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NCBC GULFPORT
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PHASE 2 OFF BASE GROUNDWATER INVESTIGATION LETTER REPORT NCBC GULFPORT MS

10/5/2009

TETRA TECH NUS

TETRA TECH

TtNUS/TAL-09-099/0521-5.1

Project Number 00521

Commander, Southeast
Naval Facilities Engineering Command Southeast
Attn: Robert Fisher
Remedial Project Manager
NAS Jacksonville
Jacksonville, FL 32212-0030

Reference: CLEAN Contract No. N62467-04-D-0055
Contract Task Order No. 0049

Subject: Phase II Off-Base Groundwater Investigation
Naval Construction Battalion Center Gulfport
Gulfport, Mississippi

Dear Mr. Fisher:

This Phase II Off-Base Groundwater Investigation Report provides the results of the Phase II groundwater sampling investigation at the Off-Base Areas of Concern (AOC) defined by the Mississippi Department of Environmental Quality (MDEQ). This investigation was conducted in response to the groundwater results first presented in the "Off-Base Sampling Investigation Field Report Letter", dated March 7, 2008; this sampling investigation was performed under the "Work Plan: Phase II Off-Base Groundwater Investigation", dated December 9, 2008.

INTRODUCTION

During the Phase I Off-Base Groundwater Investigation sampling activities, two groundwater samples, OBAOCW01 and OBAOCW02, were collected using temporary wells from the Arndt and Bennett properties (Figure 1). The dioxin toxicity equivalent quotient (TEQ) for sample OBAOCW02 was reported as 381 parts per quadrillion (ppq), which exceeds the MDEQ target remediation goal (TRG) for 2,3,7,8 tetrachloro dibenzo-p-dioxin (TCDD) of 30 ppq. It should be noted that the closest private groundwater supply wells have been tested at the tap and were non-detect for all dioxin and furan congeners [see *Off-Base Community Sampling Report* (TtNUS, 2003)].

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Based on the results from the Phase I investigation, a subsequent Phase II Off-Base groundwater sampling event was initiated. Permanent monitoring wells were installed to determine if the Phase I groundwater sampling results were due in part to the temporary well sampling method previously used or if the detected TCDD concentrations represented actual site conditions.

The Phase II groundwater sampling fieldwork, which was designed to obtain groundwater samples while avoiding any contact between surface soil, subsurface soil, and groundwater, included the following tasks:

- Global Positioning System (GPS) mapping of the major features included in the study area.
- Permanent well installation using a double-cased technique at the Arndt and Bennett properties. Due to the potential for cross-media transfer, surface casing was used to prevent contact of the drill tools and well materials with the uppermost 5 feet of soil.
- Collection of groundwater samples for a full suite of analyses.

The following section provides the details for the Phase II groundwater sampling.

MONITORING WELL INSTALLATION

Four permanent monitoring wells (OBMW1 through OBMW04) were installed at locations chosen based on the results of the Phase I direct push technology (DPT) groundwater investigation (Figure 1). Wells OBMW01 and OBMW02 were installed in the vicinity of DPT groundwater sample location OBAOCW02. Monitoring well OBMW04 was installed adjacent to DPT groundwater sample location OBAOCW01. The fourth well, OBMW03 was installed in the Turkey Creek floodplain to the northeast of OBMW01 and OBMW02.

Wells were screened in the shallow zone of the shallow surficial aquifer. The screened interval for each well was based on the lithology observed while drilling and included the interval sampled during the Phase I DPT groundwater sampling (18-20 feet below grade at locations OBAOCW01 and OBAOCW02). In this area, a stiff green massive silt unit was encountered at depths of 30 to 35 feet which was considered the base of the shallow zone of the surficial aquifer. Field parameters and well installation details can be found on Table 1.

The monitoring wells were installed using rotosonic drilling methods. A 7-inch surface casing was advanced to a depth of 5 feet to prevent contact with surface soils during drilling and well installation. The rotosonic drill string was advanced inside the surface casing to the total boring depth, based on the occurrence of the green silt horizon.

The monitoring wells were constructed of 2-inch-diameter, Schedule 40 polyvinyl chloride (PVC) flush-threaded casing with 10-foot, 0.01-inch slotted PVC, pre-packed screens. At each well, a filter pack of clean 20/40 silica sand was installed from the bottom of the borehole to 2 feet above the top of the screen. A 4-foot thick bentonite pellet seal was installed above the 20/40 sand filter pack. The remainder of the annulus of the borehole was grouted with cement/bentonite slurry. The monitoring wells were completed at ground surface with flush-mount vaults.

GROUNDWATER SAMPLING AND ANALYSIS

Following well development, groundwater samples were collected from each of the monitoring wells using low-flow purging methods. Groundwater quality parameters including pH, conductivity, temperature, dissolved oxygen, and turbidity were measured with field instruments at each monitoring well during sampling activities. Field parameters for the well development are summarized in Table 1. A field duplicate sample was collected at OBMW01 for Quality Assurance/Quality Control (QA/QC). The groundwater samples were analyzed for the full suite of analyses listed in Table 2. Groundwater sample log sheets are included in Appendix A.

DATA EVALUATION

Upon receipt of the sampling results, the laboratory data underwent full validation. Non-dioxin groundwater sample results were compared to MDEQ Tier 1 groundwater TRGs. The dioxin groundwater results were evaluated using the World Health Organization (WHO) 2005 congener toxicity equivalency factors (TEFs) and the resulting TEQs were screened against the MDEQ TRG for TCDD. The positive detections reported for the groundwater samples are summarized in Table 3.

Dioxins/Furans

Three dioxin congeners were reported at concentrations above the laboratory detection limits (Table 3). 1,2,3,4,6,7,8,9-OCDD and 1,2,3,4,6,7,8-HPCDD were detected in all of the groundwater samples. 1,2,3,7,8,9-HXCDD was detected in groundwater samples OBMW0101 and OBMW0201. TCDD was not reported in the groundwater samples. The dioxin TEQs for the Phase II samples were less than the

MDEQ TRG for TCDD (Table 3). Compared to the Phase I sampling results, the dioxin TEQs were lower and TCDD was not detected.

Other Organics

Two volatile organic compounds (VOCs), acetone and methylene chloride, were detected above the laboratory detection limits in several samples (Table 3). Reported concentrations of these VOCs, which are common laboratory contaminants, were less than the TRGs.

Two semi-volatile organic compounds (SVOCs), di-butyl phthalate and diethyl phthalate, were detected above the laboratory detection limits, but at a concentration less than their MDEQ TRG (Table 3).

Pesticide, PCB, and herbicide concentrations were less than the laboratory detection limits.

Metals

Of the 20 metals detected above the laboratory detection limits, four metals (aluminum, beryllium, iron, and lead) were present at concentrations greater than the MDEQ TRGs (Table 3).

The four metals exceeding the TRGs were detected in the sample from OBGW0401.

Iron was reported in OBGW0201at a concentration of 13,500 µg/L, greater than the TRG of 11,000 µg/L.

CONCLUSIONS

The groundwater dioxin results from the Phase II sampling did not replicate the Phase I sampling results. The dioxin TEQs in the Phase II samples were one to two orders of magnitude lower than the Phase I sample results and TCDD was not detected in the Phase II samples.

Because dioxins have extremely low solubility in water and extremely high affinity to carbon in the soil matrix, it is unlikely that dioxins are moving in the dissolved phase in groundwater or leaching from surface soil at the site. In addition, the VOC analytical results indicate that organic compounds that could act as solvents to increase dioxin mobility are not present at the site.

The elevated dioxin TEQ reported in the Phase I OBAOCW02 sample probably resulted from mixing of surface soil with groundwater allowed by the temporary well sampling method (direct push with open mill-

slot screen). The well installation method used for Phase II (rotosonic with surface casing) prevented contact of the drilling tools and well materials with the surface soil.

Other organic analytes that were detected in the groundwater samples, VOCs (acetone and methylene chloride) and SVOCs (di-butyl phthalate, and diethyl phthalate) were at concentrations below the TRGs.

Metals (aluminum, beryllium, iron, and lead) were the only analytes reported at concentrations greater than TRGs. Based on the history of this area and information available, it is unlikely that Navy activities resulted in a release of these metals.

If you have any questions regarding the information presented in this document, please contact me by phone at (850) 385-9899 or via e-mail at yarissa.martinez@tetratech.com

Cordially,

Yarissa Martinez, P.E.
Task Order Manager

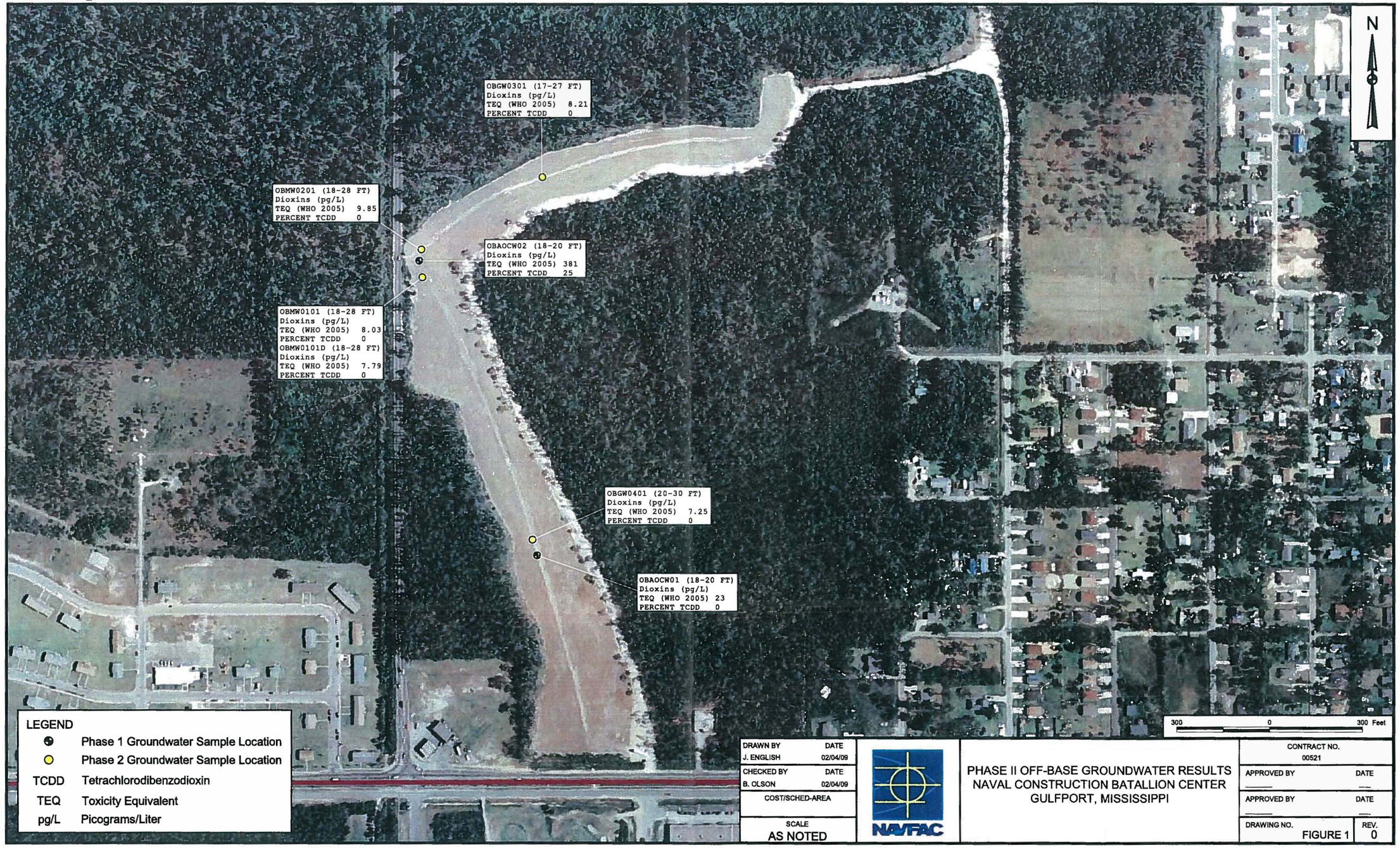
WDO/wdo

Enclosures

c: Gordon Crane (2 copies)
Bob Merrill, MDEQ (1 copy)
Debbie Humbert (1 copy)
Mark Perry (1 copy)

FIGURE

P:\GIS\GULFPORT_CBC\MAPDOCS\APR\VINCINITYMAP.APR PHASE 2 GW TAG LAYOUT 02/04/09 JEE



DRAWN BY / DATE	J. ENGLISH 02/04/09
CHECKED BY / DATE	B. OLSON 02/04/09
COST/SCHED-AREA	
SCALE	AS NOTED

NAVFAC

PHASE II OFF-BASE GROUNDWATER RESULTS
NAVAL CONSTRUCTION BATALLION CENTER
GULFPORT, MISSISSIPPI

CONTRACT NO.	00521
APPROVED BY / DATE	____ ____
APPROVED BY / DATE	____ ____
DRAWING NO.	FIGURE 1
REV.	0

TABLES

TABLE 1

GROUNDWATER QUALITY PARAMETERS
NAVAL CONSTRUCTION BATTALION CENTER GULFPORT
GULFPORT, MISSISSIPPI

Sample	**OBMW0101**	**OBMW0201**	**OBGW0301**	**OBGW0401**
Location	OBMW01	OBMW02	OBMW03	OBMW04
Dated Sampled	12/11/2008	12/12/2008	12/18/2008	12/18/2008
Well Depth (feet)	28	28	27	30
Screen Length (feet)	10	10	10	10
pH	6.50	6.27	5.47	6.56
Conductivity (mS/cm)	0.266	0.247	0.560	0.256
Temperature (°C)	20.09	20.31	20.42	21.33
Turbidity (NTU)	221	396	46.7	714
DO (mg/L)	0.08	0.07	0.23	0.06
ORP (mV)	-261.4	-181.2	-80.2	-139.4
Draw Down (feet)	0.23	1.25	7.91	1.53
Volume Purged (liters)	80	82	45	57
Time Purged (minutes)	260	320	260	270

Notes:

mS/cm = millisiemens per centimeter
°C = degrees celsius
NTU = Nephelometric Turbidity Units
DO = dissolved oxygen
mg/L = milligrams per liter
ORP = Oxidation/Reduction Potential
mV = millivolts

TABLE 2

SAMPLING AND ANALYSIS SUMMARY TABLE
NAVAL CONSTRUCTION BATTALION CENTER GULFPORT
GULFPORT, MISSISSIPPI

SAMPLE ANALYSIS	TOTAL SAMPLES	ANALYTICAL METHOD (SW-846)
Dioxins and Furans	5	8290
TCL VOCs	5	8260B
TCL SVOCs	5	8270C
TCL Pesticides/PCBs	5	8081A/8082
Appendix IX Herbicides	5	8151A
TAL Metals	5	6010B

Notes:
TCL = Target Compound List
VOC = Volatile Organic Compound
SVOC = Semivolatile Organic Compound
PCB = Polychlorinated Biphenyl
TAL = Target Analyte List

TABLE 3

GROUNDWATER DETECTIONS
NAVAL CONSTRUCTION BATTALION CENTER GULFPORT
GULFPORT, MISSISSIPPI

Sample Location Dated Sampled Media	MDEQ TRGs	OBMW0101 OBMW01 12/11/2008 GW	OBMW0101-D OBMW01 12/11/2008 GW OBMW0101 (Duplicate)	OBMW0201 OBMW02 12/12/2008 GW	OBGW0301 OBMW03 12/18/2008 GW	OBGW0401 OBMW04 12/18/2008 GW
Volatile Organics (µg/L)						
ACETONE	**608**	4 J	4 J	5 U	4 J	2 J
METHYLENE CHLORIDE	**5**	0.6 J	0.6 J	5 U	5 U	5 U
Semivolatile Organics (µg/L)						
DI-N-BUTYL PHTHALATE	**3650**	10 U	10 U	10 U	1 J	10 U
DIETHYL PHTHALATE	**29200**	10 U	10 U	10 U	2 J	3 J
Dioxins/Furans (ng/L)						
1,2,3,4,6,7,8,9-OCDD	**0.446**	**1.07**	**0.857**	**1.51**	**0.885**	0.161
1,2,3,4,6,7,8-HPCDD	**0.0446**	**0.057**	**0.047** J	**0.113**	0.012 J	0.008 J
1,2,3,7,8,9-HXCDD	**0.0108**	0.004 J	0.006 U	**0.011** J	0.005 U	0.005 U
Dioxin TEQ as TCDD (pg/L)						
EPA 1989	**30**	8.02	7.64	10.15	8.04	6.62
WHO 2005	**30**	8.03	7.79	9.86	8.21	7.25
percent TCDD		0	0	0	0	0
Inorganics (µg/L)						
ALUMINUM	**36500**	11300	8460	29000	2240	61700
ANTIMONY	**6**	0.78 U	0.78 U	0.78 U	0.78 U	1.1
BARIUM	**2000**	247	231	250	285	1160
BERYLLIUM	**4**	0.76	0.61 U	1.5	0.68	5.1
CADMIUM	**5**	0.04 U	0.04 U	0.04 U	0.37	0.8
CALCIUM	**NA**	4320	4140	3880	6240	11900
CHROMIUM	**110**	13.2	9.4	25.2	6.2	58.6
COBALT	**2190**	0.75	0.46	1.6	1.1	0.96
COPPER	**1300**	13.5	8.8	16.2	8.3	33.9
IRON	**11000**	10400	8970	13500	10700	19900
LEAD	**15**	5.4	3.5	9.3	0.97 U	22.2
MAGNESIUM	**NA**	5340	4980	5040	5590	10200
MANGANESE	**730**	159	149	124	317	398
MERCURY	**2**	0.03 U	0.03 U	0.03 U	0.03 U	0.11
NICKEL	**730**	2.9	2.2	6	4.8	12.6
POTASSIUM	**NA**	3590	3360	3900	1870	5840
SELENIUM	**50**	1.3	0.96 U	0.96 U	0.99 U	6.6
SODIUM	**NA**	43100	41900	44100	1E+05	44100
VANADIUM	**256**	13.4	10.1	34.9	6.2	90.6
ZINC	**11000**	13.2	9.7	24.1	13.5	26.9

Notes:

Shaded = Exceeds MDEQ Target Remediation Goals
MDEQ = Mississippi Department of Environmental Quality
GW = groundwater
µg/L = microgram per liter
ng/L = nanogram per liter
pg/L = picograms per liter
U = non detect
J = estimation
NA = not applicable
TRG = target remediation goal
TEQ = toxicity equivalent

APPENDIX A

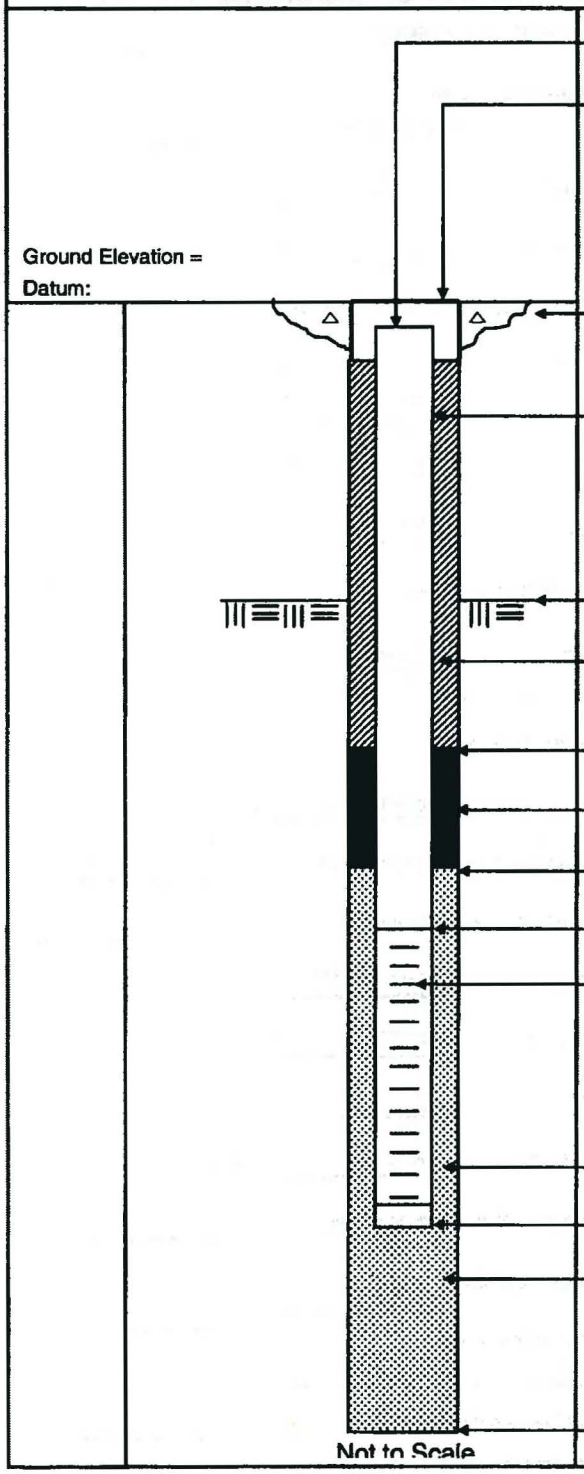
FIELD FORMS

Tetra Tech NUS, Inc.

WELL No.: OBMW01

MONITORING WELL SHEET

PROJECT:	112G00521	DRILLING Co.:	BLY	BORING No.:	OBAOMW01
PROJECT No.:	OBAOC P2	DRILLER:	J. Blackwood	DATE COMPLETED:	12-9/08
SITE:	OBAOC	DRILLING METHOD:	Sonic	NORTHING:	
GEOLOGIST:	W.D. Olson	DEV. METHOD:	Surge/Pump	EASTING:	



Elevation / Depth of Top of Riser: 1

Elevation / Height of Top of Surface Casing: 1

I.D. of Surface Casing: 8"

Type of Surface Casing: bolt down

Type of Surface Seal: 2x2 PAD

I.D. of Riser: 2"

Type of Riser: Sched 40 PVC

Borehole Diameter: 6"

Elevation / Depth Top of Rock: 1 NA

Type of Backfill: grout

Elevation / Depth of Seal: 112

Type of Seal: bentonite pellets

Elevation / Depth of Top of Filter Pack: 116

Elevation / Depth of Top of Screen: 118

Type of Screen: Sched 40 PVC

Slot Size x Length: 0.010 x 10'

I.D. of Screen: 2 inch

Type of Filter Pack: Prepack

Elevation / Depth of Bottom of Screen: 128

Elevation / Depth of Bottom of Filter Pack: 128

Type of Backfill Below Well: fine sand

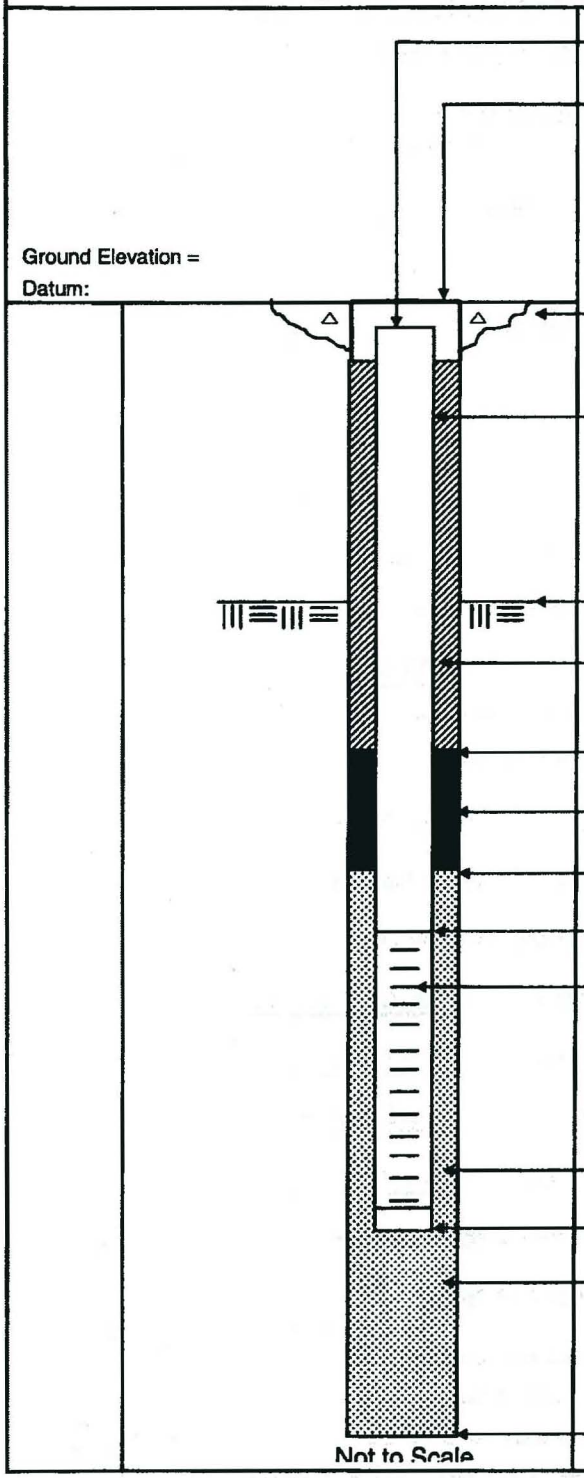
Elevation / Total Depth of Borehole: 135

Tetra Tech NUS, Inc.

WELL No.: ORMW02

MONITORING WELL SHEET

PROJECT:	BRAC EECA	DRILLING Co.:	BLY	BORING No.:	ORMW02
PROJECT No.:	1126 00521	DRILLER:	J. Blackwood	DATE COMPLETED:	12-9-08
SITE:	ORAOC P2	DRILLING METHOD:	Sonic	NORTHING:	
GEOLOGIST:	W.D. Olson	DEV. METHOD:	Surge/Pump	EASTING:	



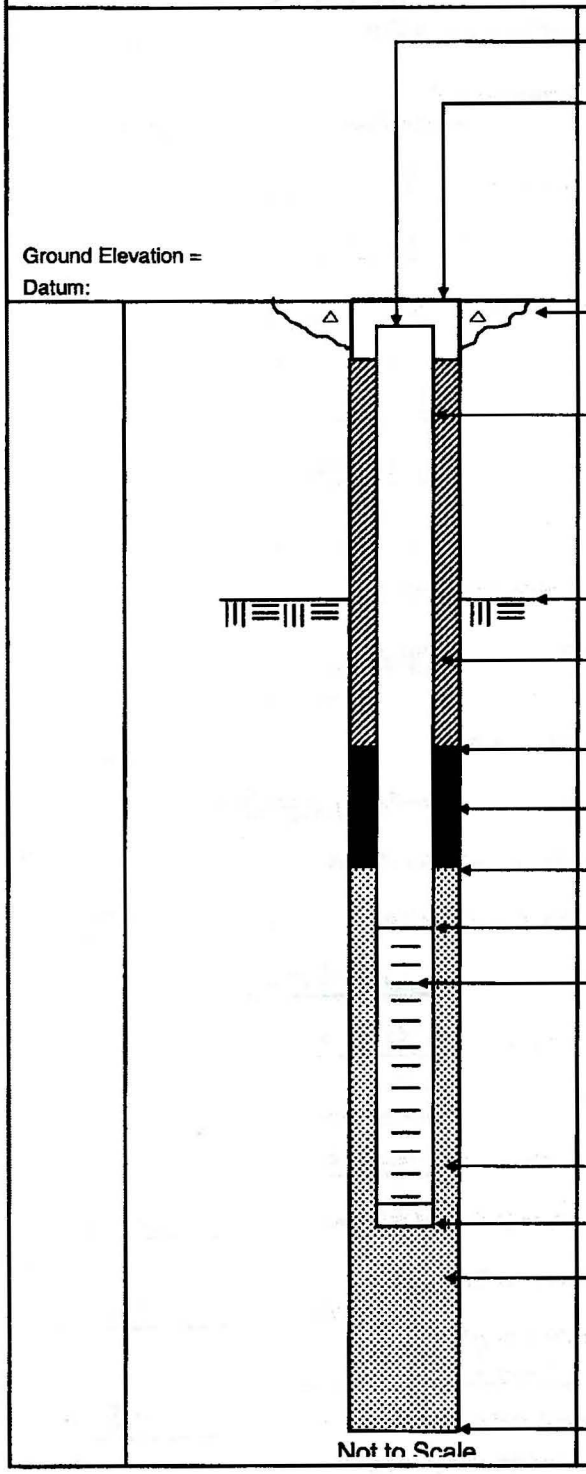
- Elevation / Depth of Top of Riser: 1
- Elevation / Height of Top of Surface Casing: 1
- I.D. of Surface Casing: 8"
- Type of Surface Casing: Bolt down
- Type of Surface Seal: 2x2 Pad
- I.D. of Riser: 2"
- Type of Riser: Sched 40 PVC
- Borehole Diameter: 6"
- Elevation / Depth Top of Rock: 1 NA
- Type of Backfill: grout
- Elevation / Depth of Seal: 1 12'
- Type of Seal: bentonite Pellets
- Elevation / Depth of Top of Filter Pack: 1 16
- Elevation / Depth of Top of Screen: 1 18
- Type of Screen: Sched 40 PVC
- Slot Size x Length: 0.010 X10'
- I.D. of Screen: 2"
- Type of Filter Pack: Pre pack 20/30
- Elevation / Depth of Bottom of Screen: 1 28'
- Elevation / Depth of Bottom of Filter Pack: 1 28'
- Type of Backfill Below Well: NA
- Elevation / Total Depth of Borehole: 128'

Tetra Tech NUS, Inc.

WELL No.: OBMW03

MONITORING WELL SHEET

PROJECT:	8B/C EECA	DRILLING Co.:	RLY	BORING No.:	OBMW03
PROJECT No.:	112G0052	DRILLER:	J. Blackwood	DATE COMPLETED:	
SITE:	OBAOC P2	DRILLING METHOD:	Sonic	NORTHING:	
GEOLOGIST:	W.D.Olsen	DEV. METHOD:	Surge/Purge	EASTING:	



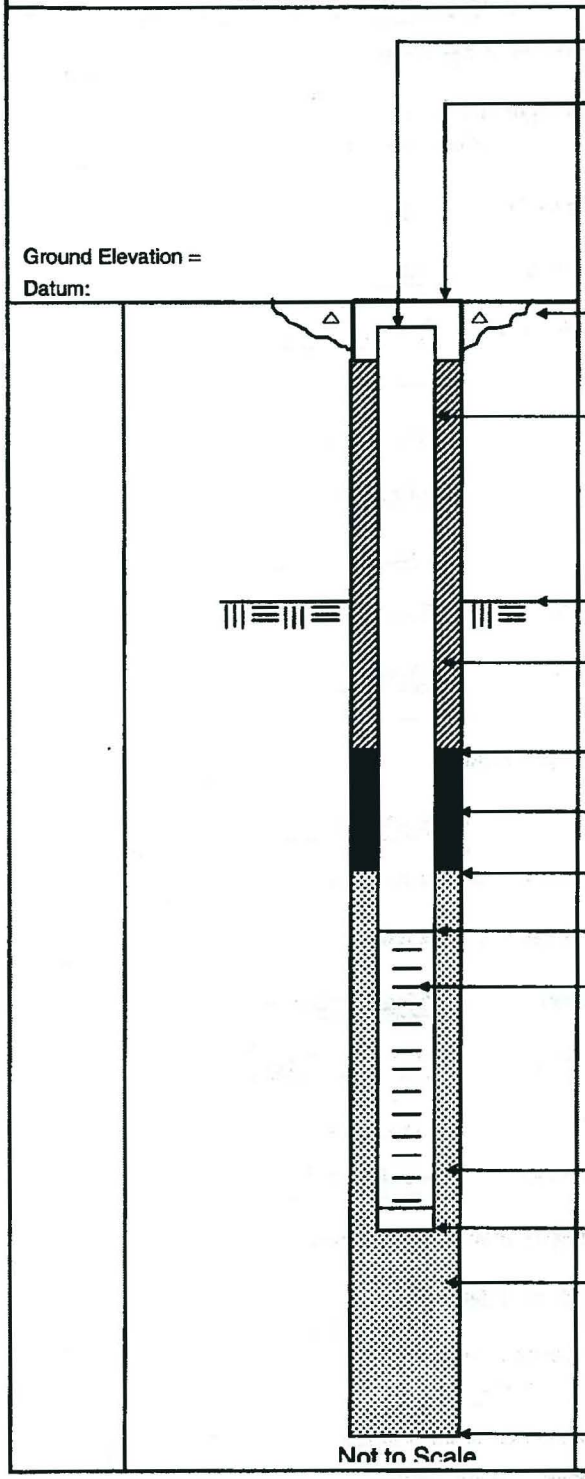
Elevation / Depth of Top of Riser:	/
Elevation / Height of Top of Surface Casing:	/
I.D. of Surface Casing:	8"
Type of Surface Casing:	bolt down
Type of Surface Seal:	2x2 PAD
I.D. of Riser:	2"
Type of Riser:	Sched 40 PVC
Borehole Diameter:	6"
Elevation / Depth Top of Rock:	/ NA
Type of Backfill:	grout
Elevation / Depth of Seal:	/ 11'
Type of Seal:	bentonite pellets
Elevation / Depth of Top of Filter Pack:	/ 15'
Elevation / Depth of Top of Screen:	/ 17'
Type of Screen:	Sched 40 PVC
Slot Size x Length:	0.010 x 10'
I.D. of Screen:	2"
Type of Filter Pack:	Pre Pack
Elevation / Depth of Bottom of Screen:	/ 27'
Elevation / Depth of Bottom of Filter Pack:	/ 27'
Type of Backfill Below Well:	Fine Sand
Elevation / Total Depth of Borehole:	/ 30

Tetra Tech NUS, Inc.

WELL No.: OBMW04

MONITORING WELL SHEET

PROJECT:	BRK EECA	DRILLING Co.:	BLY	BORING No.:	OBMW04
PROJECT No.:	112G0052I	DRILLER:	J. Blackwood	DATE COMPLETED:	
SITE:	OBAOC P2	DRILLING METHOD:	Sonic	NORTHING:	
GEOLOGIST:	W.D.Olson	DEV. METHOD:	Surge/Purge	EASTING:	



Elevation / Depth of Top of Riser:	1
Elevation / Height of Top of Surface Casing:	1
I.D. of Surface Casing:	8"
Type of Surface Casing:	Bolt down
Type of Surface Seal:	2x2 PAD
I.D. of Riser:	2"
Type of Riser:	Sched 40 PVC
Borehole Diameter:	6"
Elevation / Depth Top of Rock:	1 NA
Type of Backfill:	grout
Elevation / Depth of Seal:	1 14'
Type of Seal:	bentonite pellets
Elevation / Depth of Top of Filter Pack:	1 18'
Elevation / Depth of Top of Screen:	1 20
Type of Screen:	Sched 4 PVC
Slot Size x Length:	0.010 x 10'
I.D. of Screen:	2"
Type of Filter Pack:	Prepack
Elevation / Depth of Bottom of Screen:	1 30'
Elevation / Depth of Bottom of Filter Pack:	1 30'
Type of Backfill Below Well:	Fine Sand
Elevation / Total Depth of Borehole:	1 35'

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: [illegible]
PROJECT NUMBER: 112G0521
DRILLING COMPANY: B/L
DRILLING RIG: SONIC SAX

BORING NUMBER: - MW01
DATE: 12.9.08
GEOLOGIST: W.A. Olsen
DRILLER: J. Blackwood

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 brown FS			Ø	Ø	Ø	Ø
							TAN FS						
				wet @ 5'									
										Ø	Ø	Ø	Ø
							dk gray clayey sandy silt						
							gray FS w/silt and clay			Ø	Ø	Ø	Ø
							and gray silt w/FS and clay						
							gray clayey silt w/sand						
							gray FS w/silt grades to tan fine toned						

10
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: Cased off to @ 5' w/ 7" casing

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

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: Site 8
PROJECT NUMBER: 1126 0521
DRILLING COMPANY: B/L
DRILLING RIG: Sonic SDX
BORING NUMBER: MW 8L
DATE: 12-/98
GEOLOGIST: W.A. Olson
DRILLER: J. Blackwood

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	U S C S *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	28						sand						
	30			X			green silt						
							hard						
	35			TD									

* When rock coring, enter rock brokeness.

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

Remarks: ______

Drilling Area Background (ppm): ______

Converted to Well: Yes ______ No ______ Well I.D. #: ______

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: OSAD
PROJECT NUMBER: 112G0521
DRILLING COMPANY: B/L
DRILLING RIG: Sonic

BORING NUMBER: SM004
DATE: 12-10-03
GEOLOGIST: W.D. Osborn
DRILLER: J. Blackwood

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**
							gray silt cohesive						
							dark gray silt w/sand and clay softer						
							ltgry sand and silt some clay						
							ltbrn fine pred sand w/shells						

5 10 15 20 25 30

white to green silt & silt to 35'

* 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: 7" casing to 5'

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

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GROUNDWATER SAMPLE LOG SHEET

Page ___ of ___

Project Site Name:	Sample ID No.: DB-MW01-01
Project No.:	Sample Location: MW01
	Sampled By: C. Olson
[ ] Domestic Well Data	C.O.C. No.:
[x] Monitoring Well Data	Type of Sample:
[ ] Other Well Type:	[ ] Low Concentration
[ ] QA Sample Type:	[ ] High Concentration

SAMPLING DATA:

	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/l)	ORP (mV)	~~Other~~ SWL
Date: 12/11/08								
Time: 1415								
Method: H/SM	drk gry	6.50	0.266	20.09	221	0.08	-261.4	2.82

PURGE DATA:

	Volume	pH	S.C.	Temp.	Turbidity	DO	ORP	~~Other~~ SWL	Time
Date: 12/11/08									
Method: low flow	15L	6.75	0.295	19.94	404	0.91	-258.3	2.73	1225
Monitor Reading (ppm): 0.0	30	6.63	.282	20.20	375	0.17	-266.3	2.76	1255
Well Casing Diameter & Material	45	6.55	.271	20.06	271	0.10	-244.8	2.79	1325
Type: 2.0" PVC	60	6.52	.268	20.10	234	0.08	-217.4	2.81	1355
Total Well Depth (TD): 28.38	70	6.51	.268	20.10	226	0.08	-233.6	2.81	1405
Static Water Level (WL): 2.59	77.5	6.50	.267	20.09	219	0.07	-256.1	2.82	1410
One Casing Volume(gal/L):	80	6.50	.266	20.09	221	0.08	-261.4	2.82	1415
Start Purge (hrs): 1155									
End Purge (hrs): 1415									
Total Purge Time (min):									
Total Vol. Purged (gal/L): 80									

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOA	HCl	3x40mL vial	Yes
SVOC	—	2x1L Amber	Yes
Pest/PCB	—	2x1L Amber	Yes
Herb	—	2x1L Amber	Yes
metals	HNO_3	1x 500mL PE	Yes
Dioxin	—	2x1L Amber	Yes

OBSERVATIONS / NOTES:

1 well volume = 16 liters

Circle if Applicable:		Signature(s):
MS/MSD	Duplicate ID No.:	C. Olson

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Page___ of ___

Project Site Name:	Sample ID No.: 06-MW02-01
Project No.:	Sample Location: MW02
	Sampled By: C. Odom
[] Domestic Well Data	C.O.C. No.:
[✓] Monitoring Well Data	Type of Sample:
[] Other Well Type:	[] Low Concentration
[] QA Sample Type:	[] High Concentration

SAMPLING DATA:

Date: 12/18/08	Color	pH	S.C.	Temp.	Turbidity	DO	ORP	~~Other~~ Sal	Time
Time: 1130	(Visual)	(S.U.)	(mS/cm)	(°C)	(NTU)	(mg/l)	(mV)		
Method: LF Sm									

PURGE DATA:

Date: 12-18-08	Volume	pH	S.C.	Temp.	Turbidity	DO	ORP	~~Other~~ Sal	Time
Method: low flow	15	6.37	.257	20.30	863	0.12	-130.4	3.16	0840
Monitor Reading (ppm):	30	6.24	.255	20.18	835	0.08	-169.2	3.18	0910
Well Casing Diameter & Material	36	6.30	.256	18.27	862	0.07	-146.5	3.11	094
Type: 2.0" PVC	42	6.29	.247	19.17	635	0.14	-149.6	3.08	1010
Total Well Depth (TD): 26.45	57	6.27	.247	20.23	507	0.08	-178.9	3.15	1040
Static Water Level (WL): 1.95	67	6.27	.247	20.24	481	0.07	-174.6	3.18	~~1100~~ 1110
One Casing Volume(gal/L):	69.5	6.27	.247	20.16	459	0.08	-179.7	3.18	1105
Start Purge (hrs): 0810	72.5	6.27	.247	20.24	436	0.09	-151.0	3.18	1115
End Purge (hrs): 1130	~~74.5~~ 77	6.27	.246	20.27	421	0.07	-181.3	3.19	1120
Total Purge Time (min):	79.5	6.26	.246	20.30	408	0.07	-182.5	3.20	1125
Total Vol. Purged (gal/(L)): 82	82	6.27	.247	20.31	396	0.07	-181.2	3.20	1130

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
VOA	HCl	3 x 40 mL vial	
SVOC	—	2 x 1L Amber	
Pest/PCB	—	2 x 1L Amber	
Herb	—	2 x 1L Amber	
metals	HNO3	1 x 500 mL PE	
Dioxin	—	2 x 1L Amber	

OBSERVATIONS / NOTES:

1 well volume = 16L

Circle if Applicable:		Signature(s):
MS/MSD	Duplicate ID No.:	C. Odom (signature)

GROUNDWATER SAMPLING LOG

SITE NAME: ~~LC34~~	SITE LOCATION: ~~Kennedy Space Center~~	
WELL NO: OBAOC MW03	SAMPLE ID: ~~LC34~~ OBGW0301	DATE: 12/18/2008

PURGING DATA

WELL DIAMETER (inches): 2 4	TUBING DIAMETER (inches): 3/16	WELL SCREEN INTERVAL DEPTH: feet to 5 feet 25	STATIC DEPTH TO WATER (feet): 1.75	PURGE PUMP TYPE OR BAILER: PERISTALTIC

WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH – STATIC DEPTH TO WATER) X WELL CAPACITY
only fill out if applicable)
= (25 feet – 1.75 feet) X 23.25 liters/foot = 3.73 gal liters

EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOL. = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME
(only fill out if applicable)
= gallons + (gallons/foot X feet) + liters = liters

INITIAL PUMP OR TUBING DEPTH IN WELL (feet):	FINAL PUMP OR TUBING DEPTH IN WELL (feet):	PURGING INITIATED AT:	PURGING ENDED AT:	TOTAL VOLUME PURGED (gallons):

TIME	VOLUME PURGED (liters) g	CUMUL. VOLUME PURGED (liters) S	PURGE RATE (lpm)	DEPTH TO WATER (feet)	pH (standard units)	TEMP. (°C)	COND. (µS/cm)	DISSOLVED OXYGEN (mg/L)	TURBIDITY (NTUs)	COLOR (describe)	ORP (mv)
0750	0	0	200	1.72	—	—	—	—	—	—	—
0820	1	1	400	4.30	5.61	19.59	0.521	2.28	80.1	gray	82.5
0840	2	3	400	6.65	5.63	20.16	0.536	0.59	64.0	gray	25.1
0900	2	5	400	7.71	5.64	20.15	0.635	0.43	63.6	—	-18.7
0920	2	7	400	8.48	5.57	20.24	0.611	0.37	55.2	—	-49.8
0940	2	9	400	9.00	5.53	20.33	0.576	0.33	53.6	—	-65.3
1000	2	11	400	9.43	5.49	20.36	0.566	0.24	46.7	—	-76.6
1005	0.5	11.5	400	9.55	5.47	20.39	0.561	0.23	46.5	—	-79.4
1010	0.5	12	400	9.66	5.47	20.42	0.566	0.23	46.7	—	-80.2

2.33 1.75 +.23 +.73

WELL CAPACITY (Gallons Per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3" = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47; 12" = 5.88
TUBING INSIDE DIA. CAPACITY (Gal./Ft.): 1/8" = 0.0006; 3/16" = 0.0014; 1/4" = 0.0026; 5/16" = 0.004; 3/8" = 0.006; 1/2" = 0.010; 5/8" = 0.016

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION: /TTNUS	SAMPLER(S) SIGNATURES:	SAMPLING INITIATED AT:	SAMPLING ENDED AT:
PUMP OR TUBING DEPTH IN WELL (feet):	SAMPLE PUMP (SM) FLOW RATE (mL per minute):	TUBING MATERIAL CODE: T	
FIELD DECONTAMINATION: Y N	FIELD-FILTERED: Y N FILTER SIZE: ____ µm Filtration Equipment Type: ____	DUPLICATE: Y N	

SAMPLE CONTAINER SPECIFICATION				SAMPLE PRESERVATION			INTENDED ANALYSIS AND/OR METHOD	SAMPLING EQUIPMENT CODE
SAMPLE ID CODE	# CONTAINERS	MATERIAL CODE	VOLUME	PRESERVATIVE USED	TOTAL VOL ADDED IN FIELD (mL)	FINAL pH		
	3	CG	3x40ml	HCL			8260B (Voc's)	SM

MATERIAL CODES: AG = Amber Glass; CG = Clear Glass; PE = Polyethylene; PP = Polypropylene; S = Silicone; T = Teflon; O = Other (Specify)

SAMPLING/PURGING EQUIPMENT CODES: APP = After Peristaltic Pump; B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; PP = Peristaltic Pump; RFPP = Reverse Flow Peristaltic Pump; SM = Straw Method (Tubing Gravity Drain); VT = Vacuum Trap; O = Other (Specify)

NOTES: 1. **The above do not constitute all of the information required by Chapter 62-160, F.A.C.**

2. STABILIZATION CRITERIA FOR RANGE OF VARIATION OF LAST THREE CONSECUTIVE READINGS (SEE FS 2212, SECTION 3)

pH: ± 0.2 units **Temperature:** ± 0.2 °C **Specific Conductance:** ± 5% **Dissolved Oxygen:** all readings ≤ 20% saturation (see Table FS 2200-2); optionally, ± 0.2 mg/L or ± 10% (whichever is greater) **Turbidity:** all readings ≤ 20 NTU; optionally ± 5 NTU or ± 10% (whichever is greater)

GROUNDWATER SAMPLING LOG

SITE NAME: LC34	SITE LOCATION: Kennedy Space Center
WELL NO: OBAOC MW04	SAMPLE ID: LC34-OBGW0401
DATE: 12/18/2008	

PURGING DATA

WELL DIAMETER (inches): 2"	TUBING DIAMETER (inches): 3/16	WELL SCREEN INTERVAL 20-30 DEPTH: feet to feet	STATIC DEPTH TO WATER (feet): 2.16	PURGE PUMP TYPE OR BAILER: PERISTALTIC

WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH – STATIC DEPTH TO WATER) X WELL CAPACITY
only fill out if applicable)
= (feet – feet) X liters/foot = liters

EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOL. = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME
(only fill out if applicable) 4.45 gal = gallons + (gallons/foot X feet) + liters = liters

INITIAL PUMP OR TUBING DEPTH IN WELL (feet):	FINAL PUMP OR TUBING DEPTH IN WELL (feet):	PURGING INITIATED AT:	PURGING ENDED AT:	TOTAL VOLUME PURGED (gallons):

TIME	VOLUME PURGED (liters)	CUMUL. VOLUME PURGED (liters)	PURGE RATE (lpm)	DEPTH TO WATER (feet)	pH (standard units)	TEMP. (°C)	COND. (µS/cm)	DISSOLVED OXYGEN (mg/L)	TURBIDITY (NTUs)	COLOR (describe)	ORP (mv)
1130	Ø	Ø	400	2.25	—	~	~	—	~	~	—
1150	2	2	400	3.11	6.80	21.10	0.287	0.15	>1000	brn	-106.5
1210	2	4	400	3.26	6.69	21.17	0.277	0.12	>1000	brn	-123.6
1230	2	6	400	3.31	6.68	21.36	0.271	0.08	>1000	brn	-128.9
1250	2	8	400	3.40	6.65	21.53	0.267	0.06	>1000	Brn	-124.7
1310	2	10	400	3.50	6.62	21.61	0.263	0.05	>1000	BRN	-140.0
1330	2	12	400	3.58	6.60	21.39	0.260	0.05	871	BRN	-139.5
1350	2	14	400	3.64	6.57	21.33	0.258	0.05	731	BRN	-140.0
1355	1/2	14 1/2	400	3.66	6.56	21.41	0.257	0.05	761	BRN	-139.4
1400	1/2	15	400	3.69	6.56	21.33	0.256	0.06	714	BRN	-139.4

WELL CAPACITY (Gallons Per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3" = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47; 12" = 5.88
TUBING INSIDE DIA. CAPACITY (Gal./Ft.): 1/8" = 0.0006; 3/16" = 0.0014; 1/4" = 0.0026; 5/16" = 0.004; 3/8" = 0.006; 1/2" = 0.010; 5/8" = 0.016

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION: /TTNUS	SAMPLER(S) SIGNATURES:	SAMPLING INITIATED AT:	SAMPLING ENDED AT:
PUMP OR TUBING DEPTH IN WELL (feet):	SAMPLE PUMP (SM) FLOW RATE (mL per minute):	TUBING MATERIAL CODE: T	
FIELD DECONTAMINATION: Y N	FIELD-FILTERED: Y N FILTER SIZE: ____ µm Filtration Equipment Type:	DUPLICATE: Y N	

SAMPLE CONTAINER SPECIFICATION				SAMPLE PRESERVATION			INTENDED ANALYSIS AND/OR METHOD	SAMPLING EQUIPMENT CODE
SAMPLE ID CODE	# CONTAINERS	MATERIAL CODE	VOLUME	PRESERVATIVE USED	TOTAL VOL ADDED IN FIELD (mL)	FINAL pH		
	3	CG	3x40ml	HCL			8260B (Voc's)	SM

MATERIAL CODES: AG = Amber Glass; CG = Clear Glass; PE = Polyethylene; PP = Polypropylene; S = Silicone; T = Teflon; O = Other (Specify)

SAMPLING/PURGING EQUIPMENT CODES: APP = After Peristaltic Pump; B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; PP = Peristaltic Pump; RFPP = Reverse Flow Peristaltic Pump; SM = Straw Method (Tubing Gravity Drain); VT = Vacuum Trap; O = Other (Specify)

NOTES: 1. The above do not constitute all of the information required by Chapter 62-160, F.A.C.
2. STABILIZATION CRITERIA FOR RANGE OF VARIATION OF LAST THREE CONSECUTIVE READINGS (SEE FS 2212, SECTION 3)
pH: ± 0.2 units **Temperature:** ± 0.2 °C **Specific Conductance:** ± 5% **Dissolved Oxygen:** all readings ≤ 20% saturation (see Table FS 2200-2); optionally, ± 0.2 mg/L or ± 10% (whichever is greater) **Turbidity:** all readings ≤ 20 NTU; optionally ± 5 NTU or ± 10% (whichever is greater)

30 26
2.16
27.84

12.78
1.39

4.45

SGS Environmental Services Inc.
CHAIN OF CUSTODY RECORD

Locations Nationwide
- Alaska
- Maryland
- New Jersey
- New York
- North Carolina
- Ohio
- West Virginia

www.us.sgs.com

(1)

CLIENT: T+WUS

CONTACT: Bill Olson PHONE NO: 850 385 9899

PROJECT: CTO 49 Gulfport SITE/PWSID#:

REPORTS TO: EMAIL:

INVOICE TO: QUOTE #:

P.O. #:

SGS Reference #:

page _____ of _____

(2)

LAB NO.	SAMPLE IDENTIFICATION	DATE	TIME	MATRIX/ MATRIX CODE	# CONTAINERS	SAMPLE TYPE C= COMP G= GRAB M= Multi Incremental Samples	Preservatives Used: 4°	Analysis Required (3): Dioxins/ Furans	REMARKS/ LOC ID
	OBmw0101	12-11-08	1430	GW	2	G	2		
	OBmw0101D	12-11-08	1430	GW	2	G	2		
	OBmw0201	12-12-08	1130	GW	2	G	2		

(5)

Collected/Relinquished By:(1)	Date	Time	Received By:
[signature]	12-12-08	1600	
Relinquished By: (2)	Date	Time	Received By:
Relinquished By: (3)	Date	Time	Received By:
Relinquished By: (4)	Date	Time	Received For Laboratory By:

(4)

DOD Project? YES NO

Cooler ID _____

Special Deliverable Requirements:

Requested Turnaround Time and-or Special Instructions:

Samples Received Cold? YES NO

Cooler TB

Temperature °C: _____ • _____

Chain of Custody Seal: (Circle)

INTACT BROKEN ABSENT

Katahdin ANALYTICAL SERVICES
600 Technology Way
Scarborough, ME 04074
Tel: (207) 874-2400
Fax: (207) 775-4029

CHAIN of CUSTODY

PLEASE BEAR DOWN AND PRINT LEGIBLY IN PEN

Page 1 of 1

Client	Contact	Phone #	Fax #
T+NUS	B. Nelson	(850) 385-9899	(850) 385-986

Address	City	State	Zip Code
1558 Village Sq. Blvd - 2	Tallahassee	FL	32309

Purchase Order #	Proj. Name / No.	Katahdin Quote #
	CTO 49 Gulfport	

Bill (If different than above) — Address

Sampler (Print / Sign) Neil D. Olsen — Copies To:

LAB USE ONLY WORK ORDER #:

KATAHDIN PROJECT NUMBER _____

REMARKS: _____

SHIPPING INFO: ☐ FED EX ☐ UPS ☐ CLIENT

AIRBILL NO: _____

TEMP°C _____ ☐ TEMP BLANK ☐ INTACT ☐ NOT INTACT

*	Sample Description	Date / Time coll'd	Matrix	No. of Cntrs.	ANALYSIS AND CONTAINER TYPE PRESERVATIVES: TCL VOC (Filt. ☐Y ☒N)	TCL SVOC (Filt. ☐Y ☒N)	TCL Pest/PCB (Filt. ☐Y ☒N)	TAL metals (Filt. ☐Y ☒N)	APPX IX Metals (Filt. ☐Y ☐N)	Filt. ☐Y ☐N	Filt. ☐Y ☐N	Filt. ☐Y ☐N	Filt. ☐Y ☐N	Filt. ☐Y ☐
	OBmw0101	12-11-08 1436	Gw	10	3	2	2	1	2					
	OBmw0101D	12-11-08 1430	Gw	10	3	2	2	1	2					
	OBmw0201	12-12-08 1130	Gw	10	3	2	2	1	2					
	OBTB121208	12-12-08	QA	2	2									
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COMMENTS

Relinquished By: (Signature)	Date / Time	Received By: (Signature)	Relinquished By: (Signature)	Date / Time	Received By: (Signature)
	12-12-08 1600				
Relinquished By: (Signature)	Date / Time	Received By: (Signature)	Relinquished By: (Signature)	Date / Time	Received By: (Signature)

CUSTOMER COPY

565

EMPIRICAL LABORATORIES, LLC - CHAIN OF CUSTODY RECORD

SHIP TO: 227 French Landing Drive, Suite 550 ♦ Nashville, TN 37228 ♦ 615-345-1115 ♦ (fax) 615-846-5426

42881

Send Results to:	Send Invoice to:
Name Bill Olson	Name Gulf Port CTO 49
Company T+NUS	Company Site 8B/C
Address 1558 Village Sq. Blvd-2	Address
City Tallahassee	City
State, Zip FL 32309	State, Zip
Phone 850 385 9899	Phone
Fax	Fax
E-mail	E-mail
Project No./Name:	**Sampler's (Signature):**

Analysis Requirements: Dioxins/Furans

Lab Use Only:

VOA Headspace	Y	N	NA
Field Filtered	Y	N	NA
Correct Containers	Y	N	NA
Discrepancies	Y	N	NA
Cust. Seals Intact	Y	N	NA
Containers Intact	Y	N	NA

Airbill #:

CAR #:

Lab Use Only Lab #	Date/Time Sampled	Sample Description	Sample Matrix	Dioxins/Furans													Comments	No. of Bottles	*Lab Use Only* Containers/Pres.
	12-18/08 1015	OBG-W0301	GW	2															
	12-18/08 1405	OBG-W0401	GW	2															

Sample Kit Prep'd by: (Signature)	Date/Time	Received By: (Signature)
Relinquished by: (Signature) Will B. Olson	Date/Time 12-8-08 1630	Received By: (Signature)
Relinquished by: (Signature)	Date/Time	Received By: (Signature)
Received for Laboratory by: (Signature)	Date/Time	*Temperature*

REMARKS:

Details:

Page ____ of ____

Cooler No. ____ of ____

Date Shipped ____

Shipped By ____

Turnaround ____

Distribution: Original and yellow copies accompany sample shipment to laboratory; Pink retained by samplers.

RAHANSIN

EMPIRICAL LABORATORIES, LLC - CHAIN OF CUSTODY RECORD

SHIP TO: 227 French Landing Drive, Suite 550 ♦ Nashville, TN 37228 ♦ 615-345-1115 ♦ (fax) 615-846-5426

42880

Send Results to:	Send Invoice to:
Name: TtIO GW	Name: GULF PORT CTO 41
Company: TtNUS	Company: SB/C
Address: 558 Village Sq Blvd - [illegible]	Address:
City: Tallahassee	City:
State, Zip: FL 32309	State, Zip:
Phone: 8[illegible] 85-78[illegible]	Phone:
Fax:	Fax:
E-mail:	E-mail:
Project No./Name:	**Sampler's (Signature):**

Analysis Requirements: T[illegible] / TL SVOC / PE[illegible] CB / R S [illegible] K IX / Metals + Hg

Lab Use Only:

VOA Headspace	Y	N	NA
Field Filtered	Y	N	NA
Correct Containers	Y	N	NA
Discrepancies	Y	N	NA
Cust. Seals Intact	Y	N	NA
Containers Intact	Y	N	NA

Airbill #:

CAR #:

Lab Use Only Lab #	Date/Time Sampled	Sample Description	Sample Matrix	T[illegible]	TL SVOC	PE[illegible] CB	R S [illegible] K IX	Metals + Hg	Comments	No. of Bottles	*Lab Use Only* Containers/Pres.
	12/[illegible]/08 1015	OBGW0301	GW	3	2	2	2	1		10	
	12/[illegible]/08 [illegible]5	OBGW0401	GW	3	2	2	2	1		10	
	12-18-08 1000	OBTB1218	QA	1	~~2~~					2	

Sample Kit Prep'd by: (Signature)	Date/Time	Received By: (Signature)
Relinquished by: (Signature) [signature]	Date/Time 12/18/08 6:30	Received By: (Signature)
Relinquished by: (Signature)	Date/Time	Received By: (Signature)
Received for Laboratory by: (Signature)	Date/Time	*Temperature*

REMARKS:

Details:

Page 1 of 1

Cooler No. 1 of 1

Date Shipped

Shipped By

Turnaround

Distribution: Original and yellow copies accompany sample shipment to laboratory; Pink retained by samplers.

Tetra Tech NUS Inc.

BORING LOG

Page 1 of ___

PROJECT NAME: AB AOC
PROJECT NUMBER: 112G00521
DRILLING COMPANY: B/L
DRILLING RIG: Sonic Spider

BORING NUMBER: MW03
DATE: 12-10/09
GEOLOGIST: W.A. Olson
DRILLER: J. Blackwood

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**
							JAWFS w/shell						
							gray clayey						
							silt w/ fine sand						
							sandier @ 15'						
							gray silty sand						
							w/ clay,						
							100 sand						
							gray sandy silt						
							grades to gray						
							silt						
							grades						
							to green silt						

5 10 15 20 25 30

TD

* 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 _____ Well I.D. #: _____

APPENDIX B

RESPONSE TO MDEQ COMMENTS

RESPONSE TO COMMENTS

Responses to MDEQ comments dated June 19, 2009 for the Draft Phase II Off-Base Groundwater Investigation Report dated June 3, 2009:

MDEQ Comment 1:

> It is noted that dioxin concentrations detected in the new (permanent) groundwater monitoring wells were lower than those reported from the Phase I (March 2008) Direct Push sampling event. OPC concurs that elevated TCDD dioxin concentrations detected during the Phase I event can probably be attributed to soil particulates introduced into the groundwater sample during the DPT sampling process. It is also noted that three dioxin congeners (other than TCDD) were reported at concentrations above regulatory levels.

Response to MDEQ Comment 1:

While hexa-, hepta-, and octochlorinated dibenzo dioxins were detected in groundwater samples, tetrachlorodibenzodioxin (TCDD) was absent in all the groundwater samples from the permanent monitoring wells. The absence of TCDD does not support an HO source for the dioxin detected in the groundwater samples.

In addition, the TEQs for all the samples were less than the target remediation goal (TRG) for TCDD, accepted as the most toxic of the chlorinated dibenzodioxin congeners. The fact that the TRG for the HxCDD congener is less than the TCDD TRG indicates that the Toxicity Equivalence Factor (TEF) approach for evaluating dioxin concentrations is more representative of site conditions.

MDEQ Comment 2:

> Four metals (lead, beryllium, aluminum, and iron) were detected above regulatory screening levels. The text (page 5, paragraph 2) states that "these concentrations probably represent naturally occurring levels of these metals". Coastal plain strata of Mississippi do not contain geologic units that contain lead or beryllium that would support dissolved phase groundwater concentrations that exceed MCLs. Although these occurrences may be attributable to other sources of contamination, these concentrations do not reflect "natural" or in situ mineral assemblage (parent material) dissolution. If another source of contamination is proposed then that source should be identified. Aluminum and iron do not have primary MCLs but secondary screening levels were exceeded for those metals also, potentially exceeding ecological screening levels.

Response to MDEQ Comment 2:

The text will be revised. Based on site history, there is no evidence to suggest that the presence of these metals in site groundwater has resulted from Navy activities. Therefore, no other source of contamination is suggested.