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NSA MID SOUTH  
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SUMMARY STATUS REPORT SUPPLEMENTAL SOLID WASTE MANAGEMENT UNIT 15  
(SWMU 15) INVESTIGATIONS AND AREA OF CONCERN A (AOC A) SUBSTRATE  
INJECTIONS MILLINGTON SUPPACT TN  
2/1/2014  
RESOLUTION CONSULTANTS

# SUMMARY STATUS REPORT

## SUPPLEMENTAL SWMU 15 INVESTIGATIONS AND AOC A SUBSTRATE INJECTIONS

NAVAL SUPPORT ACTIVITY MID-SOUTH  
MILLINGTON, TENNESSEE

Version Number: 0

Prepared For:



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CTO JM02

February 2014

## TECHNICAL MEMORANDUM

To: NSA Mid-South Base Cleanup Team

From: Resolution Consultants Inc.

Date: 4 February 2014

Re: Summary Status Report — Supplemental SWMU 15 Investigation and  
AOC A Substrate Injections

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This technical memorandum contains a summary of the supplemental investigative and interim corrective measures conducted at Solid Waste Management Unit (SWMU) 15 and Area of Concern (AOC) A at Naval Support Activity Mid-South between 2012 and 2013, and associated documentation (well construction logs, figures, and analytical data). The work has been completed per the *Tier II Sampling and Analysis Plan; Area of Concern A — Fluvial Deposits Groundwater; Naval Support Activity Mid-South* (Resolutions Consultants, September 2012) (SAP).

Groundwater analytical data from an initial baseline sampling of wells constructed in January and February 2013 (collected at the conclusion of well development), along with data from the February 2013 semi-annual sampling event are briefly presented in this report. This data will be further evaluated in the context of the overall site-wide AOC A data in the upcoming *Annual Progress Report* for AOC A expected for release in January 2014.

### **SWMU 15 DPT Investigation**

SWMU 15 is a former fuel farm that contained ten 10,000- to 25,000-gallon underground storage tanks (USTs) prior to their removal in 1992. In spite of an extensive removal of petroleum-contaminated soil in 2004 (outlined in green on Figure 1), elevated benzene levels have persisted in groundwater samples collected from monitoring well 015G01UF, located north of the removal area (Figure 1). During the week of 28 October 2012, Resolution Consultants conducted a groundwater assessment near monitoring well 015G01UF using a combination of direct push technology (DPT) and sampling from temporary 1-inch diameter monitoring wells. The objectives of the data-collection effort were:



- (1) Evaluate the extent of benzene in fluvial deposits groundwater in the area of well 015G01UF.
- (2) Identify the depth interval at which the benzene was present.
- (3) Collect remedial design data for possible remedial evaluation.

To meet these objectives, a nine-location groundwater sampling grid was established around well 015G01UF from which groundwater samples were collected at three depth intervals in the upper and middle parts of the fluvial deposits; 35, 45, and 55 feet below ground surface (bgs).

Empirical Laboratories in Nashville, Tennessee, provided volatile organic compound (VOC) analyses using SW-846 Method 8260B. The validation and laboratory reports are provided in Attachments A and B, respectively, and Table 1 contains a summary of the VOCs detected during the investigation. Figures 2, 3, and 4 show benzene concentrations in groundwater samples collected at 35, 45, and 55 feet bgs, respectively. The maximum benzene concentrations are present at the 45-foot depth interval, which is at the same depth as the lower part of the screened interval in well 015G01UF. The most elevated benzene detections were identified at the southernmost transect (closest to the former tank excavation area), where concentrations of 4,380 and 2,780 micrograms per liter ( $\mu\text{g/L}$ ) were present at locations 7 and 8 (see Figure 3).

The north-south orientation of the DPT/temporary well sampling grid assumed the northern part of the former SWMU 15 fuel farm is the source for the benzene observed in 015G01UF, given its proximity to the well (approximately 100 feet south of the well). However, the distribution of the recently collected benzene data relative to the AOC A groundwater flow direction led to a soil-gas survey being conducted in October 2013 to evaluate whether the former fuel tank areas and oil water separators east-northeast of SWMU 15 (shown on Figure 5) were possible source areas to the benzene. A preliminary evaluation of the soil-gas data, as presented to the Base Cleanup Team at the November 2013 meeting, indicates no benzene soil-gas signatures associated with these areas; therefore, the current hypothesis is that residual petroleum contamination left in the SWMU 15 excavation area is the source for the benzene detections. (Additional investigative measures are proposed later in this document.)

### **Supplemental Interim Corrective Measures — Area of Concern A**

As outlined in the 2012 SAP, remedy optimization measures were warranted at two areas of AOC A because of the following conditions:

- **Former Base Boundary** — TCE in fluvial deposits groundwater has increased in the downgradient, offsite well 007G52LF, triggering supplemental corrective measures to mitigate further offsite impacts. Given the TCE increase in offsite well 007G52LF, two supplemental offsite monitoring wells were installed.
- **Sub-Plume D** — The former AOC A pilot study and interim corrective measures focused on the east side of Sub-Plume D, leaving untreated the remainder of the sub plume where TCE levels up to 500 µg/L were detected in 2010, and thus warranting expansion of the treatment zone. Additionally, several wells in the former treatment area continue to exhibit TCE levels exceeding the 100 µg/L active remediation goal, and thus also warrant continued treatment. As specified in the SAP 21 wells were used for treating the former and untreated sections of the plume. As a result of converting several monitoring wells into injection wells, three new, remedy effectiveness monitoring wells were constructed downgradient of the treatment areas.

#### **AOC A: Mitigating Offsite Migration of Trichloroethylene (TCE) and Added Delineation**

Between 21 January and 10 February 2013, ten injection wells (wells 007G93LF — 007G102LF) were constructed along the former perimeter road of the Base, creating an injection-well transect across the downgradient end of the TCE plume before it leaves the former Base property boundary (see Figure 6). The objective of the injection wells is to deliver carbon substrate into the fluvial deposits aquifer at the property boundary and create an anaerobic zone so TCE undergoes reductive dechlorination as it migrates through the treatment area, mitigating further offsite impacts.

Injection wells were constructed using rotary sonic drilling methods and consisted of 4-inch diameter, Schedule 40 poly vinyl chloride (PVC) risers, attached to 10-feet of 0.010-slot PVC screens. Wells were screened in the lowermost 10 feet of the fluvial deposits aquifer, and ranged from 88 and 100 feet deep. The two offsite monitoring wells were constructed similarly, except that well diameters were 2-inch instead of 4-inch. Table 2 provides total depths, survey information, and well-construction details for the 10 injection and two monitoring wells. Lithological descriptions and well construction logs are in Attachment C.

The newly constructed injection wells were sampled twice before the first injections were conducted; once at the end of each well's development (late January/early February) and again in February 2013 as part of the AOC A semi-annual long-term monitoring. Attachments A and B contain the validation and laboratory reports, respectively, and Table 3 provides a summary of the

VOCs detected during the baseline semi-annual event. TCE concentrations detected at the end of well development and during the baseline-sampling event are shown on Figure 6. TCE concentrations were relatively consistent with historical detections near the perimeter road, ranging between 7 and 19 µg/L, and are illustrated on Figure 6. TCE was not detected in the two newly constructed, offsite monitoring wells (007G0106LF and 007G107LF) along Veteran's Parkway.

An emulsified vegetable oil/lactate-base carbon substrate was injected into the ten injection wells between 24 June and 8 July 2013.<sup>1</sup> Resolution Consultants provided oversight and mixing directions to the injection contractor, McCray Drilling, during injection activities. Dosing quantities were established by the carbon substrate vendor (TerraSystems) and were based on the TCE concentrations, aquifer properties, and remedial cleanup goals, among other variables. The volumes of substrate, mixing water, and chase water used for distributing the material into the aquifer are listed in Table 4. The specifications for each well were the following:

- The initial injection of 626 gallons of carbon substrate diluted with 1,878 gallons of water.
- Following the initial injection, injection of 18,000 gallons of chase water to distribute the substrate into the formation away from the well. Because of permeability issues within the formation, five of the 10 wells did not receive all the entire chase water-volumes specified (as noted on Table 4).

A fire hydrant at Veteran's Parkway was used to fill two 20,000 gallon tanks (or Baker boxes) to stage the necessary mixing and chase water. The specified volumes were injected into the perimeter wells using gravity feed, and at the Sub-Plume D wells using a gravity feed or a diaphragm pump.

### **Sub-Plume D — Added Monitoring Wells and Substrate Injections**

The optimization measures at Sub-Plume D specified carbon substrate injections into 21 existing monitoring wells and construction of three new downgradient, effectiveness monitoring wells at locations shown on Figure 7. Monitoring wells were constructed at Sub-Plume D using the same drilling methods and materials during the same week as installation of the Perimeter Road injection and offsite monitoring wells. Well construction details are provided in Table 2 and lithological and construction logs are provided in Attachment C. Unlike the other AOC A Sub-Plumes (A through C)

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<sup>1</sup> Terra System's emulsified substrate (SRS<sup>®</sup>) contains a 50/50 mixture of small and large droplet sizes (SRS<sup>®</sup>-SD and SRS<sup>®</sup>-FR) for injecting at the AOC A perimeter. The small droplet substrate is designed for maximum radius of influence in the formation whereas the larger substrate droplet is designed for applications where adherence to the formation is important, particularly in highly conductive aquifers, as is the fluvial deposits along the Perimeter road.

and the Perimeter boundary area, TCE migrates from the upper to the middle portion of the fluvial deposits aquifer at Sub-Plume D and is contained well within the former Base property boundary. February 2013 sample data (pre-injection) are shown on Table 3 along with data for the samples collected following well development of the newly constructed Sub-Plume D monitoring wells 007G103MF, 007G104MF, and 007G105MF.

The substrate volumes, injection dates, and wells that received carbon substrate at Sub-Plume D are listed in Table 4. Each of the 21 wells shown on Figure 7 received 66 gallons of carbon substrate diluted with 235 gallons of water, and 485 gallons of chase water. Given the greater number of wells and their proximity to each other, less substrate and chase water were necessary compared to the property boundary injections. The eight Parson Environmental Services Sub-Plume D wells previously used for the 2010 vegetable oil pilot study contained what appeared to be a polymerized vegetable oil, requiring use of a diaphragm pump to force the carbon substrate past the remaining product and into the formation.

For the Sub-Plume D wells, the substrate and water were mixed in 300 gallon totes and chase water was placed in either a 500-gallon tank or two 300-gallon totes. Water for the Sub-Plume D wells was obtained from a Navy-owned fire hydrant near the airport property.

### **Investigative Derived Waste**

All purge and development water was managed per the SAP's Standard Operating Procedure 3-05(MS) for investigative derived waste. Attachment D contains correspondence from the City of Millington authorizing disposal of the purge/development water to the sanitary sewer.

Soil waste (drill cuttings) was placed at the former SWMU 41 site on the Base's Southside, covered with plastic sheeting, and bordered with hay bales while pending laboratory analysis. Upon receipt of the waste-soil analytical data, the data were screened against the residential U.S. Environmental Protection Agency Regional Screening Levels (RSLs) to verify no exposure risk was associated with any residual contaminants in the drill cuttings. After comparison with RSLs established no risk to human health from soil cuttings, the plastic was removed, and the soil was seeded with grass and lightly covered with straw.

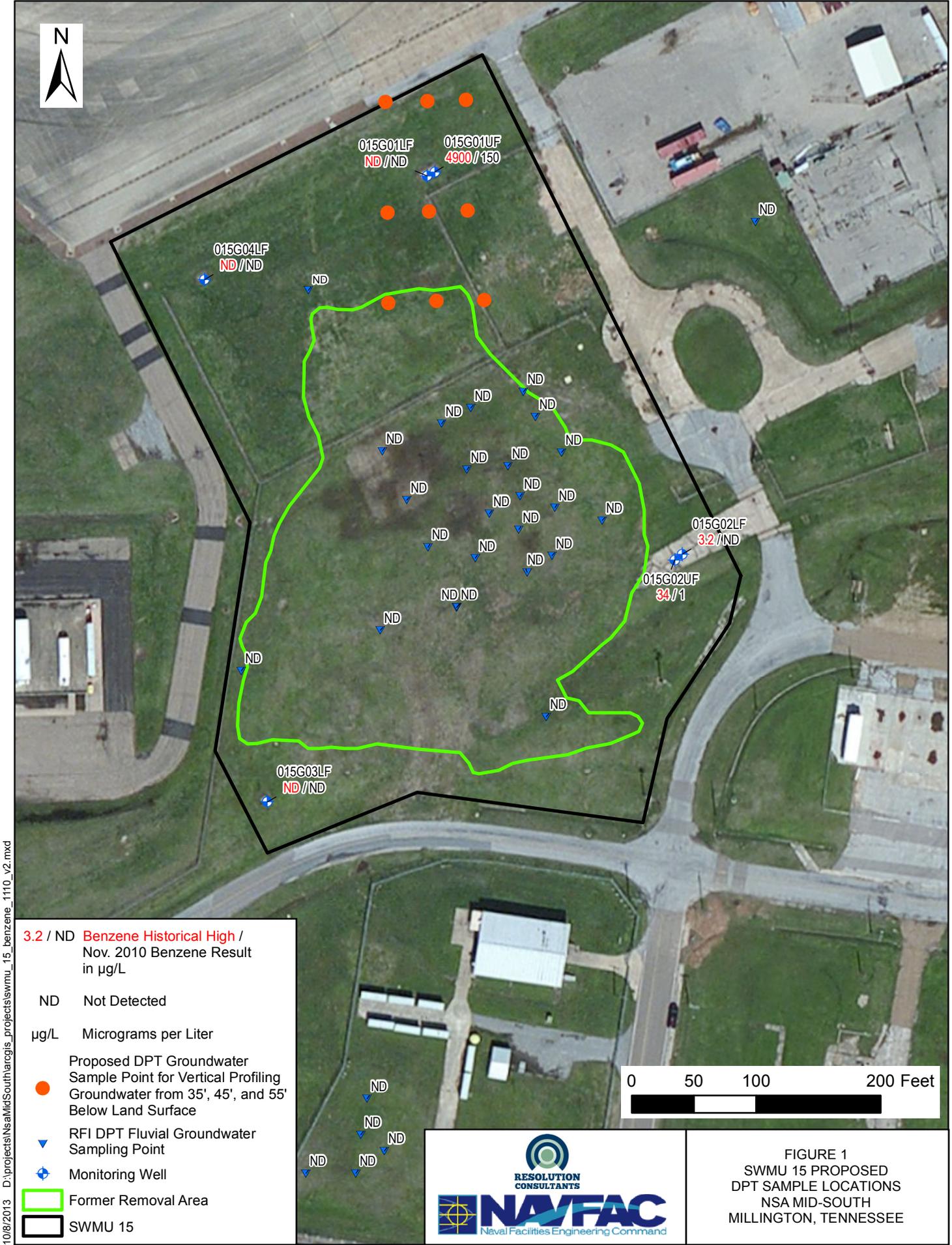
Attachment D also contains the analytical data used for profiling the soil and water waste. Solid waste generated from field activities (i.e., plastic sheeting, gloves, scrap PVC, empty bags, etc.) was placed in clear plastic bags and in dumpsters designated by NSA Mid-South on the Base Southside.

### **Upcoming Investigation and Report Schedules**

Additional groundwater sampling is proposed in the northern part of the SWMU 15 excavation area to evaluate whether a residual benzene source remains. Three monitoring wells are proposed, screened in the upper fluvial deposits (between 45 and 55 feet bgs), inside the excavation area and south of the recent transects (shown on Figure 5). As noted on the figure, numerous fluvial groundwater samples were collected in the RFI from the central part of the SWMU 15 excavation area (blue triangles labeled "ND on Figure 5); however, a data gap exists between these locations and the recently collected groundwater data. Additionally, two monitoring wells are proposed west of the southernmost DPT/temporary well transect to evaluate the horizontal, downgradient extent of the recent detections. If additional monitoring wells are necessary following the data evaluation, a proposal will be provided to the Base Cleanup Team for review and approval.

The AOC A semi-annual monitoring events completed in February and August 2013 will be presented in the upcoming Annual AOC A Progress report (scheduled for January 2014) which will contain a VOC data evaluation to gauge the remedy effectiveness associated with the supplemental interim corrective measures described above.

## Figures



10/8/2013 D:\projects\NsaMidSouth\arcgis\_projects\swmu\_15\_benzene\_1110\_v2.mxd

**3.2 / ND Benzene Historical High /**  
 Nov. 2010 Benzene Result  
 in µg/L

ND Not Detected

µg/L Micrograms per Liter

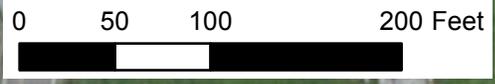
Proposed DPT Groundwater  
 Sample Point for Vertical Profiling  
 Groundwater from 35', 45', and 55'  
 Below Land Surface

RFI DPT Fluvial Groundwater  
 Sampling Point

Monitoring Well

Former Removal Area

SWMU 15



**FIGURE 1**  
 SWMU 15 PROPOSED  
 DPT SAMPLE LOCATIONS  
 NSA MID-SOUTH  
 MILLINGTON, TENNESSEE



**Legend**

- DPT Groundwater Sample (Oct./Nov. 2012)
- ◆ Monitoring Well
- Benzene Concentration Contour (µg/L)
- - - Inferred Benzene Concentration Contour
- Groundwater Flow Direction
- Potentiometric Surface Contour
- Former SWMU 15 Removal Area

NA: Not Applicable - Well Screened at a Deeper Interval  
 NS: Not Sampled Due to Absence of Water  
 1.3 = 1.3 µg/L Benzene  
 U = Method Detection Limit  
 µg/L = Micrograms per Liter

1 inch = 70 feet  
 0 70 140 Feet

**FIGURE 2**  
 SWMU 15 BENZENE PLUME  
 CONTOUR MAP (35 FEET)  
 NSA MID-SOUTH  
 MILLINGTON, TENNESSEE

REQUESTED BY: B. BRANTLEY	DATE: 10/8/2013	TASK ORDER NUMBER: TM50	
DRAWN BY: N. RINEHART			

D:\projects\Nasa\MidSouth\Detectors\SWMU15\_35ft\_Benzene\_Oct2012.mxd



D:\projects\Nisa\MidSouth\Detectors\SWMU15\_45ft\_Benzene\_Oct2012.mxd

**Legend**

- DPT Groundwater Sample (Oct./Nov. 2012)
- ▶ Groundwater Flow Direction
- ◆ Monitoring Well
- Potentiometric Surface Contour
- Benzene Concentration Contour (µg/L)
- Former SWMU 15 Removal Area
- - - Inferred Benzene Concentration Contour

NA: Not Applicable - Well Screened at a Deeper Interval  
 U = Method Detection Limit  
 NS: Not Sampled Due to Absence of Water  
 µg/L = Micrograms per Liter  
 9.19 = 9.19 µg/L Benzene  
 \*Note: 2010 Monitoring well data provided for comparison purposes.

1 inch = 70 feet

0      70      140  
 —————  
 Feet

**FIGURE 3**  
 SWMU 15 BENZENE PLUME  
 CONTOUR MAP (45 FEET)  
 NSA MID-SOUTH  
 MILLINGTON, TENNESSEE

REQUESTED BY: B. BRANTLEY	DATE: 10/8/2013
DRAWN BY: N. RINEHART	TASK ORDER NUMBER: TM50



**Legend**

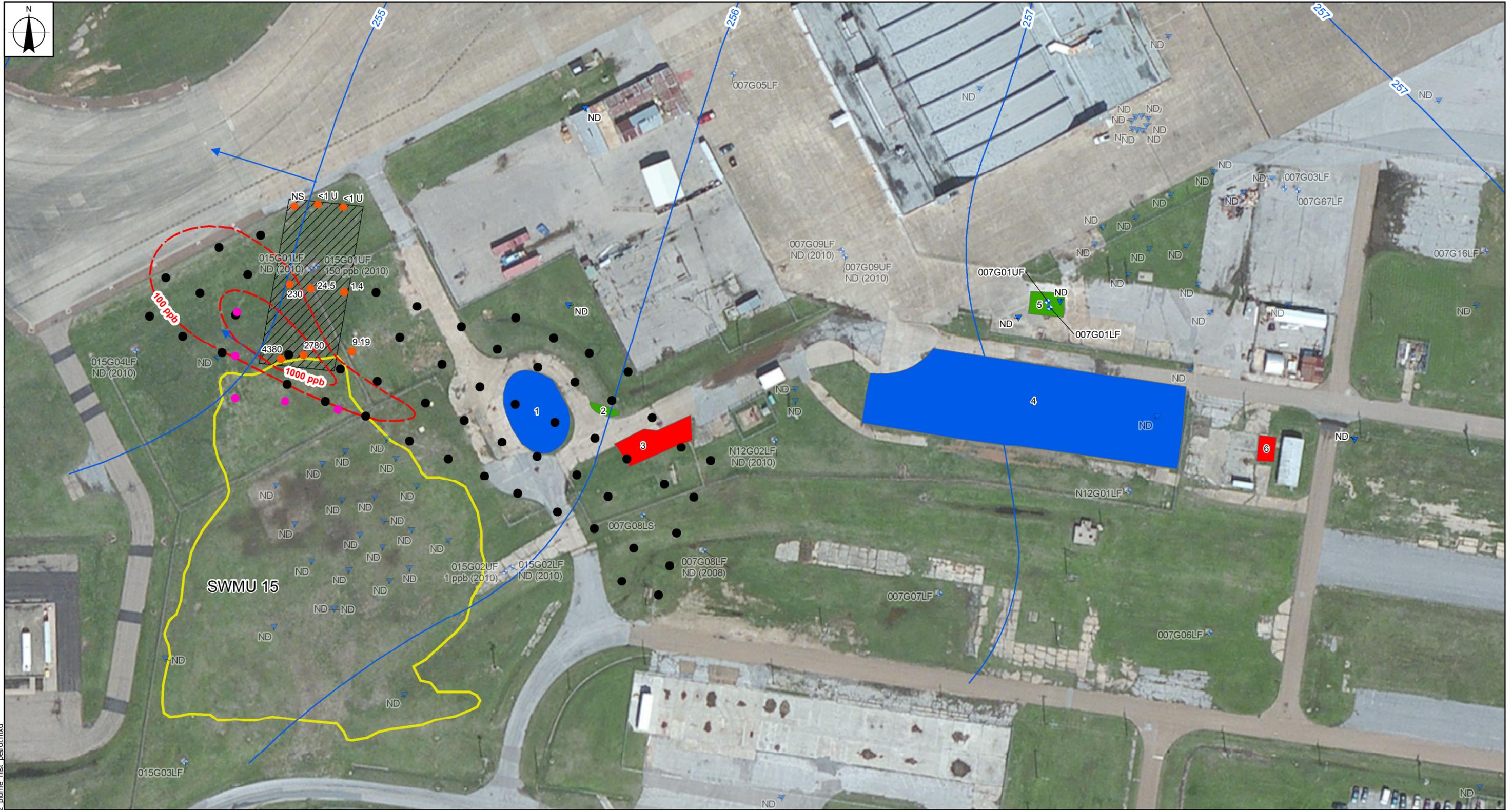
- DPT Groundwater Sample (Oct./Nov. 2012)
- ◆ Monitoring Well
- Benzene Concentration Contour (µg/L)
- - - Inferred Benzene Concentration Contour
- ➔ Groundwater Flow Direction
- Potentiometric Surface Contour
- Former SWMU 15 Removal Area
- NA: Not Applicable - Well Screened at a Deeper Interval
- 1.02 = 1.02 µg/L Benzene
- U = Method Detection Limit
- µg/L = Micrograms per Liter

1 inch = 70 feet  
 0 70 140 Feet

**FIGURE 4**  
 SWMU 15 BENZENE PLUME  
 CONTOUR MAP (55 FEET)  
 NSA MID-SOUTH  
 MILLINGTON, TENNESSEE

<b>NAFAC</b> Naval Facilities Engineering Command		<b>RESOLUTION</b> CONSULTANTS
REQUESTED BY: B. BRANTLEY	DATE: 10/8/2013	
DRAWN BY: N. RINEHART	TASK ORDER NUMBER: TM50	

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**Legend**

- DPT Groundwater Sample (Oct./Nov. 2012)
- ◆ Monitoring Well
- Proposed Soil Gas Points
- Proposed Upper Fluvial Monitoring Wells (Depth - 45' bgs)
- ▼ RFI DPT Fluvial Groundwater Sampling Point
- Groundwater Flow Direction
- Inferred Benzene Concentration Contour from October 2012 DPT Groundwater Data
- Potentiometric Surface Contour
- Former SWMU 15 Removal
- ▨ Investigated, Oct./Nov. 2012

**Areas with Known Petroleum Contaminated Soil Left in Place**

- TPH Cleanup Goal – 1,000 mg/kg
- TPH Cleanup Goal – 500 mg/kg
- TPH Cleanup Goal – 100 mg/kg

**Tank/OWS Areas**

- 1.) Former fuel dispensing area for former Tanks 301, 1242, and 1243
- 2.) Former Oil/Water Separator 1620
- 3.) Former Tanks 301, 1242, and 1243
- 4.) Former Tanks 7, 303, 1241, and AST N-3
- 5.) Former Oil/Water Separator 1621
- 6.) Former UST N-12

ND: Not Detected  
TPH: Total Petroleum Hydrocarbons

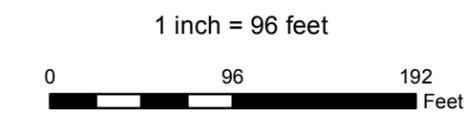


FIGURE 5  
BENZENE CONCEPTUAL PLUME MODEL AND  
HISTORICAL PETROLEUM SITES NEAR SWMU 15  
NSA MID-SOUTH  
MILLINGTON, TN

REQUESTED BY: B. BRANTLEY	DATE: 11/27/2013
DRAWN BY: B. LIPSCOMB	TASK ORDER NUMBER: JM50

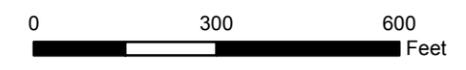
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FIGURE 6  
 TCE IN PERIMETER INJECTION WELLS &  
 ADDED OFFSITE MONITORING WELLS  
 NSA MID-SOUTH  
 MILLINGTON, TN

- Legend**
- ◆ Added Offsite Monitoring Wells
  - ◆ Semi-Annually Sampled
  - ◆ Site Boundary
  - ◆ Annually Sampled
  - ◆ Water Levels Only
  - ◆ Inferred TCE Contour (10 µg/L)
  - ◆ Injection Well

9.3/16 = TCE detected in Baseline & Feb. 2013 Semi-Annual Event.  
 µg/L = Micrograms per Liter



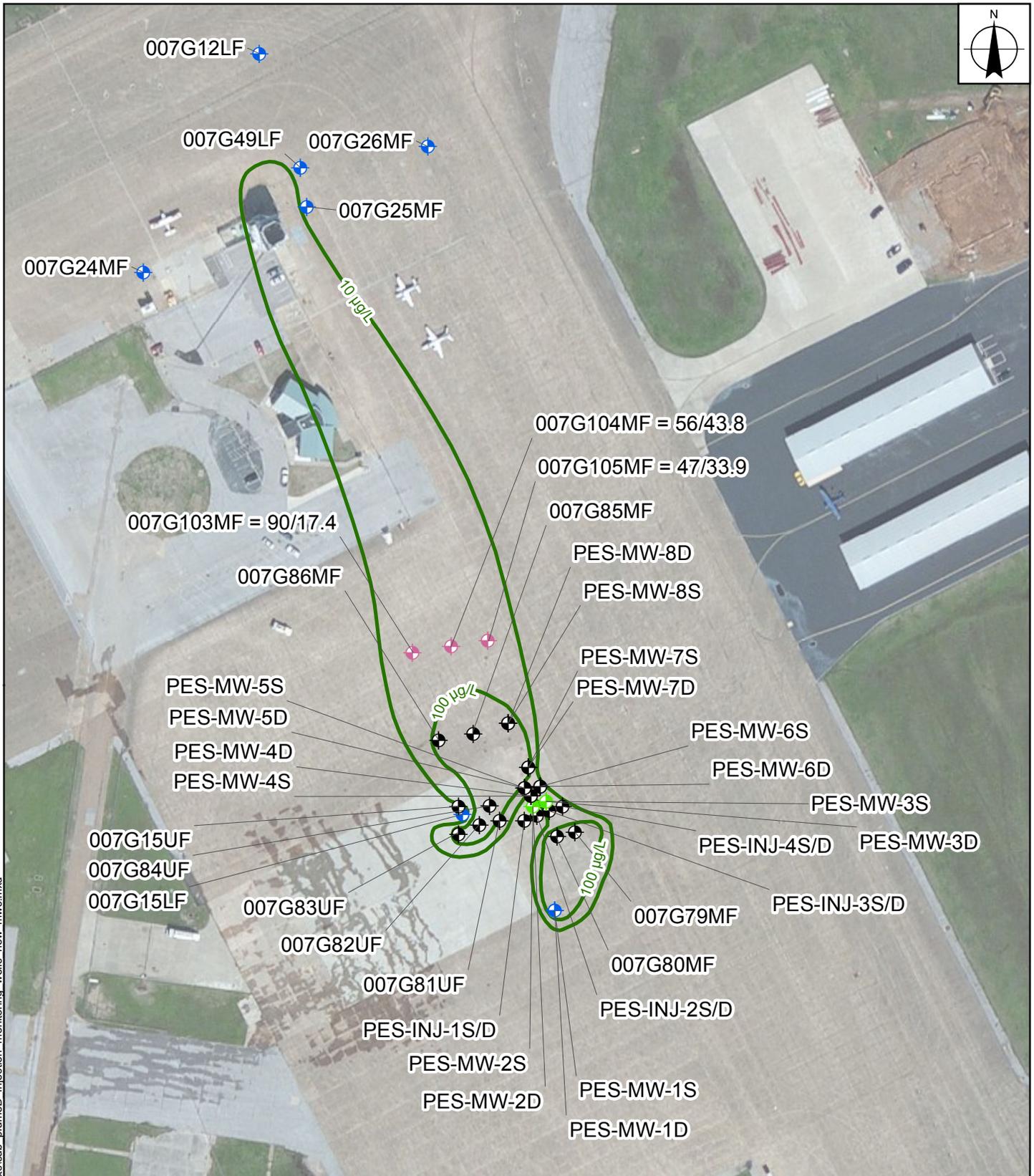
**NAVFAC**  
 Naval Facilities Engineering Command

**RESOLUTION CONSULTANTS**

REQUESTED BY: B. BRANTLEY    DATE: 10/8/2013  
 DRAWN BY: BLIPSCOMB    TASK ORDER NUMBER: XXXXX

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Credits: USDA-FSA-APFO NAIP MrSID Mosaic is from USDA/FSA - Aerial Photography Field Office



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**Legend**

- ◆ Annually Sampled
- ◆ Semi-Annually Sampled
- ◆ Injection Well
- ◆ Water Levels Only
- ◆ New Sub-Plume D Well (February 2013)
- TCE Contour (µg/L)
- - - Inferred TCE Contour

47/33.9 = TCE in µg/L Detected in Baseline and February 2013 Semiannual Monitoring Events in µg/L  
 µg/L = Micrograms per Liter

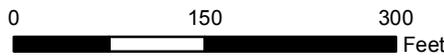


FIGURE 7  
 SUB-PLUME D INJECTION WELLS  
 AND NEWLY CONSTRUCTED  
 MONITORING WELLS  
 NSA MID-SOUTH  
 MILLINGTON, TN

<p>Naval Facilities Engineering Command</p>	<p>RESOLUTION CONSULTANTS</p>
REQUESTED BY: B. BRANTLEY	DATE: 10/8/2013
DRAWN BY: BLIPSCOMB	TASK ORDER NUMBER: XXXX

## Tables

**Table 1**  
**SWMU 15 Investigation Results**

Sample Location:				015GDPT01	015GDPT01	015GDPT02	015GDPT02	015GDPT03	015GDPT03	015GDPT03	015GDPT04	015GDPT04	015GDPT04	015GDPT05	015GDPT05	015GDPT05	015GDPT05	
Sample ID:				015GDPT0135	015GDPT0155	015GDPT0245	015GDPT0255	015GDPT0335	015GDPT0345	015GDPT0355	015GDPT0435	015GDPT0445	015GDPT0455	015GDPT0535	015GDPT0545	015GDPT0555	015HDPT0555	
Sample Date:				11/02/2012	10/31/2012	11/02/2012	11/02/2012	11/01/2012	11/01/2012	11/01/2012	11/01/2012	11/01/2012	11/01/2012	11/07/2012	11/07/2012	11/06/2012	11/06/2012	
Sample Type:				N	N	N	N	N	N	N	N	N	N	N	N	N	FD	
Matrix:				WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	
Method	Analyte	MCL (a)	Units															
300.0	NITRATE	10000	UG/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	100 U	NA	NA
300.0	NITRITE	1000	UG/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	100 U	NA	NA
300.0	SULFATE		UG/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<b>1330 J</b>	NA	NA
410.4	CHEMICAL OXYGEN DEMAND		UG/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<b>52200 J</b>	NA	NA
6010B	IRON		UG/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<b>89500</b>	NA	NA
6010B	MANGANESE		UG/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<b>3200</b>	NA	NA
8260B	1,1,1-TRICHLOROETHANE	200	UG/L	10 U	0.5 U	2.5 U	1 U	2.5 U	2.5 U	1 U	50 U	12.5 U	0.5 U	0.5 U	12.5 U	0.5 U	0.5 U	
8260B	1,1,2,2-TETRACHLOROETHANE		UG/L	10 U	0.5 U	1 U	0.4 U	1 U	1 U	0.4 U	50 U	12.5 U	0.5 U	0.25 U	5 U	0.25 U	0.25 U	
8260B	1,1,2-TRICHLOROETHANE	5	UG/L	10 U	0.5 U	1 U	0.4 U	1 U	1 U	0.4 U	50 U	12.5 U	0.5 U	0.25 U	5 U	0.25 U	0.25 U	
8260B	1,1-DICHLOROETHANE		UG/L	10 U	0.5 U	2.5 U	1 U	2.5 U	2.5 U	1 U	50 U	12.5 U	0.5 U	0.5 U	12.5 U	0.5 U	0.5 U	
8260B	1,1-DICHLOROETHENE	7	UG/L	10 U	0.5 U	2.5 U	1 U	2.5 U	2.5 U	1 U	50 U	12.5 U	0.5 U	0.5 U	12.5 U	0.5 U	0.5 U	
8260B	1,2-DICHLOROETHANE	5	UG/L	10 U	0.5 U	1 U	0.4 U	1 U	1 U	<b>1.46 DJ</b>	50 U	12.5 U	0.5 U	0.25 U	5 U	0.25 U	0.25 U	
8260B	1,2-DICHLOROPROPANE	5	UG/L	10 U	0.5 U	1 U	0.4 U	1 U	1 U	0.4 U	50 U	12.5 U	0.5 U	0.25 U	5 U	0.25 U	0.25 U	
8260B	2-BUTANONE		UG/L	100 U	5 U	15 U	10 U	15 U	15 U	10 U	500 U	125 U	5 U	5 U	125 U	5 U	5 U	
8260B	2-HEXANONE		UG/L	50 U	2.5 U	12.5 U	5 U	12.5 U	12.5 U	5 U	150 U	62.4 U	2.5 U	2.5 U	62.5 U	2.5 U	2.5 U	
8260B	4-METHYL-2-PENTANONE		UG/L	50 U	2.5 U	12.5 U	5 U	12.5 U	12.5 U	5 U	150 U	62.4 U	2.5 U	2.5 U	62.5 U	2.5 U	2.5 U	
8260B	ACETONE		UG/L	100 U	5 U	15 U	10 U	15 U	15 U	10 U	500 U	125 U	5 U	<b>14.7</b>	125 U	5 U	5 U	
8260B	<b>BENZENE</b>	<b>5</b>	UG/L	<b>140 D a</b>	<b>1.47</b>	1 U	<b>1.52 D</b>	<b>1.3 DJ</b>	1 U	<b>1.02 D</b>	<b>148 D a</b>	<b>230 D a</b>	<b>0.81 J</b>	0.25 U	<b>24.5 D a</b>	<b>2.02</b>	<b>1.93</b>	
8260B	BROMOCHLOROMETHANE		UG/L	10 U	0.5 U	NA	NA	NA	NA	NA	50 U	12.5 U	0.5 U	NA	NA	NA	NA	
8260B	BROMODICHLOROMETHANE	80	UG/L	NA	NA	1 U	0.4 U	1 U	1 U	0.4 U	NA	NA	NA	0.25 U	5 U	0.25 U	0.25 U	
8260B	BROMOFORM	80	UG/L	10 U	0.5 U	2.5 U	1 U	2.5 U	2.5 U	1 U	50 U	12.5 U	0.5 U	0.5 U	12.5 U	0.5 U	0.5 U	
8260B	BROMOMETHANE		UG/L	20 U	1 U	5 U	2 U	5 U	5 U	2 U	100 U	15 U	1 U	1 U	25 U	1 U	1 U	
8260B	CARBON DISULFIDE		UG/L	10 U	0.5 U	2.5 U	1 UJ	2.5 UJ	2.5 U	1 UJ	50 U	12.5 U	0.5 U	0.5 U	12.5 U	0.5 U	0.5 U	
8260B	CARBON TETRACHLORIDE	5	UG/L	10 U	0.5 U	1 U	0.4 U	1 U	1 U	0.4 U	50 U	12.5 U	0.5 U	0.25 U	5 U	0.25 U	0.25 U	
8260B	CHLOROBENZENE	100	UG/L	10 U	0.5 U	2.5 U	1 U	2.5 U	2.5 U	1 U	50 U	12.5 U	0.5 U	0.5 U	12.5 U	0.5 U	0.5 U	
8260B	CHLOROETHANE		UG/L	20 U	1 U	5 U	2 U	5 U	5 U	2 U	100 U	15 U	1 U	1 U	25 U	1 U	1 U	
8260B	CHLOROFORM	80	UG/L	10 U	0.5 U	1 U	0.4 U	1 U	1 U	0.4 U	50 U	12.5 U	0.5 U	0.25 U	5 U	0.25 U	0.25 U	
8260B	CHLOROMETHANE		UG/L	10 U	0.5 U	2.5 U	1 U	2.5 U	2.5 U	1 U	50 U	12.5 U	0.5 U	0.5 U	12.5 U	0.5 U	0.5 U	
8260B	CIS-1,2-DICHLOROETHENE	70	UG/L	10 U	0.5 U	2.5 U	1 U	2.5 U	2.5 U	1 U	50 U	12.5 U	0.5 U	0.5 U	12.5 U	0.5 U	0.5 U	
8260B	CIS-1,3-DICHLOROPROPENE		UG/L	10 U	0.5 U	13 U	0.5 U	13 U	13 U	0.5 U	50 U	12.5 U	0.5 U	0.25 U	6.25 U	0.25 U	0.25 U	
8260B	DIBROMOCHLOROMETHANE	80	UG/L	10 U	0.5 U	1 UJ	0.4 U	1 UJ	1 UJ	0.4 U	50 U	12.5 U	0.5 U	0.25 UJ	5 UJ	0.25 UJ	0.25 UJ	
8260B	ETHYLBENZENE	700	UG/L	<b>69.6 D</b>	<b>1.19</b>	<b>3 DJ</b>	<b>2.18 D</b>	2.5 U	2.5 U	1 U	<b>240 D</b>	<b>72.5 D</b>	0.5 U	0.5 U	<b>9.75 DJ</b>	<b>0.38 J</b>	<b>0.39 J</b>	
8260B	M- AND P-XYLENE		UG/L	20 U	<b>2.92</b>	5 U	2 U	5 U	5 U	2 U	100 U	15 U	1 U	1 U	25 U	1 U	1 U	
8260B	METHYL TERT-BUTYL ETHER		UG/L	10 U	0.5 U	2.5 U	1 U	2.5 U	2.5 U	1 U	50 U	12.5 U	<b>3.99</b>	0.5 U	12.5 U	<b>1.24</b>	<b>1.28</b>	
8260B	METHYLENE CHLORIDE	5	UG/L	20 U	1 U	5 U	2 U	5 U	5 U	2 U	100 U	15 U	1 U	1 U	25 U	1 U	1 U	
8260B	O-XYLENE	10000	UG/L	10 UJ	0.5 UJ	2.5 U	1 U	2.5 U	2.5 U	1 U	50 UJ	12.5 UJ	0.5 UJ	0.5 U	12.5 U	0.5 U	0.5 U	
8260B	STYRENE	100	UG/L	10 UJ	0.5 UJ	2.5 U	1 U	2.5 U	2.5 U	1 U	50 UJ	12.5 UJ	0.5 UJ	0.5 U	12.5 U	0.5 U	0.5 U	

**Table 1**  
**SWMU 15 Investigation Results**

Sample Location:				015GDPT01	015GDPT01	015GDPT02	015GDPT02	015GDPT03	015GDPT03	015GDPT03	015GDPT04	015GDPT04	015GDPT04	015GDPT05	015GDPT05	015GDPT05	015GDPT05
Sample ID:				015GDPT0135	015GDPT0155	015GDPT0245	015GDPT0255	015GDPT0335	015GDPT0345	015GDPT0355	015GDPT0435	015GDPT0445	015GDPT0455	015GDPT0535	015GDPT0545	015GDPT0555	015HDPT0555
Sample Date:				11/02/2012	10/31/2012	11/02/2012	11/02/2012	11/01/2012	11/01/2012	11/01/2012	11/01/2012	11/01/2012	11/01/2012	11/07/2012	11/07/2012	11/06/2012	11/06/2012
Sample Type:				N	N	N	N	N	N	N	N	N	N	N	N	N	FD
Matrix:				WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG
Method	Analyte	MCL (a)	Units														
8260B	TETRACHLOROETHENE	5	UG/L	10 U	0.5 U	1 UJ	0.4 U	1 UJ	1 UJ	0.4 UJ	50 U	12.5 U	0.5 U	0.25 UJ	5 UJ	0.25 UJ	0.25 UJ
8260B	TOLUENE	1000	UG/L	10 U	0.5 U	1 U	0.4 U	1 U	1 U	0.4 U	50 U	12.5 U	0.5 U	0.25 U	5 U	0.25 U	0.25 U
8260B	TRANS-1,2-DICHLOROETHENE	100	UG/L	10 U	0.5 U	2.5 U	1 U	2.5 U	2.5 U	1 U	50 U	12.5 U	0.5 U	0.5 U	12.5 U	0.5 U	0.5 U
8260B	TRANS-1,3-DICHLOROPROPENE		UG/L	10 U	0.5 U	1 U	0.4 U	1 U	1 U	0.4 U	50 U	12.5 U	0.5 U	0.25 U	5 U	0.25 U	0.25 U
8260B	TRICHLOROETHENE	5	UG/L	10 U	0.5 U	2.5 U	1 U	2.5 U	<b>4.45 DJ</b>	1 U	50 U	12.5 U	0.5 U	0.5 U	12.5 U	0.5 U	0.5 U
8260B	VINYL CHLORIDE	2	UG/L	10 U	0.5 U	15 U	0.5 U	15 U	15 U	0.5 U	50 U	12.5 U	0.5 U	0.25 U	6.25 U	0.25 U	0.25 U
8260B	XYLENES, TOTAL	10000	UG/L	30 U	<b>2.92 J</b>	7.5 U	3 U	7.5 U	7.5 U	3 U	150 U	37.5 U	1.5 U	1.5 U	37.5 U	1.5 U	1.5 U
9060	TOTAL ORGANIC CARBON		UG/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<b>2380 J</b>	NA	NA
SM5210B	BIOCHEMICAL OXYGEN DEMAND		UG/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10000 U	NA	NA
TNTPH-D	TPH-C12-C40		UG/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<b>277 J</b>	NA	NA

**Notes:**

- a = designates sample exceeds screening value
- D = designates sample underwent dilution during analysis
- J = estimated value
- MCL = maximum contaminant level
- NA = Not analyzed due to inadequate sample volume
- UG/L = micrograms per liter (or parts per billion)
- = Bold denotes analyte detection
- = Yellow shading denotes analyte detection above the MCL

**Table 1**  
**SWMU 15 Investigation Results**

Sample Location:				015GDPT06	015GDPT06	015GDPT06	015GDPT07	015GDPT07	015GDPT07	015GDPT08	015GDPT08	015GDPT08	015GDPT08	015GDPT09	015GDPT09	015GDPT09
Sample ID:				015GDPT0645	015GDPT0655	015HDPT0645	015GDPT0735	015GDPT0745	015GDPT0755	015GDPT0835	015GDPT0845	015GDPT0855	015HDPT0845	015GDPT0935	015GDPT0945	015GDPT0955
Sample Date:				11/07/2012	11/07/2012	11/07/2012	11/07/2012	11/07/2012	11/02/2012	11/07/2012	11/07/2012	11/02/2012	11/07/2012	11/07/2012	11/07/2012	11/07/2012
Sample Type:				N	N	FD	N	N	N	N	N	N	FD	N	N	N
Matrix:				WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG
Method	Analyte	MCL (a)	Units													
300.0	NITRATE	10000	UG/L	NA	NA	NA	NA	NA	NA	NA	NA	100 U	NA	NA	NA	NA
300.0	NITRITE	1000	UG/L	NA	NA	NA	NA	NA	NA	NA	NA	100 U	NA	NA	NA	NA
300.0	SULFATE		UG/L	NA	NA	NA	NA	NA	NA	NA	NA	<b>6960</b>	NA	NA	NA	NA
410.4	CHEMICAL OXYGEN DEMAND		UG/L	NA	NA	NA	NA	NA	NA	NA	NA	<b>259000 D</b>	NA	NA	NA	NA
6010B	IRON		UG/L	NA	NA	NA	NA	NA	NA	NA	NA	<b>146000</b>	NA	NA	NA	NA
6010B	MANGANESE		UG/L	NA	NA	NA	NA	NA	NA	NA	NA	<b>16900 D</b>	NA	NA	NA	NA
8260B	1,1,1-TRICHLOROETHANE	200	UG/L	2.5 U	1 U	2.5 U	0.5 U	25 U	5 U	0.5 U	12.5 U	5 U	12.5 U	0.5 U	0.5 U	0.5 U
8260B	1,1,2,2-TETRACHLOROETHANE		UG/L	1 U	0.5 U	1 U	0.25 U	10 U	5 U	0.25 U	5 U	5 U	5 U	0.25 U	0.25 U	0.25 U
8260B	1,1,2-TRICHLOROETHANE	5	UG/L	1 U	0.5 U	1 U	0.25 U	10 U	5 U	0.25 U	5 U	5 U	5 U	0.25 U	0.25 U	0.25 U
8260B	1,1-DICHLOROETHANE		UG/L	2.5 U	1 U	2.5 U	0.5 U	25 U	5 U	0.5 U	12.5 U	5 U	12.5 U	0.5 U	0.5 U	0.5 U
8260B	1,1-DICHLOROETHENE	7	UG/L	2.5 U	1 U	2.5 U	0.5 U	25 U	5 U	0.5 U	12.5 U	5 U	12.5 U	0.5 U	0.5 U	0.5 U
8260B	1,2-DICHLOROETHANE	5	UG/L	1 U	0.5 U	1 U	0.25 U	10 U	5 U	0.25 U	5 U	5 U	5 U	0.25 U	0.25 U	0.25 U
8260B	1,2-DICHLOROPROPANE	5	UG/L	1 U	0.5 U	1 U	0.25 U	10 U	5 U	0.25 U	5 U	5 U	5 U	0.25 U	0.25 U	0.25 U
8260B	2-BUTANONE		UG/L	25 U	10 U	25 U	5 U	250 U	50 U	5 U	125 U	50 U	125 U	5 U	5 U	5 U
8260B	2-HEXANONE		UG/L	12.5 U	5 U	12.5 U	2.5 U	125 U	15 U	2.5 U	62.5 U	15 U	62.5 U	2.5 U	2.5 U	2.5 U
8260B	4-METHYL-2-PENTANONE		UG/L	12.5 U	5 U	12.5 U	2.5 U	125 U	15 U	2.5 U	62.5 U	15 U	62.5 U	2.5 U	2.5 U	2.5 U
8260B	ACETONE		UG/L	25 U	10 U	25 U	5 U	250 U	50 U	<b>4.08 J</b>	125 U	50 U	125 U	5 U	<b>7.23 J</b>	5 U
8260B	<b>BENZENE</b>	<b>5</b>	UG/L	<b>1.4 DJ</b>	0.5 U	<b>1.5 DJ</b>	0.25 U	<b>4380 D a</b>	<b>34.7 D a</b>	<b>2.74</b>	<b>2780 D a</b>	5 U	<b>2340 D a</b>	0.25 U	<b>9.19 a</b>	0.25 U
8260B	BROMOCHLOROMETHANE		UG/L	NA	NA	NA	NA	NA	5 U	NA	NA	5 U	NA	NA	NA	NA
8260B	BROMODICHLOROMETHANE	80	UG/L	1 U	0.5 U	1 U	0.25 U	10 U	NA	0.25 U	5 U	NA	5 U	0.25 U	0.25 U	0.25 U
8260B	BROMOFORM	80	UG/L	2.5 U	1 U	2.5 U	0.5 U	25 U	5 U	0.5 U	12.5 U	5 U	12.5 U	0.5 U	0.5 U	0.5 U
8260B	BROMOMETHANE		UG/L	5 U	2 U	5 U	1 U	50 U	10 U	1 U	25 U	10 U	25 U	1 U	1 U	1 U
8260B	CARBON DISULFIDE		UG/L	2.5 U	1 U	2.5 U	0.5 U	25 U	5 U	0.5 U	12.5 U	5 U	12.5 U	0.5 U	0.5 U	0.5 U
8260B	CARBON TETRACHLORIDE	5	UG/L	1 U	0.5 U	1 U	0.25 U	10 U	5 U	0.25 U	5 U	5 U	5 U	0.25 U	0.25 U	0.25 U
8260B	CHLOROBENZENE	100	UG/L	2.5 U	1 U	2.5 U	0.5 U	25 U	5 U	0.5 U	12.5 U	5 U	12.5 U	0.5 U	0.5 U	0.5 U
8260B	CHLOROETHANE		UG/L	5 U	2 U	5 U	1 U	50 U	10 U	1 U	25 U	10 U	25 U	1 U	1 U	1 U
8260B	CHLOROFORM	80	UG/L	1 U	0.5 U	1 U	0.25 U	10 U	5 U	0.25 U	5 U	5 U	5 U	0.25 U	0.25 U	0.25 U
8260B	CHLOROMETHANE		UG/L	2.5 U	1 U	2.5 U	0.5 U	25 U	5 U	0.5 U	12.5 U	5 U	12.5 U	0.5 U	0.5 U	0.5 U
8260B	CIS-1,2-DICHLOROETHENE	70	UG/L	2.5 U	1 U	2.5 U	0.5 U	25 U	5 U	0.5 U	12.5 U	5 U	12.5 U	0.5 U	0.5 U	0.5 U
8260B	CIS-1,3-DICHLOROPROPENE		UG/L	1.25 U	0.5 U	1.25 U	0.25 U	12.5 U	5 U	0.25 U	6.25 U	5 U	6.25 U	0.25 U	0.25 U	0.25 U
8260B	DIBROMOCHLOROMETHANE	80	UG/L	1 U	0.5 UJ	1 U	0.25 UJ	10 UJ	5 U	0.25 UJ	5 UJ	5 U	5 UJ	0.25 UJ	0.25 U	0.25 U
8260B	ETHYLBENZENE	700	UG/L	<b>3.35 DJ</b>	1 U	<b>3.5 DJ</b>	0.5 U	<b>279 D</b>	<b>4.2 DJ</b>	0.5 U	<b>64.5 D</b>	5 U	<b>49.5 D</b>	0.5 U	<b>0.66 J</b>	0.5 U
8260B	M- AND P-XYLENE		UG/L	5 U	2 U	5 U	1 U	<b>49.5 DJ</b>	10 U	1 U	<b>27.8 DJ</b>	10 U	<b>22 DJ</b>	1 U	1 U	1 U
8260B	METHYL TERT-BUTYL ETHER		UG/L	2.5 U	1 U	2.5 U	<b>5.58</b>	<b>31.5 DJ</b>	<b>120 D</b>	<b>2.63</b>	<b>20 DJ</b>	<b>125 D</b>	<b>16.5 DJ</b>	<b>2.92</b>	<b>0.35 J</b>	<b>5.15</b>
8260B	METHYLENE CHLORIDE	5	UG/L	5 U	2 U	5 U	1 U	50 U	10 U	1 U	25 U	10 U	25 U	1 U	1 U	1 U
8260B	O-XYLENE	10000	UG/L	2.5 U	1 U	2.5 U	0.5 U	25 U	5 UJ	0.5 U	12.5 U	5 UJ	12.5 U	0.5 U	0.5 U	0.5 U
8260B	STYRENE	100	UG/L	2.5 U	1 U	2.5 U	0.5 U	25 U	5 UJ	0.5 U	12.5 U	5 UJ	12.5 U	0.5 U	0.5 U	0.5 U

**Table 1**  
**SWMU 15 Investigation Results**

Sample Location:				015GDPT06	015GDPT06	015GDPT06	015GDPT07	015GDPT07	015GDPT07	015GDPT08	015GDPT08	015GDPT08	015GDPT08	015GDPT09	015GDPT09	015GDPT09
Sample ID:				015GDPT0645	015GDPT0655	015HDPT0645	015GDPT0735	015GDPT0745	015GDPT0755	015GDPT0835	015GDPT0845	015GDPT0855	015HDPT0845	015GDPT0935	015GDPT0945	015GDPT0955
Sample Date:				11/07/2012	11/07/2012	11/07/2012	11/07/2012	11/07/2012	11/02/2012	11/07/2012	11/07/2012	11/02/2012	11/07/2012	11/07/2012	11/07/2012	11/07/2012
Sample Type:				N	N	FD	N	N	N	N	N	N	FD	N	N	N
Matrix:				WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG
Method	Analyte	MCL (a)	Units													
8260B	TETRACHLOROETHENE	5	UG/L	1 U	0.5 UJ	1 U	0.25 UJ	10 UJ	5 U	0.25 UJ	5 UJ	5 U	5 UJ	0.25 UJ	0.25 U	0.25 U
8260B	TOLUENE	1000	UG/L	1 U	0.5 U	1 U	0.25 U	<b>22.5 DJ</b>	5 U	0.25 U	<b>15.2 D</b>	5 U	<b>12 DJ</b>	0.25 U	0.25 U	0.25 U
8260B	TRANS-1,2-DICHLOROETHENE	100	UG/L	2.5 U	1 U	2.5 U	0.5 U	25 U	5 U	0.5 U	12.5 U	5 U	12.5 U	0.5 U	0.5 U	0.5 U
8260B	TRANS-1,3-DICHLOROPROPENE		UG/L	1 U	0.25 U	1 U	0.25 U	10 U	5 U	0.25 U	5 U	5 U	5 U	0.25 U	0.25 U	0.25 U
8260B	TRICHLOROETHENE	5	UG/L	2.5 U	1 U	2.5 U	0.5 U	25 U	5 U	0.5 U	12.5 U	5 U	12.5 U	0.5 U	0.5 U	0.5 U
8260B	VINYL CHLORIDE	2	UG/L	1.25 U	0.5 U	1.25 U	0.25 U	12.5 U	5 U	0.25 U	6.25 U	5 U	6.25 U	0.25 U	0.25 U	0.25 U
8260B	XYLENES, TOTAL	10000	UG/L	7.5 U	3 U	7.5 U	1.5 U	<b>49.5 DJ</b>	150 U	1.5 U	<b>27.8 DJ</b>	150 U	<b>22 DJ</b>	1.5 U	1.5 U	1.5 U
9060	TOTAL ORGANIC CARBON		UG/L	NA	NA	NA	NA	NA	NA	NA	NA	<b>3470</b>	NA	NA	NA	NA
SM5210B	BIOCHEMICAL OXYGEN DEMAND		UG/L	NA	NA	NA	NA	NA	NA	NA	NA	2000 U	NA	NA	NA	NA
TNTPH-D	TPH-C12-C40		UG/L	NA	NA	NA	NA	NA	NA	NA	NA	<b>105</b>	NA	NA	NA	NA

**Notes:**

- a = designates sample exceeds screening value
- D = designates sample underwent dilution during analysis
- J = estimated value
- MCL = maximum contaminant level
- NA = Not analyzed due to inadequate sample volume
- UG/L = micrograms per liter (or parts per billion)
- = Bold denotes analyte detection
- = Yellow shading denotes analyte detection above the MCL

**Table 2**  
**NSA Mid-South Newly Installed Wells**

ID	SITE	EASTING	NORTHING	TOC	FORMATION	TYPE	MOUNT	INSTALLED	TD	STKUP	MAT	DIA	SCRNINVL	SCRNL	SCRNS	GND_MSL	CONTRACTOR
007G93LF	AOC A -- SWMU 7	812083.70	395150.85	277.586	FLUVIAL	MW-CMS	FG	01 30 2013	97.5	-0.255	PVC	4	87 - 97	10	0.01	277.84	Resolution Consultants
007G94LF	AOC A -- SWMU 7	812134.37	395210.14	277.954	FLUVIAL	MW-CMS	FG	02 04 2013	96.3	-0.251	PVC	4	86 - 96	10	0.01	277.95	Resolution Consultants
007G95LF	AOC A -- SWMU 7	812179.47	395265.77	278.157	FLUVIAL	MW-CMS	FG	01 29 2013	100.0	-0.315	PVC	4	89 - 99	10	0.01	278.16	Resolution Consultants
007G96LF	AOC A -- SWMU 7	812227.93	395324.78	278.060	FLUVIAL	MW-CMS	FG	01 28 2013	99.4	-0.251	PVC	4	89 - 99	10	0.01	278.31	Resolution Consultants
007G97LF	AOC A -- SWMU 7	812273.54	395379.90	278.303	FLUVIAL	MW-CMS	FG	01 26 2013	97.0	-0.169	PVC	4	86 - 96	10	0.01	278.47	Resolution Consultants
007G98LF	AOC A -- SWMU 7	812319.14	395434.79	278.469	FLUVIAL	MW-CMS	FG	01 25 2913	95.1	-0.172	PVC	4	85 - 95	10	0.01	278.64	Resolution Consultants
007G99LF	AOC A -- SWMU 7	812368.68	395495.76	278.600	FLUVIAL	MW-CMS	FG	01 24 2013	86.4	-0.167	PVC	4	76 - 86	10	0.01	278.77	Resolution Consultants
007G100LF	AOC A -- SWMU 7	812411.76	395547.50	278.861	FLUVIAL	MW-CMS	FG	01 23 2013	88.5	-0.16	PVC	4	78 - 88	10	0.01	279.02	Resolution Consultants
007G101LF	AOC A -- SWMU 7	812461.74	395609.83	278.786	FLUVIAL	MW-CMS	FG	01 22 2013	90.7	-0.237	PVC	4	80 - 90	10	0.01	279.02	Resolution Consultants
007G102LF	AOC A -- SWMU 7	812503.02	395660.48	278.799	FLUVIAL	MW-CMS	FG	01 21 2013	84.0	-0.251	PVC	4	74 - 84	10	0.01	279.05	Resolution Consultants
007G103MF	AOC A -- SWMU 7	814906.30	392398.61	292.907	FLUVIAL	MW-CMS	FG	02 08 2013	78.3	-0.30	PVC	2	68 - 78	10	0.01	293.20	Resolution Consultants
007G104MF	AOC A -- SWMU 7	814948.86	392405.81	292.955	FLUVIAL	MW-CMS	FG	02 09 2013	81.1	-0.244	PVC	2	71 - 81	10	0.01	293.20	Resolution Consultants
007G105MF	AOC A -- SWMU 7	814988.65	392411.66	292.967	FLUVIAL	MW-CMS	FG	02 10 2013	80.5	-0.155	PVC	2	70 - 80	10	0.01	293.12	Resolution Consultants
007G106LF	AOC A -- SWMU 7	811509.24	397464.01	283.841	FLUVIAL	MW-CMS	FG	02 07 2013	93.1	0.312	PVC	2	83 - 93	10	0.01	284.15	Resolution Consultants
007G107LF	AOC A -- SWMU 7	811041.53	397366.01	281.449	FLUVIAL	MW-CMS	FG	02 04 2013	96.6	-0.204	PVC	2	86 - 96	10	0.01	281.65	Resolution Consultants

**Notes:**

- ID = identifier
- TOC = top of casing elevation (feet mean sea level)
- FG = Flush Grade
- TD = total depth (feet)
- STKUP = stickup measurement (feet above grade)
- MAT = materials
- DIA = diameter (inches)
- SCRNINVL = screen interval (feet below grade)
- SCRNL = screen length
- SCRNS = screen slot size
- GND\_MSL = ground elevation (feet mean sea level)
- SWMU = Solid Waste Management Unit
- MW = Monitoring Well
- AOC = Area of Concern
- CMS = Corrective Measure Study

Table 3  
AOC A Semi-Annual Sampling  
February 2013

Location		007G93LF	007G94LF	007G95LF	007G96LF	007G97LF	007G98LF	007G99LF	007G100LF	007G101LF	007G102LF	007G103MF		
Sample ID		007G93LF-1Q13	007G94LF-1Q13	007G95LF-1Q13	007G96LF-1Q13	007G97LF-1Q13	007G98LF-1Q13	007G99LF-1Q13	007G100LF-1Q13	007G101LF-1Q13	007G102LF-1Q13	007G103MF-1Q13		
Sample Date		2/20/2013	2/20/2013	2/21/2013	2/21/2013	2/21/2013	2/21/2013	2/22/2013	2/22/2013	2/22/2013	2/22/2013	2/22/2013		
Sample Type		Groundwater	Groundwater	Groundwater	Groundwater									
Method	Analyte	MCL	Units											
8260B	1,1-DICHLOROETHANE		UG/L	1.38	1.75	1.84	2	1.36	1.99	2.29	2.24	1.79	1.9	0.51 J
8260B	<b>1,1-DICHLOROETHENE</b>	7	UG/L	1.19	1.26	1.25	0.9 J	0.47 J	0.81 J	0.91 J	1.22	0.87 J	0.63 J	1.23
8260B	<b>1,2-DICHLOROETHANE</b>	5	UG/L	0.34 J	0.45 J	0.39 J	0.48 J	0.28 J	0.47 J	0.54	0.57	0.58	0.51	
8260B	<b>BENZENE</b>	5	UG/L											
8260B	CARBON DISULFIDE		UG/L				0.56 J							
8260B	CARBON TETRACHLORIDE	5	UG/L	0.61	0.26 J	0.78			0.65	1.61	1.72	0.45 J		0.77
8260B	CHLOROETHANE		UG/L											
8260B	CHLOROFORM	80	UG/L	1.35	1.73	1.8	2.09	1.97	2.22	2.45	2.2	2.13	2.14	3.36
8260B	<b>CIS-1,2-DICHLOROETHENE</b>	70	UG/L	6.38	7.84	8.13	7.18	3.07	5.98	8	8.57	7.47	5.45	0.25 J
8260B	ETHYLBENZENE	700	UG/L											
8260B	M- AND P-XYLENE		UG/L											
8260B	METHYL TERT-BUTYL ETHER		UG/L											
8260B	METHYLENE CHLORIDE	5	UG/L					0.61 J						
8260B	O-XYLENE	10000	UG/L											
8260B	<b>TETRACHLOROETHENE</b>	5	UG/L	3.67	4.42	4.63	4.07	2.92	4.22	4.8	4.95	4.26	3.99	
8260B	TOLUENE	1000	UG/L				1.12							
8260B	TRANS-1,2-DICHLOROETHENE	100	UG/L											
8260B	<b>TRICHLOROETHENE</b>	5	UG/L	<b>12.7 *</b>	<b>14.9 *</b>	<b>16.4 *</b>	<b>13.7 *</b>	<b>7.43 *</b>	<b>15.4 *</b>	<b>19.1 *</b>	<b>19.6 *</b>	<b>16 *</b>	<b>11.1 *</b>	<b>17.4 *</b>
8260B	<b>VINYL CHLORIDE</b>	2	UG/L											
8260B	XYLENES, TOTAL	10000	UG/L											
300.0	CHLORIDE		MG/L	40.8	44.6	46.5	47.5	38.6	45.9	47.6	45.9	36	30.6	9.52
300.0	SULFATE		MG/L	17	16.9	17.3	17.1	34.3	19.1	17.7	17.5	16.6	18	5.46
6010B	IRON		UG/L	4550	7570	8370	19300	37800	10800	5190	3040	7800	22900	10000
9060A	TOTAL ORGANIC CARBON		MG/L				1.59 J	3.94	1.48 J				1.45 J	1.61 J
AM20GAX	ETHANE		UG/L	0.43 J	0.21 J	1.1	2.6	5.9	1.4	0.53	0.24	0.74	1.8	5.5
AM20GAX	ETHENE		UG/L	0.23 J	0.14 J	0.57	1.3	2.1	0.76	0.24	0.17	0.39	0.67	4.1
AM20GAX	HYDROGEN		NMOLES	32000 J	17000 J	100000 J	5800 J	140000 J	47000 J	5000	23000	10000	720	360000
AM20GAX	METHANE		UG/L	0.9 J	0.51 J	1.8	5.2	9.6	3	1.2	0.77	2	4.5	9.8

**Notes:**

- MCL = maximum contaminant level
- UG/L = micrograms per liter
- MG/L = milligrams per liter
- NMOLES = nanomoles
- \* = Indicates constituent exceeds MCL.
- J = Estimated value
- D = designates sample underwent dilution during analysis
- BOLD** = Indicates constituent exceeds MCL.

Table 3 AOC A Semi-Annual Sampling February 2013							
Location				007G104MF	007G105MF	007G106LF	007G107LF
Sample ID				007G104MF-1Q13	007G105MF-1Q13	007G106LF-1Q13	007G107LF-1Q13
Sample Date				2/22/2013	2/22/2013	2/20/2013	2/20/2013
Sample Type				Groundwater	Groundwater	Groundwater	Groundwater
Method	Analyte	MCL	Units				
8260B	1,1-DICHLOROETHANE		UG/L	0.45 J	1.17		
8260B	<b>1,1-DICHLOROETHENE</b>	7	UG/L	1.28	2.09		
8260B	<b>1,2-DICHLOROETHANE</b>	5	UG/L		0.35 J		
8260B	<b>BENZENE</b>	5	UG/L				
8260B	CARBON DISULFIDE		UG/L				
8260B	CARBON TETRACHLORIDE	5	UG/L				
8260B	CHLOROETHANE		UG/L				
8260B	CHLOROFORM	80	UG/L	1.32	3.71		
8260B	<b>CIS-1,2-DICHLOROETHENE</b>	70	UG/L	0.55 J	1.31		
8260B	ETHYLBENZENE	700	UG/L				
8260B	M- AND P-XYLENE		UG/L				
8260B	METHYL TERT-BUTYL ETHER		UG/L				
8260B	METHYLENE CHLORIDE	5	UG/L				
8260B	O-XYLENE	10000	UG/L				
8260B	<b>TETRACHLOROETHENE</b>	5	UG/L				
8260B	TOLUENE	1000	UG/L				0.44 J
8260B	TRANS-1,2-DICHLOROETHENE	100	UG/L				
8260B	<b>TRICHLOROETHENE</b>	5	UG/L	<b>43.8 *</b>	<b>33.9 *</b>		
8260B	<b>VINYL CHLORIDE</b>	2	UG/L				
8260B	XYLENES, TOTAL	10000	UG/L				
300.0	CHLORIDE		MG/L	10.1	13	11.4	18.8
300.0	SULFATE		MG/L	10.3	11.7	10.5	10.2
6010B	IRON		UG/L	11000	9690	1670	10800
9060A	TOTAL ORGANIC CARBON		MG/L	2.38 J	1.94 J		
AM20GAX	ETHANE		UG/L	4.2	2	0.23 J	1.3 J
AM20GAX	ETHENE		UG/L	4.1	3	0.12 J	0.9 J
AM20GAX	HYDROGEN		NMOLES	270000	1100000	9400 J	150000 J
AM20GAX	METHANE		UG/L	28	140	0.47 J	3.2 J

**Notes:**

- MCL = maximum contaminant level
- UG/L = micrograms per liter
- MG/L = milligrams per liter
- NMOLES = nanomoles
- \* = Indicates constituent exceeds MCL.
- J = Estimated value
- D = designates sample underwent dilution during analysis
- BOLD** = Indicates constituent exceeds MCL.

Table 4 Summary of AOC A Carbon Substrate Injections					
Well ID	Substrate (gallons)	Mix Water (gallons)	Chase Water Specified (Gallons)	Chase Water Injected (Gallons)	Completion Date
<b>Perimeter Road Injections</b>					
007G93LF	626	1,878	18,000	18,000	6/26/2013
007G94LF	626	1,878	18,000	18,000	7/2/2013
007G95LF	626	1,878	18,000	18,000	6/27/2013
007G96LF	626	1,878	18,000	1,500 [a]	7/2/2013
007G97LF	626	1,878	18,000	18,000	6/29/2013
007G98LF	626	1,878	18,000	18,000	6/27/2013
007G99LF	626	1,878	18,000	6,000 [a]	7/17/2013
007G100LF	626	1,878	18,000	7,000 [a]	7/11/2013
007G101LF	626	1,878	18,000	7,000 [a]	7/11/2013
007G102LF	626	1,878	18,000	14,600 [a]	7/8/2013
<b>Sub-Plume D Injections</b>					
PES-INJ-1S	133	470	485	485	7/23/2103
PES-INJ-1D	133	470	485	485	7/23/2013
PES-INJ-2S	133	470	485	485	7/19/2103
PES-INJ-2D	133	470	485	485	7/19/2013
PES-INJ-3S	133	470	485	485	7/17/2013
PES-INJ-3D	133	470	485	485	7/18/2013
PES-INJ-4S	133	470	485	485	7/19/2013
PES-INJ-4D	133	470	485	485	7/19/2013
007G81UF	133	470	485	485	7/15/2013
007G82UF	133	470	485	485	7/11/2013
007G83UF	133	470	485	485	7/15/2013
007G79MF	133	470	485	485	7/12/2013
007G80MF	133	470	485	485	7/12/2013
007G86MF	133	470	485	485	7/12/2013
007G84UF	133	470	485	485	7/16/2013
007G85MF	133	470	485	485	7/11/2013
PESMW-7S	133	470	485	485	7/18/2013
PESMW-7D	133	470	485	485	7/18/2013
PESMW-8S	133	470	485	485	7/10/2013
PESMW-8D	133	470	485	485	7/15/2013
007G15UF	133	470	485	485	7/10/2013

**Note:**

a = Formation was unable to accept full volume of chase water after minimum 24 hours of gravity-feed delivery.

**Attachment A**  
**Validation Reports**

## **VALIDATION SUMMARY**

This report summarizes data review findings for samples collected at Naval Support Activity Mid-South in Millington, Tennessee in accordance with the following Sampling and Analysis Plan (SAP):

- *Draft-Final Sampling and Analysis Plan, Tier II, Area of Concern A — Fluvial Deposits Groundwater, Naval Support Activity Mid-South, Millington, Tennessee, Resolution Consultants, 2012 September.*

Data were evaluated independently from the laboratory to assess data quality. Samples discussed in this report were collected between 11 February 2013 and 22 February 2013 and were submitted to Empirical Laboratories in Nashville, Tennessee. Samples analyzed for hydrogen, methane, ethane, and ethene were submitted to Microseeps in Pittsburgh, Pennsylvania. Tina Cantwell, senior chemist from Resolution Consultants, reviewed the data packages reported for these samples. The quality assurance criteria used to assess all data were established by the analytical methods and were consistent with the measurement performance criteria provided in the project's Sampling and Analysis Plan and relevant standards in the following guidance documents:

- *Department of Defense Quality Systems Manual for Environmental Laboratories, Version 4.2, 2010 October*
- *U.S. Environmental Protection Agency (USEPA) Contract Laboratory Program National Functional Guidelines for Organic Data Review, 1999 October*
- *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, 2004 October*

Validation was performed on the water samples from Empirical Laboratories sample delivery groups (SDGs) 1302082, 1302106, 1302153, and 1302170 and Microseeps SDGs 8187, 8149, and 8150, summarized in Appendix A, Table AP-1. Samples discussed in this report were analyzed and reported as definitive data and quality control (QC) summary information was submitted for data review. When the QC parameters did not fall within the specific method or data review guidelines, the data evaluator annotated or "flagged" the corresponding compounds. The flags used during data review are provided in Appendix B, Table B-1. The data review consisted of reviewing the following parameters:



- |  |   |
|--|---|
| <ul style="list-style-type: none"> <li>* Data completeness</li> <li>* Sample receipt and preservation</li> <li style="padding-left: 20px;">Holding times</li> <li>* Instrument Tuning</li> <li>* Initial calibration</li> <li>* Continuing calibration verification</li> </ul> | <ul style="list-style-type: none"> <li>* Laboratory blanks</li> <li style="padding-left: 20px;">Field blanks (trip and equipment)</li> <li>* Surrogate Recoveries</li> <li style="padding-left: 20px;">Matrix spike/matrix spike duplicates (MS/MSDs)</li> <li>* Laboratory control samples (LCS)</li> <li>* Field duplicate precision</li> </ul> |
|--|---|

In accordance with the project SAP, all QC summary data indicated above, were reviewed for volatile organic compounds (VOCs). Non-critical monitored attenuation parameters were reviewed for the following QC elements: holding times, blank analysis, and laboratory control samples. An asterisk (\*) above indicates that all criteria were met. Data which were acceptable, as indicated with an asterisk (\*) above, will not be discussed further in the following sections.

### Holding Times

All samples were analyzed within holding times except as shown on Table 1. Samples and analytes identified in Table 1 were qualified as estimated "J", indicating potential low result bias.

Table 1 Holding Time Outliers							
Sample Delivery Group	Sample	Analytes	Sample Date	Date Analyzed	Holding Time	Days Past Hold Time	Flags
8187	007G106LF-1Q13	Methane, Ethane, Ethene	2/20/2013	3/7/2013	15	1	J, potential low bias
8187	007G106LF-1Q13	Hydrogen	2/20/2013	3/8/2013	16	2	J, potential low bias
8187	007G107LF-1Q13	Methane, Ethane, Ethene	2/20/2013	3/7/2013	15	1	J, potential low bias
8187	007G107LF-1Q13	Hydrogen	2/20/2013	3/8/2013	16	2	J, potential low bias
8187	007G93LF-1Q13	Methane, Ethane, Ethene	2/20/2013	3/7/2013	15	1	J, potential low bias
8187	007G93LF-1Q13	Hydrogen	2/20/2013	3/8/2013	16	2	J, potential low bias
8187	007G94LF-1Q13	Methane, Ethane, Ethene	2/20/2013	3/7/2013	15	1	J, potential low bias
8187	007G94LF-1Q13	Hydrogen	2/20/2013	3/8/2013	16	2	J, potential low bias
8187	007G95LF-1Q13	Hydrogen	2/21/2013	3/8/2013	15	1	J, potential low bias
8187	007G96LF-1Q13	Hydrogen	2/21/2013	3/8/2013	15	1	J, potential low bias
8187	007G97LF-1Q13	Hydrogen	2/21/2013	3/8/2013	15	1	J, potential low bias
8187	007G98LF-1Q13	Hydrogen	2/21/2013	3/8/2013	15	1	J, potential low bias

### Field Blanks

Five trip blanks and three equipment rinsate blanks were collected during this sampling effort. Samples were flagged in accordance with *Functional Guidelines* where detections were not believed to be site-related. According to *Functional Guidelines*, a sample result should not be considered positive unless the analytes' concentration in the sample exceeds ten times the amount in **any** blank for common laboratory contaminants (i.e., methylene chloride, acetone, and 2-butanone), or five times the amount for other constituents. These amounts are referred to as action levels. Because blank samples may not be prepared using the same sample weight, volume,



## Overall Assessment

The February 2013 Naval Support Activity Mid-South data were reviewed independently from the laboratory to assess data quality. Analytes outside individual QC criteria were flagged during this evaluation. No results were rejected and values that were flagged as estimated during data review may be biased high or low, but the results are usable for its intended purpose, according to USEPA guidelines. The remaining results qualified as estimated may be biased high or low, but the data are usable for their intended purpose, according to USEPA guidelines. Table 4 shows final data review qualifiers used to describe results and how they should be interpreted by the end data user. Appendix B provides final results after data review.

<b>Table 4 Result Flagging Codes</b>				
<b>Data Qualifier</b>	<b>Qualifier Definition</b>	<b>Interpret Result As a Detection?</b>	<b>Result Usable?</b>	<b>Potential Result Bias</b>
no qualifier	Acceptable	Yes	Yes	None expected
U	Undetected	No	Yes	None expected
J	Estimated	Yes	Yes	High or Low
UJ	Undetected and Estimated	No	Yes	High or Low
R, UR	Rejected	No	No	Unspecified

**Appendix A**  
**Sample and Analysis Summary**

**Table AP-1  
Sample and Analysis Summary  
NSA Mid-South — February 2013**

SDG	Sample Identification	Location	Laboratory Identification	Sample Date	Sample Type	VOCs (8260B)	Chloride, Sulfate (300.0)	Iron (6010B)	TOC (9060A)
1302082	007G03LF-1Q13	007G03LF	1302082-01	2/11/2013	Groundwater	X			
1302082	001T02113	BLANK	1302082-02	2/11/2013	Trip Blank	X			
1302082	015G01LF-1Q13	015G01LF	1302082-03	2/12/2013	Groundwater	X			
1302082	015G01UF-1Q13	015G01UF	1302082-04	2/12/2013	Groundwater	X			
1302082	007G42LF-1Q13	007G42LF	1302082-05	2/12/2013	Groundwater	X			
1302082	007G45LF-1Q13	007G45LF	1302082-06	2/12/2013	Groundwater	X			
1302106	001T021313	BLANK	1302106-01	2/13/2013	Trip Blank	X			
1302106	007G31LF-1Q13	007G31LF	1302106-02	2/13/2013	Groundwater	X			
1302106	007GPZ03-1Q13	007GPZ03	1302106-03	2/13/2013	Groundwater	X			
1302106	007G32LF-1Q13	007G32LF	1302106-04	2/13/2013	Groundwater	X			
1302106	007H32LF-1Q13	007G32LF	1302106-05	2/13/2013	Duplicate of 007G32LF-1Q13	X			
1302106	007G11LF-1Q13	007G11LF	1302106-06	2/13/2013	Groundwater	X			
1302106	007H11LF-1Q13	007G11LF	1302106-07	2/13/2013	Duplicate of 007G11LF-1Q13	X			
1302106	007G69LF-1Q13	007G69LF	1302106-08	2/13/2013	Groundwater	X			
1302106	007H69LF-1Q13	007G69LF	1302106-09	2/13/2013	Duplicate of 007G69LF-1Q13	X			
1302106	007G52LF-1Q13	007G52LF	1302106-10	2/14/2013	Groundwater	X	X	X	X
1302106	007G48LF-1Q13	007G48LF	1302106-11	2/14/2013	Groundwater	X			
1302106	007G53LF-1Q13	007G53LF	1302106-12	2/14/2013	Groundwater	X			
1302106	007G29LF-1Q13	007G29LF	1302106-13	2/14/2013	Groundwater	X			
1302106	007G28LF-1Q13	007G28LF	1302106-14	2/14/2013	Groundwater	X			
1302106	007H28LF-1Q13	007G28LF	1302106-15	2/14/2013	Duplicate of 007G28LF-1Q13	X			
1302106	007G92LF-1Q13	007G92LF	1302106-16	2/15/2013	Groundwater	X	X	X	X
1302106	PESGMW2S-1Q13	PESGMW2S	1302106-17	2/15/2013	Groundwater	X	X	X	X
1302106	001E021513	BLANK	1302106-18	2/15/2013	Equipment Blank	X			
1302106	PESGMW2D-1Q13	PESGMW2D	1302106-19	2/15/2013	Groundwater	X	X	X	X
1302106	007G87LF-1Q13	007G87LF	1302106-20	2/15/2013	Groundwater	X			
1302153	001T021813	BLANK	1302153-01	2/18/2013	Trip Blank	X			
1302153	007G22LF-1Q13	007G22LF	1302153-02	2/18/2013	Groundwater	X			
1302153	PESGMW3S-1Q13	PESGMW3S	1302153-03	2/18/2013	Groundwater	X	X	X	X
1302153	007G21LF-1Q13	007G21LF	1302153-04	2/18/2013	Groundwater	X	X	X	X
1302153	PESGMW3D-1Q13	PESGMW3D	1302153-05	2/18/2013	Groundwater	X	X	X	X
1302153	007G71LF-1Q13	007G71LF	1302153-06	2/18/2013	Groundwater	X	X	X	X
1302153	007G57LF-1Q13	007G57LF	1302153-07	2/19/2013	Groundwater	X			
1302153	007G65LF-1Q13	007G65LF	1302153-08	2/19/2013	Groundwater	X	X	X	X

**Table AP-1  
Sample and Analysis Summary  
NSA Mid-South — February 2013**

<b>SDG</b>	<b>Sample Identification</b>	<b>Location</b>	<b>Laboratory Identification</b>	<b>Sample Date</b>	<b>Sample Type</b>	<b>VOCs (8260B)</b>	<b>Chloride, Sulfate (300.0)</b>	<b>Iron (6010B)</b>	<b>TOC (9060A)</b>
1302153	007G04LF-1Q13	007G04LF	1302153-09	2/19/2013	Groundwater	X			
1302153	007H04LF-1Q13	007G04LF	1302153-10	2/19/2013	Duplicate of 007G04LF-1Q13	X			
1302153	007G58LF-1Q13	007G58LF	1302153-11	2/19/2013	Groundwater	X			
1302153	007G59LF-1Q13	007G59LF	1302153-12	2/19/2013	Groundwater	X			
1302153	007G64LF-1Q13	007G64LF	1302153-13	2/19/2013	Groundwater	X			
1302153	007G63LF-1Q13	007G63LF	1302153-14	2/19/2013	Groundwater	X			
1302153	007G66LF-1Q13	007G66LF	1302153-15	2/19/2013	Groundwater	X			
1302153	007G62LF-1Q13	007G62LF	1302153-16	2/19/2013	Groundwater	X			
1302170	001T022013	BLANK	1302170-01	2/20/2013	Trip Blank	X			
1302170	00E022013	BLANK	1302170-02	2/20/2013	Equipment Blank	X			
1302170	007G107LF-1Q13	007G107LF	1302170-03	2/20/2013	Groundwater	X	X	X	X
1302170	007G106LF-1Q13	007G106LF	1302170-04	2/20/2013	Groundwater	X	X	X	X
1302170	007G94LF-1Q13	007G94LF	1302170-05	2/20/2013	Groundwater	X	X	X	X
1302170	007G93LF-1Q13	007G93LF	1302170-06	2/20/2013	Groundwater	X	X	X	X
1302170	007G96LF-1Q13	007G96LF	1302170-07	2/21/2013	Groundwater	X	X	X	X
1302170	007G95LF-1Q13	007G95LF	1302170-08	2/21/2013	Groundwater	X	X	X	X
1302170	007G98LF-1Q13	007G98LF	1302170-09	2/21/2013	Groundwater	X	X	X	X
1302170	007G97LF-1Q13	007G97LF	1302170-10	2/21/2013	Groundwater	X	X	X	X
1302170	001E022213	BLANK	1302170-11	2/22/2013	Equipment Blank	X			
1302170	001T022213	BLANK	1302170-12	2/22/2013	Trip Blank	X			
1302170	007G99LF-1Q13	007G99LF	1302170-13	2/22/2013	Groundwater	X	X	X	X
1302170	007G100LF-1Q13	007G100LF	1302170-14	2/22/2013	Groundwater	X	X	X	X
1302170	007G102LF-1Q13	007G102LF	1302170-15	2/22/2013	Groundwater	X	X	X	X
1302170	007G101LF-1Q13	007G101LF	1302170-16	2/22/2013	Groundwater	X	X	X	X
1302170	007G103MF-1Q13	007G103MF	1302170-17	2/22/2013	Groundwater	X	X	X	X
1302170	007G104MF-1Q13	007G104MF	1302170-18	2/22/2013	Groundwater	X	X	X	X
1302170	007G105MF-1Q13	007G105MF	1302170-19	2/22/2013	Groundwater	X	X	X	X

**Note:**

X = Sample was analyzed for the method indicated in the column header.

**Appendix B**  
**Final Results after Data Review**

Table B-1 Final Interpreted Qualifiers	
Validator Qualifier (VQual)	Definition
U	<b>Undetected</b> — The parameter was analyzed but not detected or was found in a sample, but at a concentration less than five times the blank concentration for other constituents; the associated value presented is the detection limit (DL).
J	<b>Estimated Value</b> — One or more QC parameters were outside control limits.
UJ	<b>Undetected and Estimated</b> — The parameter was analyzed but not detected at concentrations above the listed DL; the DL is estimated because one QC parameter was outside of control limits.
D	<b>Diluted</b> — Sample was diluted to report the value on-scale.
R/UR	<b>Rejected/Unusable Data</b> — One or more QC parameters grossly exceeded control limits.

Table B-2 Validator Reason Codes	
Reason Code (RC)	Reason Code Description
a	Tracer recovery (radiochemical data only)
be	Equipment blank contamination
bf	Field blank contamination
bl	Laboratory blank contamination
bm	Missing Blank Information
bt	Trip blank contamination
c	Calibration issue
cl	Clean-up standard recovery
cp	Insufficient in growth (radiochemical data only)
cr	Chromatographic resolution
d	Reporting limit raised due to chromatographic interference
e	Ether interference
ej	Above calibration range; result estimated
fd	Field duplicate RPDs
g	Chromatographic pattern match issue
h	Holding times
i	Internal standard areas
ii	Injection internal standard area or retention time exceedance
k	Estimated Maximum Possible Concentrations
l	LCS recoveries
lc	Labeled compound recovery
ld	Laboratory duplicate RPDs (matrix duplicate, MSD, LCSD)
m	Matrix spike recovery
nb	Negative laboratory blank contamination
p	Chemical preservation issue
pe	Post Extraction Spike
q	Quantitation issue
r	Dual column RPD
rp	Re-extraction precision issue [PAHs only]
rt	SIM ions not within + 2 seconds
s	Surrogate recovery
sp	Sample preparation issue
su	Evidence of ion suppression
t	Temperature Preservation Issue
u	High combined sample result uncertainty (radiochemical data only)
v	Compound identification issue
x	Low % solids
y	Serial dilution results
z	ICS results

**Table B-3**  
**Volatile Organic Compound Results after Data Review**  
**NSA Mid-South — February 2013**

Location		007G03LF			007G04LF			007G04LF			007G100LF			007G101LF			
Lab ID		1302082-01			1302153-09RE1			1302153-10			1302170-14			1302170-16			
Sample ID		007G03LF-1Q13			007G04LF-1Q13			007H04LF-1Q13			007G100LF-1Q13			007G101LF-1Q13			
Sample Date		2/11/2013			2/19/2013			2/19/2013			2/22/2013			2/22/2013			
Sample Type		Groundwater			Groundwater			Duplicate			Groundwater			Groundwater			
Analyte	CAS No	Units	Result	VQual	RC	Result	VQual	RC	Result	VQual	RC	Result	VQual	RC	Result	VQual	RC
1,1,1-TRICHLOROETHANE	71-55-6	UG_L	1	U		0.25	U		0.25	U		0.5	U		0.5	U	
1,1,2,2-TETRACHLOROETHANE	79-34-5	UG_L	1	U		0.1	U		0.1	U		0.25	U		0.25	U	
1,1,2-TRICHLOROETHANE	79-00-5	UG_L	1	U		0.1	U		0.1	U		0.25	U		0.25	U	
1,1-DICHLOROETHANE	75-34-3	UG_L	1	U		0.65	J		0.69	J		2.24			1.79		
1,1-DICHLOROETHENE	75-35-4	UG_L	0.26	J		3.77			3.97			1.22			0.87	J	
1,2-DICHLOROETHANE	107-06-2	UG_L	6.91			0.1	U		0.1	U		0.57			0.58		
1,2-DICHLOROPROPANE	78-87-5	UG_L	1	U		0.1	U		0.1	U		0.25	U		0.25	U	
2-BUTANONE	78-93-3	UG_L	5	U		2.5	U		2.5	U		5	U		5	U	
2-HEXANONE	591-78-6	UG_L	2.5	U		1.25	U		1.25	U		2.5	U		2.5	U	
4-METHYL-2-PENTANONE	108-10-1	UG_L	2.5	U		1.25	U		1.25	U		2.5	U		2.5	U	
ACETONE	67-64-1	UG_L	5	U		2.5	U		2.5	U		5	U		5	U	
BENZENE	71-43-2	UG_L	1	U		0.1	U		0.1	U		0.25	U		0.25	U	
BROMODICHLOROMETHANE	75-27-4	UG_L	1	U		0.1	U		0.1	U		0.25	U		0.25	U	
BROMOFORM	75-25-2	UG_L	1	U		0.25	U		0.25	U		0.5	U		0.5	U	
BROMOMETHANE	74-83-9	UG_L	1	U		0.5	U		0.5	U		1	U		1	U	
CARBON DISULFIDE	75-15-0	UG_L	1	U		0.25	U		0.25	U		0.5	U		0.5	U	
CARBON TETRACHLORIDE	56-23-5	UG_L	1	U		0.1	U		0.1	U		1.72			0.45	J	
CHLOROENZENE	108-90-7	UG_L	1	U		0.25	U		0.25	U		0.5	U		0.5	U	
CHLOROETHANE	75-00-3	UG_L	1	U		0.5	U		0.5	U		1	U		1	U	
CHLOROFORM	67-66-3	UG_L	1	U		0.1	U		0.1	U		2.2			2.13		
CHLOROMETHANE	74-87-3	UG_L	1	U		0.25	U		0.25	U		0.5	U		0.5	U	
CIS-1,2-DICHLOROETHENE	156-59-2	UG_L	53.7			93.4			97			8.57			7.47		
CIS-1,3-DICHLOROPROPENE	10061-01-5	UG_L	1	U		0.13	U		0.13	U		0.25	U		0.25	U	
DIBROMOCHLOROMETHANE	124-48-1	UG_L	1	U		0.1	U		0.1	U		0.25	U		0.25	U	
ETHYLBENZENE	100-41-4	UG_L	1	U		0.25	U		0.25	U		0.5	U		0.5	U	
M- AND P-XYLENE	108-38-3/106-42	UG_L	1	U		0.5	U		0.5	U		1	U		1	U	
METHYL TERT-BUTYL ETHER	1634-04-4	UG_L	1	U		0.25	U		0.25	U		0.5	U		0.5	U	
METHYLENE CHLORIDE	75-09-2	UG_L	1	U		0.5	U		0.5	U		1	U		1	U	bt
O-XYLENE	95-47-6	UG_L	1	U		0.25	U		0.25	U		0.5	U		0.5	U	
STYRENE	100-42-5	UG_L	1	U		0.25	U		0.25	U		0.5	U		0.5	U	
TETRACHLOROETHENE	127-18-4	UG_L	57.4			0.78			0.73			4.95			4.26		
TOLUENE	108-88-3	UG_L	1	U		0.1	U		0.1	U		0.25	U		0.25	U	
TRANS-1,2-DICHLOROETHENE	156-60-5	UG_L	1	U		0.8	J		0.9	J		0.5	U		0.5	U	
TRANS-1,3-DICHLOROPROPENE	10061-02-6	UG_L	1	U		0.1	U		0.1	U		0.25	U		0.25	U	
TRICHLOROETHENE	79-01-6	UG_L	80.6	J	m	79.7			80.2			19.6			16		
VINYL CHLORIDE	75-01-4	UG_L	60.3	J	m	80			86.5			0.25	U		0.25	U	
XYLENES, TOTAL	1330-20-7	UG_L	1.5	U		0.75	U		0.75	U		1.5	U		1.5	U	

**Table B-3 (Continued)**  
**Volatile Organic Compound Results after Data Review**  
**NSA Mid-South — February 2013**

Location		007G102LF			007G103MF			007G104MF			007G105MF			007G106LF			
Lab ID		1302170-15			1302170-17			1302170-18			1302170-19			1302170-04			
Sample ID		007G102LF-1Q13			007G103MF-1Q13			007G104MF-1Q13			007G105MF-1Q13			007G106LF-1Q13			
Sample Date		2/22/2013			2/22/2013			2/22/2013			2/22/2013			2/20/2013			
Sample Type		Groundwater			Groundwater			Groundwater			Groundwater			Groundwater			
Analyte	CAS No	Units	Result	VQual	RC	Result	VQual	RC									
1,1,1-TRICHLOROETHANE	71-55-6	UG_L	0.5	U		0.5	U										
1,1,2,2-TETRACHLOROETHANE	79-34-5	UG_L	0.25	U		0.25	U										
1,1,2-TRICHLOROETHANE	79-00-5	UG_L	0.25	U		0.25	U										
1,1-DICHLOROETHANE	75-34-3	UG_L	1.9			0.51	J		0.45	J		1.17			0.5	U	
1,1-DICHLOROETHENE	75-35-4	UG_L	0.63	J		1.23			1.28			2.09			0.5	U	
1,2-DICHLOROETHANE	107-06-2	UG_L	0.51			0.25	U		0.25	U		0.35	J		0.25	U	
1,2-DICHLOROPROPANE	78-87-5	UG_L	0.25	U		0.25	U										
2-BUTANONE	78-93-3	UG_L	5	U		5	U		5	U		5	U		5	U	
2-HEXANONE	591-78-6	UG_L	2.5	U		2.5	U										
4-METHYL-2-PENTANONE	108-10-1	UG_L	2.5	U		2.5	U										
ACETONE	67-64-1	UG_L	5	U		5	U		5	U		5	U		5	U	
BENZENE	71-43-2	UG_L	0.25	U		0.25	U										
BROMODICHLOROMETHANE	75-27-4	UG_L	0.25	U		0.25	U										
BROMOFORM	75-25-2	UG_L	0.5	U		0.5	U										
BROMOMETHANE	74-83-9	UG_L	1	U		1	U		1	U		1	U		1	U	
CARBON DISULFIDE	75-15-0	UG_L	0.5	U		0.5	U										
CARBON TETRACHLORIDE	56-23-5	UG_L	0.25	U		0.77			0.25	U		0.25	U		0.25	U	
CHLOROENZENE	108-90-7	UG_L	0.5	U		0.5	U										
CHLOROETHANE	75-00-3	UG_L	1	U		1	U		1	U		1	U		1	U	
CHLOROFORM	67-66-3	UG_L	2.14			3.36			1.32			3.71			0.25	U	
CHLOROMETHANE	74-87-3	UG_L	0.5	U		0.5	U										
CIS-1,2-DICHLOROETHENE	156-59-2	UG_L	5.45			0.25	J		0.55	J		1.31			0.5	U	
CIS-1,3-DICHLOROPROPENE	10061-01-5	UG_L	0.25	U		0.25	U										
DIBROMOCHLOROMETHANE	124-48-1	UG_L	0.25	U		0.25	U										
ETHYLBENZENE	100-41-4	UG_L	0.5	U		0.5	U										
M- AND P-XYLENE	108-38-3/106-42	UG_L	1	U		1	U		1	U		1	U		1	U	
METHYL TERT-BUTYL ETHER	1634-04-4	UG_L	0.5	U		0.5	U										
METHYLENE CHLORIDE	75-09-2	UG_L	1	U	bt	1	U	bt	1	U		1	U	bt	1	U	
O-XYLENE	95-47-6	UG_L	0.5	U		0.5	U										
STYRENE	100-42-5	UG_L	0.5	U		0.5	U										
TETRACHLOROETHENE	127-18-4	UG_L	3.99			0.25	U										
TOLUENE	108-88-3	UG_L	0.25	U		0.25	U										
TRANS-1,2-DICHLOROETHENE	156-60-5	UG_L	0.5	U		0.5	U										
TRANS-1,3-DICHLOROPROPENE	10061-02-6	UG_L	0.25	U		0.25	U										
TRICHLOROETHENE	79-01-6	UG_L	11.1			17.4			43.8			33.9			0.5	U	
VINYL CHLORIDE	75-01-4	UG_L	0.25	U		0.25	U										
XYLENES, TOTAL	1330-20-7	UG_L	1.5	U		1.5	U										

**Table B-3 (Continued)**  
**Volatile Organic Compound Results after Data Review**  
**NSA Mid-South — February 2013**

Location		007G107LF			007G111LF			007G111LF			007G211LF			007G221LF			
Lab ID		1302170-03			1302106-06			1302106-07			1302153-04			1302153-02			
Sample ID		007G107LF-1Q13			007G111LF-1Q13			007H111LF-1Q13			007G211LF-1Q13			007G221LF-1Q13			
Sample Date		2/20/2013			2/13/2013			2/13/2013			2/18/2013			2/18/2013			
Sample Type		Groundwater			Groundwater			Duplicate			Groundwater			Groundwater			
Analyte	CAS No	Units	Result	VQual	RC	Result	VQual	RC									
1,1,1-TRICHLOROETHANE	71-55-6	UG_L	0.5	U		0.5	U		0.5	U		0.25	U		0.25	U	
1,1,2,2-TETRACHLOROETHANE	79-34-5	UG_L	0.25	U		0.25	U		0.25	U		0.1	U		0.1	U	
1,1,2-TRICHLOROETHANE	79-00-5	UG_L	0.25	U		0.25	U		0.25	U		0.1	U		0.1	U	
1,1-DICHLOROETHANE	75-34-3	UG_L	0.5	U		0.5	U		0.5	U		0.25	U		0.25	U	
1,1-DICHLOROETHANE	75-35-4	UG_L	0.5	U		0.5	U		0.5	U		1.18			0.25	U	
1,2-DICHLOROETHANE	107-06-2	UG_L	0.25	U		0.25	U		0.25	U		0.1	U		0.1	U	
1,2-DICHLOROPROPANE	78-87-5	UG_L	0.25	U		0.25	U		0.25	U		0.1	U		0.1	U	
2-BUTANONE	78-93-3	UG_L	5	U		5	U		5	U		2.5	U		2.5	U	
2-HEXANONE	591-78-6	UG_L	2.5	U		2.5	U		2.5	U		1.25	U		1.25	U	
4-METHYL-2-PENTANONE	108-10-1	UG_L	2.5	U		2.5	U		2.5	U		1.25	U		1.25	U	
ACETONE	67-64-1	UG_L	5	U		5	U		5	U		2.5	U		2.5	U	
BENZENE	71-43-2	UG_L	0.25	U		0.25	U		0.25	U		0.1	U		0.1	U	
BROMODICHLOROMETHANE	75-27-4	UG_L	0.25	U		0.25	U		0.25	U		0.1	U		0.1	U	
BROMOFORM	75-25-2	UG_L	0.5	U		0.5	U		0.5	U		0.25	U		0.25	U	
BROMOMETHANE	74-83-9	UG_L	1	U		1	U		1	U		0.5	U		0.5	U	
CARBON DISULFIDE	75-15-0	UG_L	0.5	U		0.5	U		0.5	U		0.25	U		0.25	U	
CARBON TETRACHLORIDE	56-23-5	UG_L	0.25	U		0.25	U		0.25	U		0.1	U		0.1	U	
CHLOROENZENE	108-90-7	UG_L	0.5	U		0.5	U		0.5	U		0.25	U		0.25	U	
CHLOROETHANE	75-00-3	UG_L	1	U		1	U		1	U		0.66	J		0.5	U	
CHLOROFORM	67-66-3	UG_L	0.25	U		0.25	U		0.25	U		0.1	U		0.1	U	
CHLOROMETHANE	74-87-3	UG_L	0.5	U		0.5	U		0.5	U		0.25	U		0.25	U	
CIS-1,2-DICHLOROETHENE	156-59-2	UG_L	0.5	U		6.67			6.24			45.4			2.02		
CIS-1,3-DICHLOROPROPENE	10061-01-5	UG_L	0.25	U		0.25	U		0.25	U		0.13	U		0.13	U	
DIBROMOCHLOROMETHANE	124-48-1	UG_L	0.25	U		0.25	U		0.25	U		0.1	U		0.1	U	
ETHYLBENZENE	100-41-4	UG_L	0.5	U		0.5	U		0.5	U		0.25	U		0.25	U	
M- AND P-XYLENE	108-38-3/106-42	UG_L	1	U		1	U		1	U		0.5	U		0.5	U	
METHYL TERT-BUTYL ETHER	1634-04-4	UG_L	0.5	U		0.5	U		0.5	U		0.25	U		0.25	U	
METHYLENE CHLORIDE	75-09-2	UG_L	1	U		1	U		1	U		0.5	U		0.5	U	
O-XYLENE	95-47-6	UG_L	0.5	U		0.5	U		0.5	U		0.25	U		0.25	U	
STYRENE	100-42-5	UG_L	0.5	U		0.5	U		0.5	U		0.25	U		0.25	U	
TETRACHLOROETHENE	127-18-4	UG_L	0.25	U		0.25	U	be	0.25	U	be	0.27	J		0.1	U	
TOLUENE	108-88-3	UG_L	0.44	J		0.25	U		0.25	U		0.1	U		0.1	U	
TRANS-1,2-DICHLOROETHENE	156-60-5	UG_L	0.5	U		0.5	U		0.25	J		0.47	J		0.28	J	
TRANS-1,3-DICHLOROPROPENE	10061-02-6	UG_L	0.25	U		0.25	U		0.25	U		0.1	U		0.1	U	
TRICHLOROETHENE	79-01-6	UG_L	0.5	U		0.5	U	be	0.5	U	be	3.95			0.93	J	
VINYL CHLORIDE	75-01-4	UG_L	0.25	U		93.4			88.8			53.1			68.8		
XYLENES, TOTAL	1330-20-7	UG_L	1.5	U		1.5	U		1.5	U		0.75	U		0.75	U	

**Table B-3 (Continued)**  
**Volatile Organic Compound Results after Data Review**  
**NSA Mid-South — February 2013**

Location		007G28LF			007G28LF			007G29LF			007G31LF			007G32LF			
Lab ID		1302106-14			1302106-15			1302106-13			1302106-02			1302106-04			
Sample ID		007G28LF-1Q13			007H28LF-1Q13			007G29LF-1Q13			007G31LF-1Q13			007G32LF-1Q13			
Sample Date		2/14/2013			2/14/2013			2/14/2013			2/13/2013			2/13/2013			
Sample Type		Groundwater			Duplicate			Groundwater			Groundwater			Groundwater			
Analyte	CAS No	Units	Result	VQual	RC	Result	VQual	RC									
1,1,1-TRICHLOROETHANE	71-55-6	UG_L	0.5	U		0.5	U										
1,1,2,2-TETRACHLOROETHANE	79-34-5	UG_L	0.25	U		0.25	U										
1,1,2-TRICHLOROETHANE	79-00-5	UG_L	0.25	U		0.25	U										
1,1-DICHLOROETHANE	75-34-3	UG_L	0.5	U		0.5	U		0.5	U		1.6			0.75	J	
1,1-DICHLOROETHENE	75-35-4	UG_L	0.36	J		0.39	J		0.5	U		4.96			0.5	U	
1,2-DICHLOROETHANE	107-06-2	UG_L	0.25	U		0.25	U										
1,2-DICHLOROPROPANE	78-87-5	UG_L	0.25	U		0.25	U										
2-BUTANONE	78-93-3	UG_L	5	U		5	U		5	U		5	U		5	U	
2-HEXANONE	591-78-6	UG_L	2.5	U		2.5	U										
4-METHYL-2-PENTANONE	108-10-1	UG_L	2.5	U		2.5	U										
ACETONE	67-64-1	UG_L	5	U		5	U		5	U		5	U		5	U	
BENZENE	71-43-2	UG_L	0.25	U		0.25	U										
BROMODICHLOROMETHANE	75-27-4	UG_L	0.25	U		0.25	U										
BROMOFORM	75-25-2	UG_L	0.5	U		0.5	U										
BROMOMETHANE	74-83-9	UG_L	1	U		1	U		1	U		1	U		1	U	
CARBON DISULFIDE	75-15-0	UG_L	0.5	U		0.5	U										
CARBON TETRACHLORIDE	56-23-5	UG_L	1.59			1.59			0.25	U		0.72			0.25	U	
CHLOROENZENE	108-90-7	UG_L	0.5	U		0.5	U										
CHLOROETHANE	75-00-3	UG_L	1	U		1	U		1	U		1	U		0.74	J	
CHLOROFORM	67-66-3	UG_L	2.15			2.2			0.25	U		0.25	U	be	0.25	U	
CHLOROMETHANE	74-87-3	UG_L	0.5	U		0.5	U										
CIS-1,2-DICHLOROETHENE	156-59-2	UG_L	0.5	U	be	0.5	U	be	0.5	U		18.2			0.5	U	be
CIS-1,3-DICHLOROPROPENE	10061-01-5	UG_L	0.25	U		0.25	U										
DIBROMOCHLOROMETHANE	124-48-1	UG_L	0.25	U		0.25	U										
ETHYLBENZENE	100-41-4	UG_L	0.5	U		0.5	U										
M- AND P-XYLENE	108-38-3/106-42	UG_L	1	U		1	U		1	U		1	U		1	U	
METHYL TERT-BUTYL ETHER	1634-04-4	UG_L	0.5	U		0.5	U										
METHYLENE CHLORIDE	75-09-2	UG_L	1	U		1	U		1	U		1	U		1	U	
O-XYLENE	95-47-6	UG_L	0.5	U		0.5	U										
STYRENE	100-42-5	UG_L	0.5	U		0.5	U										
TETRACHLOROETHENE	127-18-4	UG_L	9.67			9.34			0.25	U		4.82			0.25	U	be
TOLUENE	108-88-3	UG_L	0.25	U		0.25	U										
TRANS-1,2-DICHLOROETHENE	156-60-5	UG_L	0.5	U		1.9											
TRANS-1,3-DICHLOROPROPENE	10061-02-6	UG_L	0.25	U		0.25	U										
TRICHLOROETHENE	79-01-6	UG_L	26.8			26			0.5	U	be	126			0.5	U	be
VINYL CHLORIDE	75-01-4	UG_L	0.25	U	be	0.25	U	be	0.25	U		13.9			65		
XYLENES, TOTAL	1330-20-7	UG_L	1.5	U		1.5	U										

**Table B-3 (Continued)**  
**Volatile Organic Compound Results after Data Review**  
**NSA Mid-South — February 2013**

Location		007G32LF			007G42LF			007G45LF			007G48LF			007G52LF			
Lab ID		1302106-05			1302082-05			1302082-06			1302106-11			1302106-10			
Sample ID		007H32LF-1Q13			007G42LF-1Q13			007G45LF-1Q13			007G48LF-1Q13			007G52LF-1Q13			
Sample Date		2/13/2013			2/12/2013			2/12/2013			2/14/2013			2/14/2013			
Sample Type		Duplicate			Groundwater			Groundwater			Groundwater			Groundwater			
Analyte	CAS No	Units	Result	VQual	RC	Result	VQual	RC									
1,1,1-TRICHLOROETHANE	71-55-6	UG_L	0.5	U		1	U		2.5	U		0.5	U		0.5	U	
1,1,2,2-TETRACHLOROETHANE	79-34-5	UG_L	0.25	U		1	U		1	U		0.25	U		0.25	U	
1,1,2-TRICHLOROETHANE	79-00-5	UG_L	0.25	U		1	U		1	U		0.25	U		0.25	U	
1,1-DICHLOROETHANE	75-34-3	UG_L	0.73	J		0.69	J		2.5	U		0.28	J		2.36		
1,1-DICHLOROETHENE	75-35-4	UG_L	0.5	U		1.24			2.5	U		0.64	J		0.98	J	
1,2-DICHLOROETHANE	107-06-2	UG_L	0.25	U		1	U		1	U		0.25	U		0.47	J	
1,2-DICHLOROPROPANE	78-87-5	UG_L	0.25	U		1	U		1	U		0.25	U		0.25	U	
2-BUTANONE	78-93-3	UG_L	5	U		5	U		25	U		5	U		5	U	
2-HEXANONE	591-78-6	UG_L	2.5	U		2.5	U		12.5	U		2.5	U		2.5	U	
4-METHYL-2-PENTANONE	108-10-1	UG_L	2.5	U		2.5	U		12.5	U		2.5	U		2.5	U	
ACETONE	67-64-1	UG_L	5	U		5	U		25	U		5	U		5	U	
BENZENE	71-43-2	UG_L	0.25	U		1	U		1	U		0.25	U		0.25	U	
BROMODICHLOROMETHANE	75-27-4	UG_L	0.25	U		1	U		1	U		0.25	U		0.25	U	
BROMOFORM	75-25-2	UG_L	0.5	U		1	U		2.5	U		0.5	U		0.5	U	
BROMOMETHANE	74-83-9	UG_L	1	U		1	U		5	U		1	U		1	U	
CARBON DISULFIDE	75-15-0	UG_L	0.5	U		1	U		2.5	U		0.5	U		0.5	U	
CARBON TETRACHLORIDE	56-23-5	UG_L	0.25	U		1	U		1	U		2.13			2.45		
CHLOROENZENE	108-90-7	UG_L	0.5	U		1	U		2.5	U		0.5	U		0.5	U	
CHLOROETHANE	75-00-3	UG_L	0.78	J		1	U		5	U		1	U		1	U	
CHLOROFORM	67-66-3	UG_L	0.25	U		1	U		1	U		2.25			0.25	U	be
CHLOROMETHANE	74-87-3	UG_L	0.5	U		1	U		2.5	U		0.5	U		0.5	U	
CIS-1,2-DICHLOROETHENE	156-59-2	UG_L	0.5	U	be	1	U	be	2.5	U		0.5	U	be	7.22		
CIS-1,3-DICHLOROPROPENE	10061-01-5	UG_L	0.25	U		1	U		2.5	U		0.25	U		0.25	U	
DIBROMOCHLOROMETHANE	124-48-1	UG_L	0.25	U		1	U		1	U		0.25	U		0.25	U	
ETHYLBENZENE	100-41-4	UG_L	0.5	U		1	U		2.5	U		0.5	U		0.5	U	
M- AND P-XYLENE	108-38-3/106-42	UG_L	1	U		1	U		5	U		1	U		1	U	
METHYL TERT-BUTYL ETHER	1634-04-4	UG_L	0.5	U		5.1			2.5	U		0.5	U		0.5	U	
METHYLENE CHLORIDE	75-09-2	UG_L	1	U		1	U		5	U		1	U		1	U	
O-XYLENE	95-47-6	UG_L	0.5	U		1	U		2.5	U		0.5	U		0.5	U	
STYRENE	100-42-5	UG_L	0.5	U		1	U		2.5	U		0.5	U		0.5	U	
TETRACHLOROETHENE	127-18-4	UG_L	0.25	U	be	1	U	be	1	U		15.3			4.84		
TOLUENE	108-88-3	UG_L	0.25	U		1	U		1	U		0.25	U		0.25	U	
TRANS-1,2-DICHLOROETHENE	156-60-5	UG_L	1.84			1	U		2.5	U		0.5	U		0.5	U	
TRANS-1,3-DICHLOROPROPENE	10061-02-6	UG_L	0.25	U		1	U		1	U		0.25	U		0.25	U	
TRICHLOROETHENE	79-01-6	UG_L	0.5	U	be	1	U	be	2.5	U		57.2			18.4		
VINYL CHLORIDE	75-01-4	UG_L	66.1			1	U		2.5	U		0.25	U		0.25	U	
XYLENES, TOTAL	1330-20-7	UG_L	1.5	U		1.5	U		7.5	U		1.5	U		1.5	U	

**Table B-3 (Continued)**  
**Volatile Organic Compound Results after Data Review**  
**NSA Mid-South – February 2013**

Location		007G53LF			007G57LF			007G58LF			007G59LF			007G62LF			
Lab ID		1302106-12			1302153-07			1302153-11			1302153-12			1302153-16			
Sample ID		007G53LF-1Q13			007G57LF-1Q13			007G58LF-1Q13			007G59LF-1Q13			007G62LF-1Q13			
Sample Date		2/14/2013			2/19/2013			2/19/2013			2/19/2013			2/19/2013			
Sample Type		Groundwater			Groundwater			Groundwater			Groundwater			Groundwater			
Analyte	CAS No	Units	Result	VQual	RC	Result	VQual	RC									
1,1,1-TRICHLOROETHANE	71-55-6	UG_L	0.5	U		0.25	U										
1,1,2,2-TETRACHLOROETHANE	79-34-5	UG_L	0.25	U		0.1	U										
1,1,2-TRICHLOROETHANE	79-00-5	UG_L	0.25	U		0.1	U										
1,1-DICHLOROETHANE	75-34-3	UG_L	0.5	U		0.53	J		0.25	U		1.06			0.3	J	
1,1-DICHLOROETHENE	75-35-4	UG_L	0.5	U		0.76	J		0.58	J		3.08			0.26	J	
1,2-DICHLOROETHANE	107-06-2	UG_L	0.25	U		0.1	U										
1,2-DICHLOROPROPANE	78-87-5	UG_L	0.25	U		0.1	U										
2-BUTANONE	78-93-3	UG_L	5	U		2.5	U										
2-HEXANONE	591-78-6	UG_L	2.5	U		1.25	U										
4-METHYL-2-PENTANONE	108-10-1	UG_L	2.5	U		1.25	U										
ACETONE	67-64-1	UG_L	5	U		2.5	U										
BENZENE	71-43-2	UG_L	0.25	U		0.1	U										
BROMODICHLOROMETHANE	75-27-4	UG_L	0.25	U		0.1	U										
BROMOFORM	75-25-2	UG_L	0.5	U		0.25	U										
BROMOMETHANE	74-83-9	UG_L	1	U		0.5	U										
CARBON DISULFIDE	75-15-0	UG_L	0.5	U		0.25	U										
CARBON TETRACHLORIDE	56-23-5	UG_L	1.25			0.1	U										
CHLOROENZENE	108-90-7	UG_L	0.5	U		0.25	U										
CHLOROETHANE	75-00-3	UG_L	1	U		0.5	U										
CHLOROFORM	67-66-3	UG_L	0.25	U	be	0.1	U		0.1	U		0.1	U		0.1	U	
CHLOROMETHANE	74-87-3	UG_L	0.5	U		0.25	U										
CIS-1,2-DICHLOROETHENE	156-59-2	UG_L	0.5	U	be	115			78.9			103			6.41		
CIS-1,3-DICHLOROPROPENE	10061-01-5	UG_L	0.25	U		0.13	U										
DIBROMOCHLOROMETHANE	124-48-1	UG_L	0.25	U		0.1	U										
ETHYLBENZENE	100-41-4	UG_L	0.5	U		0.25	U										
M- AND P-XYLENE	108-38-3/106-42	UG_L	1	U		0.5	U										
METHYL TERT-BUTYL ETHER	1634-04-4	UG_L	0.5	U		0.25	U										
METHYLENE CHLORIDE	75-09-2	UG_L	1	U		0.5	U										
O-XYLENE	95-47-6	UG_L	0.5	U		0.25	U										
STYRENE	100-42-5	UG_L	0.5	U		0.25	U										
TETRACHLOROETHENE	127-18-4	UG_L	0.25	U	be	0.1	U		0.1	U		2.61			0.1	U	
TOLUENE	108-88-3	UG_L	0.25	U		0.1	U										
TRANS-1,2-DICHLOROETHENE	156-60-5	UG_L	0.5	U		0.49	J		0.32	J		0.39	J		0.25	U	
TRANS-1,3-DICHLOROPROPENE	10061-02-6	UG_L	0.25	U		0.1	U										
TRICHLOROETHENE	79-01-6	UG_L	0.5	U	be	3.88			9.47			194	D		1.53		
VINYL CHLORIDE	75-01-4	UG_L	0.25	U		141	D		8.55			3.09			45.2		
XYLENES, TOTAL	1330-20-7	UG_L	1.5	U		0.75	U										

**Table B-3 (Continued)**  
**Volatile Organic Compound Results after Data Review**  
**NSA Mid-South — February 2013**

Location		007G63LF			007G64LF			007G65LF			007G66LF			007G69LF			
Lab ID		1302153-14			1302153-13			1302153-08RE1			1302153-15			1302106-08			
Sample ID		007G63LF-1Q13			007G64LF-1Q13			007G65LF-1Q13			007G66LF-1Q13			007G69LF-1Q13			
Sample Date		2/19/2013			2/19/2013			2/19/2013			2/19/2013			2/13/2013			
Sample Type		Groundwater			Groundwater			Groundwater			Groundwater			Groundwater			
Analyte	CAS No	Units	Result	VQual	RC	Result	VQual	RC									
1,1,1-TRICHLOROETHANE	71-55-6	UG_L	0.25	U		0.625	U		0.25	U		0.25	U		0.5	U	
1,1,2,2-TETRACHLOROETHANE	79-34-5	UG_L	0.1	U		0.25	U		0.1	U		0.1	U		0.25	U	
1,1,2-TRICHLOROETHANE	79-00-5	UG_L	0.1	U		0.25	U		0.1	U		0.1	U		0.25	U	
1,1-DICHLOROETHANE	75-34-3	UG_L	0.48	J		0.625	U		0.25	U		0.57	J		0.5	U	
1,1-DICHLOROETHENE	75-35-4	UG_L	1.74			4.6	D		2.67			2.61			0.36	J	
1,2-DICHLOROETHANE	107-06-2	UG_L	0.1	U		0.25	U		0.1	U		0.1	U		0.44	J	
1,2-DICHLOROPROPANE	78-87-5	UG_L	0.1	U		0.25	U		0.1	U		0.1	U		0.25	U	
2-BUTANONE	78-93-3	UG_L	2.5	U		6.25	U		2.5	U		2.5	U		5	U	
2-HEXANONE	591-78-6	UG_L	1.25	U		3.12	U		1.25	U		1.25	U		2.5	U	
4-METHYL-2-PENTANONE	108-10-1	UG_L	1.25	U		3.12	U		1.25	U		1.25	U		2.5	U	
ACETONE	67-64-1	UG_L	2.5	U		6.25	U		2.5	U		2.5	U		5	U	
BENZENE	71-43-2	UG_L	0.1	U		0.25	U		0.1	U		0.1	U		0.25	U	
BROMODICHLOROMETHANE	75-27-4	UG_L	0.1	U		0.25	U		0.1	U		0.1	U		0.25	U	
BROMOFORM	75-25-2	UG_L	0.25	U		0.625	U		0.25	U		0.25	U		0.5	U	
BROMOMETHANE	74-83-9	UG_L	0.5	U		1.25	U		0.5	U		0.5	U		1	U	
CARBON DISULFIDE	75-15-0	UG_L	0.25	U		0.625	U		0.25	U		0.25	U		0.5	U	
CARBON TETRACHLORIDE	56-23-5	UG_L	0.1	U		0.25	U		0.1	U		0.1	U		0.25	U	
CHLOROENZENE	108-90-7	UG_L	0.25	U		0.625	U		0.25	U		0.25	U		0.5	U	
CHLOROETHANE	75-00-3	UG_L	0.5	U		1.25	U		0.5	U		0.5	U		1	U	
CHLOROFORM	67-66-3	UG_L	0.1	U		0.25	U		0.1	U		0.1	U		0.25	U	
CHLOROMETHANE	74-87-3	UG_L	0.25	U		0.625	U		0.25	U		0.25	U		0.5	U	
CIS-1,2-DICHLOROETHENE	156-59-2	UG_L	43.7			267	D		114			20			51.2		
CIS-1,3-DICHLOROPROPENE	10061-01-5	UG_L	0.13	U		0.325	U		0.13	U		0.13	U		0.25	U	
DIBROMOCHLOROMETHANE	124-48-1	UG_L	0.1	U		0.25	U		0.1	U		0.1	U		0.25	U	
ETHYLBENZENE	100-41-4	UG_L	0.25	U		0.625	U		0.25	U		0.25	U		0.5	U	
M- AND P-XYLENE	108-38-3/106-42	UG_L	0.5	U		1.25	U		0.5	U		0.5	U		1	U	
METHYL TERT-BUTYL ETHER	1634-04-4	UG_L	0.25	U		0.625	U		0.25	U		0.25	U		0.5	U	
METHYLENE CHLORIDE	75-09-2	UG_L	0.5	U		1.25	U		0.5	U		0.5	U		1	U	
O-XYLENE	95-47-6	UG_L	0.25	U		0.625	U		0.25	U		0.25	U		0.5	U	
STYRENE	100-42-5	UG_L	0.25	U		0.625	U		0.25	U		0.25	U		0.5	U	
TETRACHLOROETHENE	127-18-4	UG_L	0.66			0.25	U		0.35	J		0.1	U		12.5		
TOLUENE	108-88-3	UG_L	0.1	U		0.25	U		0.1	U		0.1	U		0.25	U	
TRANS-1,2-DICHLOROETHENE	156-60-5	UG_L	0.25	U		1.12	DJ		0.63	J		0.25	U		0.43	J	
TRANS-1,3-DICHLOROPROPENE	10061-02-6	UG_L	0.1	U		0.25	U		0.1	U		0.1	U		0.25	U	
TRICHLOROETHENE	79-01-6	UG_L	5.18			2.22	DJ		19.5			4.66			38.8		
VINYL CHLORIDE	75-01-4	UG_L	31.7			83.8	D		44.3			46			58.4		
XYLENES, TOTAL	1330-20-7	UG_L	0.75	U		1.88	U		0.75	U		0.75	U		1.5	U	

**Table B-3 (Continued)**  
**Volatile Organic Compound Results after Data Review**  
**NSA Mid-South — February 2013**

Location		007G69LF			007G71LF			007G87LF			007G92LF			007G93LF			
Lab ID		1302106-09			1302153-06			1302106-20			1302106-16RE1			1302170-06			
Sample ID		007H69LF-1Q13			007G71LF-1Q13			007G87LF-1Q13			007G92LF-1Q13			007G93LF-1Q13			
Sample Date		2/13/2013			2/18/2013			2/15/2013			2/15/2013			2/20/2013			
Sample Type		Duplicate			Groundwater			Groundwater			Groundwater			Groundwater			
Analyte	CAS No	Units	Result	VQual	RC	Result	VQual	RC									
1,1,1-TRICHLOROETHANE	71-55-6	UG_L	0.5	U		0.25	U		0.5	U		0.5	U		0.5	U	
1,1,2,2-TETRACHLOROETHANE	79-34-5	UG_L	0.25	U		0.1	U		0.25	U		0.25	U		0.25	U	
1,1,2-TRICHLOROETHANE	79-00-5	UG_L	0.25	U		0.1	U		0.25	U		0.25	U		0.25	U	
1,1-DICHLOROETHANE	75-34-3	UG_L	0.26	J		0.25	U		2.1			0.5	U		1.38		
1,1-DICHLOROETHENE	75-35-4	UG_L	0.34	J		0.76	J		3.1			0.5	U		1.19		
1,2-DICHLOROETHANE	107-06-2	UG_L	0.42	J		0.1	U		0.25	U		0.25	U		0.34	J	
1,2-DICHLOROPROPANE	78-87-5	UG_L	0.25	U		0.1	U		0.25	U		0.25	U		0.25	U	
2-BUTANONE	78-93-3	UG_L	5	U		2.5	U		5	U		5	U		5	U	
2-HEXANONE	591-78-6	UG_L	2.5	U		1.25	U		2.5	U		2.5	U		2.5	U	
4-METHYL-2-PENTANONE	108-10-1	UG_L	2.5	U		1.25	U		2.5	U		2.5	U		2.5	U	
ACETONE	67-64-1	UG_L	5	U		2.5	U		5	U		5	U		5	U	
BENZENE	71-43-2	UG_L	0.25	U		0.1	U		0.25	U		0.25	U		0.25	U	
BROMODICHLOROMETHANE	75-27-4	UG_L	0.25	U		0.1	U		0.25	U		0.25	U		0.25	U	
BROMOFORM	75-25-2	UG_L	0.5	U		0.25	U		0.5	U		0.5	U		0.5	U	
BROMOMETHANE	74-83-9	UG_L	1	U		0.5	U		1	U		1	U		1	U	
CARBON DISULFIDE	75-15-0	UG_L	0.5	U		0.25	U		0.5	U		0.5	U		0.5	U	
CARBON TETRACHLORIDE	56-23-5	UG_L	0.25	U		0.1	U		0.25	U		0.25	U		0.61		
CHLOROENZENE	108-90-7	UG_L	0.5	U		0.25	U		0.5	U		0.5	U		0.5	U	
CHLOROETHANE	75-00-3	UG_L	1	U		0.5	U		1	U		1	U		1	U	
CHLOROFORM	67-66-3	UG_L	0.25	U		0.1	U		0.25	U		0.25	U		1.35		
CHLOROMETHANE	74-87-3	UG_L	0.5	U		0.25	U		0.5	U		0.5	U		0.5	U	
CIS-1,2-DICHLOROETHENE	156-59-2	UG_L	52.8			19.7			7.89			0.5	U	be	6.38		
CIS-1,3-DICHLOROPROPENE	10061-01-5	UG_L	0.25	U		0.13	U		0.25	U		0.25	U		0.25	U	
DIBROMOCHLOROMETHANE	124-48-1	UG_L	0.25	U		0.1	U		0.25	U		0.25	U		0.25	U	
ETHYLBENZENE	100-41-4	UG_L	0.5	U		0.25	U		0.5	U		0.5	U		0.5	U	
M- AND P-XYLENE	108-38-3/106-42	UG_L	1	U		0.5	U		1	U		1	U		1	U	
METHYL TERT-BUTYL ETHER	1634-04-4	UG_L	0.5	U		0.25	U		0.5	U		0.5	U		0.5	U	
METHYLENE CHLORIDE	75-09-2	UG_L	1	U		0.5	U		1	U		1	U		1	U	
O-XYLENE	95-47-6	UG_L	0.5	U		0.25	U		0.5	U		0.5	U		0.5	U	
STYRENE	100-42-5	UG_L	0.5	U		0.25	U		0.5	U		0.5	U		0.5	U	
TETRACHLOROETHENE	127-18-4	UG_L	12			0.1	U		0.25	U	be	3.78			3.67		
TOLUENE	108-88-3	UG_L	0.25	U		0.1	U		0.25	U		0.25	U		0.25	U	
TRANS-1,2-DICHLOROETHENE	156-60-5	UG_L	0.44	J		0.82	J		0.32	J		0.5	U		0.5	U	
TRANS-1,3-DICHLOROPROPENE	10061-02-6	UG_L	0.25	U		0.1	U		0.25	U		0.25	U		0.25	U	
TRICHLOROETHENE	79-01-6	UG_L	37.1			0.54	J		42.4			17.8			12.7		
VINYL CHLORIDE	75-01-4	UG_L	59.4			14.5			0.25	U	be	0.25	U	be	0.25	U	
XYLENES, TOTAL	1330-20-7	UG_L	1.5	U		0.75	U		1.5	U		1.5	U		1.5	U	

**Table B-3 (Continued)**  
**Volatile Organic Compound Results after Data Review**  
**NSA Mid-South — February 2013**

Location		007G94LF			007G95LF			007G96LF			007G97LF			007G98LF			
Lab ID		1302170-05			1302170-08			1302170-07			1302170-10			1302170-09			
Sample ID		007G94LF-1Q13			007G95LF-1Q13			007G96LF-1Q13			007G97LF-1Q13			007G98LF-1Q13			
Sample Date		2/20/2013			2/21/2013			2/21/2013			2/21/2013			2/21/2013			
Sample Type		Groundwater			Groundwater			Groundwater			Groundwater			Groundwater			
Analyte	CAS No	Units	Result	VQual	RC	Result	VQual	RC									
1,1,1-TRICHLOROETHANE	71-55-6	UG_L	0.5	U		0.5	U										
1,1,2,2-TETRACHLOROETHANE	79-34-5	UG_L	0.25	U		0.25	U										
1,1,2-TRICHLOROETHANE	79-00-5	UG_L	0.25	U		0.25	U										
1,1-DICHLOROETHANE	75-34-3	UG_L	1.75			1.84			2			1.36			1.99		
1,1-DICHLOROETHENE	75-35-4	UG_L	1.26			1.25			0.9	J		0.47	J		0.81	J	
1,2-DICHLOROETHANE	107-06-2	UG_L	0.45	J		0.39	J		0.48	J		0.28	J		0.47	J	
1,2-DICHLOROPROPANE	78-87-5	UG_L	0.25	U		0.25	U										
2-BUTANONE	78-93-3	UG_L	5	U		5	U		5	U		5	U		5	U	
2-HEXANONE	591-78-6	UG_L	2.5	U		2.5	U										
4-METHYL-2-PENTANONE	108-10-1	UG_L	2.5	U		2.5	U										
ACETONE	67-64-1	UG_L	5	U		5	U		5	U		5	U		5	U	
BENZENE	71-43-2	UG_L	0.25	U		0.25	U										
BROMODICHLOROMETHANE	75-27-4	UG_L	0.25	U		0.25	U										
BROMOFORM	75-25-2	UG_L	0.5	U		0.5	U										
BROMOMETHANE	74-83-9	UG_L	1	U		1	U		1	U		1	U		1	U	
CARBON DISULFIDE	75-15-0	UG_L	0.5	U		0.5	U		0.56	J		0.5	U		0.5	U	
CARBON TETRACHLORIDE	56-23-5	UG_L	0.26	J		0.78			0.25	U		0.25	U		0.65		
CHLOROENZENE	108-90-7	UG_L	0.5	U		0.5	U										
CHLOROETHANE	75-00-3	UG_L	1	U		1	U		1	U		1	U		1	U	
CHLOROFORM	67-66-3	UG_L	1.73			1.8			2.09			1.97			2.22		
CHLOROMETHANE	74-87-3	UG_L	0.5	U		0.5	U										
CIS-1,2-DICHLOROETHENE	156-59-2	UG_L	7.84			8.13			7.18			3.07			5.98		
CIS-1,3-DICHLOROPROPENE	10061-01-5	UG_L	0.25	U		0.25	U										
DIBROMOCHLOROMETHANE	124-48-1	UG_L	0.25	U		0.25	U										
ETHYLBENZENE	100-41-4	UG_L	0.5	U		0.5	U										
M- AND P-XYLENE	108-38-3/106-42	UG_L	1	U		1	U		1	U		1	U		1	U	
METHYL TERT-BUTYL ETHER	1634-04-4	UG_L	0.5	U		0.5	U										
METHYLENE CHLORIDE	75-09-2	UG_L	1	U		1	U		1	U		0.61	J		1	U	
O-XYLENE	95-47-6	UG_L	0.5	U		0.5	U										
STYRENE	100-42-5	UG_L	0.5	U		0.5	U										
TETRACHLOROETHENE	127-18-4	UG_L	4.42			4.63			4.07			2.92			4.22		
TOLUENE	108-88-3	UG_L	0.25	U		0.25	U		1.12			0.25	U		0.25	U	
TRANS-1,2-DICHLOROETHENE	156-60-5	UG_L	0.5	U		0.5	U										
TRANS-1,3-DICHLOROPROPENE	10061-02-6	UG_L	0.25	U		0.25	U										
TRICHLOROETHENE	79-01-6	UG_L	14.9			16.4			13.7			7.43			15.4		
VINYL CHLORIDE	75-01-4	UG_L	0.25	U		0.25	U										
XYLENES, TOTAL	1330-20-7	UG_L	1.5	U		1.5	U										

**Table B-3 (Continued)**  
**Volatile Organic Compound Results after Data Review**  
**NSA Mid-South — February 2013**

Location		007G99LF			007GPZ03			015G01LF			015G01UF			PESGMW2D			
Lab ID		1302170-13			1302106-03			1302082-03			1302082-04RE1			1302106-19			
Sample ID		007G99LF-1Q13			007GPZ03-1Q13			015G01LF-1Q13			015G01UF-1Q13			PESGMW2D-1Q13			
Sample Date		2/22/2013			2/13/2013			2/12/2013			2/12/2013			2/15/2013			
Sample Type		Groundwater			Groundwater			Groundwater			Groundwater			Groundwater			
Analyte	CAS No	Units	Result	VQual	RC	Result	VQual	RC									
1,1,1-TRICHLOROETHANE	71-55-6	UG_L	0.5	U		0.5	U		1	U		2.5	U		0.5	U	
1,1,2,2-TETRACHLOROETHANE	79-34-5	UG_L	0.25	U		0.25	U		1	U		1	U		0.25	U	
1,1,2-TRICHLOROETHANE	79-00-5	UG_L	0.25	U		0.25	U		1	U		1	U		0.25	U	
1,1-DICHLOROETHANE	75-34-3	UG_L	2.29			1.87			0.34	J		2.5	U		3.02		
1,1-DICHLOROETHENE	75-35-4	UG_L	0.91	J		0.81	J		1.01			2.5	U		2.87		
1,2-DICHLOROETHANE	107-06-2	UG_L	0.54			0.43	J		1	U		1	U		0.79		
1,2-DICHLOROPROPANE	78-87-5	UG_L	0.25	U		0.25	U		1	U		1	U		0.25	U	
2-BUTANONE	78-93-3	UG_L	5	U		5	U		5	U		25	U		5	U	
2-HEXANONE	591-78-6	UG_L	2.5	U		2.5	U		2.5	U		12.5	U		2.5	U	
4-METHYL-2-PENTANONE	108-10-1	UG_L	2.5	U		2.5	U		2.5	U		12.5	U		2.5	U	
ACETONE	67-64-1	UG_L	5	U		5	U		5	U		25	U		5	U	
BENZENE	71-43-2	UG_L	0.25	U		0.25	U		1	U		59.6	D		0.3	J	
BROMODICHLOROMETHANE	75-27-4	UG_L	0.25	U		0.25	U		1	U		1	U		0.25	U	
BROMOFORM	75-25-2	UG_L	0.5	U		0.5	U		1	U		2.5	U		0.5	U	
BROMOMETHANE	74-83-9	UG_L	1	U		1	U		1	U		5	U		1	U	
CARBON DISULFIDE	75-15-0	UG_L	0.5	U	be	0.5	U		1	U		2.5	U		0.5	U	
CARBON TETRACHLORIDE	56-23-5	UG_L	1.61			2.97			0.27	J		1	U		0.25	U	
CHLOROENZENE	108-90-7	UG_L	0.5	U		0.5	U		1	U		2.5	U		0.5	U	
CHLOROETHANE	75-00-3	UG_L	1	U		1	U		1	U		5	U		1.01	J	
CHLOROFORM	67-66-3	UG_L	2.45			0.25	U	be	1	U	be	1	U		0.25	U	
CHLOROMETHANE	74-87-3	UG_L	0.5	U		0.5	U		1	U		2.5	U		0.5	U	
CIS-1,2-DICHLOROETHENE	156-59-2	UG_L	8			6.45			20.6			2.5	U		9.78		
CIS-1,3-DICHLOROPROPENE	10061-01-5	UG_L	0.25	U		0.25	U		1	U		2.5	U		0.25	U	
DIBROMOCHLOROMETHANE	124-48-1	UG_L	0.25	U		0.25	U		1	U		1	U		0.25	U	
ETHYLBENZENE	100-41-4	UG_L	0.5	U		0.5	U		1	U		19.2	D		0.39	J	
M- AND P-XYLENE	108-38-3/106-42	UG_L	1	U		1	U		1	U		5	U		2.31		
METHYL TERT-BUTYL ETHER	1634-04-4	UG_L	0.5	U		0.5	U		0.52	J		2.5	U		0.5	U	
METHYLENE CHLORIDE	75-09-2	UG_L	1	U	bt	1	U		1	U		5	U		1	U	
O-XYLENE	95-47-6	UG_L	0.5	U		0.5	U		1	U		2.5	U		0.53	J	
STYRENE	100-42-5	UG_L	0.5	U		0.5	U		1	U		2.5	U		0.5	U	
TETRACHLOROETHENE	127-18-4	UG_L	4.8			4.33			9.08			1	U		0.25	U	be
TOLUENE	108-88-3	UG_L	0.25	U		0.25	U		1	U		1	U		1.78		
TRANS-1,2-DICHLOROETHENE	156-60-5	UG_L	0.5	U		0.5	U		0.71	J		2.5	U		0.5	U	
TRANS-1,3-DICHLOROPROPENE	10061-02-6	UG_L	0.25	U		0.25	U		1	U		1	U		0.25	U	
TRICHLOROETHENE	79-01-6	UG_L	19.1			16.3			24.1			2.5	U		0.5	U	be
VINYL CHLORIDE	75-01-4	UG_L	0.25	U		0.25	U		1	U	be	2.5	U		18.4		
XYLENES, TOTAL	1330-20-7	UG_L	1.5	U		1.5	U		1.5	U		7.5	U		2.84	J	

**Table B-3 (Continued)**  
**Volatile Organic Compound Results after Data Review**  
**NSA Mid-South — February 2013**

Location		PESGMW2S				PESGMW3D			PESGMW3S		
Lab ID		1302106-17				1302153-05			1302153-03		
Sample ID		PESGMW2S-1Q13				PESGMW3D-1Q13			PESGMW3S-1Q13		
Sample Date		2/15/2013				2/18/2013			2/18/2013		
Sample Type		Groundwater				Groundwater			Groundwater		
Analyte	CAS No	Units	Result	VQual	RC	Result	VQual	RC	Result	VQual	RC
1,1,1-TRICHLOROETHANE	71-55-6	UG_L	0.5	U		0.25	U		0.25	U	
1,1,2,2-TETRACHLOROETHANE	79-34-5	UG_L	0.25	U		0.1	U		0.1	U	
1,1,2-TRICHLOROETHANE	79-00-5	UG_L	0.25	U		0.1	U		0.1	U	
1,1-DICHLOROETHANE	75-34-3	UG_L	1.81			0.3	J		81		
1,1-DICHLOROETHENE	75-35-4	UG_L	0.5	U		0.25	U		143		
1,2-DICHLOROETHANE	107-06-2	UG_L	0.25	U		0.1	U		0.61		
1,2-DICHLOROPROPANE	78-87-5	UG_L	0.25	U		0.1	U		0.1	U	
2-BUTANONE	78-93-3	UG_L	5	U		2.5	U		2.5	U	
2-HEXANONE	591-78-6	UG_L	2.5	U		1.25	U		1.25	U	
4-METHYL-2-PENTANONE	108-10-1	UG_L	2.5	U		1.25	U		1.25	U	
ACETONE	67-64-1	UG_L	5	U		2.5	U		2.5	U	
BENZENE	71-43-2	UG_L	1.58			0.34	J		1.15		
BROMODICHLOROMETHANE	75-27-4	UG_L	0.25	U		0.1	U		0.1	U	
BROMOFORM	75-25-2	UG_L	0.5	U		0.25	U		0.25	U	
BROMOMETHANE	74-83-9	UG_L	1	U		0.5	U		0.5	U	
CARBON DISULFIDE	75-15-0	UG_L	0.5	U		0.25	U		0.25	U	
CARBON TETRACHLORIDE	56-23-5	UG_L	0.25	U		0.1	U		0.1	U	
CHLOROENZENE	108-90-7	UG_L	0.5	U		0.25	U		0.25	U	
CHLOROETHANE	75-00-3	UG_L	10.9			3.22			3.34		
CHLOROFORM	67-66-3	UG_L	0.25	U		0.1	U		0.1	U	
CHLOROMETHANE	74-87-3	UG_L	0.5	U		0.25	U		0.25	U	
CIS-1,2-DICHLOROETHENE	156-59-2	UG_L	0.5	U		0.25	U		31.4		
CIS-1,3-DICHLOROPROPENE	10061-01-5	UG_L	0.25	U		0.13	U		0.13	U	
DIBROMOCHLOROMETHANE	124-48-1	UG_L	0.25	U		0.1	U		0.1	U	
ETHYLBENZENE	100-41-4	UG_L	0.45	J		0.27	J		0.25	U	
M- AND P-XYLENE	108-38-3/106-42	UG_L	3.31			1.3	J		0.5	U	
METHYL TERT-BUTYL ETHER	1634-04-4	UG_L	0.5	U		0.25	U		0.25	U	
METHYLENE CHLORIDE	75-09-2	UG_L	1	U		0.5	U		0.5	U	
O-XYLENE	95-47-6	UG_L	0.52	J		0.25	U		0.25	U	
STYRENE	100-42-5	UG_L	0.5	U		0.25	U		0.25	U	
TETRACHLOROETHENE	127-18-4	UG_L	0.25	U		0.1	U		0.27	J	
TOLUENE	108-88-3	UG_L	6.72			1.31			0.1	U	
TRANS-1,2-DICHLOROETHENE	156-60-5	UG_L	0.5	U		0.25	U		0.25	U	
TRANS-1,3-DICHLOROPROPENE	10061-02-6	UG_L	0.25	U		0.1	U		0.1	U	
TRICHLOROETHENE	79-01-6	UG_L	0.5	U		0.25	U		34.8		
VINYL CHLORIDE	75-01-4	UG_L	96.6			22.6			177	D	
XYLENES, TOTAL	1330-20-7	UG_L	3.83			1.3	J		0.75	U	

**Table B-4  
Monitored Natural Attenuation Results after Data Review  
NSA Mid-South — February 2013**

				007G100LF-1Q13 2/22/2013 Groundwater			007G101LF-1Q13 2/22/2013 Groundwater			007G102LF-1Q13 2/22/2013 Groundwater			007G103MF-1Q13 2/22/2013 Groundwater			007G104MF-1Q13 2/22/2013 Groundwater		
Method	Analyte	CAS No	Units	Result	VQual	RC	Result	VQual	RC	Result	VQual	RC	Result	VQual	RC	Result	VQual	RC
300.0	CHLORIDE	16887-00-6	MG_L	45.9			36			30.6			9.52			10.1		
300.0	SULFATE	14808-79-8	MG_L	17.5			16.6			18			5.46			10.3		
6010B	IRON	7439-89-6	UG_L	3040			7800			22900			10000			11000		
9060A	TOTAL ORGANIC CARBON	-28	MG_L	2.5	U		2.5	U		1.45	J		1.61	J		2.38	J	
				007G105MF 1302170-19 007G105MF-1Q13 2/22/2013 Groundwater			007G106LF 1302170-04 007G106LF-1Q13 2/20/2013 Groundwater			007G107LF 1302170-03 007G107LF-1Q13 2/20/2013 Groundwater			007G21LF 1302153-04 007G21LF-1Q13 2/18/2013 Groundwater			007G52LF 1302106-10 007G52LF-1Q13 2/14/2013 Groundwater		
Method	Analyte	CAS No	Units	Result	VQual	RC	Result	VQual	RC	Result	VQual	RC	Result	VQual	RC	Result	VQual	RC
300.0	CHLORIDE	16887-00-6	MG_L	13			11.4			18.8			4.42			50.7		
300.0	SULFATE	14808-79-8	MG_L	11.7			10.5			10.2			11			19		
6010B	IRON	7439-89-6	UG_L	9690			1670			10800			240			82.6	J	
9060A	TOTAL ORGANIC CARBON	-28	MG_L	1.94	J		2.5	U		2.5	U		1.25	U		2.5	U	
				007G65LF 1302153-08 007G65LF-1Q13 2/19/2013 Groundwater			007G71LF 1302153-06 007G71LF-1Q13 2/18/2013 Groundwater			007G92LF 1302106-16 007G92LF-1Q13 2/15/2013 Groundwater			007G93LF 1302170-06 007G93LF-1Q13 2/20/2013 Groundwater			007G94LF 1302170-05 007G94LF-1Q13 2/20/2013 Groundwater		
Method	Analyte	CAS No	Units	Result	VQual	RC	Result	VQual	RC	Result	VQual	RC	Result	VQual	RC	Result	VQual	RC
300.0	CHLORIDE	16887-00-6	MG_L	2.53			6.96			4.38			40.8			44.6		
300.0	SULFATE	14808-79-8	MG_L	3.71			51.9			11.1			17			16.9		
6010B	IRON	7439-89-6	UG_L	2240			3640			7910			4550			7570		
9060A	TOTAL ORGANIC CARBON	-28	MG_L	1.26	J		1.94	J		2.5	U		2.5	U		2.5	U	

**Table B-4 (Continued)**  
**Monitored Natural Attenuation Results after Data Review**  
**NSA Mid-South — February 2013**

Location Lab ID Sample ID Sample Date Sample Type				007G95LF 1302170-08 007G95LF-1Q13 2/21/2013 Groundwater			007G96LF 1302170-07 007G96LF-1Q13 2/21/2013 Groundwater			007G97LF 1302170-10 007G97LF-1Q13 2/21/2013 Groundwater			007G98LF 1302170-09 007G98LF-1Q13 2/21/2013 Groundwater			007G99LF 1302170-13 007G99LF-1Q13 2/22/2013 Groundwater		
Method	Analyte	CAS No	Units	Result	VQual	RC												
300.0	CHLORIDE	16887-00-6	MG_L	46.5			47.5			38.6			45.9			47.6		
300.0	SULFATE	14808-79-8	MG_L	17.3			17.1			34.3			19.1			17.7		
6010B	IRON	7439-89-6	UG_L	8370			19300			37800			10800			5190		
9060A	TOTAL ORGANIC CARBON	-28	MG_L	2.5	U		1.59	J		3.94			1.48	J		2.5	U	
Location Lab ID Sample ID Sample Date Sample Type				PESGMW2D 1302106-19 PESGMW2D-1Q13 2/15/2013 Groundwater			PESGMW2S 1302106-17 PESGMW2S-1Q13 2/15/2013 Groundwater			PESGMW3D 1302153-05 PESGMW3D-1Q13 2/18/2013 Groundwater			PESGMW3S 1302153-03 PESGMW3S-1Q13 2/18/2013 Groundwater					
Method	Analyte	CAS No	Units	Result	VQual	RC												
300.0	CHLORIDE	16887-00-6	MG_L	3.91			26.5			25.1			16.5					
300.0	SULFATE	14808-79-8	MG_L	0.74	J		1	U		0.33	U		1.78	J				
6010B	IRON	7439-89-6	UG_L	15200			4750			7740			52800					
9060A	TOTAL ORGANIC CARBON	-28	MG_L	2.5	U		3.1			2.54	J		5.51					

**Table B-5  
Monitored Natural Attenuation Results after Data Review  
Hydrogen, Methane, Ethane, Ethene  
NSA Mid-South — February 2013**

Location Lab ID Sample ID Sample Date Sample Type			007G100LF 81870010 007G100LF-1Q13 2/22/2013 Groundwater			007G101LF 81870012 007G101LF-1Q13 2/22/2013 Groundwater			007G102LF 81870011 007G102LF-1Q13 2/22/2013 Groundwater			007G103MF 81870013 007G103MF-1Q13 2/22/2013 Groundwater			007G104MF 81870014 007G104MF-1Q13 2/22/2013 Groundwater		
Analyte	CAS No	Units	Result	VQual	RC												
HYDROGEN	1333-74-0	NMOLES	23000			10000			720			360000			270000		
ETHANE	74-84-0	UG_L	0.24			0.74			1.8			5.5			4.2		
ETHENE	74-85-1	UG_L	0.17			0.39			0.67			4.1			4.1		
METHANE	74-82-8	UG_L	0.77			2			4.5			9.8			28		
Location Lab ID Sample ID Sample Date Sample Type			007G105MF 81870015 007G105MF-1Q13 2/22/2013 Groundwater			007G106LF 81870002 007G106LF-1Q13 2/20/2013 Groundwater			007G107LF 81870001 007G107LF-1Q13 2/20/2013 Groundwater			007G21LF 81500002 007G21LF-1Q13 2/18/2013 Groundwater			007G52LF 81490001 007G52LF-1Q13 2/14/2013 Groundwater		
Analyte	CAS No	Units	Result	VQual	RC												
HYDROGEN	1333-74-0	NMOLES	1100000			9400	J	h	150000	J	h	1.1			2.4		
ETHANE	74-84-0	UG_L	2			0.23	J	h	1.3	J	h	0.077			0.011		
ETHENE	74-85-1	UG_L	3			0.12	J	h	0.9	J	h	2.8			0.028		
METHANE	74-82-8	UG_L	140			0.47	J	h	3.2	J	h	250			1.3		
Location Lab ID Sample ID Sample Date Sample Type			007G65LF 81500005 007G65LF-1Q13 2/19/2013 Groundwater			007G71LF 81500004 007G71LF-1Q13 2/18/2013 Groundwater			007G92LF 81490002 007G92LF-1Q13 2/15/2013 Groundwater			007G93LF 81870004 007G93LF-1Q13 2/20/2013 Groundwater			007G94LF 81870003 007G94LF-1Q13 2/20/2013 Groundwater		
Analyte	CAS No	Units	Result	VQual	RC												
HYDROGEN	1333-74-0	NMOLES	1.2			10			0.45	J		32000	J	h	17000	J	h
ETHANE	74-84-0	UG_L	0.0083	J		0.14			0.0013	J		0.43	J	h	0.21	J	h
ETHENE	74-85-1	UG_L	0.25			2.6			0.01	U		0.23	J	h	0.14	J	h
METHANE	74-82-8	UG_L	690			450			39			0.9	J	h	0.51	J	h

**Table B-5 (Continued)**  
**Monitored Natural Attenuation Results after Data Review**  
**Hydrogen, Methane, Ethane, Ethene**  
**NSA Mid-South — February 2013**

Location		007G95LF			007G96LF			007G97LF			007G98LF			007G99LF			
Lab ID		81870006			81870005			81870008			81870007			81870009			
Sample ID		007G95LF-1Q13			007G96LF-1Q13			007G97LF-1Q13			007G98LF-1Q13			007G99LF-1Q13			
Sample Date		2/21/2013			2/21/2013			2/21/2013			2/21/2013			2/22/2013			
Sample Type		Groundwater			Groundwater			Groundwater			Groundwater			Groundwater			
Analyte	CAS No	Units	Result	VQual	RC	Result	VQual	RC									
HYDROGEN	1333-74-0	NMOLES	100000	J	h	5800	J	h	140000	J	h	47000	J	h	5000		
ETHANE	74-84-0	UG_L	1.1			2.6			5.9			1.4			0.53		
ETHENE	74-85-1	UG_L	0.57			1.3			2.1			0.76			0.24		
METHANE	74-82-8	UG_L	1.8			5.2			9.6			3			1.2		
Location		PESGMW2D			PESGMW2S			PESGMW3D			PESGMW3S						
Lab ID		81490004			81490003			81500003			81500001						
Sample ID		PESGMW2D-1Q13			PESGMW2S-1Q13			PESGMW3D-1Q13			PESGMW3S-1Q13						
Sample Date		2/15/2013			2/15/2013			2/18/2013			2/18/2013						
Sample Type		Groundwater			Groundwater			Groundwater			Groundwater						
Analyte	CAS No	Units	Result	VQual	RC												
HYDROGEN	1333-74-0	NMOLES	1.9			1.8			0.99			12					
ETHANE	74-84-0	UG_L	0.01	U		0.031			0.01	U		0.051					
ETHENE	74-85-1	UG_L	0.64			11			0.27			9.4					
METHANE	74-82-8	UG_L	10000			13000			12000			13000					

## TECHNICAL MEMORANDUM

To: NSA Mid-South Base Cleanup Team

From: Resolution Consultants Inc.

Date: 16 October 2013

Re: Summary Status Report — Supplement SWMU 15 Investigation and  
AOC A Substrate Injections

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This technical memorandum contains a summary of the supplemental investigative and interim corrective measures conducted at Solid Waste Management Unit (SWMU) 15 and Area of Concern (AOC) A at Naval Support Activity Mid-South between 2012 and 2013, and associated documentation (well construction logs, figures, preliminary analytical data, and associated figures). The work has been completed per the *Tier II Sampling and Analysis Plan; Area of Concern A — Fluvial Deposits Groundwater; Naval Support Activity Mid-South* (Resolutions Consultants; September 2012) (SAP).

Groundwater analytical data from an initial baseline sampling of the newly constructed wells (collected at the conclusion of well development) along with that from the February 2013 semi-annual event are presented in this report. The groundwater monitoring data will be presented again in the upcoming *Annual Progress Report* for AOC A along with an evaluation relative to the overall site-wide AOC A data.

### **SWMU 15 DPT Investigation**

SWMU 15 was formerly a fuel farm containing ten 10,000- to 25,000-gallon underground storage tanks (USTs) that were removed in 1992. In spite of an extensive soil removal action of petroleum-contaminated soil in 2004, elevated benzene levels have persisted in monitoring well 015G01UF, located north of the removal area (Figure 1). The week of October 28, 2012, Resolution Consultants conducted a groundwater assessment near monitoring well 015G01UF using direct push technology (DPT) for in situ groundwater sampling and constructing temporary 1-inch monitoring wells in zones where groundwater yields were too low for in situ-sampling. The objectives of the data collection effort were:



- (1) Evaluate the extent of benzene in fluvial deposits groundwater in the area of well 015G01UF.
- (2) Identify the preferential depth interval in which the benzene was migrating.
- (3) Collect remedial design data for possible remedial evaluation.

To meet these objectives, a 9-point groundwater sampling grid was established around well 015G01UF from which groundwater samples were collected at three depth intervals of the upper fluvial deposits; 35, 45, and 55 feet below land surface (bls).

Empirical Laboratories in Nashville, Tennessee, provided volatile organic compound (VOC) analyses using SW-846 Method 8260B. The validation and laboratory reports are provided in Attachments A and B, respectively, and Table 1 contains a summary of the detected VOCs detected at SWMU 15. Figures 2, 3, and 4 show benzene in groundwater at 35, 45, and 55 feet bls, respectively. The maximum benzene concentrations are present at the 45-foot depth interval, consistent with the lower part of the screened interval of well 015G01UF. The most elevated benzene detections were identified at the southernmost transect (closest to the excavation area), where concentrations of 4,380 and 2,780 micrograms per liter ( $\mu\text{g/L}$ ) are present at locations 7 and 8 (see Figure 3).

The north-south orientation of the sampling grid assumed the former fuel farm as the source for the benzene observed in 015G01UF, given its proximity to the well (approximately 100 feet south of the well). However, the assumption that the SWMU 15 fuel farm is the benzene source for well 015G01UF requires re-evaluation based on two factors:

- The spatial benzene distribution noted on Figures 2 through 4 suggests concentrations are highest southwest of 015G01UF, in the 45-foot depth interval. However, if this was the source, a higher concentration would be present in the upper interval, with a subtle taper in concentrations as benzene extended north, past well 015G01UF. Instead, concentrations decrease several orders of magnitude over a relatively short distance (approximately 75 feet).
- Re-evaluation of the groundwater flow direction from the larger AOC A suggests that groundwater flow is to the northwest. Redrawing the benzene concentration-contours to account for the groundwater flow direction (Figure 5) suggests the possible source-area is

east-southeast of well 015G01UF. A review of historical records for the area review found multiple closed tanks and oil water separators (OWS) as noted on Figure 5.

While all these tanks and OWSs were closed per the Tennessee Department of Environment and Conservation (TDEC) Underground Storage Tank (UST) Division guidelines, the recent data suggests a source may be remaining in the area(s). A TDEC-approved work plan for conducting a soil gas survey followed with groundwater sampling is scheduled for implementation in the fall of 2013 to evaluate these areas.

### **Supplemental Interim Corrective Measures — Area of Concern A**

As outlined in the SAP, remedy optimization measures were warranted at two areas of AOC A because of the following conditions:

- **Former Base Boundary** — TCE in groundwater has increased in the downgradient, offsite well 007G52LF, triggering supplemental corrective measures to mitigate further offsite impacts. Given the TCE increase in offsite well 007G52LF, two supplemental offsite monitoring wells were also installed.
- **Sub-Plume D** — The former AOC A pilot study and interim corrective measures focused on the east side of Sub-Plume D, leaving the remainder of the sub plume untreated where TCE levels up to 500 µg/L were detected in 2010, warranting expansion of the treatment zone. Additionally, several wells in the former treatment area continue exhibiting TCE levels above the 100 µg/L active remediation goal, warranting continued treatment. Because of the broad nature of the treatment, 21 wells were specified in the SAP for treatment, many of which were formerly used for monitoring, triggering the need for three new downgradient wells from the treatment area to monitor remedy effectiveness.

### **AOC A: Mitigating Offsite Migration of Trichloroethylene (TCE) and Added Delineation**

Between January 21 and February 10, 2013, ten injection wells (007G93LF — 007G102LF) were constructed along the former perimeter road of the Base, creating an injection-well transect perpendicular to the TCE plume before it leaves the former Base property boundary (see Figure 6). The objective of the injection wells is to deliver carbon substrate at the property boundary and create an anaerobic reductive zone so TCE undergoes reductive dechlorination as it migrates through the treatment area, mitigating further offsite impacts.

Injection wells were constructed using rotary sonic drilling methods and consisted of 4-inch diameter, Schedule 40 poly vinyl chloride (PVC) risers, attached to 10-feet of 0.010-slot PVC screens. Wells were screened in the lowermost 10 feet of the fluvial deposits aquifer, and ranged from 88 and 100 feet deep. The two offsite monitoring wells were constructed similarly, except that well diameters were 2-inch instead of 4-inch. Table 2 provides total depths, survey information, and well construction details for the 10 injection and two monitoring wells. Lithological descriptions and well construction logs are in Attachment C.

The newly constructed injection wells were sampled twice before their conversion into injection wells; once at the end of wells development (late January/early February) and in February 2013 as part of the AOC A semi-annual long term monitoring. Attachments A and B contain the validation and laboratory reports, respectively, and Table 3 provides a summary of the VOCs detected during the baseline semi-annual event and TCE detected at the end of well development and the baseline sampling is shown on Figure 6. TCE concentrations were relatively consistent with historical detections near the perimeter, ranging between 7 and 19 µg/L, and illustrated on Figure 6. TCE was not detected in the two newly constructed monitoring well (007G016LF and 007G107LF) along Veteran's Parkway.

An emulsified vegetable oil/lactate-base carbon substrate was injected into the ten injection wells between June 24 and July 8, 2013.<sup>1</sup> Resolution Consultants provided oversight and mixing directions to the injection contractor, McCray Drilling, during injection activities. Dosing quantities were established by the carbon substrate vendor (TerraSystems) and were based on the TCE concentrations, aquifer properties, and remedial cleanup goals, among other variables. The volumes of substrate, mixing water, and chase water used for distributing the material into the aquifer are listed on Table 4. The specifications for each well were the following:

- The initial injection of 626 gallons of carbon substrate diluted with 1,878 gallons of water.
- Following the initial injection, 18,000 gallons of chase water was injected to distribute the substrate away from the well.
- Due to permeability issues within the formation, five of the 10 wells did not receive all the entire chase water-volumes specified (as noted on Table 4).

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<sup>1</sup> Terra System's slow release emulsified substrate (SRS<sup>®</sup>) containing a 50/50 mixture of small and large droplet sizes (SRS<sup>®</sup>-SD and SRS<sup>®</sup>-FR) for injecting at the AOC A perimeter. The larger substrate droplet size is designed for applications where adherence to the formation is important, particularly in highly conductive aquifers, as is the fluvial deposits along the Perimeter road.

A fire hydrant at Veteran's Parkway was used to fill two 20,000 gallon tanks (or Baker boxes) to stage the necessary mixing and chase water. The specified volumes were injected into the perimeter wells using gravity feed and at the Sub-Plume D wells using a gravity feed or a diaphragm pump.

### **Sub-Plume D — Added Monitoring Wells and Substrate Injections**

The optimization measures at Sub-Plume D specified injections into 21 existing monitoring wells and construction of three new downgradient, effectiveness monitoring wells at locations shown on Figure 7. Monitoring wells were constructed at Sub-Plume D using the same drilling methods and materials during the same week of the Perimeter Road injection and offsite monitoring wells. Well construction details are provided on Table 2 and lithological and construction logs are provided in Attachment C. Unlike the other Sub-Plumes (A through C) and the Perimeter boundary, TCE migrates from the upper to the middle portion of the Fluvial Deposits aquifer at Sub-Plume D and is contained within the former Base property boundary. February 2013 data (pre-injection) are shown on Table 3 along with the samples collected following well development of the newly constructed Sub-Plume D monitoring wells 007G103MF, 007G104MF, and 007G105MF.

The substrate volumes, injection dates, and wells dosed at Sub-Plume D are listed in Table 4. Each of the 21 wells shown on Figure 7 received 66 gallons of carbon substrate diluted with 235 gallons of water, and 485 gallons of chase water. Given the greater number of wells and their proximity to each other, less substrate and chase water were necessary compared to the property boundary injections. The eight Sub-Plume D Parson's wells previously used for the 2010 vegetable oil pilot study contained what appeared to be a polymerized vegetable oil, requiring use of a diaphragm pump to force the carbon substrate past the product and into the formation.

For the Sub-plume D wells, the substrate and water were mixed in 300 gallon totes and chase water was placed in either a 500 gallon tank or two 300 gallon totes. Water for the Sub-plume D wells was obtained from a Navy-owned fire hydrant near the airport property.

### **Investigative Derived Waste**

All purge and development water was managed per the SAP's Standard Operating Procedure 3-05(MS) for investigative derived waste. Attachment D contains correspondence from the City of Millington authorizing disposal of the purge/development water to the Sanitary Sewer.

Soil waste was placed at the former SWMU 41 site on the Base's Southside, covered with plastic sheeting, and bordered with hay bales while pending laboratory analysis. Upon receipt of

the soil data it was screened against the residential U.S. Environmental Protection Agency Regional Screening Levels (RSLs) to verify no exposure risk was associated with any residual contaminants in the drill cuttings. After comparison with RSLs established no risk to human health from soil cuttings, the plastic was removed, soil was seeded with grass and lightly covered with straw.

Attachment D also contains the analytical data used for profiling the soil and water waste. Solid waste generated from field activities (i.e., plastic sheeting, gloves, scrap PVC, empty bags, etc.) was placed in clear plastic bags and in dumpsters designated by NSA Mid-South on the Base Southside.

### **Upcoming Milestones**

The SWMU 15 investigation will proceed in phases, following the initial findings of the proposed soil gas survey, and a standalone investigative report will be generated at the conclusion of the delineation activities, as decided by the Base Cleanup Team.

The AOC A semi-annual monitoring events completed in February and August 2013 will be presented in the Annual AOC A Progress report (scheduled for December 2013) which will contain a VOC data evaluation to gauge the remedy effectiveness associated with the supplemental interim corrective measures described above.



## VALIDATION SUMMARY

This report summarizes data review findings for samples collected at Naval Support Activity Mid-South in Millington, Tennessee. Data were evaluated independently from the laboratory to assess data quality. Samples discussed in this report were collected between October 31, 2012 and November 7, 2012 and were submitted to Empirical Laboratories in Nashville, Tennessee. Tina Cantwell, senior chemist from Resolution Consultants, reviewed the data packages reported for these samples. The quality assurance criteria used to assess all data were established by the analytical methods and were consistent with the relevant standards in the following guidance documents:

- Department of Defense Quality Systems Manual for Environmental Laboratories, Version 4.2, October 2010
- U.S. Environmental Protection Agency (U.S. EPA) Contract Laboratory Program National Functional Guidelines for Organic Data Review, (October 1999)
- USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, (October 2004)

Validation was performed on the water samples from sample delivery groups (SDGs) 1211037 and 1211070, summarized in Appendix A, Table AP-1. Samples discussed in this report were analyzed and reported as definitive data and quality control (QC) summary information was submitted for data review. When the QC parameters did not fall within the specific method or data review guidelines, the data evaluator annotated or “flagged” the corresponding compounds. The flags used during data review are as follows:

<b>Data Review Qualifier Definitions</b>	
<b>U</b>	= <b>Undetected</b> — The parameter was analyzed but not detected or was found in a sample, but at a concentration less than five times the blank concentration for other constituents; the associated value presented is the sample quantitation limit (SQL).
<b>J</b>	= <b>Estimated Value</b> — One or more QC parameters were outside control limits.
<b>UJ</b>	= <b>Undetected and Estimated</b> — The parameter was analyzed but not detected at concentrations above the listed SQL; the SQL is estimated because one QC parameter was outside of control limits.
<b>R/UR</b>	= <b>Rejected/Unusable Data</b> — One or more QC parameters grossly exceeded control limits.

All samples were received intact by the laboratory and with the proper documentation. The data review consisted of reviewing the following parameters:

- \* Data completeness
- Sample receipt and preservation



- Holding times
- \* Initial calibration (volatile organic compounds [VOCs] only)
- Continuing calibration verification (VOCs only)
- \* Laboratory blanks
- \* Trip blanks (VOCs only)
- \* Surrogate Recoveries (VOCs only)
- \* Matrix spike/matrix spike duplicates (MS/MSDs) (VOCs only)
- Laboratory control samples (LCS)
- \* Field duplicate precision (VOCs only)

An asterisk (\*) above indicates that all criteria were met. Data which were acceptable, as indicated with an asterisk (\*) above, will not be discussed further in the following sections.

### Sample Receipt and Preservation

All samples were received by the laboratory intact and with the proper documentation and preservation. All coolers were received by the laboratory at temperature below 6 degrees Celsius, which met acceptance limits. Three discrepancies between the bottle labels and chain-of-custody forms were noted; however, the oversights were resolved between the laboratory and samplers. No adverse effect to data quality is expected due to the chain-of-custody form oversights.

### Holding Times

Tennessee gasoline range organic (TN GRO) sample 015GDPT0545 was originally analyzed within holding times, but was diluted and re-analyzed five days outside of holding times. Therefore, the TN GRO result in sample 015GDPT0545 was qualified as estimated "J," and may be biased low.

### Laboratory Control Sample

All LCS recoveries were acceptable. One result was qualified for a LCS/LCS duplicate precision outlier shown on Table 1. All other LCS/LCS duplicate for results were acceptable.

Sample Delivery Group	LCS/LCSD	Analyte	LCS Result (mg/L)	LCSD Result (mg/L)	RPD	RPD Limits	Flags
1211070	2K14009-BS1 / 2K14009-BSD1	TPH-C12-C40	0.9698	1.187	20.2	<20	5GDPT0545 flagged J, potential poor precision

**Notes:**

- LCS = Laboratory control sample
- LCSD = Laboratory control sample duplicate
- mg/L = Milligrams per liter
- RPD = Relative percent difference
- J = Estimated value

## Calibration

All VOC initial calibration results were acceptable. Several continuing calibration verification compounds had a percent difference greater than 20%, as shown on Table 2. Compounds were qualified as estimated "J" in associated samples, indicating potential poor accuracy.

<b>Table 2 Continuing Calibration Outliers</b>					
<b>SDG</b>	<b>Analyte</b>	<b>CCV ID</b>	<b>%D</b>	<b>Associated Samples</b>	<b>Flags</b>
1211037	1,2-Dichloroethane	2K31306-CCV1	-22.7	015GDPT0135, 015GDPT0155, 015GDPT0435, 015GDPT0445, 015GDPT0455, 015GDPT0755, 015GDPT0855	J+/-
1211037	Bromomethane	2K31306-CCV1	-20.2	015GDPT0135, 015GDPT0155, 015GDPT0435, 015GDPT0445, 015GDPT0455, 015GDPT0755, 015GDPT0855	J+/-
1211037	o-Xylene	2K31306-CCV1	22.5	015GDPT0135, 015GDPT0155, 015GDPT0435, 015GDPT0445, 015GDPT0455, 015GDPT0755, 015GDPT0855	J+/-
1211037	Styrene	2K31306-CCV1	26.1	015GDPT0135, 015GDPT0155, 015GDPT0435, 015GDPT0445, 015GDPT0455, 015GDPT0755, 015GDPT0855	J+/-
1211037	1,1,2,2-Tetrachloroethane	2K31814-CCV1	-30.4	015GDPT0245, 015GDPT0335, 015GDPT0345	J+/-
1211037	1,2-Dichloroethane	2K31814-CCV1	-22.1	015GDPT0245, 015GDPT0335, 015GDPT0345	J+/-
1211037	Dibromochloromethane	2K31814-CCV1	23.9	015GDPT0245, 015GDPT0335, 015GDPT0345	J+/-
1211037	Tetrachloroethene	2K31814-CCV1	24.4	015GDPT0245, 015GDPT0335, 015GDPT0345	J+/-
1211037	1,1,2,2-Tetrachloroethane	2K31408-CCV1	-30.5	015GDPT0255, 015GDPT0355	J+/-
1211037	1,2-Dichloroethane	2K31408-CCV1	-20.2	015GDPT0255, 015GDPT0355	J+/-
1211037	Carbon disulfide	2K31408-CCV1	26.2	015GDPT0255, 015GDPT0355	J+/-
1211037	Tetrachloroethene	2K31408-CCV1	24.3	015GDPT0255, 015GDPT0355	J+/-
1211037	1,1,2,2-Tetrachloroethane	2K31303-CCV1	-30.3	015T103112	J+/-
1211037	1,2-Dichloroethane	2K31303-CCV1	-21	015T103112	J+/-
1211037	Bromomethane	2K31303-CCV1	-20.8	015T103112	J+/-
1211037	Carbon disulfide	2K31303-CCV1	28.8	015T103112	J+/-
1211037	Dibromochloromethane	2K31303-CCV1	21.5	015T103112	J+/-
1211037	Tetrachloroethene	2K31303-CCV1	24.1	015T103112	J+/-
1211070	1,1,2,2-Tetrachloroethane	2K31814-CCV1	-30.4	015GDPT0535, 015GDPT0545, 015GDPT0555, 015GDPT0655, 015GDPT0845, 015HDPT0555, 015HDPT0845, 015T110612	J+/-
1211070	1,2-Dichloroethane	2K31814-CCV1	-22.1	015GDPT0535, 015GDPT0545, 015GDPT0555, 015GDPT0655, 015GDPT0845, 015HDPT0555, 015HDPT0845, 015T110612	J+/-
1211070	Dibromochloromethane	2K31814-CCV1	23.9	015GDPT0535, 015GDPT0545, 015GDPT0555, 015GDPT0655, 015GDPT0845, 015HDPT0555, 015HDPT0845, 015T110612	J+/-
1211070	Tetrachloroethene	2K31814-CCV1	24.4	015GDPT0535, 015GDPT0545, 015GDPT0555, 015GDPT0655, 015GDPT0845, 015HDPT0555, 015HDPT0845, 015T110612	J+/-
1211070	Acetone	2K32103-CCV1	-25.1	015GDPT0645, 015GDPT0955, 015HDPT0645	J+/-
1211070	1,1,2,2-Tetrachloroethane	2K31905-CCV1	-23.3	015GDPT0735, 015GDPT0745, 015GDPT0835, 015GDPT0935	J+/-
1211070	1,2-Dichloroethane	2K31905-CCV1	-23.3	015GDPT0735, 015GDPT0745, 015GDPT0835, 015GDPT0935	J+/-
1211070	Dibromochloromethane	2K31905-CCV1	20.5	015GDPT0735, 015GDPT0745, 015GDPT0835, 015GDPT0935	J+/-



Table 2 Continuing Calibration Outliers					
SDG	Analyte	CCV ID	%D	Associated Samples	Flags
1211070	Tetrachloroethene	2K31905-CCV1	24.3	015GDPT0735, 015GDPT0745, 015GDPT0835, 015GDPT0935	J+/-

**Notes:**

- SDG = Sample Delivery Group
- CCV ID = Continuing calibration verification identification
- %D = Percent difference (limit <20%)
- J+/- = Positive and undetected compounds were flagged estimated.

**Overall Assessment**

The data from SDGs 1211037 and 1211070 were reviewed independently from the laboratory to assess data quality. Analytes outside individual QC criteria were flagged during this evaluation. No results were rejected and values that were flagged as estimated during data review may be biased high or low, but the results are usable for its intended purpose, according to USEPA guidelines. The remaining results qualified as estimated may be biased high or low, but the data are usable for their intended purpose, according to USEPA guidelines. Table 3 shows final data review qualifiers used to describe results and how they should be interpreted by the end data user.

Table 3 Result Flagging Codes				
Data Qualifier	Qualifier Definition	Interpret Result As a Detection?	Result Usable?	Potential Result Bias
no qualifier	Acceptable	Yes	Yes	None expected
U	Undetected	No	Yes	None expected
J	Estimated	Yes	Yes	High or Low
UJ	Undetected and Estimated	No	Yes	High or Low
R, UR	Rejected	No	No	Unspecified

**Appendix A**  
**Sample and Analysis Summary**

**Table AP-1**  
**Sample and Analysis Summary**  
**NSA Mid-South — October/November 2012**

SDG	Sample ID	Lab ID	Sample Date	Sample Type	300.0	410.4	6010B	8260B	9060	SM5210B	TNTPH-D	TNTPH-G
1211037	015T103112	1211037-01	10/31/2012	Trip Blank				X				
1211037	015GDPT0155	1211037-02RE1	10/31/2012	Groundwater				X				
1211037	015GDPT0355	1211037-03RE1	11/1/2012	Groundwater				X				
1211037	015GDPT0345	1211037-04RE1	11/1/2012	Groundwater				X				
1211037	015GDPT0335	1211037-05RE1	11/1/2012	Groundwater				X				
1211037	015GDPT0455	1211037-06	11/1/2012	Groundwater				X				
1211037	015GDPT0445	1211037-07	11/1/2012	Groundwater				X				
1211037	015GDPT0435	1211037-08	11/1/2012	Groundwater				X				
1211037	015GDPT0135	1211037-09	11/2/2012	Groundwater				X				
1211037	015GDPT0255	1211037-10RE1	11/2/2012	Groundwater				X				
1211037	015GDPT0245	1211037-11RE1	11/2/2012	Groundwater				X				
1211037	015GDPT0755	1211037-12	11/2/2012	Groundwater				X				
1211037	015GDPT0855	1211037-13	11/2/2012	Groundwater	X	X	X	X	X	X	X	X
1211070	015T110612	1211070-01	11/6/2012	Trip Blank				X				
1211070	015GDPT0555	1211070-02	11/6/2012	Groundwater				X				
1211070	015HDPT0555	1211070-03	11/6/2012	Dup of 015GDPT0555				X				
1211070	015GDPT0535	1211070-04	11/7/2012	Groundwater				X				
1211070	015GDPT0545	1211070-05	11/7/2012	Groundwater	X	X	X	X	X	X	X	X
1211070	015GDPT0655	1211070-06	11/7/2012	Groundwater				X				
1211070	015GDPT0845	1211070-07	11/7/2012	Groundwater				X				
1211070	015HDPT0845	1211070-08	11/7/2012	Dup of 015GDPT0845				X				
1211070	015GDPT0835	1211070-09	11/7/2012	Groundwater				X				
1211070	015GDPT0735	1211070-10	11/7/2012	Groundwater				X				
1211070	015GDPT0745	1211070-11	11/7/2012	Groundwater				X				
1211070	015GDPT0645	1211070-12RE1	11/7/2012	Groundwater				X				
1211070	015HDPT0645	1211070-13RE1	11/7/2012	Dup of 015GDPT0645				X				
1211070	015GDPT0935	1211070-14	11/7/2012	Groundwater				X				
1211070	015GDPT0945	1211070-15RE1	11/7/2012	Groundwater				X				
1211070	015GDPT0955	1211070-16	11/7/2012	Groundwater				X				

**Notes:**

- 300.0 = Nitrate, nitrite, sulfate
- 410.4 = Chemical oxygen demand
- 6010B = Iron and manganese
- 8260B = Volatile organic compounds
- 9060 = Total organic carbon
- SM5210B = Biochemical oxygen demand
- TNTPH-D = Tennessee Extractable Range Organic compounds
- TNTPH-G = Tennessee Gasoline Range Organic compounds
- X = Sample was analyzed for the method indicated in the column header



Table A-1  
Detected VOCs  
NSA Mid-South SWMU 15 DPT Groundwater Investigation  
NSA Mid-South

Sample Location:					015GDPT06	015GDPT06	015GDPT06	015GDPT07	015GDPT07	015GDPT07	015GDPT08	015GDPT08	015GDPT08	015GDPT08	015GDPT09	015GDPT09	015GDPT09
Sample ID:					015GDPT0645	015GDPT0655	015HDPT0645	015GDPT0735	015GDPT0745	015GDPT0755	015GDPT0835	015GDPT0845	015GDPT0855	015HDPT0845	015GDPT0935	015GDPT0945	015GDPT0955
Sample Date:					11/07/2012	11/07/2012	11/07/2012	11/07/2012	11/07/2012	11/02/2012	11/07/2012	11/07/2012	11/02/2012	11/07/2012	11/07/2012	11/07/2012	11/07/2012
Sample Type:					Groundwater	Groundwater	Duplicate	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Duplicate	Groundwater	Groundwater	Groundwater
Method	CAS No.	Analyte	EPA_MCL (a)	Units													
8260B	107-06-2	1,2-DICHLOROETHANE	5	UG_L	–	–	–	–	–	–	–	–	–	–	–	–	–
8260B	67-64-1	ACETONE		UG_L	–	–	–	–	–	–	4.08	–	–	–	–	7.23	–
8260B	71-43-2	<b>BENZENE</b>	<b>5</b>	UG_L	1.4	–	1.5	–	<b>4380 a</b>	<b>34.7 a</b>	2.74	<b>2780 a</b>	–	<b>2340 a</b>	–	<b>9.19 a</b>	–
8260B	100-41-4	ETHYLBENZENE	700	UG_L	–	–	3.5	–	279	4.2	–	64.5	–	49.5	–	0.66	–
8260B	108-38-3/106-42	M- AND P-XYLENE		UG_L	–	–	–	–	49.5	–	–	27.8	–	22	–	–	–
8260B	1634-04-4	METHYL TERT-BUTYL ETHER		UG_L	–	–	–	5.58	31.5	120	2.63	20	125	16.5	2.92	0.35	5.15
8260B	108-88-3	TOLUENE	1000	UG_L	–	–	–	–	22.5	–	–	15.2	–	12	–	–	–
8260B	79-01-6	TRICHLOROETHENE	5	UG_L	–	–	–	–	–	–	–	–	–	–	–	–	–
8260B	1330-20-7	XYLENES, TOTAL	10000	UG_L	–	–	–	–	49.5	–	–	27.8	–	22	–	–	–

**Table A-2**  
**Geochemical Parameters**  
**NSA Mid-South SWMU 15 DPT Groundwater Investigation**

Sample Location:					015GDPT05	015GDPT08
Sample ID:					015GDPT0545	015GDPT0855
Sample Date:					11/07/2012	11/02/2012
Sample Type:					Groundwater	Groundwater
Method	CAS No.	Analyte	EPA_MCL (a)	Units		
300	14808-79-8	SULFATE	250000	UG_L	1330	6960
410.4	-13	CHEMICAL OXYGEN DEMAND		UG_L	52200	259000
6010B	7439-89-6	<b>IRON</b>	<b>300</b>	UG_L	<b>89500 a</b>	<b>146000 a</b>
6010B	7439-96-5	<b>MANGANESE</b>	<b>50</b>	UG_L	<b>3200 a</b>	<b>16900 a</b>
9060	-28	TOTAL ORGANIC CARBON		UG_L	2380	3470
TNTPH-D	-264	TPH-C12-C40		UG_L	277 J	105
TNTPH-G	-3534	TPH-GASOLINE RANGE C6-C10		UG_L	11300 J	672

**Attachment B**  
**Laboratory Reports**  
**(Submitted Under Separate Cover)**

**Attachment C**  
**Well Construction — Drilling Logs**



**Boring/Well Construction Log: 007G93LF**

*Project: NSA Mid-South  
Site: Millington, TN*

Client: NAVFAC	Completion Date: 1/30/13	Northing: 395150.849
Location: Millington, TN	Drilling Method: Rotasonic	Easting: 812083.697
Project: NSA Mid-South	Drilling Contractor: Southern Sonic Solutions	Surface Elevation: 277.841
Purpose: Monitoring Well	Geologist: Kate Freeman	Total Depth FT: 96

DEPTH BGS	SYMBOLS	USCS	Lithologic Description Visual-Manual Description (ASTM-D2488)	Well Construction (Not to Scale)
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0		Gravel	Road Bed	
		ML	Yellowish brown clayey SILT, moist, medium stiff, some iron concretions and staining	
-5		ML	Yellowish brown and gray mottled clayey SILT, moist, medium stiff	
-10		ML	Yellowish brown with occasional gray and brownish yellow mottled clayey SILT, soft, moist, occasional iron concretions	
-15		ML	Grayish brown clayey SILT with occasional iron concretions	
-20		ML	Greenish gray clayey SILT, medium stiff, moist	
-25		ML	Iron staining increasing down column	
-28		ML	Light yellowish brown and gray clayey SILT, stiff, moist	
-29		ML	Light yellowish brown clayey SILT, stiff moist	
-30		ML	Yellowish brown clayey SILT, moist, soft	

**NOTES:**

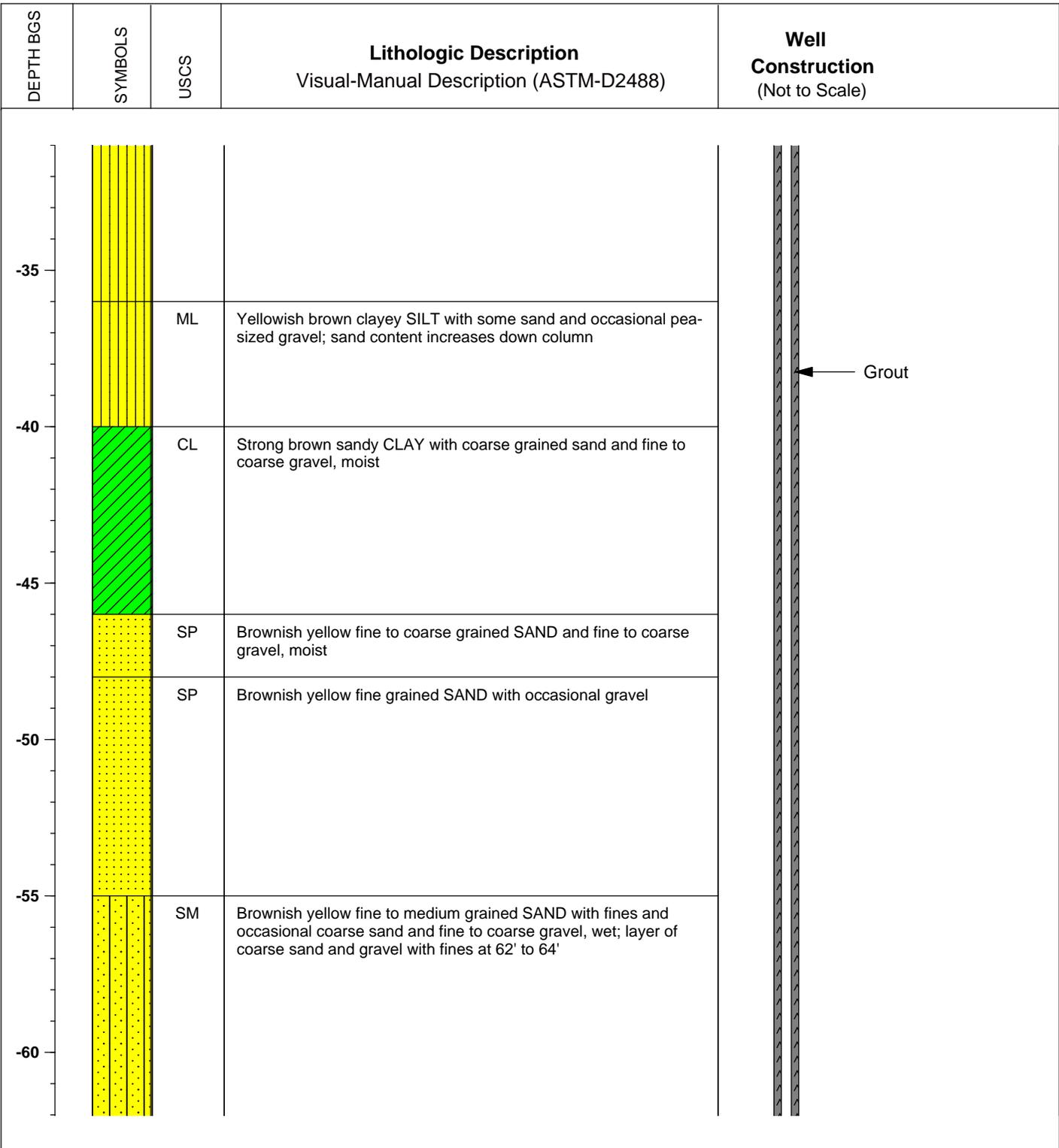
007G93LF



**Boring/Well Construction Log: 007G93LF**

*Project: NSA Mid-South  
Site: Millington, TN*

Client: NAVFAC	Completion Date: 1/30/13	Northing: 395150.849
Location: Millington, TN	Drilling Method: Rotasonic	Easting: 812083.697
Project: NSA Mid-South	Drilling Contractor: Southern Sonic Solutions	Surface Elevation: 277.841
Purpose: Monitoring Well	Geologist: Kate Freeman	Total Depth FT: 96



**NOTES:**

007G93LF



**Boring/Well Construction Log: 007G93LF**

*Project: NSA Mid-South  
Site: Millington, TN*

Client: NAVFAC	Completion Date: 1/30/13	Northing: 395150.849
Location: Millington, TN	Drilling Method: Rotasonic	Easting: 812083.697
Project: NSA Mid-South	Drilling Contractor: Southern Sonic Solutions	Surface Elevation: 277.841
Purpose: Monitoring Well	Geologist: Kate Freeman	Total Depth FT: 96

DEPTH BGS	SYMBOLS	USCS	Lithologic Description Visual-Manual Description (ASTM-D2488)	Well Construction (Not to Scale)
-65				
-70		SP	Strong brown medium grained SAND with fine to coarse gravel, wet	
-75				
-80				
-85		SM	Yellowish brown fine to coarse grained SAND with fine to coarse gravel with fines, wet	
-90		SP	Yellowish brown medium grained SAND with coarse gravel	
		CL	Yellowish brown sandy CLAY with coarse gravel	
		CH	Dark gray fat CLAY, hard	

**NOTES:**

007G93LF



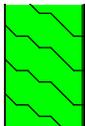
**Boring/Well Construction Log: 007G93LF**

*Project: NSA Mid-South  
Site: Millington, TN*

Client: NAVFAC	Completion Date: 1/30/13	Northing: 395150.849
Location: Millington, TN	Drilling Method: Rotasonic	Easting: 812083.697
Project: NSA Mid-South	Drilling Contractor: Southern Sonic Solutions	Surface Elevation: 277.841
Purpose: Monitoring Well	Geologist: Kate Freeman	Total Depth FT: 96

DEPTH BGS	SYMBOLS	USCS	Lithologic Description Visual-Manual Description (ASTM-D2488)	Well Construction (Not to Scale)
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-95



**NOTES:**

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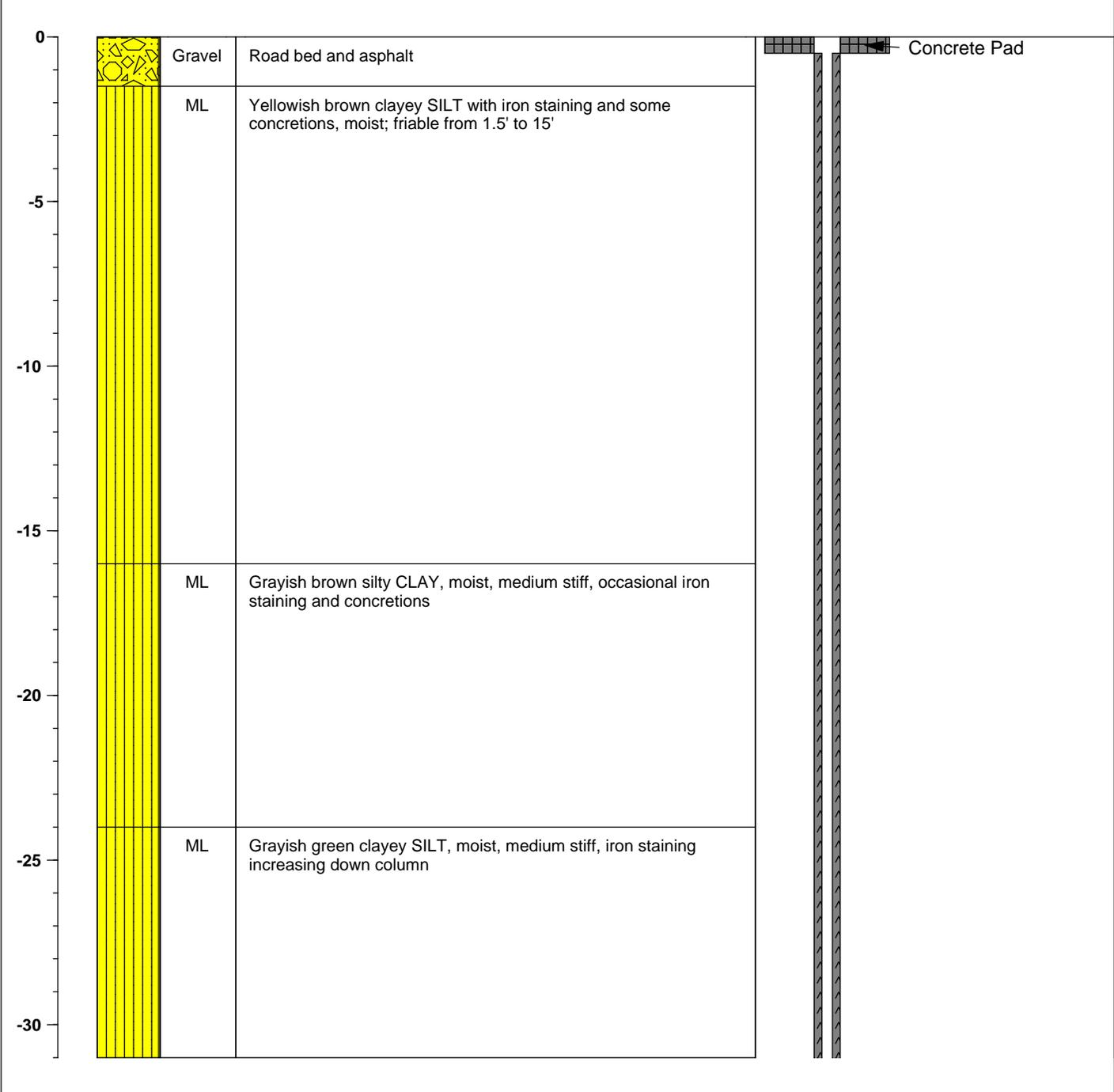


**Boring/Well Construction Log: 007G94LF**

*Project: NSA Mid-South  
Site: Millington, TN*

Client: NAVFAC	Completion Date: 2/4/13	Northing: 395210.138
Location: Millington, TN	Drilling Method: Rotasonic	Easting: 812134.367
Project: NSA Mid-South	Drilling Contractor: Southern Sonic Solutions	Surface Elevation: 277.954
Purpose: Monitoring Well	Geologist: Kate Freeman	Total Depth FT: 96

DEPTH BGS	SYMBOLS	USCS	Lithologic Description Visual-Manual Description (ASTM-D2488)	Well Construction (Not to Scale)
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**NOTES:**

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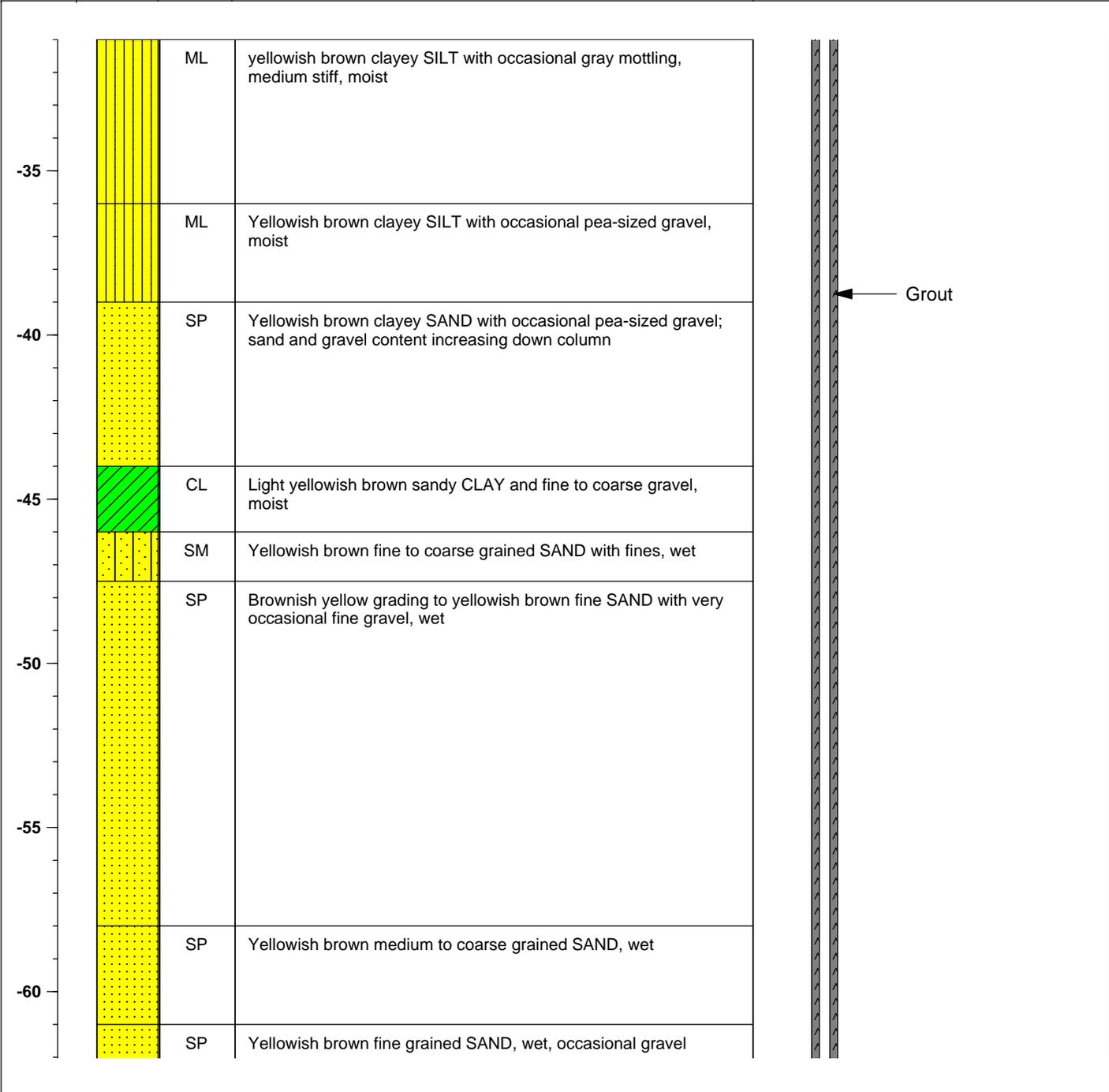


**Boring/Well Construction Log: 007G94LF**

*Project: NSA Mid-South  
Site: Millington, TN*

Client: NAVFAC	Completion Date: 2/4/13	Northing: 395210.138
Location: Millington, TN	Drilling Method: Rotasonic	Easting: 812134.367
Project: NSA Mid-South	Drilling Contractor: Southern Sonic Solutions	Surface Elevation: 277.954
Purpose: Monitoring Well	Geologist: Kate Freeman	Total Depth FT: 96

DEPTH BGS	SYMBOLS	USCS	Lithologic Description Visual-Manual Description (ASTM-D2488)	Well Construction (Not to Scale)
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**NOTES:**

007G94LF



**Boring/Well Construction Log: 007G94LF**

*Project: NSA Mid-South  
Site: Millington, TN*

Client: NAVFAC	Completion Date: 2/4/13	Northing: 395210.138
Location: Millington, TN	Drilling Method: Rotasonic	Easting: 812134.367
Project: NSA Mid-South	Drilling Contractor: Southern Sonic Solutions	Surface Elevation: 277.954
Purpose: Monitoring Well	Geologist: Kate Freeman	Total Depth FT: 96

DEPTH BGS	SYMBOLS	USCS	Lithologic Description Visual-Manual Description (ASTM-D2488)	Well Construction (Not to Scale)
-65		SP	Yellowish brown fine to coarse grained SAND with occasional gravel	
		SP	Strong brown medium grained SAND with occasional iron stone	
-70		SP	Strong brown fine to medium grained SAND with occasional gravel, wet	
		SP	Strong brown fine to coarse grained SAND, wet	
-75		SP	Strong brown fine to coarse grained SAND with occasional gravel and iron stone; conglomerate at bottom, 0.1" thick.	
-80		SM	Strong brown fine to coarse grained SAND with fine to coarse gravel with fines, wet, occasional iron stone; iron stone 4"x3" at 92'	
-85				
-90				

**NOTES:**

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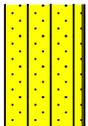
**Boring/Well Construction Log: 007G94LF**

*Project: NSA Mid-South  
Site: Millington, TN*

Client: NAVFAC	Completion Date: 2/4/13	Northing: 395210.138
Location: Millington, TN	Drilling Method: Rotasonic	Easting: 812134.367
Project: NSA Mid-South	Drilling Contractor: Southern Sonic Solutions	Surface Elevation: 277.954
Purpose: Monitoring Well	Geologist: Kate Freeman	Total Depth FT: 96

DEPTH BGS	SYMBOLS	USCS	Lithologic Description Visual-Manual Description (ASTM-D2488)	Well Construction (Not to Scale)
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-95



**NOTES:**

007G94LF



**Boring/Well Construction Log: 007G95LF**

*Project: NSA Mid-South  
Site: Millington, TN*

Client: NAVFAC	Completion Date: 1/29/13	Northing: 395265.769
Location: Millington, TN	Drilling Method: Rotasonic	Easting: 812179.467
Project: NSA Mid-South	Drilling Contractor: Southern Sonic Solutions	Surface Elevation: 278.157
Purpose: Monitoring Well	Geologist: Kate Freeman	Total Depth FT: 96

DEPTH BGS	SYMBOLS	USCS	Lithologic Description Visual-Manual Description (ASTM-D2488)	Well Construction (Not to Scale)
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0		Gravel	Road Bed	
		ML	Yellowish brown clayey SILT, moist, stiff, occasional iron concretions and staining	
-5		ML	Medium stiff	
-10		ML	Greenish gray clayey SILT, moist, medium stiff	
-15		ML	Greenish brown clayey SILT, moist, medium stiff	
-20		ML	Yellowish brown clayey SILT, moist, medium stiff	
-25		ML	Greenish gray clayey SILT, iron concretions and staining, moist, stiff	
-30		ML	Light olive brown (2.5Y 5/4) clayey SILT with occasional gray mottling, moist, stiff; at 29' to 29.6', light gray layer, very silty, little clay, dry	

**NOTES:**

007G95LF

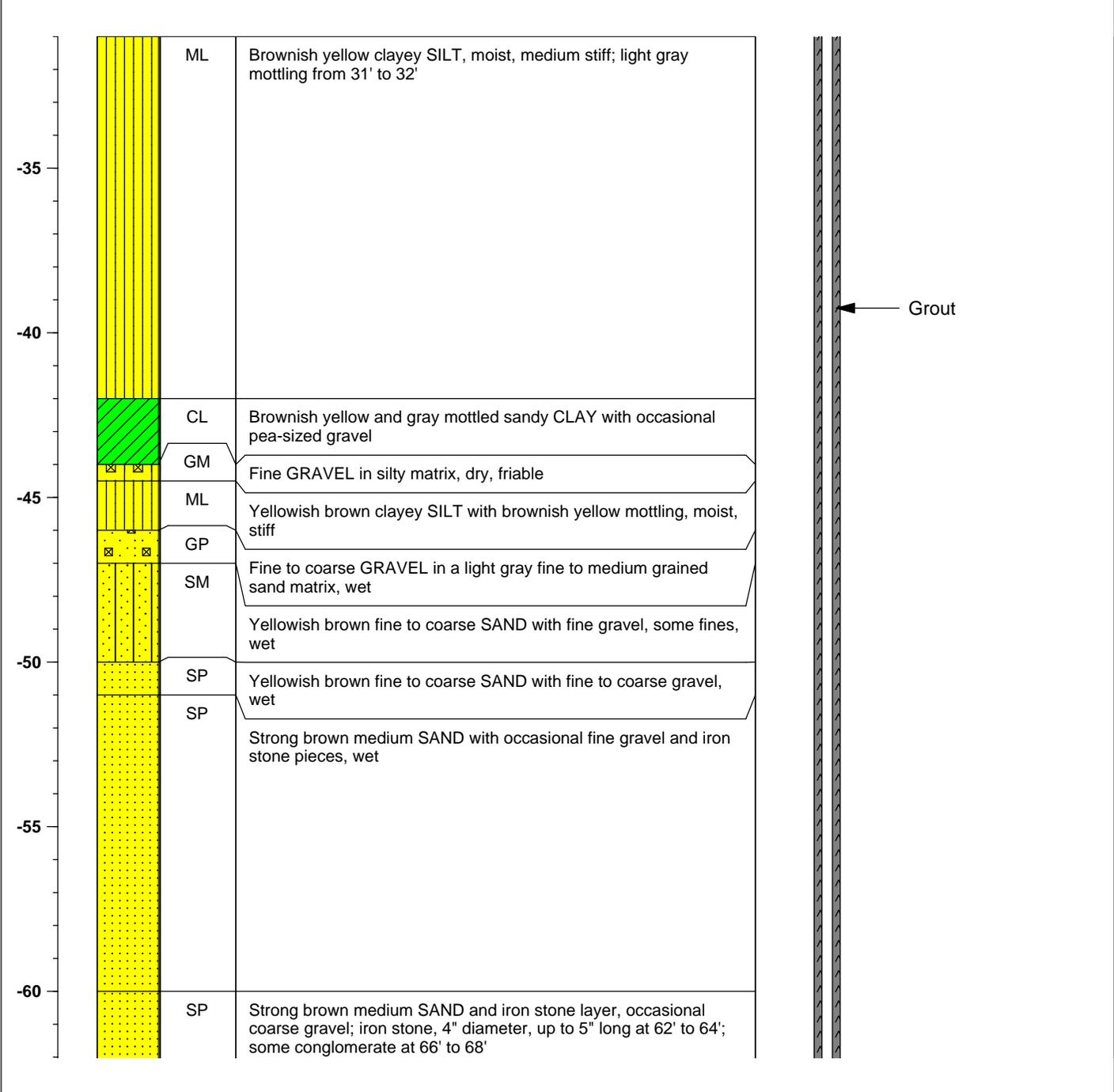


**Boring/Well Construction Log: 007G95LF**

*Project: NSA Mid-South  
Site: Millington, TN*

Client: NAVFAC	Completion Date: 1/29/13	Northing: 395265.769
Location: Millington, TN	Drilling Method: Rotasonic	Easting: 812179.467
Project: NSA Mid-South	Drilling Contractor: Southern Sonic Solutions	Surface Elevation: 278.157
Purpose: Monitoring Well	Geologist: Kate Freeman	Total Depth FT: 96

DEPTH BGS	SYMBOLS	USCS	Lithologic Description Visual-Manual Description (ASTM-D2488)	Well Construction (Not to Scale)
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**NOTES:**

007G95LF



**Boring/Well Construction Log: 007G95LF**

*Project: NSA Mid-South  
Site: Millington, TN*

Client: NAVFAC	Completion Date: 1/29/13	Northing: 395265.769
Location: Millington, TN	Drilling Method: Rotasonic	Easting: 812179.467
Project: NSA Mid-South	Drilling Contractor: Southern Sonic Solutions	Surface Elevation: 278.157
Purpose: Monitoring Well	Geologist: Kate Freeman	Total Depth FT: 96

DEPTH BGS	SYMBOLS	USCS	Lithologic Description Visual-Manual Description (ASTM-D2488)	Well Construction (Not to Scale)
<p>-65</p> <p>-70</p> <p>-75</p> <p>-80</p> <p>-85</p> <p>-90</p>		<p>SP</p> <p>SP</p>	<p>Yellowish brown fine SAND with increasing grain size and gravel content down column, wet</p> <p>Yellowish brown fine to coarse SAND and fine to coarse gravel, wet</p>	<p>Bentonite Chips</p> <p>Sand Pack</p> <p>Screen 10-slot</p>

**NOTES:**

007G95LF

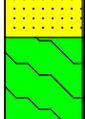


**Boring/Well Construction Log: 007G95LF**

*Project: NSA Mid-South  
Site: Millington, TN*

Client: NAVFAC	Completion Date: 1/29/13	Northing: 395265.769
Location: Millington, TN	Drilling Method: Rotasonic	Easting: 812179.467
Project: NSA Mid-South	Drilling Contractor: Southern Sonic Solutions	Surface Elevation: 278.157
Purpose: Monitoring Well	Geologist: Kate Freeman	Total Depth FT: 96

DEPTH BGS	SYMBOLS	USCS	Lithologic Description Visual-Manual Description (ASTM-D2488)	Well Construction (Not to Scale)
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-95		CH	Dark gray fat CLAY, hard, moist	
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**NOTES:**

007G95LF



**Boring/Well Construction Log: 007G96LF**

*Project: NSA Mid-South  
Site: Millington, TN*

Client: NAVFAC	Completion Date: 1/28/13	Northing: 395324.776
Location: Millington, TN	Drilling Method: Rotasonic	Easting: 812227.930
Project: NSA Mid-South	Drilling Contractor: Southern Sonic Solutions	Surface Elevation: 278.331
Purpose: Monitoring Well	Geologist: Kate Freeman	Total Depth FT: 106

DEPTH BGS	SYMBOLS	USCS	Lithologic Description Visual-Manual Description (ASTM-D2488)	Well Construction (Not to Scale)
0		Gravel	Road Bed	
-5		ML	Greenish gray clayey SILT, moist, medium stiff	
-10		ML	Grayish brown clayey SILT, moist, medium stiff, occasional iron concretions and staining	
-25		ML	Greenish gray clayey SILT, moist, stiff, occasional gray mottling, occasional iron concretion, iron staining increasing down column	
-30		ML		

**NOTES:**

007G96LF



**Boring/Well Construction Log: 007G96LF**

*Project: NSA Mid-South  
Site: Millington, TN*

Client: NAVFAC	Completion Date: 1/28/13	Northing: 395324.776
Location: Millington, TN	Drilling Method: Rotasonic	Easting: 812227.930
Project: NSA Mid-South	Drilling Contractor: Southern Sonic Solutions	Surface Elevation: 278.331
Purpose: Monitoring Well	Geologist: Kate Freeman	Total Depth FT: 106

DEPTH BGS	SYMBOLS	USCS	Lithologic Description Visual-Manual Description (ASTM-D2488)	Well Construction (Not to Scale)
-35		ML	Pale brown clayey SILT, moist, stiff; gray clay layer at 35' to 35.6'	 Grout
-40		ML	Yellowish brown clayey SILT, moist, stiff, sand content increasing down column, becoming clayey sandy SILT, occasional pea-sized gravel,	
-45		SC	Yellowish brown gray mottled clayey SAND, moist	
-50		SM	Yellowish brown fine SAND with fines, wet	
-51		CH	Yellowish brown fat CLAY, soft	
-52		SP	Strong brown medium SAND with iron stone	
-55		SP	Yellowish brown fine to medium grained SAND with fine gravel, wet	
-60		SP	Strong brown medium grained SAND with iron stone; iron stones (2-7 inches) and conglomerate at bottom	
-61		SM	Strong brown medium grained SAND with occasional fine gravel, some fines, wet	

**NOTES:**

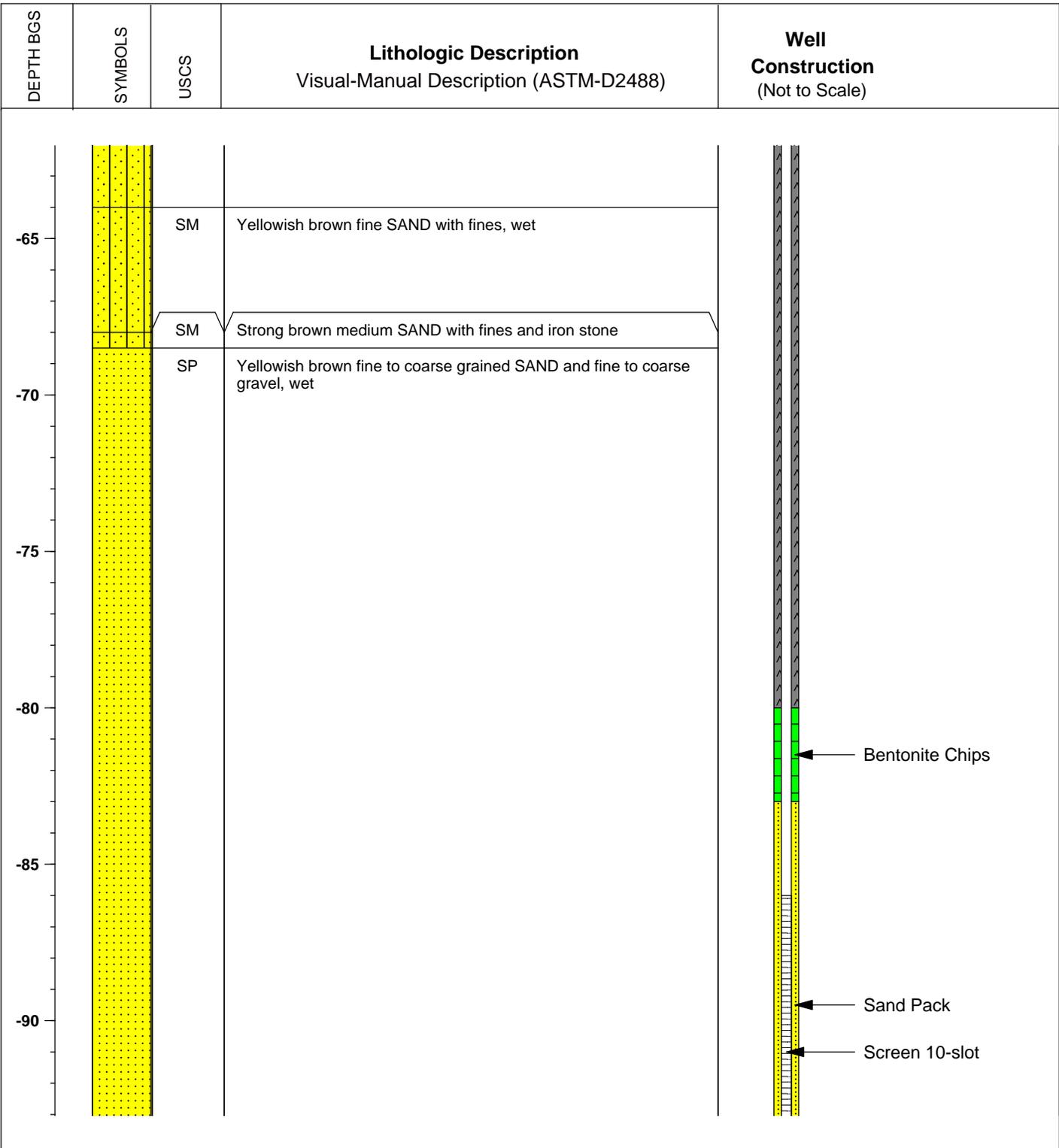
007G96LF



**Boring/Well Construction Log: 007G96LF**

*Project: NSA Mid-South  
Site: Millington, TN*

Client: NAVFAC	Completion Date: 1/28/13	Northing: 395324.776
Location: Millington, TN	Drilling Method: Rotasonic	Easting: 812227.930
Project: NSA Mid-South	Drilling Contractor: Southern Sonic Solutions	Surface Elevation: 278.331
Purpose: Monitoring Well	Geologist: Kate Freeman	Total Depth FT: 106



NOTES:

007G96LF



**Boring/Well Construction Log: 007G96LF**

*Project: NSA Mid-South  
Site: Millington, TN*

Client: NAVFAC	Completion Date: 1/28/13	Northing: 395324.776
Location: Millington, TN	Drilling Method: Rotasonic	Easting: 812227.930
Project: NSA Mid-South	Drilling Contractor: Southern Sonic Solutions	Surface Elevation: 278.331
Purpose: Monitoring Well	Geologist: Kate Freeman	Total Depth FT: 106

DEPTH BGS	SYMBOLS	USCS	Lithologic Description Visual-Manual Description (ASTM-D2488)	Well Construction (Not to Scale)
-95				
		CL	Dark gray CLAY, hard, moist	
-100		SP	Dark gray fine SAND, wet	
-105				

**NOTES:**

007G96LF

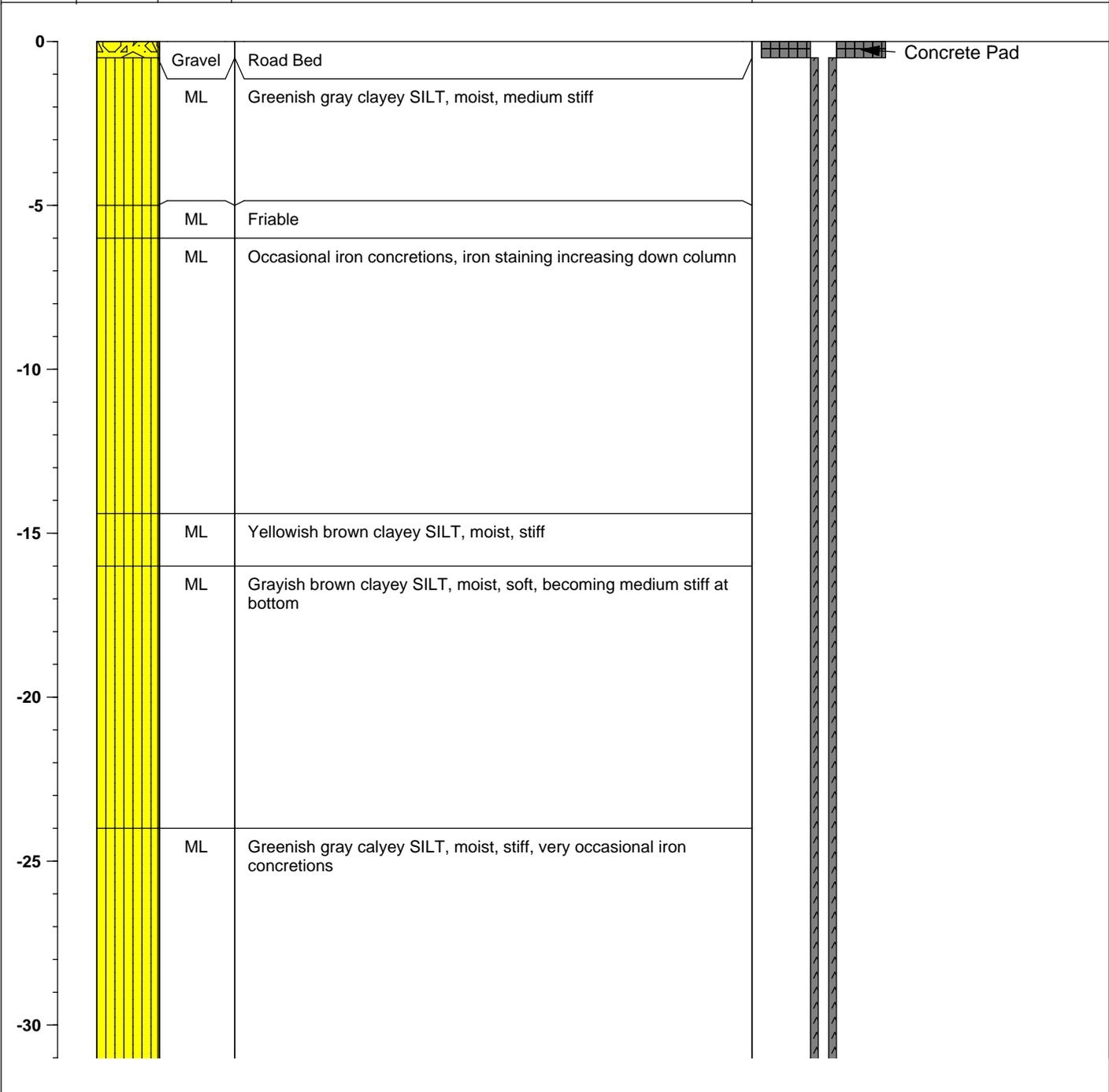


**Boring/Well Construction Log: 007G97LF**

*Project: NSA Mid-South  
Site: Millington, TN*

Client: NAVFAC	Completion Date: 1/26/13	Northing: 395379.898
Location: Millington, TN	Drilling Method: Rotasonic	Easting: 812273.539
Project: NSA Mid-South	Drilling Contractor: Southern Sonic Solutions	Surface Elevation: 278.472
Purpose: Monitoring Well	Geologist: Kate Freeman	Total Depth FT: 96

DEPTH BGS	SYMBOLS	USCS	Lithologic Description Visual-Manual Description (ASTM-D2488)	Well Construction (Not to Scale)
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**NOTES:**

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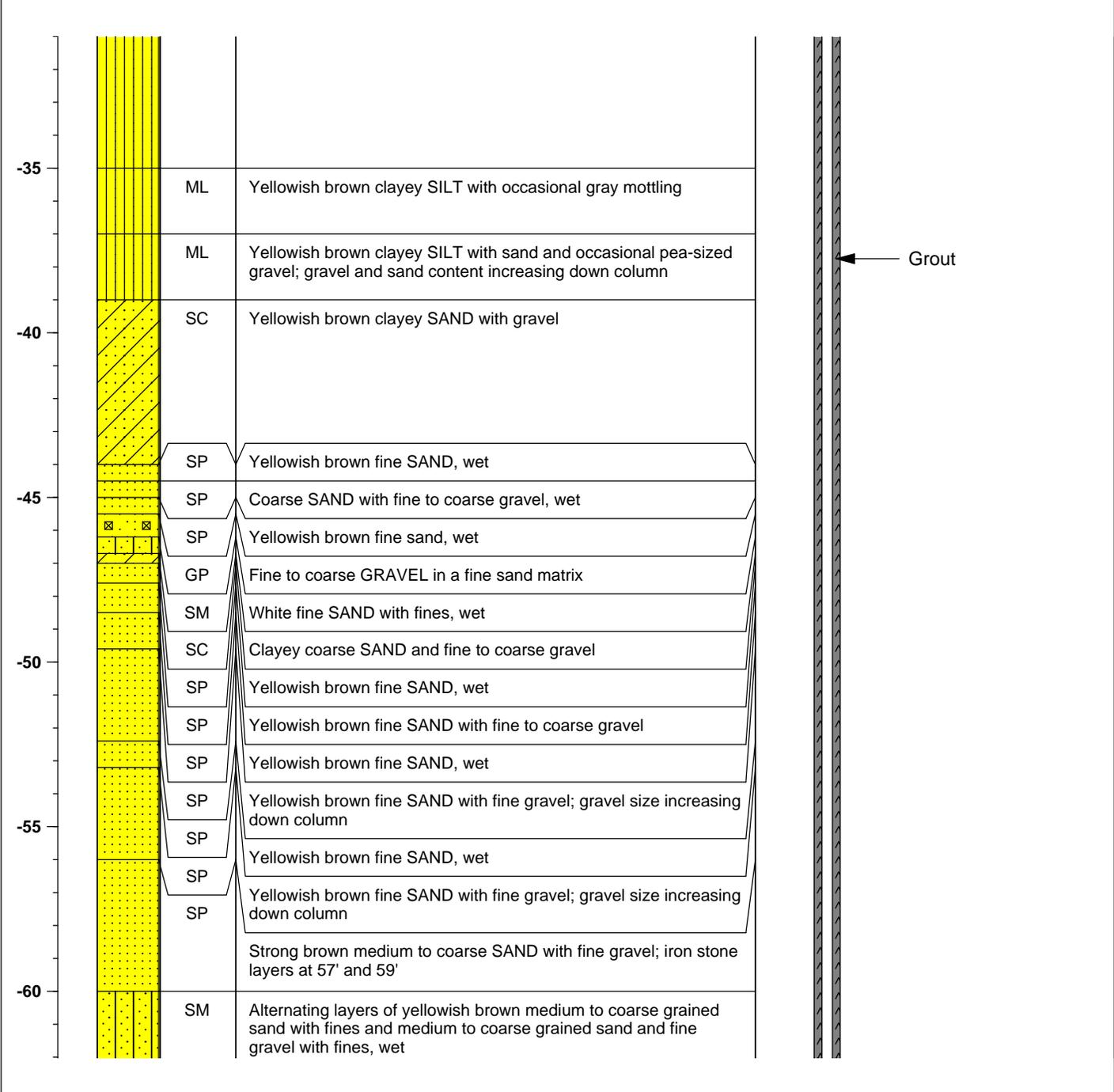


**Boring/Well Construction Log: 007G97LF**

Project: NSA Mid-South  
 Site: Millington, TN

Client: NAVFAC	Completion Date: 1/26/13	Northing: 395379.898
Location: Millington, TN	Drilling Method: Rotasonic	Easting: 812273.539
Project: NSA Mid-South	Drilling Contractor: Southern Sonic Solutions	Surface Elevation: 278.472
Purpose: Monitoring Well	Geologist: Kate Freeman	Total Depth FT: 96

DEPTH BGS	SYMBOLS	USCS	Lithologic Description Visual-Manual Description (ASTM-D2488)	Well Construction (Not to Scale)
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NOTES:

007G97LF

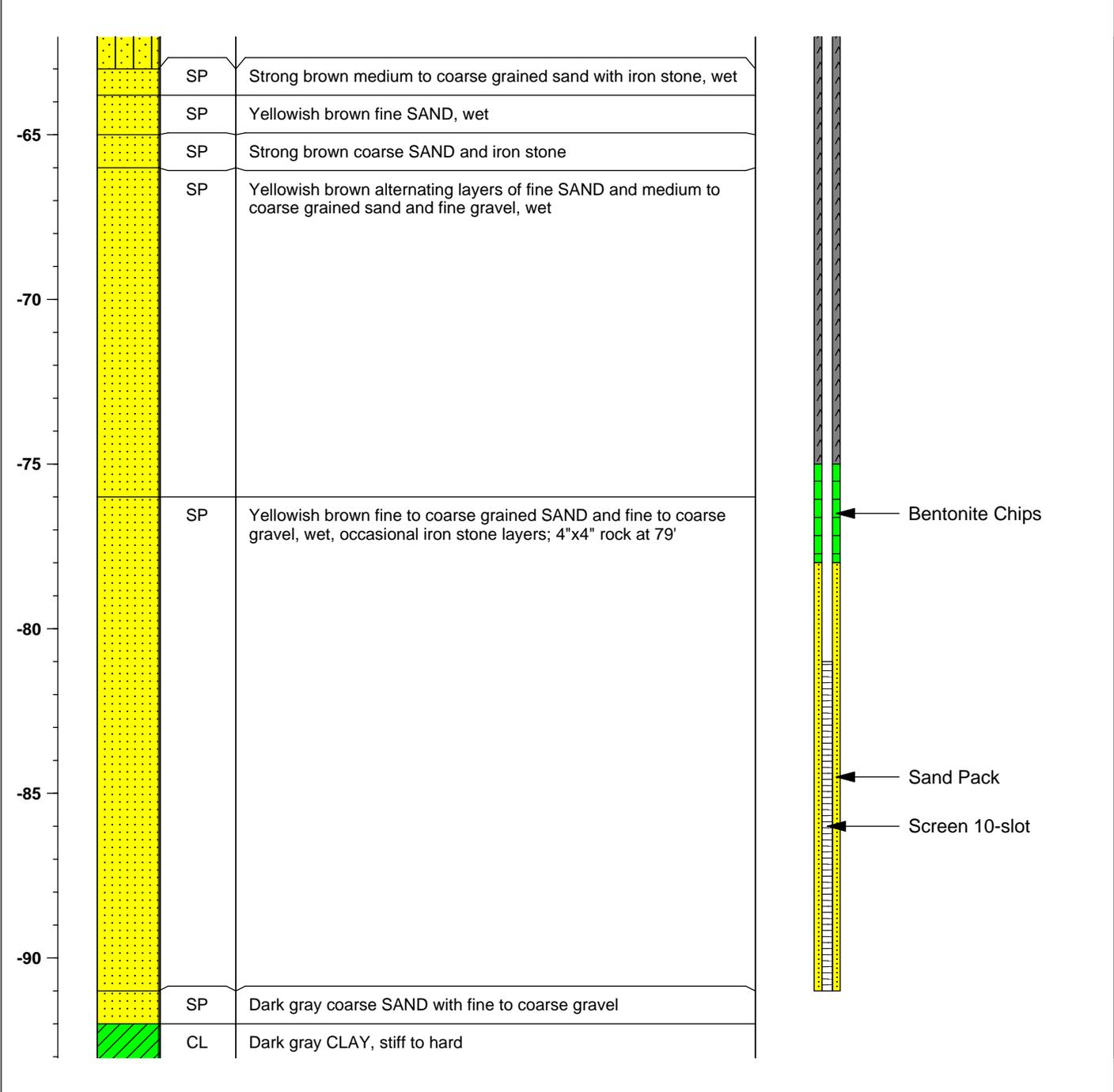


**Boring/Well Construction Log: 007G97LF**

*Project: NSA Mid-South  
Site: Millington, TN*

Client: NAVFAC	Completion Date: 1/26/13	Northing: 395379.898
Location: Millington, TN	Drilling Method: Rotasonic	Easting: 812273.539
Project: NSA Mid-South	Drilling Contractor: Southern Sonic Solutions	Surface Elevation: 278.472
Purpose: Monitoring Well	Geologist: Kate Freeman	Total Depth FT: 96

DEPTH BGS	SYMBOLS	USCS	Lithologic Description Visual-Manual Description (ASTM-D2488)	Well Construction (Not to Scale)
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**NOTES:**

007G97LF



**Boring/Well Construction Log: 007G97LF**

*Project: NSA Mid-South  
Site: Millington, TN*

Client: NAVFAC	Completion Date: 1/26/13	Northing: 395379.898
Location: Millington, TN	Drilling Method: Rotasonic	Easting: 812273.539
Project: NSA Mid-South	Drilling Contractor: Southern Sonic Solutions	Surface Elevation: 278.472
Purpose: Monitoring Well	Geologist: Kate Freeman	Total Depth FT: 96

DEPTH BGS	SYMBOLS	USCS	Lithologic Description Visual-Manual Description (ASTM-D2488)	Well Construction (Not to Scale)
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-95



**NOTES:**

007G97LF



**Boring/Well Construction Log: 007G98LF**

*Project: NSA Mid-South  
Site: Millington, TN*

Client: NAVFAC	Completion Date: 1/25/13	Northing: 395434.486
Location: Millington, TN	Drilling Method: Rotasonic	Easting: 812319.143
Project: NSA Mid-South	Drilling Contractor: Southern Sonic Solutions	Surface Elevation: 278.641
Purpose: Monitoring Well	Geologist: Kate Freeman	Total Depth FT: 96

DEPTH BGS	SYMBOLS	USCS	Lithologic Description Visual-Manual Description (ASTM-D2488)	Well Construction (Not to Scale)
0		Gravel	Road Bed	
		ML	Greenish gray clayey SILT, moist, medium stiff; friable from 2'-4'	
-5		ML	Occasional iron concretions, iron staining increasing down column	
-10		ML	Very heavy iron staining	
-15		ML	Yellowish brown clayey SILT, moist, soft to medium stiff, some iron concretions	
-20		ML	Grayish brown clayey SILT, moist, medium stiff	
-25		ML	Greenish gray clayey SILT, medium stiff to stiff, moist, numerous iron concretions	
-30				

**NOTES:**

007G98LF



# Boring/Well Construction Log: 007G98LF

Project: NSA Mid-South  
 Site: Millington, TN

Client: NAVFAC	Completion Date: 1/25/13	Northing: 395434.486
Location: Millington, TN	Drilling Method: Rotasonic	Easting: 812319.143
Project: NSA Mid-South	Drilling Contractor: Southern Sonic Solutions	Surface Elevation: 278.641
Purpose: Monitoring Well	Geologist: Kate Freeman	Total Depth FT: 96

DEPTH BGS	SYMBOLS	USCS	Lithologic Description Visual-Manual Description (ASTM-D2488)	Well Construction (Not to Scale)
-35		ML	Medium gray clayey SILT, heavy iron staining and numerous iron concretions	<p>Grout</p>
		ML	Yellowish brown with occasional gray mottling clayey SILT, soft, moist	
		ML	Yellowish brown clayey SILT with sand, occasional pea-sized gravel, sand content increasing down column, stiff	
-40		SC	Yellowish brown and gray mottled sandy CLAY, fine to coarse grained sand, and fine to coarse gravel, hard, moist	
		SC	Strong brown clayey fine to coarse grained SAND and fine to coarse gravel, hard, moist	
-45		SM	White (10YR 8/1) fine SAND with fines, wet	
		CH	White fat CLAY, soft, moist	
		SM	White fine SAND with fines	
		GP	Fine to coarse GRAVEL	
-50		SP	Yellowish brown medium grained SAND, wet	
		SP	Brownish yellow fine to coarse SAND with fine gravel, wet	
		SP	Yellowish brown fine to coarse grained SAND with fine gravel; layer of fine gravel at 54' to 54.3'	
-55		SM	Yellowish brown fine SAND with fines, wet	
-60		SP	Yellowish brown fine to coarse SAND, with fine to coarse gravel, wet	

NOTES:

007G98LF



# Boring/Well Construction Log: 007G98LF

Project: NSA Mid-South  
 Site: Millington, TN

Client: NAVFAC	Completion Date: 1/25/13	Northing: 395434.486
Location: Millington, TN	Drilling Method: Rotasonic	Easting: 812319.143
Project: NSA Mid-South	Drilling Contractor: Southern Sonic Solutions	Surface Elevation: 278.641
Purpose: Monitoring Well	Geologist: Kate Freeman	Total Depth FT: 96

DEPTH BGS	SYMBOLS	USCS	Lithologic Description Visual-Manual Description (ASTM-D2488)	Well Construction (Not to Scale)
		SC	Yellowish brown/brownish yellow clayey fine grained SAND with occasional pea-sized gravel, wet; iron stone layer at 63'	
		SP	Yellowish brown medium grained SAND, wet	
-65		CH	Yellowish brown fat CLAY, soft	
		SP	Yellowish brown fine SAND, wet	
		SP	Brownish yellow fine SAND with fine gravel	
-70		SP	Yellowish brown fine SAND, wet	
		SP	Yellowish brown fine to coarse SAND with fine to coarse gravel, wet	
-75		SP	Yellowish brown fine to coarse SAND with occasional pea sized gravel, wet	
		SP	Yellowish brown fine to coarse SAND with gravel up to cobble in size	
-80		SP	Yellowish brown fine to coarse SAND with gravel up to cobble in size	
-85		SP	Iron stone layer	
-90		SP	Light gray (2.5YR 4/1) fine SAND with lignite layers at 92' to 92.4', 93' to 93.2', and 94.2' to 94.6'; wet	

Bentonite Chips

Sand Pack

Screen 10-slot

NOTES:

007G98LF



**Boring/Well Construction Log: 007G98LF**

*Project: NSA Mid-South  
Site: Millington, TN*

Client: NAVFAC	Completion Date: 1/25/13	Northing: 395434.486
Location: Millington, TN	Drilling Method: Rotasonic	Easting: 812319.143
Project: NSA Mid-South	Drilling Contractor: Southern Sonic Solutions	Surface Elevation: 278.641
Purpose: Monitoring Well	Geologist: Kate Freeman	Total Depth FT: 96

DEPTH BGS	SYMBOLS	USCS	Lithologic Description Visual-Manual Description (ASTM-D2488)	Well Construction (Not to Scale)
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**NOTES:**

007G98LF

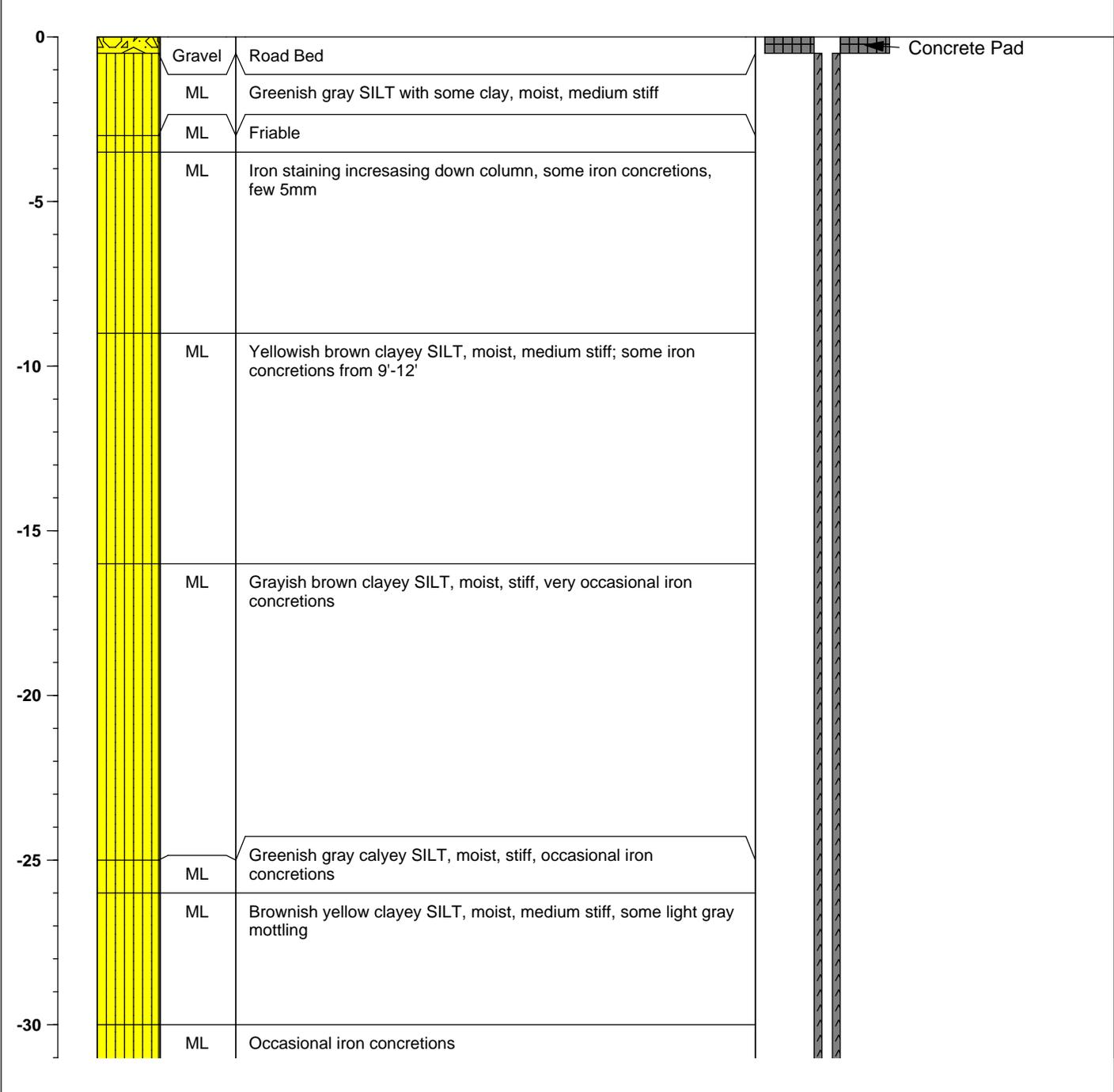


**Boring/Well Construction Log: 007G99LF**

*Project: NSA Mid-South  
Site: Millington, TN*

Client: NAVFAC	Completion Date: 1/24/13	Northing: 395495.763
Location: Millington, TN	Drilling Method: Rotasonic	Easting: 812368.682
Project: NSA Mid-South	Drilling Contractor: Southern Sonic Solutions	Surface Elevation: 278.767
Purpose: Monitoring Well	Geologist: Kate Freeman	Total Depth FT: 86

DEPTH BGS	SYMBOLS	USCS	Lithologic Description Visual-Manual Description (ASTM-D2488)	Well Construction (Not to Scale)
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**NOTES:**

007G99LF

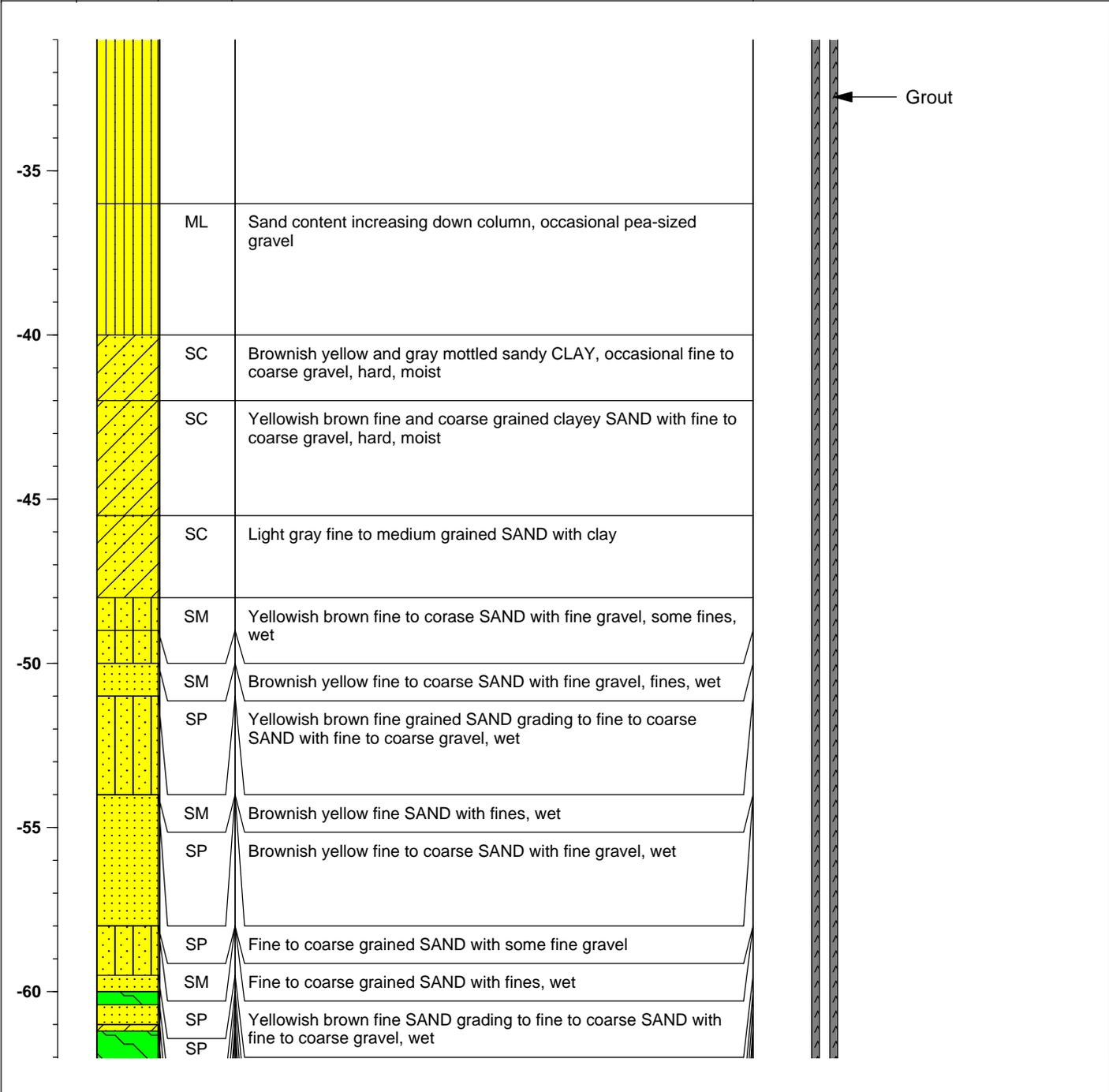


# Boring/Well Construction Log: 007G99LF

Project: NSA Mid-South  
 Site: Millington, TN

Client: NAVFAC	Completion Date: 1/24/13	Northing: 395495.763
Location: Millington, TN	Drilling Method: Rotasonic	Easting: 812368.682
Project: NSA Mid-South	Drilling Contractor: Southern Sonic Solutions	Surface Elevation: 278.767
Purpose: Monitoring Well	Geologist: Kate Freeman	Total Depth FT: 86

DEPTH BGS	SYMBOLS	USCS	Lithologic Description Visual-Manual Description (ASTM-D2488)	Well Construction (Not to Scale)
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NOTES:

007G99LF

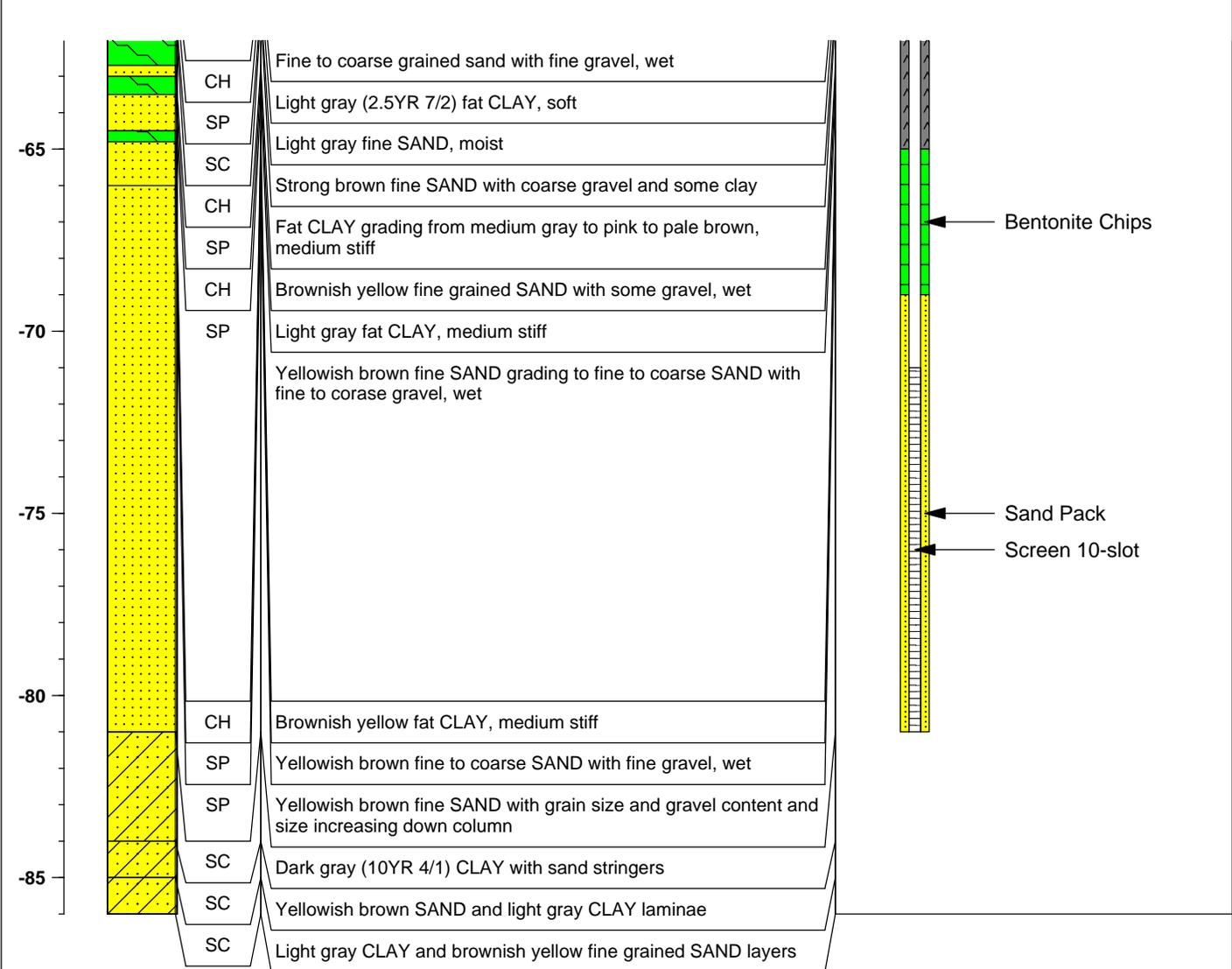


# Boring/Well Construction Log: 007G99LF

Project: NSA Mid-South  
 Site: Millington, TN

Client: NAVFAC	Completion Date: 1/24/13	Northing: 395495.763
Location: Millington, TN	Drilling Method: Rotasonic	Easting: 812368.682
Project: NSA Mid-South	Drilling Contractor: Southern Sonic Solutions	Surface Elevation: 278.767
Purpose: Monitoring Well	Geologist: Kate Freeman	Total Depth FT: 86

DEPTH BGS	SYMBOLS	USCS	Lithologic Description Visual-Manual Description (ASTM-D2488)	Well Construction (Not to Scale)
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NOTES:

007G99LF



**Boring/Well Construction Log: 007G100LF**

*Project: NSA Mid-South  
Site: Millington, TN*

Client: NAVFAC	Completion Date: 1/23/13	Northing: 395547.5
Location: Millington, TN	Drilling Method: Rotasonic	Easting: 812411.760
Project: NSA Mid-South	Drilling Contractor: Southern Sonic Solutions	Surface Elevation: 279.021
Purpose: Monitoring Well	Geologist: Kate Freeman	Total Depth FT: 86

DEPTH BGS	SYMBOLS	USCS	Lithologic Description Visual-Manual Description (ASTM-D2488)	Well Construction (Not to Scale)
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0		Gravel	Road Bed	
		ML	Greenish gray SILT with some clay, moist, medium stiff	
-5		ML	More friable	
		ML	Very stiff, some occasional iron concretions	
-10		ML	Iron staining and iron concretions increase down column	
		ML	Very heavy iron staining	
-15		ML	Yellowish brown clayey SILT, medium stiff, moist, some iron concretions	
		ML	Grayish brown clayey SILT, moist, medium stiff, some iron staining	
-20		ML	Dark grayish brown clayey SILT, moist, stiff	
		ML	Area of heavy iron staining; yellowish brown (10YR 6/8) and concretions	
-25		ML	Iron staining heavier	
-30		ML	Light gray and yellowish brown mottled clayey SILT, stiff, moist	

**NOTES:**

007G100LF



# Boring/Well Construction Log: 007G100LF

Project: NSA Mid-South  
 Site: Millington, TN

Client: NAVFAC  
 Location: Millington, TN  
 Project: NSA Mid-South  
 Purpose: Monitoring Well

Completion Date: 1/23/13  
 Drilling Method: Rotasonic  
 Drilling Contractor: Southern Sonic Solutions  
 Geologist: Kate Freeman

Northing: 395547.5  
 Easting: 812411.760  
 Surface Elevation: 279.021  
 Total Depth FT: 86

DEPTH BGS	SYMBOLS	USCS	Lithologic Description Visual-Manual Description (ASTM-D2488)	Well Construction (Not to Scale)
		CL	Light gray very soft CLAY	<p>Grout</p>
		ML	Light gray and yellowish brown mottled clayey SILT, stiff, moist	
-35		ML	Gray and yellowish brown clayey SILT with occasional pea sized gravel, hard, moist	
-40		SP	Dark yellowish brown clayey SAND with fine to coarse gravel, moist, hard	
-45		SC	Strong brown fine to coarse grained SAND with fine gravel, some clay, wet	
		SC	Seam of black staining, wet	
		SC	Strong brown fine to coarse grained SAND with fine gravel, some clay, wet	
		SP	Brownish yellow clayey fine SAND with fine gravel, wet	
		SM	Brownish yellow fine SAND with fines	
-50		CH	Brownish yellow fat CLAY, soft	
		SM	Brownish yellow fine SAND with fines	
		SP	Brownish yellow fine to coarse SAND with fine gravel, fines, wet	
		SM	Brownish yellow fine SAND with fines, wet	
-55		SP	Brownish yellow fine to coarse SAND with fine gravel, wet	
-60		SM	Fine to coarse grained SAND with fines, wet	
		SP	Fine to coarse grained sand with fine gravel, wet	
		SC	Strong brown fine SAND with coarse gravel and some clay	

NOTES:

007G100LF



**Boring/Well Construction Log: 007G100LF**

*Project: NSA Mid-South  
Site: Millington, TN*

Client: NAVFAC	Completion Date: 1/23/13	Northing: 395547.5
Location: Millington, TN	Drilling Method: Rotasonic	Easting: 812411.760
Project: NSA Mid-South	Drilling Contractor: Southern Sonic Solutions	Surface Elevation: 279.021
Purpose: Monitoring Well	Geologist: Kate Freeman	Total Depth FT: 86

DEPTH BGS	SYMBOLS	USCS	Lithologic Description Visual-Manual Description (ASTM-D2488)	Well Construction (Not to Scale)
		CH	Fat CLAY grading from medium gray to pink to pale brown, medium stiff	
		SP	Brownish yellow fine grained SAND with some gravel, wet	
-65		C	Brownish yellow fat CLAY, medium stiff	
		SP	Yellowish brown fine to coarse SAND with fine gravel, wet	
		SP	Yellowish brown fine SAND with grain size and gravel content and size increasing down column	
-70				Bentonite Chips
-75				
-80				Sand Pack Screen 10-slot
-85		SC	Yellowish brown SAND and light gray CLAY laminae	

**NOTES:**

007G100LF



**Boring/Well Construction Log: 007G101LF**

*Project: NSA Mid-South  
Site: Millington, TN*

Client: NAVFAC	Completion Date: 1/23/13	Northing: 395609.832
Location: Millington, TN	Drilling Method: Rotasonic	Easting: 812461.742
Project: NSA Mid-South	Drilling Contractor: Southern Sonic Solutions	Surface Elevation: 279.025
Purpose: Monitoring Well	Geologist: Kate Freeman	Total Depth FT: 96

DEPTH BGS	SYMBOLS	USCS	Lithologic Description Visual-Manual Description (ASTM-D2488)	Well Construction (Not to Scale)
0		Gravel	Road Bed	
		ML	Greenish gray SILT with CLAY, moist, medium stiff	
-5		ML	More friable	
		ML	Very stiff, some occasional iron concretions	
-10		ML	Yellowish brown clayey SILT, medium stiff, moist, some iron concretions, very heavy iron staining	
-15		ML	Grayish Brown clayey SILT, moist, medium stiff, some iron staining	
-20		ML	Dark grayish brown (10YR 4/1) clayey SILT, moist, stiff, occasional iron staining and concretions	
		ML	Areas of leavy iron staining (10YR 6/8) and concretions	
		ML	Areas of very soft/wet gray clay	
-25		ML	Greenish gray clayey SILT, moist, stiff, occasional iron concretions	
		ML	Heavier iron staining	
-30		ML	Yellowish brown clayey SILT with occasional soft clay layers, medium stiff, moist	

**NOTES:**

007G101LF

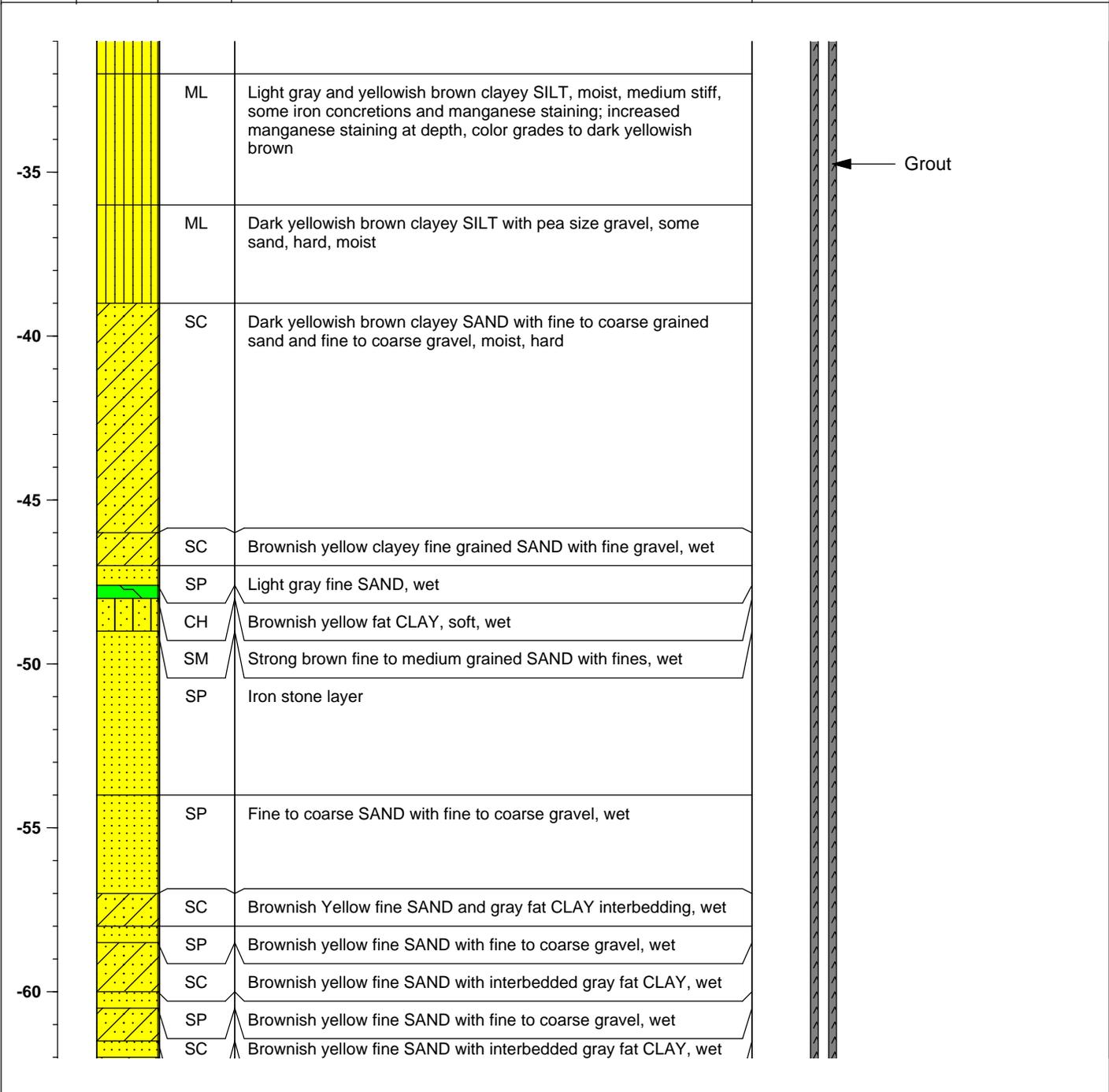


**Boring/Well Construction Log: 007G101LF**

Project: NSA Mid-South  
 Site: Millington, TN

Client: NAVFAC	Completion Date: 1/23/13	Northing: 395609.832
Location: Millington, TN	Drilling Method: Rotasonic	Easting: 812461.742
Project: NSA Mid-South	Drilling Contractor: Southern Sonic Solutions	Surface Elevation: 279.025
Purpose: Monitoring Well	Geologist: Kate Freeman	Total Depth FT: 96

DEPTH BGS	SYMBOLS	USCS	Lithologic Description Visual-Manual Description (ASTM-D2488)	Well Construction (Not to Scale)
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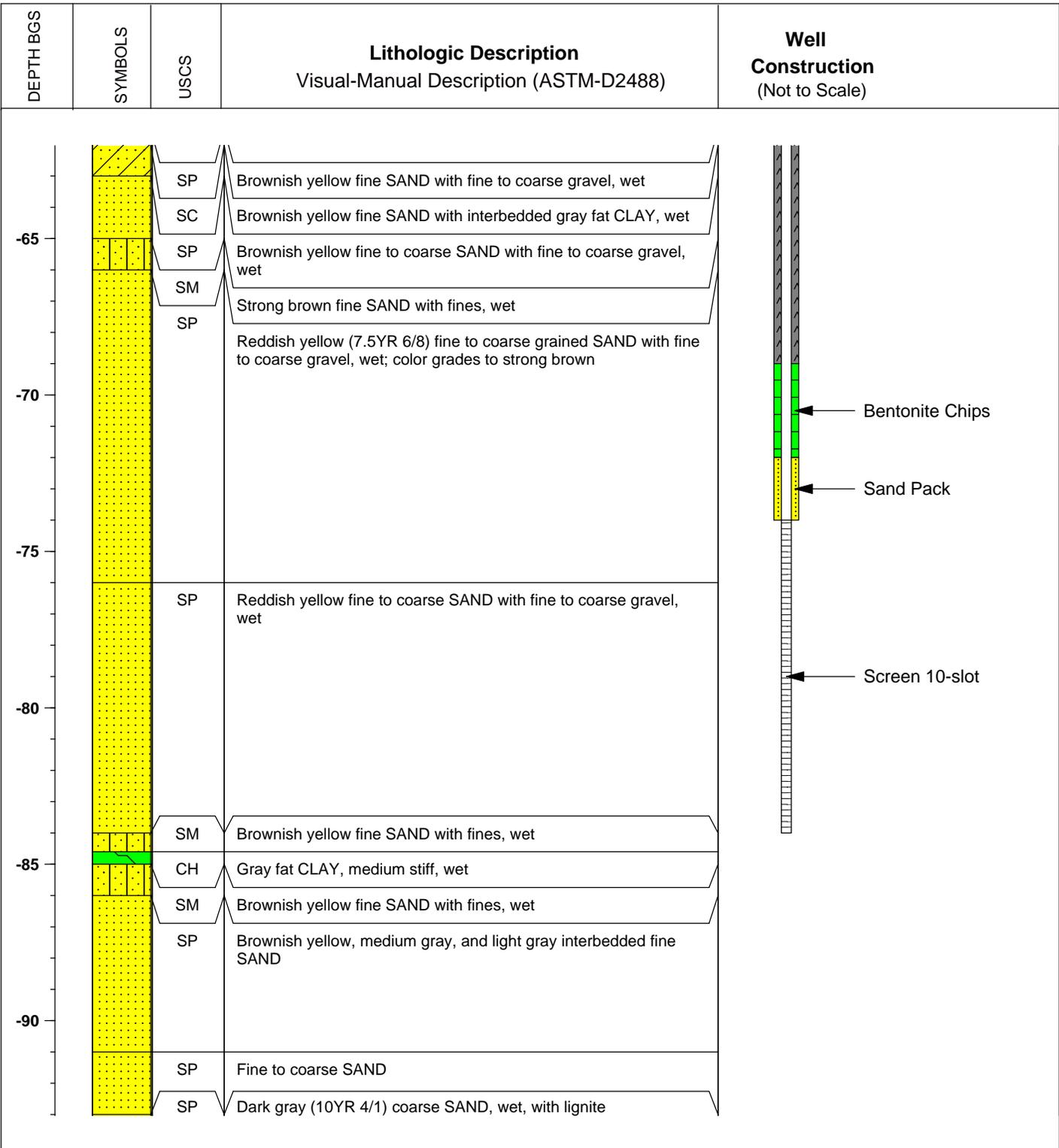
007G101LF



# Boring/Well Construction Log: 007G101LF

Project: NSA Mid-South  
 Site: Millington, TN

Client: NAVFAC	Completion Date: 1/23/13	Northing: 395609.832
Location: Millington, TN	Drilling Method: Rotasonic	Easting: 812461.742
Project: NSA Mid-South	Drilling Contractor: Southern Sonic Solutions	Surface Elevation: 279.025
Purpose: Monitoring Well	Geologist: Kate Freeman	Total Depth FT: 96



NOTES:

007G101LF



**Boring/Well Construction Log: 007G101LF**

*Project: NSA Mid-South  
Site: Millington, TN*

Client: NAVFAC	Completion Date: 1/23/13	Northing: 395609.832
Location: Millington, TN	Drilling Method: Rotasonic	Easting: 812461.742
Project: NSA Mid-South	Drilling Contractor: Southern Sonic Solutions	Surface Elevation: 279.025
Purpose: Monitoring Well	Geologist: Kate Freeman	Total Depth FT: 96

DEPTH BGS	SYMBOLS	USCS	Lithologic Description Visual-Manual Description (ASTM-D2488)	Well Construction (Not to Scale)
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-95		CL	Dark gray CLAY, stiff moist	
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**NOTES:**

007G101LF



# Boring/Well Construction Log: 007G102LF

Project: NSA Mid-South  
 Site: Millington, TN

Client: NAVFAC	Completion Date: 1/22/13	Northing: 395660.482
Location: Millington, TN	Drilling Method: Rotasonic	Easting: 812503.015
Project: NSA Mid-South	Drilling Contractor: Southern Sonic Solutions	Surface Elevation: 279.05
Purpose: Monitoring Well	Geologist: Kate Freeman	Total Depth FT: 81.5

DEPTH BGS	SYMBOLS	USCS	Lithologic Description Visual-Manual Description (ASTM-D2488)	Well Construction (Not to Scale)
0		Gravel	Road Bed	
-5		ML	Greenish gray (Gleg1 5/1) SILT with some CLAY, moist, some iron staining, medium stiff	
-10		ML	Greenish gray clayey SILT, iron and manganese striations, stiff	
-15		ML	Brown (10YR 5/2) clayey SILT, iron and manganese striations, stiff, moist	
-20		ML	Dark yellowish brown and gray mottled clayey SILT, moist, stiff	
-25		ML	Brown (10YR 5/13) clayey SILT, moist, stiff; Medium gray layer, medium stiff, around 17-17.5'	
-30		ML	Brown (10YR 4/3) clayey SILT, very stiff, moist, iron concretions	
		ML	Gray (5Y 6/1) clayey SILT with some iron concretions and occasional staining, very stiff, moist	
		ML	Yellowish brown (10YR 5/4) clayey SILT, moist, stiff, iron concretions and staining	
		ML	Yellowish brown clayey SILT, iron and manganese staining, medium stiff, moist	

NOTES:

007G102LF



# Boring/Well Construction Log: 007G102LF

Project: NSA Mid-South  
Site: Millington, TN

Client: NAVFAC	Completion Date: 1/22/13	Northing: 395660.482
Location: Millington, TN	Drilling Method: Rotasonic	Easting: 812503.015
Project: NSA Mid-South	Drilling Contractor: Southern Sonic Solutions	Surface Elevation: 279.05
Purpose: Monitoring Well	Geologist: Kate Freeman	Total Depth FT: 81.5

DEPTH BGS	SYMBOLS	USCS	Lithologic Description Visual-Manual Description (ASTM-D2488)	Well Construction (Not to Scale)
-35		ML	Yellowish brown and medium gray mottled clayey SILT, moist, stiff, iron and manganese staining	
		ML	Increasing clay content, occasional pea size gravel, moist	
-40		CL	Yellowish Brown and gray mottled silty CLAY with fine sand, occasional gravel (fine to coarse), moist	
-45		Clay and Gravel	Brownish yellow small to cobbled gravel in sandy CLAY matrix, occasional gray mottling, moist	
		SC	Brownish yellow clayey SAND with some gray mottling, occasional clay seams, wet	
		CH	Yellowish brown (10YR 5/8) fat CLAY, soft	
-50		SP	Fine yellowish brown SAND, occasional gravel, wet	
		SP	Yellowish brown fine to coarse grained SAND with some small gravel, wet	
-55		SM	Fine yellowish brown SAND, occasional gravel with fines	
		SP	Light yellowish brown fine to coarse grained SAND with fine to coarse gravel; fat CLAY lenses 0.1 to 0.3 inches thick	
		SC	Interbedded yellowish brown SAND and white fat CLAY, some lignite	
-60		SP	Strong brown (7.5YR 5/8) fine to coarse SAND with some small gravel, wet	

NOTES:

007G102LF



**Boring/Well Construction Log: 007G102LF**

*Project: NSA Mid-South  
Site: Millington, TN*

Client: NAVFAC	Completion Date: 1/22/13	Northing: 395660.482
Location: Millington, TN	Drilling Method: Rotasonic	Easting: 812503.015
Project: NSA Mid-South	Drilling Contractor: Southern Sonic Solutions	Surface Elevation: 279.05
Purpose: Monitoring Well	Geologist: Kate Freeman	Total Depth FT: 81.5

DEPTH BGS	SYMBOLS	USCS	Lithologic Description Visual-Manual Description (ASTM-D2488)	Well Construction (Not to Scale)
-65				
-70		SM	Brownish yellow fine to coarse grained SAND with fine to coarse gravel with fines, wet	
-75		SP	Brownish yellow fine SAND, wet	
-80		SM	Brownish yellow fine to coarse grained SAND with fine to coarse gravel with fines, wet	
		SP	Gravel increasing in size and quantity down column	

**NOTES:**

007G102LF



**Boring/Well Construction Log: 007G103MF**

*Project: NSA Mid-South  
Site: Millington, TN*

Client: NAVFAC	Completion Date: 2/8/13	Northing: 392398.605
Location: Millington, TN	Drilling Method: Rotasonic	Easting: 814906.303
Project: NSA Mid-South	Drilling Contractor: Southern Sonic Solutions	Surface Elevation: 293.202
Purpose: Monitoring Well	Geologist: Kate Freeman	Total Depth FT: 96

DEPTH BGS	SYMBOLS	USCS	Lithologic Description Visual-Manual Description (ASTM-D2488)	Well Construction (Not to Scale)
0		Concrete	Concrete (airport)	
		CH	Dark yellowish brown silty CLAY, moist, stiff	
-5		ML	Dark gray clayey SILT, moist, medium stiff	
		CL	Black CLAY, moist, hard	
-10		ML	Dark greenish yellow clayey SILT, stiff, iron staining, concretions	
-15		ML	Gray and brownish yellow mottled clayey SILT, moist, medium stiff	
-20		ML	Greenish brown and yellowish brown mottled clayey SILT, iron staining, moist, medium stiff	
-25				
-30				Grout

**NOTES:**

007G103MF



**Boring/Well Construction Log: 007G103MF**

*Project: NSA Mid-South  
Site: Millington, TN*

Client: NAVFAC	Completion Date: 2/8/13	Northing: 392398.605
Location: Millington, TN	Drilling Method: Rotasonic	Easting: 814906.303
Project: NSA Mid-South	Drilling Contractor: Southern Sonic Solutions	Surface Elevation: 293.202
Purpose: Monitoring Well	Geologist: Kate Freeman	Total Depth FT: 96

DEPTH BGS	SYMBOLS	USCS	Lithologic Description Visual-Manual Description (ASTM-D2488)	Well Construction (Not to Scale)
-35		ML	Medium gray clayey SILT, moist, medium stiff, trace iron staining	
		ML	Dark greenish gray clayey SILT with heavy iron staining, moist, stiff	
-40		ML	Dark yellowish brown clayey SILT with fine sand, moist, medium stiff; gray mottling from 42' to 46'	
-45		ML	Dark yellowish brown clayey SILT with fine to coarse gravel, moist	
-50		SM	Dark yellowish brown fine to medum grained SAND with fines, wet, occasional gravel	
		SP	Gray fine to medium grained SAND, wet	
-55		SM	Yellowish brown silty fine to medium grained SAND with occasional gravel, wet	
-60		SP	Pale brown grading to yellow fine SAND, wet; various gray clay layers from 60' to 62'; fine to coarse gravel at 63' to 64'	

**NOTES:**

007G103MF

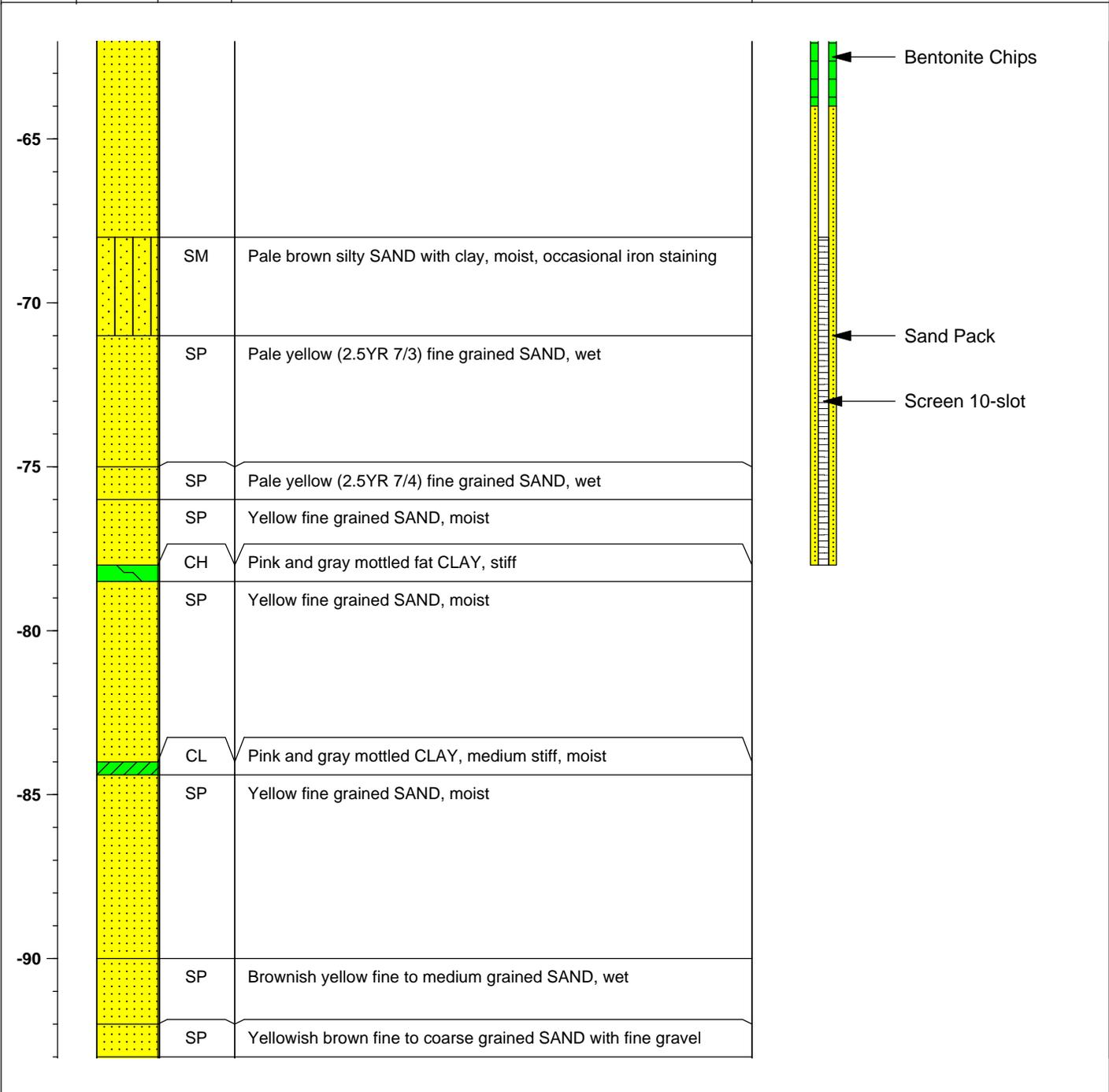


**Boring/Well Construction Log: 007G103MF**

*Project: NSA Mid-South  
Site: Millington, TN*

Client: NAVFAC	Completion Date: 2/8/13	Northing: 392398.605
Location: Millington, TN	Drilling Method: Rotasonic	Easting: 814906.303
Project: NSA Mid-South	Drilling Contractor: Southern Sonic Solutions	Surface Elevation: 293.202
Purpose: Monitoring Well	Geologist: Kate Freeman	Total Depth FT: 96

DEPTH BGS	SYMBOLS	USCS	Lithologic Description Visual-Manual Description (ASTM-D2488)	Well Construction (Not to Scale)
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**NOTES:**

007G103MF



**Boring/Well Construction Log: 007G103MF**

*Project: NSA Mid-South  
Site: Millington, TN*

Client: NAVFAC	Completion Date: 2/8/13	Northing: 392398.605
Location: Millington, TN	Drilling Method: Rotasonic	Easting: 814906.303
Project: NSA Mid-South	Drilling Contractor: Southern Sonic Solutions	Surface Elevation: 293.202
Purpose: Monitoring Well	Geologist: Kate Freeman	Total Depth FT: 96

DEPTH BGS	SYMBOLS	USCS	Lithologic Description Visual-Manual Description (ASTM-D2488)	Well Construction (Not to Scale)
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-95		SP	Dark yellow fine to coarse grained SAND with fine gravel, wet	
		SP	Yellowish brown fine to coarse SAND with fine gravel, wet	

**NOTES:** 007G103MF



**Boring/Well Construction Log: 007G104MF**

*Project: NSA Mid-South  
Site: Millington, TN*

Client: NAVFAC	Completion Date: 2/9/13	Northing: 392405.809
Location: Millington, TN	Drilling Method: Rotasonic	Easting: 814948.863
Project: NSA Mid-South	Drilling Contractor: Southern Sonic Solutions	Surface Elevation: 293.199
Purpose: Monitoring Well	Geologist: Kate Freeman	Total Depth FT: 81

DEPTH BGS	SYMBOLS	USCS	Lithologic Description Visual-Manual Description (ASTM-D2488)	Well Construction (Not to Scale)
0		Concrete	Concrete (airport)	Concrete Pad
		ML	Dark yellowish brown clayey SILT, moist, stiff	
-5		ML	Strong brown clayey SILT, moist, very stiff	
-10		ML	Dark greenish gray clayey SILT, moist, stiff	
-15		CL	Very dark green CLAY, moist, hard	
-20		ML	Medium gray clayey SILT with medium to heavy iron staining, moist, very stiff	
-25		ML	Gray, greenish brown and brownish yellow mottled clayey SILT, moist, medium stiff	
		ML	Greenish brown clayey SILT with occasional brownish yellow mottling, medium stiff, moist	
-30		ML	Medium gray clayey SILT with trace sand, moist, medium stiff; iron concretions and staining at 34' to 36'	

**NOTES:**

007G104MF



# Boring/Well Construction Log: 007G104MF

Project: NSA Mid-South  
 Site: Millington, TN

Client: NAVFAC	Completion Date: 2/9/13	Northing: 392405.809
Location: Millington, TN	Drilling Method: Rotasonic	Easting: 814948.863
Project: NSA Mid-South	Drilling Contractor: Southern Sonic Solutions	Surface Elevation: 293.199
Purpose: Monitoring Well	Geologist: Kate Freeman	Total Depth FT: 81

DEPTH BGS	SYMBOLS	USCS	Lithologic Description Visual-Manual Description (ASTM-D2488)	Well Construction (Not to Scale)
-35		ML	Very dark greenish gray (Gley 5G3/1) clayey SILT with occasional iron staining, moist, very stiff	<p>Grout</p>
-40		CL	Yellowish brown sandy silty CLAY, moist, medium stiff	
-45		CL	Yellowish brown sandy CLAY with gravel, moist, hard	
-50		SP	Yellowish brown fine to medium grained SAND with trace gravel	
-52		SM	Yellowish brown silty fine to coarse grained SAND with clay, moist	
-54		CH	Light gray fat CLAY, very stiff	
-55		SM	Light gray silty fine grained SAND, wet	
-56		CH	Gray fat CLAY, soft	
-57		SP	Pale brown fine grained SAND, wet	
-58		CH	Gray and pink fat CLAY, soft	
-59		SP	White fine to medium grained SAND, wet	
-60		SM	Brownish yellow silty fine grained SAND, wet; grades to yellowish brown	

NOTES:

007G104MF



**Boring/Well Construction Log: 007G104MF**

*Project: NSA Mid-South  
Site: Millington, TN*

Client: NAVFAC	Completion Date: 2/9/13	Northing: 392405.809
Location: Millington, TN	Drilling Method: Rotasonic	Easting: 814948.863
Project: NSA Mid-South	Drilling Contractor: Southern Sonic Solutions	Surface Elevation: 293.199
Purpose: Monitoring Well	Geologist: Kate Freeman	Total Depth FT: 81

DEPTH BGS	SYMBOLS	USCS	Lithologic Description Visual-Manual Description (ASTM-D2488)	Well Construction (Not to Scale)
-65		CL	Gray CLAY, soft, moist	<p>Bentonite Chips</p> <p>Sand Pack</p> <p>Screen 10-slot</p>
		SM	Brownish yellow and yellowish brown silty fine grained SAND, wet	
		SP	Very pale brown fine grained SAND, wet	
-70		CH	Very pale brown fat CLAY with occasional pink mottling, medium stiff, moist	
		SM	Yellowish brown silty fine grained SAND	
		CH	Pink fat CLAY, stiff, moist	
-75		SM	Yellowish brown silty fine grained SAND	
		SM	Light gray silty fine grained SAND, wet	
		SM	Yellowish brown silty fine grained SAND, occasional clay seams, wet	
-80		SM		

NOTES:

007G104MF

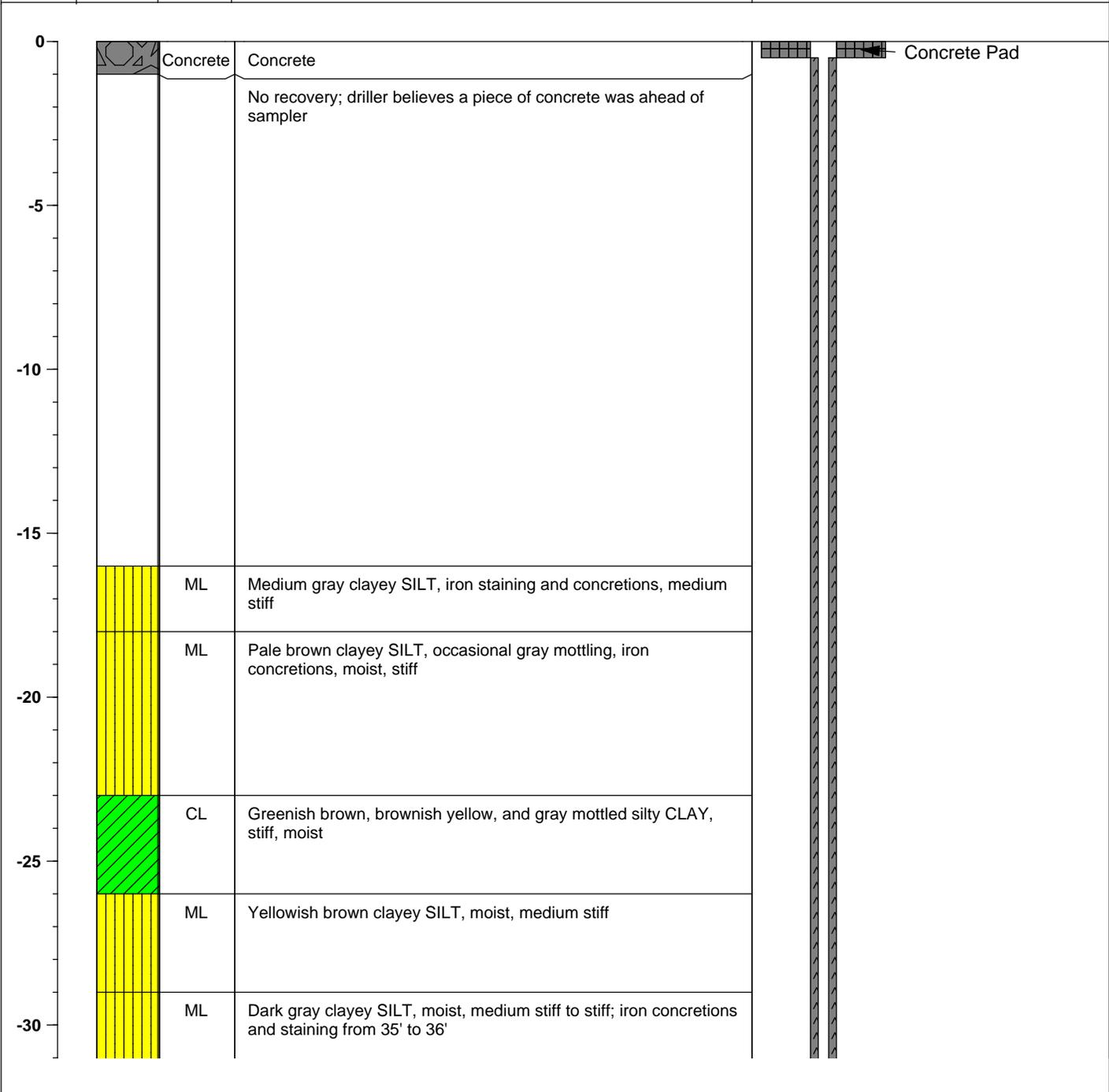


**Boring/Well Construction Log: 007G105MF**

*Project: NSA Mid-South  
Site: Millington, TN*

Client: NAVFAC	Completion Date: 2/10/13	Northing: 392411.655
Location: Millington, TN	Drilling Method: Rotasonic	Easting: 814988.646
Project: NSA Mid-South	Drilling Contractor: Southern Sonic Solutions	Surface Elevation: 293.122
Purpose: Monitoring Well	Geologist: Kate Freeman	Total Depth FT: 81

DEPTH BGS	SYMBOLS	USCS	Lithologic Description Visual-Manual Description (ASTM-D2488)	Well Construction (Not to Scale)
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**NOTES:**

007G105MF



**Boring/Well Construction Log: 007G105MF**

*Project: NSA Mid-South  
Site: Millington, TN*

Client: NAVFAC	Completion Date: 2/10/13	Northing: 392411.655
Location: Millington, TN	Drilling Method: Rotasonic	Easting: 814988.646
Project: NSA Mid-South	Drilling Contractor: Southern Sonic Solutions	Surface Elevation: 293.122
Purpose: Monitoring Well	Geologist: Kate Freeman	Total Depth FT: 81

DEPTH BGS	SYMBOLS	USCS	Lithologic Description Visual-Manual Description (ASTM-D2488)	Well Construction (Not to Scale)
-35				
-40		ML	Grayish brown fclayey SILT, heavy iron staining and concretions, moist, stiff	
-45		SC	Yellowish brown and gray mottled clayey fine SAND, moist, hard	
-50		GP	Fine to coarse GRAVEL in a yellowish brown sandy clay matrix, moist	
-55		SC	Yellowish brown clayey fine to medium grained SAND, trace gravel	
-58		SM	Light gray silty fine grained SAND, moist	
-59		SM	Light gray fine grained SAND with fines, wet	
-60		SC	Alternating layers of yellowish brown fine to medium grained SAND and gray and pink fat CLAY, layers ~0.3", moist	
-61		SP	Yellowish brown fine grained SAND, very occasional pale brown clay lens, wet	

**NOTES:**

007G105MF



**Boring/Well Construction Log: 007G105MF**

*Project: NSA Mid-South  
Site: Millington, TN*

Client: NAVFAC	Completion Date: 2/10/13	Northing: 392411.655
Location: Millington, TN	Drilling Method: Rotasonic	Easting: 814988.646
Project: NSA Mid-South	Drilling Contractor: Southern Sonic Solutions	Surface Elevation: 293.122
Purpose: Monitoring Well	Geologist: Kate Freeman	Total Depth FT: 81

DEPTH BGS	SYMBOLS	USCS	Lithologic Description Visual-Manual Description (ASTM-D2488)	Well Construction (Not to Scale)
-65		CL	Pale brown CLAY, moist, medium stiff	<p>Bentonite Chips</p> <p>Sand Pack</p> <p>Screen 10-slot</p>
-70		SC	Light yellowish brown fine to medium grained SAND, wet	
-75		SP	Strong brown fine grained SAND, occasional pale brown clay lenses	
-78		CH	Pale brown fat CLAY, medium stiff	
-79		SP	Yellowish brown fine grained SAND, wet	
-80		CH	Gray and pink fat CLAY, medium stiff	
-81		SM	Strong brown silty fine grained SAND	

**NOTES:**

007G105MF



**Boring/Well Construction Log: 007G106LF**

*Project: NSA Mid-South  
Site: Millington, TN*

Client: NAVFAC	Completion Date: 2/7/13	Northing: 397464.012
Location: Millington, TN	Drilling Method: Rotasonic	Easting: 811509.242
Project: NSA Mid-South	Drilling Contractor: Southern Sonic Solutions	Surface Elevation: 284.153
Purpose: Monitoring Well	Geologist: Kate Freeman	Total Depth FT: 96

DEPTH BGS	SYMBOLS	USCS	Lithologic Description Visual-Manual Description (ASTM-D2488)	Well Construction (Not to Scale)
0			Concrete (sidewalk)	Concrete Pad
		ML	Dark yellowish brown clayey SILT, moist, medium stiff, some pale brown mottling, iron staining and occasional iron concretions	
-5				
-10				
-15				
-20		ML	Grayish brown clayey SILT, moist, stiff, occasional iron staining and concretions	
-25		ML	Brownish yellow clayey SILT, moist, stiff	
-30		ML	Brownish yellow clayey SILT, moist, stiff to very stiff	
		ML	Gray and brownish yellow mottled SILT with clay, moist, stiff to	

**NOTES:**

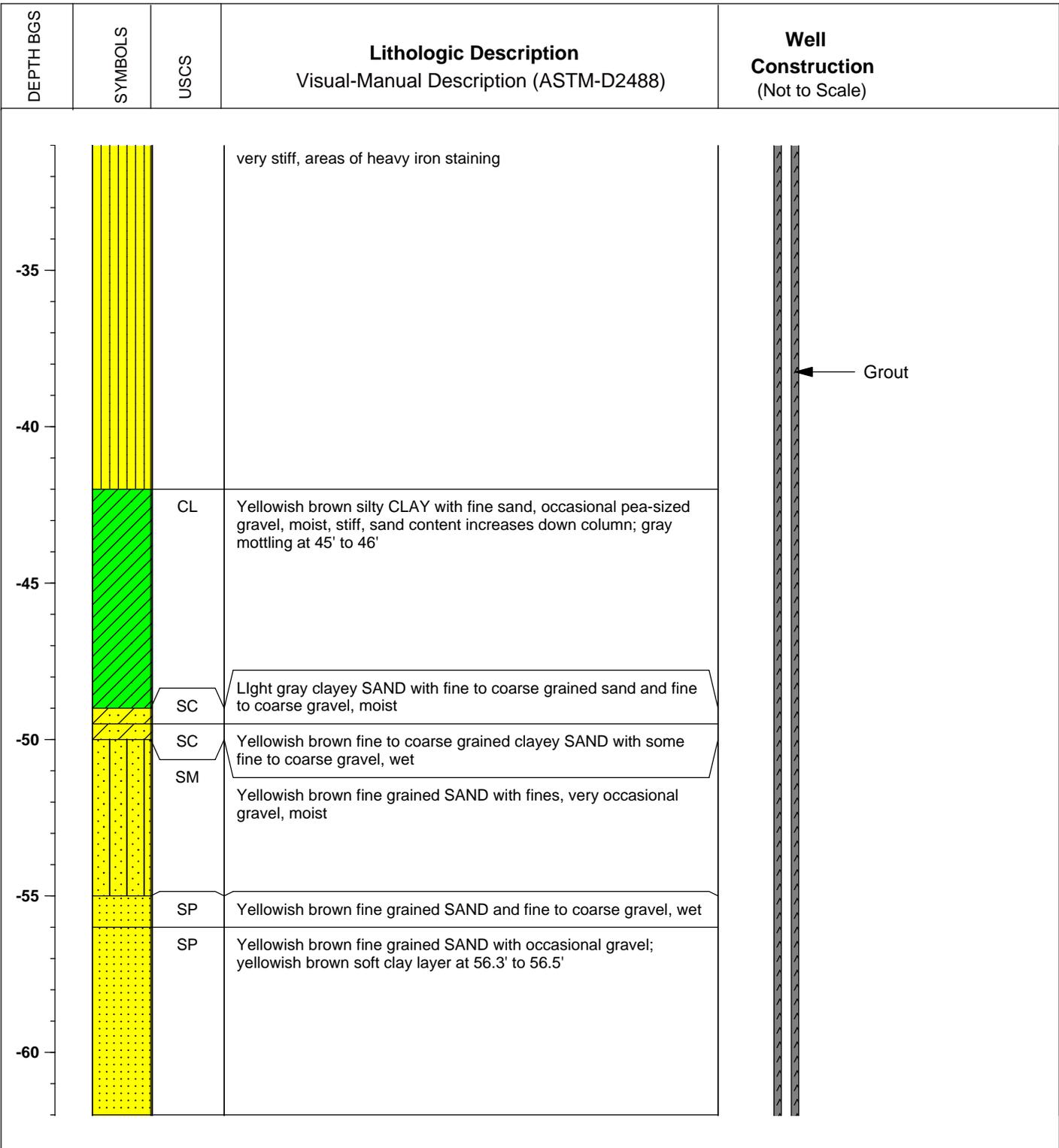
007G106LF



**Boring/Well Construction Log: 007G106LF**

*Project: NSA Mid-South  
Site: Millington, TN*

Client: NAVFAC	Completion Date: 2/7/13	Northing: 397464.012
Location: Millington, TN	Drilling Method: Rotasonic	Easting: 811509.242
Project: NSA Mid-South	Drilling Contractor: Southern Sonic Solutions	Surface Elevation: 284.153
Purpose: Monitoring Well	Geologist: Kate Freeman	Total Depth FT: 96



**NOTES:**

007G106LF

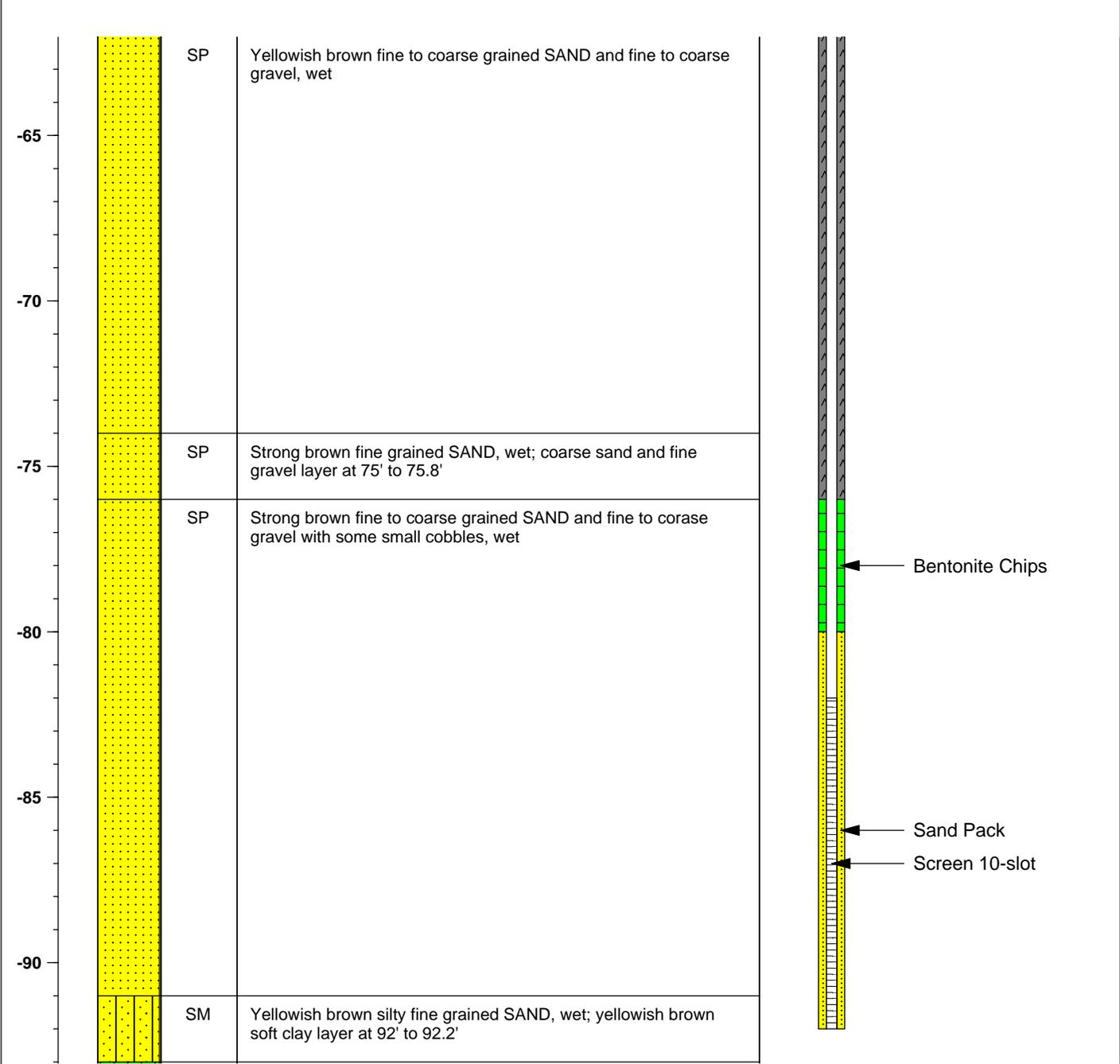


**Boring/Well Construction Log: 007G106LF**

*Project: NSA Mid-South  
Site: Millington, TN*

Client: NAVFAC	Completion Date: 2/7/13	Northing: 397464.012
Location: Millington, TN	Drilling Method: Rotasonic	Easting: 811509.242
Project: NSA Mid-South	Drilling Contractor: Southern Sonic Solutions	Surface Elevation: 284.153
Purpose: Monitoring Well	Geologist: Kate Freeman	Total Depth FT: 96

DEPTH BGS	SYMBOLS	USCS	Lithologic Description Visual-Manual Description (ASTM-D2488)	Well Construction (Not to Scale)
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**NOTES:**

007G106LF



**Boring/Well Construction Log: 007G106LF**

*Project: NSA Mid-South  
Site: Millington, TN*

Client: NAVFAC	Completion Date: 2/7/13	Northing: 397464.012
Location: Millington, TN	Drilling Method: Rotasonic	Easting: 811509.242
Project: NSA Mid-South	Drilling Contractor: Southern Sonic Solutions	Surface Elevation: 284.153
Purpose: Monitoring Well	Geologist: Kate Freeman	Total Depth FT: 96

DEPTH BGS	SYMBOLS	USCS	Lithologic Description Visual-Manual Description (ASTM-D2488)	Well Construction (Not to Scale)
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-95		CL	Dark gray CLAY, hard, moist	
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**NOTES:**

007G106LF



**Boring/Well Construction Log: 007G107LF**

*Project: NSA Mid-South  
Site: Millington, TN*

Client: NAVFAC	Completion Date: 2/6/13	Northing: 397366.010
Location: Millington, TN	Drilling Method: Rotasonic	Easting: 811041.531
Project: NSA Mid-South	Drilling Contractor: Southern Sonic Solutions	Surface Elevation: 281.653
Purpose: Monitoring Well	Geologist: Kate Freeman	Total Depth FT: 126

DEPTH BGS	SYMBOLS	USCS	Lithologic Description Visual-Manual Description (ASTM-D2488)	Well Construction (Not to Scale)
0			Concrete (sidewalk)	Concrete Pad
		ML	Dark yellowish brown clayey SILT, moist, medium stiff, occasional iron concretions	
-5				
-10				
-15				
-20		ML	Greenish gray clayey SILT, moist, soft	
-25		ML	Grayish brown with occasional gray mottling clayey SILT, moist, medium stiff, occasional iron concretions	
-30		ML	Yellowish brown and gray mottled clayey SILT, stiff, moist, occasional iron concretions	

**NOTES:**

007G107LF



**Boring/Well Construction Log: 007G107LF**

*Project: NSA Mid-South  
Site: Millington, TN*

Client: NAVFAC	Completion Date: 2/6/13	Northing: 397366.010
Location: Millington, TN	Drilling Method: Rotasonic	Easting: 811041.531
Project: NSA Mid-South	Drilling Contractor: Southern Sonic Solutions	Surface Elevation: 281.653
Purpose: Monitoring Well	Geologist: Kate Freeman	Total Depth FT: 126

DEPTH BGS	SYMBOLS	USCS	Lithologic Description Visual-Manual Description (ASTM-D2488)	Well Construction (Not to Scale)
-35		ML	Dark yellowish brown clayey SILT with medium sand, moist, stiff	<p>Grout</p>
		ML	Gray SILT, moist	
		ML	Light greenish gray clayey SILT, moist, stiff, iron staining	
-45		ML	Yellowish brown clayey SILT with occasional medium grained sand seams	
		SC	Strong brown clayey SAND with fine gravel, wet	
-50		SP	Very dark gray fine to coarse grained SAND with fine to coarse gravel, wet	
		SP	Yellowish brown fine to coarse grained SAND with fine to coarse gravel, wet; 0.2" brownish yellow clay layer at 52'	
-55		SP	Brownish yellow fine SAND, wet; very occasional fine gravel throughout	
-60				

**NOTES:**

007G107LF



**Boring/Well Construction Log: 007G107LF**

*Project: NSA Mid-South  
Site: Millington, TN*

Client: NAVFAC	Completion Date: 2/6/13	Northing: 397366.010
Location: Millington, TN	Drilling Method: Rotasonic	Easting: 811041.531
Project: NSA Mid-South	Drilling Contractor: Southern Sonic Solutions	Surface Elevation: 281.653
Purpose: Monitoring Well	Geologist: Kate Freeman	Total Depth FT: 126

DEPTH BGS	SYMBOLS	USCS	Lithologic Description Visual-Manual Description (ASTM-D2488)	Well Construction (Not to Scale)
-65				
-70		SP	Strong brown fine to coarse SAND and fine to coarse gravel, some cobbles, wet	
-75				
-80				Bentonite Chips
-85		GP	Fine to coarse GRAVEL with yellow (10YR 7/6) fine to coarse sand, wet	Sand Pack
-90		SM	Yellow silty fine grained SAND, wet, micaceous	Screen 10-slot

**NOTES:**

007G107LF



**Boring/Well Construction Log: 007G107LF**

*Project: NSA Mid-South  
Site: Millington, TN*

Client: NAVFAC	Completion Date: 2/6/13	Northing: 397366.010
Location: Millington, TN	Drilling Method: Rotasonic	Easting: 811041.531
Project: NSA Mid-South	Drilling Contractor: Southern Sonic Solutions	Surface Elevation: 281.653
Purpose: Monitoring Well	Geologist: Kate Freeman	Total Depth FT: 126

DEPTH BGS	SYMBOLS	USCS	Lithologic Description Visual-Manual Description (ASTM-D2488)	Well Construction (Not to Scale)
-95		GP	Fine to coarse GRAVEL with yellow fine to coarse grained sand, wet	
-100		SM	Yellow silty fine grained SAND, wet, micaceous	
-105		SM	Light gray (2.5Y 7/2) silty fine grained SAND, wet, some mica	
-110			No recovery	
-115		CL	Light gray CLAY, medium stiff to stiff	
-120				

**NOTES:**

007G107LF



**Boring/Well Construction Log: 007G107LF**

*Project: NSA Mid-South  
Site: Millington, TN*

Client: NAVFAC	Completion Date: 2/6/13	Northing: 397366.010
Location: Millington, TN	Drilling Method: Rotasonic	Easting: 811041.531
Project: NSA Mid-South	Drilling Contractor: Southern Sonic Solutions	Surface Elevation: 281.653
Purpose: Monitoring Well	Geologist: Kate Freeman	Total Depth FT: 126

DEPTH BGS	SYMBOLS	USCS	Lithologic Description Visual-Manual Description (ASTM-D2488)	Well Construction (Not to Scale)
-125				

**NOTES:**

007G107LF

**Attachment D**  
**Correspondence from the City of Millington**

## Diane Maddux

---

**From:** Jim Cox <jlcox@fisherarnold.com>  
**Sent:** Monday, February 11, 2013 7:32 AM  
**To:** Ben Brantley  
**Subject:** RE: Request for 1,400 gallon discharge - AOC A NSA Mid-South

Ben,

This 1400 gallon discharge is approved for the Millington sewer system.

**James L. Cox**  
**Principal**  
**FISHER & ARNOLD, Inc.**

9180 Crestwyn Hills Drive  
Memphis, TN 38125  
(901) 748-1811 Office  
(901) 634-8004 Cell  
(901) 748-3115 Fax  
[jlcox@fisherarnold.com](mailto:jlcox@fisherarnold.com)  
[www.fisherarnold.com](http://www.fisherarnold.com)

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---

**From:** Ben Brantley [<mailto:bbrantley@Ensafec.com>]  
**Sent:** Thursday, February 07, 2013 5:30 PM  
**To:** [jlcox@fisherarnold.com](mailto:jlcox@fisherarnold.com)  
**Cc:** Rachel Methvin; Kate Freeman  
**Subject:** Request for 1,400 gallon discharge - AOC A NSA Mid-South

Hi Jim,

Attached is another data set associated with 1,400 gallons of well development water we'd like to discharge to the Millington sanitary sewer with your permission. Contaminants consist of chloroform (1ppb), 1,1DCA (1 ppb), cis 1,2 DCE (3.9 ppb), PCE (3 ppb), and TCE (10.9 ppb).

Thank you,  
Ben

**From:** Environmental Testing and Consulting, Inc. [<mailto:emailetc@etcmemphis.com>]  
**Sent:** Thursday, February 07, 2013 5:25 PM  
**To:** Ben Brantley; Kate Freeman  
**Subject:** 13-038-0225 00001

Your report(s) are attached.

This report is provided in Acrobat PDF format and requires the latest version of Acrobat Reader which can be downloaded free of charge at <http://www.adobe.com/products/acrobat/readstep2.html>. If you have any problems downloading or installing Acrobat Reader, please contact Customer Service by emailing [support@lmpcorp.com](mailto:support@lmpcorp.com)

or by calling 800-494-2750 and ask for Support. Please verify receipt of the attached data.

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## Diane Maddux

---

**From:** Jim Cox <jlcox@fisherarnold.com>  
**Sent:** Tuesday, February 19, 2013 7:42 AM  
**To:** Ben Brantley  
**Subject:** RE: Request for discharge - 700 gallons

Ben,

This discharge of 700 gallons is acceptable for the Millington sewer system.

**James L. Cox**  
**Principal**  
**FISHER & ARNOLD, Inc.**

9180 Crestwyn Hills Drive  
Memphis, TN 38125  
(901) 748-1811 Office  
(901) 634-8004 Cell  
(901) 748-3115 Fax  
[jlcox@fisherarnold.com](mailto:jlcox@fisherarnold.com)  
[www.fisherarnold.com](http://www.fisherarnold.com)

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---

**From:** Ben Brantley [<mailto:bbrantley@Ensafe.com>]  
**Sent:** Friday, February 15, 2013 9:06 AM  
**To:** [jlcox@fisherarnold.com](mailto:jlcox@fisherarnold.com)  
**Cc:** Rachel Methvin  
**Subject:** Request for discharge - 700 gallons

Hi Mr. Cox.

Please find attached analytical data for a 700 gallon batch of water staged at NSA Mid-South from recent drilling activities that we'd like to discharge to the Millington sanitary sewer. Detected constituents in the water include chloroform (2 ppb), naphthalene (8 ppb), TCE (8 ppb), and xylenes (3 ppb).

Thank yo8u,  
Ben

**From:** Environmental Testing and Consulting, Inc. [<mailto:emailetc@etcmemphis.com>]  
**Sent:** Thursday, February 14, 2013 5:43 PM  
**To:** Ben Brantley; Kate Freeman  
**Subject:** 13-045-0234 00001

Your report(s) are attached.

This report is provided in Acrobat PDF format and requires the latest version of Acrobat Reader which can be downloaded free of charge at <http://www.adobe.com/products/acrobat/readstep2.html>. If you have any problems downloading or installing Acrobat Reader, please contact Customer Service by emailing [support@lmpcorp.com](mailto:support@lmpcorp.com) or by calling 800-494-2750 and ask for Support. Please verify receipt of the attached data.

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## Diane Maddux

---

**From:** Jim Cox <jlcox@fisherarnold.com>  
**Sent:** Monday, February 11, 2013 7:33 AM  
**To:** Ben Brantley  
**Subject:** RE: Request for discharge - 2,000 gallons; NSA Mid-South

Ben,

This 2000 gallon discharge si approved for the Millington sewer system.

**James L. Cox**  
**Principal**  
**FISHER & ARNOLD, Inc.**

9180 Crestwyn Hills Drive  
Memphis, TN 38125  
(901) 748-1811 Office  
(901) 634-8004 Cell  
(901) 748-3115 Fax  
[jlcox@fisherarnold.com](mailto:jlcox@fisherarnold.com)  
[www.fisherarnold.com](http://www.fisherarnold.com)

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---

**From:** Ben Brantley [<mailto:bbrantley@Ensafe.com>]  
**Sent:** Thursday, February 07, 2013 1:51 PM  
**To:** [jlcox@fisherarnold.com](mailto:jlcox@fisherarnold.com)  
**Cc:** Rachel Methvin; Kate Freeman  
**Subject:** Request for discharge - 2,000 gallons; NSA Mid-South

Hi Jim,

Attached is analytical data that is representative of two, 1,000 gallon tanks that are staging our well development water associated with drilling at NSA Mid-South. One sample was collected from each tank and the contaminants and maximum detected concentrations are the following: chloroform (1 ppb), 1,1 DCA (1 ppb), cis 1,2DCE (5.8 ppb), PCE (3 ppb), and TCE (13.8 ppb). With your permission, we'd like to release the collected water to the Millington sanitary sewer.

Thanks for your assistance.

Ben

**From:** Environmental Testing and Consulting, Inc. [<mailto:emailetc@etcmemphis.com>]  
**Sent:** Thursday, February 07, 2013 12:01 PM  
**To:** Ben Brantley; Kate Freeman  
**Subject:** 13-037-0223 00001

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This report is provided in Acrobat PDF format and requires the latest version of Acrobat Reader which can be downloaded free of charge at <http://www.adobe.com/products/acrobat/readstep2.html>. If you have any problems downloading or installing Acrobat Reader, please contact Customer Service by emailing [support@lmpcorp.com](mailto:support@lmpcorp.com)

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## Diane Maddux

---

**From:** Jim Cox <jlcox@fisherarnold.com>  
**Sent:** Thursday, February 14, 2013 7:13 AM  
**To:** Ben Brantley  
**Subject:** RE: Request for Discharge - NSA Mid-South

Ben,

This discharge of 4150 gallons is approved for the Millington Sewer System.

**James L. Cox**  
**Principal**  
**FISHER & ARNOLD, Inc.**

9180 Crestwyn Hills Drive  
Memphis, TN 38125  
(901) 748-1811 Office  
(901) 634-8004 Cell  
(901) 748-3115 Fax  
[jlcox@fisherarnold.com](mailto:jlcox@fisherarnold.com)  
[www.fisherarnold.com](http://www.fisherarnold.com)

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---

**From:** Ben Brantley [<mailto:bbrantley@Ensafes.com>]  
**Sent:** Wednesday, February 13, 2013 4:30 PM  
**To:** [jlcox@fisherarnold.com](mailto:jlcox@fisherarnold.com)  
**Cc:** Rachel Methvin  
**Subject:** Request for Discharge - NSA Mid-South

Hi Mr. Cox.

Please find enclosed analytical data associated with 4,150 gallons of well development water associated with drilling activities at NSA Mid-South. Low concentrations (< 10 ppb) of the chlorinated solvents cis,1-2 DCE, PCE, and TCE were detected by the laboratory in the collected water. With your permission, we'd like to discharge the water to the Millington sanitary sewer.

Sincerely,  
Ben

**From:** Environmental Testing and Consulting, Inc. [<mailto:emailetc@etcmemphis.com>]  
**Sent:** Wednesday, February 13, 2013 3:19 PM  
**To:** Ben Brantley  
**Subject:** 13-043-0211 00001

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Thanks.

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**Diane Maddux**

---

**To:** Methvin, Rachel M CIV NAVFAC MW, PWD Mid-South  
**Subject:** RE: Request for Discharge to Millington Sanitary Sewer (NSA Mid-South)

From: Jim Cox [<mailto:jlcox@fisherarnold.com>]  
Sent: Tuesday, February 05, 2013 9:50 AM  
To: Ben Brantley  
Subject: RE: Request for Discharge to Millington Sanitary Sewer (NSA Mid-South)

Ben,

I have reviewed the data that you provided. The discharge of 1300 gallons is approved for the Millington Sewer System.

James L. Cox

Principal

FISHER & ARNOLD, Inc.

9180 Crestwyn Hills Drive

Memphis, TN 38125

(901) 748-1811 Office

(901) 634-8004 Cell

(901) 748-3115 Fax

[jlcox@fisherarnold.com](mailto:jlcox@fisherarnold.com) <<mailto:jlcox@fisherarnold.com>>

[www.fisherarnold.com](http://www.fisherarnold.com) <<http://www.fisherarnold.com/>>

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From: Ben Brantley [ <<mailto:bbrantley@Ensaf.com>> <mailto:bbrantley@Ensaf.com>]  
Sent: Friday, February 01, 2013 5:31 PM  
To: <<mailto:jlcox@fisherarnold.com>> [jlcox@fisherarnold.com](mailto:jlcox@fisherarnold.com)  
Subject: Request for Discharge to Millington Sanitary Sewer (NSA Mid-South)

Hi Mr. Cox

On behalf of NSA Mid-South, we're requesting permission to dispose approximately 1,300 gallons of water generated during well drilling at NSA Mid-South.

The water was sampled for volatile organic compounds (VOCs), the contaminant of concern. The attached analytical results indicate VOCs were absent in the sample.

If you have any questions or need additional information please let me know.

Thanks for your assistance.

Ben

Ben Brantley

EnSafe Inc.

5724 Summer Trees Dr.

Memphis, TN 38134

901-372-7962

901-896-8457 (mobile)

<<mailto:bbrantley@ensaf.com>> [bbrantley@ensaf.com](mailto:bbrantley@ensaf.com)

<image001.jpg>

[www.ensafe.com](http://www.ensafe.com)

From: Environmental Testing and Consulting, Inc. [ <<mailto:emailetc@etcmemphis.com>>  
<mailto:emailetc@etcmemphis.com>]  
Sent: Friday, February 01, 2013 5:22 PM  
To: Ben Brantley; Wes Goodnight  
Subject: 13-029-0221 00001

Your report(s) are attached.

This report is provided in Acrobat PDF format and requires the latest version of Acrobat Reader which can be downloaded free of charge at  
<<http://www.adobe.com/products/acrobat/readstep2.html>>  
<http://www.adobe.com/products/acrobat/readstep2.html>. If you have any problems downloading or installing Acrobat Reader, please contact Customer Service by emailing  
<<mailto:support@lmpcorp.com>> [support@lmpcorp.com](mailto:support@lmpcorp.com) or by calling 800-494-2750 and ask for Support. Please verify receipt of the attached data.

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We appreciate your business. Please contact us with any questions.

Thanks.

Client Services

<<mailto:support@etcmemphis.com>> [support@etcmemphis.com](mailto:support@etcmemphis.com)

Help us to serve you better. We appreciate your business and value your opinions on our performance. Please take a moment to fill out this on-line survey. Click on the following link and go to Client Feedback Survey.

Client FeedbackSurvey <<http://survey.etcmemphis.com/clientfeedback.aspx?surl=etc>>

## Diane Maddux

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**From:** Jim Cox <jlcox@fisherarnold.com>  
**Sent:** Monday, March 25, 2013 7:28 AM  
**To:** Ben Brantley  
**Subject:** RE: Request for discharge

Ben,

This discharge of 300 gallons is approved for the Millington Sewer System. Thanks.

**James L. Cox**  
**Principal**  
**FISHER & ARNOLD, Inc.**

9180 Crestwyn Hills Drive  
Memphis, TN 38125  
(901) 748-1811 Office  
(901) 634-8004 Cell  
(901) 748-3115 Fax  
[jlcox@fisherarnold.com](mailto:jlcox@fisherarnold.com)  
[www.fisherarnold.com](http://www.fisherarnold.com)

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**From:** Ben Brantley [<mailto:bbrantley@Ensaf.com>]  
**Sent:** Thursday, March 21, 2013 5:10 PM  
**To:** Jim Cox  
**Subject:** Request for discharge

Hi Jim,,

With your permission, we'd like to discharge 300 gallons of purge water collected at NSA Mid-South to the Millington sanitary sewer. The water was collected during our February groundwater sampling activities. The attached analytical data indicates concentrations of tert-butylbenzene (0.37 ppb), cis-1,2 dichloroethylene (5 ppb), ethylbenzene (0.5 ppb), trichloroethylene (3 ppb), and xylenes (0.6 ppb) are present in the water.

Thanks for your assistance.

Ben

Ben Brantley  
EnSafe Inc.  
5724 Summer Trees Dr.  
Memphis, TN 38134  
901-372-7962  
901-896-8457 (mobile)  
[bbrantley@ensafe.com](mailto:bbrantley@ensafe.com)

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