.O.C. No.: 41519
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 8/23/01	Color	pH	S.C.	Temp.	Turbidity	DO	ORP	TDS
Time: 1504	Visual	Standard	mS/cm	°C	NTU	mg/l	(m/V)	
Method: Peristaltic Pump	Clear	4.24	0.113	20.5	1.2	4.30	315	0.07

PURGE DATA:

Date: 8/23/01	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	ORP	Flow Rate
Method: Peristaltic Pump								
Monitor Reading (ppm):								
Well Casing Diameter & Material Type: 2" PVC								
Total Well Depth (TD): 19.8				See Low Flow Purge Data Sheet				
Static Water Level (WL): 5.85								
One Casing Volume(gal/L): 3.0L								
Start Purge (hrs): 1404								
End Purge (hrs): 1504								
Total Purge Time (min): 60								
Total Vol. Purged (gal/L): 6.0L								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL Volatiles	HCl / 4°C	(2) 40 ML VIALS	2
Cadmium, Chromium, and Iron	HNO_3 / 4° C	(1) 500mL Poly	1
COD and TOC	H_2SO_4 / 4° C	(1) 120 mL Poly	1
Chromium (Hexavalent)	4° C	(1) 500mL POLY	1
Dissolved Gases	4° C	(3) 40 mL Vial	3
Hardness	HNO_3 / 4° C	(1) 500 mL Poly	1
Ferrous Iron	4° C	(1) 1L Poly	1
Misc. Anions	4° C	(1) 1L Poly	1
Sulfide	NaOH / 4° C	(1) 500mL POLY	1
Alkalinity & TSS	4° C	(1) 1L Poly	1
~~Alkalinity, BOD, DOC & TSS~~ CO2	4° C	(1) ~~1L Poly~~ 500mL	1
Dissolved Iron	HNO_3	1-500mL Poly	1

OBSERVATIONS / NOTES:

* Chromium (Hexavalent) has 24 hr Hold Time

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): Jennifer C. Wellman

Tetra Tech NUS, Inc.

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: NSWC INDIAN HEAD
PROJECT NUMBER: N7129 CTO 0245

WELL ID.: 557MW005
DATE: 8/23/01

Time (Hrs.)	Water Level (Ft. below TOC)	Volume (gal/L)	Flowrate (mL/min)	pH (S.U.)	Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celsius)	ORP (mV)	TDS ( )	Notes:
1404	5.85	—	100	—	start	purge	—	—	—	—	—
1414	5.90	1.0L	100	4.81	0.117	23	6.78	21.1	262	0.08	
1424	5.91	2.0L	100	4.71	0.115	8.9	5.46	20.7	276	0.07	
1434	5.91	3.0L	100	4.60	0.115	7.1	4.90	20.9	287	0.07	
1444	5.91	4.0L	100	4.31	0.114	5.4	4.36	20.7	308	0.07	
1454	5.91	5.0L	100	4.26	0.114	2.3	4.32	20.6	312	0.07	
1504	5.91	6.0L	100	4.24	0.113	1.2	4.30	20.5	315	0.07	

SIGNATURE(S): Jennifer C. Wellman

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129 CTO 245

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

Sample ID No.: SS7mw0026o103
Sample Location: SS7mW0026
Sampled By: J Wellman
C.O.C. No.: 41521
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 8/24/01	Color Visual	pH Standard	S.C. mS/cm	Temp. °C	Turbidity NTU	DO mg/l	ORP (m/V)	TDS
Time: 0858								
Method: Peristaltic Pump	clear	4 88	0.066	20.59	0.1	4 34	288	0.04

PURGE DATA:

Date: 8/24/01	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	ORP	Flow Rate
Method: Peristaltic Pump								
Monitor Reading (ppm): —								
Well Casing Diameter & Material Type: 2" PVC								
Total Well Depth (TD): 14 2				See Low Flow Purge Data Sheet				
Static Water Level (WL): 5.92								
One Casing Volume(gal/L): ~~4.3~~								
Start Purge (hrs): 0738								
End Purge (hrs): 0858								
Total Purge Time (min): 80								
Total Vol. Purged (gal/L): 8 5L								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL Volatiles	HCl / 4°C	(2) 40 ML VIALS	2
Cadmium, Chromium, ~~and Iron~~	HNO_3 / 4° C	(1) 500mL Poly	1
COD and TOC	H_2SO_4 / 4° C	(1) 120 mL Poly	1
Chromium (Hexavalent)	4° C	(1) 500mL POLY	
Dissolved Gases	4° C	(3) 40 mL Vial	3
Hardness	HNO_3 / 4° C	(1) 500 mL Poly	1
Ferrous Iron	4° C	(1) 1L Poly	1
Misc. Anions	4° C	(1) 1L Poly	1
Sulfide	NaOH / 4° C	(1) 500mL POLY	1
Alkalinity & TSS	4° C	(1) 1L Poly	1
~~Alkalinity, BOD, DOC & TSS~~ Carbon Dioxide	4° C	(1) ~~1L Poly~~ 500mL Poly	1
Dissolved Fe	HNO_3 / 4°C	1-500mL Poly	1

OBSERVATIONS / NOTES:

* Chromium (Hexavalent) has 24 hr Hold Time

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): Jennifer C. Wellman

Tetra Tech NUS, Inc.

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: NSWC INDIAN HEAD
PROJECT NUMBER: N7129 CTO 0245

WELL ID.: 557MW006
DATE: 8/24/01

Time (Hrs.)	Water Level (Ft. below TOC)	Volume (gal/L)	Flowrate (mL/min)	pH (S.U.)	Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celsius)	ORP (mV)	TDS ( )	Notes:
0738	5.92	—	150	start	purge	—					
0748	6.00	1.5L	100	4.81	0.0816	3.3	4.70	20.75	286	0.06	
0758	6.02	2.5L	100	4.88	0.076	0.7	4.48	20.65	290	0.05	
0808	6.02	3.5L	100	4.87	0.071	0.3	4.43	20.53	289	0.05	
0818	6.02	4.5L	100	4.87	0.068	0.1	4.39	20.47	293	0.04	
0828	6.02	5.5L	100	4.87	0.068	0.1	4.34	20.44	291	0.04	
0838	6.02	6.5L	100	4.87	0.067	0.0	4.34	20.51	288	0.04	
0848	6.02	7.5L	100	4.88	0.0666	0.0	4.33	20.56	289	0.04	
0858		8.5L	100	4.88	0.066	0.1	4.34	20.59	288	0.04	

SIGNATURE(S): Jennifer C. Wellman

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Page___ of ___

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129 CTO 245

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

Sample ID No.: 557MW0070103
Sample Location: 557MW007
Sampled By: Jennifer Wellman
C.O.C. No.: 41519
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 8/23/01	Color	pH	S.C.	Temp.	Turbidity	DO	ORP	TDS
Time: 0915	Visual	Standard	mS/cm	°C	NTU	mg/l	(m/V)	
Method: Peristaltic Pump	clear	5.28	0.365	19.4	67	4.06	22	0.24

PURGE DATA:

Date: 8/23/01	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	ORP	Flow Rate
Method: Peristaltic Pump								
Monitor Reading (ppm): —								
Well Casing Diameter & Material Type: 2" PVC								
Total Well Depth (TD): 28.2				See Low Flow Purge Data Sheet				
Static Water Level (WL): 9.27								
One Casing Volume(gal/L): 6 L								
Start Purge (hrs): 0815								
End Purge (hrs): 0915								
Total Purge Time (min): 60								
Total Vol. Purged (gal/L): 12 L								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL Volatiles	HCl / 4°C	(2) 40 ML VIALS	4
Cadmium, Chromium, ~~and Iron~~	HNO_3 / 4° C	(1) 500mL Poly	2
COD and TOC	H_2SO_4 / 4° C	(1) 120 mL Poly	2
Chromium (Hexavalent)	4° C	(1) 500mL POLY	1
Dissolved Gases	4° C	(3) 40 mL Vial	6
Hardness	HNO_3 / 4° C	(1) 500 mL Poly	2
Ferrous Iron	4° C	(1) 1L Poly	2
Misc. Anions	4° C	(1) 1L Poly	2
Sulfide	NaOH / 4° C	(1) 500mL POLY	2
Alkalinity & TSS	4° C	(1) 1L Poly	2
~~Alkalinity~~, BOD, DOC & ~~TSS~~	4° C	(1) 1L Poly	1
Carbon Dioxide	4°C	1-500mL Poly	2

OBSERVATIONS / NOTES:

* Chromium (Hexavalent) has 24 hr Hold Time - collected at 1550

Dissolved Fe HNO3 1-500mL Poly 2

Circle if Applicable:

MS/MSD: /

Duplicate ID No.: 557MWDUP03

Signature(s): Jennifer C. Wellman

Tetra Tech NUS, Inc.

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: NSWC INDIAN HEAD
PROJECT NUMBER: N7129 CTO 0245

WELL ID.: SS7MW007
DATE: 8/23/01

Time (Hrs.)	Water Level (Ft. below TOC)	Volume (gal/L)	Flowrate (mL/min)	pH (S.U.)	Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celsius)	ORP (mV)	TDS ( )	Notes:
0815	9.27	—	200	start purge							
0825	10.27	2.0	200	5.42	0.395	4	6.78	19.2	-9	0.26	
0835	10.46	4.0	200	5.28	0.390	3.2	5.81	19.2	-29	0.25	
0845	10.56	6.0	200	5.25	0.384	3.1	4.11	19.2	-25	0.25	
0855	10.67	8.0	200	5.24	0.369	2.7	4.09	19.4	-6	0.24	
0905	10.68	10.0	200	5.28	0.3666	1.4	4.08	19.4	19	0.24	
0915	10.71	12.0	200	5.28	0.365	0.7	4.06	19.4	22	0.24	

SIGNATURE(S): Jennifer C. Wellman

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129 CTO 245

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

Sample ID No.: 557MW00801O3
Sample Location: 557MW008
Sampled By: Jennifer Wellman
C.O.C. No.: 41516
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color Visual	pH Standard	S.C. mS/cm	Temp. °C	Turbidity NTU	DO mg/l	ORP (mV)	TDS
Date: 8/22/01								
Time: 1515	clear	6.45	0.365	26.4C	4.4	2.48	41	0.24
Method: Peristaltic Pump								

PURGE DATA:

	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	ORP	Flow Rate
Date: 8/22/01								
Method: Peristaltic Pump								
Monitor Reading (ppm): /								
Well Casing Diameter & Material Type: 2" PVC								
Total Well Depth (TD): 16.51				See Low Flow Purge Data Sheet				
Static Water Level (WL): 8.49								
One Casing Volume(gal/L): 4L								
Start Purge (hrs): 1425								
End Purge (hrs): 1515								
Total Purge Time (min): 50								
Total Vol. Purged (gal/L): 10 L								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL Volatiles	HCl / 4°C	(2) 40 ML VIALS	2
Cadmium, Chromium, and Iron	HNO_3 / 4° C	(1) 500mL Poly	1
COD and TOC	H_2SO_4 / 4° C	(1) 120 mL Poly	1
Chromium (Hexavalent)	4° C	(1) 500mL POLY	1
Dissolved Gases	4° C	(3) 40 mL Vial	3
Hardness	HNO_3 / 4° C	(1) 500 mL Poly	1
Ferrous Iron	4° C	(1) 1L Poly	1
Misc. Anions	4° C	(1) 1L Poly	1
Sulfide	NaOH / 4° C	(1) 500mL POLY	1
Alkalinity & TSS	4° C	(1) 1L Poly	1
~~Alkalinity~~, BOD, DOC ~~& TOC~~	4° C	(1) 1L Poly	1
CO_2	4°C	1-500mL Poly	1

OBSERVATIONS / NOTES:

* Chromium (Hexavalent) has 24 hr Hold Time

Dissolved Iron HNO_3 1-500mL Poly 1

Circle if Applicable:

MS/MSD

Duplicate ID No.:

Signature(s):

Jennifer C Wellman

Tetra Tech NUS, Inc.

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: NSWC INDIAN HEAD
PROJECT NUMBER: N7129 CTO 0245

WELL ID.: 557MW008
DATE: 8/22/01

Time (Hrs.)	Water Level (Ft. below TOC)	Volume (gal/L)	Flowrate (mL/min)	pH (S.U.)	Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celsius)	ORP (mV)	TDS ( )	Notes:
~~1425~~	8.49	—	200	Start	purge	—					
~~1435~~	8.80	2.0L	200	6.85	0.520	>1000	3.29	25.55	9	0.33	
1445	8.88	4.0L	200	6.86	0.470	100	2.64	26.63	8	0.29	
1455	8.89	6.0L	200	6.87	0.414	75	2.50	26.63	27	0.27	
1505	8.89	8.0L	200	6.55	0.375	11.0	2.46	26.59	37	0.24	
1515	9.01	10.0L	200	6.45	0.365	4.4	2.48	26.48	46	0.24	

SIGNATURE(S): Jennifer C. Wellman

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Page___ of ___

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129 CTO 245

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

Sample ID No.: S57MW0090103
Sample Location: S57MW009~~010~~ FWL
Sampled By: FWL
C.O.C. No.: 41519
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color Visual	pH Standard	S.C. mS/cm	Temp. °C	Turbidity NTU	DO mg/l	ORP (m/V)	TDS
Date: 8/23/01								
Time: 1130								
Method: Peristaltic Pump	CLEAR	5.00	0.057	22.30	0	3.14	261	0.04

PURGE DATA:

	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	ORP	Flow Rate
Date: 8/23/01								
Method: Peristaltic Pump								
Monitor Reading (ppm):								
Well Casing Diameter & Material Type: 2" PVC								
Total Well Depth (TD): 2190				See Low Flow Purge Data Sheet				
Static Water Level (WL): 8.87								
One ~~Casing~~ Purge Volume(gal/L): ~~12.6~~	~3.0 l							
Start Purge (hrs): 1017								
End Purge (hrs): 1130								
Total Purge Time (min):								
Total Vol. Purged (gal/L):								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL Volatiles	HCl / 4°C	(2) 40 ML VIALS MS/MSD	✓(6)
Cadmium, Chromium, and Iron	HNO_3 / 4°C	(1) 500mL Poly MS/MSD	✓(3)
COD and TOC	H_2SO_4 / 4°C	(1) 120 mL Poly	✓(1)
Chromium (Hexavalent)	4°C	(1200HRS) (1) 500mL POLY MS/MSD	✓(3)
Dissolved Gases	4°C	(3) 40 mL Vial MS/MSD	✓(9)
Hardness	HNO_3 / 4°C	(1) 500 mL Poly	✓(1)
Ferrous Iron	4°C	(1) 1L Poly MS/MSD	✓(3)
Misc. Anions	4°C	(1) 1L Poly	✓(1)
Sulfide	NaOH / 4°C	(1) 500mL POLY	✓(1)
Alkalinity & TSS	4°C	(1) 1L Poly	✓(1)
Alkalinity, BOD, DOC & TSS	4°C	(1) 1L Poly	—
CO_2			✓(1)

OBSERVATIONS / NOTES:

* Chromium (Hexavalent) has 24 hr Hold Time MS/MSD ✓(3)

Fe (DISS) FILTERED

NOTE SCREEN LENGTH = 5.0' ∴ ONE PURGE VOL = 3.0 l

MIN PURGE VOL TO COLLECT = 6.0 l

Circle if Applicable:

MS/MSD ✓

Duplicate ID No.: ——

Signature(s): Fred M Ramsey

Tetra Tech NUS, Inc.

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: INDIAN HEAD MD SITE 57 **WELL ID.:** 857MW1009
PROJECT NUMBER: 7129 **DATE:** 8-23-01
START 1017 STATIC H_2O = 8.87

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celsius)	ORP (mV)	TDS g/l	Comments VOL
1030	9.25	~100mL/m	5.07	0.061	10	5.82	22.08	227	004	
1040	9.25	100mL/m	5.02	0.059	5	3.38	22.07	241	0.04	
1050	9.30	100	5.01	0.059	5	3.25	21.85	254	004	
1100	9.32	100	5.00	0.059	0	3.17	22.70	255	0.04	4.5 l
1110	9.37	100	5.00	0.058	0	3.19	22.31	261	0.04	5.5 l
1120	9.42	100	5.03	0.057	0	3.15	22.24	260	0.04	6.5 l
1130	9.47	100	5.00	0.057	0	3.19	22.30	261	0.04	7.5 l
					(PURGE COMPLETED)					

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129 CTO 245

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

Sample ID No.: S57MW0100103
Sample Location: S57MW0016
Sampled By: Jennifer Wellman
C.O.C. No.: 41519
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color	pH	S.C.	Temp.	Turbidity	DO	ORP	TDS
Date: 8/23/01	Visual	Standard	mS/cm	°C	NTU	mg/l	(m/V)	
Time: 1214								
Method: Peristaltic Pump	clear	5.55	0.313	23.1	1.1	3.97	57	0.20

PURGE DATA:

Date: 8/23/01	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	ORP	Flow Rate
Method: Peristaltic Pump								
Monitor Reading (ppm): —								
Well Casing Diameter & Material								
Type: 2" PVC								
Total Well Depth (TD): 19.03				See Low Flow Purge Data Sheet				
Static Water Level (WL): 16.00								
One Casing Volume(gal/L): 4.2								
Start Purge (hrs): 1054								
End Purge (hrs): 1214								
Total Purge Time (min): 80								
Total Vol. Purged (gal/L): 5.2								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL Volatiles	HCl / 4°C	(2) 40 ML VIALS	2
Cadmium, Chromium, and Iron	HNO_3 / 4° C	(1) 500mL Poly	1
COD and TOC	H_2SO_4 / 4° C	(1) 120 mL Poly	1
Chromium (Hexavalent)	4° C	(1) 500mL POLY	1
Dissolved Gases	4° C	(3) 40 mL Vial	3
Hardness	HNO_3 / 4° C	(1) 500 mL Poly	1
Ferrous Iron	4° C	(1) 1L Poly	1
Misc. Anions	4° C	(1) 1L Poly	1
Sulfide	NaOH / 4° C	(1) 500mL POLY	1
Alkalinity & TSS	4° C	(1) 1L Poly	1
Alkalinity, BOD, DOC & TSS	4° C	(1) 1L Poly	—
Carbon Dioxide	4°C	1-500mL	1

OBSERVATIONS / NOTES:

* Chromium (Hexavalent) has 24 hr Hold Time

Dissolved Iron	HNO_3	1-500mL	1

Circle if Applicable:

MS/MSD — Duplicate ID No.:

Signature(s): Jennifer C. Wellman

Tetra Tech NUS, Inc.

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: NSWC INDIAN HEAD
PROJECT NUMBER: N7129 CTO 0245

WELL ID.: 557M001C
DATE: 8/23/01

Time (Hrs.)	Water Level (Ft. below TOC)	Volume (gal/L)	Flowrate (mL/min)	pH (S.U.)	Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celsius)	ORP (mV)	TDS ( )	Notes:
1059	9.03	—	100	start	purge	—	—	—	—	—	—
1104	9.49	1.5L	100	5.19	0.342	19	5.81	22.4	135	0.16	
1114	9.61	2.5L	100	5.30	0.301	11	5.29	22.9	98	0.20	
1124	9.72	3.5L	100	5.51	0.349	6.0	4.45	23.0	77	0.23	
1134	9.83	4.5L	100	5.57	0.352	5.1	4.42	23.0	72	0.23	
1144	9.87	5.5L	100	5.66	0.364	4.2	4.14	22.9	57	0.24	
1154	9.98	6.5L	100	5.64	0.342	4.9	3.99	23.1	62	0.22	
1204	10.00	7.5L	100	5.65	0.326	1.0	3.98	22.9	60	0.21	
1214	10.00	8.5L	100	5.55	0.313	1.1	3.97	23.1	57	0.20	

SIGNATURE(S): Jennifer C. Wellman

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129 CTO 245

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

Sample ID No.: 557MW0110103
Sample Location: 557MW011
Sampled By: Jennifer Wellman
C.O.C. No.: 15765
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color	pH	S.C.	Temp.	Turbidity	DO	ORP	TDS
Date: 8/17/01	Visual	Standard	mS/cm	°C	NTU	mg/l	(m/V)	
Time: 1100 HRS / 1200 HRS	CLEAR	5.79	0.104	21.34	0.75	3.30	135	0.07
Method: Peristaltic Pump								

PURGE DATA:

Date: 8/17/01	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	ORP	Flow Rate
Method: Peristaltic Pump								
Monitor Reading (ppm):								
Well Casing Diameter & Material Type: PVC 2"								
Total Well Depth (TD): 19.69				See Low Flow Purge Data Sheet				
Static Water Level (WL): 9.39								
One Casing Volume(gal/L): 6 L								
Start Purge (hrs): 0850 0855								
End Purge (hrs): 1055								
Total Purge Time (min): 120								
Total Vol. Purged (gal/L): 12000 mL								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL Volatiles	HCl / 4°C	(2) 40 ML VIALS	✓
Cadmium, Chromium, and Iron	HNO_3 / 4° C	(1) 500mL Poly	✓
COD and TOC	H_2SO_4 / 4° C	(1) 120 mL Poly	✓
Chromium (Hexavalent)	4° C	(1) 500mL POLY	✓
Dissolved Gases	4° C	(3) 40 mL Vial	✓
Hardness	HNO_3 / 4° C	(1) 500 mL Poly	✓
Ferrous Iron	4° C	(1) 1L Poly	✓
Misc. Anions	4° C	(1) 1L Poly	
Sulfide	NaOH / 4° C	(1) 500mL POLY	✓
Alkalinity & TSS	4° C	(1) 1L Poly	✓
Alkalinity, BOD, DOC & TSS	4° C	(1) 1L Poly	
CO_2	4°C	1-500mL Poly	✓

OBSERVATIONS / NOTES:

* Chromium (Hexavalent) has 24 hr Hold Time

Dissolved Fe — 4°C/HNO_3 — 1-500mL Poly ✓

Circle if Applicable:

MS/MSD — Duplicate ID No.:

Signature(s): FOR JW

Tetra Tech NUS, Inc.

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: NSWC INDIAN HEAD
PROJECT NUMBER: N7129 CTO 0245

WELL ID.: SS7MW011
DATE: 8/17/01

Time (Hrs.)	Water Level (Ft. below TOC)	Volume (gal/L)	Flowrate (mL/min)	pH (S.U.)	Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celsius)	ORP (mV)	TDS ( )	Notes:
0850	9.59	—	100	Start purge							
0905	10.04	1000	100	5.43	0.081	49.7	4.45	22.16	231	0.05	
0915	10.22	2000	100	5.56	0.085	33.3	3.72	22.0	218	0.06	
0925	10.26	3000	100	5.64	0.089	22.0	3.58	21.9	204	0.06	
0935	10.40	4000	100	5.75	0.094	11.7	3.53	21.6	182	0.06	
0945	10.48	5000	100	5.81	0.099	5.34	3.54	21.6	167	0.06	
0955	10.55	6000	100	5.81	0.096	3.72	3.55	21.4	160	0.06	
1005	10.60	7000	100	5.81	0.098	2.98	3.48	21.4	152	0.06	
1015	10.63	8000	100	5.80	0.100	2.18	3.34	21.4	146	0.07	
1025	10.67	9000	100	5.79	0.101	1.52	3.31	21.4	149	0.07	
1035	10.71	10000	100	5.80	0.101	2.1	3.32	21.3	141	0.07	
1045	10.66	11000	106	5.83	0.105	0.80	3.25	21.37	136	0.07	
1055	10.64	12000	100	5.79	0.104	0.75	3.30	21.34	135	0.07	
						PURGE COMPLETED BEGIN TO FILL CONTAINERS					

SIGNATURE(S): _____

PAGE___OF___

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129 CTO 245

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

Sample ID No.: 557MW012010 3
Sample Location: 557MW012
Sampled By: Jennifer Wellman
C.O.C. No.: 41516
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 8/22/01	Color	pH	S.C.	Temp.	Turbidity	DO	ORP	TDS
Time: 0915	Visual	Standard	mS/cm	°C	NTU	mg/l	(m/V)	
Method: Peristaltic Pump	clear	5.59	0.111	18.09	6.0	3.92	167	0.07

PURGE DATA:

Date: 8/22/01	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	ORP	Flow Rate
Method: Peristaltic Pump								
Monitor Reading (ppm): —								
Well Casing Diameter & Material								
Type: 2" PVC								
Total Well Depth (TD): 44.31ft				See Low Flow Purge Data Sheet				
Static Water Level (WL): 6.02ft								
One Casing Volume(gal/L): 6L								
Start Purge (hrs): 0805								
End Purge (hrs): 0915								
Total Purge Time (min): 70								
Total Vol. Purged (gal/L): 14L								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL Volatiles	HCl / 4°C	(2) 40 ML VIALS	3
Cadmium, Chromium, and Iron	HNO_3 / 4° C	(1) 500mL Poly	1
COD and TOC	H_2SO_4 / 4° C	(1) 120 mL Poly	1
Chromium (Hexavalent)	4° C	(1) 500mL POLY (1100 HR)	1
Dissolved Gases	4° C	(3) 40 mL Vial	2
Hardness	HNO_3 / 4° C	(1) 500 mL Poly	1
Ferrous Iron	4° C	(1) 1L Poly	1
Misc. Anions	4° C	(1) 1L Poly	1
Sulfide	NaOH / 4° C	(1) 500mL POLY	1
Alkalinity & TSS	4° C	(1) 1L Poly	1
~~Alkalinity, BOD, DOC & TSS~~	~~4° C~~	~~(1) 1L Poly~~	—
TOC	4°C	1-500mL Poly	1

OBSERVATIONS / NOTES:

* Chromium (Hexavalent) has 24 hr Hold Time

Dissolved Iron HNO_3 1-500mL Poly 1

Circle if Applicable:

MS/MSD — Duplicate ID No.:

Signature(s): Jennifer P Wellman

Tetra Tech NUS, Inc.

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: NSWC INDIAN HEAD
PROJECT NUMBER: N7129 CTO 0245

WELL ID.: SS7mw012
DATE: 8/22/01

Time (Hrs.)	Water Level (Ft. below TOC)	Volume (gal/L)	Flowrate (mL/min)	pH (S.U.)	Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celsius)	ORP (mV)	TDS ( )	Notes:
0805	6.02	—	200	Start	purge	—	—				
0815	6.11	2.0L	200	5.67	0.136	140	4.55	18.00	136	0.09	
0825	6.12	4.0L	200	5.67	0.121	40	4.0	18.19	158	0.08	
0835	6.13	6.0L	200	5.666	0.114	37	3.92	17.99	150	0.07	
0845	6.13	8.0L	200	5.66	0.113	40	3.88	17.86	140	0.07	
0855	6.13	10.0L	200	5.65	0.112	36	3.88	17.92	137	0.07	
0905	6.13	12.0L	200	5.61	0.111	12	3.88	17.94	149	0.07	
0915	6.13	14.0L	200	5.59	0.111	10.0	3.92	18.04	167	0.07	

SIGNATURE(S): Jennifer C. Wellman

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Page___ of ___

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129 CTO 245

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

Sample ID No.: S57mw0130103 FWR
Sample Location: S57mw0130103
Sampled By: FWR
C.O.C. No.: 41516
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color	pH	S.C.	Temp.	Turbidity	DO	ORP	TDS
Date: 8/22/01	Visual	Standard	mS/cm	°C	NTU	mg/l	(m/V)	
Time: 1100								
Method: Peristaltic Pump	CLEAR	4.25	0.164	19.2	0	—	306	0.119/2

PURGE DATA:

Date:	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	ORP	Flow Rate
Method: Peristaltic Pump								
Monitor Reading (ppm):								
Well Casing Diameter & Material Type:								
Total Well Depth (TD): 17.95				See Low Flow Purge Data Sheet				
Static Water Level (WL): 5.87								
One Casing Volume(gal/L): 6.6 L								
Start Purge (hrs): 0955								
End Purge (hrs): 1035								
Total Purge Time (min):								
Total Vol. Purged (gal/L): 12 L								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL Volatiles	HCl / 4°C	(2) 40 ML VIALS	✓
Cadmium, Chromium, ~~and Iron~~	HNO_3 / 4° C	(1) 500mL Poly	✓
COD and TOC	H_2SO_4 / 4° C	(1) 120 mL Poly	✓
Chromium (Hexavalent)	4° C	(1) 500mL POLY	✓
Dissolved Gases	4° C	(3) 40 mL Vial	✓
Hardness	HNO_3 / 4° C	(1) 500 mL Poly	✓
Ferrous Iron	4° C	(1) 1L Poly	✓
Misc. Anions	4° C	(1) 1L Poly	✓
Sulfide	NaOH / 4° C	(1) 500mL POLY	✓
Alkalinity & TSS	4° C	(1) 1L Poly	✓
~~Alkalinity, BOD, DOC & TSS~~	4° C	(1) 1L Poly	
CO_2	4°C	1 500mL PE	✓

OBSERVATIONS / NOTES:

* Chromium (Hexavalent) has 24 hr Hold Time

TOTAL DISSOLVED IRON(FILTERED) 4°C/HNO_3 | 1 500mL PE ✓

Ferrous 4°C UNPRESERVED ✓

Circle if Applicable:		Signature(s):
MS/MSD —	Duplicate ID No.: —	Fred W Kaiser

Tetra Tech NUS, Inc.

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: NSWC INDIAN HEAD
PROJECT NUMBER: N7129 CTO 0245

WELL ID.: S57MW013
DATE: 10-22-01

Time (Hrs.)	Water Level (Ft. below TOC)	Volume (gal/L)	Flowrate (mL/min)	pH (S.U.)	Cond. (mS/cm)	Turb. (1*) (NTU)	DO (mg/L)	Temp. (Celsius)	ORP (mV)	TDS (g/L)	Notes:
0955	6.00	2000ml	~200ml	4.86	0.171	41	*	19.8	254	0.11	
1005	6.07	4000ml		4.62	0.168	5	*	19.9	281	0.11	*DEFECTIVE
1015	6.07	8000ml		4.42	0.168	0	*	20.1	291	0.11	DO PROBE
1025	6.13	10000ml		4.30	0.168	0	*	19.6	300	0.11	1* USING
1035	6.17	12000ml	200ml/m	4.25	0.169	0	*	19.2	306	0.11	HORIBA
											FOR TURBIDITY
							COMPLETED PURGING @ 1035				

SIGNATURE(S): _____

PAGE___OF___

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Page___ of ___

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129 CTO 245

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

Sample ID No.: S57TW0140103
Sample Location: S57TW014
Sampled By: PJR
C.O.C. No.: 41517
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 8-23-01	Color Visual	pH Standard	S.C. mS/cm	Temp. °C	Turbidity NTU	DO mg/l	ORP (m/V)	TDS
Time: 1625								
Method: Peristaltic Pump	CLEAR	5.25	0.368	26.06	0	2.29	117	0.27

PURGE DATA:

Date: 8-23-01	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	ORP	Flow Rate
Method: Peristaltic Pump								
Monitor Reading (ppm):								
Well Casing Diameter & Material Type: 1" ID PVC								
Total Well Depth (TD): 11.70				See Low Flow Purge Data Sheet				
Static Water Level (WL): 7.37								
One ~~Casing~~ Volume(gal/L): .75L								
Start Purge (hrs): 1550								
End Purge (hrs): 1625								
Total Purge Time (min):								
Total Vol. Purged (gal/L): 3.5								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL Volatiles	HCl / 4°C	(2) 40 ML VIALS	✓
Cadmium, Chromium, and Iron	HNO_3 / 4° C	(1) 500mL Poly	✓
COD and TOC	H_2SO_4 / 4° C	(1) 120 mL Poly	✓
Chromium (Hexavalent)	4° C	(1) 500mL POLY	✓
Dissolved Gases	4° C	(3) 40 mL Vial	✓
Hardness	HNO_3 / 4° C	(1) 500 mL Poly	✓
Ferrous Iron	4° C	(1) 1L Poly	✓
Misc. Anions	4° C	(1) 1L Poly	✓
Sulfide	NaOH / 4° C	(1) 500mL POLY	✓
Alkalinity & TSS	4° C	(1) 1L Poly	✓
Alkalinity, BOD, DOC & TSS	4° C	(1) 1L Poly	
CO_2		1 500ml PE	✓

OBSERVATIONS / NOTES:

* Chromium (Hexavalent) has 24 hr Hold Time SULFIDE NAOH 1 500ml PE ✓

5 ft screen

.15 l/ft

2' STICK UP, ALL MEASUREMENTS W/R TO TPVC

11.70
7.37
4.33

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): Fred McCamber

Tetra Tech NUS, Inc.

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: NSWC INDIAN HEAD
PROJECT NUMBER: N7129 CTO 0245

WELL ID.: S57TW0140103
DATE: 8/23/01

ST. WL = 7.37

Time (Hrs.)	Water Level (Ft. below TOC)	Volume (gal/L)	Flowrate (mL/min)	pH (S.U.)	Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celsius)	ORP (mV)	TDS (g/l)	Notes:
1550											
1600	7.59	1 l	100 ml/m	5.10	0.428	30.5	5.63	26.44	112	0.28	
1605	7.72	1.5 l	100 ml/m	5.13	0.414	10.0	2.54	26.19	118	0.27	
1610	7.80	2 l	100	5.15	0.403	8.0	2.45	26.18	119	0.26	
1615	7.88	2.5 l	100	5.19	0.389	2.0	2.33	26.09	118	0.25	
1620	7.93	3.0 l	100	5.24	0.373	0.0	2.30	26.04	117	0.24	
1625	7.97	3.5	100	5.25	0.368	0	2.29	26.06	114	0.24	
							PURGE COMPLETED				

SIGNATURE(S): Fred M Causer

PAGE__OF__

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129 CTO 245

Sample ID No.: SS7TW015_0103
Sample Location: SS7TW015
Sampled By: J Wellman
C.O.C. No.: 415118
Type of Sample:
[X] Low Concentration
[] High Concentration

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

SAMPLING DATA:

Date: 8/22/01	Color Visual	pH Standard	S.C. mS/cm	Temp. °C	Turbidity NTU	DO mg/l	ORP (m/V)	TDS
Time: 1239								
Method: Peristaltic Pump	yellowish-br	5.46	0.113	18.06	500	4.53	-21	0.07

PURGE DATA:

Date: 8/22/01	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	ORP	Flow Rate
Method: Peristaltic Pump								
Monitor Reading (ppm):								
Well Casing Diameter & Material Type: 1" PVC								
Total Well Depth (TD): 32.90				See Low Flow Purge Data Sheet				
Static Water Level (WL): 8.97								
One Casing Volume(gal/L): .75L								
Start Purge (hrs): 11:39								
End Purge (hrs): 12:39								
Total Purge Time (min): 60								
Total Vol. Purged (gal/L): 9.0L								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL Volatiles	HCl / 4°C	(2) 40 ML VIALS	3
Cadmium, Chromium, and Iron	HNO_3 / 4° C	(1) 500mL Poly	1
COD and TOC	H_2SO_4 / 4° C	(1) 120 mL Poly	1
Chromium (Hexavalent)	4° C	(1) 500mL POLY	1
Dissolved Gases	4° C	(3) 40 mL Vial	2
Hardness	HNO_3 / 4° C	(1) 500 mL Poly	1
Ferrous Iron	4° C	(1) 1L Poly	1
Misc. Anions	4° C	(1) 1L Poly	1
Sulfide	NaOH / 4° C	(1) 500mL POLY	1
Alkalinity & TSS	4° C	(1) 1L Poly	1
~~Alkalinity, BOD, DOC & TSS~~	~~4° C~~	~~(1) 1L Poly~~	
CO_2	4°C	1-500 mL Poly	1

OBSERVATIONS / NOTES:

* Chromium (Hexavalent) has 24 hr Hold Time

Dissolved Iron 4°C HNO_3 1-500mL Poly 1

Circle if Applicable:

MS/MSD

Duplicate ID No.:

Signature(s): Jennifer C. Wellman

Tetra Tech NUS, Inc.

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: NSWC INDIAN HEAD
PROJECT NUMBER: N7129 CTO 0245

WELL ID.: 557 TW015 PUR
DATE: 8/22/01

Time (Hrs.)	Water Level (Ft. below TOC)	Volume (gal/L)	Flowrate (mL/min)	pH (S.U.)	Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celsius)	ORP (mV)	TDS ( )	Notes:
1139	8.97	——	100	start	purge	——	——	——	——	——	
1144	10.51	0.5L	100	5.42	0.121	+2000	7.54	20.90	1	0.08	
1149	10.97	1.0L	100	5.40	0.121	+2000	5.98	21.10	1	0.08	
1154	10.98	1.5L	100	5.48	0.120	+2000	4.48	22.30	-7	0.08	
1159	10.98	2.0L	100	5.46	0.122	+2000	4.58	20.76	-12	0.08	
1204	10.98	2.5L	100	5.49	0.118	+2000	4.37	20.46	-18	0.08	
1209	10.98	3.0L	100	5.50	0.118	+2000	4.38	20.56	-20	0.08	
1219	12.39	5.0L	200	5.49	0.115	+2000	4.54	18.11	-28	0.07	
1229	15.47	7.0L	200	5.46	0.113	850	4.52	18.02	-23	0.07	
1239	15.49	9.0L	200	5.46	0.113	500	4.53	18.06	-21	0.07	

SIGNATURE(S): Jennifer C. Wellman

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129 CTO 245

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

Sample ID No.: SS7TW0160103
Sample Location: SS7TW016
Sampled By: Jennifer Wellman
C.O.C. No.: 15734
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color	pH	S.C.	Temp.	Turbidity	DO	ORP	TDS
Date: 8/21/01	Visual	Standard	mS/cm	°C	NTU	mg/l	(mV)	
Time: 0850	clear	6.53	0.107	20.83	0.00	7.91	145	0.07
Method: Peristaltic Pump								

PURGE DATA:

Date: 8/21/01	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	ORP	Flow Rate
Method: Peristaltic Pump								
Monitor Reading (ppm): —								
Well Casing Diameter & Material Type: 1" PVC								
Total Well Depth (TD): 11.92				See Low Flow Purge Data Sheet				
Static Water Level (WL): 7.91								
One Casing Volume(gal/L): .75L								
Start Purge (hrs): 0820								
End Purge (hrs): 0850								
Total Purge Time (min): 30								
Total Vol. Purged (gal/L): 3.0L								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL Volatiles	HCl / 4°C	(2) 40 ML VIALS	2
Cadmium, Chromium, ~~and Iron~~	HNO_3 / 4° C	(1) 500mL Poly	1
COD and TOC	H_2SO_4 / 4° C	(1) 120 mL Poly	1
Chromium (Hexavalent)	4° C	(1) 500mL POLY	1
Dissolved Gases	4° C	(3) 40 mL Vial	3
Hardness	HNO_3 / 4° C	(1) 500 mL Poly	1
Ferrous Iron	4° C	(1) 1L Poly	1
Misc. Anions	4° C	(1) 1L Poly	1
Sulfide	NaOH / 4° C	(1) 500mL POLY	1
Alkalinity & TSS	4° C	(1) 1L Poly	1
~~Alkalinity, BOD, DOC & TSS~~	4° C	(1) 1L Poly	~~1~~
CO_2	4°C	1-500mL Poly	1

OBSERVATIONS / NOTES:

* Chromium (Hexavalent) has 24 hr Hold Time

Fe (Dissolved)	4°C / HNO_3	1-500mL Poly	1

Circle if Applicable:

MS/MSD	Duplicate ID No.:
/	

Signature(s): Jennifer C. Wellman

Tetra Tech NUS, Inc.

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: NSWC INDIAN HEAD
PROJECT NUMBER: N7129 CTO 0245

WELL ID.: 557 TW016
DATE: 8/21/0

Time (Hrs.)	Water Level (Ft. below TOC)	Volume (gal/L)	Flowrate (mL/min)	pH (S.U.)	Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celsius)	ORP (mV)	TDS ( )	Notes:
0820	7.91	—	100	start	purge						
0825	7.94	~~0.5L~~ 1.0L	100	6.39	0.128	80	9.40	21.35	175	0.08	
0830	7.98	1.0L	100	6.50	0.117	32	8.59	21.14	165	0.08	
0835	7.99	1.5L	100	6.53	0.117	19	8.24	20.91	160	0.08	
0840	8.00	2.0L	100	6.54	0.111	9.1	8.06	20.79	152	0.07	
0845	8.01	2.5L	100	6.54	0.108	2.0	7.95	20.82	146	0.07	
0850	8.01	3.0L	100	6.53	0.107	0.00	7.91	20.83	145	0.07	

SIGNATURE(S): Jennifer C. Wellman

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129 CTO 245

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

Sample ID No.: SS7TW0170103
Sample Location: SS7TW017
Sampled By: J Wellman
C.O.C. No.: 15735
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 8/20/01	Color	pH	S.C.	Temp.	Turbidity	DO	ORP	TDS
Time: 1601	Visual	Standard	mS/cm	°C	NTU	mg/l	(mV)	
Method: Peristaltic Pump	Clear	5.35	0.124	18.4	4.4	4.05	177	0.08

PURGE DATA:

Date: 8/20/01	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	ORP	Flow Rate
Method: Peristaltic Pump								
Monitor Reading (ppm): —								
Well Casing Diameter & Material								
Type: 1" PVC								
Total Well Depth (TD): 25.00				See Low Flow Purge Data Sheet				
Static Water Level (WL): 8.12								
One Casing Volume(gal/L): 1.5L								
Start Purge (hrs): 1531								
End Purge (hrs): 1601								
Total Purge Time (min): 30								
Total Vol. Purged (gal/L): 6 L								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL Volatiles	HCl / 4°C	(2) 40 ML VIALS	2
Cadmium, Chromium, and Iron	HNO_3 / 4° C	(1) 500mL Poly	1
COD and TOC	H_2SO_4 / 4° C	(1) 120 mL Poly	1
Chromium (Hexavalent)	4° C	(1) 500mL POLY	1
Dissolved Gases	4° C	(3) 40 mL Vial	3
Hardness	HNO_3 / 4° C	(1) 500 mL Poly	1
Ferrous Iron	4° C	(1) 1L Poly	1
Misc. Anions	4° C	(1) 1L Poly	1
Sulfide	NaOH / 4° C	(1) 500mL POLY	1
Alkalinity & TSS	4° C	(1) 1L Poly	1
Alkalinity, BOD, DOC & TSS	4° C	(1) 1L Poly	
Carbon Dioxide	4°C	1-500mL Poly	1

OBSERVATIONS / NOTES:

* Chromium (Hexavalent) has 24 hr Hold Time

Dissolved Iron HNO_3/4°C 1-500mL Poly 1

Circle if Applicable:

MS/MSD — Duplicate ID No.:

Signature(s): Jennifer C. Wellman

Tetra Tech NUS, Inc.

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: NSWC INDIAN HEAD
PROJECT NUMBER: N7129 CTO 0245
WELL ID.: SS17WP17
DATE: 8/20/01

Time (Hrs.)	Water Level (Ft. below TOC)	Volume (gal/L)	Flowrate (mL/min)	pH (S.U.)	Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celsius)	ORP (mV)	TDS ( )	Notes:
1531	8.20	—	200	—	start	purge	—	—	—	—	—
1536	8.31	1000	200	5.44	0.129	45	4.37	18.4	165	0.08	
1541	8.30	2000	200	5.37	0.129	50	4.16	18.4	168	0.08	
1546	8.30	3000	200	5.34	0.125	17	4.09	18.4	173	0.08	
1551	8.30	4000	200	5.34	0.124	7.7	4.07	18.5	174	0.08	
1556	8.30	5000	200	5.33	0.124	5.2	4.05	18.5	176	0.08	
1601	8.30	6000	200	5.35	0.124	4.4	4.05	18.4	177	0.08	

SIGNATURE(S): Jennifer C. Wellman

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129 CTO 245

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

Sample ID No.: SS7TW018010303
Sample Location: SS7TW018
Sampled By: Jennifer Wellman
C.O.C. No.: 15734
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 8/21/01	Color	pH	S.C.	Temp.	Turbidity	DO	ORP	TDS
Time: 1345	Visual	Standard	mS/cm	°C	NTU	mg/l	(mV)	
Method: Peristaltic Pump	clear	4.87	0.189	19.47	57	4.35	185	0.12

PURGE DATA:

Date: 8/21/01	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	ORP	Flow Rate
Method: Peristaltic Pump								
Monitor Reading (ppm):								
Well Casing Diameter & Material Type: 1" PVC								
Total Well Depth (TD): 15ft				See Low Flow Purge Data Sheet				
Static Water Level (WL): 10.55								
One Casing Volume(gal/L): .75L								
Start Purge (hrs): 1315								
End Purge (hrs): 1345								
Total Purge Time (min): 30								
Total Vol. Purged (gal/L): 3.0L								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL Volatiles	HCl / 4°C	(2) 40 ML VIALS	2
Cadmium, Chromium, and Iron	HNO_3 / 4° C	(1) 500mL Poly	2
COD and TOC	H_2SO_4 / 4° C	(1) 120 mL Poly	2
Chromium (Hexavalent)	4° C	(1) 500mL POLY	2
Dissolved Gases	4° C	(3) 40 mL Vial	
Hardness	HNO_3 / 4° C	(1) 500 mL Poly	2
Ferrous Iron	4° C	(1) 1L Poly	2
Misc. Anions	4° C	(1) 1L Poly	2
Sulfide	NaOH / 4° C	(1) 500mL POLY	2
Alkalinity & TSS	4° C	(1) 1L Poly	2
~~Alkalinity, BOD, DOC & TSS~~	~~4° C~~	~~(1) 1L Poly~~	
Carbon Dioxide	4°C	1-500mL Poly	2

OBSERVATIONS / NOTES:

* Chromium (Hexavalent) has 24 hr Hold Time

Dissolved Fe 4°C/HNO_3 1-500mL Poly 2

Circle if Applicable:

MS/MSD

Duplicate ID No.: SS7MWDUP02

Signature(s): Jennifer C. Wellman

Tetra Tech NUS, Inc.

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: NSWC INDIAN HEAD
PROJECT NUMBER: N7129 CTO 0245

WELL ID.: S57TW018
DATE: 8/21/01

Time (Hrs.)	Water Level (Ft. below TOC)	Volume (gal/L)	Flowrate (mL/min)	pH (S.U.)	Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celsius)	ORP (mV)	TDS ( )	Notes:
1315	10.55	—	100	start	Purge	—	—	—	—	—	
1320	10.67	.5L	100	4.76	0.259	120	7.16	19.82	184	0.17	
1325	10.69	1.0	100	4.16	0.256	110	5.59	19.79	185	0.17	
1330	10.72	1.5	100	4.74	0.237	50	4.81	19.52	190	0.15	
1335	10.79	2.0	100	4.75	0.216	22	4.60	19.68	191	0.14	
1340	10.74	2.5	100	4.81	0.201	9.8	4.42	19.62	188	0.14	
1345	10.75	3.0	100	4.87	0.189	5.7	4.35	19.47	185	0.12	

SIGNATURE(S): Jennifer C Wellman

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129 CTO 245

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

Sample ID No.: S57TW0190103
Sample Location: S57TW019
Sampled By: Jennifer Wellman
C.O.C. No.: 15734
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color	pH	S.C.	Temp.	Turbidity	DO	ORP	TDS
Date: 8/21/01	Visual	Standard	mS/cm	°C	NTU	mg/l	(m/V)	
Time: 1115								
Method: Peristaltic Pump	Clear	6.01	0.114	17.40	4.9	4.62	64	0.07

PURGE DATA:

Date: 8/21/01	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	ORP	Flow Rate
Method: Peristaltic Pump								
Monitor Reading (ppm): —								
Well Casing Diameter & Material								
Type: 1" PVC								
Total Well Depth (TD): 25.0ft				See Low Flow Purge Data Sheet				
Static Water Level (WL): 10.56								
One Casing Volume(gal/L): .75								
Start Purge (hrs): 1045								
End Purge (hrs): 1115								
Total Purge Time (min): 30								
Total Vol. Purged (gal/L): 3.0								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL Volatiles	HCl / 4°C	(2) 40 ML VIALS	2
Cadmium, Chromium, ~~and Iron~~	HNO_3 / 4° C	(1) 500mL Poly	1
COD and TOC	H_2SO_4 / 4° C	(1) 120 mL Poly	1
Chromium (Hexavalent)	4° C	(1) 500mL POLY	1
Dissolved Gases	4° C	(3) 40 mL Vial	3
Hardness	HNO_3 / 4° C	(1) 500 mL Poly	1
Ferrous Iron	4° C	(1) 1L Poly	1
Misc. Anions	4° C	(1) 1L Poly	1
Sulfide	NaOH / 4° C	(1) 500mL POLY	1
Alkalinity & TSS	4° C	(1) 1L Poly	1
~~Alkalinity, BOD, DOC & TSS~~	4° C	(1) 1L Poly	
Dissolved Iron	HNO_3 / 4°C	1-500mL Poly	1

OBSERVATIONS / NOTES:

* Chromium (Hexavalent) has 24 hr Hold Time

Carbon Dioxide 4°C 1-500mL Poly 1

Circle if Applicable:

MS/MSD	Duplicate ID No.:	Signature(s):
	[redacted] dup	Jennifer C. Wellman

Tetra Tech NUS, Inc.

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: NSWC INDIAN HEAD
PROJECT NUMBER: N7129 CTO 0245

WELL ID.: SS7TW019
DATE: 8/21/01

Time (Hrs.)	Water Level (Ft. below TOC)	Volume (gal/L)	Flowrate (mL/min)	pH (S.U.)	Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celsius)	ORP (mV)	TDS ( )	Notes:
1045	10.66	—	100	Start	purge	—	—	—	—	—	
1050	11.29	.5L	100	6.12	0.123	10	6.50	17.15	77	0.08	
1055	11.30	1.0L	100	6.09	0.120	21	5.12	17.45	72	0.08	
1100	11.32	1.5L	100	6.05	0.117	12	4.74	17.47	69	0.08	
1105	11.33	2.0L	100	6.02	0.115	6.7	4.64	17.22	65	0.07	
1110	11.35	2.5L	100	6.02	0.116	6.5	4.63	17.23	64	0.08	
1115	11.36	3.0L	100	6.01	0.114	4.9	4.62	17.40	64	0.07	

SIGNATURE(S): Jennifer C. Wellman

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129 CTO 245

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

Sample ID No.: S57MW0200103
Sample Location: S57MW020
Sampled By: Jennifer Wellman
C.O.C. No.: 41525
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color	pH	S.C.	Temp.	Turbidity	DO	ORP	TDS
	Visual	Standard	mS/cm	°C	NTU	mg/l	(m/V)	
Date: 8/29/01								
Time: 1008								
Method: Peristaltic Pump	Clear	5.62	0.089	21.02	5.9	2.89	104	0.06

PURGE DATA:

	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	ORP	Flow Rate
Date: 8/29/01								
Method: Peristaltic Pump								
Monitor Reading (ppm): —								
Well Casing Diameter & Material Type: 2" PVC								
Total Well Depth (TD): 6.88				See Low Flow Purge Data Sheet				
Static Water Level (WL): 6.50								
One Casing Volume(gal/L): 6 L								
Start Purge (hrs): 0908								
End Purge (hrs): 1008								
Total Purge Time (min): 60								
Total Vol. Purged (gal/L): 12.0L								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL Volatiles	HCl / 4°C	(2) 40 ML VIALS	2
Cadmium, Chromium, ~~arsenic~~	HNO_3 / 4° C	(1) 500mL Poly	1
COD and TOC	H_2SO_4 / 4° C	(1) 120 mL Poly	1
Chromium (Hexavalent)	4° C	(1) 500mL POLY	1040
Dissolved Gases	4° C	(3) 40 mL Vial	3
Hardness	HNO_3 / 4° C	(1) 500 mL Poly	1
Ferrous Iron	4° C	(1) 1L Poly	1
Misc. Anions	4° C	(1) 1L Poly	1
Sulfide	NaOH / 4° C	(1) 500mL POLY	1
Alkalinity & TSS	4° C	(1) 1L Poly	1
~~Alkalinity, BOD, DOC & TSS~~ CO_2	4° C	(1) ~~1L~~ Poly 500mL	1
Dissolved Iron	4°C/HNO_3	1-500mL Poly	1

OBSERVATIONS / NOTES:

* Chromium (Hexavalent) has 24 hr Hold Time

Circle if Applicable:

MS/MSD — Duplicate ID No.:

Signature(s): Jennifer C Wellman

Tetra Tech NUS, Inc.

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: NSWC INDIAN HEAD
PROJECT NUMBER: N7129 CTO 0245

WELL ID.: 57MW020
DATE: 8/29/01

Time (Hrs.)	Water Level (Ft. below TOC)	Volume (gal/L)	Flowrate (mL/min)	pH (S.U.)	Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celsius)	ORP (mV)	TDS ( )	Notes:
0908	6.50	—	200	start	purge	—	—	—	—	—	
0913	6.69	1.0L	200	5.60	0.090	121.0	6.04	20.48	125	0.06	
0918	6.71	2.0L	200	5.64	0.091	90.0	3.52	20.55	116	0.06	
0923	6.73	3.0	200	5.64	0.090	77.4	2.99	20.62	110	0.06	
0928	6.75	4.0	200	5.64	0.090	54.7	2.92	20.60	110	0.06	
0933	6.77	5.0	200	5.64	0.089	48.4	3.01	20.65	108	0.06	
0938	6.77	6.0	200	5.64	0.089	23.1	3.10	20.72	108	0.06	
0943	6.77	7.0	200	5.64	0.089	20.4	2.86	20.69	106	0.06	
0948	6.77	8.0	200	5.64	0.089	9.9	2.81	20.67	106	0.06	
0953	6.77	9.0	200	5.65	0.089	4.1	2.79	20.96	104	0.06	
0958	6.77	10.0	200	5.62	0.089	3.7	2.87	21.04	105	0.06	
1003	6.77	11.0	200	5.63	0.089	4.8	2.87	21.08	104	0.06	
1008	6.77	12.0	200	5.62	0.089	3.9	2.84	21.02	104	0.06	

SIGNATURE(S): Jennifer C. Wellman

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129 CTO 245

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

Sample ID No.: S57TW0210103
Sample Location: S57TW21
Sampled By: FWR
C.O.C. No.: 4516
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 1530 8/22/01	Color Visual	pH Standard	S.C. mS/cm	Temp. °C	Turbidity NTU	DO mg/l	ORP (m/V)	TDS
Time: 1530	CLEAR	4.83	1.78	20.7	35	7.09	-256	1.1
Method: Peristaltic Pump								

PURGE DATA:

Date: 8-22-01	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	ORP	Flow Rate
Method: Peristaltic Pump								
Monitor Reading (ppm):								
Well Casing Diameter & Material Type: 1" PVC								
Total Well Depth (TD):				See Low Flow Purge Data Sheet				
Static Water Level (WL): 6.80								
One Casing Volume(gal/L): .15/L								
Start Purge (hrs): 1435								
End Purge (hrs): 1510								
Total Purge Time (min): 35								
Total Vol. Purged (gal/L): 4.3L								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL Volatiles	HCl / 4°C	(2) 40 ML VIALS	✓
Cadmium, Chromium, and Iron	HNO_3 / 4° C	(1) 500mL Poly	✓
COD and TOC	H_2SO_4 / 4° C	(1) 120 mL Poly	✓
Chromium (Hexavalent)	4° C	(1) 500mL POLY	✓
Dissolved Gases	4° C	(3) 40 mL Vial	✓
Hardness	HNO_3 / 4° C	(1) 500 mL Poly	✓
Ferrous Iron	4° C	(1) 1L Poly	✓
Misc. Anions	4° C	(1) 1L Poly	✓
Sulfide	NaOH / 4° C	(1) 500mL POLY	✓
Alkalinity & TSS	4° C	(1) 1L Poly	✓
Alkalinity, BOD, DOC & TSS	4° C	(1) 1L Poly	—
CO2		—	✓

OBSERVATIONS / NOTES:

* Chromium (Hexavalent) has 24 hr Hold Time
Fe(DISSOLVED) ✓

ALL LEVELS MADE W/R TO TPVC
STICKUP = 7/10'

Circle if Applicable:

MS/MSD MS MSD

Duplicate ID No.: —

Signature(s): Fred W Ramsey

Tetra Tech NUS, Inc.

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: NSWC INDIAN HEAD
PROJECT NUMBER: N7129 CTO 0245

WELL ID.: S57TW21
DATE: 8-21-01

STATIC H_2O = 6.80 TPVC

Time (Hrs.)	Water Level (Ft. below TOC)	Volume (gal/L)	Flowrate (mL/min)	pH (S.U.)	Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celsius)	ORP (mV)	TDS (g/L)	Notes:
1435	6.80										
1440	8.32	1.2 l	~200 mL	5.03	1.61	>999	9.65	20.7	-63	1.0	LOWERED PUMPING RATE
1445	8.53	1.7 l	~110 mL	4.91	1.65	>999	8.31	20.9	-168	1.1	LOWER RATE TO ~100 mL
1450	8.45	2.3 l	~100 mL	4.87	1.69	930	7.45	21.1	-193	1.1	
1500	8.50	3.3 l	100 mL/min	4.83	1.76	78	8.16	20.7	-256	1.1	
1505	8.57	3.8 l	100 mL/min	4.83	1.77	35	7.27	20.7	-257	1.1	CLEANED FLOW THRU CELL
1510	8.35	4.3 l	100 mL/min	4.83	1.78	35	7.09	20.7	-256	1.1	
							PURGE COMPLETED @ 1510				

SIGNATURE(S): Fred McCauser

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129 CTO 245

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

Sample ID No.: S57MW022O103
Sample Location: S57MW022
Sampled By: J Wellman
C.O.C. No.: 41525
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 8/29/01	Color Visual	pH Standard	S.C. mS/cm	Temp. °C	Turbidity NTU	DO mg/l	ORP (m/V)	TDS
Time: 1326								
Method: Peristaltic Pump	Clear	6.52	2.09	18.52	6.2	4.45	-11	1.3

PURGE DATA:

Date: 8/29/01	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	ORP	Flow Rate
Method: Peristaltic Pump								
Monitor Reading (ppm):								
Well Casing Diameter & Material Type: 2" PVC								
Total Well Depth (TD): 17.45				See Low Flow Purge Data Sheet				
Static Water Level (WL): 8.21								
One Casing Volume(gal/L): 5.5								
Start Purge (hrs): 1130								
End Purge (hrs): 1326								
Total Purge Time (min): 110								
Total Vol. Purged (gal/L): 11.0L								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL Volatiles	HCl / 4°C	(2) 40 ML VIALS	2
Cadmium, Chromium, and Iron	HNO_3 / 4° C	(1) 500mL Poly	1
COD and TOC	H_2SO_4 / 4° C	(1) 120 mL Poly	1
Chromium (Hexavalent)	4° C	(1) 500mL POLY	1
Dissolved Gases	4° C	(3) 40 mL Vial	3
Hardness	HNO_3 / 4° C	(1) 500 mL Poly	1
Ferrous Iron	4° C	(1) 1L Poly	1
Misc. Anions	4° C	(1) 1L Poly	1
Sulfide	NaOH / 4° C	(1) 500mL POLY	1
Alkalinity & TSS	4° C	(1) 1L Poly	1
~~Alkalinity, BOD, DOC & TSS~~ CO_2	4° C	(1) ~~1L~~ Poly 500	1
Dissolved Iron	4°C / HNO_3	1-500mL Poly	1

OBSERVATIONS / NOTES:

* Chromium (Hexavalent) has 24 hr Hold Time

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s): Jennifer C. Wellman

Tetra Tech NUS, Inc.

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: NSWC INDIAN HEAD
PROJECT NUMBER: N7129 CTO 0245

WELL ID.: 557MW022
DATE: 8/29/01

Time (Hrs.)	Water Level (Ft. below TOC)	Volume (gal/L)	Flowrate (mL/min)	pH (S.U.)	Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celsius)	ORP (mV)	TDS ( )	Notes:
1136	8.21	——	100	start	Purge	←	←	←	←	←	
1146	8.58	1.0L	100	6.02	2.96	24.9	3.98	18.42	23	1.9	
1156	8.69	2.0L	100	6.09	2.88	21.6	3.55	18.73	14	1.8	
1206	8.79	3.0L	100	6.41	2.58	16.4	3.64	18.79	-8	1.7	
1216	8.88	4.0L	100	6.70	2.31	20.9	4.30	18.32	-13	1.5	
1226	8.94	5.0L	100	6.74	2.17	19.4	4.35	18.57	-10	1.4	
1236	8.97	6.0L	100	6.72	2.20	17.6	4.44	18.40	-7	1.4	
1246	9.04	7.0L	100	6.73	2.18	16.4	4.45	18.50	-7	1.4	
1256	9.10	8.0L	100	6.77	2.14	10.5	4.43	18.40	-6	1.4	
1306	9.14	9.0L	100	6.79	2.12	9.4	4.43	18.48	-9	1.4	
1316	9.18	10.0L	100	6.81	2.10	8.2	4.43	18.55	-10	1.3	
1326	9.22	11.0L	100	6.82	2.09	6.2	4.45	18.52	-11	1.3	

SIGNATURE(S): Jennifer C. Wellman

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129 CTO 245

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

Sample ID No.: SS7MW02301O3
Sample Location: SS7MW023
Sampled By: Jennifer Wellman
C.O.C. No.: 91525
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 8/29/01	Color	pH	S.C.	Temp.	Turbidity	DO	ORP	TDS
Time: 0840	Visual	Standard	mS/cm	°C	NTU	mg/l	(mV)	
Method: Peristaltic Pump	clear	4.35	0.492	16.28	0.4	3.26	355	0.32

PURGE DATA:

Date: 8/29/01	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	ORP	Flow Rate
Method: Peristaltic Pump								
Monitor Reading (ppm):								
Well Casing Diameter & Material Type: 2" PVC								
Total Well Depth (TD): 23.1				See Low Flow Purge Data Sheet				
Static Water Level (WL): 14.61								
One Casing Volume(gal/L): ~~28.6L~~								
Start Purge (hrs): 0740								
End Purge (hrs): 0840								
Total Purge Time (min): 60								
Total Vol. Purged (gal/L): 11.8L								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL Volatiles	HCl / 4°C	(2) 40 ML VIALS	2
Cadmium, Chromium, and Iron	HNO_3 / 4° C	(1) 500mL Poly	
COD and TOC	H_2SO_4 / 4° C	(1) 120 mL Poly	
Chromium (Hexavalent)	4° C	(1) 500mL POLY	
Dissolved Gases	4° C	(3) 40 mL Vial	
Hardness	HNO_3 / 4° C	(1) 500 mL Poly	
Ferrous Iron	4° C	(1) 1L Poly	
Misc. Anions	4° C	(1) 1L Poly	
Sulfide	NaOH / 4° C	(1) 500mL POLY	
Alkalinity & TSS	4° C	(1) 1L Poly	
Alkalinity, BOD, DOC & TSS	4° C	(1) 1L Poly	

OBSERVATIONS / NOTES:

* Chromium (Hexavalent) has 24 hr Hold Time

Circle if Applicable:

MS/MSD

Duplicate ID No.:

Signature(s): Jennifer C. Wellman

Tetra Tech NUS, Inc.

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: NSWC INDIAN HEAD
PROJECT NUMBER: N7129 CTO 0245

WELL ID.: 557MW02301O3
DATE: 8/29/01

Time (Hrs.)	Water Level (Ft. below TOC)	Volume (gal/L)	Flowrate (mL/min)	pH (S.U.)	Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celsius)	ORP (mV)	TDS ( )	Notes:
0740	14.61	—	150	start	purge						
0745	14.64	0.750	200	4.40	0.500	39.3	4.69	17.02	346	0.32	
0750	14.64	1.75	200	4.37	0.495	10.8	3.71	16.84	354	0.32	
0755	14.64	2.75	200	4.36	0.498	5.5	3.93	16.44	355	0.32	
0800	14.65	3.75	200	4.35	0.497	5.1	3.50	16.32	355	0.32	
0805	14.65	4.75	200	4.36	0.496	4.8	3.41	16.31	355	0.32	
0810	14.66	5.75	200	4.35	0.497	3.2	3.35	16.23	354	0.32	
0815	14.66	6.75	200	4.34	0.497	2.4	3.37	16.016	353	0.32	
0820	14.66	7.75	200	4.36	0.496	1.7	3.34	16.17	352	0.32	
0825	14.66	8.75	200	4.35	0.497	0.8	3.32	16.18	353	0.32	
0830	14.66	9.75	200	4.35	0.499	0.6	3.28	16.18	354	0.32	
0835	14.66	10.75	200	4.35	0.498	0.5	3.27	16.12	356	0.32	
0840	14.66	11.75	200	4.35	0.492	0.4	3.26	16.28	355	0.32	

SIGNATURE(S): Jennifer C Wellman

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Page___ of ___

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129 CTO 245

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

Sample ID No.: S57CP0040103
Sample Location: S57CP004
Sampled By: FWR
C.O.C. No.: 41526
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 8/28/01	Color	pH	S.C.	Temp.	Turbidity	DO	ORP	TDS
Time: 1800	Visual	Standard	mS/cm	°C	NTU	mg/l	(mV)	
Method: Peristaltic Pump				NA				

PURGE DATA:

Date: 8/18/01	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	ORP	Flow Rate
Method: ~~Peristaltic Pump~~ BAILER								
Monitor Reading (ppm): NA								
Well Casing Diameter & Material Type: 1" PVC x 2'								
Total Well Depth (TD):				See Low Flow Purge Data Sheet				
Static Water Level (WL): N/A								
One Casing Volume(gal/L): N/A								
Start Purge (hrs): NA								
End Purge (hrs): N/A								
Total Purge Time (min): N/A								
Total Vol. Purged (gal/L): N/A								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL Volatiles	HCl / 4°C	(2) 40 ML VIALS	✓
Cadmium, Chromium, and Iron	HNO_3 / 4° C	(1) 500mL Poly	
COD and TOC	H_2SO_4 / 4° C	(1) 120 mL Poly	
Chromium (Hexavalent)	4° C	(1) 500mL POLY	
Dissolved Gases	4° C	(3) 40 mL Vial	
Hardness	HNO_3 / 4° C	(1) 500 mL Poly	
Ferrous Iron	4° C	(1) 1L Poly	
Misc. Anions	4° C	(1) 1L Poly	
Sulfide	NaOH / 4° C	(1) 500mL POLY	
Alkalinity & TSS	4° C	(1) 1L Poly	
Alkalinity, BOD, DOC & TSS	4° C	(1) 1L Poly	

OBSERVATIONS / NOTES:

* Chromium (Hexavalent) has 24 hr Hold Time

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): Fred Wilson

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Page ___ of ___

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129 CTO 245

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

Sample ID No.: S57CP0050103
Sample Location: S57CP005
Sampled By: FMS
C.O.C. No.: 41526
Type of Sample:
[X] Low Concentration
[ ] High Concentration

SAMPLING DATA:

Date: 8/29/01	Color	pH	S.C.	Temp.	Turbidity	DO	ORP	TDS
Time:	Visual	Standard	mS/cm	°C	NTU	mg/l	(m/V)	
Method: Peristaltic Pump				NA				

PURGE DATA:

Date: 8/29/01	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	ORP	Flow Rate
Method: ~~Peristaltic Pump~~ Bailer								
Monitor Reading (ppm): NA								
Well Casing Diameter & Material Type: 1" PVC X 2'								
Total Well Depth (TD): 19'				See Low Flow Purge Data Sheet				
Static Water Level (WL): NA								
One Casing Volume(gal/L): NA								
Start Purge (hrs): NA								
End Purge (hrs):								
Total Purge Time (min):								
Total Vol. Purged (gal/L):								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL Volatiles	HCl / 4°C	(2) 40 ML VIALS	✓
Cadmium, Chromium, and Iron	HNO_3 / 4° C	(1) 500mL Poly	—
COD and TOC	H_2SO_4 / 4° C	(1) 120 mL Poly	—
Chromium (Hexavalent)	4° C	(1) 500mL POLY	—
Dissolved Gases	4° C	(3) 40 mL Vial	—
Hardness	HNO_3 / 4° C	(1) 500 mL Poly	—
Ferrous Iron	4° C	(1) 1L Poly	—
Misc. Anions	4° C	(1) 1L Poly	—
Sulfide	NaOH / 4° C	(1) 500mL POLY	—
Alkalinity & TSS	4° C	(1) 1L Poly	—
Alkalinity, BOD, DOC & TSS	4° C	(1) 1L Poly	—

OBSERVATIONS / NOTES:

* Chromium (Hexavalent) has 24 hr Hold Time

COLLECTED SPL @ 17'-19' BGS

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	S57CPDUP01

Signature(s): Fred M Kramer

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129 CTO 245

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

Sample ID No.: S57CP0100103
Sample Location: S57CP010
Sampled By: PWR
C.O.C. No.: 41526
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 8/28/01	Color	pH	S.C.	Temp.	Turbidity	DO	ORP	TDS
Time: 1430	Visual	Standard	mS/cm	°C	NTU	mg/l	(m/V)	
Method: Peristaltic Pump				NA				

PURGE DATA:

Date: 8/28/01	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	ORP	Flow Rate
Method: Peristaltic Pump								
Monitor Reading (ppm):								
Well Casing Diameter & Material Type: 1" x 2' PVC								
Total Well Depth (TD):				See Low Flow Purge Data Sheet				
Static Water Level (WL): NA								
One Casing Volume(gal/L): N/A								
Start Purge (hrs): N/A								
End Purge (hrs): N/A								
Total Purge Time (min): N/A								
Total Vol. Purged (gal/L): NA								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL Volatiles	HCl / 4°C	(2) 40 ML VIALS	✓
Cadmium, Chromium, and Iron	HNO_3 / 4° C	(1) 500mL Poly	
COD and TOC	H_2SO_4 / 4° C	(1) 120 mL Poly	
Chromium (Hexavalent)	4° C	(1) 500mL POLY	
Dissolved Gases	4° C	(3) 40 mL Vial	
Hardness	HNO_3 / 4° C	(1) 500 mL Poly	
Ferrous Iron	4° C	(1) 1L Poly	
Misc. Anions	4° C	(1) 1L Poly	
Sulfide	NaOH / 4° C	(1) 500mL POLY	
Alkalinity & TSS	4° C	(1) 1L Poly	
Alkalinity, BOD, DOC & TSS	4° C	(1) 1L Poly	

OBSERVATIONS / NOTES:

* Chromium (Hexavalent) has 24 hr Hold Time

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Page___ of ___

Project Site Name: NSWC INDIAN HEAD
Project No.: N7129 CTO 245

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

Sample ID No.: S57CP080103
Sample Location: S57CP08
Sampled By: FWR
C.O.C. No.: 44526 FWR
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 8/28/01	Color	pH	S.C.	Temp.	Turbidity	DO	ORP	TDS
Time:	Visual	Standard	mS/cm	°C	NTU	mg/l	(m/V)	
Method: ~~Peristaltic Pump~~ Bailer				N/A				

PURGE DATA:

Date: 8/28/01	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	ORP	Flow Rate
Method: ~~Peristaltic Pump~~ Bailer								
Monitor Reading (ppm): NA								
Well Casing Diameter & Material Type: 1" x 3'								
Total Well Depth (TD):				See Low Flow Purge Data Sheet				
Static Water Level (WL):								
One Casing Volume(gal/L):								
Start Purge (hrs):								
End Purge (hrs):								
Total Purge Time (min):								
Total Vol. Purged (gal/L):								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL Volatiles	HCl / 4°C	(2) 40 ML VIALS	
Cadmium, Chromium, and Iron	HNO_3 / 4° C	(1) 500mL Poly	
COD and TOC	H_2SO_4 / 4° C	(1) 120 mL Poly	
Chromium (Hexavalent)	4° C	(1) 500mL POLY	
Dissolved Gases	4° C	(3) 40 mL Vial	
Hardness	HNO_3 / 4° C	(1) 500 mL Poly	
Ferrous Iron	4° C	(1) 1L Poly	
Misc. Anions	4° C	(1) 1L Poly	
Sulfide	NaOH / 4° C	(1) 500mL POLY	
Alkalinity & TSS	4° C	(1) 1L Poly	
Alkalinity, BOD, DOC & TSS	4° C	(1) 1L Poly	

OBSERVATIONS / NOTES:

* Chromium (Hexavalent) has 24 hr Hold Time

NO SAMPLE COLLECTED

27-29-DRY WELL

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): Fred W Ransom

A.7 CHAIN OF CUSTODY FORMS

CHEMTECH
CHAIN OF CUSTODY RECORD

Please check one:

☐ 110 Route 4
Englewood, NJ 07631
(201) 567-6868
Fax (201) 567-1333

☐ 205 Campus Plaza 1
Edison, NJ 08837
(732) 225-4111
Fax (732) 225-4110

CHEMTECH JOB NO.:

CHEMTECH QUOTE NO.:

CLIENT INFORMATION

REPORT TO BE SENT TO:

COMPANY: Tetra Tech NUS

ADDRESS: 661 Andersen Dr.

CITY: Pittsburgh STATE: PA ZIP: 15220

ATTENTION: George Lahullier

PHONE: 412 921-7091 FAX:

PROJECT INFORMATION

PROJECT NAME: Fedrow Heat

PROJECT NO.: 1129

PROJECT MANAGER: George Lahullier

LOCATION: Pittsburgh

PHONE: 412 921-7091 FAX:

BILLING INFORMATION

BILL TO: SAME AS PO #:

ADDRESS: CLIENT INFO

CITY: STATE: ZIP:

ATTENTION: PHONE:

DATA TURNAROUND INFORMATION

FAX: _____ DAYS *
HARD COPY: _____ DAYS *
EDD: _____ DAYS *
* TO BE APPROVED BY CHEMTECH
** NORMAL TURNAROUND TIME - 14 DAYS

DATA DELIVERABLE INFORMATION

☐ RESULTS ONLY ☐ USEPA CLP
☐ RESULTS + QC ☐ NYS ASP "B"
☐ NJ REDUCED ☐ NYS ASP "A"
☐ NJ CLP ☐ EDD
☐ EDD FORMAT: _____

ANALYSIS

1 Methane Content
2 Grain size
3 TSS
4 Density
5
6
7
8
9

CHEMTECH SAMPLE ID	PROJECT SAMPLE IDENTIFICATION	SAMPLE MATRIX	SAMPLE TYPE COMP	SAMPLE TYPE GRAB	SAMPLE COLLECTION DATE	SAMPLE COLLECTION TIME	# OF BOTTLES	PRESERVATIVES 1	2	3	4	5	6	7	8	9	COMMENTS
1.	SS7SB02 20103	SO	1	X	8/29/01	1400	1	X	X	X	X						
2.	SS7SB03 20103	SO	1	X	8/29/01	1510	1	X	X	X	X						
3.	SS7SB02 10303	SO	1	X	8/30/01	1515	1	X	X	X	X						
4.	SS7SB01 30303	SO	1	X	8/30/01	1020	1	X	X	X	X						
5.	SS7SB03 10103	SO	1	X	8/30/01	0900	1	X	X	X	X						
6.	SS7SB03 10203	SO	1	X	8/30/01	0932	1	X	X	X	X						
7.	SS7SB02 20303	SO	1	X	8/30/01	1420	1	X	X	X	X						
8.	SS7SB02 40103	SO	1	X	8/30/01	0920	1	X	X	X	X						

← Specify Preservatives
A – HCl B – HNO_3
C – H_2SO_4 D – NaOH
E – ICE F – Other

SAMPLE CUSTODY MUST BE DOCUMENTED BELOW EACH TIME SAMPLES CHANGE POSSESSION INCLUDING COURIER DELIVERY

RELINQUISHED BY SAMPLER:	DATE/TIME:	RECEIVED BY:
1. [signature]	8/29/01 1100	1.
RELINQUISHED BY:	DATE/TIME:	RECEIVED BY:
2.		2.
RELINQUISHED BY:	DATE/TIME:	RECEIVED FOR LAB BY:
3.		3.

Conditions of bottles or coolers at receipt: ☐ Compliant ☐ Non-Compliant ☐ Temp. of Cooler _____

Comments:

Fed Ex Airbill - 793341777222

Page 1 of 1 Shipment Complete: Yes _____ No _____

Ver. 6/2000

WHITE – CHEMTECH COPY FOR RETURN TO CLIENT YELLOW – CHEMTECH COPY PINK – SAMPLER COPY

11522

CHEMTECH
CHAIN OF CUSTODY RECORD

Please check one:

☐ 110 Route 4
Englewood, NJ 07631
(201) 567-6868
Fax (201) 567-1333

☐ 205 Campus Plaza 1
Edison, NJ 08837
(732) 225-4111
Fax (732) 225-4110

CHEMTECH JOB NO.:

CHEMTECH QUOTE NO.:

CLIENT INFORMATION

REPORT TO BE SENT TO:

COMPANY: Tetra Tech NUS
ADDRESS: 661 Andersen Dr.
CITY: Pittsburgh STATE: PA ZIP: 15220
ATTENTION: George Lahrillipe
PHONE: 412 921-7090 FAX:

PROJECT INFORMATION

PROJECT NAME: [illegible]
PROJECT NO.: 1121
PROJECT MANAGER: George Lahrillipe
LOCATION: Pittsburgh
PHONE: 412 921-7090 FAX:

BILLING INFORMATION

BILL TO: [illegible] PO #:
ADDRESS: CLIENT INFO
CITY: STATE: ZIP:
ATTENTION: PHONE:

DATA TURNAROUND INFORMATION

FAX: _____ DAYS *
HARD COPY: _____ DAYS *
EDD: _____ DAYS *
* TO BE APPROVED BY CHEMTECH
** NORMAL TURNAROUND TIME - 14 DAYS

DATA DELIVERABLE INFORMATION

☐ RESULTS ONLY ☐ USEPA CLP
☐ RESULTS + QC ☐ NYS ASP "B"
☐ NJ REDUCED ☐ NYS ASP "A"
☐ NJ CLP ☐ EDD
☐ EDD FORMAT: _____

ANALYSIS

1 Moisture content
2 Grain size
3 Specific gravity
4 bulk density
5
6
7
8
9

CHEMTECH SAMPLE ID	PROJECT SAMPLE IDENTIFICATION	SAMPLE MATRIX	SAMPLE TYPE COMP	SAMPLE TYPE GRAB	SAMPLE COLLECTION DATE	SAMPLE COLLECTION TIME	# OF BOTTLES	PRESERVATIVES 1	2	3	4	5	6	7	8	9	COMMENTS ← Specify Preservatives A – HCl B – HNO_3 C – H_2SO_4 D – NaOH E – ICE F – Other
1.	S57SB0210103	SO		X	8/14/01	1648	1	X	X	X	X						
2.	S57SB0320203	SO		X	8/24/01	1315	1	X	X	X	X						
3.	S57SB0180103	SO		X	8/23/01	0950	1	X	X	X	X						
4.	S57SB0300203	SO		X	8/24/01	1015	1	X	X	X	X						
5.	S57SB0300403	SO		X	8/24/01	1145	1	X	X	X	X						
6.	S57SB0160303	SO		X	8/23/01	1440		X	X	X	X						
7.	S57SB0160103	SO		X	8/23/01	1413	1	X	X	X	X						
8.																	

SAMPLE CUSTODY MUST BE DOCUMENTED BELOW EACH TIME SAMPLES CHANGE POSSESSION INCLUDING COURIER DELIVERY

RELINQUISHED BY SAMPLER:	DATE/TIME:	RECEIVED BY:
1. [illegible]	8/29/01 1700	1.
RELINQUISHED BY: 2.	DATE/TIME:	RECEIVED BY: 2.
RELINQUISHED BY: 3.	DATE/TIME:	RECEIVED FOR LAB BY: 3.

Conditions of bottles or coolers at receipt: ☐ Compliant ☐ Non-Compliant ☐ Temp. of Cooler _____

Comments:

Fed Ex AB# 830334177222

Page 2 of 2

Shipment Complete: Yes _____ No _____

Ver. 6/2000

WHITE – CHEMTECH COPY FOR RETURN TO CLIENT YELLOW – CHEMTECH COPY PINK – SAMPLER COPY

41523

5SB
255

CHEMTECH
CHAIN OF CUSTODY RECORD

284 Sheffield Street, Mountainside, NJ 07092
(908) 789-8900 Fax (908) 789-8922
www.chemtech.net

CHEMTECH JOB NO.:

CHEMTECH QUOTE NO.:

CLIENT INFORMATION

REPORT TO BE SENT TO:

COMPANY: TTNUS

ADDRESS: 661 ANDERSEN DR

CITY: PITTSBURGH STATE: PA ZIP: 15220

ATTENTION: GEORGE LAFOLIPPIS

PHONE: 412 921-7090 FAX:

PROJECT INFORMATION

PROJECT NAME: INDIAN HEAD SITE 57

PROJECT NO.: 7129

PROJECT MANAGER: GEORGE LAFOLIPPIS

LOCATION: INDIAN HEAD MD

PHONE: 412-921 7090 FAX: —

BILLING INFORMATION

SAME AS CLIENT INFO

BILL TO: PO #:

ADDRESS:

CITY: STATE: ZIP:

ATTENTION: PHONE:

DATA TURNAROUND INFORMATION

FAX: _____ DAYS *

HARD COPY: _____ DAYS *

EDD: _____ DAYS *

* TO BE APPROVED BY CHEMTECH

** NORMAL TURNAROUND TIME - 14 DAYS

DATA DELIVERABLE INFORMATION

☐ RESULTS ONLY ☐ NY STATE CATEGORY A

☐ RESULTS PLUS QC ☐ NY STATE CATEGORY B

☐ REGULATORY FORMAT, STATE: _____

☐ NEW JERSEY REDUCED DELIVERABLES

☐ CLP

☐ EDD FORMAT: _____

ANALYSIS

1 TCL VOA w/ 4 ext. BF
2 ARSENIC
3 TOC, CEC + pH
4
5
6
7
8
9

CHEMTECH SAMPLE ID	PROJECT SAMPLE IDENTIFICATION	SAMPLE MATRIX	SAMPLE TYPE COMP	SAMPLE TYPE GRAB	SAMPLE COLLECTION DATE	SAMPLE COLLECTION TIME	# OF BOTTLES	PRESERVATIVES 1	2	3	4	5	6	7	8	9	COMMENTS
1.	S57TB0010002 3	AQ		X	8/14/01	1200	2	2									
2.	S57SS0220103	SO		X	8/14/01	1349	2	1	1								
3.	S57SB0220103	SO		X	8/14/01	1400	2	1		1							
4.	S57SB0220203	SO		X	8/14/01	1410	1	1									
5.	S57SB0220303	SO		X	8/14/01	1420		1		1							
6.	S57SB0230103	SO		X	8/14/01	1605		1									
7.	S57SS0230103	SO		X	8/14/01	1600		1									
8.	S57SB0230203	SO		X	8/14/01	1612		1									

← Specify Preservatives
A – HCl B – HNO_3
C – H_2SO_4 D – NaOH
E – ICE F – Other

SAMPLE CUSTODY MUST BE DOCUMENTED BELOW EACH TIME SAMPLES CHANGE POSSESSION INCLUDING COURIER DELIVERY

RELINQUISHED BY SAMPLER:	DATE/TIME:	RECEIVED BY:
1. [signature]	8/14/01 1930	1. FED Ex
RELINQUISHED BY:	DATE/TIME:	RECEIVED BY:
2.		2.
RELINQUISHED BY:	DATE/TIME:	RECEIVED FOR LAB BY:
3.		3.

Conditions of bottles or coolers at receipt: ☐ Compliant ☐ Non-Compliant ☐ Temp. of Cooler _____

Comments:

FED Ex AB# 830334177450

Page 1 of 2

SHIPPED VIA: CLIENT: ☐ HAND DELIVERED ☐ OVERNIGHT
CHEMTECH: ☐ PICKED UP ☐ OVERNIGHT

Shipment Complete: ☐ YES ☐ NO

WHITE – CHEMTECH COPY FOR RETURN TO CLIENT YELLOW – CHEMTECH COPY PINK – SAMPLER COPY

15755

3 SB
155

CHEMTECH
CHAIN OF CUSTODY RECORD

284 Sheffield Street, Mountainside, NJ 07092
(908) 789-8900 Fax (908) 789-8922
www.chemtech.net

CHEMTECH JOB NO.:

CHEMTECH QUOTE NO.:

CLIENT INFORMATION

REPORT TO BE SENT TO:

COMPANY: SEE PAGE 1 OF 2

ADDRESS:

CITY: STATE: ZIP:

ATTENTION:

PHONE: FAX:

PROJECT INFORMATION

PROJECT NAME:

PROJECT NO.: SEE PAGE 1 OF 2

PROJECT MANAGER:

LOCATION:

PHONE: FAX:

BILLING INFORMATION

BILL TO: PO #:

ADDRESS:

CITY: STATE: ZIP:

ATTENTION: PHONE:

DATA TURNAROUND INFORMATION

FAX: _____ DAYS *
HARD COPY: _____ DAYS *
EDD: _____ DAYS *
* TO BE APPROVED BY CHEMTECH
** NORMAL TURNAROUND TIME - 14 DAYS

DATA DELIVERABLE INFORMATION

☐ RESULTS ONLY ☐ NY STATE CATEGORY A
☐ RESULTS PLUS QC ☐ NY STATE CATEGORY B
☐ REGULATORY FORMAT, STATE: _____
☐ NEW JERSEY REDUCED DELIVERABLES
☐ CLP
☐ EDD FORMAT: _____

ANALYSIS

1 TCL VOA + Xylenes
2 Arsenic
3 TOC, CFC + pH
4 Arsenic, TOC, CFC + pH
5
6
7
8
9

CHEMTECH SAMPLE ID	PROJECT SAMPLE IDENTIFICATION	SAMPLE MATRIX	SAMPLE TYPE COMP	SAMPLE TYPE GRAB	SAMPLE COLLECTION DATE	SAMPLE COLLECTION TIME	# OF BOTTLES	PRESERVATIVES 1	2	3	4	5	6	7	8	9	COMMENTS
1.	S57SB0230303	SO		X	8/14/01	1625	1	1									
2.	S57SS0210103	SO		X	8/14/01	1642	2	1	1								
3.	S57SB0210103	SO		X	8/14/01	1648	1	1									
4.	S57SB0210203	SO		X	8/14/01	1700	1	1									
5.	S57FD0010003	SO		X	8/14/01	0000	1	1									S57SB0210203
6.																	
7.																	
8.																	

PRESERVATIVES: ← Specify Preservatives
A – HCl B – HNO_3
C – H_2SO_4 D – NaOH
E – ICE F – Other

SAMPLE CUSTODY MUST BE DOCUMENTED BELOW EACH TIME SAMPLES CHANGE POSSESSION INCLUDING COURIER DELIVERY

RELINQUISHED BY SAMPLER:	DATE/TIME:	RECEIVED BY:
1. [signature]	8/14/01 1930	1.
RELINQUISHED BY:	DATE/TIME:	RECEIVED BY:
2.		2.
RELINQUISHED BY:	DATE/TIME:	RECEIVED FOR LAB BY:
3.		3.

Conditions of bottles or coolers at receipt: ☐ Compliant ☐ Non-Compliant ☐ Temp. of Cooler _____
Comments:
FED EX AIR # 830334177450

Page 2 of 2

SHIPPED VIA: CLIENT: ☐ HAND DELIVERED ☐ OVERNIGHT
CHEMTECH: ☐ PICKED UP ☐ OVERNIGHT

Shipment Complete: ☐ YES ☐ NO

WHITE – CHEMTECH COPY FOR RETURN TO CLIENT YELLOW – CHEMTECH COPY PINK – SAMPLER COPY

15754

3SB
3SS

CHEMTECH
CHAIN OF CUSTODY RECORD

284 Sheffield Street, Mountainside, NJ 07092
(908) 789-8900 Fax (908) 789-8922
www.chemtech.net

CHEMTECH JOB NO.:

CHEMTECH QUOTE NO.:

CLIENT INFORMATION

REPORT TO BE SENT TO:

COMPANY: TtNUS
ADDRESS: 661 ANDERSEN DR
CITY: PITTSBURGH STATE: PA ZIP: 15220
ATTENTION: GEORGE LATULIPPE
PHONE: 412 921 7090 FAX:

PROJECT INFORMATION

PROJECT NAME: INDIAN HEAD SITE 57
PROJECT NO.: 7129
PROJECT MANAGER: GEORGE L.
LOCATION: PITTSBURGH
PHONE: 412-921-7090 FAX:

BILLING INFORMATION

BILL TO: SAME AS CLIENT INFO PO #:
ADDRESS:
CITY: STATE: ZIP:
ATTENTION: PHONE:

DATA TURNAROUND INFORMATION

FAX: _____ DAYS *
HARD COPY: _____ DAYS *
EDD: _____ DAYS *
* TO BE APPROVED BY CHEMTECH
** NORMAL TURNAROUND TIME - 14 DAYS

DATA DELIVERABLE INFORMATION

☐ RESULTS ONLY ☐ NY STATE CATEGORY A
☐ RESULTS PLUS QC ☐ NY STATE CATEGORY B
☐ REGULATORY FORMAT, STATE: _____
☐ NEW JERSEY REDUCED DELIVERABLES
☐ CLP
☐ EDD FORMAT: _____

ANALYSIS

1 TCLVOC w/ ethyl ether
2 ARSENIC
3 TOC ~~CFC + pH~~ FUC
4 TOC, CFC + pH
5
6
7
8
9

PRESERVATIVES

CHEMTECH SAMPLE ID	PROJECT SAMPLE IDENTIFICATION	SAMPLE MATRIX	SAMPLE TYPE COMP	SAMPLE TYPE GRAB	SAMPLE COLLECTION DATE	SAMPLE COLLECTION TIME	# OF BOTTLES	1	2	3	4	5	6	7	8	9	COMMENTS ← Specify Preservatives A – HCl B – HNO_3 C – H_2SO_4 D – NaOH E – ICE F – Other
1.	S57TB0020003	AQ		X	8/15/01	0800	2	2									
2.	S57RB0010003	AQ		X	8/15/01	1630	4	2	1	X							CALLED LAB TO CANCEL 8/16
3.	S57SS0200103	SO ~~AQ~~		X		0826	1		1								
4.	S57SB0200103	SO ~~AQ~~		X		0834	1		1								
5.	S57SS0240103	SO		X		0910	1	1									
6.	S57SB0240103	SO		X		0920	2	1			1						
7.	S57SB0240203	SO		X		0930	1	1									
8.	S57SS0250103	SO		X	8/15/01	0945	1	1									

SAMPLE CUSTODY MUST BE DOCUMENTED BELOW EACH TIME SAMPLES CHANGE POSSESSION INCLUDING COURIER DELIVERY

RELINQUISHED BY SAMPLER:	DATE/TIME:	RECEIVED BY:
1. [signature]	8/15/01 1930	1. FED Ex
RELINQUISHED BY: 2.	DATE/TIME:	RECEIVED BY: 2.
RELINQUISHED BY: 3.	DATE/TIME:	RECEIVED FOR LAB BY: 3.

Conditions of bottles or coolers at receipt: ☐ Compliant ☐ Non-Compliant ☐ Temp. of Cooler _____

Comments:

FED Ex 830334177428

Page 1 of _____

SHIPPED VIA: CLIENT: ☐ HAND DELIVERED ☐ OVERNIGHT
CHEMTECH: ☐ PICKED UP ☐ OVERNIGHT

Shipment Complete: ☐ YES ☐ NO

WHITE – CHEMTECH COPY FOR RETURN TO CLIENT YELLOW – CHEMTECH COPY PINK – SAMPLER COPY

15758

CHEMTECH
CHAIN OF CUSTODY RECORD

284 Sheffield Street, Mountainside, NJ 07092
(908) 789-8900 Fax (908) 789-8922
www.chemtech.net

CHEMTECH JOB NO.:

CHEMTECH QUOTE NO.:

CLIENT INFORMATION (REPORT TO BE SENT TO:)

COMPANY:

ADDRESS: SEE pg 1 of 3

CITY: STATE: ZIP:

ATTENTION:

PHONE: FAX:

PROJECT INFORMATION

PROJECT NAME:

PROJECT NO.: SEE pg 1 of 3

PROJECT MANAGER:

LOCATION:

PHONE: FAX:

BILLING INFORMATION

BILL TO: PO #:

ADDRESS: SEE pg 1 of 3

CITY: STATE: ZIP:

ATTENTION: PHONE:

DATA TURNAROUND INFORMATION

FAX: DAYS *
HARD COPY: DAYS *
EDD: DAYS *
* TO BE APPROVED BY CHEMTECH
** NORMAL TURNAROUND TIME - 14 DAYS

DATA DELIVERABLE INFORMATION

☐ RESULTS ONLY ☐ NY STATE CATEGORY A
☐ RESULTS PLUS QC ☐ NY STATE CATEGORY B
☐ REGULATORY FORMAT, STATE:
☐ NEW JERSEY REDUCED DELIVERABLES
☐ CLP
☐ EDD FORMAT:

ANALYSIS

1 TCL VOCs + ethyl ether
2 Arsenic
3 TOC
4 TOC, CEC + pH
5
6
7
8
9

CHEMTECH SAMPLE ID	PROJECT SAMPLE IDENTIFICATION	SAMPLE MATRIX	SAMPLE TYPE COMP	SAMPLE TYPE GRAB	SAMPLE COLLECTION DATE	SAMPLE COLLECTION TIME	# OF BOTTLES	PRESERVATIVES 1	2	3	4	5	6	7	8	9	COMMENTS
1.	SS7SB025 0103	SO		X	8/15/01	0955	1	1									
2.	SS7SB025 0203	SO		X		1000	1	1									
3.	SS7SB025 0303	SO		X		1007	1	1									
4.	SS7SB026 0103	SO		X		1135	1			1							
5.	SS7SB022 0403	SO		X		1420	1	1									
6.	SS7SB021 0303	SO		X		1515	1	1			1	X	SOW				
7.	SS7SB021 0403	SO		X	8/15/01	1530	1	1									
8.																	

← Specify Preservatives
A – HCl B – HNO_3
C – H_2SO_4 D – NaOH
E – ICE F – Other

SAMPLE CUSTODY MUST BE DOCUMENTED BELOW EACH TIME SAMPLES CHANGE POSSESSION INCLUDING COURIER DELIVERY

RELINQUISHED BY SAMPLER:	DATE/TIME:	RECEIVED BY:
1. Steve McRamer	8/15/01 1930	1. FED Ex
RELINQUISHED BY:	DATE/TIME:	RECEIVED BY:
2.		2.
RELINQUISHED BY:	DATE/TIME:	RECEIVED FOR LAB BY:
3.		3.

Conditions of bottles or coolers at receipt: ☐ Compliant ☐ Non-Compliant ☐ Temp. of Cooler
Comments:

Page 3 of 3

SHIPPED VIA: CLIENT: ☐ HAND DELIVERED ☐ OVERNIGHT
CHEMTECH: ☐ PICKED UP ☐ OVERNIGHT

Shipment Complete: ☐ YES ☐ NO

WHITE – CHEMTECH COPY FOR RETURN TO CLIENT YELLOW – CHEMTECH COPY PINK – SAMPLER COPY

15761

CHEMTECH
CHAIN OF CUSTODY RECORD

284 Sheffield Street, Mountainside, NJ 07092
(908) 789-8900 Fax (908) 789-8922
www.chemtech.net

CHEMTECH JOB NO.:

CHEMTECH QUOTE NO.:

CLIENT INFORMATION

REPORT TO BE SENT TO:

COMPANY: TtNUS

ADDRESS: 6161 Andersen Dr.

CITY: Pittsburgh STATE: PA ZIP: 15220

ATTENTION: George Latulippe

PHONE: 412-921-7090 FAX:

PROJECT INFORMATION

PROJECT NAME: Indianhead Site 57

PROJECT NO.: 7129

PROJECT MANAGER: George Latulippe

LOCATION: Pittsburgh

PHONE: 412-921-7090 FAX:

BILLING INFORMATION

BILL TO: Same as Client Info

ADDRESS:

CITY: STATE: ZIP:

ATTENTION: PHONE:

DATA TURNAROUND INFORMATION

FAX: _____ DAYS *

HARD COPY: _____ DAYS *

EDD: _____ DAYS *

* TO BE APPROVED BY CHEMTECH

** NORMAL TURNAROUND TIME - 14 DAYS

DATA DELIVERABLE INFORMATION

☐ RESULTS ONLY ☐ NY STATE CATEGORY A

☐ RESULTS PLUS QC ☐ NY STATE CATEGORY B

☐ REGULATORY FORMAT, STATE: _____

☐ NEW JERSEY REDUCED DELIVERABLES

☐ CLP

☐ EDD FORMAT: _____

ANALYSIS

1 TCL VOA w/2 Methylethanol
2 Cd, Cr
3 Cod + TOC
4 Het. Cr.
5 Diss. Gases
6 hardness
7 Ferrous Fe
8 Misc. Anions
9 Sulfide
Alkalinity & TSS
CO_2
Dissolved Fe

CHEMTECH SAMPLE ID	PROJECT SAMPLE IDENTIFICATION	SAMPLE MATRIX	SAMPLE TYPE COMP	SAMPLE TYPE GRAB	SAMPLE COLLECTION DATE	SAMPLE COLLECTION TIME	# OF BOTTLES	PRESERVATIVES HCl 1	HNO_3 2	H_2SO_4 3	/ 4	/ 5	HNO_3 6	/ 7	/ 8	NaOH 9	COMMENTS			
1.	S57MW00201O3	AQ		X	8/15/01	1515	15	2	1	1	1	3	1	1	1	1	1	1	1	
2.	S57MW00101O3	AQ		X	8/15/01	1121	15	2	1	1	1	3	1	1	1	1	1	1	1	
3.																			1	
4.																				
5.																				
6.																				
7.																				
8.																				

Specify Preservatives: A – HCl, B – HNO_3, C – H_2SO_4, D – NaOH, E – ICE, F – Other

SAMPLE CUSTODY MUST BE DOCUMENTED BELOW EACH TIME SAMPLES CHANGE POSSESSION INCLUDING COURIER DELIVERY

RELINQUISHED BY SAMPLER:	DATE/TIME:	RECEIVED BY:
1 Jennifer Wellman	8/15/01 1930	1. FED EX
RELINQUISHED BY:	DATE/TIME:	RECEIVED BY:
2.		2.
RELINQUISHED BY:	DATE/TIME:	RECEIVED FOR LAB BY:
3.		3.

Conditions of bottles or coolers at receipt: ☐ Compliant ☐ Non-Compliant ☐ Temp. of Cooler _____

Comments:

FEDEx 830334177428

Page 3 of 3

SHIPPED VIA: CLIENT: ☐ HAND DELIVERED ☐ OVERNIGHT CHEMTECH: ☐ PICKED UP ☐ OVERNIGHT

Shipment Complete: ☐ YES ☐ NO

WHITE – CHEMTECH COPY FOR RETURN TO CLIENT YELLOW – CHEMTECH COPY PINK – SAMPLER COPY

15760

1 55
458

CHEMTECH
CHAIN OF CUSTODY RECORD

284 Sheffield Street, Mountainside, NJ 07092
(908) 789-8900 Fax (908) 789-8922
www.chemtech.net

CHEMTECH JOB NO.:

CHEMTECH QUOTE NO.:

CLIENT INFORMATION (REPORT TO BE SENT TO:)

COMPANY: TtNUS
ADDRESS: 661 ANDERSEN DR
CITY: PITTSBURGH STATE: PA ZIP: 15220
ATTENTION: GEORGE LATULIPPE
PHONE: 412-921-7090 FAX: —

PROJECT INFORMATION

PROJECT NAME: INDIAN HEAD SITE 57
PROJECT NO.: 7129
PROJECT MANAGER: GEORGE LATULIPPE
LOCATION: INDIAN HEAD
PHONE: — FAX: —

BILLING INFORMATION

BILL TO: PO #:
ADDRESS: SEE CLIENT INFO
CITY: STATE: ZIP:
ATTENTION: PHONE:

DATA TURNAROUND INFORMATION

FAX: _____ DAYS *
HARD COPY: _____ DAYS *
EDD: _____ DAYS *
* TO BE APPROVED BY CHEMTECH
** NORMAL TURNAROUND TIME - 14 DAYS

DATA DELIVERABLE INFORMATION

☐ RESULTS ONLY ☐ NY STATE CATEGORY A
☐ RESULTS PLUS QC ☐ NY STATE CATEGORY B
☐ REGULATORY FORMAT, STATE: _____
☐ NEW JERSEY REDUCED DELIVERABLES
☐ CLP
☐ EDD FORMAT: _____

ANALYSIS

1 TCL VOC + T.E.
2 ARSENIC
3 TOC
4
5
6
7
8
9

CHEMTECH SAMPLE ID	PROJECT SAMPLE IDENTIFICATION	SAMPLE MATRIX	SAMPLE TYPE COMP	SAMPLE TYPE GRAB	SAMPLE COLLECTION DATE	SAMPLE COLLECTION TIME	# OF BOTTLES	PRESERVATIVES 1	2	3	4	5	6	7	8	9	COMMENTS
1.	S57TB0030003	AQ		X	8/16/01	0800	2										FRun LL3
2.	S57FB0010003	AQ		X	8/16/01	1330	4/3	2	1	X	HNO3						
3.	S57SS0280103	SO		X	8/16/01	1047	1	1									
4.	S57SB0280103	SO		X	8/16/01	1057	1	1									
5.	S57SBDUP02	SO		X	8/16/01	0000	1	1									S57SB0280103
6.	S57SB0280203	SO		X	8/16/01	1121	3	3									RUN MS/MSD
7.	S57SB0280303	SO		X	8/16/01	1127	1	1									
8.	S57SB0280403	SO		X	8/16/01	1150	1	1									

SAMPLE CUSTODY MUST BE DOCUMENTED BELOW EACH TIME SAMPLES CHANGE POSSESSION INCLUDING COURIER DELIVERY

RELINQUISHED BY SAMPLER:	DATE/TIME:	RECEIVED BY:
1. Frank Ramos	8/16/01 1900	1.
RELINQUISHED BY:	DATE/TIME:	RECEIVED BY:
2.		2.
RELINQUISHED BY:	DATE/TIME:	RECEIVED FOR LAB BY:
3.		3.

Conditions of bottles or coolers at receipt: ☐ Compliant ☐ Non-Compliant ☐ Temp. of Cooler _____
Comments:
FED EX AB# 830334177439

Page ____ of ____

SHIPPED VIA: CLIENT: ☐ HAND DELIVERED ☐ OVERNIGHT
CHEMTECH: ☐ PICKED UP ☐ OVERNIGHT

Shipment Complete: ☐ YES ☐ NO

WHITE – CHEMTECH COPY FOR RETURN TO CLIENT YELLOW – CHEMTECH COPY PINK – SAMPLER COPY

15750

CHEMTECH

CHAIN OF CUSTODY RECORD

284 Sheffield Street, Mountainside, NJ 07092
(908) 789-8900 Fax (908) 789-8922
www.chemtech.net

CHEMTECH JOB NO.:

CHEMTECH QUOTE NO.:

CLIENT INFORMATION

REPORT TO BE SENT TO:

COMPANY: TtNUS

ADDRESS: 661 ANDERSEN DR

CITY: PGH STATE: PA ZIP: 15220

ATTENTION: GEORGE LATULIPPE

PHONE: 412-921-7090 FAX: —

PROJECT INFORMATION

PROJECT NAME: INDIAN HEAD NSWC

PROJECT NO.: 7129

PROJECT MANAGER: GEORGE LATULIPPE

LOCATION: INDIAN HEAD MD

PHONE: FAX:

BILLING INFORMATION

BILL TO: PO #:

ADDRESS: SEE CLIENT INFO

CITY: STATE: ZIP:

ATTENTION: PHONE:

DATA TURNAROUND INFORMATION

FAX: _____ DAYS *

HARD COPY: _____ DAYS *

EDD: _____ DAYS *

* TO BE APPROVED BY CHEMTECH

** NORMAL TURNAROUND TIME - 14 DAYS

DATA DELIVERABLE INFORMATION

- ☐ RESULTS ONLY
- ☐ RESULTS PLUS QC
- ☐ REGULATORY FORMAT, STATE: _____
- ☐ NEW JERSEY REDUCED DELIVERABLES
- ☐ CLP
- ☐ EDD FORMAT: _____
- ☐ NY STATE CATEGORY A
- ☐ NY STATE CATEGORY B

ANALYSIS

1 TCL VOC + ee
2 ARSENIC
3 TOC
4
5
6
7
8
9

CHEMTECH SAMPLE ID	PROJECT SAMPLE IDENTIFICATION	SAMPLE MATRIX	SAMPLE TYPE COMP	SAMPLE TYPE GRAB	SAMPLE COLLECTION DATE	SAMPLE COLLECTION TIME	# OF BOTTLES	PRESERVATIVES 1	2	3	4	5	6	7	8	9	COMMENTS ← Specify Preservatives A – HCl B – HNO_3 C – H_2SO_4 D – NaOH E – ICE F – Other
1.	S57SBDUP03	SO		X	8/16/01	~~1500~~ 0000	1	1									S57SB0280403
2.	S57FB0020003	AQ		X	8/16/01	1500	3	2	1								
3.	S57RB0020003	AQ		X	8/16/01	1600	3	2	1								
4.																	
5.																	
6.																	
7.																	
8.																	

SAMPLE CUSTODY MUST BE DOCUMENTED BELOW EACH TIME SAMPLES CHANGE POSSESSION INCLUDING COURIER DELIVERY

RELINQUISHED BY SAMPLER:	DATE/TIME:	RECEIVED BY:
1. [signature]	8/16/01 1900	1.
RELINQUISHED BY: 2.	DATE/TIME:	RECEIVED BY: 2.
RELINQUISHED BY: 3.	DATE/TIME:	RECEIVED FOR LAB BY: 3.

Conditions of bottles or coolers at receipt: ☐ Compliant ☐ Non-Compliant ☐ Temp. of Cooler _____

Comments:

FED Ex AB# 830334177439

Page _____ of _____

SHIPPED VIA: CLIENT: ☐ HAND DELIVERED ☐ OVERNIGHT
CHEMTECH: ☐ PICKED UP ☐ OVERNIGHT

Shipment Complete: ☐ YES ☐ NO

WHITE – CHEMTECH COPY FOR RETURN TO CLIENT YELLOW – CHEMTECH COPY PINK – SAMPLER COPY

15757

CHEMTECH
CHAIN OF CUSTODY RECORD

284 Sheffield Street, Mountainside, NJ 07092
(908) 789-8900 Fax (908) 789-8922
www.chemtech.net

CHEMTECH JOB NO.:

CHEMTECH QUOTE NO.:

CLIENT INFORMATION

REPORT TO BE SENT TO:

COMPANY: TENUS

ADDRESS: 6161 Andersen Dr.

CITY: Pittsburgh STATE: PA ZIP: 15220

ATTENTION: George Latulippe

PHONE: 412-921-7090 FAX:

PROJECT INFORMATION

PROJECT NAME: Indianhead Site 57

PROJECT NO.: 7129

PROJECT MANAGER: George Latulippe

LOCATION: Pittsburgh

PHONE: 412-921-7090 FAX:

BILLING INFORMATION

BILL TO: SAME AS CLIENT INFO PO#

ADDRESS:

CITY: STATE: ZIP:

ATTENTION: PHONE:

DATA TURNAROUND INFORMATION

FAX: _____ DAYS *

HARD COPY: _____ DAYS *

EDD: _____ DAYS *

* TO BE APPROVED BY CHEMTECH

** NORMAL TURNAROUND TIME - 14 DAYS

DATA DELIVERABLE INFORMATION

☐ RESULTS ONLY ☐ NY STATE CATEGORY A

☐ RESULTS PLUS QC ☐ NY STATE CATEGORY B

☐ REGULATORY FORMAT, STATE: _____

☐ NEW JERSEY REDUCED DELIVERABLES

☐ CLP

☐ EDD FORMAT: _____

ANALYSIS

1 TCL VOL + ethylene
2 Cad, Cr
3 COD, TOC
4 Hex. Cr
5 Dissolved Gases
6 Hardness
7 Ferrous Iron
8 Misc. Anions
9 Alkalinity & TSS
BOD, DOC
CO2
Fe dissolved
sulfide

CHEMTECH SAMPLE ID	PROJECT SAMPLE IDENTIFICATION	SAMPLE MATRIX	SAMPLE TYPE COMP	SAMPLE TYPE GRAB	SAMPLE COLLECTION DATE	SAMPLE COLLECTION TIME	# OF BOTTLES	PRESERVATIVES 1	2	3	4	5	6	7	8	9	COMMENTS ← Specify Preservatives A – HCl B – HNO_3 C – H_2SO_4 D – NaOH E – ICE F – Other
1.	557MWDUP01	AQ		X	8/16/01	0000	16	2	1	1	1	3	1	1	1	1	1 1 1 1
2.	557MWOD3010C3	AQ		X	8/16/01	1030	16	2	1	1	1	3	1	1	1	1	1 1 1 1
3.	557MW0040103 *	AQ		X	8/16/01	1605	48	6	3	3	3	9	3	3	3	3	3 3 3 3
4.																	
5.																	
6.																	
7.																	
8.																	

SAMPLE CUSTODY MUST BE DOCUMENTED BELOW EACH TIME SAMPLES CHANGE POSSESSION INCLUDING COURIER DELIVERY

RELINQUISHED BY SAMPLER:	DATE/TIME:	RECEIVED BY:
1. Fred Kanser	8/16/01 1900	1.
RELINQUISHED BY: 2.	DATE/TIME:	RECEIVED BY: 2.
RELINQUISHED BY: 3.	DATE/TIME:	RECEIVED FOR LAB BY: 3.

Conditions of bottles or coolers at receipt: ☐ Compliant ☐ Non-Compliant ☐ Temp. of Cooler _____

Comments: * RUN MS/MSD ON THIS SAMPLE

FEDEx AB# 830334177439

Page ____ of ____

SHIPPED VIA: CLIENT: ☐ HAND DELIVERED ☐ OVERNIGHT

CHEMTECH: ☐ PICKED UP ☐ OVERNIGHT

Shipment Complete: ☐ YES ☐ NO

WHITE – CHEMTECH COPY FOR RETURN TO CLIENT YELLOW – CHEMTECH COPY PINK – SAMPLER COPY

15764

1 of 2

CHEMTECH
CHAIN OF CUSTODY RECORD

284 Sheffield Street, Mountainside, NJ 07092
(908) 789-8900 Fax (908) 789-8922
www.chemtech.net

CHEMTECH JOB NO.:

CHEMTECH QUOTE NO.:

CLIENT INFORMATION

REPORT TO BE SENT TO:

COMPANY: TT NUS
ADDRESS: 661 ANDERSEN DR.
CITY: PITTSBURGH STATE: PA ZIP: 15220
ATTENTION: G. LATULIPPE
PHONE: 412-921-7040 FAX: 412-921-4040

PROJECT INFORMATION

PROJECT NAME: INDIAN HEAD SITE 57
PROJECT NO.: 7129
PROJECT MANAGER: GEORGE LATULIPPE
LOCATION: PITTSBURGH
PHONE: 412-921-7040 FAX: 412-921-4040

BILLING INFORMATION

BILL TO: SAME AS CLIENT INFO
ADDRESS:
CITY: STATE: ZIP:
ATTENTION: PHONE:

DATA TURNAROUND INFORMATION

FAX: _____ DAYS *
HARD COPY: _____ DAYS *
EDD: _____ DAYS *
* TO BE APPROVED BY CHEMTECH
** NORMAL TURNAROUND TIME - 14 DAYS

DATA DELIVERABLE INFORMATION

☐ RESULTS ONLY ☐ NY STATE CATEGORY A
☐ RESULTS PLUS QC ☐ NY STATE CATEGORY B
☐ REGULATORY FORMAT, STATE: _____
☐ NEW JERSEY REDUCED DELIVERABLES
☐ CLP
☐ EDD FORMAT: _____

ANALYSIS

TCL VOC's + ETHYL ETHER

1 2 3 4 5 6 7 8 9

CHEMTECH SAMPLE ID	PROJECT SAMPLE IDENTIFICATION	SAMPLE MATRIX	SAMPLE TYPE COMP	SAMPLE TYPE GRAB	SAMPLE COLLECTION DATE	SAMPLE COLLECTION TIME	# OF BOTTLES	PRESERVATIVES 1	2	3	4	5	6	7	8	9	COMMENTS ← Specify Preservatives A – HCl B – HNO_3 C – H_2SO_4 D – NaOH E – ICE F – Other
1.	S57SS0290103	SOIL		✓	8/17/01	1100	1	1									
2.	S57SB0290103	↓		✓	↓	1110	1	1									
3.	S57SB0290203	↓		✓	↓	1132	1	1									
4.	S57SB0290303	↓		✓	↓	1210	1	1									
5.	S57SB0290403	↓		✓	↓	1220	1	1									
6.																	
7.																	
8.																	

SAMPLE CUSTODY MUST BE DOCUMENTED BELOW EACH TIME SAMPLES CHANGE POSSESSION INCLUDING COURIER DELIVERY

RELINQUISHED BY SAMPLER:	DATE/TIME:	RECEIVED BY:
1. Robert Poelkovic	8/17/01 1500	1.
RELINQUISHED BY: 2.	DATE/TIME:	RECEIVED BY: 2.
RELINQUISHED BY: 3.	DATE/TIME:	RECEIVED FOR LAB BY: 3.

Conditions of bottles or coolers at receipt: ☐ Compliant ☐ Non-Compliant ☐ Temp. of Cooler _____
Comments:

Page _____ of _____

SHIPPED VIA: CLIENT: ☐ HAND DELIVERED ☐ OVERNIGHT
CHEMTECH: ☐ PICKED UP ☐ OVERNIGHT

Shipment Complete: ☐ YES ☐ NO

WHITE – CHEMTECH COPY FOR RETURN TO CLIENT YELLOW – CHEMTECH COPY PINK – SAMPLER COPY

15756

CHEMTECH
CHAIN OF CUSTODY RECORD

284 Sheffield Street, Mountainside, NJ 07092
(908) 789-8900 Fax (908) 789-8922
www.chemtech.net

CHEMTECH JOB NO.:

CHEMTECH QUOTE NO.:

CLIENT INFORMATION

REPORT TO BE SENT TO:

COMPANY: TTNUS

ADDRESS: 661 ANDERSON DR.

CITY: PITTSBURGH STATE: PA ZIP: 15220

ATTENTION: GEORGE LATULIPPE

PHONE: 412-921-7090 FAX: 412-921-4040

PROJECT INFORMATION

PROJECT NAME: [illegible] SITE 57

PROJECT NO.: 7179

PROJECT MANAGER: GEORGE LATULIPPE

LOCATION: PITTSBURGH

PHONE: 412-921-7090 FAX: 412-921-4040

BILLING INFORMATION

BILL TO: [illegible]

ADDRESS:

CITY: STATE: ZIP:

ATTENTION: PHONE:

DATA TURNAROUND INFORMATION

FAX: _____ DAYS *

HARD COPY: _____ DAYS *

EDD: _____ DAYS *

* TO BE APPROVED BY CHEMTECH

** NORMAL TURNAROUND TIME - 14 DAYS

DATA DELIVERABLE INFORMATION

☐ RESULTS ONLY ☐ NY STATE CATEGORY A

☐ RESULTS PLUS QC ☐ NY STATE CATEGORY B

☐ REGULATORY FORMAT, STATE: _____

☐ NEW JERSEY REDUCED DELIVERABLES

☐ CLP

☐ EDD FORMAT: _____

ANALYSIS

1 [illegible] 2 [illegible] 3 [illegible] 4 [illegible] 5 [illegible] 6 [illegible] 7 [illegible] 8 [illegible] 9 [illegible]

CHEMTECH SAMPLE ID	PROJECT SAMPLE IDENTIFICATION	SAMPLE MATRIX	SAMPLE TYPE COMP	SAMPLE TYPE GRAB	SAMPLE COLLECTION DATE	SAMPLE COLLECTION TIME	# OF BOTTLES	PRESERVATIVES 1	2	3	4	5	6	7	8	9	COMMENTS
1.	557TBOOH0003	WATER		✓	5/17/01	0900	1	2									
2.	557MW011-0103	GW		✓	↓	1200	1	2	1	1	1	3	1	1	1	1	
3.	557MW011 0103	↓		✓	↓	1100			1	1			1			1	
4.																	
5.																	
6.																	
7.																	
8.																	

← Specify Preservatives
A – HCl B – HNO_3
C – H_2SO_4 D – NaOH
E – ICE F – Other

SAMPLE CUSTODY MUST BE DOCUMENTED BELOW EACH TIME SAMPLES CHANGE POSSESSION INCLUDING COURIER DELIVERY

RELINQUISHED BY SAMPLER:	DATE/TIME:	RECEIVED BY:
1. Robert Baltimore	5/17/01 1500	1.
RELINQUISHED BY:	DATE/TIME:	RECEIVED BY:
2.		2.
RELINQUISHED BY:	DATE/TIME:	RECEIVED FOR LAB BY:
3.		3.

Conditions of bottles or coolers at receipt: ☐ Compliant ☐ Non-Compliant ☐ Temp. of Cooler ____

Comments:

Page ____ of ____

SHIPPED VIA: CLIENT: ☐ HAND DELIVERED ☐ OVERNIGHT
CHEMTECH: ☐ PICKED UP ☐ OVERNIGHT

Shipment Complete: ☐ YES ☐ NO

WHITE – CHEMTECH COPY FOR RETURN TO CLIENT YELLOW – CHEMTECH COPY PINK – SAMPLER COPY

15765

CHEMTECH
CHAIN OF CUSTODY RECORD

284 Sheffield Street, Mountainside, NJ 07092
(908) 789-8900 Fax (908) 789-8922
www.chemtech.net

CHEMTECH JOB NO.:

CHEMTECH QUOTE NO.:

CLIENT INFORMATION

REPORT TO BE SENT TO:

COMPANY: TtNUS

ADDRESS: 661 ANDERSEN DR

CITY: PITTSBURGH STATE: PA ZIP: 15220

ATTENTION: GEORGE LA IULIPPE

PHONE: 412-921-7090 FAX:

PROJECT INFORMATION

PROJECT NAME: INDIANHEAD SITE 57

PROJECT NO.: 7129

PROJECT MANAGER: GEORGE L.

LOCATION: INDIAN HEAD

PHONE: FAX:

BILLING INFORMATION

BILL TO: PO #:

ADDRESS: SEE CLIENT INFO

CITY: STATE: ZIP:

ATTENTION: PHONE:

DATA TURNAROUND INFORMATION

FAX: _____ DAYS *
HARD COPY: _____ DAYS *
EDD: _____ DAYS *
* TO BE APPROVED BY CHEMTECH
** NORMAL TURNAROUND TIME - 14 DAYS

DATA DELIVERABLE INFORMATION

☐ RESULTS ONLY ☐ NY STATE CATEGORY A
☐ RESULTS PLUS QC ☐ NY STATE CATEGORY B
☐ REGULATORY FORMAT, STATE: _____
☐ NEW JERSEY REDUCED DELIVERABLES
☐ CLP
☐ EDD FORMAT: _____

ANALYSIS

1 TCL VOA + Fungicides
2 Cad, CT
3 COD + TOC
4 HEX CT
5 DISSOLVED GASES
6 HARDNESS
7 FERROUS IRON
8 MISC ANIONS
9 ALK, + TSS
BOD + DOC
CO_2
F = (DISS)
SULFIDE

CHEMTECH SAMPLE ID	PROJECT SAMPLE IDENTIFICATION	SAMPLE MATRIX	SAMPLE TYPE COMP	SAMPLE TYPE GRAB	SAMPLE COLLECTION DATE	SAMPLE COLLECTION TIME	# OF BOTTLES	PRESERVATIVES 1	2	3	4	5	6	7	8	9	COMMENTS
1.	S57TB0050003	AQ		X	8/24/01	1200	2	2									
2.	S57RB0030003	AQ		X	8/24/01	1600	7	2	1		1			1	1		(X) /
3.	S57TW0170103	AQ		X	8/24/01	1601	15	2	1	1	1	3	1	1	1	1	/ / /
4.																	
5.																	
6.																	
7.																	
8.																	

← Specify Preservatives
A – HCl B – HNO_3
C – H_2SO_4 D – NaOH
E – ICE F – Other

SAMPLE CUSTODY MUST BE DOCUMENTED BELOW EACH TIME SAMPLES CHANGE POSSESSION INCLUDING COURIER DELIVERY

RELINQUISHED BY SAMPLER:	DATE/TIME:	RECEIVED BY:
1. FRED Ramsey	8/24/01 1900	1.
RELINQUISHED BY:	DATE/TIME:	RECEIVED BY:
2.		2.
RELINQUISHED BY:	DATE/TIME:	RECEIVED FOR LAB BY:
3.		3.

Conditions of bottles or coolers at receipt: ☐ Compliant ☐ Non-Compliant ☐ Temp. of Cooler _____

Comments: FEDEX AB# 830334177380

Page _____ of _____

SHIPPED VIA: CLIENT: ☐ HAND DELIVERED ☐ OVERNIGHT
CHEMTECH: ☐ PICKED UP ☐ OVERNIGHT

Shipment Complete: ☐ YES ☐ NO

WHITE – CHEMTECH COPY FOR RETURN TO CLIENT YELLOW – CHEMTECH COPY PINK – SAMPLER COPY

15725

CHEMTECH
CHAIN OF CUSTODY RECORD

284 Sheffield Street, Mountainside, NJ 07092
(908) 789-8900 Fax (908) 789-8922
www.chemtech.net

CHEMTECH JOB NO.:

CHEMTECH QUOTE NO.:

CLIENT INFORMATION

REPORT TO BE SENT TO:

COMPANY: TtNUS

ADDRESS: 661 ANDERSON DR

CITY: PGH STATE: PA ZIP: 15220

ATTENTION: GEORGE LATULLIPE

PHONE: 412-921-7090 FAX: —

PROJECT INFORMATION

PROJECT NAME: INDIAN HEAD

PROJECT NO.: 7129

PROJECT MANAGER: GEORGE L.

LOCATION: INDIAN HEAD

PHONE: 412 921 7090 FAX: —

BILLING INFORMATION

BILL TO: PO #:

ADDRESS: SAME AS CLIENT INFO

CITY: STATE: ZIP:

ATTENTION: PHONE:

DATA TURNAROUND INFORMATION

FAX: _____ DAYS *

HARD COPY: _____ DAYS *

EDD: _____ DAYS *

* TO BE APPROVED BY CHEMTECH

** NORMAL TURNAROUND TIME - 14 DAYS

DATA DELIVERABLE INFORMATION

- ☐ RESULTS ONLY
- ☐ RESULTS PLUS QC
- ☐ REGULATORY FORMAT, STATE: _____
- ☐ NEW JERSEY REDUCED DELIVERABLES
- ☐ CLP
- ☐ EDD FORMAT: _____
- ☐ NY STATE CATEGORY A
- ☐ NY STATE CATEGORY B

ANALYSIS

1 TCL VOA STD
2 Cd + Cr
3 COD + TOC
4 HEX Cr
5 DISSOLVED GASES
6 HARDNESS
7 FERROUS IRON
8 MISC ANIONS
9 ALK + TSS
BOD + DOC
COX
Se (DISS)
SULFIDE

PRESERVATIVES

← Specify Preservatives
A – HCl B – HNO_3
C – H_2SO_4 D – NaOH
E – ICE F – Other

CHEMTECH SAMPLE ID	PROJECT SAMPLE IDENTIFICATION	SAMPLE MATRIX	SAMPLE TYPE COMP	SAMPLE TYPE GRAB	SAMPLE COLLECTION DATE	SAMPLE COLLECTION TIME	# OF BOTTLES	1	2	3	4	5	6	7	8	9	COMMENTS
1.	S57TB0060003	AQ		X	8/21/01	1000	2	2									
2.	S57RB0040003	AQ		X	8/21/01	1600	2	2									
3.	S57TW0180103	AQ		X	8/21/01	1345	15	2	1	1	1	3	1	1	1	1	
4.	S57MWDUP02	AQ		X	8/21/01	0000	15	2	1	1	1	3	1	1	1	1	S57TW0180103
5.	S57TW0190103	AQ		X	8/21/01	1115	15	2	1	1	1	3	1	1	1	1	
6.	S57TW0160103	AQ		X	8/21/01	0850	14	2	1	1	[illegible]	3	1	1	1	1	
7.	S57TW0160103	AQ		X	8/21/01	1100	1				1						
8.																	

SAMPLE CUSTODY MUST BE DOCUMENTED BELOW EACH TIME SAMPLES CHANGE POSSESSION INCLUDING COURIER DELIVERY

RELINQUISHED BY SAMPLER:	DATE/TIME:	RECEIVED BY:
1. S Wanner	8/21/01 1900	1.
RELINQUISHED BY:	DATE/TIME:	RECEIVED BY:
2.		2.
RELINQUISHED BY:	DATE/TIME:	RECEIVED FOR LAB BY:
3.		3.

Conditions of bottles or coolers at receipt: ☐ Compliant ☐ Non-Compliant ☐ Temp. of Cooler _____

Comments: FED Ex AB# 830334224747

Page ____ of ____

SHIPPED VIA: CLIENT: ☐ HAND DELIVERED ☐ OVERNIGHT
CHEMTECH: ☐ PICKED UP ☐ OVERNIGHT

Shipment Complete: ☐ YES ☐ NO

WHITE – CHEMTECH COPY FOR RETURN TO CLIENT YELLOW – CHEMTECH COPY PINK – SAMPLER COPY

15731

CHEMTECH
CHAIN OF CUSTODY RECORD

Please check or

☐ 110 Route 4
Englewood, NJ 07631
(201) 567-6868
Fax (201) 567-1333

☐ 205 Campus Plaza 1
Edison, NJ 08837
(732) 225-4111
Fax (732) 225-4110

CHEMTECH JOB NO.:

CHEMTECH QUOTE NO.:

CLIENT INFORMATION

REPORT TO BE SENT TO:

COMPANY: TTNUS

ADDRESS: 661 ANDERSEN DRIVE

CITY: PITTSBURGH STATE: PA ZIP: 15220

ATTENTION: GEORGE LATHROPE

PHONE: 412-921-7090 FAX:

PROJECT INFORMATION

PROJECT NAME: [illegible] 57

PROJECT NO.: 7129

PROJECT MANAGER: GEORGE LATHROPE

LOCATION: [illegible]

PHONE: [illegible] FAX:

BILLING INFORMATION

BILL TO: SAME AS CLIENT PO#: NTO

ADDRESS:

CITY: STATE: ZIP:

ATTENTION: PHONE:

DATA TURNAROUND INFORMATION

FAX: _____ DAYS *
HARD COPY: _____ DAYS *
EDD: _____ DAYS *
* TO BE APPROVED BY CHEMTECH
** NORMAL TURNAROUND TIME - 14 DAYS

DATA DELIVERABLE INFORMATION

☐ RESULTS ONLY ☐ USEPA CLP
☐ RESULTS + QC ☐ NYS ASP "B"
☐ NJ REDUCED ☐ NYS ASP "A"
☐ NJ CLP ☐ EDD
☐ EDD FORMAT: _____

ANALYSIS

TCL VOA + 10 TENTATIVELY IDENTIFIED COMPOUNDS

CHEMTECH SAMPLE ID	PROJECT SAMPLE IDENTIFICATION	SAMPLE MATRIX	SAMPLE TYPE COMP	SAMPLE TYPE GRAB	SAMPLE COLLECTION DATE	SAMPLE COLLECTION TIME	# OF BOTTLES	PRESERVATIVES 1	2	3	4	5	6	7	8	9	COMMENTS
1.	SS7SS037-0103	SOIL		✓	8/2/01	1112	1	1									
2.	SS7SB037-0103			✓		1125	1	1									
3.	SS7SB037-0203			✓		1136	1	1									
4.	SS7SB037-0303			✓		1155	1	1									
5.	SS7SB037-0403			✓		1215	1	1									
6.																	
7.																	
8.																	

← Specify Preservatives
A – HCl B – HNO_3
C – H_2SO_4 D – NaOH
E – ICE F – Other

SAMPLE CUSTODY MUST BE DOCUMENTED BELOW EACH TIME SAMPLES CHANGE POSSESSION INCLUDING COURIER DELIVERY

RELINQUISHED BY SAMPLER:	DATE/TIME:	RECEIVED BY:
1. [signature]	8/2/01 1400	1.
RELINQUISHED BY:	DATE/TIME:	RECEIVED BY:
2.		2.
RELINQUISHED BY:	DATE/TIME:	RECEIVED FOR LAB BY:
3.		3.

Conditions of bottles or coolers at receipt: ☐ Compliant ☐ Non-Compliant ☐ Temp. of Cooler _____

Comments:

FED EX AB# 830334224747

Page _____ of _____

Shipment Complete: Yes _____ No _____

Ver. 6/2000

WHITE – CHEMTECH COPY FOR RETURN TO CLIENT YELLOW – CHEMTECH COPY PINK – SAMPLER COPY

11515

Please check one:

CHEMTECH
CHAIN OF CUSTODY RECORD

284 SHEFFIELD [illegible] NJ 07042

☐ 110 Route 4, Englewood, NJ 07631, (201) 567-6868, Fax (201) 567-1333

☐ 205 Campus Plaza 1, Edison, NJ 08837, (732) 225-4111, Fax (732) 225-4110

CHEMTECH JOB NO.:

CHEMTECH QUOTE NO.:

CLIENT INFORMATION

REPORT TO BE SENT TO:

COMPANY: TENUS

ADDRESS: 661 ANDERSEN

CITY: PITTSBURGH STATE: PA ZIP: 15220

ATTENTION: GEORGE LATULIPPE

PHONE: 412-921-7090 FAX:

PROJECT INFORMATION

PROJECT NAME: INDIAN HEAD FS. SITE 57

PROJECT NO.: 7129

PROJECT MANAGER: GEORGE LAT.

LOCATION: INDIAN HEAD MD

PHONE: 412 921 7090 FAX:

BILLING INFORMATION

BILL TO: PO #:

ADDRESS: SEE CLIENT INFO

CITY: STATE: ZIP:

ATTENTION: PHONE:

DATA TURNAROUND INFORMATION

FAX: _____ DAYS *

HARD COPY: _____ DAYS *

EDD: _____ DAYS *

* TO BE APPROVED BY CHEMTECH

** NORMAL TURNAROUND TIME - 14 DAYS

DATA DELIVERABLE INFORMATION

☐ RESULTS ONLY ☐ USEPA CLP

☐ RESULTS + QC ☐ NYS ASP "B"

☐ NJ REDUCED ☐ NYS ASP "A"

☐ NJ CLP ☐ EDD

☐ EDD FORMAT: _____

ANALYSIS

1 TCL VOA + CE	2 Cd + CT	3 [illegible]	4 HEX CT	5 DISS GAS	6 HARDNESS	7 FERROUS IRON	8 MISC ANIONS	9 Alk + TSS	BOD + DOC	CO2	Fe (DISS)	SULFIDE

PRESERVATIVES / **COMMENTS**

← Specify Preservatives: A – HCl, B – HNO_3, C – H_2SO_4, D – NaOH, E – ICE, F – Other

CHEMTECH SAMPLE ID	PROJECT SAMPLE IDENTIFICATION	SAMPLE MATRIX	SAMPLE TYPE COMP	SAMPLE TYPE GRAB	SAMPLE COLLECTION DATE	SAMPLE COLLECTION TIME	# OF BOTTLES	1	2	3	4	5	6	7	8	9				
1.	S57TB0070003	AQ		X	8/22/01	0800	2	2												
2.	S57TW0150103	AQ		X	8/22/01	1239	15	2	1	1	1	3	1	1	1	1		1	1	1
3.	S57MW0080103	AQ		X	8/22/01	1515	16	2	1	1	1	3	1	1	1	1	1	1	1	1
4.	S57MW0130103	AQ		X	8/22/01	1100	15	2	1	1	1	3	1	1	1	1		1	1	1
5.	S57MW0120103	AQ		X	8/22/01	0115	15	2	1	1	X	3	1	1	1	1		1	1	1
6.	S57TW0210103	AQ		X	8/22/01	1530	15	2	1	1	1	3	1	1	1	1		1	1	1
7.	S57RB0050003	AQ		X	8/22/01	1650	2	2												
8.	S57MW0140103	AQ		X	8/22/01	1100					1									

SAMPLE CUSTODY MUST BE DOCUMENTED BELOW EACH TIME SAMPLES CHANGE POSSESSION INCLUDING COURIER DELIVERY

RELINQUISHED BY SAMPLER:	DATE/TIME:	RECEIVED BY:
1. [signature]	8/22/01 1900	1.
RELINQUISHED BY: 2.	DATE/TIME:	RECEIVED BY: 2.
RELINQUISHED BY: 3.	DATE/TIME:	RECEIVED FOR LAB BY: 3.

Conditions of bottles or coolers at receipt: ☐ Compliant ☐ Non-Compliant ☐ Temp. of Cooler _____

Comments: FED Ex AB# 830334177347

Page 1 of 2

Shipment Complete: Yes _____ No _____

Ver. 6/2000

WHITE – CHEMTECH COPY FOR RETURN TO CLIENT YELLOW – CHEMTECH COPY PINK – SAMPLER COPY

41516

CHEMTECH
CHAIN OF CUSTODY RECORD

284 Sheffield Street, Mountainside, NJ 07092
(908) 789-8900 Fax (908) 789-8922
www.chemtech.net

CHEMTECH JOB NO.:

CHEMTECH QUOTE NO.:

CLIENT INFORMATION

REPORT TO BE SENT TO:

COMPANY: TT NUS
ADDRESS: 661 ANDERSEN DRIVE
CITY: PITTSBURGH STATE: PA ZIP: 15220
ATTENTION: G. LATULIPPE
PHONE: 412-921-7090 FAX:

PROJECT INFORMATION

PROJECT NAME: NSWC INDIAN HEAD
PROJECT NO.: N7129
PROJECT MANAGER: G. LATULIPPE
LOCATION: INDIAN HEAD, MD.
PHONE: 412-921-7090 FAX:

BILLING INFORMATION

BILL TO: AMEAS CLIENT INFO PO #:
ADDRESS:
CITY: STATE: ZIP:
ATTENTION: PHONE:

DATA TURNAROUND INFORMATION

FAX: _____ DAYS *
HARD COPY: _____ DAYS *
EDD: _____ DAYS *
* TO BE APPROVED BY CHEMTECH
** NORMAL TURNAROUND TIME - 14 DAYS

DATA DELIVERABLE INFORMATION

☐ RESULTS ONLY ☐ NY STATE CATEGORY A
☐ RESULTS PLUS QC ☐ NY STATE CATEGORY B
☐ REGULATORY FORMAT, STATE: _____
☐ NEW JERSEY REDUCED DELIVERABLES
☐ CLP
☐ EDD FORMAT: _____

ANALYSIS

TCL VOC's: ETHYL ETHER

1 2 3 4 5 6 7 8 9

PRESERVATIVES

CHEMTECH SAMPLE ID	PROJECT SAMPLE IDENTIFICATION	SAMPLE MATRIX	SAMPLE TYPE COMP	SAMPLE TYPE GRAB	SAMPLE COLLECTION DATE	SAMPLE COLLECTION TIME	# OF BOTTLES	1 (4°C)	2	3	4	5	6	7	8	9	COMMENTS
1.	S57SB0330103	Soil		✓	8/22/01	1457	1	1									
2.																	
3.																	
4.																	
5.																	
6.																	
7.																	
8.																	

← Specify Preservatives
A – HCl B – HNO_3
C – H_2SO_4 D – NaOH
E – ICE F – Other

SAMPLE CUSTODY MUST BE DOCUMENTED BELOW EACH TIME SAMPLES CHANGE POSSESSION INCLUDING COURIER DELIVERY

RELINQUISHED BY SAMPLER:	DATE/TIME:	RECEIVED BY:
1. [signature]	8/22/01 1900	1.
RELINQUISHED BY: 2.	DATE/TIME:	RECEIVED BY: 2.
RELINQUISHED BY: 3.	DATE/TIME:	RECEIVED FOR LAB BY: 3.

Conditions of bottles or coolers at receipt: ☐ Compliant ☐ Non-Compliant ☐ Temp. of Cooler _____

Comments:
FED Ex AB# 830334177347

Page 2 of 2

SHIPPED VIA: CLIENT: ☐ HAND DELIVERED ☐ OVERNIGHT
CHEMTECH: ☐ PICKED UP ☐ OVERNIGHT

Shipment Complete: ☐ YES ☐ NO

WHITE – CHEMTECH COPY FOR RETURN TO CLIENT YELLOW – CHEMTECH COPY PINK – SAMPLER COPY

15727

CHEMTECH
CHAIN OF CUSTODY RECORD

Please check one:

☐ 110 Route 4, Englewood, NJ 07631, (201) 567-6868, Fax (201) 567-1333

☐ 205 Campus Plaza 1, Edison, NJ 08837, (732) 225-4111, Fax (732) 225-4110

CHEMTECH JOB NO.:

CHEMTECH QUOTE NO.:

CLIENT INFORMATION

REPORT TO BE SENT TO:

COMPANY: TetraTech NUS

ADDRESS: 661 Anderson Drive

CITY: Pittsburgh STATE: PA ZIP: 15220

ATTENTION: George Latuillipe

PHONE: 412-921-7090 FAX:

PROJECT INFORMATION

PROJECT NAME: Indian Head

PROJECT NO.: 7129

PROJECT MANAGER: George Latuillipe

LOCATION: Indian Head

PHONE: 412-921-7090 FAX:

BILLING INFORMATION

BILL TO: PO #:

ADDRESS: SAME AS CLIENT INFO

CITY: STATE: ZIP:

ATTENTION: PHONE:

DATA TURNAROUND INFORMATION

FAX: _____ DAYS *

HARD COPY: _____ DAYS *

EDD: _____ DAYS *

* TO BE APPROVED BY CHEMTECH

** NORMAL TURNAROUND TIME - 14 DAYS

DATA DELIVERABLE INFORMATION

☐ RESULTS ONLY ☐ USEPA CLP

☐ RESULTS + QC ☐ NYS ASP "B"

☐ NJ REDUCED ☐ NYS ASP "A"

☐ NJ CLP ☐ EDD

☐ EDD FORMAT: _____

ANALYSIS

1	2	3	4	5	6	7	8	9
TCL VOC	Cd Cr	Cod, TOC	Net Cr	Dissolved Gases	Hardness	Ferrous Iron	Misc. Anions	Sulfide
Alkalinity	TSS	DOC	BOC	CO2	Dissolved			

PRESERVATIVES

CHEMTECH SAMPLE ID	PROJECT SAMPLE IDENTIFICATION	SAMPLE MATRIX	SAMPLE TYPE COMP	SAMPLE TYPE GRAB	SAMPLE COLLECTION DATE	SAMPLE COLLECTION TIME	# OF BOTTLES	1	2	3	4	5	6	7	8	9	COMMENTS				
1.	S57MW0090103 *	AQ		X	8/23/01	1130	~~33~~ 33	6	3	1	~~X~~ 9	1	1	3	1	1	1		1	3	
2.	S57MW0100103	AQ		X	8/23/01	1214	15	2	1	1	1	3	1	1	1	1	1		1	1	
3.	S57MWDUP03	AQ		X	8/23/01	0000	15	2	1	1	1	3	1	1	1	1	1		1	1	MW07
4.	S57MW0070103	AQ		X	8/23/01	0915	15	2	1	1		3	1	1	1	1	1	1	1	1	
5.	S57MW0070103	AQ		X	8/23/01	1550	1				1										
6.	S57MW0050103	AQ		X	8/23/01	1504	15	2	1	1	1	3	1	1	1	1	1		1	1	
7.	S57MW0090103	AQ		X	8/23/01	1200	3				3*										
8.																					

← Specify Preservatives: A – HCl, B – HNO_3, C – H_2SO_4, D – NaOH, E – ICE, F – Other

SAMPLE CUSTODY MUST BE DOCUMENTED BELOW EACH TIME SAMPLES CHANGE POSSESSION INCLUDING COURIER DELIVERY

RELINQUISHED BY SAMPLER:	DATE/TIME:	RECEIVED BY:
1. S. Kramer	8/23/01 1900 HR	1.
RELINQUISHED BY: 2.	DATE/TIME:	RECEIVED BY: 2.
RELINQUISHED BY: 3.	DATE/TIME:	RECEIVED FOR LAB BY: 3.

Conditions of bottles or coolers at receipt: ☐ Compliant ☐ Non-Compliant ☐ Temp. of Cooler _____

Comments: * MS/MSD

FEDEX AB# 830334177370

Page ____ of 5

Shipment Complete: Yes _____ No _____

Ver. 6/2000

WHITE – CHEMTECH COPY FOR RETURN TO CLIENT YELLOW – CHEMTECH COPY PINK – SAMPLER COPY

41519

CHEMTECH
CHAIN OF CUSTODY RECORD

284 [illegible] ST
[illegible]
07092

Please check one:

☐ 110 Route 4
Englewood, NJ 07631
(201) 567-6868
Fax (201) 567-1333

205 Campus Plaza 1
Edison, NJ 08837
(732) 225-4111
Fax (732) 225-4110

CHEMTECH JOB NO.:

CHEMTECH QUOTE NO.:

CLIENT INFORMATION

REPORT TO BE SENT TO:

COMPANY: TENUS
ADDRESS: 661 ANDERSEN DR
CITY: PGH STATE: PA ZIP: 15220
ATTENTION: GEORGE LATULIPPE
PHONE: 412-921-7090 FAX: —

PROJECT INFORMATION

PROJECT NAME: [illegible]
PROJECT NO.: 7129
PROJECT MANAGER: GEORGE LATULIPPE
LOCATION: [illegible]
PHONE: 412-921-7090 FAX:

BILLING INFORMATION

BILL TO: PO #:
ADDRESS: [illegible]
CITY: STATE: ZIP:
ATTENTION: PHONE:

DATA TURNAROUND INFORMATION

FAX: _____ DAYS *
HARD COPY: _____ DAYS *
EDD: _____ DAYS *
* TO BE APPROVED BY CHEMTECH
** NORMAL TURNAROUND TIME - 14 DAYS

DATA DELIVERABLE INFORMATION

☐ RESULTS ONLY ☐ USEPA CLP
☐ RESULTS + QC ☐ NYS ASP "B"
☐ NJ REDUCED ☐ NYS ASP "A"
☐ NJ CLP ☐ EDD
☐ EDD FORMAT: _____

ANALYSIS

1 TCL VOA + ee
2 Cad CT
3 [illegible]
4 Hex CT
5 [illegible]
6 [illegible]
7 FERROUS IRON
8 MISC ANIONS
9 ALK + TSS
BOD + [illegible]
[illegible]

CHEMTECH SAMPLE ID	PROJECT SAMPLE IDENTIFICATION	SAMPLE MATRIX	SAMPLE TYPE COMP	SAMPLE TYPE GRAB	SAMPLE COLLECTION DATE	SAMPLE COLLECTION TIME	# OF BOTTLES	PRESERVATIVES 1	2	3	4	5	6	7	8	9	COMMENTS ← Specify Preservatives A – HCl B – HNO_3 C – H_2SO_4 D – NaOH E – ICE F – Other
1.	S57TB0080003	AQ		X	8/23/01	0800	2	2									
2.	~~S57MW0090103~~	~~AQ~~		~~X~~	~~8/23/01~~	~~1130~~		FYR									
3.	S57TW0140103	AQ		X	8/23/01	1625	15	2	1	1	1	3	1	1	1	1	1 1 1
4.																	
5.																	
6.																	
7.																	
8.																	

SAMPLE CUSTODY MUST BE DOCUMENTED BELOW EACH TIME SAMPLES CHANGE POSSESSION INCLUDING COURIER DELIVERY

RELINQUISHED BY SAMPLER:	DATE/TIME:	RECEIVED BY:
1. [signature]	8/23/01 1900HR	1.
RELINQUISHED BY: 2.	DATE/TIME:	RECEIVED BY: 2.
RELINQUISHED BY: 3.	DATE/TIME:	RECEIVED FOR LAB BY: 3.

Conditions of bottles or coolers at receipt: ☐ Compliant ☐ Non-Compliant ☐ Temp. of Cooler _____

Comments:

FED Ex AB# 830334177370

Page 2 of 5

Shipment Complete: Yes _____ No _____

Ver. 6/2000 WHITE – CHEMTECH COPY FOR RETURN TO CLIENT YELLOW – CHEMTECH COPY PINK – SAMPLER COPY

41517

CHEMTECH
CHAIN OF CUSTODY RECORD

284 Sheffield Street, Mountainside, NJ 07092
(908) 789-8900 Fax (908) 789-8922
www.chemtech.net

CHEMTECH JOB NO.:

CHEMTECH QUOTE NO.:

CLIENT INFORMATION

REPORT TO BE SENT TO:

COMPANY: TTNUS

ADDRESS: 661 ANDERSEN DR

CITY: PITTSBURGH STATE: PA ZIP: 15200

ATTENTION: G. LATULIPPE

PHONE: 412-921-7090 FAX:

PROJECT INFORMATION

PROJECT NAME: NSWC INDIAN HEAD

PROJECT NO.: N7129

PROJECT MANAGER: G. LATULIPPE

LOCATION: INDIAN HEAD, MD

PHONE: 412-921-7090 FAX:

BILLING INFORMATION

BILL TO: SAME AS CLIENT INFO

ADDRESS:

CITY: STATE: ZIP:

ATTENTION: PHONE:

DATA TURNAROUND INFORMATION

FAX: _____ DAYS *
HARD COPY: _____ DAYS *
EDD: _____ DAYS *
* TO BE APPROVED BY CHEMTECH
** NORMAL TURNAROUND TIME - 14 DAYS

DATA DELIVERABLE INFORMATION

☐ RESULTS ONLY ☐ NY STATE CATEGORY A
☐ RESULTS PLUS QC ☐ NY STATE CATEGORY B
☐ REGULATORY FORMAT, STATE: _____
☐ NEW JERSEY REDUCED DELIVERABLES
☐ CLP
☐ EDD FORMAT: _____

ANALYSIS

1 TCL VOC's w/ETHYL ETHER
2 ARSENIC
3 ARSENIC, CEC, + pH
4 CEC, + pH
5
6
7
8
9

CHEMTECH SAMPLE ID	PROJECT SAMPLE IDENTIFICATION	SAMPLE MATRIX	SAMPLE TYPE COMP	SAMPLE TYPE GRAB	SAMPLE COLLECTION DATE	SAMPLE COLLECTION TIME	# OF BOTTLES	PRESERVATIVES 1	2	3	4	5	6	7	8	9	COMMENTS
1.	S57SS0180103	SOIL		✓	8/23/01	0930	2	1	1								
2.	S57SB0180103			✓		0950	2	1		1							
3.	S57SB0180203			✓		1001	1	1									
4.	S57SB0180303			✓		1030	1	1			1						
5.	S57SB0180403			✓		1055	1	1									
6.	S57SS0190103			✓		1114	1	1									
7.	S57SB0190103			✓		1120	1	1									
8.	S57SB0190203			✓		1125	1										

← Specify Preservatives
A – HCl B – HNO_3
C – H_2SO_4 D – NaOH
E – ICE F – Other

SAMPLE CUSTODY MUST BE DOCUMENTED BELOW EACH TIME SAMPLES CHANGE POSSESSION INCLUDING COURIER DELIVERY

RELINQUISHED BY SAMPLER:	DATE/TIME:	RECEIVED BY:
1. J.W. Ramsey	8/23/01 1900HR	1.
RELINQUISHED BY: 2.	DATE/TIME:	RECEIVED BY: 2.
RELINQUISHED BY: 3.	DATE/TIME:	RECEIVED FOR LAB BY: 3.

Conditions of bottles or coolers at receipt: ☐ Compliant ☐ Non-Compliant ☐ Temp. of Cooler _____
Comments: FED EX AB# 830334177370

Page 3 of 5

SHIPPED VIA: CLIENT: ☐ HAND DELIVERED ☐ OVERNIGHT
CHEMTECH: ☐ PICKED UP ☐ OVERNIGHT

Shipment Complete: ☐ YES ☐ NO

WHITE – CHEMTECH COPY FOR RETURN TO CLIENT YELLOW – CHEMTECH COPY PINK – SAMPLER COPY

15740

Please check one:

☐ 110 Route 4
Englewood, NJ 07631
(201) 567-6868
Fax (201) 567-1333

☐ 205 Campus Plaza 1
Edison, NJ 08837
(732) 225-4111
Fax (732) 225-4110

CHEMTECH JOB NO.:

CHEMTECH QUOTE NO.:

CHEMTECH
CHAIN OF CUSTODY RECORD

CLIENT INFORMATION

REPORT TO BE SENT TO:

COMPANY: TTNUS

ADDRESS: 661 ANDERSEN DR.

CITY: PITTSBURGH STATE: PA ZIP: 15220

ATTENTION: GERALD TUMAMPAL

PHONE: 412 921 7090 FAX:

PROJECT INFORMATION

PROJECT NAME: NAVAL STATION NORFOLK

PROJECT NO.: 1) 7129

PROJECT MANAGER: GERALD TUMAMPAL

LOCATION: NORFOLK, VA

PHONE: 412 921 7090 FAX:

BILLING INFORMATION

BILL TO: PO #:

ADDRESS: SEE CLIENT INFO

CITY: STATE: ZIP:

ATTENTION: PHONE:

DATA TURNAROUND INFORMATION

FAX: _____ DAYS *
HARD COPY: _____ DAYS *
EDD: _____ DAYS *
* TO BE APPROVED BY CHEMTECH
** NORMAL TURNAROUND TIME - 14 DAYS

DATA DELIVERABLE INFORMATION

☐ RESULTS ONLY ☐ USEPA CLP
☐ RESULTS + QC ☐ NYS ASP "B"
☐ NJ REDUCED ☐ NYS ASP "A"
☐ NJ CLP ☐ EDD
☐ EDD FORMAT: _____

ANALYSIS

1 TCL VOA + TICS
2 TCL SVOA + TICS
3 TAL METALS (CEC + pH)
4 TAL METALS (CEC + pH)
5 CEC + pH
6
7
8
9

CHEMTECH SAMPLE ID	PROJECT SAMPLE IDENTIFICATION	SAMPLE MATRIX	SAMPLE TYPE COMP	SAMPLE TYPE GRAB	SAMPLE COLLECTION DATE	SAMPLE COLLECTION TIME	# OF BOTTLES	PRESERVATIVES 1	2	3	4	5	6	7	8	9	COMMENTS
1.	SS7SB01710403	SOIL		✓	8/22/01	1335	1	1									
2.	SS7SB01160103			✓		1403	2	1	1								
3.	SS7SB01160103			✓		1413	2	1		1							
4.	SS7SB01160203			✓		1420	1	1									
5.	SS7SB01160303			✓		1440	2	1			1						
6.	SS7SB04P04			✓		0900	2	1		1							
7.	SS7FB01160203			✓	↓	1345	2	1	1								
8.																	

← Specify Preservatives
A – HCl B – HNO_3
C – H_2SO_4 D – NaOH
E – ICE F – Other

SAMPLE CUSTODY MUST BE DOCUMENTED BELOW EACH TIME SAMPLES CHANGE POSSESSION INCLUDING COURIER DELIVERY

RELINQUISHED BY SAMPLER:	DATE/TIME:	RECEIVED BY:
1. [signature]	8/23/01 1900 HR	1.
RELINQUISHED BY:	DATE/TIME:	RECEIVED BY:
2.		2.
RELINQUISHED BY:	DATE/TIME:	RECEIVED FOR LAB BY:
3.		3.

Conditions of bottles or coolers at receipt: ☐ Compliant ☐ Non-Compliant ☐ Temp. of Cooler _____
Comments: FED EX AB# 823334177370

Page 4 of 5

Shipment Complete: Yes _____ No _____

Ver. 6/2000

WHITE – CHEMTECH COPY FOR RETURN TO CLIENT YELLOW – CHEMTECH COPY PINK – SAMPLER COPY

41518

CHEMTECH
CHAIN OF CUSTODY RECORD

284 Sheffield Street, Mountainside, NJ 07092
(908) 789-8900 Fax (908) 789-8922
www.chemtech.net

CHEMTECH JOB NO.:

CHEMTECH QUOTE NO.:

CLIENT INFORMATION

REPORT TO BE SENT TO:

COMPANY: TTNUS

ADDRESS: 661 ANDERSON DR

CITY: PITTSBURGH STATE: PA ZIP: 15220

ATTENTION: GEORGE LATULIPPE

PHONE: 412 921-7090 FAX:

PROJECT INFORMATION

PROJECT NAME: NSWC INDIAN HEAD

PROJECT NO.: N7124

PROJECT MANAGER: GEORGE LATULIPPE

LOCATION: INDIAN HEAD, M.D.

PHONE: 412-921-7090 FAX:

BILLING INFORMATION

BILL TO: PO #:

ADDRESS: SEE CLIENT INFO

CITY: STATE: ZIP:

ATTENTION: PHONE:

DATA TURNAROUND INFORMATION

FAX: _____ DAYS *
HARD COPY: _____ DAYS *
EDD: _____ DAYS *
* TO BE APPROVED BY CHEMTECH
** NORMAL TURNAROUND TIME - 14 DAYS

DATA DELIVERABLE INFORMATION

☐ RESULTS ONLY ☐ NY STATE CATEGORY A
☐ RESULTS PLUS QC ☐ NY STATE CATEGORY B
☐ REGULATORY FORMAT, STATE: _____
☐ NEW JERSEY REDUCED DELIVERABLES
☐ CLP
☐ EDD FORMAT: _____

ANALYSIS

1 TCL VOC's, ETHYL ETHER
2 ARSENIC
3 ARSENIC (CLC, pH)
4
5
6
7
8
9

PRESERVATIVES

CHEMTECH SAMPLE ID	PROJECT SAMPLE IDENTIFICATION	SAMPLE MATRIX	SAMPLE TYPE COMP	SAMPLE TYPE GRAB	SAMPLE COLLECTION DATE	SAMPLE COLLECTION TIME	# OF BOTTLES	1	2	3	4	5	6	7	8	9	COMMENTS
1.	S57SB0190303	SOIL		✓	8/23/01	1142	1	1									
2.	S57SB0190403			✓		1155	1	1									
3.	S57SSDUP01			✓		0000	2	1	1								
4.	S57SSDUP02			✓		0000	2	1	1								
5.	S57SS0170103			✓		1245	2	1	1								
6.	S57SB0170103			✓		1251	2	1	1								
7.	S57SB0170203			✓		1304	1	1									
8.	S57SB0170308 3			✓		1312	1	1									

← Specify Preservatives
A – HCl B – HNO_3
C – H_2SO_4 D – NaOH
E – ICE F – Other

SAMPLE CUSTODY MUST BE DOCUMENTED BELOW EACH TIME SAMPLES CHANGE POSSESSION INCLUDING COURIER DELIVERY

RELINQUISHED BY SAMPLER:	DATE/TIME:	RECEIVED BY:
1. JLRanson	8/23/01 1900HR	1.
RELINQUISHED BY: 2.	DATE/TIME:	RECEIVED BY: 2.
RELINQUISHED BY: 3.	DATE/TIME:	RECEIVED FOR LAB BY: 3.

Conditions of bottles or coolers at receipt: ☐ Compliant ☐ Non-Compliant ☐ Temp. of Cooler _____

Comments: FED EX AB# 830334177370

Page 5 of 5

SHIPPED VIA: CLIENT: ☐ HAND DELIVERED ☐ OVERNIGHT
CHEMTECH: ☐ PICKED UP ☐ OVERNIGHT

Shipment Complete: ☐ YES ☐ NO

WHITE – CHEMTECH COPY FOR RETURN TO CLIENT YELLOW – CHEMTECH COPY PINK – SAMPLER COPY

15736

Ver. 7/2001

CHEMTECH
CHAIN OF CUSTODY RECORD

284 Sheffield Street, Mountainside, NJ 07092
(908) 789-8900 Fax (908) 789-8922
www.chemtech.net

CHEMTECH JOB NO.:

CHEMTECH QUOTE NO.:

CLIENT INFORMATION

REPORT TO BE SENT TO:

COMPANY: TETRA TECH NUS

ADDRESS: 661 ANDERSEN DR

CITY: PGH STATE: PA ZIP: 15220

ATTENTION: GEORGE LAIULIPPE

PHONE: 412-921-7090 FAX: —

PROJECT INFORMATION

PROJECT NAME: INDIAN HEAD

PROJECT NO.: 7129

PROJECT MANAGER: GEORGE LAT.

LOCATION: INDIAN HEAD

PHONE: 412-921-7090 FAX: —

BILLING INFORMATION

BILL TO: PO #:

ADDRESS: SEE CLIENT INFO

CITY: STATE: ZIP:

ATTENTION: PHONE:

DATA TURNAROUND INFORMATION

FAX: _____ DAYS *

HARD COPY: _____ DAYS *

EDD: _____ DAYS *

* TO BE APPROVED BY CHEMTECH

** NORMAL TURNAROUND TIME - 14 DAYS

DATA DELIVERABLE INFORMATION

☐ RESULTS ONLY ☐ NY STATE CATEGORY A

☐ RESULTS PLUS QC ☐ NY STATE CATEGORY B

☐ REGULATORY FORMAT, STATE: _____

☐ NEW JERSEY REDUCED DELIVERABLES

☐ CLP

☐ EDD FORMAT: _____

ANALYSIS

1 TCL VOC's + TICs 2 TCL SVOC's + TICs 3 TOC + pH 4 5 6 7 8 9

CHEMTECH SAMPLE ID	PROJECT SAMPLE IDENTIFICATION	SAMPLE MATRIX	SAMPLE TYPE COMP	SAMPLE TYPE GRAB	SAMPLE COLLECTION DATE	SAMPLE COLLECTION TIME	# OF BOTTLES	PRESERVATIVES 1	2	3	4	5	6	7	8	9	COMMENTS
1.	S57TB0040003	WATER		✓	8/24/01	0730	2	2									
2.	S57SB0310103	SOIL		✓		0807	3	3									RUN MS/MSD (VOC's)
3.	S57SB0310203			✓		0828	2	1	1								
4.	S57SB0310303			✓		0840	1	1									
5.	S57SB0310403			✓		0400	4	3	1								RUN MS/MSD (VOC's)
6.	S57SB0300103			✓		1005	1	1									
7.	S57SB0300203			✓		1015	2	2	1								
8.	S57SB0300303			✓		1045	1	1									

← Specify Preservatives
A – HCl B – HNO_3
C – H_2SO_4 D – NaOH
E – ICE F – Other

SAMPLE CUSTODY MUST BE DOCUMENTED BELOW EACH TIME SAMPLES CHANGE POSSESSION INCLUDING COURIER DELIVERY

RELINQUISHED BY SAMPLER:	DATE/TIME:	RECEIVED BY:
1. [signature]	8/24/01 1530	1.
RELINQUISHED BY:	DATE/TIME:	RECEIVED BY:
2.		2.
RELINQUISHED BY:	DATE/TIME:	RECEIVED FOR LAB BY:
3.		3.

Conditions of bottles or coolers at receipt: ☐ Compliant ☐ Non-Compliant ☐ Temp. of Cooler _____

Comments:

FED EX AB# 830334224758

Page 1 of 3

SHIPPED VIA: CLIENT: ☐ HAND DELIVERED ☐ OVERNIGHT
CHEMTECH: ☐ PICKED UP ☐ OVERNIGHT

Shipment Complete: ☐ YES ☐ NO

WHITE – CHEMTECH COPY FOR RETURN TO CLIENT YELLOW – CHEMTECH COPY PINK – SAMPLER COPY

15762

CHEMTECH

CHAIN OF CUSTODY RECORD

Please check one:

☐ 110 Route 4
Englewood, NJ 07631
(201) 567-6868
Fax (201) 567-1333

☐ 205 Campus Plaza 1
Edison, NJ 08837
(732) 225-4111
Fax (732) 225-4110

CHEMTECH JOB NO.:

CHEMTECH QUOTE NO.:

CLIENT INFORMATION

REPORT TO BE SENT TO:

COMPANY: TtNUS

ADDRESS: 661 Andersen Dr

CITY: Pittsburgh STATE: PA ZIP: 15220

ATTENTION: George Latullipe

PHONE: 412-921-7090 FAX: ——

PROJECT INFORMATION

PROJECT NAME: Indian Head

PROJECT NO.: 7121

PROJECT MANAGER: George Latullipe

LOCATION: Indian Head

PHONE: 412-921-7090 FAX: ——

BILLING INFORMATION

BILL TO: PO #:

ADDRESS: NAVY AS CLIENT INFO

CITY: STATE: ZIP:

ATTENTION: PHONE:

DATA TURNAROUND INFORMATION

FAX: _____ DAYS *
HARD COPY: _____ DAYS *
EDD: _____ DAYS *
* TO BE APPROVED BY CHEMTECH
** NORMAL TURNAROUND TIME - 14 DAYS

DATA DELIVERABLE INFORMATION

☐ RESULTS ONLY ☐ USEPA CLP
☐ RESULTS + QC ☐ NYS ASP "B"
☐ NJ REDUCED ☐ NYS ASP "A"
☐ NJ CLP ☐ EDD
☐ EDD FORMAT: _____

ANALYSIS

1 TCL VOA +22
2 Cd + Cr
3 Cadmium
4 Hex Cr
5 Dissolved Gases
6 Hardness
7 Ferrous Iron
8 Mix Anions
9 Alk + TSS
Carbon Dioxide
Dissolved Fe
Sulfide

CHEMTECH SAMPLE ID	PROJECT SAMPLE IDENTIFICATION	SAMPLE MATRIX	SAMPLE TYPE COMP	SAMPLE TYPE GRAB	SAMPLE COLLECTION DATE	SAMPLE COLLECTION TIME	# OF BOTTLES	PRESERVATIVES 1 (HCl)	2 (HNO3)	3 (H2SO4)	4	5	6 (NaOH)	7	8	9	COMMENTS
1.	SS7MW0060102	AQ		X	9/21/01	0858	14	2	1	1		3	1	1	1	1	
2.	SS7MW0060103	AQ		X	9/21/01	[illegible]	1				1						
3.																	
4.																	
5.																	
6.																	
7.																	
8.																	

Specify Preservatives
A – HCl B – HNO_3
C – H_2SO_4 D – NaOH
E – ICE F – Other

SAMPLE CUSTODY MUST BE DOCUMENTED BELOW EACH TIME SAMPLES CHANGE POSSESSION INCLUDING COURIER DELIVERY

RELINQUISHED BY SAMPLER:	DATE/TIME:	RECEIVED BY:
1. [signature]	9/24/01 1530	1.
RELINQUISHED BY:	DATE/TIME:	RECEIVED BY:
2.		2.
RELINQUISHED BY	DATE/TIME:	RECEIVED FOR LAB BY:
3.		3.

Conditions of bottles or coolers at receipt: ☐ Compliant ☐ Non-Compliant ☐ Temp. of Cooler _____

Comments: Fed Ex AB# 830334224758

Page 2 of 3

Shipment Complete: Yes _____ No _____

Ver. 6/2000

WHITE – CHEMTECH COPY FOR RETURN TO CLIENT YELLOW – CHEMTECH COPY PINK – SAMPLER COPY

41501

CHEMTECH

CHAIN OF CUSTODY RECORD

284 Sheffield Street, Mountainside, NJ 07092
(908) 789-8900 Fax (908) 789-8922
www.chemtech.net

CHEMTECH JOB NO.:

CHEMTECH QUOTE NO.:

CLIENT INFORMATION

REPORT TO BE SENT TO:

COMPANY: TTNUS

ADDRESS: 661 ANDERSEN DR

CITY: PITTSBURGH STATE: PA ZIP: 15220

ATTENTION: G. LATULIPPE

PHONE: 412 921 7090 FAX:

PROJECT INFORMATION

PROJECT NAME: NSWC INDIAN HEAD

PROJECT NO.: 7129

PROJECT MANAGER: G. LATULIPPE

LOCATION: INDIAN HEAD, MD

PHONE: 412-921-7090 FAX:

BILLING INFORMATION

BILL TO: PO #:

ADDRESS: SEE CLIENT INFO

CITY: STATE: ZIP:

ATTENTION: PHONE:

DATA TURNAROUND INFORMATION

FAX: _____ DAYS *

HARD COPY: _____ DAYS *

EDD: _____ DAYS *

* TO BE APPROVED BY CHEMTECH

** NORMAL TURNAROUND TIME - 14 DAYS

DATA DELIVERABLE INFORMATION

- ☐ RESULTS ONLY
- ☐ RESULTS PLUS QC
- ☐ REGULATORY FORMAT, STATE: _____
- ☐ NEW JERSEY REDUCED DELIVERABLES
- ☐ CLP
- ☐ EDD FORMAT: _____
- ☐ NY STATE CATEGORY A
- ☐ NY STATE CATEGORY B

ANALYSIS

1 TCL VOC's 2 TOC + PH 3 TOC 4 5 6 7 8 9

CHEMTECH SAMPLE ID	PROJECT SAMPLE IDENTIFICATION	SAMPLE MATRIX	SAMPLE TYPE COMP	SAMPLE TYPE GRAB	SAMPLE COLLECTION DATE	SAMPLE COLLECTION TIME	# OF BOTTLES	PRESERVATIVES 1	2	3	4	5	6	7	8	9	COMMENTS ← Specify Preservatives A – HCl B – HNO_3 C – H_2SO_4 D – NaOH E – ICE F – Other
1.	S57SB0300403	Soil		✓	8/24/01	1145	2	1	1								Run MS/MD on VOC [illegible]
2.	S57SBDUP05			✓		0000	2	1	1								
3.	S57SBDUP06			✓		0000	2	1	1								
4.	S57SB0320103			✓		1305	1	1									
5.	S57SB0320203			✓		1315	2	1	1								
6.	S57SB0320303			✓		1335	1	1									
7.	S57SB0320403			✓		1345	2	1	1								
8.	S57RB0070003	Water		✓	8/24/01	1445	3	2		1							

SAMPLE CUSTODY MUST BE DOCUMENTED BELOW EACH TIME SAMPLES CHANGE POSSESSION INCLUDING COURIER DELIVERY

RELINQUISHED BY SAMPLER:	DATE/TIME:	RECEIVED BY:
1. [signature]	8/24/01 1530	1.
RELINQUISHED BY: 2.	DATE/TIME:	RECEIVED BY: 2.
RELINQUISHED BY: 3.	DATE/TIME:	RECEIVED FOR LAB BY: 3.

Conditions of bottles or coolers at receipt: ☐ Compliant ☐ Non-Compliant ☐ Temp. of Cooler _____

Comments:

FED Fx AB# 830334224758

Page 3 of 3

SHIPPED VIA: CLIENT: ☐ HAND DELIVERED ☐ OVERNIGHT
CHEMTECH: ☐ PICKED UP ☐ OVERNIGHT

Shipment Complete: ☐ YES ☐ NO

WHITE – CHEMTECH COPY FOR RETURN TO CLIENT YELLOW – CHEMTECH COPY PINK – SAMPLER COPY

15762

CHEMTECH
CHAIN OF CUSTODY RECORD

Please check one:

☐ 110 Route 4
Englewood, NJ 07631
(201) 567-6868
Fax (201) 567-1333

☐ 205 Campus Plaza 1
Edison, NJ 08837
(732) 225-4111
Fax (732) 225-4110

CHEMTECH JOB NO.:

CHEMTECH QUOTE NO.:

CLIENT INFORMATION

REPORT TO BE SENT TO:

COMPANY: TENUS
ADDRESS: 661 Anderson Dr.
CITY: Pittsburgh STATE: PA ZIP: 15220
ATTENTION: George Latulippe
PHONE: 412-921-7090 FAX:

PROJECT INFORMATION

PROJECT NAME: Indian Head
PROJECT NO.: 7129
PROJECT MANAGER: G Latulippe
LOCATION: Indian head
PHONE: 412-921-7090 FAX:

BILLING INFORMATION

BILL TO: SEE CLIENT PO#: INFO
ADDRESS:
CITY: STATE: ZIP:
ATTENTION: PHONE:

DATA TURNAROUND INFORMATION

FAX: _____ DAYS *
HARD COPY: _____ DAYS *
EDD: _____ DAYS *
* TO BE APPROVED BY CHEMTECH
** NORMAL TURNAROUND TIME - 14 DAYS

DATA DELIVERABLE INFORMATION

☐ RESULTS ONLY ☐ USEPA CLP
☐ RESULTS + QC ☐ NYS ASP "B"
☐ NJ REDUCED ☐ NYS ASP "A"
☐ NJ CLP ☐ EDD
☐ EDD FORMAT: _____

ANALYSIS

1 TCL VOAs + Fe
2 Cd + Cr
3 COD + TOC
4 Hex Cr
5 Diss Gases
6 Hardness
7 Ferrous Iron
8 Misc Anions
9 Alk + TSS
Carbon Dioxide
Dissolved Fe
Sulfide

PRESERVATIVES

CHEMTECH SAMPLE ID	PROJECT SAMPLE IDENTIFICATION	SAMPLE MATRIX	SAMPLE TYPE COMP	SAMPLE TYPE GRAB	SAMPLE COLLECTION DATE	SAMPLE COLLECTION TIME	# OF BOTTLES	1	2	3	4	5	6	7	8	9	COMMENTS
1.	SS7 TD011003	AQ		X	7/29/01	0700	2	2									
2.	SS7 MW0200103	AQ		X	7/29/01	1008	14	2	1	1		3	1	1	1	1	1 1 1
3.	SS7 MW0200103	AQ		X	7/29/01	1010	1				1						
4.	SS7 MW0230103	AQ		X	7/29/01	0840	2	2									
5.	SS7 MW0220103	AQ		X	7/29/01	1326	15	2	1	1	1	3	1	1	1	1	1 1 1
6.																	
7.																	
8.																	

← Specify Preservatives
A – HCl B – HNO_3
C – H_2SO_4 D – NaOH
E – ICE F – Other

SAMPLE CUSTODY MUST BE DOCUMENTED BELOW EACH TIME SAMPLES CHANGE POSSESSION INCLUDING COURIER DELIVERY

RELINQUISHED BY SAMPLER:	DATE/TIME:	RECEIVED BY:
1. [signature]	8/29/01 1900	1.
RELINQUISHED BY: 2.	DATE/TIME:	RECEIVED BY: 2.
RELINQUISHED BY: 3.	DATE/TIME:	RECEIVED FOR LAB BY: 3.

Conditions of bottles or coolers at receipt: ☐ Compliant ☐ Non-Compliant ☐ Temp. of Cooler _____
Comments:
Fed Ex AB# 830334177325

Page 1 of _____ Shipment Complete: Yes _____ No _____

Ver. 6/2000 WHITE – CHEMTECH COPY FOR RETURN TO CLIENT YELLOW – CHEMTECH COPY PINK – SAMPLER COPY

41525

CHEMTECH
CHAIN OF CUSTODY RECORD

Please check one

☐ 110 Route 4
Englewood, NJ 07631
(201) 567-6868
Fax (201) 567-1333

☐ 205 Campus Plaza 1
Edison, NJ 08837
(732) 225-4111
Fax (732) 225-4110

CHEMTECH JOB NO.:

CHEMTECH QUOTE NO.:

CLIENT INFORMATION

REPORT TO BE SENT TO:

COMPANY: TENUS

ADDRESS: 661 Andersen Dr.

CITY: PGH STATE: PA ZIP: 15220

ATTENTION: George Castulik

PHONE: [illegible] FAX: [illegible]

PROJECT INFORMATION

PROJECT NAME: [illegible]

PROJECT NO.: [illegible]

PROJECT MANAGER: [illegible]

LOCATION: [illegible]

PHONE: FAX:

BILLING INFORMATION

BILL TO: PO #:

ADDRESS: [illegible] INFO

CITY: STATE: ZIP:

ATTENTION: PHONE:

DATA TURNAROUND INFORMATION

FAX: _____ DAYS *
HARD COPY: _____ DAYS *
EDD: _____ DAYS *
* TO BE APPROVED BY CHEMTECH
** NORMAL TURNAROUND TIME - 14 DAYS

DATA DELIVERABLE INFORMATION

☐ RESULTS ONLY ☐ USEPA CLP
☐ RESULTS + QC ☐ NYS ASP "B"
☐ NJ REDUCED ☐ NYS ASP "A"
☐ NJ CLP ☐ EDD
☐ EDD FORMAT: _____

ANALYSIS

TAL VOA [illegible]

1 2 3 4 5 6 7 8 9

CHEMTECH SAMPLE ID	PROJECT SAMPLE IDENTIFICATION	SAMPLE MATRIX	SAMPLE TYPE COMP	SAMPLE TYPE GRAB	SAMPLE COLLECTION DATE	SAMPLE COLLECTION TIME	# OF BOTTLES	PRESERVATIVES 1	2	3	4	5	6	7	8	9	COMMENTS ← Specify Preservatives A – HCl B – HNO_3 C – H_2SO_4 D – NaOH E – ICE F – Other
1.	S57TB010[illegible]3	AQ		X	[illegible]	1400	2	2									
2.	S57CP0040103	AQ		X	[illegible]	1800	2	2									
3.	S57CP0100103	AQ		X	[illegible]	1430	2	2									
4.	S57CP0050103	[illegible]		X	[illegible]	0130	2	2									
5.	S57CP0060103	AQ		X	[illegible]	1200	2	2									
6.	S57CPDUP01	AQ		X	[illegible]	0000	2	2									
7.																	
8.																	

SAMPLE CUSTODY MUST BE DOCUMENTED BELOW EACH TIME SAMPLES CHANGE POSSESSION INCLUDING COURIER DELIVERY

RELINQUISHED BY SAMPLER:	DATE/TIME:	RECEIVED BY:
1. [illegible]	[illegible]	1. FED Ex
RELINQUISHED BY: 2.	DATE/TIME:	RECEIVED BY: 2.
RELINQUISHED BY: 3.	DATE/TIME:	RECEIVED FOR LAB BY: 3.

Conditions of bottles or coolers at receipt: ☐ Compliant ☐ Non-Compliant ☐ Temp. of Cooler _____

Comments: FED Ex AB# 830334177314

Page 1 of 1

Shipment Complete: Yes _____ No _____

Ver. 6/2000

WHITE – CHEMTECH COPY FOR RETURN TO CLIENT YELLOW – CHEMTECH COPY PINK – SAMPLER COPY

41526

DUPLICATE LOCATIONS SITE 57

DUP SAMPLE ID	SAMPLE LOCATION	MEDIA SUBSURFACE	DATE
S57FD0010003	S57SB0210203	SB	8/14
S57SBDUP02	S57SB0280103	SUBSURFACE	8/16
S57SBDUP03	S57SB0280403	SUBSUR.	8/16
S57CPDUP01	S57CP0050103	GW	8/29
S57SBDUP05	S57SB0310203	SUBSUR.	8/24
S57SBDUP06	S57SB0300203	SUBSUR	8/24
S57MWDUP03	S57MW0070103	GW	8/23
S57SSDUP01	S57SS0180103	SURFACE SOIL	8/23
S57SSDUP02	S57SS0170103	SURFACE SOIL	8/23
S57SBDUP04	S57SB0160103	SUBSURFACE	8/23
S57MWDUP01	S57MW0030103	GW	8/16
S57MWDUP02	S57TW0180103	GW	8/21

BACKGROUND INVEST.

BGDDUP01	BGDSS0120101	SURFACE SOIL	9/11/01

DUPLICATE LOCATIONS
SITE 57 FS

EDIA	DUPLICATE ID	SAMPLE LOCATION
SURFACE SOIL	S57SSDUP01	S57SS0180103
	S57SSDUP02	S57SS0170103
SUBSURFACE SOIL	S57FD0010003	S57SB0210203
	S57SBDUP02	S57SB0280103
	S57SBDUP03	S57SB0280403
	S57SBDUP04	S57SB0160103
	S57SBDUP05	S57SB0310203
	S57SBDUP06	S57SB0300203
GROUND WATER	S57MWDUP01	S57MW0030103
	S57MWDUP02	S57TW0180103
	S57MWDUP03	S57MW0070103
	S57CPDUP01	S57CP0050103

BACKGROUND INVEST.

SURFACE SOIL	BGDDUP01	BGDSS0120101

NVHM FREDRICK
BD 3/10/60

A.8 GROUNDWATER LEVEL MEASUREMENTS

Tetra Tech NUS, Inc.

GROUNDWATER LEVEL MEASUREMENT SHEET

Project Name: Indian Head
Location: Site 57
Weather Conditions: Overcast 80's
Tidally Influenced: Yes ___ No X

Project No.: 7129
Personnel: Jennifer Wellman
Measuring Device: water-level indicator
Remarks:

Well or Piezometer Number	Date	Time	Elevation of Reference Point (feet)*	Total Well Depth (feet)*	Water Level Indicator Reading (feet)*	Thickness of Free Product (feet)*	Groundwater Elevation (feet)*	Comments
MW022	8/29/01	1618	10.09	17.45	8.24	—	1.85	
MW023	8/29/01	1614	40.54	23.10	14.60	—	25.94	
MW020	8/29/01	1622	13.31	17.58	6.52	—	6.79	
MW005	8/29/01	1628	18.54	19.80	5.96	—	12.58	
MW006	8/29/01	1630	18.57	14.20	6.03	—	12.54	
MW 009	8/29/01	1633	25.75	21.90	8.93	—	16.82	
MW 010	8/29/01	1635	25.82	16.00	8.93	—	16.89	
MW008	8/29/01	1640	30.26	16.80	8.55	—	21.71	
MW007	8/29/01	1639	30.58	28.20	9.27	—	21.31	
MW011	8/29/01	1642	33.49	19.69	9.31	—	24.18	
MW003	8/29/01	1644	35.82	24.35	8.97	—	26.85	
MW004	8/29/01	1646	35.72	16.15	9.18	—	26.54	
MW001	8/29/01	1649	37.09	26.25	7.52	—	29.57	
MW002	8/29/01	1650	37.58	14.32	8.17	—	29.41	
MW013	8/29/01	1654	43.98	17.95	5.88	—	38.10	
MW012	8/29/01	1656	43.82	44.30	6.03	—	37.79	
TW014	8/29/01	1659	44.54	11.70	7.38	—	37.16	
TW015	8/29/01	1701	45.92	32.90	8.99	—	36.93	
TW016	8/29/01	1705	35.68	11.92	7.92	—	27.76	
TW017	8/29/01	1707	35.48	25.00	8.13	—	27.35	
TW 018	8/29/01	1709	31.16	15.00	10.55	—	20.61	
TW019	8/29/01	1713	31.64	25.00	10.57	—	21.07	
TW021	8/29/01	1720	10.49	14.65	6.81	—	3.68	

* All measurements to the nearest 0.01 foot

A.9 SURVEY DATA

Indian Head, Md. Site 57

POINT	Northing	Easting	Elevaion	Description
1255	335,279.07	1,263,762.47	33.73	57-SB-016
1250	335,275.25	1,263,786.41	33.81	57-SB-017
1251	335,265.94	1,263,786.96	33.60	57-SB-018
1252	335,259.16	1,263,782.68	33.21	57-SB-019
1253	335,262.91	1,263,760.40	32.64	57-SB-020
1254	335,243.02	1,263,758.24	32.57	57-SB-021
1256	335,265.48	1,263,720.24	33.07	57-SB-022
1257	335,285.19	1,263,688.81	33.88	57-SB-023
1258	335,298.59	1,263,680.26	34.04	57-SB-024
1259	335,319.34	1,263,686.09	34.28	57-SB-025
1247	335,582.55	1,263,496.60	42.08	57-SB-026
1264	335,449.71	1,263,455.01	42.71	57-SB-027
1262	335,289.40	1,263,606.71	34.78	57-SB-028
1248	335,078.62	1,263,897.69	30.64	57-SB-029
1201	334,582.73	1,264,271.91	17.33	57-SB-030
1267	334532.34	1264264.58	14.25	57-SB-031
1242	334,372.21	1,264,235.26	14.53	57-SB-032
1232	334,392.01	1,263,440.68	38.86	57-SB-033
1243	335,041.75	1,263,378.61	75.96	57-CP-001
1266	334733.23	1263591.09	39.00	57-CP-002
1265	334820.26	1264059.09	34.42	57-CP-003
1241	334,365.84	1,264,190.00	20.41	57-CP-004
1222	334,071.68	1,264,896.71	8.25	57-CP-005
1230	333,968.89	1,264,640.78	6.78	57-CP-006
1237	334,278.06	1,264,026.24	29.14	57-CP-007
1236	334,208.41	1,263,509.08	28.52	57-CP-008
1231	334,378.55	1,263,452.66	38.35	57-CP-009
1260	335,292.06	1,263,606.29	34.98	57-CP-010
1263	335,445.15	1,263,459.21	42.51	57-TW-014
1264	335,449.71	1,263,455.01	42.71	57-TW-015
1261	335,291.18	1,263,603.59	34.83	57-TW-016
1262	335,289.40	1,263,606.71	34.78	57-TW-017
1249	335,080.92	1,263,895.89	30.71	57-TW-018
1248	335,078.62	1,263,897.69	30.64	57-TW-019
1220	334,173.08	1,264,593.47	9.84	57-TW-021

Indian Head, Md. Site 57

POINT	Northing	Easting	T.O.C.	T.O.R.	GROUND	Description
1200	334,440.46	1,264,429.15	13.75	13.31	10.39	57-MW-020
1221	334,065.57	1,264,908.66	10.60	10.09	8.11	57-MW-022
1232	334,392.01	1,263,440.68	41.03	40.54	37.44	57-MW-023

APPENDIX B

ANALYTICAL RESULTS

B.1 SOIL ANALYTICAL DATA

B.2 SOIL GEOTECHNICAL DATA

B.3 GROUNDWATER ANALYTICAL DATA

B.1 SOIL ANALYTICAL DATA

ANALYTICAL RESULTS - SOIL
AUGUST 2001
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

LOCATION	S57SB016		S57SB016		S57SB016		S57SB016		S57SB016	
SAMPLE ID	S57SS0160103		S57SB0160103		S57SB0160103-D		S57SB0160203		S57SB0160303	
SAMPLE DATE	8/23/2001		8/23/2001		8/23/2001		8/23/2001		8/23/2001	
DEPTH RANGE	0 - 0.5	QUAL	4 - 5	QUAL	4 - 5	QUAL	8 - 10	QUAL	18 - 20	QUAL
VOLATILE ORGANICS (UG/KG)										
1,1,1-TRICHLOROETHANE	5.3	U	5	U	5.9	U	6.1	U	6.2	U
1,1,2,2-TETRACHLOROETHANE	5.3	U	5	U	5.9	U	6.1	U	6.2	U
1,1,2-TRICHLOROETHANE	5.3	U	5	U	5.9	U	6.1	U	6.2	U
1,1,2-TRICHLOROTRIFLUOROETHANE	5.3	U	5	U	5.9	U	6.1	U	6.2	U
1,1-DICHLOROETHANE	5.3	U	5	U	5.9	U	6.1	U	6.2	U
1,1-DICHLOROETHENE	5.3	U	5	U	5.9	U	6.1	U	6.2	U
1,2-DICHLOROETHANE	5.3	U	5	U	5.9	U	6.1	U	6.2	U
1,2-DICHLOROPROPANE	5.3	U	5	U	5.9	U	6.1	U	6.2	U
2-BUTANONE	5.3	U	5	U	5.9	U	6.1	U	6.2	U
2-HEXANONE	5.3	U	5	U	5.9	U	6.1	U	6.2	U
4-METHYL-2-PENTANONE	5.3	U	5	U	5.9	U	6.1	U	6.2	U
ACETONE	5.3	U	5	U	5.9	U	280	J	6.2	U
BENZENE	5.3	U	5	U	5.9	U	6.1	U	6.2	U
BROMODICHLOROMETHANE	5.3	U	5	U	5.9	U	6.1	U	6.2	U
BROMOFORM	5.3	U	5	U	5.9	U	6.1	U	6.2	U
BROMOMETHANE	5.3	U	5	U	5.9	U	6.1	U	6.2	U
CARBON DISULFIDE	5.3	U	5	U	5.9	U	6.1	U	6.2	U
CARBON TETRACHLORIDE	5.3	U	5	U	5.9	U	6.1	U	6.2	U
CHLOROBENZENE	5.3	U	5	U	5.9	U	6.1	U	6.2	U
CHLORODIBROMOMETHANE	5.3	U	5	U	5.9	U	6.1	U	6.2	U
CHLOROETHANE	5.3	U	5	U	5.9	U	6.1	U	6.2	U
CHLOROFORM	5.3	U	5	U	5.9	U	6.1	U	6.2	U
CHLOROMETHANE	5.3	U	5	U	5.9	U	6.1	U	6.2	U
CIS-1,2-DICHLOROETHENE	5.3	U	5	U	5.9	U	6.1	U	6.2	U
CIS-1,3-DICHLOROPROPENE	5.3	U	5	U	5.9	U	6.1	U	6.2	U
CYCLOHEXANE	5.3	U	5	U	5.9	U	6.1	U	6.2	U
DIETHYL ETHER	5.3	U	5	U	5.9	U	6.1	U	8.3	
ETHYLBENZENE	5.3	U	5	U	5.9	U	6.1	U	6.2	U
ISOPROPYLBENZENE	5.3	U	5	U	5.9	U	6.1	U	6.2	U
M+P-XYLENES	5.3	U	5	U	5.9	U	6.1	U	6.2	U
METHYL ACETATE	5.3	U	5	U	5.9	U	6.1	U	6.2	U
METHYL CYCLOHEXANE	5.3	U	5	U	5.9	U	6.1	U	6.2	U
METHYL TERT-BUTYL ETHER	5.3	U	5	U	5.9	U	6.1	U	6.2	U
METHYLENE CHLORIDE	3.5	B	3.1	B	5.7	B	8	B	5.3	B
O-XYLENE	5.3	U	5	U	5.9	U	6.1	U	6.2	U
STYRENE	5.3	U	5	U	5.9	U	6.1	U	6.2	U

ANALYTICAL RESULTS - SOIL
AUGUST 2001
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

LOCATION SAMPLE ID SAMPLE DATE DEPTH RANGE	S57SB016 S57SS0160103 8/23/2001 0 - 0.5	QUAL	S57SB016 S57SB0160103 8/23/2001 4 - 5	QUAL	S57SB016 S57SB0160103-D 8/23/2001 4 - 5	QUAL	S57SB016 S57SB0160203 8/23/2001 8 - 10	QUAL	S57SB016 S57SB0160303 8/23/2001 18 - 20	QUAL
TETRACHLOROETHENE	5.3	U	5	U	5.9	U	6.1	U	6.2	U
TOLUENE	5.3	U	5	U	5.9	U	6.1	U	6.2	U
TRANS-1,2-DICHLOROETHENE	5.3	U	5	U	5.9	U	6.1	U	6.2	U
TRANS-1,3-DICHLOROPROPENE	5.3	U	5	U	5.9	U	6.1	U	6.2	U
TRICHLOROETHENE	5.3	U	5	U	5.6	J	6.1	U	6.2	U
VINYL CHLORIDE	5.3	U	5	U	5.9	U	6.1	U	6.2	U
INORGANICS (MG/KG)										
ARSENIC	6.9		35.2	J	1.5	UJ				
FIELD PARAMETERS										
BULK DENSITY (lb/cu ft)			129.8						111.7	
NO. 10 SIEVE %			68.4						97.5	
NO. 100 SIEVE %			45						13.4	
NO. 20 SIEVE %			63						74.3	
NO. 200 SIEVE %			41						8.5	
NO. 4 SIEVE %			79.5						98.7	
NO. 40 SIEVE %			55.3						34.1	
POROSITY %			32.9						43.3	
SIEVE 1" %										
SIEVE 1-1/2" %										
SIEVE 1/2" %			93.3							
SIEVE 3/4" %			100							
SIEVE 3/8" %			89.3						100	
SPECIFIC GRAVITY S.U.			2.65						2.63	
MISCELLANEOUS PARAMETERS										
CATION EXCHANGE CAPACITY MEQ/1			160	J	550	J			70	J
PH MEQ/1			7.17		6.4				5.5	
TOTAL ORGANIC CARBON MG/KG										
USCS CLASSIFICATION			SM						SW-SM	
AASHTO CLASSIFICATION			A-4(0)						A-1-b	

ANALYTICAL RESULTS - SOIL
AUGUST 2001
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

LOCATION	S57SB017		S57SB017		S57SB017		S57SB017		S57SB017	
SAMPLE ID	S57SS0170103		S57SS0170103-D		S57SB0170103		S57SB0170203		S57SB0170303	
SAMPLE DATE	8/23/2001		8/23/2001		8/23/2001		8/23/2001		8/23/2001	
DEPTH RANGE	0 - 0.5	QUAL	0 - 0.5	QUAL	4 - 5	QUAL	8 - 10	QUAL	14 - 16	QUAL
VOLATILE ORGANICS (UG/KG)										
1,1,1-TRICHLOROETHANE	5.8	U	6	U	6.6	U	6	U	5.9	U
1,1,2,2-TETRACHLOROETHANE	5.8	U	6	U	6.6	U	6	U	5.9	U
1,1,2-TRICHLOROETHANE	5.8	U	6	U	6.6	U	6	U	5.9	U
1,1,2-TRICHLOROTRIFLUOROETHANE	5.8	U	6	U	6.6	U	6	U	5.9	U
1,1-DICHLOROETHANE	5.8	U	6	U	6.6	U	6	U	5.9	U
1,1-DICHLOROETHENE	5.8	U	6	U	6.6	U	6	U	5.9	U
1,2-DICHLOROETHANE	5.8	U	6	U	6.6	U	6	U	5.9	U
1,2-DICHLOROPROPANE	5.8	U	6	U	6.6	U	6	U	5.9	U
2-BUTANONE	5.8	U	6	U	6.6	U	6	U	5.9	U
2-HEXANONE	5.8	U	6	U	6.6	U	6	U	5.9	U
4-METHYL-2-PENTANONE	5.8	U	6	U	6.6	U	6	U	5.9	U
ACETONE	5.8	U	6	U	6.6	U	6	U	5.9	U
BENZENE	5.8	U	6	U	6.6	U	6	U	5.9	U
BROMODICHLOROMETHANE	5.8	U	6	U	6.6	U	6	U	5.9	U
BROMOFORM	5.8	U	6	U	6.6	U	6	U	5.9	U
BROMOMETHANE	5.8	U	6	U	6.6	U	6	U	5.9	U
CARBON DISULFIDE	5.8	U	6	U	6.6	U	6	U	5.9	U
CARBON TETRACHLORIDE	5.8	U	6	U	6.6	U	6	U	5.9	U
CHLOROBENZENE	5.8	U	6	U	6.6	U	6	U	5.9	U
CHLORODIBROMOMETHANE	5.8	U	6	U	6.6	U	6	U	5.9	U
CHLOROETHANE	5.8	U	6	U	6.6	U	6	U	5.9	U
CHLOROFORM	5.8	U	6	U	6.6	U	6	U	5.9	U
CHLOROMETHANE	5.8	U	6	U	6.6	U	6	U	5.9	U
CIS-1,2-DICHLOROETHENE	21		24		16		6	U	5.9	U
CIS-1,3-DICHLOROPROPENE	5.8	U	6	U	6.6	U	6	U	5.9	U
CYCLOHEXANE	5.8	U	6	U	6.6	U	6	U	5.9	U
DIETHYL ETHER	5.8	U	6	U	6.6	U	6	U	5.9	U
ETHYLBENZENE	5.8	U	6	U	6.6	U	6	U	5.9	U
ISOPROPYLBENZENE	5.8	U	6	U	6.6	U	6	U	5.9	U
M+P-XYLENES	5.8	U	6	U	6.6	U	6	U	5.9	U
METHYL ACETATE	5.8	U	6	U	6.6	U	6	U	5.9	U
METHYL CYCLOHEXANE	5.8	U	6	U	6.6	U	6	U	5.9	U
METHYL TERT-BUTYL ETHER	5.8	U	6	U	6.6	U	6	U	5.9	U
METHYLENE CHLORIDE	6.2	B	7.4	B	8.2	B	6.3	B	6.2	B
O-XYLENE	5.8	U	6	U	6.6	U	6	U	5.9	U
STYRENE	5.8	U	6	U	6.6	U	6	U	5.9	U

ANALYTICAL RESULTS - SOIL
AUGUST 2001
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

LOCATION SAMPLE ID SAMPLE DATE DEPTH RANGE	S57SB017 S57SS0170103 8/23/2001 0 - 0.5	QUAL	S57SB017 S57SS0170103-D 8/23/2001 0 - 0.5	QUAL	S57SB017 S57SB0170103 8/23/2001 4 - 5	QUAL	S57SB017 S57SB0170203 8/23/2001 8 - 10	QUAL	S57SB017 S57SB0170303 8/23/2001 14 - 16	QUAL
TETRACHLOROETHENE	5.8	U	6	U	6.6	U	6	U	5.9	U
TOLUENE	5.8	U	6	U	6.6	U	6	U	5.9	U
TRANS-1,2-DICHLOROETHENE	5.8	U	6	U	6.6	U	6	U	5.9	U
TRANS-1,3-DICHLOROPROPENE	5.8	U	6	U	6.6	U	6	U	5.9	U
TRICHLOROETHENE	220		210		5.5	J	6	U	5.9	U
VINYL CHLORIDE	5.8	U	6	U	6.6	U	6	U	5.9	U
INORGANICS (MG/KG)										
ARSENIC	21		21.8		2.6					
FIELD PARAMETERS										
BULK DENSITY (lb/cu ft)										
NO. 10 SIEVE %										
NO. 100 SIEVE %										
NO. 20 SIEVE %										
NO. 200 SIEVE %										
NO. 4 SIEVE %										
NO. 40 SIEVE %										
POROSITY %										
SIEVE 1" %										
SIEVE 1-1/2" %										
SIEVE 1/2" %										
SIEVE 3/4" %										
SIEVE 3/8" %										
SPECIFIC GRAVITY S.U.										
MISCELLANEOUS PARAMETERS										
CATION EXCHANGE CAPACITY MEQ/1										
PH MEQ/1										
TOTAL ORGANIC CARBON MG/KG										
USCS CLASSIFICATION										
AASHTO CLASSIFICATION										

ANALYTICAL RESULTS - SOIL
AUGUST 2001
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

LOCATION	S57SB017		S57SB018		S57SB018		S57SB018		S57SB018	
SAMPLE ID	S57SB0170403		S57SS0180103		S57SS0180103-D		S57SB0180103		S57SB0180203	
SAMPLE DATE	8/23/2001		8/23/2001		8/23/2001		8/23/2001		8/23/2001	
DEPTH RANGE	18 - 20	QUAL	0 - 0.5	QUAL	0 - 0.5	QUAL	4 - 5	QUAL	8 - 10	QUAL
VOLATILE ORGANICS (UG/KG)										
1,1,1-TRICHLOROETHANE	6.1	U	5.5	U	5.5	U	6.8	U	5.7	U
1,1,2,2-TETRACHLOROETHANE	6.1	U	5.5	U	5.5	U	6.8	U	5.7	U
1,1,2-TRICHLOROETHANE	6.1	U	5.5	U	5.5	U	6.8	U	5.7	U
1,1,2-TRICHLOROTRIFLUOROETHANE	6.1	U	5.5	U	5.5	U	6.8	U	5.7	U
1,1-DICHLOROETHANE	6.1	U	5.5	U	5.5	U	6.8	U	5.7	U
1,1-DICHLOROETHENE	6.1	U	5.5	U	5.5	U	6.8	U	5.7	U
1,2-DICHLOROETHANE	6.1	U	5.5	U	5.5	U	6.8	U	5.7	U
1,2-DICHLOROPROPANE	6.1	U	5.5	U	5.5	U	6.8	U	5.7	U
2-BUTANONE	6.1	U	5.5	U	5.5	U	6.8	U	5.7	U
2-HEXANONE	6.1	U	5.5	U	5.5	U	6.8	U	5.7	U
4-METHYL-2-PENTANONE	6.1	U	5.5	U	5.5	U	6.8	U	5.7	U
ACETONE	6.1	U	5.5	U	5.5	U	6.8	U	5.7	U
BENZENE	6.1	U	5.5	U	5.5	U	6.8	U	5.7	U
BROMODICHLOROMETHANE	6.1	U	5.5	U	5.5	U	6.8	U	5.7	U
BROMOFORM	6.1	U	5.5	U	5.5	U	6.8	U	5.7	U
BROMOMETHANE	6.1	U	5.5	U	5.5	U	6.8	U	5.7	U
CARBON DISULFIDE	6.1	U	5.5	U	5.5	U	6.8	U	5.7	U
CARBON TETRACHLORIDE	6.1	U	5.5	U	5.5	U	6.8	U	5.7	U
CHLOROBENZENE	6.1	U	5.5	U	5.5	U	6.8	U	5.7	U
CHLORODIBROMOMETHANE	6.1	U	5.5	U	5.5	U	6.8	U	5.7	U
CHLOROETHANE	6.1	U	5.5	U	5.5	U	6.8	U	5.7	U
CHLOROFORM	6.1	U	5.5	U	5.5	U	6.8	U	5.7	U
CHLOROMETHANE	6.1	U	5.5	U	5.5	U	6.8	U	5.7	U
CIS-1,2-DICHLOROETHENE	6.1	U	5.5	U	5.5	U	84		5.7	U
CIS-1,3-DICHLOROPROPENE	6.1	U	5.5	U	5.5	U	6.8	U	5.7	U
CYCLOHEXANE	6.1	U	5.5	U	5.5	U	6.8	U	5.7	U
DIETHYL ETHER	6.1	U	5.5	U	5.5	U	6.8	U	5.7	U
ETHYLBENZENE	6.1	U	5.5	U	5.5	U	6.8	U	5.7	U
ISOPROPYLBENZENE	6.1	U	5.5	U	5.5	U	6.8	U	5.7	U
M+P-XYLENES	6.1	U	5.5	U	5.5	U	6.8	U	5.7	U
METHYL ACETATE	6.1	U	5.5	U	5.5	U	6.8	U	5.7	U
METHYL CYCLOHEXANE	6.1	U	5.5	U	5.5	U	6.8	U	5.7	U
METHYL TERT-BUTYL ETHER	6.1	U	5.5	U	5.5	U	6.8	U	5.7	U
METHYLENE CHLORIDE	7.8	B	3.4	B	6.3	B	12	B	6.8	B
O-XYLENE	6.1	U	5.5	U	5.5	U	6.8	U	5.7	U
STYRENE	6.1	U	5.5	U	5.5	U	6.8	U	5.7	U

ANALYTICAL RESULTS - SOIL
AUGUST 2001
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

LOCATION SAMPLE ID SAMPLE DATE DEPTH RANGE	S57SB017 S57SB0170403 8/23/2001 18 - 20	QUAL	S57SB018 S57SS0180103 8/23/2001 0 - 0.5	QUAL	S57SB018 S57SS0180103-D 8/23/2001 0 - 0.5	QUAL	S57SB018 S57SB0180103 8/23/2001 4 - 5	QUAL	S57SB018 S57SB0180203 8/23/2001 8 - 10	QUAL
TETRACHLOROETHENE	6.1	U	5.5	U	5.5	U	6.8	U	5.7	U
TOLUENE	6.1	U	5.5	U	5.5	U	6.8	U	5.7	U
TRANS-1,2-DICHLOROETHENE	6.1	U	5.5	U	5.5	U	6.8	U	5.7	U
TRANS-1,3-DICHLOROPROPENE	6.1	U	5.5	U	5.5	U	6.8	U	5.7	U
TRICHLOROETHENE	6.1	U	5.5	U	5.5	U	270		5.7	U
VINYL CHLORIDE	6.1	U	5.5	U	5.5	U	6.8	U	5.7	U
INORGANICS (MG/KG)										
ARSENIC			26.6		22.6		2.3			
FIELD PARAMETERS										
BULK DENSITY (lb/cu ft)							122.3			
NO. 10 SIEVE %							69.6			
NO. 100 SIEVE %							50.6			
NO. 20 SIEVE %							65			
NO. 200 SIEVE %							46.4			
NO. 4 SIEVE %							79.1			
NO. 40 SIEVE %							59.4			
POROSITY %							41.9			
SIEVE 1" %							100			
SIEVE 1-1/2" %										
SIEVE 1/2" %							95.7			
SIEVE 3/4" %							100			
SIEVE 3/8" %							92.2			
SPECIFIC GRAVITY S.U.							2.58			
MISCELLANEOUS PARAMETERS										
CATION EXCHANGE CAPACITY MEQ/1							420	J		
PH MEQ/1							5.48			
TOTAL ORGANIC CARBON MG/KG										
USCS CLASSIFICATION							SM			
AASHTO CLASSIFICATION							A-4(0)			

ANALYTICAL RESULTS - SOIL
AUGUST 2001
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

LOCATION	S57SB018		S57SB018		S57SB019		S57SB019		S57SB019	
SAMPLE ID	S57SB0180303		S57SB0180403		S57SS0190103		S57SB0190103		S57SB0190203	
SAMPLE DATE	8/23/2001		8/23/2001		8/23/2001		8/23/2001		8/23/2001	
DEPTH RANGE	16 - 18	QUAL	18 - 20	QUAL	0 - 0.5	QUAL	4 - 5	QUAL	8 - 10	QUAL
VOLATILE ORGANICS (UG/KG)										
1,1,1-TRICHLOROETHANE	6.3	U	5.8	U	5.5	U	6.5	U	5.7	U
1,1,2,2-TETRACHLOROETHANE	6.3	U	5.8	U	5.5	U	6.5	U	5.7	U
1,1,2-TRICHLOROETHANE	6.3	U	5.8	U	5.5	U	6.5	U	5.7	U
1,1,2-TRICHLOROTRIFLUOROETHANE	6.3	U	5.8	U	5.5	U	6.5	U	5.7	U
1,1-DICHLOROETHANE	6.3	U	5.8	U	5.5	U	6.5	U	5.7	U
1,1-DICHLOROETHENE	6.3	U	5.8	U	5.5	U	6.5	U	5.7	U
1,2-DICHLOROETHANE	6.3	U	5.8	U	5.5	U	6.5	U	5.7	U
1,2-DICHLOROPROPANE	6.3	U	5.8	U	5.5	U	6.5	U	5.7	U
2-BUTANONE	6.3	U	5.8	U	5.5	U	6.5	U	5.7	U
2-HEXANONE	6.3	U	5.8	U	5.5	U	6.5	U	5.7	U
4-METHYL-2-PENTANONE	6.3	U	5.8	U	5.5	U	6.5	U	5.7	U
ACETONE	6.3	U	5.8	U	5.5	U	6.5	U	5.7	U
BENZENE	6.3	U	5.8	U	5.5	U	6.5	U	5.7	U
BROMODICHLOROMETHANE	6.3	U	5.8	U	5.5	U	6.5	U	5.7	U
BROMOFORM	6.3	U	5.8	U	5.5	U	6.5	U	5.7	U
BROMOMETHANE	6.3	U	5.8	U	5.5	U	6.5	U	5.7	U
CARBON DISULFIDE	6.3	U	5.8	U	5.5	U	6.5	U	5.7	U
CARBON TETRACHLORIDE	6.3	U	5.8	U	5.5	U	6.5	U	5.7	U
CHLOROBENZENE	6.3	U	5.8	U	5.5	U	6.5	U	5.7	U
CHLORODIBROMOMETHANE	6.3	U	5.8	U	5.5	U	6.5	U	5.7	U
CHLOROETHANE	6.3	U	5.8	U	5.5	U	6.5	U	5.7	U
CHLOROFORM	6.3	U	5.8	U	5.5	U	6.5	U	5.7	U
CHLOROMETHANE	6.3	U	5.8	U	5.5	U	6.5	U	5.7	U
CIS-1,2-DICHLOROETHENE	6.3	U	5.8	U	12		32		5.7	U
CIS-1,3-DICHLOROPROPENE	6.3	U	5.8	U	5.5	U	6.5	U	5.7	U
CYCLOHEXANE	6.3	U	5.8	U	5.5	U	6.5	U	5.7	U
DIETHYL ETHER	36		4.6	J	5.5	U	6.5	U	5.7	U
ETHYLBENZENE	6.3	U	5.8	U	5.5	U	6.5	U	5.7	U
ISOPROPYLBENZENE	6.3	U	5.8	U	5.5	U	6.5	U	5.7	U
M+P-XYLENES	6.3	U	5.8	U	5.5	U	6.5	U	5.7	U
METHYL ACETATE	6.3	U	5.8	U	5.5	U	6.5	U	5.7	U
METHYL CYCLOHEXANE	6.3	U	5.8	U	5.5	U	6.5	U	5.7	U
METHYL TERT-BUTYL ETHER	6.3	U	5.8	U	5.5	U	6.5	U	5.7	U
METHYLENE CHLORIDE	8.4	B	7.7	B	4.3	B	7.2	B	9.2	B
O-XYLENE	6.3	U	5.8	U	5.5	U	6.5	U	5.7	U
STYRENE	6.3	U	5.8	U	5.5	U	6.5	U	5.7	U

ANALYTICAL RESULTS - SOIL
AUGUST 2001
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

LOCATION SAMPLE ID SAMPLE DATE DEPTH RANGE	S57SB018 S57SB0180303 8/23/2001 16 - 18	QUAL	S57SB018 S57SB0180403 8/23/2001 18 - 20	QUAL	S57SB019 S57SS0190103 8/23/2001 0 - 0.5	QUAL	S57SB019 S57SB0190103 8/23/2001 4 - 5	QUAL	S57SB019 S57SB0190203 8/23/2001 8 - 10	QUAL
TETRACHLOROETHENE	6.3	U	5.8	U	5.5	U	6.5	U	5.7	U
TOLUENE	6.3	U	5.8	U	5.5	U	6.5	U	5.7	U
TRANS-1,2-DICHLOROETHENE	6.3	U	5.8	U	5.5	U	6.5	U	5.7	U
TRANS-1,3-DICHLOROPROPENE	6.3	U	5.8	U	5.5	U	6.5	U	5.7	U
TRICHLOROETHENE	6.3	U	5.8	U	49		52		4.6	J
VINYL CHLORIDE	6.3	U	5.8	U	5.5	U	6.5	U	5.7	U
INORGANICS (MG/KG)										
ARSENIC										
FIELD PARAMETERS										
BULK DENSITY (lb/cu ft)	111.7									
NO. 10 SIEVE %	98									
NO. 100 SIEVE %	25									
NO. 20 SIEVE %	76.7									
NO. 200 SIEVE %	22.2									
NO. 4 SIEVE %	99.5									
NO. 40 SIEVE %	41.6									
POROSITY %	37.2									
SIEVE 1" %										
SIEVE 1-1/2" %										
SIEVE 1/2" %										
SIEVE 3/4" %										
SIEVE 3/8" %	100									
SPECIFIC GRAVITY S.U.	2.61									
MISCELLANEOUS PARAMETERS										
CATION EXCHANGE CAPACITY MEQ/1	64	J								
PH MEQ/1	5.91									
TOTAL ORGANIC CARBON MG/KG										
USCS CLASSIFICATION	SM									
AASHTO CLASSIFICATION	A-1-b									

ANALYTICAL RESULTS - SOIL
AUGUST 2001
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

LOCATION	S57SB019		S57SB019		S57SB020		S57SB020		S57SB021	
SAMPLE ID	S57SB0190303		S57SB0190403		S57SS0200103		S57SB0200103		S57SS0210103	
SAMPLE DATE	8/23/2001		8/23/2001		8/15/2001		8/15/2001		8/14/2001	
DEPTH RANGE	14 - 16	QUAL	18 - 20	QUAL	0 - 0.5	QUAL	4 - 5	QUAL	0 - 0.5	QUAL
VOLATILE ORGANICS (UG/KG)										
1,1,1-TRICHLOROETHANE	5.9	U	5.8	U					5.4	U
1,1,2,2-TETRACHLOROETHANE	5.9	U	5.8	U					5.4	U
1,1,2-TRICHLOROETHANE	5.9	U	5.8	U					5.4	U
1,1,2-TRICHLOROTRIFLUOROETHANE	5.9	U	5.8	U						
1,1-DICHLOROETHANE	5.9	U	5.8	U					5.4	U
1,1-DICHLOROETHENE	5.9	U	5.8	U					5.4	U
1,2-DICHLOROETHANE	5.9	U	5.8	U					5.4	U
1,2-DICHLOROPROPANE	5.9	U	5.8	U					5.4	U
2-BUTANONE	5.9	U	5.8	U					5.4	U
2-HEXANONE	5.9	U	5.8	U					5.4	U
4-METHYL-2-PENTANONE	5.9	U	5.8	U					5.4	U
ACETONE	2400		5.8	U					16	B
BENZENE	5.9	U	5.8	U					5.4	U
BROMODICHLOROMETHANE	5.9	U	5.8	U					5.4	U
BROMOFORM	5.9	U	5.8	U					5.4	U
BROMOMETHANE	5.9	U	5.8	U					5.4	U
CARBON DISULFIDE	5.9	U	5.8	U					5.4	U
CARBON TETRACHLORIDE	5.9	U	5.8	U					5.4	U
CHLOROBENZENE	5.9	U	5.8	U					5.4	U
CHLORODIBROMOMETHANE	5.9	U	5.8	U					5.4	U
CHLOROETHANE	5.9	U	5.8	U					5.4	U
CHLOROFORM	5.9	U	5.8	U					5.4	U
CHLOROMETHANE	5.9	U	5.8	U					5.4	U
CIS-1,2-DICHLOROETHENE	22		5.8	U					16	
CIS-1,3-DICHLOROPROPENE	5.9	U	5.8	U					5.4	U
CYCLOHEXANE	5.9	U	5.8	U						
DIETHYL ETHER	10		5.8	U					5.4	U
ETHYLBENZENE	5.9	U	5.8	U					5.4	U
ISOPROPYLBENZENE	5.9	U	5.8	U						
M+P-XYLENES	5.9	U	5.8	U					5.4	U
METHYL ACETATE	5.9	U	5.8	U						
METHYL CYCLOHEXANE	5.9	U	5.8	U						
METHYL TERT-BUTYL ETHER	5.9	U	5.8	U						
METHYLENE CHLORIDE	7.1	B	5.4	B					9.9	B
O-XYLENE	5.9	U	5.8	U					5.4	U
STYRENE	5.9	U	5.8	U					5.4	U

ANALYTICAL RESULTS - SOIL
AUGUST 2001
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

LOCATION SAMPLE ID SAMPLE DATE DEPTH RANGE	S57SB019 S57SB0190303 8/23/2001 14 - 16	QUAL	S57SB019 S57SB0190403 8/23/2001 18 - 20	QUAL	S57SB020 S57SS0200103 8/15/2001 0 - 0.5	QUAL	S57SB020 S57SB0200103 8/15/2001 4 - 5	QUAL	S57SB021 S57SS0210103 8/14/2001 0 - 0.5	QUAL
TETRACHLOROETHENE	5.9	U	5.8	U					5.4	U
TOLUENE	5.9	U	5.8	U					5.4	U
TRANS-1,2-DICHLOROETHENE	5.9	U	5.8	U					5.4	U
TRANS-1,3-DICHLOROPROPENE	5.9	U	5.8	U					5.4	U
TRICHLOROETHENE	45		5.8	U					53	
VINYL CHLORIDE	5.9	U	5.8	U					5.4	U
INORGANICS (MG/KG)										
ARSENIC					33.6		3.3		79.9	
FIELD PARAMETERS										
BULK DENSITY (lb/cu ft)										
NO. 10 SIEVE %										
NO. 100 SIEVE %										
NO. 20 SIEVE %										
NO. 200 SIEVE %										
NO. 4 SIEVE %										
NO. 40 SIEVE %										
POROSITY %										
SIEVE 1" %										
SIEVE 1-1/2" %										
SIEVE 1/2" %										
SIEVE 3/4" %										
SIEVE 3/8" %										
SPECIFIC GRAVITY S.U.										
MISCELLANEOUS PARAMETERS										
CATION EXCHANGE CAPACITY MEQ/1										
PH MEQ/1										
TOTAL ORGANIC CARBON MG/KG										
USCS CLASSIFICATION										
AASHTO CLASSIFICATION										

ANALYTICAL RESULTS - SOIL
AUGUST 2001
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

LOCATION SAMPLE ID SAMPLE DATE DEPTH RANGE	S57SB021 S57SB0210103 8/14/2001 4 - 5	QUAL	S57SB021 S57SB0210203 8/14/2001 8 - 10	QUAL	S57SB021 S57SB0210203-D 8/14/2001 8 - 10	QUAL	S57SB021 S57SB0210303 8/15/2001 14 - 16	QUAL	S57SB021 S57SB0210403 8/15/2001 18 - 20	QUAL
VOLATILE ORGANICS (UG/KG)										
1,1,1-TRICHLOROETHANE	6.2	U	6.9	U	6.6	U	6.5	U	6.1	U
1,1,2,2-TETRACHLOROETHANE	6.2	U	6.9	U	6.6	U	6.5	U	6.1	U
1,1,2-TRICHLOROETHANE	6.2	U	6.9	U	6.6	U	6.5	U	6.1	U
1,1,2-TRICHLOROTRIFLUOROETHANE							6.5	U	6.1	U
1,1-DICHLOROETHANE	6.2	U	6.9	U	6.6	U	6.5	U	6.1	U
1,1-DICHLOROETHENE	6.2	U	6.9	U	6.6	U	6.5	U	6.1	U
1,2-DICHLOROETHANE	6.2	U	6.9	U	6.6	U	6.5	U	6.1	U
1,2-DICHLOROPROPANE	6.2	U	6.9	U	6.6	U	6.5	U	6.1	U
2-BUTANONE	25		6.9	U	6.6	U	6.5	U	6.1	U
2-HEXANONE	23		6.9	U	6.6	U	6.5	U	6.1	U
4-METHYL-2-PENTANONE	16		6.9	U	6.6	U	6.5	U	6.1	U
ACETONE	30	B	43	B	34	B	19	B	18	B
BENZENE	6.2	U	6.9	U	6.6	U	6.5	U	6.1	U
BROMODICHLOROMETHANE	6.2	U	6.9	U	6.6	U	6.5	U	6.1	U
BROMOFORM	6.2	U	6.9	U	6.6	U	6.5	U	6.1	U
BROMOMETHANE	6.2	U	6.9	U	6.6	U	6.5	U	6.1	U
CARBON DISULFIDE	6.2	U	6.9	U	6.6	U	6.5	U	6.1	U
CARBON TETRACHLORIDE	6.2	U	6.9	U	6.6	U	6.5	U	6.1	U
CHLOROBENZENE	6.2	U	6.9	U	6.6	U	6.5	U	6.1	U
CHLORODIBROMOMETHANE	6.2	U	6.9	U	6.6	U	6.5	U	6.1	U
CHLOROETHANE	6.2	U	6.9	U	6.6	U	6.5	U	6.1	U
CHLOROFORM	6.2	U	6.9	U	6.6	U	6.5	U	6.1	U
CHLOROMETHANE	6.2	U	6.9	U	6.6	U	6.5	U	6.1	U
CIS-1,2-DICHLOROETHENE	16		690		240		6.5	U	6.1	U
CIS-1,3-DICHLOROPROPENE	6.2	U	6.9	U	6.6	U	6.5	U	6.1	U
CYCLOHEXANE							6.5	U	6.1	U
DIETHYL ETHER	6.2	U	6.9	U	6.6	U	6.5	U	6.1	U
ETHYLBENZENE	6.2	U	6.9	U	6.6	U	6.5	U	6.1	U
ISOPROPYLBENZENE							6.5	U	6.1	U
M+P-XYLENES	3.1	J	6.9	U	6.6	U	6.5	U	6.1	U
METHYL ACETATE							6.5	U	6.1	U
METHYL CYCLOHEXANE							6.5	U	6.1	U
METHYL TERT-BUTYL ETHER							6.5	U	6.1	U
METHYLENE CHLORIDE	17	B	22	B	18	B	13	B	16	B
O-XYLENE	6.2	U	6.9	U	6.6	U	6.5	U	6.1	U
STYRENE	6.2	U	6.9	U	6.6	U	6.5	U	6.1	U

ANALYTICAL RESULTS - SOIL
AUGUST 2001
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

LOCATION SAMPLE ID SAMPLE DATE DEPTH RANGE	S57SB021 S57SB0210103 8/14/2001 4 - 5	QUAL	S57SB021 S57SB0210203 8/14/2001 8 - 10	QUAL	S57SB021 S57SB0210203-D 8/14/2001 8 - 10	QUAL	S57SB021 S57SB0210303 8/15/2001 14 - 16	QUAL	S57SB021 S57SB0210403 8/15/2001 18 - 20	QUAL
TETRACHLOROETHENE	6.2	U	6.9	U	6.6	U	6.5	U	6.1	U
TOLUENE	3.2	J	6.9	U	6.6	U	6.5	U	6.1	U
TRANS-1,2-DICHLOROETHENE	6.2	U	5.9	J	6.6	U	6.5	U	6.1	U
TRANS-1,3-DICHLOROPROPENE	6.2	U	6.9	U	6.6	U	6.5	U	6.1	U
TRICHLOROETHENE	82		98		41		6.5	U	6.1	U
VINYL CHLORIDE	6.2	U	6.9	U	6.6	U	6.5	U	6.1	U
INORGANICS (MG/KG)										
ARSENIC										
FIELD PARAMETERS										
BULK DENSITY (lb/cu ft)	112.9						122.9			
NO. 10 SIEVE %	88.2						95.7			
NO. 100 SIEVE %	76.9						12.4			
NO. 20 SIEVE %	86						74.1			
NO. 200 SIEVE %	66.7						9.8			
NO. 4 SIEVE %	97.1						99.2			
NO. 40 SIEVE %	82.9						27.8			
POROSITY %	45.9						36.7			
SIEVE 1" %										
SIEVE 1-1/2" %										
SIEVE 1/2" %										
SIEVE 3/4" %										
SIEVE 3/8" %	100						100			
SPECIFIC GRAVITY S.U.	2.59						2.65			
MISCELLANEOUS PARAMETERS										
CATION EXCHANGE CAPACITY MEQ/1							38			
PH MEQ/1							5.54			
TOTAL ORGANIC CARBON MG/KG							28000			
USCS CLASSIFICATION	ML						SP-SM			
AASHTO CLASSIFICATION	A-4(0)						A-1b			

ANALYTICAL RESULTS - SOIL
AUGUST 2001
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

LOCATION	S57SB022		S57SB022		S57SB022		S57SB022		S57SB022	
SAMPLE ID	S57SS0220103		S57SB0220103		S57SB0220203		S57SB0220303		S57SB0220403	
SAMPLE DATE	8/14/2001		8/14/2001		8/14/2001		8/14/2001		8/15/2001	
DEPTH RANGE	0 - 0.5	QUAL	4 - 5	QUAL	8 - 10	QUAL	12 - 14	QUAL	18 - 20	QUAL
VOLATILE ORGANICS (UG/KG)										
1,1,1-TRICHLOROETHANE	5.6	U	6	U	5.6	U	6.4	U	6.8	U
1,1,2,2-TETRACHLOROETHANE	5.6	U	6	U	5.6	U	6.4	U	6.8	U
1,1,2-TRICHLOROETHANE	5.6	U	6	U	5.6	U	6.4	U	6.8	U
1,1,2-TRICHLOROTRIFLUOROETHANE									6.8	U
1,1-DICHLOROETHANE	5.6	U	6	U	5.6	U	6.4	U	6.8	U
1,1-DICHLOROETHENE	5.6	U	6	U	5.6	U	6.4	U	6.8	U
1,2-DICHLOROETHANE	5.6	U	6	U	5.6	U	6.4	U	6.8	U
1,2-DICHLOROPROPANE	5.6	U	6	U	5.6	U	6.4	U	6.8	U
2-BUTANONE	5.6	U	6	U	5.6	U	6.4	U	6.8	U
2-HEXANONE	5.6	U	6	U	5.6	U	6.4	U	6.8	U
4-METHYL-2-PENTANONE	5.6	U	6	U	5.6	U	6.4	U	6.8	U
ACETONE	14	B	14	B	16	B	18	B	12	B
BENZENE	5.6	U	6	U	5.6	U	6.4	U	6.8	U
BROMODICHLOROMETHANE	5.6	U	6	U	5.6	U	6.4	U	6.8	U
BROMOFORM	5.6	U	6	U	5.6	U	6.4	U	6.8	U
BROMOMETHANE	5.6	U	6	U	5.6	U	6.4	U	6.8	U
CARBON DISULFIDE	5.6	U	6	U	5.6	U	6.4	U	6.8	U
CARBON TETRACHLORIDE	5.6	U	6	U	5.6	U	6.4	U	6.8	U
CHLOROBENZENE	5.6	U	6	U	5.6	U	6.4	U	6.8	U
CHLORODIBROMOMETHANE	5.6	U	6	U	5.6	U	6.4	U	6.8	U
CHLOROETHANE	5.6	U	6	U	5.6	U	6.4	U	6.8	U
CHLOROFORM	5.6	U	6	U	5.6	U	6.4	U	6.8	U
CHLOROMETHANE	5.6	U	6	U	5.6	U	6.4	U	6.8	U
CIS-1,2-DICHLOROETHENE	14		15		34		6.4	U	6.8	U
CIS-1,3-DICHLOROPROPENE	5.6	U	6	U	5.6	U	6.4	U	6.8	U
CYCLOHEXANE									6.8	U
DIETHYL ETHER	5.6	U	6	U	5.6	U	6.4	U	13	
ETHYLBENZENE	5.6	U	6	U	5.6	U	6.4	U	6.8	U
ISOPROPYLBENZENE									6.8	U
M+P-XYLENES	5.6	U	6	U	5.6	U	6.4	U	6.8	U
METHYL ACETATE									6.8	U
METHYL CYCLOHEXANE									6.8	U
METHYL TERT-BUTYL ETHER									6.8	U
METHYLENE CHLORIDE	5.6	U	5.2	B	4.1	B	4.7	B	14	B
O-XYLENE	5.6	U	6	U	5.6	U	6.4	U	6.8	U
STYRENE	5.6	U	6	U	5.6	U	6.4	U	6.8	U

ANALYTICAL RESULTS - SOIL
AUGUST 2001
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

LOCATION SAMPLE ID SAMPLE DATE DEPTH RANGE	S57SB022 S57SS0220103 8/14/2001 0 - 0.5	QUAL	S57SB022 S57SB0220103 8/14/2001 4 - 5	QUAL	S57SB022 S57SB0220203 8/14/2001 8 - 10	QUAL	S57SB022 S57SB0220303 8/14/2001 12 - 14	QUAL	S57SB022 S57SB0220403 8/15/2001 18 - 20	QUAL
TETRACHLOROETHENE	5.6	U	6	U	5.6	U	6.4	U	6.8	U
TOLUENE	5.6	U	6	U	5.6	U	6.4	U	6.8	U
TRANS-1,2-DICHLOROETHENE	5.6	U	6	U	5.6	U	6.4	U	6.8	U
TRANS-1,3-DICHLOROPROPENE	5.6	U	6	U	5.6	U	6.4	U	6.8	U
TRICHLOROETHENE	21		7.5		43		6.4	U	6.8	U
VINYL CHLORIDE	5.6	U	6	U	5.6	U	6.4	U	6.8	U
INORGANICS (MG/KG)										
ARSENIC	2.7									
FIELD PARAMETERS										
BULK DENSITY (lb/cu ft)			127.3				132.9			
NO. 10 SIEVE %			46.7				44.7			
NO. 100 SIEVE %			23.1				6.9			
NO. 20 SIEVE %			42.3				29.8			
NO. 200 SIEVE %							5.3			
NO. 4 SIEVE %			73.7				54.3			
NO. 40 SIEVE %			33.3				16.5			
POROSITY %			32.9				30.1			
SIEVE 1" %							92.8			
SIEVE 1-1/2" %							100			
SIEVE 1/2" %			95.8				65.4			
SIEVE 3/4" %			100				77.4			
SIEVE 3/8" %			88.8				62			
SPECIFIC GRAVITY S.U.			2.57				2.63			
MISCELLANEOUS PARAMETERS										
CATION EXCHANGE CAPACITY MEQ/1			290				17			
PH MEQ/1			4.95				5.17			
TOTAL ORGANIC CARBON MG/KG			30000				20000			
USCS CLASSIFICATION			SM				SP-SM			
AASHTO CLASSIFICATION			A-1-b				A-1a			

ANALYTICAL RESULTS - SOIL
AUGUST 2001
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

LOCATION SAMPLE ID SAMPLE DATE DEPTH RANGE	S57SB023 S57SS0230103 8/14/2001 0 - 0.5	QUAL	S57SB023 S57SB0230103 8/14/2001 4 - 5	QUAL	S57SB023 S57SB0230203 8/14/2001 8 - 10	QUAL	S57SB023 S57SB0230303 8/14/2001 12 - 14	QUAL	S57SB024 S57SS0240103 8/15/2001 0 - 0.5	QUAL
VOLATILE ORGANICS (UG/KG)										
1,1,1-TRICHLOROETHANE	5.8	U	6.1	U	6	U	5.8	U	5.5	U
1,1,2,2-TETRACHLOROETHANE	5.8	U	6.1	U	6	U	5.8	U	5.5	U
1,1,2-TRICHLOROETHANE	5.8	U	6.1	U	6	U	5.8	U	5.5	U
1,1,2-TRICHLOROTRIFLUOROETHANE										
1,1-DICHLOROETHANE	5.8	U	6.1	U	6	U	5.8	U	5.5	U
1,1-DICHLOROETHENE	5.8	U	6.1	U	6	U	5.8	U	5.5	U
1,2-DICHLOROETHANE	5.8	U	6.1	U	6	U	5.8	U	5.5	U
1,2-DICHLOROPROPANE	5.8	U	6.1	U	6	U	5.8	U	5.5	U
2-BUTANONE	5.8	U	6.1	U	6	U	5.8	U	5.5	U
2-HEXANONE	5.8	U	6.1	U	6	U	5.8	U	5.5	U
4-METHYL-2-PENTANONE	5.8	U	6.1	U	6	U	5.8	U	5.5	U
ACETONE	25	B	22	B	18	B	18	B	20	B
BENZENE	5.8	U	6.1	U	6	U	5.8	U	5.5	U
BROMODICHLOROMETHANE	5.8	U	6.1	U	6	U	5.8	U	5.5	U
BROMOFORM	5.8	U	6.1	U	6	U	5.8	U	5.5	U
BROMOMETHANE	5.8	U	6.1	U	6	U	5.8	U	5.5	U
CARBON DISULFIDE	5.8	U	6.1	U	6	U	5.8	U	5.5	U
CARBON TETRACHLORIDE	5.8	U	6.1	U	6	U	5.8	U	5.5	U
CHLOROBENZENE	5.8	U	6.1	U	6	U	5.8	U	5.5	U
CHLORODIBROMOMETHANE	5.8	U	6.1	U	6	U	5.8	U	5.5	U
CHLOROETHANE	5.8	U	6.1	U	6	U	5.8	U	5.5	U
CHLOROFORM	5.8	U	6.1	U	6	U	5.8	U	5.5	U
CHLOROMETHANE	5.8	U	6.1	U	6	U	5.8	U	5.5	U
CIS-1,2-DICHLOROETHENE	3.9	J	6.1	U	6	U	5.8	U	5.5	U
CIS-1,3-DICHLOROPROPENE	5.8	U	6.1	U	6	U	5.8	U	5.5	U
CYCLOHEXANE										
DIETHYL ETHER	5.8	U	6.1	U	6	U	5.8	U	5.5	U
ETHYLBENZENE	5.8	U	6.1	U	6	U	5.8	U	5.5	U
ISOPROPYLBENZENE										
M+P-XYLENES	5.8	U	6.1	U	6	U	5.8	U	2.8	J
METHYL ACETATE										
METHYL CYCLOHEXANE										
METHYL TERT-BUTYL ETHER										
METHYLENE CHLORIDE	5.8	B	4.7	B	5.2	B	13	B	13	B
O-XYLENE	5.8	U	6.1	U	6	U	5.8	U	3	J
STYRENE	5.8	U	6.1	U	6	U	5.8	U	5.5	U

ANALYTICAL RESULTS - SOIL
AUGUST 2001
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

LOCATION SAMPLE ID SAMPLE DATE DEPTH RANGE	S57SB023 S57SS0230103 8/14/2001 0 - 0.5	QUAL	S57SB023 S57SB0230103 8/14/2001 4 - 5	QUAL	S57SB023 S57SB0230203 8/14/2001 8 - 10	QUAL	S57SB023 S57SB0230303 8/14/2001 12 - 14	QUAL	S57SB024 S57SS0240103 8/15/2001 0 - 0.5	QUAL
TETRACHLOROETHENE	5.8	U	6.1	U	6	U	5.8	U	5.5	U
TOLUENE	5.8	U	6.1	U	3.7	J	5.8	U	5.5	U
TRANS-1,2-DICHLOROETHENE	5.8	U	6.1	U	6	U	5.8	U	5.5	U
TRANS-1,3-DICHLOROPROPENE	5.8	U	6.1	U	6	U	5.8	U	5.5	U
TRICHLOROETHENE	20		6.1	U	6	U	5.8	U	5.5	U
VINYL CHLORIDE	5.8	U	6.1	U	6	U	5.8	U	5.5	U
INORGANICS (MG/KG)										
ARSENIC										
FIELD PARAMETERS										
BULK DENSITY (lb/cu ft)										
NO. 10 SIEVE %										
NO. 100 SIEVE %										
NO. 20 SIEVE %										
NO. 200 SIEVE %										
NO. 4 SIEVE %										
NO. 40 SIEVE %										
POROSITY %										
SIEVE 1" %										
SIEVE 1-1/2" %										
SIEVE 1/2" %										
SIEVE 3/4" %										
SIEVE 3/8" %										
SPECIFIC GRAVITY S.U.										
MISCELLANEOUS PARAMETERS										
CATION EXCHANGE CAPACITY MEQ/1										
PH MEQ/1										
TOTAL ORGANIC CARBON MG/KG										
USCS CLASSIFICATION										
AASHTO CLASSIFICATION										

ANALYTICAL RESULTS - SOIL
AUGUST 2001
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

LOCATION	S57SB024		S57SB024		S57SB025		S57SB025		S57SB025	
SAMPLE ID	S57SB0240103		S57SB0240203		S57SS0250103		S57SB0250103		S57SB0250203	
SAMPLE DATE	8/15/2001		8/15/2001		8/15/2001		8/15/2001		8/15/2001	
DEPTH RANGE	4 - 5	QUAL	8 - 10	QUAL	0 - 0.5	QUAL	4 - 5	QUAL	8 - 10	QUAL
VOLATILE ORGANICS (UG/KG)										
1,1,1-TRICHLOROETHANE	5.7	U	5.7	U	5.5	U	6.2	U	5.9	U
1,1,2,2-TETRACHLOROETHANE	5.7	U	5.7	U	5.5	U	6.2	U	5.9	U
1,1,2-TRICHLOROETHANE	5.7	U	5.7	U	5.5	U	6.2	U	5.9	U
1,1,2-TRICHLOROTRIFLUOROETHANE							6.2	U	5.9	U
1,1-DICHLOROETHANE	5.7	U	5.7	U	5.5	U	6.2	U	5.9	U
1,1-DICHLOROETHENE	5.7	U	5.7	U	5.5	U	6.2	U	5.9	U
1,2-DICHLOROETHANE	5.7	U	5.7	U	5.5	U	6.2	U	5.9	U
1,2-DICHLOROPROPANE	5.7	U	5.7	U	5.5	U	6.2	U	5.9	U
2-BUTANONE	5.7	U	5.7	U	5.5	U	6.2	U	5.9	U
2-HEXANONE	5.7	U	5.7	U	5.5	U	6.2	U	5.9	U
4-METHYL-2-PENTANONE	5.7	U	5.7	U	5.5	U	6.2	U	5.9	U
ACETONE	26	B	23	B	18	B	19	B	20	B
BENZENE	5.7	U	5.7	U	5.5	U	6.2	U	5.9	U
BROMODICHLOROMETHANE	5.7	U	5.7	U	5.5	U	6.2	U	5.9	U
BROMOFORM	5.7	U	5.7	U	5.5	U	6.2	U	5.9	U
BROMOMETHANE	5.7	U	5.7	U	5.5	U	6.2	U	5.9	U
CARBON DISULFIDE	5.7	U	5.7	U	5.5	U	6.2	U	5.9	U
CARBON TETRACHLORIDE	5.7	U	5.7	U	5.5	U	6.2	U	5.9	U
CHLOROBENZENE	5.7	U	5.7	U	5.5	U	6.2	U	5.9	U
CHLORODIBROMOMETHANE	5.7	U	5.7	U	5.5	U	6.2	U	5.9	U
CHLOROETHANE	5.7	U	5.7	U	5.5	U	6.2	U	5.9	U
CHLOROFORM	5.7	U	5.7	U	5.5	U	6.2	U	5.9	U
CHLOROMETHANE	5.7	U	5.7	U	5.5	U	6.2	U	5.9	U
CIS-1,2-DICHLOROETHENE	5.7	U	5.7	U	5.5	U	6.2	U	11	
CIS-1,3-DICHLOROPROPENE	5.7	U	5.7	U	5.5	U	6.2	U	5.9	U
CYCLOHEXANE							6.2	U	5.9	U
DIETHYL ETHER	5.7	U	5.7	U	5.5	U	6.2	U	17	
ETHYLBENZENE	5.7	U	5.7	U	9.6		6.2	U	5.9	U
ISOPROPYLBENZENE							6.2	U	5.9	U
M+P-XYLENES	5.7	U	5.7	U	35		6.2	U	5.9	U
METHYL ACETATE							6.2	U	5.9	U
METHYL CYCLOHEXANE							6.2	U	5.9	U
METHYL TERT-BUTYL ETHER							6.2	U	5.9	U
METHYLENE CHLORIDE	13	B	15	B	11	B	15	B	17	B
O-XYLENE	5.7	U	5.7	U	22		6.2	U	5.9	U
STYRENE	5.7	U	5.7	U	5.5	U	6.2	U	5.9	U

ANALYTICAL RESULTS - SOIL
AUGUST 2001
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

LOCATION SAMPLE ID SAMPLE DATE DEPTH RANGE	S57SB024 S57SB0240103 8/15/2001 4 - 5	QUAL	S57SB024 S57SB0240203 8/15/2001 8 - 10	QUAL	S57SB025 S57SS0250103 8/15/2001 0 - 0.5	QUAL	S57SB025 S57SB0250103 8/15/2001 4 - 5	QUAL	S57SB025 S57SB0250203 8/15/2001 8 - 10	QUAL
TETRACHLOROETHENE	5.7	U	5.7	U	5.5	U	6.2	U	5.9	U
TOLUENE	5.7	U	5.7	U	5.2	J	6.2	U	5.9	U
TRANS-1,2-DICHLOROETHENE	5.7	U	5.7	U	5.5	U	6.2	U	5.9	U
TRANS-1,3-DICHLOROPROPENE	5.7	U	5.7	U	5.5	U	6.2	U	5.9	U
TRICHLOROETHENE	5.7	U	5.7	U	8		6.2	U	5.9	U
VINYL CHLORIDE	5.7	U	5.7	U	5.5	U	6.2	U	5.9	U
INORGANICS (MG/KG)										
ARSENIC										
FIELD PARAMETERS										
BULK DENSITY (lb/cu ft)	134.8									
NO. 10 SIEVE %	86.7									
NO. 100 SIEVE %	63.6									
NO. 20 SIEVE %	85.3									
NO. 200 SIEVE %	54.9									
NO. 4 SIEVE %	89.6									
NO. 40 SIEVE %	82.4									
POROSITY %	30.4									
SIEVE 1" %										
SIEVE 1-1/2" %										
SIEVE 1/2" %	100									
SIEVE 3/4" %										
SIEVE 3/8" %	92.8									
SPECIFIC GRAVITY S.U.	2.62									
MISCELLANEOUS PARAMETERS										
CATION EXCHANGE CAPACITY MEQ/1	210									
PH MEQ/1	5.01									
TOTAL ORGANIC CARBON MG/KG	23000									
USCS CLASSIFICATION	ML									
AASHTO CLASSIFICATION	A-4(0)									

ANALYTICAL RESULTS - SOIL
AUGUST 2001
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

LOCATION	S57SB025		S57SB026		S57SB027		S57SB027		S57SB027	
SAMPLE ID	S57SB0250303		S57SB0260103		S57SS0270103		S57SB0270103		S57SB0270203	
SAMPLE DATE	8/15/2001		8/15/2001		8/21/2001		8/21/2001		8/21/2001	
DEPTH RANGE	12 - 14	QUAL	8 - 9	QUAL	0 - 0.5	QUAL	4 - 5	QUAL	8 - 10	QUAL
VOLATILE ORGANICS (UG/KG)										
1,1,1-TRICHLOROETHANE	6	U			5.8	U	6.1	U	6.5	U
1,1,2,2-TETRACHLOROETHANE	6	U			5.8	U	6.1	U	6.5	U
1,1,2-TRICHLOROETHANE	6	U			5.8	U	6.1	U	6.5	U
1,1,2-TRICHLOROTRIFLUOROETHANE	6	U			5.8	U	6.1	U	6.5	U
1,1-DICHLOROETHANE	6	U			5.8	U	6.1	U	6.5	U
1,1-DICHLOROETHENE	6	U			5.8	U	6.1	U	6.5	U
1,2-DICHLOROETHANE	6	U			5.8	U	6.1	U	6.5	U
1,2-DICHLOROPROPANE	6	U			5.8	U	6.1	U	6.5	U
2-BUTANONE	6	U			5.8	U	6.1	U	6.5	U
2-HEXANONE	6	U			5.8	U	6.1	U	6.5	U
4-METHYL-2-PENTANONE	6	U			5.8	U	6.1	U	6.5	U
ACETONE	19	B			19	B	14	B	81	B
BENZENE	6	U			5.8	U	6.1	U	6.5	U
BROMODICHLOROMETHANE	6	U			5.8	U	6.1	U	6.5	U
BROMOFORM	6	U			5.8	U	6.1	U	6.5	U
BROMOMETHANE	6	U			5.8	U	6.1	U	6.5	U
CARBON DISULFIDE	6	U			5.8	U	6.1	U	6.5	U
CARBON TETRACHLORIDE	6	U			5.8	U	6.1	U	6.5	U
CHLOROBENZENE	6	U			5.8	U	6.1	U	6.5	U
CHLORODIBROMOMETHANE	6	U			5.8	U	6.1	U	6.5	U
CHLOROETHANE	6	U			5.8	U	6.1	U	6.5	U
CHLOROFORM	6	U			5.8	U	6.1	U	6.5	U
CHLOROMETHANE	6	U			5.8	U	6.1	U	6.5	U
CIS-1,2-DICHLOROETHENE	4.7	J			5.8	U	6.1	U	6.5	U
CIS-1,3-DICHLOROPROPENE	6	U			5.8	U	6.1	U	6.5	U
CYCLOHEXANE	6	U			5.8	U	6.1	U	6.5	U
DIETHYL ETHER	18				5.8	U	6.1	U	2100	
ETHYLBENZENE	6	U			5.8	U	6.1	U	6.5	U
ISOPROPYLBENZENE	6	U			5.8	U	6.1	U	6.5	U
M+P-XYLENES	2.6	J			5.8	U	6.1	U	6.5	U
METHYL ACETATE	6	U			5.8	U	6.1	U	6.5	U
METHYL CYCLOHEXANE	6	U			5.8	U	6.1	U	6.5	U
METHYL TERT-BUTYL ETHER	6	U			5.8	U	6.1	U	6.5	U
METHYLENE CHLORIDE	14	B			7.6	B	8.5	B	9.8	B
O-XYLENE	6	U			5.8	U	6.1	U	6.5	U
STYRENE	6	U			5.8	U	6.1	U	6.5	U

ANALYTICAL RESULTS - SOIL
AUGUST 2001
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

LOCATION SAMPLE ID SAMPLE DATE DEPTH RANGE	S57SB025 S57SB0250303 8/15/2001 12 - 14	QUAL	S57SB026 S57SB0260103 8/15/2001 8 - 9	QUAL	S57SB027 S57SS0270103 8/21/2001 0 - 0.5	QUAL	S57SB027 S57SB0270103 8/21/2001 4 - 5	QUAL	S57SB027 S57SB0270203 8/21/2001 8 - 10	QUAL
TETRACHLOROETHENE	6	U			5.8	U	6.1	U	6.5	U
TOLUENE	6	U			5.8	U	6.1	U	6.5	U
TRANS-1,2-DICHLOROETHENE	6	U			5.8	U	6.1	U	6.5	U
TRANS-1,3-DICHLOROPROPENE	6	U			5.8	U	6.1	U	6.5	U
TRICHLOROETHENE	6	U			5.8	U	6.1	U	6.5	U
VINYL CHLORIDE	6	U			5.8	U	6.1	U	6.5	U
INORGANICS (MG/KG)										
ARSENIC										
FIELD PARAMETERS										
BULK DENSITY (lb/cu ft)										
NO. 10 SIEVE %										
NO. 100 SIEVE %										
NO. 20 SIEVE %										
NO. 200 SIEVE %										
NO. 4 SIEVE %										
NO. 40 SIEVE %										
POROSITY %										
SIEVE 1" %										
SIEVE 1-1/2" %										
SIEVE 1/2" %										
SIEVE 3/4" %										
SIEVE 3/8" %										
SPECIFIC GRAVITY S.U.										
MISCELLANEOUS PARAMETERS										
CATION EXCHANGE CAPACITY MEQ/1										
PH MEQ/1										
TOTAL ORGANIC CARBON MG/KG			51000							
USCS CLASSIFICATION										
AASHTO CLASSIFICATION										

ANALYTICAL RESULTS - SOIL
AUGUST 2001
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

LOCATION SAMPLE ID SAMPLE DATE DEPTH RANGE	S57SB027 S57SB0270303 8/21/2001 12 - 14	QUAL	S57SB027 S57SB0270403 8/21/2001 16 - 18	QUAL	S57SB028 S57SS0280103 8/16/2001 0 - 0.5	QUAL	S57SB028 S57SB0280103 8/16/2001 4 - 5	QUAL	S57SB028 S57SB0280103-D 8/16/2001 4 - 5	QUAL
VOLATILE ORGANICS (UG/KG)										
1,1,1-TRICHLOROETHANE	6.4	U	6.5	U	6.5	U	6.3	U	6.4	U
1,1,2,2-TETRACHLOROETHANE	6.4	U	6.5	U	6.5	U	6.3	U	6.4	U
1,1,2-TRICHLOROETHANE	6.4	U	6.5	U	6.5	U	6.3	U	6.4	U
1,1,2-TRICHLOROTRIFLUOROETHANE	6.4	U	6.5	U	6.5	U	6.3	U	6.4	U
1,1-DICHLOROETHANE	6.4	U	6.5	U	6.5	U	6.3	U	6.4	U
1,1-DICHLOROETHENE	6.4	U	6.5	U	6.5	U	6.3	U	6.4	U
1,2-DICHLOROETHANE	6.4	U	6.5	U	6.5	U	6.3	U	6.4	U
1,2-DICHLOROPROPANE	6.4	U	6.5	U	6.5	U	6.3	U	6.4	U
2-BUTANONE	6.4	U	6.5	U	6.5	U	6.3	U	6.4	U
2-HEXANONE	6.4	U	6.5	U	6.5	U	6.3	U	6.4	U
4-METHYL-2-PENTANONE	6.4	U	6.5	U	6.5	U	6.3	U	6.4	U
ACETONE	42	B	97	B	22	B	61	B	42	B
BENZENE	6.4	U	6.5	U	6.5	U	6.3	U	6.4	U
BROMODICHLOROMETHANE	6.4	U	6.5	U	6.5	U	6.3	U	6.4	U
BROMOFORM	6.4	U	6.5	U	6.5	U	6.3	U	6.4	U
BROMOMETHANE	6.4	U	6.5	U	6.5	U	6.3	U	6.4	U
CARBON DISULFIDE	6.4	U	6.5	U	6.5	U	6.3	U	6.4	U
CARBON TETRACHLORIDE	6.4	U	6.5	U	6.5	U	6.3	U	6.4	U
CHLOROBENZENE	6.4	U	6.5	U	6.5	U	6.3	U	6.4	U
CHLORODIBROMOMETHANE	6.4	U	6.5	U	6.5	U	6.3	U	6.4	U
CHLOROETHANE	6.4	U	6.5	U	6.5	U	6.3	U	6.4	U
CHLOROFORM	6.4	U	6.5	U	6.5	U	6.3	U	6.4	U
CHLOROMETHANE	6.4	U	6.5	U	6.5	U	6.3	U	6.4	U
CIS-1,2-DICHLOROETHENE	6.4	U	6.5	U	6.5	U	6.3	U	6.4	U
CIS-1,3-DICHLOROPROPENE	6.4	U	6.5	U	6.5	U	6.3	U	6.4	U
CYCLOHEXANE	6.4	U	6.5	U	6.5	U	6.3	U	6.4	U
DIETHYL ETHER	750		230		6.5	U	6.3	U	6.4	U
ETHYLBENZENE	6.4	U	6.5	U	6.5	U	6.3	U	6.4	U
ISOPROPYLBENZENE	6.4	U	6.5	U	6.5	U	6.3	U	6.4	U
M+P-XYLENES	6.4	U	6.5	U	6.5	U	6.3	U	6.4	U
METHYL ACETATE	6.4	U	6.5	U	6.5	U	6.3	U	6.4	U
METHYL CYCLOHEXANE	6.4	U	6.5	U	6.5	U	6.3	U	6.4	U
METHYL TERT-BUTYL ETHER	6.4	U	6.5	U	6.5	U	6.3	U	6.4	U
METHYLENE CHLORIDE	8	B	9.1	B	21	B	18	B	19	B
O-XYLENE	6.4	U	6.5	U	6.5	U	6.3	U	6.4	U
STYRENE	6.4	U	6.5	U	6.5	U	6.3	U	6.4	U

ANALYTICAL RESULTS - SOIL
AUGUST 2001
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

LOCATION SAMPLE ID SAMPLE DATE DEPTH RANGE	S57SB027 S57SB0270303 8/21/2001 12 - 14	QUAL	S57SB027 S57SB0270403 8/21/2001 16 - 18	QUAL	S57SB028 S57SS0280103 8/16/2001 0 - 0.5	QUAL	S57SB028 S57SB0280103 8/16/2001 4 - 5	QUAL	S57SB028 S57SB0280103-D 8/16/2001 4 - 5	QUAL
TETRACHLOROETHENE	6.4	U	6.5	U	6.5	U	6.3	U	6.4	U
TOLUENE	6.4	U	6.5	U	6.5	U	6.3	U	6.4	U
TRANS-1,2-DICHLOROETHENE	6.4	U	6.5	U	6.5	U	6.3	U	6.4	U
TRANS-1,3-DICHLOROPROPENE	6.4	U	6.5	U	6.5	U	6.3	U	6.4	U
TRICHLOROETHENE	6.4	U	6.5	U	6.5	U	6.3	U	6.4	U
VINYL CHLORIDE	6.4	U	6.5	U	6.5	U	6.3	U	6.4	U
INORGANICS (MG/KG)										
ARSENIC										
FIELD PARAMETERS										
BULK DENSITY (lb/cu ft)										
NO. 10 SIEVE %										
NO. 100 SIEVE %										
NO. 20 SIEVE %										
NO. 200 SIEVE %										
NO. 4 SIEVE %										
NO. 40 SIEVE %										
POROSITY %										
SIEVE 1" %										
SIEVE 1-1/2" %										
SIEVE 1/2" %										
SIEVE 3/4" %										
SIEVE 3/8" %										
SPECIFIC GRAVITY S.U.										
MISCELLANEOUS PARAMETERS										
CATION EXCHANGE CAPACITY MEQ/1										
PH MEQ/1										
TOTAL ORGANIC CARBON MG/KG										
USCS CLASSIFICATION										
AASHTO CLASSIFICATION										

ANALYTICAL RESULTS - SOIL
AUGUST 2001
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

LOCATION SAMPLE ID SAMPLE DATE DEPTH RANGE	S57SB028 S57SB0280203 8/16/2001 10 - 12	QUAL	S57SB028 S57SB0280303 8/16/2001 12 - 14	QUAL	S57SB028 S57SB0280403 8/16/2001 18 - 20	QUAL	S57SB029 S57SS0290103 8/17/2001 0 - 0.5	QUAL	S57SB029 S57SB0290103 8/17/2001 4 - 5	QUAL
VOLATILE ORGANICS (UG/KG)										
1,1,1-TRICHLOROETHANE	6	U	6.2	U	6.5	U	5.8	U	6	U
1,1,2,2-TETRACHLOROETHANE	6	U	6.2	U	6.5	U	5.8	U	6	U
1,1,2-TRICHLOROETHANE	6	U	6.2	U	6.5	U	5.8	U	6	U
1,1,2-TRICHLOROTRIFLUOROETHANE	6	U	6.2	U	6.5	U	5.8	U	6	U
1,1-DICHLOROETHANE	6	U	6.2	U	6.5	U	5.8	U	6	U
1,1-DICHLOROETHENE	6	U	6.2	U	6.5	U	5.8	U	6	U
1,2-DICHLOROETHANE	6	U	6.2	U	6.5	U	5.8	U	6	U
1,2-DICHLOROPROPANE	6	U	6.2	U	6.5	U	5.8	U	6	U
2-BUTANONE	6	U	6.2	U	6.5	U	5.8	U	11	
2-HEXANONE	6	U	6.2	U	6.5	U	5.8	U	6	U
4-METHYL-2-PENTANONE	6	U	6.2	U	6.5	U	5.8	U	6	U
ACETONE	23	B	18	B	17	B	20	B	23	B
BENZENE	6	U	6.2	U	6.5	U	5.8	U	6	U
BROMODICHLOROMETHANE	6	U	6.2	U	6.5	U	5.8	U	6	U
BROMOFORM	6	U	6.2	U	6.5	U	5.8	U	6	U
BROMOMETHANE	6	U	6.2	U	6.5	U	5.8	U	6	U
CARBON DISULFIDE	6	U	6.2	U	6.5	U	5.8	U	6	U
CARBON TETRACHLORIDE	6	U	6.2	U	6.5	U	5.8	U	6	U
CHLOROBENZENE	6	U	6.2	U	6.5	U	5.8	U	6	U
CHLORODIBROMOMETHANE	6	U	6.2	U	6.5	U	5.8	U	6	U
CHLOROETHANE	6	U	6.2	U	6.5	U	5.8	U	6	U
CHLOROFORM	6	U	6.2	U	6.5	U	5.8	U	6	U
CHLOROMETHANE	6	U	6.2	U	6.5	U	5.8	U	6	U
CIS-1,2-DICHLOROETHENE	6	U	6.2	U	6.5	U	5.8	U	6	U
CIS-1,3-DICHLOROPROPENE	6	U	6.2	U	6.5	U	5.8	U	6	U
CYCLOHEXANE	6	U	6.2	U	6.5	U	5.8	U	6	U
DIETHYL ETHER	11		54		14		5.8	U	6	U
ETHYLBENZENE	6	U	6.2	U	6.5	U	5.8	U	6	U
ISOPROPYLBENZENE	6	U	6.2	U	6.5	U	5.8	U	6	U
M+P-XYLENES	6	U	6.2	U	6.5	U	5.8	U	6	U
METHYL ACETATE	6	U	6.2	U	6.5	U	5.8	U	6	U
METHYL CYCLOHEXANE	6	U	6.2	U	6.5	U	5.8	U	6	U
METHYL TERT-BUTYL ETHER	6	U	6.2	U	6.5	U	5.8	U	6	U
METHYLENE CHLORIDE	15	B	7	B	7.6	B	3	B	2.9	B
O-XYLENE	6	U	6.2	U	6.5	U	5.8	U	6	U
STYRENE	6	U	6.2	U	6.5	U	5.8	U	6	U

ANALYTICAL RESULTS - SOIL
AUGUST 2001
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

LOCATION SAMPLE ID SAMPLE DATE DEPTH RANGE	S57SB028 S57SB0280203 8/16/2001 10 - 12	QUAL	S57SB028 S57SB0280303 8/16/2001 12 - 14	QUAL	S57SB028 S57SB0280403 8/16/2001 18 - 20	QUAL	S57SB029 S57SS0290103 8/17/2001 0 - 0.5	QUAL	S57SB029 S57SB0290103 8/17/2001 4 - 5	QUAL
TETRACHLOROETHENE	6	U	6.2	U	6.5	U	5.8	U	6	U
TOLUENE	6	U	6.2	U	6.5	U	5.8	U	6	U
TRANS-1,2-DICHLOROETHENE	6	U	6.2	U	6.5	U	5.8	U	6	U
TRANS-1,3-DICHLOROPROPENE	6	U	6.2	U	6.5	U	5.8	U	6	U
TRICHLOROETHENE	6	U	6.2	U	6.5	U	5.8	U	6	U
VINYL CHLORIDE	6	U	6.2	U	6.5	U	5.8	U	6	U
INORGANICS (MG/KG)										
ARSENIC										
FIELD PARAMETERS										
BULK DENSITY (lb/cu ft)										
NO. 10 SIEVE %										
NO. 100 SIEVE %										
NO. 20 SIEVE %										
NO. 200 SIEVE %										
NO. 4 SIEVE %										
NO. 40 SIEVE %										
POROSITY %										
SIEVE 1" %										
SIEVE 1-1/2" %										
SIEVE 1/2" %										
SIEVE 3/4" %										
SIEVE 3/8" %										
SPECIFIC GRAVITY S.U.										
MISCELLANEOUS PARAMETERS										
CATION EXCHANGE CAPACITY MEQ/1										
PH MEQ/1										
TOTAL ORGANIC CARBON MG/KG										
USCS CLASSIFICATION										
AASHTO CLASSIFICATION										

ANALYTICAL RESULTS - SOIL
AUGUST 2001
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

LOCATION SAMPLE ID SAMPLE DATE DEPTH RANGE	S57SB029 S57SB0290203 8/17/2001 10 - 12	QUAL	S57SB029 S57SB0290303 8/17/2001 20 - 22	QUAL	S57SB029 S57SB0290403 8/17/2001 24 - 26	QUAL	S57SB029 S57SB0290403-D 8/16/2001 24 - 26	QUAL	S57SB030 S57SB0300103 8/24/2001 4 - 6	QUAL
VOLATILE ORGANICS (UG/KG)										
1,1,1-TRICHLOROETHANE	6.1	U	6.3	U	6.4	U	6.6	U	5.7	U
1,1,2,2-TETRACHLOROETHANE	6.1	U	6.3	U	6.4	U	6.6	U	5.7	U
1,1,2-TRICHLOROETHANE	6.1	U	6.3	U	6.4	U	6.6	U	5.7	U
1,1,2-TRICHLOROTRIFLUOROETHANE	6.1	U	6.3	U	6.4	U	6.6	U		
1,1-DICHLOROETHANE	6.1	U	6.3	U	6.4	U	6.6	U	5.7	U
1,1-DICHLOROETHENE	6.1	U	6.3	U	6.4	U	6.6	U	5.7	U
1,2-DICHLOROETHANE	6.1	U	6.3	U	6.4	U	6.6	U	5.7	U
1,2-DICHLOROPROPANE	6.1	U	6.3	U	6.4	U	6.6	U	5.7	U
2-BUTANONE	6.1	U	6.3	U	6.4	U	6.6	U	5.7	U
2-HEXANONE	6.1	U	6.3	U	6.4	U	6.6	U	5.7	U
4-METHYL-2-PENTANONE	6.1	U	6.3	U	6.4	U	6.6	U	5.7	U
ACETONE	15	B	76	B	12	B	28	B	5.7	U
BENZENE	6.1	U	6.3	U	6.4	U	6.6	U	5.7	U
BROMODICHLOROMETHANE	6.1	U	6.3	U	6.4	U	6.6	U	5.7	U
BROMOFORM	6.1	U	6.3	U	6.4	U	6.6	U	5.7	U
BROMOMETHANE	6.1	U	6.3	U	6.4	U	6.6	U	5.7	U
CARBON DISULFIDE	6.1	U	6.3	U	6.4	U	6.6	U	5.7	U
CARBON TETRACHLORIDE	6.1	U	6.3	U	6.4	U	6.6	U	5.7	U
CHLOROBENZENE	6.1	U	6.3	U	6.4	U	6.6	U	5.7	U
CHLORODIBROMOMETHANE	6.1	U	6.3	U	6.4	U	6.6	U	5.7	U
CHLOROETHANE	6.1	U	6.3	U	6.4	U	6.6	U	5.7	U
CHLOROFORM	6.1	U	6.3	U	6.4	U	6.6	U	5.7	U
CHLOROMETHANE	6.1	U	6.3	U	6.4	U	6.6	U	5.7	U
CIS-1,2-DICHLOROETHENE	6.1	U	6.3	U	6.4	U	6.6	U	5.7	U
CIS-1,3-DICHLOROPROPENE	6.1	U	6.3	U	6.4	U	6.6	U	5.7	U
CYCLOHEXANE	6.1	U	6.3	U	6.4	U	6.6	U		
DIETHYL ETHER	6.1	U	6.3	U	6.4	U	6.6	U	5.7	U
ETHYLBENZENE	6.1	U	6.3	U	6.4	U	6.6	U	5.7	U
ISOPROPYLBENZENE	6.1	U	6.3	U	6.4	U	6.6	U		
M+P-XYLENES	6.1	U	6.3	U	6.4	U	6.6	U	5.7	U
METHYL ACETATE	6.1	U	6.3	U	6.4	U	6.6	U		
METHYL CYCLOHEXANE	6.1	U	6.3	U	6.4	U	6.6	U		
METHYL TERT-BUTYL ETHER	6.1	U	6.3	U	6.4	U	6.6	U		
METHYLENE CHLORIDE	2.6	B	2.1	B	2.6	B	3.2	B	5.7	B
O-XYLENE	6.1	U	6.3	U	6.4	U	6.6	U	5.7	U
STYRENE	6.1	U	6.3	U	6.4	U	6.6	U	5.7	U

ANALYTICAL RESULTS - SOIL
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SITE 57 - FORMER DRUM LOADING AREA
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LOCATION SAMPLE ID SAMPLE DATE DEPTH RANGE	S57SB029 S57SB0290203 8/17/2001 10 - 12	QUAL	S57SB029 S57SB0290303 8/17/2001 20 - 22	QUAL	S57SB029 S57SB0290403 8/17/2001 24 - 26	QUAL	S57SB029 S57SB0290403-D 8/16/2001 24 - 26	QUAL	S57SB030 S57SB0300103 8/24/2001 4 - 6	QUAL
TETRACHLOROETHENE	6.1	U	6.3	U	6.4	U	6.6	U	5.7	U
TOLUENE	6.1	U	6.3	U	6.4	U	6.6	U	5.7	U
TRANS-1,2-DICHLOROETHENE	6.1	U	6.3	U	6.4	U	6.6	U	5.7	U
TRANS-1,3-DICHLOROPROPENE	6.1	U	6.3	U	6.4	U	6.6	U	5.7	U
TRICHLOROETHENE	6.1	U	6.3	U	6.4	U	6.6	U	5.7	U
VINYL CHLORIDE	6.1	U	6.3	U	6.4	U	6.6	U	5.7	U
INORGANICS (MG/KG)										
ARSENIC										
FIELD PARAMETERS										
BULK DENSITY (lb/cu ft)										
NO. 10 SIEVE %										
NO. 100 SIEVE %										
NO. 20 SIEVE %										
NO. 200 SIEVE %										
NO. 4 SIEVE %										
NO. 40 SIEVE %										
POROSITY %										
SIEVE 1" %										
SIEVE 1-1/2" %										
SIEVE 1/2" %										
SIEVE 3/4" %										
SIEVE 3/8" %										
SPECIFIC GRAVITY S.U.										
MISCELLANEOUS PARAMETERS										
CATION EXCHANGE CAPACITY MEQ/1										
PH MEQ/1										
TOTAL ORGANIC CARBON MG/KG										
USCS CLASSIFICATION										
AASHTO CLASSIFICATION										

ANALYTICAL RESULTS - SOIL
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SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

LOCATION	S57SB030		S57SB030		S57SB030		S57SB030		S57SB031	
SAMPLE ID	S57SB0300203		S57SB0300203-D		S57SB0300303		S57SB0300403		S57SB0310103	
SAMPLE DATE	8/24/2001		8/24/2001		8/24/2001		8/24/2001		8/24/2001	
DEPTH RANGE	8 - 10	QUAL	8 - 10	QUAL	14 - 16	QUAL	22 - 24	QUAL	4 - 6	QUAL
VOLATILE ORGANICS (UG/KG)										
1,1,1-TRICHLOROETHANE	6	U	5.5	U	6.2	U	6.4	U	6.2	U
1,1,2,2-TETRACHLOROETHANE	6	U	5.5	U	6.2	U	6.4	U	6.2	U
1,1,2-TRICHLOROETHANE	6	U	5.5	U	6.2	U	6.4	U	6.2	U
1,1,2-TRICHLOROTRIFLUOROETHANE										
1,1-DICHLOROETHANE	6	U	5.5	U	6.2	U	6.4	U	6.2	U
1,1-DICHLOROETHENE	6	U	5.5	U	6.2	U	6.4	U	6.2	U
1,2-DICHLOROETHANE	6	U	5.5	U	6.2	U	6.4	U	6.2	U
1,2-DICHLOROPROPANE	6	U	5.5	U	6.2	U	6.4	U	6.2	U
2-BUTANONE	6	U	5.5	U	6.2	U	6.4	U	6.2	U
2-HEXANONE	6	U	5.5	U	6.2	U	6.4	U	6.2	U
4-METHYL-2-PENTANONE	6	U	5.5	U	6.2	U	6.4	U	6.2	U
ACETONE	6	U	5.5	U	6.2	U	80	J	35	J
BENZENE	6	U	5.5	U	6.2	U	6.4	U	6.2	U
BROMODICHLOROMETHANE	6	U	5.5	U	6.2	U	6.4	U	6.2	U
BROMOFORM	6	U	5.5	U	6.2	U	6.4	U	6.2	U
BROMOMETHANE	6	U	5.5	U	6.2	U	6.4	U	6.2	U
CARBON DISULFIDE	6	U	5.5	U	6.2	U	6.4	U	6.2	U
CARBON TETRACHLORIDE	6	U	5.5	U	6.2	U	6.4	U	6.2	U
CHLOROBENZENE	6	U	5.5	U	6.2	U	6.4	U	6.2	U
CHLORODIBROMOMETHANE	6	U	5.5	U	6.2	U	6.4	U	6.2	U
CHLOROETHANE	6	U	5.5	U	6.2	U	6.4	U	6.2	U
CHLOROFORM	6	U	5.5	U	6.2	U	6.4	U	6.2	U
CHLOROMETHANE	6	U	5.5	U	6.2	U	6.4	U	6.2	U
CIS-1,2-DICHLOROETHENE	6	U	5.5	U	6.2	U	6.4	U	6.2	U
CIS-1,3-DICHLOROPROPENE	6	U	5.5	U	6.2	U	6.4	U	6.2	U
CYCLOHEXANE										
DIETHYL ETHER	6	U	5.5	U	6.2	U	6.4	U	6.2	U
ETHYLBENZENE	6	U	5.5	U	6.2	U	6.4	U	6.2	U
ISOPROPYLBENZENE										
M+P-XYLENES	6	U	5.5	U	6.2	U	6.4	U	6.2	U
METHYL ACETATE										
METHYL CYCLOHEXANE										
METHYL TERT-BUTYL ETHER										
METHYLENE CHLORIDE	6.2	B	6.1	B	7.1	B	11	B	5.8	B
O-XYLENE	6	U	5.5	U	6.2	U	6.4	U	6.2	U
STYRENE	6	U	5.5	U	6.2	U	6.4	U	6.2	U

ANALYTICAL RESULTS - SOIL
AUGUST 2001
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

LOCATION SAMPLE ID SAMPLE DATE DEPTH RANGE	S57SB030 S57SB0300203 8/24/2001 8 - 10	QUAL	S57SB030 S57SB0300203-D 8/24/2001 8 - 10	QUAL	S57SB030 S57SB0300303 8/24/2001 14 - 16	QUAL	S57SB030 S57SB0300403 8/24/2001 22 - 24	QUAL	S57SB031 S57SB0310103 8/24/2001 4 - 6	QUAL
TETRACHLOROETHENE	6	U	5.5	U	6.2	U	6.4	U	6.2	U
TOLUENE	6	U	5.5	U	6.2	U	6.4	U	6.2	U
TRANS-1,2-DICHLOROETHENE	6	U	5.5	U	6.2	U	6.4	U	6.2	U
TRANS-1,3-DICHLOROPROPENE	6	U	5.5	U	6.2	U	6.4	U	6.2	U
TRICHLOROETHENE	6	U	5.5	U	6.2	U	6.4	U	6.2	U
VINYL CHLORIDE	6	U	5.5	U	6.2	U	6.4	U	6.2	U
INORGANICS (MG/KG)										
ARSENIC										
FIELD PARAMETERS										
BULK DENSITY (lb/cu ft)	130.4						119.2			
NO. 10 SIEVE %	95.9						98.2			
NO. 100 SIEVE %	58.1						92			
NO. 20 SIEVE %	91.4						97.8			
NO. 200 SIEVE %	47.8						77.2			
NO. 4 SIEVE %	97.9						100			
NO. 40 SIEVE %	82.4						96.2			
POROSITY %	29.8						47.3			
SIEVE 1" %										
SIEVE 1-1/2" %										
SIEVE 1/2" %										
SIEVE 3/4" %										
SIEVE 3/8" %	100						100			
SPECIFIC GRAVITY S.U.	2.57						2.56			
MISCELLANEOUS PARAMETERS										
CATION EXCHANGE CAPACITY MEQ/1										
PH MEQ/1	7.4		4.87				5.65			
TOTAL ORGANIC CARBON MG/KG	9900		6600				8900			
USCS CLASSIFICATION	SM						ML			
AASHTO CLASSIFICATION	A-4(0)						A-4(0)			

ANALYTICAL RESULTS - SOIL
AUGUST 2001
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

LOCATION	S57SB031		S57SB031		S57SB031		S57SB031		S57SB032	
SAMPLE ID	S57SB0310203		S57SB0310203-D		S57SB0310303		S57SB0310403		S57SB0320103	
SAMPLE DATE	8/24/2001		8/24/2001		8/24/2001		8/24/2001		8/24/2001	
DEPTH RANGE	8 - 10	QUAL	8 - 10	QUAL	14 - 16	QUAL	18 - 20	QUAL	6 - 8	QUAL
VOLATILE ORGANICS (UG/KG)										
1,1,1-TRICHLOROETHANE	5.9	U	5.5	U	6.5	U	6.4	U	5.8	U
1,1,2,2-TETRACHLOROETHANE	5.9	U	5.5	U	6.5	U	6.4	U	5.8	U
1,1,2-TRICHLOROETHANE	5.9	U	5.5	U	6.5	U	6.4	U	5.8	U
1,1,2-TRICHLOROTRIFLUOROETHANE										
1,1-DICHLOROETHANE	5.9	U	5.5	U	6.5	U	6.4	U	5.8	U
1,1-DICHLOROETHENE	5.9	U	5.5	U	6.5	U	6.4	U	5.8	U
1,2-DICHLOROETHANE	5.9	U	5.5	U	6.5	U	6.4	U	5.8	U
1,2-DICHLOROPROPANE	5.9	U	5.5	U	6.5	U	6.4	U	5.8	U
2-BUTANONE	5.9	U	5.5	U	6.5	U	6.4	U	5.8	U
2-HEXANONE	5.9	U	5.5	U	6.5	U	6.4	U	5.8	U
4-METHYL-2-PENTANONE	5.9	U	5.5	U	6.5	U	6.4	U	5.8	U
ACETONE	5.9	U	5.5	U	6.5	U	6.4	U	5.8	U
BENZENE	5.9	U	5.5	U	6.5	U	6.4	U	5.8	U
BROMODICHLOROMETHANE	5.9	U	5.5	U	6.5	U	6.4	U	5.8	U
BROMOFORM	5.9	U	5.5	U	6.5	U	6.4	U	5.8	U
BROMOMETHANE	5.9	U	5.5	U	6.5	U	6.4	U	5.8	U
CARBON DISULFIDE	5.9	U	5.5	U	6.5	U	6.4	U	5.8	U
CARBON TETRACHLORIDE	5.9	U	5.5	U	6.5	U	6.4	U	5.8	U
CHLOROBENZENE	5.9	U	5.5	U	6.5	U	6.4	U	5.8	U
CHLORODIBROMOMETHANE	5.9	U	5.5	U	6.5	U	6.4	U	5.8	U
CHLOROETHANE	5.9	U	5.5	U	6.5	U	6.4	U	5.8	U
CHLOROFORM	5.9	U	5.5	U	6.5	U	6.4	U	5.8	U
CHLOROMETHANE	5.9	U	5.5	U	6.5	U	6.4	U	5.8	U
CIS-1,2-DICHLOROETHENE	5.9	U	5.5	U	6.5	U	6.4	U	5.8	U
CIS-1,3-DICHLOROPROPENE	5.9	U	5.5	U	6.5	U	6.4	U	5.8	U
CYCLOHEXANE										
DIETHYL ETHER	5.9	U	5.5	U	6.5	U	6.4	U	5.8	U
ETHYLBENZENE	5.9	U	5.5	U	6.5	U	6.4	U	5.8	U
ISOPROPYLBENZENE										
M+P-XYLENES	5.9	U	5.5	U	6.5	U	6.4	U	5.8	U
METHYL ACETATE										
METHYL CYCLOHEXANE										
METHYL TERT-BUTYL ETHER										
METHYLENE CHLORIDE	5.9	B	6.1	B	7	B	8.5	B	7.8	B
O-XYLENE	5.9	U	5.5	U	6.5	U	6.4	U	5.8	U
STYRENE	5.9	U	5.5	U	6.5	U	6.4	U	5.8	U

ANALYTICAL RESULTS - SOIL
AUGUST 2001
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

LOCATION SAMPLE ID SAMPLE DATE DEPTH RANGE	S57SB031 S57SB0310203 8/24/2001 8 - 10	QUAL	S57SB031 S57SB0310203-D 8/24/2001 8 - 10	QUAL	S57SB031 S57SB0310303 8/24/2001 14 - 16	QUAL	S57SB031 S57SB0310403 8/24/2001 18 - 20	QUAL	S57SB032 S57SB0320103 8/24/2001 6 - 8	QUAL
TETRACHLOROETHENE	5.9	U	5.5	U	6.5	U	6.4	U	5.8	U
TOLUENE	5.9	U	5.5	U	6.5	U	6.4	U	5.8	U
TRANS-1,2-DICHLOROETHENE	5.9	U	5.5	U	6.5	U	6.4	U	5.8	U
TRANS-1,3-DICHLOROPROPENE	5.9	U	5.5	U	6.5	U	6.4	U	5.8	U
TRICHLOROETHENE	5.9	U	5.5	U	6.5	U	6.4	U	5.8	U
VINYL CHLORIDE	5.9	U	5.5	U	6.5	U	6.4	U	5.8	U
INORGANICS (MG/KG)										
ARSENIC										
FIELD PARAMETERS										
BULK DENSITY (lb/cu ft)	135.2						123.6			
NO. 10 SIEVE %	94						100			
NO. 100 SIEVE %	59.9						70.8			
NO. 20 SIEVE %	90.9						99.9			
NO. 200 SIEVE %	47						38.2			
NO. 4 SIEVE %	95.4									
NO. 40 SIEVE %	84.6						99.7			
POROSITY %	29.7						40.1			
SIEVE 1" %										
SIEVE 1-1/2" %										
SIEVE 1/2" %	100									
SIEVE 3/4" %										
SIEVE 3/8" %	99.3									
SPECIFIC GRAVITY S.U.	2.61						2.62			
MISCELLANEOUS PARAMETERS										
CATION EXCHANGE CAPACITY MEQ/1										
PH MEQ/1	5.83		5.74				9.08			
TOTAL ORGANIC CARBON MG/KG	10000		8100				12000			
USCS CLASSIFICATION	SM						SM			
AASHTO CLASSIFICATION	A-4(0)						A-4(0)			

ANALYTICAL RESULTS - SOIL
AUGUST 2001
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

LOCATION	S57SB032		S57SB032		S57SB032		S57SB033	
SAMPLE ID	S57SB0320203		S57SB0320303		S57SB0320403		S57SB0330103	
SAMPLE DATE	8/24/2001		8/24/2001		8/24/2001		8/22/2001	
DEPTH RANGE	8 - 10	QUAL	14 - 16	QUAL	18 - 20	QUAL	10 - 12	QUAL
VOLATILE ORGANICS (UG/KG)								
1,1,1-TRICHLOROETHANE	5.5	U	5.9	U	5.8	U	5.8	U
1,1,2,2-TETRACHLOROETHANE	5.5	U	5.9	U	5.8	U	5.8	U
1,1,2-TRICHLOROETHANE	5.5	U	5.9	U	5.8	U	5.8	U
1,1,2-TRICHLOROTRIFLUOROETHANE							5.8	U
1,1-DICHLOROETHANE	5.5	U	5.9	U	5.8	U	5.8	U
1,1-DICHLOROETHENE	5.5	U	5.9	U	5.8	U	5.8	U
1,2-DICHLOROETHANE	5.5	U	5.9	U	5.8	U	5.8	U
1,2-DICHLOROPROPANE	5.5	U	5.9	U	5.8	U	5.8	U
2-BUTANONE	5.5	U	5.9	U	5.8	U	5.8	U
2-HEXANONE	5.5	U	5.9	U	5.8	U	5.8	U
4-METHYL-2-PENTANONE	5.5	U	5.9	U	5.8	U	5.8	U
ACETONE	5.5	U	5.9	U	5.8	U	18	B
BENZENE	5.5	U	5.9	U	5.8	U	5.8	U
BROMODICHLOROMETHANE	5.5	U	5.9	U	5.8	U	5.8	U
BROMOFORM	5.5	U	5.9	U	5.8	U	5.8	U
BROMOMETHANE	5.5	U	5.9	U	5.8	U	5.8	U
CARBON DISULFIDE	5.5	U	5.9	U	5.8	U	5.8	U
CARBON TETRACHLORIDE	5.5	U	5.9	U	5.8	U	5.8	U
CHLOROBENZENE	5.5	U	5.9	U	5.8	U	5.8	U
CHLORODIBROMOMETHANE	5.5	U	5.9	U	5.8	U	5.8	U
CHLOROETHANE	5.5	U	5.9	U	5.8	U	5.8	U
CHLOROFORM	5.5	U	5.9	U	5.8	U	5.8	U
CHLOROMETHANE	5.5	U	5.9	U	5.8	U	5.8	U
CIS-1,2-DICHLOROETHENE	5.5	U	5.9	U	5.8	U	5.8	U
CIS-1,3-DICHLOROPROPENE	5.5	U	5.9	U	5.8	U	5.8	U
CYCLOHEXANE								
DIETHYL ETHER	5.5	U	5.9	U	5.8	U	5.8	U
ETHYLBENZENE	5.5	U	5.9	U	5.8	U	5.8	U
ISOPROPYLBENZENE								
M+P-XYLENES	5.5	U	5.9	U	5.8	U	5.8	U
METHYL ACETATE							5.8	U
METHYL CYCLOHEXANE							5.8	U
METHYL TERT-BUTYL ETHER							5.8	U
METHYLENE CHLORIDE	6	B	6.7	B	5.3	B	1.3	J
O-XYLENE	5.5	U	5.9	U	5.8	U	5.8	U
STYRENE	5.5	U	5.9	U	5.8	U	5.8	U

ANALYTICAL RESULTS - SOIL
AUGUST 2001
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

LOCATION SAMPLE ID SAMPLE DATE DEPTH RANGE	S57SB032 S57SB0320203 8/24/2001 8 - 10	QUAL	S57SB032 S57SB0320303 8/24/2001 14 - 16	QUAL	S57SB032 S57SB0320403 8/24/2001 18 - 20	QUAL	S57SB033 S57SB0330103 8/22/2001 10 - 12	QUAL
TETRACHLOROETHENE	5.5	U	5.9	U	5.8	U	5.8	U
TOLUENE	5.5	U	5.9	U	5.8	U	5.8	U
TRANS-1,2-DICHLOROETHENE	5.5	U	5.9	U	5.8	U	5.8	U
TRANS-1,3-DICHLOROPROPENE	5.5	U	5.9	U	5.8	U	5.8	U
TRICHLOROETHENE	5.5	U	5.9	U	5.8	U	5.8	U
VINYL CHLORIDE	5.5	U	5.9	U	5.8	U	5.8	U
INORGANICS (MG/KG)								
ARSENIC								
FIELD PARAMETERS								
BULK DENSITY (lb/cu ft)	118.6				120.4			
NO. 10 SIEVE %	83.9				75.2			
NO. 100 SIEVE %	74.5				66.5			
NO. 20 SIEVE %	82				73.6			
NO. 200 SIEVE %	72.1				63.6			
NO. 4 SIEVE %	89.4				85			
NO. 40 SIEVE %	79.9				72			
POROSITY %	41.5				42.8			
SIEVE 1" %								
SIEVE 1-1/2" %								
SIEVE 1/2" %	94.9				93.4			
SIEVE 3/4" %	100				100			
SIEVE 3/8" %	92.6				90.7			
SPECIFIC GRAVITY S.U.	2.55				2.54			
MISCELLANEOUS PARAMETERS								
CATION EXCHANGE CAPACITY MEQ/1								
PH MEQ/1	5.29				5.27			
TOTAL ORGANIC CARBON MG/KG	9000				6500			
USCS CLASSIFICATION	ML				ML			
AASHTO CLASSIFICATION	A-4(0)				A-4(0)			

B.2 SOIL GEOTECHNICAL DATA

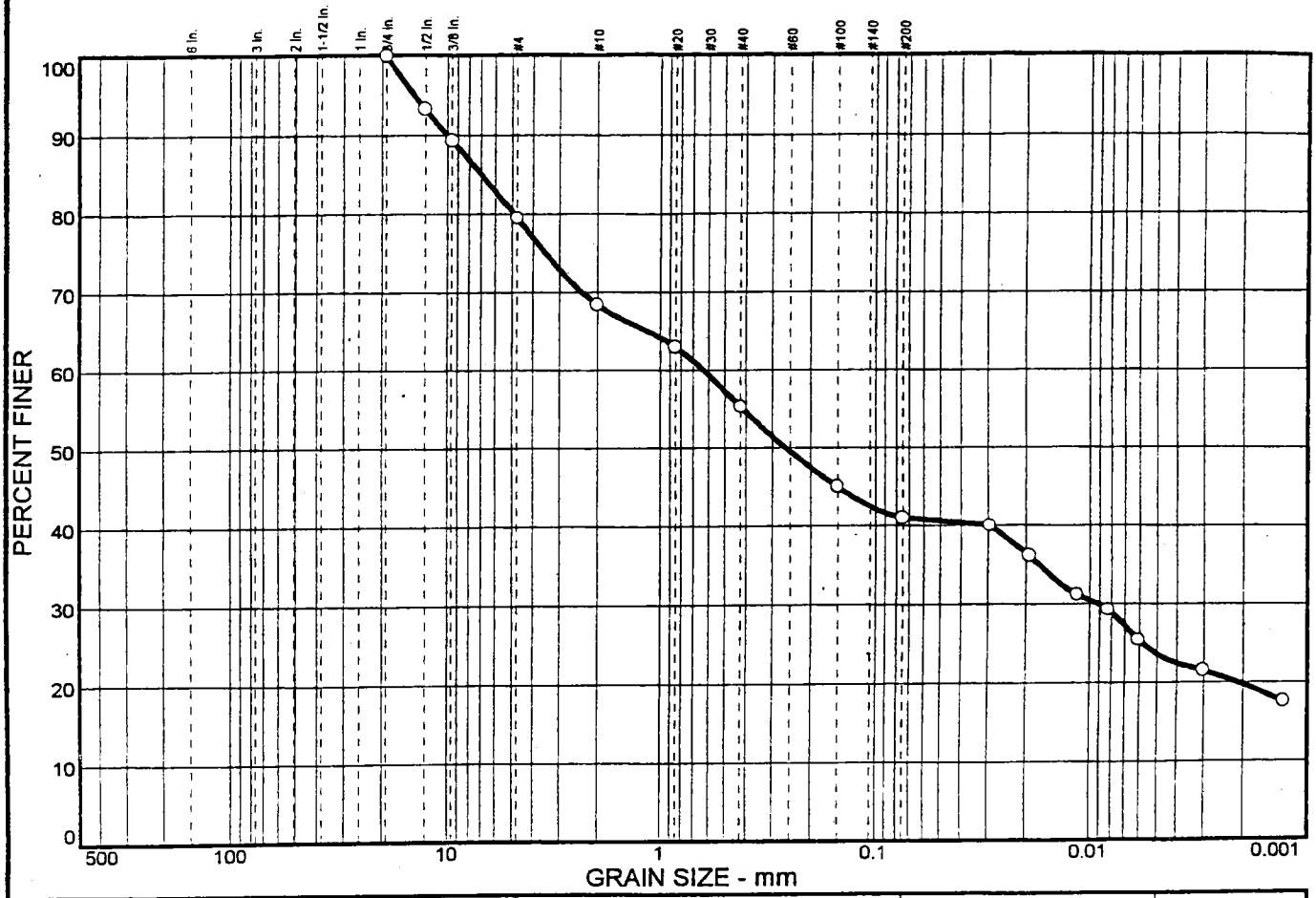
ACKENHEIL ENGINEERS, INC.
Civil • Environmental • Materials Testing

SPECIFIC GRAVITY, POROSITY AND BULK DENSITY

Project: Naval Surface Weapons Center
Indian Head, Maryland
Project No.: 7129 (CTO 245)
Date: 9/8/01

Sample Number	Specific Gravity	Porosity (Percent)	Bulk Density (pcf)
S-57-SB-0160103	2.65	32.9	129.8
S-57-SB-0160303	2.63	43.3	111.7
S-57-SB-0180103	2.58	41.9	122.3
S-57-SB-0180303	2.61	37.2	111.7
S-57-SB-0210103	2.59	45.9	112.9
S-57-SB-0210303	2.65	36.7	122.9
S-57-SB-0220103	2.57	32.9	127.3
S-57-SB-0220303	2.63	30.1	132.9
S-57-SB-0240103	2.62	30.4	134.8
S-57-SB-0300203	2.57	29.8	130.4
S-57-SB-0300403	2.56	47.3	119.2
S-57-SB-0310203	2.61	29.7	135.2
S-57-SB-0310403	2.62	40.1	123.6
S-57-SB-0320203	2.55	41.5	118.6
S-57-SB-0320403	2.54	42.8	120.4

Particle Size Distribution Report



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY
0.0	20.5	38.5	17.4	23.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75 in.	100.0		
.5 in.	93.3		
.375 in.	89.3		
#4	79.5		
#10	68.4		
#20	63.0		
#40	55.3		
#100	45.0		
#200	41.0		

* (no specification provided)

Soil Description

USCS Group Name: Silty sand with gravel

Atterberg Limits

PL= na LL= na PI= na

Coefficients

D_{85}= 6.97 D_{60}= 0.630 D_{50}= 0.261
D_{30}= 0.0091 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO= A-4(0)

Remarks

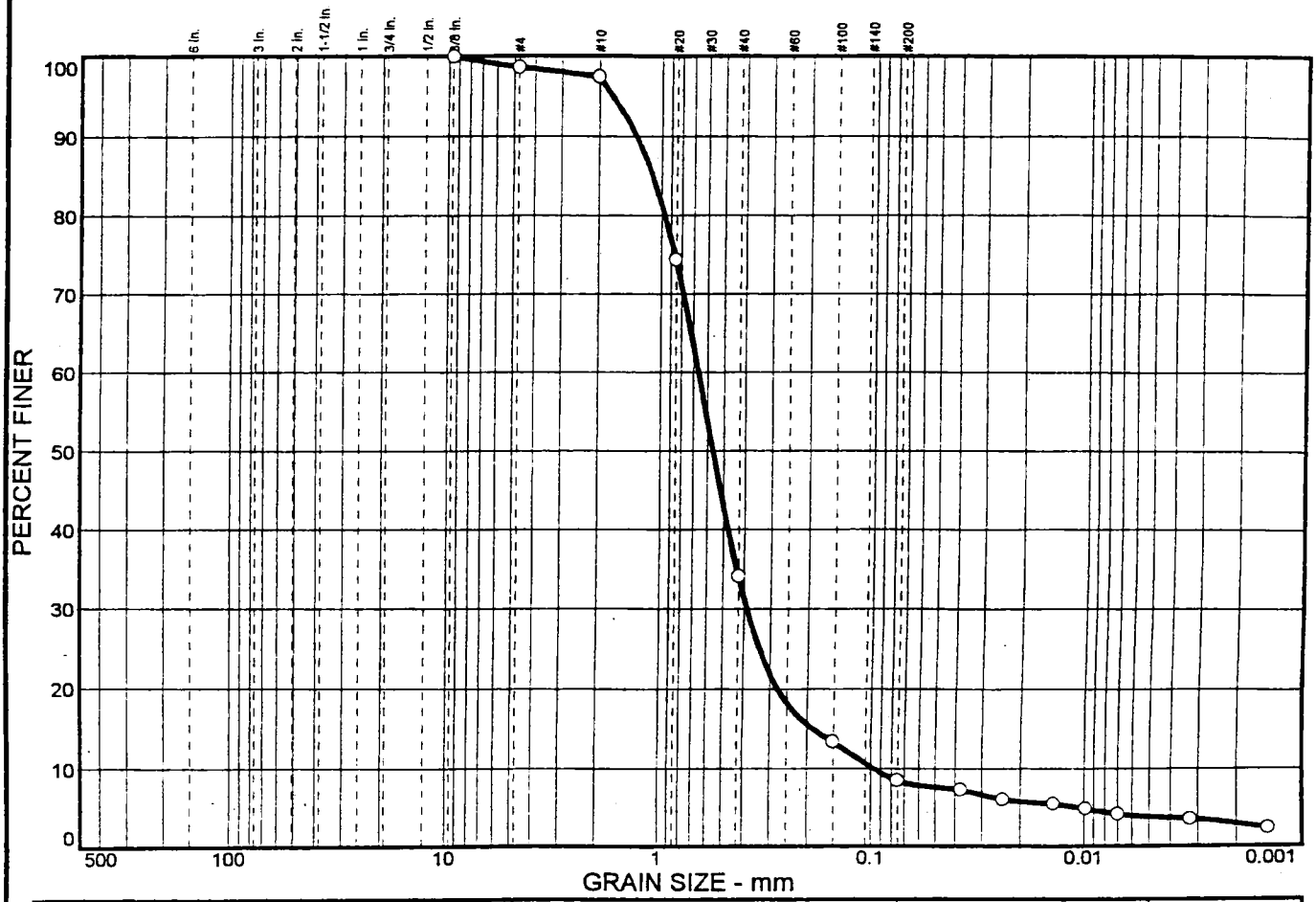
Natural Water Content: 18.8%

Sample No.: S-57-SB-0160103 **Source of Sample:** **Date:** 9-7-01
Location: Indian Head, Maryland **Elev./Depth:** na

ACKENHEIL ENGINEERS, INC.

Client: Tetra Tech NUS, Inc.
Project: Naval Surface Weapons Center
Indian Head, Maryland (CTO 245)
Project No: 21730

Particle Size Distribution Report



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY
0.0	1.3	90.2	4.6	3.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375 in.	100.0		
#4	98.7		
#10	97.5		
#20	74.3		
#40	34.1		
#100	13.4		
#200	8.5		

* (no specification provided)

Soil Description

USCS Group Name: Well-graded sand with silt

Atterberg Limits

PL= na LL= na PI= na

Coefficients

D_{85}= 1.11 D_{60}= 0.661 D_{50}= 0.563
D_{30}= 0.387 D_{15}= 0.186 D_{10}= 0.0969
C_u= 6.82 C_c= 2.34

Classification

USCS= SW-SM AASHTO= A-1-b

Remarks

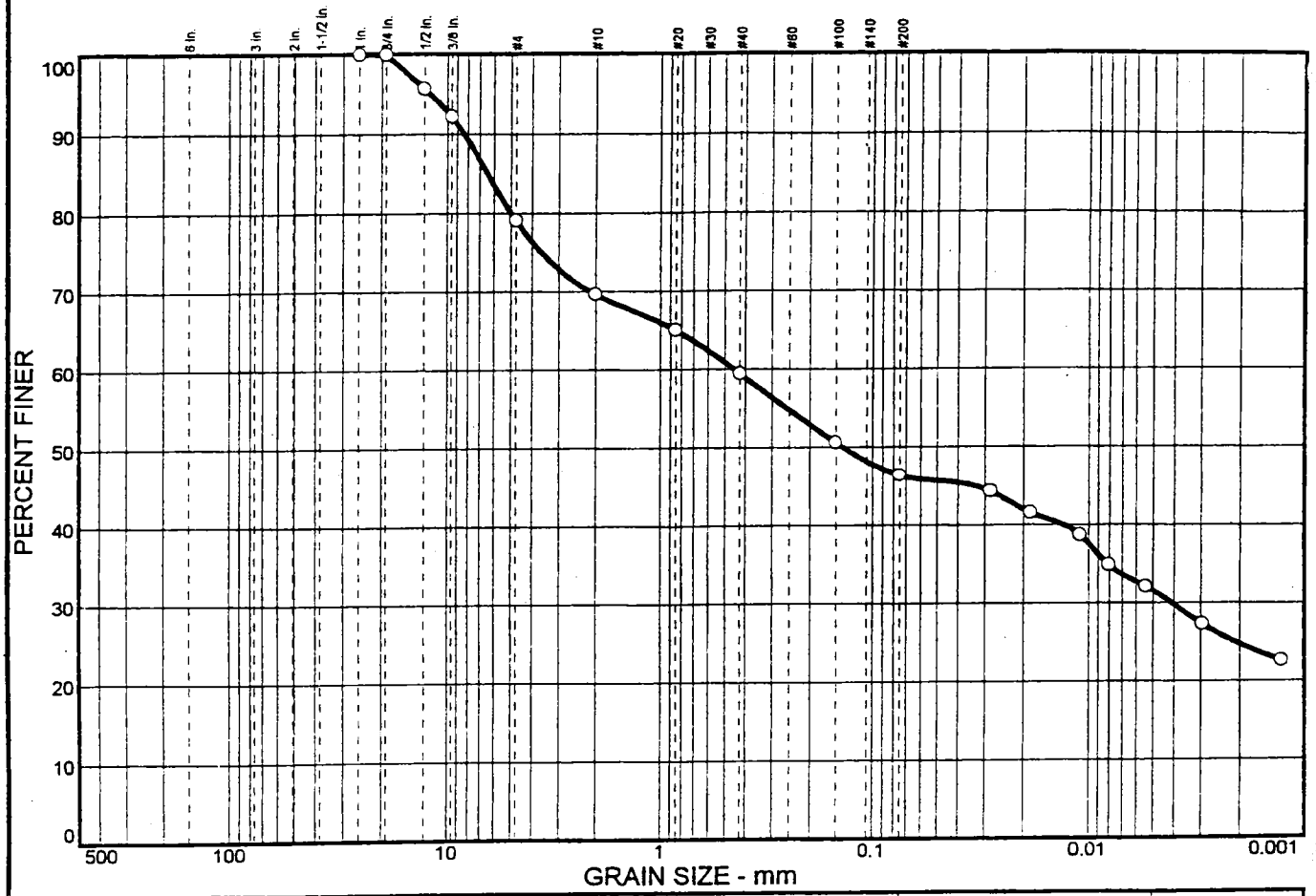
Natural Water Content: 19.8%

Sample No.: S-57-SB-0160303 **Date:** 9-7-01
Location: Indian Head, Maryland **Elev./Depth:** na

ACKENHEIL ENGINEERS, INC.

Client: Tetra Tech NUS, Inc.
Project: Naval Surface Weapons Center
Indian Head, Maryland (CTO 245)
Project No: 21730

Particle Size Distribution Report



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY
0.0	20.9	32.7	14.8	31.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100.0		
.75 in.	100.0		
.5 in.	95.7		
.375 in.	92.2		
#4	79.1		
#10	69.6		
#20	65.0		
#40	59.4		
#100	50.6		
#200	46.4		

* (no specification provided)

Soil Description

USCS Group Name: Silty sand with gravel

Atterberg Limits

PL= na LL= na PI= na

Coefficients

D_{85}= 6.44 D_{60}= 0.455 D_{50}= 0.139
D_{30}= 0.0041 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO= A-4(0)

Remarks

Natural Water Content: 26.3%

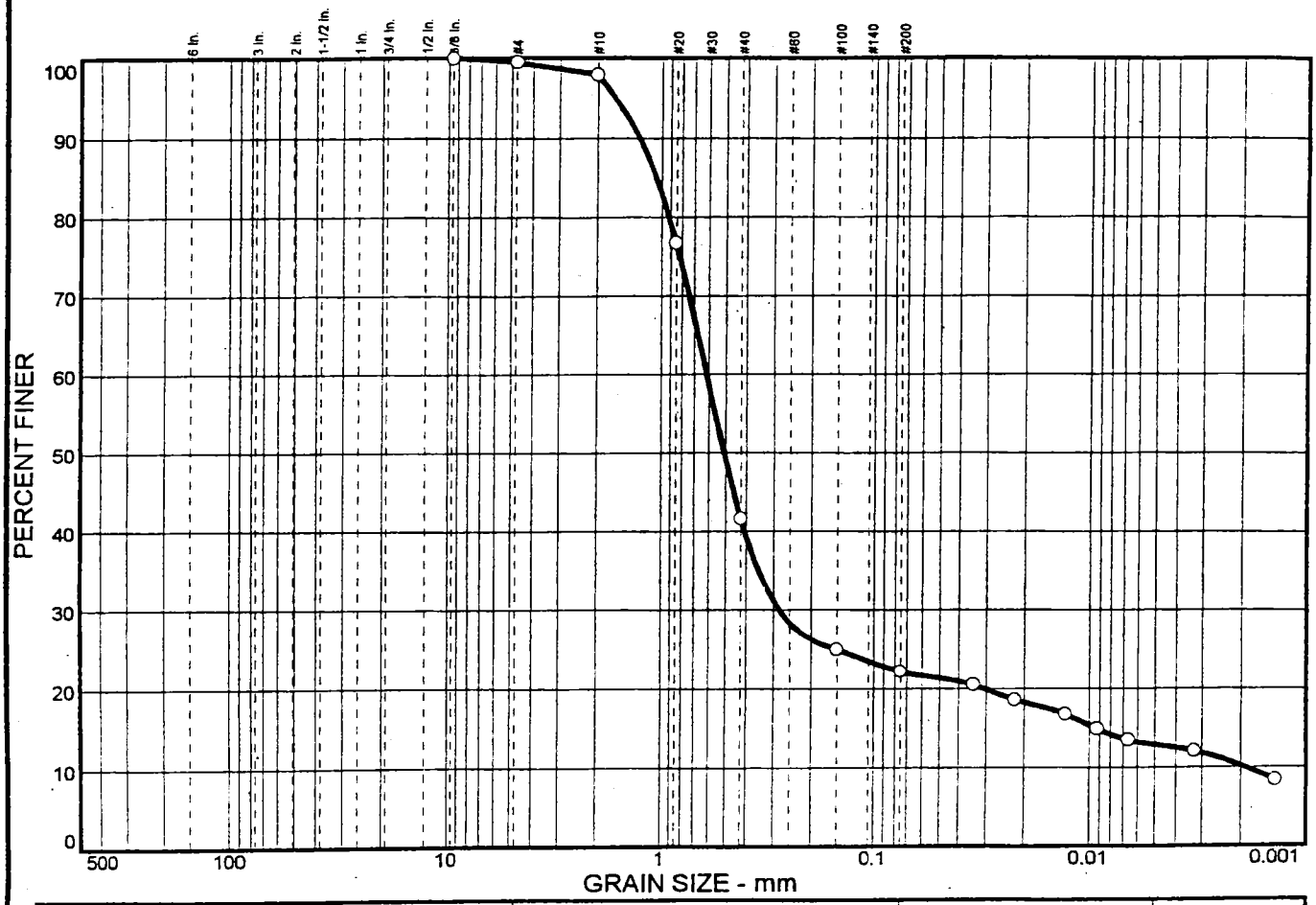
Sample No.: S-57-SB-0180103
Location: Indian Head, Maryland

Date: 9-8-01
Elev./Depth: na

ACKENHEIL ENGINEERS, INC.

Client: Tetra Tech NUS, inc.
Project: Naval Surface Weapons Center
Indian Head, Maryland (CTO 245)
Project No: 21730

Particle Size Distribution Report



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.5	77.3	9.3	12.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375 in.	100.0		
#4	99.5		
#10	98.0		
#20	76.7		
#40	41.6		
#100	25.0		
#200	22.2		

* (no specification provided)

Soil Description

USCS Group Name: Silty sand

Atterberg Limits

PL= na LL= na PI= na

Coefficients

D_{85}= 1.06 D_{60}= 0.613 D_{50}= 0.509
D_{30}= 0.280 D_{15}= 0.0094 D_{10}= 0.0019
C_u= 322.18 C_c= 67.35

Classification

USCS= SM AASHTO= A-1-b

Remarks

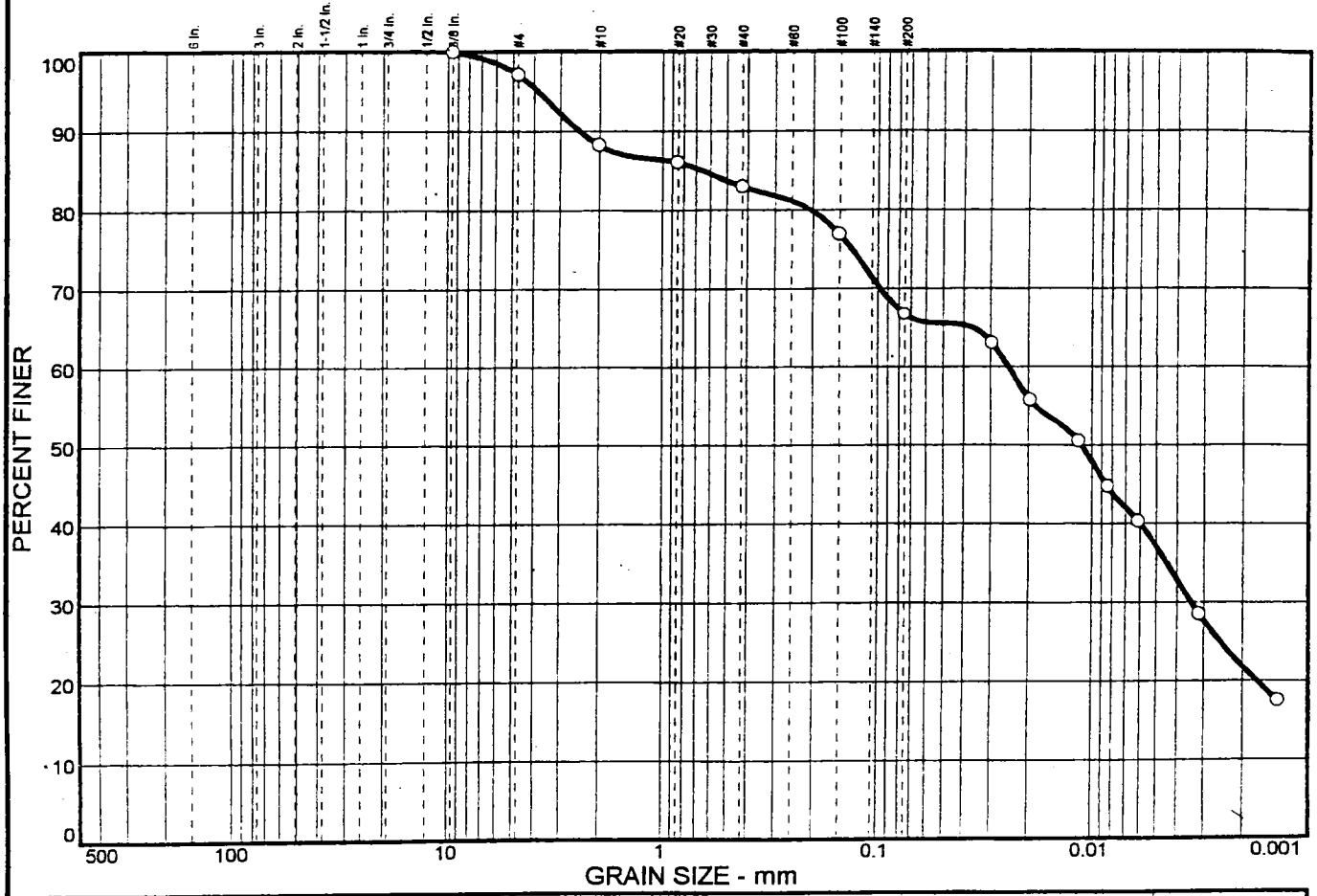
Natural Water Content: 25.6%

Sample No.: S-57-SB-0180303 **Date:** 9-7-01
Location: Indian Head, Maryland **Elev./Depth:** na

ACKENHEIL ENGINEERS, INC.

Client: Tetra Tech NUS, Inc.
Project: Naval Surface Weapons Center
Indian Head, Maryland (CTO 245)
Project No: 21730

Particle Size Distribution Report



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY
0.0	2.9	30.4	29.6	37.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375 in.	100.0		
#4	97.1		
#10	88.2		
#20	86.0		
#40	82.9		
#100	76.9		
#200	66.7		

* (no specification provided)

Soil Description

USCS Group Name: Sandy silt

Atterberg Limits

PL= na LL= na PI= na

Coefficients

D_{85}= 0.659 D_{60}= 0.0248 D_{50}= 0.0112
D_{30}= 0.0034 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= ML AASHTO= A-4(0)

Remarks

Natural Water Content: 29.4%

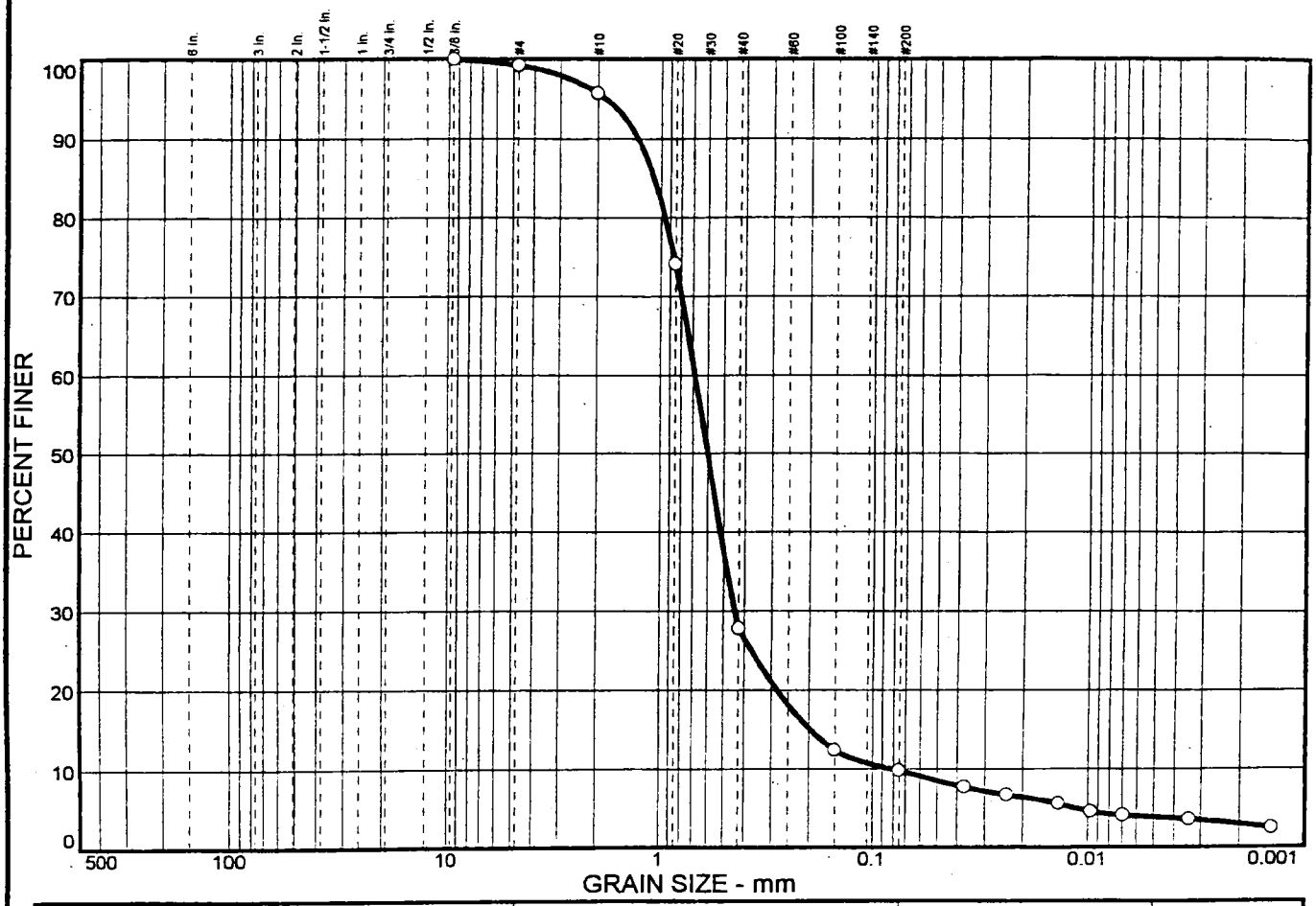
Sample No.: S-57-SB-0210103
Location: Indian Head, Maryland

Date: 9-6-01
Elev./Depth: na

ACKENHEIL ENGINEERS, INC.

Client: Tetra Tech NUS, Inc.
Project: Naval Surface Weapons Center
Indian Head, Maryland (CTO 245)
Project No: 21730

Particle Size Distribution Report



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.8	89.4	5.9	3.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375 in.	100.0		
#4	99.2		
#10	95.7		
#20	74.1		
#40	27.8		
#100	12.4		
#200	9.8		

* (no specification provided)

Soil Description

USCS Group Name: Poorly graded sand with silt

Atterberg Limits

PL= na LL= na PI= na

Coefficients

D_{85}= 1.08 D_{60}= 0.684 D_{50}= 0.596
D_{30}= 0.443 D_{15}= 0.195 D_{10}= 0.0807
C_u= 8.47 C_c= 3.55

Classification

USCS= SP-SM AASHTO= A-1-b

Remarks

Natural Water Content: 22.9%

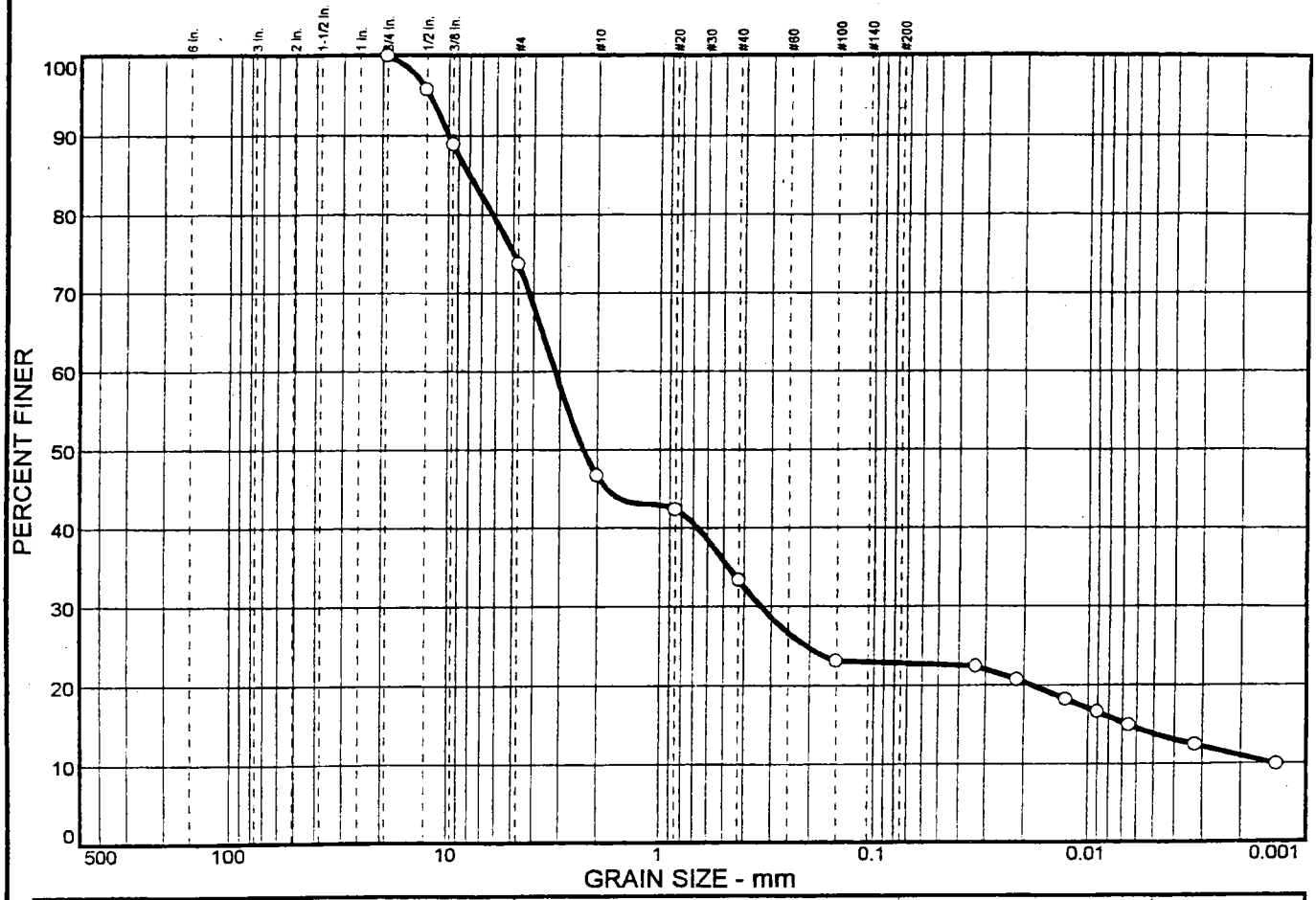
Sample No.: S-57-SB-0210303
Location: Indian Head, Maryland

Date: 9-7-01
Elev./Depth: na

ACKENHEIL ENGINEERS, INC.

Client: Tetra Tech NUS, Inc.
Project: Naval Surface Weapons Center
Indian Head, Maryland (CTO 245)
Project No: 21730

Particle Size Distribution Report



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY
0.0	26.3	50.9	9.0	13.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75 in.	100.0		
.5 in.	95.8		
.375 in.	88.8		
#4	73.7		
#10	46.7		
#20	42.3		
#40	33.3		
#100	23.1		

* (no specification provided)

Soil Description

USCS Group Name: Silty sand with gravel

Atterberg Limits

PL= na LL= na PI= na

Coefficients

D_{85}= 8.02 D_{60}= 3.15 D_{50}= 2.31
D_{30}= 0.335 D_{15}= 0.0066 D_{10}= 0.0014
C_u= 2217.01 C_c= 25.05

Classification

USCS= SM AASHTO= A-1-b

Remarks

Natural Water Content: 17.5%

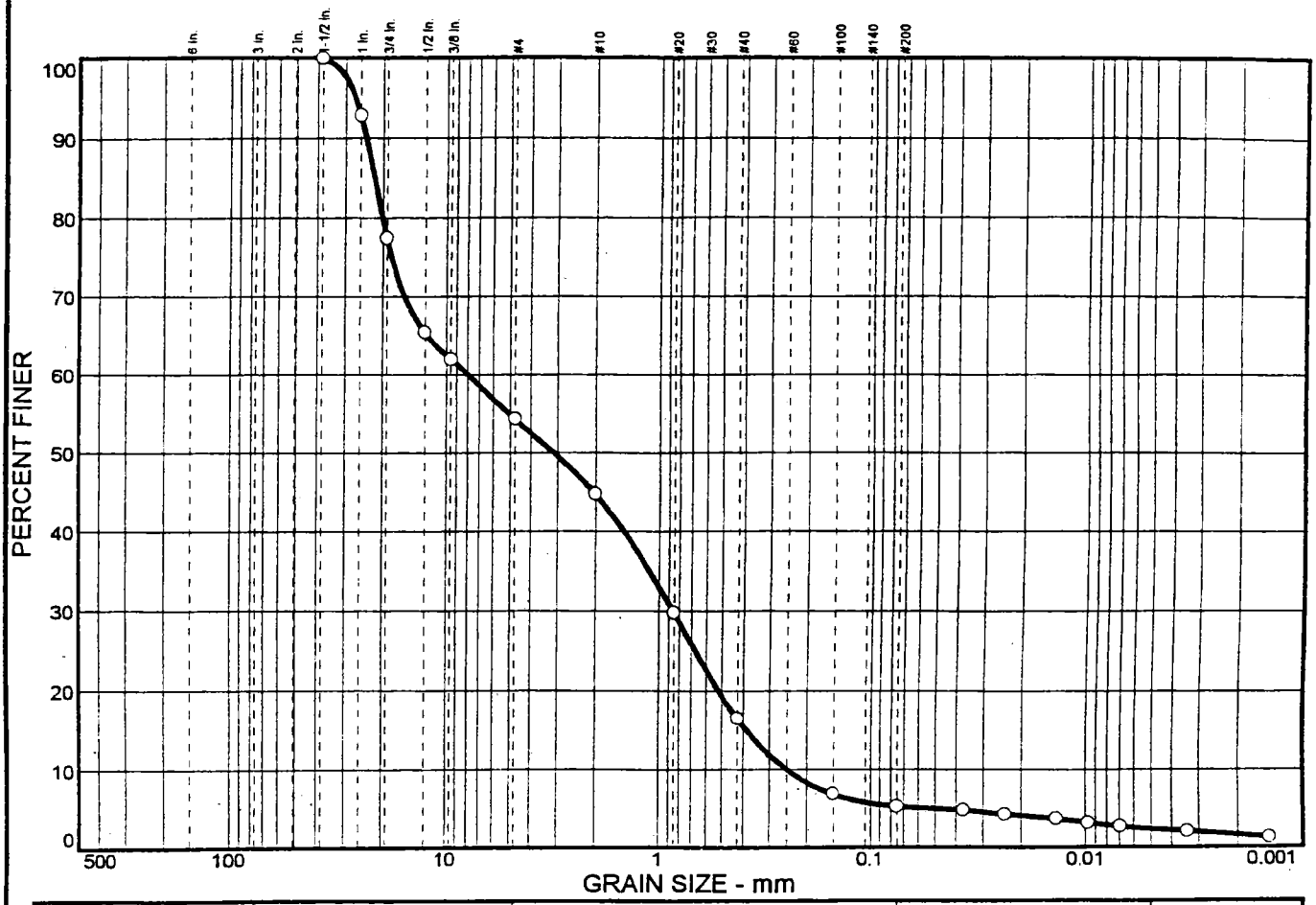
Sample No.: S-57-SB-0220103
Location: Indian Head, Maryland

Date: 9-7-01
Elev./Depth: na

ACKENHEIL ENGINEERS, INC.

Client: Tetra Tech NUS, Inc.
Project: Naval Surface Weapons Center
Indian Head, Maryland (CTO 245)
Project No: 21730

Particle Size Distribution Report



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY
0.0	45.7	49.0	2.9	2.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5 in.	100.0		
1 in.	92.8		
.75 in.	77.4		
.5 in.	65.4		
.375 in.	62.0		
#4	54.3		
#10	44.7		
#20	29.8		
#40	16.5		
#100	6.9		
#200	5.3		

* (no specification provided)

Soil Description

USCS Group Name: Poorly graded sand with silt and gravel

Atterberg Limits

PL= na LL= na PI= na

Coefficients

D_{85}= 21.9 D_{60}= 7.91 D_{50}= 3.13
D_{30}= 0.858 D_{15}= 0.385 D_{10}= 0.248
C_u= 31.91 C_c= 0.38

Classification

USCS= SP-SM AASHTO= A-1-a

Remarks

Natural Water Content: 12.2%

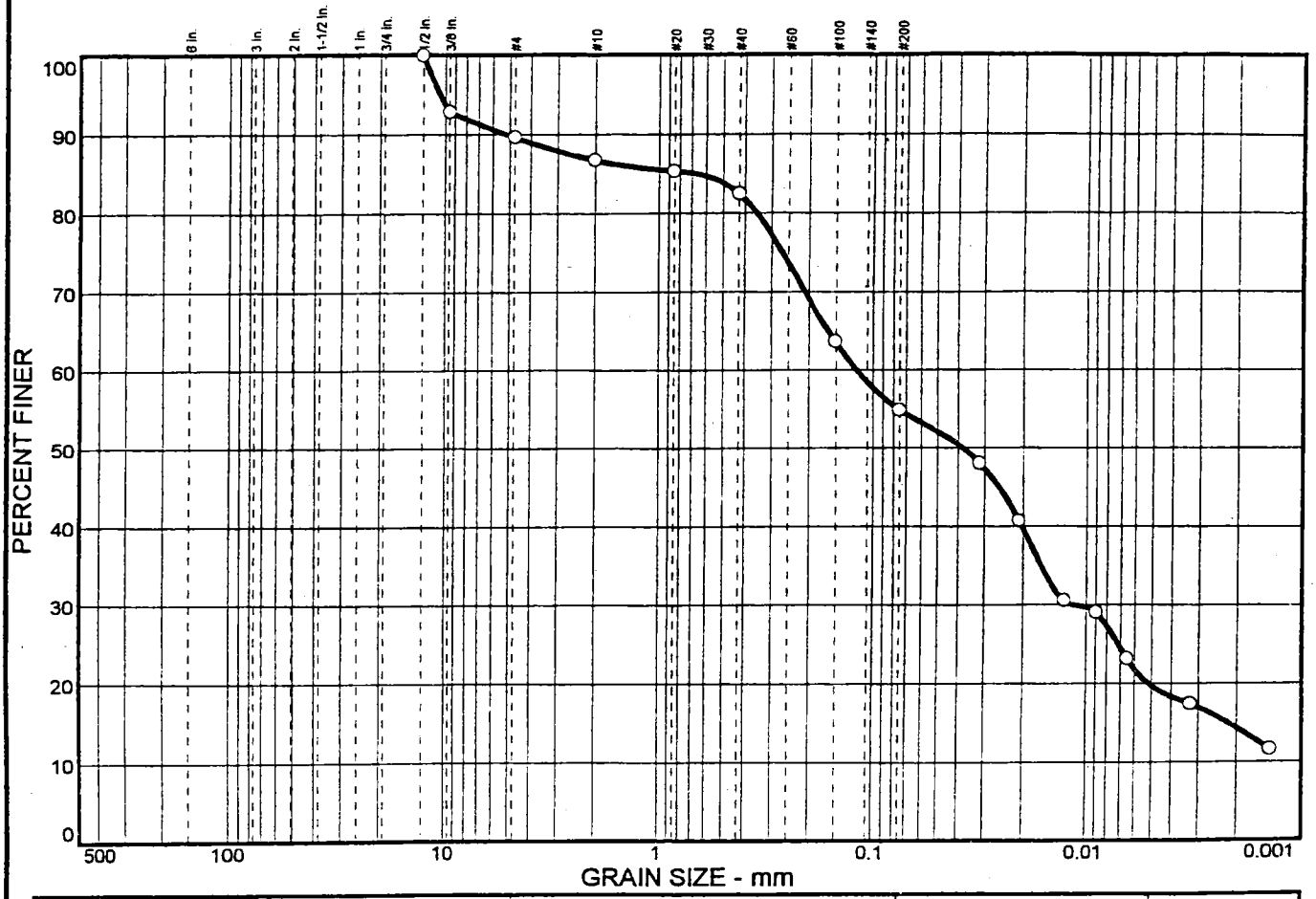
Sample No.: S-57-SB-0220303
Location: Indian Head, Maryland

Date: 9-7-01
Elev./Depth: na

ACKENHEIL ENGINEERS, INC.

Client: Tetra Tech NUS, Inc.
Project: Naval Surface Weapons Center
Indian Head, Maryland (CTO 245)
Project No: 21730

Particle Size Distribution Report



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY
0.0	10.4	34.7	35.1	19.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.5 in.	100.0		
.375 in.	92.8		
#4	89.6		
#10	86.7		
#20	85.3		
#40	82.4		
#100	63.6		
#200	54.9		

* (no specification provided)

Soil Description

USCS Group Name: Sandy silt

Atterberg Limits

PL= na LL= na PI= na

Coefficients

D_{85}= 0.677 D_{60}= 0.119 D_{50}= 0.0383
D_{30}= 0.0115 D_{15}= 0.0022 D_{10}=
C_u= C_c=

Classification

USCS= ML AASHTO= A-4(0)

Remarks

Natural Water Content: 16.4%

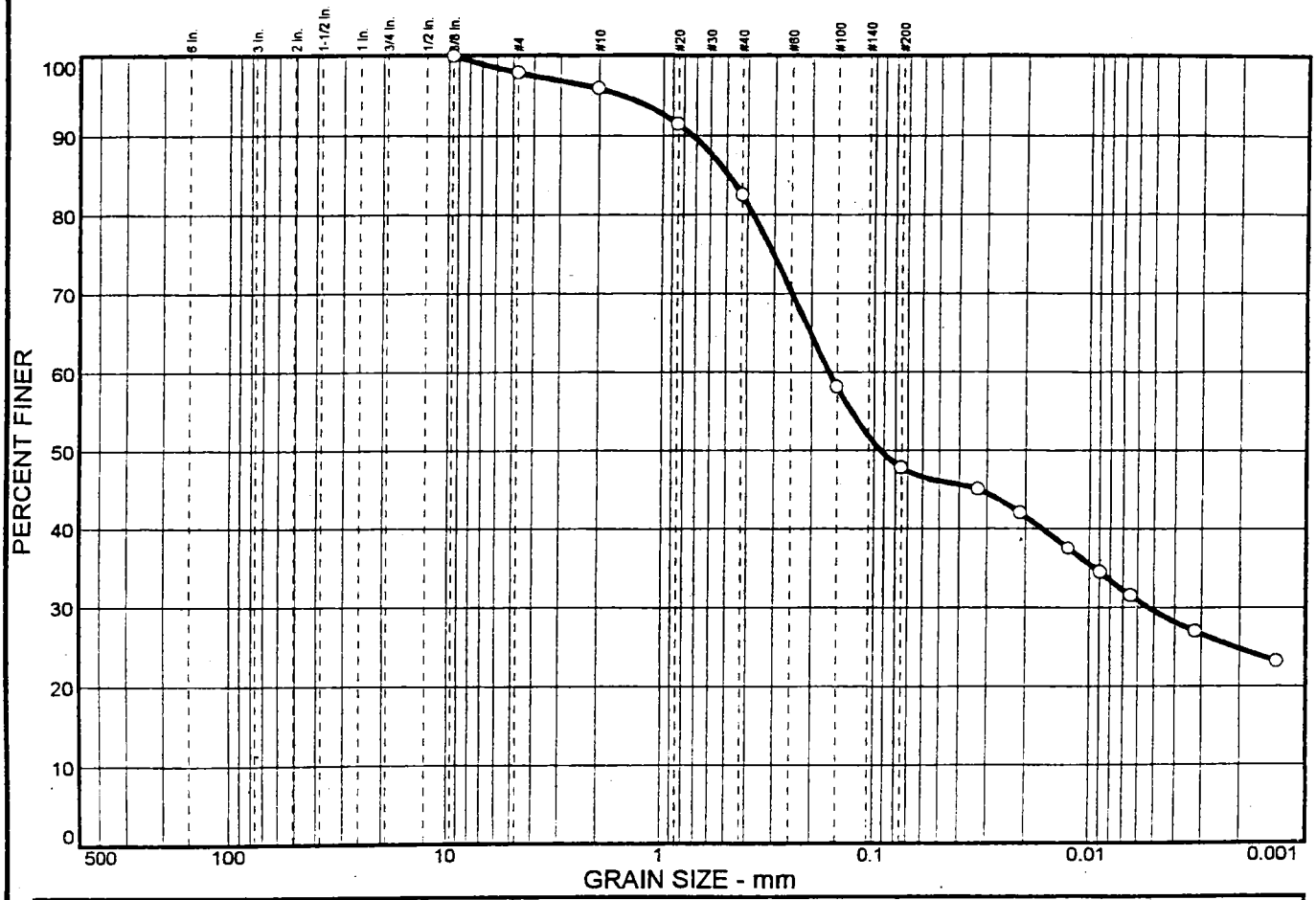
Sample No.: S-57-SB-0240103
Location: Indian Head, Maryland

Date: 9-7-01
Elev./Depth: na

ACKENHEIL ENGINEERS, INC.

Client: Tetra Tech NUS, Inc.
Project: Naval Surface Weapons Center
Indian Head, Maryland (CTO 245)
Project No: 21730

Particle Size Distribution Report



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY
0.0	2.1	50.1	18.2	29.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375 in.	100.0		
#4	97.9		
#10	95.9		
#20	91.4		
#40	82.4		
#100	58.1		
#200	47.8		

* (no specification provided)

Soil Description

USCS Group Name: Silty sand

Atterberg Limits

PL= na LL= na PI= na

Coefficients

D_{85}= 0.494 D_{60}= 0.164 D_{50}= 0.0933
D_{30}= 0.0053 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO= A-4(0)

Remarks

Natural Water Content: 16.7%

Sample No.: S-57-SB-0300203
Location: Indian Head, Maryland

Date: 9-7-01
Elev./Depth: na

ACKENHEIL ENGINEERS, INC.

Client: Tetra Tech NUS, Inc.
Project: Naval Surface Weapons Center
Indian Head, Maryland (CTO 245)
Project No: 21730

Particle Size Distribution Report

% + 3"	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	22.8	28.8	48.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375 in.	100.0		
#4	100.0		
#10	98.2		
#20	97.8		
#40	96.2		
#100	92.0		
#200	77.2		

* (no specification provided)

Soil Description

USCS Group Name: Silt with sand

Atterberg Limits

PL= na LL= na PI= na

Coefficients

D_{85}= 0.116 D_{60}= 0.0131 D_{50}= 0.0054
D_{30}= 0.0016 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= ML AASHTO= A-4(0)

Remarks

Natural Water Content: 32.8%

Sample No.: S-57-SB-0300403
Location: Indian Head, Maryland

Date: 9-7-01
Elev./Depth: na

ACKENHEIL ENGINEERS, INC.

Client: Tetra Tech NUS, Inc.
Project: Naval Surface Weapons Center
Indian Head, Maryland (CTO 245)
Project No: 21730

Particle Size Distribution Report

% + 3"	% GRAVEL	% SAND	% SILT	% CLAY
0.0	4.6	48.4	27.0	20.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.5 in.	100.0		
.375 in.	99.3		
#4	95.4		
#10	94.0		
#20	90.9		
#40	84.6		
#100	59.9		
#200	47.0		

* (no specification provided)

Soil Description

USCS Group Name: Silty sand

Atterberg Limits

PL= na LL= na PI= na

Coefficients

D_{85}= 0.436 D_{60}= 0.151 D_{50}= 0.0931
D_{30}= 0.0138 D_{15}= 0.0031 D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO= A-4(0)

Remarks

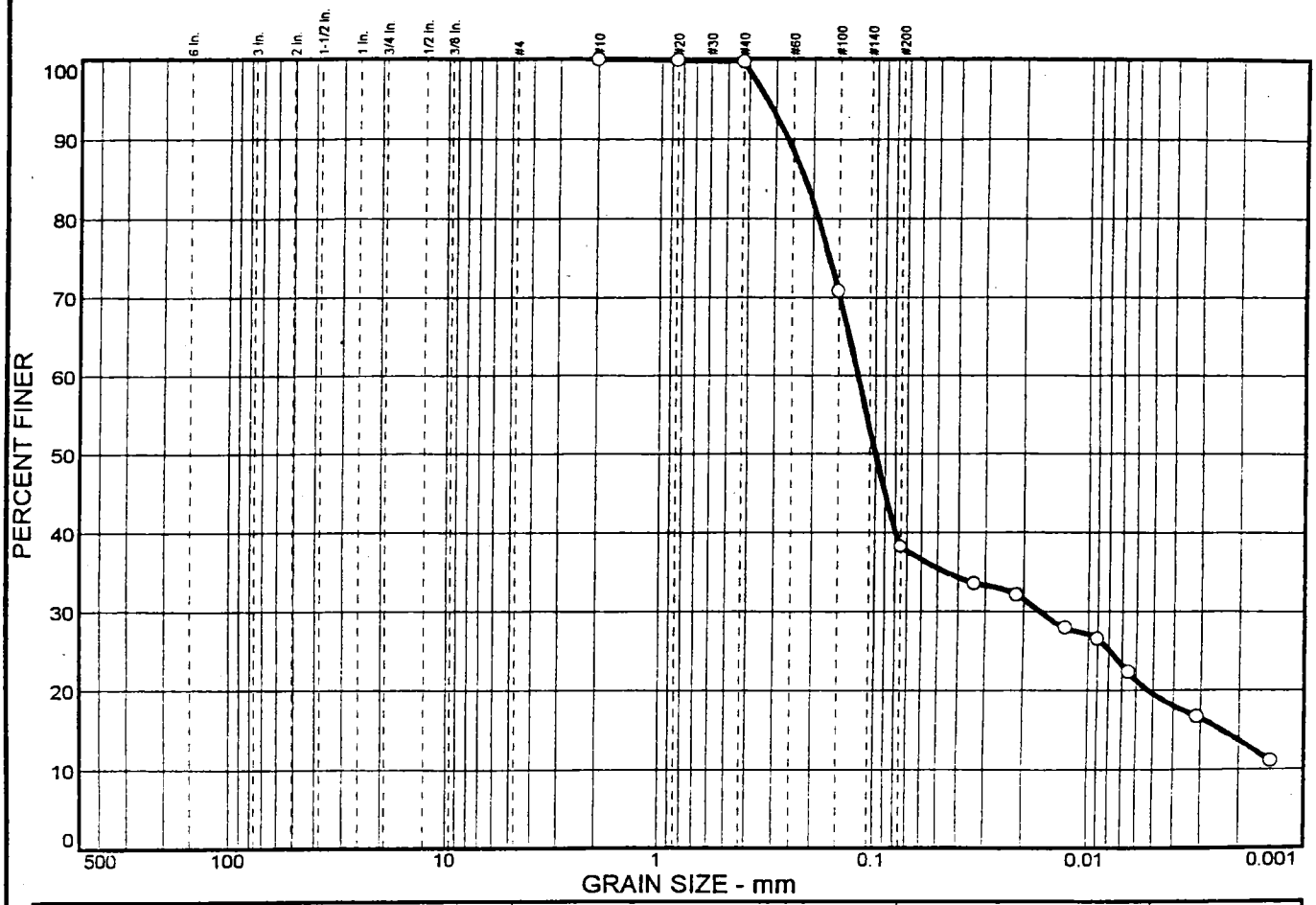
Natural Water Content: 15.8%

Sample No.: S-57-SB-0310203 **Date:** 9-7-01
Location: Indian Head, Maryland **Elev./Depth:** na

ACKENHEIL ENGINEERS, INC.

Client: Tetra Tech NUS, Inc.
Project: Naval Surface Weapons Center
Indian Head, Maryland (CTO 245)
Project No: 21730

Particle Size Distribution Report



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	61.8	18.6	19.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	99.9		
#40	99.7		
#100	70.8		
#200	38.2		

* (no specification provided)

Soil Description

USCS Group Name: Silty sand

Atterberg Limits

PL= na LL= na PI= na

Coefficients

D_{85}= 0.219 D_{60}= 0.121 D_{50}= 0.0998
D_{30}= 0.0168 D_{15}= 0.0024 D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO= A-4(0)

Remarks

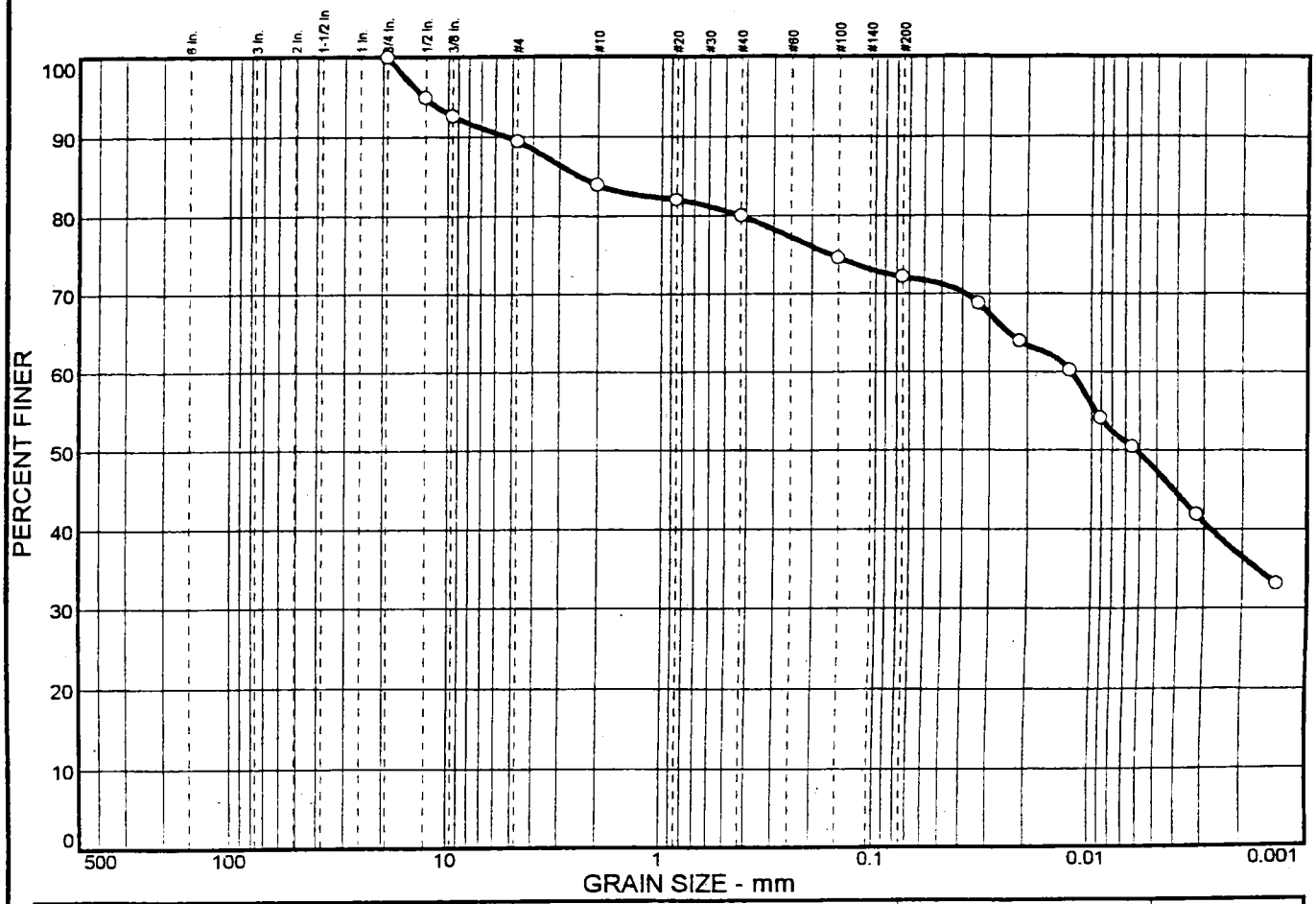
Natural Water Content: 25.4%

Sample No.: S-57-SB-0310403 **Date:** 9-7-01
Location: Indian Head, Maryland **Elev./Depth:** na

ACKENHEIL ENGINEERS, INC.

Client: Tetra Tech NUS, Inc.
Project: Naval Surface Weapons Center
Indian Head, Maryland (CTO 245)
Project No: 21730

Particle Size Distribution Report



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY
0.0	10.6	17.3	24.7	47.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75 in.	100.0		
.5 in.	94.9		
.375 in.	92.6		
#4	89.4		
#10	83.9		
#20	82.0		
#40	79.9		
#100	74.5		
#200	72.1		

* (no specification provided)

Soil Description

USCS Group Name: Silt with sand

Atterberg Limits

PL= na LL= na PI= na

Coefficients

D_{85}= 2.44 D_{60}= 0.0125 D_{50}= 0.0062
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= ML AASHTO= A-4(0)

Remarks

Natural Water Content: 27.9%

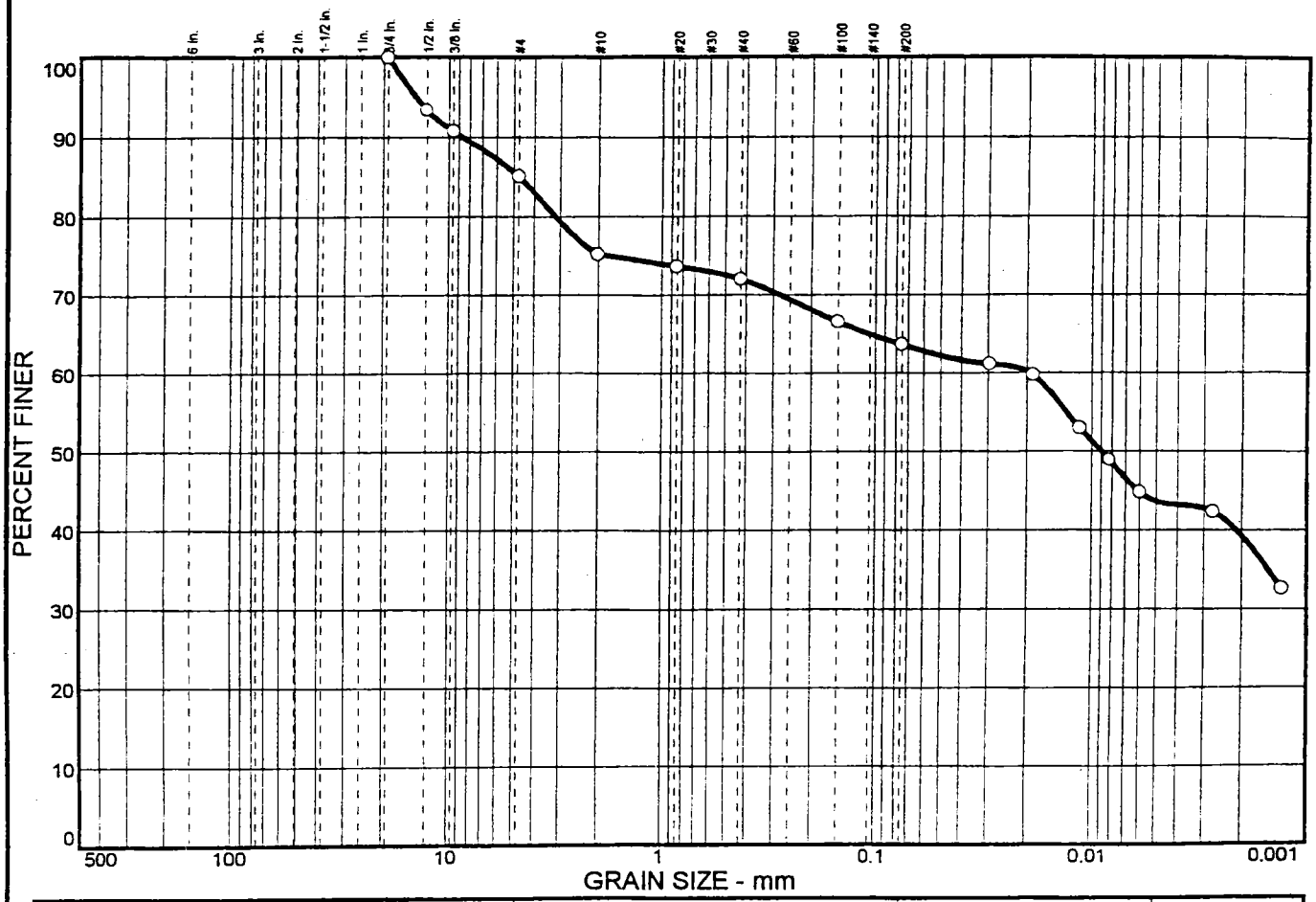
Sample No.: S-57-SB-0320203
Location: Indian Head, Maryland

Date: 9-7-01
Elev./Depth: na

ACKENHEIL ENGINEERS, INC.

Client: Tetra Tech NUS, Inc.
Project: Naval Surface Weapons Center
Indian Head, Maryland (CTO 245)
Project No: 21730

Particle Size Distribution Report



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY
0.0	15.0	21.4	19.9	43.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75 in.	100.0		
.5 in.	93.4		
.375 in.	90.7		
#4	85.0		
#10	75.2		
#20	73.6		
#40	72.0		
#100	66.5		
#200	63.6		

* (no specification provided)

Soil Description

USCS Group Name: Sandy silt with gravel

Atterberg Limits

PL= na LL= na PI= na

Coefficients

D_{85}= 4.75 D_{60}= 0.0196 D_{50}= 0.0090
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= ML AASHTO= A-4(0)

Remarks

Natural Water Content: 28.6%

Sample No.: S-57-SB-0320403 **Date:** 9-7-01
Location: Indian Head, Maryland **Elev./Depth:** na

ACKENHEIL ENGINEERS, INC.

Client: Tetra Tech NUS, Inc.
Project: Naval Surface Weapons Center
Indian Head, Maryland (CTO 245)
Project No: 21730

B.3 GROUNDWATER ANALYTICAL DATA

ANALYTICAL RESULTS - GROUNDWATER
AUGUST 2001
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

LOCATION	S57CP004		S57CP005		S57CP005		S57CP006		S57CP010		S57MW001/SB001	
SAMPLE ID	S57CP0040103		S57CP0050103		S57CP0050103-D		S57CP0060103		S57CP0100103		S57MW0010103	
SAMPLE DATE	8/28/2001		8/29/2001		8/29/2001		8/29/2001		8/28/2001		8/15/2001	
DEPTH RANGE	-9999 - -9999	QUAL	-9999 - -9999	QUAL	-9999 - -9999	QUAL	-9999 - -9999	QUAL	-9999 - -9999	QUAL	-9999 - -9999	QUAL
VOLATILE ORGANICS (UG/L)												
1,1,1-TRICHLOROETHANE	5	U	5	U	5	U	5	U	5	U	5	B
1,1,2,2-TETRACHLOROETHANE	5	U	5	U	5	U	5	U	5	U	5	U
1,1,2-TRICHLOROETHANE	5	U	5	U	5	U	5	U	5	U	5	U
1,1-DICHLOROETHANE	5	U	5	U	5	U	5	U	5	U	2	J
1,1-DICHLOROETHENE	5	U	5	U	5	U	5	U	5	U	5	U
1,2-DIBROMO-3-CHLOROPROPANE	5	U	5	U	5	U	5	U	5	U	5	U
1,2-DIBROMOETHANE	5	U	5	U	5	U	5	U	5	U	5	U
1,2-DICHLOROBENZENE	5	U	5	U	5	U	5	U	5	U	5	U
1,2-DICHLOROETHANE	5	U	5	U	5	U	5	U	5	U	5	U
1,2-DICHLOROPROPANE	5	U	5	U	5	U	5	U	5	U	5	U
1,3-DICHLOROBENZENE	5	U	5	U	5	U	5	U	5	U	5	U
1,4-DICHLOROBENZENE	5	U	5	U	5	U	5	U	5	U	5	U
2-BUTANONE	5	U	5	U	5	U	5	U	5	U	5	U
2-HEXANONE	5	U	5	U	5	U	5	U	5	U	5	UR
4-METHYL-2-PENTANONE	5	U	5	U	5	U	5	U	5	U	5	UR
ACETONE	5	U	5	U	5	U	5	U	5	U	5	U
BENZENE	5	U	5	U	5	U	5	U	5	U	5	U
BROMOCHLOROMETHANE	5	U	5	U	5	U	5	U	5	U	5	U
BROMODICHLOROMETHANE	5	U	5	U	5	U	5	U	5	U	5	U
BROMOFORM	5	U	5	U	5	U	5	U	5	U	5	U
BROMOMETHANE	5	U	5	U	5	U	5	U	5	U	5	U
CARBON DISULFIDE	5	U	5	U	5	U	5	U	5	U	5	U
CARBON TETRACHLORIDE	5	U	5	U	5	U	5	U	5	U	5	U
CHLOROBENZENE	5	U	5	U	5	U	5	U	5	U	5	U
CHLORODIBROMOMETHANE	5	U	5	U	5	U	5	U	5	U	5	U
CHLOROETHANE	5	U	5	U	5	U	5	U	5	U	5	U
CHLOROFORM	5	U	5	U	5	U	5	U	5	U	5	U
CHLOROMETHANE	5	U	5	U	5	U	5	U	5	U	5	U
CIS-1,2-DICHLOROETHENE	5	U	5	U	5	U	5	U	5	U	5	U
CIS-1,3-DICHLOROPROPENE	5	U	5	U	5	U	5	U	5	U	5	U
DIETHYL ETHER	5	U	800		720		5	U	5	U	450	L
ETHANE											4	UL
ETHENE											4	UL
ETHYLBENZENE	5	U	5	U	5	U	5	U	5	U	5	U
M+P-XYLENES	5	U	5	U	5	U	5	U	5	U	5	U
METHANE											2	UL
METHYLENE CHLORIDE	5	U	5	U	5	U	5	U	5	U	5	U
O-XYLENE	5	U	5	U	5	U	5	U	5	U	5	U
STYRENE	5	U	5	U	5	U	5	U	5	U	5	U
TETRACHLOROETHENE	5	U	5	U	5	U	5	U	5	U	5	U
TOLUENE	5	U	5	U	5	U	5	U	5	U	5	U
TRANS-1,2-DICHLOROETHENE	5	U	5	U	5	U	5	U	5	U	5	U

ANALYTICAL RESULTS - GROUNDWATER
AUGUST 2001
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

LOCATION SAMPLE ID SAMPLE DATE DEPTH RANGE	S57CP004 S57CP0040103 8/28/2001 -9999 - -9999	QUAL	S57CP005 S57CP0050103 8/29/2001 -9999 - -9999	QUAL	S57CP005 S57CP0050103-D 8/29/2001 -9999 - -9999	QUAL	S57CP006 S57CP0060103 8/29/2001 -9999 - -9999	QUAL	S57CP010 S57CP0100103 8/28/2001 -9999 - -9999	QUAL	S57MW001/SB001 S57MW0010103 8/15/2001 -9999 - -9999	QUAL
TRANS-1,3-DICHLOROPROPENE	5	U	5	U	5	U	5	U	5	U	5	U
TRICHLOROETHENE	5	U	11		9.4		5	U	5	U	2.6	J
VINYL CHLORIDE	5	U	5	U	5	U	5	U	5	U	5	U
INORGANICS (UG/L)												
CADMIUM											3	U
CHROMIUM											5	U
FILTERED INORGANICS (UG/L)												
IRON												
MISCELLANEOUS PARAEMTERS (MG/L)												
ALKALINITY											12	
BIOCHEMICAL OXYGEN DEMAND												
CARBON DIOXIDE											110	
CHEMICAL OXYGEN DEMAND											5	U
CHLORIDE											6.2	
DISSOLVED ORGANIC CARBON												
DISSOLVED OXYGEN											3.2	
FERROUS IRON											0.1	U
HARDNESS											18.7	
HEXAVALENT CHROMIUM											0.01	U
NITRATE											4.1	
NITRITE											1.2	
OXIDATION REDUCTION POTENTIAL (MV)											155	
PH (S.U.)											5.78	
PHOSPHATE											1	U
SPECIFIC CONDUCTANCE (MS/CM)											0.089	
SULFATE											1.3	
SULFIDE											4	
TEMPERATURE (°C)											21.8	
TOTAL DISSOLVED SOLIDS											60	
TOTAL ORGANIC CARBON											6.8	
TOTAL SUSPENDED SOLIDS											6	

ASSOCIATED SAMPLES

S57CP0040103	S57MW0030103-D	S57MW0070103-D	S57MW0110103-F	S57TW0140103	S57TW0180103-F
S57CP0050103	S57MW0030103-F	S57MW0070103-F	S57MW0120103	S57TW0140103-F	S57TW0180103-F-D
S57CP0050103-D	S57MW0030103-F-D	S57MW0070103-F-D	S57MW0120103-F	S57TW0150103	S57TW0190103
S57CP0060103	S57MW0040103	S57MW0080103	S57MW0130103	S57TW0150103-F	S57TW0190103-F
S57CP0100103	S57MW0040103-F	S57MW0080103-F	S57MW0130103-F	S57TW0160103	S57TW0210103
S57MW0010103	S57MW0050103	S57MW0090103	S57MW0200103	S57TW0160103-F	S57TW0210103-F
S57MW0010103-F	S57MW0050103-F	S57MW0090103-F	S57MW0200103-F	S57TW0170103	
S57MW0020103	S57MW0060103	S57MW0100103	S57MW0220103	S57TW0170103-F	
S57MW0020103-F	S57MW0060103-F	S57MW0100103-F	S57MW0220103-F	S57TW0180103	
S57MW0030103	S57MW0070103	S57MW0110103	S57MW0230103	S57TW0180103-D	

ANALYTICAL RESULTS - GROUNDWATER
AUGUST 2001
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

LOCATION SAMPLE ID SAMPLE DATE DEPTH RANGE	S57MW001/SB001 S57MW0010103-F 8/15/2001 -9999 - -9999	QUAL	S57MW002 S57MW0020103 8/15/2001 -9999 - -9999	QUAL	S57MW002 S57MW0020103-F 8/15/2001 -9999 - -9999	QUAL	S57MW003/SB002 S57MW0030103 8/16/2001 -9999 - -9999	QUAL	S57MW003/SB002 S57MW0030103-D 8/16/2001 -9999 - -9999	QUAL	S57MW003/SB002 S57MW0030103-F 8/16/2001 -9999 - -9999	QUAL
VOLATILE ORGANICS (UG/L)												
1,1,1-TRICHLOROETHANE			5	B			5	U	5	U		
1,1,2,2-TETRACHLOROETHANE			5	U			5	U	5	U		
1,1,2-TRICHLOROETHANE			5	U			5	U	5	U		
1,1-DICHLOROETHANE			5	U			5	U	5	U		
1,1-DICHLOROETHENE			5	U			3	J	5	UJ		
1,2-DIBROMO-3-CHLOROPROPANE			5	U			5	U	5	U		
1,2-DIBROMOETHANE			5	U			5	U	5	U		
1,2-DICHLOROBENZENE			5	U			5	U	5	U		
1,2-DICHLOROETHANE			5	U			5	U	5	U		
1,2-DICHLOROPROPANE			5	U			5	U	5	U		
1,3-DICHLOROBENZENE			5	U			5	U	5	U		
1,4-DICHLOROBENZENE			5	U			5	U	5	U		
2-BUTANONE			5	U			5	U	5	U		
2-HEXANONE			5	UR			5	U	5	U		
4-METHYL-2-PENTANONE			5	UR			5	U	5	U		
ACETONE			5	U			5	U	5	U		
BENZENE			5	U			5	U	5	U		
BROMOCHLOROMETHANE			5	U			5	U	5	U		
BROMODICHLOROMETHANE			5	U			5	U	5	U		
BROMOFORM			5	U			5	U	5	U		
BROMOMETHANE			5	U			5	U	5	U		
CARBON DISULFIDE			5	U			5	U	5	U		
CARBON TETRACHLORIDE			5	U			5	U	5	U		
CHLOROBENZENE			5	U			5	U	5	U		
CHLORODIBROMOMETHANE			5	U			5	U	5	U		
CHLOROETHANE			5	U			5	U	5	U		
CHLOROFORM			5	U			5	U	5	U		
CHLOROMETHANE			5	U			5	U	5	U		
CIS-1,2-DICHLOROETHENE			2.6	J			47	J	14	J		
CIS-1,3-DICHLOROPROPENE			5	U			5	U	5	U		
DIETHYL ETHER			930	L			440	J	320	J		
ETHANE			4	UL			4	UL	4	UL		
ETHENE			4	UL			4	UL	4	UL		
ETHYLBENZENE			5	U			5	U	5	U		
M+P-XYLENES			5	U			5	U	5	U		
METHANE			2	UL			2	UL	2	UL		
METHYLENE CHLORIDE			5	U			5	U	5	U		
O-XYLENE			5	U			5	U	5	U		
STYRENE			5	U			5	U	5	U		
TETRACHLOROETHENE			5	U			5	U	5	U		
TOLUENE			5	U			5	U	5	U		
TRANS-1,2-DICHLOROETHENE			5	U			5	U	5	U		

ANALYTICAL RESULTS - GROUNDWATER
AUGUST 2001
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

LOCATION SAMPLE ID SAMPLE DATE DEPTH RANGE	S57MW001/SB001 S57MW0010103-F 8/15/2001 -9999 - -9999	QUAL	S57MW002 S57MW0020103 8/15/2001 -9999 - -9999	QUAL	S57MW002 S57MW0020103-F 8/15/2001 -9999 - -9999	QUAL	S57MW003/SB002 S57MW0030103 8/16/2001 -9999 - -9999	QUAL	S57MW003/SB002 S57MW0030103-D 8/16/2001 -9999 - -9999	QUAL	S57MW003/SB002 S57MW0030103-F 8/16/2001 -9999 - -9999	QUAL
TRANS-1,3-DICHLOROPROPENE			5	U			5	U	5	U		
TRICHLOROETHENE			43				450	J	280	J		
VINYL CHLORIDE			5	U			5	U	5	U		
INORGANICS (UG/L)												
CADMIUM			3	U			3	U	3	U		
CHROMIUM			5	U			5.6		5	U		
FILTERED INORGANICS (UG/L)												
IRON	155	B			87.3	B					22.5	B
MISCELLANEOUS PARAEMTERS (MG/L)												
ALKALINITY			56				3		3.5			
BIOCHEMICAL OXYGEN DEMAND							4		4.1			
CARBON DIOXIDE			160				80		220			
CHEMICAL OXYGEN DEMAND			5	U			5	U	5	U		
CHLORIDE			9.8				6.1		7.3			
DISSOLVED ORGANIC CARBON							1	U	1	U		
DISSOLVED OXYGEN			3.26				3.43					
FERROUS IRON			0.1	U			0.1	U	0.1	U		
HARDNESS			53.3				7.5		7.7			
HEXAVALENT CHROMIUM			0.01	U			0.01	U	0.01	U		
NITRATE			3.6				4.6		5.1			
NITRITE			1.2				1	U	1	U		
OXIDATION REDUCTION POTENTIAL (MV)			53				258					
PH (S.U.)			6.56				5.29					
PHOSPHATE			1	U			1	U	1	U		
SPECIFIC CONDUCTANCE (MS/CM)			0.172				0.064					
SULFATE			1	U			1.2		1.4			
SULFIDE			4				2.8		2			
TEMPERATURE (°C)			24.4				20.7					
TOTAL DISSOLVED SOLIDS			110				40					
TOTAL ORGANIC CARBON			2.8				1	U	1.2			
TOTAL SUSPENDED SOLIDS			23				5	U	5	U		

ANALYTICAL RESULTS - GROUNDWATER
AUGUST 2001
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

LOCATION	S57MW003/SB002		S57MW004		S57MW004		S57MW005/SB015		S57MW005/SB015		S57MW006	
SAMPLE ID	S57MW0030103-F-D		S57MW0040103		S57MW0040103-F		S57MW0050103		S57MW0050103-F		S57MW0060103	
SAMPLE DATE	8/16/2001		8/16/2001		8/16/2001		8/23/2001		8/23/2001		8/24/2001	
DEPTH RANGE	-9999 - -9999	QUAL	-9999 - -9999	QUAL	-9999 - -9999	QUAL	-9999 - -9999	QUAL	-9999 - -9999	QUAL	-9999 - -9999	QUAL
VOLATILE ORGANICS (UG/L)												
1,1,1-TRICHLOROETHANE			20				5	U			4.6	J
1,1,2,2-TETRACHLOROETHANE			5	U			5	U			10	U
1,1,2-TRICHLOROETHANE			5	U			5	U			10	U
1,1-DICHLOROETHANE			5	U			5	U			10	U
1,1-DICHLOROETHENE			6.5				5	U			6.7	J
1,2-DIBROMO-3-CHLOROPROPANE			5	U			5	U			5	U
1,2-DIBROMOETHANE			5	U			5	U			5	U
1,2-DICHLOROBENZENE			5	U			5	U			5	U
1,2-DICHLOROETHANE			5	U			5	U			10	U
1,2-DICHLOROPROPANE			5	U			5	U			10	U
1,3-DICHLOROBENZENE			5	U			5	U			5	U
1,4-DICHLOROBENZENE			5	U			5	U			5	U
2-BUTANONE			5	U			5	U			10	U
2-HEXANONE			5	U			5	U			10	U
4-METHYL-2-PENTANONE			5	U			5	U			10	U
ACETONE			5	U			5	U			10	U
BENZENE			5	U			5	U			10	U
BROMOCHLOROMETHANE			5	U			5	U			5	U
BROMODICHLOROMETHANE			5	U			5	U			10	U
BROMOFORM			5	U			5	U			10	U
BROMOMETHANE			5	U			5	U			10	U
CARBON DISULFIDE			5	U			5	U			10	U
CARBON TETRACHLORIDE			5	U			5	U			10	U
CHLOROBENZENE			5	U			5	U			10	U
CHLORODIBROMOMETHANE			5	U			5	U			10	U
CHLOROETHANE			5	U			5	U			10	U
CHLOROFORM			5	U			5	U			10	U
CHLOROMETHANE			5	U			5	U			10	U
CIS-1,2-DICHLOROETHENE			620				5	U			46	
CIS-1,3-DICHLOROPROPENE			5	U			5	U			10	U
DIETHYL ETHER			320				570				10	U
ETHANE			4	UL			4	U			4	U
ETHENE			4	UL			4	U			4	U
ETHYLBENZENE			5	U			5	U			10	U
M+P-XYLENES			5	U			5	U			10	U
METHANE			0.1	L			2	U			2	U
METHYLENE CHLORIDE			5	U			5	U			10	U
O-XYLENE			5	U			5	U			10	U
STYRENE			5	U			5	U			10	U
TETRACHLOROETHENE			6.3				5	U			10	U
TOLUENE			5	U			5	U			10	U
TRANS-1,2-DICHLOROETHENE			3.7	J			5	U			10	U

ANALYTICAL RESULTS - GROUNDWATER
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SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

LOCATION SAMPLE ID SAMPLE DATE DEPTH RANGE	S57MW003/SB002 S57MW0030103-F-D 8/16/2001 -9999 - -9999	QUAL	S57MW004 S57MW0040103 8/16/2001 -9999 - -9999	QUAL	S57MW004 S57MW0040103-F 8/16/2001 -9999 - -9999	QUAL	S57MW005/SB015 S57MW0050103 8/23/2001 -9999 - -9999	QUAL	S57MW005/SB015 S57MW0050103-F 8/23/2001 -9999 - -9999	QUAL	S57MW006 S57MW0060103 8/24/2001 -9999 - -9999	QUAL
TRANS-1,3-DICHLOROPROPENE			5	U			5	U			10	U
TRICHLOROETHENE			12000				5	U			250	
VINYL CHLORIDE			26				5	U			10	U
INORGANICS (UG/L)												
CADMIUM			3	U			3	U			3	U
CHROMIUM			5	U			5	U			5	U
FILTERED INORGANICS (UG/L)												
IRON	32.8	B			7	U			19.6	B		
MISCELLANEOUS PARAEMTERS (MG/L)												
ALKALINITY			50				2	U			2	U
BIOCHEMICAL OXYGEN DEMAND			3.8									
CARBON DIOXIDE			83				2	U			73	
CHEMICAL OXYGEN DEMAND			5	U			5	U			5	U
CHLORIDE			4.8				3.1				15	
DISSOLVED ORGANIC CARBON			1	U								
DISSOLVED OXYGEN			3.26				4.3				4.34	
FERROUS IRON			0.1	U			0.1	U			0.1	U
HARDNESS			42				13				1000	
HEXAVALENT CHROMIUM			0.01	U			0.01	U			0.01	U
NITRATE			4.9				1	U			3.9	
NITRITE			1	U			1	U			1	U
OXIDATION REDUCTION POTENTIAL (MV)			168				315				288	
PH (S.U.)			6.49				4.24				4.88	
PHOSPHATE			1	U			1	U			1	U
SPECIFIC CONDUCTANCE (MS/CM)			0.14				0.113				0.066	
SULFATE			1	U			1	U			1.8	
SULFIDE			4				1.6				5.2	
TEMPERATURE (°C)			22.5				20.5				20.59	
TOTAL DISSOLVED SOLIDS			90				70				40	
TOTAL ORGANIC CARBON			1.4				1	U			1	U
TOTAL SUSPENDED SOLIDS			5	U			5	U			5	U

ANALYTICAL RESULTS - GROUNDWATER
AUGUST 2001
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

LOCATION SAMPLE ID SAMPLE DATE DEPTH RANGE	S57MW006 S57MW0060103-F 8/24/2001 -9999 - -9999	QUAL	S57MW007/SB004 S57MW0070103 8/23/2001 -9999 - -9999	QUAL	S57MW007/SB004 S57MW0070103-D 8/23/2001 -9999 - -9999	QUAL	S57MW007/SB004 S57MW0070103-F 8/23/2001 -9999 - -9999	QUAL	S57MW007/SB004 S57MW0070103-F-D 8/23/2001 -9999 - -9999	QUAL	S57MW008 S57MW0080103 8/22/2001 -9999 - -9999
VOLATILE ORGANICS (UG/L)											
1,1,1-TRICHLOROETHANE			5	U	5	U					5
1,1,2,2-TETRACHLOROETHANE			5	U	5	U					5
1,1,2-TRICHLOROETHANE			5	U	5	U					5
1,1-DICHLOROETHANE			1.7	J	5	U					5
1,1-DICHLOROETHENE			11		5	U					5
1,2-DIBROMO-3-CHLOROPROPANE			5	U	5	U					5
1,2-DIBROMOETHANE			5	U	5	U					5
1,2-DICHLOROBENZENE			5	U	5	U					5
1,2-DICHLOROETHANE			5	U	5	U					5
1,2-DICHLOROPROPANE			5	U	5	U					5
1,3-DICHLOROBENZENE			5	U	5	U					5
1,4-DICHLOROBENZENE			5	U	5	U					5
2-BUTANONE			5	U	5	U					5
2-HEXANONE			5	U	5	U					5
4-METHYL-2-PENTANONE			5	U	5	U					5
ACETONE			9.8	B	5	U					12
BENZENE			5	U	5	U					5
BROMOCHLOROMETHANE			5	U	5	U					5
BROMODICHLOROMETHANE			5	U	5	U					5
BROMOFORM			5	U	5	U					5
BROMOMETHANE			5	U	5	U					5
CARBON DISULFIDE			5	U	5	U					5
CARBON TETRACHLORIDE			5	U	5	U					5
CHLOROBENZENE			5	U	5	U					5
CHLORODIBROMOMETHANE			5	U	5	U					5
CHLOROETHANE			5	U	5	U					5
CHLOROFORM			5	U	5	U					5
CHLOROMETHANE			5	U	5	U					5
CIS-1,2-DICHLOROETHENE			47		5	U					5
CIS-1,3-DICHLOROPROPENE			5	U	5	U					5
DIETHYL ETHER			5	U	750						1300
ETHANE			4	U	4	U					4
ETHENE			4	U	4	U					4
ETHYLBENZENE			5	U	5	U					5
M+P-XYLENES			5	U	5	U					5
METHANE			2	U	0.07						2
METHYLENE CHLORIDE			1	B	5	U					0.7
O-XYLENE			5	U	5	U					5
STYRENE			5	U	5	U					5
TETRACHLOROETHENE			5	U	5	U					5
TOLUENE			5	U	5	U					5
TRANS-1,2-DICHLOROETHENE			5	U	5	U					5

ANALYTICAL RESULTS - GROUNDWATER
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IHDIV-NSWC, INDIAN HEAD, MARYLAND

LOCATION SAMPLE ID SAMPLE DATE DEPTH RANGE	S57MW006 S57MW0060103-F 8/24/2001 -9999 - -9999	QUAL	S57MW007/SB004 S57MW0070103 8/23/2001 -9999 - -9999	QUAL	S57MW007/SB004 S57MW0070103-D 8/23/2001 -9999 - -9999	QUAL	S57MW007/SB004 S57MW0070103-F 8/23/2001 -9999 - -9999	QUAL	S57MW007/SB004 S57MW0070103-F-D 8/23/2001 -9999 - -9999	QUAL	S57MW008 S57MW0080103 8/22/2001 -9999 - -9999
TRANS-1,3-DICHLOROPROPENE			5	U	5	U					5
TRICHLOROETHENE			280		0.6	J					5
VINYL CHLORIDE			5	U	5	U					5
INORGANICS (UG/L)											
CADMIUM			3	U	3	U					3.9
CHROMIUM			5	U	5	U					5
FILTERED INORGANICS (UG/L)											
IRON	22.7	B					114	B	164		
MISCELLANEOUS PARAEMTERS (MG/L)											
ALKALINITY			20		20						42
BIOCHEMICAL OXYGEN DEMAND			3.9								9.8
CARBON DIOXIDE			120		110						150
CHEMICAL OXYGEN DEMAND			5	U	5	U					5
CHLORIDE			6.9		6.8						60
DISSOLVED ORGANIC CARBON			1	U							1
DISSOLVED OXYGEN			4.06								2.48
FERROUS IRON			0.1	U	0.1	U					0.1
HARDNESS			46		48						93
HEXAVALENT CHROMIUM			0.01	U	0.01	U					0.01
NITRATE			3.2		2.9						6.8
NITRITE			1	U	1	U					1
OXIDATION REDUCTION POTENTIAL (MV)			22								46
PH (S.U.)			5.28								6.45
PHOSPHATE			1	U	1	U					1
SPECIFIC CONDUCTANCE (MS/CM)			0.365								0.365
SULFATE			1	U	1	U					1
SULFIDE			5.6		1	U					2.8
TEMPERATURE (°C)			19.4								26.48
TOTAL DISSOLVED SOLIDS			240								240
TOTAL ORGANIC CARBON			1	U	1	U					1.9
TOTAL SUSPENDED SOLIDS			5	U	5	U					23

ANALYTICAL RESULTS - GROUNDWATER
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SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

LOCATION SAMPLE ID SAMPLE DATE DEPTH RANGE	QUAL	S57MW008 S57MW0080103-F 8/22/2001 -9999 - -9999	QUAL	S57MW009/SB005 S57MW0090103 8/23/2001 -9999 - -9999	QUAL	S57MW009/SB005 S57MW0090103-F 8/23/2001 -9999 - -9999	QUAL	S57MW010 S57MW0100103 8/23/2001 -9999 - -9999	QUAL	S57MW010 S57MW0100103-F 8/23/2001 -9999 - -9999	QUAL	S57MW011/SB008 S57MW0110103 8/17/2001 -9999 - -9999
VOLATILE ORGANICS (UG/L)												
1,1,1-TRICHLOROETHANE	U			5	U			5	U			5
1,1,2,2-TETRACHLOROETHANE	U			5	U			5	U			5
1,1,2-TRICHLOROETHANE	U			5	U			5	U			5
1,1-DICHLOROETHANE	U			4	J			4.3	J			5
1,1-DICHLOROETHENE	U			28				13				5
1,2-DIBROMO-3-CHLOROPROPANE	U			5	U			5	U			5
1,2-DIBROMOETHANE	U			5	U			5	U			5
1,2-DICHLOROBENZENE	U			5	U			5	U			5
1,2-DICHLOROETHANE	U			5	U			5	U			5
1,2-DICHLOROPROPANE	U			5	U			5	U			5
1,3-DICHLOROBENZENE	U			5	U			5	U			5
1,4-DICHLOROBENZENE	U			5	U			5	U			5
2-BUTANONE	U			5	U			5	U			5
2-HEXANONE	U			5	U			5	U			5
4-METHYL-2-PENTANONE	U			5	U			5	U			5
ACETONE	B			5.9	B			5	U			5
BENZENE	U			5	U			5	U			5
BROMOCHLOROMETHANE	U			5	U			5	U			5
BROMODICHLOROMETHANE	U			5	U			5	U			5
BROMOFORM	U			5	U			5	U			5
BROMOMETHANE	U			5	U			5	U			5
CARBON DISULFIDE	U			5	U			5	U			5
CARBON TETRACHLORIDE	U			5	U			5	U			5
CHLOROBENZENE	U			5	U			5	U			5
CHLORODIBROMOMETHANE	U			5	U			5	U			5
CHLOROETHANE	U			5	U			5	U			5
CHLOROFORM	U			5	U			5	U			5
CHLOROMETHANE	U			5	U			5	U			5
CIS-1,2-DICHLOROETHENE	U			85				150				30
CIS-1,3-DICHLOROPROPENE	U			5	U			5	U			5
DIETHYL ETHER				5	U			5	U			1700
ETHANE	U			4	U			4	U			4
ETHENE	U			4	U			4	U			4
ETHYLBENZENE	U			5	U			5	U			5
M+P-XYLENES	U			5	U			5	U			5
METHANE	U			2	U			0.07				2
METHYLENE CHLORIDE	B			5	U			5	U			5
O-XYLENE	U			5	U			5	U			5
STYRENE	U			5	U			5	U			5
TETRACHLOROETHENE	U			5	U			5	U			5
TOLUENE	U			5	U			5	U			5
TRANS-1,2-DICHLOROETHENE	U			5	U			5	U			5

ANALYTICAL RESULTS - GROUNDWATER
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SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

LOCATION SAMPLE ID SAMPLE DATE DEPTH RANGE	QUAL	S57MW008 S57MW0080103-F 8/22/2001 -9999 - -9999	QUAL	S57MW009/SB005 S57MW0090103 8/23/2001 -9999 - -9999	QUAL	S57MW009/SB005 S57MW0090103-F 8/23/2001 -9999 - -9999	QUAL	S57MW010 S57MW0100103 8/23/2001 -9999 - -9999	QUAL	S57MW010 S57MW0100103-F 8/23/2001 -9999 - -9999	QUAL	S57MW011/SB008 S57MW0110103 8/17/2001 -9999 - -9999
TRANS-1,3-DICHLOROPROPENE	U			5	U			5	U			5
TRICHLOROETHENE	U			480				330				94
VINYL CHLORIDE	U			5	U			5.5				5
INORGANICS (UG/L)												
CADMIUM	B			3	U			3	U			3
CHROMIUM	U			5	U			5	U			5
FILTERED INORGANICS (UG/L)												
IRON		312				15.8	U			4850		
MISCELLANEOUS PARAEMTERS (MG/L)												
ALKALINITY				2				19				19
BIOCHEMICAL OXYGEN DEMAND												2
CARBON DIOXIDE				54				100				130
CHEMICAL OXYGEN DEMAND	U			5	U			5	U			5
CHLORIDE				1	U			1	U			3.2
DISSOLVED ORGANIC CARBON	U											
DISSOLVED OXYGEN				3.14				3.97				3.3
FERROUS IRON	U			0.1	U			6.3				0.14
HARDNESS				8.2				34				25
HEXAVALENT CHROMIUM	U			0.01	U			0.01	U			0.01
NITRATE				1	U			6.8				1.6
NITRITE	U			1	U			1	U			1
OXIDATION REDUCTION POTENTIAL (MV)				261				57				135
PH (S.U.)				5				5.55				5.79
PHOSPHATE	U			1	U			1	U			1
SPECIFIC CONDUCTANCE (MS/CM)				0.057				0.313				0.104
SULFATE	U			1	U			1	U			1.3
SULFIDE				1	U			2				4
TEMPERATURE (°C)				22.3				23.1				21.34
TOTAL DISSOLVED SOLIDS				40				200				70
TOTAL ORGANIC CARBON				1	U			1.9				
TOTAL SUSPENDED SOLIDS				5	U			5	U			5

ANALYTICAL RESULTS - GROUNDWATER
AUGUST 2001
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

OCATION AMPLE ID AMPLE DATE EPTH RANGE	QUAL	S57MW011/SB008 S57MW0110103-F 8/17/2001 -9999 - -9999	QUAL	S57MW012/SB013 S57MW0120103 8/22/2001 -9999 - -9999	QUAL	S57MW012/SB013 S57MW0120103-F 8/22/2001 -9999 - -9999	QUAL	S57MW013 S57MW0130103 8/22/2001 -9999 - -9999	QUAL	S57MW013 S57MW0130103-F 8/22/2001 -9999 - -9999	QUAL	S57MW020 S57MW0200103 8/29/2001 -9999 - -9999	QUAL
OLATILE ORGANICS (UG/L)													
1,1-TRICHLOROETHANE	U			5	U			5	U			5	U
1,2,2-TETRACHLOROETHANE	U			5	U			5	U			5	U
1,2-TRICHLOROETHANE	U			5	U			5	U			5	U
1-DICHLOROETHANE	U			5.3				5	U			5	U
1-DICHLOROETHENE	U			2	J			74				5	U
2-DIBROMO-3-CHLOROPROPANE	U			5	U			5	U			5	U
2-DIBROMOETHANE	U			5	U			5	U			5	U
2-DICHLOROBENZENE	U			5	U			5	U			5	U
2-DICHLOROETHANE	U			5	U			4.8	J			5	U
2-DICHLOROPROPANE	U			5	U			5	U			5	U
3-DICHLOROBENZENE	U			5	U			5	U			5	U
4-DICHLOROBENZENE	U			5	U			5	U			5	U
BUTANONE	U			5	U			5	U			5	U
HEXANONE	U			5	U			5	U			5	U
METHYL-2-PENTANONE	U			5	U			5	U			5	U
CETONE	U			9.6	B			21	B			5	U
ENZENE	U			5	U			5	U			5	U
ROMOCHLOROMETHANE	U			5	U			5	U			5	U
ROMODICHLOROMETHANE	U			5	U			5	U			5	U
ROMOFORM	U			5	U			5	U			5	U
ROMOMETHANE	U			5	U			5	U			5	U
ARBON DISULFIDE	U			5	U			5	U			5	U
ARBON TETRACHLORIDE	U			5	U			5	U			5	U
HLOROBENZENE	U			5	U			5	U			5	U
HLORODIBROMOMETHANE	U			5	U			5	U			5	U
HLOROETHANE	U			5	U			5	U			5	U
HLOROFORM	U			5	U			5	U			5	U
HLOROMETHANE	U			5	U			5	U			5	U
IS-1,2-DICHLOROETHENE				1.9	J			5	U			5	U
IS-1,3-DICHLOROPROPENE	U			5	U			5	U			5	U
IETHYL ETHER				5	U			5	U			18	
THANE	UL			4	U			4	U			4	U
THENE	UL			4	U			4	U			4	U
THYLBENZENE	U			5	U			5	U			5	U
+P-XYLENES	U			5	U			5	U			5	U
IETHANE	UL			2	U			2	U			2	U
IETHYLENE CHLORIDE	U			5	U			1.2	B			5	U
-XYLENE	U			5	U			5	U			5	U
TYRENE	U			5	U			5	U			5	U
ETRACHLOROETHENE	U			5	U			5	U			5	U
OLUENE	U			5	U			5	U			5	U
RANS-1,2-DICHLOROETHENE	U			5	U			5	U			5	U

ANALYTICAL RESULTS - GROUNDWATER
AUGUST 2001
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

OCATION AMPLE ID AMPLE DATE EPTH RANGE	QUAL	S57MW011/SB008 S57MW0110103-F 8/17/2001 -9999 - -9999	QUAL	S57MW012/SB013 S57MW0120103 8/22/2001 -9999 - -9999	QUAL	S57MW012/SB013 S57MW0120103-F 8/22/2001 -9999 - -9999	QUAL	S57MW013 S57MW0130103 8/22/2001 -9999 - -9999	QUAL	S57MW013 S57MW0130103-F 8/22/2001 -9999 - -9999	QUAL	S57MW020 S57MW0200103 8/29/2001 -9999 - -9999	QUAL
RANS-1,3-DICHLOROPROPENE	U			5	U			5	U			5	U
RICHLOROETHENE				1.6	J			5	U			5	U
NYL CHLORIDE	U			5	U			5	U			5	U
IORGANICS (UG/L)													
ADMIUM	U			3	U			3	U			3	U
HROMIUM	U			5	U			5	U			5	U
LTERED INORGANICS (UG/L)													
ON		1060				64.3	B			37	B		
ISCELLANEOUS PARAEMTERS (MG/L)													
LKALINITY				10				4.5				2	
IOCHEMICAL OXYGEN DEMAND	U												
ARBON DIOXIDE				120				94				81	
HEMICAL OXYGEN DEMAND	U			5	U			5	U			5	U
HLORIDE				7.2				8.6				4.3	
ISSOLVED ORGANIC CARBON													
ISSOLVED OXYGEN				3.92				0				2.84	
ERROUS IRON				0.1	U			0.1	U			0.99	
ARDNESS				16				12				12	
EXAVALENT CHROMIUM	U			0.01	U			0.01	U			0.01	U
ITRATE				1	U			1	U			2.1	
ITRITE	U			1	U			1	U			1	U
XIDATION REDUCTION POTENTIAL (MV)				167				306				104	
H (S.U.)				5.59				4.25				5.62	
HOSPHATE	U			1	U			1	U			1	U
PECIFIC CONDUCTANCE (MS/CM)				0.111				0.169				0.089	
ULFATE				1	U			1	U			1	U
ULFIDE				1.6				1	U			1	U
EMPERATURE (°C)				18.04				19.2				21.02	
OTAL DISSOLVED SOLIDS				70				110				60	
OTAL ORGANIC CARBON				1	U			1	U			1	U
OTAL SUSPENDED SOLIDS	U			5	U			5	U			39	

ANALYTICAL RESULTS - GROUNDWATER
AUGUST 2001
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

LOCATION	S57MW020		S57MW022		S57MW022		S57MW023		S57TW014		S57TW014	
SAMPLE ID	S57MW0200103-F		S57MW0220103		S57MW0220103-F		S57MW0230103		S57TW0140103		S57TW0140103-F	
SAMPLE DATE	8/29/2001		8/29/2001		8/29/2001		8/29/2001		8/23/2001		8/23/2001	
DEPTH RANGE	-9999 - -9999	QUAL	-9999 - -9999	QUAL	-9999 - -9999	QUAL	-9999 - -9999	QUAL	-9999 - -9999	QUAL	-9999 - -9999	QUAL
VOLATILE ORGANICS (UG/L)												
1,1,1-TRICHLOROETHANE			50	U			25	U	5	U		
1,1,2,2-TETRACHLOROETHANE			50	U			25	U	5	U		
1,1,2-TRICHLOROETHANE			50	U			25	U	5	U		
1,1-DICHLOROETHANE			50	U			25	U	5	U		
1,1-DICHLOROETHENE			50	U			25	U	5	U		
1,2-DIBROMO-3-CHLOROPROPANE			50	U			25	U	5	U		
1,2-DIBROMOETHANE			50	U			25	U	5	U		
1,2-DICHLOROBENZENE			50	U			25	U	5	U		
1,2-DICHLOROETHANE			50	U			25	U	5	U		
1,2-DICHLOROPROPANE			50	U			25	U	5	U		
1,3-DICHLOROBENZENE			50	U			25	U	5	U		
1,4-DICHLOROBENZENE			50	U			25	U	5	U		
2-BUTANONE			50	U			25	U	5	U		
2-HEXANONE			50	U			25	U	5	U		
4-METHYL-2-PENTANONE			50	U			25	U	5	U		
ACETONE			50	U			25	U	70			
BENZENE			50	U			900		5	U		
BROMOCHLOROMETHANE			50	U			25	U	5	U		
BROMODICHLOROMETHANE			50	U			25	U	5	U		
BROMOFORM			50	U			25	U	5	U		
BROMOMETHANE			50	U			25	U	5	U		
CARBON DISULFIDE			50	U			25	U	5	U		
CARBON TETRACHLORIDE			50	U			25	U	5	U		
CHLOROBENZENE			50	U			25	U	5	U		
CHLORODIBROMOMETHANE			50	U			25	U	5	U		
CHLOROETHANE			50	U			25	U	5	U		
CHLOROFORM			50	U			25	U	5	U		
CHLOROMETHANE			50	U			25	U	5	U		
CIS-1,2-DICHLOROETHENE			1400				25	U	5	U		
CIS-1,3-DICHLOROPROPENE			50	U			25	U	5	U		
DIETHYL ETHER			50	U			25	U	740			
ETHANE			280	J					4	U		
ETHENE			150	J					4	U		
ETHYLBENZENE			50	U			25	U	5	U		
M+P-XYLENES			50	U			25	U	5	U		
METHANE			740						2	U		
METHYLENE CHLORIDE			50	U			25	U	5	U		
O-XYLENE			50	U			28		5	U		
STYRENE			50	U			25	U	5	U		
TETRACHLOROETHENE			50	U			25	U	5	U		
TOLUENE			50	U			25	U	5	U		
TRANS-1,2-DICHLOROETHENE			50	U			25	U	5	U		

ANALYTICAL RESULTS - GROUNDWATER
AUGUST 2001
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

LOCATION SAMPLE ID SAMPLE DATE DEPTH RANGE	S57MW020 S57MW0200103-F 8/29/2001 -9999 - -9999	QUAL	S57MW022 S57MW0220103 8/29/2001 -9999 - -9999	QUAL	S57MW022 S57MW0220103-F 8/29/2001 -9999 - -9999	QUAL	S57MW023 S57MW0230103 8/29/2001 -9999 - -9999	QUAL	S57TW014 S57TW0140103 8/23/2001 -9999 - -9999	QUAL	S57TW014 S57TW0140103-F 8/23/2001 -9999 - -9999	QUAL
TRANS-1,3-DICHLOROPROPENE			50	U			25	U	5	U		
TRICHLOROETHENE			50	U			30		5	U		
VINYL CHLORIDE			1500				25	U	5	U		
INORGANICS (UG/L)												
CADMIUM			3	U					3	U		
CHROMIUM			5	U					5	U		
FILTERED INORGANICS (UG/L)												
IRON	1370				8430						15500	
MISCELLANEOUS PARAEMTERS (MG/L)												
ALKALINITY			440						6			
BIOCHEMICAL OXYGEN DEMAND												
CARBON DIOXIDE			1300						130			
CHEMICAL OXYGEN DEMAND			29						27			
CHLORIDE			9.8						1	U		
DISSOLVED ORGANIC CARBON												
DISSOLVED OXYGEN			4.45				3.26		2.29			
FERROUS IRON			4.8						15			
HARDNESS			227						77			
HEXAVALENT CHROMIUM			0.01	U					0.01	U		
NITRATE			6.3						9.8			
NITRITE			1	U					1	U		
OXIDATION REDUCTION POTENTIAL (MV)			-11				355		114			
PH (S.U.)			6.82				4.35		5.25			
PHOSPHATE			1	U					1	U		
SPECIFIC CONDUCTANCE (MS/CM)			2.09				0.492		0.368			
SULFATE			1	U					1	U		
SULFIDE			8						8			
TEMPERATURE (°C)			18.52				16.28		26.06			
TOTAL DISSOLVED SOLIDS			1300				320		240			
TOTAL ORGANIC CARBON			13						9.7			
TOTAL SUSPENDED SOLIDS			17						6			

ANALYTICAL RESULTS - GROUNDWATER
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SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

LOCATION	S57TW015		S57TW015		S57TW016		S57TW016		S57TW017		S57TW017	
SAMPLE ID	S57TW0150103		S57TW0150103-F		S57TW0160103		S57TW0160103-F		S57TW0170103		S57TW0170103-F	
SAMPLE DATE	8/22/2001		8/22/2001		8/21/2001		8/20/2001		8/20/2001		8/20/2001	
DEPTH RANGE	-9999 - -9999	QUAL	-9999 - -9999	QUAL	-9999 - -9999	QUAL	-9999 - -9999	QUAL	-9999 - -9999	QUAL	-9999 - -9999	QUAL
VOLATILE ORGANICS (UG/L)												
1,1,1-TRICHLOROETHANE	5	U			5	U			5	U		
1,1,2,2-TETRACHLOROETHANE	5	U			5	U			5	U		
1,1,2-TRICHLOROETHANE	5	U			5	U			5	U		
1,1-DICHLOROETHANE	5	U			5	U			5	U		
1,1-DICHLOROETHENE	5	U			5	U			5	U		
1,2-DIBROMO-3-CHLOROPROPANE	5	U			5	U			5	U		
1,2-DIBROMOETHANE	5	U			5	U			5	U		
1,2-DICHLOROBENZENE	5	U			5	U			5	U		
1,2-DICHLOROETHANE	5	U			5	U			5	U		
1,2-DICHLOROPROPANE	5	U			5	U			5	U		
1,3-DICHLOROBENZENE	5	U			5	U			5	U		
1,4-DICHLOROBENZENE	5	U			5	U			5	U		
2-BUTANONE	5	U			5	U			5	U		
2-HEXANONE	5	U			5	U			5	U		
4-METHYL-2-PENTANONE	5	U			5	U			5	U		
ACETONE	20	B			12	B			5	U		
BENZENE	5	U			5	U			5	U		
BROMOCHLOROMETHANE	5	U			5	U			5	U		
BROMODICHLOROMETHANE	5	U			5	U			5	U		
BROMOFORM	5	U			5	U			5	U		
BROMOMETHANE	5	U			5	U			5	U		
CARBON DISULFIDE	5	U			5	U			5	U		
CARBON TETRACHLORIDE	5	U			5	U			5	U		
CHLOROBENZENE	5	U			5	U			5	U		
CHLORODIBROMOMETHANE	5	U			5	U			5	U		
CHLOROETHANE	5	U			5	U			5	U		
CHLOROFORM	5	U			5	U			5	U		
CHLOROMETHANE	5	U			5	U			5	U		
CIS-1,2-DICHLOROETHENE	5	U			5	U			5	U		
CIS-1,3-DICHLOROPROPENE	5	U			5	U			5	U		
DIETHYL ETHER	920				5.4				4800			
ETHANE	4	U			4	U			4	UL		
ETHENE	4	U			4	U			4	UL		
ETHYLBENZENE	5	U			5	U			5	U		
M+P-XYLENES	5	U			5	U			5	U		
METHANE	2	U			2	U			2	UL		
METHYLENE CHLORIDE	1.5	B			1.8	B			5	U		
O-XYLENE	5	U			5	U			5	U		
STYRENE	5	U			5	U			5	U		
TETRACHLOROETHENE	7.1				5	U			1.6	J		
TOLUENE	5	U			5	U			5	U		
TRANS-1,2-DICHLOROETHENE	5	U			5	U			5	U		

ANALYTICAL RESULTS - GROUNDWATER
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SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

LOCATION SAMPLE ID SAMPLE DATE DEPTH RANGE	S57TW015 S57TW0150103 8/22/2001 -9999 - -9999	QUAL	S57TW015 S57TW0150103-F 8/22/2001 -9999 - -9999	QUAL	S57TW016 S57TW0160103 8/21/2001 -9999 - -9999	QUAL	S57TW016 S57TW0160103-F 8/20/2001 -9999 - -9999	QUAL	S57TW017 S57TW0170103 8/20/2001 -9999 - -9999	QUAL	S57TW017 S57TW0170103-F 8/20/2001 -9999 - -9999	QUAL
TRANS-1,3-DICHLOROPROPENE	5	U			5	U			5	U		
TRICHLOROETHENE	2.3	J			5	U			1.1	J		
VINYL CHLORIDE	5	U			5	U			5	U		
INORGANICS (UG/L)												
CADMIUM	3	U			3	U			3	U		
CHROMIUM	5	U			5	U			5	U		
FILTERED INORGANICS (UG/L)												
IRON			43.1	B			41.5	B			47.5	B
MISCELLANEOUS PARAEMTERS (MG/L)												
ALKALINITY	9				27				8.5			
BIOCHEMICAL OXYGEN DEMAND					3.4				9.4			
CARBON DIOXIDE	92				61				110			
CHEMICAL OXYGEN DEMAND	5	U			5	U			5	U		
CHLORIDE	4.8				9.2				4.8			
DISSOLVED ORGANIC CARBON					1	U			1	U		
DISSOLVED OXYGEN	4.53				7.91				4.05			
FERROUS IRON	0.1	U			0.1	U			0.1	U		
HARDNESS	18				31.2				19			
HEXAVALENT CHROMIUM	0.01	U			0.01	U			0.01	U		
NITRATE	2.1				5.6				1.2			
NITRITE	1	U			1	U			1	U		
OXIDATION REDUCTION POTENTIAL (MV)	-21				145				177			
PH (S.U.)	5.46				6.53				5.35			
PHOSPHATE	1	U			1	U			1	U		
SPECIFIC CONDUCTANCE (MS/CM)	0.113				0.107				0.124			
SULFATE	1	U			1	U			1	U		
SULFIDE	2.8				4				1.2			
TEMPERATURE (°C)	18.06				20.83				18.4			
TOTAL DISSOLVED SOLIDS	70				70				80			
TOTAL ORGANIC CARBON	1				1.4				1.3			
TOTAL SUSPENDED SOLIDS	440				10	J			5	UJ		

ANALYTICAL RESULTS - GROUNDWATER
AUGUST 2001
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

LOCATION	S57TW018		S57TW018		S57TW018		S57TW018		S57TW019		S57TW019	
SAMPLE ID	S57TW0180103		S57TW0180103-D		S57TW0180103-F		S57TW0180103-F-D		S57TW0190103		S57TW0190103-F	
SAMPLE DATE	8/21/2001		8/21/2001		8/20/2001		8/20/2001		8/21/2001		8/20/2001	
DEPTH RANGE	-9999 - -9999	QUAL	-9999 - -9999	QUAL	-9999 - -9999	QUAL	-9999 - -9999	QUAL	-9999 - -9999	QUAL	-9999 - -9999	QUAL
VOLATILE ORGANICS (UG/L)												
1,1,1-TRICHLOROETHANE	5	U	5	U					5	U		
1,1,2,2-TETRACHLOROETHANE	5	U	5	U					5	U		
1,1,2-TRICHLOROETHANE	5	U	5	U					5	U		
1,1-DICHLOROETHANE	2.2	J	1.9	J					5	U		
1,1-DICHLOROETHENE	3.7	J	2.5	J					5	U		
1,2-DIBROMO-3-CHLOROPROPANE	5	U	5	U					5	U		
1,2-DIBROMOETHANE	5	U	5	U					5	U		
1,2-DICHLOROBENZENE	5	U	5	U					5	U		
1,2-DICHLOROETHANE	5	U	5	U					5	U		
1,2-DICHLOROPROPANE	5	U	5	U					5	U		
1,3-DICHLOROBENZENE	5	U	5	U					5	U		
1,4-DICHLOROBENZENE	5	U	5	U					5	U		
2-BUTANONE	5	U	5	U					5	U		
2-HEXANONE	5	U	5	U					5	U		
4-METHYL-2-PENTANONE	5	U	5	U					5	U		
ACETONE	17	B	37	B					14	B		
BENZENE	5	U	5	U					5	U		
BROMOCHLOROMETHANE	5	U	5	U					5	U		
BROMODICHLOROMETHANE	5	U	5	U					5	U		
BROMOFORM	5	U	5	U					5	U		
BROMOMETHANE	5	U	5	U					5	U		
CARBON DISULFIDE	5	U	5	U					5	U		
CARBON TETRACHLORIDE	5	U	5	U					5	U		
CHLOROBENZENE	5	U	5	U					5	U		
CHLORODIBROMOMETHANE	5	U	5	U					5	U		
CHLOROETHANE	5	U	5	U					5	U		
CHLOROFORM	5	U	5	U					5	U		
CHLOROMETHANE	5	U	5	U					5	U		
CIS-1,2-DICHLOROETHENE	64		68						5.5			
CIS-1,3-DICHLOROPROPENE	5	U	5	U					5	U		
DIETHYL ETHER	2.1	J	5	U					77			
ETHANE	4	U	4	U					4	U		
ETHENE	4	U	4	U					4	U		
ETHYLBENZENE	5	U	5	U					5	U		
M+P-XYLENES	5	U	5	U					5	U		
METHANE	2	U	0.19						2	U		
METHYLENE CHLORIDE	1.3	J	5	U					1.9	J		
O-XYLENE	5	U	5	U					5	U		
STYRENE	5	U	5	U					5	U		
TETRACHLOROETHENE	5	U	5	U					5	U		
TOLUENE	5	U	5	U					5	U		
TRANS-1,2-DICHLOROETHENE	5	U	5	U					5	U		

ANALYTICAL RESULTS - GROUNDWATER
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SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

LOCATION SAMPLE ID SAMPLE DATE DEPTH RANGE	S57TW018 S57TW0180103 8/21/2001 -9999 - -9999	QUAL	S57TW018 S57TW0180103-D 8/21/2001 -9999 - -9999	QUAL	S57TW018 S57TW0180103-F 8/20/2001 -9999 - -9999	QUAL	S57TW018 S57TW0180103-F-D 8/20/2001 -9999 - -9999	QUAL	S57TW019 S57TW0190103 8/21/2001 -9999 - -9999	QUAL	S57TW019 S57TW0190103-F 8/20/2001 -9999 - -9999	QUAL
TRANS-1,3-DICHLOROPROPENE	5	U	5	U					5	U		
TRICHLOROETHENE	210		210						62			
VINYL CHLORIDE	5	U	5	U					5	U		
INORGANICS (UG/L)												
CADMIUM	3	U	3	U					3	U		
CHROMIUM	5	U	5	U					5	U		
FILTERED INORGANICS (UG/L)												
IRON					4700		4280				200	
MISCELLANEOUS PARAEMTERS (MG/L)												
ALKALINITY	7.5		7						14			
BIOCHEMICAL OXYGEN DEMAND	8.5		8.3						2.3			
CARBON DIOXIDE	110		90						2.5			
CHEMICAL OXYGEN DEMAND	5	U	5	U					5	U		
CHLORIDE	2.6		2.8						3			
DISSOLVED ORGANIC CARBON	1.2		1	U					1	U		
DISSOLVED OXYGEN	4.35								4.62			
FERROUS IRON	4.1		4.2						0.3			
HARDNESS	41.1		33.2						22.1			
HEXAVALENT CHROMIUM	0.01	U	0.01						0.01	U		
NITRATE	8.3		8.6						3.8			
NITRITE	1	U	1	U					1	U		
OXIDATION REDUCTION POTENTIAL (MV)	185								64			
PH (S.U.)	4.87								6.01			
PHOSPHATE	1	U	1	U					1	U		
SPECIFIC CONDUCTANCE (MS/CM)	0.189								0.114			
SULFATE	1	U	1	U					1	U		
SULFIDE	1.6		2						2			
TEMPERATURE (°C)	19.47								17.4			
TOTAL DISSOLVED SOLIDS	120								70			
TOTAL ORGANIC CARBON	4.7		4.5						1.5			
TOTAL SUSPENDED SOLIDS	8	J	11	J					17	J		

ANALYTICAL RESULTS - GROUNDWATER
AUGUST 2001
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

LOCATION SAMPLE ID SAMPLE DATE DEPTH RANGE	S57TW021 S57TW0210103 8/22/2001 -9999 - -9999	QUAL	S57TW021 S57TW0210103-F 8/22/2001 -9999 - -9999	QUAL
VOLATILE ORGANICS (UG/L)				
1,1,1-TRICHLOROETHANE	5	U		
1,1,2,2-TETRACHLOROETHANE	5	U		
1,1,2-TRICHLOROETHANE	5	U		
1,1-DICHLOROETHANE	5	U		
1,1-DICHLOROETHENE	5	U		
1,2-DIBROMO-3-CHLOROPROPANE	5	U		
1,2-DIBROMOETHANE	5	U		
1,2-DICHLOROBENZENE	5	U		
1,2-DICHLOROETHANE	5	U		
1,2-DICHLOROPROPANE	5	U		
1,3-DICHLOROBENZENE	5	U		
1,4-DICHLOROBENZENE	5	U		
2-BUTANONE	5	U		
2-HEXANONE	5	U		
4-METHYL-2-PENTANONE	5	U		
ACETONE	37	B		
BENZENE	5	U		
BROMOCHLOROMETHANE	5	U		
BROMODICHLOROMETHANE	5	U		
BROMOFORM	5	U		
BROMOMETHANE	5	U		
CARBON DISULFIDE	5	U		
CARBON TETRACHLORIDE	5	U		
CHLOROBENZENE	5	U		
CHLORODIBROMOMETHANE	5	U		
CHLOROETHANE	5	U		
CHLOROFORM	5	U		
CHLOROMETHANE	5	U		
CIS-1,2-DICHLOROETHENE	5	U		
CIS-1,3-DICHLOROPROPENE	5	U		
DIETHYL ETHER	5	U		
ETHANE	4	U		
ETHENE	4	U		
ETHYLBENZENE	5	U		
M+P-XYLENES	5	U		
METHANE	2	U		
METHYLENE CHLORIDE	0.7	B		
O-XYLENE	5	U		
STYRENE	5	U		
TETRACHLOROETHENE	5	U		
TOLUENE	5	U		
TRANS-1,2-DICHLOROETHENE	5	U		

ANALYTICAL RESULTS - GROUNDWATER
AUGUST 2001
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

LOCATION SAMPLE ID SAMPLE DATE DEPTH RANGE	S57TW021 S57TW0210103 8/22/2001 -9999 - -9999	QUAL	S57TW021 S57TW0210103-F 8/22/2001 -9999 - -9999	QUAL
TRANS-1,3-DICHLOROPROPENE	5	U		
TRICHLOROETHENE	5	U		
VINYL CHLORIDE	5	U		
INORGANICS (UG/L)				
CADMIUM	3	U		
CHROMIUM	5	U		
FILTERED INORGANICS (UG/L)				
IRON			5760	
MISCELLANEOUS PARAEMTERS (MG/L)				
ALKALINITY	5			
BIOCHEMICAL OXYGEN DEMAND				
CARBON DIOXIDE	120			
CHEMICAL OXYGEN DEMAND	9			
CHLORIDE	8.9			
DISSOLVED ORGANIC CARBON				
DISSOLVED OXYGEN	7.09			
FERROUS IRON	5.7			
HARDNESS	110			
HEXAVALENT CHROMIUM	0.01	U		
NITRATE	30			
NITRITE	1	U		
OXIDATION REDUCTION POTENTIAL (MV)	-256			
PH (S.U.)	4.83			
PHOSPHATE	1	U		
SPECIFIC CONDUCTANCE (MS/CM)	1.78			
SULFATE	1	U		
SULFIDE	1	U		
TEMPERATURE (°C)	20.7			
TOTAL DISSOLVED SOLIDS	1100			
TOTAL ORGANIC CARBON	3.6			
TOTAL SUSPENDED SOLIDS	24			

APPENDIX C

DATA VALIDATION MEMORANDA

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO: **G. LATULIPPE** **DATE:** **DECEMBER 3, 2001**

FROM: **DOUGLAS S. SCHLOER** **COPIES:** **DV FILE**

SUBJECT: **ORGANIC DATA VALIDATION – VOA / DISSOLVED GASES**
CTO 245, NSWC INDIAN HEAD
SDG: N5719

SAMPLES: 2 / Aqueous / VOA

S57TB0010003 S57TB011003

10 / Aqueous / VOA / DISSOLVED GASES

S57CP0040103	S57CP0050103	S57CP0060103
S57CP0100103	S57CPDUP01	S57MW0200103
S57MW0220103	S57MW0230103	

OVERVIEW

The sample set for CTO 245; SDG N5719, NSWC Indian Head consists of ten (10) aqueous environmental samples and two (2) aqueous field quality control blanks. The trip blanks were analyzed for Target Compound List (TCL) volatile organic compounds (VOA) only. The groundwater environmental samples were analyzed for TCL volatile organic compounds (VOA) and 2 selected samples were analyzed for dissolved gases (ethane, ethene and methane). One field duplicate pair was included in this SDG: S57CP0050103 and S57CPDUP01.

The samples were collected by TetraTech NUS on August 28th and 29th, 2001 and analyzed by Chemtech. The dissolved gases analyses were subcontracted by Chemtech to New Jersey Analytical Laboratories (NJAL) Inc. All analyses were conducted in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria using USEPA SW-846 Methods 8260B and the U.S. EPA Robert S. Kerr (RSK) SOP 147 (SW-846 8015B Modified) analytical and reporting protocols.

The findings in this report are based upon a general review of all available data including: data completeness, system performance, holding times, initial / continuing calibrations, laboratory method blank results, surrogate spike/internal standard recoveries, blank spike results, field duplicate results, matrix spike/matrix spike duplicate results, compound identification, and detection limits. Areas of concern are listed below. The text of this report is formulated to address only gross noncompliances and the rejection of analytical data.

Major Problems

- No major problems were noted.

Minor Problems

- The following compound was detected in the trip blanks at the maximum concentration as indicated below:

Compound	Concentration (µg/L)	Action Level (µg/L)
Methylene chloride	5	50

Blank Actions

- Value < Reporting Limit (RL); report value followed by a B.
- Value > RL and < Action Level; report value followed by a B.
- Value > RL and > Action Level; report value unqualified.

An action level of 10X the maximum contaminant concentration was established to evaluate laboratory contamination for methylene chloride. Dilution factors, % solids (where applicable) and sample aliquots were taken into consideration during the application of all action levels. Field quality control blanks were not qualified based on method blank contamination.

Notes

Due to the presence of diethyl ether at concentrations that exceeded the linear range of the instrument calibration, samples S57CP0050103 and S57CPDUP01 were re-analyzed at 50X dilution. The laboratory reported both sets of analytical data. Positive results for diethyl ether were transposed onto the Electronic Data Deliverable (EDD) from the 50X dilution and the remaining compounds were reported form the undiluted sample analysis.

Due to the presence of cis-1.2-dichloroethene and vinyl chloride, sample S57MW0220103 was analyzed and reported at a 10X dilution. This accounts for the elevated reporting limits for this sample.

Due to the presence of benzene, sample S57MW0230103 was analyzed and reported at a 5X dilution. This accounts for the elevated reporting limits for this sample.

Due to the presence of methane at a concentration that exceeded the linear range of the instrument calibration, sample S57MW0220103 was analyzed and reported at a 100X dilution. Only the data for the 100X dilution was reported. This accounts for the elevated reporting limits for this sample.

The following aqueous target compounds (OLC 02.1) were requested but not initially reported:

1,2-dibromo-3-chloropropane	1,2-dichlorobenzene	1,3-dichlorobenzene
1,4-dichlorobenzene	1,2-dibromoethane	bromochloromethane

The reviewer requested that the contracted laboratory update all sample Form I results and all associated QC data to reflect the inclusion of the above target compounds and that the data be resubmitted in a timely fashion. However, following numerous correspondence with laboratory representatives, the sample results were delayed 4-5 weeks from the initial request. Data processing delays resulted from the untimely reporting of the requested analytical parameters.

The dissolved gases (methane, ethane, and ethene) analysis was subcontracted by Chemtech to New Jersey Analytical Laboratories. The data reported on the EDD for this analytical fraction was not in agreement with sample Form I results. The reviewer contacted the laboratory and requested resubmitted versions of the EDD and Form I results which were in agreement.

As detailed in the Statement of Work for Analytical Services, the requested method of analysis for aqueous environmental samples is CLP OLC02.1. However, the laboratory analyzed the samples by SW-846 method 8260B. Consequently, Target Compound List and detection limit requirements were not met for the volatile analysis for the aqueous samples in this SDG.

There were calibration verification noncompliances (%Ds); however, no action was taken, as only a limited data review is being performed.

EXECUTIVE SUMMARY

Laboratory Performance Issues: Methylene chloride was detected in the trip blanks. Several target compounds were not reported as detailed in the SOW. The laboratory analyzed and reported the groundwater environmental samples using SW-846 methodology. However, the Specification for Laboratory Services specifies that CLP OLC02.1 methodology be used to analyze the samples. This accounts for the elevated detection limits.

Other Factors Affecting Data Quality: None.

The data for these analyses were reviewed with reference to the EPA Functional Guidelines for Organic Data Validation (9/94) as modified by Region III and the NFESC guidelines "Navy IRCDQM" (September, 1999). The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC guidelines and the Quality Assurance Project Plan (QAPP)."

TetraTech NUS

Douglas S. Schloer
Chemist/Data Validator

TetraTech NUS

Joseph A. Samchuck
Data Validation Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as Reported by the Laboratory
3. Appendix C - Support Documentation

FIELD DUPLI E SUMMARY
NSWC INDIAN HEAD SITE 57

Analytical Fraction	Compound	S57CP0050103 (ug/L)	S57CPDUP01 (ug/L)	RPD
Volatiles				
	Diethyl Ether	800	720	10.5
	Trichloroethene	11	9.4	15.7

ND - Compound not detected.
NC - RPD not calculated.

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO :	**G. LATULIPPE**	**DATE:**	**JANUARY 7, 2002**
FROM:	**SETH STAFFEN**	**COPIES:**	**DV FILE**

SUBJECT: **ORGANIC DATA VALIDATION – VOA / OVG**
CTO 245 – NSWC INDIAN HEAD
SAMPLE DELIVERY GROUP (SDG) – N5562

SAMPLES: 4/Aqueous/VOA

S57FB0010003	S57MW0010103	S57MW0020103	S57TB0030003

12/Solid/VOA

S57SB0210303	S57SB0210403	S57SB0220403	S57SB0250103
S57SB0250203	S57SB0250303	S57SB0280103	S57SB0280203
S57SB0280303	S57SB0280403	S57SBDUP02	S57SS0280103

Overview

The sample set for CTO 245, SDG: N5532, NSWC Indian Head, two (2) aqueous environmental samples, one (1) field blank, one (1) trip blank, and twelve (12) solid environmental samples. All environmental samples for Target Compound List (TCL) volatile organic compounds. Samples S57MW0010103 and S57MW0020103 were analyzed for methane, ethane, and ethene. One field duplicate pair was included in this SDG: S57SB0280103 / S57SBDUP02.

The samples were collected by Tetra Tech NUS on August 15 and 16, 2001 and analyzed by Chemtech. All analyses were performed in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria and analyzed according to SW-846 Methods 8260B and the U.S. EPA Robert S. Kerr (RSK) SOP 147 (SW-846 8015B modified) analytical and reporting protocols.

Summary

All samples were successfully analyzed. The findings offered in this report are based upon a general review of all available data including: data completeness, holding times, initial/continuing calibrations, laboratory method blank results, field duplicate precision, and detection limits. Areas of concern are listed below.

Major Problems

- The initial calibration on 08/25/01 on instrument E contained RRFs that were less than the 0.05 quality control limit for 4-methyl-2-pentanone and 2-hexanone. Nondetected results for the aforementioned compounds were qualified as rejected, UR, in the aqueous samples and are considered to be biased very low. No positive results were reported for these compounds.

- The continuing calibrations on 08/28/01 at 1418 and 08/29/01 at 1409 on instrument E contained RRFs that were less than the 0.05 quality control limit for 4-methyl-2-pentanone, 2-hexanone, and diethyl ether. Nondetected results for the aforementioned compounds were qualified as rejected, UR, in the associated aqueous samples. The positive results reported for diethyl ether were qualified as, L, biased low.

Minor Problems

- The following compounds were detected in the laboratory method blanks and/or field quality control blank (*) at the maximum concentration indicated below:

Compound	Concentration	Action Level
Methylene chloride*	5.4 µg/L	54 µg/Kg
1,1,1-Trichloroethane	2.0 µg/L	10 µg/L
Acetone	19 µg/Kg	190 µg/Kg

  Sample aliquot and dilution factors were taken into consideration when applying the blank action limit. Positive results for methylene chloride and 1,1,1-trichloroethane below the blank action level were qualified as, B. Field quality control blanks were not qualified based on contamination in other field quality control blanks.

- Samples S57MW0010103 and S57MW0020103 of the dissolved gases fraction were analyzed on the 20th day from collection date. The results in the aforementioned samples were qualified as estimated, UL, biased low.

- Positive results < Reporting Limit were qualified as estimated, J.

Notes

The linear calibration range of the instrument was exceeded by diethyl ether in samples S57MW0010103 and S57MW0020103. The result from the dilution analysis was transposed over and used for validation.

The initial calibration on 08/24/01 on instrument H contained a %RSD >50% quality control limit for acetone. No qualification action was taken since acetone was already qualifications for blank contamination.

The dissolved gases (methane, ethane, and ethene) analysis was subcontracted by Chemtech to New Jersey Analytical Laboratories. The data reported on the EDD for this analytical fraction was not in agreement with sample Form I results. The reviewer contacted the laboratory and requested a resubmitted version of the EDD/Form I results that agree with each other.

As detailed in the Statement of Work for Analytical Services, the requested method of analysis for aqueous environmental samples is CLP OLC02.1. However, the laboratory analyzed the samples by SW-846 method 8260B. Consequently, Target Compound List and detection limit requirements were not met for the volatile analysis for the aqueous samples in this SDG.

The laboratory analyzed the samples by Method 8260B instead of OLM04.2, as stated in the Statement of Work. In addition the following target compounds were listed in the statement of work but were not reported by the laboratory in the soil samples:

1,2-dibromo-3-chloropropane	1,2-dichlorobenzene	1,3-dichlorobenzene
1,4-dichlorobenzene	1,2-dibromoethane	bromochloromethane

TO: G. Latulippe
01/07/02

Executive Summary

Laboratory Performance: Several compounds did not met the initial and/or continuing calibration RRF criteria. Methylene chloride, acetone, and 1,1,1-trichloroethane were detected in the method blank or field quality control blank. Diethyl ether exceeded the linear calibration range of the instrument.

Other Factors Affecting Data Quality: None.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Organic Data Validation", (September 1994) as amended for use within USEPA Region III, and the NFESC document entitled "Navy IRCDQM" (September 1999).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."

Tetra Tech NUS

Seth Staffen
Environmental Scientist

Tetra Tech NUS

Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO :	**G. LATULIPPE**	**DATE:**	**JANUARY 7, 2002**
FROM:	**SETH STAFFEN**	**COPIES:**	**DV FILE**

SUBJECT: **ORGANIC DATA VALIDATION – VOA / OVG**
CTO 245 – NSWC INDIAN HEAD
SAMPLE DELIVERY GROUP (SDG) – N5584

SAMPLES:

7/Aqueous/VOA

S57FB0020003	S57MW0030103*	S57MW0040103*	S57MW0110103*
S57MWDUP01*	S57RB0020003	S57TB0040003	

6/Solid/VOA

S57SB0290103	S57SB0290203	S57SB0290303	S57SB0290403
S57SBDUP03	S57SS0290103		

Overview

The sample set for CTO 245, SDG: N5584, NSWC Indian Head, three (3) aqueous environmental samples, one (1) field blank, one (1) trip blank, one (1) rinsate blank, and six (6) solid environmental samples. All environmental samples for Target Compound List (TCL) volatile organic compounds and diethyl ether. In addition, samples designated (*) were analyzed for methane, ethane, and ethene. Two field duplicate pairs were included in this SDG: S57MW0030103 / S57MWDUP01 and S57SB0290403 / S57SBDUP03.

The samples were collected by Tetra Tech NUS on August 16 and 17, 2001 and analyzed by Chemtech. All analyses were performed in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria and analyzed according to SW-846 Methods 8260B and the U.S. EPA Robert S. Kerr (RSK) SOP 147 (SW-846 8015B modified) analytical and reporting protocols.

Summary

All samples were successfully analyzed. The findings offered in this report are based upon a general review of all available data including: data completeness, holding times, initial/continuing calibrations, laboratory method blank results, field duplicate precision, and detection limits. Areas of concern are listed below.

Major Problems

- No major problems were noted that would have resulted in the rejection of data.

Minor Problems

- The following compounds were detected in the laboratory method blanks at the maximum concentration indicated below:

Compound	Concentration	Action Level
Acetone	7.8 µg/Kg	78 µg/Kg
Methylene chloride	1.9 µg/Kg	19 µg/Kg

  Sample aliquot, percent moisture, and dilution factors were taken into consideration when applying the blank action limit. Positive results for acetone and methylene chloride below the blank action level were qualified as, B. Field quality control blanks were not qualified based on contamination in other field quality control blanks.

- Field duplicate imprecision occurred between sample S57MW030103 and its duplicate S57MWDUP01, for 1,1-dichloroethene, cis-1,2-dichloroethene, diethyl ether, and trichloroethene. Positive and nondetected results were qualified as estimated, J, and UJ, respectively.

- Samples S57MW0030103, S57MW0040103, S57MW0110103, and S57MWDUP01 of the dissolved gases fraction were analyzed on the 19th day from collection date. Positive and nondetected results were qualified as estimated, L, and, UL, biased low, respectively.

- Positive results < Reporting Limit were qualified as estimated, J.

Notes

The continuing calibration on 08/30/01 contained %Ds that were greater than the quality control limit on instrument D for acetone and 2-butanone. No qualification action was taken because the exceedances were less than 50%. Acetone was already qualified for blank contamination.

The continuing calibration on 08/28/01 contained a %D that was greater than the quality control limit on instrument B for methylene chloride. No qualification action was taken because the exceedance was less than 50% and methylene chloride was already qualified for blank contamination.

The linear calibration range of the instrument was exceeded by diethyl ether and trichloroethene in sample S57MW0030103. The results from the 10X-dilution analysis were transposed over and used for validation.

The linear calibration range of the instrument was exceeded by diethyl ether, cis-1,2-dichloroethene, and trichloroethene in sample S57MW0040103. The results for diethyl ether and cis-1,2-dichloroethene were transposed over and used for validation from the 50X dilution and trichloroethene was transposed over and used for validation from the 100X dilution .

The linear calibration range of the instrument was exceeded by diethyl ether in sample S57MW0110103. The result from the 20X-dilution analysis was transposed over and used for validation.

The linear calibration range of the instrument was exceeded by diethyl ether and trichloroethene in sample S57MWDUP01. The result from the 10X-dilution analysis was transposed over and used for validation.

The matrix spike and matrix spike percent recoveries were less than 10% for trichloroethene in sample S57MW0040103. No action was taken basis on the presents of trichloroethene in the native sample and the reported result is from a 100X dilution analysis.

The rinsate blank, S57RB0020003, contained a positive result for trichloroethene. No qualification action was taken.

The dissolved gases (methane, ethane, and ethene) analysis was subcontracted by Chemtech to New Jersey Analytical Laboratories. The data reported on the EDD for this analytical fraction was not in agreement with sample Form I results. The reviewer contacted the laboratory and requested a resubmitted version of the EDD/Form I results that agree with each other.

As detailed in the Statement of Work for Analytical Services, the requested method of analysis for aqueous environmental samples is CLP OLC02.1. However, the laboratory analyzed the samples by SW-846 method 8260B. Consequently, Target Compound List and detection limit requirements were not met for the volatile analysis for the aqueous samples in this SDG. The following target compounds were requested but not reported:

1,2-dibromo-3-chloropropane	1,2-dichlorobenzene	1,3-dichlorobenzene
1,4-dichlorobenzene	1,2-dibromoethane	bromochloromethane

The laboratory analyzed the soil samples by Method 8260B instead of OLM04.2, as stated in the Statement of Work. In addition, the following target compounds were listed in the statement of work.

Executive Summary

Laboratory Performance: Methylene chloride and acetone were detected in the method blank or field quality control blank. Diethyl ether, cis-1,2-dichloroethene, and trichloroethene exceeded the linear calibration range of the instrument.

Other Factors Affecting Data Quality: None.

TO: G. Latulippe
01/07/02

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Organic Data Validation", (September 1994) as amended for use within USEPA Region III, and the NFESC document entitled "Navy IRCDQM" (September 1999).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."

Tetra Tech NUS

Seth Staffen
Environmental Scientist

Tetra Tech NUS

Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO :	**G. LATULIPPE**	**DATE:**	**JANUARY 7, 2002**
FROM:	**SETH STAFFEN**	**COPIES:**	**DV FILE**

SUBJECT: **ORGANIC DATA VALIDATION – VOA / OVG**
CTO 245 – NSWC INDIAN HEAD
SAMPLE DELIVERY GROUP (SDG) – N5683

SAMPLES: 1/Aqueous/VOA/OVG

S57MW0060103 S57RB0070003 S57TB0090003

14/Soil/VOA

S57SB0300103	S57SB0300203	S57SB0300303	S57SB0300403
S57SB0310103	S57SB0310203	S57SB0310303	S57SB0310403
S57SB0320103	S57SB0320203	S57SB0320303	S57SB0320403
S57SBDUP05	S57SBDUP06		

Overview

The sample set for CTO 245, SDG: N5683, NSWC Indian Head, consists of one (1) aqueous environmental sample, one (1) trip blank, one (1) rinsate blank, and fourteen (14) solid environmental samples. All environmental samples were analyzed for Target Compound List (TCL) volatile organic compounds and diethyl ether. Sample S57MW0060103 was analyzed for methane, ethane, and ethene. Two field duplicate pairs were included in this SDG: S57SB0310203 / S57SBDUP05 and S57SB0300203 / S57SBDUP06.

The samples were collected by Tetra Tech NUS on August 24, 2001 and analyzed by Chemtech. All analyses were performed in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria and analyzed according to SW-846 Methods 8260B and the U.S. EPA Robert S. Kerr (RSK) SOP 147 (SW-846 8015B modified) analytical and reporting protocols.

Summary

All samples were successfully analyzed. The findings offered in this report are based upon a general review of all available data including: data completeness, holding times, initial/continuing calibrations, laboratory method blank results, field duplicate precision, and detection limits. Areas of concern are listed below.

Major Problems

- No problems were noted that would have resulted in the rejection of data.

Minor Problems

- The following compounds were detected in the laboratory method blanks and/or field quality control blank (*) at the maximum concentration indicated below:

Compound	Concentration	Action Level
Methylene chloride*	4.9 µg/L	49 µg/Kg
Methylene chloride	4.4 µg/Kg	44 µg/Kg

  Sample aliquot, percent moisture, and dilution factors were taken into consideration when applying the blank action limit. Positive results for methylene chloride below the blank action level were qualified as, B. Field quality control blanks were not qualified based on contamination in other field quality control blanks.

- Despite the absence of acetone in the laboratory method blank, acetone is a common laboratory contaminant. Therefore, the presence of acetone in environmental samples is a suspected laboratory contaminant. Positive results were qualified as estimated, J.

- Positive results < Reporting Limit were qualified as estimated, J.

Notes

The initial calibration on 08/24/01 on instrument H contained a relative standard deviation (%RSD) that was greater than the 30% quality control limit for acetone. No qualification action was taken because the exceedance was not a gross noncompliance.

The rinsate blank, S57RB0070003, contained a positive result for acetone. No qualification action was taken.

The dissolved gases (methane, ethane, and ethene) analysis was subcontracted by Chemtech to New Jersey Analytical Laboratories. The data reported on the EDD for this analytical fraction was not in agreement with sample Form I results. The reviewer contacted the laboratory and requested a resubmitted version of the EDD/Form I results that agree with each other.

The continuing calibration contained a %D that was greater than the 25% quality control limit for acetone on instrument D. No qualification action was taken because the exceedance was not a gross noncompliance.

The continuing calibration contained %Ds that were greater than the 25% quality control limit for several compounds. No qualification action was taken because the exceedance was not a gross noncompliance.

The matrix spike and matrix spike duplicate RPD was greater than the upper quality control limit for benzene. No qualification action was taken based on RPD noncompliance.

As detailed in the Statement of Work for Analytical Services, the requested method of analysis for aqueous environmental samples is CLP OLC02.1. However, the laboratory analyzed the samples by SW-846 method 8260B for sample S57MW0060103. Consequently, Target Compound List and detection limit requirements were not met for the volatile analysis for the aqueous samples in this SDG.

TO: G. Latulippe
01/07/02

The laboratory analyzed the soil samples by Method 8260B instead of OLM04.2, as stated in the Statement of Work. In addition the following target compounds were listed in the statement of work but were not reported by the laboratory in the soil samples:

1,2-dibromo-3-chloropropane	1,2-dichlorobenzene	1,3-dichlorobenzene
1,4-dichlorobenzene	1,2-dibromoethane	bromochloromethane

Executive Summary

Laboratory Performance: Acetone did not met %RSD quality control criteria in the volatile fraction. Methylene chloride was detected in the method blank and/or field quality control blank.

Other Factors Affecting Data Quality: None.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Organic Data Validation", (September 1994) as amended for use within USEPA Region III, and the NFESC document entitled "Navy IRCDQM" (September 1999).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."

_____
Tetra Tech NUS

Seth Staffen
Environmental Scientist

_____
Tetra Tech NUS

Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO: **G. LATULIPPE** **DATE:** **NOVEMBER 20, 2001**

FROM: **DOUGLAS S. SCHLOER** **COPIES:** **DV FILE**

SUBJECT: **ORGANIC DATA VALIDATION – VOA / DISSOLVED GASES**
CTO 245, NSWC INDIAN HEAD
SDG: N5622

SAMPLES: 5 / Soil / VOA

S57SB0270103	S57SB0270203	S57SB0270303
S57SB0270403	S57SS0270103	

4 / Aqueous / VOA

S57RB0030003	S57RB0040003	S57TB0050003
S57TB0060003		

5 / Aqueous / VOA / DISSOLVED GASES

S57MWDUP02	S57TW0160103	S57TW0170103
S57TW0180103	S57TW0190103	

OVERVIEW

The sample set for CTO 245; SDG N5622, NSWC Indian Head consists of nine (9) aqueous environmental samples including four (4) aqueous field quality control blanks. The trip blanks and rinsate blanks were analyzed for Target Compound List (TCL) volatile organic compounds (VOA) only. The environmental samples were analyzed for TCL volatile organic compounds (VOA) and selected environmental samples were analyzed for dissolved gases (ethane, ethene and methane). One field duplicate pair was included in this SDG: S57TW0180103 and S57MWDUP02.

The samples were collected by TetraTech NUS on August 20th and 21st, 2001 and analyzed by Chemtech. The dissolved gases analyses were subcontracted by Chemtech to New Jersey Analytical Laboratories (NJAL) Inc. All analyses were conducted in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria using USEPA SW-846 Methods 8260B and the U.S. EPA Robert S. Kerr (RSK) SOP 147 (SW-846 8015B Modified) analytical and reporting protocols.

The findings in this report are based upon a general review of all available data including: data completeness, system performance, holding times, initial / continuing calibrations, laboratory method blank results, surrogate spike/internal standard recoveries, blank spike results, field duplicate results, matrix spike/matrix spike duplicate results, compound identification, and detection limits. Areas of concern are listed below. The text of this report is formulated to address only gross noncompliances and the rejection of analytical data.

Major Problems

- No major problems were noted.

Minor Problems

- The following compounds were detected in the method blanks and/or *trip blanks at the maximum concentrations as indicated below:

Compound	Concentration (µg/L)	Action Level (µg/L),(ug/kg)
*Acetone	28	280
*Methylene chloride	7.9	79

Compound	Concentration (µg/kg)	Action Level (µg/kg)
Acetone	15	150

Blank Actions

- Value < Reporting Limit (RL); report value followed by a B.
- Value > RL and < Action Level; report value followed by a B.
- Value > RL and > Action Level; report value unqualified.

An action level of 10X the maximum contaminant concentration was established to evaluate laboratory contamination for acetone and methylene chloride. Dilution factors, % solids (where applicable) and sample aliquots were taken into consideration during the application of all action levels. The affected positive results were qualified (B) as a result of blank contamination for acetone and methylene chloride. Field quality control blanks were not qualified based on method blank contamination.

- The analysis of the aqueous sample S57TW0170103 for dissolved gases (ethane, ethene and methane) exceeded the 14-day hold-time requirement by one day. Only nondetected results were reported for ethane, ethene and methane and these were qualified as estimated (UL), due to hold-time noncompliance. The results are considered biased low.

Notes

The following aqueous target compounds (OLC 02.1) were requested but not initially reported:

1,2-dibromo-3-chloropropane	1,2-dichlorobenzene	1,3-dichlorobenzene
1,4-dichlorobenzene	1,2-dibromoethane	bromochloromethane

The reviewer requested that the contracted laboratory update all sample Form I results and all associated QC data to reflect the inclusion of the above target compounds and that the data be resubmitted in a timely fashion. However, following numerous correspondence with laboratory representatives, the sample results were delayed 4-5 weeks from the initial request. Data processing delays resulted from the untimely reporting of the requested analytical parameters.

The dissolved gases (methane, ethane, ethene) analysis was subcontracted by Chemtech to New Jersey Analytical Laboratories. The data reported on the EDD for this analytical fraction was not in agreement with sample Form I results. The reviewer contacted the laboratory and requested resubmitted versions of EDD and Form I results which were in agreement.

An initial calibration percent Relative Standard Deviation (%RSD) exceeded the 30% quality control limit for acetone on 8/31/01, on instrument B. No action was taken based on this noncompliance as only a limited data review is being performed.

Initial calibration %RSDs exceeded the 30% quality control limit for acetone on 8/26/01, on instrument H. No action was taken based on this noncompliance as only a limited data review is being performed.

Calibration verification %Ds exceeded the 25% quality control limit for chloroethane, acetone and dibromochloromethane on 9/2/01, on instrument B, at 13:54. No action was taken based on this noncompliance as only a limited data review is being performed.

Calibration verification %Ds exceeded the 25% quality control limit for trichlorofluoromethane, acetone, 2-chloroethylvinyl ether, 2-hexanone and tetrachloroethene on 9/3/01, on instrument B, at 13:39. No action was taken based on this noncompliance as only a limited data review is being performed.

Due to the presence of diethyl ether at a concentration that exceeded the linear range of the instrument calibration, sample S57TW0170103 was re-analyzed a 500X dilution. The laboratory reported both sets of analytical data. Positive results for diethyl ether were transposed onto the Electronic Data Deliverable (EDD) from the 500X dilution and the remaining parameters were reported from the undiluted sample analysis.

Due to the presence of diethyl ether at a concentration that exceeded the linear range of the instrument calibration, sample S57TSB0270203 was re-analyzed a 10X dilution. The laboratory reported both sets of analytical data. Positive results for diethyl ether were transposed onto the Electronic Data Deliverable (EDD) from the 10X dilution and the remaining parameters were reported from the undiluted sample analysis.

Due to the presence of diethyl ether at concentrations that exceeded the linear range of the instrument calibration, samples S57SB0270303 and S57SB0270403 were re-analyzed a 5X dilutions. The laboratory reported both sets of analytical data. Positive results for diethyl ether were transposed onto the Electronic Data Deliverable (EDD) from the 5X dilutions and the remaining parameters were reported from the undiluted sample analysis.

The following soil surrogate recoveries fell below quality control limits for the analysis of sample S57SB0270203: dibromofluoromethane, toluene-d8 and 4-bromofluorobenzene. No action was taken based on this noncompliance as only a limited data review is being performed.

The following aqueous surrogate recoveries exceeded quality control limits for the analysis of sample S57TW0160103: dibromofluoromethane, toluene-d8 and 4-bromofluorobenzene. No action was taken as only a limited data review is being performed.

Recovery of trichloroethene fell below the 70%-120% quality control limit for the Matrix Spike Duplicate (MSD) analysis of the aqueous sample S57MW0090103. Matrix Spike (MS) recovery of trichloroethene was complaint. No action was taken based on this noncompliance as only a limited data review is being performed.

The volatile compound diethyl ether was not present on the EDD submitted by the laboratory for SDG N5622. However, this compound was present on the sample Form I. The EDD was corrected accordingly.

As detailed in the Statement of Work for Analytical Services, the requested method of analysis for aqueous environmental samples is CLP OLC02.1. However, the laboratory analyzed the samples by SW-846 method 8260B. Consequently, Target Compound List and detection limit requirements were not met for the volatile analysis for the aqueous samples in this SDG.

The field quality control blanks S57RB0030003, S57RB0040003, S57TB0050003 and S57TB0060003 contained acetone and methylene chloride at concentrations above sample reporting limits. The aforementioned compounds were also present in the laboratory method blanks. However, field quality control blanks were not qualified based on method blank contamination.

EXECUTIVE SUMMARY

Laboratory Performance Issues: The Initial calibration of several volatile and semivolatile compounds failed to meet linearity and/or %D criteria. Methylene chloride and acetone were detected in field quality control samples and laboratory method blanks resulting in the qualification of analytical data. The laboratory failed to analyze the environmental samples by the methodologies as detailed in the Specification for Analytical Services. A total of six target compounds were not reported in the volatile fraction.

Other Factors Affecting Data Quality: None.

The data for these analyses were reviewed with reference to the EPA Functional Guidelines for Organic Data Validation (9/94) as modified by Region III and the NFESC guidelines "Navy IRCDQM" (September, 1999). The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC guidelines and the Quality Assurance Project Plan (QAPP)."

TetraTech NUS

Douglas S. Schloer
Chemist/Data Validator

TetraTech NUS

Joseph A. Samchuck
Data Validation Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as Reported by the Laboratory
3. Appendix C - Support Documentation

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO : **G. LATULIPPE** **DATE:** **JANUARY 7, 2002**

FROM: **SETH STAFFEN** **COPIES:** **DV FILE**

SUBJECT: **ORGANIC DATA VALIDATION – VOA**
CTO 245 – NSWC INDIAN HEAD
SAMPLE DELIVERY GROUP (SDG) – N5669

SAMPLES: 1/Aqueous/VOA
S57RB0060003

22/Solid/VOA

S57SB0160103	S57SB0160203	S57SB0160303
S57SB0170103	S57SB0170203	S57SB0170303
S57SB0170403	S57SB0180103	S57SB0180203
S57SB0180303	S57SB0180403	S57SB0190103
S57SB0190203	S57SB0190303	S57SB0190403
S57SBDUP04	S57SS0160103	S57SS0170103
S57SS0180103	S57SS0190103	57SSDUP01
S57SSDUP02		

Overview

The sample set for CTO 245, SDG: N5669, NSWC Indian Head, consists of one (1) rinsate blank and twenty-two (22) solid environmental samples. All environmental samples for Target Compound List (TCL) volatile organic compounds and diethyl ether. Three field duplicate pairs were included in this SDG: S57SBDUP04 / S57SS0160103, S57SS0180103 / 57SSDUP01, and S57SS0170103 / S57SSDUP02.

The samples were collected by Tetra Tech, NUS on August 23, 2001 and analyzed by Chemtech. All analyses were performed in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria and analyzed according to SW-846 Method 8260B analytical and reporting protocols.

Summary

All samples were successfully analyzed. The findings offered in this report are based upon a general review of all available data including: data completeness, holding times, initial/continuing calibrations, laboratory method blank results, field duplicate precision, and detection limits. Areas of concern are listed below.

Major Problems

- No major problems were noted that would have resulted in the rejection of data.

Minor Problems

- The following compound was detected in the laboratory method blanks at the maximum concentration indicated below:

Compound	Concentration	Action Level
Methylene chloride	4.8 µg/Kg	48 µg/Kg

  Sample aliquot, percent moisture and dilution factors were taken into consideration when applying the blank action limit. Positive results for methylene chloride below the blank action level were qualified as, B. Field quality control blanks were not qualified based on contamination in other field quality control blanks.

- Despite the absence of acetone in the laboratory method blank, acetone is a common laboratory contaminant. Therefore, the presence of acetone in environmental samples is a suspected laboratory contaminant. Positive results were qualified as estimated, J.

- Positive results < Reporting Limit were qualified as estimated, J.

Notes

The linear calibration range of the instrument was exceeded by acetone in sample S57SB0190303. The result from the 10X-dilution analysis was transposed over and used for data validation.

The original sample, S57SB0160203, had three surrogates that were less than the lower quality control (QC) limits. The re-analysis was compliant. Therefore, The re-analysis of sample S57SB0160203 was used for data validation. No qualification action was taken since this is only a limited data validation review. The reviewer used professional judgement in deciding between the original sample and the re-analysis in determining which sample has the best representative data.

The original sample, S57SS0160103, had four surrogates that were less than the lower quality control limits. The re-analysis had two SMCs greater than QC limits and four internal standards that were less than the lower QC limits. Therefore, the original analysis sample S57SS0160103 was used for data validation. No qualification action was taken since this is only a limited data validation review. The reviewer used professional judgement in deciding between the original sample and the re-analysis in determining which sample has the best representative data.

The original sample, S57SS0170103, had two surrogates that were greater than the upper quality control limits and one internal standard that was less than the lower QC limits. The re-analysis had four SMCs and one internal standard that were less than the lower QC limits. Therefore, the original analysis sample S57SS0170103 was used for data validation. No qualification action was taken since this is only a limited data validation review. The reviewer used professional judgement in deciding between the original sample and the re-analysis in determining which sample has the best representative data.

The original sample, S57SS0190103, had four surrogates that were less than the lower quality control limits. The re-analysis had four internal standards that were less than the lower QC limits. Therefore, the original analysis sample S57SS0190103 was used for data validation. No qualification action was taken since this is only a limited data validation review. The reviewer used professional judgement in deciding between the original sample and the re-analysis in determining which sample has the best representative data.

The original samples, S57SSDUP01 and S57SSDUP02, had three surrogates that were less than the lower quality control limits. The re-analyses had four internal standards that were less than the lower QC limits. Therefore, the original analyses were used for data validation. No qualification action was taken since this is only a limited data validation review. The reviewer used professional judgement in deciding between the original sample and the re-analysis in determining which sample has the best representative data.

The initial calibration on 08/24/01 contained a %RSD that was greater than the 30% quality control limit for methylene chloride on instrument H. No qualification action was taken because the exceedance was less than 50% and methylene chloride was already qualified was blank contamination.

The continuing calibration on 09/06/01 (instrument D) and 09/02/01 (instrument H) contained %Ds that were greater than the 25% quality control limit for several compounds. No qualification action was taken because the exceedances were less than 50%.

The matrix spike duplicate RPD was greater than the upper quality control limit for benzene. No qualification action was taken based on RPD noncompliance.

The laboratory analyzed the samples by Method 8260B instead of OLM04.2, as stated in the Statement of Work. In addition the following target compounds were listed in the statement of work but were not reported by the laboratory in the soil samples:

1,2-dibromo-3-chloropropane	1,2-dichlorobenzene	1,3-dichlorobenzene
1,4-dichlorobenzene	1,2-dibromoethane	bromochloromethane

Executive Summary

Laboratory Performance: Methylene chloride was detected in the laboratory method blank. Acetone exceeded the linear calibration range of the instrument.

Other Factors Affecting Data Quality: None.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Organic Data Validation", (September 1994) as amended for use within USEPA Region III, and the NFESC document entitled "Navy IRCDQM" (September 1999).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."

Tetra Tech NUS

Seth Staffen
Environmental Scientist

Tetra Tech NUS

Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO:	**G. LATULIPPE**	**DATE:**	**NOVEMBER 19, 2001**
FROM:	**DOUGLAS S. SCHLOER**	**COPIES:**	**DV FILE**

SUBJECT: **ORGANIC DATA VALIDATION – VOA / DISSOLVED GASES**
CTO 245, NSWC INDIAN HEAD
SDG: N5651

SAMPLES: 1 / Soil / VOA

S57SB0330103

3 / Aqueous / VOA

S57RB0050003	S57TB0070003	S57TB0080003

11 / Aqueous / VOA / DISSOLVED GASES

S57MW0070103	S57MW0050103	S57MW0080103
S57MW0090103	S57MW0100103	S57MW0120103
S57MW0130103	S57MWDUP03	S57TW01400103
S57TW0150103	S57TW0210103	

OVERVIEW

The sample set for CTO 245; SDG N5651, NSWC Indian Head consists of eleven (11) aqueous environmental samples and three (3) aqueous field quality control blanks. The trip blanks and rinsate blank were analyzed for Target Compound List (TCL) volatile organic compounds (VOA) only. The environmental samples were analyzed for TCL volatile organic compounds (VOA) and 11 selected samples were analyzed for dissolved gases (ethane, ethene and methane). One field duplicate pair was included in this SDG: S57MW0070103 and S57MWDUP03.

The samples were collected by TetraTech NUS on August 22nd and 23rd, 2001 and analyzed by Chemtech. The dissolved gases analyses were subcontracted by Chemtech to New Jersey Analytical Laboratories (NJAL) Inc. All analyses were conducted in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria using USEPA SW-846 Methods 8260B and the U.S. EPA Robert S. Kerr (RSK) SOP 147 (SW-846 8015B Modified) analytical and reporting protocols.

The findings in this report are based upon a general review of all available data including: data completeness, system performance, holding times, initial / continuing calibrations, laboratory method blank results, surrogate spike/internal standard recoveries, blank spike results, field duplicate results, matrix spike/matrix spike duplicate results, compound identification, and detection limits. Areas of concern are listed below. The text of this report is formulated to address only gross noncompliances and the rejection of analytical data.

Major Problems

- No major problems were noted.

Minor Problems

- The following compounds were detected in the method blanks and/or *trip blank at the maximum concentrations as indicated below:

Compound	Concentration (µg/L)	Action Level (µg/L),(ug/kg)
*Acetone	41	410
*Methylene chloride	6.8	68

Compound	Concentration (µg/kg)	Action Level (µg/kg)
Acetone	7.8	78

Blank Actions

- Value < Reporting Limit (RL); report value followed by a B.
- Value > RL and < Action Level; report value followed by a B.
- Value > RL and > Action Level; report value unqualified.

An action level of 10X the maximum contaminant concentration was established to evaluate laboratory contamination for acetone and methylene chloride. Dilution factors, % solids (where applicable) and sample aliquots were taken into consideration during the application of all action levels. The affected positive results were qualified (B) as a result of blank contamination for acetone and methylene chloride. Field quality control blanks were not qualified based on method blank contamination.

Notes

The following aqueous target compounds (OLC 02.1) were requested but not initially reported:

1,2-dibromo-3-chloropropane	1,2-dichlorobenzene	1,3-dichlorobenzene
1,4-dichlorobenzene	1,2-dibromoethane	bromochloromethane

The reviewer requested that the contracted laboratory update all sample Form I results and all associated QC data to reflect the inclusion of the above target compounds and that the data be resubmitted in a timely fashion. However, following numerous correspondence with laboratory representatives, the sample results were delayed 4-5 weeks from the initial request. Data processing delays resulted from the untimely reporting of the requested analytical parameters.

An initial calibration percent Relative Standard Deviation (%RSD) exceeded the 30% quality control limit for acetone on 8/31/01, on instrument B. No action was taken based on this noncompliance as only a limited data review is being performed.

Initial calibration %RSDs exceeded the 30% quality control limit for bromomethane, chloroethane and acetone on 8/28/01, on instrument B. No action was taken based on this noncompliance as only a limited data review is being performed.

Calibration verification %Ds exceeded the 25% quality control limit for chloroethane, acetone, 2-hexanone and tetrachloroethene on 9/3/01, on instrument B, at 13:39. No action was taken based on this noncompliance as only a limited data review is being performed.

Calibration verification %Ds exceeded the 25% quality control limit for chloroethane and 2-butanone on 9/4/01, on instrument B, at 12:27. No action was taken based on this noncompliance as only a limited data review is being performed.

Due to the presence of trichloroethene and/or diethyl ether at concentrations that exceeded the linear range of the instrument calibration, the following samples were re-analyzed a 10X dilution:

Sample	Over cal compound
S57MW0070103	Trichloroethene
S57MW0050103	Diethyl ether
S57MW0080103	Diethyl ether
S57MW0090103	Trichloroethene
S57MW0100103	Trichloroethene
S57MWDUP03	Diethyl ether
S57TW0140103	Diethyl ether
S57MW0150103	Diethyl ether

The laboratory reported both sets of analytical data for each sample. For data validation purposes, the positive results for trichloroethene and/or diethyl ether were transposed onto the Electronic Data Deliverable (EDD) from the 10X dilutions and the remaining parameters were reported from the undiluted sample analyses.

Matrix Spike (MS) recovery of trichloroethene fell below the 71%-120% quality control limit for the analysis of sample S57MW0090103 and Matrix Spike Duplicate (MSD) recovery of trichloroethene exceeded the 71%-120% quality control limit. In addition, the Relative Percent Difference (RPD) exceeded the 14% quality control limit for trichloroethene. RPDs also exceeded their respective quality control limits for 1,1-dichloroethene, benzene, toluene and chlorobenzene. However, the native sample S57MW0090103 contained trichloroethene at approximately 10X the spiked amount. No action was taken based on these noncompliances.

The dissolved gases (methane, ethane, and ethene) analysis was subcontracted by Chemtech to New Jersey Analytical Laboratories. The data reported on the EDD for this analytical fraction was not in agreement with sample Form I results. The reviewer contacted the laboratory and requested a resubmitted version of the EDD/Form I results that agree with each other.

As detailed in the Statement of Work for Analytical Services, the requested method of analysis for aqueous environmental samples is CLP OLC02.1. However, the laboratory analyzed the samples by SW-846 method 8260B. Consequently, Target Compound List and detection limit requirements were not met for the volatile analysis for the aqueous samples in this SDG. The detection limits for the volatile organic compounds were approximately 5X higher than would have been achieved using CLP methodology.

As identified on the Chain of Custody (COC) documentation, sample S57MW0070103 was incorrectly identified and logged into the electronic database as S57MQ0070103. The reviewer updated the Form I and the EDD to reflect the correct sample identification.

Volatile organic compound analysis (VOC) was not indicated on the COC for sample S57MW0120103; however, VOC results were provided by the laboratory.

As received from the laboratory, the volatile compound diethyl ether was not present on the EDD for sample S57SB030103. However, this compound was present on the sample Form I. The reviewer added diethyl ether to the volatile database.

FIELD DUPLICATE SUMMARY
NSWC INDIAN HEAD SITE 57

Analytical Fraction	Compound	S57MW0180103 (ug/L)	S57MWDUP02 (ug/L)	RPD	S57MW0070103 (ug/L)	S57MWDUP03 (ug/L)	RPD
Volatiles							
	1,1-dichloroethene	2.2 J	1.9 J	14.6	1.7 J	ND	NC
	1,1,-dichloroethane	3.7 J	2.5 J	38.7	11	ND	NC
	acetone	17	37	74.1	9.8	ND	NC
	cis-1,2-dichloroethene	64	68	6.1	47	ND	NC
	methylene chloride	1.3 J	ND	NC	1 J	ND	NC
	trichloroethene	210	210	0.0	280	0.6 J	199.1
	diethyl ether	ND	ND		ND	750	NC
Dissolved Gases							
	methane				ND	7	NC

ND - Compound not detected.
NC - RPD not calculated.

12/7/01

The field quality control blanks S57TB007003, S57TB008003 and S57RB005003 contained acetone and methylene chloride. The aforementioned compounds were also present in the laboratory method blanks.

EXECUTIVE SUMMARY

Laboratory Performance Issues: The Initial calibration of several volatile and semivolatile compounds failed to meet linearity and/or %D criteria. Methylene chloride and acetone was detected in trip blanks and laboratory method blanks resulting in the qualification of analytical data. Numerous and reoccurring transcription errors were noted during the review of the data reported within this SDG.

Other Factors Affecting Data Quality: None.

The data for these analyses were reviewed with reference to the EPA Functional Guidelines for Organic Data Validation (9/94) as modified by Region III and the NFESC guidelines "Navy IRCDQM" (September, 1999). The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC guidelines and the Quality Assurance Project Plan (QAPP)."

TetraTech NUS

Douglas S. Schloer
Chemist/Data Validator

TetraTech NUS

Joseph A. Samchuck
Data Validation Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as Reported by the Laboratory
3. Appendix C - Support Documentation

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO : **G. LATULIPPE** **DATE:** **JANUARY 7, 2002**

FROM: **SETH STAFFEN** **COPIES:** **DV FILE**

SUBJECT: **ORGANIC DATA VALIDATION – VOA**
CTO 245 – NSWC INDIAN HEAD
SAMPLE DELIVERY GROUP (SDG) – N5555

SAMPLES:

3/Aqueous/VOA

S57RB0010003	S57TB0010003	S57TB0020003

16/Solid/VOA

S57FD0010003	S57SB0210103	S57SB0210203
S57SB0220103	S57SB0220203	S57SB0220303
S57SB0230103	S57SB0230203	S57SB0230303
S57SB0240103	S57SB0240203	S57SS0210103
S57SS0220103	S57SS0230103	S57SS0240103
S57SS0250103		

Overview

The sample set for CTO 245, SDG: N5555, NSWC Indian Head, consists of one (1) rinsate blank, two (2) trip blanks, and sixteen (16) solid environmental samples. All environmental samples for Target Compound List (TCL) volatile organic compounds and diethyl ether. One field duplicate pair was included in this SDG: S57FD0010003 / S57SB0210203.

The samples were collected by Tetra Tech NUS on August 14 and 15, 2001 and analyzed by Chemtech. All analyses were performed in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria and analyzed according to SW-846 Method 8260B analytical and reporting protocols.

Summary

All samples were successfully analyzed. The findings offered in this report are based upon a general review of all available data including: data completeness, holding times, initial/continuing calibrations, laboratory method blank results, field duplicate precision, and detection limits. Areas of concern are listed below.

Major Problems

- No major problems were noted that would have resulted in the rejection of data.

Minor Problems

- The following compound was detected in the laboratory method blanks and/or field quality blanks (*) at the maximum concentration indicated below:

Compound	Concentration	Action Level
Methylene chloride	7.5 µg/L	75 µg/L
Methylene chloride*	4.5 µg/L	45 µg/L
Acetone	15 µg/kg	150 µg/kg
Methylene chloride	3.7 µg/kg	37 µg/kg

  Sample aliquot, percent moisture and dilution factors were taken into consideration when applying the blank action limit. Positive results for methylene chloride and acetone below the blank action level were qualified as, B. Field quality control blanks were not qualified based on contamination in other field quality control blanks.

- Field duplicate imprecision occurred between sample S57SB0210203 and its duplicate S57FD0010003 for cis-1,2-dichloroethene and trichloroethene. The positive results were qualified as estimated, J, in the field pair.

- Positive results < Reporting Limit were qualified as estimated, J.

Notes

The linear calibration range of the instrument was exceeded by cis-1,2-dichloroethene in sample S57SB0210203. The result from the 10-X dilution analysis was transposed over and used for data validation.

The original sample, S57SS0250103, had two surrogates that were less than the lower quality control (QC) limits. The re-analysis had four surrogates that were greater than the upper QC limits and four internal standards that were less than the lower QC limits. Therefore, the original analysis of sample S57SS0250103 was used for data validation. The reviewer used professional judgement in deciding between the original sample and the re-analysis in determining which sample has the best representative data. No qualification action was taken since this is only a limited data validation review.

The initial calibration on instrument H contained a %RSD that was greater than the 30% for methylene chloride. No qualification action was taken because the exceedance was less than 50%.

The continuing calibration on instrument G contained %Ds that were greater than the 25% quality control limit for several compounds. No qualification action was taken because the exceedance was less than 50%.

The laboratory analyzed the samples by Method 8260B instead of OLM04.2, as stated in the Statement of Work. In addition the following target compounds were listed in the statement of work but were not reported by the laboratory in the soil samples:

1,2-dibromo-3-chloropropane	1,2-dichlorobenzene	1,3-dichlorobenzene
1,4-dichlorobenzene	1,2-dibromoethane	bromochloromethane

TO: G. Latulippe
01/07/02

Executive Summary

Laboratory Performance: Methylene chloride and acetone were detected in the laboratory method blank and/or field quality control blanks. Cis-1,2-dichloroethene exceeded the linear calibration range of the instrument.

Other Factors Affecting Data Quality: None.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Organic Data Validation", (September 1994) as amended for use within USEPA Region III, and the NFESC document entitled "Navy IRCDQM" (September 1999).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."

Tetra Tech NUS

Seth Staffen
Environmental Scientist

Tetra Tech NUS

Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO: **G. LATULIPPE** **DATE:** **DECEMBER 26, 2001**

FROM: **CATHERINE NORONHA & ERIN FAUST** **COPIES:** **DV FILE**

SUBJECT: **INORGANIC DATA VALIDATION – METALS AND MISCELLANEOUS PARAMETERS**
CTO-245 NSWC INDIAN HEAD
SAMPLE DELIVERY GROUP (SDG) – N5584

SAMPLES: 10/Aqueous/

S57FB0020003	S57MW0030103	S57MW0030103-F
S57MW0040103	S57MW0040103-F	S57MW0110103
S57MW0110103-F	S57MWDUP01	S57MWDUP01-F
S57RB0020003		

Overview

The sample set for CTO 245, NSWC Indian Head, SDG N5584, consists of eight (8) aqueous environmental samples, one (1) aqueous field blank, S57FB0020003 and one (1) aqueous rinsate blank, S57RB0020003. Two (2) field duplicate pairs (S57MWDUP01 / S57MW0030103 and S57MWDUP01-F / S57MW0030103-F) are included within this SDG.

Samples S57FB0020003 and S57RB0020003 were analyzed for arsenic only. Samples designated -F were analyzed for dissolved iron only. The remaining samples were analyzed for cadmium, chromium, chloride, dissolved organic carbon (DOC), ferrous iron, hardness, nitrate, nitrite, phosphate, alkalinity, biochemical oxygen demand (BOD), carbon dioxide, chemical oxygen demand (COD), hexavalent chromium, sulfate, sulfide, total organic carbon (TOC) and total suspended solids (TSS), with the exception of sample S57MW0110103, which was not analyzed for TOC or DOC. The samples were collected by TetraTech NUS on August 16-17, 2001 and analyzed by Chemtech Consulting Group under Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria.

Metals analyses were conducted using Contract Laboratory Program (CLP) method ILM04.1. Sulfide, alkalinity, BOD and TSS analyses were conducted using EPA methods 376.1, 310.1, 405.1 and 160.2, respectively. Chloride, nitrate, nitrite, phosphate, and sulfate were analyzed by ion chromatography using EPA method 300.0. Analyses for COD and ferrous iron were conducted using HACH methods 8000 and 8146, respectively. Analyses for hardness and carbon dioxide were conducted using Standard Methods, 18th Edition, methods 2340B and 4500, respectively. TOC and DOC analyses were conducted using the Lloyd Kahn method. Hexavalent chromium was analyzed using SW 846 method 7196.

These data were evaluated based on the following parameters:

* • Data Completeness
* • Holding Times
* • Calibration Recoveries
• Laboratory Blank Analyses
* • Field Duplicate Results
* • Detection Limits

* - All quality control criteria were met for this parameter.

- The following contaminant was detected in the laboratory method blanks at the following maximum concentration:

Analyte	Maximum Concentration	Action Level
Iron	34.4 µg/L	172.0 µg/L

An action level of 5X the maximum concentration was used to evaluate the sample data for blank contamination. Sample aliquot and dilution factors, if applicable, were taken into consideration when evaluating for blank contamination. Positive results less than the action level reported for iron were qualified "B" as a result of blank contamination.

Notes

Sample S57MW0110103 should have been analyzed for TOC, according to the chain of custody (COC); however, no results for TOC were provided by the laboratory for this sample.

Executive Summary

Laboratory Performance: Iron was present in the laboratory method blanks.

Other Factors Affecting Data Quality: None.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Review", February 1994 and the NFESC document entitled "Navy IRCDQM" (September 1999).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."

Tetra Tech NUS
Catherine Noronha & Erin M. Faust
Environmental Scientists

Tetra Tech NUS
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation

Data Qualifier Key:

U - Value is a nondetect as reported by the laboratory.

B - Positive result is considered to be an artifact of blank contamination and should not be considered present.

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO : **G. LATULIPPE** **DATE:** **JANUARY 3, 2002**

FROM: **ERIN M. FAUST** **COPIES:** **DV FILE**

SUBJECT: **INORGANIC DATA VALIDATION – ARSENIC, TOC, CEC AND pH**
CTO 245 NSWC INDIAN HEAD
SAMPLE DELIVERY GROUP (SDG) – N5555

SAMPLES: 7/Soil/

S57SS0200103	S57SB0200103	S57SS0210103
S57SS0220103	S57SB0220103	S57SB0220303
S57SB0240103		

1/Aqueous/

S57RB0010003

Overview

The sample set for CTO 245, NSWC Indian Head, SDG N5555, consists of seven (7) soil environmental samples and one (1) aqueous rinsate blank.

Samples S57SS0200103, S57SB0200103, S57SS0210103 and S57SS0220103 were analyzed for arsenic only. Samples S57SB0220103, S57SB0220303 and S57SB0240103 were analyzed for total organic carbon (TOC), cation exchange capacity (CEC) and pH. Sample S57RB0010003 was analyzed for arsenic and TOC only. The samples were collected by Tetra Tech NUS on August 14 and 15, 2001 and analyzed by Chemtech under Naval Facilities Engineering Service Center (NFESC) Quality Assurance / Quality Control (QA/QC) criteria. Arsenic analyses were conducted using Contact Laboratory Program (CLP) method ILM04.1. CEC analyses were conducted using EPA method 9080. Analyses for pH were conducted using SW 846 method 9045. Analyses for TOC were conducted using the Lloyd Kahn method.

Arsenic analyses were conducted using Inductively Coupled Plasma (ICP) instrumentation.

Summary

All analytes were successfully analyzed. The findings offered in this report are based upon a general review of all available data. The data review was based on data completeness, holding times, calibration data, laboratory method/preparation blanks, detection limits and analyte quantitation.

Areas of concern with respect to data quality are listed below.

Executive Summary

Laboratory Performance: None.

Other Factors Affecting Data Quality: None.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Data Validation", April 1993 as amended for use within USEPA Region III, and the NFESC document entitled "Navy Installation Restoration Chemical Data Quality Manual" (September 1999).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."

Tetra Tech NUS
Erin M. Faust
Environmental Scientist

Tetra Tech NUS
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation

Data Qualifier Key:

U - Value is a nondetect as reported by the laboratory.

J - Positive result is considered estimated, "J", as a result of technical noncompliances.

UJ - Nondetected result is considered estimated, "UJ", as a result of technical noncompliances.

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO : **G. LATULIPPE** **DATE:** **JANUARY 3, 2002**

FROM: **ERIN M. FAUST** **COPIES:** **DV FILE**

SUBJECT: **INORGANIC DATA VALIDATION – ARSENIC, CEC AND pH**
CTO 245 NSWC INDIAN HEAD
SAMPLE DELIVERY GROUP (SDG) – N5669

SAMPLES: 11/Soil/

S57SS0180103	S57SB0180103	S57SB0180303
S57SS0160103	S57SB0160103	S57SB0160303
S57SBDUP04	S57SSDUP01	S57SSDUP02
S57SS0170103	S57SB0170103	

1/Aqueous/

S57RB0060003

Overview

The sample set for CTO 245, NSWC Indian Head, SDG N5669, consists of eleven (11) soil environmental samples and one (1) aqueous rinsate blank. Three (3) field duplicate pairs (S57SBDUP04 / S57SB0160103, S57SSDUP01 / S57SS0180103 and S57SSDUP02 / S57SS0170103) are included within this SDG.

All samples were analyzed for arsenic, with the exception of samples S57SB0180303 and S57SB0160303, which were analyzed for Cation Exchange Capacity (CEC) and pH only. In addition to arsenic, samples S57SB0180103, S57SB0160103 and S57SBDUP04 were also analyzed for CEC and pH. The samples were collected by Tetra Tech NUS on August 23, 2001 and analyzed by Chemtech under Naval Facilities Engineering Service Center (NFESC) Quality Assurance / Quality Control (QA/QC) criteria. Arsenic analyses were conducted using Contact Laboratory Program (CLP) method ILM04.1. CEC analyses were conducted using EPA method 9080. Analyses for pH were conducted using SW 846 method 9045.

Arsenic analyses were conducted using Inductively Coupled Plasma (ICP) instrumentation.

Summary

All analytes were successfully analyzed. The findings offered in this report are based upon a general review of all available data. The data review was based on data completeness, holding times, calibration data, laboratory method/preparation blanks, field duplicate results, detection limits and analyte quantitation.

Areas of concern with respect to data quality are listed below.

Minor Problems

- Field duplicate imprecision (difference > 4X CRDL) was noted for arsenic in the S57SBDUP04 / S57SB0160103 sample pair. The positive and nondetected results reported for arsenic in this sample pair were qualified as estimated, "J".

- Field duplicate imprecision (RPD>50%) was noted for CEC. Positive results reported for CEC were qualified as estimated, "J".

Notes

The result reported by the laboratory for arsenic for sample S57SS0160103 was incorrect. The laboratory used the incorrect percent solid when determining the arsenic concentration. The data reviewer corrected the arsenic result.

Executive Summary

Laboratory Performance: The result reported by the laboratory for sample S57SS0160103 was incorrect.

Other Factors Affecting Data Quality: Field duplicate imprecision was noted for arsenic and CEC.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Data Validation", April 1993 as amended for use within USEPA Region III, and the NFESC document entitled "Navy Installation Restoration Chemical Data Quality Manual" (September 1999).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."

Tetra Tech NUS
Erin M. Faust
Environmental Scientist

Tetra Tech NUS
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation

Data Qualifier Key:

U - Value is a nondetect as reported by the laboratory.

J - Positive result is considered estimated, "J", as a result of technical noncompliances.

UJ - Nondetected result is considered estimated, "UJ", as a result of technical noncompliances.

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO:	**G. LATULIPPE**	**DATE:**	**DECEMBER 21, 2001**
FROM:	**CATHERINE NORONHA & ERIN FAUST**	**COPIES:**	**DV FILE**

SUBJECT: **INORGANIC DATA VALIDATION – METALS AND MISCELLANEOUS PARAMETERS**
CTO-245 NSWC INDIAN HEAD
SAMPLE DELIVERY GROUP (SDG) – N5622

SAMPLES: 11/Aqueous/

S57MWDUP02	S57MWDUP02-F	S57RB0030003
S57TW0160103	S57TW0160103-F	S57TW0170103
S57TWO17103-F	S57TW0180103	S57TW0180103-F
S57TW0190103	S57TW0190103-F	

Overview

The sample set for CTO 245, NSWC Indian Head, SDG N5722, consists of ten (10) aqueous environmental samples and one (1) aqueous rinsate blank, S57RB0030003. Two (2) field duplicate pairs (S57MWDUP02 / S57TW0180103 and S57MWDUP02-F / S57TW0180103-F) are included within this SDG.

Samples designated -F were analyzed for dissolved iron. The remaining samples, with the exception of sample S57RB0030003, were analyzed for cadmium, chromium, hardness, chloride, nitrate, nitrite, phosphate, sulfate, ferrous iron, hexavalent chromium, sulfide, alkalinity, carbon dioxide, biochemical oxygen demand (BOD), chemical oxygen demand (COD), total organic carbon (TOC), dissolved organic carbon (DOC) and total suspended solids (TSS). Sample S57RB0030003 was analyzed for cadmium, chromium, chloride, nitrate, nitrite, phosphate, sulfate, ferrous iron, hexavalent chromium and sulfide. The samples were collected by TetraTech NUS on August 20-21 2001 and analyzed by Chemtech Consulting Group under Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria.

Metals analyses were conducted using Contract Laboratory Program (CLP) method ILM04.1. Sulfide, alkalinity, BOD and TSS analyses were conducted using EPA methods 376.1, 310.1, 405.1 and 160.2, respectively. Chloride, nitrate, nitrite, phosphate, and sulfate were analyzed by ion chromatography using EPA method 300.0. Analyses for COD and ferrous iron were conducted using HACH methods 8000 and 8146, respectively. Analyses for hardness and carbon dioxide were conducted using Standard Methods, 18th Edition, methods 2340B and 4500, respectively. TOC and DOC analyses were conducted using the Lloyd Kahn method. Hexavalent chromium was analyzed using SW 846 method 7196.

These data were evaluated based on the following parameters:

* • Data Completeness
* • Holding Times
* • Calibration Recoveries
• Laboratory Blank Analyses
• Field Duplicate Results
* • Detection Limits

* - All quality control criteria were met for this parameter.

- The following contaminants were detected in the laboratory method/preparation blanks at the following maximum concentrations:

Analyte	Maximum Concentration	Action Level
Chromium	1.355 µg/L	6.775 µg/L
Iron	34.4 µg/L	172.0 µg/L

An action level of 5X the maximum concentration was used to evaluate the sample data for blank contamination. Sample aliquot and dilution factors, if applicable, were taken into consideration when evaluating for blank contamination. Positive results less than the action level reported for iron were qualified "B" as a result of blank contamination.

- Field duplicate imprecision (RPD > 50%) was noted for TSS. Positive and nondetected results reported for TSS were qualified as estimated, "J" and "UJ", respectively.

Executive Summary

Laboratory Performance: Chromium and iron were present in the laboratory method/preparation blanks.

Other Factors Affecting Data Quality: Field duplicate imprecision was noted for TSS.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Review", February 1994 and the NFESC document entitled "Navy IRCDQM" (September 1999).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."

Tetra Tech NUS
Catherine Noronha & Erin M. Faust
Environmental Scientists

Tetra Tech NUS
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation

Data Qualifier Key:

U - Value is a nondetect as reported by the laboratory.

B - Positive result is considered to be an artifact of blank contamination and should not be considered present.

J - Positive result is qualified as estimated, "J", due to technical noncompliances.

UJ - Nondetected result is qualified as estimated, "UJ", due to technical noncompliances.

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO:	**G. LATULIPPE**	**DATE:**	**DECEMBER 26, 2001**
FROM:	**CATHERINE NORONHA & ERIN FAUST**	**COPIES:**	**DV FILE**

SUBJECT: **INORGANIC DATA VALIDATION – METALS AND MISCELLANEOUS PARAMETERS**
CTO-245 NSWC INDIAN HEAD
SAMPLE DELIVERY GROUP (SDG) – N5683

SAMPLES: 3/Aqueous/

S57MW0060103	S57MW0060103-F	S57RB0070003

8/Soils/

S57SB0300203	S57SB0300403	S57SB0310203
S57SB0310403	S57SB0320203	S57SB0320403
S57SBDUP05	S57SBDUP06	

Overview

The sample set for CTO 245, NSWC Indian Head, SDG N5683, consists of two (2) aqueous environmental samples, one (1) aqueous rinsate blank, S57RB0070003, and eight (8) soil environmental samples. Two (2) field duplicate pairs (S57SBDUP05 / S57SB0310203 and S57SBDUP06 / S57SB0300203) were included in this SDG.

All soil samples were analyzed for total organic carbon (TOC) and pH. Sample S57MW0060103 was analyzed for cadmium, chromium, alkalinity, carbon dioxide, chemical oxygen demand (COD), chloride, nitrite, hexavalent chromium, ferrous iron, hardness, nitrate, phosphate, sulfate, sulfide, TOC and total suspended solids (TSS). Sample S57MW0060103-F was analyzed for dissolved iron only. Sample S57RB0070003 was analyzed for TOC only. The samples were collected by TetraTech NUS on August 24, 2001 and analyzed by Chemtech Consulting Group under Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria.

Metals analyses were conducted using Contract Laboratory Program (CLP) method ILM04.1. Sulfide, alkalinity and TSS analyses were conducted using EPA methods 376.1, 310.1 and 160.2, respectively. Chloride, nitrate, nitrite, phosphate, and sulfate were analyzed by ion chromatography using EPA method 300.0. Analyses for COD and ferrous iron were conducted using HACH methods 8000 and 8146, respectively. Analyses for hardness and carbon dioxide were conducted using Standard Methods, 18th Edition, methods 2340B and 4500, respectively. TOC analyses were conducted using the Lloyd Kahn method. Hexavalent chromium was analyzed using SW 846 method 7196.

These data were evaluated based on the following parameters:

* • Data Completeness
* • Holding Times
* • Calibration Recoveries
• Laboratory Blank Analyses
* • Field Duplicate Results
* • Detection Limits

* - All quality control criteria were met for this parameter.

- The following contaminant was detected in the laboratory method blanks at the following maximum concentration:

Analyte	Maximum Concentration	Action Level
Iron	33.5 µg/L	167.5 µg/L

An action level of 5X the maximum concentration was used to evaluate the sample data for blank contamination. Sample aliquot and dilution factors, if applicable, were taken into consideration when evaluating for blank contamination. The positive result less than the action level reported for iron was qualified "B" as a result of blank contamination.

Executive Summary

Laboratory Performance: Iron was present in the laboratory method blanks.

Other Factors Affecting Data Quality: None.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Review", February 1994 and the NFESC document entitled "Navy IRCDQM" (September 1999).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."

Tetra Tech NUS
Catherine Noronha & Erin M. Faust
Environmental Scientists

Tetra Tech NUS
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
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Data Qualifier Key:

U - Value is a nondetect as reported by the laboratory.

B - Positive result is considered to be an artifact of blank contamination and should not be considered present.

APPENDIX D

AQUIFER TEST MEASUREMENTS AND CALCULATIONS

HYDRAULIC CONDUCTIVITY TESTING DATA SHEET

Tetra Tech NUS, Inc.

PROJECT NAME: INDIANHEAD SITE 57 FS WELL/BORING NO.: S57MW01

PROJECT NO.: 7129-2920 GEOLOGIST: FRED W. RAMSER

WELL DIAMETER: 2" ID SCREEN LENGTH/DEPTH: 10', 16.18-26.18 TEST NO.:

STATIC WATER LEVEL (Depth/Elevation): 7.35 DATE: 10-24-01

TEST TYPE (Rising/Falling/Constant Head): RISING HEAD CHECKED:

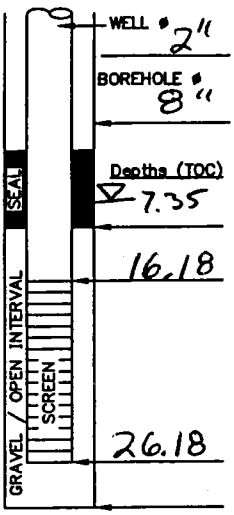
METHOD OF INDUCING WATER LEVEL CHANGE: 2 x 1 Liter Bailers PAGE ..... OF .....

REFERENCE PT. FOR WL MEAS. (Top of Casing, Transducer, etc.): TOC, Ref to 0.00

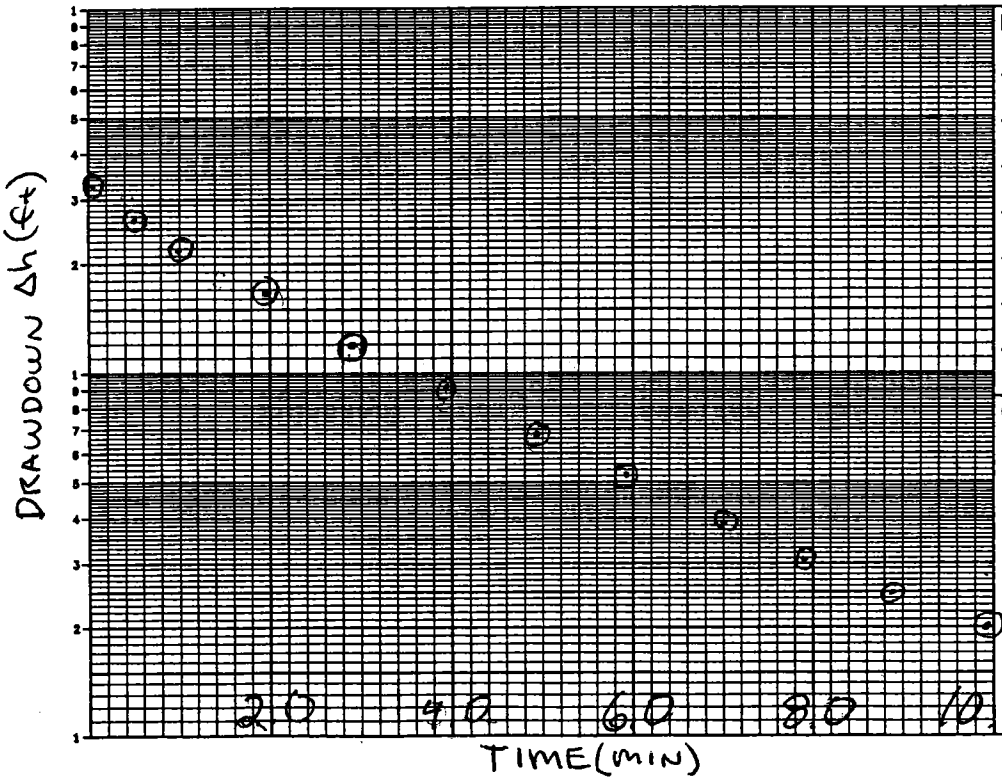
ACAD:FORM_HYDCONTST.dwg 07/06/99 INL

ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)	ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)
0.000		0.000	9.9497		0.200
0.050		3.375			
0.4963		2.681			
1.04		2.23			
1.9678		1.658			
2.9530		1.227			
3.9463		0.914			
4.9728		0.682			
5.9145		0.529			
7.0345		0.395			
7.8962		0.318			
8.8645		0.252			

WELL SCHEMATIC



▽ Indicate SWL Depth on Drawing



REMARKS:

INSERTED BAILERS

1527 HRS

1551 START

WL @ STOP = 7.40

CALCS, SKETCH MAPS, ETC.:

TETRA TECH NUS, INC. CALCULATION WORKSHEET PAGE ____ OF ____

CLIENT: INDIAN HEAD NSWC	JOB NUMBER: 7129 SITE 57 FS
SUBJECT: SLUG TEST WELL S57MW01	
BASED ON: HVORSLEV	DRAWING NUMBER:
BY: FRED R. / CHECKED BY: gk	APPROVED BY: / DATE: 11-2-01

EQ:

$$K = \frac{r^2 \ln(L/R)}{2LT_o}$$

WHERE:

$r = 0.083$ (RISER RADIUS, Ft)
$R = 0.083$ (SCREEN RADIUS, Ft)
$L = 10'$ (INPUT LENGTH, Ft)
$T_o = 3.2$ (FROM PLOT, MIN)
K = HYDRAULIC COND. (ft/min)

SUB:

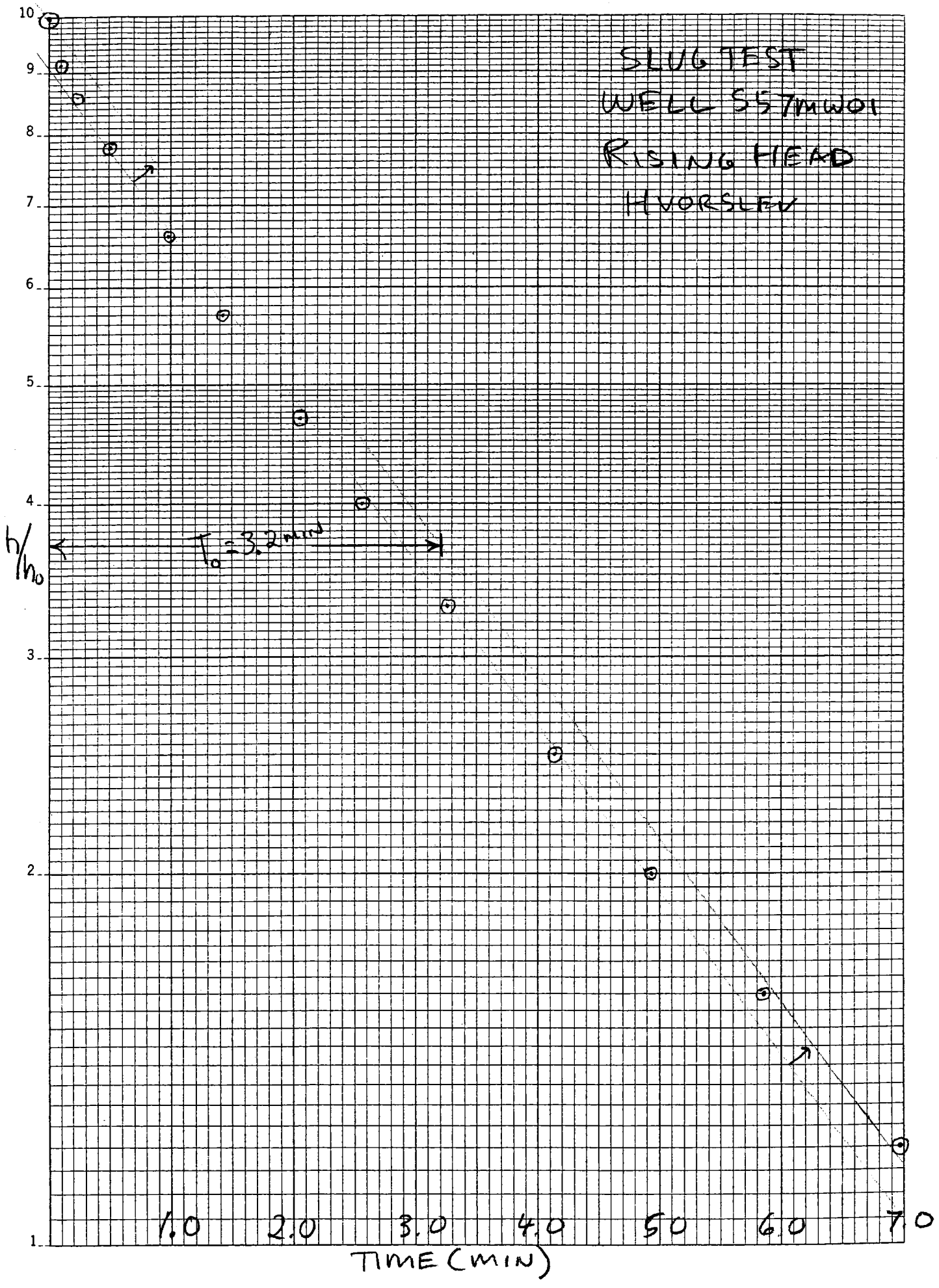
$$K = \frac{(0.083)^2 \ln(10/0.083)}{2(10)(3.2)}$$

$$= \frac{3.30086419 \times 10^{-2}}{64}$$

$$= 5.16 \times 10^{-4} \text{ ft/min}$$

$$= 2.6 \times 10^{-4} \text{ cm/sec}$$

$$= 0.743 \text{ ft/day}$$



46 4650
K+E SEMI-LOGARITHMIC 1 CYCLE X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

In-Situ Inc.	MiniTroll Pro
Report generated:	10/30/01 15:07:19
Report from file:	C:\Win-Situ\Data\SN01966 2001-10-24 155047 s57mw01rhno1.bin
DataMgr Version	3.68
Serial number:	1966
Firmware Version	3.01
Unit name:	miniTROLL
Test name:	s57mw01rhno1
Test defined on:	10/24/01 15:20:25
Test started on:	10/24/01 15:50:47
Test stopped on:	10/24/01 16:17:56
Test extracted on:	N/A

Data gathered using Logarithmic testing
ximum time between data points: 10. Minutes.
Number of data samples: 118

TOTAL DATA SAMPLES 118

Channel number [1]
Measurement type: Temperature
Channel name: OnBoard Temp

Channel number [2]
Measurement type: Pressure
Channel name: OnBoard Pressure
Sensor Range: 30 PSI.
Specific gravity: 1
Mode: TOC
User-defined reference: 0 Feet H2O
Referenced on: test start
Pressure head at reference: 11.435 Feet H2O

Date	Time	ET (min)	Chan[1] Celsius	Chan[2] Feet H2O	Adj. ET (min)	h/ho	ho= 3.375
10/24/01	15:50	0	19.28	0			
10/24/01	15:50	0.005	19.28	0			
10/24/01	15:50	0.01	19.29	-0.002			
10/24/01	15:50	0.015	19.29	-0.002			
10/24/01	15:50	0.02	19.29	-0.004			
10/24/01	15:50	0.025	19.31	0.077			
10/24/01	15:50	0.03	19.31	16.167			
10/24/01	15:50	0.035	19.31	4.154			
10/24/01	15:50	0.04	19.31	3.526			
10/24/01	15:50	0.045	19.31	3.36			
10/24/01	15:50	0.05	19.31	3.375	0	1.00	-
10/24/01	15:50	0.055	19.31	3.312	0.005	0.98	
10/24/01	15:50	0.06	19.31	3.296	0.01	0.98	

10/24/01 15:50	0.065	19.31	3.294	0.015	0.98
10/24/01 15:50	0.07	19.31	3.265	0.02	0.97
10/24/01 15:50	0.075	19.32	3.29	0.025	0.97
10/24/01 15:50	0.08	19.32	3.23	0.03	0.96
10/24/01 15:50	0.0848	19.32	3.209	0.0348	0.95
10/24/01 15:50	0.09	19.32	3.16	0.04	0.94
10/24/01 15:50	0.095	19.32	3.17	0.045	0.94
10/24/01 15:50	0.1	19.32	3.178	0.05	0.94
10/24/01 15:50	0.1058	19.32	3.168	0.0558	0.94
10/24/01 15:50	0.112	19.32	3.156	0.062	0.94
10/24/01 15:50	0.1185	19.32	3.143	0.0685	0.93
10/24/01 15:50	0.1255	19.32	3.129	0.0755	0.93
10/24/01 15:50	0.1328	19.32	3.116	0.0828	0.92
10/24/01 15:50	0.1407	19.32	3.102	0.0907	0.92
10/24/01 15:50	0.149	19.32	3.087	0.099	0.91 –
10/24/01 15:50	0.1578	19.32	3.073	0.1078	0.91
10/24/01 15:50	0.167	19.32	3.058	0.117	0.91
10/24/01 15:50	0.177	19.32	3.044	0.127	0.90
10/24/01 15:50	0.1875	19.32	3.029	0.1375	0.90
10/24/01 15:50	0.1985	19.32	3.013	0.1485	0.89
10/24/01 15:50	0.2102	19.31	2.996	0.1602	0.89
10/24/01 15:51	0.2227	19.32	2.982	0.1727	0.88
10/24/01 15:51	0.2358	19.31	2.963	0.1858	0.88
10/24/01 15:51	0.2498	19.31	2.946	0.1998	0.87
10/24/01 15:51	0.2647	19.31	2.928	0.2147	0.87
10/24/01 15:51	0.2803	19.31	2.909	0.2303	0.86
10/24/01 15:51	0.297	19.31	2.888	0.247	0.86 –
10/24/01 15:51	0.3147	19.31	2.868	0.2647	0.85
10/24/01 15:51	0.3333	19.31	2.847	0.2833	0.84
10/24/01 15:51	0.3532	19.31	2.826	0.3032	0.84
10/24/01 15:51	0.3742	19.31	2.804	0.3242	0.83
10/24/01 15:51	0.3963	19.31	2.781	0.3463	0.82
10/24/01 15:51	0.4198	19.31	2.756	0.3698	0.82
10/24/01 15:51	0.4447	19.29	2.731	0.3947	0.81
10/24/01 15:51	0.4697	19.29	2.706	0.4197	0.80
10/24/01 15:51	0.4963	19.29	2.681	0.4463	0.79
10/24/01 15:51	0.5247	19.29	2.654	0.4747	0.79
10/24/01 15:51	0.5547	19.29	2.625	0.5047	0.78 –
10/24/01 15:51	0.5863	19.29	2.596	0.5363	0.77
10/24/01 15:51	0.6213	19.29	2.567	0.5713	0.76
10/24/01 15:51	0.6578	19.29	2.534	0.6078	0.75
10/24/01 15:51	0.6963	19.29	2.501	0.6463	0.74
10/24/01 15:51	0.738	19.28	2.466	0.688	0.73
10/24/01 15:51	0.7813	19.28	2.431	0.7313	0.72
10/24/01 15:51	0.828	19.28	2.393	0.778	0.71
10/24/01 15:51	0.8763	19.28	2.354	0.8263	0.70
10/24/01 15:51	0.928	19.28	2.315	0.878	0.69
10/24/01 15:51	0.983	19.27	2.271	0.933	0.67
10/24/01 15:51	1.0413	19.27	2.23	0.9913	0.66 –
10/24/01 15:51	1.103	19.27	2.184	1.053	0.65
10/24/01 15:51	1.168	19.26	2.138	1.118	0.63
10/24/01 15:52	1.238	19.26	2.091	1.188	0.62
10/24/01 15:52	1.3113	19.26	2.043	1.2613	0.61
10/24/01 15:52	1.3897	19.24	1.991	1.3397	0.59
10/24/01 15:52	1.473	19.24	1.94	1.423	0.57 –

10/24/01 15:52	1.5613	19.23	1.883	1.5113	0.56
10/24/01 15:52	1.6547	19.23	1.832	1.6047	0.54
10/24/01 15:52	1.753	19.23	1.776	1.703	0.53
10/24/01 15:52	1.858	19.22	1.718	1.808	0.51
10/24/01 15:52	1.968	19.22	1.658	1.918	0.49
10/24/01 15:52	2.0847	19.2	1.599	2.0347	0.47
10/24/01 15:52	2.2097	19.2	1.539	2.1597	0.46
10/24/01 15:53	2.3412	19.2	1.477	2.2912	0.44
10/24/01 15:53	2.4813	19.19	1.415	2.4313	0.42
10/24/01 15:53	2.6297	19.19	1.353	2.5797	0.40
10/24/01 15:53	2.7863	19.19	1.289	2.7363	0.38
10/24/01 15:53	2.953	19.18	1.227	2.903	0.36
10/24/01 15:53	3.1297	19.18	1.162	3.0797	0.34
10/24/01 15:54	3.3163	19.18	1.1	3.2663	0.33
10/24/01 15:54	3.5147	19.17	1.038	3.4647	0.31
10/24/01 15:54	3.7247	19.17	0.974	3.6747	0.29
10/24/01 15:54	3.9463	19.18	0.914	3.8963	0.27
10/24/01 15:54	4.1813	19.18	0.854	4.1313	0.25
10/24/01 15:55	4.4295	19.18	0.796	4.3795	0.24
10/24/01 15:55	4.693	19.17	0.738	4.643	0.22
10/24/01 15:55	4.973	19.18	0.682	4.923	0.20
10/24/01 15:56	5.2697	19.18	0.631	5.2197	0.19
10/24/01 15:56	5.583	19.18	0.577	5.533	0.17
10/24/01 15:56	5.9147	19.17	0.529	5.8647	0.16
10/24/01 15:57	6.2663	19.17	0.484	6.2163	0.14
10/24/01 15:57	6.6397	19.17	0.438	6.5897	0.13
10/24/01 15:57	7.0347	19.17	0.395	6.9847	0.12
10/24/01 15:58	7.453	19.17	0.355	7.403	0.11
10/24/01 15:58	7.8963	19.17	0.318	7.8463	0.09
10/24/01 15:59	8.3663	19.18	0.285	8.3163	0.08
10/24/01 15:59	8.8647	19.18	0.252	8.8147	0.07
10/24/01 16:00	9.3913	19.18	0.225	9.3413	0.07
10/24/01 16:00	9.9497	19.18	0.2	9.8997	0.06
10/24/01 16:01	10.5413	19.18	0.178	10.4913	0.05
10/24/01 16:01	11.168	19.18	0.157	11.118	0.05
10/24/01 16:02	11.8313	19.18	0.141	11.7813	0.04
10/24/01 16:03	12.5347	19.19	0.124	12.4847	0.04
10/24/01 16:04	13.2797	19.2	0.11	13.2297	0.03
10/24/01 16:04	14.0697	19.22	0.096	14.0197	0.03
10/24/01 16:05	14.9063	19.19	0.081	14.8563	0.02
10/24/01 16:06	15.7913	19.17	0.068	15.7413	0.02
10/24/01 16:07	16.7297	19.15	0.061	16.6797	0.02
10/24/01 16:08	17.723	19.14	0.055	17.673	0.02
10/24/01 16:09	18.7763	19.15	0.051	18.7263	0.02
10/24/01 16:10	19.8913	19.14	0.047	19.8413	0.01
10/24/01 16:11	21.073	19.17	0.045	21.023	0.01
10/24/01 16:13	22.3247	19.14	0.038	22.2747	0.01
10/24/01 16:14	23.6497	19.14	0.04	23.5997	0.01
10/24/01 16:15	25.0547	19.15	0.034	25.0047	0.01
10/24/01 16:17	26.543	19.1	0.025	26.493	0.01

HYDRAULIC CONDUCTIVITY TESTING DATA SHEET

Tetra Tech NUS, Inc.

PROJECT NAME: INDIANHEAD SITE 57 FS WELL/BORING NO.: 57MW02

PROJECT NO.: 7129-2920 GEOLOGIST: FRED W. RAMSER

WELL DIAMETER: 2" ID SCREEN LENGTH/DEPTH: 10', 4.15'-14.15' TEST NO.:

STATIC WATER LEVEL (Depth/Elevation): 8.01 DATE: 10-24-01

TEST TYPE (Rising/Falling/Constant Head): RISING HEAD CHECKED:

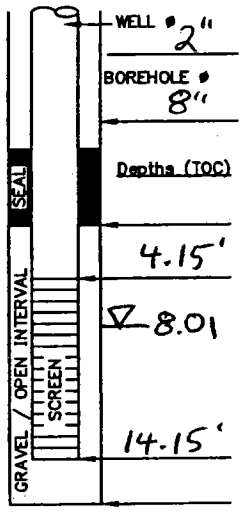
METHOD OF INDUCING WATER LEVEL CHANGE: 2 x 1 liter bailer PAGE ..... OF .....

REFERENCE PT. FOR WL MEAS. (Top of Casing, Transducer, etc.):

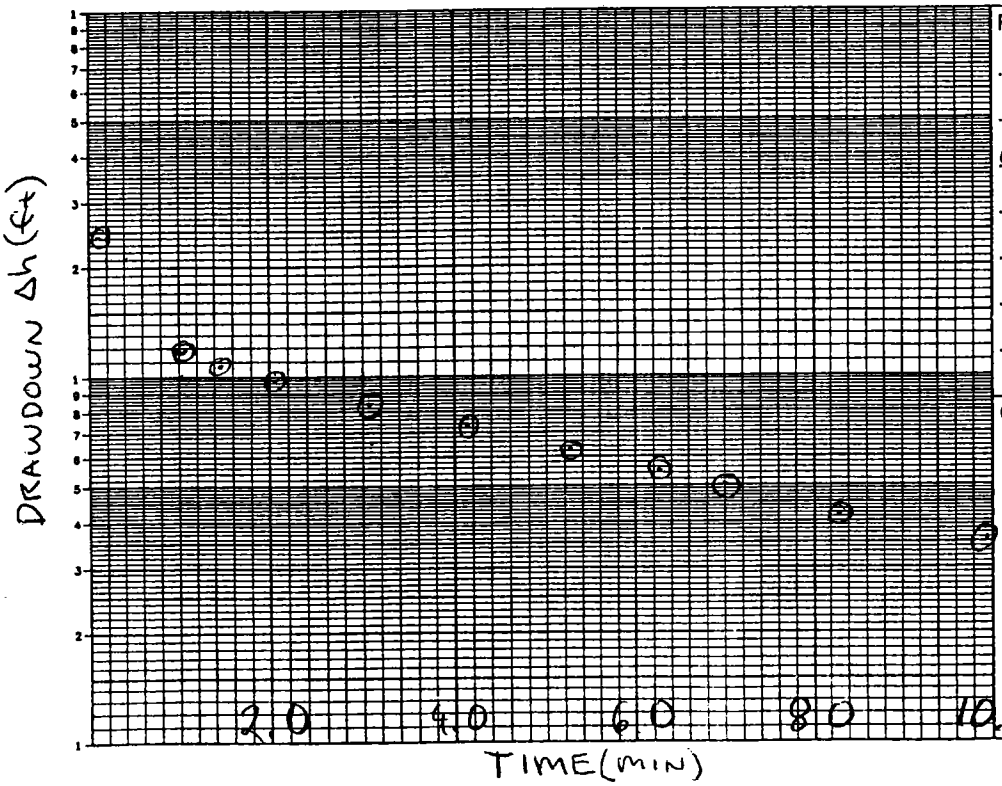
ACAD:FORM_HYDCONTST.dwg 07/06/99 INL

ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)	ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)
0.000		0.000	7.0345		0.500
0.015		3.104	8.3663		0.430
0.100		2.436	9.9497		0.357
0.4963		1.453			
0.7380		1.308			
1.0412		1.198			
1.4728		1.091			
2.0845		0.983			
3.1297		0.838			
4.1812		0.722			
5.2697		0.622			
6.2663		0.548			

WELL SCHEMATIC



▽ Indicate SWL Depth on Drawing



REMARKS:

Head = 5.983

WL = 8.03 @ END OF TEST

CALCS, SKETCH MAPS, ETC.:

TETRA TECH NUS, INC. **CALCULATION WORKSHEET** PAGE _____ OF _____

CLIENT: INDIAN HEAD NSWC	JOB NUMBER: 7129 SITE 57 FS
SUBJECT: SLUG TEST WELL S57MW02	
BASED ON: HVORSLEV	DRAWING NUMBER:
BY: FRED R. / CHECKED BY: GK	APPROVED BY: / DATE:

EQ:

$$K = \frac{r^2 \ln(L/R)}{2L T_o}$$

WHERE:

$r = 0.083$ (RISER RADIUS, Ft)
$R = 0.083$ (SCREEN RADIUS, Ft)
$L = 6.14$ (INPUT LENGTH, Ft)
$T_o = 3.18$ (FROM PLOT, MIN)
K = HYDRAULIC COND. (ft/min)

SUB:

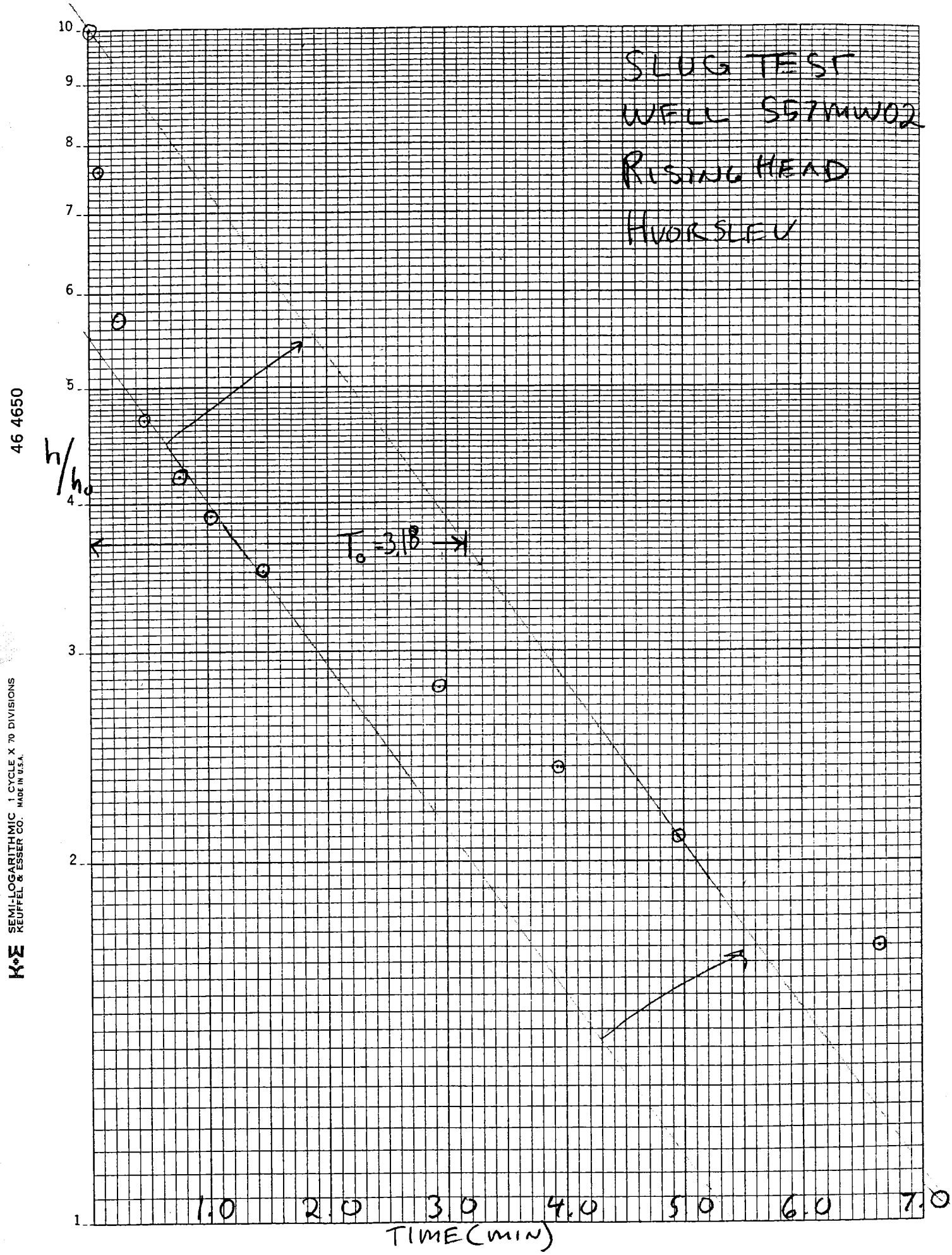
$$K = \frac{(0.083)^2 \ln(6.14/0.083)}{2(6.14)(3.18)}$$

$$K = \frac{2.965 \times 10^{-2}}{39.0504}$$

$K = 7.59 \times 10^{-4}$ ft/min

$K = 3.86 \times 10^{-4}$ cm/sec

$K = 1.1$ ft/day


SLUG TEST
WELL S57MW02
RISING HEAD
HVORSLEV
h/h0
T0 = 3.18
10
9
8
7
6
5
4
3
2
1
1.0
2.0
3.0
4.0
5.0
6.0
7.0
TIME (MIN)
46 4650
K+E SEMI-LOGARITHMIC 1 CYCLE X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

In-Situ Inc. MiniTroll Pro

Report generated: 11/1/01 9:32:31
Report from file: C:\Win-Situ\Data\SN01966 2001-10-24 145354 s57mw02rhno1.bin
DataMgr Version 3.68

Serial number: 1966
Firmware Version 3.01
Unit name: miniTROLL

Test name: s57mw02rhno1

Test defined on: 10/24/01 14:29:36
Test started on: 10/24/01 14:53:54
Test stopped on: 10/24/01 15:19:13
Test extracted on: N/A

Data gathered using Logarithmic testing
Maximum time between data points:10. Minutes.
Number of data samples: 117

TOTAL DATA SAMPLES 117

Channel number [1]
Measurement type: Temperature
Channel name: OnBoard Temp

Channel number [2]
Measurement type: Pressure
Channel name: OnBoard Pressure
Sensor Range: 30 PSI.
Specific gravity: 1
Mode: TOC
User-defined reference: 0 Feet H2O
Referenced on: test start
Pressure head at reference: 5.927 Feet H2O

Date	Time	ET (min)	Chan[1] Celsius	Chan[2] Feet H2O	Adj ET (min)	h/ho	ho= 3.104
10/24/01	14:53	0	20.66	0			
10/24/01	14:53	0.005	20.67	1.449			
10/24/01	14:53	0.01	20.67	10.729			
10/24/01	14:53	0.015	20.67	3.104	0	1.00	
10/24/01	14:53	0.02	20.69	2.988	0.005	0.96	
10/24/01	14:53	0.025	20.69	2.895	0.01	0.93	
10/24/01	14:53	0.03	20.69	2.858	0.015	0.92	
10/24/01	14:53	0.035	20.69	2.802	0.02	0.90	
10/24/01	14:53	0.04	20.69	2.769	0.025	0.89	
10/24/01	14:53	0.045	20.7	2.734	0.03	0.88	
10/24/01	14:53	0.05	20.7	2.705	0.035	0.87	
10/24/01	14:53	0.055	20.7	2.684	0.04	0.86	
10/24/01	14:53	0.06	20.7	2.649	0.045	0.85	

10/24/01 14:53	0.065	20.7	2.624	0.05	0.85
10/24/01 14:53	0.07	20.7	2.591	0.055	0.83
10/24/01 14:53	0.075	20.7	2.568	0.06	0.83
10/24/01 14:53	0.08	20.7	2.539	0.065	0.82
10/24/01 14:53	0.0848	20.7	2.513	0.0698	0.81
10/24/01 14:54	0.09	20.7	2.488	0.075	0.80
10/24/01 14:54	0.095	20.7	2.461	0.08	0.79
10/24/01 14:54	0.1	20.71	2.436	0.085	0.78
10/24/01 14:54	0.1058	20.71	2.403	0.0908	0.77
10/24/01 14:54	0.112	20.71	2.374	0.097	0.76
10/24/01 14:54	0.1185	20.71	2.341	0.1035	0.75
10/24/01 14:54	0.1255	20.71	2.308	0.1105	0.74
10/24/01 14:54	0.1328	20.71	2.273	0.1178	0.73
10/24/01 14:54	0.1407	20.71	2.238	0.1257	0.72
10/24/01 14:54	0.149	20.71	2.198	0.134	0.71
10/24/01 14:54	0.1578	20.71	2.161	0.1428	0.70
10/24/01 14:54	0.167	20.71	2.12	0.152	0.68
10/24/01 14:54	0.177	20.71	2.078	0.162	0.67
10/24/01 14:54	0.1875	20.71	2.037	0.1725	0.66
10/24/01 14:54	0.1985	20.71	1.996	0.1835	0.64
10/24/01 14:54	0.2102	20.7	1.952	0.1952	0.63
10/24/01 14:54	0.2227	20.7	1.91	0.2077	0.62
10/24/01 14:54	0.2358	20.7	1.865	0.2208	0.60
10/24/01 14:54	0.2498	20.7	1.824	0.2348	0.59
10/24/01 14:54	0.2647	20.7	1.784	0.2497	0.57
10/24/01 14:54	0.2803	20.7	1.743	0.2653	0.56
10/24/01 14:54	0.297	20.7	1.706	0.282	0.55
10/24/01 14:54	0.3147	20.7	1.67	0.2997	0.54
10/24/01 14:54	0.3333	20.7	1.637	0.3183	0.53
10/24/01 14:54	0.3532	20.7	1.604	0.3382	0.52
10/24/01 14:54	0.3742	20.7	1.577	0.3592	0.51
10/24/01 14:54	0.3963	20.7	1.548	0.3813	0.50
10/24/01 14:54	0.4198	20.7	1.524	0.4048	0.49
10/24/01 14:54	0.4447	20.7	1.497	0.4297	0.48
10/24/01 14:54	0.4697	20.7	1.476	0.4547	0.48
10/24/01 14:54	0.4963	20.7	1.453	0.4813	0.47
10/24/01 14:54	0.5247	20.7	1.433	0.5097	0.46
10/24/01 14:54	0.5547	20.7	1.412	0.5397	0.45
10/24/01 14:54	0.5863	20.7	1.389	0.5713	0.45
10/24/01 14:54	0.6213	20.7	1.368	0.6063	0.44
10/24/01 14:54	0.6578	20.69	1.349	0.6428	0.43
10/24/01 14:54	0.6963	20.69	1.329	0.6813	0.43
10/24/01 14:54	0.738	20.69	1.308	0.723	0.42
10/24/01 14:54	0.7813	20.69	1.289	0.7663	0.42
10/24/01 14:54	0.828	20.69	1.271	0.813	0.41
10/24/01 14:54	0.8763	20.69	1.252	0.8613	0.40
10/24/01 14:54	0.928	20.69	1.234	0.913	0.40
10/24/01 14:54	0.983	20.69	1.215	0.968	0.39
10/24/01 14:54	1.0413	20.69	1.198	1.0263	0.39
10/24/01 14:55	1.103	20.69	1.18	1.088	0.38
10/24/01 14:55	1.168	20.69	1.163	1.153	0.37
10/24/01 14:55	1.238	20.69	1.147	1.223	0.37
10/24/01 14:55	1.3113	20.69	1.13	1.2963	0.36
10/24/01 14:55	1.3897	20.67	1.111	1.3747	0.36
10/24/01 14:55	1.473	20.67	1.091	1.458	0.35

10/24/01 14:55	1.5613	20.67	1.074	1.5463	0.35
10/24/01 14:55	1.6547	20.67	1.057	1.6397	0.34
10/24/01 14:55	1.753	20.67	1.041	1.738	0.34
10/24/01 14:55	1.858	20.67	1.022	1.843	0.33
10/24/01 14:55	1.968	20.67	1.002	1.953	0.32
10/24/01 14:55	2.0847	20.67	0.983	2.0697	0.32
10/24/01 14:56	2.2097	20.67	0.964	2.1947	0.31
10/24/01 14:56	2.3412	20.67	0.944	2.3262	0.30
10/24/01 14:56	2.4813	20.67	0.923	2.4663	0.30
10/24/01 14:56	2.6297	20.66	0.902	2.6147	0.29
10/24/01 14:56	2.7863	20.67	0.882	2.7713	0.28
10/24/01 14:56	2.953	20.66	0.861	2.938	0.28
10/24/01 14:57	3.1297	20.66	0.838	3.1147	0.27
10/24/01 14:57	3.3163	20.66	0.815	3.3013	0.26
10/24/01 14:57	3.5147	20.66	0.792	3.4997	0.26
10/24/01 14:57	3.7247	20.66	0.768	3.7097	0.25
10/24/01 14:57	3.9463	20.66	0.745	3.9313	0.24
10/24/01 14:58	4.1813	20.66	0.722	4.1663	0.23
10/24/01 14:58	4.4295	20.66	0.699	4.4145	0.23
10/24/01 14:58	4.693	20.65	0.674	4.678	0.22
10/24/01 14:58	4.973	20.65	0.647	4.958	0.21
10/24/01 14:59	5.2697	20.65	0.622	5.2547	0.20
10/24/01 14:59	5.583	20.65	0.602	5.568	0.19
10/24/01 14:59	5.9147	20.65	0.575	5.8997	0.19
10/24/01 15:00	6.2663	20.65	0.548	6.2513	0.18
10/24/01 15:00	6.6397	20.65	0.523	6.6247	0.17
10/24/01 15:00	7.0347	20.65	0.5	7.0197	0.16
10/24/01 15:01	7.453	20.65	0.476	7.438	0.15
10/24/01 15:01	7.8963	20.65	0.455	7.8813	0.15
10/24/01 15:02	8.3663	20.63	0.43	8.3513	0.14
10/24/01 15:02	8.8647	20.63	0.405	8.8497	0.13
10/24/01 15:03	9.3913	20.63	0.38	9.3763	0.12
10/24/01 15:03	9.9497	20.63	0.357	9.9347	0.12
10/24/01 15:04	10.5413	20.63	0.333	10.5263	0.11
10/24/01 15:05	11.168	20.63	0.308	11.153	0.10
10/24/01 15:05	11.8313	20.63	0.285	11.8163	0.09
10/24/01 15:06	12.5347	20.62	0.26	12.5197	0.08
10/24/01 15:07	13.2797	20.62	0.235	13.2647	0.08
10/24/01 15:07	14.0697	20.62	0.212	14.0547	0.07
10/24/01 15:08	14.9063	20.62	0.19	14.8913	0.06
10/24/01 15:09	15.7913	20.62	0.167	15.7763	0.05
10/24/01 15:10	16.7297	20.62	0.144	16.7147	0.05
10/24/01 15:11	17.723	20.62	0.121	17.708	0.04
10/24/01 15:12	18.7763	20.62	0.103	18.7613	0.03
10/24/01 15:13	19.8913	20.62	0.088	19.8763	0.03
10/24/01 15:14	21.073	20.61	0.071	21.058	0.02
10/24/01 15:16	22.3247	20.61	0.061	22.3097	0.02
10/24/01 15:17	23.6497	20.61	0.051	23.6347	0.02
10/24/01 15:18	25.0547	20.6	0.042	25.0397	0.01

HYDRAULIC CONDUCTIVITY TESTING DATA SHEET

Tetra Tech NUS, Inc.

PROJECT NAME: INDIANHEAD SITE 57 FS WELL/BORING NO.: 557MW03

PROJECT NO.: 7129-2920 GEOLOGIST: FRED W. RAMSER

WELL DIAMETER: 2" SCREEN LENGTH/DEPTH: 5' / 18.99'-23.99' TEST NO.:

STATIC WATER LEVEL (Depth/Elevation): 8.95 DATE: 10-23-01

TEST TYPE (Rising/Falling/Constant Head): RISING CHECKED:

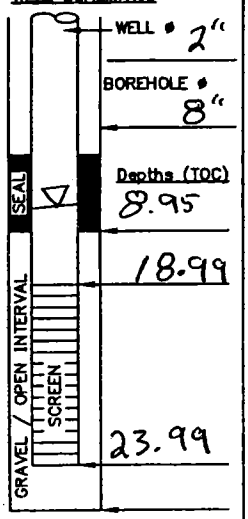
METHOD OF INDUCING WATER LEVEL CHANGE: PULL TWO x 1 liter Bailer PAGE ..... OF .....

REFERENCE PT. FOR WL MEAS. (Top of Casing, Transducer, etc.):

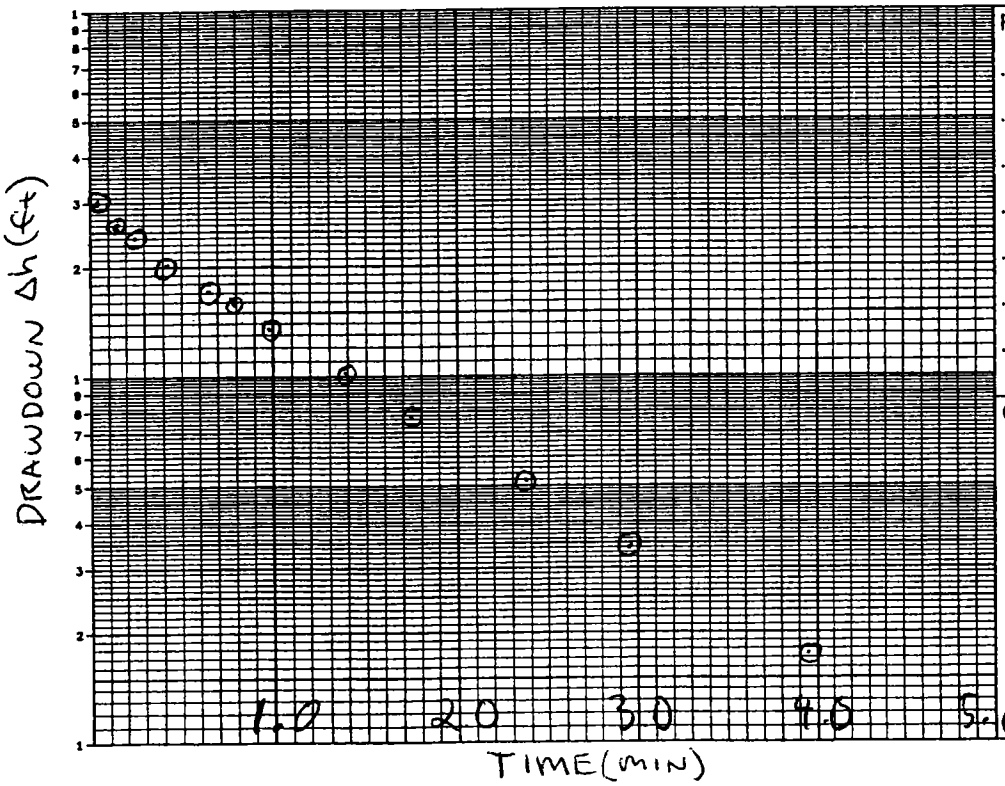
ACAD:FORM_HYDCONTST.dwg 07/06/99 INL

ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)	ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)
0.05		3.07			
0.15		2.669			
0.25		2.425			
0.42		2.094			
0.658		1.73			
0.7813		1.57			
0.9828		1.35			
1.389		1.01			
1.75		0.78			
2.34		0.522			
2.95		0.347			
3.946		0.175			

WELL SCHEMATIC



▽ Indicate SWL Depth on Drawing



REMARKS:

HEAD = 14.595

ABOVE MINI-TROLL

DONE

CALCS, SKETCH MAPS, ETC.:

TETRA TECH NUS, INC. CALCULATION WORKSHEET PAGE _____ OF _____

CLIENT: INDIAN HEAD NSWC	JOB NUMBER: 7129 SITE 57 FS
SUBJECT: SLUG TEST WELL S57MW03 RISING HEAD	
BASED ON: HVORSLEV	DRAWING NUMBER:
BY: FRED R. / CHECKED BY:	APPROVED BY: / DATE: 11-2-01

EQ:

$$K = \frac{r^2 \ln(L/R)}{2LT_o}$$

WHERE:

$r = 0.083$ (RISER RADIUS, Ft)
$R = 0.083$ (SCREEN RADIUS, Ft)
$L = 5$ (INPUT LENGTH, Ft)
$T_o = 1.28$ (FROM PLOT, MIN)
K = HYDRAULIC COND. (ft/min)

SUB:

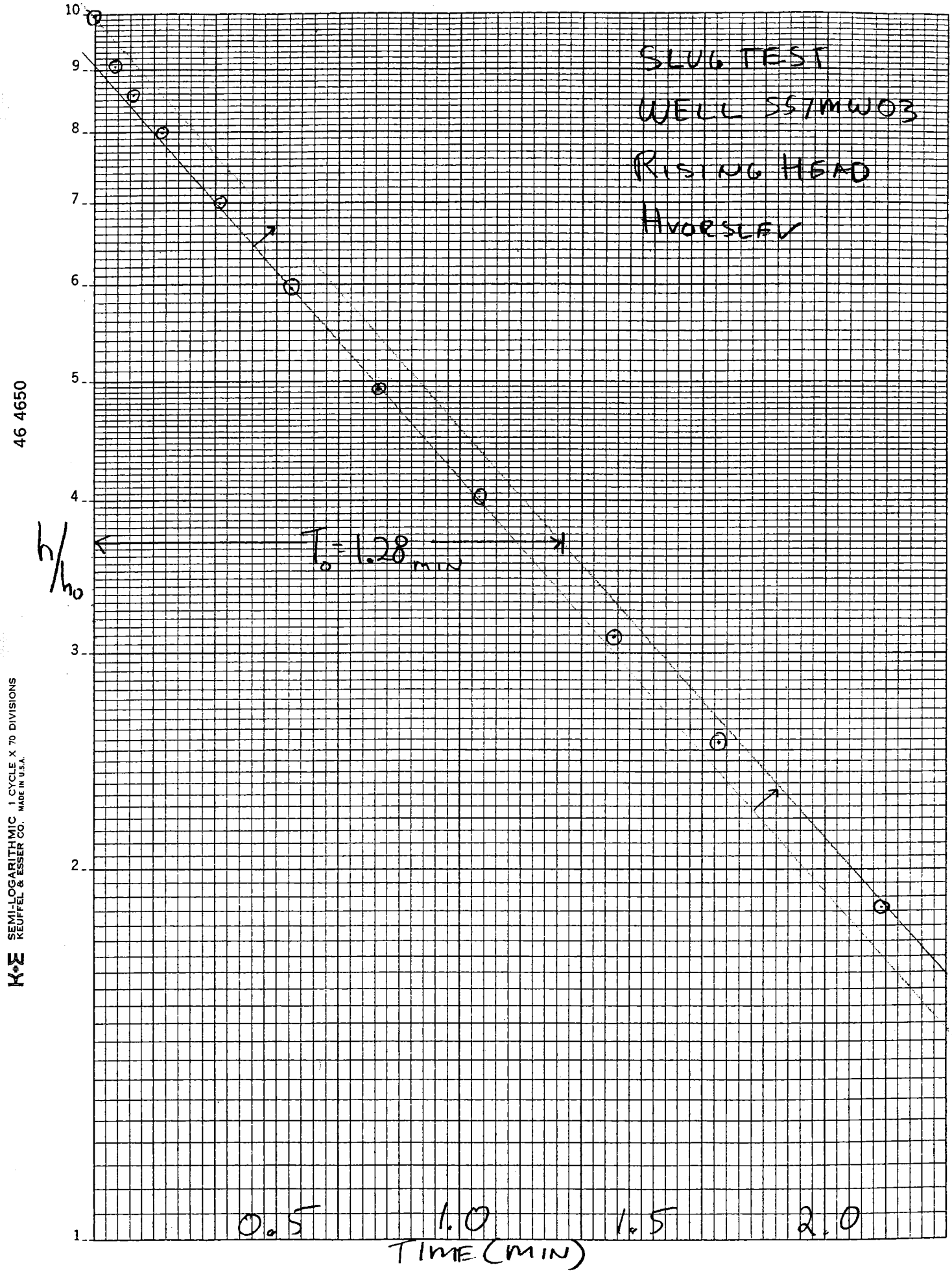
$$K = \frac{(0.083)^2 \ln(5/0.083)}{2(5)(1.28)}$$

$$K = \frac{2.82335509 \times 10^{-2}}{12.8}$$

$K = 2.21 \times 10^{-3}$ ft/min

$K = 1.120 \times 10^{-3}$ cm/sec

$K = 3.18$ ft/day ✓



46 4650
K+E SEMI-LOGARITHMIC 1 CYCLE X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

In-Situ Inc.	MiniTroll Pro
Report generated:	11/1/01 10:53:39
Report from file:	C:\Win-Situ\Data\SN01966 2001-10-23 170218 s57mw3rhno1.bin
DataMgr Version	3.68
Serial number:	1966
Firmware Version	3.01
Unit name:	miniTROLL
Test name:	s57mw3rhno1
Test defined on:	10/23/01 16:50:47
Test started on:	10/23/01 17:02:18
Test stopped on:	10/23/01 17:16:27
Test extracted on:	N/A

ata gathered using Logarithmic testing
mum time between data points: 1 Minutes.
Number of data samples: 107

TOTAL DATA SAMPLES 107

Channel number [1]
Measurement type: Temperature
Channel name: OnBoard Temp

Channel number [2]
Measurement type: Pressure
Channel name: OnBoard Pressure
Sensor Range: 30 PSI.
Specific gravity: 1
Mode: TOC
User-defined reference: 0 Feet H2O
Referenced on: test start
Pressure head at reference: 14.436 Feet H2O

Date	Time	ET (min)	Chan[1] Celsius	Chan[2] Feet H2O	Adj ET (min)	h/ho	ho= 3.072
10/23/01	17:02	0	19.28	0			
10/23/01	17:02	0.005	19.29	4.569			
10/23/01	17:02	0.01	19.29	10.985			
10/23/01	17:02	0.015	19.29	9.138			
10/23/01	17:02	0.02	19.31	9.477			
10/23/01	17:02	0.025	19.31	9.51			
10/23/01	17:02	0.03	19.31	7.969			
10/23/01	17:02	0.035	19.31	5.259			
10/23/01	17:02	0.04	19.31	2.824			
10/23/01	17:02	0.045	19.31	3.159			

10/23/01 17:02	0.05	19.32	3.072	0	1.000
10/23/01 17:02	0.055	19.32	3.029	0.005	0.986
10/23/01 17:02	0.06	19.32	3.012	0.01	0.980
10/23/01 17:02	0.065	19.32	2.971	0.015	0.967
10/23/01 17:02	0.07	19.32	2.965	0.02	0.965
10/23/01 17:02	0.075	19.32	2.932	0.025	0.954
10/23/01 17:02	0.08	19.32	2.909	0.03	0.947
10/23/01 17:02	0.0848	19.32	2.886	0.0348	0.939
10/23/01 17:02	0.09	19.32	2.863	0.04	0.932
10/23/01 17:02	0.095	19.32	2.845	0.045	0.926
10/23/01 17:02	0.1	19.32	2.826	0.05	0.920
10/23/01 17:02	0.1058	19.32	2.805	0.0558	0.913
10/23/01 17:02	0.112	19.32	2.785	0.062	0.907
10/23/01 17:02	0.1185	19.32	2.764	0.0685	0.900
10/23/01 17:02	0.1255	19.32	2.741	0.0755	0.892
10/23/01 17:02	0.1328	19.33	2.717	0.0828	0.884
10/23/01 17:02	0.1407	19.33	2.692	0.0907	0.876
10/23/01 17:02	0.149	19.33	2.669	0.099	0.869
10/23/01 17:02	0.1578	19.33	2.644	0.1078	0.861
10/23/01 17:02	0.167	19.32	2.621	0.117	0.853
10/23/01 17:02	0.177	19.32	2.595	0.127	0.845
10/23/01 17:02	0.1875	19.32	2.57	0.1375	0.837
10/23/01 17:02	0.1985	19.32	2.543	0.1485	0.828
10/23/01 17:02	0.2102	19.32	2.514	0.1602	0.818
10/23/01 17:02	0.2227	19.32	2.485	0.1727	0.809
10/23/01 17:02	0.2358	19.32	2.456	0.1858	0.799
10/23/01 17:02	0.2498	19.31	2.425	0.1998	0.789
10/23/01 17:02	0.2647	19.32	2.394	0.2147	0.779
10/23/01 17:02	0.2803	19.31	2.36	0.2303	0.768
10/23/01 17:02	0.297	19.31	2.325	0.247	0.757
10/23/01 17:02	0.3147	19.31	2.29	0.2647	0.745
10/23/01 17:02	0.3333	19.32	2.253	0.2833	0.733
10/23/01 17:02	0.3532	19.31	2.216	0.3032	0.721
10/23/01 17:02	0.3742	19.31	2.176	0.3242	0.708
10/23/01 17:02	0.3963	19.31	2.137	0.3463	0.696
10/23/01 17:02	0.4198	19.31	2.094	0.3698	0.682
10/23/01 17:02	0.4447	19.31	2.052	0.3947	0.668
10/23/01 17:02	0.4697	19.31	2.011	0.4197	0.655
10/23/01 17:02	0.4963	19.31	1.967	0.4463	0.640
10/23/01 17:02	0.5247	19.31	1.922	0.4747	0.626
10/23/01 17:02	0.5547	19.31	1.876	0.5047	0.611
10/23/01 17:02	0.5863	19.31	1.831	0.5363	0.596
10/23/01 17:02	0.6213	19.31	1.779	0.5713	0.579
10/23/01 17:02	0.6578	19.31	1.728	0.6078	0.563
10/23/01 17:03	0.6963	19.31	1.678	0.6463	0.546
10/23/01 17:03	0.738	19.31	1.624	0.688	0.529
10/23/01 17:03	0.7813	19.31	1.572	0.7313	0.512
10/23/01 17:03	0.828	19.29	1.518	0.778	0.494
10/23/01 17:03	0.8763	19.31	1.463	0.8263	0.476
10/23/01 17:03	0.928	19.31	1.407	0.878	0.458
10/23/01 17:03	0.983	19.31	1.351	0.933	0.440
10/23/01 17:03	1.0413	19.31	1.293	0.9913	0.421

10/23/01 17:03	1.103	19.31	1.237	1.053	0.403
10/23/01 17:03	1.168	19.31	1.182	1.118	0.385
10/23/01 17:03	1.238	19.31	1.119	1.188	0.364
10/23/01 17:03	1.3113	19.31	1.068	1.2613	0.348
10/23/01 17:03	1.3897	19.31	1.006	1.3397	0.327
10/23/01 17:03	1.473	19.31	0.95	1.423	0.309
10/23/01 17:03	1.5613	19.31	0.892	1.5113	0.290
10/23/01 17:03	1.6547	19.31	0.836	1.6047	0.272
10/23/01 17:04	1.753	19.31	0.78	1.703	0.254
10/23/01 17:04	1.858	19.31	0.727	1.808	0.237
10/23/01 17:04	1.968	19.32	0.673	1.918	0.219
10/23/01 17:04	2.0847	19.32	0.621	2.0347	0.202
10/23/01 17:04	2.2097	19.32	0.57	2.1597	0.186
10/23/01 17:04	2.3412	19.32	0.522	2.2912	0.170
10/23/01 17:04	2.4813	19.33	0.475	2.4313	0.155
10/23/01 17:04	2.6297	19.33	0.431	2.5797	0.140
10/23/01 17:05	2.7863	19.33	0.388	2.7363	0.126
10/23/01 17:05	2.953	19.33	0.347	2.903	0.113
10/23/01 17:05	3.1297	19.34	0.307	3.0797	0.100
10/23/01 17:05	3.3163	19.34	0.27	3.2663	0.088
10/23/01 17:05	3.5147	19.34	0.237	3.4647	0.077
10/23/01 17:06	3.7247	19.34	0.204	3.6747	0.066
10/23/01 17:06	3.9463	19.34	0.175	3.8963	0.057
10/23/01 17:06	4.1813	19.34	0.148	4.1313	0.048
10/23/01 17:06	4.4295	19.34	0.123	4.3795	0.040
10/23/01 17:07	4.693	19.36	0.101	4.643	0.033
10/23/01 17:07	4.973	19.36	0.08	4.923	0.026
10/23/01 17:07	5.2697	19.36	0.064	5.2197	0.021
10/23/01 17:07	5.583	19.37	0.045	5.533	0.015
10/23/01 17:08	5.9147	19.37	0.033	5.8647	0.011
10/23/01 17:08	6.2663	19.38	0.019	6.2163	0.006
10/23/01 17:08	6.6397	19.41	0.013	6.5897	0.004
10/23/01 17:09	7.0347	19.43	0.003	6.9847	0.001
10/23/01 17:09	7.453	19.47	-0.008	7.403	-0.003
10/23/01 17:10	7.8963	19.48	-0.016	7.8463	-0.005
10/23/01 17:10	8.3663	19.48	-0.02	8.3163	-0.007
10/23/01 17:11	8.8647	19.5	-0.024	8.8147	-0.008
10/23/01 17:11	9.3913	19.52	-0.028	9.3413	-0.009
10/23/01 17:12	9.9497	19.53	-0.03	9.8997	-0.010
10/23/01 17:12	10.5413	19.53	-0.032	10.4913	-0.010
10/23/01 17:13	11.168	19.53	-0.036	11.118	-0.012
10/23/01 17:14	11.8313	19.55	-0.038	11.7813	-0.012
10/23/01 17:14	12.5347	19.56	-0.037	12.4847	-0.012
10/23/01 17:15	13.2797	19.57	-0.037	13.2297	-0.012
10/23/01 17:16	14.0697	19.6	-0.034	14.0197	-0.011

HYDRAULIC CONDUCTIVITY TESTING DATA SHEET

Tetra Tech NUS, Inc.

PROJECT NAME: INDIANHEAD SITE 57 FS WELL/BORING NO.: S57MW04

PROJECT NO.: 7129-2920 GEOLOGIST: FRED W. RAMSER

WELL DIAMETER: 2" ID SCREEN LENGTH/DEPTH: 10, 7.97'-17.97' TEST NO.:

STATIC WATER LEVEL (Depth/Elevation): 8.91 TPVC DATE: 10-23-01

TEST TYPE (Rising/Falling/Constant Head): RISING CHECKED:

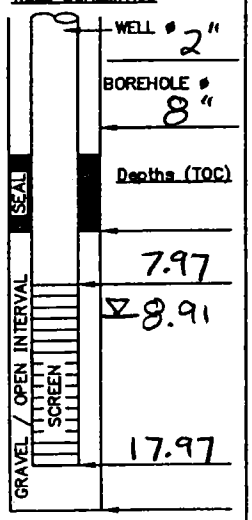
METHOD OF INDUCING WATER LEVEL CHANGE: 7.8' x 0.1' SOLID SLUG PAGE ..... OF .....

REFERENCE PT. FOR WL MEAS. (Top of Casing, Transducer, etc.):

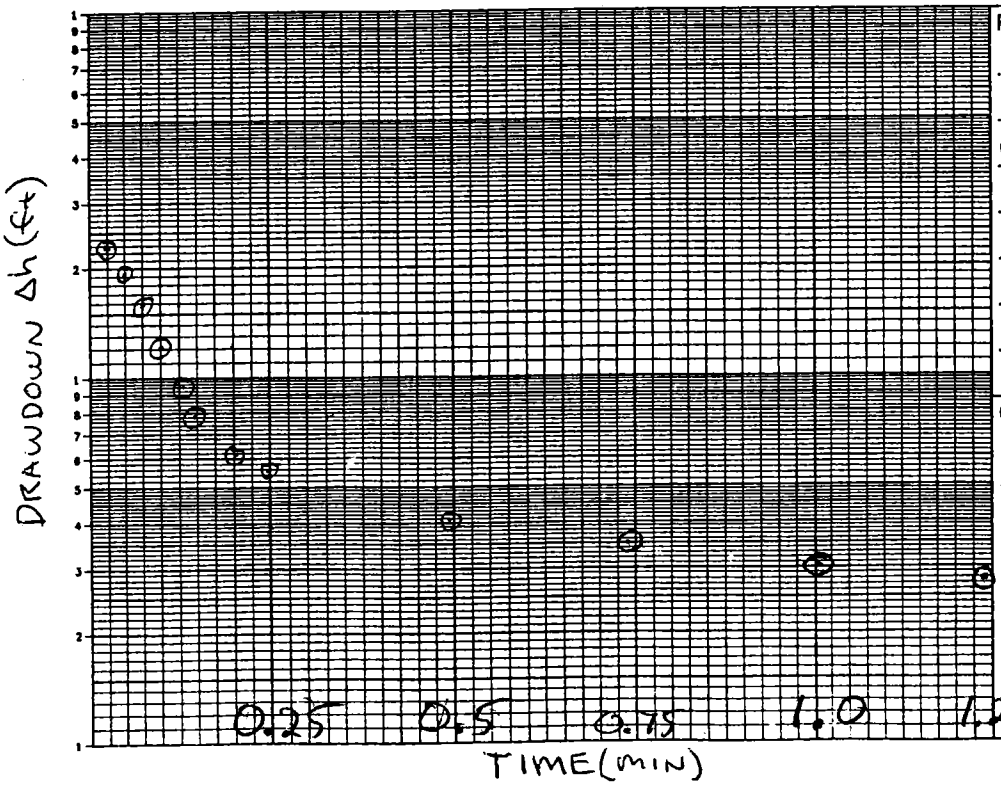
ACAD:FORM_HYDCONTST.dwg 07/06/99 INL

ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)	ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)
0.025	2.353	2.353	0.876		0.332
0.050		1.970	1.04		0.309
0.075		1.559	1.17		0.294
0.100		1.223	1.24		0.284
0.126		0.954			
0.149		0.795			
0.210		0.611			
0.2498		0.551			
0.2970		0.503			
0.4963		0.410			
0.6213		0.379			
0.740		0.354			

WELL SCHEMATIC



▽ Indicate SWL Depth on Drawing



REMARKS:

NOTE: 0.000 ON COMPUTER DOES NOT REPRESENT SWL of 8.91. STOPPED TEST WL=8.93

CALCS, SKETCH MAPS, ETC.:

TETRA TECH NUS, INC. **CALCULATION WORKSHEET** PAGE _____ OF _____

CLIENT: INDIAN HEAD NSWC	JOB NUMBER: 7129 SITE 57 FS
SUBJECT: SLUG TEST WELL S57MW04 RISING HEAD	
BASED ON: HVORSLEV	DRAWING NUMBER:
BY: FRED R. / CHECKED BY:	APPROVED BY: / DATE: 11-02-01

EQ:

$$K = \frac{r^2 \ln(L/R)}{2LT_o}$$

WHERE:

$r = 0.083$ (RISER RADIUS, Ft)
$R = 0.083$ (SCREEN RADIUS, Ft)
$L = 9.06$ (INPUT LENGTH, Ft)
$T_o = 0.1688$ (FROM PLOT, MIN)
K = HYDRAULIC COND. (ft/MIN)

SUB:

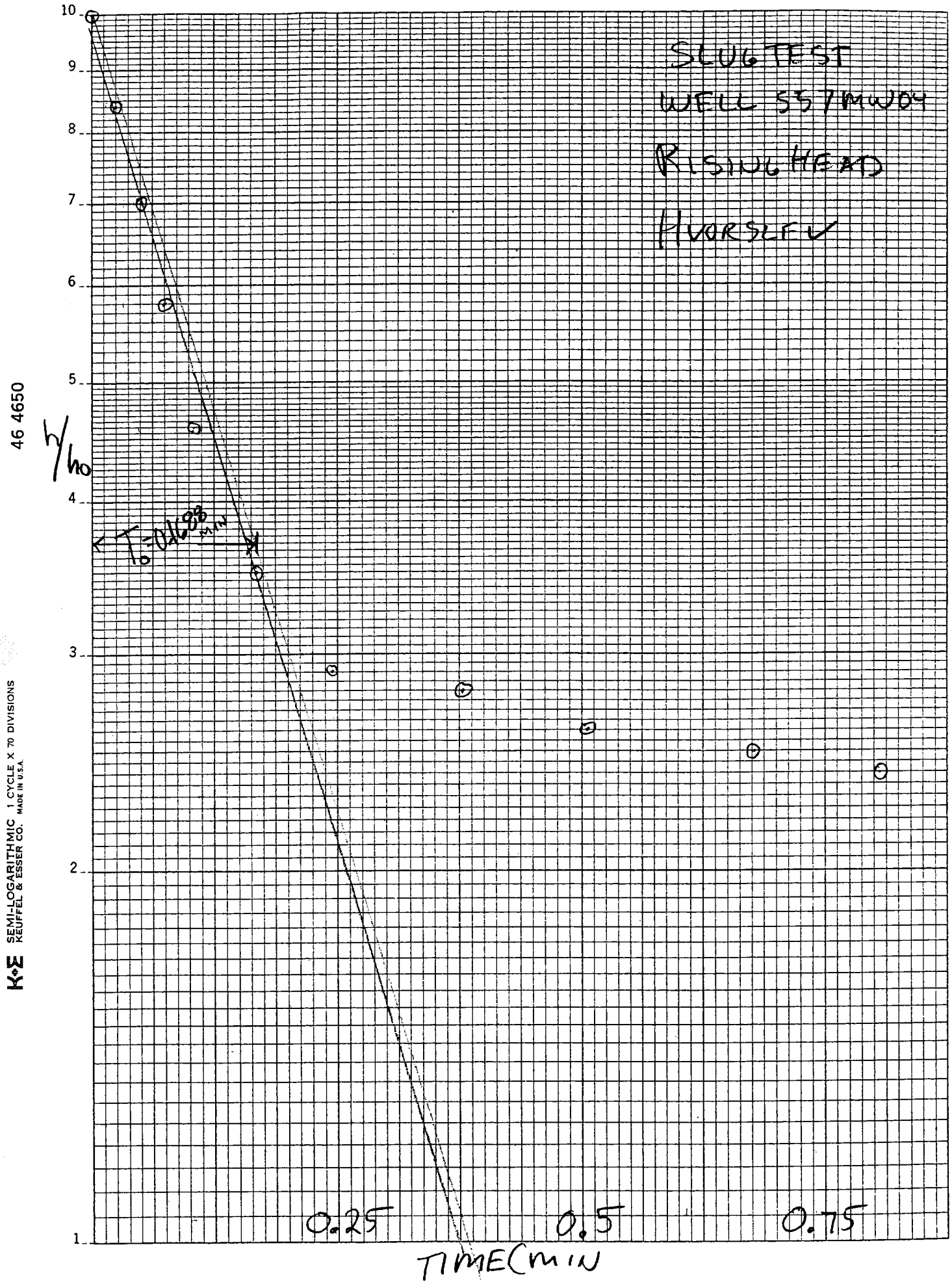
$$K = \frac{(0.083)^2 \ln(9.06/0.083)}{2(9.06)(0.1688)}$$

$$= \frac{3.23 \times 10^{-2}}{3.058}$$

$$= 1.06 \times 10^{-2} \text{ ft/min}$$

$$= 5.37 \times 10^{-3} \text{ cm/sec}$$

$$= 15.2 \text{ ft/day}$$


SLUG TEST
WELL 557MW04
RISING HEAD
HVORSLEV
h/ho
10
9
8
7
6
5
4
3
2
1
T0=0.1688 MIN
0.25
0.5
0.75
TIME(MIN
46 4650
K+E SEMI-LOGARITHMIC 1 CYCLE X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

In-Situ Inc. MiniTroll Pro

Report generated: 10/31/01 9:31:39
Report from file: C:\Win-Situ\Data\SN01966 2001-10-23 175342 s57mw4rhno1.bin
DataMgr Version 3.68

Serial number: 1966
Firmware Version 3.01
Unit name: miniTROLL

Test name: s57mw4rhno1

Test defined on: 10/23/01 17:34:13
Test started on: 10/23/01 17:53:42
Test stopped on: 10/23/01 18:20:48
Test extracted on: N/A

Data gathered using Logarithmic testing
aximum time between data points: 10.0 Minutes.
Number of data samples: 118

TOTAL DATA SAMPLES 118

Channel number [1]
Measurement type: Temperature
Channel name: OnBoard Temp

Channel number [2]
Measurement type: Pressure
Channel name: OnBoard Pressure
Sensor Range: 30 PSI.
Specific gravity: 1
Mode: TOC
User-defined reference: 0 Feet H2O
Referenced on: test start
Pressure head at reference: 8.398 Feet H2O

Date	Time	ET (min)	Chan[1] Celsius	Chan[2] Feet H2O	Adj Feet H2O	Adj ET (min)	Adj h/ho	ho= 2.756
10/23/01	17:53	0	20.65	0	0.313			
10/23/01	17:53	0.005	20.65	4.409	4.722			
10/23/01	17:53	0.01	20.66	0.664	0.977			
10/23/01	17:53	0.015	20.66	2.232	2.545			
10/23/01	17:53	0.02	20.66	2.443	2.756	0	1.00	
10/23/01	17:53	0.025	20.67	2.353	2.666	0.005	0.97	
10/23/01	17:53	0.03	20.67	2.276	2.589	0.01	0.94	
10/23/01	17:53	0.035	20.67	2.185	2.498	0.015	0.91	
10/23/01	17:53	0.04	20.67	2.106	2.419	0.02	0.88	
10/23/01	17:53	0.045	20.67	2.013	2.326	0.025	0.84	
10/23/01	17:53	0.05	20.67	1.97	2.283	0.03	0.83	
10/23/01	17:53	0.055	20.67	1.854	2.167	0.035	0.79	
10/23/01	17:53	0.06	20.67	1.784	2.097	0.04	0.76	
10/23/01	17:53	0.065	20.67	1.701	2.014	0.045	0.73	
10/23/01	17:53	0.07	20.69	1.629	1.942	0.05	0.70	
10/23/01	17:53	0.075	20.69	1.559	1.872	0.055	0.68	

10/23/01 17:53	0.08	20.69	1.486	1.799	0.06	0.65
10/23/01 17:53	0.0848	20.69	1.418	1.731	0.0648	0.63
10/23/01 17:53	0.09	20.69	1.352	1.665	0.07	0.60
10/23/01 17:53	0.095	20.69	1.283	1.596	0.075	0.58
10/23/01 17:53	0.1	20.69	1.223	1.536	0.08	0.56
10/23/01 17:53	0.1058	20.69	1.153	1.466	0.0858	0.53
10/23/01 17:53	0.112	20.69	1.087	1.4	0.092	0.51
10/23/01 17:53	0.1185	20.69	1.021	1.334	0.0985	0.48
10/23/01 17:53	0.1255	20.69	0.954	1.267	0.1055	0.46
10/23/01 17:53	0.1328	20.69	0.899	1.212	0.1128	0.44
10/23/01 17:53	0.1407	20.7	0.845	1.158	0.1207	0.42
10/23/01 17:53	0.149	20.7	0.795	1.108	0.129	0.40
10/23/01 17:53	0.1578	20.7	0.756	1.069	0.1378	0.39
10/23/01 17:53	0.167	20.69	0.721	1.034	0.147	0.38
10/23/01 17:53	0.177	20.69	0.69	1.003	0.157	0.36
10/23/01 17:53	0.1875	20.69	0.659	0.972	0.1675	0.35
10/23/01 17:53	0.1985	20.69	0.634	0.947	0.1785	0.34
10/23/01 17:53	0.2102	20.69	0.611	0.924	0.1902	0.34
10/23/01 17:53	0.2227	20.69	0.59	0.903	0.2027	0.33
10/23/01 17:53	0.2358	20.69	0.57	0.883	0.2158	0.32
10/23/01 17:53	0.2498	20.69	0.551	0.864	0.2298	0.31
10/23/01 17:53	0.2647	20.69	0.537	0.85	0.2447	0.31
10/23/01 17:53	0.2803	20.69	0.518	0.831	0.2603	0.30
10/23/01 17:54	0.297	20.69	0.503	0.816	0.277	0.30
10/23/01 17:54	0.3147	20.67	0.491	0.804	0.2947	0.29
10/23/01 17:54	0.3333	20.67	0.478	0.791	0.3133	0.29
10/23/01 17:54	0.3532	20.69	0.466	0.779	0.3332	0.28
10/23/01 17:54	0.3742	20.67	0.456	0.769	0.3542	0.28
10/23/01 17:54	0.3963	20.67	0.445	0.758	0.3763	0.28
10/23/01 17:54	0.4198	20.67	0.437	0.75	0.3998	0.27
10/23/01 17:54	0.4447	20.67	0.427	0.74	0.4247	0.27
10/23/01 17:54	0.4697	20.67	0.42	0.733	0.4497	0.27
10/23/01 17:54	0.4963	20.67	0.41	0.723	0.4763	0.26
10/23/01 17:54	0.5247	20.67	0.402	0.715	0.5047	0.26
10/23/01 17:54	0.5547	20.67	0.396	0.709	0.5347	0.26
10/23/01 17:54	0.5863	20.67	0.385	0.698	0.5663	0.25
10/23/01 17:54	0.6213	20.67	0.379	0.692	0.6013	0.25
10/23/01 17:54	0.6578	20.67	0.371	0.684	0.6378	0.25
10/23/01 17:54	0.6963	20.67	0.363	0.676	0.6763	0.25
10/23/01 17:54	0.738	20.67	0.354	0.667	0.718	0.24
10/23/01 17:54	0.7813	20.67	0.348	0.661	0.7613	0.24
10/23/01 17:54	0.828	20.67	0.34	0.653	0.808	0.24
10/23/01 17:54	0.8763	20.67	0.332	0.645	0.8563	0.23
10/23/01 17:54	0.928	20.67	0.323	0.636	0.908	0.23
10/23/01 17:54	0.983	20.67	0.317	0.63	0.963	0.23
10/23/01 17:54	1.0413	20.67	0.309	0.622	1.0213	0.23
10/23/01 17:54	1.103	20.67	0.303	0.616	1.083	0.22
10/23/01 17:54	1.168	20.66	0.294	0.607	1.148	0.22
10/23/01 17:54	1.238	20.66	0.284	0.597	1.218	0.22
10/23/01 17:55	1.3113	20.66	0.275	0.588	1.2913	0.21
10/23/01 17:55	1.3897	20.66	0.265	0.578	1.3697	0.21
10/23/01 17:55	1.473	20.66	0.257	0.57	1.453	0.21
10/23/01 17:55	1.5613	20.66	0.251	0.564	1.5413	0.20
10/23/01 17:55	1.6547	20.66	0.24	0.553	1.6347	0.20
10/23/01 17:55	1.753	20.66	0.23	0.543	1.733	0.20
10/23/01 17:55	1.858	20.66	0.22	0.533	1.838	0.19
10/23/01 17:55	1.968	20.66	0.211	0.524	1.948	0.19
10/23/01 17:55	2.0847	20.66	0.201	0.514	2.0647	0.19

10/23/01 17:55	2.2097	20.66	0.191	0.504	2.1897	0.18
10/23/01 17:56	2.3412	20.66	0.18	0.493	2.3212	0.18
10/23/01 17:56	2.4813	20.66	0.17	0.483	2.4613	0.18
10/23/01 17:56	2.6297	20.65	0.157	0.47	2.6097	0.17
10/23/01 17:56	2.7863	20.65	0.149	0.462	2.7663	0.17
10/23/01 17:56	2.953	20.65	0.134	0.447	2.933	0.16
10/23/01 17:56	3.1297	20.65	0.124	0.437	3.1097	0.16
10/23/01 17:57	3.3163	20.65	0.114	0.427	3.2963	0.15
10/23/01 17:57	3.5147	20.65	0.101	0.414	3.4947	0.15
10/23/01 17:57	3.7247	20.65	0.089	0.402	3.7047	0.15
10/23/01 17:57	3.9463	20.65	0.077	0.39	3.9263	0.14
10/23/01 17:57	4.1813	20.65	0.062	0.375	4.1613	0.14
10/23/01 17:58	4.4295	20.65	0.052	0.365	4.4095	0.13
10/23/01 17:58	4.693	20.65	0.037	0.35	4.673	0.13
10/23/01 17:58	4.973	20.65	0.025	0.338	4.953	0.12
10/23/01 17:58	5.2697	20.65	0.012	0.325	5.2497	0.12
10/23/01 17:59	5.583	20.65	-0.002	0.311	5.563	0.11
10/23/01 17:59	5.9147	20.65	-0.014	0.299	5.8947	0.11
10/23/01 17:59	6.2663	20.65	-0.029	0.284	6.2463	0.10
10/23/01 18:00	6.6397	20.65	-0.041	0.272	6.6197	0.10
10/23/01 18:00	7.0347	20.63	-0.054	0.259	7.0147	0.09
10/23/01 18:01	7.453	20.65	-0.066	0.247	7.433	0.09
10/23/01 18:01	7.8963	20.65	-0.079	0.234	7.8763	0.08
10/23/01 18:02	8.3663	20.65	-0.093	0.22	8.3463	0.08
10/23/01 18:02	8.8647	20.65	-0.105	0.208	8.8447	0.08
10/23/01 18:03	9.3913	20.66	-0.118	0.195	9.3713	0.07
10/23/01 18:03	9.9497	20.67	-0.13	0.183	9.9297	0.07
10/23/01 18:04	10.5413	20.69	-0.142	0.171	10.5213	0.06
10/23/01 18:04	11.168	20.69	-0.154	0.159	11.148	0.06
10/23/01 18:05	11.8313	20.7	-0.164	0.149	11.8113	0.05
10/23/01 18:06	12.5347	20.71	-0.177	0.136	12.5147	0.05
10/23/01 18:06	13.2797	20.72	-0.189	0.124	13.2597	0.04
10/23/01 18:07	14.0697	20.72	-0.203	0.11	14.0497	0.04
10/23/01 18:08	14.9063	20.74	-0.217	0.096	14.8863	0.03
10/23/01 18:09	15.7913	20.75	-0.244	0.069	15.7713	0.03
10/23/01 18:10	16.7297	20.75	-0.256	0.057	16.7097	0.02
10/23/01 18:11	17.723	20.75	-0.269	0.044	17.703	0.02
10/23/01 18:12	18.7763	20.75	-0.273	0.04	18.7563	0.01
10/23/01 18:13	19.8913	20.75	-0.283	0.03	19.8713	0.01
10/23/01 18:14	21.073	20.74	-0.292	0.021	21.053	0.01
10/23/01 18:16	22.3247	20.74	-0.298	0.015	22.3047	0.01
10/23/01 18:17	23.6497	20.72	-0.307	0.006	23.6297	0.00
10/23/01 18:18	25.0547	20.72	-0.313	0	25.0347	0.00
10/23/01 18:20	26.543	20.71	-0.319	-0.006	26.523	0.00

HYDRAULIC CONDUCTIVITY TESTING DATA SHEET

Tetra Tech NUS, Inc.

PROJECT NAME: INDIANHEAD SITE 57 FS WELL/BORING NO.: 57MW05

PROJECT NO.: 7129-2920 GEOLOGIST: FRED W. RAMSER

WELL DIAMETER: 2" ID SCREEN LENGTH/DEPTH: 5' / 19.98 TEST NO.:

STATIC WATER LEVEL (Depth/Elevation): 6.16' TPVC DATE: 10-25-01

TEST TYPE (Rising/Falling/Constant Head): RISING HEAD CHECKED:

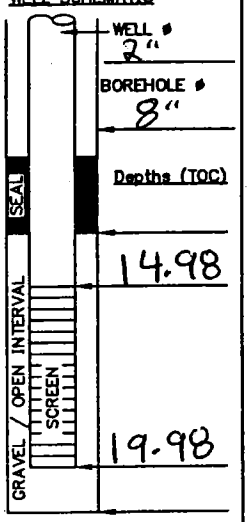
METHOD OF INDUCING WATER LEVEL CHANGE: BAIL x 2 PAGE ..... OF .....

REFERENCE PT. FOR WL MEAS. (Top of Casing, Transducer, etc.): 0.00 (TOC)

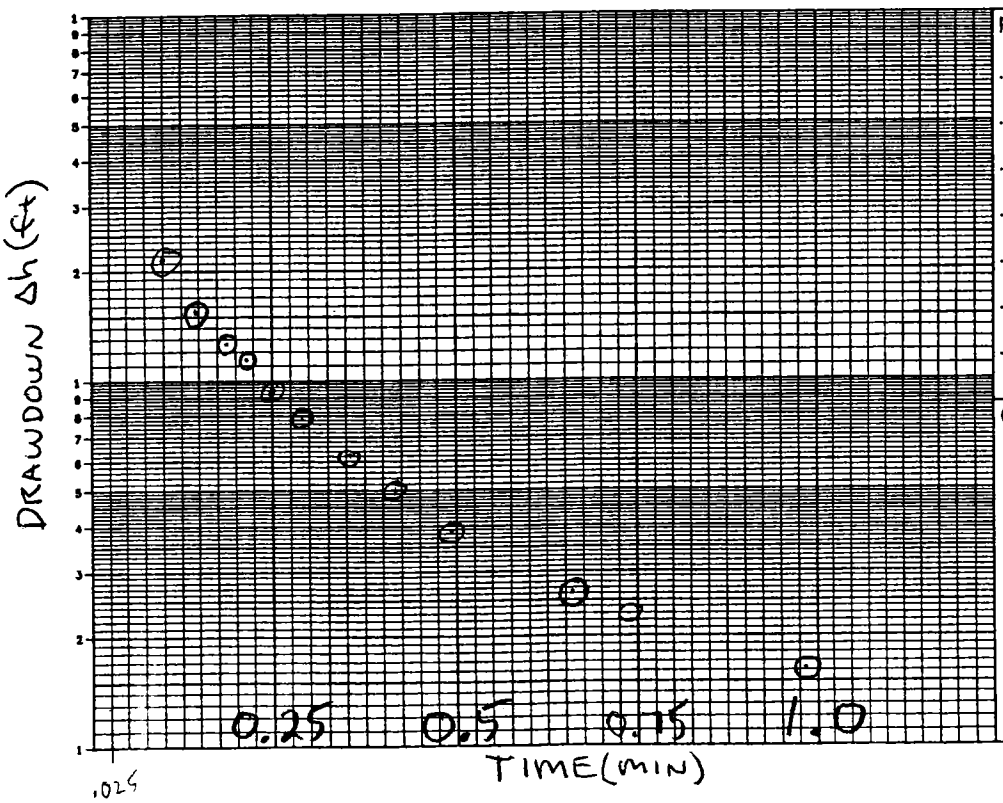
ACAD:FORM_HYDCONTST.dwg 07/06/99 INL

ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)	ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)
0.000		0000	0.7380		0.230
0.0600		2.866	0.9828		0.164
0.1000		2.126			
0.1488		1.561			
0.1875		1.269			
0.2100		1.132			
0.2498		0.940			
0.2970		0.768			
0.3532		0.619			
0.4198		0.493			
0.4963		0.394			
0.6578		0.269			

WELL SCHEMATIC



▽ Indicate SWL Depth on Drawing



REMARKS:
INSERTED BAILERS @ 0853
PULLED BAILERS @ 0916.

CALCS, SKETCH MAPS, ETC.:

TETRA TECH NUS, INC. CALCULATION WORKSHEET PAGE _____ OF _____

CLIENT: INDIAN HEAD NSWC	JOB NUMBER: 7129 SITE 57 FS
SUBJECT: SLUG TEST WELL 57MW05 RISING HEAD	
BASED ON: HVORSLEV	DRAWING NUMBER:
BY: FRED R. / CHECKED BY: CA	APPROVED BY: / DATE: 11-2-01

EQ:

$$K = \frac{r^2 \ln(L/R)}{2LT_o}$$

WHERE:

$r = 0.083$ (RISER RADIUS, Ft)
$R = 0.083$ (SCREEN RADIUS, Ft)
$L = 5'$ (INPUT LENGTH, Ft)
$T_o = 0.22$ (FROM PLOT, MIN)
K = HYDRAULIC COND. (ft/MIN)

SUB:

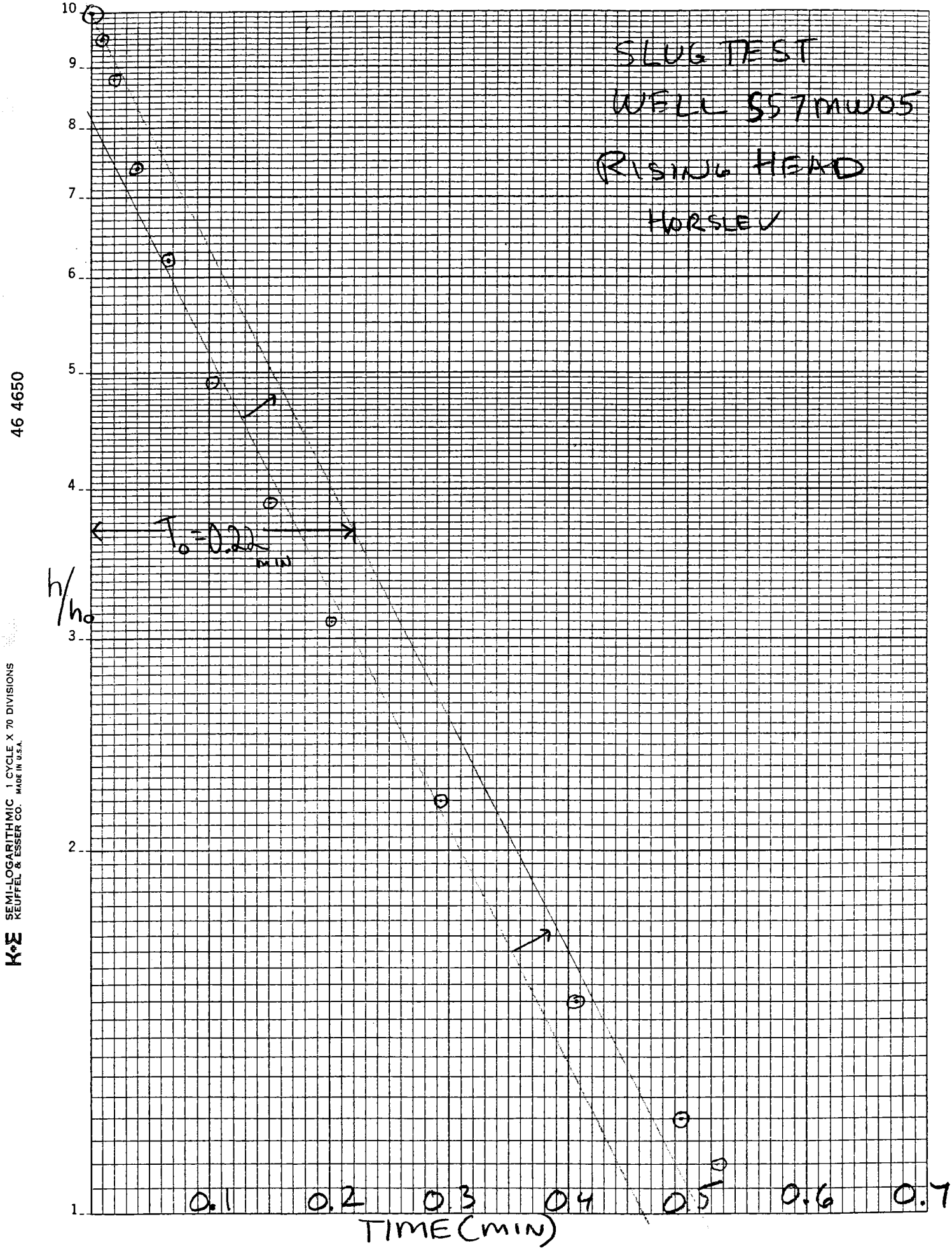
$$K = \frac{(0.083)^2 \ln(5/0.083)}{2(5)(0.22)}$$

$$\frac{2.8234 \times 10^{-2}}{2.2}$$

$K = 1.28 \times 10^{-2}$ ft/MIN

$K = 6.52 \times 10^{-3}$ cm/sec

$K = 18.4$ ft/day


SLUG TEST
WELL S57MW05
RISING HEAD
HORSLEV
$T_0 = 0.22$ MIN
h/ho
TIME (MIN)
0.1
0.2
0.3
0.4
0.5
0.6
0.7
1
2
3
4
5
6
7
8
9
10
46 4650
K+E SEMI-LOGARITHMIC 1 CYCLE X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

In-Situ Inc.	MiniTroll Pro
Report generated:	10/30/01 14:52:07
Report from file:	C:\Win-Situ\Data\SN01966 2001-10-25 091505 s57mw5rhno1.bin
DataMgr Version	3.68
Serial number:	1966
Firmware Version	3.01
Unit name:	miniTROLL
Test name:	s57mw5rhno1
Test defined on:	10/25/01 8:58:03
Test started on:	10/25/01 9:15:05
Test stopped on:	10/25/01 9:23:49
Test extracted on:	N/A

)ata gathered using Logarithmic testing
:imum time between data points: 1(Minutes.
Number of data samples: 98

TOTAL DATA SAMPLES 98

Channel number [1]
Measurement type: Temperature
Channel name: OnBoard Temp

Channel number [2]
Measurement type: Pressure
Channel name: OnBoard Pressure
Sensor Range: 30 PSI.
Specific gravity: 1
Mode: TOC
User-defined reference: 0 Feet H2O
Referenced on: test start
Pressure head at reference: 11.401 Feet H2O

Date	Time	ET (min)	Chan[1] Celsius	Chan[2] Feet H2O	Adj. ET (min)	h/ho	ho= 2.866
10/25/01	9:15	0	18.2	0			
10/25/01	9:15	0.005	18.22	0.004			
10/25/01	9:15	0.01	18.23	0.003			
10/25/01	9:15	0.015	18.23	0.005			
10/25/01	9:15	0.02	18.23	0.001			
10/25/01	9:15	0.025	18.24	-0.001			
10/25/01	9:15	0.03	18.24	0.001			
10/25/01	9:15	0.035	18.24	0.001			
10/25/01	9:15	0.04	18.24	-0.001			
10/25/01	9:15	0.045	18.24	7.601			

10/25/01 9:15	0.05	18.24	6.92		
10/25/01 9:15	0.055	18.24	3.154		
10/25/01 9:15	0.06	18.24	2.866	0	1.00
10/25/01 9:15	0.065	18.24	2.783	0.005	0.97
10/25/01 9:15	0.07	18.24	2.713	0.01	0.95
10/25/01 9:15	0.075	18.24	2.61	0.015	0.91
10/25/01 9:15	0.08	18.24	2.521	0.02	0.88
10/25/01 9:15	0.0848	18.24	2.388	0.0248	0.83
10/25/01 9:15	0.09	18.26	2.302	0.03	0.80
10/25/01 9:15	0.095	18.24	2.223	0.035	0.78
10/25/01 9:15	0.1	18.26	2.126	0.04	0.74
10/25/01 9:15	0.1058	18.26	2.026	0.0458	0.71
10/25/01 9:15	0.112	18.26	1.946	0.052	0.68
10/25/01 9:15	0.1185	18.26	1.867	0.0585	0.65
10/25/01 9:15	0.1255	18.26	1.788	0.0655	0.62
10/25/01 9:15	0.1328	18.26	1.714	0.0728	0.60
10/25/01 9:15	0.1407	18.26	1.635	0.0807	0.57
10/25/01 9:15	0.149	18.26	1.561	0.089	0.54
10/25/01 9:15	0.1578	18.26	1.484	0.0978	0.52
10/25/01 9:15	0.167	18.26	1.412	0.107	0.49
10/25/01 9:15	0.177	18.26	1.34	0.117	0.47
10/25/01 9:15	0.1875	18.26	1.269	0.1275	0.44
10/25/01 9:15	0.1985	18.24	1.201	0.1385	0.42
10/25/01 9:15	0.2102	18.24	1.132	0.1502	0.39
10/25/01 9:15	0.2227	18.24	1.066	0.1627	0.37
10/25/01 9:15	0.2358	18.24	1.002	0.1758	0.35
10/25/01 9:15	0.2498	18.24	0.94	0.1898	0.33
10/25/01 9:15	0.2647	18.24	0.88	0.2047	0.31
10/25/01 9:15	0.2803	18.24	0.824	0.2203	0.29
10/25/01 9:15	0.297	18.24	0.768	0.237	0.27
10/25/01 9:15	0.3147	18.24	0.717	0.2547	0.25
10/25/01 9:15	0.3333	18.24	0.667	0.2733	0.23
10/25/01 9:15	0.3532	18.24	0.619	0.2932	0.22
10/25/01 9:15	0.3742	18.24	0.574	0.3142	0.20
10/25/01 9:15	0.3963	18.24	0.532	0.3363	0.19
10/25/01 9:15	0.4198	18.23	0.493	0.3598	0.17
10/25/01 9:15	0.4447	18.23	0.458	0.3847	0.16
10/25/01 9:15	0.4697	18.23	0.425	0.4097	0.15
10/25/01 9:15	0.4963	18.23	0.394	0.4363	0.14
10/25/01 9:15	0.5247	18.23	0.367	0.4647	0.13
10/25/01 9:15	0.5547	18.23	0.34	0.4947	0.12
10/25/01 9:15	0.5863	18.23	0.315	0.5263	0.11
10/25/01 9:15	0.6213	18.23	0.29	0.5613	0.10
10/25/01 9:15	0.6578	18.23	0.269	0.5978	0.09
10/25/01 9:15	0.6963	18.23	0.251	0.6363	0.09
10/25/01 9:15	0.738	18.22	0.23	0.678	0.08
10/25/01 9:15	0.7813	18.22	0.215	0.7213	0.08
10/25/01 9:15	0.828	18.22	0.201	0.768	0.07
10/25/01 9:15	0.8763	18.22	0.189	0.8163	0.07
10/25/01 9:16	0.928	18.22	0.176	0.868	0.06
10/25/01 9:16	0.983	18.22	0.164	0.923	0.06
10/25/01 9:16	1.0413	18.22	0.155	0.9813	0.05

10/25/01 9:16	1.103	18.22	0.145	1.043	0.05
10/25/01 9:16	1.168	18.22	0.137	1.108	0.05
10/25/01 9:16	1.238	18.22	0.131	1.178	0.05
10/25/01 9:16	1.3113	18.22	0.122	1.2513	0.04
10/25/01 9:16	1.3897	18.22	0.116	1.3297	0.04
10/25/01 9:16	1.473	18.22	0.112	1.413	0.04
10/25/01 9:16	1.5613	18.22	0.104	1.5013	0.04
10/25/01 9:16	1.6547	18.2	0.099	1.5947	0.03
10/25/01 9:16	1.753	18.2	0.095	1.693	0.03
10/25/01 9:16	1.858	18.2	0.091	1.798	0.03
10/25/01 9:17	1.968	18.2	0.091	1.908	0.03
10/25/01 9:17	2.0847	18.2	0.089	2.0247	0.03
10/25/01 9:17	2.2097	18.2	0.085	2.1497	0.03
10/25/01 9:17	2.3412	18.2	0.081	2.2812	0.03
10/25/01 9:17	2.4813	18.19	0.078	2.4213	0.03
10/25/01 9:17	2.6297	18.19	0.076	2.5697	0.03
10/25/01 9:17	2.7863	18.19	0.072	2.7263	0.03
10/25/01 9:18	2.953	18.19	0.068	2.893	0.02
10/25/01 9:18	3.1297	18.19	0.066	3.0697	0.02
10/25/01 9:18	3.3163	18.19	0.064	3.2563	0.02
10/25/01 9:18	3.5147	18.2	0.062	3.4547	0.02
10/25/01 9:18	3.7247	18.19	0.06	3.6647	0.02
10/25/01 9:19	3.9463	18.2	0.058	3.8863	0.02
10/25/01 9:19	4.1813	18.2	0.056	4.1213	0.02
10/25/01 9:19	4.4295	18.2	0.054	4.3695	0.02
10/25/01 9:19	4.693	18.2	0.052	4.633	0.02
10/25/01 9:20	4.973	18.2	0.052	4.913	0.02
10/25/01 9:20	5.2697	18.2	0.05	5.2097	0.02
10/25/01 9:20	5.583	18.22	0.052	5.523	0.02
10/25/01 9:21	5.9147	18.23	0.05	5.8547	0.02
10/25/01 9:21	6.2663	18.26	0.049	6.2063	0.02
10/25/01 9:21	6.6397	18.27	0.047	6.5797	0.02
10/25/01 9:22	7.0347	18.28	0.047	6.9747	0.02
10/25/01 9:22	7.453	18.28	0.045	7.393	0.02
10/25/01 9:22	7.8963	18.28	0.041	7.8363	0.01
10/25/01 9:23	8.3663	18.29	0.041	8.3063	0.01

HYDRAULIC CONDUCTIVITY TESTING DATA SHEET

Tetra Tech NUS, Inc.

PROJECT NAME: INDIANHEAD SITE 57 FS WELL/BORING NO.: S57MW06

PROJECT NO.: 7129-2920 GEOLOGIST: FRED W. RAMSER

WELL DIAMETER: 2" SCREEN LENGTH/DEPTH: 10', 4.39-14.39 TEST NO.: 1

STATIC WATER LEVEL (Depth/Elevation): 6.28 DATE: 10-25-01

TEST TYPE (Rising/Falling/Constant Head): RISING HEAD CHECKED:

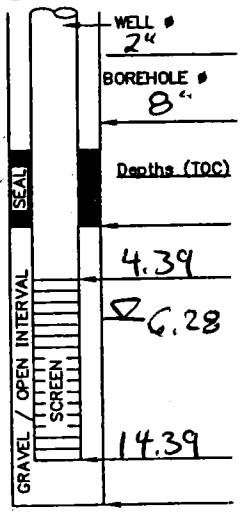
METHOD OF INDUCING WATER LEVEL CHANGE: Bailer x 2 PAGE ..... OF .....

REFERENCE PT. FOR WL MEAS. (Top of Casing, Transducer, etc.): 0.00 Ref

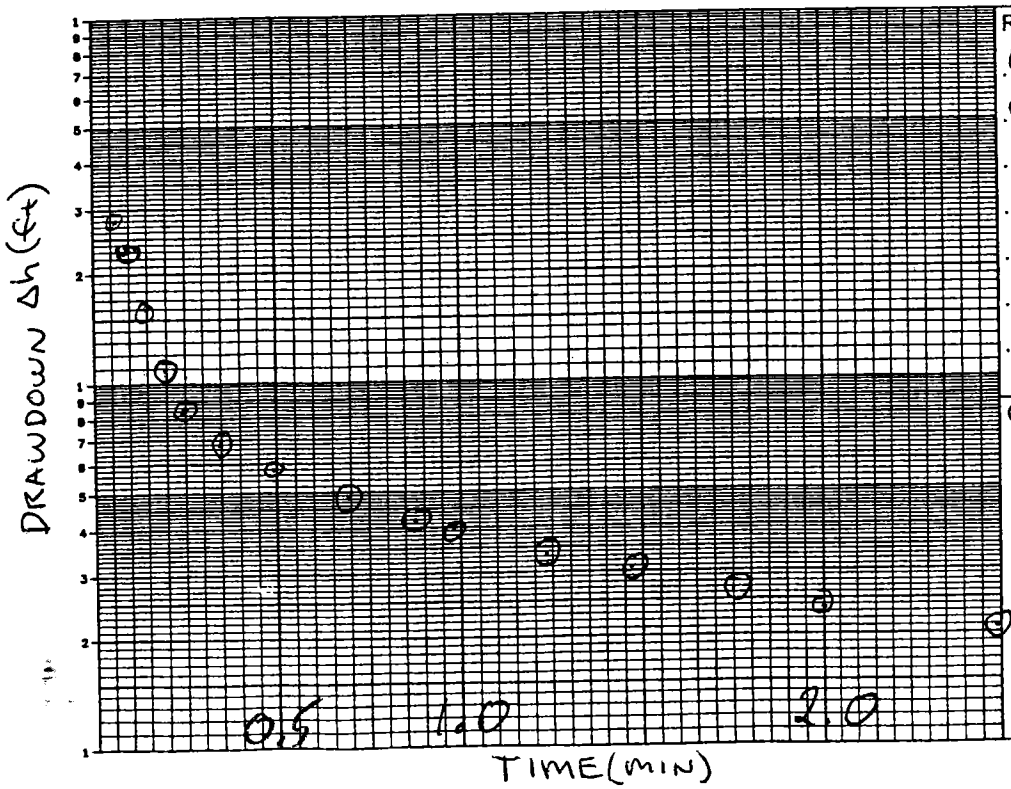
ACAD:FORM_HYDCONTST.dwg 07/06/99 INL

ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)	ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)
0.000		0000	1.2380		0.336 ✓
0.0548		3.324	1.4728		0.303 ✓
0.0700		2.837	1.7530		0.270 ✓
0.100		2.300	1.9678		0.245 ✓
0.1488		1.592	2.4812		0.204
0.1985		1.089	2.9530		0.177
0.2498		0.855			
0.3532		0.694			
0.4963		0.588			
0.6963		0.489			
0.8762		0.423			
0.9828		0.390			

WELL SCHEMATIC



▽ Indicate SWL Depth on Drawing



REMARKS:

WL @ END OF TEST

6.31

CALCS, SKETCH MAPS, ETC.:

TETRA TECH NUS, INC. **CALCULATION WORKSHEET** PAGE ____ OF ____

CLIENT INDIAN HEAD NSWC		JOB NUMBER 7129 SITE 57 FS	
SUBJECT SLUG TEST WELL S57MW06 RISING HEAD			
BASED ON HVORSLEV		DRAWING NUMBER	
BY FRED R.	CHECKED BY RmB 4/16/02	APPROVED BY	DATE 11-2-01

EQ:

$$K = \frac{r^2 \ln(L/R)}{2LT_o}$$

WHERE:

$r = 8.33 \times 10^{-2}$ (RISER RADIUS, Ft)
$R = 8.33 \times 10^{-2}$ (SCREEN RADIUS, Ft)
$L = 8.11$ (INPUT LENGTH, Ft)
$T_o = 0.19$ (FROM PLOT, MIN)
K = HYDRAULIC COND. (ft/min)

SUB:

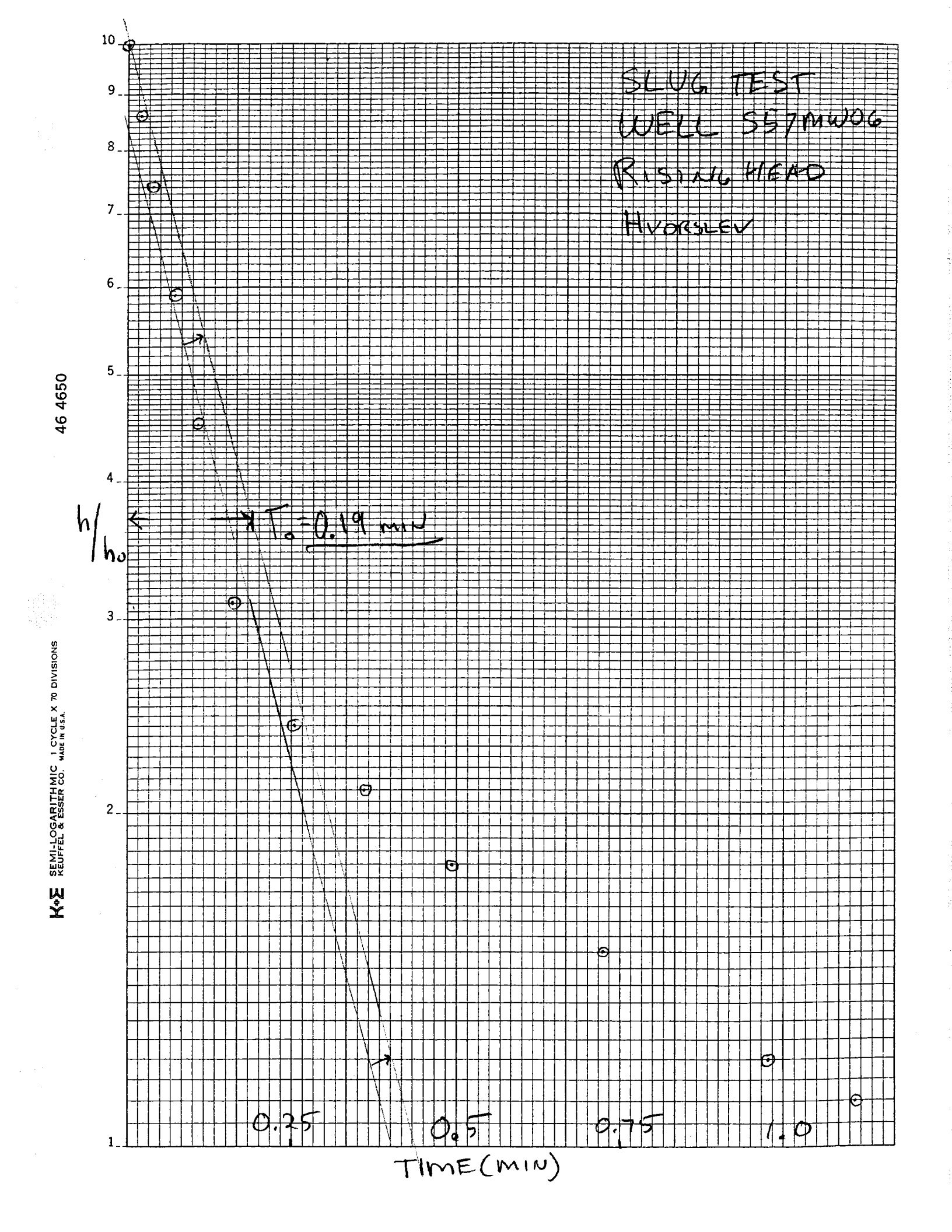
$$K = \frac{(8.33\times10^{-2})^2 \ln(8.11/8.33\times10^{-2})}{2(8.11)(0.19)}$$

$$K = \frac{3.177 \times 10^{-2}}{3.0818}$$

$K = 1.0 \times 10^{-2}$ ft/min

$K = 5.24 \times 10^{-3}$ cm/sec

$K = 14.9$ ft/day


SLUG TEST
WELL SS7MW06
RISING HEAD
HVORSLEV
h/h0
T0 = 0.19 min
10
9
8
7
6
5
4
3
2
1
0.25
0.5
0.75
1.0
TIME (MIN)
46 4650
K&E SEMI-LOGARITHMIC 1 CYCLE X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

In-Situ Inc.	MiniTroll Pro
Report generated:	10/31/01 15:33:29
Report from file:	C:\Win-Situ\Data\SN01966 2001-10-25 094958 s57mw6rhno1.bin
DataMgr Version	3.68
Serial number:	1966
Firmware Version	3.01
Unit name:	miniTROLL
Test name:	s57mw6rhno1
Test defined on:	10/25/01 9:25:17
Test started on:	10/25/01 9:49:58
Test stopped on:	10/25/01 10:01:57
Test extracted on:	N/A

Data gathered using Logarithmic testing
aximum time between data points: 10.0 Minutes.
Number of data samples: 104

TOTAL DATA SAMPLES 104

Channel number [1]
Measurement type: Temperature
Channel name: OnBoard Temp

Channel number [2]
Measurement type: Pressure
Channel name: OnBoard Pressure
Sensor Range: 30 PSI.
Specific gravity: 1
Mode: TOC
User-defined reference: 0 Feet H2O
Referenced on: test start
Pressure head at reference: 7.622 Feet H2O

Date	Time	ET (min)	Chan[1] Celsius	Chan[2] Feet H2O	Adj ET (min)	h/ho	ho= 3.092
10/25/01	9:49	0	19	0			
10/25/01	9:49	0.005	19	-0.002			
10/25/01	9:49	0.01	19.01	-0.002			
10/25/01	9:49	0.015	19.01	-0.002			
10/25/01	9:49	0.02	19.01	-0.002			
10/25/01	9:50	0.025	19.01	-0.002			
10/25/01	9:50	0.03	19.01	-0.002			
10/25/01	9:50	0.035	19.03	-0.002			
10/25/01	9:50	0.04	19.03	-0.002			
10/25/01	9:50	0.045	19.03	8.485			

10/25/01 9:50	0.05	19.03	5.857		
10/25/01 9:50	0.055	19.03	3.324		
10/25/01 9:50	0.06	19.03	3.092	0	1.00
10/25/01 9:50	0.065	19.03	2.949	0.005	0.95
10/25/01 9:50	0.07	19.03	2.837	0.01	0.92
10/25/01 9:50	0.075	19.03	2.74	0.015	0.89
10/25/01 9:50	0.08	19.03	2.645	0.02	0.86
10/25/01 9:50	0.0848	19.03	2.552	0.0248	0.83
10/25/01 9:50	0.09	19.03	2.467	0.03	0.80
10/25/01 9:50	0.095	19.03	2.38	0.035	0.77
10/25/01 9:50	0.1	19.04	2.3	0.04	0.74
10/25/01 9:50	0.1058	19.04	2.204	0.0458	0.71
10/25/01 9:50	0.112	19.03	2.109	0.052	0.68
10/25/01 9:50	0.1185	19.04	2.012	0.0585	0.65
10/25/01 9:50	0.1255	19.04	1.908	0.0655	0.62
10/25/01 9:50	0.1328	19.04	1.809	0.0728	0.59
10/25/01 9:50	0.1407	19.04	1.699	0.0807	0.55
10/25/01 9:50	0.149	19.04	1.592	0.089	0.51
10/25/01 9:50	0.1578	19.04	1.484	0.0978	0.48
10/25/01 9:50	0.167	19.04	1.379	0.107	0.45
10/25/01 9:50	0.177	19.04	1.273	0.117	0.41
10/25/01 9:50	0.1875	19.04	1.176	0.1275	0.38
10/25/01 9:50	0.1985	19.04	1.089	0.1385	0.35
10/25/01 9:50	0.2102	19.03	1.014	0.1502	0.33
10/25/01 9:50	0.2227	19.03	0.95	0.1627	0.31
10/25/01 9:50	0.2358	19.03	0.898	0.1758	0.29
10/25/01 9:50	0.2498	19.03	0.855	0.1898	0.28
10/25/01 9:50	0.2647	19.03	0.814	0.2047	0.26
10/25/01 9:50	0.2803	19.03	0.787	0.2203	0.25
10/25/01 9:50	0.297	19.03	0.758	0.237	0.25
10/25/01 9:50	0.3147	19.03	0.735	0.2547	0.24
10/25/01 9:50	0.3333	19.03	0.712	0.2733	0.23
10/25/01 9:50	0.3532	19.03	0.694	0.2932	0.22
10/25/01 9:50	0.3742	19.03	0.675	0.3142	0.22
10/25/01 9:50	0.3963	19.03	0.654	0.3363	0.21
10/25/01 9:50	0.4198	19.03	0.638	0.3598	0.21
10/25/01 9:50	0.4447	19.03	0.621	0.3847	0.20
10/25/01 9:50	0.4697	19.03	0.605	0.4097	0.20
10/25/01 9:50	0.4963	19.03	0.588	0.4363	0.19
10/25/01 9:50	0.5247	19.03	0.574	0.4647	0.19
10/25/01 9:50	0.5547	19.03	0.557	0.4947	0.18
10/25/01 9:50	0.5863	19.03	0.541	0.5263	0.17
10/25/01 9:50	0.6213	19.03	0.524	0.5613	0.17
10/25/01 9:50	0.6578	19.03	0.505	0.5978	0.16
10/25/01 9:50	0.6963	19.03	0.489	0.6363	0.16
10/25/01 9:50	0.738	19.03	0.47	0.678	0.15
10/25/01 9:50	0.7813	19.03	0.454	0.7213	0.15
10/25/01 9:50	0.828	19.03	0.437	0.768	0.14
10/25/01 9:50	0.8763	19.03	0.423	0.8163	0.14
10/25/01 9:50	0.928	19.03	0.406	0.868	0.13
10/25/01 9:50	0.983	19.03	0.39	0.923	0.13
10/25/01 9:51	1.0413	19.03	0.373	0.9813	0.12

10/25/01 9:51	1.103	19.03	0.361	1.043	0.12
10/25/01 9:51	1.168	19.03	0.348	1.108	0.11
10/25/01 9:51	1.238	19.03	0.336	1.178	0.11
10/25/01 9:51	1.3113	19.03	0.325	1.2513	0.11
10/25/01 9:51	1.3897	19.03	0.313	1.3297	0.10
10/25/01 9:51	1.473	19.03	0.303	1.413	0.10
10/25/01 9:51	1.5613	19.03	0.288	1.5013	0.09
10/25/01 9:51	1.6547	19.03	0.28	1.5947	0.09
10/25/01 9:51	1.753	19.03	0.27	1.693	0.09
10/25/01 9:51	1.858	19.03	0.257	1.798	0.08
10/25/01 9:51	1.968	19.03	0.245	1.908	0.08
10/25/01 9:52	2.0847	19.03	0.232	2.0247	0.08
10/25/01 9:52	2.2097	19.03	0.222	2.1497	0.07
10/25/01 9:52	2.3412	19.04	0.214	2.2812	0.07
10/25/01 9:52	2.4813	19.04	0.204	2.4213	0.07
10/25/01 9:52	2.6297	19.04	0.195	2.5697	0.06
10/25/01 9:52	2.7863	19.04	0.187	2.7263	0.06
10/25/01 9:52	2.953	19.04	0.177	2.893	0.06
10/25/01 9:53	3.1297	19.04	0.168	3.0697	0.05
10/25/01 9:53	3.3163	19.04	0.16	3.2563	0.05
10/25/01 9:53	3.5147	19.04	0.152	3.4547	0.05
10/25/01 9:53	3.7247	19.04	0.146	3.6647	0.05
10/25/01 9:53	3.9463	19.05	0.14	3.8863	0.05
10/25/01 9:54	4.1813	19.05	0.131	4.1213	0.04
10/25/01 9:54	4.4295	19.05	0.125	4.3695	0.04
10/25/01 9:54	4.693	19.05	0.121	4.633	0.04
10/25/01 9:54	4.973	19.05	0.115	4.913	0.04
10/25/01 9:55	5.2697	19.05	0.109	5.2097	0.04
10/25/01 9:55	5.583	19.05	0.102	5.523	0.03
10/25/01 9:55	5.9147	19.05	0.098	5.8547	0.03
10/25/01 9:56	6.2663	19.07	0.094	6.2063	0.03
10/25/01 9:56	6.6397	19.07	0.094	6.5797	0.03
10/25/01 9:57	7.0347	19.07	0.088	6.9747	0.03
10/25/01 9:57	7.453	19.07	0.086	7.393	0.03
10/25/01 9:57	7.8963	19.07	0.084	7.8363	0.03
10/25/01 9:58	8.3663	19.07	0.078	8.3063	0.03
10/25/01 9:58	8.8647	19.07	0.076	8.8047	0.02
10/25/01 9:59	9.3913	19.07	0.074	9.3313	0.02
10/25/01 9:59	9.9497	19.08	0.072	9.8897	0.02
10/25/01 10:00	10.5413	19.07	0.068	10.4813	0.02
10/25/01 10:01	11.168	19.07	0.066	11.108	0.02
10/25/01 10:01	11.8313	19.08	0.064	11.7713	0.02

HYDRAULIC CONDUCTIVITY TESTING DATA SHEET

Tetra Tech NUS, Inc.

PROJECT NAME: INDIANHEAD SITE 57 FS WELL/BORING NO.: S57MW07

PROJECT NO.: 7129-2920 GEOLOGIST: FRED W. RAMSER

WELL DIAMETER: 2" SCREEN LENGTH/DEPTH: 10', 17.96-27.96 TEST NO.:

STATIC WATER LEVEL (Depth/Elevation): 9.16 DATE: 10-25-01

TEST TYPE (Rising/Falling/Constant Head): RISING HEAD CHECKED:

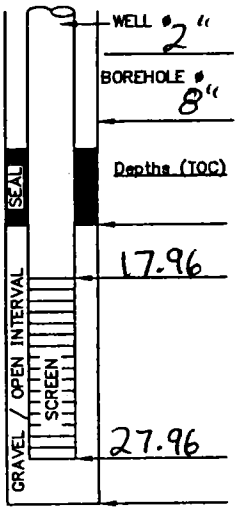
METHOD OF INDUCING WATER LEVEL CHANGE: Bailer x2 (1 liter bailers) PAGE ..... OF .....

REFERENCE PT. FOR WL MEAS. (Top of Casing, Transducer, etc.): 0.00 ref

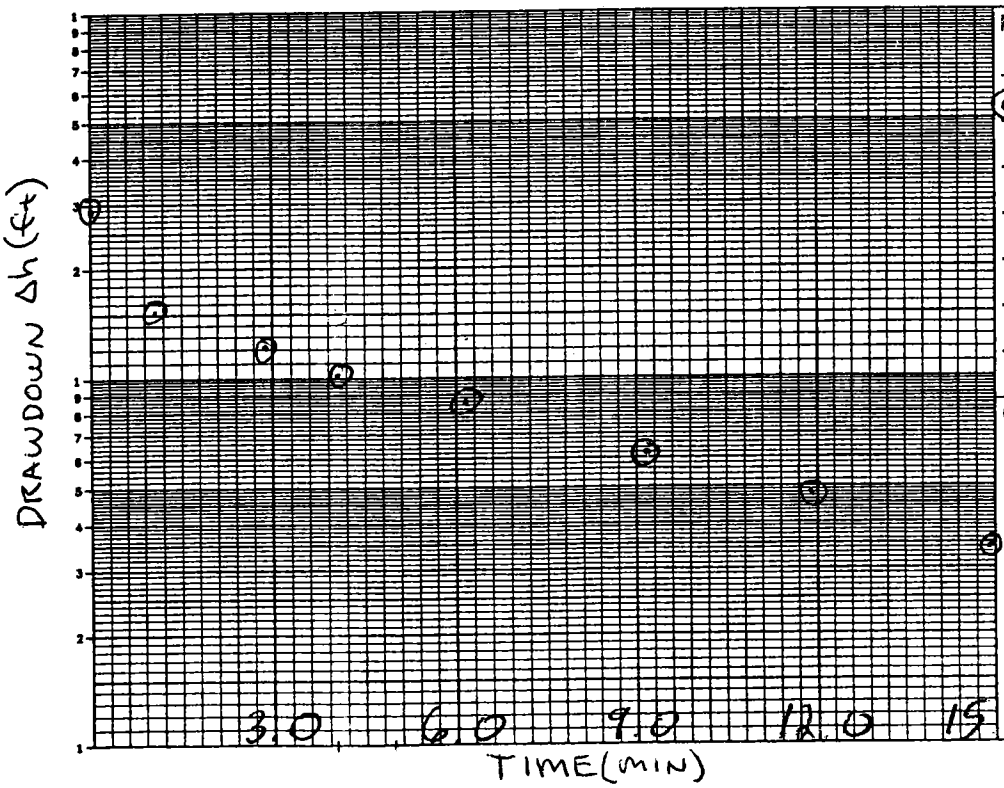
ACAD:FORM_HYDCONTST.dwg 07/06/99 INL

ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)	ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)
0.000		0.000	6.2663		0.860
0.0398		2.949	7.4530		0.756
0.0600		2.618	8.3663		0.686
0.1000		2.308	9.3913		0.616
0.1985		1.991	10.5413		0.547
0.3963		1.810	11.8312		0.479
0.7813		1.671	13.2795		0.413
1.103		1.589	14.9062		0.349
1.9678		1.413			
2.9530		1.254			
4.1812		1.089			
5.2697		0.960			

WELL SCHEMATIC



▽ Indicate SWL Depth on Drawing



REMARKS:

INSERTED Bailers @ 10:18 HRS

STARTED TEST @ 1040

WL = 9.25 @ END OF TEST

CALCS, SKETCH MAPS, ETC.:

TETRA TECH NUS, INC. CALCULATION WORKSHEET PAGE ____ OF ____

CLIENT: INDIAN HEAD NSWC		JOB NUMBER: 7129 SITE 57 FS	
SUBJECT: SLUG TEST WELL S57MW07			
BASED ON: HVORSLEV		DRAWING NUMBER:	
BY: FRED R.	CHECKED BY:	APPROVED BY:	DATE: 11-2-01

EQ:

$$K = \frac{r^2 \ln(L/R)}{2L T_o}$$

WHERE:

$r = 0.083$ (RISER RADIUS, Ft)
$R = 0.083$ (SCREEN RADIUS, Ft)
$L = 10.0$ (INPUT LENGTH, Ft)
$T_o = 4.2$ (FROM PLOT, MIN)
K = HYDRAULIC COND. (ft/MIN)

SUB:

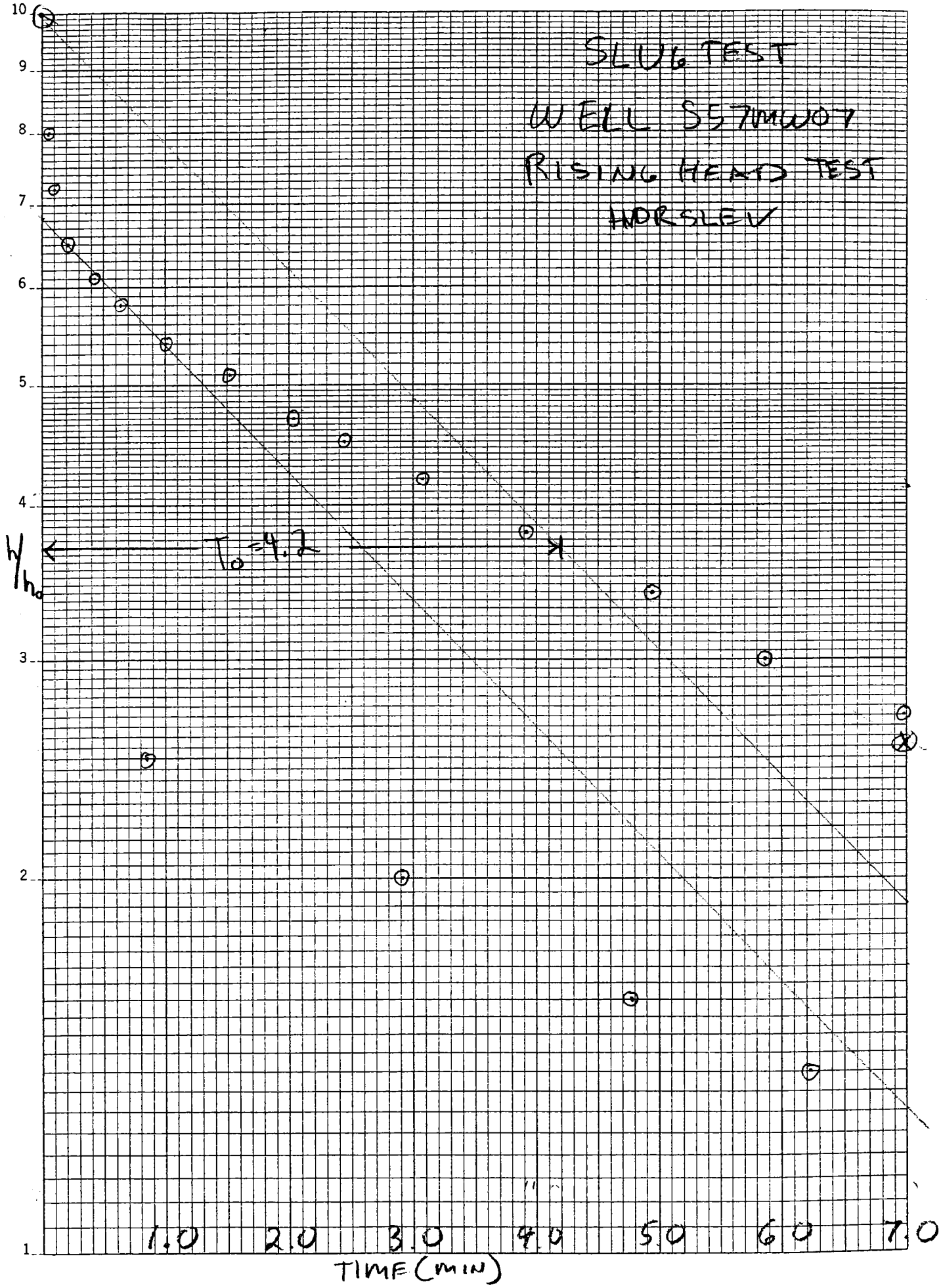
$$K = \frac{(0.083)^2 \ln(10/0.083)}{2(10)(4.2)}$$

$$K = \frac{3.300864 \times 10^{-2}}{84}$$

$K = 3.93 \times 10^{-4}$ ft/min

$K = 2.0 \times 10^{-4}$ cm/sec

$K = 5.7 \times 10^{-1}$ ft/day



46 4650
K+E SEMI-LOGARITHMIC. 1 CYCLE X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

In-Situ Inc. MiniTroll Pro

Report generated: 10/30/01 13:41:33
Report from file: C:\Win-Situ\Data\SN01966 2001-10-25 104056 s57mw7rhno1.bin
DataMgr Version 3.68

Serial number: 1966
Firmware Version 3.01
Unit name: miniTROLL

Test name: s57mw7rhno1

Test defined on: 10/25/01 10:37:34
Test started on: 10/25/01 10:40:56
Test stopped on: 10/25/01 11:14:06
Test extracted on: N/A

Data gathered using Logarithmic testing
aximum time between data points: 10.(Minutes.
Number of data samples: 121

TOTAL DATA SAMPLES 121

Channel number [1]
Measurement type: Temperature
Channel name: OnBoard Temp

Channel number [2]
Measurement type: Pressure
Channel name: OnBoard Pressure
Sensor Range: 30 PSI.
Specific gravity: 1
Mode: TOC
User-defined reference: 0 Feet H2O
Referenced on: test start
Pressure head at reference: 7.94 Feet H2O

Date	Time	ET (min)	Chan[1] Celsius	Chan[2] Feet H2O	ET(min) adj.	h/ho	ho= 2.949
10/25/01	10:40	0	19.61	0			
10/25/01	10:40	0.005	19.62	0			
10/25/01	10:40	0.01	19.62	-0.002			
10/25/01	10:40	0.015	19.64	-0.002			
10/25/01	10:40	0.02	19.64	0.565			
10/25/01	10:40	0.025	19.64	7.897			
10/25/01	10:40	0.03	19.64	5.064			
10/25/01	10:40	0.035	19.64	2.897			
10/25/01	10:40	0.04	19.65	2.949	0	1.00	-
10/25/01	10:40	0.045	19.65	2.86	0.005	0.97	
10/25/01	10:40	0.05	19.65	2.759	0.01	0.94	
10/25/01	10:41	0.055	19.65	2.705	0.015	0.92	

10/25/01 10:41	0.06	19.65	2.618	0.02	0.89
10/25/01 10:41	0.065	19.65	2.575	0.025	0.87
10/25/01 10:41	0.07	19.65	2.527	0.03	0.86
10/25/01 10:41	0.075	19.65	2.475	0.035	0.84
10/25/01 10:41	0.08	19.65	2.438	0.04	0.83
10/25/01 10:41	0.0848	19.65	2.403	0.0448	0.81
10/25/01 10:41	0.09	19.65	2.366	0.05	0.80
10/25/01 10:41	0.095	19.65	2.339	0.055	0.79
10/25/01 10:41	0.1	19.65	2.308	0.06	0.78
10/25/01 10:41	0.1058	19.66	2.279	0.0658	0.77
10/25/01 10:41	0.112	19.65	2.246	0.072	0.76
10/25/01 10:41	0.1185	19.65	2.217	0.0785	0.75
10/25/01 10:41	0.1255	19.65	2.188	0.0855	0.74
10/25/01 10:41	0.1328	19.66	2.157	0.0928	0.73
10/25/01 10:41	0.1407	19.66	2.13	0.1007	0.72
10/25/01 10:41	0.149	19.66	2.103	0.109	0.71
10/25/01 10:41	0.1578	19.66	2.078	0.1178	0.70
10/25/01 10:41	0.167	19.65	2.055	0.127	0.70
10/25/01 10:41	0.177	19.65	2.032	0.137	0.69
10/25/01 10:41	0.1875	19.65	2.012	0.1475	0.68
10/25/01 10:41	0.1985	19.65	1.991	0.1585	0.68
10/25/01 10:41	0.2102	19.65	1.975	0.1702	0.67
10/25/01 10:41	0.2227	19.65	1.956	0.1827	0.66
10/25/01 10:41	0.2358	19.64	1.937	0.1958	0.66
10/25/01 10:41	0.2498	19.64	1.923	0.2098	0.65
10/25/01 10:41	0.2647	19.64	1.906	0.2247	0.65
10/25/01 10:41	0.2803	19.64	1.889	0.2403	0.64
10/25/01 10:41	0.297	19.64	1.877	0.257	0.64
10/25/01 10:41	0.3147	19.62	1.862	0.2747	0.63
10/25/01 10:41	0.3333	19.62	1.85	0.2933	0.63
10/25/01 10:41	0.3532	19.62	1.835	0.3132	0.62
10/25/01 10:41	0.3742	19.62	1.823	0.3342	0.62
10/25/01 10:41	0.3963	19.61	1.81	0.3563	0.61
10/25/01 10:41	0.4198	19.61	1.798	0.3798	0.61
10/25/01 10:41	0.4447	19.61	1.788	0.4047	0.61
10/25/01 10:41	0.4697	19.6	1.775	0.4297	0.60
10/25/01 10:41	0.4963	19.6	1.764	0.4563	0.60
10/25/01 10:41	0.5247	19.6	1.754	0.4847	0.59
10/25/01 10:41	0.5547	19.58	1.741	0.5147	0.59
10/25/01 10:41	0.5863	19.58	1.731	0.5463	0.59
10/25/01 10:41	0.6213	19.58	1.719	0.5813	0.58
10/25/01 10:41	0.6578	19.57	1.706	0.6178	0.58
10/25/01 10:41	0.6963	19.57	1.696	0.6563	0.58
10/25/01 10:41	0.738	19.56	1.683	0.698	0.57
10/25/01 10:41	0.7813	19.56	1.671	0.7413	0.57
10/25/01 10:41	0.828	19.55	1.658	0.788	0.56
10/25/01 10:41	0.8763	19.53	1.645	0.8363	0.56
10/25/01 10:41	0.928	19.53	1.633	0.888	0.55
10/25/01 10:41	0.983	19.52	1.618	0.943	0.55
10/25/01 10:41	1.0413	19.52	1.604	1.0013	0.54
10/25/01 10:42	1.103	19.51	1.589	1.063	0.54
10/25/01 10:42	1.168	19.5	1.574	1.128	0.53
10/25/01 10:42	1.238	19.5	1.557	1.198	0.53
10/25/01 10:42	1.3113	19.48	1.543	1.2713	0.52
10/25/01 10:42	1.3897	19.47	1.526	1.3497	0.52

10/25/01 10:42	1.473	19.46	1.509	1.433	0.51
10/25/01 10:42	1.5613	19.45	1.49	1.5213	0.51
10/25/01 10:42	1.6547	19.43	1.471	1.6147	0.50
10/25/01 10:42	1.753	19.42	1.452	1.713	0.49
10/25/01 10:42	1.858	19.41	1.434	1.818	0.49
10/25/01 10:42	1.968	19.39	1.413	1.928	0.48
10/25/01 10:43	2.0847	19.38	1.394	2.0447	0.47
10/25/01 10:43	2.2097	19.37	1.371	2.1697	0.46
10/25/01 10:43	2.3412	19.36	1.35	2.3012	0.46
10/25/01 10:43	2.4813	19.34	1.327	2.4413	0.45
10/25/01 10:43	2.6297	19.34	1.296	2.5897	0.44
10/25/01 10:43	2.7863	19.33	1.277	2.7463	0.43
10/25/01 10:43	2.953	19.32	1.254	2.913	0.43
10/25/01 10:44	3.1297	19.31	1.229	3.0897	0.42
10/25/01 10:44	3.3163	19.29	1.201	3.2763	0.41
10/25/01 10:44	3.5147	19.28	1.176	3.4747	0.40
10/25/01 10:44	3.7247	19.27	1.145	3.6847	0.39
10/25/01 10:44	3.9463	19.26	1.116	3.9063	0.38
10/25/01 10:45	4.1813	19.24	1.089	4.1413	0.37
10/25/01 10:45	4.4295	19.24	1.056	4.3895	0.36
10/25/01 10:45	4.693	19.23	1.024	4.653	0.35
10/25/01 10:45	4.973	19.22	0.993	4.933	0.34
10/25/01 10:46	5.2697	19.2	0.96	5.2297	0.33
10/25/01 10:46	5.583	19.2	0.926	5.543	0.31
10/25/01 10:46	5.9147	19.19	0.893	5.8747	0.30
10/25/01 10:47	6.2663	19.19	0.86	6.2263	0.29
10/25/01 10:47	6.6397	19.18	0.824	6.5997	0.28
10/25/01 10:47	7.0347	19.18	0.791	6.9947	0.27
10/25/01 10:48	7.453	19.18	0.756	7.413	0.26
10/25/01 10:48	7.8963	19.17	0.723	7.8563	0.25
10/25/01 10:49	8.3663	19.17	0.686	8.3263	0.23
10/25/01 10:49	8.8647	19.17	0.652	8.8247	0.22
10/25/01 10:50	9.3913	19.18	0.616	9.3513	0.21
10/25/01 10:50	9.9497	19.18	0.58	9.9097	0.20
10/25/01 10:51	10.5413	19.18	0.547	10.5013	0.19
10/25/01 10:52	11.168	19.19	0.512	11.128	0.17
10/25/01 10:52	11.8313	19.19	0.479	11.7913	0.16
10/25/01 10:53	12.5347	19.19	0.444	12.4947	0.15
10/25/01 10:54	13.2797	19.2	0.413	13.2397	0.14
10/25/01 10:55	14.0697	19.2	0.38	14.0297	0.13
10/25/01 10:55	14.9063	19.2	0.349	14.8663	0.12
10/25/01 10:56	15.7913	19.22	0.318	15.7513	0.11
10/25/01 10:57	16.7297	19.22	0.294	16.6897	0.10
10/25/01 10:58	17.723	19.23	0.263	17.683	0.09
10/25/01 10:59	18.7763	19.23	0.234	18.7363	0.08
10/25/01 11:00	19.8913	19.24	0.211	19.8513	0.07
10/25/01 11:02	21.073	19.24	0.184	21.033	0.06
10/25/01 11:03	22.3247	19.24	0.162	22.2847	0.05
10/25/01 11:04	23.6497	19.26	0.143	23.6097	0.05
10/25/01 11:06	25.0547	19.27	0.123	25.0147	0.04
10/25/01 11:07	26.543	19.27	0.104	26.503	0.04
10/25/01 11:09	28.118	19.28	0.086	28.078	0.03
10/25/01 11:10	29.7863	19.28	0.072	29.7463	0.02
10/25/01 11:12	31.5547	19.29	0.059	31.5147	0.02

HYDRAULIC CONDUCTIVITY TESTING DATA SHEET

Tetra Tech NUS, Inc.

PROJECT NAME: INDIANHEAD SITE 57 FS WELL/BORING NO.: S57MW08

PROJECT NO.: 7129-2920 GEOLOGIST: FRED W. RAMSER

WELL DIAMETER: 2" SCREEN LENGTH/DEPTH: 10' / 6.64-16.64 TEST NO.: 1

STATIC WATER LEVEL (Depth/Elevation): 8.45 DATE: 10-25-01

TEST TYPE (Rising/Falling/Constant Head): RISING HEAD CHECKED:

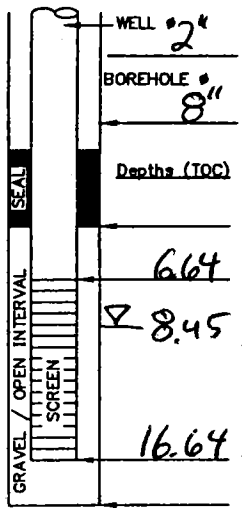
METHOD OF INDUCING WATER LEVEL CHANGE: 2 x 3' SS Bailer PAGE ..... OF .....

REFERENCE PT. FOR WL MEAS. (Top of Casing, Transducer, etc.): REF TO 0.00

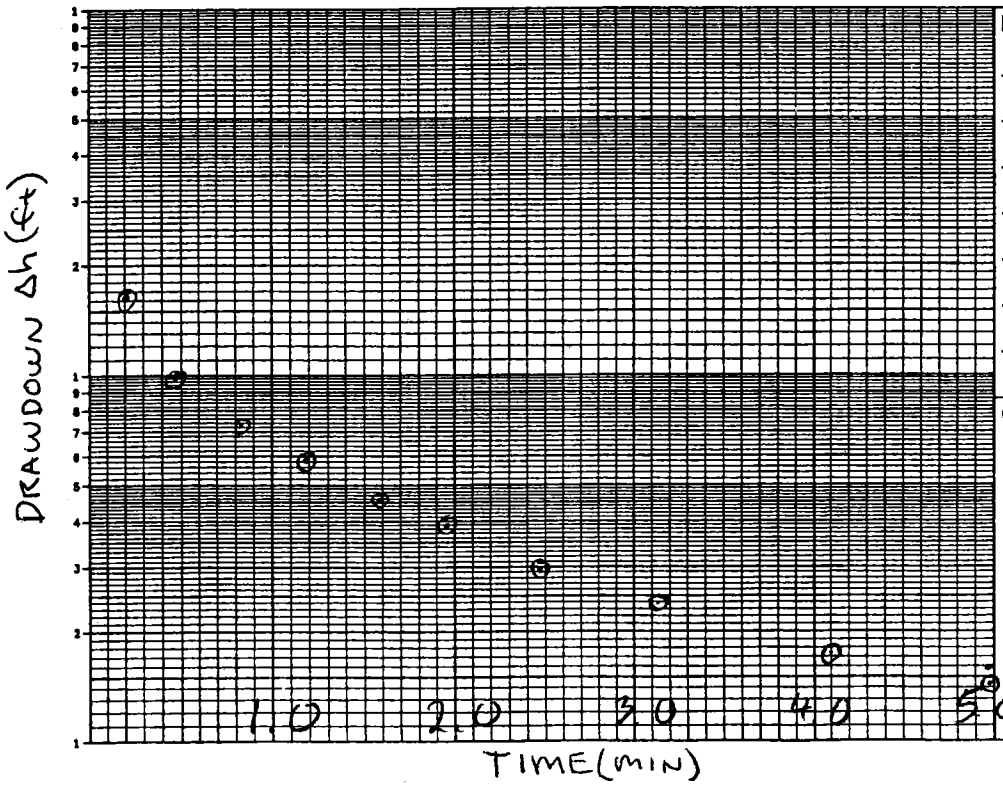
ACAD:FORM_HYDCONTST.dwg 07/06/99 INL

ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)	ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)
0.000		0.000	1.1678		0.590
0.0548		3.371	1.5613		0.460
0.0700		3.003	1.9678		0.371
0.0900		2.728	2.4812		0.298
0.1488		2.066	3.1297		0.242
0.1875		1.776	4.1812		0.178
0.2100		1.648	4.9728		0.145
0.2498		1.464			
0.3532		1.180			
0.4695		1.021			
0.6218		0.880			
0.8278		0.744			

WELL SCHEMATIC



▽ Indicate SWL Depth on Drawing



REMARKS:

INSERTED BAILERS.

1118

- POCKET SITE PC

MALFUNCTION HYD

TO REDO

1207 START 2ND

CALCS, SKETCH MAPS, ETC.:

TETRA TECH NUS, INC. CALCULATION WORKSHEET PAGE ____ OF ____

CLIENT: INDIAN HEAD NSWC	JOB NUMBER: 7129 SITE 57 FS
SUBJECT: SLUG TEST WELL S57MW08 RISING HEAD	
BASED ON: HVORSLEV	DRAWING NUMBER:
BY: FRED R. / CHECKED BY:	APPROVED BY: / DATE: 11-2-01

EQ:

$$K = \frac{r^2 \ln(L/R)}{2L T_o}$$

WHERE:

$r = 8.33 \times 10^{-2}$ (RISER RADIUS, Ft)
$R = 8.33 \times 10^{-2}$ (SCREEN RADIUS, Ft)
$L = 8.19$ ft (INPUT LENGTH, Ft)
$T_o = 0.30$ min (FROM PLOT, MIN)
K = HYDRAULIC COND. (ft/min)

SUB:

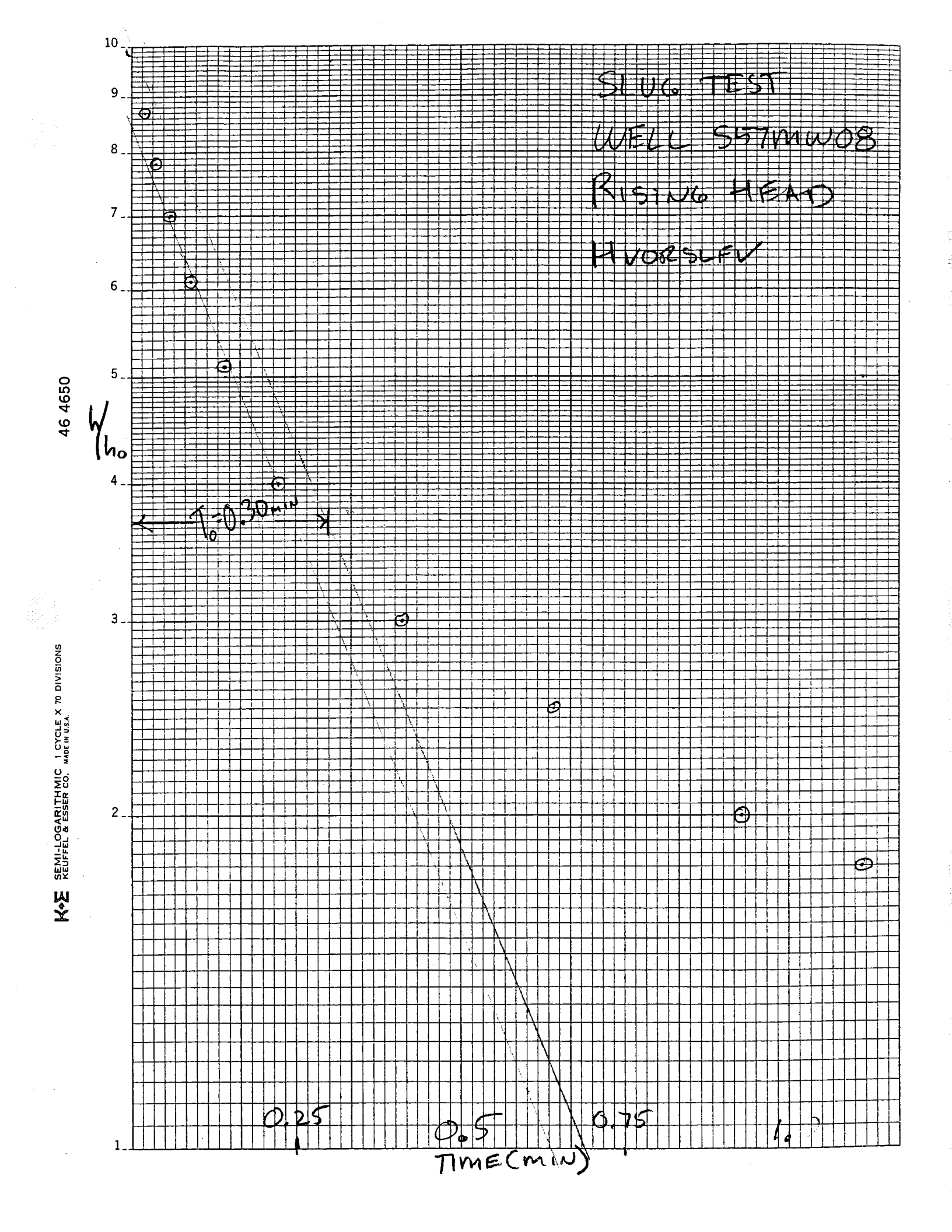
$$K = \frac{(8.33 \times 10^{-2})^2 \ln(8.19/8.33 \times 10^{-2})}{2(8.19)(0.30)}$$

$$K = \frac{3.184 \times 10^{-2}}{4.914}$$

$K = 6.48 \times 10^{-3}$ ft/min

$K = 3.29 \times 10^{-3}$ cm/sec

$K = 9.33$ ft/day


SLUG TEST
WELL 557MW08
RISING HEAD
HVORSLEV
10
9
8
7
6
5
4
3
2
1
W/h0
T0=0.30min
0.25
0.5
0.75
1.0
TIME(min)
46 4650
K+E SEMI-LOGARITHMIC 1 CYCLE X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

In-Situ Inc.	MiniTroll Pro
Report generated:	10/31/01 14:48:01
Report from file:	C:\Win-Situ\Data\SN01966 2001-10-25 120739 s57mw8rhno1.bin
DataMgr Version	3.68
Serial number:	1966
Firmware Version	3.01
Unit name:	miniTROLL
Test name:	s57mw8rhno1
Test defined on:	10/25/01 11:44:07
Test started on:	10/25/01 12:07:39
Test stopped on:	10/25/01 12:25:42
Test extracted on:	N/A

Data gathered using Logarithmic testing
laximum time between data points: 10.0 Minutes.
Number of data samples: 111

TOTAL DATA SAMPLES 111

Channel number [1]
Measurement type: Temperature
Channel name: OnBoard Temp

Channel number [2]
Measurement type: Pressure
Channel name: OnBoard Pressure
Sensor Range: 30 PSI.
Specific gravity: 1
Mode: TOC
User-defined reference: 0 Feet H2O
Referenced on: test start
Pressure head at reference: 7.875 Feet H2O

Date	Time	ET (min)	Chan[1] Celsius	Chan[2] Feet H2O	Adj ET (min)	h/ho	ho= 3.371
10/25/01	12:07	0	19.34	0			
10/25/01	12:07	0.005	19.36	0			
10/25/01	12:07	0.01	19.37	-0.002			
10/25/01	12:07	0.015	19.37	-0.002			
10/25/01	12:07	0.02	19.37	-0.002			
10/25/01	12:07	0.025	19.37	-0.002			
10/25/01	12:07	0.03	19.38	-0.001			
10/25/01	12:07	0.035	19.38	-0.001			
10/25/01	12:07	0.04	19.38	1.329			
10/25/01	12:07	0.045	19.38	8.137			

10/25/01 12:07	0.05	19.38	5.973		
10/25/01 12:07	0.055	19.38	3.371	0	1.00
10/25/01 12:07	0.06	19.38	3.216	0.005	0.95
10/25/01 12:07	0.065	19.38	3.092	0.01	0.92
10/25/01 12:07	0.07	19.38	3.003	0.015	0.89
10/25/01 12:07	0.075	19.39	2.933	0.02	0.87
10/25/01 12:07	0.08	19.39	2.858	0.025	0.85
10/25/01 12:07	0.0848	19.38	2.786	0.0298	0.83
10/25/01 12:07	0.09	19.39	2.728	0.035	0.81
10/25/01 12:07	0.095	19.39	2.641	0.04	0.78
10/25/01 12:07	0.1	19.39	2.565	0.045	0.76
10/25/01 12:07	0.1058	19.39	2.5	0.0508	0.74
10/25/01 12:07	0.112	19.39	2.434	0.057	0.72
10/25/01 12:07	0.1185	19.39	2.36	0.0635	0.70
10/25/01 12:07	0.1255	19.39	2.296	0.0705	0.68
10/25/01 12:07	0.1328	19.39	2.227	0.0778	0.66
10/25/01 12:07	0.1407	19.39	2.155	0.0857	0.64
10/25/01 12:07	0.149	19.39	2.066	0.094	0.61
10/25/01 12:07	0.1578	19.39	1.991	0.1028	0.59
10/25/01 12:07	0.167	19.39	1.917	0.112	0.57
10/25/01 12:07	0.177	19.39	1.847	0.122	0.55
10/25/01 12:07	0.1875	19.39	1.776	0.1325	0.53
10/25/01 12:07	0.1985	19.39	1.712	0.1435	0.51
10/25/01 12:07	0.2102	19.39	1.648	0.1552	0.49
10/25/01 12:07	0.2227	19.38	1.584	0.1677	0.47
10/25/01 12:07	0.2358	19.38	1.524	0.1808	0.45
10/25/01 12:07	0.2498	19.38	1.464	0.1948	0.43
10/25/01 12:07	0.2647	19.38	1.408	0.2097	0.42
10/25/01 12:07	0.2803	19.38	1.354	0.2253	0.40
10/25/01 12:07	0.297	19.38	1.306	0.242	0.39
10/25/01 12:07	0.3147	19.38	1.261	0.2597	0.37
10/25/01 12:07	0.3333	19.38	1.219	0.2783	0.36
10/25/01 12:08	0.3532	19.38	1.18	0.2982	0.35
10/25/01 12:08	0.3742	19.38	1.145	0.3192	0.34
10/25/01 12:08	0.3963	19.38	1.11	0.3413	0.33
10/25/01 12:08	0.4198	19.38	1.077	0.3648	0.32
10/25/01 12:08	0.4447	19.38	1.046	0.3897	0.31
10/25/01 12:08	0.4697	19.38	1.021	0.4147	0.30
10/25/01 12:08	0.4963	19.38	0.99	0.4413	0.29
10/25/01 12:08	0.5247	19.38	0.963	0.4697	0.29
10/25/01 12:08	0.5547	19.38	0.934	0.4997	0.28
10/25/01 12:08	0.5863	19.38	0.909	0.5313	0.27
10/25/01 12:08	0.6213	19.38	0.88	0.5663	0.26
10/25/01 12:08	0.6578	19.38	0.853	0.6028	0.25
10/25/01 12:08	0.6963	19.38	0.826	0.6413	0.25
10/25/01 12:08	0.738	19.38	0.799	0.683	0.24
10/25/01 12:08	0.7813	19.38	0.773	0.7263	0.23
10/25/01 12:08	0.828	19.38	0.744	0.773	0.22
10/25/01 12:08	0.8763	19.38	0.717	0.8213	0.21
10/25/01 12:08	0.928	19.38	0.692	0.873	0.21
10/25/01 12:08	0.983	19.38	0.665	0.928	0.20
10/25/01 12:08	1.0413	19.37	0.64	0.9863	0.19

10/25/01 12:08	1.103	19.37	0.613	1.048	0.18
10/25/01 12:08	1.168	19.37	0.59	1.113	0.18
10/25/01 12:08	1.238	19.37	0.563	1.183	0.17
10/25/01 12:08	1.3113	19.37	0.538	1.2563	0.16
10/25/01 12:09	1.3897	19.37	0.514	1.3347	0.15
10/25/01 12:09	1.473	19.37	0.487	1.418	0.14
10/25/01 12:09	1.5613	19.37	0.46	1.5063	0.14
10/25/01 12:09	1.6547	19.37	0.435	1.5997	0.13
10/25/01 12:09	1.753	19.37	0.412	1.698	0.12
10/25/01 12:09	1.858	19.36	0.391	1.803	0.12
10/25/01 12:09	1.968	19.36	0.371	1.913	0.11
10/25/01 12:09	2.0847	19.36	0.352	2.0297	0.10
10/25/01 12:09	2.2097	19.36	0.333	2.1547	0.10
10/25/01 12:09	2.3412	19.36	0.315	2.2862	0.09
10/25/01 12:10	2.4813	19.36	0.298	2.4263	0.09
10/25/01 12:10	2.6297	19.36	0.282	2.5747	0.08
10/25/01 12:10	2.7863	19.36	0.267	2.7313	0.08
10/25/01 12:10	2.953	19.36	0.259	2.898	0.08
10/25/01 12:10	3.1297	19.36	0.242	3.0747	0.07
10/25/01 12:10	3.3163	19.36	0.224	3.2613	0.07
10/25/01 12:11	3.5147	19.36	0.213	3.4597	0.06
10/25/01 12:11	3.7247	19.36	0.201	3.6697	0.06
10/25/01 12:11	3.9463	19.36	0.195	3.8913	0.06
10/25/01 12:11	4.1813	19.36	0.178	4.1263	0.05
10/25/01 12:12	4.4295	19.36	0.168	4.3745	0.05
10/25/01 12:12	4.693	19.36	0.155	4.638	0.05
10/25/01 12:12	4.973	19.36	0.145	4.918	0.04
10/25/01 12:12	5.2697	19.36	0.135	5.2147	0.04
10/25/01 12:13	5.583	19.36	0.124	5.528	0.04
10/25/01 12:13	5.9147	19.36	0.114	5.8597	0.03
10/25/01 12:13	6.2663	19.34	0.108	6.2113	0.03
10/25/01 12:14	6.6397	19.34	0.097	6.5847	0.03
10/25/01 12:14	7.0347	19.34	0.091	6.9797	0.03
10/25/01 12:15	7.453	19.34	0.083	7.398	0.02
10/25/01 12:15	7.8963	19.34	0.077	7.8413	0.02
10/25/01 12:16	8.3663	19.34	0.072	8.3113	0.02
10/25/01 12:16	8.8647	19.34	0.066	8.8097	0.02
10/25/01 12:17	9.3913	19.34	0.06	9.3363	0.02
10/25/01 12:17	9.9497	19.34	0.058	9.8947	0.02
10/25/01 12:18	10.5413	19.34	0.05	10.4863	0.01
10/25/01 12:18	11.168	19.34	0.046	11.113	0.01
10/25/01 12:19	11.8313	19.34	0.041	11.7763	0.01
10/25/01 12:20	12.5347	19.34	0.037	12.4797	0.01
10/25/01 12:20	13.2797	19.34	0.035	13.2247	0.01
10/25/01 12:21	14.0697	19.34	0.031	14.0147	0.01
10/25/01 12:22	14.9063	19.34	0.029	14.8513	0.01
10/25/01 12:23	15.7913	19.34	0.023	15.7363	0.01
10/25/01 12:24	16.7297	19.34	0.019	16.6747	0.01
10/25/01 12:25	17.723	19.34	0.019	17.668	0.01

HYDRAULIC CONDUCTIVITY TESTING DATA SHEET

Tetra Tech NUS, Inc.

PROJECT NAME: INDIANHEAD SITE 57 FS WELL/BORING NO.: 57MW09

PROJECT NO.: 7129-2920 GEOLOGIST: FRED W. RAMSER

WELL DIAMETER: 2" SCREEN LENGTH/DEPTH: 5' / 15.85-20.85 TEST NO.:

STATIC WATER LEVEL (Depth/Elevation): 9.08' TPVC DATE: 10-24-01

TEST TYPE (Rising/Falling/Constant Head): RISING HEAD CHECKED:

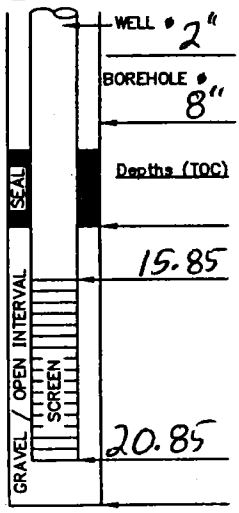
METHOD OF INDUCING WATER LEVEL CHANGE: 2x 1L bailers PAGE ..... OF .....

REFERENCE PT. FOR WL MEAS. (Top of Casing, Transducer, etc.): TOC, Ref to 0.00

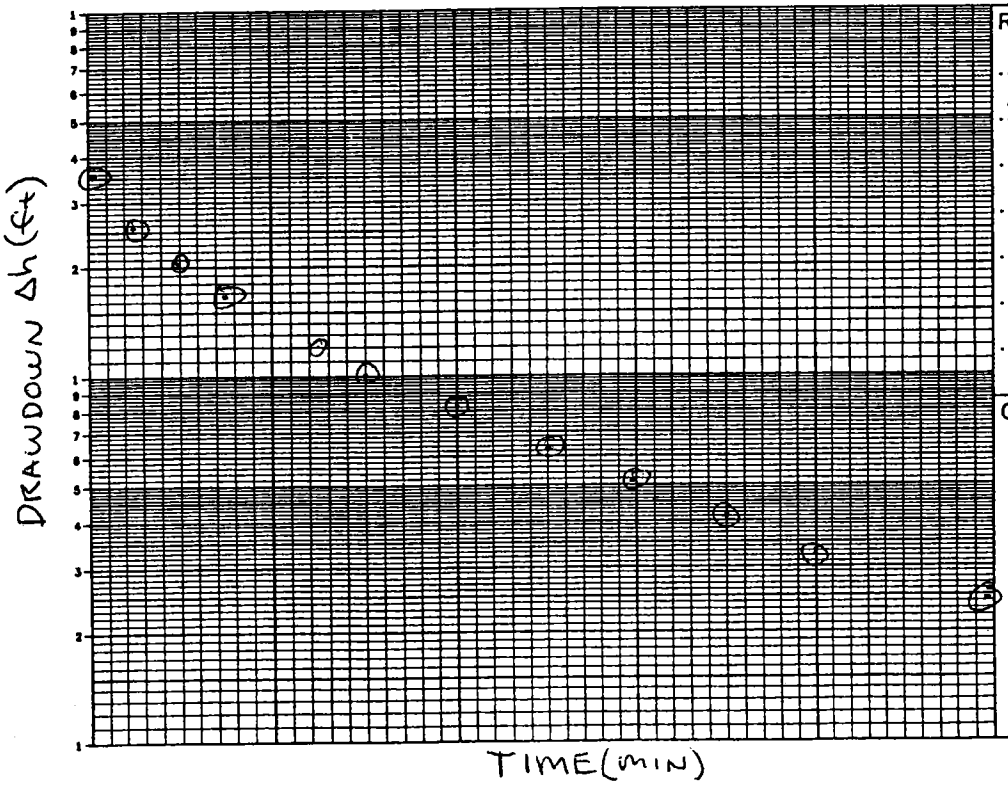
ACAD:FORM_HYDCONTST.dwg 07/06/99 INL

ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)	ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)
0.000		0.000	6.6397		0.433
0.025		3.516	8.3663		0.315
0.085		3.189	9.9497		0.246
0.2647		2.850			
0.6963		2.334			
1.0413		2.028			
1.473		1.724			
1.968		1.453			
2.6297		1.176			
3.9463		0.807			
4.6930		0.668			
5.583		0.542			

WELL SCHEMATIC



▽ Indicate SWL Depth on Drawing



REMARKS:

STARTED: 0922

STOPPED TEST @ 0937

CALCS, SKETCH MAPS, ETC.:

TETRA TECH NUS, INC. CALCULATION WORKSHEET PAGE ____ OF ____

CLIENT: INDIAN HEAD NSWC	JOB NUMBER: 7129 SITE 57 FS
SUBJECT: SLUG TEST WELL S57MW09	
BASED ON: HVORSLEV	DRAWING NUMBER:
BY: FRED R. / CHECKED BY: JK	APPROVED BY: / DATE: 11-2-01

EQ:

$$K = \frac{r^2 \ln(L/R)}{2L T_0}$$

WHERE:

$r = 0.083$ (RISER RADIUS, Ft)
$R = 0.083$ (SCREEN RADIUS, Ft)
$L = 5$ (INPUT LENGTH, Ft)
$T_0 = 2.75$ min (FROM PLOT, MIN)
K = HYDRAULIC COND. (ft/min)

SUB:

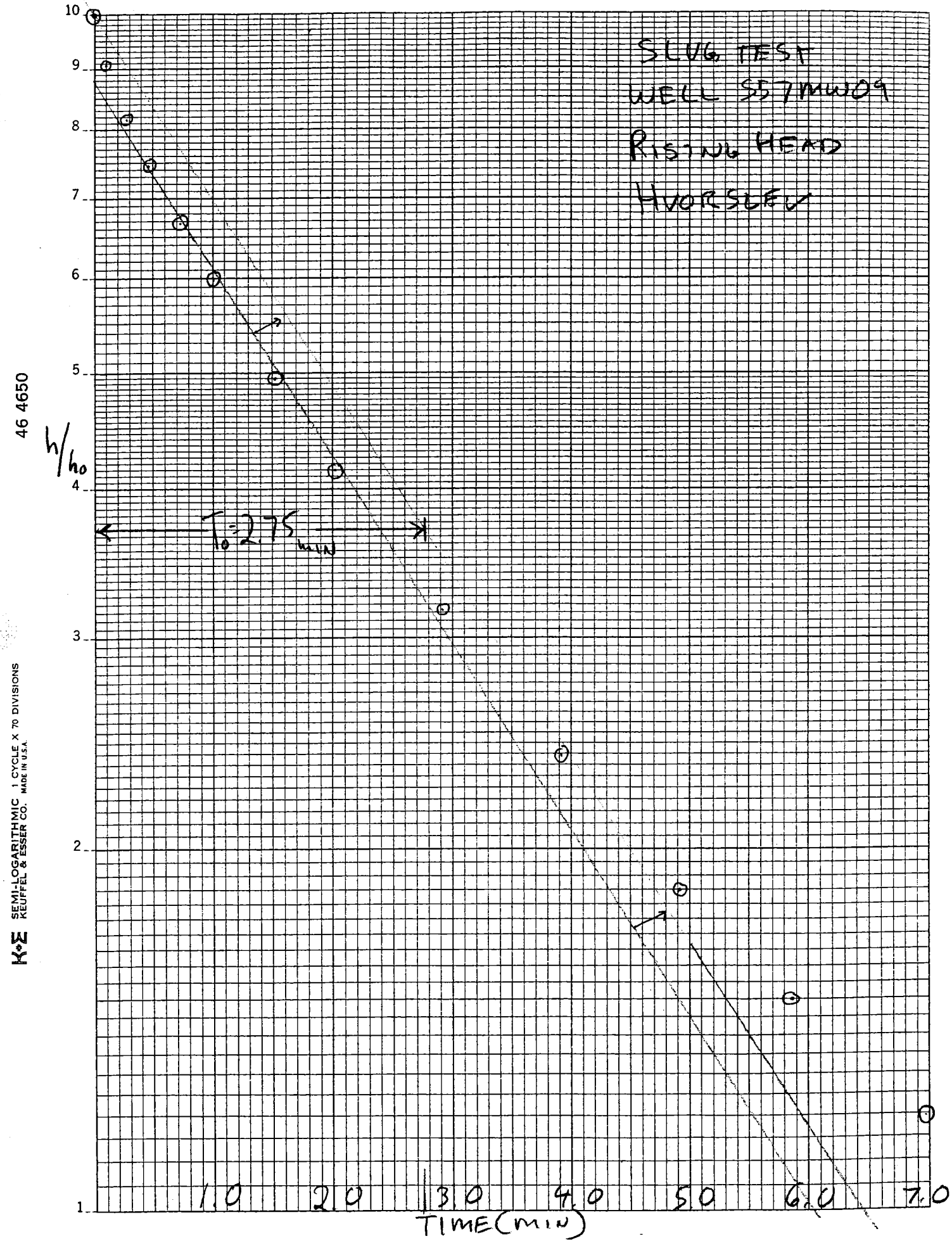
$$K = \frac{(0.083)^2 \ln(5/.083)}{2(5)(2.75)}$$

$$K = \frac{2.82335509 \times 10^{-2}}{27.5}$$

$K = 1.03 \times 10^{-3}$ ft/min

$K = 5.22 \times 10^{-4}$ cm/sec

$K = 1.5$ ft/day


SLUG TEST
WELL SS7MW09
RISING HEAD
HVORSLEV
h/h0
T0=2.75 MIN
TIME(MIN)
10
9
8
7
6
5
4
3
2
1
1.0
2.0
3.0
4.0
5.0
6.0
7.0
46 4650
K&E SEMI-LOGARITHMIC 1 CYCLE X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

In-Situ Inc.	MiniTroll Pro
Report generated:	11/1/01 10:30:06
Report from file:	C:\Win-Situ\Data\SN01966 2001-10-24 082207 s57mw9rhno1.bin
DataMgr Version	3.68
Serial number:	1966
Firmware Version	3.01
Unit name:	miniTROLL
Test name:	s57mw9rhno1
Test defined on:	10/24/01 7:56:10
Test started on:	10/24/01 8:22:07
Test stopped on:	10/24/01 9:37:32
Test extracted on:	N/A

Data gathered using Logarithmic testing
Maximum time between data points: 10 Minutes.
Number of data samples: 136

TOTAL DATA SAMPLES 136

Channel number [1]	
Measurement type:	Temperature
Channel name:	OnBoard Temp
Channel number [2]	
Measurement type:	Pressure
Channel name:	OnBoard Pressure
Sensor Range:	30 PSI.
Specific gravity:	1
Mode:	TOC
User-defined reference:	0 Feet H2O
Referenced on:	test start
Pressure head at reference:	11.1 Feet H2O

Date	Time	ET (min)	Chan[1] Celsius	Chan[2] Feet H2O	Adj ET (min)	h/ho	ho= 3.375
10/24/01	8:22	0	18.62	0			
10/24/01	8:22	0.005	18.64	-0.002			
10/24/01	8:22	0.01	18.64	9.572			
10/24/01	8:22	0.015	18.65	4.78			
10/24/01	8:22	0.02	18.65	3.269			
10/24/01	8:22	0.025	18.65	3.518			
10/24/01	8:22	0.03	18.65	3.418			
10/24/01	8:22	0.035	18.66	3.418			
10/24/01	8:22	0.04	18.66	3.375	0	1	
10/24/01	8:22	0.045	18.66	3.321	0.005	0.984	
10/24/01	8:22	0.05	18.66	3.342	0.01	0.99	
10/24/01	8:22	0.055	18.66	3.315	0.015	0.982	
10/24/01	8:22	0.06	18.66	3.265	0.02	0.967	
10/24/01	8:22	0.065	18.66	3.253	0.025	0.964	
10/24/01	8:22	0.07	18.66	3.238	0.03	0.959	
10/24/01	8:22	0.075	18.66	3.22	0.035	0.954	
10/24/01	8:22	0.08	18.66	3.203	0.04	0.949	
10/24/01	8:22	0.0848	18.66	3.189	0.0448	0.945	

10/24/01 8:22	0.09	18.67	3.175	0.05	0.941
10/24/01 8:22	0.095	18.66	3.164	0.055	0.937
10/24/01 8:22	0.1	18.67	3.15	0.06	0.933
10/24/01 8:22	0.1058	18.67	3.137	0.0658	0.929
10/24/01 8:22	0.112	18.67	3.121	0.072	0.925
10/24/01 8:22	0.1185	18.67	3.106	0.0785	0.92
10/24/01 8:22	0.1255	18.67	3.092	0.0855	0.916
10/24/01 8:22	0.1328	18.67	3.075	0.0928	0.911
10/24/01 8:22	0.1407	18.67	3.059	0.1007	0.906 –
10/24/01 8:22	0.149	18.67	3.04	0.109	0.901
10/24/01 8:22	0.1578	18.67	3.024	0.1178	0.896
10/24/01 8:22	0.167	18.67	3.009	0.127	0.892
10/24/01 8:22	0.177	18.67	2.99	0.137	0.886
10/24/01 8:22	0.1875	18.66	2.972	0.1475	0.881
10/24/01 8:22	0.1985	18.66	2.955	0.1585	0.876
10/24/01 8:22	0.2102	18.66	2.934	0.1702	0.869
10/24/01 8:22	0.2227	18.66	2.914	0.1827	0.863
10/24/01 8:22	0.2358	18.66	2.893	0.1958	0.857
10/24/01 8:22	0.2498	18.66	2.872	0.2098	0.851
10/24/01 8:22	0.2647	18.66	2.85	0.2247	0.844
10/24/01 8:22	0.2803	18.66	2.827	0.2403	0.838
10/24/01 8:22	0.297	18.66	2.802	0.257	0.83
10/24/01 8:22	0.3147	18.66	2.779	0.2747	0.823
10/24/01 8:22	0.3333	18.66	2.752	0.2933	0.815 –
10/24/01 8:22	0.3532	18.66	2.727	0.3132	0.808
10/24/01 8:22	0.3742	18.66	2.698	0.3342	0.799
10/24/01 8:22	0.3963	18.66	2.67	0.3563	0.791
10/24/01 8:22	0.4198	18.66	2.641	0.3798	0.783
10/24/01 8:22	0.4447	18.66	2.612	0.4047	0.774
10/24/01 8:22	0.4697	18.66	2.581	0.4297	0.765
10/24/01 8:22	0.4963	18.66	2.55	0.4563	0.756
10/24/01 8:22	0.5247	18.66	2.516	0.4847	0.745 –
10/24/01 8:22	0.5547	18.66	2.483	0.5147	0.736
10/24/01 8:22	0.5863	18.66	2.448	0.5463	0.725
10/24/01 8:22	0.6213	18.66	2.411	0.5813	0.714
10/24/01 8:22	0.6578	18.66	2.374	0.6178	0.703
10/24/01 8:22	0.6963	18.66	2.334	0.6563	0.692
10/24/01 8:22	0.738	18.65	2.293	0.698	0.679
10/24/01 8:22	0.7813	18.65	2.251	0.7413	0.667 –
10/24/01 8:22	0.828	18.65	2.208	0.788	0.654
10/24/01 8:23	0.8763	18.65	2.164	0.8363	0.641
10/24/01 8:23	0.928	18.65	2.121	0.888	0.628
10/24/01 8:23	0.983	18.65	2.075	0.943	0.615
10/24/01 8:23	1.0413	18.65	2.028	1.0013	0.601 –
10/24/01 8:23	1.103	18.65	1.98	1.063	0.587
10/24/01 8:23	1.168	18.65	1.931	1.128	0.572
10/24/01 8:23	1.238	18.65	1.881	1.198	0.557
10/24/01 8:23	1.3113	18.65	1.831	1.2713	0.543
10/24/01 8:23	1.3897	18.65	1.778	1.3497	0.527
10/24/01 8:23	1.473	18.65	1.724	1.433	0.511
10/24/01 8:23	1.5613	18.65	1.672	1.5213	0.495 –
10/24/01 8:23	1.6547	18.65	1.618	1.6147	0.479
10/24/01 8:23	1.753	18.65	1.562	1.713	0.463
10/24/01 8:23	1.858	18.65	1.509	1.818	0.447
10/24/01 8:24	1.968	18.65	1.453	1.928	0.431
10/24/01 8:24	2.0847	18.65	1.399	2.0447	0.415 –
10/24/01 8:24	2.2097	18.65	1.343	2.1697	0.398
10/24/01 8:24	2.3412	18.64	1.287	2.3012	0.381
10/24/01 8:24	2.4813	18.65	1.231	2.4413	0.365
10/24/01 8:24	2.6297	18.65	1.176	2.5897	0.348

10/24/01 8:24	2.7863	18.64	1.122	2.7463	0.332
10/24/01 8:25	2.953	18.64	1.066	2.913	0.316
10/24/01 8:25	3.1297	18.65	1.014	3.0897	0.3
10/24/01 8:25	3.3163	18.64	0.96	3.2763	0.284
10/24/01 8:25	3.5147	18.64	0.908	3.4747	0.269
10/24/01 8:25	3.7247	18.64	0.857	3.6847	0.254
10/24/01 8:26	3.9463	18.64	0.807	3.9063	0.239
10/24/01 8:26	4.1813	18.64	0.759	4.1413	0.225
10/24/01 8:26	4.4295	18.64	0.712	4.3895	0.211
10/24/01 8:26	4.693	18.64	0.668	4.653	0.198
10/24/01 8:27	4.973	18.64	0.625	4.933	0.185
10/24/01 8:27	5.2697	18.64	0.582	5.2297	0.172
10/24/01 8:27	5.583	18.64	0.542	5.543	0.161
10/24/01 8:28	5.9147	18.64	0.505	5.8747	0.15
10/24/01 8:28	6.2663	18.64	0.468	6.2263	0.139
10/24/01 8:28	6.6397	18.64	0.433	6.5997	0.128
10/24/01 8:29	7.0347	18.64	0.402	6.9947	0.119
10/24/01 8:29	7.453	18.64	0.368	7.413	0.109
10/24/01 8:30	7.8963	18.64	0.34	7.8563	0.101
10/24/01 8:30	8.3663	18.64	0.315	8.3263	0.093
10/24/01 8:30	8.8647	18.64	0.29	8.8247	0.086
10/24/01 8:31	9.3913	18.64	0.267	9.3513	0.079
10/24/01 8:32	9.9497	18.64	0.246	9.9097	0.073
10/24/01 8:32	10.5413	18.64	0.228	10.5013	0.068
10/24/01 8:33	11.168	18.64	0.207	11.128	0.061
10/24/01 8:33	11.8313	18.65	0.193	11.7913	0.057
10/24/01 8:34	12.5347	18.66	0.177	12.4947	0.052
10/24/01 8:35	13.2797	18.66	0.164	13.2397	0.049
10/24/01 8:36	14.0697	18.67	0.15	14.0297	0.044
10/24/01 8:37	14.9063	18.67	0.138	14.8663	0.041
10/24/01 8:37	15.7913	18.67	0.125	15.7513	0.037
10/24/01 8:38	16.7297	18.69	0.117	16.6897	0.035
10/24/01 8:39	17.723	18.69	0.111	17.683	0.033
10/24/01 8:40	18.7763	18.69	0.103	18.7363	0.031
10/24/01 8:42	19.8913	18.69	0.097	19.8513	0.029
10/24/01 8:43	21.073	18.69	0.086	21.033	0.025
10/24/01 8:44	22.3247	18.69	0.082	22.2847	0.024
10/24/01 8:45	23.6497	18.69	0.082	23.6097	0.024
10/24/01 8:47	25.0547	18.69	0.076	25.0147	0.023
10/24/01 8:48	26.543	18.7	0.072	26.503	0.021
10/24/01 8:50	28.118	18.7	0.068	28.078	0.02
10/24/01 8:51	29.7863	18.69	0.063	29.7463	0.019
10/24/01 8:53	31.5547	18.69	0.061	31.5147	0.018
10/24/01 8:55	33.428	18.69	0.057	33.388	0.017
10/24/01 8:57	35.4112	18.69	0.053	35.3712	0.016
10/24/01 8:59	37.513	18.69	0.049	37.473	0.015
10/24/01 9:01	39.7397	18.69	0.045	39.6997	0.013
10/24/01 9:04	42.098	18.67	0.038	42.058	0.011
10/24/01 9:06	44.5963	18.67	0.036	44.5563	0.011
10/24/01 9:09	47.243	18.67	0.036	47.203	0.011
10/24/01 9:12	50.0463	18.67	0.034	50.0063	0.01
10/24/01 9:15	53.0147	18.67	0.034	52.9747	0.01
10/24/01 9:18	56.1597	18.67	0.036	56.1197	0.011
10/24/01 9:21	59.4913	18.66	0.034	59.4513	0.01
10/24/01 9:25	63.0197	18.66	0.032	62.9797	0.009
10/24/01 9:28	66.758	18.66	0.022	66.718	0.007
10/24/01 9:32	70.718	18.66	0.024	70.678	0.007
10/24/01 9:37	74.9113	18.66	0.009	74.8713	0.003

HYDRAULIC CONDUCTIVITY TESTING DATA SHEET

Tetra Tech NUS, Inc.

PROJECT NAME: INDIANHEAD SITE S7 FS WELL/BORING NO.: S57MW10

PROJECT NO.: 7129-2920 GEOLOGIST: FRED W. RAMSER

WELL DIAMETER: 2" SCREEN LENGTH/DEPTH: 10'/5.88-15.88 TEST NO.:

STATIC WATER LEVEL (Depth/Elevation): 9.15 DATE: 10-24-01

TEST TYPE (Rising/Falling/Constant Head): RISING HEAD CHECKED:

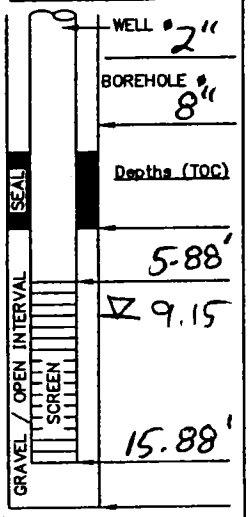
METHOD OF INDUCING WATER LEVEL CHANGE: 2x2.8' SS BAILERS PAGE ..... OF .....

REFERENCE PT. FOR WL MEAS. (Top of Casing, Transducer, etc.): TOC

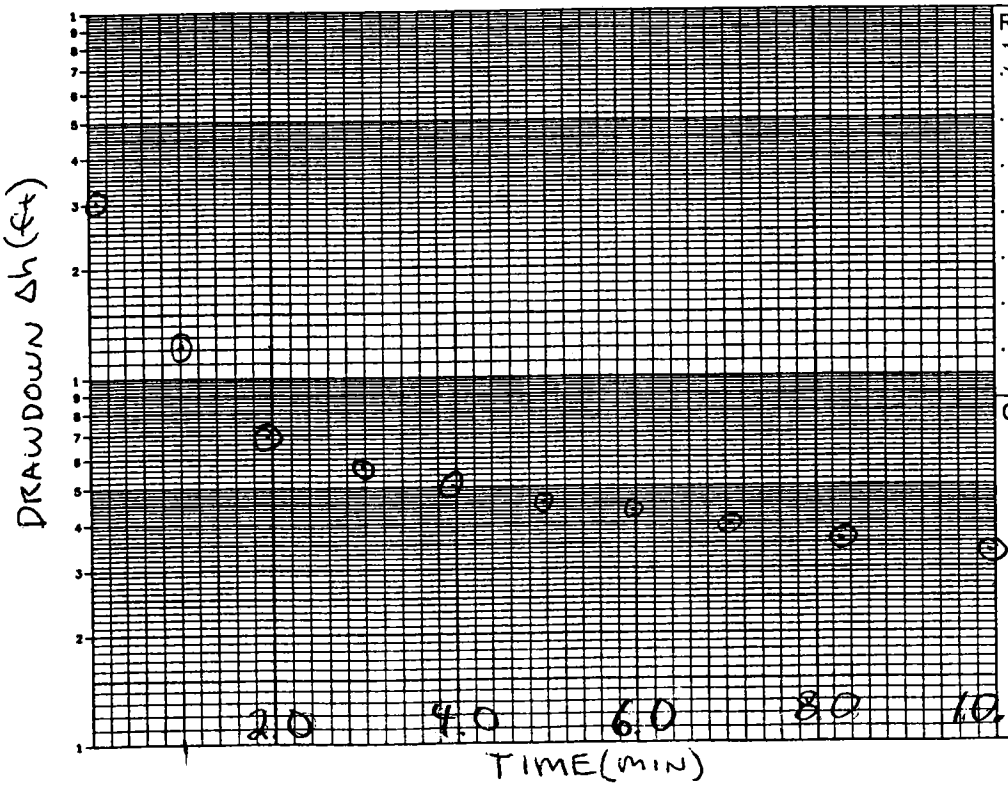
ACAD:FORM_HYDCONTST.dwg 07/06/99 INL

ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)	ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)
0.000		0.000	8.3663		0.368
0.03		3.381	9.9497		0.337
0.1000		3.078			
0.3963		2.231			
0.738		1.594			
1.0412		1.211			
1.9678		0.695			
2.953		0.571			
3.9463		0.511			
4.9728		0.463			
5.9145		0.430			
7.0345		0.397			

WELL SCHEMATIC



▽ Indicate SWL Depth on Drawing



REMARKS:

INSERTED SLUG 0950

6.471 = head x-D

CALCS, SKETCH MAPS, ETC.:

TETRA TECH NUS, INC. **CALCULATION WORKSHEET** PAGE _____ OF _____

CLIENT: INDIAN HEAD NSWC	JOB NUMBER: 7129 SITE 57 FS
SUBJECT: SLUG TEST WELL S57MW10	
BASED ON: HVORSLEV	DRAWING NUMBER:
BY: FRED R. / CHECKED BY:	APPROVED BY: / DATE: 11-2-01

EQ:

$$K = \frac{r^2 \ln(L/R)}{2L T_o}$$

WHERE:

$r = 0.083$ (RISER RADIUS, Ft)
$R = 0.083$ (SCREEN RADIUS, Ft)
$L = 6.73$ (INPUT LENGTH, Ft)
$T_o = 1.1$ min (FROM PLOT, MIN)
K = HYDRAULIC COND. (ft/min)

SUB:

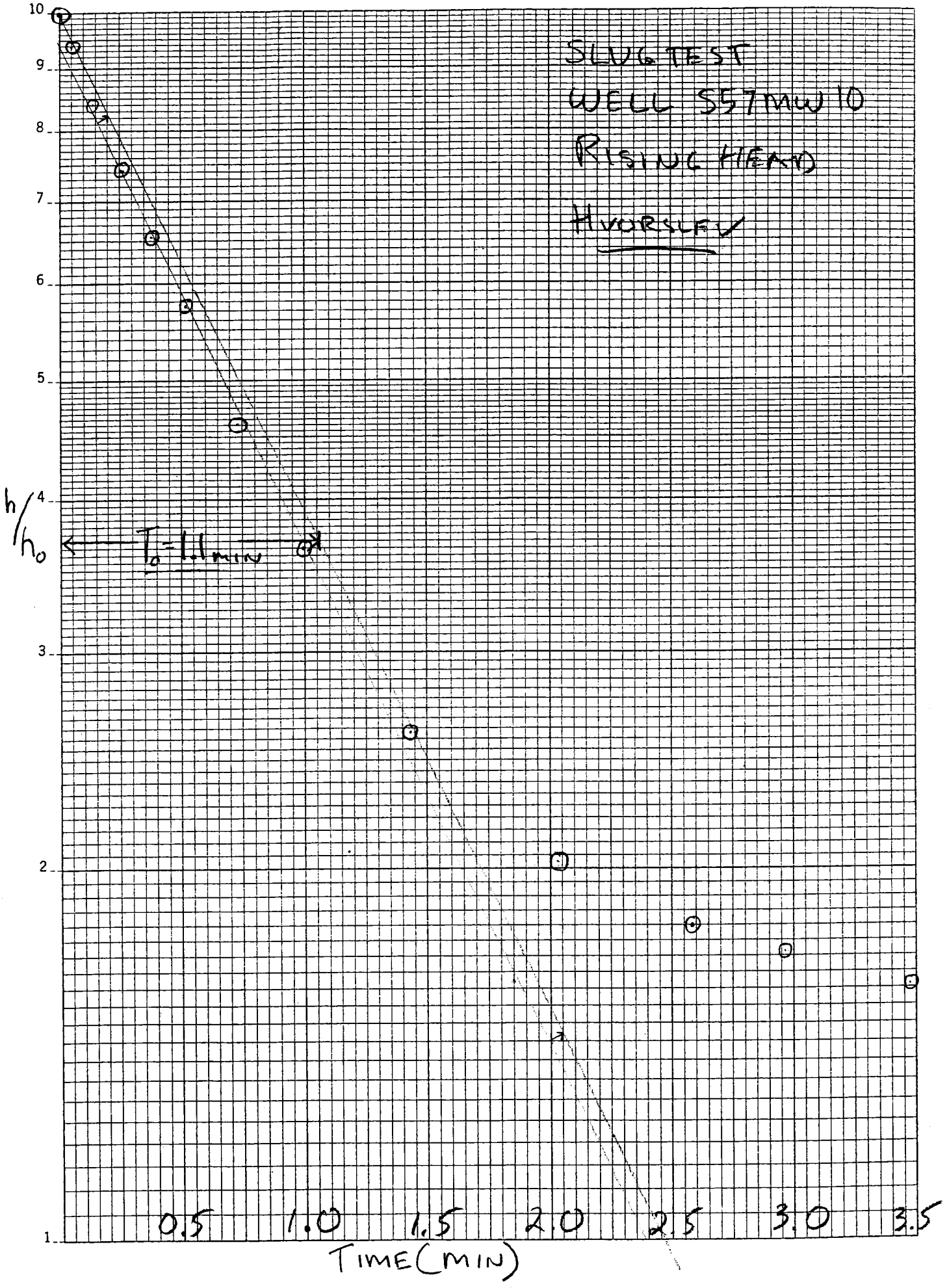
$$K = \frac{(0.083)^2 \ln(6.73/0.083)}{2(6.73)(1.1)}$$

$$K = \frac{3.02805293 \times 10^{-2}}{14.806}$$

$K = 2.05 \times 10^{-3}$ ft/min

$K = 1.04 \times 10^{-3}$ cm/sec

$K = 2.95$ ft/day


SLUG TEST
WELL S57MW10
RISING HEAD
HVORSLEV
h/h0
T0=1.1 MIN
10
9
8
7
6
5
4
3
2
1
0.5
1.0
1.5
2.0
2.5
3.0
3.5
TIME(MIN)
46 4650
K+E SEMI-LOGARITHMIC 1 CYCLE X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

In-Situ Inc. MiniTroll Pro

Report generated: 10/31/01 8:51:22
Report from file: C:\Win-Situ\Data\SN01966 2001-10-24 101004 s57mw10rhno1.bin
DataMgr Version 3.68

Serial number: 1966
Firmware Version 3.01
Unit name: miniTROLL

Test name: s57mw10rhno1

Test defined on: 10/24/01 9:46:16
Test started on: 10/24/01 10:10:04
Test stopped on: 10/24/01 11:36:16
Test extracted on: N/A

Data gathered using Logarithmic testing
ıximum time between data points: 10. Minutes.
Number of data samples: 138

TOTAL DATA SAMPLES 138

Channel number [1]
Measurement type: Temperature
Channel name: OnBoard Temp

Channel number [2]
Measurement type: Pressure
Channel name: OnBoard Pressure
Sensor Range: 30 PSI.
Specific gravity: 1
Mode: TOC
User-defined reference: 0 Feet H2O
Referenced on: test start
Pressure head at reference: 6.466 Feet H2O

Date	Time	ET (min)	Chan[1] Celsius	Chan[2] Feet H2O	Adj ET (min)	h/ho	ho= 3.317
10/24/01	10:10	0	19.74	0			
10/24/01	10:10	0.005	19.74	3.619			
10/24/01	10:10	0.01	19.74	8.371			
10/24/01	10:10	0.015	19.75	3.642			
10/24/01	10:10	0.02	19.75	3.516			
10/24/01	10:10	0.025	19.75	3.377			
10/24/01	10:10	0.03	19.75	3.381			
10/24/01	10:10	0.035	19.75	3.35			
10/24/01	10:10	0.04	19.76	3.317	0	1	
10/24/01	10:10	0.045	19.76	3.301	0.005	0.995	
10/24/01	10:10	0.05	19.76	3.276	0.01	0.988	
10/24/01	10:10	0.055	19.76	3.245	0.015	0.978	
10/24/01	10:10	0.06	19.76	3.226	0.02	0.973	
10/24/01	10:10	0.065	19.76	3.208	0.025	0.967	
10/24/01	10:10	0.07	19.76	3.185	0.03	0.96	
10/24/01	10:10	0.075	19.76	3.168	0.035	0.955	
10/24/01	10:10	0.08	19.76	3.148	0.04	0.949	
10/24/01	10:10	0.0848	19.76	3.129	0.0448	0.943	

10/24/01 10:10	0.09	19.76	3.113	0.05	0.938
10/24/01 10:10	0.095	19.77	3.094	0.055	0.933
10/24/01 10:10	0.1	19.77	3.078	0.06	0.928
10/24/01 10:10	0.1058	19.77	3.057	0.0658	0.922
10/24/01 10:10	0.112	19.77	3.034	0.072	0.915
10/24/01 10:10	0.1185	19.77	3.013	0.0785	0.908
10/24/01 10:10	0.1255	19.77	2.989	0.0855	0.901
10/24/01 10:10	0.1328	19.77	2.964	0.0928	0.894
10/24/01 10:10	0.1407	19.77	2.939	0.1007	0.886
10/24/01 10:10	0.149	19.77	2.91	0.109	0.877
10/24/01 10:10	0.1578	19.77	2.883	0.1178	0.869
10/24/01 10:10	0.167	19.77	2.852	0.127	0.86
10/24/01 10:10	0.177	19.77	2.821	0.137	0.85
10/24/01 10:10	0.1875	19.77	2.79	0.1475	0.841
10/24/01 10:10	0.1985	19.77	2.755	0.1585	0.831
10/24/01 10:10	0.2102	19.77	2.72	0.1702	0.82
10/24/01 10:10	0.2227	19.76	2.684	0.1827	0.809
10/24/01 10:10	0.2358	19.76	2.645	0.1958	0.797
10/24/01 10:10	0.2498	19.76	2.606	0.2098	0.786
10/24/01 10:10	0.2647	19.76	2.564	0.2247	0.773
10/24/01 10:10	0.2803	19.76	2.521	0.2403	0.76
10/24/01 10:10	0.297	19.76	2.477	0.257	0.747
10/24/01 10:10	0.3147	19.76	2.43	0.2747	0.733
10/24/01 10:10	0.3333	19.76	2.382	0.2933	0.718
10/24/01 10:10	0.3532	19.76	2.332	0.3132	0.703
10/24/01 10:10	0.3742	19.76	2.283	0.3342	0.688
10/24/01 10:10	0.3963	19.76	2.231	0.3563	0.673
10/24/01 10:10	0.4198	19.76	2.177	0.3798	0.656
10/24/01 10:10	0.4447	19.76	2.125	0.4047	0.641
10/24/01 10:10	0.4697	19.76	2.072	0.4297	0.625
10/24/01 10:10	0.4963	19.76	2.016	0.4563	0.608
10/24/01 10:10	0.5247	19.76	1.96	0.4847	0.591
10/24/01 10:10	0.5547	19.76	1.902	0.5147	0.573
10/24/01 10:10	0.5863	19.76	1.844	0.5463	0.556
10/24/01 10:10	0.6213	19.76	1.782	0.5813	0.537
10/24/01 10:10	0.6578	19.76	1.72	0.6178	0.519
10/24/01 10:10	0.6963	19.76	1.658	0.6563	0.5
10/24/01 10:10	0.738	19.76	1.594	0.698	0.481
10/24/01 10:10	0.7813	19.76	1.532	0.7413	0.462
10/24/01 10:10	0.828	19.76	1.465	0.788	0.442
10/24/01 10:10	0.8763	19.76	1.403	0.8363	0.423
10/24/01 10:11	0.928	19.75	1.341	0.888	0.404
10/24/01 10:11	0.983	19.75	1.275	0.943	0.384
10/24/01 10:11	1.0413	19.75	1.211	1.0013	0.365
10/24/01 10:11	1.103	19.75	1.149	1.063	0.346
10/24/01 10:11	1.168	19.75	1.084	1.128	0.327
10/24/01 10:11	1.238	19.75	1.022	1.198	0.308
10/24/01 10:11	1.3113	19.75	0.964	1.2713	0.291
10/24/01 10:11	1.3897	19.75	0.911	1.3497	0.275
10/24/01 10:11	1.473	19.75	0.859	1.433	0.259
10/24/01 10:11	1.5613	19.75	0.818	1.5213	0.247
10/24/01 10:11	1.6547	19.75	0.78	1.6147	0.235
10/24/01 10:11	1.753	19.75	0.749	1.713	0.226
10/24/01 10:11	1.858	19.75	0.72	1.818	0.217
10/24/01 10:12	1.968	19.74	0.695	1.928	0.21
10/24/01 10:12	2.0847	19.75	0.673	2.0447	0.203
10/24/01 10:12	2.2097	19.74	0.65	2.1697	0.196
10/24/01 10:12	2.3412	19.74	0.631	2.3012	0.19
10/24/01 10:12	2.4813	19.74	0.614	2.4413	0.185
10/24/01 10:12	2.6297	19.74	0.598	2.5897	0.18

10/24/01 10:12	2.7863	19.74	0.586	2.7463	0.177
10/24/01 10:13	2.953	19.74	0.571	2.913	0.172
10/24/01 10:13	3.1297	19.74	0.559	3.0897	0.169
10/24/01 10:13	3.3163	19.74	0.546	3.2763	0.165
10/24/01 10:13	3.5147	19.74	0.534	3.4747	0.161
10/24/01 10:13	3.7247	19.74	0.521	3.6847	0.157
10/24/01 10:14	3.9463	19.74	0.511	3.9063	0.154
10/24/01 10:14	4.1813	19.74	0.499	4.1413	0.15
10/24/01 10:14	4.4295	19.74	0.486	4.3895	0.147
10/24/01 10:14	4.693	19.74	0.476	4.653	0.144
10/24/01 10:15	4.973	19.74	0.463	4.933	0.14
10/24/01 10:15	5.2697	19.74	0.451	5.2297	0.136
10/24/01 10:15	5.583	19.74	0.441	5.543	0.133
10/24/01 10:15	5.9147	19.74	0.43	5.8747	0.13
10/24/01 10:16	6.2663	19.74	0.42	6.2263	0.127
10/24/01 10:16	6.6397	19.74	0.408	6.5997	0.123
10/24/01 10:17	7.0347	19.74	0.397	6.9947	0.12
10/24/01 10:17	7.453	19.74	0.387	7.413	0.117
10/24/01 10:17	7.8963	19.74	0.377	7.8563	0.114
10/24/01 10:18	8.3663	19.74	0.368	8.3263	0.111
10/24/01 10:18	8.8647	19.74	0.358	8.8247	0.108
10/24/01 10:19	9.3913	19.72	0.347	9.3513	0.105
10/24/01 10:20	9.9497	19.72	0.337	9.9097	0.102
10/24/01 10:20	10.5413	19.72	0.329	10.5013	0.099
10/24/01 10:21	11.168	19.74	0.319	11.128	0.096
10/24/01 10:21	11.8313	19.74	0.31	11.7913	0.093
10/24/01 10:22	12.5347	19.74	0.302	12.4947	0.091
10/24/01 10:23	13.2797	19.74	0.294	13.2397	0.089
10/24/01 10:24	14.0697	19.74	0.283	14.0297	0.085
10/24/01 10:24	14.9063	19.72	0.273	14.8663	0.082
10/24/01 10:25	15.7913	19.72	0.265	15.7513	0.08
10/24/01 10:26	16.7297	19.72	0.256	16.6897	0.077
10/24/01 10:27	17.723	19.74	0.246	17.683	0.074
10/24/01 10:28	18.7763	19.74	0.238	18.7363	0.072
10/24/01 10:29	19.8913	19.72	0.227	19.8513	0.068
10/24/01 10:31	21.073	19.72	0.217	21.033	0.065
10/24/01 10:32	22.3247	19.72	0.211	22.2847	0.064
10/24/01 10:33	23.6497	19.74	0.201	23.6097	0.061
10/24/01 10:35	25.0547	19.74	0.194	25.0147	0.058
10/24/01 10:36	26.543	19.72	0.186	26.503	0.056
10/24/01 10:38	28.118	19.72	0.176	28.078	0.053
10/24/01 10:39	29.7863	19.74	0.168	29.7463	0.051
10/24/01 10:41	31.5547	19.74	0.159	31.5147	0.048
10/24/01 10:43	33.428	19.74	0.151	33.388	0.046
10/24/01 10:45	35.4112	19.74	0.139	35.3712	0.042
10/24/01 10:47	37.513	19.74	0.13	37.473	0.039
10/24/01 10:49	39.7397	19.72	0.124	39.6997	0.037
10/24/01 10:52	42.098	19.72	0.111	42.058	0.033
10/24/01 10:54	44.5963	19.72	0.103	44.5563	0.031
10/24/01 10:57	47.243	19.74	0.097	47.203	0.029
10/24/01 11:00	50.0463	19.74	0.091	50.0063	0.027
10/24/01 11:03	53.0147	19.74	0.083	52.9747	0.025
10/24/01 11:06	56.1597	19.72	0.078	56.1197	0.024
10/24/01 11:09	59.4913	19.72	0.078	59.4513	0.024
10/24/01 11:13	63.0197	19.72	0.076	62.9797	0.023
10/24/01 11:16	66.758	19.74	0.072	66.718	0.022
10/24/01 11:20	70.718	19.72	0.074	70.678	0.022
10/24/01 11:24	74.9113	19.74	0.072	74.8713	0.022
10/24/01 11:29	79.3547	19.74	0.07	79.3147	0.021
10/24/01 11:34	84.0613	19.74	0.064	84.0213	0.019

HYDRAULIC CONDUCTIVITY TESTING DATA SHEET

Tetra Tech NUS, Inc.

PROJECT NAME: INDIANHEAD SITE 57 FS WELL/BORING NO.: S57MW11

PROJECT NO.: 7129-2920 GEOLOGIST: FRED W. RAMSER

WELL DIAMETER: 2" SCREEN LENGTH/DEPTH: 10 / 10.61-20.61' TEST NO.:

STATIC WATER LEVEL (Depth/Elevation): 9.23 TPVC DATE: 10-24-01

TEST TYPE (Rising/Falling/Constant Head): RISING HEAD CHECKED:

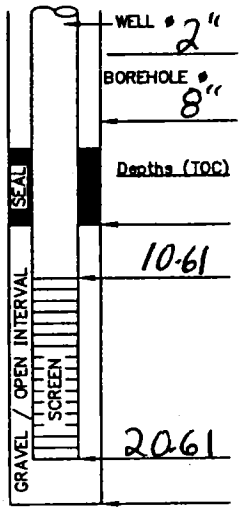
METHOD OF INDUCING WATER LEVEL CHANGE: 2 x 1 liter BAILERS PAGE ..... OF .....

REFERENCE PT. FOR WL MEAS. (Top of Casing, Transducer, etc.): 0.00 TOC

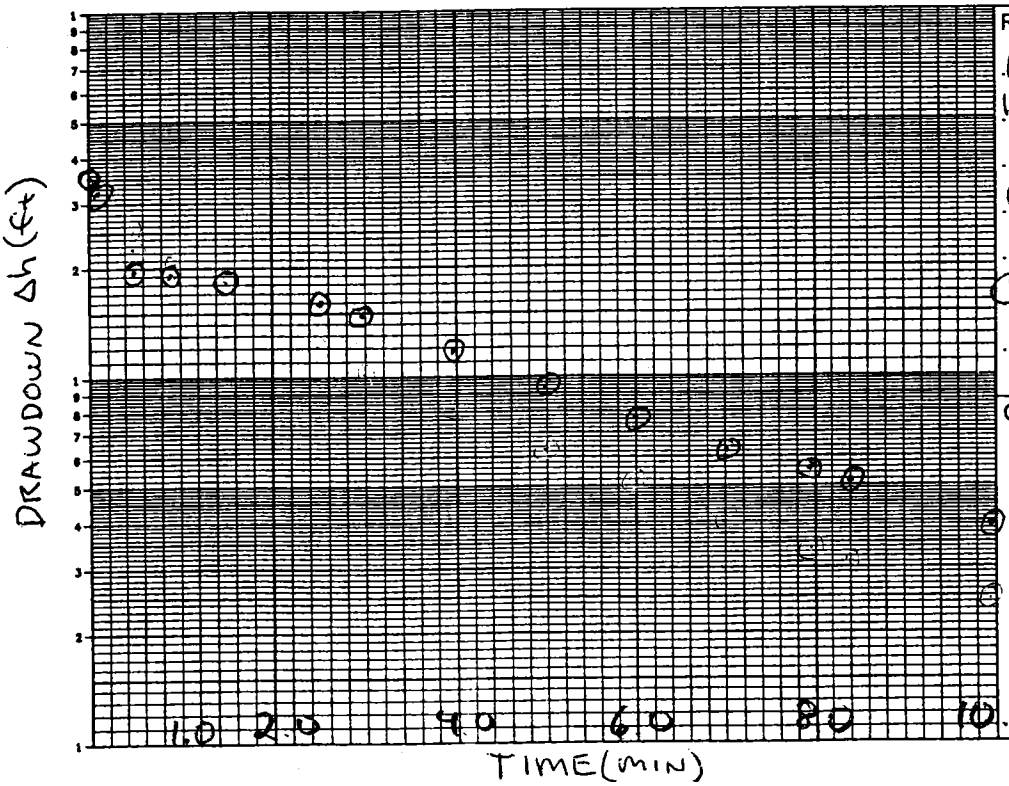
ACAD:FORM_HYDCONTST.dwg 07/06/99 INL

ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)	ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)
0.000		0.000	7.8962		0.542
0.035		3.300	8.3663		0.501
0.1488		2.289	9.9497		0.399
0.4963		1.995			
0.9828		1.891			
1.4728		1.814			
2.4812		1.589			
2.9530		1.487			
3.9463		1.173			
4.9728		0.935			
5.9145		0.770			
7.0345		0.627			

WELL SCHEMATIC



▽ Indicate SWL Depth on Drawing



REMARKS:
INSERTED BAILER 1635
START TEST @ 1705
STOP TEST @ 1743 WL = 9.31

CALCS, SKETCH MAPS, ETC.:

TETRA TECH NUS, INC. **CALCULATION WORKSHEET** PAGE _____ OF _____

CLIENT: INDIAN HEAD NSWC	JOB NUMBER: 7129 SITE 57 FS
SUBJECT: SLUG TEST WELL S57MW11	
BASED ON: HVORSLEV	DRAWING NUMBER:
BY: FRED R. / CHECKED BY:	APPROVED BY: / DATE: 11-2-01

EQ:

$$K = \frac{r^2 \ln(L/R)}{2LT_o}$$

WHERE:

$r = 0.083$ (RISER RADIUS, Ft)
$R = 0.083$ (SCREEN RADIUS, Ft)
$L = 10$ (INPUT LENGTH, Ft)
$T_o = 4.8$ min (FROM PLOT, MIN)
K = HYDRAULIC COND. (ft/min)

SUB:

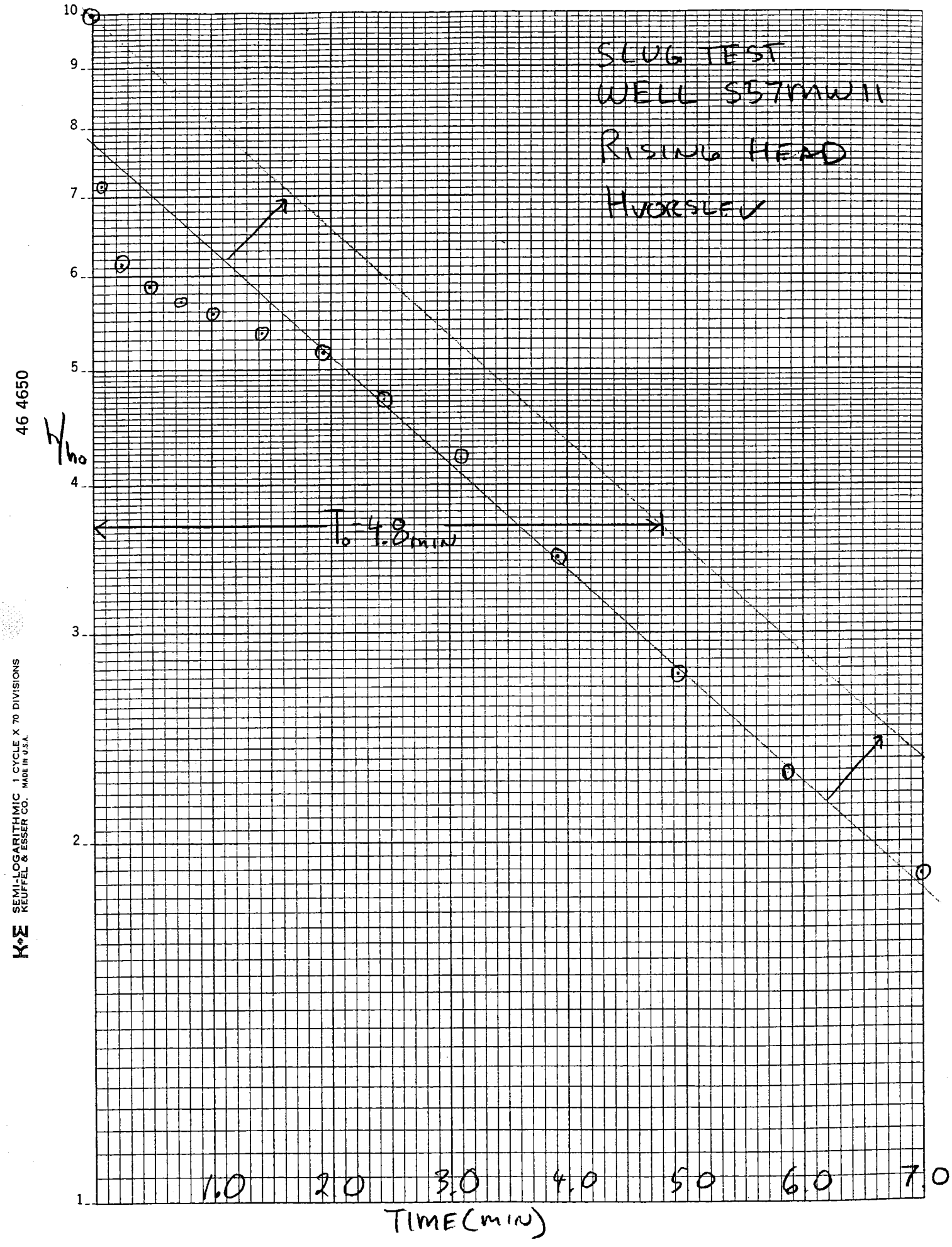
$$K = \frac{(0.083)^2 \ln(10/0.083)}{2(10)(4.8)}$$

$$= \frac{3.30086419 \times 10^{-2}}{96}$$

$$= 3.44 \times 10^{-4} \text{ ft/min}$$

$$= 1.75 \times 10^{-4} \text{ cm/sec}$$

$$= 0.495 \text{ ft/day}$$


SLUG TEST
WELL S57MW11
RISING HEAD
HVORSLEV
H/Ho
To=4.8 MIN
10
9
8
7
6
5
4
3
2
1
1.0
2.0
3.0
4.0
5.0
6.0
7.0
TIME (MIN)
46 4650
K+E SEMI-LOGARITHMIC 1 CYCLE X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

In-Situ Inc.	MiniTroll Pro
Report generated:	11/1/01 8:58:11
Report from file:	C:\Win-Situ\Data\SN01966 2001-10-24 170552 s57mw11rhno1.bin
DataMgr Version	3.68
Serial number:	1966
Firmware Version	3.01
Unit name:	miniTROLL
Test name:	s57mw11rhno1
Test defined on:	10/24/01 17:03:56
Test started on:	10/24/01 17:05:52
Test stopped on:	10/24/01 17:41:58
Test extracted on:	N/A

Data gathered using Logarithmic testing
Maximum time between data points:10.00(Minutes.
Number of data samples: 123

TOTAL DATA SAMPLES 123

Channel number [1]	
Measurement type:	Temperature
Channel name:	OnBoard Temp
Channel number [2]	
Measurement type:	Pressure
Channel name:	OnBoard Pressure
Sensor Range:	30 PSI.
Specific gravity:	1
Mode:	TOC
User-defined reference:	0 Feet H2O
Referenced on:	test start
Pressure head at reference:	9.863 Feet H2O

Date	Time	ET (min)	Chan[1] Celsius	Chan[2] Feet H2O	Adj ET (min)	h/ho	ho= 3.373
10/24/01	17:05	0	19.76	0			
10/24/01	17:05	0.005	19.77	-0.002			
10/24/01	17:05	0.01	19.77	-0.004			
10/24/01	17:05	0.015	19.77	8.798			
10/24/01	17:05	0.02	19.79	7.815			
10/24/01	17:05	0.025	19.79	4.012			
10/24/01	17:05	0.03	19.79	3.373	0	1.000	
10/24/01	17:05	0.035	19.79	3.3	0.005	0.978	
10/24/01	17:05	0.04	19.79	3.226	0.01	0.956	
10/24/01	17:05	0.045	19.79	3.128	0.015	0.927	
10/24/01	17:05	0.05	19.79	3.1	0.02	0.919	
10/24/01	17:05	0.055	19.8	3.034	0.025	0.899	
10/24/01	17:05	0.06	19.8	2.978	0.03	0.883	

10/24/01 17:05	0.065	19.8	2.926	0.035	0.867
10/24/01 17:05	0.07	19.8	2.876	0.04	0.853
10/24/01 17:05	0.075	19.8	2.829	0.045	0.839
10/24/01 17:05	0.08	19.8	2.765	0.05	0.820
10/24/01 17:05	0.0848	19.8	2.723	0.0548	0.807
10/24/01 17:05	0.09	19.8	2.68	0.06	0.795
10/24/01 17:05	0.095	19.8	2.638	0.065	0.782
10/24/01 17:05	0.1	19.8	2.595	0.07	0.769
10/24/01 17:05	0.1058	19.8	2.549	0.0758	0.756
10/24/01 17:05	0.112	19.8	2.502	0.082	0.742
10/24/01 17:06	0.1185	19.8	2.456	0.0885	0.728
10/24/01 17:06	0.1255	19.8	2.411	0.0955	0.715
10/24/01 17:06	0.1328	19.8	2.367	0.1028	0.702
10/24/01 17:06	0.1407	19.81	2.326	0.1107	0.690
10/24/01 17:06	0.149	19.81	2.289	0.119	0.679
10/24/01 17:06	0.1578	19.81	2.256	0.1278	0.669
10/24/01 17:06	0.167	19.8	2.225	0.137	0.660
10/24/01 17:06	0.177	19.8	2.2	0.147	0.652
10/24/01 17:06	0.1875	19.8	2.179	0.1575	0.646
10/24/01 17:06	0.1985	19.8	2.161	0.1685	0.641
10/24/01 17:06	0.2102	19.8	2.14	0.1802	0.634
10/24/01 17:06	0.2227	19.8	2.125	0.1927	0.630
10/24/01 17:06	0.2358	19.8	2.113	0.2058	0.626
10/24/01 17:06	0.2498	19.8	2.098	0.2198	0.622
10/24/01 17:06	0.2647	19.8	2.088	0.2347	0.619
10/24/01 17:06	0.2803	19.8	2.076	0.2503	0.615
10/24/01 17:06	0.297	19.8	2.067	0.267	0.613
10/24/01 17:06	0.3147	19.79	2.057	0.2847	0.610
10/24/01 17:06	0.3333	19.8	2.049	0.3033	0.607
10/24/01 17:06	0.3532	19.79	2.04	0.3232	0.605
10/24/01 17:06	0.3742	19.79	2.032	0.3442	0.602
10/24/01 17:06	0.3963	19.79	2.024	0.3663	0.600
10/24/01 17:06	0.4198	19.8	2.016	0.3898	0.598
10/24/01 17:06	0.4447	19.79	2.009	0.4147	0.596
10/24/01 17:06	0.4697	19.79	2.001	0.4397	0.593
10/24/01 17:06	0.4963	19.79	1.995	0.4663	0.591
10/24/01 17:06	0.5247	19.79	1.986	0.4947	0.589
10/24/01 17:06	0.5547	19.79	1.978	0.5247	0.586
10/24/01 17:06	0.5863	19.79	1.972	0.5563	0.585
10/24/01 17:06	0.6213	19.79	1.962	0.5913	0.582
10/24/01 17:06	0.6578	19.79	1.953	0.6278	0.579
10/24/01 17:06	0.6963	19.79	1.945	0.6663	0.577
10/24/01 17:06	0.738	19.79	1.937	0.708	0.574
10/24/01 17:06	0.7813	19.79	1.929	0.7513	0.572
10/24/01 17:06	0.828	19.79	1.92	0.798	0.569
10/24/01 17:06	0.8763	19.79	1.912	0.8463	0.567
10/24/01 17:06	0.928	19.79	1.902	0.898	0.564
10/24/01 17:06	0.983	19.79	1.891	0.953	0.561
10/24/01 17:06	1.0413	19.79	1.883	1.0113	0.558
10/24/01 17:06	1.103	19.79	1.873	1.073	0.555
10/24/01 17:07	1.168	19.77	1.864	1.138	0.553
10/24/01 17:07	1.238	19.77	1.852	1.208	0.549
10/24/01 17:07	1.3113	19.77	1.839	1.2813	0.545
10/24/01 17:07	1.3897	19.77	1.827	1.3597	0.542
10/24/01 17:07	1.473	19.77	1.814	1.443	0.538

10/24/01 17:07	1.5613	19.77	1.802	1.5313	0.534
10/24/01 17:07	1.6547	19.77	1.792	1.6247	0.531
10/24/01 17:07	1.753	19.77	1.775	1.723	0.526
10/24/01 17:07	1.858	19.77	1.759	1.828	0.521
10/24/01 17:07	1.968	19.77	1.744	1.938	0.517
10/24/01 17:07	2.0847	19.77	1.723	2.0547	0.511
10/24/01 17:08	2.2097	19.77	1.701	2.1797	0.504
10/24/01 17:08	2.3412	19.77	1.645	2.3112	0.488
10/24/01 17:08	2.4813	19.77	1.589	2.4513	0.471
10/24/01 17:08	2.6297	19.76	1.537	2.5997	0.456
10/24/01 17:08	2.7863	19.76	1.518	2.7563	0.450
10/24/01 17:08	2.953	19.76	1.487	2.923	0.441
10/24/01 17:09	3.1297	19.76	1.425	3.0997	0.422
10/24/01 17:09	3.3163	19.76	1.361	3.2863	0.403
10/24/01 17:09	3.5147	19.76	1.299	3.4847	0.385
10/24/01 17:09	3.7247	19.76	1.237	3.6947	0.367
10/24/01 17:09	3.9463	19.76	1.173	3.9163	0.348
10/24/01 17:10	4.1813	19.76	1.113	4.1513	0.330
10/24/01 17:10	4.4295	19.76	1.053	4.3995	0.312
10/24/01 17:10	4.693	19.76	0.989	4.663	0.293
10/24/01 17:10	4.973	19.76	0.935	4.943	0.277
10/24/01 17:11	5.2697	19.76	0.879	5.2397	0.261
10/24/01 17:11	5.583	19.76	0.823	5.553	0.244
10/24/01 17:11	5.9147	19.76	0.77	5.8847	0.228
10/24/01 17:12	6.2663	19.76	0.718	6.2363	0.213
10/24/01 17:12	6.6397	19.76	0.67	6.6097	0.199
10/24/01 17:12	7.0347	19.76	0.627	7.0047	0.186
10/24/01 17:13	7.453	19.76	0.581	7.423	0.172
10/24/01 17:13	7.8963	19.75	0.542	7.8663	0.161
10/24/01 17:14	8.3663	19.76	0.501	8.3363	0.149
10/24/01 17:14	8.8647	19.75	0.463	8.8347	0.137
10/24/01 17:15	9.3913	19.75	0.432	9.3613	0.128
10/24/01 17:15	9.9497	19.75	0.399	9.9197	0.118
10/24/01 17:16	10.5413	19.75	0.37	10.5113	0.110
10/24/01 17:17	11.168	19.75	0.343	11.138	0.102
10/24/01 17:17	11.8313	19.75	0.32	11.8013	0.095
10/24/01 17:18	12.5347	19.75	0.293	12.5047	0.087
10/24/01 17:19	13.2797	19.75	0.275	13.2497	0.082
10/24/01 17:19	14.0697	19.75	0.256	14.0397	0.076
10/24/01 17:20	14.9063	19.75	0.24	14.8763	0.071
10/24/01 17:21	15.7913	19.75	0.223	15.7613	0.066
10/24/01 17:22	16.7297	19.75	0.211	16.6997	0.063
10/24/01 17:23	17.723	19.75	0.196	17.693	0.058
10/24/01 17:24	18.7763	19.75	0.213	18.7463	0.063
10/24/01 17:25	19.8913	19.75	0.205	19.8613	0.061
10/24/01 17:26	21.073	19.75	0.186	21.043	0.055
10/24/01 17:28	22.3247	19.75	0.169	22.2947	0.050
10/24/01 17:29	23.6497	19.75	0.157	23.6197	0.047
10/24/01 17:30	25.0547	19.75	0.142	25.0247	0.042
10/24/01 17:32	26.543	19.75	0.134	26.513	0.040
10/24/01 17:34	28.118	19.75	0.122	28.088	0.036
10/24/01 17:35	29.7863	19.75	0.116	29.7563	0.034
10/24/01 17:37	31.5547	19.75	0.107	31.5247	0.032
10/24/01 17:39	33.428	19.75	0.099	33.398	0.029
10/24/01 17:41	35.4112	19.75	0.095	35.3812	0.028

HYDRAULIC CONDUCTIVITY TESTING DATA SHEET

Tetra Tech NUS, Inc.

PROJECT NAME: INDIANHEAD SITE 57 FS WELL/BORING NO.: S57MW12

PROJECT NO.: 7129-2920 GEOLOGIST: FRED W. RAMSER

WELL DIAMETER: 2" SCREEN LENGTH/DEPTH: 10' / 34.09 - 44.09 TEST NO.:

STATIC WATER LEVEL (Depth/Elevation): 6.08 TPVC DATE: 10-24-01

TEST TYPE (Rising/Falling/Constant Head): RISING HEAD CHECKED:

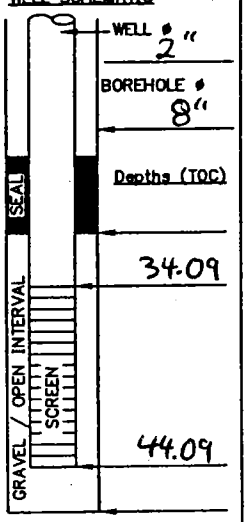
METHOD OF INDUCING WATER LEVEL CHANGE: 2 x 1 liter bailer PAGE ..... OF .....

REFERENCE PT. FOR WL MEAS. (Top of Casing, Transducer, etc.): TOC Ref to 0.00

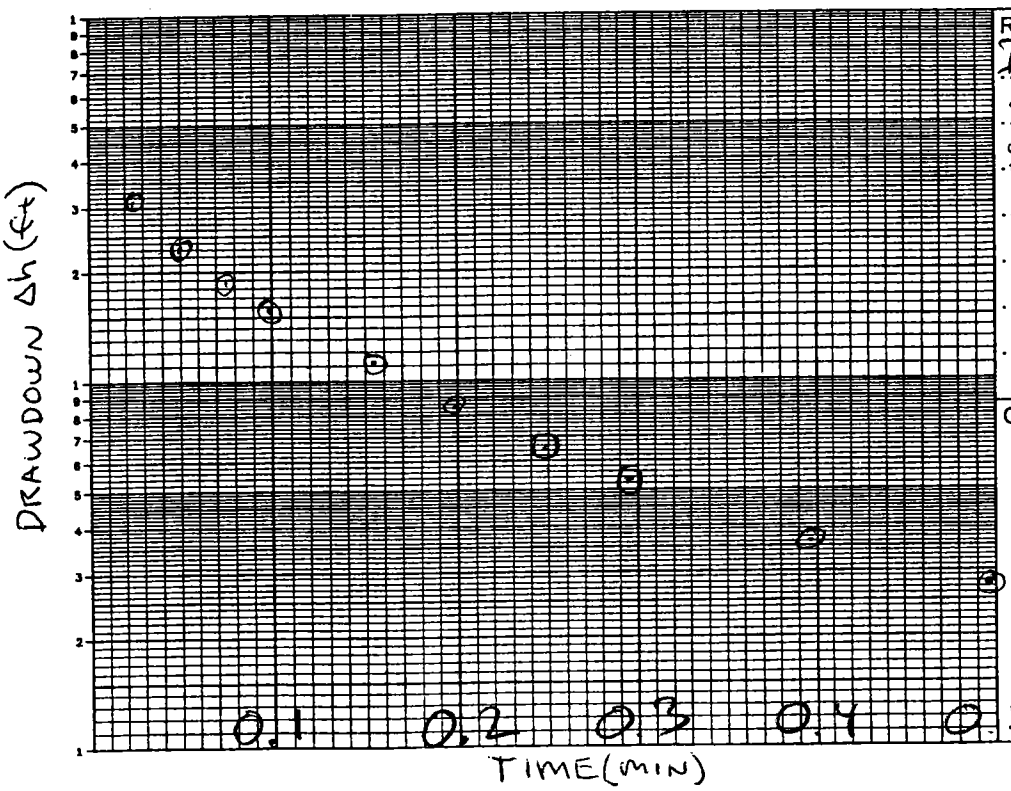
ACAD:FORM_HYDCONTST.dwg 07/06/99 INL

ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)	ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)
0.000		0.000			
0.025		3.110			
0.05		2.337			
0.075		1.888			
0.100		1.550			
0.1488		1.106			
0.1985		0.830			
0 2498		0.642			
0 2970		0.523			
0.3963		0.366			
0.4963		0 274			

WELL SCHEMATIC



▽ Indicate SWL Depth on Drawing



REMARKS:

INSERT SLUG @ 1300

STARTED TEST @ 1323

STOPPED 1336

CALCS, SKETCH MAPS, ETC.:

TETRA TECH NUS, INC. CALCULATION WORKSHEET PAGE ____ OF ____

CLIENT: INDIAN HEAD NSWC	JOB NUMBER: 7129 SITE 57 FS
SUBJECT: SLUG TEST WELL S57MW12 RISING HEAD	
BASED ON: HVORSLEV	DRAWING NUMBER:
BY: FRED R. / CHECKED BY: CK	APPROVED BY: / DATE: 11-2-01

EQ:

$$K = \frac{r^2 \ln(L/R)}{2L T_o}$$

WHERE:

$r = 0.083$ (RISER RADIUS, Ft)
$R = 0.083$ (SCREEN RADIUS, Ft)
$L = 10.0$ (INPUT LENGTH, Ft)
$T_o = 0.1325$ (FROM PLOT, MIN)
K = HYDRAULIC COND. (ft/min)

SUB:

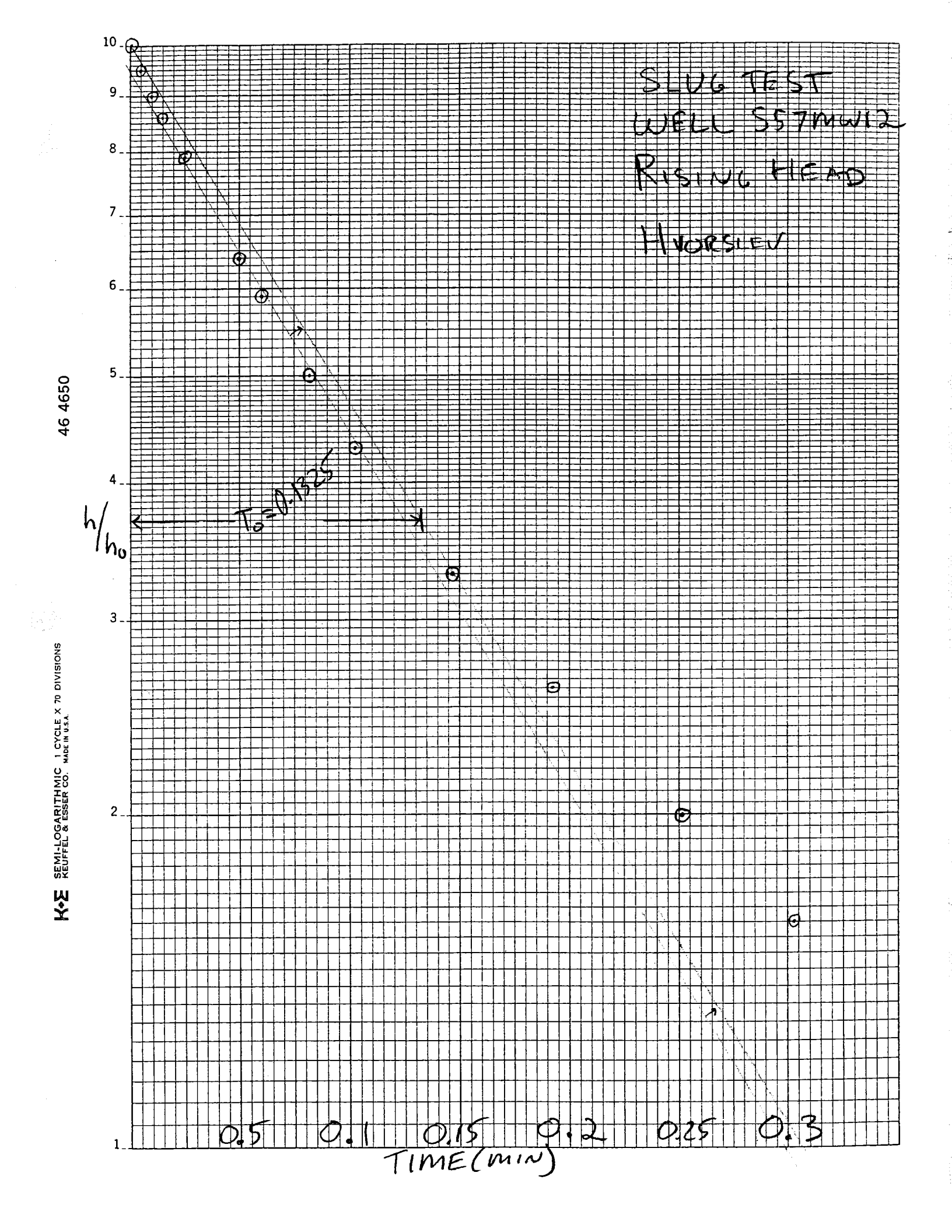
$$K = \frac{(0.083)^2 \ln(10/0.083)}{2(10)(0.1325)}$$

$$= \frac{3.30086419 \times 10^{-2}}{2.65}$$

$$= 1.25 \times 10^{-4} \text{ ft/min}$$

$$= 6.33 \times 10^{-3} \text{ cm/sec}$$

$$= 17.94 \text{ ft/day}$$


SLUG TEST
WELL 557MW12
RISING HEAD
HVORSLEV
h/h0
T0=0.1525
10
9
8
7
6
5
4
3
2
1
0.5
0.1
0.15
0.2
0.25
0.3
TIME(MIN)
46 4650
K+E SEMI-LOGARITHMIC 1 CYCLE X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

In-Situ Inc. MiniTroll Pro

Report generated: 10/30/01 16:04:31
Report from file: C:\Win-Situ\Data\SN01966 2001-10-24 132329 s57mw12rhno1.bin
DataMgr Version 3.68

Serial number: 1966
Firmware Version 3.01
Unit name: miniTROLL

Test name: s57mw12rhno1

Test defined on: 10/24/01 13:03:40
Test started on: 10/24/01 13:23:29
Test stopped on: 10/24/01 13:36:42
Test extracted on: N/A

Data gathered using Logarithmic testing
ximum time between data points: 10. Minutes.
Number of data samples: 105

TOTAL DATA SAMPLES 105

Channel number [1]
Measurement type: Temperature
Channel name: OnBoard Temp

Channel number [2]
Measurement type: Pressure
Channel name: OnBoard Pressure
Sensor Range: 30 PSI.
Specific gravity: 1
Mode: TOC
User-defined reference: 0 Feet H2O
Referenced on: test start
Pressure head at reference: 11.608 Feet H2O

Date	Time	ET (min)	Chan[1] Celsius	Chan[2] Feet H2O	Adj ET (min)	h/ho	ho= 2.837
10/24/01	13:23	0	17.05	0			
10/24/01	13:23	0.005	17.06	-0.002			
10/24/01	13:23	0.01	17.06	0.011			
10/24/01	13:23	0.015	17.06	5.728			
10/24/01	13:23	0.02	17.06	3.793			
10/24/01	13:23	0.025	17.08	3.11			
10/24/01	13:23	0.03	17.08	2.837	0	1.00	
10/24/01	13:23	0.035	17.08	2.707	0.005	0.95	
10/24/01	13:23	0.04	17.08	2.552	0.01	0.90	
10/24/01	13:23	0.045	17.08	2.452	0.015	0.86	

10/24/01 13:23	0.05	17.09	2.337	0.02	0.82
10/24/01 13:23	0.055	17.09	2.235	0.025	0.79
10/24/01 13:23	0.06	17.09	2.14	0.03	0.75
10/24/01 13:23	0.065	17.09	2.053	0.035	0.72
10/24/01 13:23	0.07	17.09	1.966	0.04	0.69
10/24/01 13:23	0.075	17.09	1.888	0.045	0.67
10/24/01 13:23	0.08	17.09	1.817	0.05	0.64
10/24/01 13:23	0.0848	17.09	1.741	0.0548	0.61
10/24/01 13:23	0.09	17.09	1.673	0.06	0.59
10/24/01 13:23	0.095	17.09	1.608	0.065	0.57
10/24/01 13:23	0.1	17.09	1.55	0.07	0.55
10/24/01 13:23	0.1058	17.09	1.486	0.0758	0.52
10/24/01 13:23	0.112	17.09	1.418	0.082	0.50
10/24/01 13:23	0.1185	17.09	1.356	0.0885	0.48
10/24/01 13:23	0.1255	17.09	1.29	0.0955	0.45
10/24/01 13:23	0.1328	17.09	1.228	0.1028	0.43
10/24/01 13:23	0.1407	17.09	1.166	0.1107	0.41
10/24/01 13:23	0.149	17.09	1.106	0.119	0.39
10/24/01 13:23	0.1578	17.09	1.046	0.1278	0.37
10/24/01 13:23	0.167	17.09	0.99	0.137	0.35
10/24/01 13:23	0.177	17.09	0.934	0.147	0.33
10/24/01 13:23	0.1875	17.08	0.88	0.1575	0.31
10/24/01 13:23	0.1985	17.08	0.83	0.1685	0.29
10/24/01 13:23	0.2102	17.08	0.781	0.1802	0.28
10/24/01 13:23	0.2227	17.08	0.731	0.1927	0.26
10/24/01 13:23	0.2358	17.06	0.685	0.2058	0.24
10/24/01 13:23	0.2498	17.06	0.642	0.2198	0.23
10/24/01 13:23	0.2647	17.06	0.6	0.2347	0.21
10/24/01 13:23	0.2803	17.05	0.561	0.2503	0.20
10/24/01 13:23	0.297	17.05	0.523	0.267	0.18
10/24/01 13:23	0.3147	17.05	0.488	0.2847	0.17
10/24/01 13:23	0.3333	17.04	0.455	0.3033	0.16
10/24/01 13:23	0.3532	17.04	0.424	0.3232	0.15
10/24/01 13:23	0.3742	17.04	0.393	0.3442	0.14
10/24/01 13:23	0.3963	17.03	0.366	0.3663	0.13
10/24/01 13:23	0.4198	17.03	0.339	0.3898	0.12
10/24/01 13:23	0.4447	17.01	0.314	0.4147	0.11
10/24/01 13:23	0.4697	17	0.293	0.4397	0.10
10/24/01 13:23	0.4963	17	0.274	0.4663	0.10
10/24/01 13:24	0.5247	16.99	0.253	0.4947	0.09
10/24/01 13:24	0.5547	16.99	0.234	0.5247	0.08
10/24/01 13:24	0.5863	16.98	0.218	0.5563	0.08
10/24/01 13:24	0.6213	16.96	0.201	0.5913	0.07
10/24/01 13:24	0.6578	16.95	0.186	0.6278	0.07
10/24/01 13:24	0.6963	16.94	0.173	0.6663	0.06
10/24/01 13:24	0.738	16.93	0.159	0.708	0.06
10/24/01 13:24	0.7813	16.91	0.146	0.7513	0.05
10/24/01 13:24	0.828	16.9	0.133	0.798	0.05
10/24/01 13:24	0.8763	16.89	0.123	0.8463	0.04
10/24/01 13:24	0.928	16.87	0.112	0.898	0.04
10/24/01 13:24	0.983	16.86	0.101	0.953	0.04
10/24/01 13:24	1.0413	16.85	0.091	1.0113	0.03

10/24/01 13:24	1.103	16.84	0.082	1.073	0.03
10/24/01 13:24	1.168	16.81	0.073	1.138	0.03
10/24/01 13:24	1.238	16.8	0.063	1.208	0.02
10/24/01 13:24	1.3113	16.79	0.058	1.2813	0.02
10/24/01 13:24	1.3897	16.77	0.052	1.3597	0.02
10/24/01 13:24	1.473	16.76	0.041	1.443	0.01
10/24/01 13:25	1.5613	16.75	0.035	1.5313	0.01
10/24/01 13:25	1.6547	16.72	0.03	1.6247	0.01
10/24/01 13:25	1.753	16.71	0.024	1.723	0.01
10/24/01 13:25	1.858	16.7	0.017	1.828	0.01
10/24/01 13:25	1.968	16.68	0.013	1.938	0.00
10/24/01 13:25	2.0847	16.67	0.008	2.0547	0.00
10/24/01 13:25	2.2097	16.66	0.004	2.1797	0.00
10/24/01 13:25	2.3412	16.65	0.002	2.3112	0.00
10/24/01 13:25	2.4813	16.63	0.001	2.4513	0.00
10/24/01 13:26	2.6297	16.62	-0.001	2.5997	0.00
10/24/01 13:26	2.7863	16.62	-0.005	2.7563	0.00
10/24/01 13:26	2.953	16.61	-0.008	2.923	0.00
10/24/01 13:26	3.1297	16.6	-0.012	3.0997	0.00
10/24/01 13:26	3.3163	16.58	-0.012	3.2863	0.00
10/24/01 13:27	3.5147	16.58	-0.014	3.4847	0.00
10/24/01 13:27	3.7247	16.57	-0.017	3.6947	-0.01
10/24/01 13:27	3.9463	16.57	-0.017	3.9163	-0.01
10/24/01 13:27	4.1813	16.56	-0.019	4.1513	-0.01
10/24/01 13:27	4.4295	16.56	-0.017	4.3995	-0.01
10/24/01 13:28	4.693	16.55	-0.019	4.663	-0.01
10/24/01 13:28	4.973	16.55	-0.019	4.943	-0.01
10/24/01 13:28	5.2697	16.55	-0.019	5.2397	-0.01
10/24/01 13:29	5.583	16.55	-0.021	5.553	-0.01
10/24/01 13:29	5.9147	16.55	-0.019	5.8847	-0.01
10/24/01 13:29	6.2663	16.55	-0.019	6.2363	-0.01
10/24/01 13:30	6.6397	16.55	-0.019	6.6097	-0.01
10/24/01 13:30	7.0347	16.55	-0.021	7.0047	-0.01
10/24/01 13:30	7.453	16.55	-0.021	7.423	-0.01
10/24/01 13:31	7.8963	16.55	-0.021	7.8663	-0.01
10/24/01 13:31	8.3663	16.55	-0.019	8.3363	-0.01
10/24/01 13:32	8.8647	16.56	-0.019	8.8347	-0.01
10/24/01 13:32	9.3913	16.56	-0.021	9.3613	-0.01
10/24/01 13:33	9.9497	16.56	-0.019	9.9197	-0.01
10/24/01 13:34	10.5413	16.57	-0.021	10.5113	-0.01
10/24/01 13:34	11.168	16.57	-0.019	11.138	-0.01
10/24/01 13:35	11.8313	16.58	-0.018	11.8013	-0.01
10/24/01 13:36	12.5347	16.58	-0.018	12.5047	-0.01

HYDRAULIC CONDUCTIVITY TESTING DATA SHEET

Tetra Tech NUS, Inc.

PROJECT NAME: INDIANHEAD SITE 57 FS WELL/BORING NO.: S57MW13

PROJECT NO.: 7129-2920 GEOLOGIST: FRED W. RAMSER

WELL DIAMETER: 2" SCREEN LENGTH/DEPTH: 10' / 7.76 - 17.76 TEST NO.:

STATIC WATER LEVEL (Depth/Elevation): 5.87 DATE: 10-24-01

TEST TYPE (Rising/Falling/Constant Head): RISING HEAD CHECKED:

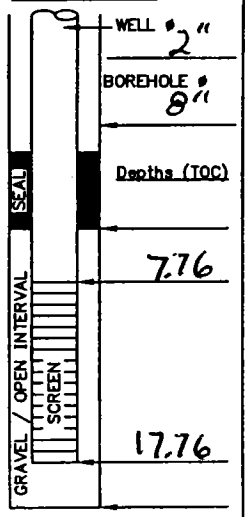
METHOD OF INDUCING WATER LEVEL CHANGE: 2 x 1 liter bailers PAGE ..... OF .....

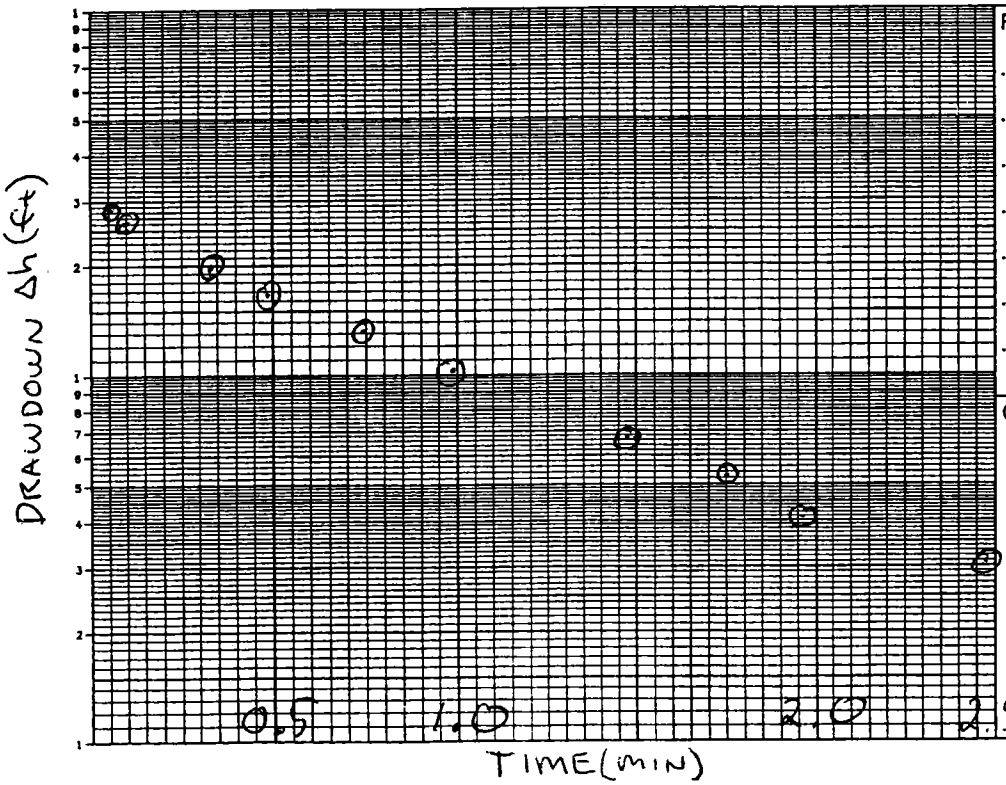
REFERENCE PT. FOR WL MEAS. (Top of Casing, Transducer, etc.): TOC Ref = 0.00

ACAD:FORM_HYDCONTST.dwg 07/06/99 INL

ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)	ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)
0.000		0.000			
0.025		3.098			
0.050		2.868			
0.100		2.622			
0.333		1.999			
0.4963		1.685			
0.7380		1.323			
0.9828		1.044			
1.4728		0.671			
1.7530		0.535			
1.9678		0.452			
2.4812		0.312			

WELL SCHEMATIC





REMARKS:

head = 11.577

INSERT BAILER 11.55 MPS

CALCS, SKETCH MAPS, ETC.:

TETRA TECH NUS, INC. CALCULATION WORKSHEET PAGE ____ OF ____

CLIENT: INDIAN HEAD NSWC	JOB NUMBER: 7129 SITE 57 FS
SUBJECT: SLUG TEST WELL S57MW13	
BASED ON: HVORSLEV	DRAWING NUMBER:
BY: FRED R. / CHECKED BY:	APPROVED BY: / DATE: 11-2-01

EQ:

$$K = \frac{r^2 \ln(L/R)}{2L T_o}$$

WHERE:

$r = 0.083$ (RISER RADIUS, Ft)
$R = 0.083$ (SCREEN RADIUS, Ft)
$L = 10$ (INPUT LENGTH, Ft)
$T_o = 1.002$ min (FROM PLOT, MIN)
K = HYDRAULIC COND. (ft/min)

SUB:

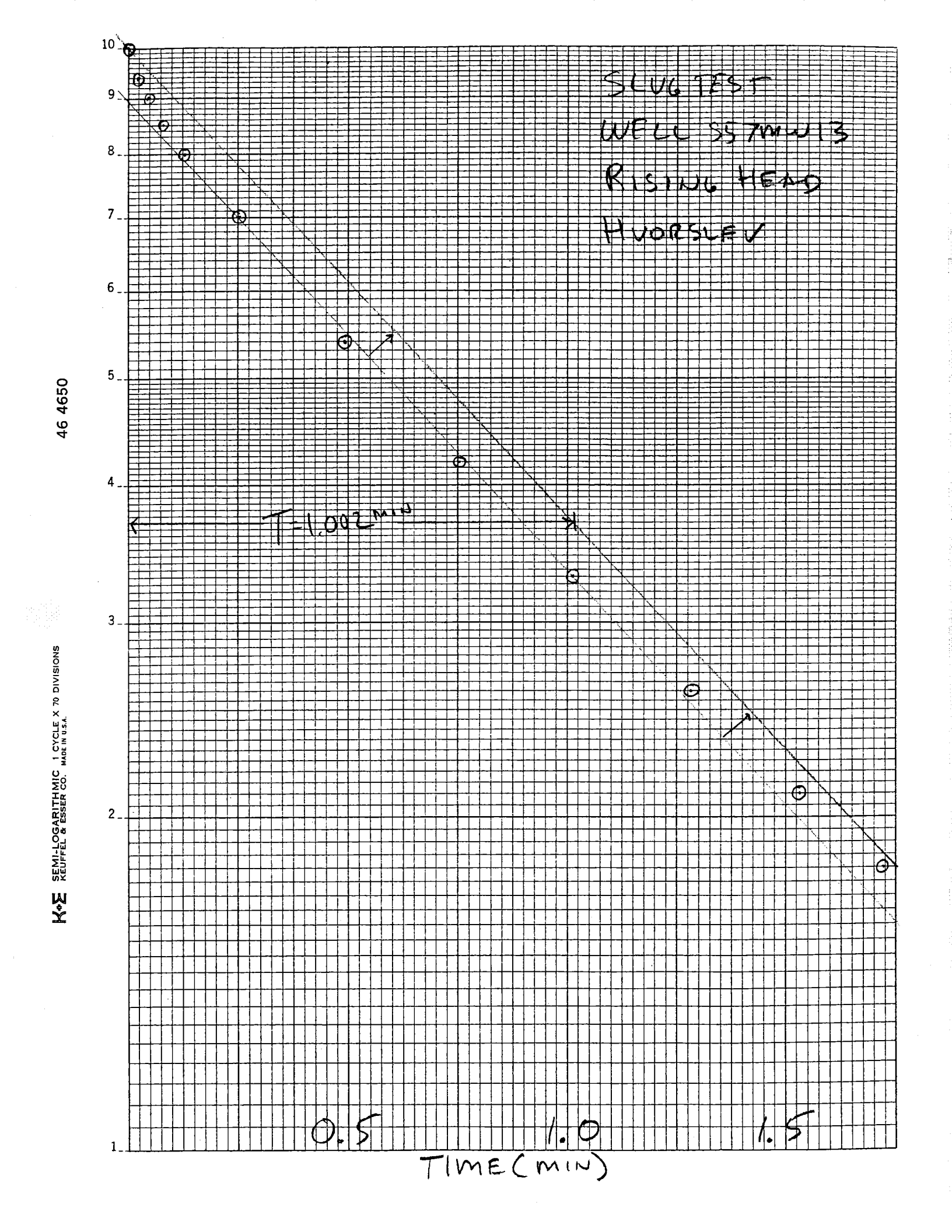
$$K = \frac{(0.083)^2 \ln(10/0.083)}{2(10)(1.002)}$$

$$\frac{3.30086419 \times 10^{-2}}{40.08} \longrightarrow$$

$= 1.65 \times 10^{-3}$ ft/min

$= 8.37 \times 10^{-4}$ cm/sec

$= 2.37$ ft/day


SLUG TEST
WELL SS7MW13
RISING HEAD
HVORSLEV
T=1.002 m²/d
10
9
8
7
6
5
4
3
2
1
0.5
1.0
1.5
TIME (MIN)
46 4650
K+E SEMI-LOGARITHMIC 1 CYCLE X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

In-Situ Inc.	MiniTroll Pro
Report generated:	11/1/01 9:59:42
Report from file:	C:\Win-Situ\Data\SN01966 2001-10-24 123922 s57mw13rhno1.bin
DataMgr Version	3.68
Serial number:	1966
Firmware Version	3.01
Unit name:	miniTROLL
Test name:	s57mw13rhno1
Test defined on:	10/24/01 11:51:42
Test started on:	10/24/01 12:39:22
Test stopped on:	10/24/01 12:53:12
Test extracted on:	N/A

ata gathered using Logarithmic testing
mum time between data points: 1 Minutes.
Number of data samples: 106

TOTAL DATA SAMPLES 106

Channel number [1]
Measurement type: Temperature
Channel name: OnBoard Temp

Channel number [2]
Measurement type: Pressure
Channel name: OnBoard Pressure
Sensor Range: 30 PSI.
Specific gravity: 1
Mode: TOC
User-defined reference: 0 Feet H2O
Referenced on: test start
Pressure head at reference: 11.56 Feet H2O

Date	Time	ET (min)	Chan[1] Celsius	Chan[2] Feet H2O	Adj ET (min)	h/ho	ho= 3.027
10/24/01	12:39	0	17.17	0			
10/24/01	12:39	0.005	17.18	0.004			
10/24/01	12:39	0.01	17.18	3.412			
10/24/01	12:39	0.015	17.19	7.659			
10/24/01	12:39	0.02	17.19	3.075			
10/24/01	12:39	0.025	17.19	3.098			
10/24/01	12:39	0.03	17.19	3.027	0	1	
10/24/01	12:39	0.035	17.19	2.963	0.005	0.98	
10/24/01	12:39	0.04	17.19	2.943	0.01	0.97	
10/24/01	12:39	0.045	17.19	2.893	0.015	0.96	

10/24/01 12:39	0.05	17.2	2.868	0.02	0.95
10/24/01 12:39	0.055	17.2	2.835	0.025	0.94
10/24/01 12:39	0.06	17.2	2.81	0.03	0.93
10/24/01 12:39	0.065	17.2	2.79	0.035	0.92
10/24/01 12:39	0.07	17.2	2.765	0.04	0.91
10/24/01 12:39	0.075	17.2	2.726	0.045	0.9
10/24/01 12:39	0.08	17.2	2.711	0.05	0.9
10/24/01 12:39	0.0848	17.2	2.688	0.0548	0.89
10/24/01 12:39	0.09	17.2	2.668	0.06	0.88
10/24/01 12:39	0.095	17.2	2.643	0.065	0.87
10/24/01 12:39	0.1	17.2	2.622	0.07	0.87
10/24/01 12:39	0.1058	17.2	2.599	0.0758	0.86
10/24/01 12:39	0.112	17.2	2.577	0.082	0.85
10/24/01 12:39	0.1185	17.2	2.556	0.0885	0.84
10/24/01 12:39	0.1255	17.2	2.533	0.0955	0.84
10/24/01 12:39	0.1328	17.22	2.509	0.1028	0.83
10/24/01 12:39	0.1407	17.22	2.484	0.1107	0.82
10/24/01 12:39	0.149	17.22	2.459	0.119	0.81
10/24/01 12:39	0.1578	17.22	2.432	0.1278	0.8
10/24/01 12:39	0.167	17.22	2.405	0.137	0.79
10/24/01 12:39	0.177	17.2	2.378	0.147	0.79
10/24/01 12:39	0.1875	17.2	2.349	0.1575	0.78
10/24/01 12:39	0.1985	17.2	2.32	0.1685	0.77
10/24/01 12:39	0.2102	17.2	2.289	0.1802	0.76
10/24/01 12:39	0.2227	17.2	2.256	0.1927	0.75
10/24/01 12:39	0.2358	17.2	2.223	0.2058	0.73
10/24/01 12:39	0.2498	17.2	2.19	0.2198	0.72
10/24/01 12:39	0.2647	17.2	2.155	0.2347	0.71
10/24/01 12:39	0.2803	17.2	2.117	0.2503	0.7
10/24/01 12:39	0.297	17.2	2.08	0.267	0.69
10/24/01 12:39	0.3147	17.19	2.038	0.2847	0.67
10/24/01 12:39	0.3333	17.2	1.999	0.3033	0.66
10/24/01 12:39	0.3532	17.2	1.956	0.3232	0.65
10/24/01 12:39	0.3742	17.19	1.912	0.3442	0.63
10/24/01 12:39	0.3963	17.19	1.869	0.3663	0.62
10/24/01 12:39	0.4198	17.19	1.823	0.3898	0.6
10/24/01 12:39	0.4447	17.2	1.778	0.4147	0.59
10/24/01 12:39	0.4697	17.19	1.732	0.4397	0.57
10/24/01 12:39	0.4963	17.19	1.685	0.4663	0.56
10/24/01 12:39	0.5247	17.19	1.637	0.4947	0.54
10/24/01 12:39	0.5547	17.2	1.588	0.5247	0.52
10/24/01 12:39	0.5863	17.19	1.538	0.5563	0.51
10/24/01 12:39	0.6213	17.19	1.484	0.5913	0.49
10/24/01 12:40	0.6578	17.19	1.432	0.6278	0.47
10/24/01 12:40	0.6963	17.2	1.377	0.6663	0.45
10/24/01 12:40	0.738	17.19	1.323	0.708	0.44
10/24/01 12:40	0.7813	17.2	1.267	0.7513	0.42
10/24/01 12:40	0.828	17.2	1.211	0.798	0.4
10/24/01 12:40	0.8763	17.2	1.155	0.8463	0.38
10/24/01 12:40	0.928	17.2	1.099	0.898	0.36
10/24/01 12:40	0.983	17.2	1.044	0.953	0.34
10/24/01 12:40	1.0413	17.2	0.99	1.0113	0.33

10/24/01 12:40	1.103	17.2	0.934	1.073	0.31
10/24/01 12:40	1.168	17.2	0.878	1.138	0.29
10/24/01 12:40	1.238	17.2	0.826	1.208	0.27
10/24/01 12:40	1.3113	17.22	0.773	1.2813	0.26
10/24/01 12:40	1.3897	17.22	0.721	1.3597	0.24
10/24/01 12:40	1.473	17.22	0.671	1.443	0.22
10/24/01 12:40	1.5613	17.22	0.624	1.5313	0.21
10/24/01 12:41	1.6547	17.22	0.58	1.6247	0.19
10/24/01 12:41	1.753	17.22	0.535	1.723	0.18
10/24/01 12:41	1.858	17.22	0.493	1.828	0.16
10/24/01 12:41	1.968	17.22	0.452	1.938	0.15
10/24/01 12:41	2.0847	17.23	0.415	2.0547	0.14
10/24/01 12:41	2.2097	17.23	0.378	2.1797	0.12
10/24/01 12:41	2.3412	17.23	0.345	2.3112	0.11
10/24/01 12:41	2.4813	17.23	0.312	2.4513	0.1
10/24/01 12:42	2.6297	17.23	0.283	2.5997	0.09
10/24/01 12:42	2.7863	17.23	0.256	2.7563	0.08
10/24/01 12:42	2.953	17.23	0.229	2.923	0.08
10/24/01 12:42	3.1297	17.23	0.208	3.0997	0.07
10/24/01 12:42	3.3163	17.24	0.188	3.2863	0.06
10/24/01 12:42	3.5147	17.24	0.171	3.4847	0.06
10/24/01 12:43	3.7247	17.24	0.155	3.6947	0.05
10/24/01 12:43	3.9463	17.24	0.142	3.9163	0.05
10/24/01 12:43	4.1813	17.24	0.13	4.1513	0.04
10/24/01 12:43	4.4295	17.25	0.118	4.3995	0.04
10/24/01 12:44	4.693	17.25	0.11	4.663	0.04
10/24/01 12:44	4.973	17.25	0.101	4.943	0.03
10/24/01 12:44	5.2697	17.27	0.095	5.2397	0.03
10/24/01 12:44	5.583	17.27	0.089	5.553	0.03
10/24/01 12:45	5.9147	17.28	0.087	5.8847	0.03
10/24/01 12:45	6.2663	17.29	0.077	6.2363	0.03
10/24/01 12:46	6.6397	17.29	0.077	6.6097	0.03
10/24/01 12:46	7.0347	17.31	0.073	7.0047	0.02
10/24/01 12:46	7.453	17.32	0.074	7.423	0.02
10/24/01 12:47	7.8963	17.33	0.07	7.8663	0.02
10/24/01 12:47	8.3663	17.34	0.07	8.3363	0.02
10/24/01 12:48	8.8647	17.34	0.07	8.8347	0.02
10/24/01 12:48	9.3913	17.36	0.066	9.3613	0.02
10/24/01 12:49	9.9497	17.36	0.07	9.9197	0.02
10/24/01 12:49	10.5413	17.37	0.071	10.5113	0.02
10/24/01 12:50	11.168	17.37	0.069	11.138	0.02
10/24/01 12:51	11.8313	17.37	0.071	11.8013	0.02
10/24/01 12:51	12.5347	17.38	0.071	12.5047	0.02
10/24/01 12:52	13.2797	17.38	0.071	13.2497	0.02

HYDRAULIC CONDUCTIVITY TESTING DATA SHEET

Tetra Tech NUS, Inc.

PROJECT NAME: INDIANHEAD SITE 57 FS WELL/BORING NO.: S57TW15

PROJECT NO.: 7129-2920 GEOLOGIST: FRED W. RAMSER

WELL DIAMETER: 1" SCREEN LENGTH/DEPTH: 5' / TEST NO.: 1

STATIC WATER LEVEL (Depth/Elevation): 8.70 TPVC DATE: 10-3-01

TEST TYPE (Rising/Falling/Constant Head): RISING HEAD CHECKED:

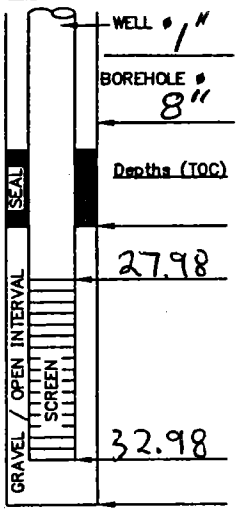
METHOD OF INDUCING WATER LEVEL CHANGE: ~~PE BAILER~~ 3'/4" x 3/8" 6' x 1/2" STEEL SLUG PAGE ..... OF .....

REFERENCE PT. FOR WL MEAS. (Top of Casing, Transducer, etc.):

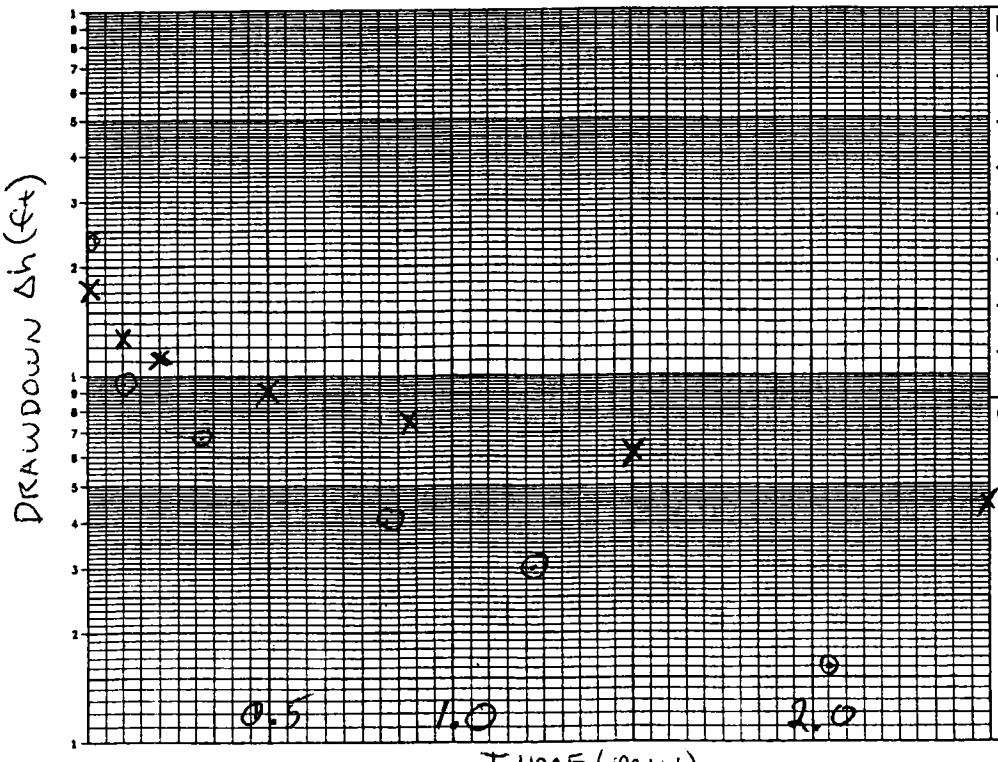
ACAD:FORM_HYDCONTST.dwg 07/06/99 INL

FALLING HEAD			RISING HEAD		
ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)	ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)
0.00	16.23		0.00	16.05	
0.035	18.60	2.37	0.02	14.29	1.73
0.100	17.18	0.95	0.10	14.78	1.27
0.333	16.91	0.68	0.21	14.93	1.12
0.83	16.63	0.40	0.50	15.13	0.92
1.24	16.53	0.30	0.88	15.30	0.75
2.2	16.39	0.16	1.50	15.44	0.61
			2.48	15.60	0.45

WELL SCHEMATIC



▽ Indicate SWL Depth on Drawing



REMARKS:

REDO TEST
10-4-01
- PLACED X-DUCER
23' BTPVC
- 16.25' OF WATER ABOVE X-DUCER
SWL @ 8.68 START OF RISING HEAD

CALCS, SKETCH MAPS, ETC.:

FALLING HEAD ⊙
RISING HEAD 'X'

REDO = 2 FH
TEST II 3 RH

~ 1.4' DISPLACEMENT W/ SLUG

TETRA TECH NUS, INC. CALCULATION WORKSHEET PAGE ____ OF ____

CLIENT: INDIAN HEAD NSWC	JOB NUMBER: 7129 SITE 57 FS
SUBJECT: SLUG TEST WELL S57TW15 RISING HEAD	
BASED ON: HVORSLEV	DRAWING NUMBER:
BY: FRED R. / CHECKED BY:	APPROVED BY: / DATE: 11-2-01

EQ:

$$K = \frac{r^2 \ln(L/R)}{2LT_o}$$

WHERE:

$r = 0.041667$ (RISER RADIUS, Ft)
$R = 0.041667$ (SCREEN RADIUS, Ft)
$L = 5'$ (INPUT LENGTH, Ft)
$T_o = 3.0$ (FROM PLOT, MIN)
$K =$ HYDRAULIC COND. (ft/min)

SUB:

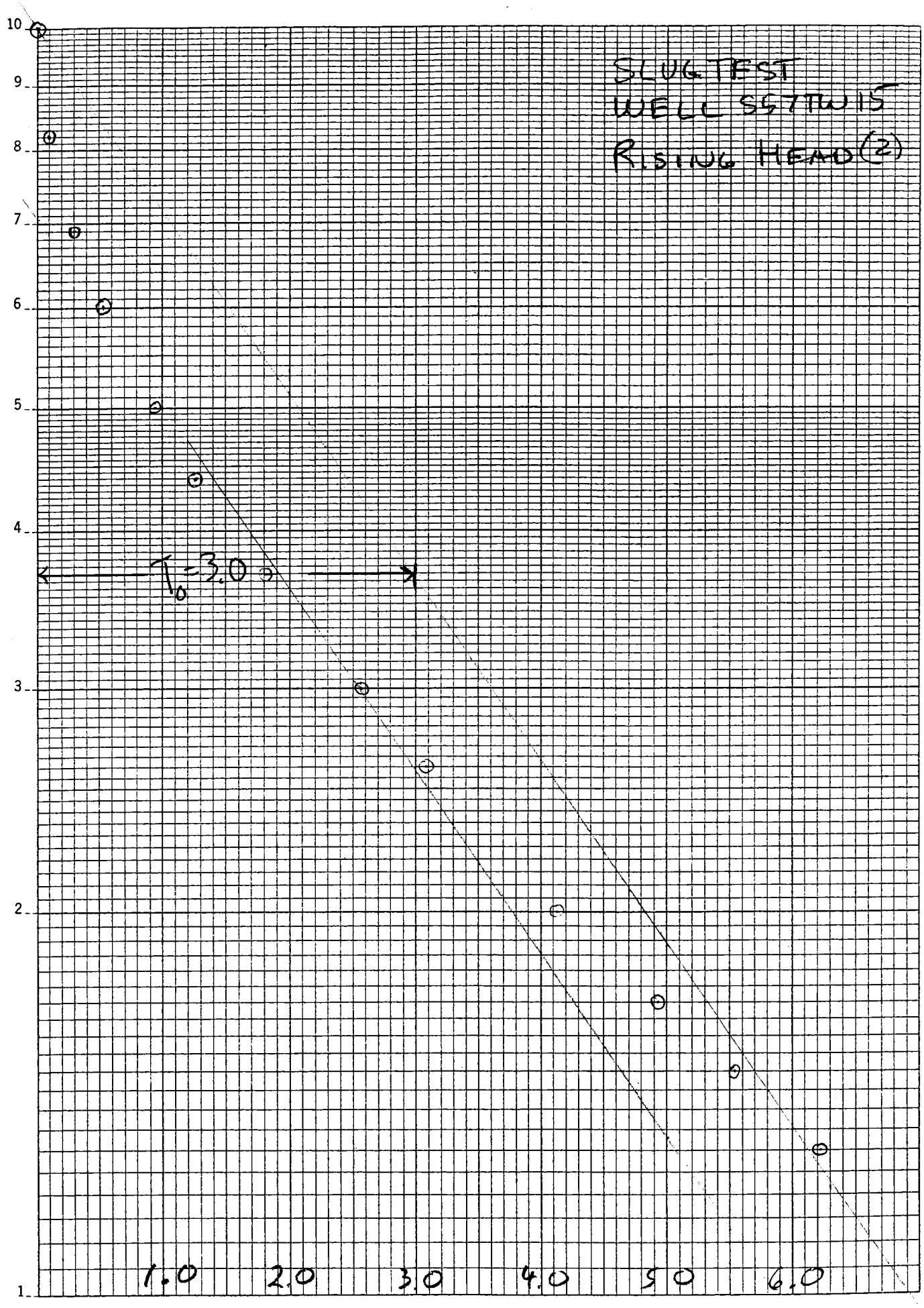
$$K = \frac{(0.041667)^2 \ln(5/0.041667)}{2(5)(3.0)}$$

$$\frac{8.31160372 \times 10^{-3}}{30}$$

$= 2.8 \times 10^{-4}$ ft/min

$= 1.4 \times 10^{-4}$ cm/sec

$= 3.99 \times 10^{-1}$ ft/day ✓



46 4650
K+E SEMI-LOGARITHMIC 1 CYCLE X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

In-Situ Inc. MiniTroll Pro

Report generated: 10/18/01 13:17:22
Report from file: C:\Win-Situ\Data\SN00956 2001-10-04 155054 s57tw15rhno3.bin
DataMgr Version 3.68

Serial number: 956
Firmware Version 3.01
Unit name: P-4

Test name: s57tw15rhno3

Test defined on: 10/4/01 15:50:05
Test started on: 10/4/01 15:50:54
Test stopped on: 10/4/01 16:11:04
Test extracted on: N/A

Data gathered using Logarithmic testing
Maximum time between ‹ Minutes.
Number of data samples 113

TOTAL DATA SAMPLES 113

Channel number [1]
Measurement type: Temperature
Channel name: OnBoard Temp

Channel number [2]
Measurement type: Pressure
Channel name: OnBoard Pressure
Sensor Range: 30 PSI.
Specific gravity: 1
Mode: TOC
User-defined reference: 0 Feet H2O
Referenced on: test start
Pressure head at referen‹ 16.049 Feet H2O

Date	Time	ET (min)	Chan[1] Celsius	Chan[2] Feet H2O	ET (min) adj	h/ho	ho= 1.45
10/4/01	15:50	0	16.49	0			
10/4/01	15:50	0.005	16.52	-0.027			
10/4/01	15:50	0.01	16.52	1.471			
10/4/01	15:50	0.015	16.52	2.243			
10/4/01	15:50	0.02	16.52	1.763			
10/4/01	15:50	0.025	16.52	1.611			
10/4/01	15:50	0.03	16.53	1.684			
10/4/01	15:50	0.035	16.53	1.579			
10/4/01	15:50	0.04	16.53	1.518			
10/4/01	15:50	0.045	16.53	1.482			

10/4/01 15:50	0.05	16.53	1.45	0	1.00
10/4/01 15:50	0.055	16.53	1.411	0.005	0.97
10/4/01 15:50	0.06	16.54	1.394	0.01	0.96
10/4/01 15:50	0.065	16.54	1.368	0.015	0.94
10/4/01 15:50	0.07	16.54	1.347	0.02	0.93
10/4/01 15:50	0.075	16.54	1.325	0.025	0.91
10/4/01 15:50	0.08	16.54	1.314	0.03	0.91
10/4/01 15:50	0.0848	16.54	1.304	0.0348	0.90
10/4/01 15:50	0.09	16.54	1.297	0.04	0.89
10/4/01 15:50	0.095	16.54	1.245	0.045	0.86
10/4/01 15:51	0.1	16.54	1.276	0.05	0.88
10/4/01 15:51	0.1058	16.54	1.25	0.0558	0.86
10/4/01 15:51	0.112	16.54	1.241	0.062	0.86
10/4/01 15:51	0.1185	16.54	1.23	0.0685	0.85
10/4/01 15:51	0.1255	16.54	1.22	0.0755	0.84
10/4/01 15:51	0.1328	16.54	1.207	0.0828	0.83
10/4/01 15:51	0.1407	16.54	1.198	0.0907	0.83
10/4/01 15:51	0.149	16.54	1.187	0.099	0.82
10/4/01 15:51	0.1578	16.55	1.177	0.1078	0.81
10/4/01 15:51	0.167	16.53	1.168	0.117	0.81
10/4/01 15:51	0.177	16.53	1.159	0.127	0.80
10/4/01 15:51	0.1875	16.53	1.148	0.1375	0.79
10/4/01 15:51	0.1985	16.53	1.137	0.1485	0.78
10/4/01 15:51	0.2102	16.53	1.125	0.1602	0.78
10/4/01 15:51	0.2227	16.53	1.114	0.1727	0.77
10/4/01 15:51	0.2358	16.52	1.103	0.1858	0.76
10/4/01 15:51	0.2498	16.52	1.09	0.1998	0.75
10/4/01 15:51	0.2647	16.52	1.075	0.2147	0.74
10/4/01 15:51	0.2803	16.52	1.064	0.2303	0.73
10/4/01 15:51	0.297	16.52	1.049	0.247	0.72
10/4/01 15:51	0.3147	16.52	1.034	0.2647	0.71
10/4/01 15:51	0.3333	16.52	1.021	0.2833	0.70
10/4/01 15:51	0.3532	16.52	1.006	0.3032	0.69
10/4/01 15:51	0.3742	16.52	0.991	0.3242	0.68
10/4/01 15:51	0.3963	16.52	0.978	0.3463	0.67
10/4/01 15:51	0.4198	16.52	0.963	0.3698	0.66
10/4/01 15:51	0.4447	16.52	0.946	0.3947	0.65
10/4/01 15:51	0.4697	16.52	0.935	0.4197	0.64
10/4/01 15:51	0.4963	16.5	0.917	0.4463	0.63
10/4/01 15:51	0.5247	16.52	0.905	0.4747	0.62
10/4/01 15:51	0.5547	16.52	0.89	0.5047	0.61
10/4/01 15:51	0.5863	16.5	0.874	0.5363	0.60
10/4/01 15:51	0.6213	16.5	0.857	0.5713	0.59
10/4/01 15:51	0.6578	16.5	0.842	0.6078	0.58
10/4/01 15:51	0.6963	16.5	0.825	0.6463	0.57
10/4/01 15:51	0.738	16.5	0.807	0.688	0.56
10/4/01 15:51	0.7813	16.5	0.792	0.7313	0.55
10/4/01 15:51	0.828	16.49	0.777	0.778	0.54
10/4/01 15:51	0.8763	16.49	0.76	0.8263	0.52
10/4/01 15:51	0.928	16.49	0.743	0.878	0.51
10/4/01 15:51	0.983	16.49	0.725	0.933	0.50
10/4/01 15:51	1.0413	16.49	0.708	0.9913	0.49

10/4/01 15:52	1.103	16.48	0.693	1.053	0.48
10/4/01 15:52	1.168	16.48	0.675	1.118	0.47
10/4/01 15:52	1.238	16.48	0.658	1.188	0.45
10/4/01 15:52	1.3113	16.47	0.641	1.2613	0.44
10/4/01 15:52	1.3897	16.47	0.623	1.3397	0.43
10/4/01 15:52	1.473	16.47	0.606	1.423	0.42
10/4/01 15:52	1.5613	16.47	0.587	1.5113	0.40
10/4/01 15:52	1.6547	16.47	0.57	1.6047	0.39
10/4/01 15:52	1.753	16.45	0.552	1.703	0.38
10/4/01 15:52	1.858	16.45	0.535	1.808	0.37
10/4/01 15:52	1.968	16.45	0.518	1.918	0.36
10/4/01 15:52	2.0847	16.45	0.5	2.0347	0.34
10/4/01 15:53	2.2097	16.44	0.483	2.1597	0.33
10/4/01 15:53	2.3412	16.44	0.463	2.2912	0.32
10/4/01 15:53	2.4813	16.43	0.448	2.4313	0.31
10/4/01 15:53	2.6297	16.43	0.429	2.5797	0.30
10/4/01 15:53	2.7863	16.43	0.411	2.7363	0.28
10/4/01 15:53	2.953	16.43	0.394	2.903	0.27
10/4/01 15:54	3.1297	16.41	0.377	3.0797	0.26
10/4/01 15:54	3.3163	16.41	0.359	3.2663	0.25
10/4/01 15:54	3.5147	16.41	0.342	3.4647	0.24
10/4/01 15:54	3.7247	16.41	0.325	3.6747	0.22
10/4/01 15:54	3.9463	16.4	0.31	3.8963	0.21
10/4/01 15:55	4.1813	16.4	0.292	4.1313	0.20
10/4/01 15:55	4.4295	16.4	0.277	4.3795	0.19
10/4/01 15:55	4.693	16.4	0.26	4.643	0.18
10/4/01 15:55	4.973	16.4	0.245	4.923	0.17
10/4/01 15:56	5.2697	16.39	0.23	5.2197	0.16
10/4/01 15:56	5.583	16.39	0.215	5.533	0.15
10/4/01 15:56	5.9147	16.39	0.202	5.8647	0.14
10/4/01 15:57	6.2663	16.39	0.187	6.2163	0.13
10/4/01 15:57	6.6397	16.39	0.172	6.5897	0.12
10/4/01 15:57	7.0347	16.39	0.161	6.9847	0.11
10/4/01 15:58	7.453	16.38	0.145	7.403	0.10
10/4/01 15:58	7.8963	16.38	0.135	7.8463	0.09
10/4/01 15:59	8.3663	16.38	0.124	8.3163	0.09
10/4/01 15:59	8.8647	16.38	0.113	8.8147	0.08
10/4/01 16:00	9.3913	16.38	0.102	9.3413	0.07
10/4/01 16:00	9.9497	16.38	0.092	9.8997	0.06
10/4/01 16:01	10.5413	16.38	0.083	10.4913	0.06
10/4/01 16:02	11.168	16.38	0.072	11.118	0.05
10/4/01 16:02	11.8313	16.38	0.066	11.7813	0.05
10/4/01 16:03	12.5347	16.38	0.057	12.4847	0.04
10/4/01 16:04	13.2797	16.38	0.051	13.2297	0.04
10/4/01 16:04	14.0697	16.38	0.044	14.0197	0.03
10/4/01 16:05	14.9063	16.38	0.038	14.8563	0.03
10/4/01 16:06	15.7913	16.38	0.031	15.7413	0.02
10/4/01 16:07	16.7297	16.38	0.029	16.6797	0.02
10/4/01 16:08	17.723	16.38	0.023	17.673	0.02
10/4/01 16:09	18.7763	16.38	0.018	18.7263	0.01
10/4/01 16:10	19.8913	16.38	0.016	19.8413	0.01

TETRA TECH NUS, INC. CALCULATION WORKSHEET PAGE ____ OF ____

CLIENT	JOB NUMBER
INDIAN HEAD NSWC	7129 SITE 57 FS
SUBJECT	
SLUG TEST WELL 557 TW15 RISING HEAD	
BASED ON	DRAWING NUMBER
HVORSLEV	
BY / CHECKED BY	APPROVED BY / DATE
FRED R. /	

EQ: $K = \frac{r^2 \ln(L/R)}{2LT_0}$ $L/R = 5'/.042$

WHERE:
- $r = 0.042$ feet (riser radius)
- $R = 0.042$ (screen radius)
- $L = 5'$ (INPUT LENGTH)
- $T_0 = 3.3$ (FROM PLOT)
- K = HYDRAULIC COND. (ft/min)

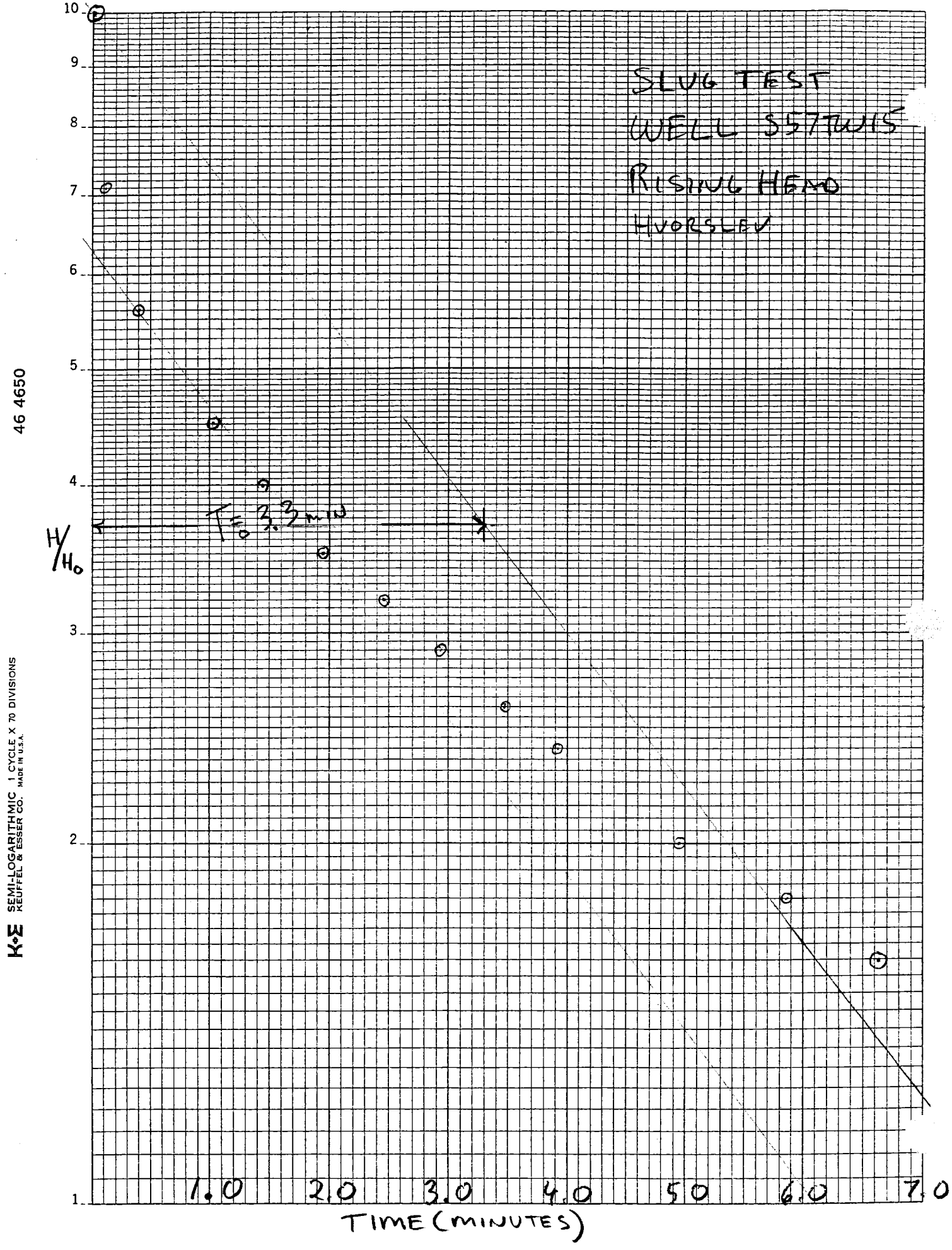
SUB: $K = \frac{(0.042)^2 \ln(5/0.042)}{2(5)(3.3)}$

$= \frac{8.43 \times 10^{-3}}{33}$

$= 2.56 \times 10^{-4}$ ft/min

$= 1.3 \times 10^{-4}$ cm/sec

$= 3.69 \times 10^{-1}$ ft/day ✓


SLUG TEST
WELL S57TWIS
RISING HEAD
HVORSLEV
H/H0
T=0
3.3 min
10
9
8
7
6
5
4
3
2
1
1.0
2.0
3.0
4.0
5.0
6.0
7.0
TIME (MINUTES)
46 4650
K+E SEMI-LOGARITHMIC 1 CYCLE X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

In-Situ Inc. MiniTroll Pro

Report generated: 10/18/01 10:36:22
Report from file: C:\Win-Situ\Data\SN00856 2001-10-03 155907 s57tw15rhno1.bin
DataMgr Version 3.68

Serial number: 856
Firmware Version 3.01
Unit name: miniTROLL

Test name: s57tw15rhno1

Test defined on: 10/3/01 15:44:20
Test started on: 10/3/01 15:59:07
Test stopped on: 10/3/01 17:08:20

Data gathered using Logarithmic testing
Maximum time between data points: 10.00(Minutes.
Number of data samples: 134

TOTAL DATA SAMPLES 134

Channel number [1]
Measurement type: Temperature
Channel name: OnBoard Temp

Channel number [2]
Measurement type: Pressure
Channel name: OnBoard Pressure
Sensor Range: 30 PSI.
Density: 1.000 g/cm3
Mode: TOC
User-defined reference: 0 Feet H2O
Referenced on: test start
Pressure head at reference: 4.808 Feet H2O

Date	Time	ET (min)	Chan[1] Celsius	Chan[2] Feet H2O	ET (min)adj	h/ho	ho= 0.623
10/3/01	15:59	0	21	0		0.00	
10/3/01	15:59	0.005	21.01	0.366		0.59	
10/3/01	15:59	0.01	21.02	0.3		0.48	
10/3/01	15:59	0.015	21.02	0.442		0.71	
10/3/01	15:59	0.02	21.02	0.623	0	1.00	
10/3/01	15:59	0.025	21.02	0.589	0.005	0.95	
10/3/01	15:59	0.03	21.02	0.571	0.01	0.92	
10/3/01	15:59	0.035	21.02	0.564	0.015	0.91	
10/3/01	15:59	0.04	21.04	0.55	0.02	0.88	
10/3/01	15:59	0.045	21.04	0.552	0.025	0.89	
10/3/01	15:59	0.05	21.04	0.536	0.03	0.86	
10/3/01	15:59	0.055	21.04	0.529	0.035	0.85	
10/3/01	15:59	0.06	21.04	0.525	0.04	0.84	
10/3/01	15:59	0.065	21.04	0.519	0.045	0.83	
10/3/01	15:59	0.07	21.04	0.515	0.05	0.83	
10/3/01	15:59	0.075	21.04	0.508	0.055	0.82	
10/3/01	15:59	0.08	21.04	0.502	0.06	0.81	
10/3/01	15:59	0.0848	21.04	0.494	0.0648	0.79	
10/3/01	15:59	0.09	21.04	0.488	0.07	0.78	

10/3/01 15:59	0.095	21.04	0.477	0.075	0.77
10/3/01 15:59	0.1	21.04	0.471	0.08	0.76
10/3/01 15:59	0.1058	21.04	0.463	0.0858	0.74
10/3/01 15:59	0.112	21.04	0.456	0.092	0.73
10/3/01 15:59	0.1185	21.04	0.446	0.0985	0.72
10/3/01 15:59	0.1255	21.04	0.44	0.1055	0.71
10/3/01 15:59	0.1328	21.05	0.434	0.1128	0.70
10/3/01 15:59	0.1407	21.05	0.43	0.1207	0.69
10/3/01 15:59	0.149	21.05	0.424	0.129	0.68
10/3/01 15:59	0.1578	21.05	0.419	0.1378	0.67
10/3/01 15:59	0.167	21.04	0.413	0.147	0.66
10/3/01 15:59	0.177	21.04	0.409	0.157	0.66
10/3/01 15:59	0.1875	21.04	0.404	0.1675	0.65
10/3/01 15:59	0.1985	21.04	0.402	0.1785	0.65
10/3/01 15:59	0.2102	21.04	0.396	0.1902	0.64
10/3/01 15:59	0.2227	21.04	0.394	0.2027	0.63
10/3/01 15:59	0.2358	21.02	0.39	0.2158	0.63
10/3/01 15:59	0.2498	21.02	0.385	0.2298	0.62
10/3/01 15:59	0.2647	21.02	0.381	0.2447	0.61
10/3/01 15:59	0.2803	21.02	0.377	0.2603	0.61
10/3/01 15:59	0.297	21.02	0.373	0.277	0.60
10/3/01 15:59	0.3147	21.02	0.369	0.2947	0.59
10/3/01 15:59	0.3333	21.02	0.365	0.3133	0.59
10/3/01 15:59	0.3532	21.02	0.363	0.3332	0.58
10/3/01 15:59	0.3742	21.02	0.356	0.3542	0.57
10/3/01 15:59	0.3963	21.02	0.352	0.3763	0.57
10/3/01 15:59	0.4198	21.02	0.348	0.3998	0.56
10/3/01 15:59	0.4447	21.02	0.346	0.4247	0.56
10/3/01 15:59	0.4697	21.02	0.342	0.4497	0.55
10/3/01 15:59	0.4963	21.01	0.335	0.4763	0.54
10/3/01 15:59	0.5247	21.01	0.333	0.5047	0.53
10/3/01 15:59	0.5547	21.01	0.327	0.5347	0.52
10/3/01 15:59	0.5863	21.01	0.323	0.5663	0.52
10/3/01 15:59	0.6213	21.01	0.321	0.6013	0.52
10/3/01 15:59	0.6578	21.01	0.314	0.6378	0.50
10/3/01 15:59	0.6963	21.01	0.31	0.6763	0.50
10/3/01 15:59	0.738	21	0.306	0.718	0.49
10/3/01 15:59	0.7813	21	0.299	0.7613	0.48
10/3/01 15:59	0.828	21	0.297	0.808	0.48
10/3/01 15:59	0.8763	21	0.291	0.8563	0.47
10/3/01 16:00	0.928	20.99	0.287	0.908	0.46
10/3/01 16:00	0.983	20.99	0.283	0.963	0.45
10/3/01 16:00	1.0413	20.99	0.278	1.0213	0.45
10/3/01 16:00	1.103	20.99	0.274	1.083	0.44
10/3/01 16:00	1.168	20.97	0.268	1.148	0.43
10/3/01 16:00	1.238	20.97	0.263	1.218	0.42
10/3/01 16:00	1.3113	20.96	0.257	1.2913	0.41
10/3/01 16:00	1.3897	20.96	0.253	1.3697	0.41
10/3/01 16:00	1.473	20.96	0.247	1.453	0.40
10/3/01 16:00	1.5613	20.95	0.24	1.5413	0.39
10/3/01 16:00	1.6547	20.95	0.236	1.6347	0.38
10/3/01 16:00	1.753	20.95	0.232	1.733	0.37
10/3/01 16:00	1.858	20.94	0.225	1.838	0.36
10/3/01 16:01	1.968	20.94	0.219	1.948	0.35
10/3/01 16:01	2.0847	20.92	0.214	2.0647	0.34
10/3/01 16:01	2.2097	20.92	0.208	2.1897	0.33
10/3/01 16:01	2.3412	20.92	0.204	2.3212	0.33
10/3/01 16:01	2.4813	20.91	0.197	2.4613	0.32
10/3/01 16:01	2.6297	20.91	0.191	2.6097	0.31
10/3/01 16:01	2.7863	20.9	0.185	2.7663	0.30

10/3/01 16:02	2.953	20.9	0.18	2.933	0.29
10/3/01 16:02	3.1297	20.89	0.174	3.1097	0.28
10/3/01 16:02	3.3163	20.89	0.168	3.2963	0.27
10/3/01 16:02	3.5147	20.87	0.159	3.4947	0.26
10/3/01 16:02	3.7247	20.87	0.155	3.7047	0.25
10/3/01 16:03	3.9463	20.86	0.15	3.9263	0.24
10/3/01 16:03	4.1813	20.86	0.144	4.1613	0.23
10/3/01 16:03	4.4295	20.85	0.137	4.4095	0.22
10/3/01 16:03	4.693	20.85	0.133	4.673	0.21
10/3/01 16:04	4.973	20.84	0.127	4.953	0.20
10/3/01 16:04	5.2697	20.84	0.12	5.2497	0.19
10/3/01 16:04	5.583	20.82	0.114	5.563	0.18
10/3/01 16:05	5.9147	20.82	0.11	5.8947	0.18
10/3/01 16:05	6.2663	20.81	0.103	6.2463	0.17
10/3/01 16:05	6.6397	20.81	0.099	6.6197	0.16
10/3/01 16:06	7.0347	20.8	0.092	7.0147	0.15
10/3/01 16:06	7.453	20.8	0.088	7.433	0.14
10/3/01 16:07	7.8963	20.78	0.082	7.8763	0.13
10/3/01 16:07	8.3663	20.78	0.078	8.3463	0.13
10/3/01 16:07	8.8647	20.77	0.073	8.8447	0.12
10/3/01 16:08	9.3913	20.77	0.069	9.3713	0.11
10/3/01 16:09	9.9497	20.77	0.065	9.9297	0.10
10/3/01 16:09	10.5413	20.76	0.06	10.5213	0.10
10/3/01 16:10	11.168	20.76	0.058	11.148	0.09
10/3/01 16:10	11.8313	20.76	0.054	11.8113	0.09
10/3/01 16:11	12.5347	20.75	0.049	12.5147	0.08
10/3/01 16:12	13.2797	20.75	0.047	13.2597	0.08
10/3/01 16:13	14.0697	20.75	0.043	14.0497	0.07
10/3/01 16:14	14.9063	20.75	0.043	14.8863	0.07
10/3/01 16:14	15.7913	20.75	0.039	15.7713	0.06
10/3/01 16:15	16.7297	20.73	0.037	16.7097	0.06
10/3/01 16:16	17.723	20.73	0.035	17.703	0.06
10/3/01 16:17	18.7763	20.73	0.033	18.7563	0.05
10/3/01 16:19	19.8913	20.73	0.03	19.8713	0.05
10/3/01 16:20	21.073	20.73	0.03	21.053	0.05
10/3/01 16:21	22.3247	20.72	0.028	22.3047	0.04
10/3/01 16:22	23.6497	20.72	0.028	23.6297	0.04
10/3/01 16:24	25.0547	20.72	0.026	25.0347	0.04
10/3/01 16:25	26.543	20.72	0.026	26.523	0.04
10/3/01 16:27	28.118	20.72	0.026	28.098	0.04
10/3/01 16:28	29.7863	20.72	0.024	29.7663	0.04
10/3/01 16:30	31.5547	20.72	0.026	31.5347	0.04
10/3/01 16:32	33.428	20.72	0.026	33.408	0.04
10/3/01 16:34	35.4112	20.71	0.026	35.3912	0.04
10/3/01 16:36	37.513	20.71	0.024	37.493	0.04
10/3/01 16:38	39.7397	20.71	0.024	39.7197	0.04
10/3/01 16:41	42.098	20.71	0.024	42.078	0.04
10/3/01 16:43	44.5963	20.71	0.021	44.5763	0.03
10/3/01 16:46	47.243	20.71	0.021	47.223	0.03
10/3/01 16:49	50.0463	20.71	0.021	50.0263	0.03
10/3/01 16:52	53.0147	20.7	0.021	52.9947	0.03
10/3/01 16:55	56.1597	20.7	0.021	56.1397	0.03
10/3/01 16:58	59.4913	20.7	0.019	59.4713	0.03
10/3/01 17:02	63.0197	20.7	0.019	62.9997	0.03
10/3/01 17:05	66.758	20.7	0.019	66.738	0.03

HYDRAULIC CONDUCTIVITY TESTING DATA SHEET

Tetra Tech NUS, Inc.

PROJECT NAME: INDIANHEAD SITE 57 FS WELL/BORING NO.: S57TW16

PROJECT NO.: 7129-2920 GEOLOGIST: FRED W. RAMSER

WELL DIAMETER: 1" SCREEN LENGTH/DEPTH: 5' / TEST NO.: 1

STATIC WATER LEVEL (Depth/Elevation): 6.61TPVC DATE: 10-23-01

TEST TYPE (Rising/Falling/Constant Head): FALLING HEAD CHECKED:

METHOD OF INDUCING WATER LEVEL CHANGE: DI H2O PAGE ..... OF .....

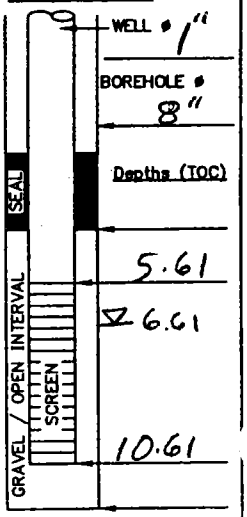
REFERENCE PT. FOR WL MEAS. (Top of Casing, Transducer, etc.): SURFACE

FALLING HI

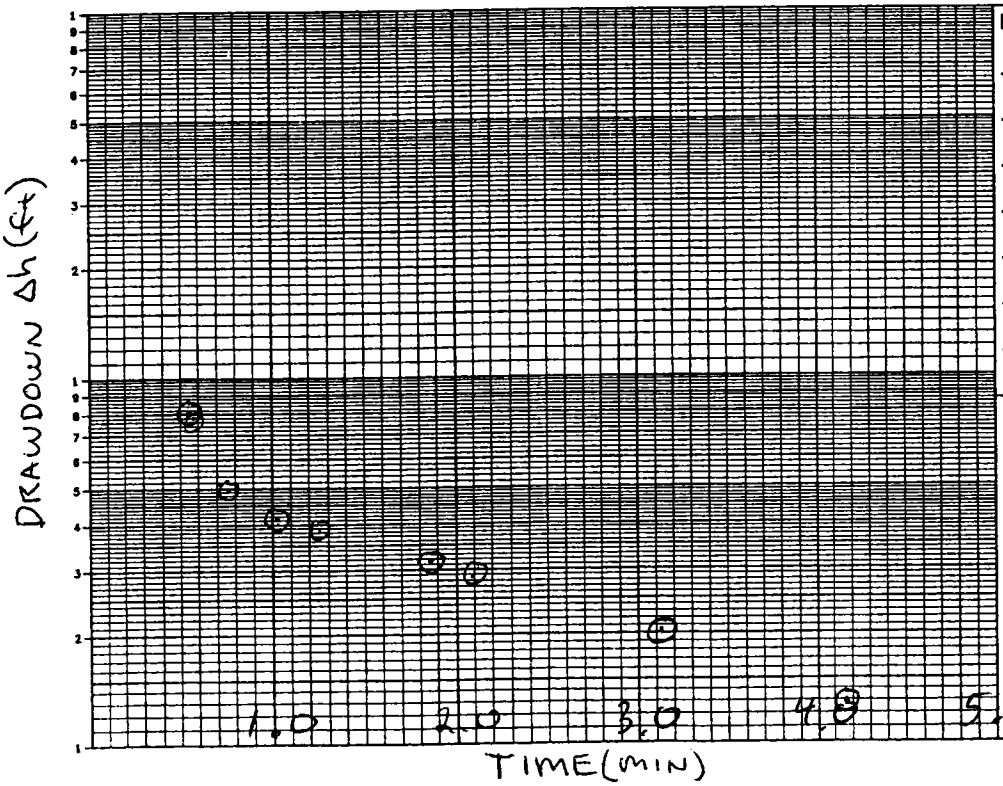
ACAD:FORM_HYDCONTST.dwg 07/06/99 INL

ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)	ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)
0.555		0.811	3.13		0.203
0.586		0.792			
0.621		0.722			
0.658		0.672			
0.696		0.583			
0.781		0.494			
1.04		0.432			
1.24		0.397			
1.86		0.315			
2.09		0.294			
4.18		0.131			
4.97		0.094			

WELL SCHEMATIC



▽ Indicate SWL Depth on Drawing



REMARKS:

3.293 head @ 10:11 HRS

CALCS, SKETCH MAPS, ETC.:

TETRA TECH NUS, INC. **CALCULATION WORKSHEET** PAGE _____ OF _____

CLIENT INDIAN HEAD NSWC	JOB NUMBER 7129 SITE 57 FS
SUBJECT SLUG TEST WELL 557TW16 FALLING HEAD	
BASED ON HVORSLEV	DRAWING NUMBER
BY FRED R. / CHECKED BY:	APPROVED BY / DATE

EQ:

$$K = \frac{r^2 \ln(L/R)}{2L T_o}$$

WHERE:

$r = 0.04166$ (RISER RADIUS, Ft)
$R = 0.04166$ (SCREEN RADIUS, Ft)
$L = 4$ (INPUT LENGTH, Ft)
$T_o = 2.7$ (FROM PLOT, MIN)
K = HYDRAULIC COND. (ft/min)

SUB:

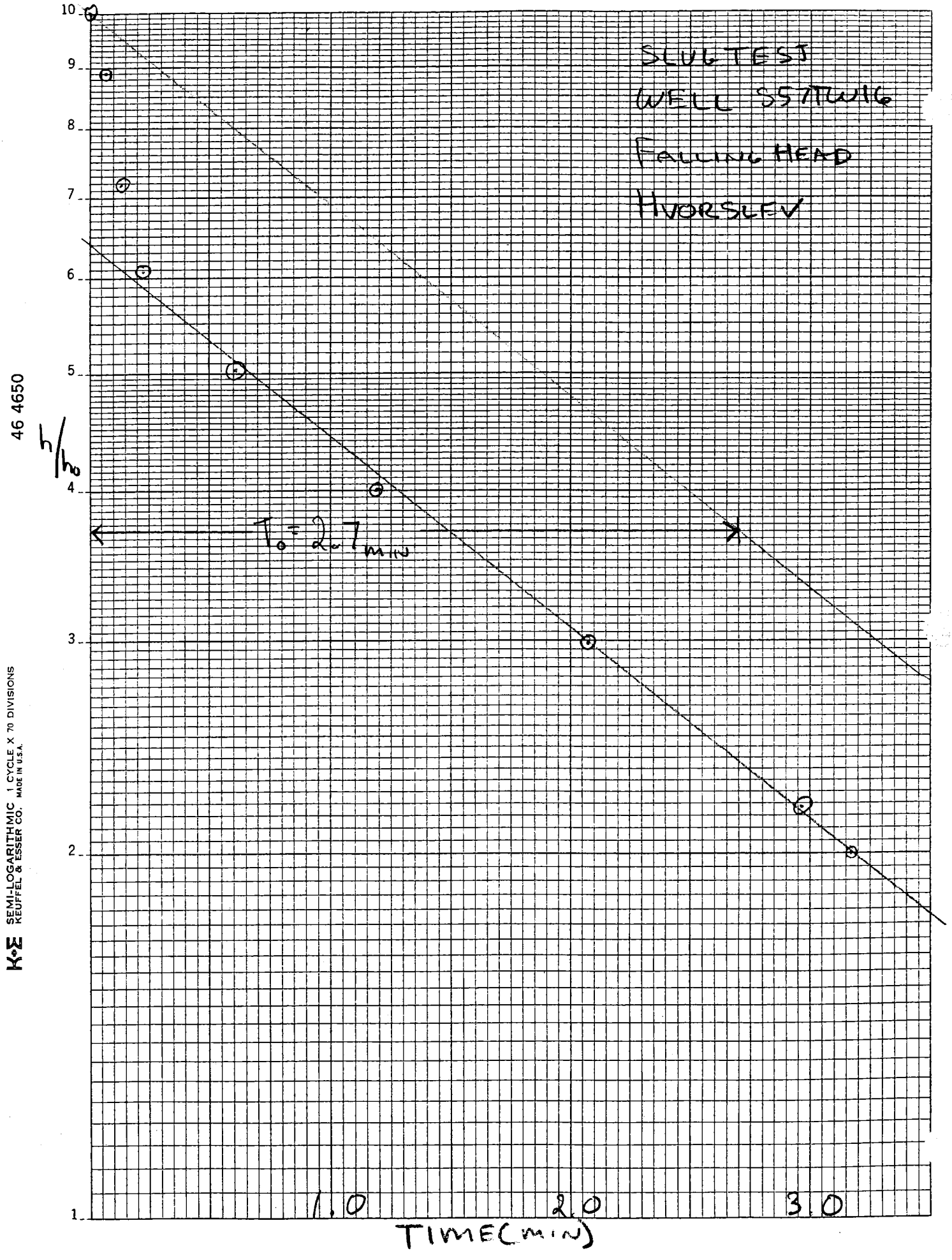
$$K = \frac{(0.04166)^2 \ln(4/0.04166)}{2(4)(2.7)}$$

$$= \frac{7.92195778 \times 10^{-3}}{21.6}$$

$$= 3.67 \times 10^{-4} \text{ ft/min}$$

$$= 1.86 \times 10^{-4} \text{ cm/sec}$$ ✓

$$= 5.28 \times 10^{-1} \text{ ft/day}$$


SLUG TEST
WELL S57TW16
FALLING HEAD
HVORSLEV
$T_0 = 2.7_{min}$
h/h0
10
9
8
7
6
5
4
3
2
1
1.0
2.0
3.0
TIME(MIN)
46 4650
K+E SEMI-LOGARITHMIC 1 CYCLE X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

In-Situ Inc.	MiniTroll Pro
Report generated:	11/1/01 13:39:05
Report from file:	C:\Win-Situ\Data\SN01966 2001-10-23 101741 s57tw16fhno1.bin
DataMgr Version	3.68
Serial number:	1966
Firmware Version	3.01
Unit name:	miniTROLL
Test name:	s57tw16fhno1
Test defined on:	10/23/01 10:16:46
Test started on:	10/23/01 10:17:41
Test stopped on:	10/23/01 10:36:40
Test extracted on:	N/A

Data gathered using Logarithmic testing
Maximum time between data points:10. Minutes.
Number of data samples: 112

TOTAL DATA SAMPLES 112

Channel number [1]
Measurement type: Temperature
Channel name: OnBoard Temp

Channel number [2]
Measurement type: Pressure
Channel name: OnBoard Pressure
Sensor Range: 30 PSI.
Specific gravity: 1
Mode: Surface
User-defined reference: 0 Feet H2O
Referenced on: test start
Pressure head at reference: 3.225 Feet H2O

Date	Time	ET (min)	Chan[1] Celsius	Chan[2] Feet H2O	Adj ET (min)	h/ho	ho= 0.811
10/23/01	10:17	0	18.71	0			
10/23/01	10:17	0.005	18.72	0			
10/23/01	10:17	0.01	18.72	0			
10/23/01	10:18	0.4963	18.74	0.738			
10/23/01	10:18	0.5247	18.74	0.761			
10/23/01	10:18	0.5547	18.74	0.811	0	1.000	
10/23/01	10:18	0.5863	18.74	0.792	0.0316	0.977	
10/23/01	10:18	0.6213	18.74	0.722	0.0666	0.890	
10/23/01	10:18	0.6578	18.74	0.672	0.1031	0.829	
10/23/01	10:18	0.6963	18.74	0.583	0.1416	0.719	

10/23/01 10:18	0.738	18.74	0.523	0.1833	0.645
10/23/01 10:18	0.7813	18.74	0.494	0.2266	0.609
10/23/01 10:18	0.828	18.74	0.478	0.2733	0.589
10/23/01 10:18	0.8763	18.74	0.467	0.3216	0.576
10/23/01 10:18	0.928	18.74	0.455	0.3733	0.561
10/23/01 10:18	0.983	18.72	0.445	0.4283	0.549
10/23/01 10:18	1.0413	18.72	0.432	0.4866	0.533
10/23/01 10:18	1.103	18.72	0.42	0.5483	0.518
10/23/01 10:18	1.168	18.72	0.409	0.6133	0.504
10/23/01 10:18	1.238	18.72	0.397	0.6833	0.490
10/23/01 10:19	1.3113	18.72	0.385	0.7566	0.475
10/23/01 10:19	1.3897	18.72	0.374	0.835	0.461
10/23/01 10:19	1.473	18.72	0.362	0.9183	0.446
10/23/01 10:19	1.5613	18.71	0.35	1.0066	0.432
10/23/01 10:19	1.6547	18.72	0.337	1.1	0.416
10/23/01 10:19	1.753	18.71	0.325	1.1983	0.401
10/23/01 10:19	1.858	18.71	0.315	1.3033	0.388
10/23/01 10:19	1.968	18.71	0.304	1.4133	0.375
10/23/01 10:19	2.0847	18.71	0.294	1.53	0.363
10/23/01 10:19	2.2097	18.71	0.281	1.655	0.346
10/23/01 10:20	2.3412	18.71	0.269	1.7865	0.332
10/23/01 10:20	2.4813	18.7	0.255	1.9266	0.314
10/23/01 10:20	2.6297	18.7	0.242	2.075	0.298
10/23/01 10:20	2.7863	18.7	0.23	2.2316	0.284
10/23/01 10:20	2.953	18.7	0.215	2.3983	0.265
10/23/01 10:20	3.1297	18.7	0.203	2.575	0.250
10/23/01 10:21	3.3163	18.7	0.189	2.7616	0.233
10/23/01 10:21	3.5147	18.7	0.176	2.96	0.217
10/23/01 10:21	3.7247	18.7	0.162	3.17	0.200
10/23/01 10:21	3.9463	18.69	0.143	3.3916	0.176
10/23/01 10:21	4.1813	18.69	0.131	3.6266	0.162
10/23/01 10:22	4.4295	18.69	0.116	3.8748	0.143
10/23/01 10:22	4.693	18.69	0.106	4.1383	0.131
10/23/01 10:22	4.973	18.69	0.094	4.4183	0.116
10/23/01 10:22	5.2697	18.69	0.081	4.715	0.100
10/23/01 10:23	5.583	18.67	0.075	5.0283	0.092
10/23/01 10:23	5.9147	18.67	0.065	5.36	0.080
10/23/01 10:23	6.2663	18.67	0.057	5.7116	0.070
10/23/01 10:24	6.6397	18.67	0.048	6.085	0.059
10/23/01 10:24	7.0347	18.67	0.04	6.48	0.049
10/23/01 10:25	7.453	18.67	0.032	6.8983	0.039
10/23/01 10:25	7.8963	18.67	0.026	7.3416	0.032
10/23/01 10:26	8.3663	18.67	0.017	7.8116	0.021
10/23/01 10:26	8.8647	18.66	0.007	8.31	0.009
10/23/01 10:27	9.3913	18.66	0.003	8.8366	0.004
10/23/01 10:27	9.9497	18.66	-0.003	9.395	-0.004
10/23/01 10:28	10.5413	18.66	-0.007	9.9866	-0.009
10/23/01 10:28	11.168	18.65	-0.013	10.6133	-0.016
10/23/01 10:29	11.8313	18.66	-0.02	11.2766	-0.025
10/23/01 10:30	12.5347	18.65	-0.023	11.98	-0.028
10/23/01 10:30	13.2797	18.65	-0.026	12.725	-0.032
10/23/01 10:31	14.0697	18.65	-0.032	13.515	-0.039

10/23/01 10:32	14.9063	18.65	-0.036	14.3516	-0.044
10/23/01 10:33	15.7913	18.65	-0.04	15.2366	-0.049
10/23/01 10:34	16.7297	18.65	-0.044	16.175	-0.054
10/23/01 10:35	17.723	18.65	-0.048	17.1683	-0.059
10/23/01 10:36	18.7763	18.64	-0.048	18.2216	-0.059

HYDRAULIC CONDUCTIVITY TESTING DATA SHEET

Tetra Tech NUS, Inc.

PROJECT NAME: INDIANHEAD SITE 57 FS WELL/BORING NO.: S57TW17

PROJECT NO.: 7129-2920 GEOLOGIST: FRED W. RAMSER

WELL DIAMETER: 1" SCREEN LENGTH/DEPTH: 10'/ TEST NO.: 1

STATIC WATER LEVEL (Depth/Elevation): 6.76' TPVC DATE: 10-23-01

TEST TYPE (Rising/Falling/Constant Head): FALLING+RISING CHECKED:

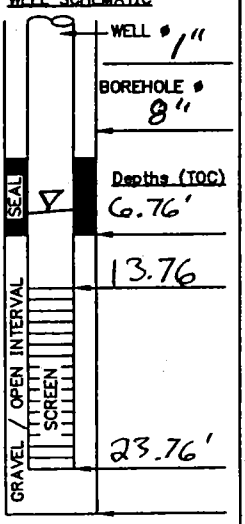
METHOD OF INDUCING WATER LEVEL CHANGE: SOLID SLUG 1/2" x 6' PAGE ..... OF .....

REFERENCE PT. FOR WL MEAS. (Top of Casing, Transducer, etc.): SURFACE

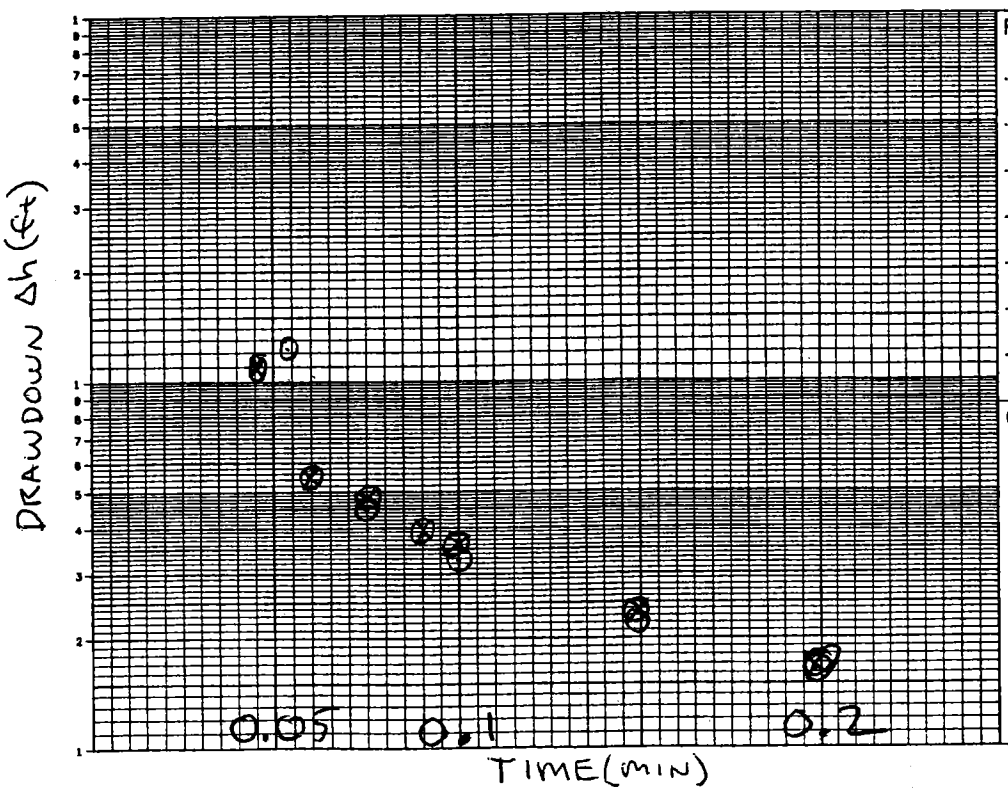
ACAD:FORM_HYDCONTST.dwg 07/06/99 INL

FALLING HEAD			RISING HEAD		
ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)	ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)
0.054		1.207	0.045		-1.118
0.075		0.442	0.060		.578
0.100		0.326	0.075		.487
0.149		0.224	0.090		.398
0.1985		0.165	0.100		.355
			0.149		.227
			0.199		.162

WELL SCHEMATIC



▽ Indicate SWL Depth on Drawing



REMARKS:

CALCS, SKETCH MAPS, ETC.:

⊙ = FALLING HEAD

⊗ = RISING HEAD

TETRA TECH NUS, INC. **CALCULATION WORKSHEET** PAGE _____ OF _____

CLIENT INDIAN HEAD NSWC	JOB NUMBER 7129 SITE 57 FS
SUBJECT SLUG TEST WELL 57TW17 RISING HEAD	
BASED ON HVORSLEV	DRAWING NUMBER
BY FRED R. / CHECKED BY	APPROVED BY / DATE 11-2-01

EQ:

$$K = \frac{r^2 \ln(L/R)}{2L T_o}$$

WHERE:

$r = 0.041667$ (RISER RADIUS, Ft)
$R = 0.041667$ (SCREEN RADIUS, Ft)
$L = 10$ (INPUT LENGTH, Ft)
$\rightarrow T_o = 0.132$ (FROM PLOT, MIN)
$K =$ HYDRAULIC COND. (ft/MIN)

SUB:

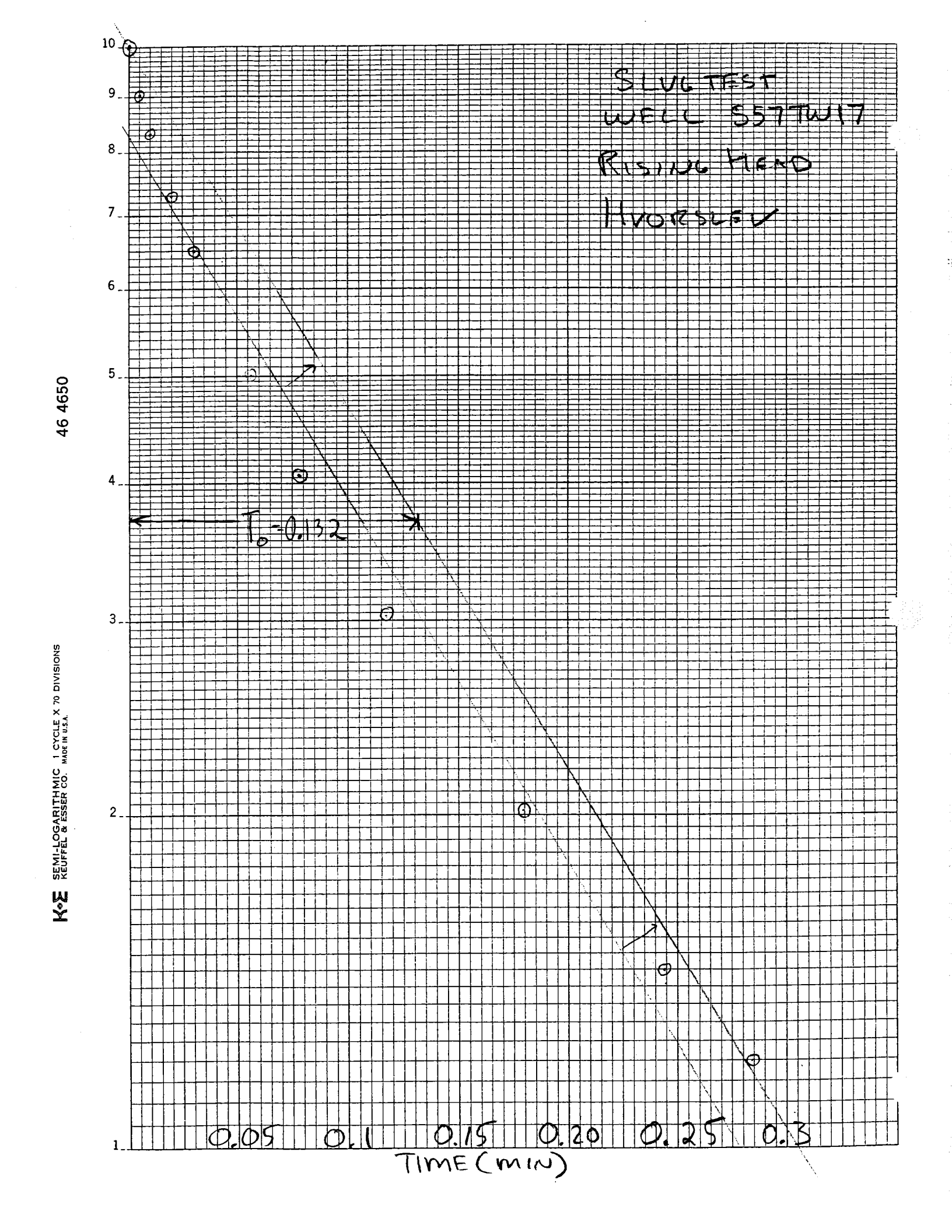
$$K = \frac{(0.041667)^2 \ln(10/0.041667)}{2(10)(0.132)}$$

$$= \frac{9.5151364 \times 10^{-3}}{2.64}$$

$$= 3.60 \times 10^{-3} \text{ ft/min}$$

$$= 1.83 \times 10^{-3} \text{ cm/sec}$$

$$= 5.2 \text{ ft/day}$$


SLUG TEST
WELL S57TW17
RISING HEAD
HVORSLEV
T_o=0.132
10
9
8
7
6
5
4
3
2
1
0.05
0.1
0.15
0.20
0.25
0.3
TIME (MIN)
46 4650
K&E SEMI-LOGARITHMIC 1 CYCLE X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

In-Situ Inc.	MiniTroll Pro
Report generated:	11/1/01 13:06:01
Report from file:	C:\Win-Situ\Data\SN01966 2001-10-23 105121 s57tw17rhno2.bin
DataMgr Version	3.68
Serial number:	1966
Firmware Version	3.01
Unit name:	miniTROLL
Test name:	s57tw17rhno2
Test defined on:	10/23/01 10:50:31
Test started on:	10/23/01 10:51:21
Test stopped on:	10/23/01 10:57:55
Test extracted on:	N/A

Data gathered using Logarithmic testing
Maximum time between data points:10 Minutes.
Number of data samples: 93

TOTAL DATA SAMPLES 93

Channel number [1]	
Measurement type:	Temperature
Channel name:	OnBoard Temp
Channel number [2]	
Measurement type:	Pressure
Channel name:	OnBoard Pressure
Sensor Range:	30 PSI.
Specific gravity:	1
Mode:	TOC
User-defined reference:	0 Feet H2O
Referenced on:	test start
Pressure head at reference:	16.407 Feet H2O

Date	Time	ET (min)	Chan[1] Celsius	Chan[2] Feet H2O	adj Feet H2O	Adj ET (min)	h/ho	ho= 0.525
10/23/01	10:51	0	16.3	0	-0.014			
10/23/01	10:51	0.005	16.32	-0.004	-0.018			
10/23/01	10:51	0.01	16.32	-0.006	-0.02			
10/23/01	10:51	0.065	16.34	0.582	0.568			
10/23/01	10:51	0.07	16.34	0.539	0.525	0	1	
10/23/01	10:51	0.075	16.34	0.487	0.473	0.005	0.901	
10/23/01	10:51	0.08	16.34	0.45	0.436	0.01	0.83	
10/23/01	10:51	0.0848	16.34	0.423	0.409	0.0148	0.779	
10/23/01	10:51	0.09	16.34	0.398	0.384	0.02	0.731	
10/23/01	10:51	0.095	16.34	0.375	0.361	0.025	0.688	
10/23/01	10:51	0.1	16.34	0.355	0.341	0.03	0.65	
10/23/01	10:51	0.1058	16.36	0.334	0.32	0.0358	0.61	
10/23/01	10:51	0.112	16.34	0.315	0.301	0.042	0.573	
10/23/01	10:51	0.1185	16.36	0.295	0.281	0.0485	0.535	
10/23/01	10:51	0.1255	16.36	0.278	0.264	0.0555	0.503	
10/23/01	10:51	0.1328	16.36	0.262	0.248	0.0628	0.472	

10/23/01 10:51	0.1407	16.36	0.245	0.231	0.0707	0.44
10/23/01 10:51	0.149	16.36	0.227	0.213	0.079	0.406
10/23/01 10:51	0.1578	16.36	0.212	0.198	0.0878	0.377
10/23/01 10:51	0.167	16.34	0.199	0.185	0.097	0.352
10/23/01 10:51	0.177	16.34	0.187	0.173	0.107	0.33
10/23/01 10:51	0.1875	16.34	0.173	0.159	0.1175	0.303
10/23/01 10:51	0.1985	16.34	0.162	0.148	0.1285	0.282
10/23/01 10:51	0.2102	16.34	0.15	0.136	0.1402	0.259
10/23/01 10:51	0.2227	16.34	0.141	0.127	0.1527	0.242
10/23/01 10:51	0.2358	16.34	0.131	0.117	0.1658	0.223
10/23/01 10:51	0.2498	16.34	0.121	0.107	0.1798	0.204
10/23/01 10:51	0.2647	16.34	0.11	0.096	0.1947	0.183
10/23/01 10:51	0.2803	16.34	0.102	0.088	0.2103	0.168
10/23/01 10:51	0.297	16.33	0.096	0.082	0.227	0.156
10/23/01 10:51	0.3147	16.33	0.09	0.076	0.2447	0.145
10/23/01 10:51	0.3333	16.33	0.083	0.069	0.2633	0.131
10/23/01 10:51	0.3532	16.33	0.077	0.063	0.2832	0.12
10/23/01 10:51	0.3742	16.33	0.071	0.057	0.3042	0.109
10/23/01 10:51	0.3963	16.33	0.067	0.053	0.3263	0.101
10/23/01 10:51	0.4198	16.33	0.063	0.049	0.3498	0.093
10/23/01 10:51	0.4447	16.33	0.058	0.044	0.3747	0.084
10/23/01 10:51	0.4697	16.33	0.054	0.04	0.3997	0.076
10/23/01 10:51	0.4963	16.33	0.052	0.038	0.4263	0.072
10/23/01 10:51	0.5247	16.33	0.05	0.036	0.4547	0.069
10/23/01 10:51	0.5547	16.33	0.046	0.032	0.4847	0.061
10/23/01 10:51	0.5863	16.33	0.044	0.03	0.5163	0.057
10/23/01 10:51	0.6213	16.33	0.042	0.028	0.5513	0.053
10/23/01 10:52	0.6578	16.33	0.04	0.026	0.5878	0.05
10/23/01 10:52	0.6963	16.33	0.038	0.024	0.6263	0.046
10/23/01 10:52	0.738	16.33	0.036	0.022	0.668	0.042
10/23/01 10:52	0.7813	16.33	0.034	0.02	0.7113	0.038
10/23/01 10:52	0.828	16.33	0.034	0.02	0.758	0.038
10/23/01 10:52	0.8763	16.33	0.03	0.016	0.8063	0.03
10/23/01 10:52	0.928	16.33	0.032	0.018	0.858	0.034
10/23/01 10:52	0.983	16.32	0.029	0.015	0.913	0.029
10/23/01 10:52	1.0413	16.32	0.027	0.013	0.9713	0.025
10/23/01 10:52	1.103	16.32	0.025	0.011	1.033	0.021
10/23/01 10:52	1.168	16.32	0.023	0.009	1.098	0.017
10/23/01 10:52	1.238	16.32	0.023	0.009	1.168	0.017
10/23/01 10:52	1.3113	16.32	0.019	0.005	1.2413	0.01
10/23/01 10:52	1.3897	16.32	0.019	0.005	1.3197	0.01
10/23/01 10:52	1.473	16.32	0.019	0.005	1.403	0.01
10/23/01 10:52	1.5613	16.32	0.017	0.003	1.4913	0.006
10/23/01 10:53	1.6547	16.3	0.017	0.003	1.5847	0.006
10/23/01 10:53	1.753	16.3	0.014	0	1.683	0
10/23/01 10:53	1.858	16.3	0.014	0	1.788	0
10/23/01 10:53	1.968	16.3	0.014	0	1.898	0
10/23/01 10:53	2.0847	16.3	0.017	0.003	2.0147	0.006
10/23/01 10:53	2.2097	16.3	0.017	0.003	2.1397	0.006
10/23/01 10:53	2.3412	16.3	0.017	0.003	2.2712	0.006
10/23/01 10:53	2.4813	16.3	0.017	0.003	2.4113	0.006
10/23/01 10:53	2.6297	16.3	0.017	0.003	2.5597	0.006
10/23/01 10:54	2.7863	16.29	0.016	0.002	2.7163	0.004
10/23/01 10:54	2.953	16.3	0.017	0.003	2.883	0.006
10/23/01 10:54	3.1297	16.29	0.018	0.004	3.0597	0.008
10/23/01 10:54	3.3163	16.29	0.016	0.002	3.2463	0.004
10/23/01 10:54	3.5147	16.29	0.018	0.004	3.4447	0.008
10/23/01 10:55	3.7247	16.29	0.016	0.002	3.6547	0.004

10/23/01 10:55	3.9463	16.29	0.02	0.006	3.8763	0.011
10/23/01 10:55	4.1813	16.29	0.02	0.006	4.1113	0.011
10/23/01 10:55	4.4295	16.29	0.02	0.006	4.3595	0.011
10/23/01 10:56	4.693	16.28	0.022	0.008	4.623	0.015
10/23/01 10:56	4.973	16.28	0.022	0.008	4.903	0.015
10/23/01 10:56	5.2697	16.28	0.022	0.008	5.1997	0.015
10/23/01 10:56	5.583	16.28	0.022	0.008	5.513	0.015
10/23/01 10:57	5.9147	16.28	0.022	0.008	5.8447	0.015
10/23/01 10:57	6.2663	16.27	0.026	0.012	6.1963	0.023

TETRA TECH NUS, INC. **CALCULATION WORKSHEET** PAGE ____ OF ____

CLIENT: INDIAN HEAD NSWC	JOB NUMBER: 7129 SITE 57 FS
SUBJECT: SLUG TEST WELL S57TW17 FALLING HEAD	
BASED ON: HVORSLEV	DRAWING NUMBER:
BY: FRED R. / CHECKED BY:	APPROVED BY: / DATE: 11-2-01

EQ:

$$K = \frac{r^2 \ln(L/R)}{2LT_o}$$

WHERE:

$r = 0.041667$ (RISER RADIUS, Ft)
$R = 0.041667$ (SCREEN RADIUS, Ft)
$L = 10.0$ (INPUT LENGTH, Ft)
$T_o = 0.189$ (FROM PLOT, MIN)
K = HYDRAULIC COND. (ft/MIN)

SUB:

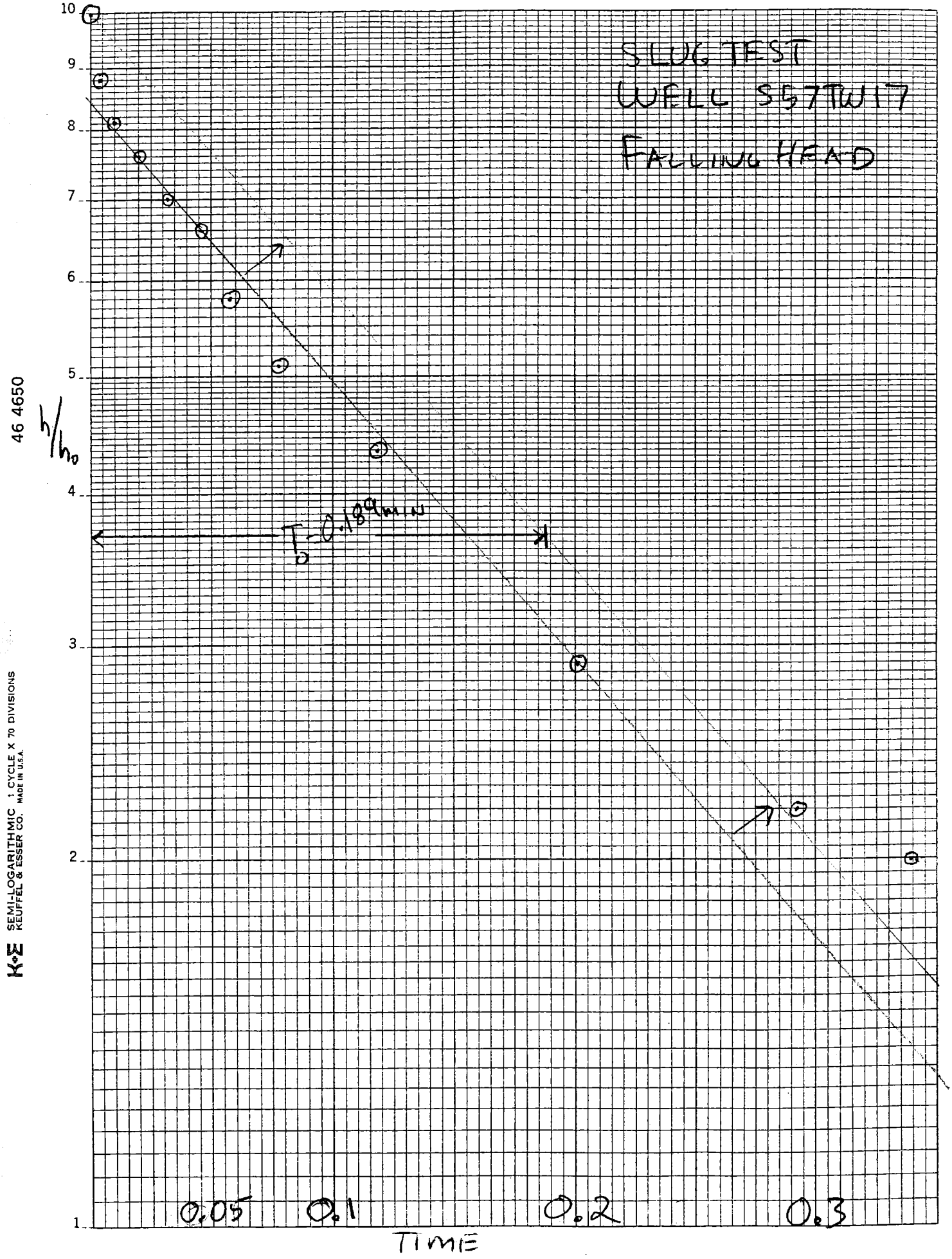
$$K = \frac{(0.041667)^2 \ln(10/0.041667)}{2(10)(0.189)}$$

$$K = \frac{9.5153648 \times 10^{-3}}{3.78}$$

$K = 2.52 \times 10^{-3}$ ft/min

$K = 1.28 \times 10^{-3}$ cm/sec

$K = 3.6$ ft/day


SLUG TEST
WELL S57TW17
FALLING HEAD
h/h0
T0=0.189 min
10
9
8
7
6
5
4
3
2
1
0.05
0.1
0.2
0.3
TIME
46 4650
K+E SEMI-LOGARITHMIC 1 CYCLE X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

In-Situ Inc. MiniTroll Pro

Report generated: 10/31/01 14:11:20
Report from file: C:\Win-Situ\Data\SN01966 2001-10-23 104247 s57tw17fhno1.bin
DataMgr Version 3.68

Serial number: 1966
Firmware Version 3.01
Unit name: miniTROLL

Test name: s57tw17fhno1

Test defined on: 10/23/01 10:40:51
Test started on: 10/23/01 10:42:47
Test stopped on: 10/23/01 10:49:01
Test extracted on: N/A

Data gathered using Logarithmic testing
aximum time between data points: 10.0 Minutes.
Number of data samples: 92

TOTAL DATA SAMPLES 92

Channel number [1]
Measurement type: Temperature
Channel name: OnBoard Temp

Channel number [2]
Measurement type: Pressure
Channel name: OnBoard Pressure
Sensor Range: 30 PSI.
Specific gravity: 1
Mode: Surface
User-defined reference: 0 Feet H2O
Referenced on: test start
Pressure head at reference: 16.464 Feet H2O

Date	Time	ET (min)	Chan[1] Celsius	Chan[2] Feet H2O	Adj ET (min)	Adj Feet H2O	Adj h/ho	Adj h/ho= 0.489
10/23/01	10:42	0	16.44	0				
10/23/01	10:42	0.005	16.46	0.006				
10/23/01	10:42	0.01	16.47	0.008				
10/23/01	10:42	0.015	16.47	0.43				
10/23/01	10:42	0.02	16.47	3.056				
10/23/01	10:42	0.025	16.47	3.784				
10/23/01	10:42	0.03	16.48	0.63				
10/23/01	10:42	0.035	16.48	0.74				
10/23/01	10:42	0.04	16.48	0.08				
10/23/01	10:42	0.045	16.48	0.386				
10/23/01	10:42	0.05	16.48	0.75				
10/23/01	10:42	0.055	16.48	1.207				
10/23/01	10:42	0.06	16.48	0.411				
10/23/01	10:42	0.065	16.48	0.101				
10/23/01	10:42	0.07	16.48	0.293				
10/23/01	10:42	0.075	16.48	0.442				
10/23/01	10:42	0.08	16.48	0.442	0	0.489	1.00	—
10/23/01	10:42	0.0848	16.48	0.384	0.0048	0.431	0.88	—

10/23/01 10:42	0.09	16.48	0.349	0.01	0.396	0.81
10/23/01 10:42	0.095	16.48	0.332	0.015	0.379	0.78
10/23/01 10:42	0.1	16.48	0.326	0.02	0.373	0.76
10/23/01 10:42	0.1058	16.48	0.311	0.0258	0.358	0.73
10/23/01 10:42	0.112	16.48	0.295	0.032	0.342	0.70
10/23/01 10:42	0.1185	16.48	0.28	0.0385	0.327	0.67
10/23/01 10:42	0.1255	16.49	0.276	0.0455	0.323	0.66
10/23/01 10:42	0.1328	16.48	0.235	0.0528	0.282	0.58
10/23/01 10:42	0.1407	16.49	0.222	0.0607	0.269	0.55
10/23/01 10:42	0.149	16.49	0.224	0.069	0.271	0.55
10/23/01 10:42	0.1578	16.49	0.202	0.0778	0.249	0.51
10/23/01 10:42	0.167	16.48	0.115	0.087	0.162	0.33
10/23/01 10:42	0.177	16.48	0.177	0.097	0.224	0.46
10/23/01 10:42	0.1875	16.48	0.177	0.1075	0.224	0.46
10/23/01 10:42	0.1985	16.48	0.165	0.1185	0.212	0.43
10/23/01 10:43	0.2102	16.48	0.107	0.1302	0.154	0.31
10/23/01 10:43	0.2227	16.47	0.167	0.1427	0.214	0.44
10/23/01 10:43	0.2358	16.47	0.119	0.1558	0.166	0.34
10/23/01 10:43	0.2498	16.47	0.113	0.1698	0.16	0.33
10/23/01 10:43	0.2647	16.47	0.103	0.1847	0.15	0.31
10/23/01 10:43	0.2803	16.47	0.095	0.2003	0.142	0.29
10/23/01 10:43	0.297	16.47	0.086	0.217	0.133	0.27
10/23/01 10:43	0.3147	16.47	0.08	0.2347	0.127	0.26
10/23/01 10:43	0.3333	16.47	0.074	0.2533	0.121	0.25
10/23/01 10:43	0.3532	16.47	0.068	0.2732	0.115	0.24
10/23/01 10:43	0.3742	16.46	0.062	0.2942	0.109	0.22
10/23/01 10:43	0.3963	16.47	0.057	0.3163	0.104	0.21
10/23/01 10:43	0.4198	16.46	0.051	0.3398	0.098	0.20
10/23/01 10:43	0.4447	16.46	0.047	0.3647	0.094	0.19
10/23/01 10:43	0.4697	16.46	0.043	0.3897	0.09	0.18
10/23/01 10:43	0.4963	16.46	0.039	0.4163	0.086	0.18
10/23/01 10:43	0.5247	16.46	0.035	0.4447	0.082	0.17
10/23/01 10:43	0.5547	16.46	0.033	0.4747	0.08	0.16
10/23/01 10:43	0.5863	16.46	0.029	0.5063	0.076	0.16
10/23/01 10:43	0.6213	16.46	0.025	0.5413	0.072	0.15
10/23/01 10:43	0.6578	16.46	0.02	0.5778	0.067	0.14
10/23/01 10:43	0.6963	16.44	0.021	0.6163	0.068	0.14
10/23/01 10:43	0.738	16.44	0.019	0.658	0.066	0.13
10/23/01 10:43	0.7813	16.44	0.017	0.7013	0.064	0.13
10/23/01 10:43	0.828	16.44	0.012	0.748	0.059	0.12
10/23/01 10:43	0.8763	16.44	0.01	0.7963	0.057	0.12
10/23/01 10:43	0.928	16.43	0.009	0.848	0.056	0.11
10/23/01 10:43	0.983	16.43	0.006	0.903	0.053	0.11
10/23/01 10:43	1.0413	16.43	0.004	0.9613	0.051	0.10
10/23/01 10:43	1.103	16.43	0.002	1.023	0.049	0.10
10/23/01 10:43	1.168	16.43	0	1.088	0.047	0.10
10/23/01 10:44	1.238	16.42	0.001	1.158	0.048	0.10
10/23/01 10:44	1.3113	16.42	-0.002	1.2313	0.045	0.09
10/23/01 10:44	1.3897	16.42	-0.004	1.3097	0.043	0.09
10/23/01 10:44	1.473	16.42	-0.006	1.393	0.041	0.08
10/23/01 10:44	1.5613	16.42	-0.008	1.4813	0.039	0.08
10/23/01 10:44	1.6547	16.41	-0.007	1.5747	0.04	0.08
10/23/01 10:44	1.753	16.41	-0.007	1.673	0.04	0.08
10/23/01 10:44	1.858	16.41	-0.012	1.778	0.035	0.07
10/23/01 10:44	1.968	16.41	-0.012	1.888	0.035	0.07
10/23/01 10:44	2.0847	16.39	-0.013	2.0047	0.034	0.07
10/23/01 10:45	2.2097	16.39	-0.015	2.1297	0.032	0.07
10/23/01 10:45	2.3412	16.39	-0.017	2.2612	0.03	0.06
10/23/01 10:45	2.4813	16.39	-0.02	2.4013	0.027	0.06
10/23/01 10:45	2.6297	16.38	-0.021	2.5497	0.026	0.05

10/23/01 10:45	2.7863	16.38	-0.023	2.7063	0.024	0.05
10/23/01 10:45	2.953	16.38	-0.025	2.873	0.022	0.04
10/23/01 10:45	3.1297	16.38	-0.028	3.0497	0.019	0.04
10/23/01 10:46	3.3163	16.37	-0.029	3.2363	0.018	0.04
10/23/01 10:46	3.5147	16.37	-0.031	3.4347	0.016	0.03
10/23/01 10:46	3.7247	16.37	-0.033	3.6447	0.014	0.03
10/23/01 10:46	3.9463	16.36	-0.035	3.8663	0.012	0.02
10/23/01 10:46	4.1813	16.36	-0.035	4.1013	0.012	0.02
10/23/01 10:47	4.4295	16.36	-0.037	4.3495	0.01	0.02
10/23/01 10:47	4.693	16.34	-0.039	4.613	0.008	0.02
10/23/01 10:47	4.973	16.34	-0.041	4.893	0.006	0.01
10/23/01 10:48	5.2697	16.34	-0.043	5.1897	0.004	0.01
10/23/01 10:48	5.583	16.33	-0.045	5.503	0.002	0.00
10/23/01 10:48	5.9147	16.33	-0.047	5.8347	0	0.00

HYDRAULIC CONDUCTIVITY TESTING DATA SHEET

Tetra Tech NUS, Inc.

PROJECT NAME: INDIANHEAD SITE 57 FS WELL/BORING NO.: S57TW18

PROJECT NO.: 7129-2920 GEOLOGIST: FRED W. RAMSER

WELL DIAMETER: 1" SCREEN LENGTH/DEPTH: 5' / TEST NO.: 1

STATIC WATER LEVEL (Depth/Elevation): 10.77 DATE: 10-23-01

TEST TYPE (Rising/Falling/Constant Head): FALLING HEAD CHECKED:

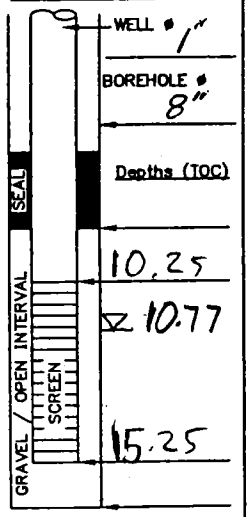
METHOD OF INDUCING WATER LEVEL CHANGE: ADD DI H_2O PAGE ..... OF .....

REFERENCE PT. FOR WL MEAS. (Top of Casing, Transducer, etc.): SURFACE

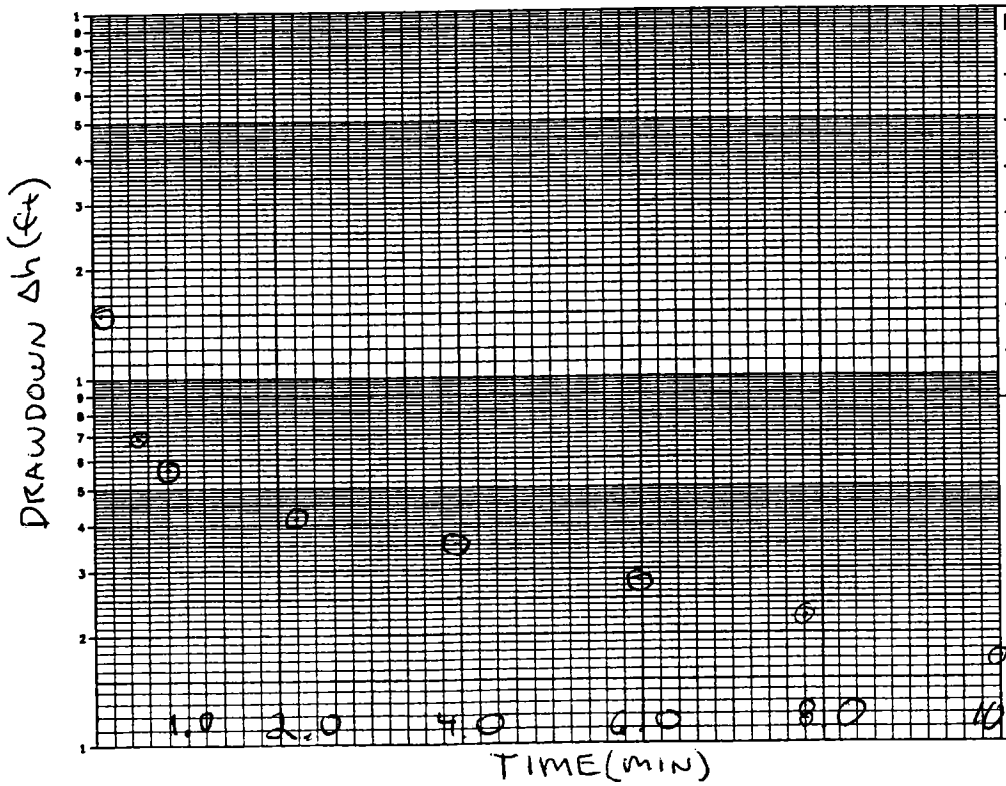
ACAD:FORM_HYDCONTST.dwg 07/06/99 INL

ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)	ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)
0.3145		1.512	3.946		0.354
0.3740		1.288	5.9145		0.282
0.3963		1.034			
0.4198		0.906			
0.4695		0.788			
0.5547		0.699			
0.8278		0.564			
1.103		0.519			
1.4728		0.486			
2.21		0.435			
7.896		0.224			
9.95		0.171			

WELL SCHEMATIC



▽ Indicate SWL Depth on Drawing



REMARKS:

head = 3.967

CALCS, SKETCH MAPS, ETC.:

TETRA TECH NUS, INC. **CALCULATION WORKSHEET** PAGE ____ OF ____

CLIENT: INDIAN HEAD NSWC	JOB NUMBER: 7129 SITE 57 FS
SUBJECT: SLUG TEST WELL S57TW18 FALLING HEAD	
BASED ON: HVORSLEV	DRAWING NUMBER:
BY: FRED R. / CHECKED BY:	APPROVED BY: / DATE: 11-2-01

EQ:

$$K = \frac{r^2 \ln(L/R)}{2L T_o}$$

WHERE:

$r = 0.041667$ (RISER RADIUS, Ft)
$R = 0.041667$ (SCREEN RADIUS, Ft)
$L = 4.48$ (INPUT LENGTH, Ft)
$T_o = 7.93$ min (FROM PLOT, MIN)
K = HYDRAULIC COND. (ft/min)

SUB:

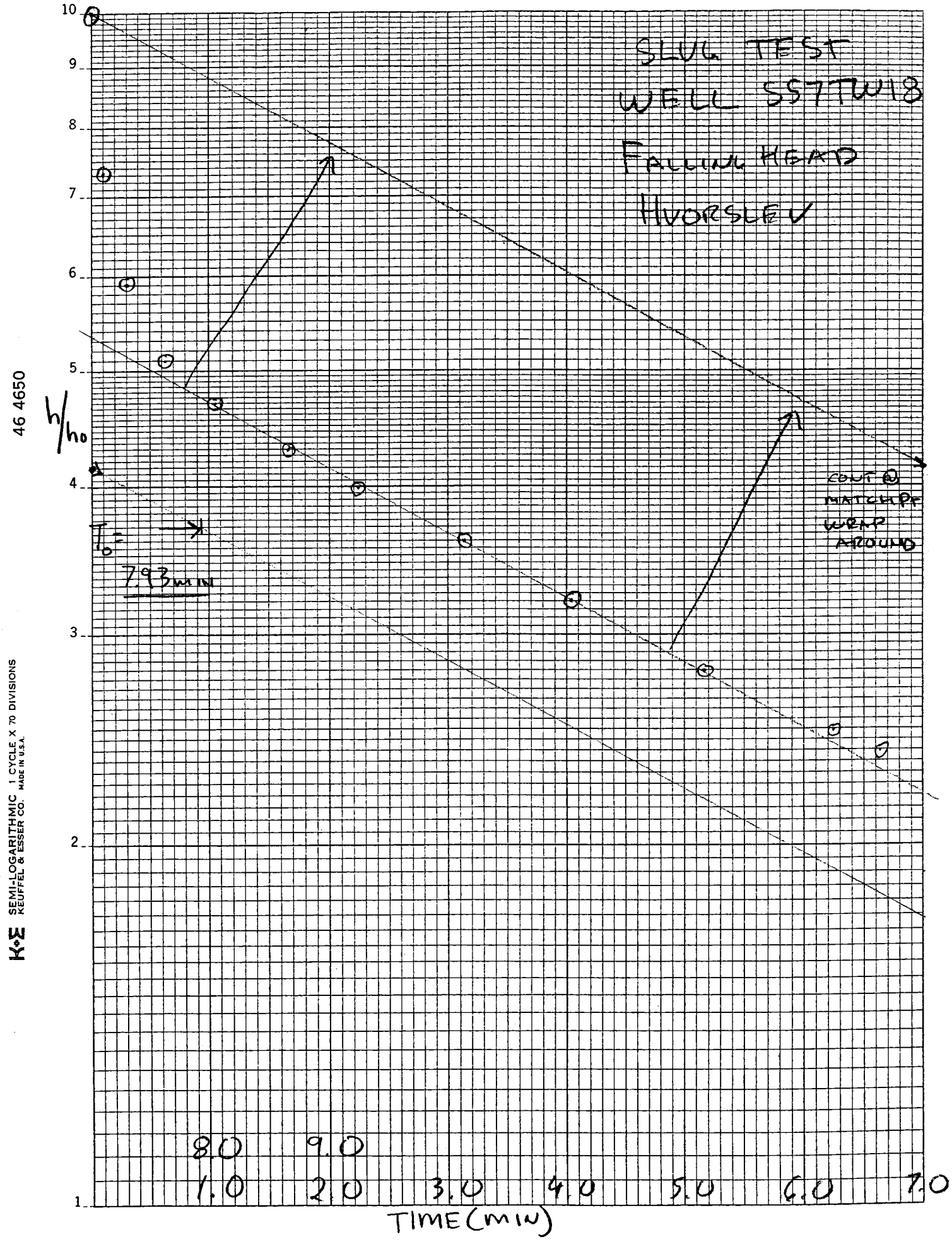
$$K = \frac{(0.041667)^2 \ln(4.48/0.041667)}{2(4.48)(7.93)}$$

$$= \frac{8.12108285 \times 10^{-3}}{71.0528}$$

$K = 1.14 \times 10^{-4}$ ft/min

$K = 5.8 \times 10^{-5}$ cm/sec

$K = 1.65 \times 10^{-1}$ ft/day ✓



46 4650

K+E SEMI-LOGARITHMIC 1 CYCLE X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

In-Situ Inc.	MiniTroll Pro
Report generated:	10/31/01 12:54:18
Report from file:	C:\Win-Situ\Data\SN01966 2001-10-23 112411 s57tw18fhno1.bin
DataMgr Version	3.68
Serial number:	1966
Firmware Version	3.01
Unit name:	miniTROLL
Test name:	s57tw18fhno1
Test defined on:	10/23/01 11:14:42
Test started on:	10/23/01 11:24:11
Test stopped on:	10/23/01 11:54:32
Test extracted on:	N/A

Data gathered using Logarithmic testing
aximum time between data points: 10.(Minutes.
Number of data samples: 120

TOTAL DATA SAMPLES 120

Channel number [1]
Measurement type: Temperature
Channel name: OnBoard Temp

Channel number [2]
Measurement type: Pressure
Channel name: OnBoard Pressure
Sensor Range: 30 PSI.
Specific gravity: 1
Mode: Surface
User-defined reference: 0 Feet H2O
Referenced on: test start
Pressure head at reference: 3.963 Feet H2O

Date	Time	ET (min)	Chan[1] Celsius	Chan[2] Feet H2O	Adj ET (min)	h/ho	ho= 1.034
10/23/01	11:24	0	17.67	0			
10/23/01	11:24	0.005	17.67	0			
10/23/01	11:24	0.01	17.69	0			
10/23/01	11:24	0.015	17.69	0.002			
10/23/01	11:24	0.02	17.7	0.004			
10/23/01	11:24	0.025	17.7	0.004			
10/23/01	11:24	0.03	17.7	0.008			
10/23/01	11:24	0.035	17.7	0.008			
10/23/01	11:24	0.04	17.7	0.008			
10/23/01	11:24	0.3963	17.7	1.034	0	1.00	

10/23/01 11:24	0.4198	17.7	0.906	0.0235	0.88
10/23/01 11:24	0.4447	17.7	0.831	0.0484	0.80
10/23/01 11:24	0.4697	17.7	0.788	0.0734	0.76
10/23/01 11:24	0.4963	17.7	0.753	0.1	0.73
10/23/01 11:24	0.5247	17.7	0.724	0.1284	0.70
10/23/01 11:24	0.5547	17.7	0.699	0.1584	0.68
10/23/01 11:24	0.5863	17.7	0.676	0.19	0.65
10/23/01 11:24	0.6213	17.7	0.656	0.225	0.63
10/23/01 11:24	0.6578	17.7	0.633	0.2615	0.61
10/23/01 11:24	0.6963	17.7	0.612	0.3	0.59
10/23/01 11:24	0.738	17.7	0.595	0.3417	0.58
10/23/01 11:24	0.7813	17.7	0.579	0.385	0.56
10/23/01 11:25	0.828	17.7	0.564	0.4317	0.55
10/23/01 11:25	0.8763	17.7	0.552	0.48	0.53
10/23/01 11:25	0.928	17.69	0.544	0.5317	0.53
10/23/01 11:25	0.983	17.69	0.534	0.5867	0.52
10/23/01 11:25	1.0413	17.69	0.527	0.645	0.51
10/23/01 11:25	1.103	17.69	0.519	0.7067	0.50
10/23/01 11:25	1.168	17.69	0.511	0.7717	0.49
10/23/01 11:25	1.238	17.69	0.505	0.8417	0.49
10/23/01 11:25	1.3113	17.69	0.498	0.915	0.48
10/23/01 11:25	1.3897	17.69	0.494	0.9934	0.48
10/23/01 11:25	1.473	17.69	0.486	1.0767	0.47
10/23/01 11:25	1.5613	17.69	0.478	1.165	0.46
10/23/01 11:25	1.6547	17.67	0.472	1.2584	0.46
10/23/01 11:25	1.753	17.67	0.468	1.3567	0.45
10/23/01 11:26	1.858	17.67	0.459	1.4617	0.44
10/23/01 11:26	1.968	17.67	0.449	1.5717	0.43
10/23/01 11:26	2.0847	17.67	0.441	1.6884	0.43
10/23/01 11:26	2.2097	17.67	0.435	1.8134	0.42
10/23/01 11:26	2.3412	17.67	0.426	1.9449	0.41
10/23/01 11:26	2.4813	17.67	0.418	2.085	0.40
10/23/01 11:26	2.6297	17.67	0.412	2.2334	0.40
10/23/01 11:26	2.7863	17.67	0.406	2.39	0.39
10/23/01 11:27	2.953	17.66	0.398	2.5567	0.38
10/23/01 11:27	3.1297	17.67	0.391	2.7334	0.38
10/23/01 11:27	3.3163	17.66	0.381	2.92	0.37
10/23/01 11:27	3.5147	17.66	0.373	3.1184	0.36
10/23/01 11:27	3.7247	17.66	0.365	3.3284	0.35
10/23/01 11:28	3.9463	17.66	0.354	3.55	0.34
10/23/01 11:28	4.1813	17.66	0.344	3.785	0.33
10/23/01 11:28	4.4295	17.66	0.336	4.0332	0.32
10/23/01 11:28	4.693	17.65	0.328	4.2967	0.32
10/23/01 11:29	4.973	17.66	0.317	4.5767	0.31
10/23/01 11:29	5.2697	17.65	0.305	4.8734	0.29
10/23/01 11:29	5.583	17.66	0.294	5.1867	0.28
10/23/01 11:30	5.9147	17.65	0.282	5.5184	0.27
10/23/01 11:30	6.2663	17.65	0.272	5.87	0.26
10/23/01 11:30	6.6397	17.65	0.261	6.2434	0.25
10/23/01 11:31	7.0347	17.65	0.249	6.6384	0.24
10/23/01 11:31	7.453	17.65	0.236	7.0567	0.23
10/23/01 11:32	7.8963	17.65	0.224	7.5	0.22

10/23/01 11:32	8.3663	17.65	0.212	7.97	0.21
10/23/01 11:33	8.8647	17.65	0.197	8.4684	0.19
10/23/01 11:33	9.3913	17.63	0.187	8.995	0.18
10/23/01 11:34	9.9497	17.63	0.171	9.5534	0.17
10/23/01 11:34	10.5413	17.63	0.158	10.145	0.15
10/23/01 11:35	11.168	17.63	0.144	10.7717	0.14
10/23/01 11:36	11.8313	17.63	0.131	11.435	0.13
10/23/01 11:36	12.5347	17.63	0.119	12.1384	0.12
10/23/01 11:37	13.2797	17.63	0.106	12.8834	0.10
10/23/01 11:38	14.0697	17.63	0.096	13.6734	0.09
10/23/01 11:39	14.9063	17.63	0.086	14.51	0.08
10/23/01 11:39	15.7913	17.63	0.077	15.395	0.07
10/23/01 11:40	16.7297	17.63	0.067	16.3334	0.06
10/23/01 11:41	17.723	17.63	0.059	17.3267	0.06
10/23/01 11:42	18.7763	17.63	0.055	18.38	0.05
10/23/01 11:44	19.8913	17.63	0.048	19.495	0.05
10/23/01 11:45	21.073	17.63	0.042	20.6767	0.04
10/23/01 11:46	22.3247	17.63	0.036	21.9284	0.03
10/23/01 11:47	23.6497	17.63	0.032	23.2534	0.03
10/23/01 11:49	25.0547	17.63	0.028	24.6584	0.03
10/23/01 11:50	26.543	17.63	0.022	26.1467	0.02
10/23/01 11:52	28.118	17.63	0.017	27.7217	0.02
10/23/01 11:53	29.7863	17.63	0.015	29.39	0.01

HYDRAULIC CONDUCTIVITY TESTING DATA SHEET

Tetra Tech NUS, Inc.

PROJECT NAME: INDIANHEAD SITE 57 FS WELL/BORING NO.: S57TW19

PROJECT NO.: 7129-2920 GEOLOGIST: FRED W. RAMSER

WELL DIAMETER: 1" SCREEN LENGTH/DEPTH: 5' / TEST NO.:

STATIC WATER LEVEL (Depth/Elevation): 10.74 TPVC DATE: 10-23-01

TEST TYPE (Rising/Falling/Constant Head): FALLING/RISING CHECKED:

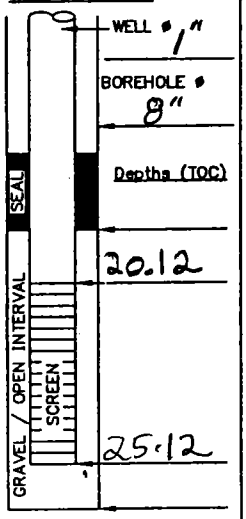
METHOD OF INDUCING WATER LEVEL CHANGE: SOLID SLUG PAGE ..... OF .....

REFERENCE PT. FOR WL MEAS. (Top of Casing, Transducer, etc.): SURFACE (FH) TOC (RH)

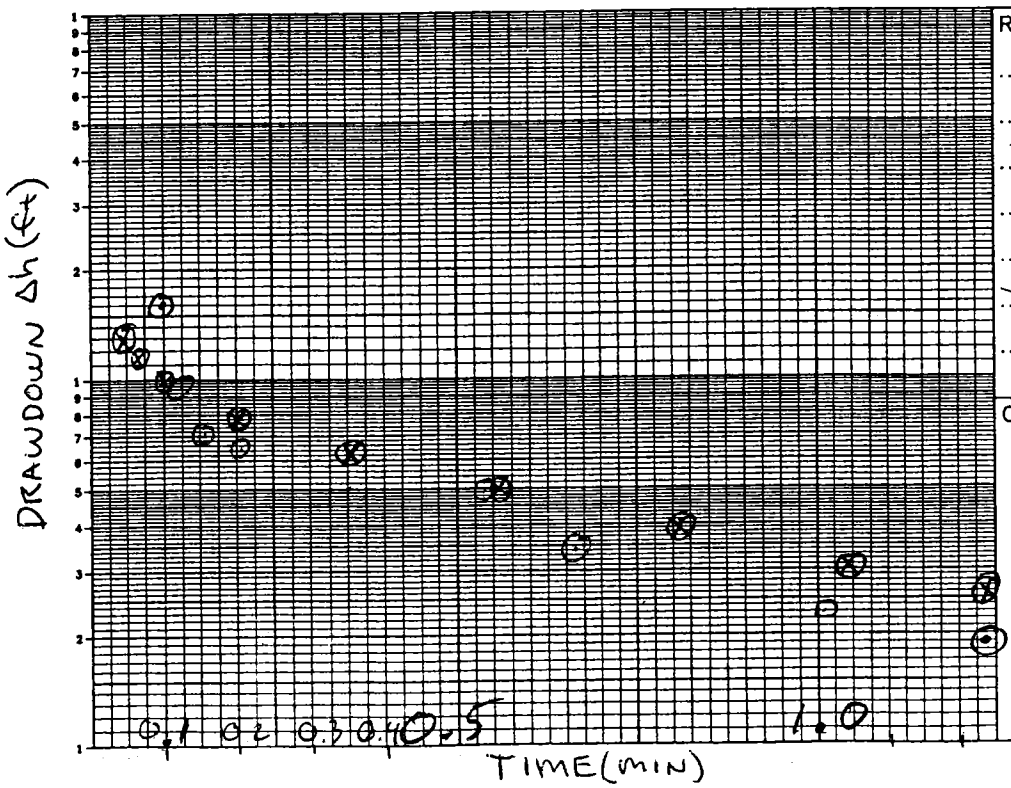
ACAD:FORM_HYDCONTST.dwg 07/06/99 INL

FALLING HEAD			RISING HEAD		
ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)	ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)
0.100		1.625	0.045		1.311
0.1255		0.967	0.060		1.159
0.1578		0.709	0.100		0.994
0.2100		0.636	0.210		0.781
0.5247		0.409	0.3532		0.630
0.6578		0.349	0.5547		0.495
0.7813		0.306	0.7813		0.394
0.9278		0.260	1.0412		0.313
1.0412		0.231	1.238		0.267
1.238		0.190	1.4728		0.224
			1.7530		0.186

WELL SCHEMATIC



▽ Indicate SWL Depth on Drawing



REMARKS:

head = 12.622

- RISING BENT SLUG DID NOT LOWER FREELY
- RISING HEAD TEST MORE RELIABLE

CALCS, SKETCH MAPS, ETC.:

⊙ – FALLING HEAD

⊗ – RISING HEAD

TETRA TECH NUS, INC. CALCULATION WORKSHEET PAGE ____ OF ____

CLIENT INDIAN HEAD NSWC	JOB NUMBER 7129 SITE 57 FS
SUBJECT SLUG TEST WELL S57TW19 FALLING HEAD	
BASED ON HVORSLEV	DRAWING NUMBER
BY FRED R. / CHECKED BY CA	APPROVED BY / DATE 11-2-01

EQ:

$$K = \frac{r^2 \ln(L/R)}{2LT_o}$$

WHERE:

$r = 0.041667$ (RISER RADIUS, Ft)
$R = 0.041667$ (SCREEN RADIUS, Ft)
$L = 5$ (INPUT LENGTH, Ft)
$T_o = 0.983$ (FROM PLOT, MIN)
K = HYDRAULIC COND. (ft/MIN)

SUB:

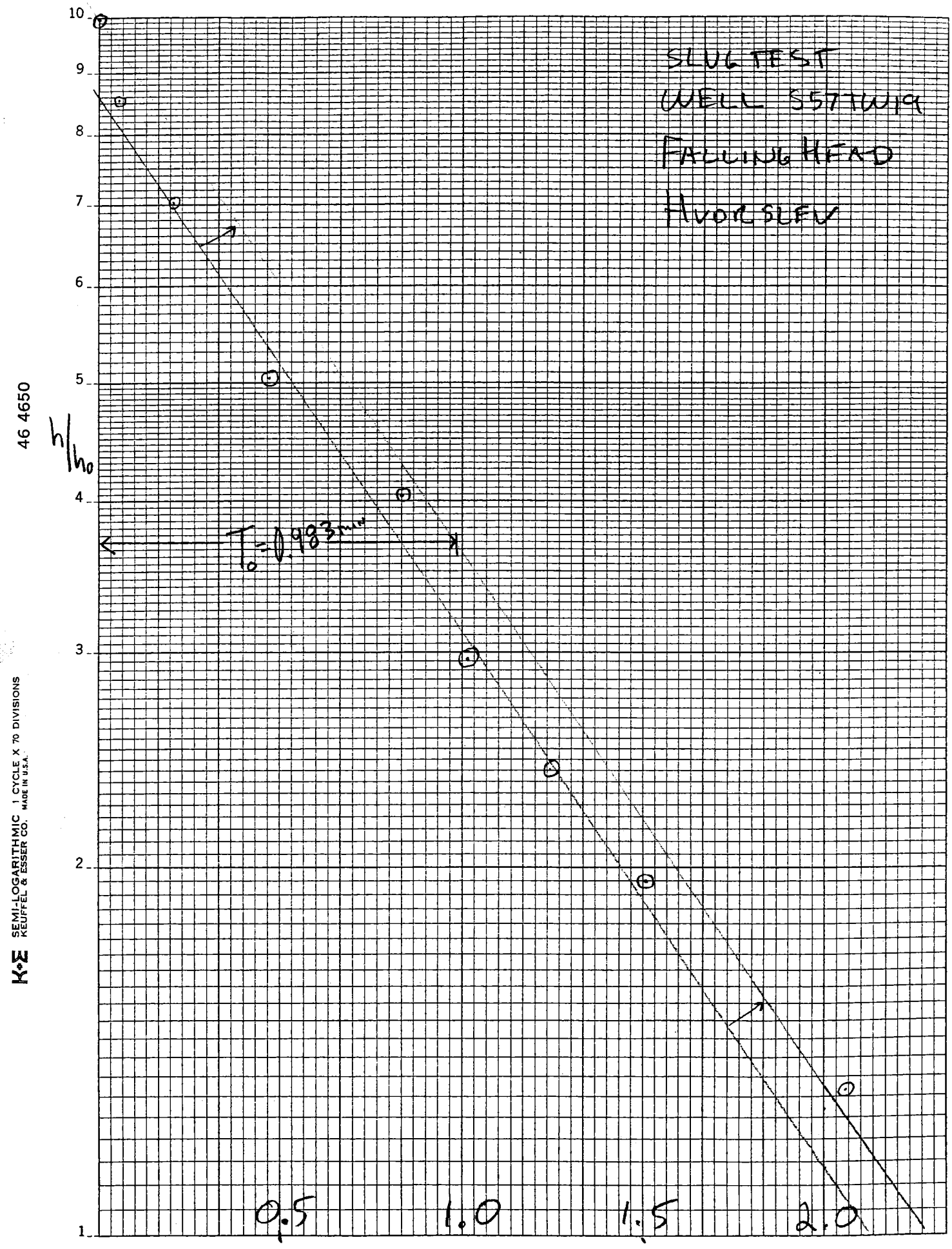
$$K = \frac{(0.041667)^2 \ln(5/0.041667)}{2(5)(0.983)}$$

$$K = \frac{8.31160372 \times 10^{-3}}{9.83}$$

$$K = 8.5 \times 10^{-4} \text{ ft/min}$$

$$K = 4.3 \times 10^{-4} \text{ cm/sec}$$

$$K = 1.22 \text{ ft/day}$$ ✓



46 4650
K+E SEMI-LOGARITHMIC 1 CYCLE X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

In-Situ Inc.	MiniTroll Pro
Report generated:	11/1/01 12:08:48
Report from file:	C:\Win-Situ\Data\SN01966 2001-10-23 121018 s57tw19fhno1.bin
DataMgr Version	3.68
Serial number:	1966
Firmware Version	3.01
Unit name:	miniTROLL
Test name:	s57tw19fhno1
Test defined on:	10/23/01 12:04:23
Test started on:	10/23/01 12:10:18
Test stopped on:	10/23/01 12:19:11
Test extracted on:	N/A

Data gathered using Logarithmic testing
Maximum time between data points:10 Minutes.
Number of data samples: 99

TOTAL DATA SAMPLES 99

Channel number [1]
Measurement type: Temperature
Channel name: OnBoard Temp

Channel number [2]
Measurement type: Pressure
Channel name: OnBoard Pressure
Sensor Range: 30 PSI.
Specific gravity: 1
Mode: Surface
User-defined reference: 0 Feet H2O
Referenced on: test start
Pressure head at reference: 12.649 Feet H2O

Date	Time	ET (min)	Chan[1] Celsius	Chan[2] Feet H2O	Adj Feet H2O	h/ho (ho= 0.768)	Adj ET (min)
10/23/01	12:10	0	15.79	0	0.022		
10/23/01	12:10	0.005	15.8	0	0.022		
10/23/01	12:10	0.01	15.8	0.002	0.024		
10/23/01	12:10	0.1407	15.84	0.721	0.743		
10/23/01	12:10	0.149	15.84	0.746	0.768	1.000	0
10/23/01	12:10	0.1578	15.84	0.709	0.731	0.952	0.0088
10/23/01	12:10	0.167	15.84	0.704	0.726	0.945	0.018
10/23/01	12:10	0.177	15.82	0.682	0.704	0.917	0.028
10/23/01	12:10	0.1875	15.82	0.663	0.685	0.892	0.0385
10/23/01	12:10	0.1985	15.82	0.651	0.673	0.876	0.0495
10/23/01	12:10	0.2102	15.82	0.636	0.658	0.857	0.0612
10/23/01	12:10	0.2227	15.82	0.632	0.654	0.852	0.0737
10/23/01	12:10	0.2358	15.82	0.609	0.631	0.822	0.0868

10/23/01 12:10	0.2498	15.82	0.593	0.615	0.801	0.1008
10/23/01 12:10	0.2647	15.82	0.578	0.6	0.781	0.1157
10/23/01 12:10	0.2803	15.82	0.574	0.596	0.776	0.1313
10/23/01 12:10	0.297	15.82	0.558	0.58	0.755	0.148
10/23/01 12:10	0.3147	15.82	0.543	0.565	0.736	0.1657
10/23/01 12:10	0.3333	15.81	0.531	0.553	0.720	0.1843
10/23/01 12:10	0.3532	15.81	0.517	0.539	0.702	0.2042
10/23/01 12:10	0.3742	15.81	0.498	0.52	0.677	0.2252
10/23/01 12:10	0.3963	15.81	0.653	0.675	0.879	0.2473
10/23/01 12:10	0.4198	15.81	0.436	0.458	0.596	0.2708
10/23/01 12:10	0.4447	15.81	0.674	0.696	0.906	0.2957
10/23/01 12:10	0.4697	15.81	0.508	0.53	0.690	0.3207
10/23/01 12:10	0.4963	15.81	0.422	0.444	0.578	0.3473
10/23/01 12:10	0.5247	15.81	0.409	0.431	0.561	0.3757
10/23/01 12:10	0.5547	15.81	0.395	0.417	0.543	0.4057
10/23/01 12:10	0.5863	15.81	0.38	0.402	0.523	0.4373
10/23/01 12:10	0.6213	15.81	0.366	0.388	0.505	0.4723
10/23/01 12:10	0.6578	15.81	0.349	0.371	0.483	0.5088
10/23/01 12:11	0.6963	15.81	0.335	0.357	0.465	0.5473
10/23/01 12:11	0.738	15.8	0.318	0.34	0.443	0.589
10/23/01 12:11	0.7813	15.8	0.306	0.328	0.427	0.6323
10/23/01 12:11	0.828	15.8	0.289	0.311	0.405	0.679
10/23/01 12:11	0.8763	15.8	0.273	0.295	0.384	0.7273
10/23/01 12:11	0.928	15.8	0.26	0.282	0.367	0.779
10/23/01 12:11	0.983	15.8	0.246	0.268	0.349	0.834
10/23/01 12:11	1.0413	15.8	0.231	0.253	0.329	0.8923
10/23/01 12:11	1.103	15.8	0.217	0.239	0.311	0.954
10/23/01 12:11	1.168	15.8	0.205	0.227	0.296	1.019
10/23/01 12:11	1.238	15.8	0.19	0.212	0.276	1.089
10/23/01 12:11	1.3113	15.8	0.176	0.198	0.258	1.1623
10/23/01 12:11	1.3897	15.79	0.163	0.185	0.241	1.2407
10/23/01 12:11	1.473	15.79	0.151	0.173	0.225	1.324
10/23/01 12:11	1.5613	15.79	0.139	0.161	0.210	1.4123
10/23/01 12:11	1.6547	15.79	0.128	0.15	0.195	1.5057
10/23/01 12:12	1.753	15.79	0.118	0.14	0.182	1.604
10/23/01 12:12	1.858	15.79	0.108	0.13	0.169	1.709
10/23/01 12:12	1.968	15.79	0.097	0.119	0.155	1.819
10/23/01 12:12	2.0847	15.79	0.087	0.109	0.142	1.9357
10/23/01 12:12	2.2097	15.77	0.079	0.101	0.132	2.0607
10/23/01 12:12	2.3412	15.77	0.071	0.093	0.121	2.1922
10/23/01 12:12	2.4813	15.77	0.062	0.084	0.109	2.3323
10/23/01 12:12	2.6297	15.77	0.054	0.076	0.099	2.4807
10/23/01 12:13	2.7863	15.77	0.048	0.07	0.091	2.6373
10/23/01 12:13	2.953	15.77	0.04	0.062	0.081	2.804
10/23/01 12:13	3.1297	15.77	0.035	0.057	0.074	2.9807
10/23/01 12:13	3.3163	15.77	0.027	0.049	0.064	3.1673
10/23/01 12:13	3.5147	15.77	0.023	0.045	0.059	3.3657
10/23/01 12:14	3.7247	15.77	0.019	0.041	0.053	3.5757
10/23/01 12:14	3.9463	15.76	0.013	0.035	0.046	3.7973
10/23/01 12:14	4.1813	15.76	0.009	0.031	0.040	4.0323
10/23/01 12:14	4.4295	15.76	0.005	0.027	0.035	4.2805
10/23/01 12:15	4.693	15.76	0.001	0.023	0.030	4.544
10/23/01 12:15	4.973	15.76	-0.002	0.02	0.026	4.824
10/23/01 12:15	5.2697	15.76	-0.004	0.018	0.023	5.1207
10/23/01 12:15	5.583	15.76	-0.006	0.016	0.021	5.434

10/23/01 12:16	5.9147	15.76	-0.008	0.014	0.018	5.7657
10/23/01 12:16	6.2663	15.76	-0.012	0.01	0.013	6.1173
10/23/01 12:16	6.6397	15.75	-0.014	0.008	0.010	6.4907
10/23/01 12:17	7.0347	15.75	-0.018	0.004	0.005	6.8857
10/23/01 12:17	7.453	15.75	-0.02	0.002	0.003	7.304
10/23/01 12:18	7.8963	15.75	-0.02	0.002	0.003	7.7473
10/23/01 12:18	8.3663	15.75	-0.022	0	0.000	8.2173
10/23/01 12:19	8.8647	15.75	-0.022	0	0.000	8.7157

TETRA TECH NUS, INC. CALCULATION WORKSHEET PAGE ____ OF ____

CLIENT: INDIAN HEAD NSWC	JOB NUMBER: 7129 SITE 57 FS
SUBJECT: SLUG TEST WELL S57TW19 RISING HEAD	
BASED ON: HVORSLEV	DRAWING NUMBER:
BY: FRED R. / CHECKED BY:	APPROVED BY: / DATE: 11-2-01

EQ:

$$K = \frac{r^2 \ln(L/R)}{2LT_o}$$

WHERE:

$r = 0.041667$ (RISER RADIUS, Ft)
$R = 0.041667$ (SCREEN RADIUS, Ft)
$L = 5$ (INPUT LENGTH, Ft)
$T_o = 0.583$ (FROM PLOT, MIN)
K = HYDRAULIC COND. (ft/min)

SUB:

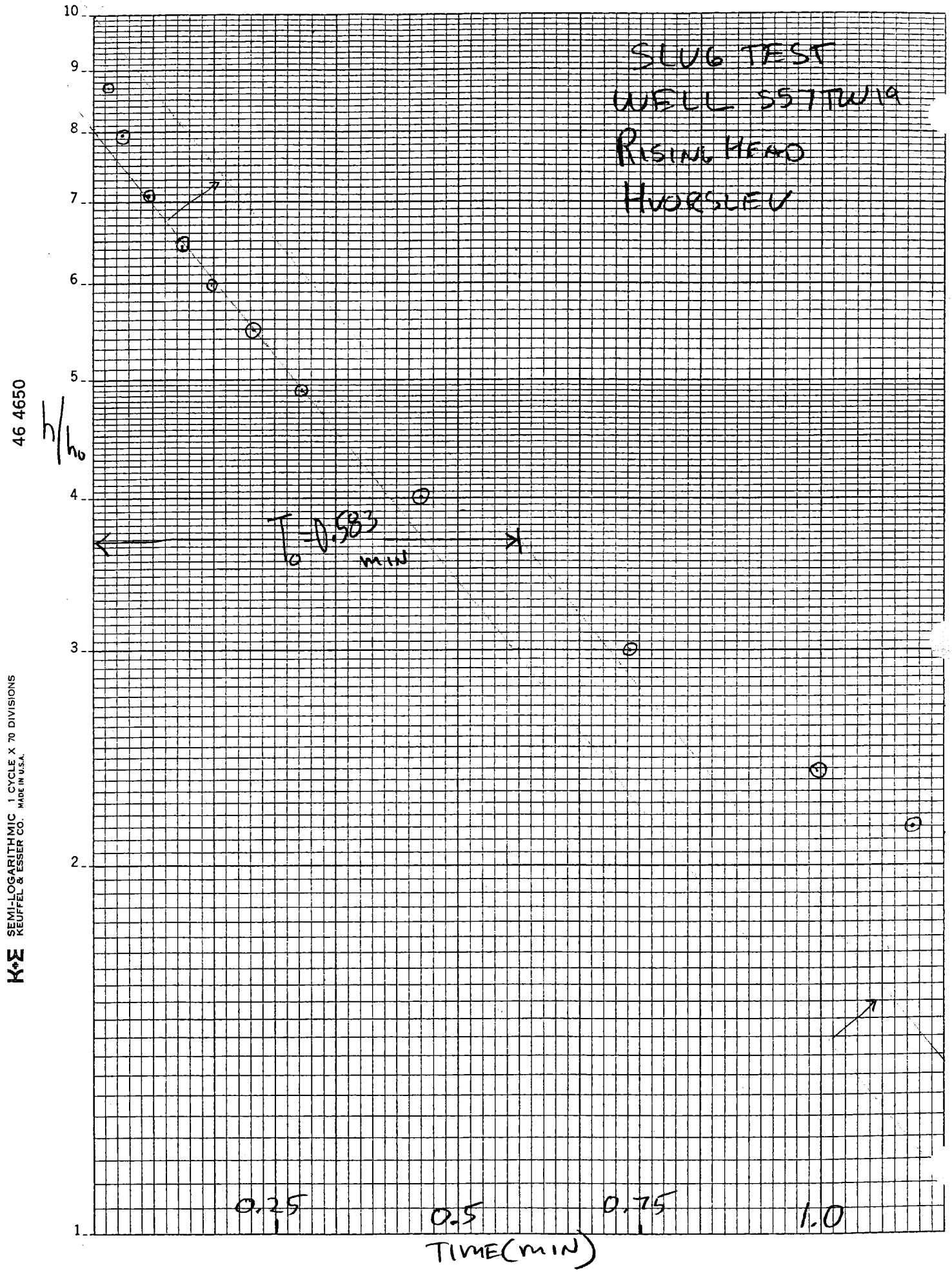
$$K = \frac{(0.041667)^2 \ln(5/0.041667)}{2(5)(0.583)}$$

$$= \frac{8.3117367 \times 10^{-3}}{5.83}$$

$$= 1.43 \times 10^{-3} \text{ ft/min}$$

$$= 7.24 \times 10^{-4} \text{ cm/sec}$$

$$= 2.1 \text{ ft/day} \quad \checkmark$$



46 4650
K+E SEMI-LOGARITHMIC 1 CYCLE X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

In-Situ Inc.	MiniTroll Pro
Report generated:	10/31/01 12:24:39
Report from file:	C:\Win-Situ\Data\SN01966 2001-10-23 122122 s57tw19rhno2.bin
DataMgr Version	3.68
Serial number:	1966
Firmware Version	3.01
Unit name:	miniTROLL
Test name:	s57tw19rhno2
Test defined on:	10/23/01 12:20:47
Test started on:	10/23/01 12:21:22
Test stopped on:	10/23/01 12:35:28
Test extracted on:	N/A

Data gathered using Logarithmic testing
Maximum time between data points: 10.00 Minutes.
Number of data samples: 107

TOTAL DATA SAMPLES 107

Channel number [1]
Measurement type: Temperature
Channel name: OnBoard Temp

Channel number [2]
Measurement type: Pressure
Channel name: OnBoard Pressure
Sensor Range: 30 PSI.
Specific gravity: 1
Mode: TOC
User-defined reference: 0 Feet H2O
Referenced on: test start
Pressure head at reference: 12.619 Feet H2O

Date	Time	ET (min)	Chan[1] Celsius	Chan[2] Feet H2O	Adj ET (min)	h/ho	ho= 1.311
10/23/01	12:21	0	15.73	0			
10/23/01	12:21	0.005	15.75	0.191			
10/23/01	12:21	0.01	15.76	2.663			
10/23/01	12:21	0.015	15.76	2.475			
10/23/01	12:21	0.02	15.76	0.961			
10/23/01	12:21	0.025	15.76	1.383			
10/23/01	12:21	0.03	15.76	1.691			
10/23/01	12:21	0.035	15.77	1.284			
10/23/01	12:21	0.04	15.77	1.186			
10/23/01	12:21	0.045	15.77	1.311	0	1	

				ET	h/ho
10/23/01 12:21	0.05	15.77	1.257	0.005	0.959
10/23/01 12:21	0.055	15.77	1.17	0.01	0.892
10/23/01 12:21	0.06	15.77	1.159	0.015	0.884
10/23/01 12:21	0.065	15.77	1.145	0.02	0.873
10/23/01 12:21	0.07	15.77	1.108	0.025	0.845
10/23/01 12:21	0.075	15.77	1.085	0.03	0.828
10/23/01 12:21	0.08	15.79	1.069	0.035	0.815
10/23/01 12:21	0.0848	15.79	1.04	0.0398	0.793
10/23/01 12:21	0.09	15.79	1.017	0.045	0.776
10/23/01 12:21	0.095	15.79	1.005	0.05	0.767
10/23/01 12:21	0.1	15.79	0.994	0.055	0.758
10/23/01 12:21	0.1058	15.77	0.973	0.0608	0.742
10/23/01 12:21	0.112	15.79	0.959	0.067	0.732
10/23/01 12:21	0.1185	15.79	0.942	0.0735	0.719
10/23/01 12:21	0.1255	15.79	0.926	0.0805	0.706
10/23/01 12:21	0.1328	15.79	0.911	0.0878	0.695
10/23/01 12:21	0.1407	15.79	0.895	0.0957	0.683
10/23/01 12:21	0.149	15.79	0.876	0.104	0.668
10/23/01 12:21	0.1578	15.79	0.862	0.1128	0.658
10/23/01 12:21	0.167	15.79	0.845	0.122	0.645
10/23/01 12:21	0.177	15.79	0.831	0.132	0.634
10/23/01 12:21	0.1875	15.77	0.814	0.1425	0.621
10/23/01 12:21	0.1985	15.79	0.802	0.1535	0.612
10/23/01 12:21	0.2102	15.77	0.781	0.1652	0.596
10/23/01 12:21	0.2227	15.77	0.764	0.1777	0.583
10/23/01 12:21	0.2358	15.77	0.748	0.1908	0.571
10/23/01 12:21	0.2498	15.77	0.731	0.2048	0.558
10/23/01 12:21	0.2647	15.77	0.717	0.2197	0.547
10/23/01 12:21	0.2803	15.77	0.698	0.2353	0.532
10/23/01 12:21	0.297	15.77	0.682	0.252	0.52
10/23/01 12:21	0.3147	15.77	0.665	0.2697	0.507
10/23/01 12:21	0.3333	15.77	0.648	0.2883	0.494
10/23/01 12:21	0.3532	15.77	0.63	0.3082	0.481
10/23/01 12:21	0.3742	15.77	0.613	0.3292	0.468
10/23/01 12:21	0.3963	15.77	0.597	0.3513	0.455
10/23/01 12:21	0.4198	15.77	0.578	0.3748	0.441
10/23/01 12:21	0.4447	15.77	0.562	0.3997	0.429
10/23/01 12:21	0.4697	15.77	0.545	0.4247	0.416
10/23/01 12:21	0.4963	15.77	0.528	0.4513	0.403
10/23/01 12:21	0.5247	15.77	0.512	0.4797	0.391
10/23/01 12:21	0.5547	15.77	0.495	0.5097	0.378
10/23/01 12:21	0.5863	15.76	0.478	0.5413	0.365
10/23/01 12:21	0.6213	15.76	0.46	0.5763	0.351
10/23/01 12:22	0.6578	15.76	0.443	0.6128	0.338
10/23/01 12:22	0.6963	15.76	0.427	0.6513	0.326
10/23/01 12:22	0.738	15.76	0.41	0.693	0.313
10/23/01 12:22	0.7813	15.76	0.394	0.7363	0.301
10/23/01 12:22	0.828	15.76	0.377	0.783	0.288
10/23/01 12:22	0.8763	15.76	0.361	0.8313	0.275
10/23/01 12:22	0.928	15.76	0.344	0.883	0.262
10/23/01 12:22	0.983	15.76	0.327	0.938	0.249
10/23/01 12:22	1.0413	15.76	0.313	0.9963	0.239

10/23/01 12:22	1.103	15.76	0.296	1.058	0.226
10/23/01 12:22	1.168	15.76	0.282	1.123	0.215
10/23/01 12:22	1.238	15.76	0.267	1.193	0.204
10/23/01 12:22	1.3113	15.75	0.253	1.2663	0.193
10/23/01 12:22	1.3897	15.75	0.236	1.3447	0.18
10/23/01 12:22	1.473	15.75	0.224	1.428	0.171
10/23/01 12:22	1.5613	15.75	0.211	1.5163	0.161
10/23/01 12:23	1.6547	15.75	0.199	1.6097	0.152
10/23/01 12:23	1.753	15.75	0.186	1.708	0.142
10/23/01 12:23	1.858	15.75	0.176	1.813	0.134
10/23/01 12:23	1.968	15.75	0.164	1.923	0.125
10/23/01 12:23	2.0847	15.75	0.153	2.0397	0.117
10/23/01 12:23	2.2097	15.75	0.143	2.1647	0.109
10/23/01 12:23	2.3412	15.75	0.135	2.2962	0.103
10/23/01 12:23	2.4813	15.75	0.124	2.4363	0.095
10/23/01 12:23	2.6297	15.75	0.116	2.5847	0.088
10/23/01 12:24	2.7863	15.73	0.108	2.7413	0.082
10/23/01 12:24	2.953	15.75	0.102	2.908	0.078
10/23/01 12:24	3.1297	15.73	0.093	3.0847	0.071
10/23/01 12:24	3.3163	15.73	0.087	3.2713	0.066
10/23/01 12:24	3.5147	15.73	0.083	3.4697	0.063
10/23/01 12:25	3.7247	15.73	0.077	3.6797	0.059
10/23/01 12:25	3.9463	15.73	0.07	3.9013	0.053
10/23/01 12:25	4.1813	15.73	0.068	4.1363	0.052
10/23/01 12:25	4.4295	15.73	0.066	4.3845	0.05
10/23/01 12:26	4.693	15.73	0.062	4.648	0.047
10/23/01 12:26	4.973	15.73	0.058	4.928	0.044
10/23/01 12:26	5.2697	15.73	0.056	5.2247	0.043
10/23/01 12:26	5.583	15.73	0.052	5.538	0.04
10/23/01 12:27	5.9147	15.73	0.052	5.8697	0.04
10/23/01 12:27	6.2663	15.73	0.05	6.2213	0.038
10/23/01 12:28	6.6397	15.73	0.048	6.5947	0.037
10/23/01 12:28	7.0347	15.73	0.046	6.9897	0.035
10/23/01 12:28	7.453	15.73	0.043	7.408	0.033
10/23/01 12:29	7.8963	15.73	0.046	7.8513	0.035
10/23/01 12:29	8.3663	15.72	0.041	8.3213	0.031
10/23/01 12:30	8.8647	15.72	0.043	8.8197	0.033
10/23/01 12:30	9.3913	15.72	0.043	9.3463	0.033
10/23/01 12:31	9.9497	15.72	0.041	9.9047	0.031
10/23/01 12:31	10.5413	15.72	0.039	10.4963	0.03
10/23/01 12:32	11.168	15.72	0.039	11.123	0.03
10/23/01 12:33	11.8313	15.72	0.037	11.7863	0.028
10/23/01 12:33	12.5347	15.72	0.039	12.4897	0.03
10/23/01 12:34	13.2797	15.72	0.039	13.2347	0.03
10/23/01 12:35	14.0697	15.72	0.041	14.0247	0.031

HYDRAULIC CONDUCTIVITY TESTING DATA SHEET

Tetra Tech NUS, Inc.

PROJECT NAME: INDIANHEAD SITE 57 FS WELL/BORING NO.: S57MW20

PROJECT NO.: 7129-2920 GEOLOGIST: FRED W. RAMSER

WELL DIAMETER: 2" SCREEN LENGTH/DEPTH: 10'/ TEST NO.: 4.5

STATIC WATER LEVEL (Depth/Elevation): 6.50 DATE: 10-4-01

TEST TYPE (Rising/Falling/Constant Head): FALLING + RISING CHECKED:

METHOD OF INDUCING WATER LEVEL CHANGE: SOLID SLUG PAGE 1 OF

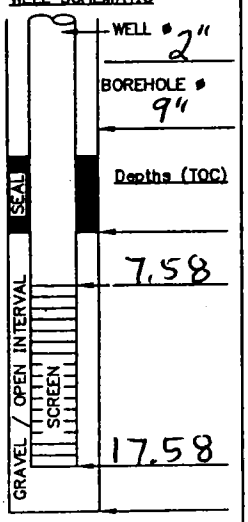
REFERENCE PT. FOR WL MEAS. (Top of Casing, Transducer, etc.):

ACAD:FORM_HYDCONTST.dwg 07/06/99 INL

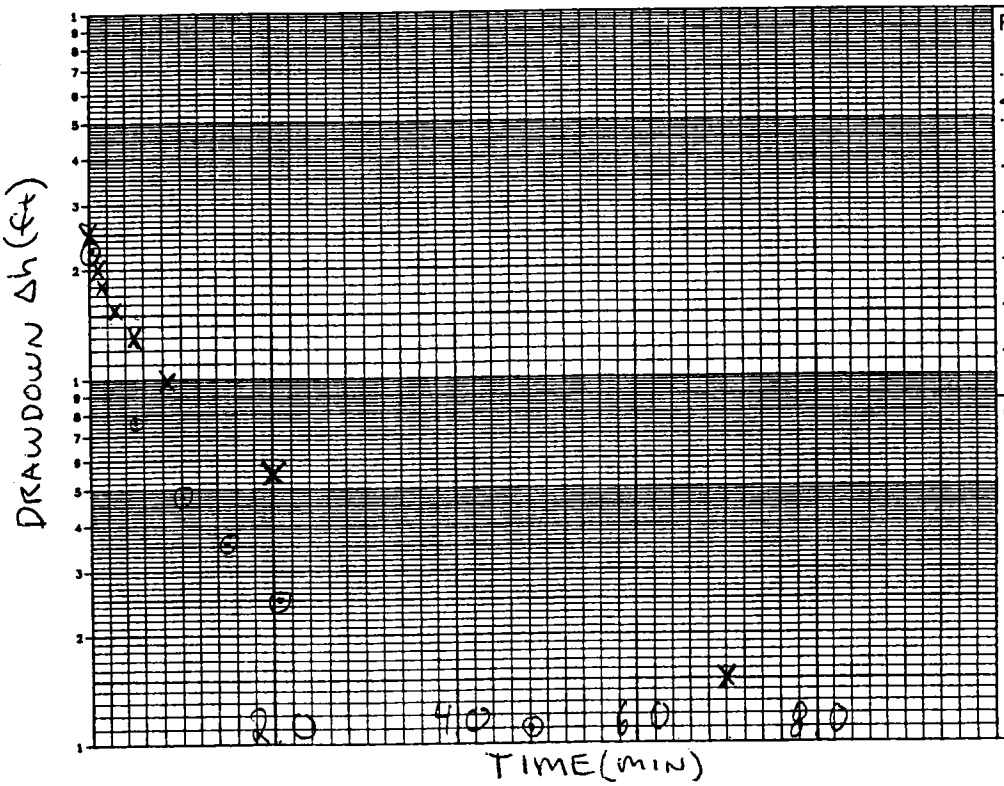
FALLING HEAD DATA | RISING HEAD

ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)	ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)
0.01	-12.79	2.24	0.02	8.08	2.47
0.03	-11.73	1.18	0.05	8.5	2.05
0.10	-11.92	1.37	0.15	8.74	1.81
0.1985	-11.69	1.14	0.30	8.99	1.56
0.50	-11.31	0.76	0.5	9.22	1.33
1.04	-11.02	0.47	1.1	9.64	0.91
1.47	-10.9	0.35	2.2	10.0	0.55
2.09	-10.8	0.25	7.0	10.4	0.15
4.97	-10.66	0.11	19.89	10.5	0.05
9.94	-10.6				

WELL SCHEMATIC



▽ Indicate SWL Depth on Drawing



REMARKS:

PLACED X-DUPER ~0.5 FROM BOTTOM.

(10.55 REF 0.00)

CALCS, SKETCH MAPS, ETC.:

RISING HEAD ×

FALLING HEAD ⊙

TETRA TECH NUS, INC. **CALCULATION WORKSHEET** PAGE _____ OF _____

CLIENT: INDIAN HEAD NSWC	JOB NUMBER: 7129 SITE 57 FS
SUBJECT: SLUG TEST WELL S57MW20 FALLING HEAD	
BASED ON: HVORSLEV	DRAWING NUMBER:
BY: FRED R. / CHECKED BY:	APPROVED BY: / DATE: 11-2-01

EQ:

$$K = \frac{r^2 \ln(L/R)}{2L T_o}$$

WHERE:

$r = 0.0833$ (RISER RADIUS, Ft)
$R = 0.0833$ (SCREEN RADIUS, Ft)
$L = 10$ (INPUT LENGTH, Ft)
$T_o = 0.74$ (FROM PLOT, MIN)
K = HYDRAULIC COND. (ft/min)

SUB:

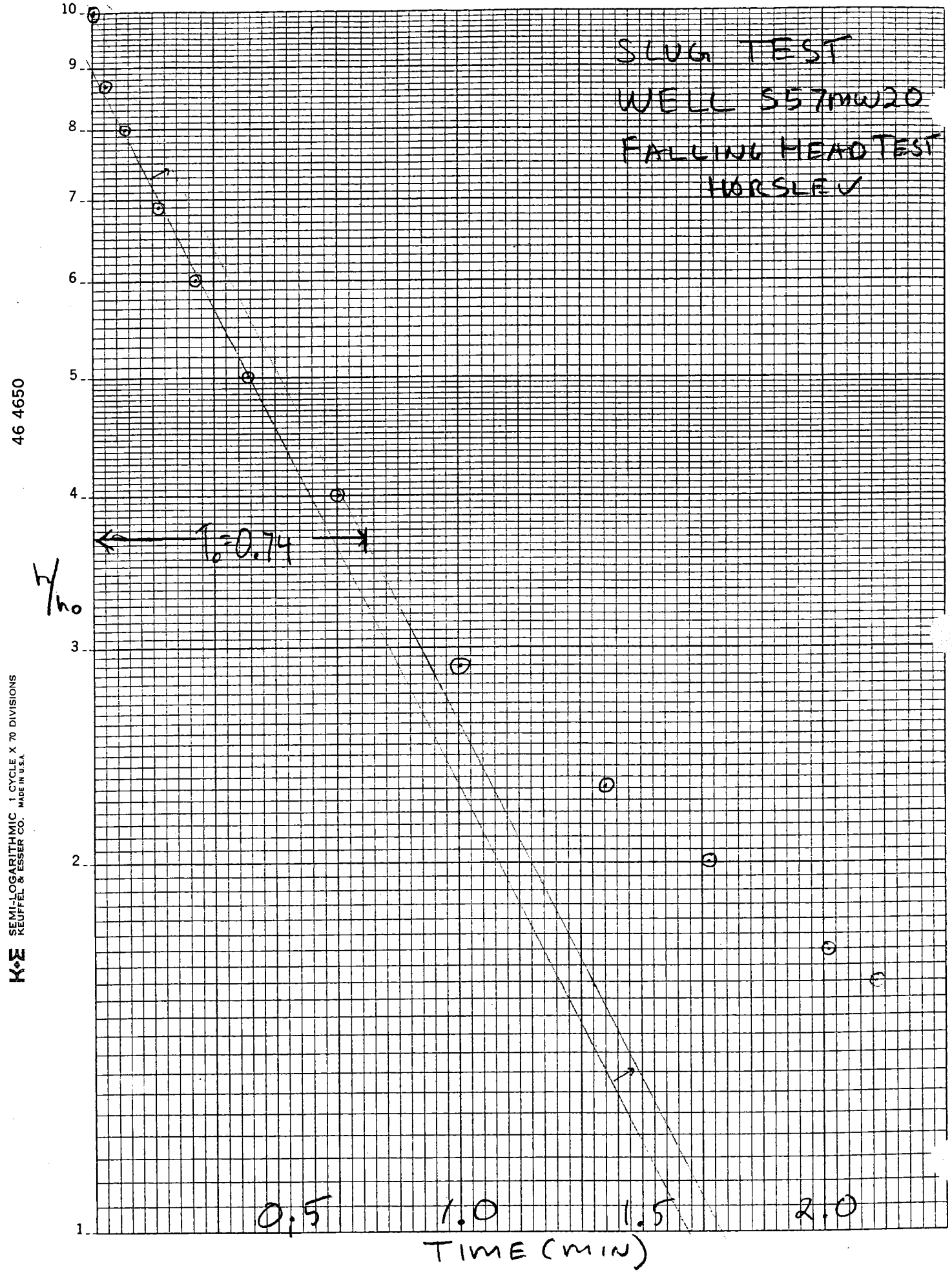
$$K = \frac{(0.0833)^2 \ln(10/0.0833)}{2(10)(0.74)}$$

$$= \frac{33249248 \times 10^{-2}}{14.8}$$

$$= 2.25 \times 10^{-3} \text{ ft/min}$$

$$= 1.14 \times 10^{-3} \text{ cm/sec}$$

$$= 3.2 \text{ ft/day} \checkmark$$


SLUG TEST
WELL S57MW20
FALLING HEAD TEST
HORSLEV
$T_0 = 0.74$
h/ho
10
9
8
7
6
5
4
3
2
1
0.5
1.0
1.5
2.0
TIME (MIN)
46 4650
K+E SEMI-LOGARITHMIC 1 CYCLE X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

In-Situ Inc. MiniTroll Pro

Report generated: 10/18/01 14:15:19
Report from file: C:\Win-Situ\Data\SN00856 2001-10-04 094955 s57mw20fhno4.bin
DataMgr Version 3.68

Serial number: 856
Firmware Version 3.01
Unit name: miniTROLL

Test name: s57mw20fhno4

Test defined on: 10/4/01 9:38:09
Test started on: 10/4/01 9:49:55
Test stopped on: 10/4/01 10:13:28
Test extracted on: N/A

Data gathered using Logarithmic testing
Maximum time between data points: Minutes.
Number of data samples: 115

TOTAL DATA SAMPLES 115

Channel number [1]
Measurement type: Temperature
Channel name: OnBoard Temp

Channel number [2]
Measurement type: Pressure
Channel name: OnBoard Pressure
Sensor Range: 30 PSI.
Specific gravity: 1

Date	Time	ET (min)	Chan[1] Celsius	Chan[2] Feet H2O	H2O feet adj by 10.55	ET (min) adj	h/ho	ho= 1.53
10/4/01	9:49	0	18.52	12.14	1.59			
10/4/01	9:49	0.005	18.54	12.526	1.976			
10/4/01	9:49	0.01	18.55	12.791	2.241			
10/4/01	9:49	0.015	18.55	12.677	2.127			
10/4/01	9:49	0.02	18.55	12.706	2.156			
10/4/01	9:49	0.025	18.55	11.871	1.321			
10/4/01	9:49	0.03	18.55	11.73	1.18			
10/4/01	9:49	0.035	18.55	11.873	1.323			
10/4/01	9:49	0.04	18.55	12.262	1.712			
10/4/01	9:49	0.045	18.56	12.388	1.838			
10/4/01	9:49	0.05	18.56	12.195	1.645			
10/4/01	9:49	0.055	18.56	11.979	1.429			
10/4/01	9:49	0.06	18.56	11.954	1.404			
10/4/01	9:49	0.065	18.56	12.045	1.495			
10/4/01	9:49	0.07	18.56	12.08	1.53	0	1.00	—
10/4/01	9:49	0.075	18.56	12.024	1.474	0.005	0.96	
10/4/01	9:50	0.08	18.56	11.968	1.418	0.01	0.93	
10/4/01	9:50	0.0848	18.56	11.952	1.402	0.0148	0.92	
10/4/01	9:50	0.09	18.56	11.962	1.412	0.02	0.92	
10/4/01	9:50	0.095	18.56	11.937	1.387	0.025	0.91	

10/4/01 9:50	0.1	18.56	11.918	1.368	0.03	0.89
10/4/01 9:50	0.1058	18.56	11.875	1.325	0.0358	0.87
10/4/01 9:50	0.112	18.56	11.891	1.341	0.042	0.88
10/4/01 9:50	0.1185	18.56	11.881	1.331	0.0485	0.87
10/4/01 9:50	0.1255	18.56	11.854	1.304	0.0555	0.85
10/4/01 9:50	0.1328	18.56	11.837	1.287	0.0628	0.84
10/4/01 9:50	0.1407	18.58	11.822	1.272	0.0707	0.83
10/4/01 9:50	0.149	18.56	11.802	1.252	0.079	0.82
10/4/01 9:50	0.1578	18.58	11.781	1.231	0.0878	0.80
10/4/01 9:50	0.167	18.56	11.76	1.21	0.097	0.79
10/4/01 9:50	0.177	18.55	11.738	1.188	0.107	0.78
10/4/01 9:50	0.1875	18.55	11.717	1.167	0.1175	0.76
10/4/01 9:50	0.1985	18.55	11.694	1.144	0.1285	0.75
10/4/01 9:50	0.2102	18.55	11.675	1.125	0.1402	0.74
10/4/01 9:50	0.2227	18.55	11.651	1.101	0.1527	0.72
10/4/01 9:50	0.2358	18.55	11.63	1.08	0.1658	0.71
10/4/01 9:50	0.2498	18.55	11.607	1.057	0.1798	0.69
10/4/01 9:50	0.2647	18.55	11.584	1.034	0.1947	0.68
10/4/01 9:50	0.2803	18.55	11.559	1.009	0.2103	0.66
10/4/01 9:50	0.297	18.55	11.538	0.988	0.227	0.65
10/4/01 9:50	0.3147	18.55	11.513	0.963	0.2447	0.63
10/4/01 9:50	0.3333	18.55	11.493	0.943	0.2633	0.62
10/4/01 9:50	0.3532	18.55	11.47	0.92	0.2832	0.60
10/4/01 9:50	0.3742	18.55	11.445	0.895	0.3042	0.58
10/4/01 9:50	0.3963	18.55	11.42	0.87	0.3263	0.57
10/4/01 9:50	0.4198	18.55	11.397	0.847	0.3498	0.55
10/4/01 9:50	0.4447	18.55	11.372	0.822	0.3747	0.54
10/4/01 9:50	0.4697	18.55	11.339	0.789	0.3997	0.52
10/4/01 9:50	0.4963	18.55	11.314	0.764	0.4263	0.50
10/4/01 9:50	0.5247	18.55	11.303	0.753	0.4547	0.49
10/4/01 9:50	0.5547	18.55	11.279	0.729	0.4847	0.48
10/4/01 9:50	0.5863	18.55	11.256	0.706	0.5163	0.46
10/4/01 9:50	0.6213	18.55	11.231	0.681	0.5513	0.45
10/4/01 9:50	0.6578	18.55	11.206	0.656	0.5878	0.43
10/4/01 9:50	0.6963	18.55	11.183	0.633	0.6263	0.41
10/4/01 9:50	0.738	18.55	11.158	0.608	0.668	0.40
10/4/01 9:50	0.7813	18.55	11.135	0.585	0.7113	0.38
10/4/01 9:50	0.828	18.55	11.11	0.56	0.758	0.37
10/4/01 9:50	0.8763	18.55	11.087	0.537	0.8063	0.35
10/4/01 9:50	0.928	18.55	11.064	0.514	0.858	0.34
10/4/01 9:50	0.983	18.54	11.042	0.492	0.913	0.32
10/4/01 9:50	1.0413	18.54	11.021	0.471	0.9713	0.31
10/4/01 9:51	1.103	18.54	11	0.45	1.033	0.29
10/4/01 9:51	1.168	18.54	10.98	0.43	1.098	0.28
10/4/01 9:51	1.238	18.54	10.959	0.409	1.168	0.27
10/4/01 9:51	1.3113	18.54	10.938	0.388	1.2413	0.25
10/4/01 9:51	1.3897	18.54	10.919	0.369	1.3197	0.24
10/4/01 9:51	1.473	18.54	10.905	0.355	1.403	0.23
10/4/01 9:51	1.5613	18.54	10.886	0.336	1.4913	0.22
10/4/01 9:51	1.6547	18.54	10.869	0.319	1.5847	0.21
10/4/01 9:51	1.753	18.54	10.855	0.305	1.683	0.20
10/4/01 9:51	1.858	18.54	10.84	0.29	1.788	0.19
10/4/01 9:51	1.968	18.54	10.828	0.278	1.898	0.18
10/4/01 9:52	2.0847	18.52	10.816	0.266	2.0147	0.17
10/4/01 9:52	2.2097	18.52	10.801	0.251	2.1397	0.16
10/4/01 9:52	2.3412	18.52	10.791	0.241	2.2712	0.16
10/4/01 9:52	2.4813	18.52	10.778	0.228	2.4113	0.15
10/4/01 9:52	2.6297	18.51	10.768	0.218	2.5597	0.14

10/4/01 9:52	2.7863	18.51	10.756	0.206	2.7163	0.13
10/4/01 9:52	2.953	18.51	10.745	0.195	2.883	0.13
10/4/01 9:53	3.1297	18.51	10.729	0.179	3.0597	0.12
10/4/01 9:53	3.3163	18.5	10.727	0.177	3.2463	0.12
10/4/01 9:53	3.5147	18.5	10.717	0.167	3.4447	0.11
10/4/01 9:53	3.7247	18.5	10.706	0.156	3.6547	0.10
10/4/01 9:53	3.9463	18.5	10.698	0.148	3.8763	0.10
10/4/01 9:54	4.1813	18.5	10.69	0.14	4.1113	0.09
10/4/01 9:54	4.4295	18.5	10.679	0.129	4.3595	0.08
10/4/01 9:54	4.693	18.49	10.671	0.121	4.623	0.08
10/4/01 9:54	4.973	18.49	10.663	0.113	4.903	0.07
10/4/01 9:55	5.2697	18.49	10.655	0.105	5.1997	0.07
10/4/01 9:55	5.583	18.49	10.646	0.096	5.513	0.06
10/4/01 9:55	5.9147	18.49	10.642	0.092	5.8447	0.06
10/4/01 9:56	6.2663	18.49	10.634	0.084	6.1963	0.05
10/4/01 9:56	6.6397	18.5	10.625	0.075	6.5697	0.05
10/4/01 9:56	7.0347	18.5	10.623	0.073	6.9647	0.05
10/4/01 9:57	7.453	18.51	10.619	0.069	7.383	0.05
10/4/01 9:57	7.8963	18.52	10.614	0.064	7.8263	0.04
10/4/01 9:58	8.3663	18.54	10.61	0.06	8.2963	0.04
10/4/01 9:58	8.8647	18.56	10.605	0.055	8.7947	0.04
10/4/01 9:59	9.3913	18.59	10.6	0.05	9.3213	0.03
10/4/01 9:59	9.9497	18.61	10.595	0.045	9.8797	0.03
10/4/01 10:00	10.5413	18.65	10.592	0.042	10.4713	0.03
10/4/01 10:01	11.168	18.68	10.587	0.037	11.098	0.02
10/4/01 10:01	11.8313	18.7	10.582	0.032	11.7613	0.02
10/4/01 10:02	12.5347	18.73	10.58	0.03	12.4647	0.02
10/4/01 10:03	13.2797	18.73	10.578	0.028	13.2097	0.02
10/4/01 10:03	14.0697	18.74	10.573	0.023	13.9997	0.02
10/4/01 10:04	14.9063	18.74	10.571	0.021	14.8363	0.01
10/4/01 10:05	15.7913	18.75	10.569	0.019	15.7213	0.01
10/4/01 10:06	16.7297	18.75	10.564	0.014	16.6597	0.01
10/4/01 10:07	17.723	18.75	10.564	0.014	17.653	0.01
10/4/01 10:08	18.7763	18.74	10.561	0.011	18.7063	0.01
10/4/01 10:09	19.8913	18.74	10.559	0.009	19.8213	0.01
10/4/01 10:10	21.073	18.74	10.559	0.009	21.003	0.01
10/4/01 10:12	22.3247	18.74	10.556	0.006	22.2547	0.00

TETRA TECH NUS, INC. CALCULATION WORKSHEET PAGE ____ OF ____

CLIENT: INDIAN HEAD NSWC	JOB NUMBER: 7129 SITE 57 FS
SUBJECT: SLUG TEST WELL	S57MW20 RISING HEAD
BASED ON: HVORSLEV	DRAWING NUMBER:
BY: FRED R. / CHECKED BY:	APPROVED BY: / DATE: 11-2-01

EQ:

$$K = \frac{r^2 \ln(L/R)}{2LT_o}$$

WHERE:

$r = 0.0833$ (RISER RADIUS, Ft)
$R = 0.0833$ (SCREEN RADIUS, Ft)
$L = 10$ (INPUT LENGTH, Ft)
$T_o = 1.8$ (FROM PLOT, MIN)
$K =$ HYDRAULIC COND. (ft/MIN)

SUB:

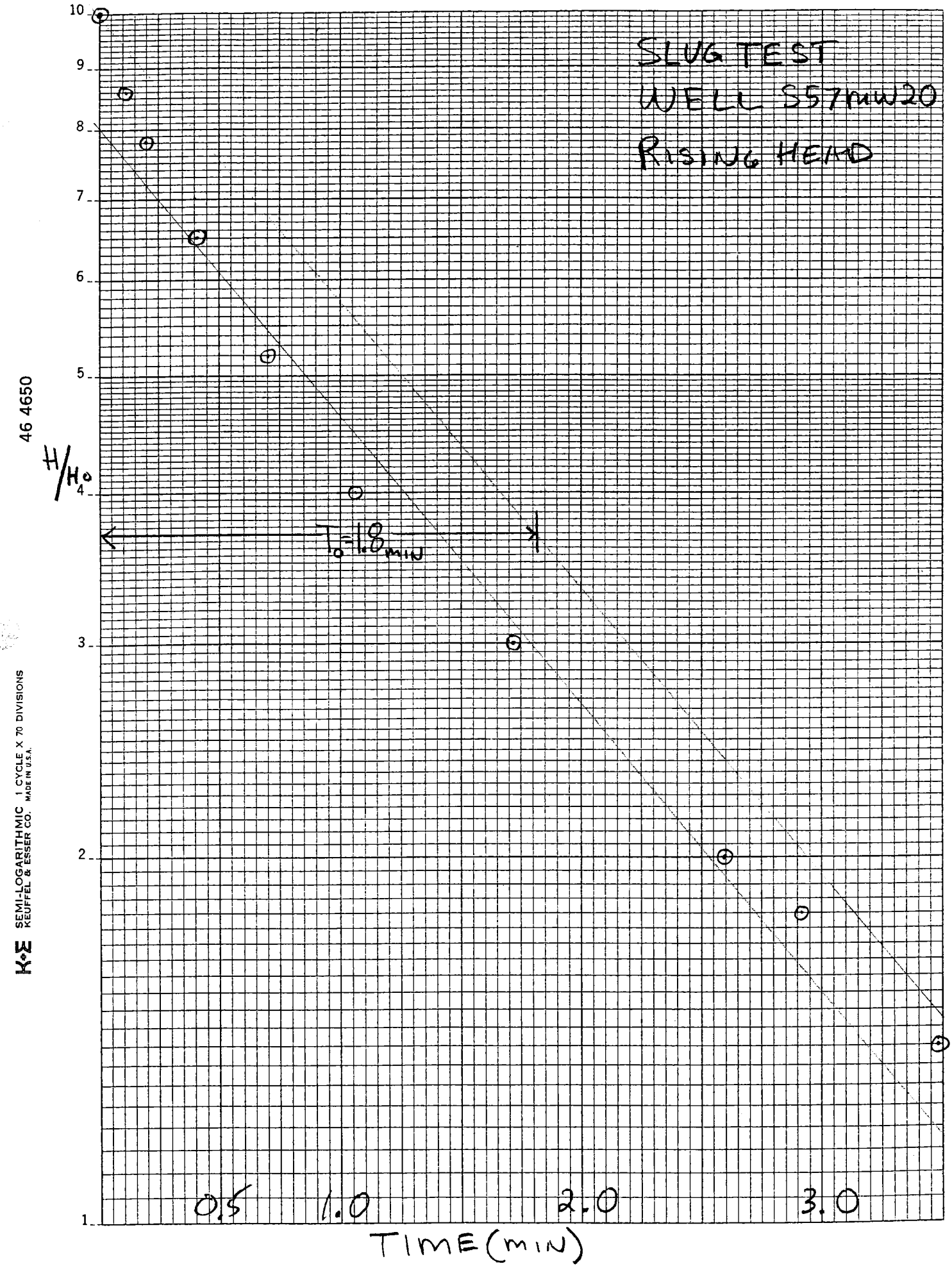
$$K = \frac{(0.0833)^2 \ln(10/0.0833)}{2(10)(1.8)}$$

$$K = \frac{3.32726547 \times 10^{-2}}{36.0}$$

$K = 9.23 \times 10^{-4}$ ft/min

$K = 4.7 \times 10^{-4}$ cm/sec

$K = 1.33$ ft/day


SLUG TEST
WELL S57mw20
RISING HEAD
H/Ho
T_o=1.8 min
10
9
8
7
6
5
4
3
2
1
0.5
1.0
2.0
3.0
TIME (min)
46 4650
K+E SEMI-LOGARITHMIC 1 CYCLE X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

In-Situ Inc. MiniTroll Pro

Report generated: 10/18/01 14:53:45
Report from file: C:\Win-Situ\Data\SN00856 2001-10-04 101756 s57mw20rhno5.bin
DataMgr Version 3.68

Serial number: 856
Firmware Version 3.01
Unit name: miniTROLL

Test name: s57mw20rhno5

Test defined on: 10/4/01 10:16:16
Test started on: 10/4/01 10:17:56
Test stopped on: 10/4/01 10:54:36
Test extracted on: N/A

ata gathered using Logarithmic testing
num time between data points: 1 Minutes.
Number of data samples: 123

TOTAL DATA SAMPLES 123

Channel number [1]
Measurement type: Temperature
Channel name: OnBoard Temp

Channel number [2]
Measurement type: Pressure
Channel name: OnBoard Pressure
Sensor Range: 30 PSI.
Specific gravity: 1

Date	Time	ET (min)	Chan[1] Celsius	Chan[2] Feet H2O	Feet H2O adj by 10.5	ET adj	h/ho	ho = 2.058
10/4/01	10:17	0	18.7	8.809	1.691			
10/4/01	10:17	0.005	18.73	8.476	2.024			
10/4/01	10:17	0.01	18.73	9.166	1.334			
10/4/01	10:17	0.015	18.73	8.542	1.958			
10/4/01	10:17	0.02	18.74	8.078	2.422			
10/4/01	10:17	0.025	18.74	8.432	2.068			
10/4/01	10:17	0.03	18.74	8.382	2.118			
10/4/01	10:17	0.035	18.74	8.442	2.058	0	1.00	
10/4/01	10:17	0.04	18.74	8.461	2.039	0.005	0.99	
10/4/01	10:17	0.045	18.74	8.498	2.002	0.01	0.97	
10/4/01	10:17	0.05	18.74	8.515	1.985	0.015	0.96	
10/4/01	10:17	0.055	18.74	8.496	2.004	0.02	0.97	
10/4/01	10:17	0.06	18.75	8.527	1.973	0.025	0.96	
10/4/01	10:18	0.065	18.75	8.548	1.952	0.03	0.95	
10/4/01	10:18	0.07	18.75	8.565	1.935	0.035	0.94	
10/4/01	10:18	0.075	18.75	8.577	1.923	0.04	0.93	
10/4/01	10:18	0.08	18.75	8.592	1.908	0.045	0.93	

10/4/01 10:18	0.0848	18.75	8.6	1.9	0.0498	0.92
10/4/01 10:18	0.09	18.75	8.612	1.888	0.055	0.92
10/4/01 10:18	0.095	18.75	8.623	1.877	0.06	0.91
10/4/01 10:18	0.1	18.75	8.635	1.865	0.065	0.91
10/4/01 10:18	0.1058	18.75	8.648	1.852	0.0708	0.90
10/4/01 10:18	0.112	18.75	8.662	1.838	0.077	0.89
10/4/01 10:18	0.1185	18.75	8.675	1.825	0.0835	0.89
10/4/01 10:18	0.1255	18.75	8.691	1.809	0.0905	0.88
10/4/01 10:18	0.1328	18.75	8.706	1.794	0.0978	0.87
10/4/01 10:18	0.1407	18.75	8.723	1.777	0.1057	0.86
10/4/01 10:18	0.149	18.75	8.739	1.761	0.114	0.86
10/4/01 10:18	0.1578	18.75	8.756	1.744	0.1228	0.85
10/4/01 10:18	0.167	18.74	8.775	1.725	0.132	0.84
10/4/01 10:18	0.177	18.74	8.792	1.708	0.142	0.83
10/4/01 10:18	0.1875	18.74	8.81	1.69	0.1525	0.82
10/4/01 10:18	0.1985	18.74	8.829	1.671	0.1635	0.81
10/4/01 10:18	0.2102	18.74	8.85	1.65	0.1752	0.80
10/4/01 10:18	0.2227	18.74	8.873	1.627	0.1877	0.79
10/4/01 10:18	0.2358	18.74	8.893	1.607	0.2008	0.78
10/4/01 10:18	0.2498	18.74	8.916	1.584	0.2148	0.77
10/4/01 10:18	0.2647	18.74	8.939	1.561	0.2297	0.76
10/4/01 10:18	0.2803	18.74	8.964	1.536	0.2453	0.75
10/4/01 10:18	0.297	18.74	8.989	1.511	0.262	0.73
10/4/01 10:18	0.3147	18.74	9.014	1.486	0.2797	0.72
10/4/01 10:18	0.3333	18.74	9.037	1.463	0.2983	0.71
10/4/01 10:18	0.3532	18.74	9.064	1.436	0.3182	0.70
10/4/01 10:18	0.3742	18.74	9.091	1.409	0.3392	0.68
10/4/01 10:18	0.3963	18.74	9.116	1.384	0.3613	0.67
10/4/01 10:18	0.4198	18.74	9.145	1.355	0.3848	0.66
10/4/01 10:18	0.4447	18.74	9.17	1.33	0.4097	0.65
10/4/01 10:18	0.4697	18.74	9.197	1.303	0.4347	0.63
10/4/01 10:18	0.4963	18.74	9.224	1.276	0.4613	0.62
10/4/01 10:18	0.5247	18.73	9.253	1.247	0.4897	0.61
10/4/01 10:18	0.5547	18.73	9.28	1.22	0.5197	0.59
10/4/01 10:18	0.5863	18.73	9.31	1.19	0.5513	0.58
10/4/01 10:18	0.6213	18.73	9.339	1.161	0.5863	0.56
10/4/01 10:18	0.6578	18.73	9.368	1.132	0.6228	0.55
10/4/01 10:18	0.6963	18.73	9.399	1.101	0.6613	0.53
10/4/01 10:18	0.738	18.73	9.428	1.072	0.703	0.52
10/4/01 10:18	0.7813	18.73	9.459	1.041	0.7463	0.51
10/4/01 10:18	0.828	18.73	9.49	1.01	0.793	0.49
10/4/01 10:18	0.8763	18.73	9.52	0.98	0.8413	0.48
10/4/01 10:18	0.928	18.73	9.553	0.947	0.893	0.46
10/4/01 10:18	0.983	18.73	9.582	0.918	0.948	0.45
10/4/01 10:18	1.0413	18.73	9.613	0.887	1.0063	0.43
10/4/01 10:19	1.103	18.73	9.644	0.856	1.068	0.42
10/4/01 10:19	1.168	18.73	9.675	0.825	1.133	0.40
10/4/01 10:19	1.238	18.73	9.707	0.793	1.203	0.39
10/4/01 10:19	1.3113	18.73	9.738	0.762	1.2763	0.37
10/4/01 10:19	1.3897	18.73	9.769	0.731	1.3547	0.36
10/4/01 10:19	1.473	18.73	9.8	0.7	1.438	0.34
10/4/01 10:19	1.5613	18.71	9.832	0.668	1.5263	0.32
10/4/01 10:19	1.6547	18.71	9.861	0.639	1.6197	0.31
10/4/01 10:19	1.753	18.73	9.892	0.608	1.718	0.30
10/4/01 10:19	1.858	18.71	9.921	0.579	1.823	0.28

10/4/01 10:19	1.968	18.71	9.95	0.55	1.933	0.27
10/4/01 10:20	2.0847	18.71	9.979	0.521	2.0497	0.25
10/4/01 10:20	2.2097	18.71	10.006	0.494	2.1747	0.24
10/4/01 10:20	2.3412	18.71	10.035	0.465	2.3062	0.23
10/4/01 10:20	2.4813	18.73	10.062	0.438	2.4463	0.21
10/4/01 10:20	2.6297	18.73	10.089	0.411	2.5947	0.20
10/4/01 10:20	2.7863	18.73	10.114	0.386	2.7513	0.19
10/4/01 10:20	2.953	18.74	10.139	0.361	2.918	0.18
10/4/01 10:21	3.1297	18.74	10.164	0.336	3.0947	0.16
10/4/01 10:21	3.3163	18.75	10.186	0.314	3.2813	0.15
10/4/01 10:21	3.5147	18.75	10.209	0.291	3.4797	0.14
10/4/01 10:21	3.7247	18.76	10.229	0.271	3.6897	0.13
10/4/01 10:21	3.9463	18.76	10.25	0.25	3.9113	0.12
10/4/01 10:22	4.1813	18.78	10.269	0.231	4.1463	0.11
10/4/01 10:22	4.4295	18.78	10.285	0.215	4.3945	0.10
10/4/01 10:22	4.693	18.78	10.302	0.198	4.658	0.10
10/4/01 10:22	4.973	18.79	10.318	0.182	4.938	0.09
10/4/01 10:23	5.2697	18.79	10.335	0.165	5.2347	0.08
10/4/01 10:23	5.583	18.79	10.349	0.151	5.548	0.07
10/4/01 10:23	5.9147	18.82	10.361	0.139	5.8797	0.07
10/4/01 10:24	6.2663	18.83	10.373	0.127	6.2313	0.06
10/4/01 10:24	6.6397	18.85	10.385	0.115	6.6047	0.06
10/4/01 10:24	7.0347	18.88	10.395	0.105	6.9997	0.05
10/4/01 10:25	7.453	18.92	10.406	0.094	7.418	0.05
10/4/01 10:25	7.8963	18.94	10.414	0.086	7.8613	0.04
10/4/01 10:26	8.3663	18.97	10.422	0.078	8.3313	0.04
10/4/01 10:26	8.8647	18.99	10.429	0.071	8.8297	0.03
10/4/01 10:27	9.3913	18.99	10.435	0.065	9.3563	0.03
10/4/01 10:27	9.9497	19	10.443	0.057	9.9147	0.03
10/4/01 10:28	10.5413	19.02	10.449	0.051	10.506	0.02
10/4/01 10:29	11.168	19.03	10.455	0.045	11.133	0.02
10/4/01 10:29	11.8313	19.04	10.461	0.039	11.796	0.02
10/4/01 10:30	12.5347	19.05	10.467	0.033	12.5	0.02
10/4/01 10:31	13.2797	19.08	10.47	0.03	13.245	0.01
10/4/01 10:32	14.0697	19.09	10.476	0.024	14.035	0.01
10/4/01 10:32	14.9063	19.11	10.48	0.02	14.871	0.01
10/4/01 10:33	15.7913	19.12	10.484	0.016	15.756	0.01
10/4/01 10:34	16.7297	19.12	10.488	0.012	16.695	0.01
10/4/01 10:35	17.723	19.12	10.492	0.008	17.688	0.00
10/4/01 10:36	18.7763	19.11	10.495	0.005	18.741	0.00
10/4/01 10:37	19.8913	19.11	10.499	0.001	19.856	0.00
10/4/01 10:39	21.073	19.09	10.501	-0.001	21.038	0.00
10/4/01 10:40	22.3247	19.09	10.505	-0.005	22.29	0.00
10/4/01 10:41	23.6497	19.09	10.508	-0.008	23.615	0.00
10/4/01 10:42	25.0547	19.08	10.512	-0.012	25.02	-0.01
10/4/01 10:44	26.543	19.08	10.514	-0.014	26.508	-0.01
10/4/01 10:46	28.118	19.08	10.516	-0.016	28.083	-0.01
10/4/01 10:47	29.7863	19.05	10.517	-0.017	29.751	-0.01
10/4/01 10:49	31.5547	19.05	10.519	-0.019	31.52	-0.01
10/4/01 10:51	33.428	19.03	10.522	-0.022	33.393	-0.01
10/4/01 10:53	35.4112	19.02	10.522	-0.022	35.376	-0.01

HYDRAULIC CONDUCTIVITY TESTING DATA SHEET

Tetra Tech NUS, Inc.

PROJECT NAME: INDIANHEAD SITE 57 FS WELL/BORING NO.: S57TW21

PROJECT NO.: 7129-2920 GEOLOGIST: FRED W. RAMSER

WELL DIAMETER: 1" SCREEN LENGTH/DEPTH: 5' / TEST NO.:

STATIC WATER LEVEL (Depth/Elevation): 6.51 TPVC DATE: 10-23-01

TEST TYPE (Rising/Falling/Constant Head): RISING + FALLING CHECKED:

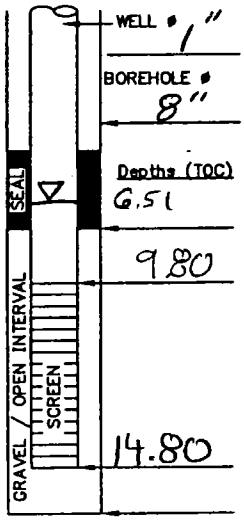
METHOD OF INDUCING WATER LEVEL CHANGE: SOLID SLUG 0.5" x 6' PAGE ..... OF .....

REFERENCE PT. FOR WL MEAS. (Top of Casing, Transducer, etc.): SURFACE (FH) TOC (RH)

← FALLING HEAD → ← RISING HEAD →

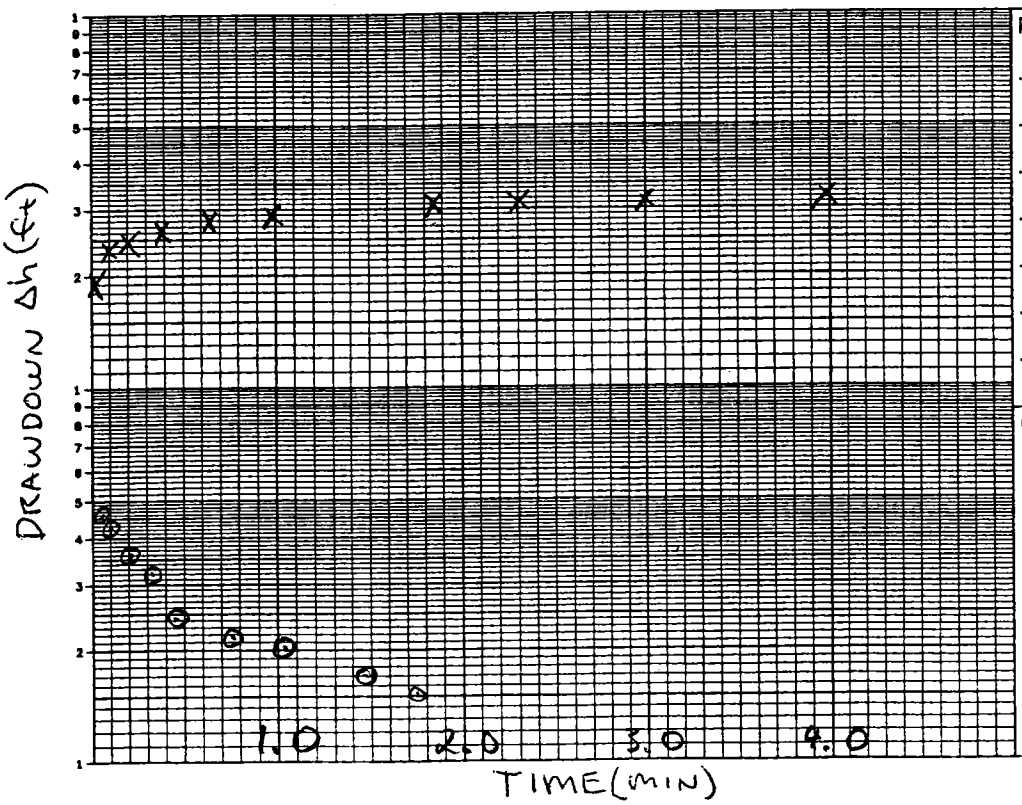
ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)	ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)
0.05		0.453	0.015		1.945
0.06		0.446	0.05		2.261
0.09		0.427	0.075		2.319
0.1255		0.405	0.100		2.362
0.2100		0.367	0.210		2.482
0.3333		0.322	0.3963		2.613
0.4695		0.289	0.6963		2.754
0.7813		0.237	0.9828		2.851
1.0412		0.207	1.858		3.035
1.238		0.188	2.34		3.097
1.4728		0.170	2.953		3.154
1.753		0.151	3.9463		3.211

WELL SCHEMATIC



▽ Indicate SWL Depth on Drawing

ACAD:FORM_HYDCONTST.dwg 07/06/99 INL



REMARKS:

TD w/TROLL = 13.20"

- 6.51

6.69

CALCS, SKETCH MAPS, ETC.:

⊙ - FALLING HEAD

X - RISING HEAD

TETRA TECH NUS, INC. CALCULATION WORKSHEET PAGE _____ OF _____

CLIENT INDIAN HEAD NSWC		JOB NUMBER 7129 SITE 57 FS	
SUBJECT SLUG TEST WELL		S57TW21 RISING HEAD	
BASED ON HVORSLEV		DRAWING NUMBER	
BY FRED R.	CHECKED BY CJK	APPROVED BY	DATE 11-2-01

EQ:

$$K = \frac{r^2 \ln(L/R)}{2LT_o}$$

WHERE:

$r = 0.041667$ ft (RISER RADIUS, Ft)
$R = 0.041667$ ft (SCREEN RADIUS, Ft)
$L = 5$ ft (INPUT LENGTH, Ft)
$T_o = 1.22$ min (FROM PLOT, MIN)
K = HYDRAULIC COND. (ft/min)

SUB:

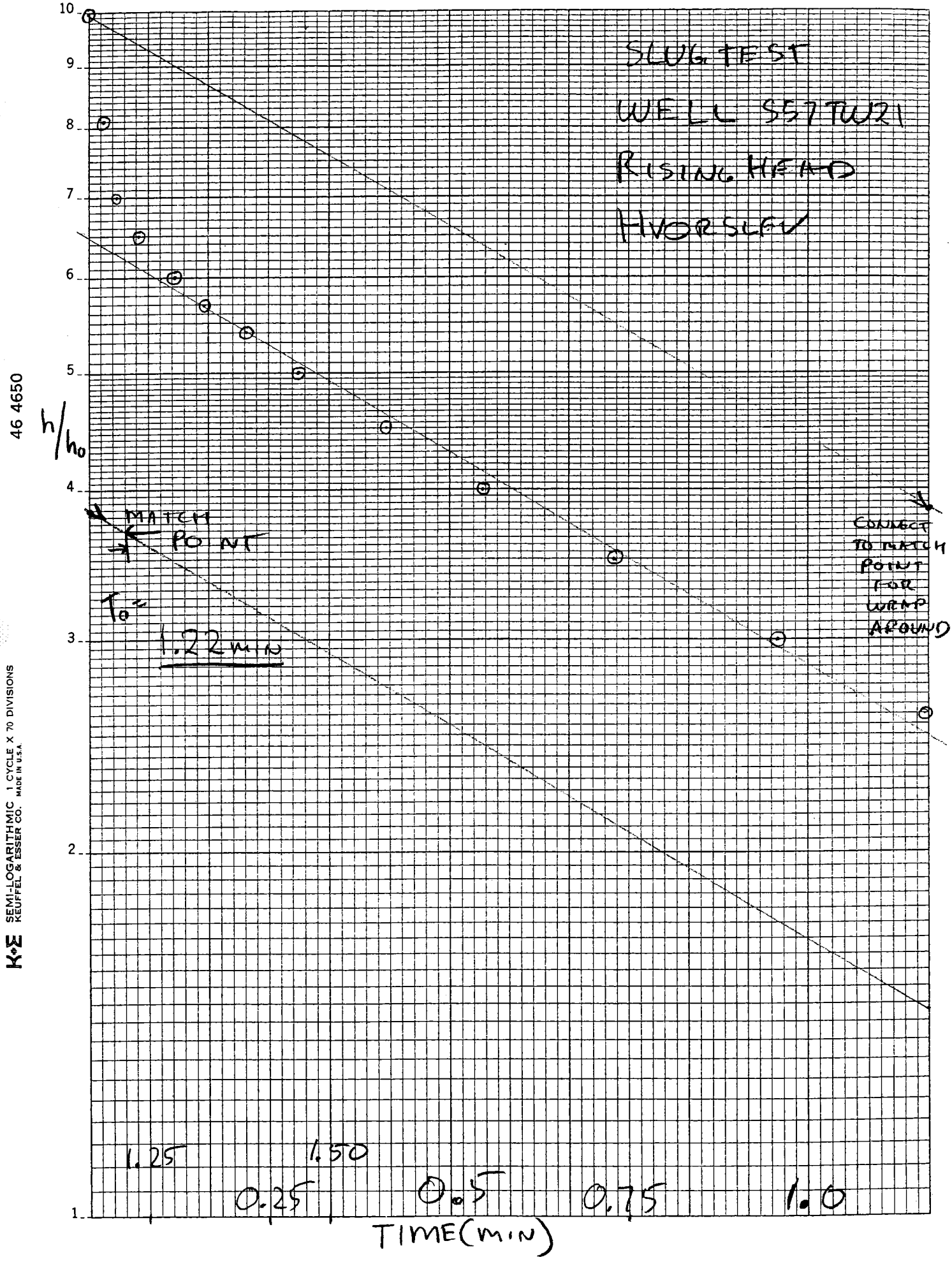
$$K = \frac{(0.041667)^2 \ln(5/0.041667)}{2(5)(1.22)}$$

$$\frac{8.31173671 \times 10^{-3}}{12.2}$$

$= 6.8 \times 10^{-4}$ ft/min

$= 3.5 \times 10^{-4}$ cm/sec

$= 9.8 \times 10^{-1}$ ft/day


SLUG TEST
WELL S57TW21
RISING HEAD
HVORSLEV
h/h0
MATCH POINT
T0 = 1.22 min
CONNECT TO MATCH POINT FOR WRAP AROUND
10
9
8
7
6
5
4
3
2
1
1.25
1.50
0.25
0.5
0.75
1.0
TIME(min)
46 4650
K+E SEMI-LOGARITHMIC 1 CYCLE X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

In-Situ Inc. MiniTroll Pro

Report generated: 10/31/01 11:38:36
Report from file: C:\Win-Situ\Data\SN01966 2001-10-23 152803 s57tw21rhno2.bin
DataMgr Version 3.68

Serial number: 1966
Firmware Version 3.01
Unit name: miniTROLL

Test name: s57tw21rhno2

Test defined on: 10/23/01 15:27:13
Test started on: 10/23/01 15:28:03
Test stopped on: 10/23/01 15:45:03
Test extracted on: N/A

Data gathered using Logarithmic testing
ximum time between data points: 10. Minutes.
Number of data samples: 110

TOTAL DATA SAMPLES 110

Channel number [1]
Measurement type: Temperature
Channel name: OnBoard Temp

Channel number [2]
Measurement type: Pressure
Channel name: OnBoard Pressure
Sensor Range: 30 PSI.
Specific gravity: 1
Mode: Surface
User-defined reference: 0 Feet H2O
Referenced on: test start
Pressure head at reference: 4.064 Feet H2O

Date	Time	ET (min)	Chan[1] Celsius	Chan[2] Feet H2O	Adj Feet H2O	Adj ET (min)	h/ho	ho= 1.501
10/23/01	15:28	0	18.66	0	3.297			
10/23/01	15:28	0.005	18.67	1.796	1.501	0	1.00	–
10/23/01	15:28	0.01	18.67	2.034	1.263	0.005	0.84	
10/23/01	15:28	0.015	18.69	1.945	1.352	0.01	0.90	
10/23/01	15:28	0.02	18.69	2.023	1.274	0.015	0.85	
10/23/01	15:28	0.025	18.69	2.087	1.21	0.02	0.81	–
10/23/01	15:28	0.03	18.69	2.164	1.133	0.025	0.75	
10/23/01	15:28	0.035	18.69	2.189	1.108	0.03	0.74	
10/23/01	15:28	0.04	18.69	2.228	1.069	0.035	0.71	
10/23/01	15:28	0.045	18.7	2.242	1.055	0.04	0.70	–
10/23/01	15:28	0.05	18.7	2.261	1.036	0.045	0.69	
10/23/01	15:28	0.055	18.7	2.273	1.024	0.05	0.68	
10/23/01	15:28	0.06	18.7	2.288	1.009	0.055	0.67	

10/23/01 15:28	0.065	18.7	2.296	1.001	0.06	0.67
10/23/01 15:28	0.07	18.7	2.309	0.988	0.065	0.66
10/23/01 15:28	0.075	18.7	2.319	0.978	0.07	0.65
10/23/01 15:28	0.08	18.7	2.329	0.968	0.075	0.64
10/23/01 15:28	0.0848	18.7	2.34	0.957	0.0798	0.64
10/23/01 15:28	0.09	18.7	2.348	0.949	0.085	0.63
10/23/01 15:28	0.095	18.71	2.356	0.941	0.09	0.63
10/23/01 15:28	0.1	18.71	2.362	0.935	0.095	0.62
10/23/01 15:28	0.1058	18.71	2.372	0.925	0.1008	0.62
10/23/01 15:28	0.112	18.71	2.381	0.916	0.107	0.61
10/23/01 15:28	0.1185	18.71	2.389	0.908	0.1135	0.60
10/23/01 15:28	0.1255	18.71	2.397	0.9	0.1205	0.60
10/23/01 15:28	0.1328	18.71	2.405	0.892	0.1278	0.59
10/23/01 15:28	0.1407	18.71	2.416	0.881	0.1357	0.59
10/23/01 15:28	0.149	18.71	2.424	0.873	0.144	0.58
10/23/01 15:28	0.1578	18.71	2.432	0.865	0.1528	0.58
10/23/01 15:28	0.167	18.71	2.443	0.854	0.162	0.57
10/23/01 15:28	0.177	18.71	2.451	0.846	0.172	0.56
10/23/01 15:28	0.1875	18.71	2.463	0.834	0.1825	0.56
10/23/01 15:28	0.1985	18.7	2.474	0.823	0.1935	0.55
10/23/01 15:28	0.2102	18.7	2.482	0.815	0.2052	0.54
10/23/01 15:28	0.2227	18.7	2.493	0.804	0.2177	0.54
10/23/01 15:28	0.2358	18.7	2.505	0.792	0.2308	0.53
10/23/01 15:28	0.2498	18.7	2.515	0.782	0.2448	0.52
10/23/01 15:28	0.2647	18.7	2.526	0.771	0.2597	0.51
10/23/01 15:28	0.2803	18.7	2.538	0.759	0.2753	0.51
10/23/01 15:28	0.297	18.7	2.551	0.746	0.292	0.50
10/23/01 15:28	0.3147	18.7	2.563	0.734	0.3097	0.49
10/23/01 15:28	0.3333	18.7	2.575	0.722	0.3283	0.48
10/23/01 15:28	0.3532	18.7	2.588	0.709	0.3482	0.47
10/23/01 15:28	0.3742	18.7	2.6	0.697	0.3692	0.46
10/23/01 15:28	0.3963	18.7	2.613	0.684	0.3913	0.46
10/23/01 15:28	0.4198	18.7	2.627	0.67	0.4148	0.45
10/23/01 15:28	0.4447	18.7	2.64	0.657	0.4397	0.44
10/23/01 15:28	0.4697	18.7	2.654	0.643	0.4647	0.43
10/23/01 15:28	0.4963	18.7	2.669	0.628	0.4913	0.42
10/23/01 15:28	0.5247	18.69	2.681	0.616	0.5197	0.41
10/23/01 15:28	0.5547	18.69	2.696	0.601	0.5497	0.40
10/23/01 15:28	0.5863	18.69	2.71	0.587	0.5813	0.39
10/23/01 15:28	0.6213	18.69	2.725	0.572	0.6163	0.38
10/23/01 15:28	0.6578	18.69	2.739	0.558	0.6528	0.37
10/23/01 15:28	0.6963	18.69	2.754	0.543	0.6913	0.36
10/23/01 15:28	0.738	18.69	2.77	0.527	0.733	0.35
10/23/01 15:28	0.7813	18.69	2.785	0.512	0.7763	0.34
10/23/01 15:28	0.828	18.69	2.803	0.494	0.823	0.33
10/23/01 15:28	0.8763	18.69	2.818	0.479	0.8713	0.32
10/23/01 15:28	0.928	18.69	2.834	0.463	0.923	0.31
10/23/01 15:29	0.983	18.69	2.851	0.446	0.978	0.30
10/23/01 15:29	1.0413	18.69	2.869	0.428	1.0363	0.29
10/23/01 15:29	1.103	18.69	2.886	0.411	1.098	0.27
10/23/01 15:29	1.168	18.69	2.903	0.394	1.163	0.26
10/23/01 15:29	1.238	18.69	2.919	0.378	1.233	0.25
10/23/01 15:29	1.3113	18.69	2.936	0.361	1.3063	0.24
10/23/01 15:29	1.3897	18.69	2.952	0.345	1.3847	0.23
10/23/01 15:29	1.473	18.69	2.969	0.328	1.468	0.22

10/23/01 15:29	1.5613	18.67	2.986	0.311	1.5563	0.21
10/23/01 15:29	1.6547	18.67	3.002	0.295	1.6497	0.20
10/23/01 15:29	1.753	18.67	3.019	0.278	1.748	0.19
10/23/01 15:29	1.858	18.67	3.035	0.262	1.853	0.17
10/23/01 15:30	1.968	18.67	3.052	0.245	1.963	0.16
10/23/01 15:30	2.0847	18.67	3.066	0.231	2.0797	0.15
10/23/01 15:30	2.2097	18.67	3.083	0.214	2.2047	0.14
10/23/01 15:30	2.3412	18.67	3.097	0.2	2.3362	0.13
10/23/01 15:30	2.4813	18.67	3.11	0.187	2.4763	0.12
10/23/01 15:30	2.6297	18.67	3.126	0.171	2.6247	0.11
10/23/01 15:30	2.7863	18.66	3.139	0.158	2.7813	0.11
10/23/01 15:31	2.953	18.66	3.154	0.143	2.948	0.10
10/23/01 15:31	3.1297	18.66	3.166	0.131	3.1247	0.09
10/23/01 15:31	3.3163	18.66	3.178	0.119	3.3113	0.08
10/23/01 15:31	3.5147	18.66	3.189	0.108	3.5097	0.07
10/23/01 15:31	3.7247	18.66	3.199	0.098	3.7197	0.07
10/23/01 15:32	3.9463	18.66	3.211	0.086	3.9413	0.06
10/23/01 15:32	4.1813	18.66	3.22	0.077	4.1763	0.05
10/23/01 15:32	4.4295	18.66	3.228	0.069	4.4245	0.05
10/23/01 15:32	4.693	18.66	3.238	0.059	4.688	0.04
10/23/01 15:33	4.973	18.66	3.247	0.05	4.968	0.03
10/23/01 15:33	5.2697	18.65	3.251	0.046	5.2647	0.03
10/23/01 15:33	5.583	18.66	3.259	0.038	5.578	0.03
10/23/01 15:33	5.9147	18.65	3.265	0.032	5.9097	0.02
10/23/01 15:34	6.2663	18.65	3.27	0.027	6.2613	0.02
10/23/01 15:34	6.6397	18.66	3.274	0.023	6.6347	0.02
10/23/01 15:35	7.0347	18.65	3.278	0.019	7.0297	0.01
10/23/01 15:35	7.453	18.65	3.282	0.015	7.448	0.01
10/23/01 15:35	7.8963	18.65	3.284	0.013	7.8913	0.01
10/23/01 15:36	8.3663	18.65	3.288	0.009	8.3613	0.01
10/23/01 15:36	8.8647	18.65	3.29	0.007	8.8597	0.00
10/23/01 15:37	9.3913	18.65	3.292	0.005	9.3863	0.00
10/23/01 15:38	9.9497	18.65	3.284	0.013	9.9447	0.01
10/23/01 15:38	10.5413	18.64	3.291	0.006	10.5363	0.00
10/23/01 15:39	11.168	18.64	3.295	0.002	11.163	0.00
10/23/01 15:39	11.8313	18.64	3.297	0	11.8263	0.00
10/23/01 15:40	12.5347	18.64	3.295	0.002	12.5297	0.00
10/23/01 15:41	13.2797	18.64	3.297	0	13.2747	0.00
10/23/01 15:42	14.0697	18.64	3.297	0	14.0647	0.00
10/23/01 15:42	14.9063	18.64	3.295	0.002	14.9013	0.00
10/23/01 15:43	15.7913	18.64	3.291	0.006	15.7863	0.00
10/23/01 15:44	16.7297	18.64	3.297	0	16.7247	0.00

TETRA TECH NUS, INC. CALCULATION WORKSHEET PAGE ____ OF ____

CLIENT INDIAN HEAD NSWC		JOB NUMBER 7129 SITE 57 FS	
SUBJECT SLUG TEST WELL		S57TW21 FALLING HEAD	
BASED ON HVORSLEV		DRAWING NUMBER	
BY FRED R.	CHECKED BY CJK	APPROVED BY	DATE 11-2-01

EQ:

$$K = \frac{r^2 \ln(L/R)}{2LT_o}$$

WHERE:

$r = 0.041667$ (RISER RADIUS, Ft)
$R = 0.041667$ (SCREEN RADIUS, Ft)
$L = 5$ (INPUT LENGTH, Ft)
$T_o = 2.21$ (FROM PLOT, MIN)
K = HYDRAULIC COND. (ft/MIN)

SUB:

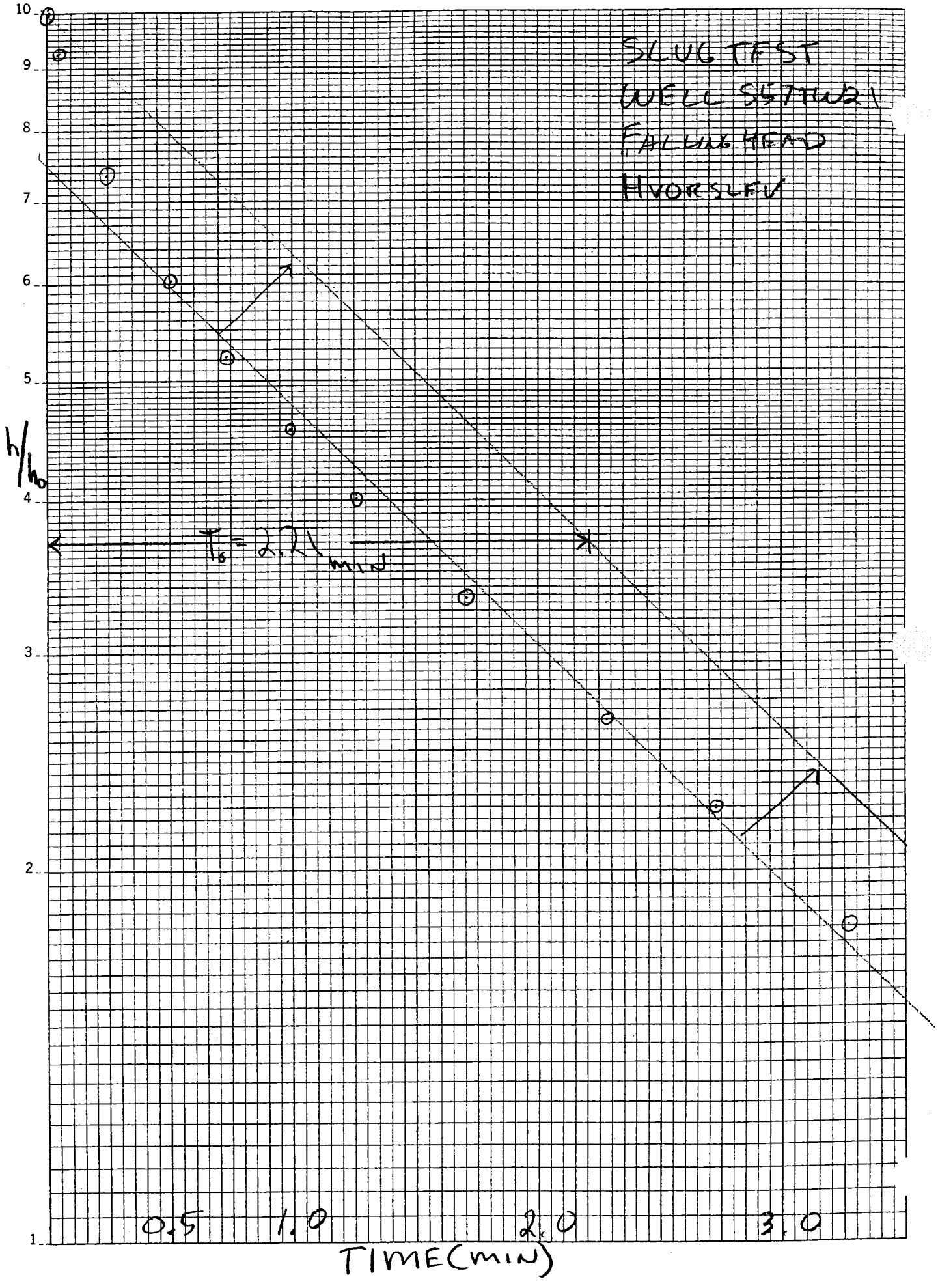
$$K = \frac{(0.041667)^2 \ln(5/0.041667)}{2(5)(2.21)}$$

$$= \frac{8.31160372 \times 10^{-3}}{22.1}$$

$$= 3.76 \times 10^{-4} \text{ ft/MIN}$$

$$= 1.91 \times 10^{-4} \text{ cm/sec}$$

$$= 5.4 \times 10^{-1} \text{ ft/day}$$ ✓



46 4650
K+E SEMI-LOGARITHMIC 1 CYCLE X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

In-Situ Inc.	MiniTroll Pro
Report generated:	11/1/01 11:14:17
Report from file:	C:\Win-Situ\Data\SN01966 2001-10-23 151325 s57tw21fhno1.bin
DataMgr Version	3.68
Serial number:	1966
Firmware Version	3.01
Unit name:	miniTROLL
Test name:	s57tw21fhno1
Test defined on:	10/23/01 14:58:38
Test started on:	10/23/01 15:13:25
Test stopped on:	10/23/01 15:24:37
Test extracted on:	N/A

)ata gathered using Logarithmic testing
:imum time between data points: 1C Minutes.
Number of data samples: 103

TOTAL DATA SAMPLES 103

Channel number [1]
Measurement type: Temperature
Channel name: OnBoard Temp

Channel number [2]
Measurement type: Pressure
Channel name: OnBoard Pressure
Sensor Range: 30 PSI.
Specific gravity: 1
Mode: Surface
User-defined reference: 0 Feet H2O
Referenced on: test start
Pressure head at reference: 7.4 Feet H2O

Date	Time	ET (min)	Chan[1] Celsius	Chan[2] Feet H2O	Adj ET (min)	h/ho	ho= 0.453
10/23/01	15:13	0	18.75	0			
10/23/01	15:13	0.005	18.75	0			
10/23/01	15:13	0.01	18.76	0			
10/23/01	15:13	0.015	18.76	0.422			
10/23/01	15:13	0.02	18.77	2.029			
10/23/01	15:13	0.025	18.77	4.613			
10/23/01	15:13	0.03	18.77	0.581			
10/23/01	15:13	0.035	18.77	-0.003			
10/23/01	15:13	0.04	18.77	0.442			
10/23/01	15:13	0.045	18.77	0.399			

10/23/01 15:13	0.05	18.77	0.453	0	1.000
10/23/01 15:13	0.055	18.79	0.452	0.005	0.998
10/23/01 15:13	0.06	18.77	0.446	0.01	0.985
10/23/01 15:13	0.065	18.79	0.444	0.015	0.980
10/23/01 15:13	0.07	18.79	0.44	0.02	0.971
10/23/01 15:13	0.075	18.79	0.438	0.025	0.967
10/23/01 15:13	0.08	18.79	0.432	0.03	0.954
10/23/01 15:13	0.0848	18.79	0.43	0.0348	0.949
10/23/01 15:13	0.09	18.79	0.427	0.04	0.943
10/23/01 15:13	0.095	18.79	0.423	0.045	0.934
10/23/01 15:13	0.1	18.79	0.419	0.05	0.925
10/23/01 15:13	0.1058	18.79	0.415	0.0558	0.916
10/23/01 15:13	0.112	18.79	0.413	0.062	0.912
10/23/01 15:13	0.1185	18.79	0.409	0.0685	0.903
10/23/01 15:13	0.1255	18.79	0.405	0.0755	0.894
10/23/01 15:13	0.1328	18.79	0.403	0.0828	0.890
10/23/01 15:13	0.1407	18.79	0.396	0.0907	0.874
10/23/01 15:13	0.149	18.79	0.535	0.099	1.181
10/23/01 15:13	0.1578	18.8	0.336	0.1078	0.742
10/23/01 15:13	0.167	18.79	0.463	0.117	1.022
10/23/01 15:13	0.177	18.79	0.398	0.127	0.879
10/23/01 15:13	0.1875	18.79	0.367	0.1375	0.810
10/23/01 15:13	0.1985	18.79	0.374	0.1485	0.826
10/23/01 15:13	0.2102	18.79	0.367	0.1602	0.810
10/23/01 15:13	0.2227	18.79	0.361	0.1727	0.797
10/23/01 15:13	0.2358	18.79	0.357	0.1858	0.788
10/23/01 15:13	0.2498	18.77	0.349	0.1998	0.770
10/23/01 15:13	0.2647	18.77	0.343	0.2147	0.757
10/23/01 15:13	0.2803	18.77	0.339	0.2303	0.748
10/23/01 15:13	0.297	18.77	0.333	0.247	0.735
10/23/01 15:13	0.3147	18.77	0.326	0.2647	0.720
10/23/01 15:13	0.3333	18.77	0.322	0.2833	0.711
10/23/01 15:13	0.3532	18.77	0.299	0.3032	0.660
10/23/01 15:13	0.3742	18.77	0.31	0.3242	0.684
10/23/01 15:13	0.3963	18.77	0.306	0.3463	0.675
10/23/01 15:13	0.4198	18.77	0.299	0.3698	0.660
10/23/01 15:13	0.4447	18.77	0.293	0.3947	0.647
10/23/01 15:13	0.4697	18.77	0.289	0.4197	0.638
10/23/01 15:13	0.4963	18.77	0.283	0.4463	0.625
10/23/01 15:13	0.5247	18.77	0.281	0.4747	0.620
10/23/01 15:13	0.5547	18.77	0.273	0.5047	0.603
10/23/01 15:14	0.5863	18.77	0.266	0.5363	0.587
10/23/01 15:14	0.6213	18.77	0.26	0.5713	0.574
10/23/01 15:14	0.6578	18.77	0.256	0.6078	0.565
10/23/01 15:14	0.6963	18.77	0.248	0.6463	0.547
10/23/01 15:14	0.738	18.76	0.242	0.688	0.534
10/23/01 15:14	0.7813	18.77	0.237	0.7313	0.523
10/23/01 15:14	0.828	18.76	0.231	0.778	0.510
10/23/01 15:14	0.8763	18.76	0.223	0.8263	0.492
10/23/01 15:14	0.928	18.76	0.217	0.878	0.479
10/23/01 15:14	0.983	18.76	0.213	0.933	0.470
10/23/01 15:14	1.0413	18.76	0.207	0.9913	0.457

10/23/01 15:14	1.103	18.76	0.198	1.053	0.437
10/23/01 15:14	1.168	18.76	0.194	1.118	0.428
10/23/01 15:14	1.238	18.76	0.188	1.188	0.415
10/23/01 15:14	1.3113	18.76	0.182	1.2613	0.402
10/23/01 15:14	1.3897	18.76	0.171	1.3397	0.377
10/23/01 15:14	1.473	18.75	0.17	1.423	0.375
10/23/01 15:14	1.5613	18.75	0.163	1.5113	0.360
10/23/01 15:15	1.6547	18.75	0.157	1.6047	0.347
10/23/01 15:15	1.753	18.75	0.151	1.703	0.333
10/23/01 15:15	1.858	18.75	0.145	1.808	0.320
10/23/01 15:15	1.968	18.75	0.139	1.918	0.307
10/23/01 15:15	2.0847	18.75	0.134	2.0347	0.296
10/23/01 15:15	2.2097	18.74	0.126	2.1597	0.278
10/23/01 15:15	2.3412	18.74	0.12	2.2912	0.265
10/23/01 15:15	2.4813	18.74	0.114	2.4313	0.252
10/23/01 15:16	2.6297	18.74	0.106	2.5797	0.234
10/23/01 15:16	2.7863	18.74	0.102	2.7363	0.225
10/23/01 15:16	2.953	18.72	0.096	2.903	0.212
10/23/01 15:16	3.1297	18.74	0.087	3.0797	0.192
10/23/01 15:16	3.3163	18.72	0.083	3.2663	0.183
10/23/01 15:16	3.5147	18.72	0.077	3.4647	0.170
10/23/01 15:17	3.7247	18.72	0.071	3.6747	0.157
10/23/01 15:17	3.9463	18.72	0.065	3.8963	0.143
10/23/01 15:17	4.1813	18.71	0.061	4.1313	0.135
10/23/01 15:17	4.4295	18.72	0.054	4.3795	0.119
10/23/01 15:18	4.693	18.71	0.013	4.643	0.029
10/23/01 15:18	4.973	18.71	0.046	4.923	0.102
10/23/01 15:18	5.2697	18.71	0.04	5.2197	0.088
10/23/01 15:19	5.583	18.71	0.036	5.533	0.079
10/23/01 15:19	5.9147	18.71	0.03	5.8647	0.066
10/23/01 15:19	6.2663	18.7	0.028	6.2163	0.062
10/23/01 15:20	6.6397	18.7	0.022	6.5897	0.049
10/23/01 15:20	7.0347	18.7	0.018	6.9847	0.040
10/23/01 15:20	7.453	18.7	0.014	7.403	0.031
10/23/01 15:21	7.8963	18.69	0.01	7.8463	0.022
10/23/01 15:21	8.3663	18.69	0.005	8.3163	0.011
10/23/01 15:22	8.8647	18.69	0.003	8.8147	0.007
10/23/01 15:22	9.3913	18.69	-0.003	9.3413	-0.007
10/23/01 15:23	9.9497	18.69	-0.005	9.8997	-0.011
10/23/01 15:23	10.5413	18.69	0.001	10.4913	0.002
10/23/01 15:24	11.168	18.67	-0.005	11.118	-0.011

HYDRAULIC CONDUCTIVITY TESTING DATA SHEET

Tetra Tech NUS, Inc.

PROJECT NAME: INDIANHEAD SITE 57 FS WELL/BORING NO.: S57MW22

PROJECT NO.: 7129-2920 GEOLOGIST: FRED W. RAMSER

WELL DIAMETER: 2" SCREEN LENGTH/DEPTH: 10' / TEST NO.: 3

STATIC WATER LEVEL (Depth/Elevation): 8.02TPVC DATE: 10-4-01

TEST TYPE (Rising/Falling/Constant Head): RISING HEAD CHECKED:

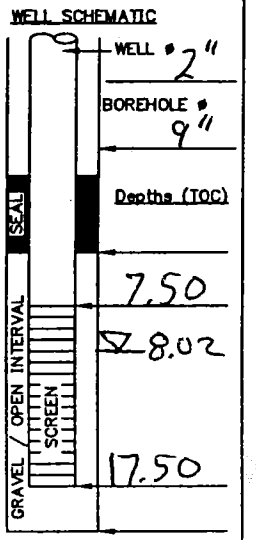
METHOD OF INDUCING WATER LEVEL CHANGE: SOLID SLUG PAGE ..... OF .....

REFERENCE PT. FOR WL MEAS. (Top of Casing, Transducer, etc.):

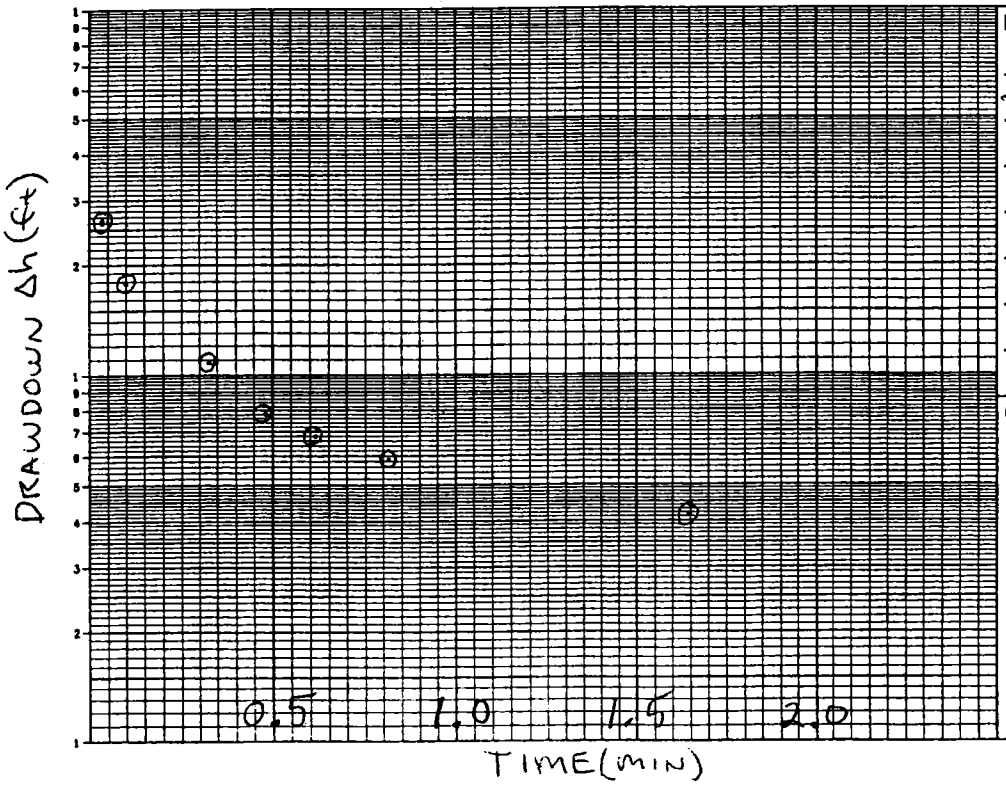
ACAD:FORM_HYDCONTST.dwg 07/06/99 INL

ELAPSED TIME (min.) or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)	ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)
0.03	6.52	2.54			
0.10	7.28	1.78			
0.333	7.96	1.09			
0.496		0.793			
0.621	8.363	0.697			
0.828	8.48	0.58			
1.65	8.64	0.42			
9.94	8.94	0.12			

WELL SCHEMATIC



▽ Indicate SWL Depth on Drawing



REMARKS:

DATA LOGGER MINI TROLL S/N 856 (1.2' LONG PROBE) PLACED ~2'

CALCS, SKETCH MAPS, ETC.:

TETRA TECH NUS, INC. **CALCULATION WORKSHEET** PAGE _____ OF _____

CLIENT: INDIAN HEAD NSWC		JOB NUMBER: 7129 SITE 57 FS	
SUBJECT: SLUG TEST WELL S57MW22			
BASED ON: HVORSLEV		DRAWING NUMBER:	
BY: FRED R.	CHECKED BY:	APPROVED BY:	DATE: 11-2-01

EQ:

$$K = \frac{r^2 \ln(L/R)}{2L T_o}$$

WHERE:

r = .083 ft (RISER RADIUS, Ft)
R = .083 ft (SCREEN RADIUS, Ft)
L = 9.48 ft (INPUT LENGTH, Ft)
T_o = 0.75 MIN (FROM PLOT, MIN)
K = HYDRAULIC COND. (ft/MIN)

SUB:

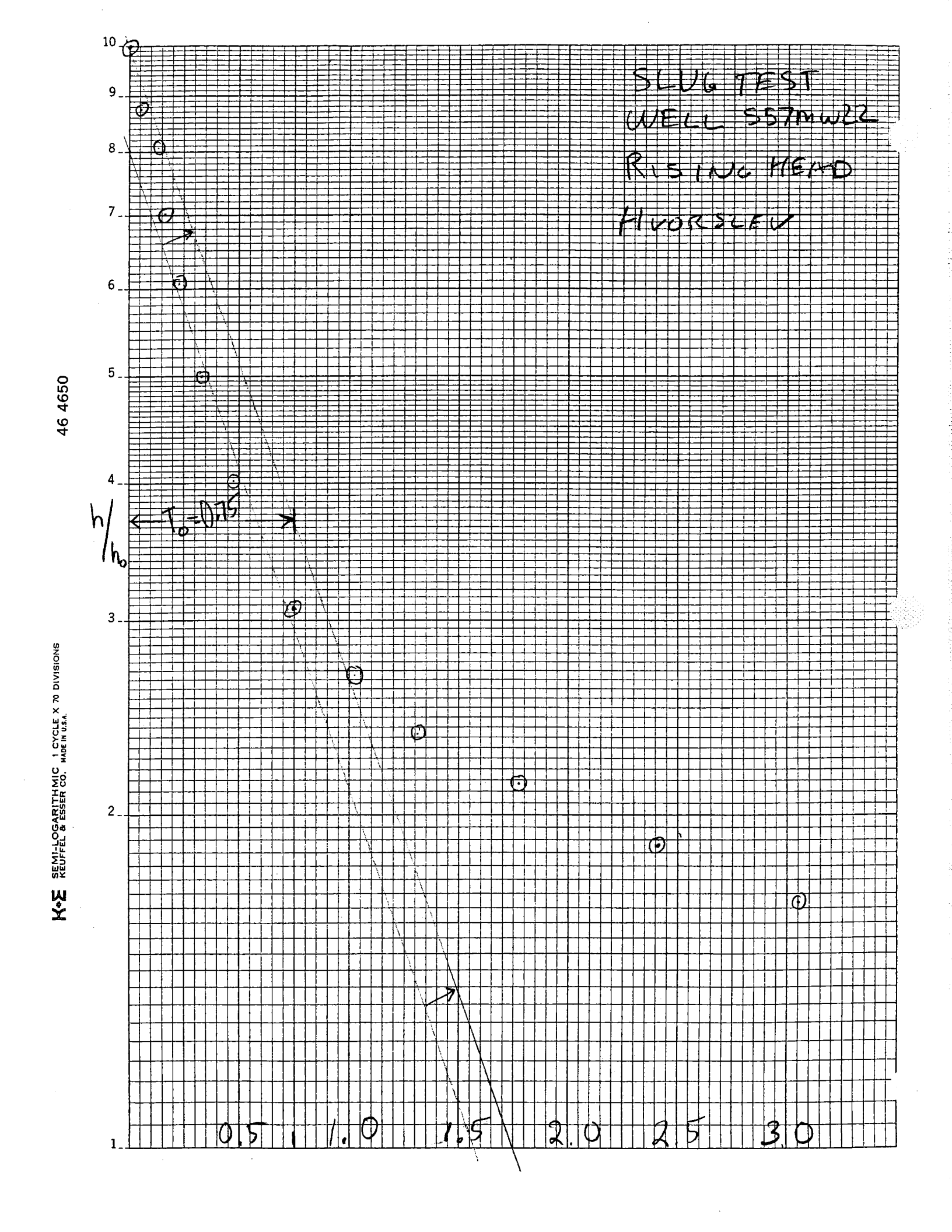
$$K = \frac{(.083)^2 \ln(9.48/.083)}{2(9.48)(0.75)}$$

$$K = \frac{3.26 \times 10^{-2}}{14.22}$$

$K = 2.3 \times 10^{-3}$ ft/min

$K = 1.17 \times 10^{-3}$ cm/sec

$K = 3.3$ ft/day ✓


SLUG TEST
WELL 557MW22
RISING HEAD
FLOWSLEW
h/h0
T0=0.75
10
9
8
7
6
5
4
3
2
1
0.5
1.0
1.5
2.0
2.5
3.0
46 4650
K&E SEMI-LOGARITHMIC 1 CYCLE X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

In-Situ Inc. MiniTroll Pro

Report generated: 11/1/01 14:35:51
Report from file: C:\Win-Situ\Data\SN00856 2001-10-04 084146 s57mw22rhno3.bin
DataMgr Version 3.68

Serial number: 856
Firmware Version 3.01
Unit name: miniTROLL

Test name: s57mw22rhno3

Test defined on: 10/4/01 8:24:36
Test started on: 10/4/01 8:41:46
Test stopped on: 10/4/01 9:08:20
Test extracted on: N/A

Data gathered using Logarithmic testing
Maximum time between data points:10 Minutes.
Number of data samples: 118

TOTAL DATA SAMPLES 118

Channel number [1]
Measurement type: Temperature
Channel name: OnBoard Temp

Channel number [2]
Measurement type: Pressure
Channel name: OnBoard Pressure
Sensor Range: 30 PSI.
Specific gravity: 1
Mode: TOC
User-defined reference: 0 Feet H2O
Referenced on: test start
Pressure head at reference: 9.06 Feet H2O

Date	Time	ET (min)	Chan[1] Celsius	Chan[2] Feet H2O	Adj ET (min)	h/ho	ho= 1.881
10/4/01	8:41	0	16.07	0			
10/4/01	8:41	0.005	16.09	-0.006			
10/4/01	8:41	0.075	16.11	1.885			
10/4/01	8:41	0.08	16.11	1.881	0	1.000	
10/4/01	8:41	0.0848	16.11	1.843	0.0048	0.980	
10/4/01	8:41	0.09	16.11	1.827	0.01	0.971	
10/4/01	8:41	0.095	16.11	1.8	0.015	0.957	
10/4/01	8:41	0.1	16.11	1.779	0.02	0.946	
10/4/01	8:41	0.1058	16.11	1.754	0.0258	0.932	
10/4/01	8:41	0.112	16.11	1.729	0.032	0.919	

10/4/01 8:41	0.1185	16.11	1.702	0.0385	0.905
10/4/01 8:41	0.1255	16.12	1.675	0.0455	0.890
10/4/01 8:41	0.1328	16.12	1.644	0.0528	0.874
10/4/01 8:41	0.1407	16.12	1.615	0.0607	0.859
10/4/01 8:41	0.149	16.12	1.586	0.069	0.843
10/4/01 8:41	0.1578	16.12	1.552	0.0778	0.825
10/4/01 8:41	0.167	16.11	1.521	0.087	0.809
10/4/01 8:41	0.177	16.11	1.49	0.097	0.792
10/4/01 8:41	0.1875	16.11	1.459	0.1075	0.776
10/4/01 8:41	0.1985	16.11	1.425	0.1185	0.758
10/4/01 8:41	0.2102	16.1	1.394	0.1302	0.741
10/4/01 8:41	0.2227	16.1	1.361	0.1427	0.724
10/4/01 8:42	0.2358	16.1	1.323	0.1558	0.703
10/4/01 8:42	0.2498	16.1	1.288	0.1698	0.685
10/4/01 8:42	0.2647	16.1	1.248	0.1847	0.663
10/4/01 8:42	0.2803	16.1	1.213	0.2003	0.645
10/4/01 8:42	0.297	16.1	1.175	0.217	0.625
10/4/01 8:42	0.3147	16.1	1.136	0.2347	0.604
10/4/01 8:42	0.3333	16.1	1.099	0.2533	0.584
10/4/01 8:42	0.3532	16.1	1.061	0.2732	0.564
10/4/01 8:42	0.3742	16.1	1.022	0.2942	0.543
10/4/01 8:42	0.3963	16.1	0.98	0.3163	0.521
10/4/01 8:42	0.4198	16.1	0.94	0.3398	0.500
10/4/01 8:42	0.4447	16.1	0.901	0.3647	0.479
10/4/01 8:42	0.4697	16.1	0.864	0.3897	0.459
10/4/01 8:42	0.4963	16.1	0.828	0.4163	0.440
10/4/01 8:42	0.5247	16.1	0.793	0.4447	0.422
10/4/01 8:42	0.5547	16.1	0.76	0.4747	0.404
10/4/01 8:42	0.5863	16.1	0.728	0.5063	0.387
10/4/01 8:42	0.6213	16.1	0.697	0.5413	0.371
10/4/01 8:42	0.6578	16.1	0.668	0.5778	0.355
10/4/01 8:42	0.6963	16.1	0.641	0.6163	0.341
10/4/01 8:42	0.738	16.1	0.618	0.658	0.329
10/4/01 8:42	0.7813	16.1	0.595	0.7013	0.316
10/4/01 8:42	0.828	16.1	0.577	0.748	0.307
10/4/01 8:42	0.8763	16.1	0.56	0.7963	0.298
10/4/01 8:42	0.928	16.1	0.543	0.848	0.289
10/4/01 8:42	0.983	16.09	0.528	0.903	0.281
10/4/01 8:42	1.0413	16.09	0.516	0.9613	0.274
10/4/01 8:42	1.103	16.09	0.503	1.023	0.267
10/4/01 8:42	1.168	16.09	0.489	1.088	0.260
10/4/01 8:43	1.238	16.09	0.479	1.158	0.255
10/4/01 8:43	1.3113	16.09	0.466	1.2313	0.248
10/4/01 8:43	1.3897	16.09	0.445	1.3097	0.237
10/4/01 8:43	1.473	16.09	0.443	1.393	0.236
10/4/01 8:43	1.5613	16.09	0.433	1.4813	0.230
10/4/01 8:43	1.6547	16.09	0.422	1.5747	0.224
10/4/01 8:43	1.753	16.09	0.412	1.673	0.219
10/4/01 8:43	1.858	16.09	0.402	1.778	0.214
10/4/01 8:43	1.968	16.09	0.393	1.888	0.209
10/4/01 8:43	2.0847	16.09	0.383	2.0047	0.204
10/4/01 8:43	2.2097	16.09	0.373	2.1297	0.198

10/4/01 8:44	2.3412	16.09	0.362	2.2612	0.192
10/4/01 8:44	2.4813	16.09	0.354	2.4013	0.188
10/4/01 8:44	2.6297	16.09	0.343	2.5497	0.182
10/4/01 8:44	2.7863	16.09	0.335	2.7063	0.178
10/4/01 8:44	2.953	16.09	0.325	2.873	0.173
10/4/01 8:44	3.1297	16.09	0.314	3.0497	0.167
10/4/01 8:45	3.3163	16.1	0.306	3.2363	0.163
10/4/01 8:45	3.5147	16.1	0.298	3.4347	0.158
10/4/01 8:45	3.7247	16.1	0.288	3.6447	0.153
10/4/01 8:45	3.9463	16.1	0.279	3.8663	0.148
10/4/01 8:45	4.1813	16.1	0.269	4.1013	0.143
10/4/01 8:46	4.4295	16.1	0.258	4.3495	0.137
10/4/01 8:46	4.693	16.1	0.248	4.613	0.132
10/4/01 8:46	4.973	16.1	0.238	4.893	0.127
10/4/01 8:47	5.2697	16.1	0.229	5.1897	0.122
10/4/01 8:47	5.583	16.1	0.219	5.503	0.116
10/4/01 8:47	5.9147	16.1	0.209	5.8347	0.111
10/4/01 8:48	6.2663	16.11	0.201	6.1863	0.107
10/4/01 8:48	6.6397	16.11	0.19	6.5597	0.101
10/4/01 8:48	7.0347	16.11	0.18	6.9547	0.096
10/4/01 8:49	7.453	16.11	0.169	7.373	0.090
10/4/01 8:49	7.8963	16.11	0.159	7.8163	0.085
10/4/01 8:50	8.3663	16.11	0.149	8.2863	0.079
10/4/01 8:50	8.8647	16.12	0.139	8.7847	0.074
10/4/01 8:51	9.3913	16.12	0.128	9.3113	0.068
10/4/01 8:51	9.9497	16.14	0.116	9.8697	0.062
10/4/01 8:52	10.5413	16.15	0.108	10.4613	0.057
10/4/01 8:52	11.168	16.15	0.098	11.088	0.052
10/4/01 8:53	11.8313	16.16	0.088	11.7513	0.047
10/4/01 8:54	12.5347	16.17	0.08	12.4547	0.043
10/4/01 8:55	13.2797	16.19	0.07	13.1997	0.037
10/4/01 8:55	14.0697	16.2	0.062	13.9897	0.033
10/4/01 8:56	14.9063	16.22	0.054	14.8263	0.029
10/4/01 8:57	15.7913	16.24	0.044	15.7113	0.023
10/4/01 8:58	16.7297	16.26	0.038	16.6497	0.020
10/4/01 8:59	17.723	16.27	0.032	17.643	0.017
10/4/01 9:00	18.7763	16.3	0.025	18.6963	0.013
10/4/01 9:01	19.8913	16.33	0.019	19.8113	0.010
10/4/01 9:02	21.073	16.35	0.014	20.993	0.007
10/4/01 9:04	22.3247	16.36	0.01	22.2447	0.005
10/4/01 9:05	23.6497	16.38	0.004	23.5697	0.002
10/4/01 9:06	25.0547	16.4	0.002	24.9747	0.001
10/4/01 9:08	26.543	16.41	-0.001	26.463	-0.001

HYDRAULIC CONDUCTIVITY TESTING DATA SHEET

Tetra Tech NUS, Inc.

PROJECT NAME: INDIANHEAD SITE 57 FS WELL/BORING NO.: S57MW23

PROJECT NO.: 7129-2920 GEOLOGIST: FRED W. RAMSER

WELL DIAMETER: 2" SCREEN LENGTH/DEPTH: 10' / TEST NO.:

STATIC WATER LEVEL (Depth/Elevation): 14.83 DATE: 10-25-01

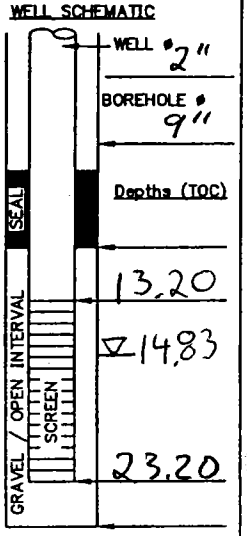
TEST TYPE (Rising/Falling/Constant Head): RISING HEAD CHECKED:

METHOD OF INDUCING WATER LEVEL CHANGE: BAILER x 2 PAGE ..... OF .....

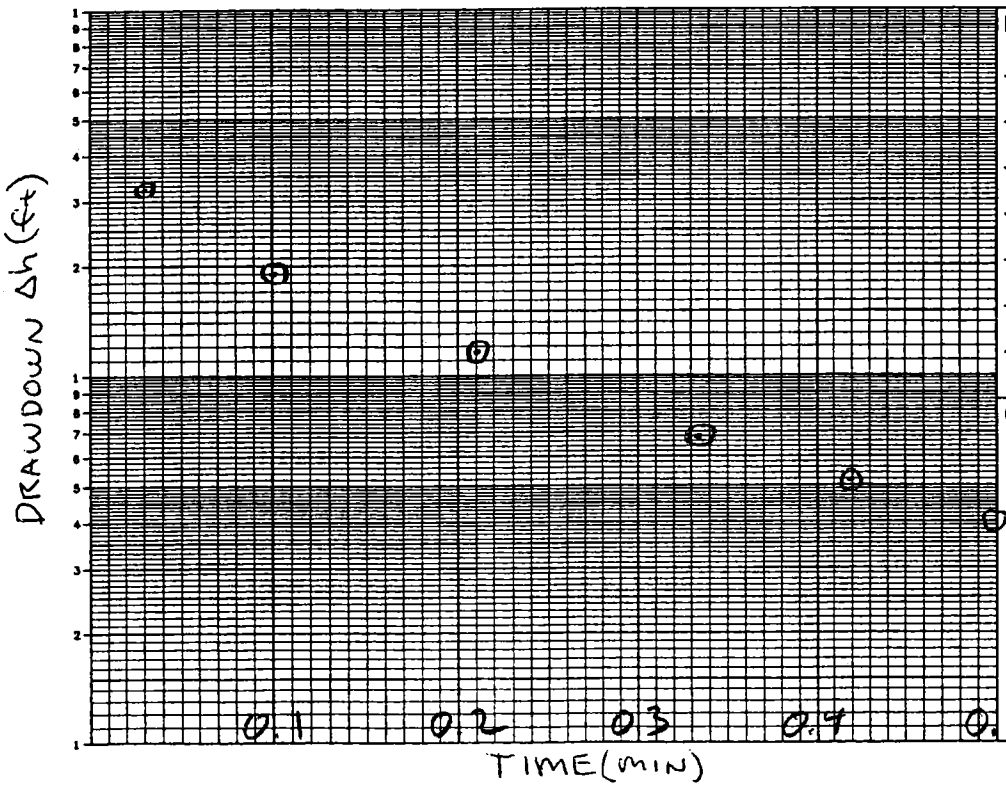
REFERENCE PT. FOR WL MEAS. (Top of Casing, Transducer, etc.): TOP OF CASING

ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)	ELAPSED TIME (min. or sec.)	MEASURED WATER LEVEL (feet)	DRAWDOWN OR HEAD (ΔH) (feet)
0.000		6.000	0.4198		0.508
0.030		3.242	0.4963		0.400
0.045		2.648	0.6963		0.226
0.060		2.391	0.8762		0.147
0.075		2.190	1.0412		0.104
0.090		2.006			
0.1000		1.907			
0.1405		1.566			
0.1768		1.336			
0.2100		1.154			
0.2498		0.971			
0.3333		0.688			

WELL SCHEMATIC



▽ Indicate SWL Depth on Drawing



REMARKS:

WL = 14.85 @ END OF TEST

CALCS, SKETCH MAPS, ETC.:

ACAD:FORM_HYDCONTST.dwg 07/06/99 INL

TETRA TECH NUS, INC. **CALCULATION WORKSHEET** PAGE _____ OF _____

CLIENT: INDIAN HEAD NSWC	JOB NUMBER: 7129 SITE 57 FS
SUBJECT: SLUG TEST WELL S57MW23 RISING HEAD	
BASED ON: HVORSLEV	DRAWING NUMBER:
BY: FRED R.	CHECKED BY: gk
APPROVED BY:	DATE: 11-2-01

EQ:

$$K = \frac{r^2 \ln(L/R)}{2LT_o}$$

WHERE:

$r = 0.0833$ (RISER RADIUS, Ft)
$R = 0.0833$ (SCREEN RADIUS, Ft)
$L = 8.37$ (INPUT LENGTH, Ft)
$T_o = 0215$ (FROM PLOT, MIN)
K = HYDRAULIC COND. (ft/min)

SUB:

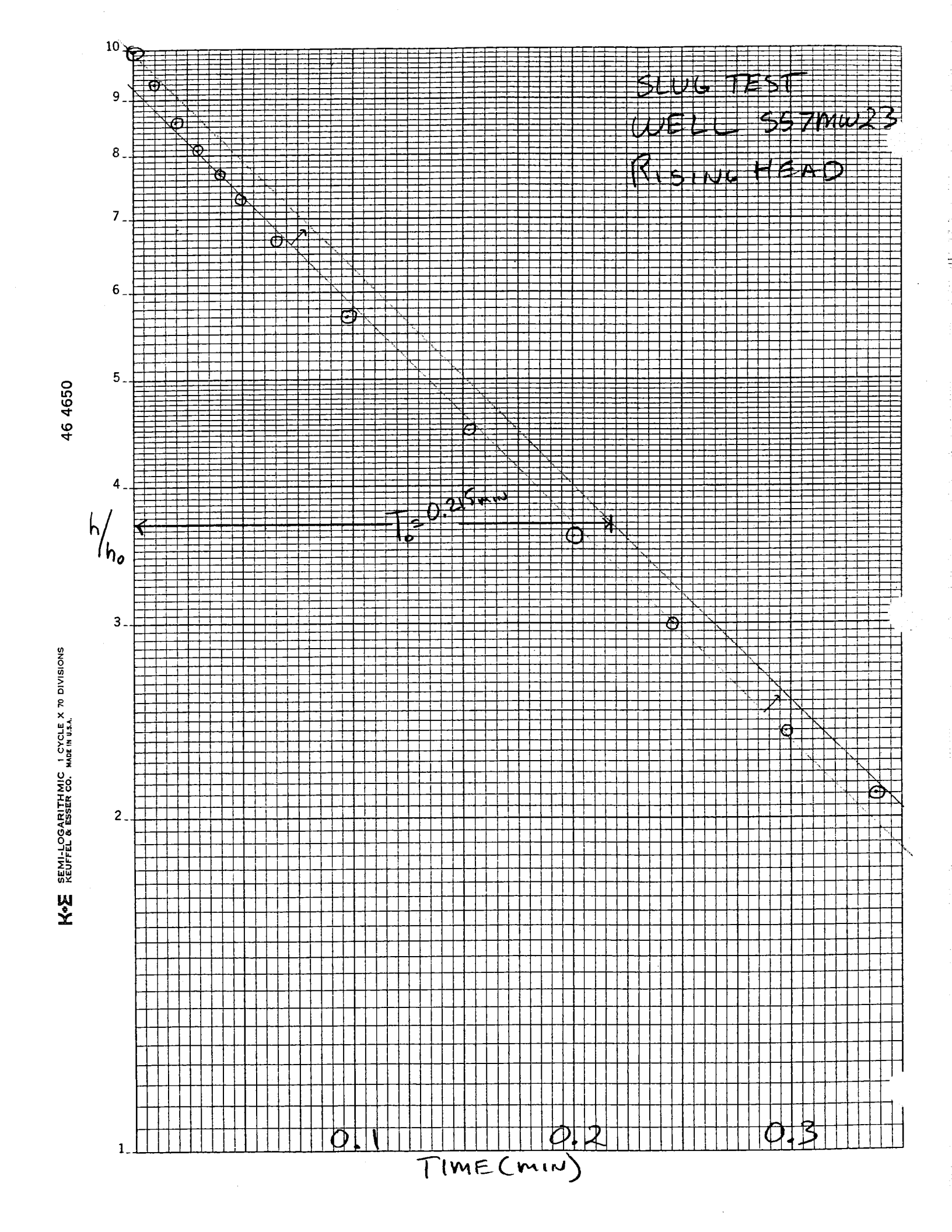
$$K = \frac{(0.0833)^2 \ln(8.37/0.0833)}{2(8.37)(0.215)}$$

$$= \frac{3.19880096 \times 10^{-2}}{3.5991}$$

$$= 8.9 \times 10^{-3} \text{ ft/min}$$

$$= 4.5 \times 10^{-3}$$

$$= 12.8 \text{ ft/day}$$


SLUG TEST
WELL 557MW23
RISING HEAD
h/h0
T0 = 0.25 min
10
9
8
7
6
5
4
3
2
1
0.1
0.2
0.3
TIME (MIN)
46 4650
K+E SEMI-LOGARITHMIC 1 CYCLE X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

In-Situ Inc.	MiniTroll Pro
Report generated:	10/30/01 12:24:37
Report from file:	C:\Win-Situ\Data\SN01966 2001-10-25 125200 s57mw23rhno1.bin
DataMgr Version	3.68
Serial number:	1966
Firmware Version	3.01
Unit name:	miniTROLL
Test name:	s57mw23rhno1
Test defined on:	10/25/01 12:39:03
Test started on:	10/25/01 12:52:00
Test stopped on:	10/25/01 13:00:29
Test extracted on:	N/A

Data gathered using Logarithmic testing
aximum time between data points: 10.0 Minutes.
Number of data samples: 98

TOTAL DATA SAMPLES 98

Channel number [1]
Measurement type: Temperature
Channel name: OnBoard Temp

Channel number [2]
Measurement type: Pressure
Channel name: OnBoard Pressure
Sensor Range: 30 PSI.
Specific gravity: 1
Mode: TOC
User-defined reference: 0 Feet H2O
Referenced on: test start
Pressure head at reference: 7.801 Feet H2O

Date	Time	ET (min)	Chan[1] Celsius	Chan[2] Feet H2O	ET (min) adj	h/ho	ho= 2.861
10/25/01	12:52	0	15.9	0			
10/25/01	12:52	0.005	15.91	-0.002			
10/25/01	12:52	0.01	15.91	0.004			
10/25/01	12:52	0.015	15.91	3.531			
10/25/01	12:52	0.02	15.91	7.164			
10/25/01	12:52	0.025	15.92	6.216			
10/25/01	12:52	0.03	15.92	3.242			
10/25/01	12:52	0.035	15.92	2.861	0	1.00	-
10/25/01	12:52	0.04	15.92	2.747	0.005	0.96	
10/25/01	12:52	0.045	15.92	2.648	0.01	0.93	-

10/25/01 12:52	0.05	15.92	2.554	0.015	0.89
10/25/01 12:52	0.055	15.92	2.472	0.02	0.86
10/25/01 12:52	0.06	15.94	2.391	0.025	0.84
10/25/01 12:52	0.065	15.94	2.331	0.03	0.81
10/25/01 12:52	0.07	15.94	2.248	0.035	0.79
10/25/01 12:52	0.075	15.94	2.19	0.04	0.77
10/25/01 12:52	0.08	15.94	2.126	0.045	0.74
10/25/01 12:52	0.0848	15.94	2.079	0.0498	0.73
10/25/01 12:52	0.09	15.94	2.006	0.055	0.70
10/25/01 12:52	0.095	15.94	1.952	0.06	0.68
10/25/01 12:52	0.1	15.94	1.907	0.065	0.67
10/25/01 12:52	0.1058	15.94	1.855	0.0708	0.65
10/25/01 12:52	0.112	15.94	1.791	0.077	0.63
10/25/01 12:52	0.1185	15.94	1.737	0.0835	0.61
10/25/01 12:52	0.1255	15.94	1.679	0.0905	0.59
10/25/01 12:52	0.1328	15.94	1.623	0.0978	0.57
10/25/01 12:52	0.1407	15.95	1.566	0.1057	0.55
10/25/01 12:52	0.149	15.94	1.507	0.114	0.53
10/25/01 12:52	0.1578	15.95	1.452	0.1228	0.51
10/25/01 12:52	0.167	15.94	1.394	0.132	0.49
10/25/01 12:52	0.177	15.94	1.336	0.142	0.47
10/25/01 12:52	0.1875	15.94	1.278	0.1525	0.45
10/25/01 12:52	0.1985	15.94	1.216	0.1635	0.43
10/25/01 12:52	0.2102	15.94	1.154	0.1752	0.40
10/25/01 12:52	0.2227	15.94	1.094	0.1877	0.38
10/25/01 12:52	0.2358	15.94	1.031	0.2008	0.36
10/25/01 12:52	0.2498	15.94	0.971	0.2148	0.34
10/25/01 12:52	0.2647	15.94	0.911	0.2297	0.32
10/25/01 12:52	0.2803	15.94	0.853	0.2453	0.30
10/25/01 12:52	0.297	15.94	0.795	0.262	0.28
10/25/01 12:52	0.3147	15.92	0.739	0.2797	0.26
10/25/01 12:52	0.3333	15.92	0.688	0.2983	0.24
10/25/01 12:52	0.3532	15.94	0.638	0.3182	0.22
10/25/01 12:52	0.3742	15.92	0.59	0.3392	0.21
10/25/01 12:52	0.3963	15.92	0.549	0.3613	0.19
10/25/01 12:52	0.4198	15.92	0.508	0.3848	0.18
10/25/01 12:52	0.4447	15.92	0.47	0.4097	0.16
10/25/01 12:52	0.4697	15.92	0.433	0.4347	0.15
10/25/01 12:52	0.4963	15.92	0.4	0.4613	0.14
10/25/01 12:52	0.5247	15.92	0.365	0.4897	0.13
10/25/01 12:52	0.5547	15.92	0.336	0.5197	0.12
10/25/01 12:52	0.5863	15.92	0.305	0.5513	0.11
10/25/01 12:52	0.6213	15.92	0.276	0.5863	0.10
10/25/01 12:52	0.6578	15.92	0.249	0.6228	0.09
10/25/01 12:52	0.6963	15.92	0.226	0.6613	0.08
10/25/01 12:52	0.738	15.92	0.203	0.703	0.07
10/25/01 12:52	0.7813	15.92	0.185	0.7463	0.06
10/25/01 12:52	0.828	15.92	0.166	0.793	0.06
10/25/01 12:52	0.8763	15.92	0.147	0.8413	0.05
10/25/01 12:52	0.928	15.91	0.133	0.893	0.05
10/25/01 12:52	0.983	15.92	0.116	0.948	0.04
10/25/01 12:53	1.0413	15.91	0.104	1.0063	0.04

10/25/01 12:53	1.103	15.91	0.091	1.068	0.03
10/25/01 12:53	1.168	15.91	0.081	1.133	0.03
10/25/01 12:53	1.238	15.91	0.071	1.203	0.02
10/25/01 12:53	1.3113	15.91	0.062	1.2763	0.02
10/25/01 12:53	1.3897	15.91	0.056	1.3547	0.02
10/25/01 12:53	1.473	15.91	0.05	1.438	0.02
10/25/01 12:53	1.5613	15.91	0.046	1.5263	0.02
10/25/01 12:53	1.6547	15.91	0.04	1.6197	0.01
10/25/01 12:53	1.753	15.9	0.035	1.718	0.01
10/25/01 12:53	1.858	15.9	0.033	1.823	0.01
10/25/01 12:53	1.968	15.9	0.031	1.933	0.01
10/25/01 12:54	2.0847	15.9	0.029	2.0497	0.01
10/25/01 12:54	2.2097	15.9	0.029	2.1747	0.01
10/25/01 12:54	2.3412	15.9	0.027	2.3062	0.01
10/25/01 12:54	2.4813	15.9	0.025	2.4463	0.01
10/25/01 12:54	2.6297	15.9	0.023	2.5947	0.01
10/25/01 12:54	2.7863	15.9	0.023	2.7513	0.01
10/25/01 12:54	2.953	15.9	0.023	2.918	0.01
10/25/01 12:55	3.1297	15.9	0.021	3.0947	0.01
10/25/01 12:55	3.3163	15.9	0.021	3.2813	0.01
10/25/01 12:55	3.5147	15.9	0.019	3.4797	0.01
10/25/01 12:55	3.7247	15.89	0.018	3.6897	0.01
10/25/01 12:55	3.9463	15.89	0.018	3.9113	0.01
10/25/01 12:56	4.1813	15.89	0.018	4.1463	0.01
10/25/01 12:56	4.4295	15.89	0.016	4.3945	0.01
10/25/01 12:56	4.693	15.89	0.016	4.658	0.01
10/25/01 12:56	4.973	15.89	0.014	4.938	0.00
10/25/01 12:57	5.2697	15.89	0.014	5.2347	0.00
10/25/01 12:57	5.583	15.89	0.014	5.548	0.00
10/25/01 12:57	5.9147	15.89	0.014	5.8797	0.00
10/25/01 12:58	6.2663	15.89	0.014	6.2313	0.00
10/25/01 12:58	6.6397	15.89	0.016	6.6047	0.01
10/25/01 12:59	7.0347	15.89	0.016	6.9997	0.01
10/25/01 12:59	7.453	15.89	0.014	7.418	0.00
10/25/01 12:59	7.8963	15.89	0.014	7.8613	0.00
10/25/01 13:00	8.3663	15.89	0.012	8.3313	0.00

TETRA TECH NUS, INC. **CALCULATION WORKSHEET** PAGE 1 OF 2

CLIENT	JOB NUMBER		
NAVY INDIAN HEAD	4020 1110		
SUBJECT	HYDRAULIC GRADIENT		
BASED ON		DRAWING NUMBER	
BY	CHECKED BY	APPROVED BY	DATE
FWR	FCW		4-17-02

ESTIMATED GRAPHICALLY FROM POTENTIOMETRIC SURFACE MAP. FIGURE 1-9

$$\frac{dh}{dl} = i$$

TOP $$\frac{dh}{dl} = \left(\frac{2}{20} + \frac{2}{30} + \frac{2}{34} + \frac{2}{48} + \frac{2}{65} + \frac{2}{94} + \frac{2}{88} + \frac{2}{73} + \frac{2}{94} + \frac{2}{120}\right)\frac{1}{10}$$

$$= 0.0407 \checkmark$$

BOTTOM $$\frac{dh}{dl} = \left(\frac{2}{50} + \frac{2}{64} + \frac{2}{137} + \frac{2}{188} + \frac{2}{140}\right)\frac{1}{5}$$

$$= 0.022 \checkmark$$

CLIENT	JOB NUMBER
NAVY INDIAN HEAD	4020 1110
SUBJECT: SEEPAGE VELOCITY	
BASED ON	DRAWING NUMBER
BY: FWR / CHECKED BY: FCW	APPROVED BY / DATE: 4-17-02

$V_s = K \times i (1/n)$

V_s = SEEPAGE VELOCITY (feet/day)

K = HORIZONTAL HYDRAULIC COND. (FEET/DAY)

i = HYDRAULIC GRADIENT (FEET/FEET)

n = EFFECTIVE POROSITY

NORTHERN PORTION

$K = 2.3$ FEET/DAY

$i = 0.04$

$n = 0.25$

SUB:

$V_s = 2.3 \times 0.04 (1/0.25)$

$V_s = 0.37$ ✓

SOUTHERN PORTION

$K = 2.3$ FEET/day

$i = 0.022$ FEET/FEET

$n = 0.25$

SUB:

$V_s = 2.3 \times 0.022 (1/0.25)$

$= 0.20$ ✓

APPENDIX E

CONE PENETROMETER TESTING REPORT

CONE PENETRATION TESTING
AT THE
NAVAL SURFACE WARFARE CENTER
INDIAN HEAD, MARYLAND

Draft Report

Prepared for:

Tetra Tech NUS, Inc.
600 Clark Avenue, Suite 3
King of Prussia, PA 19406-1433

Prepared by:

Applied Research Associates, Inc.
New England Division
415 Waterman Road
South Royalton, Vermont 05068

ARA Report No. 0740

November 16, 2001

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SECTION 1

OVERVIEW OF CONE PENETROMETER TESTING AT THE NAVAL SURFACE WARFARE CENTER INDIAN HEAD, MARYLAND

1.1 INTRODUCTION

Applied Research Associates, Inc. (ARA) under contract to Tetra Tech NUS, Inc., (TTNUS), conducted Piezo-Electric Cone Penetration Tests (P-CPT) at the Naval Surface Warfare Center-Indian Head, Indian Head, Maryland (NSWC Indian Head), Figure 1. This report documents ARA's site investigation efforts, field testing methods, data analysis techniques, and a brief discussion of results for fieldwork conducted August 27 through August 31, 2001.

1.2 TEST LOCATIONS

Cone penetrometer tests were conducted at ten locations on the NSWC Indian Head project. All penetrations measured tip stress, sleeve stress, and penetration pore pressure. Multiple attempts were made at locations where the CPT met early refusal. A total of 406.8 feet of CPT soundings were completed. Regardless of final depth, data is reported for all locations.

Table 1 is a chronological listing of the penetrations conducted and relevant information for each location. All locations were grouted upon retraction of the rod string or using a standard tremie grout method.

1.3 REPORT OUTLINE

This report is organized into four sections and three appendices. Section 2 discusses the CPT equipment, field procedures, and daily calibrations. Section 3 describes the methods used to interpret the CPT results and discusses the correlation of a boring log to typical CPT results obtained from the NSWC Indian Head project. Section 4 lists references. Appendix A presents the piezocone profiles. Plots of pore pressure dissipation tests are presented in Appendix B. Appendix C contains calibration certifications for the reference load cell and reference pressure transducer used to calibrate the cone penetrometer on this investigation.

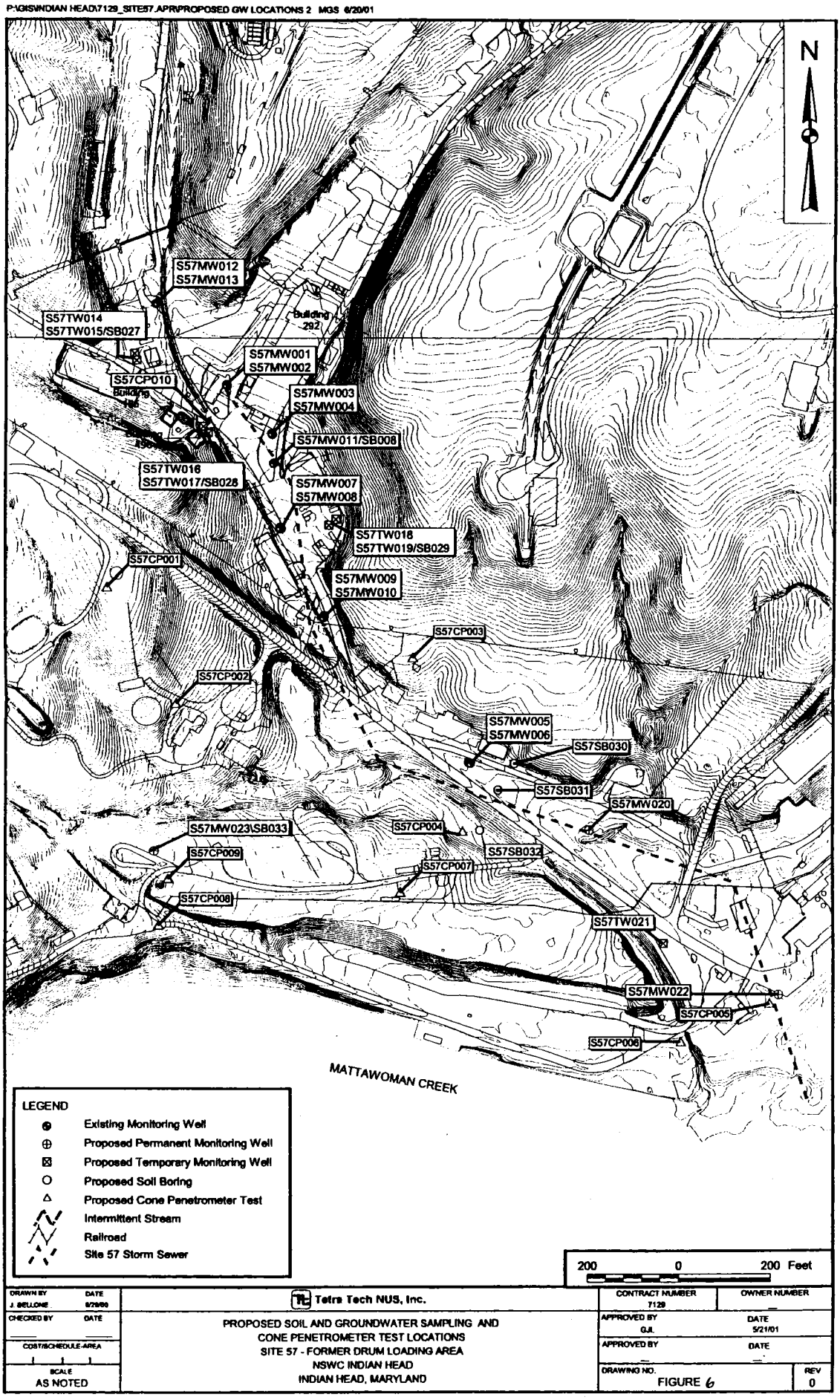


Figure 1.1 NSWC Indian Head site map

Table 1.1 Summary of CPT borings at the NSWC Indian Head

Test ID	ARA Filename	Type of Test	Date of Test	Final Depth (ft)	Northing (ft)	Easting (ft)	Surface Elevation (ft)	G.W.T. Depth (ft)
CPT-01	430G106	P-CPT	8/30/01	16.5				5
CPT-01B	430G107	P-CPT	8/30/01	16.4				5
CPT-01	--	WS	8/30/01	43.2	--	--	--	--
CPT-02	430G104	P-CPT	8/30/01	53.3				2
CPT-03	429G114	P-CPT	8/29/01	52.7				9.5
CPT-03	--	WS	8/30/01	45.0*	--	--	--	--
CPT-04	428G104	P-CPT	8/28/01	21.7				3
CPT-04	--	WS	8/28/01	23.0	--	--	--	--
CPT-05	429G101	P-CPT	8/29/01	20.5				6
CPT-05B	429G103	P-CPT	8/29/01	14.0				6
CPT-05	--	WS	8/29/01	19.0	--	--	--	--
CPT-06	429G105	P-CPT	8/29/01	31.5				6
CPT-06	--	WS	8/29/01	27.0	--	--	--	--
CPT-07	430G102	P-CPT	8/30/01	43.0				5
CPT-08	429G108	P-CPT	8/29/01	32.7				5
CPT-08	--	WS	8/29/01	29.0*	--	--	--	--
CPT-09	429G112	P-CPT	8/29/01	55.3				12
CPT-10	428G101	P-CPT	8/28/01	49.2				7
CPT-10	--	WS	8/28/01	39.5	--	--	--	--

* No Water

SECTION 2
TESTING EQUIPMENT AND PROCEDURES

2.1 INTRODUCTION

The CPT was originally developed for use in soft soil. Over the years, cone and push system designs have evolved to the point where they can now be used in strong cemented soils and even soft rock. ARA's penetrometer consists of an instrumented probe that is forced into the ground using a hydraulic load frame mounted on a heavy truck with the weight of the truck providing the necessary reaction mass. The probe has a conical tip and a friction sleeve that independently measures vertical resistance beneath the tip as well as frictional resistance on the side of the probe as a function of depth. Figure 2.1 presents ARA's piezo-cone penetrometer. A pressure transducer in the cone is used to measure the pore water pressure as the probe is pushed into the ground (P-CPT). A schematic of the piezo-cone penetrometer with dimensions is found in Figure 2.2.

2.2 PIEZO-ELECTRIC CONE PENETROMETER EQUIPMENT

2.2.1 Equipment

The P-CPT's were conducted using the ARA penetrometer truck. The penetrometer equipment is mounted inside a van body attached to a ten-wheel truck chassis with a diesel engine. Ballast in the form of weights can be added to the truck to achieve an overall push capacity of 60,000 lbs. Penetration force is supplied by a pair of large hydraulic cylinders bolted to the truck frame.

A 15-cm^2 penetrometer probe (which has 1.73-inch diameter, 60° conical tip, and a 1.73-inch diameter by 6.5-inch long friction sleeve) was used on this project (Figure 2.1 and 2.2). This probe size is in conformance with ASTM D 5778 (Ref. 1). The shoulder between the base of the tip and the porous filter measures 0.185 inches. The penetrometer is advanced vertically into the soil at a constant rate of 48 inches/minute (2 cm/second), although this rate must sometimes be reduced as hard layers are encountered.

The piezo-electric cone penetrometer test (P-CPT) was conducted in accordance with ASTM D 5778 (Ref. 1). As shown in Figure 2.1, the piezo-cone probe senses the pore pressure

immediately behind the tip. ARA chose to locate the sensing element behind the tip since the filter is protected from the direct thrust of the penetrometer and the measured pore pressure can be used to correct the tip resistance data, as recommended by Robertson and Campanella (Ref. 2). Furthermore, this is the standard location as specified by ASTM 5778-95.

Inside the probe, two load cells independently measure the vertical resistance against the conical tip and the side friction along the sleeve. Each load cell is a cylinder of uniform cross section instrumented with four strain gages in a full-bridge circuit. The forces are sensed by the load cells and the data are transmitted from the probe assembly via a cable running through the push rods. The analog data are digitized, recorded, and plotted by computer in the penetrometer truck. A set of data is normally recorded each second, for a minimum resolution of about one data point every 0.8 inch of cone advance. The depth of penetration is measured using a string potentiometer mounted on the push frame.

Electronic data acquisition equipment for the cone penetrometer consists of a computer and signal conditioners. Analog signals are transmitted from the probe to the signal conditioners where the CPT data are amplified and filtered at 1 Hz. Once amplified, the analog signals are transmitted to a high-speed analog-to-digital converter board, where the signals are digitized; usually at the rate of one sample per second for the penetration data. The digital data are then read into memory and written to the internal hard disk for future processing. Upon completion of the test the penetration data are plotted. The digital data are sent to ARA's New England Division in South Royalton, Vermont, for analysis and preparation of report plots.

2.2.2 Saturation of the Piezo-Cone

Penetration pore pressures are measured with a pressure transducer located behind the tip in the lower end of the probe. Water pressures in the soil are sensed through a 250 micro-inch porous polyethylene filter that is 0.25-inch high and 0.202-inch thick. The pressure transducer is connected to the porous filter through a pressure port as shown in Figure 2.1. The pressure port and the filter are filled with de-aired high viscosity silicone oil.

In order for the pressure transducer to respond rapidly and correctly to changing pore pressures during the penetration, the filter and pressure port must be saturated with oil upon

assembly of the probe. A vacuum pump is used to de-air the silicone oil before use and also to saturate the porous filters with oil. The probe is assembled with the pressure transducer facing upwards. The cavity above the pressure transducer is then filled with de-aired oil. A previously saturated filter is then placed on a tip and oil is poured over the threads of the tip. When the cone tip is screwed into place, excess oil is ejected through the pressure port and filter, thereby forcing out any trapped air. The high viscosity of the silicone oil coupled with the small pore space in the filter prevents the loss of saturation as the cone is pushed through dry soils. Saturation of the cone can be verified with a calibration check at the completion of the penetration. Extensive field experience has proven the reliability of this technique.

2.2.3 Field Calibrations

Many factors can effectively change the calibration factors used to convert the raw instrument readouts, measured in volts, to units of force or pressure. As a quality control measure, as well as a check for instrument damage, the load cells and the pressure transducer are routinely calibrated. Calibrations are completed with the probe ready to insert into the ground so that any factor affecting any component of the instrumentation system will be included and detected during the calibration.

The tip and sleeve load cells are calibrated with the conical tip and friction sleeve in place on the probe. For each calibration, the probe is placed in the push frame and loaded onto a precision reference load cell. The reference load cell is calibrated annually in ARA's laboratory against instruments traceable to NIST standards. To calibrate the pore pressure transducer, the saturated probe is inserted into a pressure chamber with air pressure supplied by the compressor on the truck. The reference transducer in the pressure chamber is also calibrated annually against an NIST traceable instrument. Additionally, the linear displacement transducer used to measure the depth of penetration, is periodically checked against a tape measure. All records of device and load cell calibrations are located at ARA's New England Division.

Each instrument is calibrated using a specially developed computer code that displays the output from the reference device and the probe instrument in graphical form. During the calibration procedure, the operator checks for linearity and repeatability in the instrument output. At the completion of each calibration, this code computes the needed calibration factors using a

linear regression algorithm. At a minimum, each probe instrument is calibrated at the beginning of each day of field-testing. Furthermore, the pressure transducer is recalibrated each time the porous filter is changed and the cone re-saturated with silicone oil. Calibrations are also performed to verify the operation of any instrument if damage is suspected.

2.2.4 Numerical Editing of the Penetration Data

Any time that the cone penetrometer is stopped or pulled back during a test, misleading data can result. For instance, when the probe is stopped to add the next push rod section, or when a pore pressure dissipation test is run, excess pore pressure will dissipate towards the hydrostatic pore pressure. When the penetration is resumed, the pore pressure rises very quickly to the pressure experienced prior to the pause in the test. In addition, the probe is sometimes pulled back and cycled up and down at intervals in deep holes to reduce soil friction on the push rods. This results in erroneous tip stress data when the cone is advanced in the previously penetrated hole.

To eliminate this misleading data from the penetration profile, the data is numerically edited before it is plotted or used in further analysis. Each time the penetration is paused or retracted, as apparent from the depth data, the penetration data is not plotted. Plotting of successive data is resumed only after the tip is fully re-engaged in the soil by one tip length of new penetration. In addition, each time the probe stops, the previous 0.5 inch of penetration data is filtered out. This filter is required to remove data that was recorded while the operator was in the process of stopping the probe. This algorithm also eliminates any data acquired at the ground surface before the tip has been completely inserted into the ground. The sleeve data is treated in a similar manner, resulting in the first data point occurring below the ground surface, as can be seen in the sleeve profile presented in Figure 2.3. These procedures ensure that all of the penetration data that is plotted and used for analysis was acquired with the probe advancing fully into undisturbed soil.

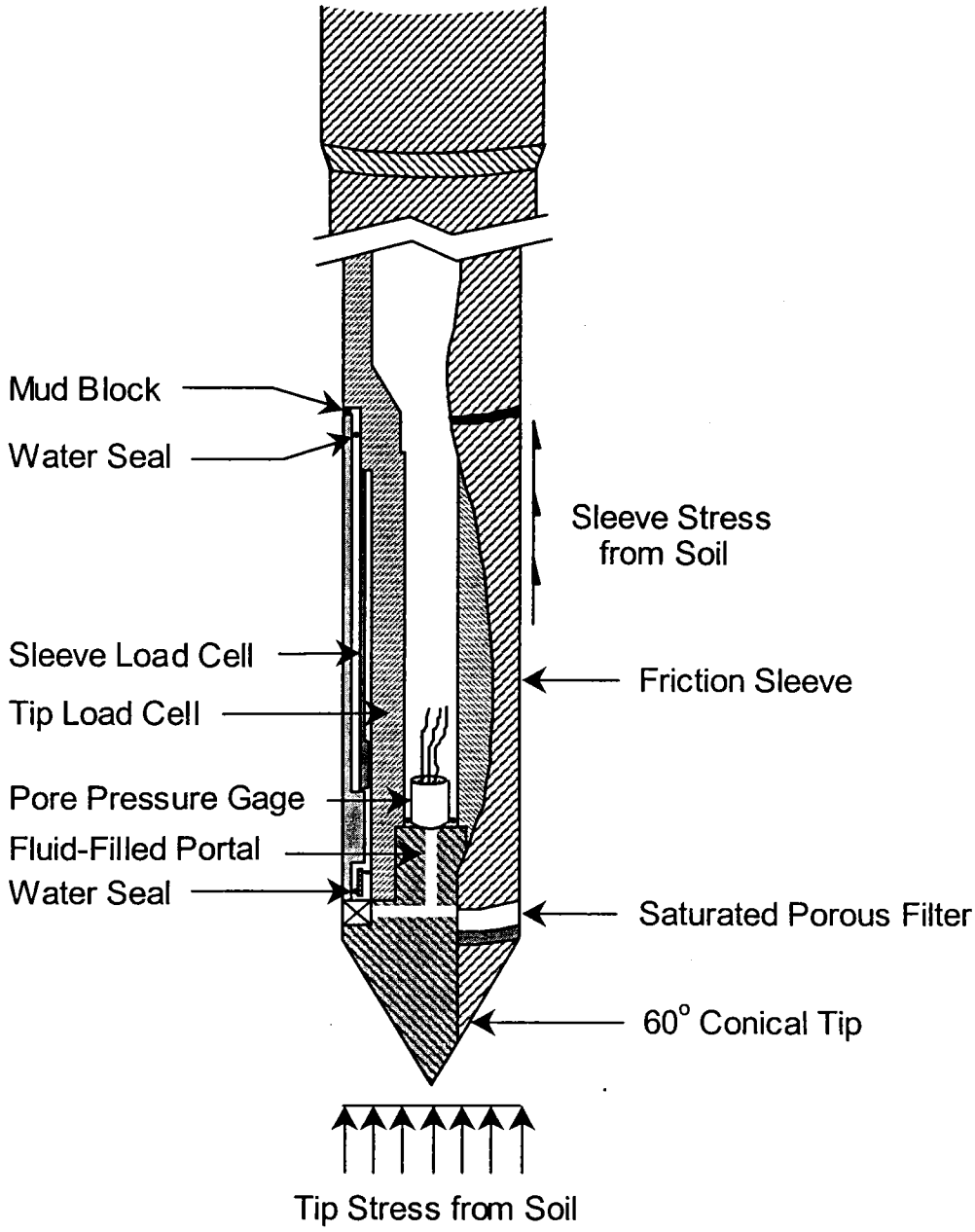


Figure 2.1 ARA's cone penetrometer

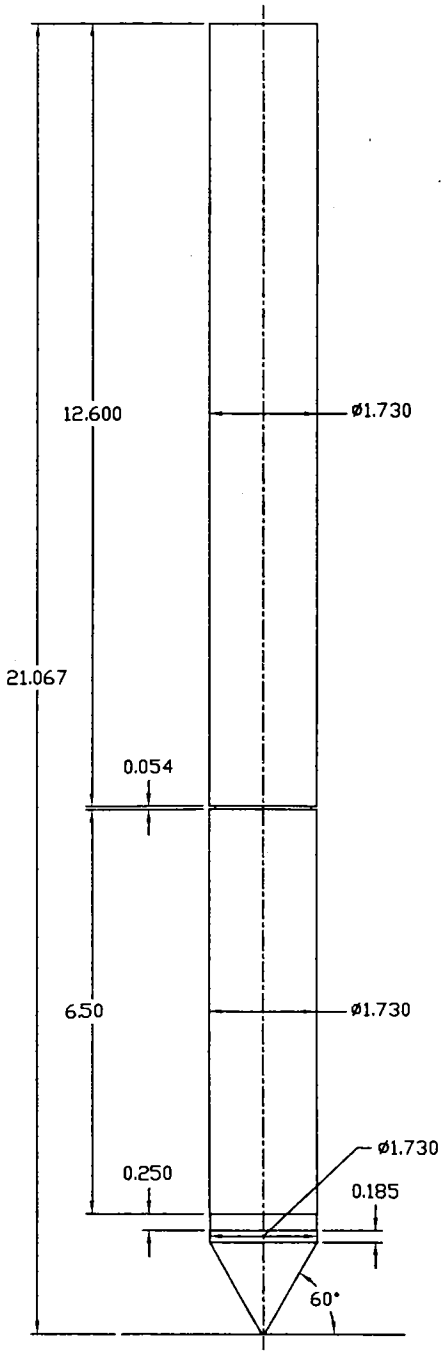


Figure 2.2 Schematic of cone penetrometer with dimensions

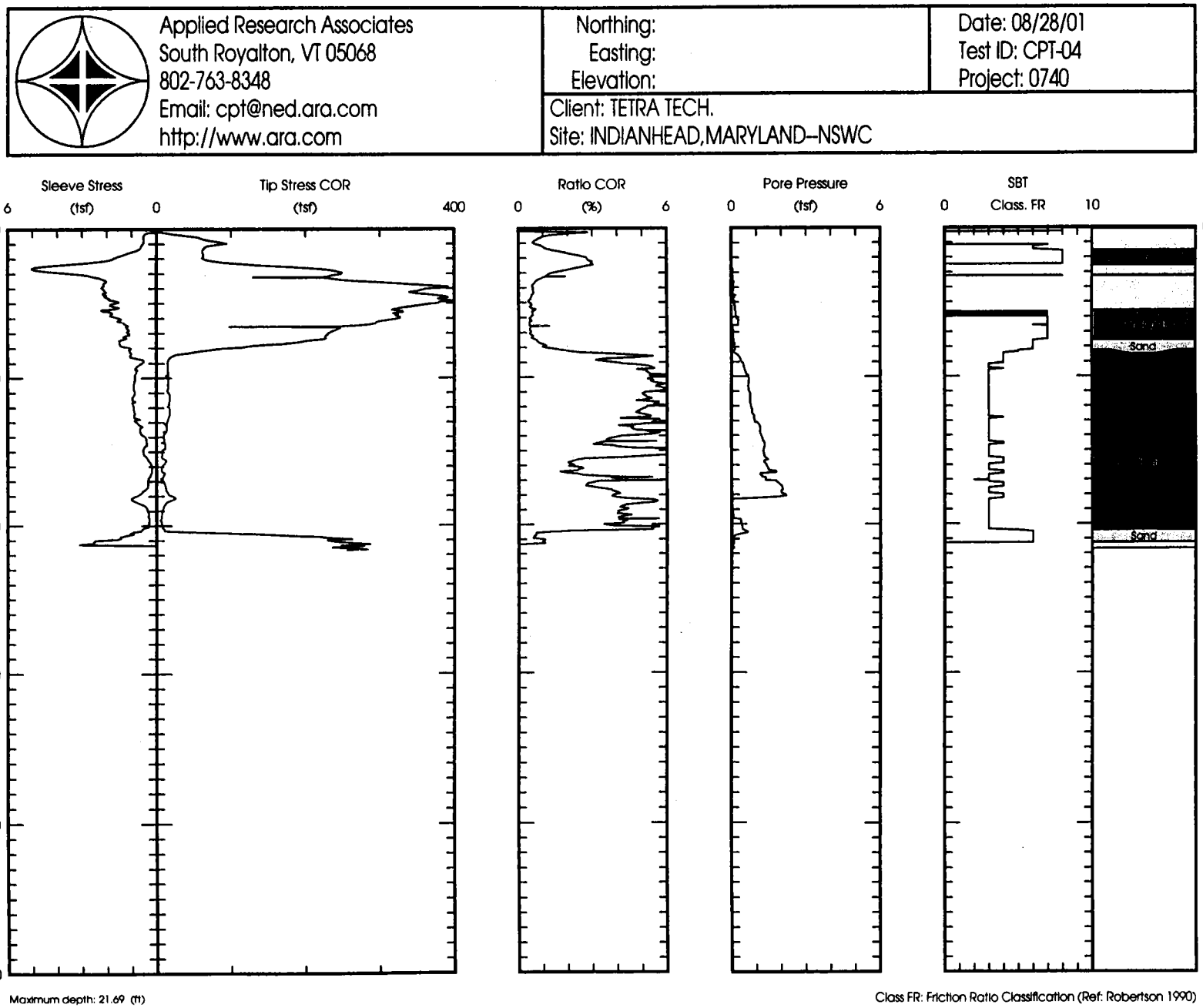


Figure 2.3 Example CPT profile n the NSWC Indian Head project

Test ID: CPT-04
File: 426G104.ECP

SECTION 3
DATA ANALYSIS TECHNIQUES

3.1 OVERVIEW

Presented in this section is a description of analysis techniques used to determine engineering parameters. The methods used to determine the soil type information from the CPT data are also discussed.

3.2 LOCATION OF THE SITE WATER TABLE

Generally, the static water table at a given site can be identified from the penetration pore pressures, since it will be equal to the hydrostatic pore pressure in freely draining soil layers. When no such layers are present, pore pressure dissipation tests can be performed to determine hydrostatic pressures. This information was used in the soil classification routines for the calculation of effective stress of the soil materials. A saturated unit weight of 120 pounds per cubic foot was assumed for all calculations. For the NSWC Indian Head site, depth to groundwater was determined from nearby monitoring wells. Table 1 lists depth to groundwater at most locations.

3.3 PORE PRESSURE CORRECTION OF TIP STRESS

Cone penetrometers, by necessity, must have a joint between the tip and sleeve. Pore pressure acting behind the tip decreases the total tip resistance that would be measured if the penetrometer was without joints. The influence of pore pressure in these joints is compensated for by using the net area concept (Ref. 2). The corrected tip resistance is given by:

$$q_T = q_c + u\left[1 - \frac{A_n}{A_T}\right] \tag{3.1}$$

where: q_T = corrected tip resistance (psi)
q_c = measured tip resistance (psi)
u = penetration pore pressure measured behind the tip (psi)
A_n = net area behind the tip not subjected to the pore pressure (1.95 in^2)
A_T = projected area of the tip (2.405 in^2).

Hence, for the ARA cone design, the tip resistance is corrected as:

$$q_T = q_c + u(0.189) \tag{3.2}$$

Laboratory calibrations have verified Equation 3.2 for ARA's piezo-cone design.

A joint also exists behind the top of the sleeve (see Figure 2.1). However, since the sleeve is designed to have the same cross sectional area on both ends, the pore pressures acting on the sleeve cancel out. Laboratory tests have verified that the sleeve is not subjected to unequal end area effects. Thus, no correction for pore pressure is needed for the sleeve friction data. The net effect of applying the pore pressure correction is to increase the tip resistance. Generally, this correction is only significant when the measured tip resistance is very low.

3.4 SOIL BEHAVIOR TYPE

The tip resistance, friction ratio, and pore pressure values from CPT profiles can be used to determine a soil stratigraphy profile. Plots of normalized tip resistance versus friction ratio and normalized tip resistance versus penetration pore pressure can be used to determine Soil Behavior Type, SBT, as a function of depth. Both methods of soil description are based on empirical charts developed by Robertson and Campanella (Ref. 2). The friction ratio based routines were selected for initial layering for this project, due to the variability in soil. All locations were processed using this routine to compare to the boring logs provided. The friction ratio SBT is determined from the chart in Figure 3.1 using the normalized corrected tip stress, q_{NT}, and the normalized friction ratio, f_{SN}.

The normalized tip resistance is defined as:

$$q_{NT} = \frac{q_T - \sigma_{vo}}{\sigma'_{vo}} \tag{3.3}$$

The normalized friction ratio is defined as:

$$f_{SN} = \frac{f_s}{q_T - \sigma_{vo}} x\,100 \tag{3.4}$$

where: f_s = sleeve friction
q_T = corrected tip resistance
σ_{vo} = total overburden stress
σ'_{vo} = effective overburden stress

The intersection point of the q_{NT} and f_{SN} values normally falls in a classification zone. The zone number corresponds to a soil behavior type (SBT) as shown in Figure 3.1. At some depths, the CPT data will fall outside of the range of the chart. When this occurs, no data is plotted and a break is seen in the SBT profile. This occasionally occurs at the top of a penetration as the

effective vertical stress is very small and produces normalized cone resistances greater than 1000.

The classification profiles can be very detailed due to the high spatial resolution afforded by collecting one sample every 2 cm (0.8 in) for CPT profiles. Frequently significant variability in soil types over small changes in elevation can be observed in the profiles. To provide a simplified soil stratigraphy for comparison to standard boring logs, a layering and generalized classification system was implemented. Layer thicknesses are determined based on the variability of the SBT profile. The layer sequence begins at the ground surface and layer thicknesses are determined based upon changes in the standard deviation of the SBT number. Whenever an additional 6-inch increment deviates from the previous increment, a new layer is started, otherwise, this material is added to the layer above and the next 6-inch section is evaluated. The soil type for the layer is determined by the mean value for the complete layer.

The soil classification chart and SBT descriptors were compared to the respective boring logs. Initial comparisons indicated that the empirical correlations could accurately delineate the underlying soils. Table 3.1 lists CPT locations and the correlating boring logs used in the comparison.

Table 3.1 CPT Locations and Corresponding Boring Locations

Date of CPT Sounding	CPT Location	Maximum Depth of Penetration (ft)	Corresponding Boring Log I.D.
28 Aug 01	CPT-04	21.7	S57SB32
29 Aug 01	CPT-05	20.5	S57MW022
29 Aug 01	CPT-09	55.3	S57SB033/MW023

3.5 CORRELATION OF CPT-04 TO BORING LOG S57SB32

Test location CPT-04 was located approximately 40 feet from boring location S57SB32 as indicated on Figure 1.1. The soil classification correlation described in section 3.4 and illustrated on Figure 3.1 was used to generate the soil classification profile presented on Figure 2.3 and all locations completed at this site.

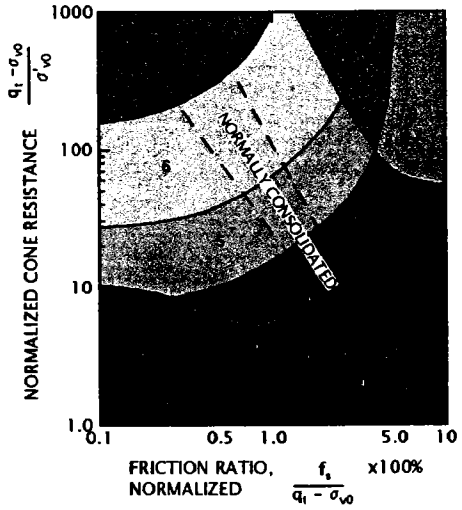
Beneath the top soil, the cone penetrometer encountered very stiff over consolidated material in the first 6 to 7 feet of penetration followed by a 2 foot layer of gravely sand as evident by the extremely high tip stresses and friction ratio values of 1%. Accordingly, at boring location S57SB32, sand and gravel was observed from the ground surface to a depth of 6.5 feet below ground surface (bgs). Below 6.5 feet bgs at this boing location, finer silts and clays, and clay with trace silts were observed that extended to a final boring depth of 20 feet bgs. Similarly, the cone penetrometer identified the soils as predominantly clay from 8 feet to 20 feet bgs as indicated by the significant decrease in tip stress and increase in pore pressure. The increase in friction ratio also confirms the presences of finer, less permeable material. A clayey silt lens (less than 1 ft thick) is encountered at 16.5 feet bgs as evident by the very low tip stress and sleeve friction. Sounding refusal occurred as the probe encountered a more resistant sand layer.

CPT Soil Classification Legend

Zone	Q_t/N	Description
1	2	Sensitive, Fine Grained
2	1	Organic Soils-Peats
3	1.5	Clays-Clay to Silty Clay
4	2	Silt Mixtures-Clayey Silt to Silty Clay
5	3	Sand Mixtures-Silty Sand to Sandy Silt
6	4.5	Sands-Clean Sand to Silty Sand
7	6	Gravelly Sand to Sand
8	1	Very Stiff Sand to Clayey Sand *
9	2	Very Stiff, Fine Grained *

(*) *Heavily Overconsolidated or Cemented*

Normalized Friction Ratio Classification Chart



(Ref. Robertson, 1990)

Coefficient of Permeability (cm/s)

Zone	Description	Permeability
1	Sensitive Fines	10^{-5}
2	Organic Soils-Peats	10^{-5}
3	Clays	10^{-7}
4	Silt Mixtures	10^{-6}
5	Sand Mixtures	10^{-4}
6	Sands	10^{-2}
7	Gravelly Sands	10^{-1}
8	Very Stiff Sands	10^{-5}
9	Very Stiff Fines	10^{-6}

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(802) 763-8348, cpt@ara.com, http://www.ara.com

Figure 3.1 Soil classification chart

SECTION 4

LIST OF REFERENCES

1. American Society for Testing Materials, "Standard Test Method for Performing Electric Friction Cone and Piezocone Penetration Testing of Soil," ASTM Designation: D5778, 1995.
2. Robertson, P. K. and R. G. Campanella, Guidelines for Using the CPT, CPTU and Marchetti DMT for Geotechnical Design, Vol. II, University of British Columbia, Vancouver, BC, Canada, March 1988.
3. Schmertmann, J. H., Guidelines for Using the CPT, CPTU, and Marchetti DMT for Geotechnical Design, Volume III, University of British Columbia, Vancouver, BC, Canada, March 1988.
4. Use of In Situ Test in Geotechnical Engineering, S. P. Clemence, ed., Geotechnical Special Publications No. 6, proceedings of In Situ '86 Conference, sponsored by Geotechnical Engineering Division of the American Society of Civil Engineers, Blacksburg, VA, June 1986.
5. Raligh, M. M. and J. N. Levadoux, Pore Pressure Dissipation After Cone Penetration, Massachusetts Institute of Technology, Cambridge, MA, April 1980.

APPENDIX A

PIEZOCONE PROFILES

Applied Research Associates
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Email: cpt@ned.ara.com
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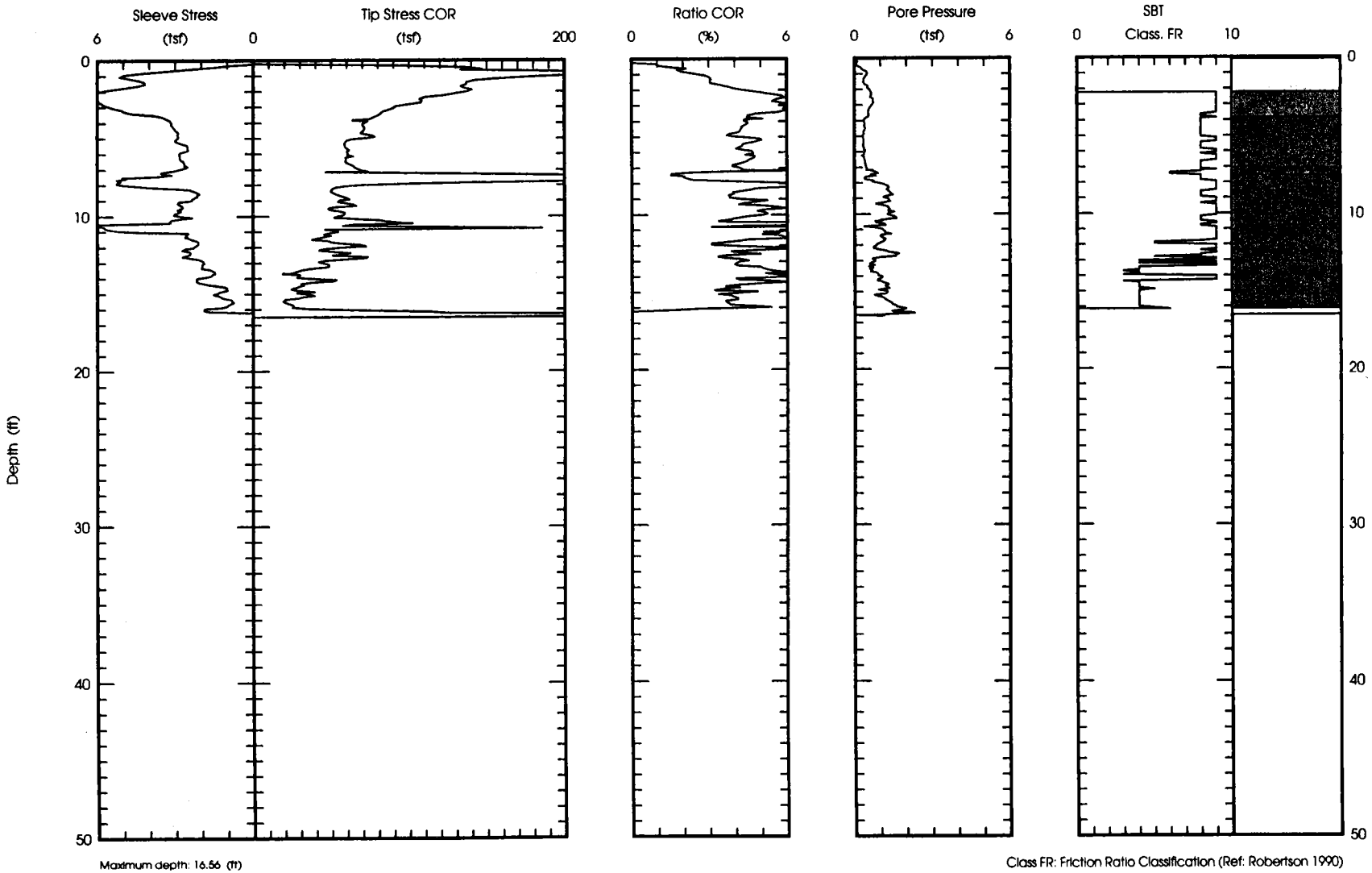
Northing:
Easting:
Elevation:

Date: 08/30/01
Test ID: CPT-01
Project: 0740

Client: TETRA TECH.
Site: INDIANHEAD,MARYLAND–NSWC



Maximum depth: 16.56 (ft)

Class FR: Friction Ratio Classification (Ref: Robertson 1990)

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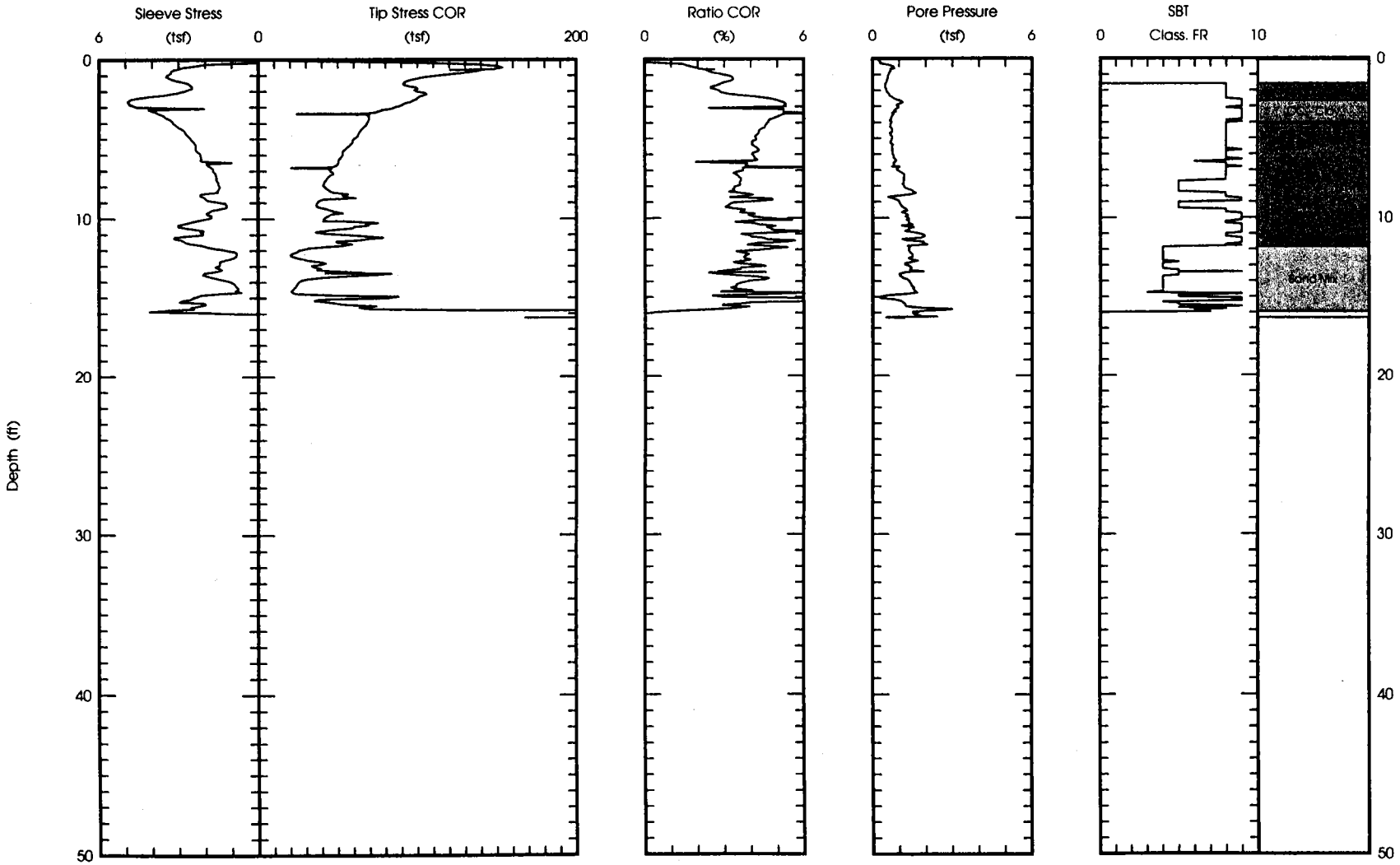
Email: cpt@ned.ara.com
http://www.ara.com

Northing:
Easting:
Elevation:

Date: 08/30/01
Test ID: CPT-01B
Project: 0740

Client: TETRA TECH.
Site: INDIANHEAD,MARYLAND--NSWC



Maximum depth: 16.35 (ft)

Class FR: Friction Ratio Classification (Ref: Robertson 1990)

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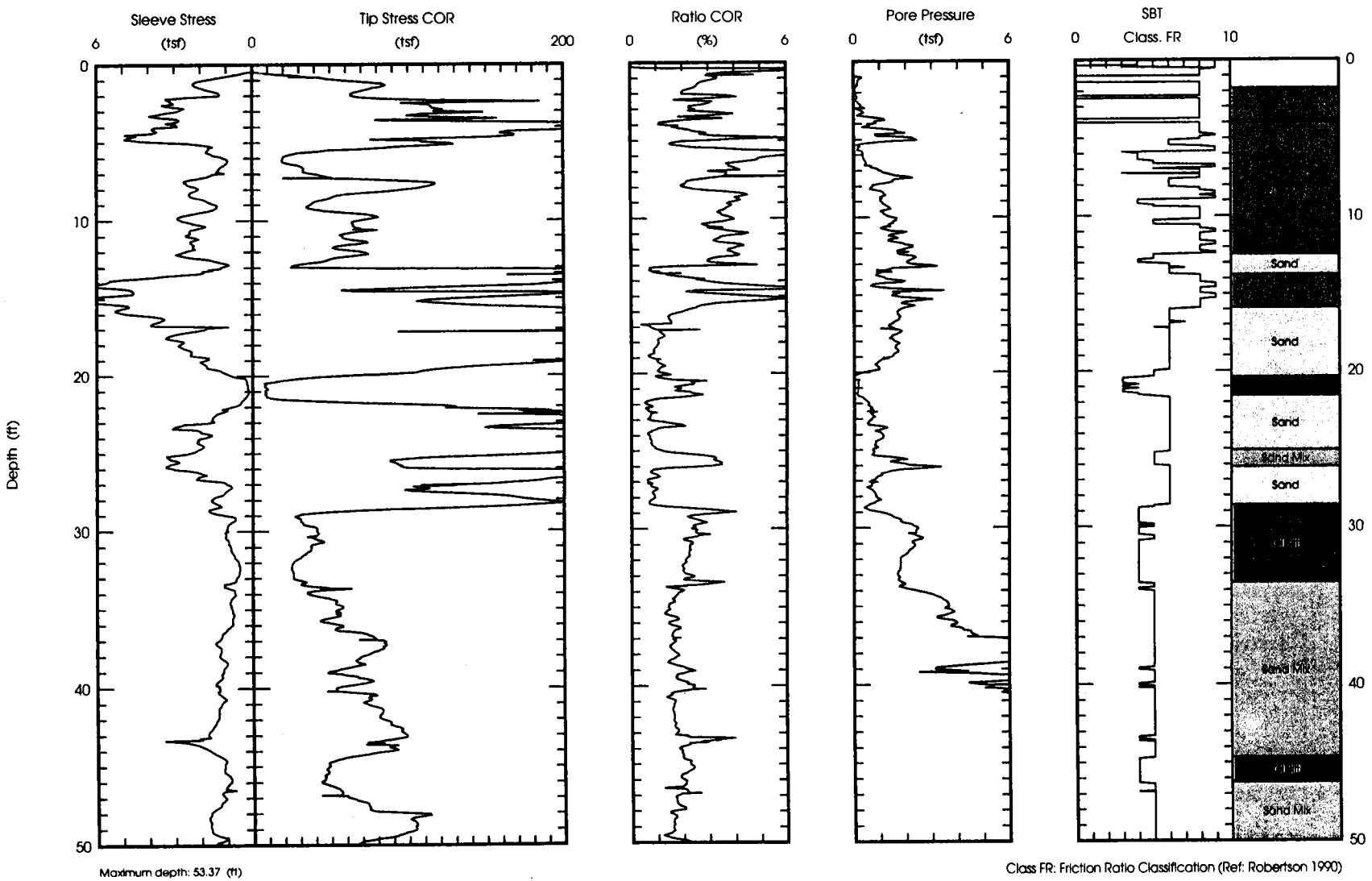
South Royalton, VT 05068
802-763-8348
Email: cpt@ned.ara.com
http://www.ara.com

Northing:
Easting:
Elevation:

Date: 08/30/01
Test ID: CPT-02
Project: 0740

Client: TETRA TECH.
Site: INDIANHEAD,MARYLAND--NSWC



Maximum depth: 53.37 (ft)

Class FR: Friction Ratio Classification (Ref: Robertson 1990)

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Email: cpt@ned.ara.com
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Northing:
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Project: 0740

Client: TETRA TECH.
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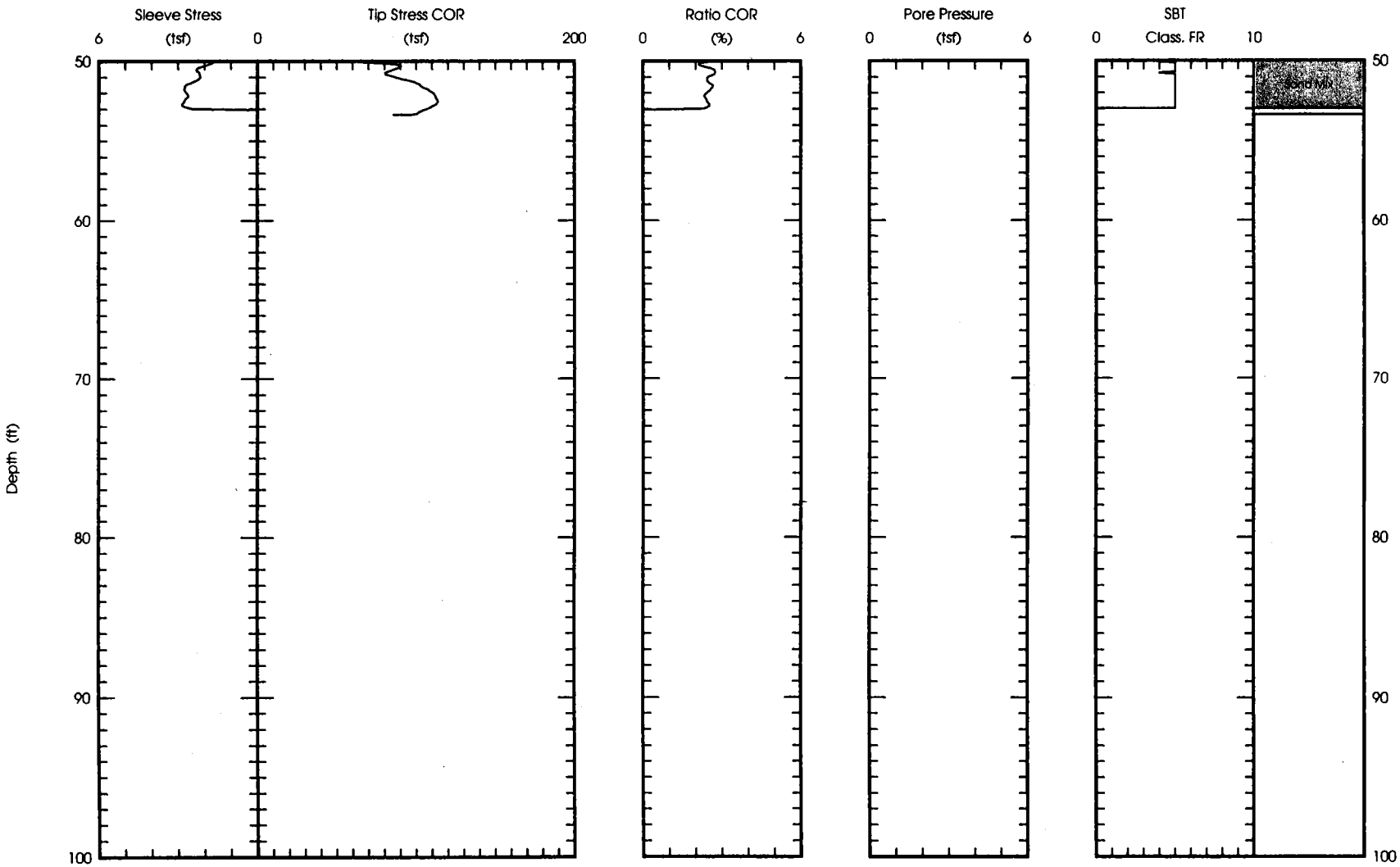

Maximum depth: 53.37 (ft)

Class FR: Friction Ratio Classification (Ref: Robertson 1990)

Test ID: CPT-02
File: 430G104.ECP

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Elevation:

Date: 08/29/01
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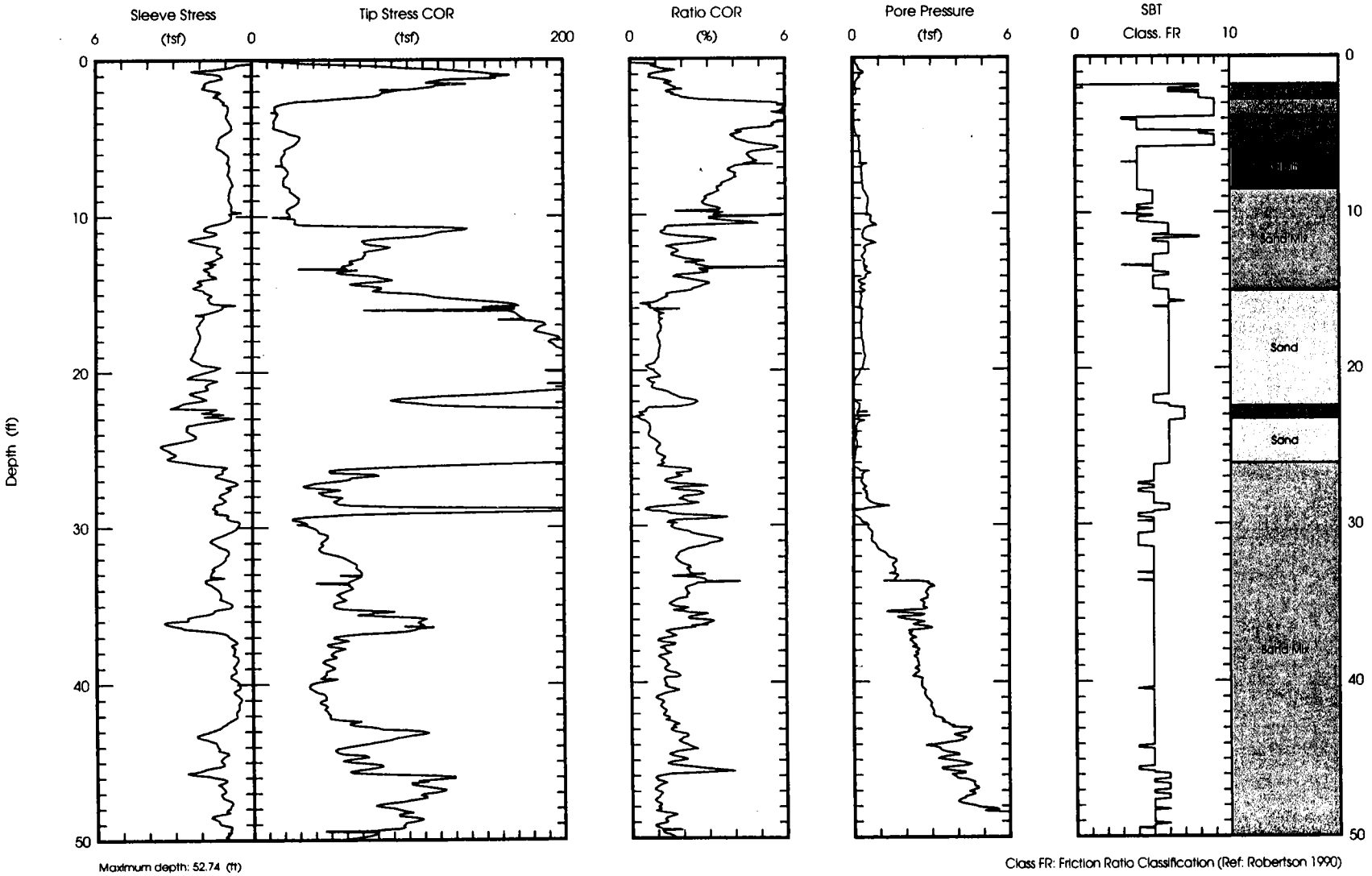

Maximum depth: 52.74 (ft)

Class FR: Friction Ratio Classification (Ref: Robertson 1990)

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Project: 0740

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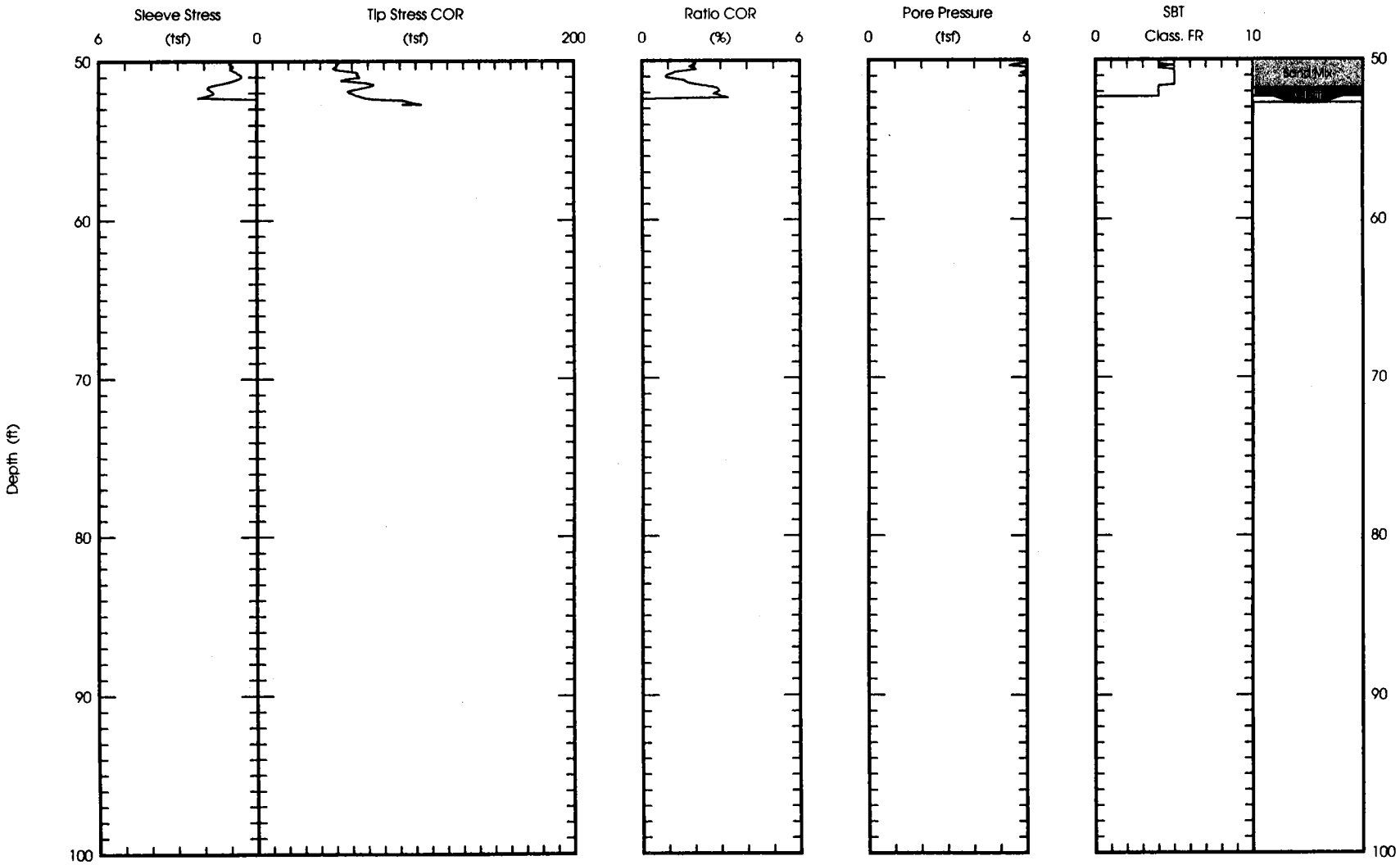

Maximum depth: 52.74 (ft)

Class FR: Friction Ratio Classification (Ref: Robertson 1990)

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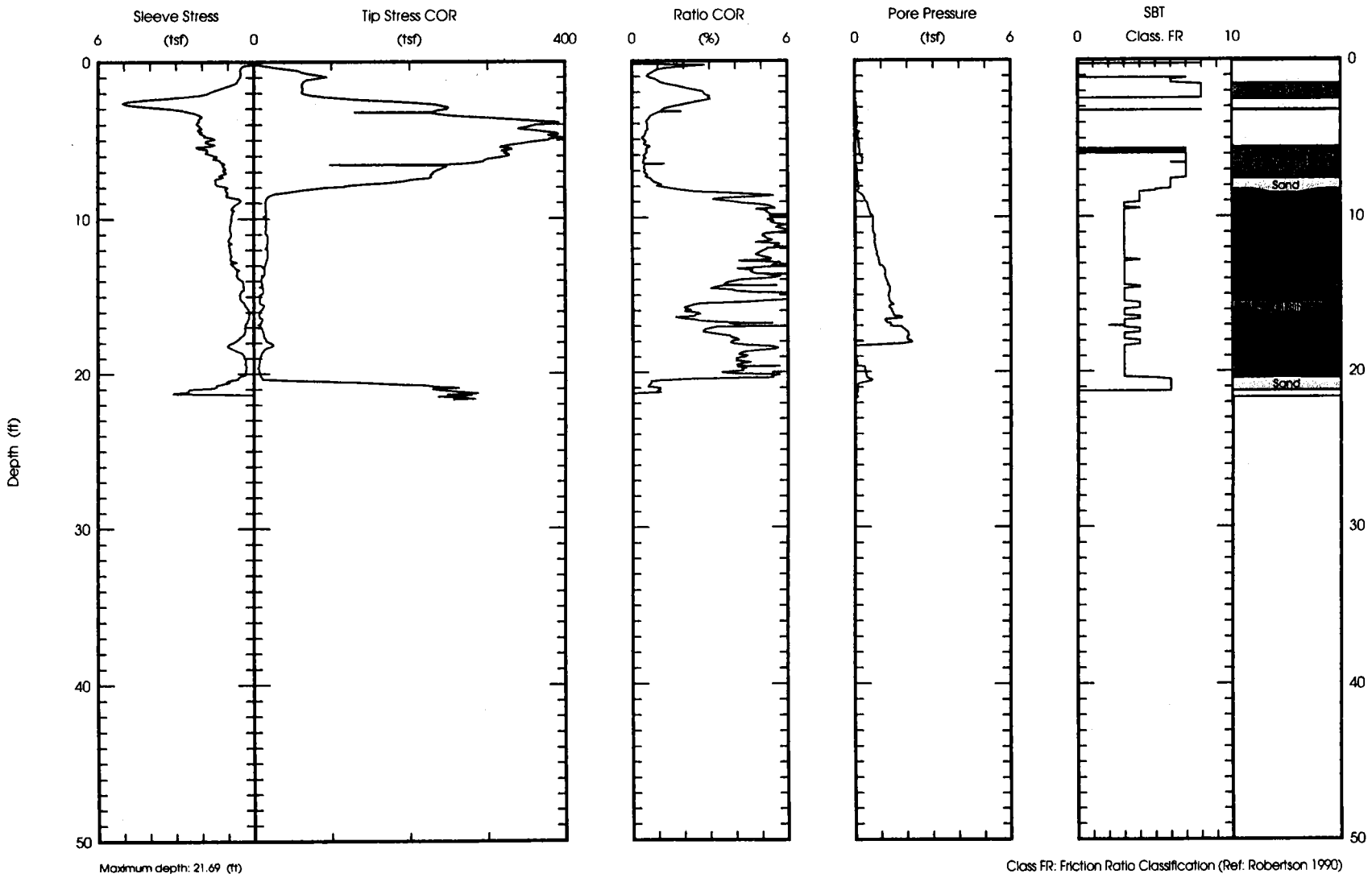

Maximum depth: 21.69 (ft)

Class FR: Friction Ratio Classification (Ref: Robertson 1990)

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Elevation:

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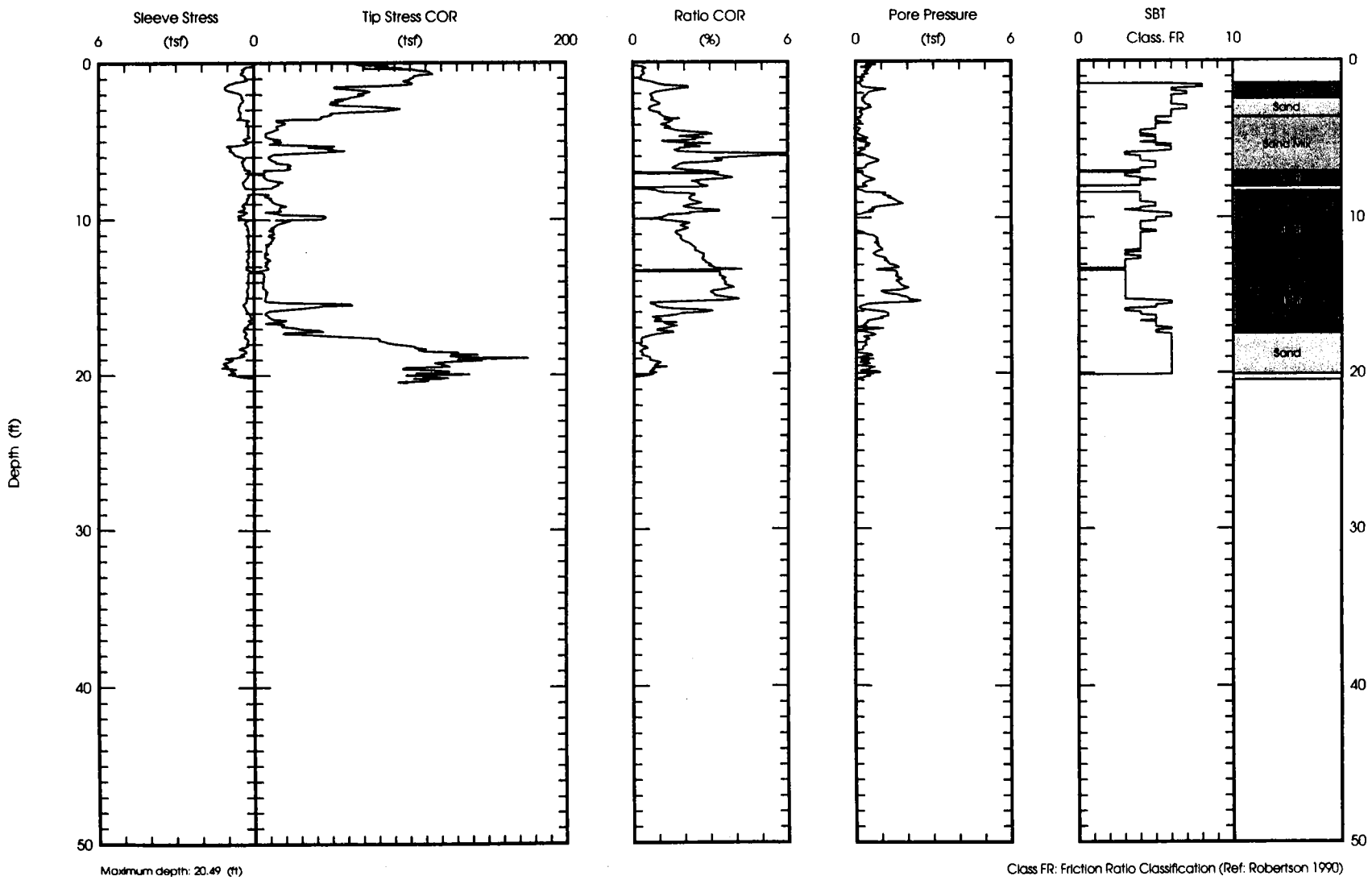
Site: INDIANHEAD,MARYLAND--NSWC



Maximum depth: 20.49 (ft)

Class FR: Friction Ratio Classification (Ref: Robertson 1990)

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Northing:
Easting:
Elevation:

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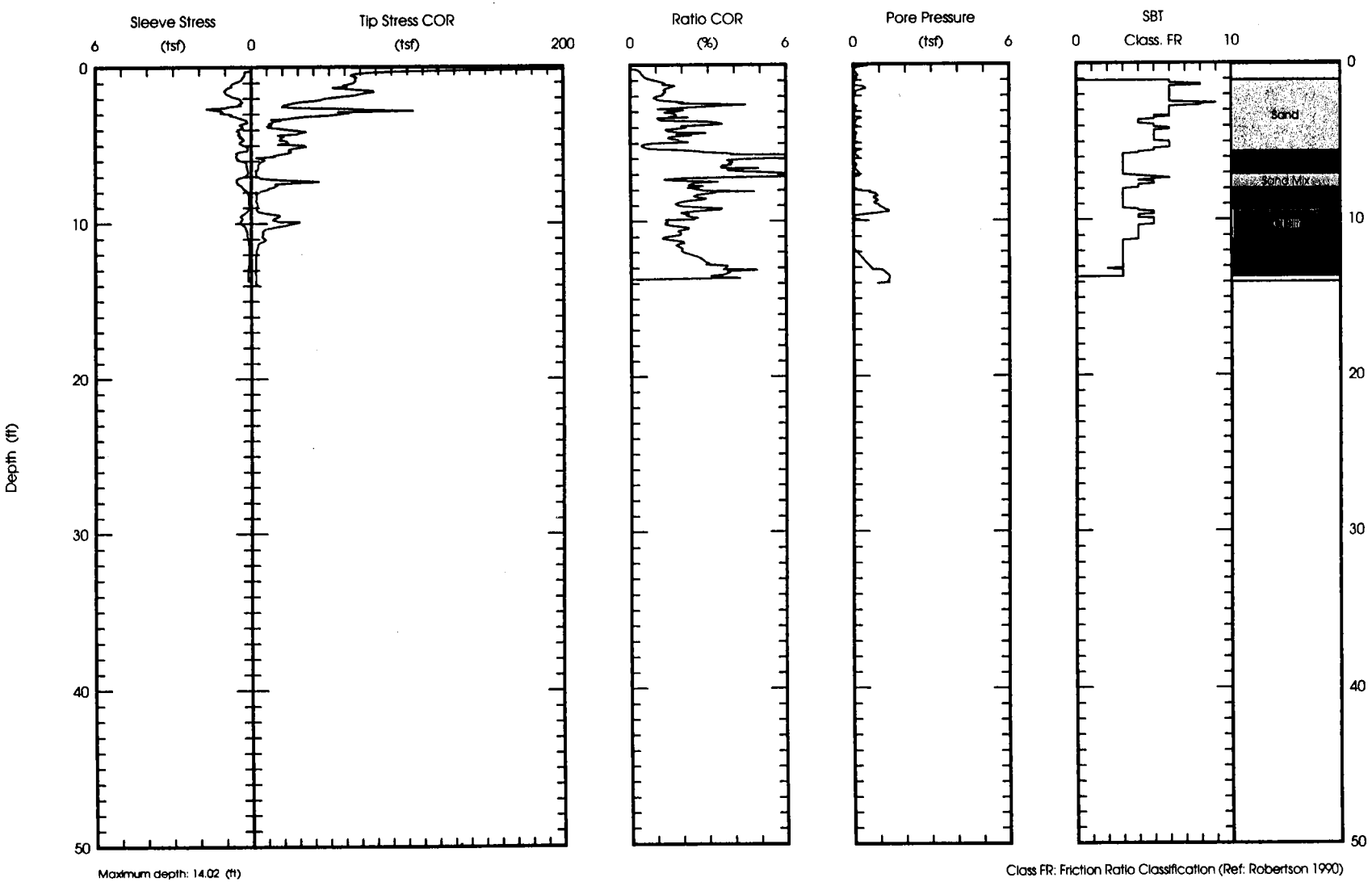

Maximum depth: 14.02 (ft)

Class FR: Friction Ratio Classification (Ref: Robertson 1990)

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Email: cpt@ned.ara.com
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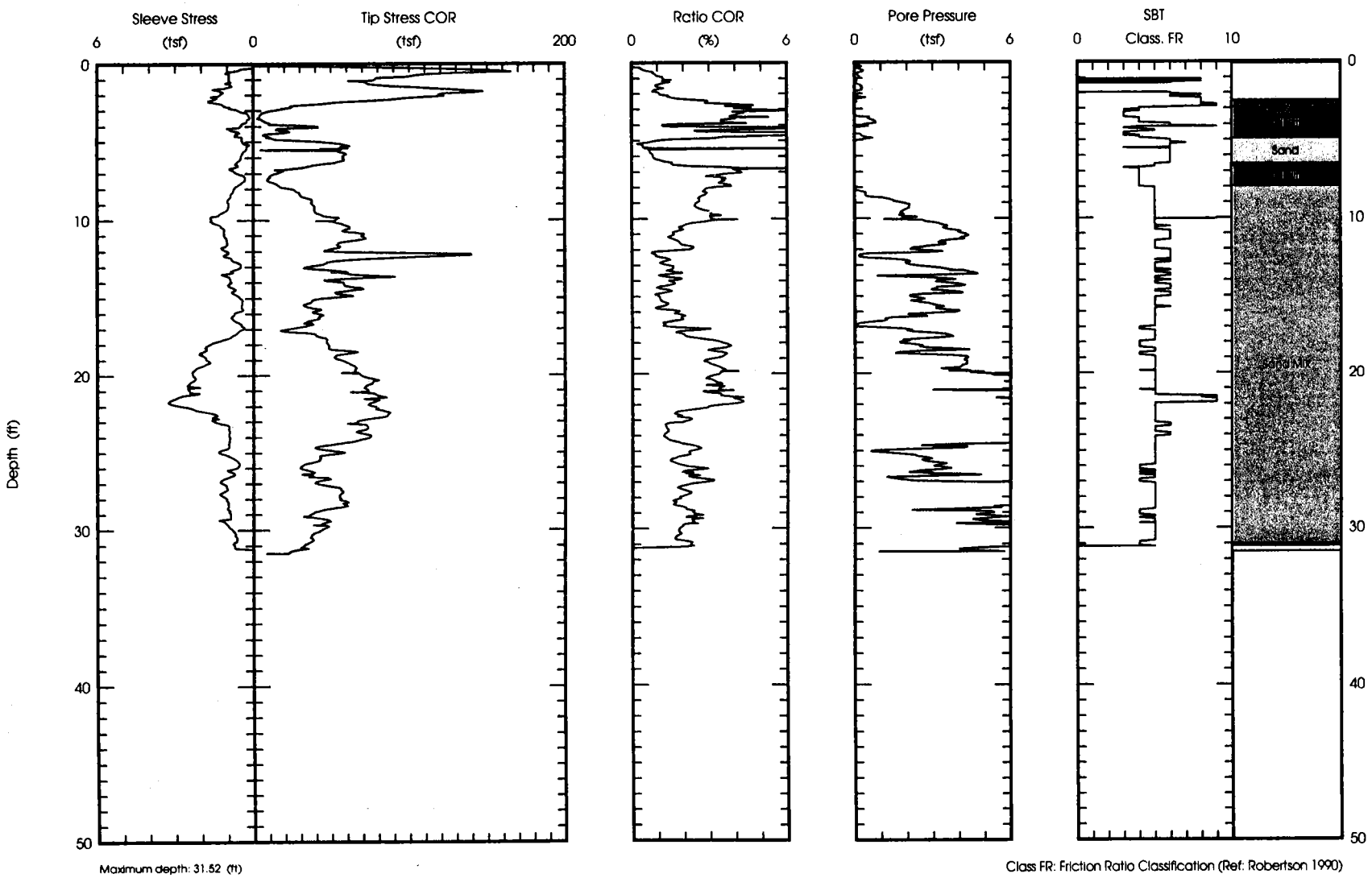
Northing:
Easting:
Elevation:

Date: 08/29/01
Test ID: CPT-06
Project: 0740

Client: TETRA TECH.
Site: INDIANHEAD,MARYLAND--NSWC



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Email: cpt@ned.ara.com
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Northing:
Easting:
Elevation:

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Project: 0740

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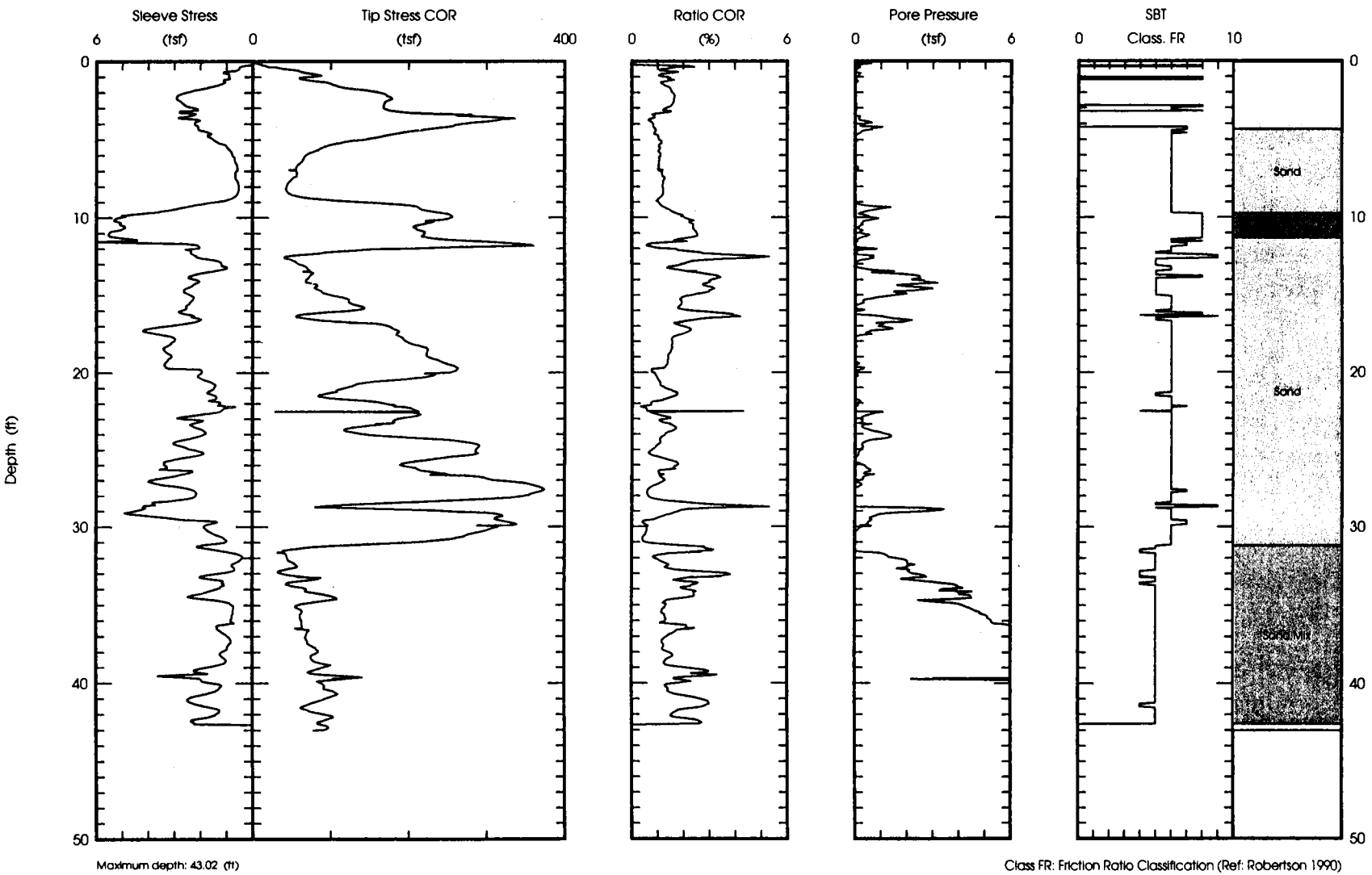

Maximum depth: 43.02 (ft)

Class FR: Friction Ratio Classification (Ref: Robertson 1990)

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802-763-8348
Email: cpt@ned.ara.com
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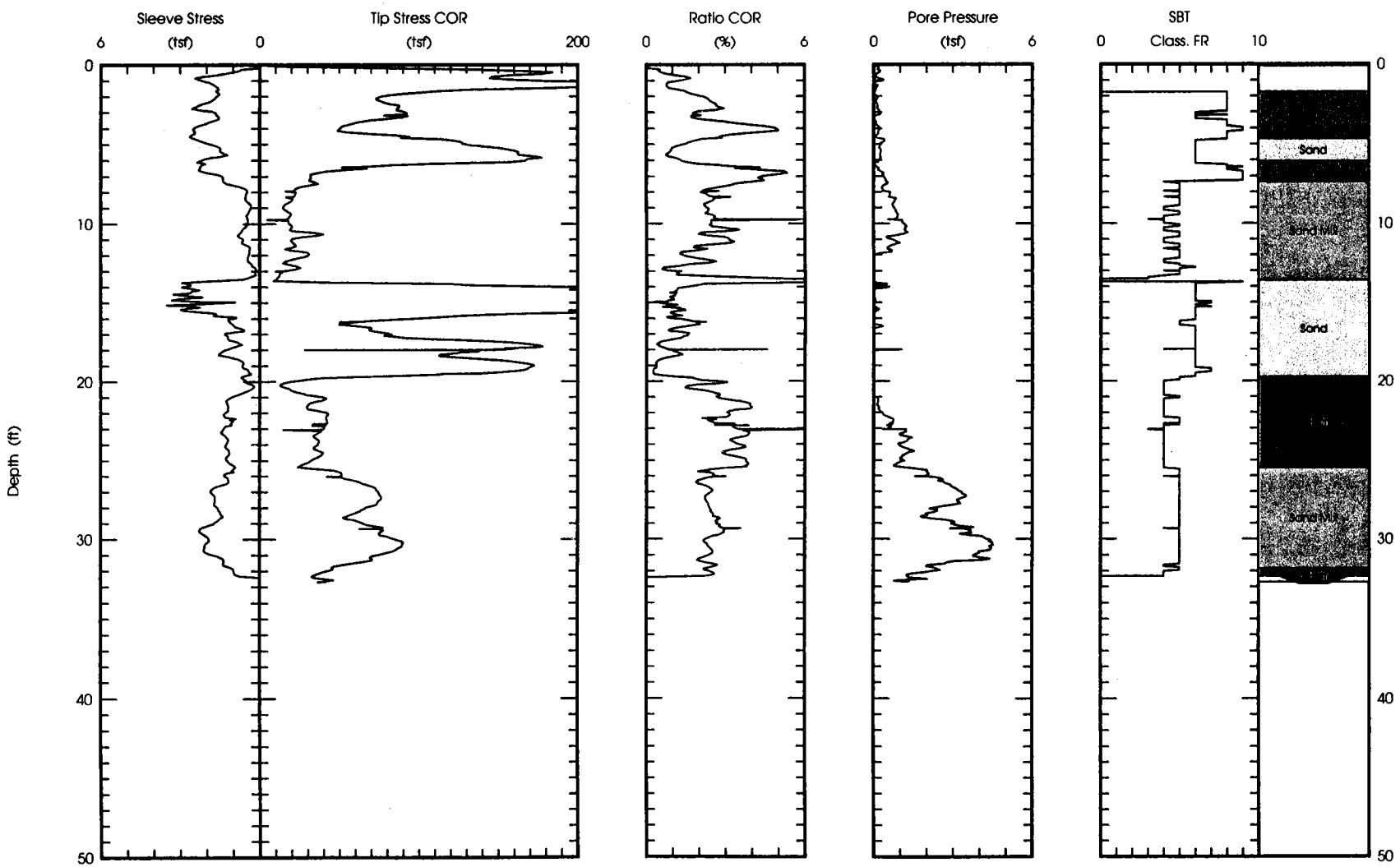
Northing:
Easting:
Elevation:

Date: 08/29/01
Test ID: CPT-08
Project: 0740

Client: TETRA TECH.
Site: INDIANHEAD,MARYLAND--NSWC



Maximum depth. 32.72 (ft)

Class FR: Friction Ratio Classification (Ref: Robertson 1990)

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Email: cpt@ned.ara.com
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Easting:
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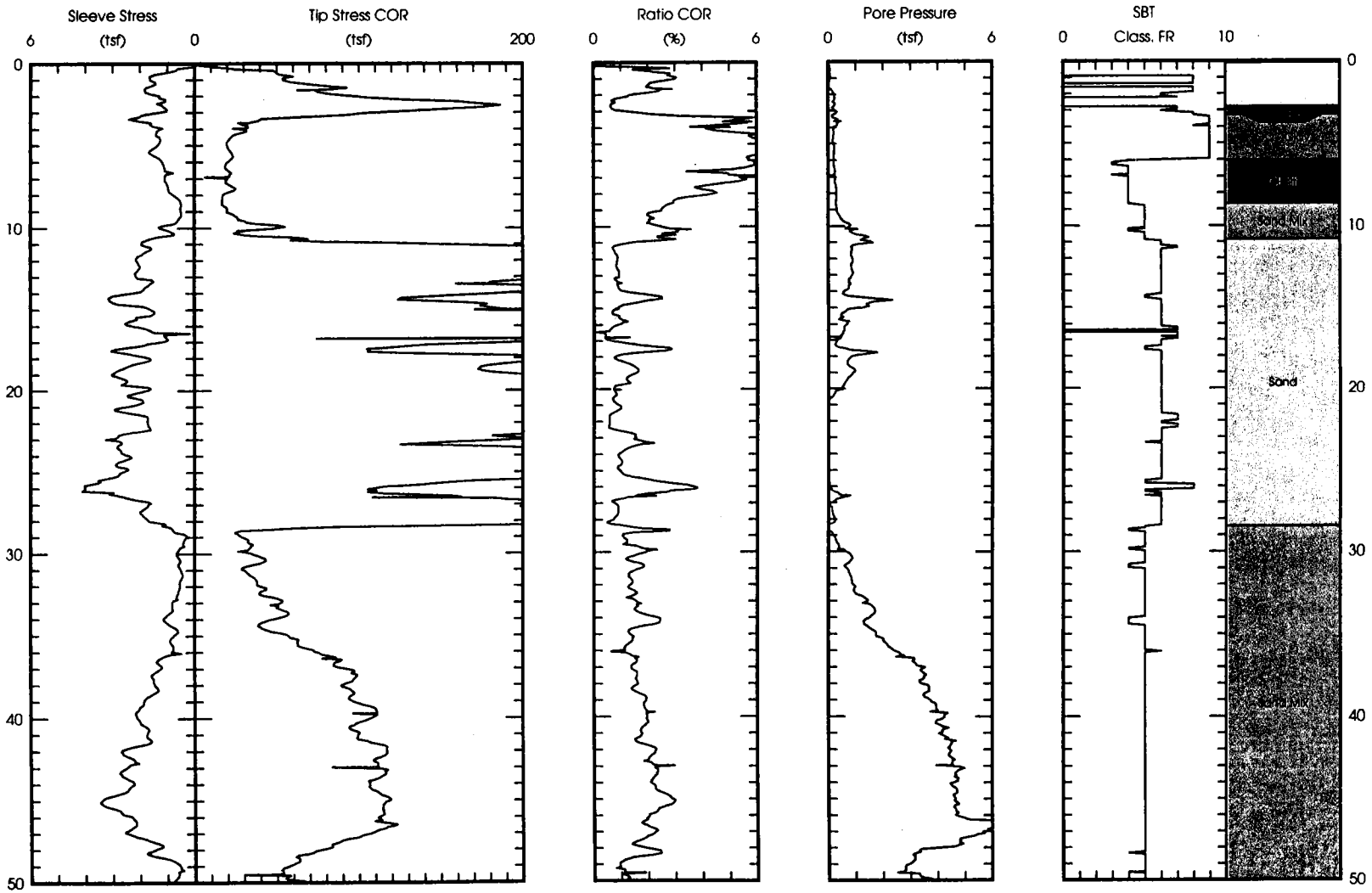
Date: 08/29/01
Test ID: CPT-09
Project: 0740

Client: TETRA TECH.
Site: INDIANHEAD,MARYLAND--NSWC



Maximum depth: 55.36 (ft)

Class FR: Friction Ratio Classification (Ref: Robertson 1990)

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South Royalton, VT 05068
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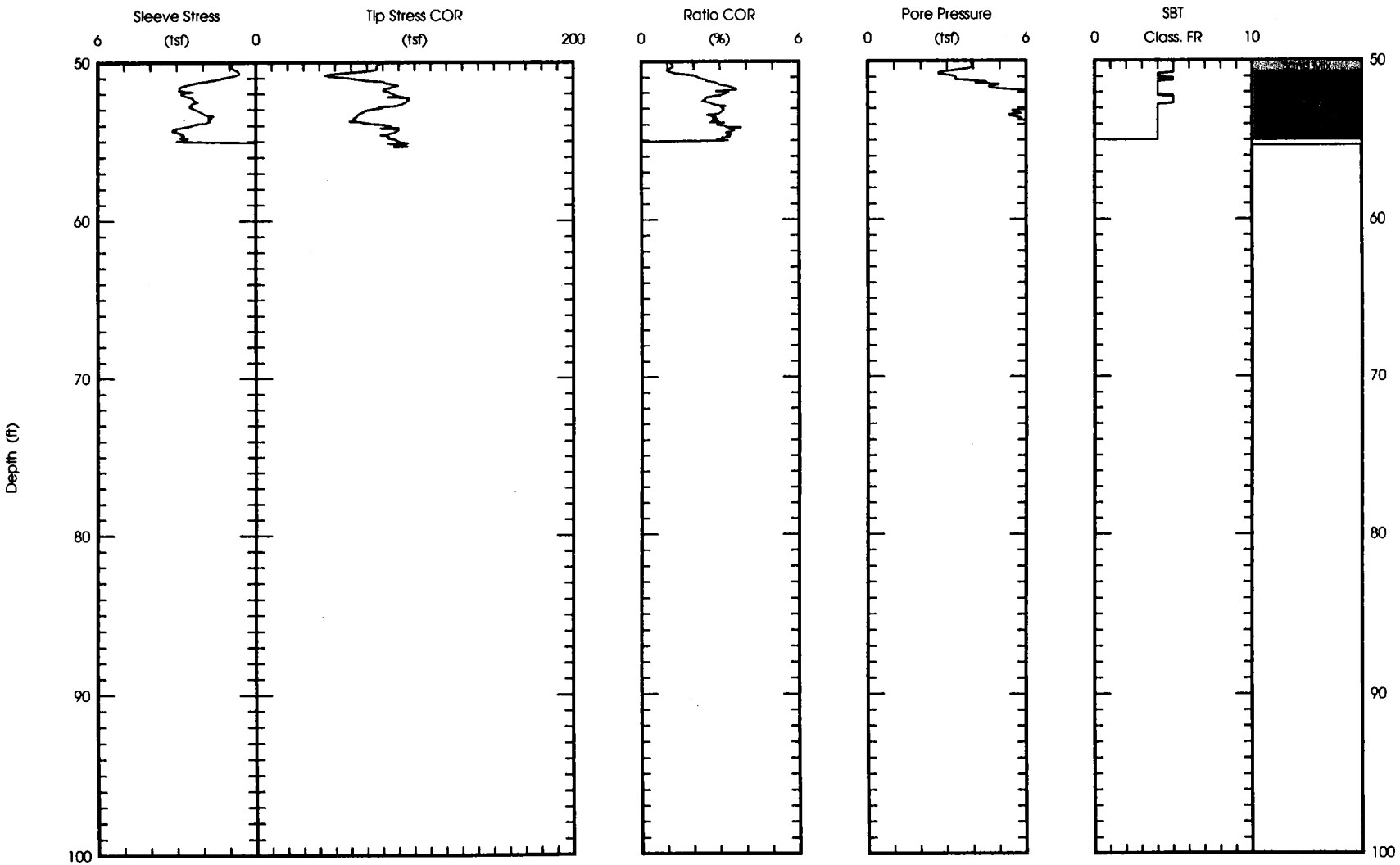
Site: INDIANHEAD,MARYLAND--NSWC



Maximum depth: 55.36 (ft)

Class FR: Friction Ratio Classification (Ref: Robertson 1990)

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South Royalton, VT 05068
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Email: cpt@ned.ara.com
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Northing:
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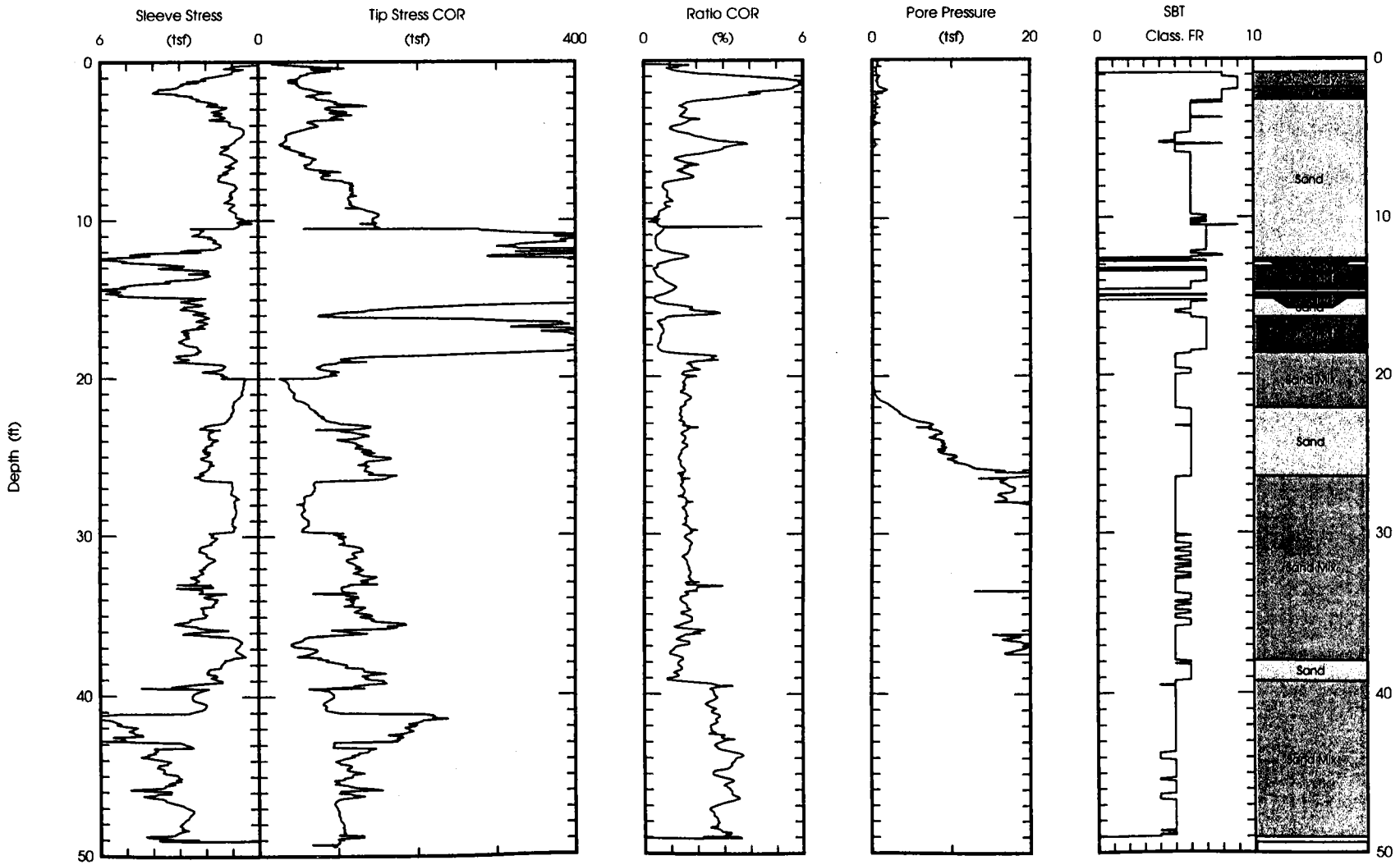
Site: INDIANHEAD,MARYLAND--NSWC



Maximum depth: 49.39 (ft)

Class FR: Friction Ratio Classification (Ref: Robertson 1990)

Appendix B

Dissipation Profiles

APPENDIX B

PORE PRESSURE DISSIPATION TESTS

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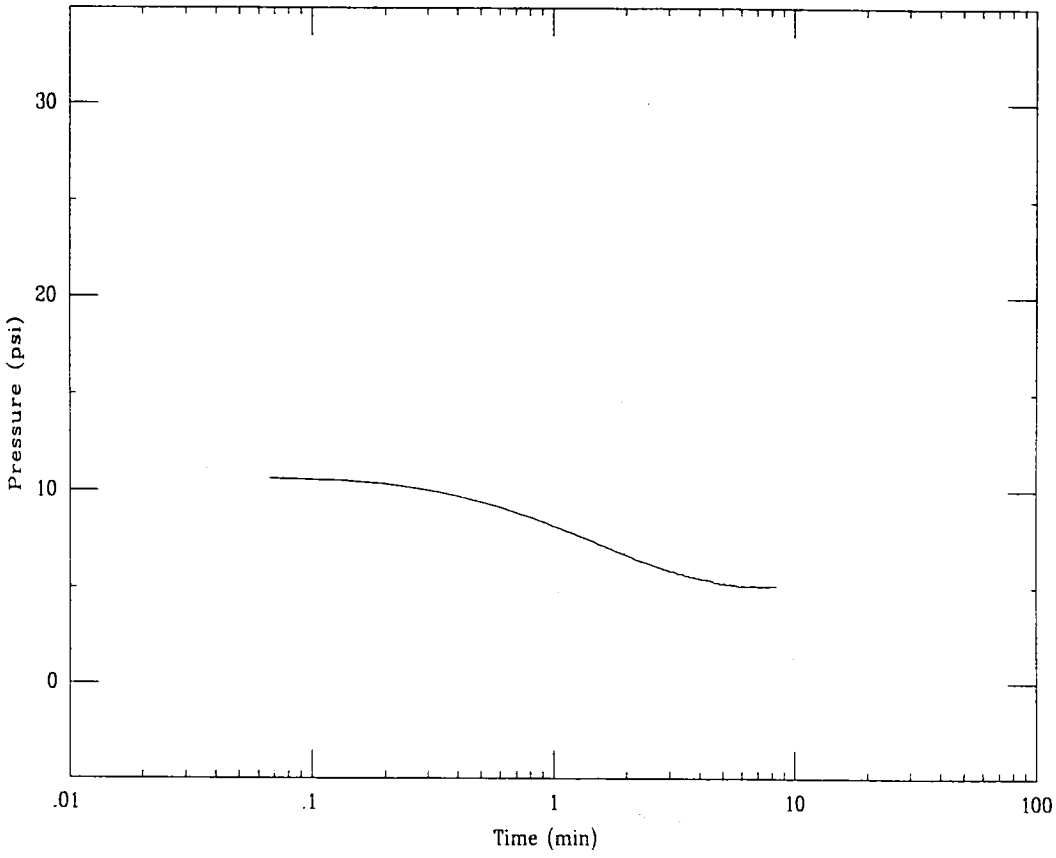
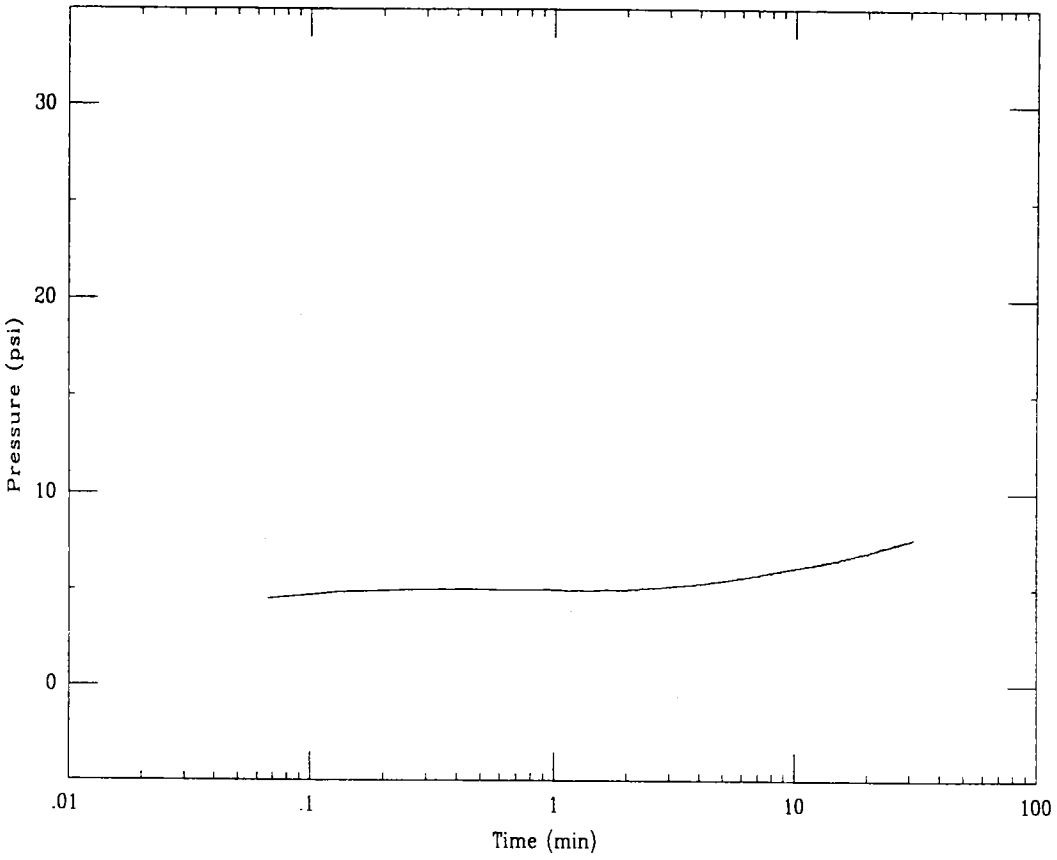
Depth = 13.5 ft Max Pressure = 10.61 psi Pn = 5.06 psi



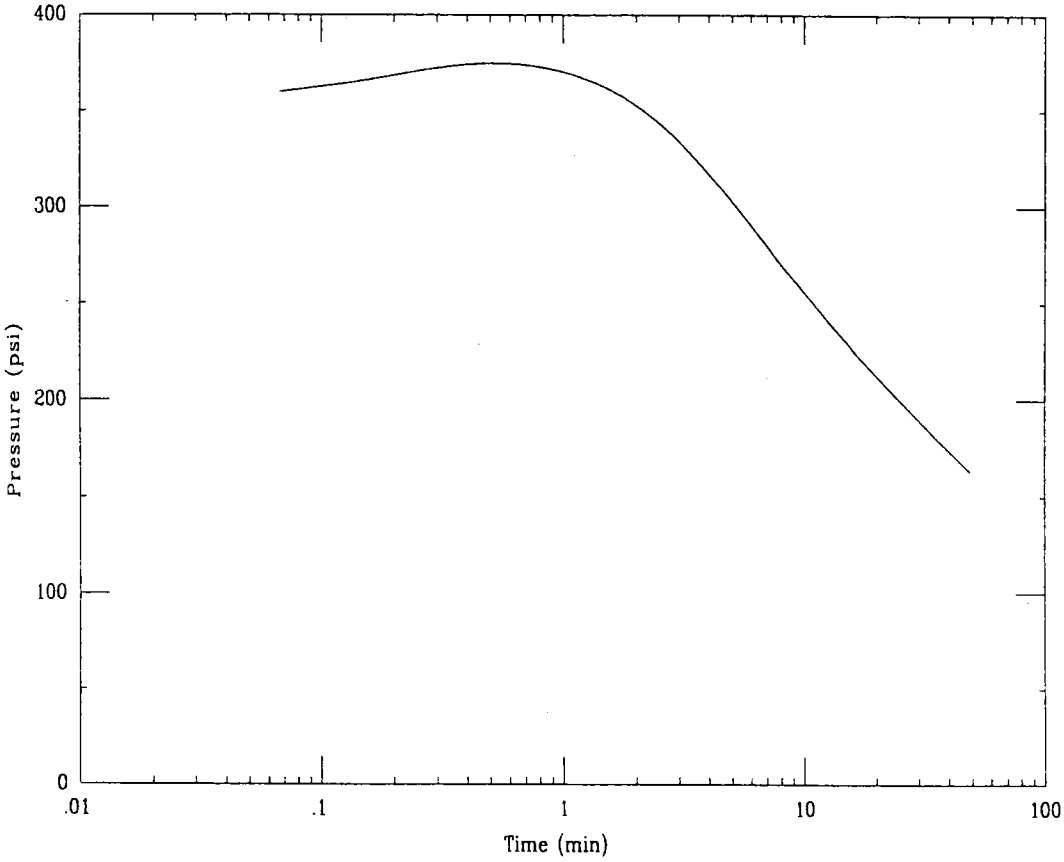
CPT-02 Applied Research Associates 08/30/01

Depth = 22.5 ft Max Pressure = 7.66 psi Pn = 7.62 psi



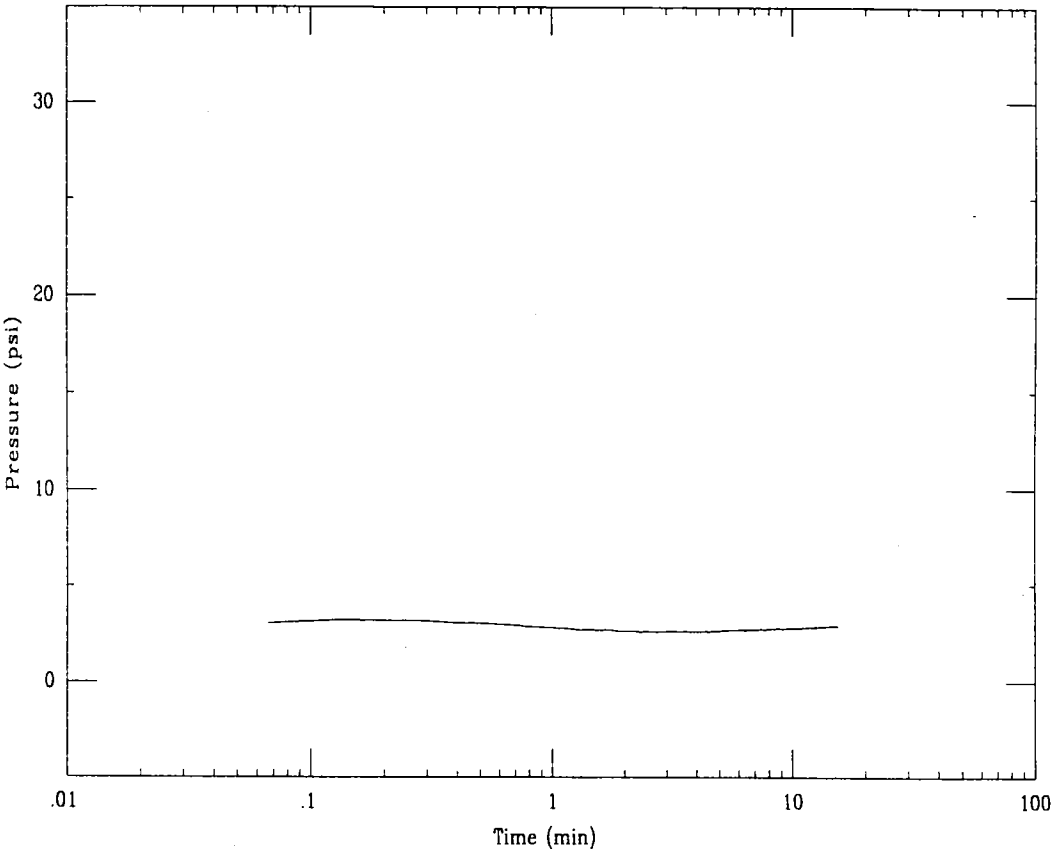
CPT-02 Applied Research Associates 08/30/01

Depth = 43.6 ft Max Pressure = 374.72 psi Pn = 163.69 psi



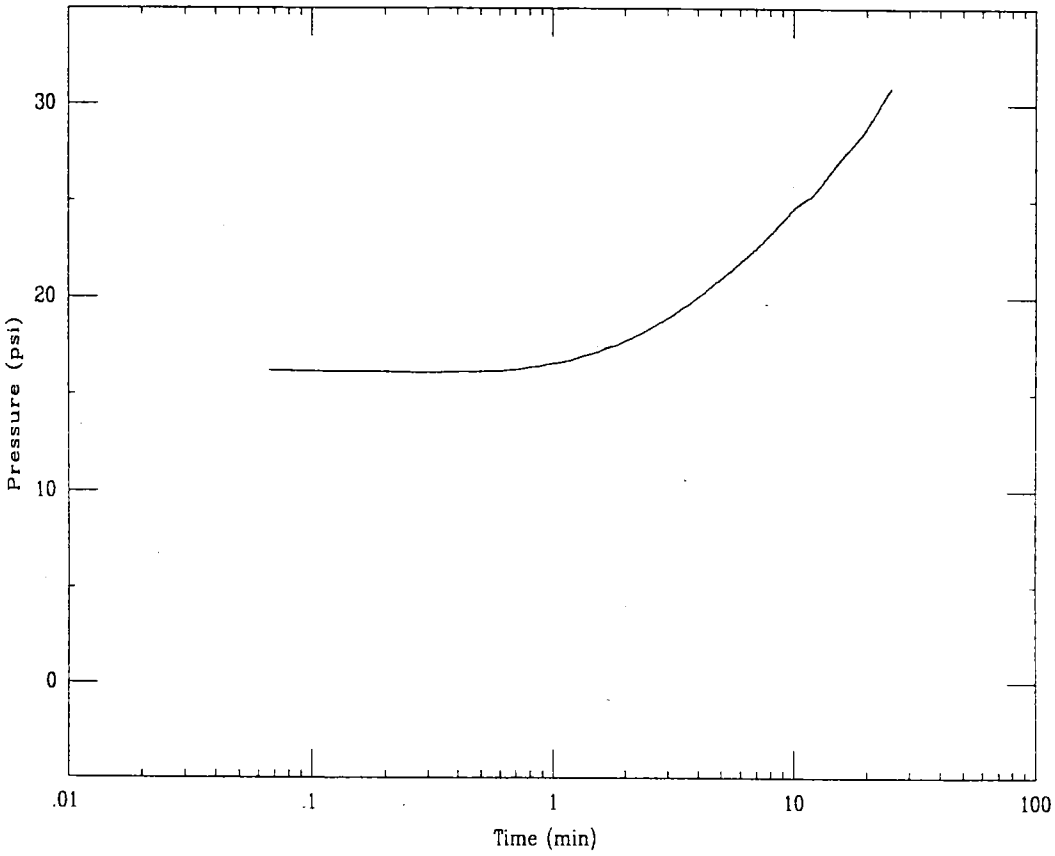
CPT-03 Applied Research Associates 08/29/01

Depth = 16.0 ft Max Pressure = 3.20 psi Pn = 2.86 psi



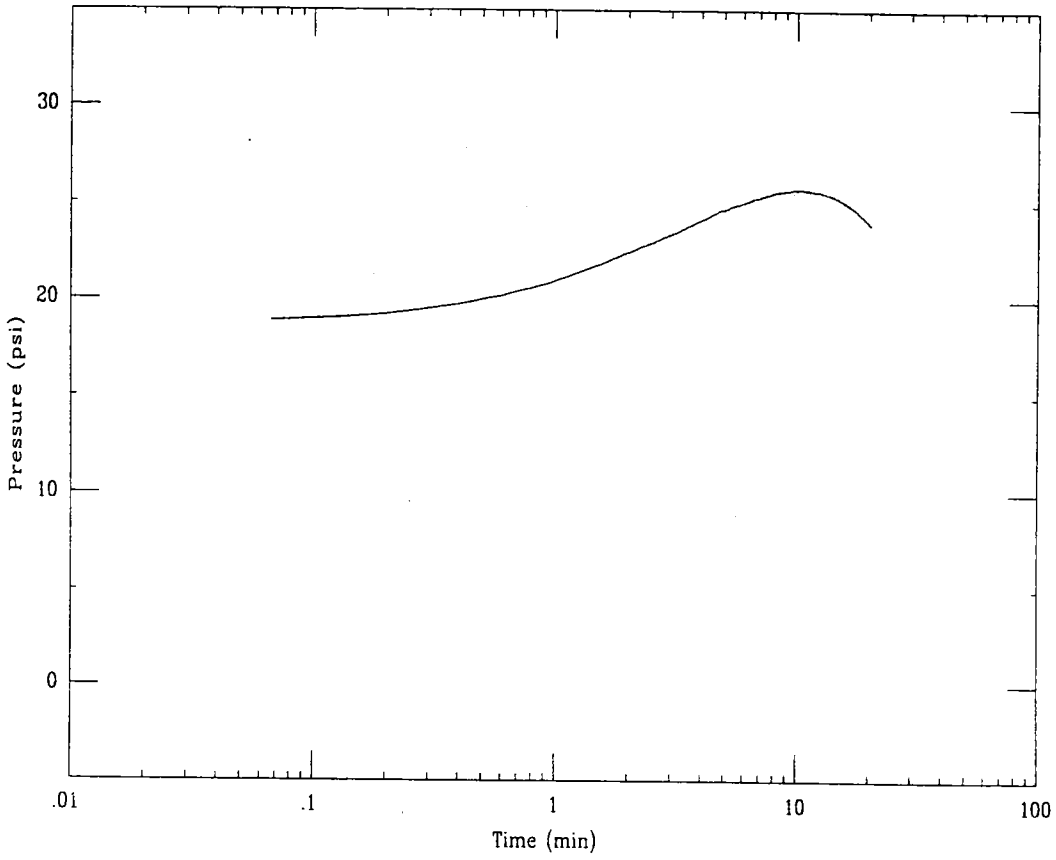
CPT-03 Applied Research Associates 08/29/01

Depth = 33.6 ft Max Pressure = 30.89 psi Pn = 30.81 psi



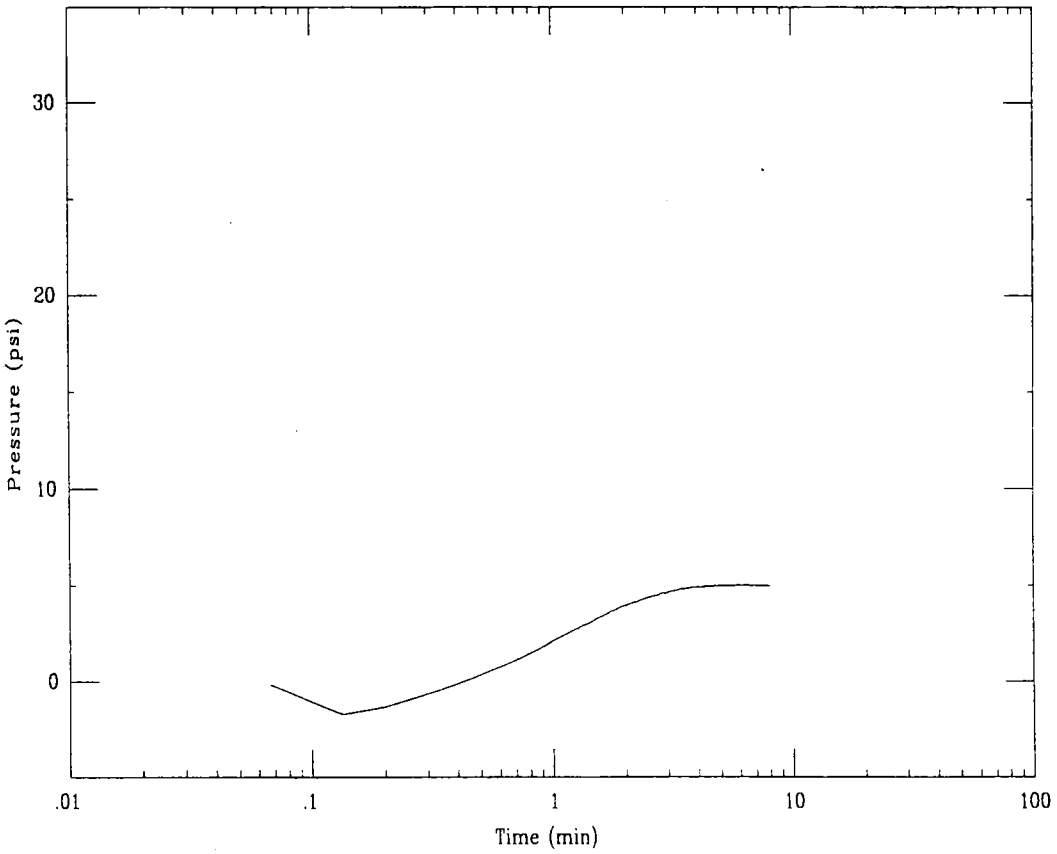
CPT-04 Applied Research Associates 08/28/01

Depth = 17.0 ft Max Pressure = 25.79 psi Pn = 24.03 psi



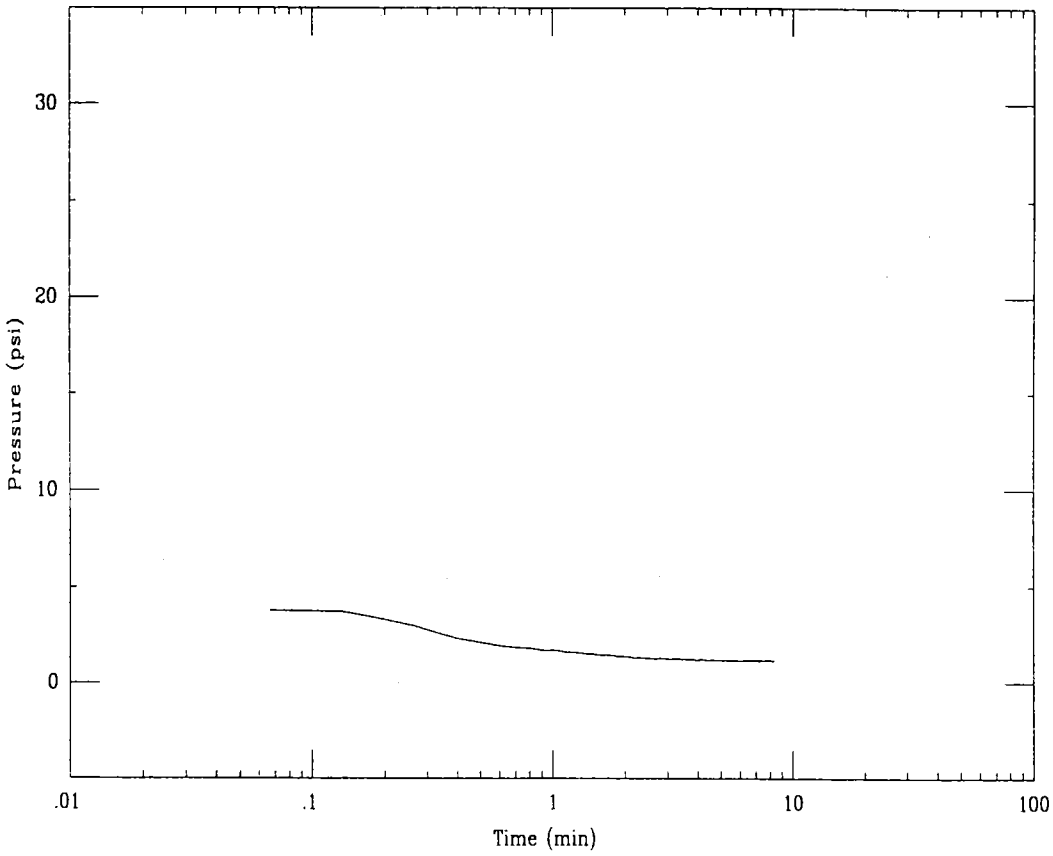
CPT-04 Applied Research Associates 08/28/01

Depth = 21.7 ft Max Pressure = 5.02 psi Pn = 4.95 psi



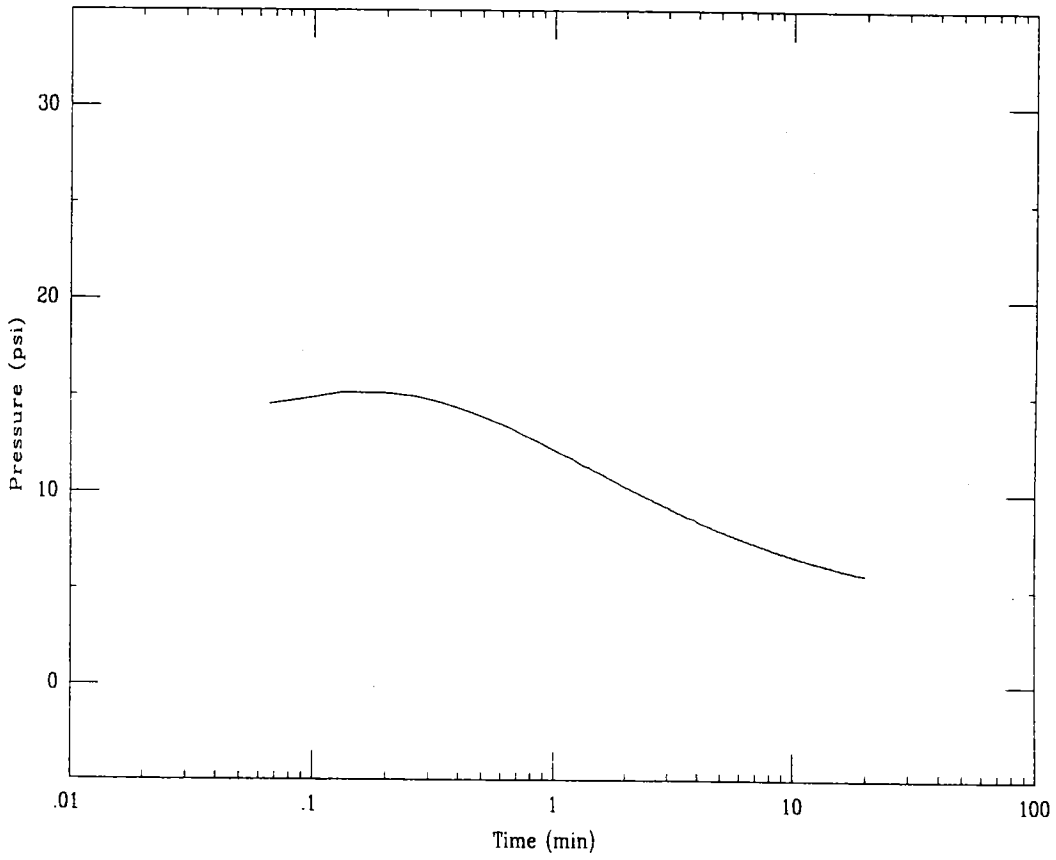
CPT-05 Applied Research Associates 08/29/01

Depth = 8.0 ft Max Pressure = 3.78 psi Pn = 1.15 psi



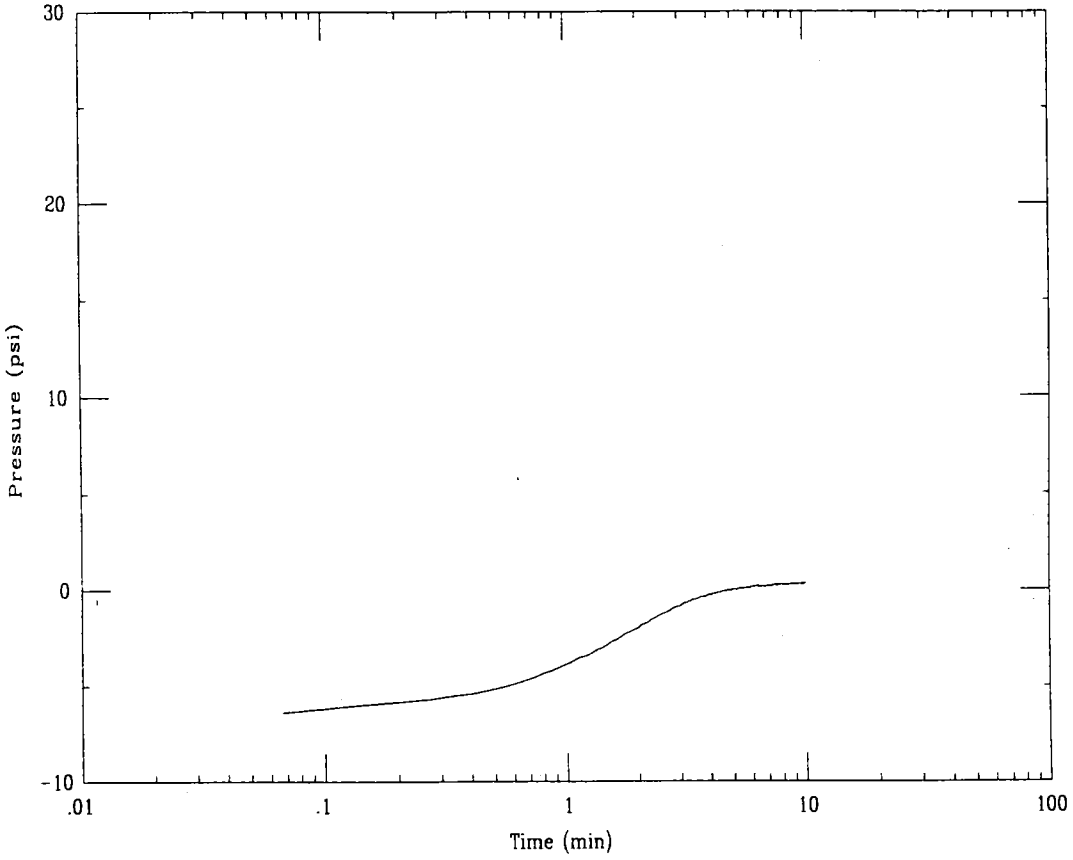
CPT-05B Applied Research Associates 08/29/01

Depth = 14.0 ft Max Pressure = 15.19 psi Pn = 5.81 psi



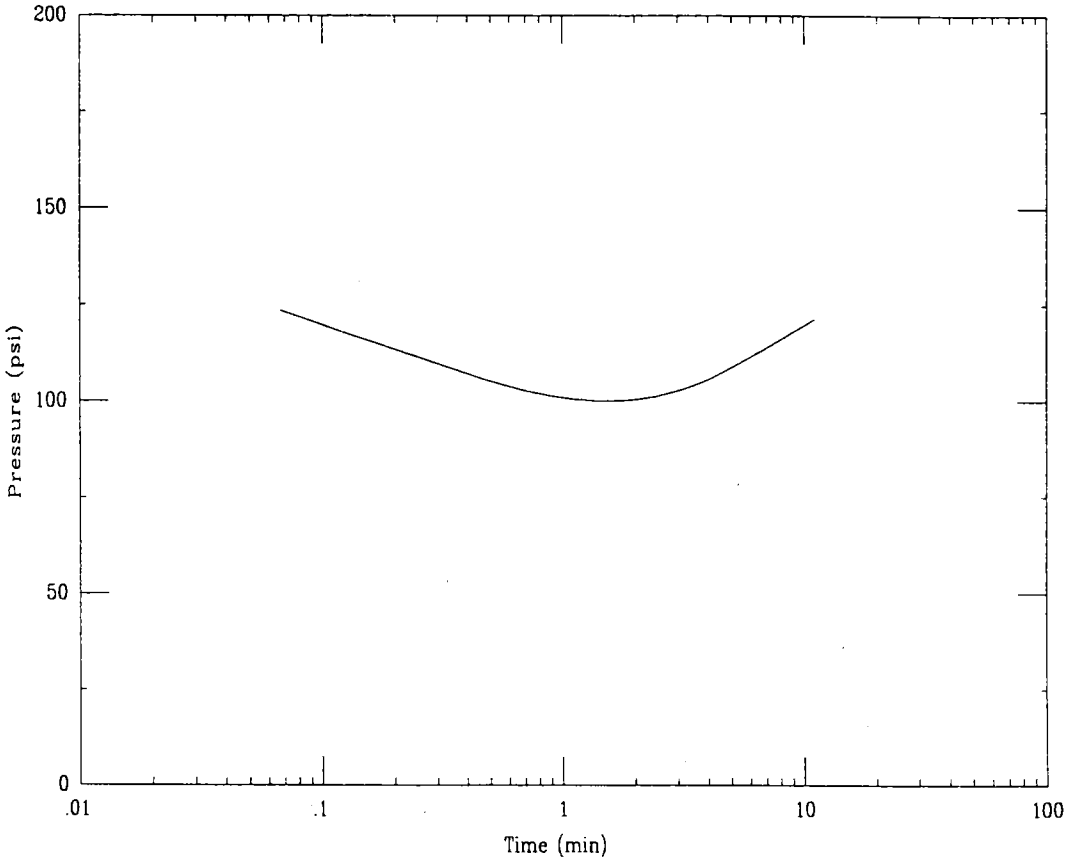
CPT-06 Applied Research Associates 08/29/01

Depth = 5.5 ft Max Pressure = 0.34 psi Pn = 0.30 psi



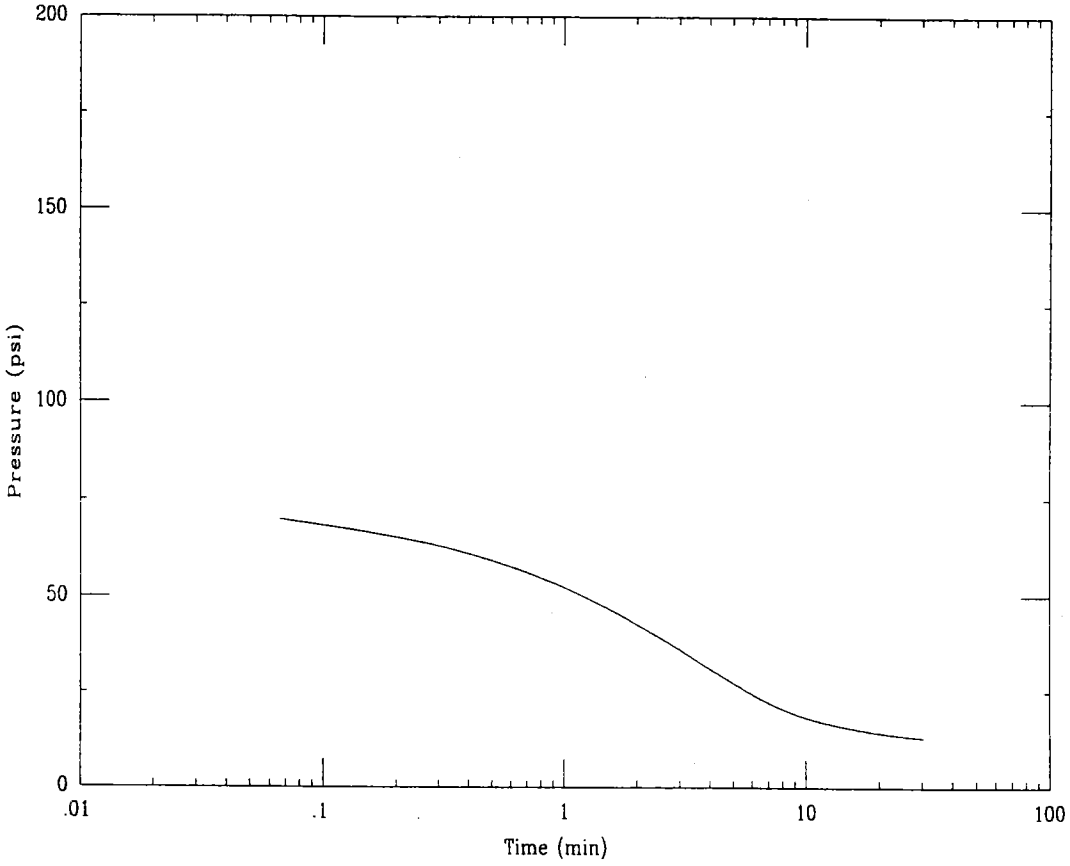
CPT-06 Applied Research Associates 08/29/01

Depth = 21.5 ft Max Pressure = 123.59 psi Pn = 120.94 psi



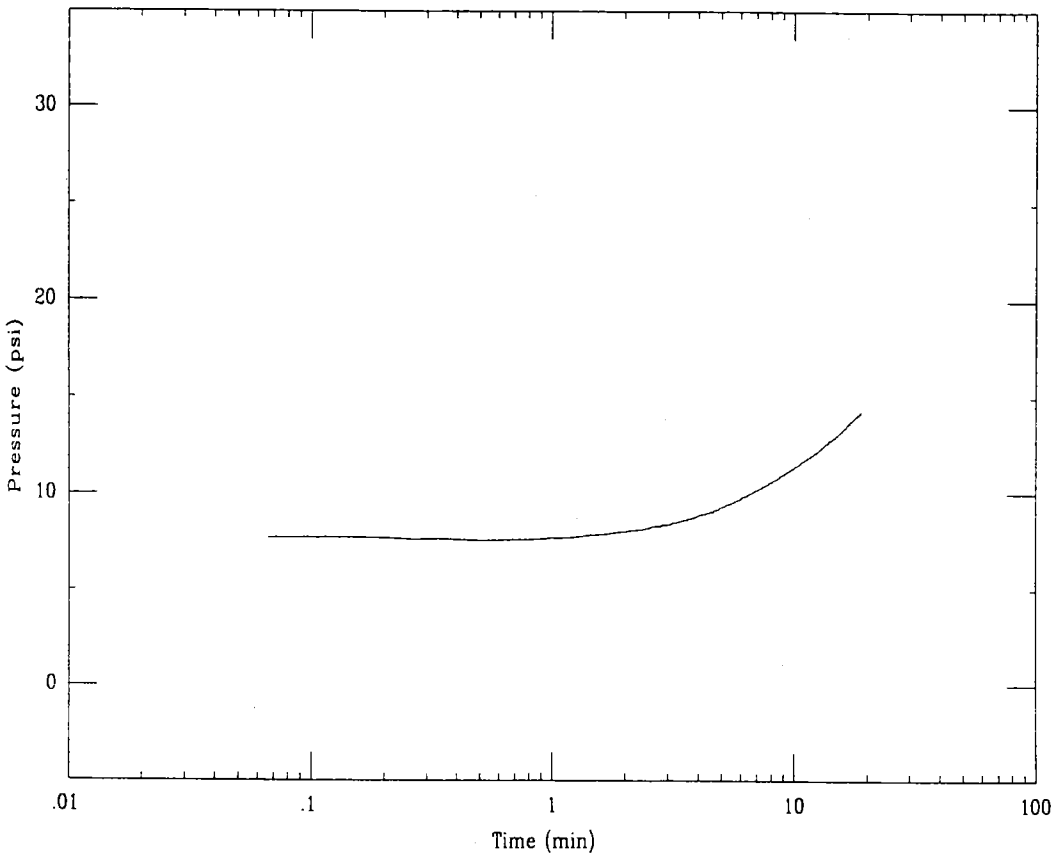
CPT-06 Applied Research Associates 08/29/01

Depth = 31.5 ft Max Pressure = 69.68 psi Pn = 13.09 psi



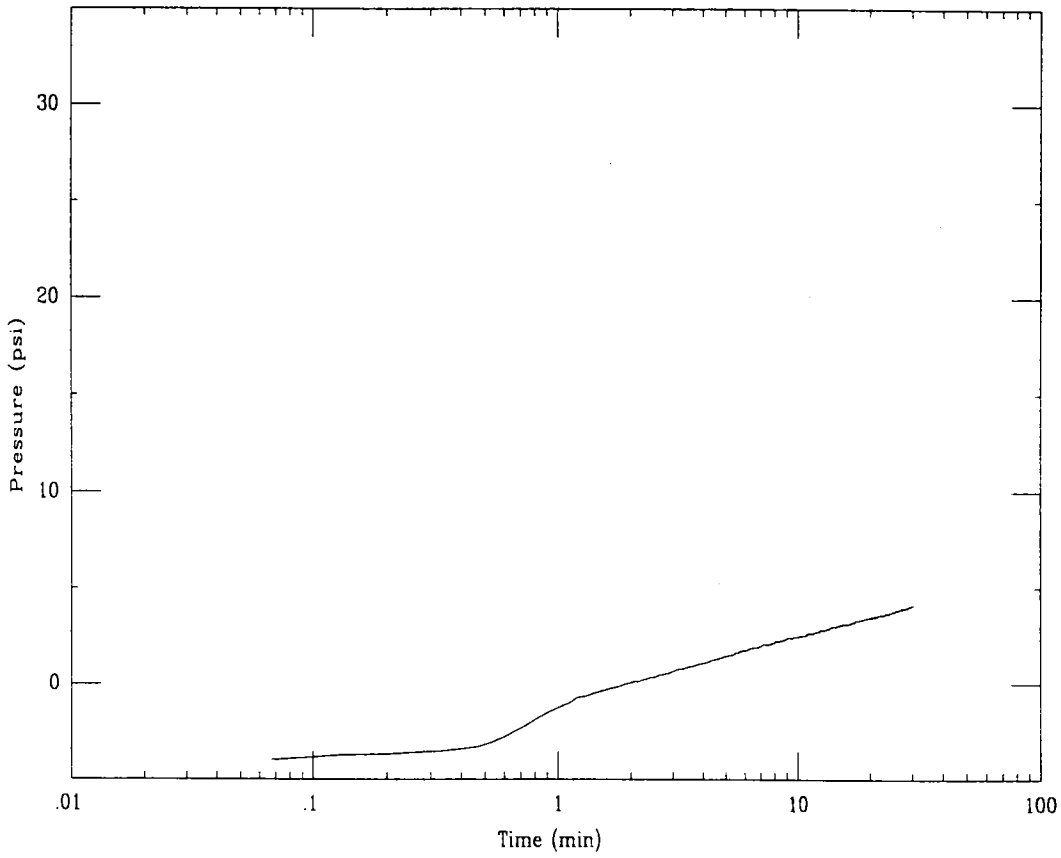
CPT-08 Applied Research Associates 08/29/01

Depth = 23.1 ft Max Pressure = 14.29 psi Pn = 14.21 psi



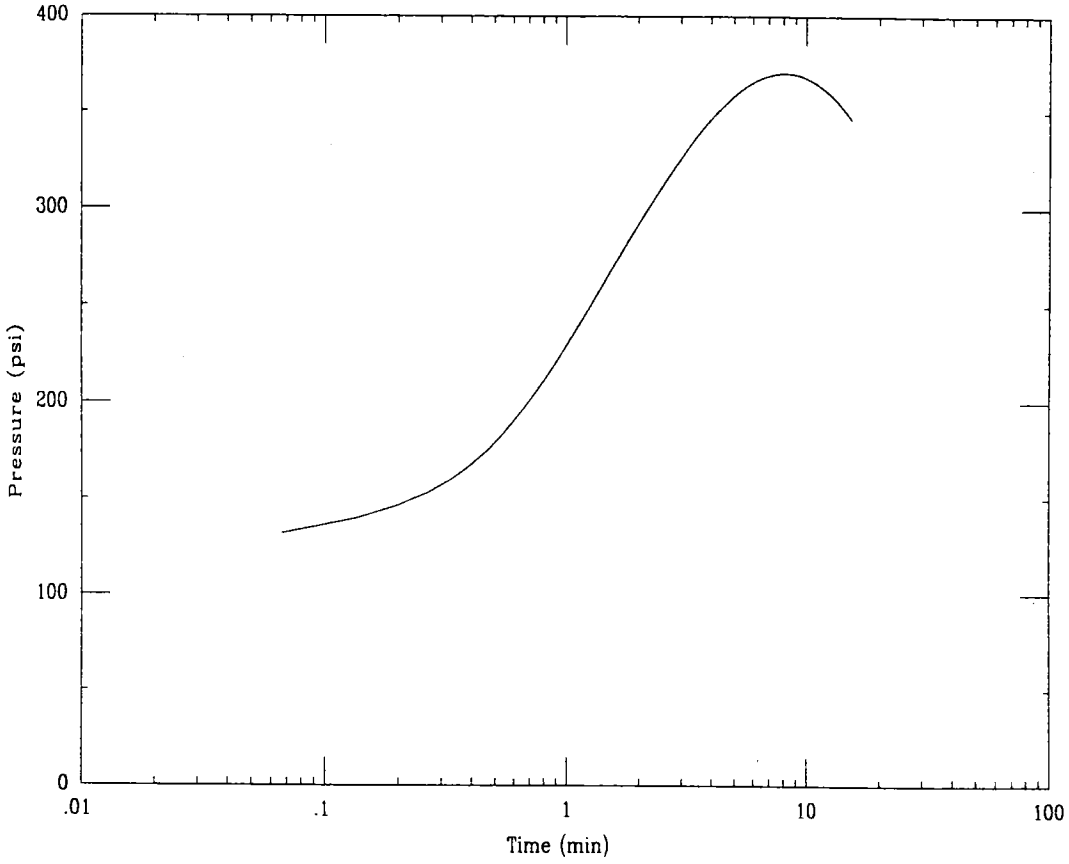
CPT-07 Applied Research Associates 08/30/01

Depth = 22.5 ft Max Pressure = 4.12 psi Pn = 4.08 psi



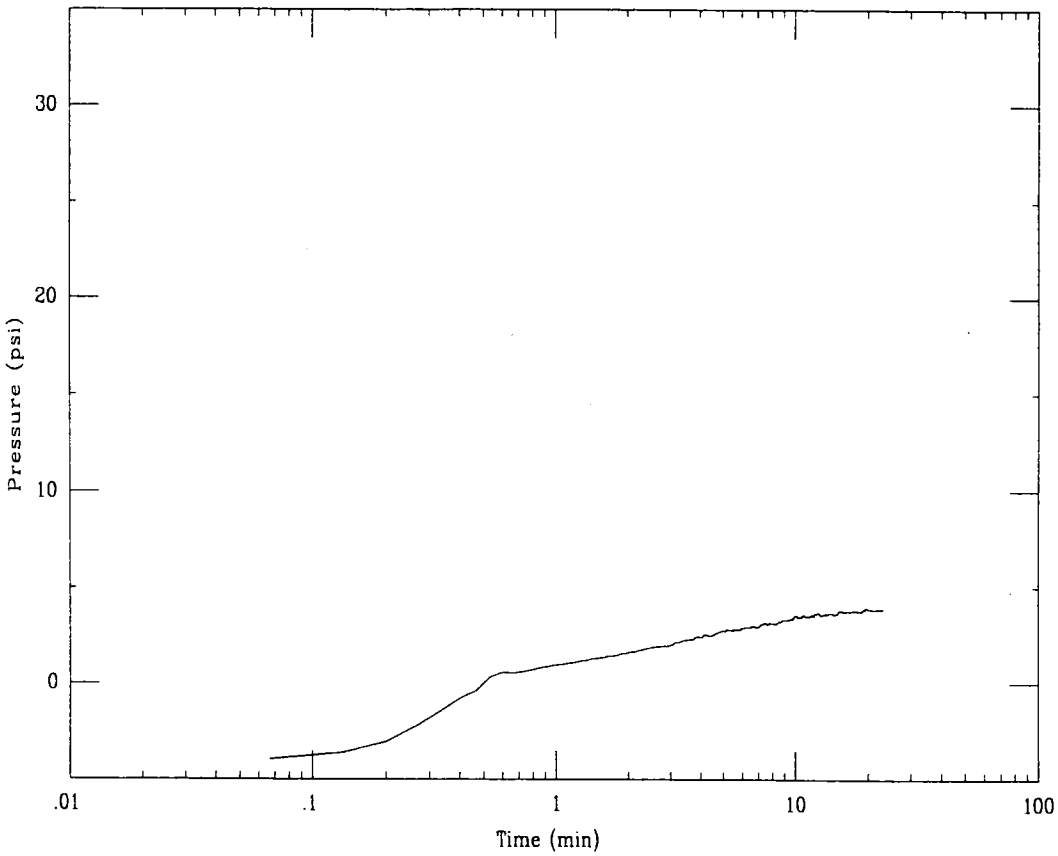
CPT-07 Applied Research Associates 08/30/01

Depth = 36.5 ft Max Pressure = 370.36 psi Pn = 347.97 psi



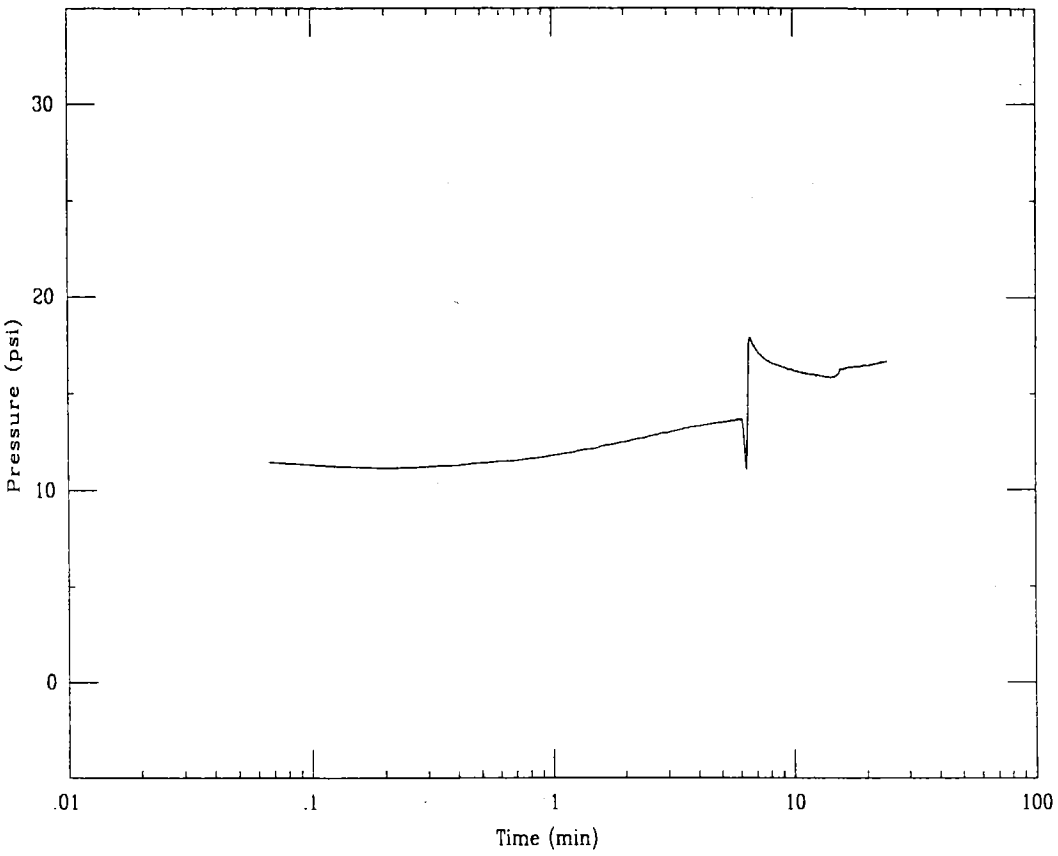
CPT-08 Applied Research Associates 08/29/01

Depth = 18.0 ft Max Pressure = 3.95 psi Pn = 3.84 psi



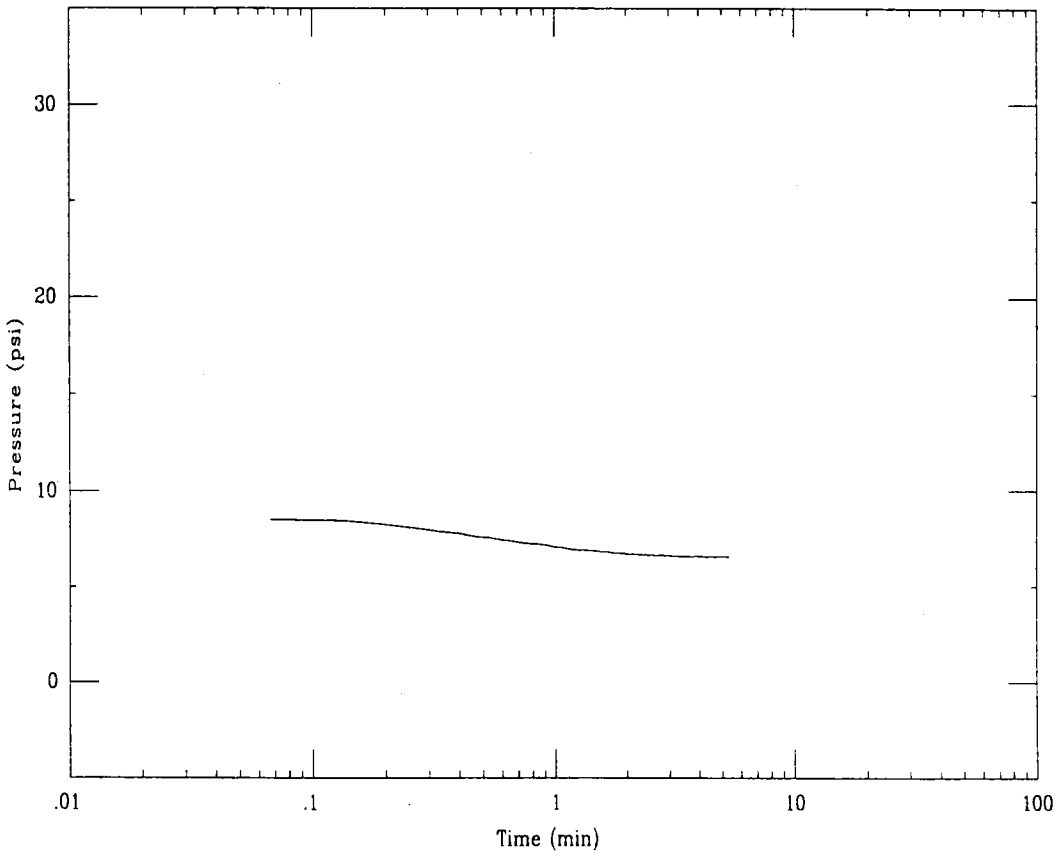
CPT-08 Applied Research Associates 08/29/01

Depth = 32.7 ft Max Pressure = 17.94 psi Pn = 16.67 psi



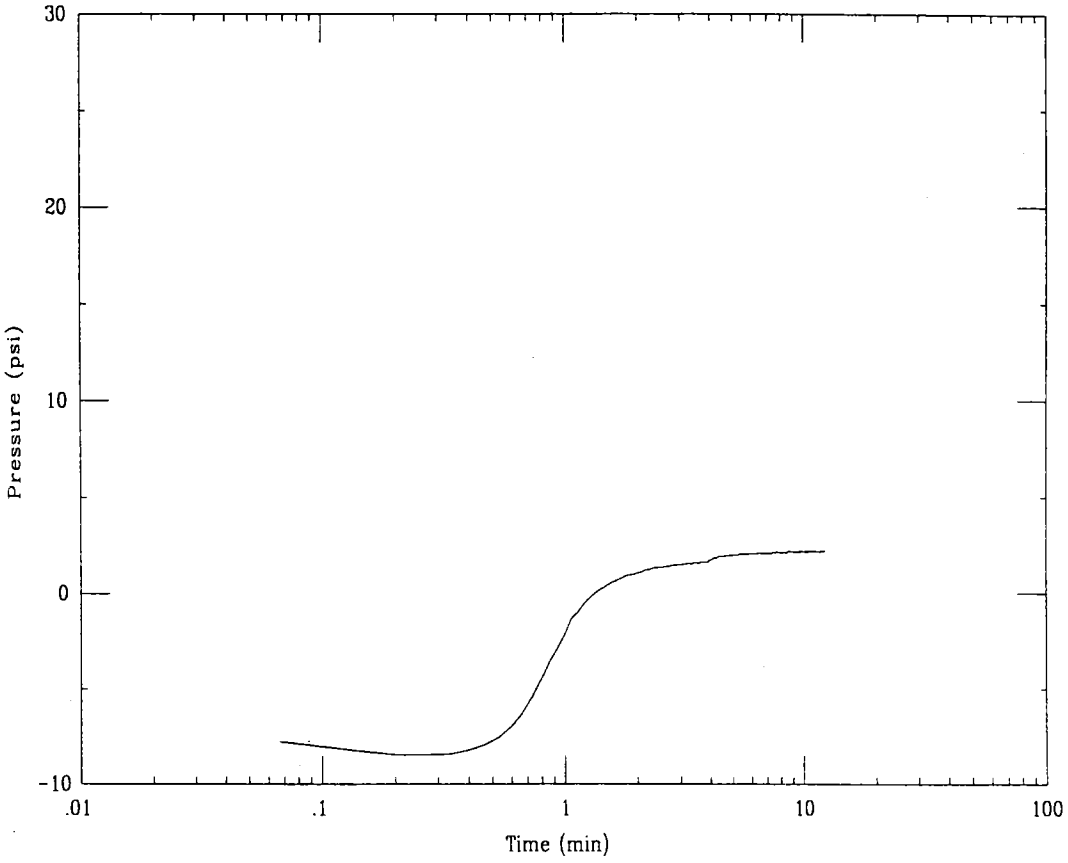
CPT-09 Applied Research Associates 08/29/01

Depth = 15.1 ft Max Pressure = 8.49 psi Pn = 6.52 psi



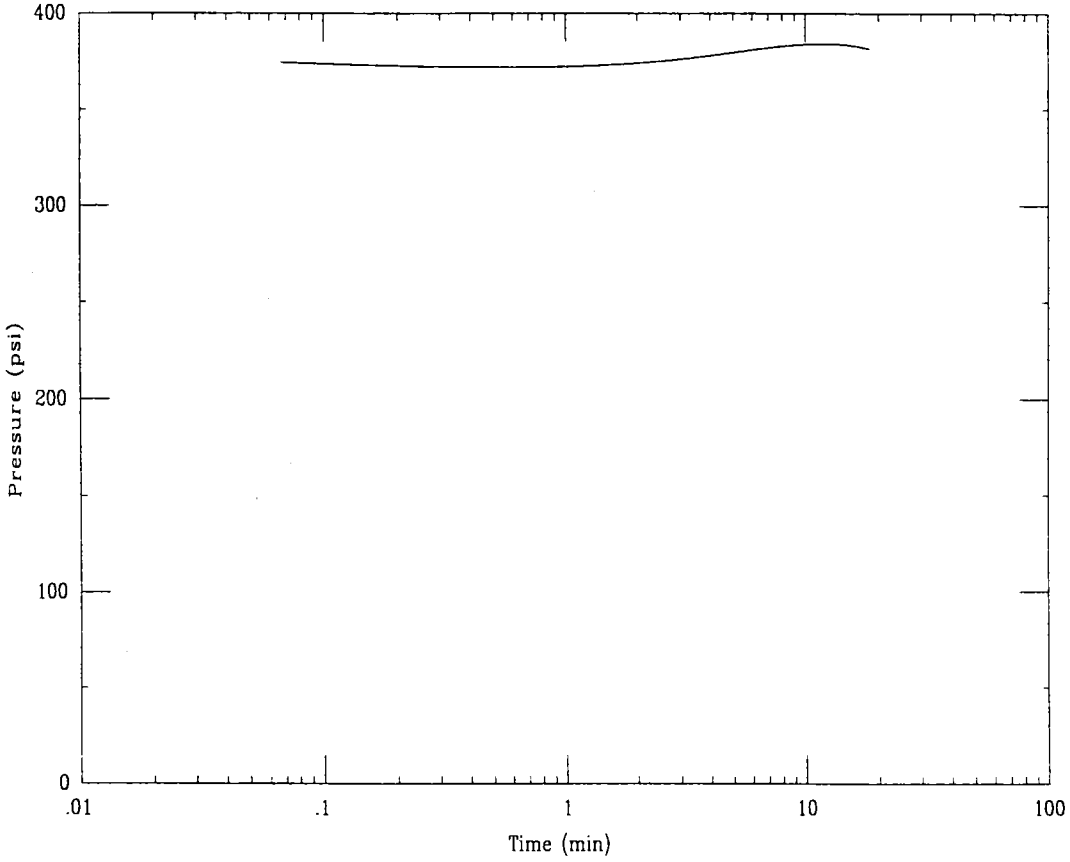
CPT-10 Applied Research Associates 08/28/01

Depth = 10.5 ft Max Pressure = 2.24 psi Pn = 2.18 psi



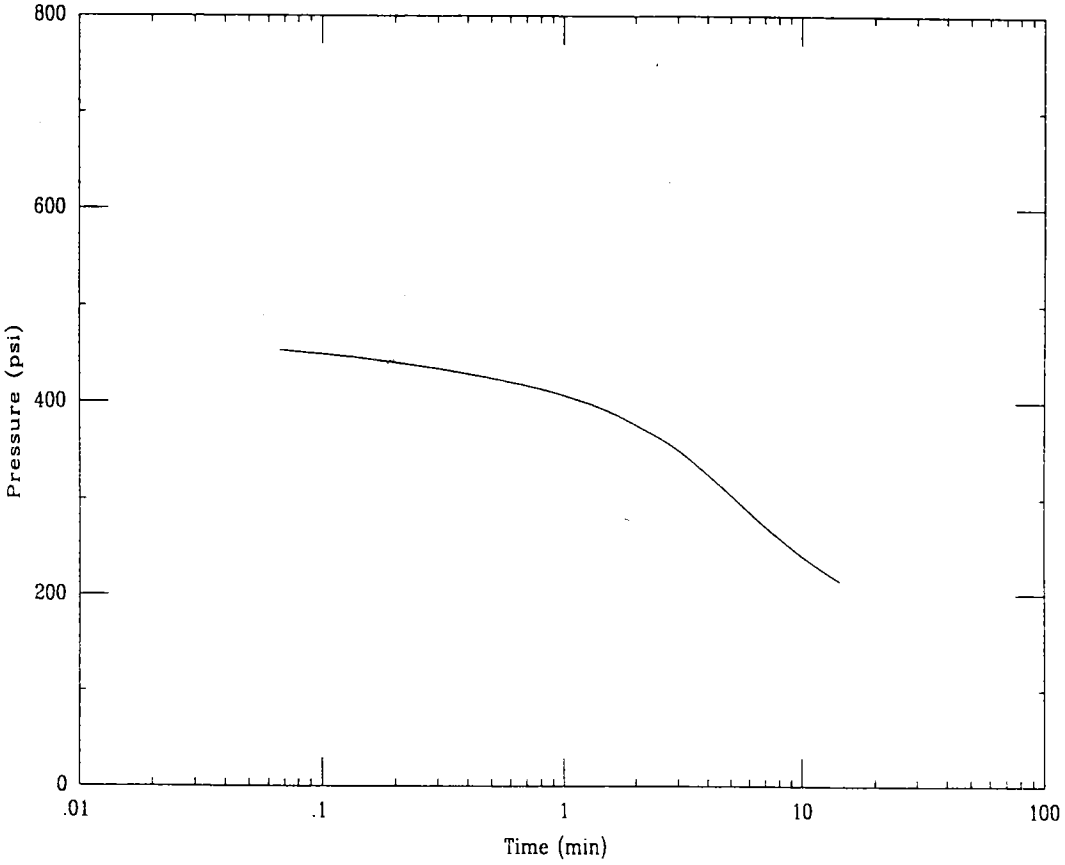
CPT-10 Applied Research Associates 08/28/01

Depth = 49.4 ft Max Pressure = 384.25 psi Pn = 381.81 psi



CPT-10 Applied Research Associates 08/28/01

Depth = 33.6 ft Max Pressure = 453.65 psi Pn = 215.16 psi



APPENDIX C

CALIBRATION CERTIFICATIONS

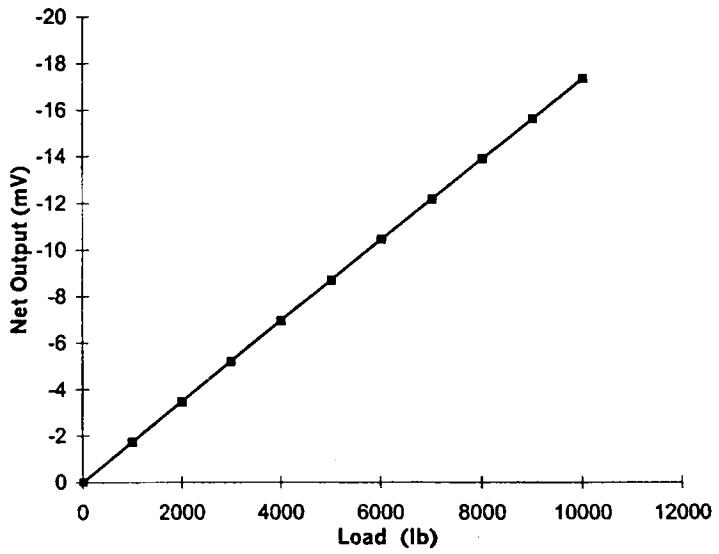
VERTEK
RR 1, Box 120A, Waterman Road
South Royalton, Vermont 05068
phone: (800) 639-6315 fax: (802) 763-8283

Reference Load Cell Calibration

Manufacturer	Interface
Model	1211NE-10KB
Load Cell S/N	72685A .REF
Rated Range	10000 lb
Calibrated with:	
Excitation	4.00012 Volt DC
Amplification	1.0000
Load Reference:	Interface S/N69351A

Date: 18-Jun-01
Calibrated by:
Approved by:
Date Due: 18-Dec-01

Load (lb)	Net Output (mv)
0	0.0000
1000	-1.7347
2000	-3.4709
3000	-5.2094
4000	-6.9470
5000	-8.6845
6000	-10.4227
7000	-12.1623
8000	-13.9004
9000	-15.6413
10000	-17.3804
9000	-15.6414
8000	-13.9027
7000	-12.1648
6000	-10.4268
5000	-8.6896
4000	-6.9518
3000	-5.2141
2000	-3.4751
1000	-1.7388
-1	-0.0011



Sensitivity	-4.345E-04	mV / V / lb
Cal. Factor	-0.4390	lb/A-D with 2^{16} A-D counts for 10.0 V span; 4.000 V excitation; 200 gain
r^2	1.000000	
Nonlinearity	-0.03%	calibrated range
Zero Load Output	3.9985	mV/V

CALCO METROLOGY SYSTEMS
18 HAWKVIEW ROAD HUDSON, NH 03051-4408 (603) 883-6557

****
* CALIBRATION REPORT *
****

OWNER: APPLIED RESEARCH ASSOCIATES
DESCRIPTION: PRESSURE GAGE
MANUFACTURER: DATA INSTRUMENTS
MODEL: AB HP 500 9222503
CALIBRATION ID NUMBER: 95082-427
SERIAL NUMBER: 95082-427
P.O. NUMBER: VT974
STD USED: JF164
NIST #: 822/260205-98 822/25870397
NOTES:

FOUND IN TOLERANCE: YES
CALIBRATION DATE DONE: 01/31/2001
CALIBRATION DATE DUE: 01/31/2002
PROCEDURE: 02-00034.A
CALIBRATION TECHNICIAN: JF
ENVIRONMENT: 68°F
REPORT NUMBER: 20710

==========

THIS CERTIFIES THAT THE ABOVE NAMED EQUIPMENT WAS TESTED AND FOUND TO BE IN COMPLIANCE WITH THE CALIBRATION PROCEDURE INDICATED AND THE MANUFACTURER'S DESIGN SPECIFICATIONS UNLESS OTHERWISE NOTED.

THIS CERTIFIES THAT THE ABOVE TESTS ARE IN COMPLIANCE WITH ISO 10012-1, ANSI/NCSL Z540-1, ISO GUIDE 25, FDA CODE SECTION 820.72, NRC-10CFR-21 AND ISO 9002 AS APPROPRIATE. THIS REPORT MAY NOT BE DUPLICATED EXCEPT IN FULL WITHOUT THE WRITTEN APPROVAL OF CALCO METROLOGY SYSTEMS.

TRANSDUCER TEST 13101

MFR	MODEL	IDNUMBER
DATA INSTRUMENTS	9222503	95082-427

LO PRESSURE	HIGH PRESSURE	SPAN
0 PSI	500 PSI	500 PSI

NOMINAL LO MV	NOMINAL HI MV	NOMINAL SPAN
0 MV	100 MV	100 MV

ZERO TOL	SPAN TOL	LINEAR TOL
5 MV	1 MV	.25 % SPAN WHICH = .249165 MV

ZERO OFFSET	HIGH VALUE MV	SPAN
1.53 MV	101.2 MV	99.67 MV

FOR AN EXCITATION VOLTAGE OF 5 VDC THE SENSITIVITY = .199332 MV/PSI

ZERO OFFSET TEST: PASS

SPAN ERROR TEST: PASS

APPLIED PSI	OUTPUT MV	ZERO CORRECTED	STRAIGHT LINE	DEVIATION
0	1.53	0	0	0
100	21.27	19.73	19.93	.2
200	41.14	39.61	39.87	.26
300	61.12	59.59	59.8	.21
400	81.16001	79.63	79.73001	.11
500	101.2	99.67	99.67	0
300	61.14	59.6	59.8	.2
100	21.27	19.74	19.93	.2
0	1.53	0	0	0

APPENDIX F

PRELIMINARY REMEDIATION GOALS

PRELIMINARY REMEDIATION GOAL FOR CONSTRUCTION WORKER – ARSENIC IN SOIL

The PRG for is based on the following ratio:

$$\frac{\text{Exposure Point Concentration (EPC)}}{\text{Total HI}} = \frac{\text{Preliminary Remediation Goal (PRG)}}{\text{Target HI}}$$

EPC = 71.7 mg/kg (RI Report Table 9-13)

Total HI = 1.1 (RI Report Table 9.7 in Appendix K)

For a Target HI = 1.0, the PRG is as follows

$$\text{PRG} = \frac{\text{EPC} \times \text{Target HI}}{\text{Total HI}} = \frac{71.7 \times 1.0}{1.1} = 65 \text{ mg/kg}$$

PRELIMINARY REMEDIATION GOAL FOR CHILD RESIDENT – ARSENIC IN SOIL

The PRG for is based on the following ratios for noncarcinogenic and carcinogenic risks, respectively:

$$\frac{\text{EPC}}{\text{Total HI}} = \frac{\text{PRG}}{\text{Target HI}} \quad \text{OR} \quad \frac{\text{EPC}}{\text{Total ICR}} = \frac{\text{PRG}}{\text{Target ICR}}$$

EPC = 71.7 mg/kg (RI Report Table 9-13)

Total HI = 3.2 (RI Report Table 9.13 in Appendix K)

Total ICR – 1.2E-04 (RI Report Table 9.13 in Appendix K)

For a Target HI = 1.0:

$$\text{PRG} = \frac{71.7 \times 1.0}{3.2} = 22.4 \text{ mg/kg}$$

For a Target ICR = 1.0E-04:

$$\text{PRG} = \frac{71.7 \times (1\text{E}-04)}{1.2\text{E}-04} = 60 \text{ mg/kg}$$

Use the lower value for the PRG, 22.4 mg/kg

PRELIMINARY REMEDIATION GOAL FOR CHILD RESIDENT – ETHYL ETHER IN GROUNDWATER

The PRGs for COCs other than ether ethyl are based on MCLs. There is no MCL for ethyl ether; therefore, a risk-based value needs to be calculated. The HI contribution based on the MCLs is calculated first. The PRG for ethyl ether is then calculated based on the remaining available HI, assuming a target HI of 1.0 for all COCs, including ethyl ether.

The HI contribution from the PRGs (i.e., MCLs) for COCs other than ethyl ether is calculated as follows:

$$\text{PRG HI} = \frac{\text{EPC HI x PRG}}{\text{EPC}}$$

EPC = Exposure Point Concentration (RI Report Table 9-13)
EPC HI = HI for child resident from EPC (RI Report Table 9.13 in Appendix K)
PRG = Preliminary Remediation Goal (FS Report Table 2-5)

COC	EPC HI	EPC (µg/L)	PRG (µg/L)	PRG HI
cis-1,2-Dichloroethene	3.6	528	70	0.48
1,1-Dichloroethene	0.22	29	7	0.05
Tetrachloroethene	0.05	5.41	5	0.05
Trichloroethene	7.3	612	5	0.06
Vinyl chloride	NC	85	2	NC
Total				**0.64**
Ethyl ether	1.3	3,950		0.36

The PRG HI was not calculated for chloroform because the maximum concentration (1.3 µg/L) is less than the MCL (80 µg/L) and the EPC HI was negligible (0.0088). The PRG HI was not calculated for vinyl chloride in the RI because there is no toxicity data available.

For a Target HI = 0.36 for ethyl ether:

$$\text{PRG} = \frac{\text{EPC x PRG HI}}{\text{EPC HI}} = \frac{3{,}950 \times 0.36}{1.3} = 1{,}094\ \mu\text{g/L}$$

CHECK INCREMENTAL CANCER RISK (ICR) FOR GROUNDWATER PRGs

The ICR contribution from each PRG is calculated as follows:

$$\text{PRG ICR} = \frac{\text{EPC ICR x PRG}}{\text{EPC}}$$

EPC = Exposure Point Concentration (RI Report Table 9-13)

EPC ICR = ICR for Child Resident at EPC (RI Report Table 9.13 in Appendix K)

PRG = Preliminary Remediation Goal (FS Report Table 2-5)

COC	EPC ICR	EPC (µg/L)	PRG (µg/L)	PRG ICR
cis-1,2-Dichloroethene	NC	528	70	NC
1,1-Dichloroethene	1.2E-04	29	7	2.9E-05
Ethyl ether	NC	3,950	1.094	NC
Tetrachloroethene	2.6E-06	5.41	5	2.4E-06
Trichloroethene	4.8E-05	612	5	3.9E-07
Vinyl chloride	1.1E-03	85	2	2.6E-05
Total				**5.8E-05**

The ICR was not calculated for cis-1,2-dichloroethene or ethyl ether because no cancer toxicity data are available.

The total ICR for the groundwater COCs (5.8E-05) is within the EPA target risk range. Therefore, the PRGs are protective of human health.

APPENDIX G

TECHNOLOGY EVALUATIONS

G.1 MONITORED NATURAL ATTENUATION

G.2 GROUNDWATER MODELING

G.3 IN SITU BIOLOGICAL TREATMENT

G.1 MONITORED NATURAL ATTENUATION

APPENDIX G.1
SCREENING FOR NATURAL ATTENUATION OF CHLORINATED VOLATILE ORGANIC COMPOUNDS

Groundwater samples were analyzed for the parameters listed on Table G-1. In accordance to a United States Environmental Protection Agency (U.S. EPA) protocol summarized on that table (U.S. EPA, 1998), analytical results for these parameters can provide an indication of how favorable, or unfavorable, conditions are in the contaminated groundwater for the natural attenuation of chlorinated volatile organic compounds (VOCs), particularly tetrachloroethene (PCE) and trichloroethene (TCE) that are the main chemicals of concern (COCs) for the Site 57 groundwater.

Table G-2 provides a summary of the natural attenuation parameters analytical results measured during the latest round of sampling (August 2001) for a total of 23 Site 57 wells, including 4 upgradient/background wells (MW012, MW013, TW014, and TW015), 11 source areas wells (MW001 to MW004, MW007, MW008, MW011, and TW017 to TW019), 5 mid-plume wells (MW005, MW006, MW009, MW010, and MW023), and 3 downgradient wells (MW020, TW021, and MW022).

Table G-3 provides a summary of the natural attenuation scoring. In this table, each analytical result listed in Table G-2 for the source areas, mid-plume, and downgradient wells was assigned a positive, negative, or neutral (0) numerical score in accordance with the previously-mentioned U.S. EPA protocol to denote if it represents conditions which are favorable, unfavorable, or indifferent to the degradation of chlorinated VOCs through natural attenuation. As can be seen from Table G-3, total scores for each sampling location ranged from 0 in one mid-plume well (MW023) to 21 in one downgradient well (MW022). The site-wide average score for the 19 contaminated wells was 7.3, with average area scores of 7.3 for the source area wells, 5.6 for the mid-plume wells, and 9.0 for the downgradient wells.

It should be noted that the scoring was relatively liberal because most of the points were consistently awarded for such parameters as the absence (<20 mg/L) of sulfates, the presence (>2 mg/L) of suffused, and the mild (>20°C) groundwater temperature. While these three parameters are indeed favorable to the natural attenuation of chlorinated VOCs, they are generally not considered as significant as the absence of dissolved oxygen (DO), the presence of ferrous iron, a negative oxidation/reduction potential (ORP), or the presence of gases such as methane, ethane or ethene. In particular, DO concentration was relatively high at all but one of the sampling locations, averaging 4.06 mg/L through the entire site. This should fairly much impede anaerobic dechlorination that is typically the most important pathway for natural attenuation of chlorinated VOCs

Total scores for each sampling location were then interpreted in accordance with the following table (U.S. EPA, 1998) to determine whether or not overall groundwater conditions in the vicinity of that location are favorable to natural attenuation of chlorinated VOCs:

Total Score	Interpretation
0 to 5	Conditions unfavorable to natural attenuation of chlorinated VOCs
6 to 14	Limited possibilities of natural attenuation of chlorinated VOCs
15 to 20	Conditions favorable to natural attenuation of chlorinated VOCs
20 or more	Conditions very favorable to natural attenuation of chlorinated VOCs

Accordingly, it can be concluded that, with the exception of one downgradient location (MW022), conditions in the Site 57 groundwater are not favorable to the natural attenuation of chlorinated VOCs.

However, this does not necessarily mean that conditions are unfavorable to the natural attenuation of other site COCs which do not depend on a reductive dechlorination pathway. In particular, the presence of significant DO concentrations which is unfavorable to the natural attenuation of chlorinated VOCs could be quite favorable to the natural attenuation of organic compounds amenable to aerobic biodegradation, such as ethyl ether, which is another of the Site 57 groundwater COCs.

REFERENCE

U.S. EPA, 1998. *Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Groundwater.* EPA Publication 600/R-998/128, Washington, DC.

TABLE G-1

NATURAL ATTENUATION PARAMETERS AND SCORING PROTOCOL
SITE 57 – FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

Parameter	Maximum Detected Concentration	Interpretation	Score
Dissolved Oxygen (DO) (O_2)*	<0.5 mg/L >5 mg/L	Tolerated, suppresses the reductive pathway at higher concentrations Not tolerated; however, VC may be oxidized aerobically	3 -3
Nitrate (NO_3^-) / Nitrite (NO_2^-)*	<1 mg/L	At higher concentrations may compete with reductive pathway	2
Ferrous Iron (Fe^{2+})*	>1 mg/L	Reductive pathway possible; VC may be oxidized under ferric iron reducing conditions	3
Sulfate (SO_4^{2-})*	<20 mg/L	At higher concentrations may compete with reductive pathway	2
Sulfide (S^{2-})*	>1 mg/L	Reductive pathway possible	3
Methane (CH_4)*	<0.5 mg/L >0.5 mg/L	VC oxidizes Ultimate reductive daughter product, VC accumulates	0 3
Oxidation Reduction Potential* (ORP)	<50 millivolts (mV) < -100mV	Reductive pathway possible Reductive pathway likely	1 2
pH*	5 < pH <9 5 > pH >9	Optimal range for reductive pathway Outside optimal range for reductive pathway	0 -2
Total Organic Carbon (TOC)	>20 mg/L	Carbon and energy source; drives dechlorination; can be natural or anthropogenic	2
Temperature*	>20°C	At T>20°C biochemical process is accelerated	1
Carbon Dioxide (CO_2)	>2x background	Ultimate oxidative daughter product	1
Alkalinity (as $CaCO_3$)	>2x background	Results from interaction between CO_2 and aquifer minerals	1
Chloride (Cl^-)*	>2x background	Daughter product of organic chlorine	2
Tetrachloroethene (PCE) (C_2Cl_4)*		Material released	0
Trichloroethene (TCE) (C_2HCl_3)*		Material released Daughter product of PCE	0 2[a/]
Dichloroethene (DCE) ($C_2H_2Cl_2$)*		Material released Daughter product of TCE If cis is > 80% of total DCE it is likely a daughter product 1,1-DCE can be chemical reaction product of TCA	0 2[a/]
Vinyl Chloride (VC) (C_2H_3Cl)*		Material released Daughter product of DCE	0 2[a/]
Chloroethane (C_2H_5Cl)*		Daughter product of VC under reducing conditions	2

TABLE G-1

NATURAL ATTENUATION PARAMETERS AND SCORING PROTOCOL
SITE 57 – FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

Parameter	Maximum Detected Concentration	Interpretation	Score
Ethene (C_2H_2) / Ethane (C_2H_4)	>0.01 mg/L >0.1 mg/L	Daughter product of VC/ethene	2 3
Chloroform ($CHCl_3$)		Material released Daughter product of Carbon Tetrachloride	0 2
Dichloromethane (CH_2Cl_2)		Material released Daughter product of Chloroform	0 2

NOTES:

* Required analysis
a/ Points awarded only if it can be shown that the compound is a daughter product

TABLE G-2

SUMMARY OF GROUNDWATER ANALYTICAL RESULTS
NATURAL ATTENUATION PARAMETERS
SITE 57 – FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

Parameter	Units	Upgradient/Background Wells				Source Areas Wells			
		MW012	MW013	TW014	TW015	MW001	MW002	MW003	MW004
Dissolved Oxygen (DO) (O_2)	mg/L	3.92	0	2.29	4.53	3.2	3.26	3.43	3.26
Nitrate (NO_3^-) / Nitrites (NO_2^-)	mg/L	1 U/1 U	1 U/1 U	9.8/1 U	2.1/1 U	4.1/1.2	3.6/1.2	4.8/1 U	4.9/1 U
Ferrous Iron (Fe^{2+})	mg/L	0.1 U	0.1 U	15	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Sulfate (SO_4^{2-})	mg/L	1 U	1 U	1 U	1 U	1.3	1 U	1.3	1 U
Sulfide (S^{2-})	mg/L	1.6	1 U	8	2.8	4	4	2.4	4
Methane (CH_4)	µg/L	2 U	2 U	2 U	2 U	2 UL	2 UL	2 UL	0. L
Oxidation/Reduction Potential (ORP)	MV	167	306	114	-21	155	53	258	168
PH	S.U.	5.59	4.25	5.25	5.46	5.78	6.56	5.29	6.49
Total Organic Carbon (TOC)	mg/L	1 U	1 U	9.7	1	6.8	2.8	1.1	1.4
Temperature	ºC	18.04	19.2	26.06	18.06	21.8	24.4	20.7	22.5
Carbon Dioxide (CO_2)	mg/L	120	94	130	92	110	160	150	83
Alkalinity (as $CaCO_3$)	mg/L	10	4.5	6	9	12	56	3.25	50
Chloride (Cl^-)	mg/L	7.2	8.6	1 U	4.8	6.2	9.8	6.7	4.8
Tetrachloroethene (PCE) (C_2Cl_4)	µg/L	5 U	5 U	5 U	7.1	5 U	5 U	5 U	6.3
Trichloroethene (TCE) (C_2HCl_3)	µg/L	1.6 J	5 U	5 U	2.3 J	2.6 J	43	365 J	12,000
1,1-Dichloroethene (DCE) ($C_2H_2Cl_2$)	µg/L	2 J	74	5 U	5 U	2 J	5 U	2.75 J	6.5
Cis-1,2-DCE	µg/L	1.9	5 U	5 U	5 U	5 U	2.6 J	30.5 J	620
Trans-1,2-DCE	µg/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U	3.7 J
Total DCE	µg/L	1.9	5 U	5 U	5 U	5 U	2.6 J	33.3 J	630
Vinyl Chloride (VC) (C_2H_3Cl)	µg/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U	26
Chloroethane (C_2H_5Cl)	µg/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Ethane (C_2H_6)	µg/L	4 U	4 U	4 U	4 U	4 UL	4 UL	4 UL	4 UL
Ethene (C_2H_4)	µg/L	4 U	4 U	2 U	4 U	4 UL	4 UL	4 UL	4 UL
Dichloromethane (CH_2Cl_2)	µg/L	5 U	1.2 B	5 U	1.5 B	5 U	5 U	5 U	5 U
Chloroform ($CHCl_3$)	µg/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U

TABLE G-2

SUMMARY OF GROUNDWATER ANALYTICAL RESULTS
NATURAL ATTENUATION PARAMETERS
SITE 57 – FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

Parameter	Units	Source Areas Wells						
		MW007	MW008	MW011	TW016	TW017	TW018	TW019
Dissolved Oxygen (DO) (O_2)	mg/L	4.06	2.48	3.3	7.91	4.05	4.35	4.62
Nitrate (NO_3^-) / Nitrite (NO_2^-)	mg/L	3.05/1 U	6.8/1U	1.6/1 U	5.6/1 U	1.2/1 U	8.4/1 U	3.8/1 U
Ferrous Iron (Fe^{2+})	mg/L	0.1 U	0.1 U	0.14	0.1 U	0.1 U	4.1	0.3
Sulfate (SO_4^{2-})	mg/L	1 U	1 U	1.3	1 U	1 U	1 U	1 U
Sulfide (S^{2-})	mg/L	2.8	2.8	4	4	1.2	1.8	2
Methane (CH_4)	µg/L	0.07	2 U	2 UL	2 U	2 UL	0.19	2 U
Oxidation/Reduction Potential (ORP)	mV	22	46	135	145	177	185	64
pH	S.U.	5.28	6.45	5.79	6.53	5.35	4.87	6.01
Total Organic Carbon (TOC)	mg/L	1 U	1.9	NA	1.4	1.3	4.6	1.5
Temperature	ºC	19.4	26.48	21.34	20.83	18.4	19.47	17.4
Carbon Dioxide (CO_2)	mg/L	115	150	130	61	110	100	2.5
Alkalinity (as $CaCO_3$)	mg/L	20	42	19	27	8.5	7.3	14
Chloride (Cl^-)	mg/L	6.8	60	3.2	9.2	4.8	2.7	3
Tetrachloroethene (PCE) (C_2Cl_4)	µg/L	5 U	5 U	5 U	5 U	1.6 J	5 U	5 U
Trichloroethene (TCE) (C_2HCl_3)	µg/L	140	5 U	94	5 U	1.1 J	210	62
1,1-Dichloroethene (DCE) ($C_2H_2Cl_2$)	µg/L	6.75	5 U	5 U	5 U	5 U	3.1 J	5 U
cis-1,2-DCE	µg/L	25	5 U	30	5 U	5 U	5 U	5 U
trans-1,2-DCE	µg/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Total DCE	µg/L	32	5 U	30	5 U	5 U	5 U	5.5
Vinyl Chloride (VC) (C_2H_3Cl)	µg/L	5 U	5 U	5 U	5 U	5 U	5 U	5.5
Chloroethane (C_2H_5Cl)	µg/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Ethane (C_2H_6)	µg/L	4 U	4 U	4 UL	4 U	4 UL	4 U	4 U
Ethene (C_2H_4)	µg/L	4 U	4 U	4 UL	4 U	4 UL	4 U	4 U
Dichloromethane (CH_2Cl_2)	µg/L	5 U	0.7 B	5 U	1.8 B	5 U	1.3 J	1.9 J
loroform ($CHCl_3$)	µg/L	5 U	U	5 U	5 U	5 U	5 U	5 U

TABLE G-2

SUMMARY OF GROUNDWATER ANALYTICAL RESULTS
NATURAL ATTENUATION PARAMETERS
SITE 57 – FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

Parameter	Units	Mid-Plume Wells				Downgradient Wells		
		MW005	MW006	MW009	MW010	MW020	TW021	MW022
Dissolved Oxygen (DO) (O_2)	mg/L	4.3	4.34	3.14	3.97	2.84	7.09	4.45
Nitrate (NO_3^-) / Nitrite (NO_2^-)	mg/L	1 U/1 U	3.9/1 U	1 U/1 U	6.8/1 U	2.1/1 U	30/1 U	6.3/1 U
Ferrous Iron (Fe^{2+})	mg/L	0.1 U	0.1 U	0.1 U	6.3	0.99	5.7	4.8
Sulfate (SO_4^{2-})	mg/L	1 U	1.8	1 U	1 U	1 U	1 U	1 U
Sulfide (S^{2-})	mg/L	1.6	5.2	1 U	2	1 U	1 U	8
Methane (CH_4)	µg/L	2 U	2 U	2 U	0.07	2 U	2 U	740
Oxidation/Reduction Potential (ORP)	mV	315	288	261	57	104	-256	-11
PH	S.U.	4.24	4.88	5	5.55	5.62	4.83	6.82
Total Organic Carbon (TOC)	mg/L	1 U	1 U	1 U	1.9	1 U	3.6	13
Temperature	ºC	20.5	20.59	22.3	23.1	21.02	20.7	18.52
Carbon Dioxide (CO_2)	mg/L	2 U	73	54	100	81	120	1,300
Alkalinity (as $CaCO_3$)	mg/L	2 U	2 U	2	19	2	5	440
Chloride (Cl^-)	mg/L	3.1	15	1 U	1 U	4.3	8.9	9.8
Tetrachloroethene (PCE) (C_2Cl_4)	µg/L	5 U	10 U	5 U	5 U	5 U	5 U	50 U
Trichloroethene (TCE) (C_2HCl_3)	µg/L	5 U	250	480	330	5 U	5 U	50 U
1,1-Dichloroethene (DCE) ($C_2H_2Cl_2$)	µg/L	5 U	6.7 J	28	13	5 U	5 U	50 U
Cis-1,2-DCE	µg/L	5 U	46	85	150	5 U	5 U	1,400
Trans-1,2-DCE	µg/L	5 U	10 U	5 U	5 U	5 U	5 U	50 U
Total DCE	µg/L	5 U	46	85	150	5 U	5 U	1,400
Vinyl Chloride (VC) (C_2H_3Cl)	µg/L	5 U	10 U	5 U	5.5	5 U	5 U	1,500
Chloroethane (C_2H_5Cl)	µg/L	5 U	10 U	5 U	5 U	5 U	5 U	50 U
Ethane (C_2H_6)	µg/L	4 UL	4 U	4 U	4 U	4 U	4 U	280 J
Ethene (C_2H_4)	µg/L	4 UL	4 U	4 U	4 U	4 U	4 U	150 J
Dichloromethane (CH_2Cl_2)	µg/L	5 U	10 U	5 U	5 U	5 U	0.7 B	50 U
Chloroform ($CHCl_3$)	µg/L	5 U	10 U	5 U	5 U	5 U	5 U	50 U

TABLE G-2

SUMMARY OF GROUNDWATER ANALYTICAL RESULTS
NATURAL ATTENUATION PARAMETERS
SITE 57 – FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

NOTES:

B	False positive because of blank contamination
J	Estimated value
NA	Not analyzed
U	Undetected at the indicated detection limit
UL	Undetected at the indicated detection limit. Biased low

TABLE G-3

SUMMARY OF NATURAL ATTENUATION PARAMETERS SCORINGS
SITE 57 – FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

Parameters	Available Points[1]	Source Areas Wells				
		MW001	MW002	MW003	MW004	MW007
Dissolved Oxygen (DO) (O_2)	-3 to +3	0	0	0	0	0
Nitrate (NO_3^-) / Nitrites (NO_2^-)	0 to 2	0	0	0	0	0
Ferrous Iron (Fe^{2+})	0 to 3	0	0	0	0	0
Sulfate (SO_4^{2-})	0 to 2	2	2	2	2	2
Sulfide (S^{2-})	0 to 3	3	3	3	3	3
Methane (CH_4)	0 to 3	0	0	0	0	0
Oxidation/Reduction Potential (ORP)	1 to 2	0	0	0	0	1
pH	-2 to 0	0	0	0	0	0
Total Organic Carbon (TOC)	0 to 2	0	0	0	0	0
Temperature	0 to 1	1	1	1	1	0
Carbon Dioxide (CO_2)	0 to 1	0	0	0	0	0
Alkalinity (as $CaCO_3$)	0 to 1	0	1	0	1	1
Chloride (Cl^-)	0 to 2	0	0	0	0	0
Tetrachloroethene (PCE) (C_2Cl_4)	0	0	0	0	0	0
Trichloroethene (TCE) (C_2HCl_3)	0 to 2	0	0	0	0	0
Dichloroethene (DCE) ($C_2H_2Cl_2$)	0 to 2	0	2	2	2	2
Vinyl Chloride (VC) (C_2H_3Cl)	0 to 2	0	0	0	2	0
Chloroethane (C_2H_5Cl)	0 to 2	0	0	0	0	0
Ethane (C_2H_6) / Ethene (C_2H_4)	0 to 3	0	0	0	0	0
Dichloromethane (CH_2Cl_2)	0 to 2	0	0	0	0	0
Chloroform ($CHCl_3$)	0 to 2	0	0	0	0	0
Totals[2]	**40**	**6**	**9**	**8**	**11**	**9**

TABLE G-3

SUMMARY OF NATURAL ATTENUATION PARAMETERS SCORINGS
SITE 57 – FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

Parameters	Available Points[1]	Source Areas Wells (continued)					
		MW008	MW011	TW016	TW017	TW018	TW019
Dissolved Oxygen (DO) (O_2)	-3 to +3	0	0	-3	0	0	0
Nitrate (NO_3^-) / Nitrite (NO_2^-)	0 to 2	0	0	0	0	0	0
Ferrous Iron (Fe^{2+})	0 to 3	0	0	0	0	3	0
Sulfate (SO_4^{2-})	0 to 2	2	2	2	2	2	2
Sulfide (S^{2-})	0 to 3	3	3	3	3	3	3
Methane (CH_4)	0 to 3	0	0	0	0	0	0
Oxidation/Reduction Potential (ORP)	1 to 2	1	0	0	0	0	0
pH	-2 to 0	0	0	0	0	-2	0
Total Organic Carbon (TOC)	0 to 2	0	0	0	0	0	0
Temperature	0 to 1	1	1	1	0	0	0
Carbon Dioxide (CO_2)	0 to 1	0	0	0	0	0	0
Alkalinity (as $CaCO_3$)	0 to 1	1	1	1	0	0	1
Chloride (Cl^-)	0 to 2	2	0	0	0	0	0
Tetrachloroethene (PCE) (C_2Cl_4)	0	0	0	0	0	0	0
Trichloroethene (TCE) (C_2HCl_3)	0 to 2	0	0	0	0	0	0
Dichloroethene (DCE) ($C_2H_2Cl_2$)	0 to 2	0	2	0	0	0	2
Vinyl Chloride (VC) (C_2H_3Cl)	0 to 2	0	0	0	0	0	0
Chloroethane (C_2H_5Cl)	0 to 2	0	0	0	0	0	0
Ethane (C_2H_6) / Ethene (C_2H_4)	0 to 3	0	0	0	0	0	0
Dichloromethane (CH_2Cl_2)	0 to 2	0	0	0	0	2	2
Chloroform ($CHCl_3$)	0 to 2	0	0	0	0	0	0
Totals[2]	**43**	**10**	**9**	**4**	**5**	**8**	**10**

TABLE G-3

SUMMARY OF NATURAL ATTENUATION PARAMETERS SCORINGS
SITE 57 – FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

Parameter	Available Points[1]	Mid-Plume Wells				Downgradient Wells		
		MW005	MW006	MW009	MW010	MW020	TW021	MW022
Dissolved Oxygen (DO) (O_2)	-3 to +3	0	0	0	0	0	-3	0
Nitrate (NO_3^-) / Nitrite (NO_2^-)	0 to 2	0	0	0	0	0	0	0
Ferrous Iron (Fe^{2+})	0 to 3	0	0	0	3	2	3	3
Sulfate (SO_4^{2-})	0 to 2	2	2	2	2	2	2	2
Sulfide (S^{2-})	0 to 3	3	3	0	3	0	0	3
Methane (CH_4)	0 to 3	0	0	0	0	0	0	3
Oxidation/Reduction Potential (ORP)	1 to 2	0	0	0	0	0	2	1
pH	-2 to 0	-2	-2	0	0	0	-2	0
Total Organic Carbon (TOC)	0 to 2	0	0	0	0	0	0	0
Temperature	0 to 1	1	1	1	1	1	1	0
Carbon Dioxide (CO_2)	0 to 1	0	0	0	0	0	0	1
Alkalinity (as $CaCO_3$)	0 to 1	0	0	0	1	0	0	1
Chloride (Cl^-)	0 to 2	0	2	0	0	0	0	0
Tetrachloroethene (PCE) (C_2Cl_4)	0	0	0	0	0	0	0	0
Trichloroethene (TCE) (C_2HCl_3)	0	0	0	0	0	0	0	0
Dichloroethene (DCE) ($C_2H_2Cl_2$)	0 to 2	0	2	2	2	0	0	2
Vinyl Chloride (VC) (C_2H_3Cl)	0 to 2	0	0	0	2	0	0	2
Chloroethane (C_2H_5Cl)	0 to 2	0	0	0	0	0	0	0
Ethane (C_2H_6) / Ethene (C_2H_4)	0 to 3	0	0	0	0	0	0	3
Dichloromethane (CH_2Cl_2)	0 to 2	0	0	0	0	0	0	0
Chloroform ($CHCl_3$)	0 to 2	0	0	0	0	0	0	0
Totals[2]	**40**	**4**	**8**	**5**	**14**	**3**	**3**	**21**

TABLE G-3

SUMMARY OF NATURAL ATTENUATION PARAMETERS SCORINGS
SITE 57 – FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

NOTES:

(1) According to Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Groundwater, EPA Publication 600/R-998/128, September 1998

(2) 0-5 pt: conditions unfavorable to natural attenuation, 6-14 pt: limited possibility of natural attenuation, 15-20pt: conditions favorable to natural attenuation, 20+ pt: conditions very favorable to natural attenuation

G.2 GROUNDWATER MODELING

APPENDIX G.2
GROUNDWATER MODELING REPORT

1.0 INTRODUCTION

As part of the Feasibility Study (FS) process, Tetra Tech NUS, Inc. (TtNUS) estimated the time frame required for reducing TCE below the federal MCL. The chlorinated solvents in groundwater reportedly originated from drum storage sources near the southeastern corner of Building 292 (FS Figure 1-4). Free product or non-aqueous phase liquid (NAPL) has not been noted in borings or in subsurface structures or drains. However, a known source area is present. A key assumption in the modeling is that the source area contaminant concentrations will not drop with time and will be continuously emitting TCE contamination into groundwater if a source removal is not undertaken. The Navy is expected to use the groundwater modeling results to assist in the selection of the remedy for the plume.

The property in question is a former drum storage area. Future land use for this property is expected to remain as it currently is. TtNUS performed a site investigation of the sites and determine the concentrations of the volatile organic compound (VOC) contamination in the shallow, intermediate, and deep portions of the surficial aquifer along an unnamed tributary of Mattawoman Creek. The distribution of chlorinated solvents showed the natural degradation of trichloroethene (TCE) to daughter products cis-1-2-dichloroethene (DCE) and vinyl chloride (VC) has been minor.

2.0 OBJECTIVES AND TECHNICAL APPROACH

The goals of the modeling were to:

- Create a groundwater flow field that represents current site conditions.
- Assess fate and transport of TCE.
- Estimate the clean-up times for TCE under natural attenuation and source removal scenarios.
- Estimate the clean-up times for TCE under a groundwater extraction scenario.

The technical approach used in this study involved the use of a groundwater flow model (MODFLOW) and a groundwater solute transport model (MT3D for TCE) to assess the Site 57 plume remediation. The computer codes were implemented within the graphical pre/post processor program called Groundwater Modeling System (GMS). Initially, an evaluation of the existing data was conducted. Based on the available data, the site was conceptualized in terms of groundwater flow and solute transport characteristics. The computer codes used in the study are described in Section 4. Construction of the numerical flow and solute transport models are described in Section 5. The flow model was manually

calibrated using the hydrologic and analytical site data (Sections 5 and 6). Based on analytical data, it was decided to limit the solute transport evaluation to TCE. Unfortunately, there is little information available concerning contaminant concentration data through time to assist in the formulation of half-lives and decay constants for each contaminant. Chlorinated solvents undergo degradation through dechlorination most effectively under reducing conditions. Literature values for partitioning coefficient and decay constants were used in the modeling.

3.0 EVALUATION OF EXISTING DATA AND SITE CONCEPTUAL MODEL

Geology

As part of the site investigations that were conducted in Site 57, numerous borings, monitoring wells, and cone penetrometer technology (CPT) wells were sampled. Geological cross sections that show the geological characteristics observed beneath the site are shown in FS Figures 1-6 to 1-8. Generally the site consists of approximately 15 to 35 feet of saturated sand above a brown silt, clay, sand confining unit. The top of the clay unit was represented as an impermeable base of the model.

Hydrogeology

Outside of a narrow band of monitoring wells along the unnamed tributary of Mattawoman Creek, there are no wells to provide hydrogeologic information. The general groundwater flow direction across Site 57 is from northwest to southeast (FS Figure 1-9).

The hydraulic conductivity of the shallow geologic materials in the valley have been quantified by slug tests performed for 22 monitoring wells during the Remedial Investigation (RI) (TtNUS, 2000).

An annual average recharge rate (based on the HELP model) was previously estimated for a site at NAS Dahlgren. This value is approximately 5 inches per year. Slight adjustments to this value were used to assist in the Site 57 model calibration.

The primary surface water discharge point for groundwater at Site 57 is Mattawoman Creek, located south of the site.

Contaminant Sources

During the field investigation, there were no reports of free product occurring in any of the soil or groundwater samples collected in this area. An elevated concentration of TCE (12,000 μg/L) and lower concentrations of other chlorinated solvents were detected in monitoring well S57MW004, which is located near the southeastern corner of Building 292. The source of these detections is reported to be

storage of drums containing spent TCE. This occurrence appears to be isolated, since none of the adjacent sampling points had concentrations comparable to this 12,000 μg/L value.

The most prominent chlorinated solvent in this area is TCE with considerably lower detections of DCE and VC. This observation, along with dissolved oxygen analysis, suggests that aerobic conditions, not conducive to dechlorination, occur at Site 57. The lack of biodegradation products suggests that the use of relatively long half-lives for chlorinated solvent modeling may be warranted. The concentrations of chlorinated solvents appear to be larger and more concentrated near the suspected source where TCE concentrations in excess of 12,000 μg/L were detected.

Extent of Groundwater Contamination

The "plume" extends from the suspected source area at Building 292 along an unnamed tributary of Mattawoman Creek to Mattawoman Creek. The data do not show continuity in TCE concentrations from the source to Mattawoman Creek. This discontinuity in the plume could imply that there is more than one source, or that there is one source but contaminants are moving down-valley through the sewer and/or creek and entering the groundwater system at one or more locations.

4.0 MODEL CODES

MODFLOW

Groundwater flow was modeled for Site 57 using MODFLOW (McDonald and Harbaugh, 1984). MODFLOW is a finite-difference groundwater model that can simulate two-dimensional (areal or cross-sectional) three-dimensional, transient flow in anisotropic, heterogeneous, layered aquifer systems. The model is based on a block-centered finite-difference approach, using variable grid spacing in x-, y-, and z-directions. Layers may be simulated as (semi-) confined, unconfined, or convertible between conditions. The model can simulate stratigraphic layers that pinch out (representing aquifers, aquitards, or layers within an aquifer). The model allows for analysis of external influences, such as constant or time-varying pumping wells, areal recharge, drains, evapotranspiration, and streams.

MT3D

TCE transport at Site 57 was modeled using the computer code MT3D (Zheng, 1992). MT3D, developed by U.S. EPA, is intended for use with MODFLOW. MT3D retrieves the hydraulic heads and the various flow and sink/source terms saved by the flow model, automatically incorporating the specified hydrologic boundary conditions.

MT3D can be used to simulate changes in concentration of single-species miscible contaminants in groundwater considering advection, dispersion, and some simple chemical reactions. The chemical reactions included in the model-controlled linear or non-linear sorption and first-order, irreversible decay or biodegradation.

GMS

GMS software was used as the pre/post processor for MODFLOW, MODPATH, and MT3D. GMS was developed under the direction of the U.S. Army Corps of Engineers and involves support from the Department of Defense, Department of Energy, and the U.S. Environmental Protection Agency. GMS provides a comprehensive graphical (Windows) environment for numerical modeling, tools for site characterization, model conceptualization, mesh and grid generation, geostatistics, and sophisticated tools for graphical visualization.

5.0 MODEL DESIGN AND DEVELOPMENT

One model grid was used to simulate both groundwater flow and solute transport within the study area. The model grid and the layer boundary conditions are shown on Figure 1. The active model area was aligned with its long dimension parallel to the tributary valley and groundwater flow direction. The model area was divided into 80 columns (aligned north-south), 98 rows (aligned east-west), and one layer. The active model area extends southeast to Mattawoman Creek in the event that the contaminant plume actually migrates the full distance to the creek over time.

Model Assumptions

Groundwater

- Steady-state, 3-dimensional flow
- Aquifer properties vary horizontally
- Precipitation recharge is approximately 5 inches per year

The groundwater flow data suggests that a drain boundary condition is a good representation of the intermittent unnamed tributary to Mattawoman Creek. A single layer was used in the model because the shallow contaminated alluvial sand unit is relatively thin (necessitating only one layer), and this unit is underlain by relatively impermeable silty clay.

Recharge was estimated at a rate of approximately 5 inches per year based on HELP modeling at the Dahlgren site (TtNUS, 2001).

The hydraulic conductivity data obtained from slug tests shows that that hydraulic conductivity in the unconsolidated surficial aquifer is consistent across the site. Field-estimated hydraulic conductivity values throughout the model area are quite consistent, ranging from 1 to less than 20 feet per day. As a result, a limited understanding of this flow parameter exists and a narrow range of hydraulic conductivity values was chosen for the model calibration.

Boundary Conditions

- Boundary conditions are shown in Figure 1.
- Upper boundary of Layer 1 is the water table.
- The bottom of Layer 1 is modeled as being impermeable.
- The drain cells in the model represent the tributary stream and have an elevation of 0.5 to 17 ft above mean seal level (msl).
- The general head boundary cells range in elevation from 2 to 28 ft msl.

The boundary conditions that surround the model constrain the solution more than is typically desired. This constraint is due to the distribution of site data being concentrated along the banks of the unnamed tributary of Mattawoman Creek. Data from the uplands that surround the creek bed are very limited and consist of only cone penetrometer data point. The lack of water elevation data in the upland areas of the site is problematic when constructing the model because an "artificial" boundary condition (a general head in the valley walls) must be defined along the edges of the valley.

Transport

- Changes in the concentration field do not affect the flow field.
- Chemical partitioning of TCE between the groundwater and aquifer material is instantaneous and linear, and reversible.
- TCE degradation is a first-order process.
- Significant quantities of daughter products are not being produced or are not accumulating in the aquifer (i.e., daughter products are degrading or volatilizing).
- Sources of TCE may still exist and have reached steady state in terms of dissolved phase rate of release.

Model Input

- Layer 1 Bottom Elevation ranges from –5 to 5 ft above msl.
- First Sorption Coefficient: TCE: 1.3.
- Bulk Density: 1.6 gm/cm^3.

- Effective Porosity: 0.25 (Estimate).
- Starting Concentrations: Based on RI data.
- Longitudinal Dispersivity: 20 ft (estimate).
- Decay Constant for TCE: 0.0007 $days^{-1}$.

None of the transport parameters listed above were varied between remedial alternatives.

Groundwater Flow and Solute Transport Solvers

- MODFLOW: Strongly Implicit Procedure
- MT3D: Upstream Finite Difference

6.0 MODEL CALIBRATION

Groundwater elevation measurements from on-site monitoring wells were used as a data set to calibrate the steady-state flow model. The current site conditions under which the model was calibrated did account for the groundwater sink that caused the depression of the shallow water table. Adjustments in the hydraulic conductivity were performed in order to reduce the error (residuals) in the observed versus measured groundwater elevation measurements in monitoring wells. Figure 2 shows the differences between the observed versus the measured heads for the final calibrated model containing drain cells. The further the point is away from the standard line the larger the residual for that measuring point. Calibration was performed using manual techniques. After the residuals were reduced to a reasonable level, calibration efforts were terminated. The mean residual error was 0.34 feet, while the mean absolute error and root mean square errors were 0.9 and 1.15 feet, respectively. A summary of the residuals is included in Table 1. Figure 3 shows the simulated groundwater elevations. MODPATH was used to determine whether the flow model correctly predicted flow directions.

The contaminant distribution data do not show the full extent of the TCE plume. Also, information is not available as to when the release(s) occurred. This limitation on the temporal distribution of groundwater analytical data prevents a thorough understanding of the rates at which physical and biological activities are diluting and attenuating the concentrations of contaminants with time. These limitations prevented calibrating the transport model.

7.0 PREDICTIVE SIMULATIONS

The purpose of the predictive simulations was to determine timeframes for natural attenuation and to assess potential future impacts to Mattawoman Creek. Average literature values for decay constants, bulk density, porosity, and partitioning coefficients were combined with site-specific organic carbon

concentrations. Based on this information, an interpretation of the current distribution of contamination is simulated on Figure 4.

Source Removal, Dissolved Phase Natural Attenuation, Institutional Controls, and Monitoring

The model shows that the TCE plume reaches Mattawoman Creek in the future. The amount of time necessary to attain MCLs under a source removal followed by natural attenuation scenario was estimated at approximately 72 years. A plot showing the time frame for the reduction of TCE to below the MCLs is presented in Figure 5.

Source Removal, Pump and Treat, Institutional Controls, and Monitoring

If six pumping wells (pumping a total of 75 gpm) are added along the length of the unnamed tributary to Mattawoman Creek, the time period necessary to attain MCLs for TCE is estimated at 19 years (Figure 6). A figure showing the well configuration of the system is shown on Figure 7.

8.0 MODEL LIMITATIONS

The models used in this study are theoretical representations of the site conditions. Therefore, results from these simulations should be used with a degree of caution. Deterministic models require specific input data at each cell location. The input data are subject to large uncertainties because of the complexity of the natural subsurface system and lack of detailed historical information about the site. Specific data/information lacking for the site include:

- Contaminant source loading history
- Geochemical data, which may vary spatially and temporally
- Temporal groundwater elevation data
- Precise distribution of hydraulic conductivity
- Precise estimates of groundwater velocities
- Effective porosity
- Good estimates of recharge rates over the area
- Contaminant biodegradation rates and partitioning coefficients

In addition to the factors contributing to the uncertainty described above, several assumptions needed to be made, which may affect the direct application of the model results. These assumptions include:

- Very limited horizontal control on hydrogeology and TCE contamination distribution.

Data input in the flow model were based on site-specific data. These flow model data were considered best estimates and, therefore, do not represent overly conservative or non-conservative values. To better understand the uncertainty in the model results, a sensitivity analysis should be performed.

9.0 SUMMARY AND CONCLUSIONS

A TCE transport model was developed using MT3D for the purpose of determining the effects of natural attenuation and groundwater pumping.

It is recommended that a pre-design investigation be conducted prior to the implementation of natural attenuation or any aquifer remediation. The data collected for the investigation include the following:

- Pumping test information from highly-contaminated portions of the plumes,
- Geochemical data from as many monitoring points within the "heart of the plume" should be resampled so that the half-lives of the TCE can be better estimated for modeling.
- Lateral groundwater contamination data outside of the valley of the unnamed tributary to Mattawoman Creek.

The clean-up times for the site appear to be lengthy (72 years for source removal and MNA and 19 years for source removal and pump and treat) because significant concentrations of TCE have migrated beyond the source area. Unless these downgradient sources are eliminated, the sorbed TCE downgradient of the source area will continue to leach TCE into the groundwater system. Pumping only addresses the TCE in the dissolved phase. The leaching rate from the sorbed phase is expected to be the limiting factor in aquifer clean-up time.

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TABLE 1

SUMMARY OF SIMULATED VERSUS OBSERVED POTENTIOMETRIC HEADS
GROUNDWATER MODELING REPORT
SITE 57 – FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

Well	Observed	Computed	Residual
S57MW001/SB001	29.57	31.77	2.20
S57MW002	29.41	31.93	2.52
S57MW003/SB002	26.85	26.96	0.11
S57MW004	26.54	27.06	0.52
S57MW005/SB015	12.58	10.99	-1.59
S57MW006	12.54	10.94	-1.60
S57MW007/SB004	21.31	21.59	0.28
S57MW008	21.71	21.66	-0.05
S57MW009/SB005	16.82	17.12	0.30
S57MW010	16.89	17.06	0.17
S57MW011/SB008	24.18	24.97	0.79
S57MW012/SB013	37.79	37.40	-0.39
S57MW013	38.10	37.38	-0.72
S57TW014	37.16	37.81	0.65
S57TW015/SB027	36.93	37.89	0.96
S57TW016	27.76	26.93	-0.83
S57TW017/SB028	27.35	26.86	-0.49
S57MW020	6.79	7.57	0.78
S57TW021	3.68	4.69	1.01
S57MW022	1.85	3.94	2.09

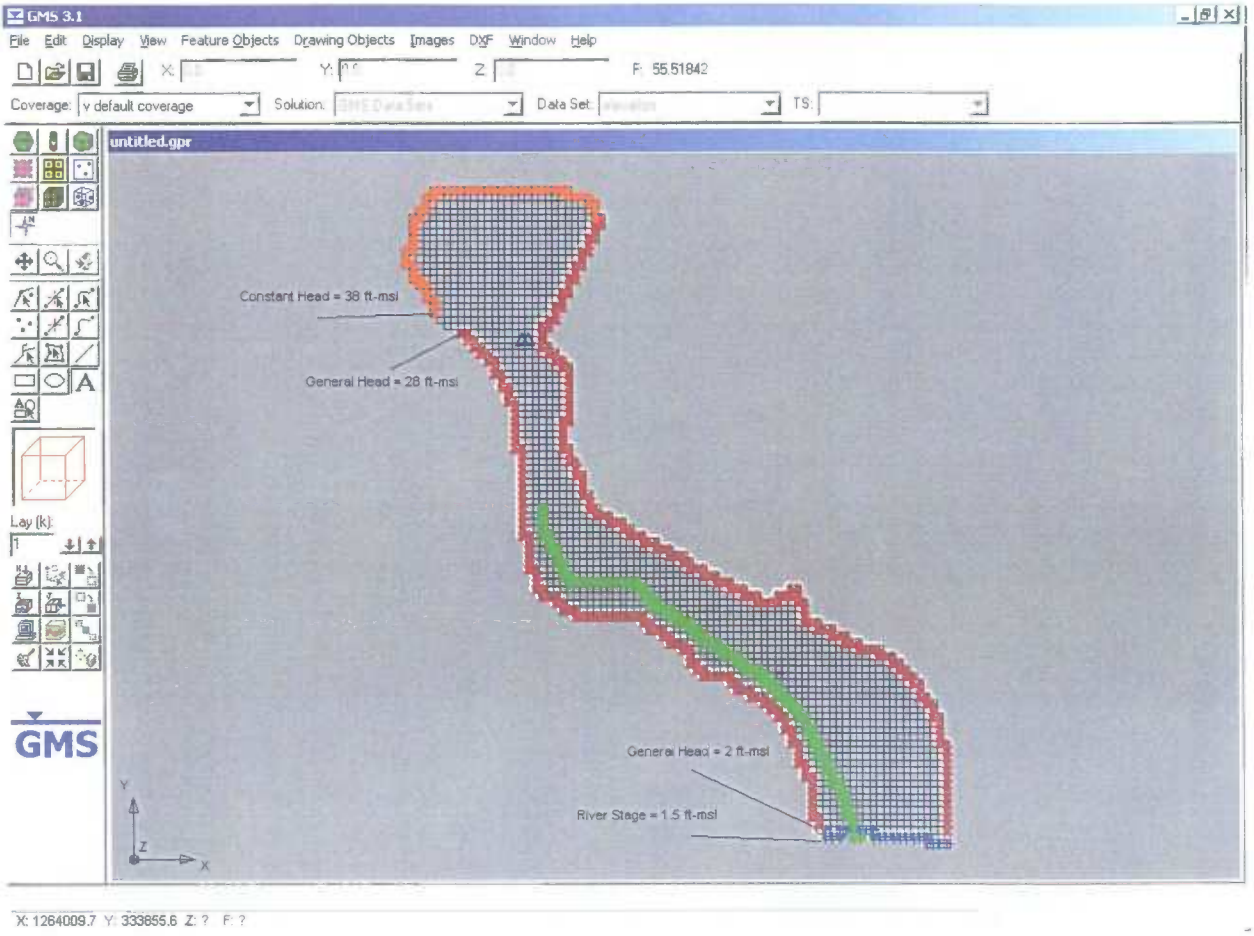


Figure 1 – Boundary Conditions. Boundary conditions for flow model include river cells, general head cells, constant head cells, and stream cells.

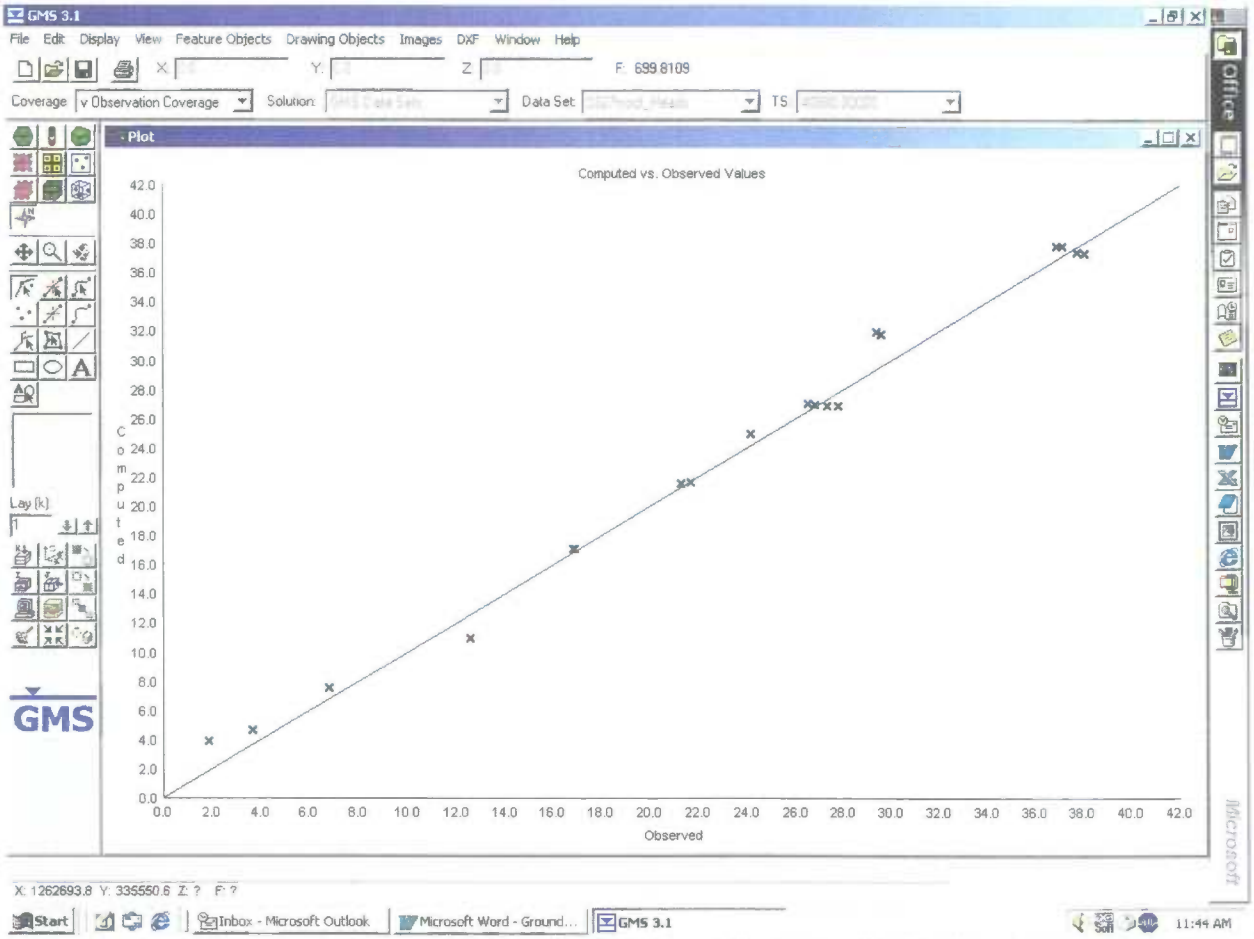


Figure 2 – Computed versus Observed Potentiometric Head Contours. Distribution shows that the model does not overestimate or underestimate the simulated heads throughout the model domain.

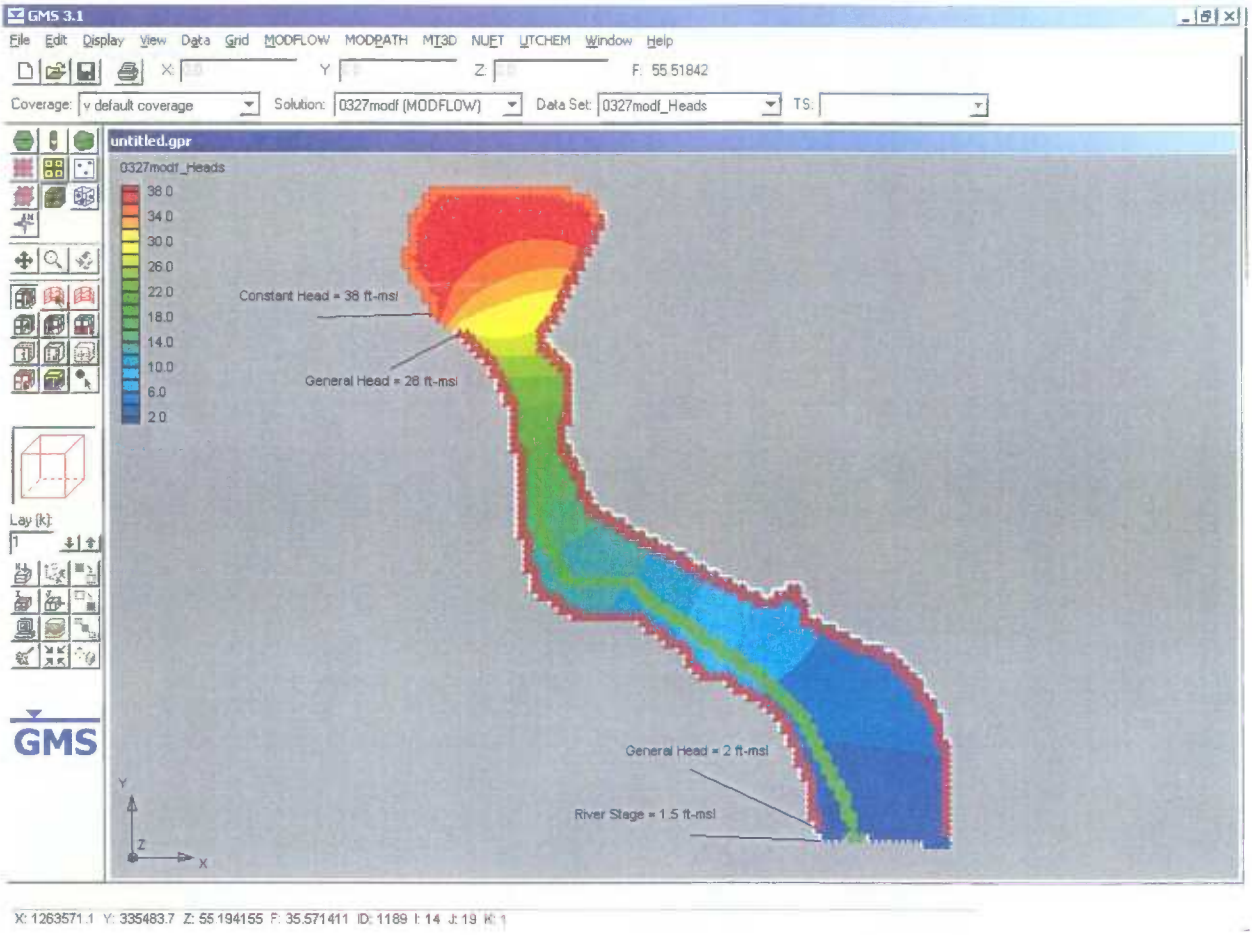


Figure 3 – Simulated Groundwater Flow Field. The density of monitoring points along the unnamed tributary of Mattawoman Creek causes a model result that is highly constrained by boundary conditions and thus is nonunique.

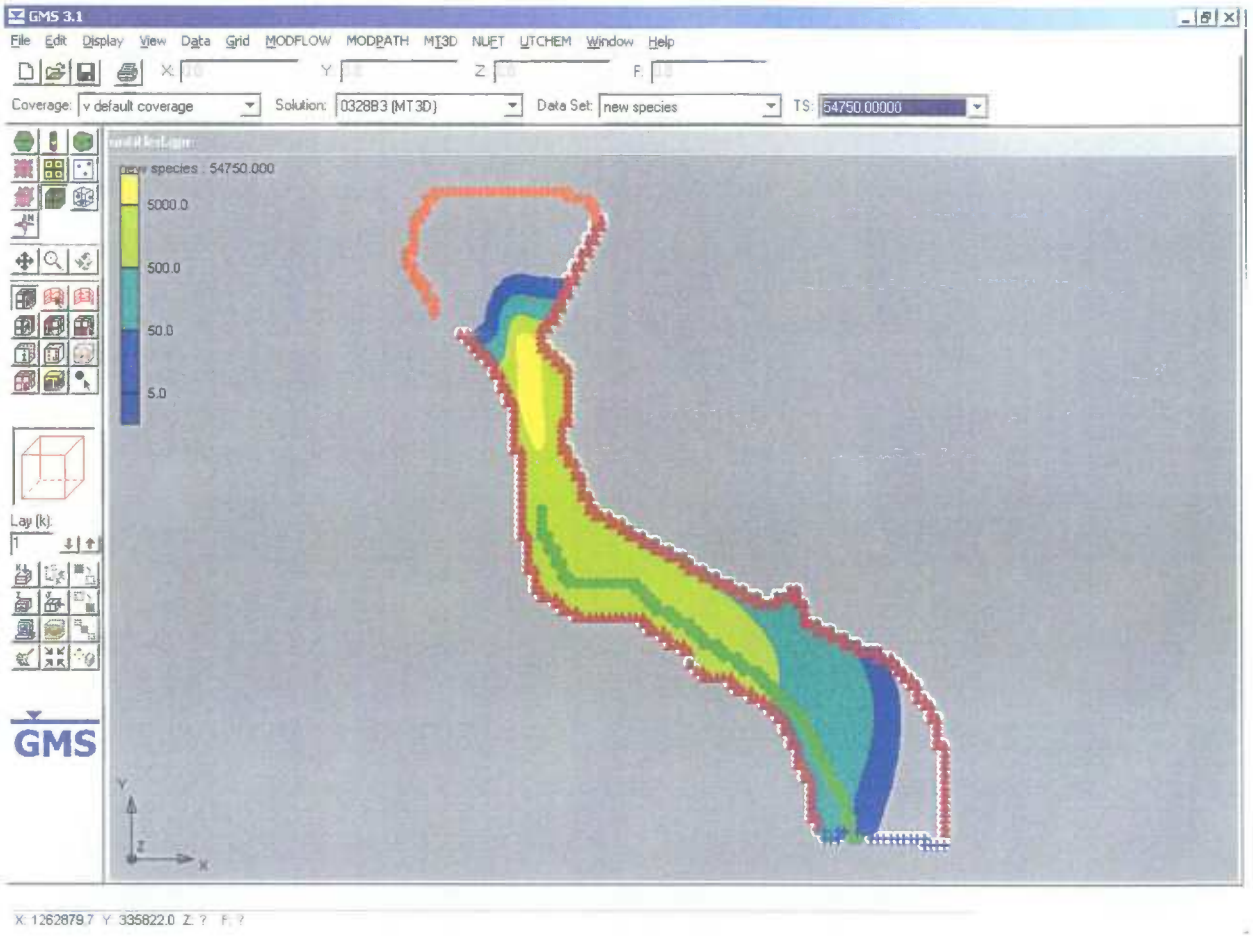


Figure 4 – Steady state distribution of TCE. This distribution assumes that a steady state source is present at monitoring well S57MW004 at a concentration of 12,000 ug/L (the detected concentration in the latest sampling event).

Figure 6
Source Removal with Pump & Treat
Site 57 IHDIV-NSWC

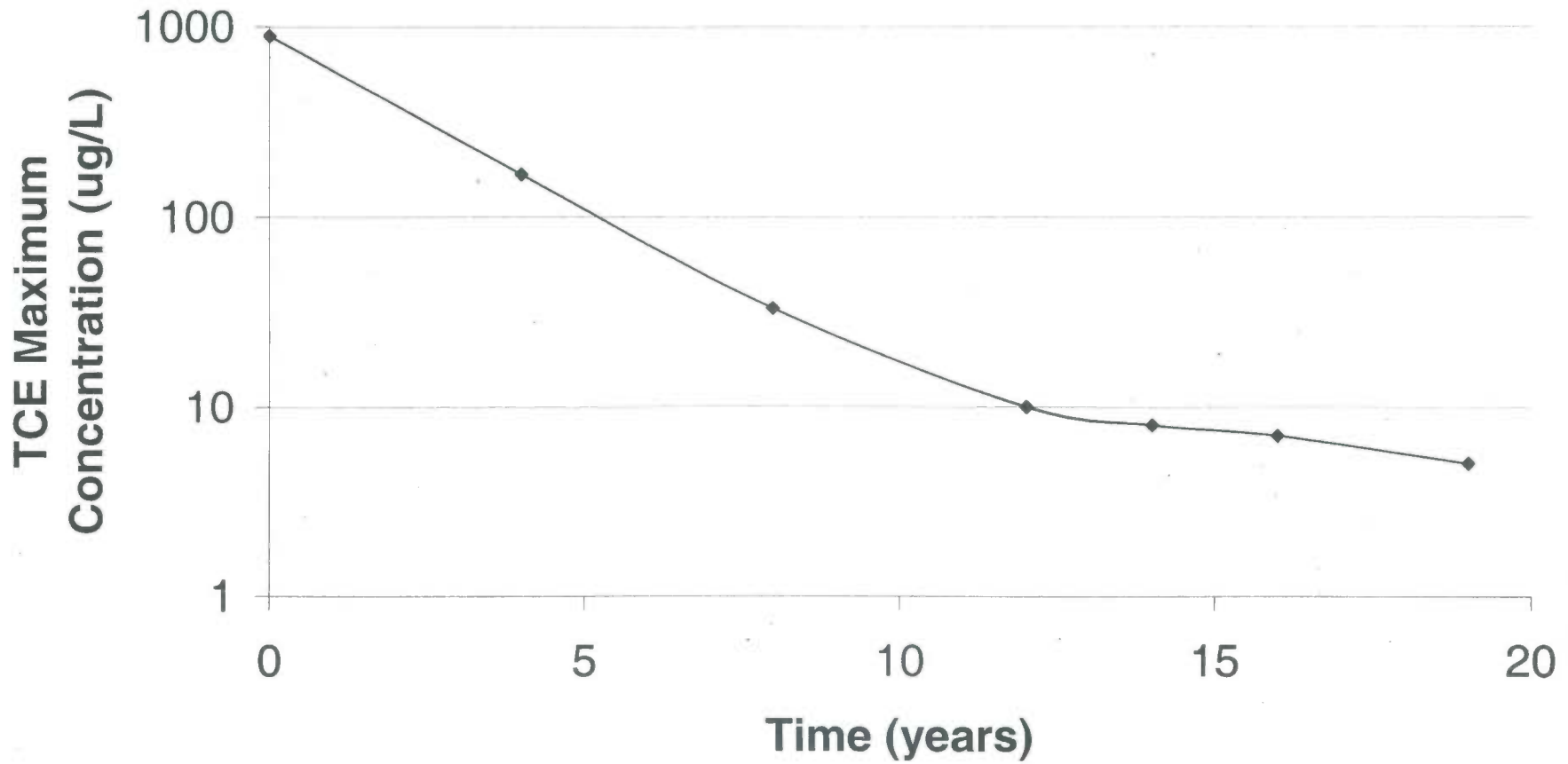
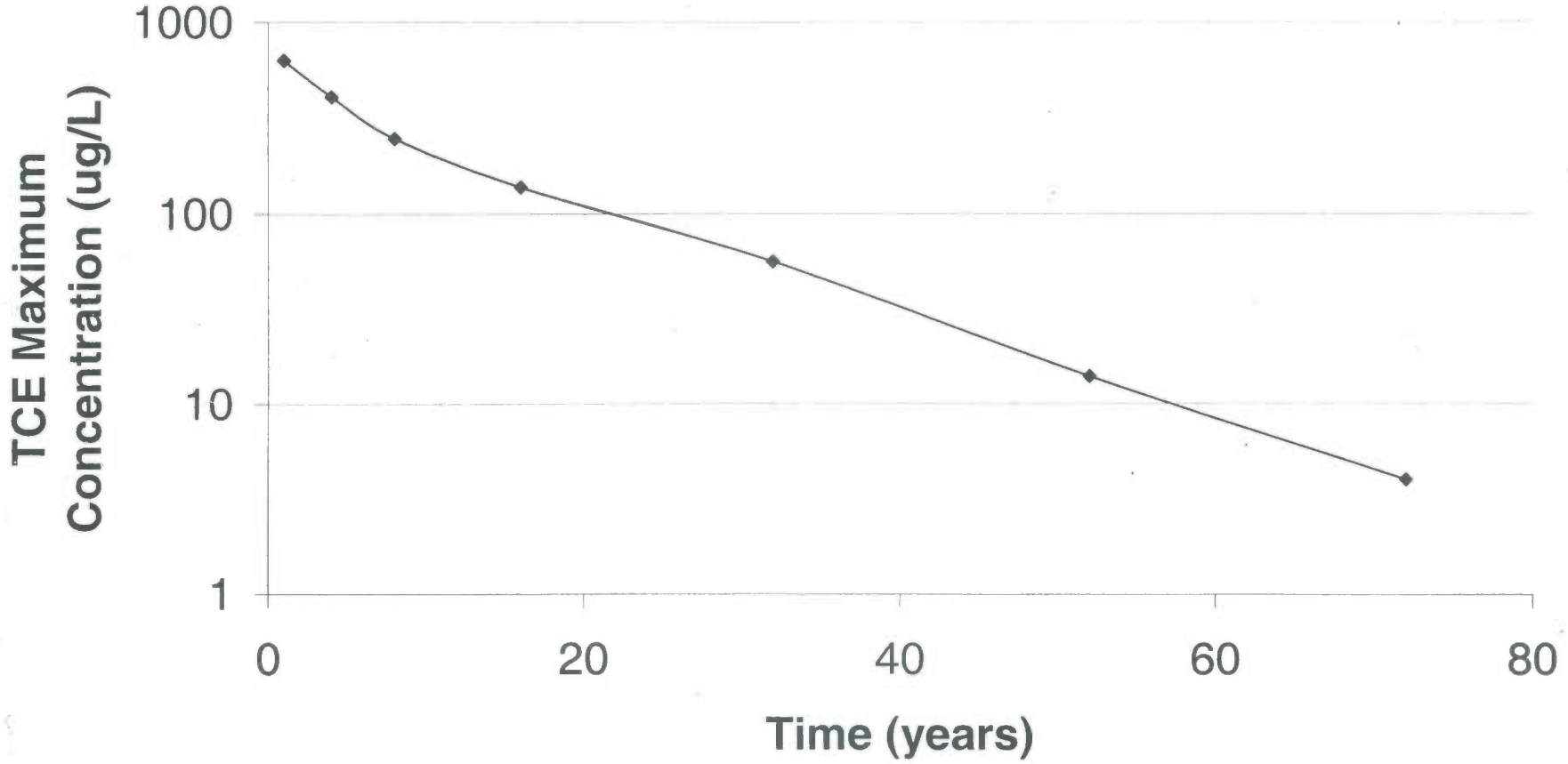


Figure 5
Source Removal and MNA
Site 57 IHDIV-NSWC



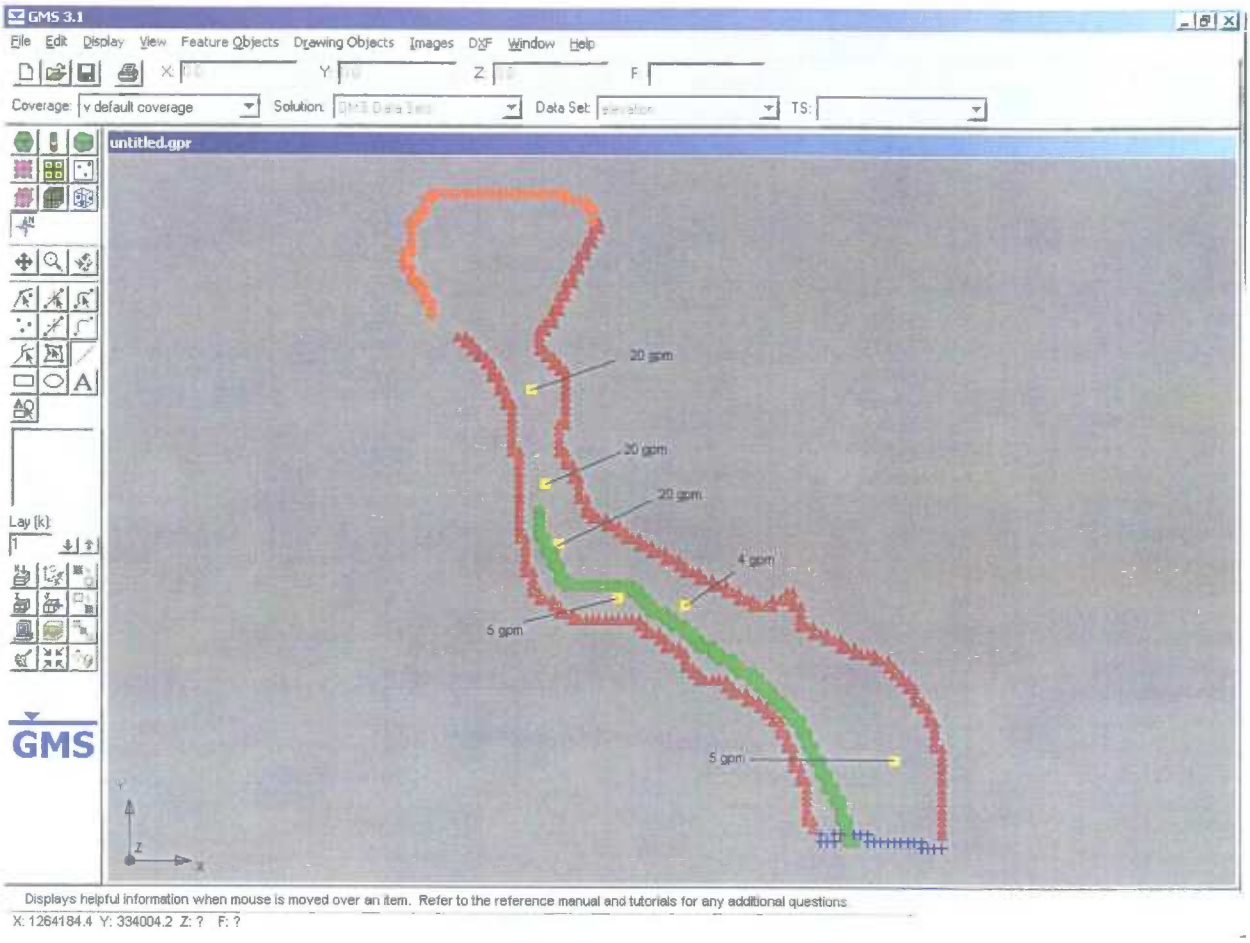


Figure 7 – Pumping Scenario. Six extraction wells are pumping a combined total of 75 gallons per minute (gpm).

G.3 IN SITU BIOLOGICAL TREAMENT

APPENDIX G.3
SCREENING FOR IN-SITU BIOLOGICAL TREATMENT

The screening presented in Appendix G.1 concluded that conditions in the Site 57 groundwater are not favorable to the natural attenuation of chlorinated volatile organic compounds (VOCs). The purpose of the screening in this appendix was to determine whether biological activity could be enhanced to degrade such compounds through reductive anaerobic degradation. The screening was conducted according to a draft technical protocol titled "A Treatability Test for Evaluating the Potential Applicability of the Reductive Anaerobic Biological In Situ Treatment Technology (RABITT) to Remediate Chloroethenes" (ESTCP, 1998). The geologic setting in which a RABITT system is installed governs its successful operation. RABITT systems rely on the delivery of dissolved amendments throughout the contaminant plume. Administering these amendments requires careful engineering and knowledge of the geologic parameters affecting groundwater flow and transport.

The draft technical protocol uses a rating system that includes three independent categories. There are the contaminant profile, hydrogeological profile, and geochemical profile. Each profile contains a category scoring profile table that lists a set of possible site conditions followed by an assigned score. The sum of the scores is compared with the site potential analysis.

The contaminant profile is based on the chemicals detected in the groundwater, including the presence of vinyl chloride (VC), dichloroethene (DCE), tetrachloroethene (PCE), trichloroethene (TCE), dissolved oxygen, and nitrate (see Table G-2 in Appendix G.1 for concentrations in each monitoring well). The scoring for contaminant profile is as follows:

Evidence of Daughter Product Formation	Score
Ethene detected above background levels in or immediately downgradient of a VC daughter plume.	25
VC daughter plume associated with or immediately downgradient from a DCE daughter plume.	15
DCE daughter plume associated with or immediately downgradient from the parent plume (PCE or TCE).	5
No daughter products present and greater than 1 mg/L dissolved oxygen.	0
No daughter products, dissolved oxygen less than 0.5 mg/l, and nitrate less than 1 mg/L.	-6

The hydrogeological profile is based on the hydraulic conductivity (see FS Table 1-2 for hydraulic conductivity values measured in each monitoring well). The scoring for hydraulic conductivity (K) is as follows:

- 25 $K \geq 1.0E\text{-}03$ cm/sec
- 0 $1.0E\text{-}04 < K < 1.0E\text{-}03$ cm/sec
- -50 $K \leq 1.0E\text{-}05$ cm/sec

The geochemical profile is based on measurements of dissolved oxygen, nitrate, hydrogen sulfide, sulfate, redox potential, temperature, dissolved organic carbon, bicarbonate alkalinity, pH, and methane. The scoring for geochemical profile is as follows:

Dissolved Oxygen	Score
< 0.5 mg/L	3
0.5 – 1.0 mg/L	1
1.0 – 3.0 mg/L	0
> 3.0 mg/L	-3

Nitrate	Score
< 1 mg/L	3
1 – 2 mg/L	1
2 – 5 mg/L	0
> 5 mg/L	-3

Hydrogen Sulfide	Score
> 0.1 mg/L	3
≤ 0.1 mg/L	0

Sulfate	Score
< 20 mg/L	2
> 20 mg/L	0

Redox Potential	Score
< -200 mV	1
-200 mV – 200 mV	0
> 200 mV	-1

Temperature	Score
> 15° C	3
10° C – 15° C	0
< 10° C	-3

Dissolved Organic Carbon	Score
> 20 mg/L	3
10 – 20 mg/L	1
< 10 mg/L	0

Bicarbonate Alkalinity	Score
> 5,000 mg/L	1
1,000 – 5,000 mg/L	0
< 1,000 mg/L	-1

pH	Score
6.5 – 7.5	3
6.0 – 6.5 or 7.5 – 8.0	0
5.0 – 6.0 or 8.0 – 9.0	-1
< 5.0 or > 9.0	-5

Methane	Score
> 0.1 mg/L	3
≤ 0.1 mg/L	0

Based on the contaminant profile, hydrogeological profile, and geochemical profile scores listed above, a total point value was calculated for each monitoring well. The results are presented in Table 1. The wells

are presented in approximately upgradient to downgradient in the source area, mid-plume area, and downgradient area of the site. The scores in Table 1 are evaluated below.

Score from 36 to 55: Satisfactory

Some level of dechlorination is probably occurring and hydrogeological and geochemical conditions are favorable. Under these conditions, accelerating RABITT is likely, but care needs to be taken to ensure that DCE does not accumulate. Proceed to microcosm testing and evaluate the microbiological potential for complete dechlorination to ethene. If results are congruent with project goals, proceed with in situ treatability testing to determine the extent of chloroethene degradation and to assess electron donor demand. The three wells in the category include S57MW004, S57MW010, and S57MW022.

Score from 16 to 35: Marginal

Although scores in this range are not strong indicators of success, they do indicate that it is worthwhile to conduct the RABITT treatability test. Sites in this range exhibiting dechlorination and favorable geochemistry often have hydraulic conductivity in the 1.0E-04 cm/sec range. If groundwater manipulation is plausible (i.e., $K \geq$ 5.0E-04 cm/sec), such a site should be considered favorably. Microcosm and treatability testing will provide insight into the extent of dechlorination and electron donor demand that may be expected in situ. Based on the results from these studies, a cost benefit analysis should be used to see if full-scale RABITT implementation is likely to meet project goals at acceptable costs. The five wells in this category include S57MW008, S57TW017, S57TW019, S57MW005, and S57MW006. The hydraulic conductivity at these wells is greater than 5.0E-04 cm/sec.

Score from –5 to 15: Questionable

Scores falling in this range require a closer look. Although stimulating dechlorination at this site may be possible, it will probably be more expensive and time consuming than sites with higher rankings. To be worthy of further consideration, this site must allow the effective distribution of electron donor and nutrients. Therefore, the site's hydraulic conductivity is the key. If substantial groundwater manipulation is plausible (i.e., $K \geq$ 5.0E-04 cm/sec), microcosm testing to evaluate in situ electron donor demand and the microbiological potential for dechlorination should be undertaken. If difficulties are anticipated with groundwater manipulation, the site should be excluded from further consideration. The eight wells in this category include S57MW001, S57MW002, S57MW003, S57MW007, S57MW011, S57TW016, S57MW009, and S57MW020. The hydraulic conductivity at wells S57MW003, S57MW009, and S57MW020 are greater than 5.0E-04 cm/sec. The hydraulic conductivities for the other wells range from 1.7E-04 to 3.9E-04 cm/sec. No COCs were detected above PRGs for wells S57MW001 and S57TW016.

Score from –6 to –15: Unfavorable

The combination of unfavorable geochemical conditions and questionable low hydraulic conductivity make the implementation of RABITT at this site extremely unlikely. Stimulating dechlorination will probably require considerable effort to modify existing geochemical conditions, including the exhaustion of several electron-accepting species. Questionable hydraulic conductivities in the range of 1.0E-04 cm/sec may significantly increase the difficulty and expense of distributing electron donor and nutrients throughout the system. The two wells in the category are S57TW018 and S57TW021. No COCs were detected above PRGs at well S57TW021.

Conclusion

The scoring indicated that in situ biological treatment is worthy of further evaluation in the FS; however, treatability studies are recommended before this technology is implemented.

Reference

ESTCP (Environmental Security Technology Certification Program), 1998. Draft Technical Protocol, A Treatability Test for Evaluating the Potential Applicability of the Reductive Anaerobic Biological In Situ Treatment Technology (RABITT) to Remediation Chloroethenes. Prepared by Batelle Memorial Institute, Columbus, Ohio.

TABLE 1

SUMMARY OF RABITT PARAMETERS SCORING
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

Parameter	MW001	MW002	MW003	MW004	MW007	MW008	MW011	TW016	TW017	TW018
Daughter Product Formation	0	5	5	15	5	0	5	0	0	0
Hydrogeologic Profile	0	0	0	25	0	25	0	0	25	0
Dissolved Oxygen	-3	-3	-3	-3	-3	0	-3	-3	-3	-3
Nitrate	0	0	0	0	0	-3	1	-3	1	-3
Hydrogen Sulfide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate	2	2	2	2	2	2	2	2	2	2
Redox Potential	0	0	-1	0	0	0	0	0	0	0
Temperature	3	3	3	3	3	3	3	3	3	3
Dissolved Organic Carbon	0	0	0	0	0	0	NA	0	0	0
Bicarbonate Alkalinity	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
pH	-1	3	-1	0	-1	0	-1	3	-1	-5
Methane	0	0	0	0	0	0	0	0	0	0
Total Point Value	**0**	**9**	**4**	**41**	**5**	**26**	**6**	**1**	**26**	**-7**
Rating	**Q**	**Q**	**Q**	**S**	**Q**	**M**	**Q**	**Q**	**M**	**U**

S - Satisfactory
M - Marginal
Q - Questionable
U - Unfavorable

TABLE 1

SUMMARY OF RABITT PARAMETERS SCORING
SITE 57 - FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

Parameter	TW019	MW005	MW006	MW009	MW010	MW020	TW021	MW022
Daughter Product Formation	15	0	5	5	15	0	0	25
Hydrogeologic Profile	0	25	25	0	25	0	0	25
Dissolved Oxygen	-3	-3	-3	-3	-3	0	-3	-3
Nitrate	0	3	0	3	-3	0	-3	-3
Hydrogen Sulfide	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate	2	2	2	2	2	2	2	2
Redox Potential	0	-1	-1	-1	0	0	1	0
Temperature	3	3	3	3	3	3	3	3
Dissolved Organic Carbon	0	0	0	0	0	0	0	1
Bicarbonate Alkalinity	-1	-1	-1	-1	-1	-1	-1	-1
pH	0	-5	-5	-1	-1	-1	-5	3
Methane	0	0	0	0	0	0	0	3
Total Point Value	**16**	**23**	**25**	**7**	**37**	**3**	**-6**	**55**
Rating	**M**	**M**	**M**	**Q**	**S**	**Q**	**U**	**S**

S - Satisfactory
M - Marginal
Q - Questionable
U - Unfavorable

APPENDIX H

CONCEPTUAL DESIGN CALCULATIONS

INDIAN HEAD SITE 57 FS REMEDIAL ALTERNATIVES

Soil

1 No Action

2 Capping

3 Excavation and Off-Site Disposal

Groundwater

1 No Action

2 Monitored Natural Attenuation

3 In Situ Biological Treatment

4 Permeable Reactive Barrier

5 Groundwater Extraction and Treatment

CLIENT:	INDIAN HEAD SITE 57 FS			JOB NUMBER:	N4020.1110
SUBJECT:	SOIL ALTERNATIVE 2 - CAPPING				
BASED ON:				DRAWING NUMBER:	
BY:	KCT	CHECKED BY:	KMS	APPROVED BY:	DATE:
Date:	4/12/02	Date:	5/3/02		

Place asphalt/geomembrane cap over area near Bldg. 292 where VOCs exceed PRGs (Fig. 5-1).

Area of contamination = 100 ft x 65 ft

Excavate 2.5 ft of soil to maintain existing grade and provide protection for geomembrane.

Volume = 100 ft x 65 ft x 2.5 ft / 27 ft^3/cy = 602 cy

Haul excavated soil to hazardous waste landfill for disposal. The soil is contaminated with a listed hazardous waste (spent TCE). However, the average TCE concentration in the excavated soil (<50 ppb) is less than the LDR treatment standard for contaminated soil. Therefore, treatment would not be required prior to disposal.

Place 6 in. of select fill for geomembrane bedding as shown in cross section below:

Volume = 100 ft x 65 ft x 0.5 ft / 27 ft^3/cy = 120 cy

Place geomembrane and geotextile

Area = 100 ft x 65 ft = 6500 sf

Place 9 in. of select fill above geomembrane and geotextile

Volume = 100 ft x 65 ft x 0.75 ft / 27 ft^3/cy = 181 cy

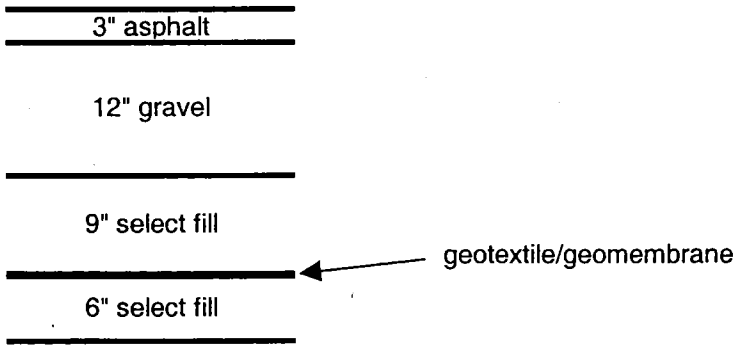
Place 12 in. of gravel for asphalt sub-base

Volume = 100 ft x 65 ft x 1 ft / 27 ft^3/cy = 241 cy

Place 3 in. of asphalt paving

Area = 100 ft x 65 ft = 6500 sf

Cap cross section:



Annual costs would include costs for asphalt maintenance.
Groundwater monitoring is included with groundwater alternatives.

CLIENT:	INDIAN HEAD SITE 57 FS			JOB NUMBER:	N4020.1110
SUBJECT:	SOIL ALTERNATIVE 3 - EXCAVATION AND OFF-SITE DISPOSAL				
BASED ON:				DRAWING NUMBER:	
BY:	KCT	CHECKED BY:	KMS	APPROVED BY:	DATE:
Date:	4/12/02	Date:	5/3/02		

Excavate soil near Bldg. 292 where VOCs and arsenic exceed PRGs (Fig. 5-1).
Area of contamination = 100 ft x 65 ft
Average depth of contamination = 8 ft

Excavate soil near S57SB005 where arsenic exceeds the PRG (Fig. 1-4).
Area of contamination = 10 ft x 10 ft (assumed based on one sampling location)
Depth of contamination = 6 ft

Excavate VOC and arsenic contaminated soil near Bldg. 292.

Volume = 100 ft x 65 ft x 8 ft / 27 ft^3/cy = 1926 cy

Excavate arsenic contaminated soil near S57SB005.

Volume = 10 ft x 10 ft x 6 ft / 27 ft^3/cy = 22 cy

Haul Bldg. 292 soil to hazardous waste landfill for disposal. The soil is contaminated with a listed hazardous waste (spent TCE). However, the average TCE concentration in the excavated soil (based on the average of positive TCE detections) is less than the LDR treatment standard for contaminated soil. Therefore, treatment would not be required prior to disposal.

Haul arsenic contaminated soil from S57SB005 area to solid waste landfill for disposal. This soil is not contaminated with a listed waste.

Collect verification samples from sidewalls and floor of excavation (5 for each area) plus 3 QC samples.
Building 292 area - 8 samples (including QC samples) @ $155 (VOCs and arsenic)
S57SB005 area - 8 samples (including QC samples) @ $25 (arsenic)

Backfill excavations

Volume = 1926 cy + 22 cy = 1948 cy

Replace 18-in. diameter clay storm sewer

Length = 150 feet

Restore backfilled areas

Area = (100 ft x 65 ft) + (10 ft x 10 ft) = 6600 sf

There would be no annual costs associated with this alternative.

CLIENT:	INDIAN HEAD SITE 57 FS			JOB NUMBER:	N4020.1110
SUBJECT:	GROUNDWATER ALTERNATIVE 2 - NATURAL ATTENUATION				
BASED ON:				DRAWING NUMBER:	
BY:	KCT	CHECKED BY:	KMS	APPROVED BY:	DATE:
Date:	4/12/02	Date:	5/3/02		

There are no capital costs associated with this alternative.

Annual costs would include annual sampling of groundwater from 15 existing permanent wells for 30 years (S57MW001 to S57MW013, S57MW020, and S57MW022).

Groundwater samples would be analyzed for TCL VOCs (including diethyl ether) and natural attenuation parameters ($515/sample).

Assume 20 samples per sampling period (including blanks and duplicates).

CLIENT:	INDIAN HEAD SITE 57 FS			JOB NUMBER:	N4020.1110
SUBJECT:	GROUNDWATER ALTERNATIVE 3 - IN SITU BIOREMEDIATION				
BASED ON:				DRAWING NUMBER:	
BY:	KCT	CHECKED BY:	KMS	APPROVED BY:	DATE:
Date:	4/19/02	Date:	5/3/02		

Evaluate 3 areas of the plume based on chemical concentrations and hydrogeology.

Area 1 (Source Area) includes MW001 to MW004, MW007, MW008, TW016 to TW019. The main chlorinated VOCs in this area are cis-1,2-dichloroethene and trichloroethene. This area has higher contaminant concentrations, a greater aquifer thickness, and a steeper hydraulic gradient.

Area 2 (Mid-Plume Area) includes MW005, MW006, MW009, MW010. The main chlorinated VOCs in this area are cis-1,2-dichloroethene and trichloroethene. This area has lower contaminant concentrations, a smaller aquifer thickness, and a shallower hydraulic gradient.

Area 3 (Downgradient Area) includes MW022. The main chlorinated VOCs in this area are cis-1,2-dichloroethene and vinyl chloride. This area is separated from Area 2 by an uncontaminated zone of the aquifer.

Assume that HRC barriers will be used for Areas 1 and 2. Each barrier will be installed approximately perpendicular to the groundwater flow direction (i.e., across the valley). The spacing between each barrier will be based on one year groundwater travel time. Injection spacing and HRC dose will be based on Regenesis HRC Design Software for Barrier Treatment.

Assume that an ORC grid will be used for Area 3. Injection spacing and ORC dose will be based on Regenesis ORC Design Software for Grid Applications using Slurry Injection.

Input Parameters for Area 1 (see page 5 of 7)

Assume the length of the barrier intersecting groundwater flow direction is 160 ft. This is the approximate width of the valley or the area between the valley wall and a structure (e.g., Building 292). HRC barriers will not be installed beneath structures.

Assume depth to contaminated zone is 6 ft. based on the depth to water table on cross-section A-A' (see Fig. 1-6)

Assume thickness of saturated zone is 25 ft. based on cross-section A-A' (ranges from 20 to 30 ft.)

Assume effective porosity is 0.25.

Assume hydraulic conductivity of 1.47 ft/day based on 2001 slug test results for wells in area.

Assume hydraulic gradient of 0.025 ft/ft based on 2001 water level measurements.

Average chemical concentrations based on 2001 groundwater sampling (see page 4 of 7):

cis-1,2-dichloroethene - 0.071 mg/L
trichloroethene - 1.174 mg/L
DO - 3.92 mg/L
Nitrate - 4.35 mg/L
Iron - 0.57 mg/L
Manganese - 0.25 mg/L
Sulfate - 0.35 mg/L

CLIENT:	INDIAN HEAD SITE 57 FS			JOB NUMBER:	N4020.1110
SUBJECT:	GROUNDWATER ALTERNATIVE 3 - IN SITU BIOREMEDIATION				
BASED ON:				DRAWING NUMBER:	
BY:	KCT	CHECKED BY:	KMS	APPROVED BY:	DATE:
Date:	4/19/02	Date:	5/3/02		

Based on an estimated plume length of 550 ft., a seepage velocity of 53.7 ft/yr, and a 1 yr lifespan for one application, 10 barrier walls would be needed. Each barrier would have 2 rows of injection points on 10-ft. centers. (see page 5 of 7)

Install wells upgradient and downgradient of each barrier. Total of 12 wells (approx. 30 ft deep).

Input Parameters for Area 2 (see page 6 of 7)

Assume length of barrier intersecting groundwater flow is 80 ft. This is the approximate width of the of the valley or the area between the valley wall and a structure (e.g., Buildings 157 to 159). HRC barriers will not be installed beneath structures.

Assume depth to contaminated zone is 5 ft. based on depth to water table on cross-section B-B' (see Fig. 1-7).

Assume thickness of saturated zone is 14 ft. based on cross-section B-B' (range is 12 to 16 ft.).

Assume effective porosity is 0.25.

Assume hydraulic conductivity of 5.90 ft/day based on 2001 slug tests for wells in area.

Assume hydraulic gradient of 0.0125 ft/ft based on 2001 water level measurements.

Average chemical concentrations based on 2001 groundwater sampling (see page 4 of 7):

cis-1,2-dichloroethene - 0.07 mg/L
trichloroethene - 0.265 mg/L
DO - 3.94 mg/L
Nitrate - 2.68 mg/L
Iron - 1.21 mg/L
Manganese - 0.05 mg/L
Sulfate - 0.7 mg/L

Based on an estimated plume length of 500 ft, a seepage velocity of 107.7 ft/yr, and a 1 yr lifespan for one application, 5 barrier walls would be needed. Each barrier would have 2 rows of injection points on 10-ft centers. (see page 6 of 7)

Install wells upgradient and downgradient of each wall. Total of 7 wells (approx. 20 ft deep).

Input Parameters for Area 3 (see page 7 of 7)

Assume width of plume is 150 ft. and assume length of plume is 150 ft. Actual dimensions may vary because there is only one permanent well (MW022) in this area. Temporary well TW003, which was installed, sample, and removed in 1999, is approximate 50 ft. from MW022.

Assume depth to contaminated zone 6 ft. based on the depth to water table on cross-section B-B' (see Fig. 1-7).

CLIENT:	INDIAN HEAD SITE 57 FS			JOB NUMBER:	N4020.1110
SUBJECT:	GROUNDWATER ALTERNATIVE 3 - IN SITU BIOREMEDIATION				
BASED ON:				DRAWING NUMBER:	
BY:	KCT	CHECKED BY:	KMS	APPROVED BY:	DATE:
Date:	4/19/02	Date:	5/3/02		

Assume thickness of saturated zone is 8 ft. based on cross-section B-B'. Although the clayey sand unit at this location is a poor aquitard based on field observations, the concentrations of chlorinated VOCs were much lower in a groundwater sample from CP005, which is deeper than MW022.

Assume effective porosity is 0.25.

Assume hydraulic conductivity of 3.3 ft/day based on 2001 slug test data for MW022.

Assume hydraulic gradient of 0.0125 based on 2001 water level measurements.

Chemical concentrations based on 1999 results (TW003) and 2001 results (MW022) (see page 4 of 7)):

cis-1,2-dichloroethene - 0.83 mg/l
vinyl chloride - 0.793 mg/L
COD - 29 mg/L
ferrous iron - 4.8 mg/L

Based on the ORC spreadsheet, the ORC requirements for COD are higher than the requirements for the individual chemicals.

Install wells upgradient and downgradient of area. Total of 2 wells (approx. 15 ft. deep).

Other Capital Costs

Collect groundwater samples from new wells (21) and existing wells (15) one month after treatment.
Assume 40 samples for HRC @ $515.
Assume 5 samples for ORC @ $205.

Annual Costs

Annual groundwater sampling for 2 years.
Same number of samples and analytical cost as above.

Average Groundwater Concentrations for PRGs
2001 data. If not available, used 1999 data.

Source Area

Analyte	MW001	MW002	MW003	MW004	MW007	MW008	MW011	TW016	TW017	TW018	TW019	Average
cis-1,2-Dichloroethene	0	2.6	30	620	25	0	30	0	0	66	5.5	71
1,1-Dichloroethene	0	0	3	6.5	7	0	0	0	0	3.1	0	2
Ethyl ether	450	930	380	320	375	1300	1700	5.4	4800	2.1	77	940
Tetrachloroethene	0	0	0	6.3	0	0	0	0	1.6	0	0	1
Trichloroethene	0	43	365	12000	140	0	94	0	1.1	210	62	1174
Vinyl chloride	0	0	0	26	0	0	0	0	0	0	0	2
DO (mg/L)	3.2	3.26	3.43	3.26	4.06	2.48	3.3	7.91	4.05	4.35	3.8	3.92
Nitrate (mg/L)	4.1	3.6	4.8	4.91	3.05	6.8	1.6	5.6	1.2	8.4	3.8	4.35
Iron	0	0	0	0	164	312	1060	0	0	4490	200	566
Manganese	NA	244	250	244	NA	NA	NA	NA	NA	NA	NA	246
Sulfate (mg/L)	1.3	0	1.3	0	0	0	1.3	0	0	0	0	0.35
Hydaulic conductivity*	0.74	1.1	3.18	15.2	0.57	9.33	0.5	0.53	4.4	0.17	1.66	1.47

*geometric mean ft/day

Mid-Plume

Analyte	MW005	MW006	MW009	MW010	Average
cis-1,2-Dichloroethene	0	46	85	150	70
1,1-Dichloroethene	0	6.7	28	13	12
Ethyl ether	570	0	0	0	143
Tetrachloroethene	0	0	0	0	0
Trichloroethene	0	250	480	330	265
Vinyl chloride	0	0	0	5.5	1
DO (mg/L)	4.3	4.34	3.14	3.97	3.94
Nitrate (mg/L)	0	3.9	0	6.8	2.68
Iron	0	0	0	4850	1213
Manganese	NA	NA	48.5	NA	48.5
Sulfate (mg/L)	0	1.8	0	1	0.70
Hydaulic conductivity*	18.4	14.9	1.5	2.95	5.90

*geometric mean ft/day

Downgradient

Analyte	MW022	TW003	Average	CP005
cis-1,2-Dichloroethene	1400	260	830	0
1,1-Dichloroethene	0	0	0	0
Ethyl ether	0	0	0	760
Tetrachloroethene	0	0	0	0
Trichloroethene	0	0	0	10
Vinyl chloride	1500	85	792.5	0
Iron (+2)	4.8	NA	4.8	
COD (mg/L)	29	NA	29	NA
Hydaulic conductivity*	3.3	NA	3.3	NA

*geometric mean ft/day
TW003 was sample in 1999.
CP005 was sampled from below the CVOC contamination zone

HRC Design Software for Barrier Treatment

US Version 3.0

Regenesis Technical Support: USA (949) 366-8000, www.regenesis.com

Site Name: Site 57
Location: Area 1
Consultant:

Site Conceptual Model/Extent of Plume Requiring Remediation

Length of Barrier (intersecting gw flow direction)	160	ft		
Depth to contaminated zone	6	ft		
Thickness of contaminated saturated zone	25	ft		
Aquifer soil type		<-(not recognized, enter Kh or Vs below)		
Effective porosity	0.25			
Hydraulic conductivity	1.47	ft/day =	5.2E-04	cm/sec
Hydraulic gradient	0.025	ft/ft		
Seepage velocity	53.7	ft/yr =	0.147	ft/day,

Dissolved Phase Electron Donor Demand

	Contaminant Loading Conc (mg/L)	Contaminant Loading Mass (lb)	Stoich. (wt/wt) contam/H_2
Tetrachloroethene (PCE)	0.00	0.00	20.7
Trichloroethene (TCE)	1.17	3.93	21.9
cis-1,2-dichloroethene (DCE)	0.07	0.24	24.2
Vinyl Chloride (VC)	0.00	0.00	31.2
Carbon tetrachloride	0.00	0.00	19.2
Chloroform	0.00	0.00	19.9
1,1,1-Trichloroethane (TCA)	0.00	0.00	22.2
1,1-Dichlorochloroethane (DCA)	0.00	0.00	24.7
Hexavalent Chromium	0.00	0.00	17.3
User added, also add stoichiometric demand	0.00	0.00	0.0
User added, also add stoichiometric demand	0.00	0.00	0.0

Competing Electron Acceptors:

	Electron Acceptor Loading Conc (mg/L)	Electron Acceptor Loading Mass (lb)	Stoich. (wt/wt) contam/H_2
Oxygen	3.92	13.12	8.0
Nitrate	4.35	14.56	12.4
Est. Mn reduction demand (potential amt of Mn2+ formed)	0.25	0.84	27.5
Est. Fe reduction demand (potential amt of Fe2+ formed)	0.57	1.91	55.9
Estimated sulfate reduction demand	0.35	1.17	12.0

Microbial Demand Factor	3	Recommend 1-4x
Safety Factor	2	Recommend 1-4x
Lifespan for one application	1	Year(s)

Injection Spacing and Dose:

Number of rows in barrier	2	rows
Spacing within rows	10	ft on center spacing within rows
Effective spacing perpendicular to flow (ft)	5.0	
Total number of HRC injection locations	32	points
Minimum required HRC dose per foot (lb/ft)	2.0	<- Minimum Dose Override

Project Summary			
Number of HRC delivery points (adjust as nec. for site)		32	
HRC Dose in lb/foot (adjust as nec. for site)		2.0	<- Minimum Dose Override
Corresponding amount of HRC per point (lb)		50	
Number of 30 lb HRC Buckets per injection point		1.7	
Total Number of 30 lb Buckets		54	
Total Amt of HRC (lb)		1,620	
HRC Cost	$	7.00	
Total Material Cost	**$**	**11,340**	
Shipping and Tax Estimates in US Dollars			
Sales Tax rate: 5%	$	567	
Total Matl. Cost w/Tax	$	11,907	
Shipping of HRC (call for amount)	$	-	
Total Regenesis Material Cost	**$**	**11,907**	

HRC Installation Cost Est. (responsibility of customer to contract work)			**Other Project Costs**		
Footage for each inj. point = uncontaminated + HRC inj. interval (ft)		31	Design and Regulatory Issues	$	-
Total length for direct push for project (ft)		992	Groundwater monitoring and reporting	$	-
Estimated daily installation rate (ft per day: 500 for push, 200 for drilling)		400	Other	$	-
Estimated points per day (10 to 20 is typical for direct push)		12.9	Other	$	-
Required number of days		3	Other	$	-
Mob/demob cost for injection subcontractor	$	1,000	Other	$	-
Daily rate for inj. Sub. ($1-2K for push $3-4K for drill rig)	$	1,500	Other	$	-
Total injection subcontrator cost for application	$	5,500	Other	$	-
Total Install Cost(not inc. consultant, lab, etc.)	**$**	**17,407**	**Total Project Cost**	**$**	**17,407**

HRC Design Software for Barrier Treatment

US Version 3.0

Regenesis Technical Support: USA (949) 366-8000, www.regenesis.com

Site Name: Site 57
Location: Area 2
Consultant:

Site Conceptual Model/Extent of Plume Requiring Remediation

Length of Barrier (intersecting gw flow direction)	80	ft		
Depth to contaminated zone	5	ft		
Thickness of contaminated saturated zone	14	ft		
Aquifer soil type		<-(not recognized, enter Kh or Vs below)		
Effective porosity	0.25			
Hydraulic conductivity	5.9	ft/day =	2.1E-03	cm/sec
Hydraulic gradient	0.0125	ft/ft		
Seepage velocity	107.7	ft/yr =	0.295	ft/day,

Dissolved Phase Electron Donor Demand

	Contaminant Loading Conc (mg/L)	Contaminant Loading Mass (lb)	Stoich. (wt/wt) contam/H_2
Tetrachloroethene (PCE)	0.00	0.00	20.7
Trichloroethene (TCE)	0.27	0.50	21.9
cis-1,2-dichloroethene (DCE)	0.07	0.13	24.2
Vinyl Chloride (VC)	0.00	0.00	31.2
Carbon tetrachloride	0.00	0.00	19.2
Chloroform	0.00	0.00	19.9
1,1,1-Trichloroethane (TCA)	0.00	0.00	22.2
1,1-Dichlorochloroethane (DCA)	0.00	0.00	24.7
Hexavalent Chromium	0.00	0.00	17.3
User added, also add stoichiometric demand	0.00	0.00	0.0
User added, also add stoichiometric demand	0.00	0.00	0.0

Competing Electron Acceptors:

	Electron Acceptor Loading Conc (mg/L)	Electron Acceptor Loading Mass (lb)	Stoich. (wt/wt) contam/H_2
Oxygen	3.94	7.41	8.0
Nitrate	2.68	5.04	12.4
Est. Mn reduction demand (potential amt of Mn2+ formed)	0.05	0.09	27.5
Est. Fe reduction demand (potential amt of Fe2+ formed)	1.21	2.28	55.9
Estimated sulfate reduction demand	0.70	1.32	12.0

Microbial Demand Factor	3	Recommend 1-4x
Safety Factor	2	Recommend 1-4x
Lifespan for one application	1	Year(s)

Injection Spacing and Dose:

Number of rows in barrier	2	rows
Spacing within rows	10	ft on center spacing within rows
Effective spacing perpendicular to flow (ft)	5.0	
Total number of HRC injection locations	16	points
Minimum required HRC dose per foot (lb/ft)	2.0	<- Minimum Dose Override

Project Summary			
Number of HRC delivery points (adjust as nec. for site)		16	
HRC Dose in lb/foot (adjust as nec. for site)		2.0	<- Minimum Dose Override
Corresponding amount of HRC per point (lb)		28	
Number of 30 lb HRC Buckets per injection point		0.9	
Total Number of 30 lb Buckets		15	
Total Amt of HRC (lb)		450	
HRC Cost		$ 8.00	
Total Material Cost		**$ 3,600**	
Shipping and Tax Estimates in US Dollars			
Sales Tax	rate: 5%	$ 180	
Total Matl. Cost w/Tax		$ 3,780	
Shipping of HRC (call for amount)		$ -	
Total Regenesis Material Cost		**$ 3,780**	

HRC Installation Cost Est. (responsibility of customer to contract work)			**Other Project Costs**		
Footage for each inj. point = uncontaminated + HRC inj. interval (ft)		19	Design and Regulatory Issues	$	-
Total length for direct push for project (ft)		304	Groundwater monitoring and reporting	$	-
Estimated daily installation rate (ft per day: 500 for push, 200 for drilling)		400	Other	$	-
Estimated points per day (10 to 20 is typical for direct push)		21.1	Other	$	-
Required number of days		1	Other	$	-
Mob/demob cost for injection subcontractor	$	1,000	Other	$	-
Daily rate for inj. Sub. ($1-2K for push $3-4K for drill rig)	$	1,500	Other	$	-
Total injection subcontrator cost for application	$	2,500	Other	$	-
Total Install Cost(not inc. consultant, lab, etc.)	**$**	**6,280**	**Total Project Cost**	**$**	**6,280**

ORC Design Software for Grid Applications Using Slurry Injection

US Version 3.0

Regenesis Technical Support: USA (949) 366-8000, www.regenesis.com

Site Name: Site 57
Location: Area 3
Consultant:

Site Conceptual Model/Extent of Plume Requiring Remediation

Width of plume (intersecting gw flow direction)	150 ft			
Length of plume (parallel to gw flow direction)	150 ft	=	22,500	sq. ft.
Depth to contaminated zone	6 ft			
Thickness of contaminated saturated zone	8 ft			
Nominal aquifer soil (gravel, sand, silty sand, silt, clay)		<-(not recognized, enter Kh or Vs below)		
Total porosity	0.3	Eff. porosity	0.25	
Hydraulic conductivity	3.3 ft/day	=	1.2E-03	cm/sec
Hydraulic gradient	0.0125 ft/ft			
Seepage velocity	60.2 ft/yr	=	0.165	ft/day
Treatment Zone Pore Volume	54,000 ft^3	=	403,974	gallons

Dissolved Phase Oxygen Demand:

Individual species that represent oxygen demand:	Contaminant Conc (mg/L)	Contaminant Mass (lb)	Stoich. (wt/wt) O_2/contam.	ORC (lb) (10% O_2)
benzene	0.00	0.0	3.1	0
toluene	0.00	0.0	3.1	0
ethylbenzene	0.00	0.0	3.2	0
xylenes	0.00	0.0	3.2	0
MTBE	0.00	0.0	2.7	0
dichloroethene	0.83	2.8	0.7	20
vinyl chloride	0.79	2.7	1.3	35
User added, also add stoichiometric demand	0.00	0.0	0.0	0
User added, also add stoichiometric demand	0.00	0.0	0.0	0
reduced metals: Fe (+2) and Mn(+2)	4.80	16.2	0.10	16
Measures of total oxygen demand				
Total Petroleum Hydrocarbons	0.00	0.0	3.1	0
Biological Oxygen Demand (BOD)	0.00	0.0	1	0
Chemical Oxygen Demand (COD)	29.00	97.7	1	977

Estimates for Sorbed Phase Oxygen Demand:

Soil bulk density	1.76 g/cm^3	=	110	lb/cf
Fraction of organic carbon: foc	0.005	range: 0 to 0.01		

(Estimated using Soil Conc=foc*Koc*Cgw)
(Adjust Koc as nec. to provide realistic est.)

Individual species that represent oxygen demand:	Koc (L/kg)	Contaminant Conc (mg/kg)	Contaminant Mass (lb)	Stoich. O_2/contam.	ORC (lb) (10% O_2)
benzene	83	0.00	0.0	3.1	0
toluene	135	0.00	0.0	3.1	0
ethylbenzene	95	0.00	0.0	3.2	0
xylenes	240	0.00	0.0	3.2	0
MTBE	12	0.00	0.0	2.7	0
dichloroethene	80	0.33	6.6	0.7	46
vinyl chloride	2.5	0.01	0.2	1.3	3
User added, also add stoichiometric demand	0.0	0.00	0.0	0.0	0
User added, also add stoichiometric demand	0.0	0.00	0.0	0.0	0
Measures of total oxygen demand					
Total Petroleum Hydrocarbons	178	0.00	0.0	3.1	0
Biological Oxygen Demand (BOD): Use a multiple of dissolved phase -> 1.00			0.0	1	0
Chemical Oxygen Demand (COD): Use a multiple of dissolved phase -> 1.00			97.7	1	977

Summary of Estimated ORC Requirements

	ORC for Dissolved Phase (lbs)	ORC for Sorbed Phase (lbs)	Add Dem Factor (1 to 10x)	ORC Total w/ Add Dem Factor	ORC Cost at $ 10.00	
Individual Species: Total BTEX, MTBE	70	49	5	594	$ 5,942	
Total Petroleum Hydrocarbons	-	-	2	-	$ -	
Biological Oxygen Demand (BOD)	-	-	2	-	$ -	
Chemical Oxygen Demand (COD)	977	977	1	1,954	$ 19,537	<-

Select above measure (button) to specify required ORC quantity (in 30 lb increments) ——> 1,980 pounds ORC

Delivery Design for ORC Slurry

Spacing within rows (ft)	10.0 feet	
# points per row	15 points/row	
Spacing between rows (ft)	10.0 ft	
# of rows	15 rows	
Advective travel time bet. rows (days)	61 days	
Number of points in grid	225 points	
Required ORC per foot	Minimum Dose Override-> 2.0 lbs/foot	
Total ORC	Minimum Dose Override-> 3,600 lbs of ORC	

Slurry Mixing Volume for Injections

Pounds per location	16
Buckets per location	0.5
Design solids content (20-40% by wt. for injections)	30%
Volume of water required per hole (gal)	4
Total water for mixing all holes (gal)	1007
Simple ORC Backfilling: min hole dia. for 67% slurry	2.3
Feasibility for slurry injection in sand: ok up to 15 lb/ft	(ok)
Feasibility for slurry injection in silt: ok up to 10 lb/ft	(ok)
Feasibility for slurry injection in clay: ok up to 5 lb/ft	(ok)

Project Summary		
ORC bulk material for slurry injection (lbs)		3,600
Number of 30 lb ORC buckets		120.0
ORC bulk material cost	$	9.00
Cost for bulk ORC material	$	32,400
Shipping and Tax Estimates in US Dollars		
Sales Tax rate: 5%	$	1,620
Total Matl. Cost	$	34,020
Shipping (call for amount)	$	-
Total Regenesis Material Cost	$	34,020

ORC Slurry Injection Cost Est. (responsibility of customer to contract work)		
Footage for each inj. point = uncontaminated + HRC inj. interval (ft)		14
Total length for direct push for project (ft)		3,150
Estimated daily installation rate (ft per day: 400 for push, 150 for drilling)		400
Estimated points per day (15 to 30 is possible for direct push)		28.6
Required number of days		8
Mob/demob cost for injection subcontractor	$	1,000
Daily rate for inj. Sub. ($1-2K for push $3-4K for drill rig)	$	1,500
Total injection subcontrator cost for application	$	13,000
Total Install Cost (not including consultant, lab, etc.)	$	47,020

Other Project Cost Estimates		
Design	$	-
Permitting and reporting	$	-
Construction management	$	-
Groundwater monitoring and rpts	$	-
Other	$	-
Other	$	-
Other	$	-
Other	$	-
Total Project Cost	$	47,020

CLIENT:	INDIAN HEAD SITE 57 FS			JOB NUMBER:	N4020.1110
SUBJECT:	GROUNDWATER ALTERNATIVE 4 - PERMEABLE REACTIVE BARRIER				
BASED ON:				DRAWING NUMBER:	
BY:	KCT	CHECKED BY:	KMS	APPROVED BY:	DATE:
Date:	4/19/02	Date:	5/3/02		

All calculations and assumptions are very preliminary. A treatability study and additional groundwater modeling would be needed to confirm and refine assumptions.

The pre-FS investigation assumed a permeable reactive barrier (PRB), using iron as the reactive medium, would be installed in the area where borings S57SB030 through S57SB032 were installed (see Fig. 1-4). This area is near the downgradient portion of the TCE plume.

The depth to the confining unit at these borings (cross-section D-D' on Fig. 1-8) is as follows: SB030 - 20 ft; SB031 - 19 ft; SB032 - 6 ft. The average depth is approximately 15 ft. The depth to groundwater in this area (cross-section B-B') is approximately 4 ft. Therefore, the height of the PRB (aquifer thickness) would be 15 ft - 4 ft = 11 ft.

The PRB would extent across the valley from SB030 to SB032, which is approximately 210 ft. This would include the PRB gate (70 ft) and the slurry wall funnel on each side of the reactive zone (70 ft. each).

The thickness of the PRB equals the groundwater velocity multiplied by the residence time required. The groundwater velocity can be estimated using slug test data from wells MW005/MW006 located upgradient of the proposed location and well MW020 located downgradient of the proposed location. Based on slug test data obtained during the pre-FS investigation, there is a wide variation in the hydraulic conductivity values for these wells. The average hydraulic conductivity for well cluster MW005/MW006 is 16.65 ft/day, and the hydraulic conductivity for well MW020 is 2.25 ft/day (Table 1-2). Therefore, the average hydraulic conductivity in the area is 9.45 ft/day.

Groundwater velocity = (hydraulic conductivity)*(hydraulic gradient/effective porosity)

The hydraulic gradient between locations MW005/MW006 and MW020 is 0.02 ft/ft (Figure 1-9). The effective porosity is 0.25. Therefore, the groundwater velocity is 9.45*(0.02/0.25) = 0.76 ft/day.

The residence time can be estimated using literature-based half-life values for TCE. The half-life values contained in the Design Guidance for Application of Permeable Reactive Barriers for Groundwater Remediation (Batelle, 2000) vary widely and range from 0.67 hr to 9.7 hr (see page 3 of 3). According to this guidance the actual half-life may vary depending on the iron source and site-specific groundwater chemistry. A treatability study would be required to determine the half-life for design. A lower half-life value would correspond to a faster degradation rate. The average half-life based on values provided in this guidance is approximately 3.5 hr. The TCE concentration at shallow upgradient well MW006 is 250 µg/L. TCE was not detected in the deep upgradient well (MW005) or well MW020. Assuming a starting TCE value of 250 µg/L, the required residence time to attain the PRG for TCE (5 µg/L) would be approximately 21 hr, as shown below:

TCE (µg/L)	Time (hr)
250	0
125	3.5
62.5	7
31.25	10.5
15.625	14
7.8125	17.5
3.90625	21

CLIENT:	INDIAN HEAD SITE 57 FS			JOB NUMBER:	N4020.1110
SUBJECT:	GROUNDWATER ALTERNATIVE 4 - PERMEABLE REACTIVE BARRIER				
BASED ON:				DRAWING NUMBER:	
BY:	KCT	CHECKED BY:	KMS	APPROVED BY:	DATE:
Date:	4/19/02	Date:	5/3/02		

The required PRB thickness equals velocity x residence time

Thickness = (0.76 ft/day*21 hr) / (24 hr/day) = 0.665 ft.

The design guidance (Batelle, 2000) recommends applying a correction (safety) factor to account for changes in bulk density of the reactive medium between the laboratory and the field, seasonal variations in groundwater flow, potential loss of reactivity of the iron over time, and any other field uncertainties.

Assuming a safety factor of 5, the PRB thickness would be approximately 3.5 ft.

Following is a summary of the PRB gate and slurry wall funnel dimensions:

Length = 210 ft (70 ft PRB gate and 70 ft slurry wall on each side of gate)
Height = 11 ft
Thickness = 3.5 ft

These calculations and assumptions are for FS cost estimating purposes only. The required dimensions could vary based on the results of treatability studies and additional hydrogeologic modeling. These additional studies would also be needed to optimize the final design.

Annual Costs

Assume annual sampling of existing permanent wells (15) for 30 years (MW001 to MW013, MW020, and MW022). Samples would be analyzed for TCL VOCs (including diethyl ether).

Assume 20 samples per sampling period (incl. blanks and duplicates) @ $120.

References

Batelle, 2000. Design Guidance for Application of Permeable Reactive Barriers for Groundwater Remediation. Prepared for Air Force Research Laboratory, Tyndall Air Force Base, Florida. Sponsored by DOD Strategic Environmental Research and Development Program (SERDI).

Table 2-1. Compounds Tested and Half-Lives Normalized to 1 m^2 Iron Surface per mL Solution (Adapted from Gillham, 1996 and other sources listed in the footnotes)

Organic Compounds	Pure Iron[m] $t_{1/2}$ (hr)	Commercial Iron[m] $t_{1/2}$ (hr)
Methanes		
Carbon tetrachloride	0.02[a], 0.003[g], 0.023[i]	0.31-0.85[b]
Chloroform	1.49[a], 0.73[g]	4.8[b]
Bromoform	0.041[a]	
Ethanes		
Hexachloroethane	0.013[a]	NA
1,1,2,2-Tetrachloroethane	0.053[a]	NA
1,1,1,2-Tetrachloroethane	0.049[a]	NA
1,1,1-Trichloroethane	0.065[a], 1.4[h]	1.7-4.1[b]
1,1-Dichloroethane	NA	NA
Ethenes		
Tetrachloroethene	0.28[a], 5.2[h]	2.1-10.8[b],3.2[e]
Trichloroethene	0.67[a], 7.3-9.7[g], 0.68[j]	1.1-4.6[b], 2.4[e], 2.8[f]
1,1-Dichloroethene	5.5[a], 2.8[h]	37.4[e], 15.2[f]
trans-1,2-Dichloroethene	6.4[a]	4.9[b], 6.9[e], 7.6[f]
cis-1,2-Dichloroethene	19.7[a]	10.8-33.9[b], 47.6[e]
Vinyl chloride	12.6[a]	10.8-12.3[b], 4.7[e]
Other Organics		
1,1,2-Trichlorotrifluoroethane (Freon 113)	1.02[b]	NA
1,2,3-Trichloropropane	NA	24.0[c]
1,2-Dichloropropane	NA	4.5[c]
1,3-Dichloropropane	NA	2.2[c]
1,2-Dibromo-3-chloropropane	NA	0.72[b]
1,2-Dibromoethane	NA	1.5-6.5[b]
n-Nitrosodimethylamine (NDMA)	1.83[b]	NA
Nitrobenzene	0.008[d]	NA
Inorganics		
Chromium[k][l], nickel[l]	NA	NA
Uranium[l]	NA	NA
Nitrate [l]	NA	NA
No Apparent Degradation		
Dichloromethane[a][g][h]	NA	NA
1,4-Dichlorobenzene[h]	NA	NA
1,2-Dichloroethane[b]	NA	NA
Chloromethane[b]	NA	NA

(a) Gillham and O'Hannesin (1994)
(b) ETI (1997)
(c) Focht (1994)
(d) Agrawal and Tratnyek (1994)
(e) Sivavec and Horney (1995)
(f) Mackenzie et al. (1995)
(g) Matheson and Tratnyek (1994)
(h) Schreier and Reinhard (1994)
(i) Lipczynska-Kochany et al. (1994)
(j) Orth and Gillham (1995)
(k) Blowes et al. (1997)
(l) WSRC (1999)
(m) The half-lives reported in this table are for illustration purposes only. Contaminant half-lives may vary depending on the iron source and site-specific groundwater chemistry.

NA = Not available.

CLIENT:	INDIAN HEAD SITE 57 FS			JOB NUMBER:	N4020.1110
SUBJECT:	GROUNDWATER ALTERNATIVE 5 - EXTRACTION AND TREATMENT				
BASED ON:				DRAWING NUMBER:	
BY:	KCT	CHECKED BY:	KMS	APPROVED BY:	DATE:
Date:	4/19/02	Date:	5/3/02		

The groundwater model (App. G.2) was used to estimate the number of extraction wells and flow rate for each well. The model predicted that five wells would be needed in the TCE plume area and one well would be needed in the area near MW022 where only cis-1,2-dichloroethene and vinyl chloride were detected.

Wells 1 and 2 would be installed between locations MW003/MW004 and MW009/MW010. Wells 3, 4, and 5 would be installed between locations MW009/MW010 and MW005/MW006. Well 6 would be installed near MW022.

Following is a summary of the approximate depth and flow rate of each well:

Well	Depth	Flow (gpm)
1	30	20
2	20	20
3	20	20
4	20	5
5	20	5
6	15	5
Total	125	75

Six wells at a total depth of 125 ft to be installed.

This would require approx. 125 of in-well piping.

Assuming the treatment facility (air stripping tower) would be installed near MW022, the total length of header piping would be approximately 1900 ft. This location is above the 100-yr flood elevation (8 ft).

It is assumed that the treated groundwater would be discharged to Mattawoman Creek. The length of discharge piping would be approximately 250 ft.

The contaminants that exceed PRGs are cis-1,2-dichloroethene (12DCE), 1,1-dichloroethene (11DCE), diethyl ether (ether), tetrachloroethene (PCE), trichloroethene (TCE), and vinyl chloride (VC).

The average concentrations (μg/L) (page 3 of 5) and flow rates (gpm) for each area are as follows:

Well	Flow	12DCE	11DCE	ether	PCE	TCE	VC
Well 1	20	71	2	940	1	1174	2
Wells 2-5	50	70	12	143	0	265	1
Well 6	5	830	0	0	0	0	793

Flow weighted average (influent) concentrations are as follows:

12DCE	121	μg/L
11DCE	8.5	μg/L
ether	346	μg/L
PCE	0.01	μg/L
TCE	490	μg/L
VC	53	μg/L

CLIENT:	INDIAN HEAD SITE 57 FS			JOB NUMBER:	N4020.1110
SUBJECT:	GROUNDWATER ALTERNATIVE 5 - EXTRACTION AND TREATMENT				
BASED ON:				DRAWING NUMBER:	
BY:	KCT	CHECKED BY:	KMS	APPROVED BY:	DATE:
Date:	4/19/02	Date:	5/3/02		

The assumed effluent limits for discharge to Mattawoman Creek are assumed to be the PRGs:

12DCE	70	µg/L
11DCE	7	µg/L
ether	1094	µg/L
PCE	5	µg/L
TCE	5	µg/L
VC	2	µg/L

Note that treatment would not be required for ether or PCE to attain the assumed discharge limits.

Assume that treatment would include flow equalization tank and air stripping.

Size equalization tank for 30-min retention time

Vol = flow (gpm)*retention time (min) = 75 gpm*30 min = 2250 gal

See pages 4 of 5 and 5 of 5 for air stripper sizing.

Annual Costs

Annual costs include O&M costs for extraction system and treatment plant for 19 years.

Assume annual sampling of existing permanent monitoring wells (15) for 19 years (MW001 to MW013, MW022, and MW022). Samples would be analyzed for TCL VOCs (including diethyl ether). Assume 20 samples per sampling period (incl. blanks and duplicates) @ $120.

Assume monthly sampling of treatment plant influent and effluent for 19 years. Assume 4 samples per sampling period (incl. Blanks and duplicates) @ $120.

Average Groundwater Concentrations for PRGs
2001 data. If not available, used 1999 data.

Source Area

Analyte	MW001	MW002	MW003	MW004	MW007	MW008	MW011	TW016	TW017	TW018	TW019	Average
cis-1,2-Dichloroethene	0	2.6	30	620	25	0	30	0	0	66	5.5	71
1,1-Dichloroethene	0	0	3	6.5	7	0	0	0	0	3.1	0	2
Ethyl ether	450	930	380	320	375	1300	1700	5.4	4800	2.1	77	940
Tetrachloroethene	0	0	0	6.3	0	0	0	0	1.6	0	0	1
Trichloroethene	0	43	365	12000	140	0	94	0	1.1	210	62	1174
Vinyl chloride	0	0	0	26	0	0	0	0	0	0	0	2
DO (mg/L)	3.2	3.26	3.43	3.26	4.06	2.48	3.3	7.91	4.05	4.35	3.8	3.92
Nitrate (mg/L)	4.1	3.6	4.8	4.91	3.05	6.8	1.6	5.6	1.2	8.4	3.8	4.35
Iron	0	0	0	0	164	312	1060	0	0	4490	200	566
Manganese	NA	244	250	244	NA	NA	NA	NA	NA	NA	NA	246
Sulfate (mg/L)	1.3	0	1.3	0	0	0	1.3	0	0	0	0	0.35
Hydaulic conductivity*	0.74	1.1	3.18	15.2	0.57	9.33	0.5	0.53	4.4	0.17	1.66	1.47

*geometric mean ft/day

Mid-Plume

Analyte	MW005	MW006	MW009	MW010	Average
cis-1,2-Dichloroethene	0	46	85	150	70
1,1-Dichloroethene	0	6.7	28	13	12
Ethyl ether	570	0	0	0	143
Tetrachloroethene	0	0	0	0	0
Trichloroethene	0	250	480	330	265
Vinyl chloride	0	0	0	5.5	1
DO (mg/L)	4.3	4.34	3.14	3.97	3.94
Nitrate (mg/L)	0	3.9	0	6.8	2.68
Iron	0	0	0	4850	1213
Manganese	NA	NA	48.5	NA	48.5
Sulfate (mg/L)	0	1.8	0	1	0.70
Hydaulic conductivity*	18.4	14.9	1.5	2.95	5.90

*geometric mean ft/day

Downgradient

Analyte	MW022	TW003	Average	CP005
cis-1,2-Dichloroethene	1400	260	830	0
1,1-Dichloroethene	0	0	0	0
Ethyl ether	0	0	0	760
Tetrachloroethene	0	0	0	0
Trichloroethene	0	0	0	10
Vinyl chloride	1500	85	792.5	0
Iron (+2)	4.8	NA	4.8	
COD (mg/L)	29	NA	29	NA
Hydaulic conductivity*	3.3	NA	3.3	NA

*geometric mean ft/day
TW003 was sample in 1999.
CP005 was sampled from below the CVOC contamination zone

INDIAN
STAT MODEL CALCULATIONS
VERSION 4.1

04/26/02
08:58:42

CARBONAIR ENVIRONMENTAL SYSTEMS
2731 NEVADA AVENUE NORTH, NEW HOPE, MN 55427
PHONE: 612-544-2154 FAX: 612-544-2151

UNIT MODEL:	STAT 180	WATER TEMPERATURE (F):	55.0
WATER FLOW RATE (GPM):	75.0	AIR TEMPERATURE (F):	55.0
AIR FLOW RATE (ACFM):	650.0	AIR-TO-WATER RATIO:	65:1
OPERATING PRESS (ATM):	1.0	SAFETY FACTOR (%):	0.0

Influent Conc. for 1,1-DICHLOROETHENE 8.5 ppb

NO OF TRAY	REMOVAL EFF %	EFF CONC ppb	OFF-GAS CONC ug/l	AIR EMISSION lb/d
1	86.86263	1.1167	0.1136	0.0066
2	98.25344	0.1485	0.1285	0.0075
3	99.76744	0.0198	0.1305	0.0076
4	99.96903	0.0026	0.1307	0.0077
5	99.99587	0.0004	0.1308	0.0077
6	99.99945	0.0000	0.1308	0.0077

Influent Conc. for 1,2-DICHLOROETHENE (CIS) 121.0 ppb

NO OF TRAY	REMOVAL EFF %	EFF CONC ppb	OFF-GAS CONC ug/l	AIR EMISSION lb/d
1	68.88192	37.6529	1.2823	0.0750
2	89.64280	12.5322	1.6687	0.0977
3	96.47891	4.2605	1.7960	0.1051
4	98.79444	1.4587	1.8391	0.1076
5	99.58625	0.5006	1.8538	0.1085
6	99.85788	0.1720	1.8589	0.1088

Influent Conc. for TETRACHLOROETHENE 0.0 ppb

NO OF TRAY	REMOVAL EFF %	EFF CONC ppb	OFF-GAS CONC ug/l	AIR EMISSION lb/d
1	80.06764	0.0020	0.0001	0.0000
2	95.93194	0.0004	0.0001	0.0000
3	99.16578	0.0001	0.0002	0.0000
4	99.82876	0.0000	0.0002	0.0000
5	99.96484	0.0000	0.0002	0.0000
6	99.99278	0.0000	0.0002	0.0000

Influent Conc. for TRICHLOROETHENE 490.0 ppb

NO OF TRAY	REMOVAL EFF %	EFF CONC ppb	OFF-GAS CONC ug/l	AIR EMISSION lb/d
1	78.16662	106.9836	5.8926	0.3449
2	95.05836	24.2140	7.1659	0.4194
3	98.87261	5.5242	7.4535	0.4362
→ 4	99.74233	1.2626	7.5190	0.4401
5	99.94109	0.2887	7.5340	0.4409
6	99.98653	0.0660	7.5374	0.4411

Influent Conc. for VINYL CHLORIDE 53.0 ppb

INDIAN

NO OF TRAY	REMOVAL EFF %	EFF CONC ppb	OFF-GAS CONC ug/l	AIR EMISSION lb/d
1	90.24635	5.1694	0.7359	0.0431
2	99.04364	0.5069	0.8076	0.0473
3	99.90618	0.0497	0.8146	0.0477
4	99.99080	0.0049	0.8153	0.0477
5	99.99910	0.0005	0.8154	0.0477
6	99.99991	0.0000	0.8154	0.0477

Influent Conc. for TOTAL VOCs 672.5 ppb

NO OF TRAY	REMOVAL EFF %	EFF CONC ppb	OFF-GAS CONC ug/l	AIR EMISSION lb/d
1	77.55802	150.9245	8.0244	0.4696
2	94.43845	37.4020	9.7709	0.5718
3	98.53470	9.8543	10.1947	0.5967
4	99.59423	2.7288	10.3043	0.6031
5	99.88251	0.7902	10.3342	0.6048
6	99.96460	0.2381	10.3426	0.6053

APPENDIX I

REMEDIAL ALTERNATIVE COST ESTIMATES

COST SUMMARY

SITE 57 – FORMER DRUM LOADING AREA
IHDIV-NSWC, INDIAN HEAD, MARYLAND

Soil Alternatives	Capital Cost	Annual Cost	Present Worth
1 – No Action	$0	$0	$0
2 – Capping with Land Use Controls	$492,400	$620	$526,000
3 – Excavation and Off-Site Disposal	$907,000	$0	$907,000

Groundwater Alternatives	Capital Cost	Annual Cost	Present Worth
1 – No Action	$0	$0	$0
2 – Monitored Natural Attenuation	$8,100	$29,600	$397,000
3 – In Situ Bioremediation	$1,229,100	$50,000	$1,320,000
4 – Permeable Reactive Barrier	$668,200	$20,600	$1,046,000
5 – Extraction and Treatment	$410,700	$63,500	$1,083,000

Annual cost includes yearly monitoring and O&M costs but does not include 5-year reviews or major repairs.

INDIAN HEAD DIVISION - NAVAL SURFACE WARFARE CENTER
Indian Head, Maryland
Site 57 - Former Drum Loading Area
Soil Alternative 2: Capping
Capital Cost

Item	Quantity	Unit	Unit Cost Subcontract	Unit Cost Material	Unit Cost Labor	Unit Cost Equipment	Extended Cost Subcontract	Extended Cost Material	Extended Cost Labor	Extended Cost Equipment	Subtotal
1 PROJECT PLANNING & DOCUMENTS											
1.1 Prepare Documents & Plans including Permits	500	hr			$30.00		$0	$0	$15,000	$0	$15,000
2 MOBILIZATION/DEMOBILIZATION & SITE SUPPORT											
2.1 Office Trailer	3	mo	$345.00				$1,035	$0	$0	$0	$1,035
2.2 Field Office Support	3	mo		$136.00			$0	$408	$0	$0	$408
2.3 Storage Trailer (1)	3	mo	$103.00				$309	$0	$0	$0	$309
2.4 Utility Connection/Disconnection (phone/electric)	1	ls	$1,500.00				$1,500	$0	$0	$0	$1,500
2.5 Construction Survey	0.5	ac	$1,575.00				$788	$0	$0	$0	$788
2.6 Equipment Mobilization/Demobilization	4	ea			$96.00	$396.00	$0	$0	$384	$1,584	$1,968
2.7 Site Utilities	3	mo	$150.00				$450	$0	$0	$0	$450
2.8 Field Construction Mgt. (5p * 5 days/week)	12	mwk			$4,000.00		$0	$0	$48,000	$0	$48,000
3 DECONTAMINATION											
3.1 Decontamination Services	3	mo	$3,400.00				$10,200	$0	$0	$0	$10,200
3.2 Equipment Decon Pad	1	ls		$5,800.00	$6,650.00	$700.00	$0	$5,800	$6,650	$700	$13,150
3.3 Decon Water	3,000	gal		$0.20			$0	$600	$0	$0	$600
3.4 Decon Water Storage Tank, 6,000 gallon	3	mo				$600.00	$0	$0	$0	$1,800	$1,800
3.5 Clean Water Storage Tank, 4,000 gallon	3	mo				$540.00	$0	$0	$0	$1,620	$1,620
3.6 PPE (6 p * 5 days * 12 weeks)	360	day		$30.90			$0	$11,124	$0	$0	$11,124
3.7 Disposal of Decon Waste (liquid & solid)	3	mo	$900.00				$2,700	$0	$0	$0	$2,700
4 EXCAVATION AND DISPOSAL											
4.1 Soil Excavation (level D)	602	cy			$0.50	$1.77	$0	$0	$301	$1,066	$1,367
4.2 Transportation/Disposal of Hazardous Material	895	ton	$117.00				$104,715	$0	$0	$0	$104,715
4.6 Waste Characterization Testing (TCLP),1 per 1000 cy	1	ea	$785.00	$5.00	$30.00		$785	$5	$30	$0	$820
5 BACKFILL AND SITE RESTORATION											
5.1 Grade & Proof Roll Cap Area	725	sy			$0.24	$0.26	$0	$0	$174	$189	$363
5.2 Import Select Fill	120	cy		$8.50			$0	$1,020	$0	$0	$1,020
5.3 Place/Grade/Compact Fill	120	cy			$0.43	$1.00	$0	$0	$52	$120	$172
5.4 Geomembrane, 60 mil	6,500	sf		$0.44	$1.19	$0.26	$0	$2,860	$7,735	$1,690	$12,285
5.5 Geotextile, 12 oz.	725	sy		$1.04	$0.63	$0.04	$0	$754	$457	$29	$1,240
5.6 Anchor Trench	330	lf		$0.05	$0.47	$0.16	$0	$17	$155	$53	$224
5.7 Import Select Fill	181	cy		$8.50			$0	$1,539	$0	$0	$1,539
5.8 Place/Grade/Compact Fill	181	cy			$0.43	$1.00	$0	$0	$78	$181	$259
5.9 Crush Stone, 6" thick	121	cy		$24.50	$1.23	$2.31	$0	$2,965	$149	$280	$3,393
5.10 Base Course (6")/Asphalt Paving (3")	6,500	sf		$1.13	$0.14	$0.17	$0	$7,345	$910	$1,105	$9,360
Subtotal							$122,482	$34,436	$80,074	$10,415	$247,406
Local Area Adjustments							100.0%	104.2%	88.0%	88.0%	
							$122,482	$35,882	$70,465	$9,166	$237,994
Overhead on Labor Cost @ 30%									$21,140		$21,140
G & A on Labor Cost @ 10%									$7,047		$7,047
G & A on Material Cost @ 10%								$3,588			$3,588
G & A on Subcontract Cost @ 10%							$12,248				$12,248
Total Direct Cost							$134,730	$39,470	$98,651	$9,166	$282,016

Item	Quantity	Unit	Unit Cost Subcontract	Unit Cost Material	Unit Cost Labor	Unit Cost Equipment	Extended Cost Subcontract	Extended Cost Material	Extended Cost Labor	Extended Cost Equipment	Subtotal
Indirects on Total Direct Cost @ 35%		(excluding transportation & disposal cost)									$61,111
Profit on Total Direct Cost @ 10%											$28,202
Subtotal											$371,329
Health & Safety Monitoring @ 2%											$7,427
Total Field Cost											$378,755
Contingency on Total Field Costs @ 20%											$75,751
Engineering on Total Field Cost @ 10%											$37,876
TOTAL COST											**$492,382**

INDIAN HEAD DIVISION - NAVAL SURFACE WARFARE CENTER
Indian Head, Maryland
Site 57 - Former Drum Loading Area
Soil Alternative 2: Capping
Annual Cost

Item	Item Cost per year	Item Cost every 5 years	Item Cost year 15	Notes
Inspection	$620			Labor, Travel, Report
Asphalt Repair(1)		$1,500		Seal and patch asphalt
Asphalt Repair(1)			$5,600	Repave asphalt
Site Review		$10,000	$10,000	Five Year Site Reviews
TOTALS	$620	$11,500	$15,600	

(1) Seal and patch every 5 years, repave year 15.

INDIAN HEAD DIVISION - NAVAL SURFACE WARFARE CENTER
Indian Head, Maryland
Site 57 - Former Drum Loading Area
Soil Alternative 2: Capping
Present Worth Analysis

Year	Capital Cost	Annual Cost	Total Year Cost	Annual Discount Rate at 7%	Present Worth
0	$492,382		$492,382	1.000	$492,382
1		$620	$620	0.935	$580
2		$620	$620	0.873	$541
3		$620	$620	0.816	$506
4		$620	$620	0.763	$473
5		$12,120	$12,120	0.713	$8,642
6		$620	$620	0.666	$413
7		$620	$620	0.623	$386
8		$620	$620	0.582	$361
9		$620	$620	0.544	$337
10		$12,120	$12,120	0.508	$6,157
11		$620	$620	0.475	$295
12		$620	$620	0.444	$275
13		$620	$620	0.415	$257
14		$620	$620	0.388	$241
15		$16,220	$16,220	0.362	$5,872
16		$620	$620	0.339	$210
17		$620	$620	0.317	$197
18		$620	$620	0.296	$184
19		$620	$620	0.277	$172
20		$12,120	$12,120	0.258	$3,127
21		$620	$620	0.242	$150
22		$620	$620	0.226	$140
23		$620	$620	0.211	$131
24		$620	$620	0.197	$122
25		$12,120	$12,120	0.184	$2,230
26		$620	$620	0.172	$107
27		$620	$620	0.161	$100
28		$620	$620	0.150	$93
29		$620	$620	0.141	$87
30		$12,120	$12,120	0.131	$1,588
				TOTAL PRESENT WORTH	**$526,353**

INDIAN HEAD DIVISION - NAVAL SURFACE WARFARE CENTER
Indian Head, Maryland
Site 57 - Former Drum Loading Area
Soil Alternative 3: Excavation and Off-site Disposal
Capital Cost

Item	Quantity	Unit	Unit Cost Subcontract	Unit Cost Material	Unit Cost Labor	Unit Cost Equipment	Extended Cost Subcontract	Extended Cost Material	Extended Cost Labor	Extended Cost Equipment	Subtotal
1 PROJECT PLANNING & DOCUMENTS											
1.1 Prepare Documents & Plans including Permits	500	hr			$30.00		$0	$0	$15,000	$0	$15,000
2 MOBILIZATION/DEMOBILIZATION & SITE SUPPORT											
2.1 Office Trailer	3	mo	$345.00				$1,035	$0	$0	$0	$1,035
2.2 Field Office Support	3	mo		$136.00			$0	$408	$0	$0	$408
2.3 Storage Trailer (1)	3	mo	$103.00				$309	$0	$0	$0	$309
2.4 Utility Connection/Disconnection (phone/electric)	1	ls	$1,500.00				$1,500	$0	$0	$0	$1,500
2.5 Construction Survey	0.5	ac	$1,575.00				$788	$0	$0	$0	$788
2.6 Equipment Mobilization/Demobilization	4	ea			$96.00	$396.00	$0	$0	$384	$1,584	$1,968
2.7 Site Utilities	3	mo	$150.00				$450	$0	$0	$0	$450
2.8 Field Construction Mgt. (5p * 5 days/week)	12	mwk			$4,000.00		$0	$0	$48,000	$0	$48,000
3 DECONTAMINATION											
3.1 Decontamination Services	3	mo	$3,400.00				$10,200	$0	$0	$0	$10,200
3.2 Equipment Decon Pad	1	ls		$5,800.00	$6,650.00	$700.00	$0	$5,800	$6,650	$700	$13,150
3.3 Decon Water	3,000	gal		$0.20			$0	$600	$0	$0	$600
3.4 Decon Water Storage Tank, 6,000 gallon	3	mo				$600.00	$0	$0	$0	$1,800	$1,800
3.5 Clean Water Storage Tank, 4,000 gallon	3	mo				$540.00	$0	$0	$0	$1,620	$1,620
3.6 PPE (6 p * 5 days * 12 weeks)	360	day		$30.90			$0	$11,124	$0	$0	$11,124
3.7 Disposal of Decon Waste (liquid & solid)	3	mo	$900.00				$2,700	$0	$0	$0	$2,700
4 EXCAVATION AND DISPOSAL											
4.1 Soil Excavation (level D)	1,948	cy			$0.50	$1.77	$0	$0	$974	$3,448	$4,422
4.2 Transportation/Disposal of Hazardous Material	2,860	ton	$117.00				$334,620	$0	$0	$0	$334,620
4.3 Transportation/Disposal of Soil	22	cy	$54.00				$1,188	$0	$0	$0	$1,188
4.4 Verification Sampling (VOC & arsenic)	8	ea	$155.00	$20.00	$50.00	$20.00	$1,240	$160	$400	$160	$1,960
4.5 Verification Sampling (arsenic)	8	ea	$25.00	$20.00	$50.00	$20.00	$200	$160	$400	$160	$920
4.6 Waste Characterization Testing (TCLP),1 per 1000 cy	3	ea	$785.00	$5.00	$30.00		$2,355	$15	$90	$0	$2,460
5 BACKFILL AND SITE RESTORATION											
5.1 Import Fill	1825	cy		$7.50			$0	$13,688	$0	$0	$13,688
5.2 Place/Grade/Compact Fill	1825	cy			$0.43	$1.00	$0	$0	$785	$1,825	$2,610
5.3 Import Topsoil, 6" thick	125	cy		$10.00			$0	$1,250	$0	$0	$1,250
5.4 Place/Grade Topsoil	125	cy			$0.33	$0.74	$0	$0	$41	$93	$134
5.5 Fine Grading & Seeding	735	sy		$0.30	$1.09	$0.22	$0	$221	$801	$162	$1,183
5.6 Asphalt Repair	360	sy		$10.05	$21.00	$2.43	$0	$3,618	$7,560	$875	$12,053
5.7 Replace Storm Drain Pipe (18" VCP)	150	lf		$21.50	$8.45	$1.61	$0	$3,225	$1,268	$242	$4,734
5.8 Trench & Backfill for Drain	150	lf			$6.75	$3.67	$0	$0	$1,013	$551	$1,563
5.9 Pipe Beding	150	lf		$1.52	$1.74	$0.87	$0	$228	$261	$131	$620
Subtotal							$356,585	$40,496	$83,626	$13,348	$494,055
Local Area Adjustments							100.0%	104.2%	88.0%	88.0%	
							$356,585	$42,197	$73,591	$11,747	$484,119
Overhead on Labor Cost @ 30%									$22,077		$22,077
G & A on Labor Cost @ 10%									$7,359		$7,359
G & A on Material Cost @ 10%								$4,220			$4,220
G & A on Subcontract Cost @ 10%							$35,658				$35,658
Total Direct Cost							$392,243	$46,417	$103,027	$11,747	$553,434

Item	Quantity	Unit	Unit Cost Subcontract	Unit Cost Material	Unit Cost Labor	Unit Cost Equipment	Extended Cost Subcontract	Extended Cost Material	Extended Cost Labor	Extended Cost Equipment	Subtotal
Indirects on Total Direct Cost @ 35%		(excluding transportation & disposal cost)									$75,224
Profit on Total Direct Cost @ 10%											$55,343
Subtotal											$684,001
Health & Safety Monitoring @ 2%											$13,680
Total Field Cost											$697,681
Contingency on Total Field Costs @ 20%											$139,536
Engineering on Total Field Cost @ 10%											$69,768
TOTAL COST											**$906,985**

INDIAN HEAD DIVISION - NAVAL SURFACE WARFARE CENTER
Indian Head, Maryland
Site 57 - Former Drum Loading Area
Groundwater Alternative 2: Monitored Natural Attenuation
Capital Cost

Item	Quantity	Unit	Unit Cost Subcontract	Unit Cost Material	Unit Cost Labor	Unit Cost Equipment	Extended Cost Subcontract	Extended Cost Material	Extended Cost Labor	Extended Cost Equipment	Subtotal
1 PROJECT PLANNING & DOCUMENTS											
1.1 Prepare Documents	200	hr			$30.00		$0	$0	$6,000	$0	$6,000
Subtotal							$0	$0	$6,000	$0	$6,000
Local Area Adjustments							100.0%	104.2%	88.0%	88.0%	
							$0	$0	$5,280	$0	$5,280
Overhead on Labor Cost @ 30%									$1,584		$1,584
G & A on Labor Cost @ 10%									$528		$528
G & A on Material Cost @ 10%								$0			$0
G & A on Subcontract Cost @ 10%							$0				$0
Total Direct Cost							$0	$0	$7,392	$0	$7,392
Indirects on Total Direct Cost @ 0%											$0
Profit on Total Direct Cost @ 10%											$739
Subtotal											$8,131
Health & Safety Monitoring @ 0%											$0
Total Field Cost											$8,131
Contingency on Total Field Costs @ 0%											$0
Engineering on Total Field Cost @ 0%											$0
TOTAL COST											**$8,131**

INDIAN HEAD DIVISION - NAVAL SURFACE WARFARE CENTER
Indian Head, Maryland
Site 57 - Former Drum Loading Area
Groundwater Alternative 2: Monitored Natural Attenuation
Annual Cost

Item	Item Cost per round	Item Cost every 5 years	Notes
Sampling	$7,790		Labor, Field Supplies, Travel
Analysis/Water[1]	$11,850		Analyze twenty groundwater samples for TCL VOCs and natural attenuation including blanks and duplicates. Monitor for 30 years.
Report	$10,000		Document sampling events and results
Site Review		$10,000	Five Year Site Reviews
TOTALS	$29,640	$10,000	

(1) Sampling rounds would occur annually for years 1 through 30.

INDIAN HEAD DIVISION - NAVAL SURFACE WARFARE CENTER
Indian Head, Maryland
Site 57 - Former Drum Loading Area
Groundwater Alternative 2: Monitored Natural Attenuation
Present Worth Analysis

Year	Capital Cost	Annual Cost	Total Year Cost	Annual Discount Rate at 7%	Present Worth
0	$8,131		$8,131	1.000	$8,131
1		$29,640	$29,640	0.935	$27,713
2		$29,640	$29,640	0.873	$25,876
3		$29,640	$29,640	0.816	$24,186
4		$29,640	$29,640	0.763	$22,615
5		$39,640	$39,640	0.713	$28,263
6		$29,640	$29,640	0.666	$19,740
7		$29,640	$29,640	0.623	$18,466
8		$29,640	$29,640	0.582	$17,250
9		$29,640	$29,640	0.544	$16,124
10		$39,640	$39,640	0.508	$20,137
11		$29,640	$29,640	0.475	$14,079
12		$29,640	$29,640	0.444	$13,160
13		$29,640	$29,640	0.415	$12,301
14		$29,640	$29,640	0.388	$11,500
15		$39,640	$39,640	0.362	$14,350
16		$29,640	$29,640	0.339	$10,048
17		$29,640	$29,640	0.317	$9,396
18		$29,640	$29,640	0.296	$8,773
19		$29,640	$29,640	0.277	$8,210
20		$39,640	$39,640	0.258	$10,227
21		$29,640	$29,640	0.242	$7,173
22		$29,640	$29,640	0.226	$6,699
23		$29,640	$29,640	0.211	$6,254
24		$29,640	$29,640	0.197	$5,839
25		$39,640	$39,640	0.184	$7,294
26		$29,640	$29,640	0.172	$5,098
27		$29,640	$29,640	0.161	$4,772
28		$29,640	$29,640	0.150	$4,446
29		$29,640	$29,640	0.141	$4,179
30		$39,640	$39,640	0.131	$5,193
				TOTAL PRESENT WORTH	**$397,494**

INDIAN HEAD DIVISION - NAVAL SURFACE WARFARE CENTER
Indian Head, Maryland
Site 57 - Former Drum Loading Area
Groundwater Alternative 3: In-situ Biological Treatment
Capital Cost

Item	Quantity	Unit	Unit Cost Subcontract	Unit Cost Material	Unit Cost Labor	Unit Cost Equipment	Extended Cost Subcontract	Extended Cost Material	Extended Cost Labor	Extended Cost Equipment	Subtotal
1 PROJECT PLANNING & DOCUMENTS											
1.1 Prepare Documents & Plans including Permits	500	hr			$30.00		$0	$0	$15,000	$0	$15,000
2 MOBILIZATION/DEMOBILIZATION & SITE SUPPORT											
2.1 Office Trailer	3	mo	$345.00				$1,035	$0	$0	$0	$1,035
2.2 Field Office Support	3	mo		$136.00			$0	$408	$0	$0	$408
2.3 Storage Trailer (1)	3	mo	$103.00				$309	$0	$0	$0	$309
2.4 Utility Connection/Disconnection (phone/electric)	1	ls	$1,500.00				$1,500	$0	$0	$0	$1,500
2.5 Construction Survey	2.5	ac	$1,575.00				$3,938	$0	$0	$0	$3,938
2.6 Equipment Mobilization/Demobilization	2	ea			$96.00	$396.00	$0	$0	$192	$792	$984
2.7 Site Utilities	3	mo	$150.00				$450	$0	$0	$0	$450
2.8 Field Construction Mgt. (5p * 5 days/week)	12	mwk			$4,000.00		$0	$0	$48,000	$0	$48,000
3 DECONTAMINATION											
3.1 Decontamination Services	3	mo	$3,400.00				$10,200	$0	$0	$0	$10,200
3.2 Temporary Equipment Decon Pad	1	ls		$1,500.00	$2,000.00	$200.00	$0	$1,500	$2,000	$200	$3,700
3.3 Decon Water	3,000	gal		$0.20			$0	$600	$0	$0	$600
3.4 Decon Water Storage Tank, 6,000 gallon	3	mo				$600.00	$0	$0	$0	$1,800	$1,800
3.5 Clean Water Storage Tank, 4,000 gallon	3	mo				$540.00	$0	$0	$0	$1,620	$1,620
3.6 PPE (6 p * 5 days * 9 weeks)	270	day		$30.90			$0	$8,343	$0	$0	$8,343
3.7 Disposal of Decon Waste (liquid & solid)	3	mo	$900.00				$2,700	$0	$0	$0	$2,700
4 IN-SITU BIOLOGICAL TREATMENT											
4.1 Treatability Study	1	ls	$25,000.00				$25,000	$0	$0	$0	$25,000
4.2 Subcontractor's Mobilization & Demobilization	1	ea	$2,000.00				$2,000	$0	$0	$0	$2,000
4.3 Area 1 Probe/Pump/Injection Subcontractor	30	day	$2,000.00				$60,000	$0	$0	$0	$60,000
4.4 Area 1 Core & Repair Injection Points	320	ea		$16.27	$47.97	$9.71	$0	$5,206	$15,350	$3,107	$23,664
4.5 Area 1 HRC Cost (16,200 lb. + 10%)	17,820	lb		$8.50			$0	$151,470	$0	$0	$151,470
4.6 Area 2 Probe/Pump/Injection Subcontractor	5	day	$2,000.00				$10,000	$0	$0	$0	$10,000
4.7 Area 2 Core & Repair Injection Points	40	ea		$16.27	$47.97	$9.71	$0	$651	$1,919	$388	$2,958
4.8 Area 2 HRC Cost (2,250 lb. + 10%)	2,475	lb		$8.50			$0	$21,038	$0	$0	$21,038
4.9 Area 3 Probe/Pump/Injection Subcontractor	8	day	$2,000.00				$16,000	$0	$0	$0	$16,000
4.10 Area 3 Core & Repair Injection Points	115	ea		$16.27	$47.97	$9.71	$0	$1,871	$5,517	$1,117	$8,504
4.11 Area 3 ORC Cost (3600 lb. + 10%)	3,960	lb		$10.10			$0	$39,996	$0	$0	$39,996
5 MONITORING WELLS											
5.1 Install Monitoring Wells (21 wells)	530	lf	$65.00				$34,450	$0	$0	$0	$34,450
5.2 Well Development (4 hr/well)	84	hr	$35.00				$2,940	$0	$0	$0	$2,940
5.3 Collect/Containerize IDW	40	drum	$55.00				$2,200	$0	$0	$0	$2,200
5.4 Transport/Dispose IDW	40	drum	$170.00				$6,800	$0	$0	$0	$6,800
6 GROUNDWATER SAMPLING											
6.1 Collection (labor)	1	ls		$2,550.00	$4,000.00		$0	$2,550	$4,000	$0	$6,550
6.2 Equipment/Supplies	1	ls		$400.00		$1,400.00	$0	$400	$0	$1,400	$1,800
6.3 Analytical Cost	1	ls	$24,870.00				$24,870	$0	$0	$0	$24,870
Subtotal							$204,392	$234,033	$91,978	$10,424	$540,826
Local Area Adjustments							100.0%	104.2%	88.0%	88.0%	
							$204,392	$243,862	$80,940	$9,173	$538,367

INDIAN HEAD DIVISION - NAVAL SURFACE WARFARE CENTER
Indian Head, Maryland
Site 57 - Former Drum Loading Area
Groundwater Alternative 3: In-situ Biological Treatment
Capital Cost

Item	Quantity	Unit	Unit Cost Subcontract	Unit Cost Material	Unit Cost Labor	Unit Cost Equipment	Extended Cost Subcontract	Extended Cost Material	Extended Cost Labor	Extended Cost Equipment	Subtotal
Overhead on Labor Cost @ 30%									$24,282		$24,282
G & A on Labor Cost @ 10%									$8,094		$8,094
G & A on Material Cost @ 10%								$24,386			$24,386
G & A on Subcontract Cost @ 10%							$20,439				$20,439
Total Direct Cost							$224,831	$268,248	$113,317	$9,173	$615,569
Indirects on Total Direct Cost @ 35%											$215,449
Profit on Total Direct Cost @ 10%											$61,557
Subtotal											$892,575
Health & Safety Monitoring @ 2%											$17,851
Total Field Cost											$910,426
Contingency on Total Field Costs @ 25%											$227,607
Engineering on Total Field Cost @ 10%											$91,043
TOTAL COST											**$1,229,076**

Item	Item Cost per round	Notes
Sampling	$15,150	Labor, Field Supplies, Travel
Analysis/Water[1]	$24,870	Analyze forty groundwater samples for VOCs and HRC evaluation parameters and five groundwater samples for VOCs and ORC evaluation parameters including blanks and duplicates. Monitor for 2 years.
Report	$10,000	Document sampling events and results
TOTALS	$50,020	

(1) Sampling rounds would occur annually for years 1 and 2.

INDIAN HEAD DIVISION - NAVAL SURFACE WARFARE CENTER
Indian Head, Maryland
Site 57 - Former Drum Loading Area
Groundwater Alternative 3: In-situ Biological Treatment
Present Worth Analysis

Year	Capital Cost	Annual Cost	Total Year Cost	Annual Discount Rate at 7%	Present Worth
0	$1,229,076		$1,229,076	1.000	$1,229,076
1		$50,020	$50,020	0.935	$46,769
2		$50,020	$50,020	0.873	$43,667
			TOTAL PRESENT WORTH		**$1,319,512**

INDIAN HEAD DIVISION - NAVAL SURFACE WARFARE CENTER
Indian Head, Maryland
Site 57 - Former Drum Loading Area
Groundwater Alternative 4: Permeable Reactive Barrier
Capital Cost

Item	Quantity	Unit	Unit Cost Subcontract	Unit Cost Material	Unit Cost Labor	Unit Cost Equipment	Extended Cost Subcontract	Extended Cost Material	Extended Cost Labor	Extended Cost Equipment	Subtotal
1 PROJECT PLANNING & DOCUMENTS											
1.1 Prepare Documents & Plans including Permits	500	hr			$30.00		$0	$0	$15,000	$0	$15,000
2 MOBILIZATION/DEMOBILIZATION & SITE SUPPORT											
2.1 Office Trailer	3	mo	$345.00				$1,035	$0	$0	$0	$1,035
2.2 Field Office Support	3	mo		$136.00			$0	$408	$0	$0	$408
2.3 Storage Trailer (1)	3	mo	$103.00				$309	$0	$0	$0	$309
2.4 Utility Connection/Disconnection (phone/electric)	1	ls	$1,500.00				$1,500	$0	$0	$0	$1,500
2.5 Construction Survey	0.5	ac	$1,575.00				$788	$0	$0	$0	$788
2.6 Equipment Mobilization/Demobilization	4	ea			$96.00	$396.00	$0	$0	$384	$1,584	$1,968
2.7 Site Utilities	3	mo	$150.00				$450	$0	$0	$0	$450
2.8 Field Construction Mgt. (5p * 5 days/week)	12	mwk			$4,000.00		$0	$0	$48,000	$0	$48,000
3 DECONTAMINATION											
3.1 Decontamination Services	3	mo	$3,400.00				$10,200	$0	$0	$0	$10,200
3.2 Temporary Equipment Decon Pad	1	ls		$1,500.00	$2,000.00	$200.00	$0	$1,500	$2,000	$200	$3,700
3.3 Decon Water	3,000	gal		$0.20			$0	$600	$0	$0	$600
3.4 Decon Water Storage Tank, 6,000 gallon	3	mo				$600.00	$0	$0	$0	$1,800	$1,800
3.5 Clean Water Storage Tank, 4,000 gallon	3	mo				$540.00	$0	$0	$0	$1,620	$1,620
3.6 PPE (6 p * 5 days * 12 weeks)	360	day		$30.90			$0	$11,124	$0	$0	$11,124
3.7 Disposal of Decon Waste (liquid & solid)	3	mo	$900.00				$2,700	$0	$0	$0	$2,700
4 PERMEABLE REACTIVE BARRIER											
4.1 Treatability Study	1	ls	$50,000.00				$50,000	$0	$0	$0	$50,000
4.2 Cut & Chip Trees	0.5	ac			$1,675.00	$1,500.00	$0	$0	$838	$750	$1,588
4.3 Grub Stumps & Remove	0.5	ac			$625.00	$1,530.00	$0	$0	$313	$765	$1,078
4.4 Slurry Wall (2' thick)	1,540	sf	$10.00				$15,400	$0	$0	$0	$15,400
4.5 Sheet Piling, temporary (70' by 3.5' box)	2,205	sf	$16.45				$36,272	$0	$0	$0	$36,272
4.6 Excavate in Box with Clamshell	100	cy			$7.60	$10.30	$0	$0	$760	$1,030	$1,790
4.7 Iron Filings	100	cy		$365.65			$0	$36,565	$0	$0	$36,565
4.8 Place Iron Filings	2	day			$455.20	$618.20	$0	$0	$910	$1,236	$2,147
4.9 Construct/Remove Dewatering Pad (25' * 80')	2,000	sf		$3.72	$2.07	$0.85	$0	$7,440	$4,140	$1,700	$13,280
4.10 Mix/Spread/Load Soil on Pad	10	day			$334.20	$284.40	$0	$0	$3,342	$2,844	$6,186
4.11 Haul/Disposal of Excavated Soil	320	ton	$55.00				$17,600	$0	$0	$0	$17,600
4.12 Backfill/Compact Excavation, top 4'	80	cy			$1.44	$0.97	$0	$0	$115	$78	$193
4.13 Disposal Testing	1	ea	$450.00	$50.00	$100.00	$10.00	$450	$50	$100	$10	$610
5 SITE RESTORATION											
5.1 Top Dress Soil, 1 cy for 600 sf (21,780 sf)	36	cy		$18.25	$14.90		$0	$657	$536	$0	$1,193
5.2 Fine Grading & Seeding	2420	sy		$0.30	$1.09	$0.22	$0	$726	$2,638	$532	$3,896
5.3 Asphalt Repair (30' by 50')	170	sy		$10.05	$21.00	$2.43	$0	$1,709	$3,570	$413	$5,692
Subtotal							$136,704	$60,779	$82,646	$14,563	$294,691
Local Area Adjustments							100.0%	104.2%	88.0%	88.0%	
							$136,704	$63,331	$72,728	$12,815	$285,578

INDIAN HEAD DIVISION - NAVAL SURFACE WARFARE CENTER
Indian Head, Maryland
Site 57 - Former Drum Loading Area
Groundwater Alternative 4: Permeable Reactive Barrier
Capital Cost

Item	Quantity	Unit	Unit Cost Subcontract	Unit Cost Material	Unit Cost Labor	Unit Cost Equipment	Extended Cost Subcontract	Extended Cost Material	Extended Cost Labor	Extended Cost Equipment	Subtotal
Overhead on Labor Cost @ 30%									$21,818		$21,818
G & A on Labor Cost @ 10%									$7,273		$7,273
G & A on Material Cost @ 10%								$6,333			$6,333
G & A on Subcontract Cost @ 10%							$13,670				$13,670
Total Direct Cost							$150,374	$69,664	$101,820	$12,815	$334,673
Indirects on Total Direct Cost @ 35%											$117,136
Profit on Total Direct Cost @ 10%											$33,467
Subtotal											$485,276
Health & Safety Monitoring @ 2%											$9,706
Total Field Cost											$494,981
Contingency on Total Field Costs @ 25%											$123,745
Engineering on Total Field Cost @ 10%											$49,498
TOTAL COST											**$668,225**

INDIAN HEAD DIVISION - NAVAL SURFACE WARFARE CENTER
Indian Head, Maryland
Site 57 - Former Drum Loading Area
Groundwater Alternative 4: Permeable Reactive Barrier
Capital Cost - Year 15 Iron Replacement

Item	Quantity	Unit	Unit Cost Subcontract	Unit Cost Material	Unit Cost Labor	Unit Cost Equipment	Extended Cost Subcontract	Extended Cost Material	Extended Cost Labor	Extended Cost Equipment	Subtotal
1 PROJECT PLANNING & DOCUMENTS											
1.1 Prepare Documents & Plans including Permits	200	hr			$30.00		$0	$0	$6,000	$0	$6,000
2 MOBILIZATION/DEMOBILIZATION & SITE SUPPORT											
2.1 Office Trailer	1	mo	$345.00				$345	$0	$0	$0	$345
2.2 Field Office Support	1	mo		$136.00			$0	$136	$0	$0	$136
2.3 Storage Trailer (1)	1	mo	$103.00				$103	$0	$0	$0	$103
2.4 Utility Connection/Disconnection (phone/electric)	1	ls	$1,500.00				$1,500	$0	$0	$0	$1,500
2.5 Equipment Mobilization/Demobilization	3	ea			$96.00	$396.00	$0	$0	$288	$1,188	$1,476
2.6 Site Utilities	1	mo	$150.00				$150	$0	$0	$0	$150
2.7 Field Construction Mgt. (5p * 5 days/week)	4	mwk			$4,000.00		$0	$0	$16,000	$0	$16,000
3 DECONTAMINATION											
3.1 Decontamination Services	1	mo	$3,400.00				$3,400	$0	$0	$0	$3,400
3.2 Temporary Equipment Decon Pad	1	ls		$1,500.00	$2,000.00	$200.00	$0	$1,500	$2,000	$200	$3,700
3.3 Decon Water	1,000	gal		$0.20			$0	$200	$0	$0	$200
3.4 Decon Water Storage Tank, 6,000 gallon	1	mo				$600.00	$0	$0	$0	$600	$600
3.5 Clean Water Storage Tank, 4,000 gallon	1	mo				$540.00	$0	$0	$0	$540	$540
3.6 PPE (6 p * 5 days * 4 weeks)	120	day		$30.90			$0	$3,708	$0	$0	$3,708
3.7 Disposal of Decon Waste (liquid & solid)	1	mo	$900.00				$900	$0	$0	$0	$900
4 PERMEABLE REACTIVE BARRIER											
4.1 Sheet Piling, temporary (70' by 3.5' box)	2,205	sf	$16.45				$36,272	$0	$0	$0	$36,272
4.2 Excavate Iron in Box with Clamshell	100	cy			$7.60	$10.30	$0	$0	$760	$1,030	$1,790
4.3 Iron Filings	100	cy		$365.65			$0	$36,565	$0	$0	$36,565
4.4 Place Iron Filings	2	day			$455.20	$618.20	$0	$0	$910	$1,236	$2,147
4.5 Construct/Remove Dewatering Pad (25' * 55')	1,375	sf		$3.72	$2.07	$0.85	$0	$5,115	$2,846	$1,169	$9,130
4.6 Mix/Spread/Load Iron on Pad	5	day			$334.20	$284.40	$0	$0	$1,671	$1,422	$3,093
4.7 Haul/Disposal of Excavated Iron	150	ton	$55.00				$8,250	$0	$0	$0	$8,250
4.8 Backfill/Compact Excavation, top 4'	36	cy			$1.44	$0.97	$0	$0	$52	$35	$87
4.9 Disposal Testing	1	ea	$450.00	$50.00	$100.00	$10.00	$450	$50	$100	$10	$610
5 SITE RESTORATION											
5.1 Top Dress Soil, 1 cy for 600 sf 10,890 sf)	18	cy		$18.25	$14.90		$0	$329	$268	$0	$597
5.2 Fine Grading & Seeding	1210	sy		$0.30	$1.09	$0.22	$0	$363	$1,319	$266	$1,948
Subtotal							$51,370	$47,966	$32,215	$7,696	$139,247
Local Area Adjustments							100.0%	104.2%	88.0%	88.0%	
							$51,370	$49,980	$28,349	$6,773	$136,472
Overhead on Labor Cost @ 30%									$8,505		$8,505
G & A on Labor Cost @ 10%									$2,835		$2,835
G & A on Material Cost @ 10%								$4,998			$4,998
G & A on Subcontract Cost @ 10%							$5,137				$5,137
Total Direct Cost							$56,507	$54,978	$39,688	$6,773	$157,946
Indirects on Total Direct Cost @ 35%											$55,281
Profit on Total Direct Cost @ 10%											$15,795

INDIAN HEAD DIVISION - NAVAL SURFACE WARFARE CENTER
Indian Head, Maryland
Site 57 - Former Drum Loading Area
Groundwater Alternative 4: Permeable Reactive Barrier
Capital Cost - Year 15 Iron Replacement

Item	Quantity	Unit	Unit Cost Subcontract	Unit Cost Material	Unit Cost Labor	Unit Cost Equipment	Extended Cost Subcontract	Extended Cost Material	Extended Cost Labor	Extended Cost Equipment	Subtotal
Subtotal											$229,022
Health & Safety Monitoring @ 2%											$4,580
Total Field Cost											$233,603
Contingency on Total Field Costs @ 10%											$23,360
Engineering on Total Field Cost @ 10%											$23,360
TOTAL COST											**$280,323**

INDIAN HEAD DIVISION - NAVAL SURFACE WARFARE CENTER
Indian Head, Maryland
Site 57 - Former Drum Loading Area
Groundwater Alternative 4: Permeable Reactive Barrier
Annual Cost

Item	Item Cost per round	Item Cost every 5 years	Notes
Sampling	$7,790		Labor, Field Supplies, Travel
Analysis/Water[1]	$2,760		Analyze twenty groundwater samples for TCL VOCs including blanks and duplicates. Monitor for 30 years.
Report	$10,000		Document sampling events and results
Site Review		$10,000	Five Year Site Reviews
TOTALS	$20,550	$10,000	

(1) Sampling rounds would occur annually for years 1 through 30.

INDIAN HEAD DIVISION - NAVAL SURFACE WARFARE CENTER
Indian Head, Maryland
Site 57 - Former Drum Loading Area
Groundwater Alternative 4: Permeable Reactive Barrier
Present Worth Analysis

Year	Capital Cost	Annual Cost	Total Year Cost	Annual Discount Rate at 7%	Present Worth
0	$668,225		$668,225	1.000	$668,225
1		$20,550	$20,550	0.935	$19,214
2		$20,550	$20,550	0.873	$17,940
3		$20,550	$20,550	0.816	$16,769
4		$20,550	$20,550	0.763	$15,680
5		$30,550	$30,550	0.713	$21,782
6		$20,550	$20,550	0.666	$13,686
7		$20,550	$20,550	0.623	$12,803
8		$20,550	$20,550	0.582	$11,960
9		$20,550	$20,550	0.544	$11,179
10		$30,550	$30,550	0.508	$15,519
11		$20,550	$20,550	0.475	$9,761
12		$20,550	$20,550	0.444	$9,124
13		$20,550	$20,550	0.415	$8,528
14		$20,550	$20,550	0.388	$7,973
15	$280,323	$30,550	$310,873	0.362	$112,536
16		$20,550	$20,550	0.339	$6,966
17		$20,550	$20,550	0.317	$6,514
18		$20,550	$20,550	0.296	$6,083
19		$20,550	$20,550	0.277	$5,692
20		$30,550	$30,550	0.258	$7,882
21		$20,550	$20,550	0.242	$4,973
22		$20,550	$20,550	0.226	$4,644
23		$20,550	$20,550	0.211	$4,336
24		$20,550	$20,550	0.197	$4,048
25		$30,550	$30,550	0.184	$5,621
26		$20,550	$20,550	0.172	$3,535
27		$20,550	$20,550	0.161	$3,309
28		$20,550	$20,550	0.150	$3,083
29		$20,550	$20,550	0.141	$2,898
30		$30,550	$30,550	0.131	$4,002
				TOTAL PRESENT WORTH	**$1,046,267**

INDIAN HEAD DIVISION - NAVAL SURFACE WARFARE CENTER
Indian Head, Maryland
Site 57 - Former Drum Loading Area
Groundwater Alternative 5: Extraction and Treatment
Capital Cost

Item	Quantity	Unit	Unit Cost Subcontract	Unit Cost Material	Unit Cost Labor	Unit Cost Equipment	Extended Cost Subcontract	Extended Cost Material	Extended Cost Labor	Extended Cost Equipment	Subtotal
1 PROJECT PLANNING & DOCUMENTS											
1.1 Prepare Documents & Plans including Permits	500	hr			$30.00		$0	$0	$15,000	$0	$15,000
2 MOBILIZATION/DEMOBILIZATION & SITE SUPPORT											
2.1 Office Trailer	5	mo	$345.00				$1,725	$0	$0	$0	$1,725
2.2 Field Office Support	5	mo		$136.00			$0	$680	$0	$0	$680
2.3 Storage Trailer (1)	5	mo	$103.00				$515	$0	$0	$0	$515
2.4 Utility Connection/Disconnection (phone/electric)	1	ls	$1,500.00				$1,500	$0	$0	$0	$1,500
2.5 Construction Survey	0.5	ac	$1,575.00				$788	$0	$0	$0	$788
2.6 Equipment Mobilization/Demobilization	5	ea			$96.00	$396.00	$0	$0	$480	$1,980	$2,460
2.7 Site Utilities	5	mo	$150.00				$750	$0	$0	$0	$750
2.8 Field Construction Mgt. (5p * 5 days/week)	21	mwk			$4,000.00		$0	$0	$84,000	$0	$84,000
3 DECONTAMINATION											
3.1 Decontamination Services	1	mo	$3,400.00				$3,400	$0	$0	$0	$3,400
3.2 Temporary Equipment Decon Pad	1	ls		$1,500.00	$2,000.00	$200.00	$0	$1,500	$2,000	$200	$3,700
3.3 Decon Water	1,000	gal		$0.20			$0	$200	$0	$0	$200
3.4 Decon Water Storage Tank, 6,000 gallon	1	mo				$600.00	$0	$0	$0	$600	$600
3.5 Clean Water Storage Tank, 4,000 gallon	1	mo				$540.00	$0	$0	$0	$540	$540
3.6 PPE (6 p * 5 days * 4 weeks)	120	day		$30.90			$0	$3,708	$0	$0	$3,708
3.7 Disposal of Decon Waste (liquid & solid)	1	mo	$900.00				$900	$0	$0	$0	$900
4 EXTRACTION SYSTEM											
4.1 Install Wells (6 wells)	125	lf	$65.00				$8,125	$0	$0	$0	$8,125
4.2 Well Covers	6	ea	$97.50				$585	$0	$0	$0	$585
4.3 Well Development (4 hours per well)	24	ea	$35.00				$840	$0	$0	$0	$840
4.4 Collect/Containerize IDW	12	drum	$55.00				$660	$0	$0	$0	$660
4.5 Transport/Dispose IDW	12	drum	$170.00				$2,040	$0	$0	$0	$2,040
4.6 Asphalt Removal/Replacement for 4" pipe	550	lf		$3.05	$8.48	$4.13	$0	$1,678	$4,664	$2,272	$8,613
4.7 Excavate/Backfill Pipe Trench for 4" pipe	1,900	lf			$0.29	$0.25	$0	$0	$551	$475	$1,026
4.8 Header Pipe, PVC 4" w/fittings	2,025	lf		$2.63	$5.60		$0	$5,326	$11,340	$0	$16,666
4.9 Extraction Pump, 5 gpm, 1/3 HP w/controls	3	ea		$1,732.00	$154.00		$0	$5,196	$462	$0	$5,658
4.10 Extraction Pump, 20 gpm, 1/2 HP w/controls	3	ea		$1,547.00	$154.00		$0	$4,641	$462	$0	$5,103
4.11 Vault Boxes and Misc. Piping/Valves at Well Head	6	ea		$399.50	$299.63		$0	$2,397	$1,798	$0	$4,195
5 TREATMENT SYSTEM											
5.1 Building Foundation	500	sf	$3.87				$1,935	$0	$0	$0	$1,935
5.2 Treatment Building	500	sf	$11.03				$5,515	$0	$0	$0	$5,515
5.3 Building Misc. (doors/vent/insulation/lighting/misc.)	1	ls	$5,725.00				$5,725	$0	$0	$0	$5,725
5.4 Electrical Service, 1000 A, 480 V	1	ea	$14,440.00				$14,440	$0	$0	$0	$14,440
5.5 Equalization Tank (2,250 gal)	1	ea		$2,327.60	$864.37	$148.35	$0	$2,328	$864	$148	$3,340
5.6 Top Mounted Mixer (1 hp)	1	ea		$4,842.00	$73.20		$0	$4,842	$73	$0	$4,915
5.7 Centrifugal Transfer Pump, 75 gpm (3 hp)	2	ea		$3,545.00	$994.30		$0	$7,090	$1,989	$0	$9,079
5.8 Air Stripper, 4 tray, 300 cfm	1	ea		$29,500.00	$7,800.00	$2,500.00	$0	$29,500	$7,800	$2,500	$39,800
5.9 Asphalt Removal/Replacement for 4" pipe	50	lf		$3.05	$8.48	$4.13	$0	$153	$424	$207	$783
5.10 Excavate/Backfill Pipe Trench for 4" pipe	250	lf			$0.29	$0.25	$0	$0	$73	$63	$135
5.11 Discharge Pipe,PVC 4" w/fittings	250	lf		$2.63	$5.60		$0	$658	$1,400	$0	$2,058
5.12 Instruments and Controls	1	ls		$13,500.00	$8,520.00		$0	$13,500	$8,520	$0	$22,020
5.13 Plumb/Electrify System	1	ls		$3,000.00	$2,500.00		$0	$3,000	$2,500	$0	$5,500
5.14 System Start-Up and Testing	1	ls		$1,000.00	$925.00		$0	$1,000	$925	$0	$1,925
6 SITE RESTORATION											
6.1 Top Dress Soil, 1 cy for 600 sf	14	cy		$18.25	$14.90		$0	$256	$209	$0	$464
6.2 Fine Grading & Seeding	930	sy		$0.30	$1.09	$0.22	$0	$279	$1,014	$205	$1,497

INDIAN HEAD DIVISION - NAVAL SURFACE WARFARE CENTER
Indian Head, Maryland
Site 57 - Former Drum Loading Area
Groundwater Alternative 5: Extraction and Treatment
Capital Cost

Item	Quantity	Unit	Unit Cost Subcontract	Unit Cost Material	Unit Cost Labor	Unit Cost Equipment	Extended Cost Subcontract	Extended Cost Material	Extended Cost Labor	Extended Cost Equipment	Subtotal
Subtotal							$39,865	$81,841	$45,067	$5,868	$172,642
Local Area Adjustments							100.0%	104.2%	88.0%	88.0%	
							$39,865	$85,279	$39,659	$5,164	$169,967
Overhead on Labor Cost @ 30%									$11,898		$11,898
G & A on Labor Cost @ 10%									$3,966		$3,966
G & A on Material Cost @ 10%								$8,528			$8,528
G & A on Subcontract Cost @ 10%							$3,987				$3,987
Total Direct Cost							$43,852	$93,807	$55,522	$5,164	$198,345
Indirects on Total Direct Cost @ 35%											$69,421
Profit on Total Direct Cost @ 10%											$19,834
Subtotal											$287,600
Health & Safety Monitoring @ 2%											$5,752
Total Field Cost											$293,352
Contingency on Total Field Costs @ 20%											$58,670
Engineering on Total Field Cost @ 20%											$58,670
TOTAL CAPITAL COST											**$410,692**

INDIAN HEAD DIVISION - NAVAL SURFACE WARFARE CENTER
Indian Head, Maryland
Site 57 - Former Drum Loading Area
Groundwater Alternative 5: Extraction and Treatment
Operation and Maintenance Cost

	Item	Quantity	Unit	Unit Cost	Subtotal	Notes
Treatment System (for 19 years)						
1	Energy - Electric	61,200	kWh	$0.06	$3,672	
2	System Maintenance	1	ls	$12,727	$12,727	10% of Installation Cost
3	Sampling labor, travel & living, supplies	12	ea	$410	$4,920	1 person/1 day per month
4	Analysis of influent and effluent water	12	ea	$138	$1,656	TCL VOC, two per month
5	Quarterly Reports	4	ea	$5,000	$20,000	
				Subtotal	**$42,975**	

INDIAN HEAD DIVISION - NAVAL SURFACE WARFARE CENTER
Indian Head, Maryland
Site 57 - Former Drum Loading Area
Groundwater Alternative 5: Extraction and Treatment
Annual Cost

Item	Item Cost per round	Item Cost every 5 years	Notes
Sampling	$7,790		Labor, Field Supplies, Local Travel
Analysis/Water[1]	$2,760		Analyze twenty groundwater samples for TCL VOCs including blanks and duplicates. Monitor for 19 years.
Report	$10,000		Document sampling events and results
Site Review		$10,000	Five Year Site Reviews
TOTALS	$20,550	$10,000	

(1) Sampling rounds would occur annually for years 1 through 19.

INDIAN HEAD DIVISION - NAVAL SURFACE WARFARE CENTER
Indian Head, Maryland
Site 57 - Former Drum Loading Area
Groundwater Alternative 5: Extraction and Treatment
Present Worth Analysis

Year	Capital Cost	Operation & Maintenance Cost	Annual Cost	Total Year Cost	Annual Discount Rate at 7%	Present Worth
0	$410,692			$410,692	1.000	$410,692
1		$42,975	$20,550	$63,525	0.935	$59,396
2		$42,975	$20,550	$63,525	0.873	$55,458
3		$42,975	$20,550	$63,525	0.816	$51,837
4		$42,975	$20,550	$63,525	0.763	$48,470
5		$42,975	$30,550	$73,525	0.713	$52,424
6		$42,975	$20,550	$63,525	0.666	$42,308
7		$42,975	$20,550	$63,525	0.623	$39,576
8		$42,975	$20,550	$63,525	0.582	$36,972
9		$42,975	$20,550	$63,525	0.544	$34,558
10		$42,975	$30,550	$73,525	0.508	$37,351
11		$42,975	$20,550	$63,525	0.475	$30,175
12		$42,975	$20,550	$63,525	0.444	$28,205
13		$42,975	$20,550	$63,525	0.415	$26,363
14		$42,975	$20,550	$63,525	0.388	$24,648
15		$42,975	$30,550	$73,525	0.362	$26,616
16		$42,975	$20,550	$63,525	0.339	$21,535
17		$42,975	$20,550	$63,525	0.317	$20,138
18		$42,975	$20,550	$63,525	0.296	$18,803
19		$42,975	$20,550	$63,525	0.277	$17,597
				TOTAL PRESENT WORTH		**$1,083,120**