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FIELD TASK MODIFICATION REQUEST FORM TO SAMPLING AND ANALYSIS PLAN FACILITY INVESTIGATION SOLID WASTE MANAGEMENT UNIT 18 (SWMU 18) LOAD AND FILL AREA SUBAREA D SP AREA NSA CRANE IN
2/15/2013
TETRA TECH

TETRA TECH

FIELD TASK MODIFICATION REQUEST FORM

Project/Installation Name SWMU 18 – Load and Fill Area, NSA Crane, IN	CTO & Project Number CTO F201; 112G01851	Task Modification Number D001
Modification to: Sampling and Analysis Plan, RCRA Facility Investigation, SWMU 18-Load and Fill Area	**Site Location** Subarea D – SP Area	**Date of Request** February 15, 2013

Background. Tetra Tech performed RCRA Facility Investigation (RFI) sampling at Subarea D – SP Area – from October 2011 through January 2012 that included the collection of surface and subsurface soil samples, composite soil samples, and groundwater samples. Analyses included explosives and metals. Volatile organic compounds (VOCs) and semivolatile organic compounds (SVOCs), including polynuclear aromatic hydrocarbons (PAHs), were also analyzed in surface and subsurface soil samples around Building 2707, VOCs were also analyzed in groundwater. Polychlorinated biphenyls were analyzed in two composite soil sample. The distribution of constituents in the site media are illustrated on Figures D-2 and D-3.

Based on the human risk assessment, unacceptable risks were estimated for hypothetical future resident for PAHs in surface soil and VOCs and metals in groundwater. PAHs occurred in the surface soil at locations on the northern, eastern, and southern sides of Building 2707. In groundwater, trichloroethene (TCE) and vinyl chloride and aluminum, arsenic, beryllium, cobalt, iron, and manganese were of concern. Table D-1 summarizes the results of the risk assessment for Subarea D based on the data collected to date. To characterize the nature and extent of contamination in site media at Subarea D, additional activities are proposed.

Purpose of FTMR. The purpose of this FTMR form is to present the supplemental sampling to: 1) collect surface and subsurface soil samples to define the lateral and vertical extent of PAHs contamination in the area of Building 2707 and Subarea D and 2) characterize soil in the southwestern portion of Subarea D to determine if VOC contamination in soil is present that may be contributing to groundwater contamination.

Proposed Supplemental Activities. The supplemental sampling will be performed as described in this FTMR form and the approved September 2011 SAP. This FTMR form includes figures and tables to perform the proposed additional activities.

The approximate locations of the supplemental surface soil samples are shown on Figure D-5; the supplemental sampling and analysis is presented on attached Table D-4 and described as follows:

- **Soil:** Seventeen soil borings will be advanced at Subarea D to collect surface and subsurface soil samples.

  - Six soil borings (18DSB019 through 18DSB024) will be advanced from around the perimeter of Subarea D to assess if PAH contamination is present throughout Subarea D. The soil borings will be advanced using direct-push technology (DPT) to refusal. A surface soil sample will be collected from each location from 0 to 2 feet below ground surface (bgs) for PAHs analysis. The remaining 1-foot intervals from each boring will be held for possible analysis pending the results of the surface soil.

  - Six soil borings (18DSB025 through 18DSB030) will be advanced from around Building 2707 to further characterize PAH contamination in soil around the building. Soil samples will also be collected from previously sampled 18DSB012, 18DSB013, and 18DSB015. The soil borings will be advanced using DPT to refusal. Soil sample will be collected from each location from 0 to 1 feet, 1 to 2 feet, and 2 to 3 feet bgs for PAHs analysis. The remaining 1-foot intervals from each boring will be held for possible analysis pending the results of the surface soil. Soil samples from boring 18DSB027 will also be analyzed for VOC analyses.

- Soil samples will be collected from two soil boring locations previously advanced Subarea D: 18SB009 and 18DSB016. These locations are along the southwestern side of Building 143 near sewer lines. These borings will be advanced using DPT to refusal. A surface soil sample (0 to 2 feet bgs) and a subsurface soil sample (based on field screening reading or refusal) will be collected for PAH and VOC analyses.

Attachments to this FTMR include:

Figures
Figure D-1 Distribution of Constituents in Soil
Figure D-2 Distribution of Constituents in Surface and Sediment
Figure D-3 Distribution of Constituents in Groundwater
Figure D-4 Groundwater Potentiometric Map
Figure D-5 Proposed Supplemental Sampling Locations

Table
Table 1 Summary of Receptor-Specific Human Risks and Hazards and Ecological Risks
Table 2 Proposed Supplemental Sampling and Analysis

Reason for Change/Modification: Supplemental activities for characterization of nature and extent of constituents of concern, based on potential unacceptable human health and ecological risks.

Person Requesting Change/Modification:

2/15/13

Tim Evans, Project Manager / Date

Approvals:

2/15/13

Ralph Basinski, Tetra Tech Activity Coordinator / Date

Modifications to the HASP required based on this change? ☐ Yes ☒ No ☐ NA

Health Safety Manager (Signature) **Date**

FIGURES

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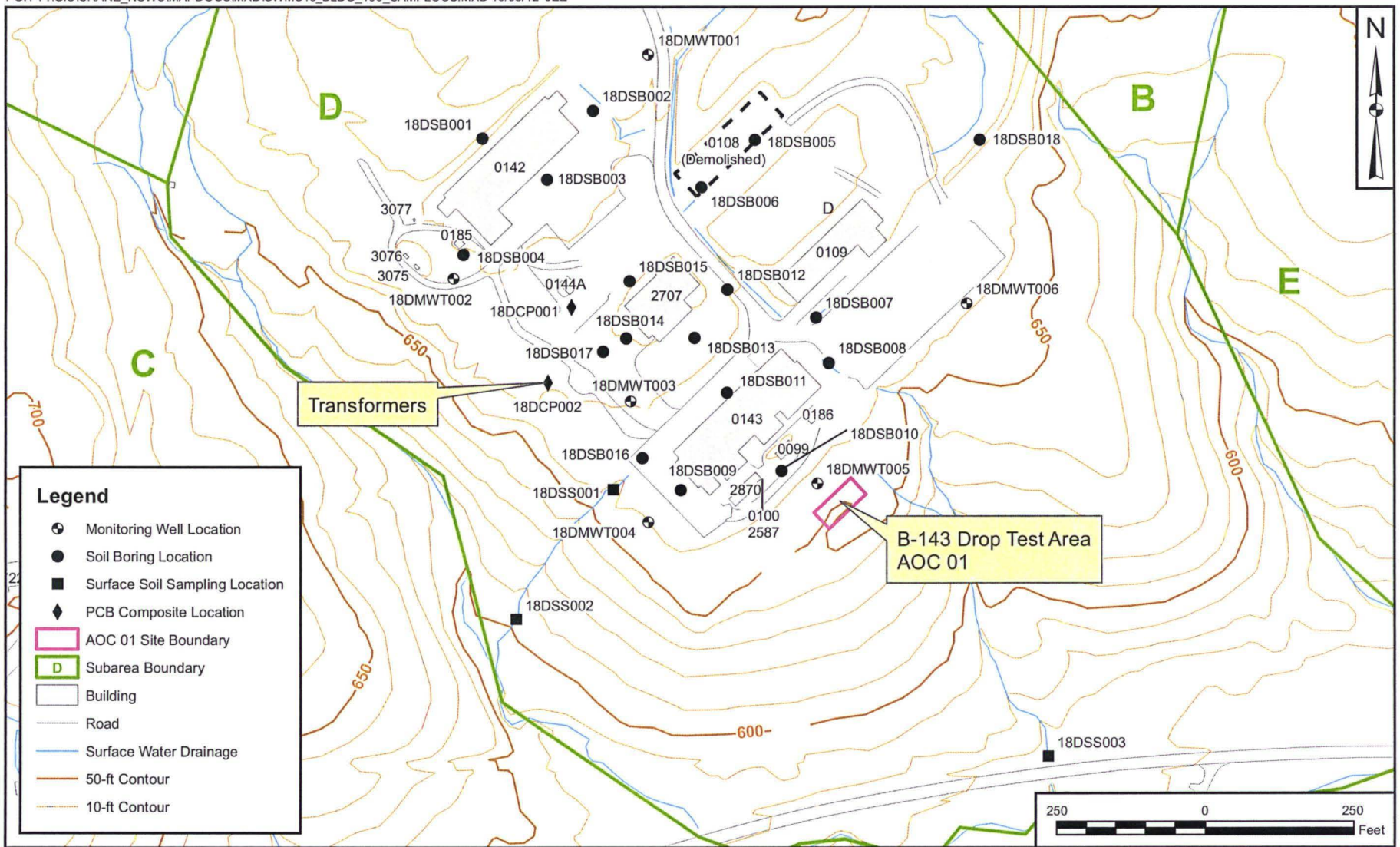

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J. ENGLISH	10/03/12
SCALE	
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SUBAREA D - SPECIAL PROGRAMS AREA
SAMPLE LOCATIONS
SWMU 18 - LOAD & FILL AREA
NSA CRANE
CRANE, INDIANA

CONTRACT NUMBER	CTO NUMBER
1851	F201
APPROVED BY	DATE
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FIGURE NO.	REV
FIGURE D-1	0

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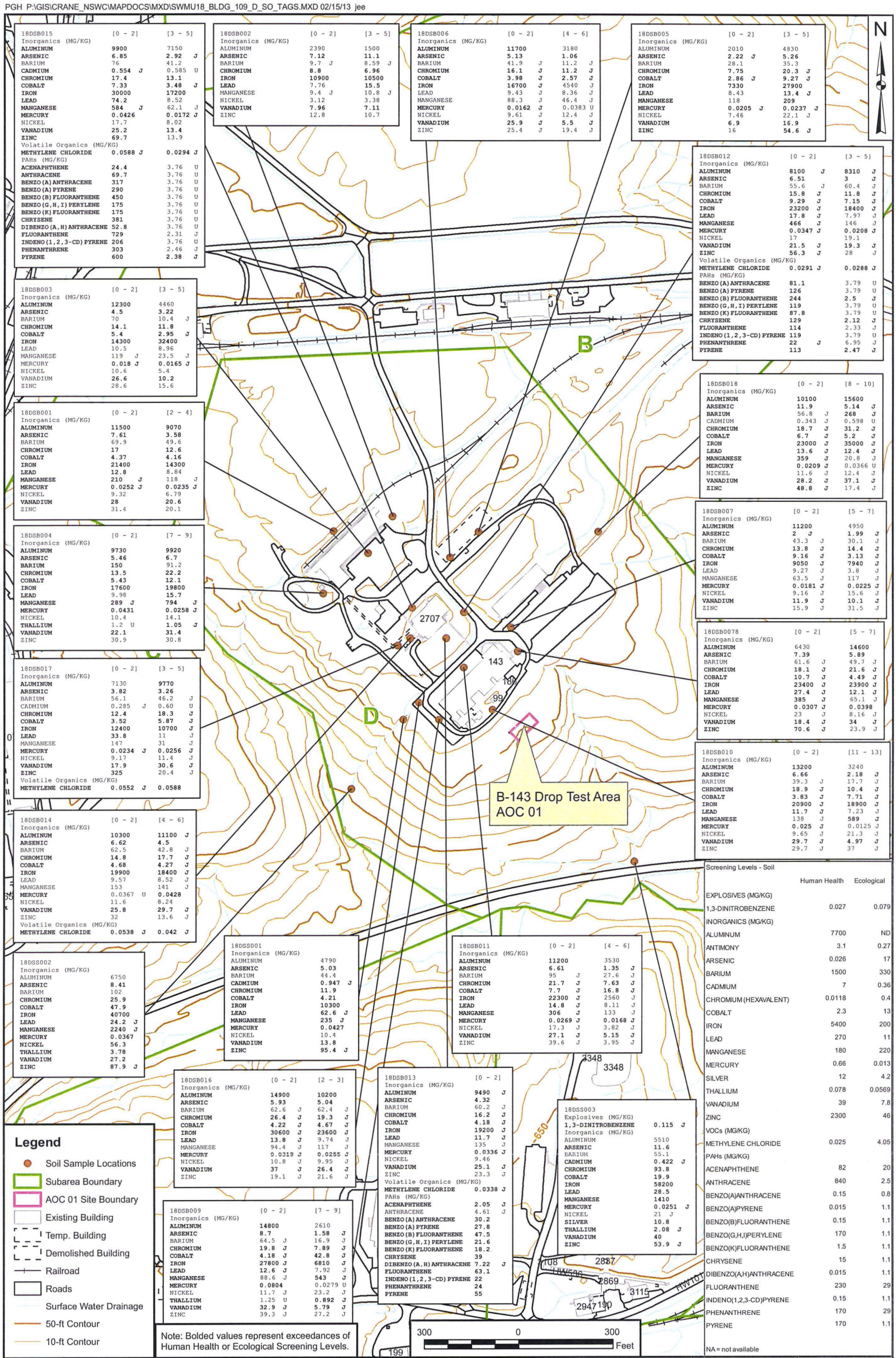

18DSB015	[0 - 2]	[3 - 5]
Inorganics (MG/KG)		
ALUMINUM	**9900**	7150
ARSENIC	**6.85**	**2.92 J**
BARIUM	76	41.2
CADMIUM	**0.554 J**	0.585 U
CHROMIUM	**17.4**	**13.1**
COBALT	**7.33**	**3.48 J**
IRON	**30000**	**17200**
LEAD	**74.2**	8.52
MANGANESE	**584 J**	62.1 J
MERCURY	**0.0426**	**0.0172 J**
NICKEL	17.7	8.02
VANADIUM	**25.2**	**13.4**
ZINC	**69.7**	13.9
Volatile Organics (MG/KG)		
METHYLENE CHLORIDE	**0.0588 J**	**0.0294 J**
PAHs (MG/KG)		
ACENAPHTHENE	**24.4**	3.76 U
ANTHRACENE	**69.7**	3.76 U
BENZO(A)ANTHRACENE	**317**	3.76 U
BENZO(A)PYRENE	**290**	3.76 U
BENZO(B)FLUORANTHENE	**450**	3.76 U
BENZO(G,H,I)PERYLENE	**175**	3.76 U
BENZO(K)FLUORANTHENE	**175**	3.76 U
CHRYSENE	**381**	3.76 U
DIBENZO(A,H)ANTHRACENE	**52.8**	3.76 U
FLUORANTHENE	**729**	2.31 J
INDENO(1,2,3-CD)PYRENE	**206**	3.76 U
PHENANTHRENE	**303**	2.46 J
PYRENE	**600**	**2.38 J**

18DSB002	[0 - 2]	[3 - 5]
Inorganics (MG/KG)		
ALUMINUM	2390	1500
ARSENIC	**7.12**	**11.1**
BARIUM	9.7 J	8.59 J
CHROMIUM	**8.8**	**6.96**
IRON	**10900**	**10500**
LEAD	7.76	**15.5**
MANGANESE	9.4 J	10.8 J
NICKEL	3.12	3.38
VANADIUM	**7.96**	**7.11**
ZINC	12.8	10.7

18DSB006	[0 - 2]	[4 - 6]
Inorganics (MG/KG)		
ALUMINUM	**11700**	3180
ARSENIC	**5.13**	**1.06**
BARIUM	41.9 J	11.2 J
CHROMIUM	**16.1 J**	**11.2 J**
COBALT	**3.98 J**	**2.57 J**
IRON	**16700 J**	4540 J
LEAD	9.43 J	8.36 J
MANGANESE	88.3 J	46.4 J
MERCURY	**0.0162 J**	0.0383 U
NICKEL	9.61 J	12.4 J
VANADIUM	**25.9 J**	**5.5 J**
ZINC	25.4 J	19.4 J

18DSB005	[0 - 2]	[3 - 5]
Inorganics (MG/KG)		
ALUMINUM	2010	4830
ARSENIC	**2.22 J**	**5.26**
BARIUM	28.1	35.3
CHROMIUM	**7.75**	**20.3 J**
COBALT	**2.86 J**	**9.27 J**
IRON	**7330**	**27900**
LEAD	8.43	**13.4 J**
MANGANESE	118	**209**
MERCURY	**0.0205 J**	**0.0237 J**
NICKEL	7.46	22.1 J
VANADIUM	**6.9**	**16.9**
ZINC	16	**54.6 J**

18DSB012	[0 - 2]	[3 - 5]
Inorganics (MG/KG)		
ALUMINUM	**8100 J**	**8310 J**
ARSENIC	**6.51**	**3 J**
BARIUM	55.6 J	60.4 J
CHROMIUM	**15.8 J**	**11.8 J**
COBALT	**9.29 J**	**7.15 J**
IRON	**23200 J**	**18400 J**
LEAD	**17.8 J**	7.97 J
MANGANESE	**466 J**	146 J
MERCURY	**0.0347 J**	**0.0208 J**
NICKEL	17	19.1
VANADIUM	**21.5 J**	**19.3 J**
ZINC	**56.3 J**	28 J
Volatile Organics (MG/KG)		
METHYLENE CHLORIDE	**0.0291 J**	**0.0288 J**
PAHs (MG/KG)		
BENZO(A)ANTHRACENE	**81.1**	3.79 U
BENZO(A)PYRENE	**126**	3.79 U
BENZO(B)FLUORANTHENE	**244**	**2.5 J**
BENZO(G,H,I)PERYLENE	**119**	3.79 U
BENZO(K)FLUORANTHENE	**87.8**	3.79 U
CHRYSENE	**129**	**2.12 J**
FLUORANTHENE	**114**	2.33 J
INDENO(1,2,3-CD)PYRENE	**119**	3.79 U
PHENANTHRENE	**22 J**	6.95 J
PYRENE	**113**	**2.47 J**

18DSB003	[0 - 2]	[3 - 5]
Inorganics (MG/KG)		
ALUMINUM	**12300**	4460
ARSENIC	**4.5**	**3.22**
BARIUM	70	10.4 J
CHROMIUM	**14.1**	**11.8**
COBALT	**5.4**	**2.95 J**
IRON	**14300**	**32400**
LEAD	10.5	8.96
MANGANESE	119 J	23.5 J
MERCURY	**0.018 J**	**0.0165 J**
NICKEL	10.6	5.4
VANADIUM	**26.6**	**10.2**
ZINC	28.6	15.6

18DSB018	[0 - 2]	[8 - 10]
Inorganics (MG/KG)		
ALUMINUM	**10100**	**15600**
ARSENIC	**11.9**	**5.14 J**
BARIUM	56.8 J	**268 J**
CADMIUM	0.343 J	0.598 U
CHROMIUM	**18.7 J**	**31.2 J**
COBALT	**6.7 J**	**5.2 J**
IRON	**23000 J**	**35000 J**
LEAD	**13.6 J**	**12.4 J**
MANGANESE	**359 J**	20.8 J
MERCURY	**0.0209 J**	0.0366 U
NICKEL	11.6 J	12.4 J
VANADIUM	**28.2 J**	**37.1 J**
ZINC	**48.8 J**	17.4 J

18DSB001	[0 - 2]	[2 - 4]
Inorganics (MG/KG)		
ALUMINUM	**11500**	**9070**
ARSENIC	**7.61**	**3.58**
BARIUM	69.9	49.6
CHROMIUM	**17**	**12.6**
COBALT	**4.37**	**4.16**
IRON	**21400**	**14300**
LEAD	**12.8**	8.84
MANGANESE	**210 J**	118 J
MERCURY	**0.0252 J**	**0.0235 J**
NICKEL	9.32	6.79
VANADIUM	**28**	**20.6**
ZINC	31.4	20.1

18DSB004	[0 - 2]	[7 - 9]
Inorganics (MG/KG)		
ALUMINUM	**9730**	**9920**
ARSENIC	**5.46**	**6.7**
BARIUM	**150**	91.2
CHROMIUM	**13.5**	**22.2**
COBALT	**5.43**	**12.1**
IRON	**17600**	**19800**
LEAD	9.98	**15.7**
MANGANESE	**289 J**	**794 J**
MERCURY	**0.0431**	**0.0258 J**
NICKEL	10.4	14.1
THALLIUM	1.2 U	**1.05 J**
VANADIUM	**22.1**	**31.4**
ZINC	30.9	30.8

18DSB007	[0 - 2]	[5 - 7]
Inorganics (MG/KG)		
ALUMINUM	**11200**	4950
ARSENIC	**2 J**	**1.99 J**
BARIUM	43.3 J	30.1 J
CHROMIUM	**13.8 J**	**14.4 J**
COBALT	**9.16 J**	**3.13 J**
IRON	**9050 J**	**7940 J**
LEAD	9.27 J	3.8 J
MANGANESE	63.5 J	117 J
MERCURY	**0.0181 J**	**0.0225 J**
NICKEL	9.16 J	15.6 J
VANADIUM	**11.9 J**	**10.1 J**
ZINC	15.9 J	31.5 J

18DSB0078	[0 - 2]	[5 - 7]
Inorganics (MG/KG)		
ALUMINUM	6430	**14600**
ARSENIC	**7.39**	**5.89**
BARIUM	61.6 J	49.7 J
CHROMIUM	**18.1 J**	**21.6 J**
COBALT	**10.7 J**	**4.49 J**
IRON	**23400 J**	**23900 J**
LEAD	**27.4 J**	**12.1 J**
MANGANESE	**385 J**	65.1 J
MERCURY	**0.0307 J**	**0.0398**
NICKEL	23 J	8.16 J
VANADIUM	**18.4 J**	**34 J**
ZINC	**70.6 J**	23.9 J

18DSB017	[0 - 2]	[3 - 5]
Inorganics (MG/KG)		
ALUMINUM	7130	**9770**
ARSENIC	**3.82**	**3.26**
BARIUM	56.1	46.2 J
CADMIUM	0.285 J	0.60 U
CHROMIUM	**12.4**	**18.3 J**
COBALT	**3.52**	**5.87 J**
IRON	**12400**	**10700 J**
LEAD	**33.8**	11 J
MANGANESE	147	31 J
MERCURY	**0.0234 J**	**0.0256 J**
NICKEL	9.17	11.4 J
VANADIUM	**17.9**	**30.6 J**
ZINC	**325**	20.4 J
Volatile Organics (MG/KG)		
METHYLENE CHLORIDE	**0.0552 J**	**0.0588**

18DSB010	[0 - 2]	[11 - 13]
Inorganics (MG/KG)		
ALUMINUM	**13200**	3240
ARSENIC	**6.66**	**2.18 J**
BARIUM	39.3 J	17.7 J
CHROMIUM	**18.9 J**	**10.4 J**
COBALT	**3.83 J**	**7.71 J**
IRON	**20900 J**	**18900 J**
LEAD	**11.7 J**	7.23 J
MANGANESE	138 J	**589 J**
MERCURY	**0.025 J**	0.0125 J
NICKEL	9.65 J	21.3 J
VANADIUM	**29.7 J**	**4.97 J**
ZINC	29.7 J	37 J

18DSB014	[0 - 2]	[4 - 6]
Inorganics (MG/KG)		
ALUMINUM	**10300**	**11100 J**
ARSENIC	**6.62**	**4.5**
BARIUM	62.5	42.8 J
CHROMIUM	**14.8**	**17.7 J**
COBALT	**4.68**	**4.27 J**
IRON	**19900**	**18400 J**
LEAD	9.57	8.52 J
MANGANESE	153	141 J
MERCURY	0.0367 U	**0.0428**
NICKEL	11.6	8.24
VANADIUM	**25.8**	**29.7 J**
ZINC	32	13.6 J
Volatile Organics (MG/KG)		
METHYLENE CHLORIDE	**0.0538 J**	**0.042 J**

18DSS002	
Inorganics (MG/KG)	
ALUMINUM	6750
ARSENIC	**8.41**
BARIUM	102
CHROMIUM	**25.9**
COBALT	**47.9**
IRON	**40700**
LEAD	**24.2 J**
MANGANESE	**2240 J**
MERCURY	**0.0367**
NICKEL	**56.3**
THALLIUM	**3.78**
VANADIUM	**27.2**
ZINC	**87.9 J**

18DSS001	
Inorganics (MG/KG)	
ALUMINUM	4790
ARSENIC	**5.03**
BARIUM	44.4
CADMIUM	**0.947 J**
CHROMIUM	**11.9**
COBALT	**4.21**
IRON	**10300**
LEAD	**62.6 J**
MANGANESE	**235 J**
MERCURY	**0.0427**
NICKEL	10.4
VANADIUM	**13.8**
ZINC	**95.4 J**

18DSB011	[0 - 2]	[4 - 6]
Inorganics (MG/KG)		
ALUMINUM	**11200**	3530
ARSENIC	**6.61**	**1.35 J**
BARIUM	95 J	27.6 J
CHROMIUM	**21.7 J**	**7.63 J**
COBALT	**7.7 J**	**16.8 J**
IRON	**22300 J**	2560 J
LEAD	**14.8 J**	8.11 J
MANGANESE	**306 J**	133 J
MERCURY	**0.0269 J**	**0.0168 J**
NICKEL	17.3 J	3.82 J
VANADIUM	**27.1 J**	**5.15 J**
ZINC	39.6 J	3.95 J

18DSB016	[0 - 2]	[2 - 3]
Inorganics (MG/KG)		
ALUMINUM	**14900**	**10200**
ARSENIC	**5.93**	**5.04**
BARIUM	62.6 J	62.4 J
CHROMIUM	**26.4 J**	**19.3 J**
COBALT	**4.22 J**	**4.67 J**
IRON	**30600 J**	**23600 J**
LEAD	**13.8 J**	9.74 J
MANGANESE	94.4 J	117 J
MERCURY	**0.0319 J**	**0.0255 J**
NICKEL	10.8 J	9.95 J
VANADIUM	**37 J**	**26.4 J**
ZINC	19.1 J	21.6 J

18DSB013	[0 - 2]
Inorganics (MG/KG)	
ALUMINUM	**9490 J**
ARSENIC	**4.32**
BARIUM	60.2 J
CHROMIUM	**16.2 J**
COBALT	**4.18 J**
IRON	**19200 J**
LEAD	**11.7 J**
MANGANESE	135 J
MERCURY	**0.0336 J**
NICKEL	9.46
VANADIUM	**25.1 J**
ZINC	23.3 J
Volatile Organics (MG/KG)	
METHYLENE CHLORIDE	**0.0338 J**
PAHs (MG/KG)	
ACENAPHTHENE	**2.05 J**
ANTHRACENE	4.61 J
BENZO(A)ANTHRACENE	**30.2**
BENZO(A)PYRENE	**27.8**
BENZO(B)FLUORANTHENE	**47.5**
BENZO(G,H,I)PERYLENE	**21.6**
BENZO(K)FLUORANTHENE	**18.2**
CHRYSENE	**39**
DIBENZO(A,H)ANTHRACENE	**7.22 J**
FLUORANTHENE	**63.1**
INDENO(1,2,3-CD)PYRENE	**22**
PHENANTHRENE	**24**
PYRENE	**55**

18DSS003	
Explosives (MG/KG)	
1,3-DINITROBENZENE	**0.115 J**
Inorganics (MG/KG)	
ALUMINUM	5510
ARSENIC	**11.6**
BARIUM	55.1
CADMIUM	**0.422 J**
CHROMIUM	**93.8**
COBALT	**19.9**
IRON	**58200**
LEAD	**28.5**
MANGANESE	**1410**
MERCURY	**0.0251 J**
NICKEL	21 J
SILVER	**10.8**
THALLIUM	**2.08 J**
VANADIUM	**40**
ZINC	**53.9 J**

18DSB009	[0 - 2]	[7 - 9]
Inorganics (MG/KG)		
ALUMINUM	**14800**	2610
ARSENIC	**8.7**	**1.58 J**
BARIUM	64.5 J	16.9 J
CHROMIUM	**19.8 J**	**7.89 J**
COBALT	**4.18 J**	**42.8 J**
IRON	**27800 J**	**6810 J**
LEAD	**12.6 J**	7.92 J
MANGANESE	88.6 J	**543 J**
MERCURY	**0.0804**	0.0279 U
NICKEL	11.7 J	23.2 J
THALLIUM	1.25 U	**0.892 J**
VANADIUM	**32.9 J**	**5.79 J**
ZINC	39.3 J	27.2 J

Legend

- Soil Sample Locations
- Subarea Boundary
- AOC 01 Site Boundary
- Existing Building
- Temp. Building
- Demolished Building
- Railroad
- Roads
- Surface Water Drainage
- 50-ft Contour
- 10-ft Contour

Note: Bolded values represent exceedances of Human Health or Ecological Screening Levels.

Screening Levels - Soil	Human Health	Ecological
EXPLOSIVES (MG/KG)		
1,3-DINITROBENZENE	0.027	0.079
INORGANICS (MG/KG)		
ALUMINUM	7700	ND
ANTIMONY	3.1	0.27
ARSENIC	0.026	17
BARIUM	1500	330
CADMIUM	7	0.36
CHROMIUM (HEXAVALENT)	0.0118	0.4
COBALT	2.3	13
IRON	5400	200
LEAD	270	11
MANGANESE	180	220
MERCURY	0.66	0.013
SILVER	12	4.2
THALLIUM	0.078	0.0569
VANADIUM	39	7.8
ZINC	2300	46
VOCs (MG/KG)		
METHYLENE CHLORIDE	0.025	4.05
PAHs (MG/KG)		
ACENAPHTHENE	82	20
ANTHRACENE	840	2.5
BENZO(A)ANTHRACENE	0.15	0.8
BENZO(A)PYRENE	0.015	1.1
BENZO(B)FLUORANTHENE	0.15	1.1
BENZO(G,H,I)PERYLENE	170	1.1
BENZO(K)FLUORANTHENE	1.5	1.1
CHRYSENE	15	1.1
DIBENZO(A,H)ANTHRACENE	0.015	1.1
FLUORANTHENE	230	29
INDENO(1,2,3-CD)PYRENE	0.15	1.1
PHENANTHRENE	170	29
PYRENE	170	1.1

NA = not available

DRAWN BY	DATE
J. NOVAK	09/06/12
CHECKED BY	DATE
T. EVANS	02/15/13
REVISED BY	DATE
D. COUCH	02/12/13
SCALE	
AS NOTED	

NAVFAC

SUBAREA D - SPECIAL PROGRAMS AREA
EXCEEDANCES OF ANALYTES IN SOIL
SWMU 18 - LOAD & FILL AREA
NSA CRANE
CRANE, INDIANA

CONTRACT NUMBER	CTO NUMBER
1851	F201
APPROVED BY	DATE
APPROVED BY	DATE
FIGURE NO. FIGURE D-2	REV 0

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Note: Bolded values represent exceedances of Human Health or Ecological Screening Levels.

N

HW010
HW512
HW011
HW045
700
650
600
101
102
109
142
143
144A
2707
3076
3214
3348
99
100
2870

B

18DMWT001

Total Inorganics (UG/L)		
ALUMINUM	28.5	J
IRON	12.7	J
MANGANESE	6.89	
NICKEL	1.56	J
Filtered Inorganics (UG/L)		
ALUMINUM	21.1	J
MANGANESE	8.36	
NICKEL	1.8	J

18DMWT002

Total Inorganics (UG/L)		
ALUMINUM	346	
ARSENIC	**0.861**	**J**
BERYLLIUM	1.08	J
CADMIUM	0.561	J
CHROMIUM	**0.674**	**J**
COBALT	**144**	
IRON	157	
MANGANESE	**1720**	
MERCURY	**0.549**	
NICKEL	**269**	
Volatile Organics (UG/L)		
CIS-1,2-DICHLOROETHENE	**12.7**	
TRICHLOROETHENE	0.251	J
VINYL CHLORIDE	**0.6**	**J**

18DMWT006

Explosives (UG/L)		
NITROBENZENE	**0.633**	
Total Inorganics (UG/L)		
ALUMINUM	**5690**	**J**
ARSENIC	**4.73**	**J**
BERYLLIUM	0.59	J
CHROMIUM	**22.2**	
COBALT	**133**	
IRON	**27900**	**J**
MANGANESE	**7970**	
NICKEL	**358**	
VANADIUM	**14.6**	
Filtered Inorganics (UG/L)		
COBALT	**118**	
MANGANESE	**7340**	
NICKEL	**310**	

18DMWT003

Total Inorganics (UG/L)		
ALUMINUM	896	
BERYLLIUM	0.793	J
COBALT	**57.1**	
IRON	299	
MANGANESE	**7290**	
NICKEL	**194**	
Volatile Organics (UG/L)		
CHLOROFORM	**0.309**	**J**
TRICHLOROETHENE	**0.544**	**J**

18DMWT005

Total Inorganics (UG/L)		
ALUMINUM	1530	
ARSENIC	**5.5**	
BERYLLIUM	**5.34**	
CADMIUM	**0.767**	**J**
CHROMIUM	**0.783**	**J**
COBALT	**57.2**	
IRON	**1700**	
MANGANESE	**606**	
MERCURY	0.198	J
NICKEL	**75.8**	
Volatile Organics (UG/L)		
CHLOROFORM	**0.749**	**J**
CIS-1,2-DICHLOROETHENE	1.98	
TRICHLOROETHENE	**0.965**	**J**

18DMWT004

Total Inorganics (UG/L)		
ALUMINUM	1260	
BERYLLIUM	0.958	J
CADMIUM	0.26	J
COBALT	**52.3**	
IRON	126	
MANGANESE	**3070**	
NICKEL	**139**	
Volatile Organics (UG/L)		
CHLOROFORM	**0.323**	**J**
TRICHLOROETHENE	**10.8**	

B-143 Drop Test Area
AOC 01

Screening Levels	Groundwater Human Health
Explosives (ug/L)	
Nitrobenzene	0.12
Volatile Organic (ug/L)	
Chloroform	0.19
cis-1,2-Dichloroethene	2.8
Trichloroethene	0.26
Vinyl Chloride	0.015
Inorganics (ug/L)	
Aluminum	1,600
Arsenic	0.045
Beryllium	1.6
Cadmium	0.69
Chromium (HEXAVALENT)	0.031
Cobalt	0.47
Iron	1,100
Manganese	32
Mercury	0.43
Nickel	30
Vanadium	7.8
Zinc	470

NA = not available

Legend

- Monitoring Well Location
- Subarea Boundary
- AOC 01 Site Boundary
- Existing Building
- Temp. Building
- Demolished Building
- Railroad
- Roads
- Surface Water Drainage
- 50-ft Contour
- 10-ft Contour

200 0 200 Feet

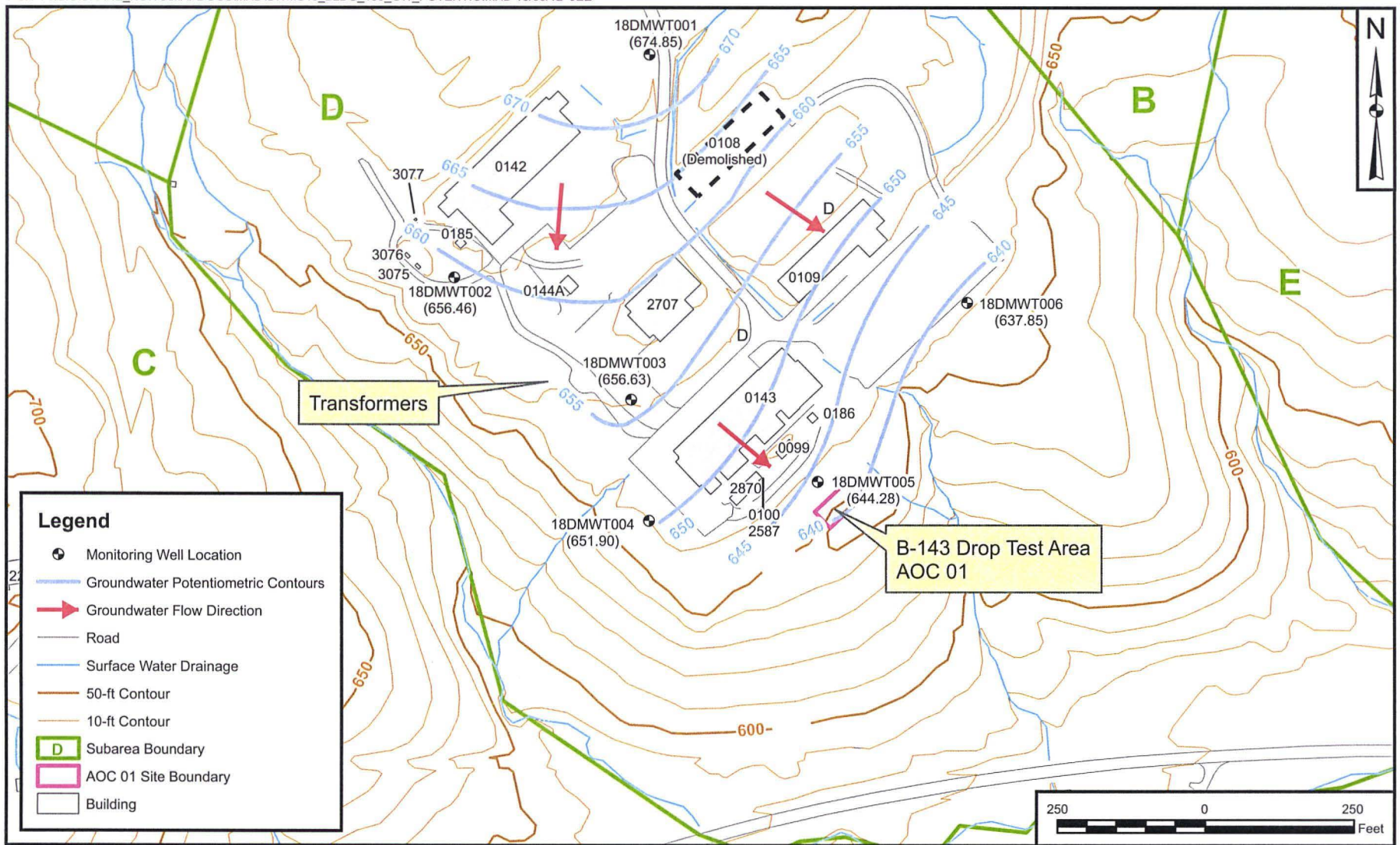
DRAWN BY	DATE
J. NOVAK	09/06/12
CHECKED BY	DATE
T. EVANS	02/15/13
REVISED BY	DATE
D. COUCH	02/13/13
SCALE	
AS NOTED	

NAVFAC

SUBAREA D - SPECIAL PROGRAMS AREA
EXCEEDANCES OF ANALYTES IN GROUNDWATER
SWMU 18 - LOAD & FILL AREA
NSA CRANE
CRANE, INDIANA

CONTRACT NUMBER	CTO NUMBER
1851	F201
APPROVED BY	DATE
APPROVED BY	DATE
FIGURE NO. FIGURE D-3	REV 0

PGH P:\GIS\CRANE_NSWC\MAPDOCS\MXD\SWMU18_BLDG_109_GW_POTENTIO.MXD 10/03/12 JEE



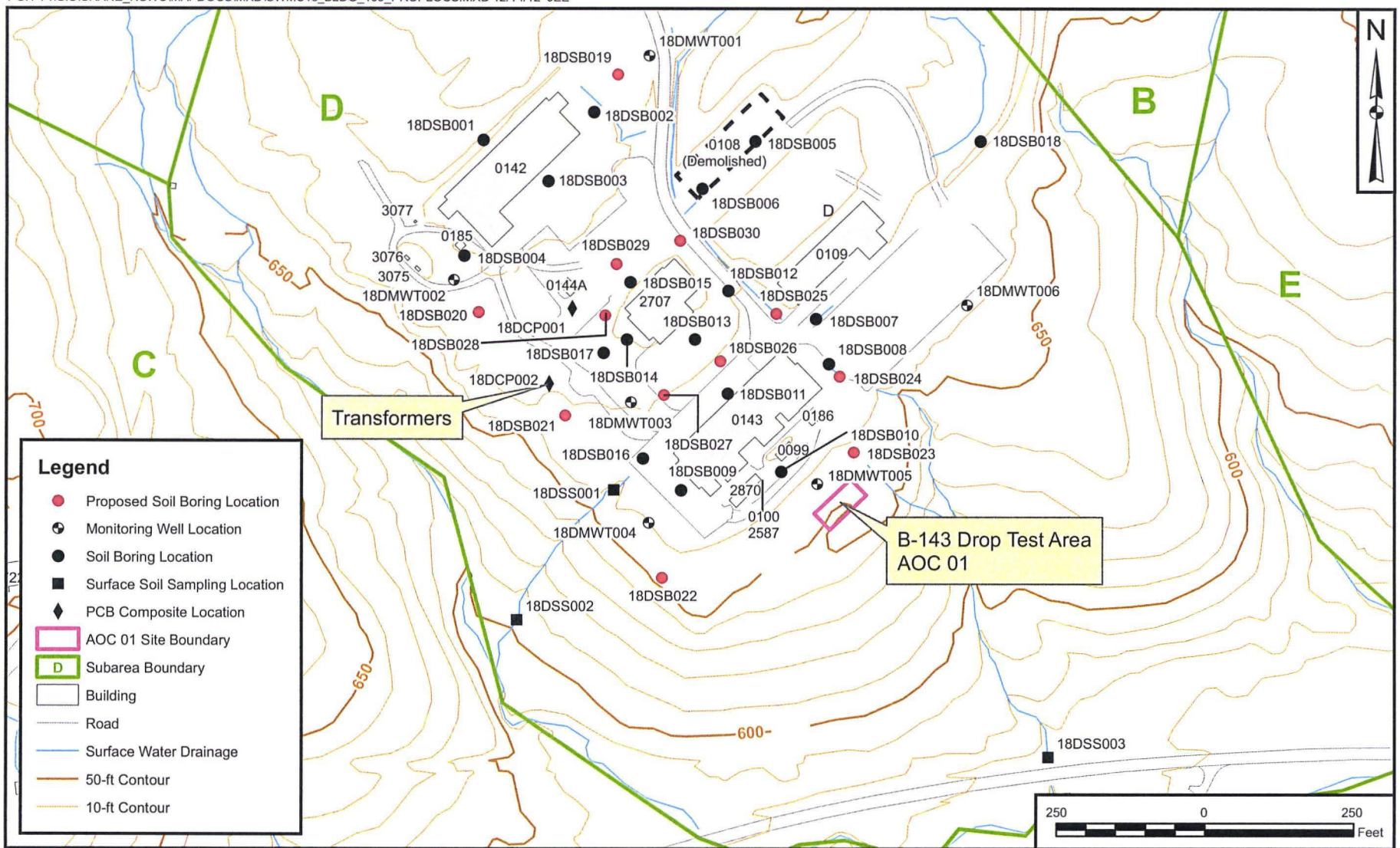
DRAWN BY	DATE
C. TULLEY	03/06/12
CHECKED BY	DATE
T. EVANS	10/03/12
REVISED BY	DATE
J. ENGLISH	10/03/12
SCALE	
AS NOTED	

NAVFAC

SUBAREA D - SPECIAL PROGRAMS AREA
GROUNDWATER POTENTIOMETRIC MAP
SWMU 18 - LOAD & FILL AREA
NSA CRANE
CRANE, INDIANA

CONTRACT NUMBER	CTO NUMBER
1851	F201
APPROVED BY	DATE
—	—
APPROVED BY	DATE
—	—
FIGURE NO.	REV
FIGURE D-4	0

PGH P:\GIS\CRANE_NSWC\MAPDOCS\MXD\SWMU18_BLDG_109_PROPLOCS.MXD 12/14/12 JEE



DRAWN BY	DATE
J. ENGLISH	10/03/12
CHECKED BY	DATE
C. RUMER	12/14/12
REVISED BY	DATE
—	—
SCALE	
AS NOTED	

NAVFAC

SUBAREA D - SPECIAL PROGRAMS AREA
PROPOSED SAMPLE LOCATIONS
SWMU 18 - LOAD & FILL AREA
NSA CRANE
CRANE, INDIANA

CONTRACT NUMBER	CTO NUMBER
1851	F201
APPROVED BY	DATE
—	—
APPROVED BY	DATE
—	—
FIGURE NO.	REV
FIGURE D-5	0

TABLES

TABLE D-1

SUMMARY OF ENVIRONMENTAL SAMPLES AND LABORATORY ANALYSIS
SUBAREA D - SP AREA
SWMU 18 - LOAD AND FILL AREA
NAVAL SUPPORT ACTIVITY
CRANE, INDIANA

Sample Location	Sample Identification	Sample Type	Date Sampled	Sample Depth Interval Sampled (feet bgs)	Energetics		Metals		VOCs	SVOCs	PCBs	Miscellaneous	Comments
					Nitroaromatics/ Nitramines	NG	TAL Metals (total)	TAL Metals (dissolved)				pH	
Subarea D - SP Area													
18DSS001	18DSS0010002	Surface Soil	20-Oct-11	0-2	X	X	X					X	
18DSS002	18DSS0020002	Surface Soil	20-Oct-11	0-2	X	X	X						
18DSS003	18DSS0030002	Surface Soil	20-Oct-11	0-2	X	X	X						
18DSB001	18DSB0010002	Surface Soil	25-Oct-11	0-2	X	X	X						
	18DSB0010204	Subsurface Soil	25-Oct-11	2-4	X	X	X						
18DSB002	18DSB0020002	Surface Soil	25-Oct-11	0-2	X	X	X						
	18DSB0020305	Subsurface Soil	25-Oct-11	3-5	X	X	X						
18DSB003	18DSB0030002	Surface Soil	25-Oct-11	0-2	X	X	X						
	18DSB0030305	Subsurface Soil	25-Oct-11	3-5	X	X	X						
18DSB004	18DSB0040002	Surface Soil	25-Oct-11	0-2	X	X	X						
	18DSB0040709	Subsurface Soil	25-Oct-11	7-9	X	X	X						
18DSB005	18DSB0050002	Surface Soil	24-Oct-11	0-2	X	X	X						
	18DSB0050305	Subsurface Soil	24-Oct-11	3-5	X	X	X						Field Duplicate FD102411-01 on metals only
18DSB006	18DSB0060002	Surface Soil	24-Oct-11	0-2	X	X	X						
	18DSB0060406	Subsurface Soil	24-Oct-11	4-6	X	X	X						
18DSB007	18DSB0070002	Surface Soil	24-Oct-11	0-2	X	X	X						
	18DSB0070507	Subsurface Soil	24-Oct-11	5-7	X	X	X						
18DSB008	18DSB0080002	Surface Soil	24-Oct-11	0-2	X	X	X						
	18DSB0080507	Subsurface Soil	24-Oct-11	5-7	X	X	X						
18DSB009	18DSB0090002	Surface Soil	24-Oct-11	0-2	X	X	X						
	18DSB0090709	Subsurface Soil	24-Oct-11	7-9	X	X	X						
18DSB010	18DSB0100002	Surface Soil	24-Oct-11	0-2	X	X	X						
	18DSB0101113	Subsurface Soil	24-Oct-11	11-13	X	X	X						
18DSB011	18DSB0110002	Surface Soil	24-Oct-11	0-2	X	X	X						
	18DSB0110406	Subsurface Soil	24-Oct-11	4-6	X	X	X						
18DSB012	18DSB0120002	Surface Soil	24-Oct-11	0-2	X	X	X		X	X		X	
	18DSB0120305	Subsurface Soil	24-Oct-11	3-5	X	X	X		X	X			
18DSB013	18DSB0130002	Surface Soil	24-Oct-11	0-2	X	X	X		X	X			
	18DSB013XXXX	Subsurface Soil	NA	NA	--	--	--		--	--			Sample not collected due to boring refusal before sample depth
18DSB014	18DSB0140002	Surface Soil	24-Oct-11	0-2	X	X	X		X	X			
	18DSB0140406	Subsurface Soil	24-Oct-11	4-6	X	X	X		X	X			Field Duplicate FD102411-05
18DSB015	18DSB0150002	Surface Soil	25-Oct-11	0-2	X	X	X		X	X			
	18DSB0150305	Subsurface Soil	25-Oct-11	3-5	X	X	X		X	X			
18DSB016	18DSB0160002	Surface Soil	24-Oct-11	0-2	X	X	X						
	18DSB0160203	Subsurface Soil	24-Oct-11	2-3	X	X	X						
18DSB017	18DSB0170002	Surface Soil	24-Oct-11	0-2	X	X	X		X				
	18DSB0170305	Subsurface Soil	24-Oct-11	3-5	X	X	X		X				

TABLE D-1

SUMMARY OF ENVIRONMENTAL SAMPLES AND LABORATORY ANALYSIS
SUBAREA D - SP AREA
SWMU 18 - LOAD AND FILL AREA
NAVAL SUPPORT ACTIVITY
CRANE, INDIANA

Sample Location	Sample Identification	Sample Type	Date Sampled	Sample Depth Interval Sampled (feet bgs)	Energetics		Metals		VOCs	SVOCs	PCBs	Miscellaneous	Comments
					Nitroaromatics/ Nitramines	NG	TAL Metals (total)	TAL Metals (dissolved)				pH	
18DSB018	18DSB0180002	Surface Soil	24-Oct-11	0-2	X	X	X						
	18DSB0180810	Subsurface Soil	24-Oct-11	8-10	X	X	X						Field Duplicate FD102411-02
18DCP001	18DCP0010002	Composite Soil	20-Oct-11	0-2							X		
18DCP002	18DCP0020002	Composite Soil	20-Oct-11	0-2							X		
18DMWT001	18DGWT001	Groundwater	17-Jan-12	8-18	X	X	X	X	X				Field Duplicate FD011712-01
18DMWT002	18DGWT002	Groundwater	18-Jan-12	16-26	X	X	X		X				
18DMWT003	18DGWT003	Groundwater	18-Jan-12	14-24	X	X	X		X				
18DMWT004	18DGWT004	Groundwater	17-Jan-12	13-23	X	X	X		X				
18DMWT005	18DGWT005	Groundwater	17-Jan-12	11-21	X	X	X		X				
18DMWT006	18DGWT006	Groundwater	19-Jan-12	20-30	X	X	X	X	X				

TABLE D-2

SUMMARY OF RECEPTOR-SPECIFIC HUMAN RISKS AND HAZARDS AN ECOLOGICAL RISKS
SUBAREA D - SP AREA
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Receptor Population	Environmental Media	Overall Carcinogenic Risk (Human)	Overall Hazard Index (Human)	Overall Risk (Ecological)	Critical Pathways & Chemicals of Concern
Current/Future Trespassers (Adolescent)	Surface Soil	4E-4 (4E-04)(2)	0.02	NA	Ingestion of soil (**Benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene,** chromium)
	Subsurface Soil	2E-07	0.01	NA	NA
Future Construction Worker (Adult)	Surface Soil	1E-04	0.1	NA	NA
	Subsurface Soil	3E-07	0.1	NA	NA
	Groundwater	2E-07	0.1	NA	NA
Future Industrial Worker (Adult)	Surface Soil	2E-03 (2E-03)(2)	0.1	NA	Ingestion of soil (**Benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene,** chromium)
	Subsurface Soil	1E-06	0.06	NA	NA

TABLE D-2

SUMMARY OF RECEPTOR-SPECIFIC HUMAN RISKS AND HAZARDS AN ECOLOGICAL RISKS
SUBAREA D - SP AREA
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Receptor Population	Environmental Media	Overall Carcinogenic Risk (Human)	Overall Hazard Index (Human)	Overall Risk (Ecological)	Critical Pathways & Chemicals of Concern
Future Recreational User (Adult)	Surface Soil	5E-04 (5E-04)[2]	0.02	NA	Ingestion of soil (Benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, chromium)
	Subsurface Soil	3E-07	0.006	NA	NA
Future Recreational User (Child)	Surface Soil	2E-03 (2E-03)[2]	0.1	NA	Ingestion of soil (**Benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene,** chromium)
	Subsurface Soil	1E-06	0.06	NA	NA

TABLE D-2

SUMMARY OF RECEPTOR-SPECIFIC HUMAN RISKS AND HAZARDS AN ECOLOGICAL RISKS
SUBAREA D - SP AREA
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Receptor Population	Environmental Media	Overall Carcinogenic Risk (Human)	Overall Hazard Index (Human)	Overall Risk (Ecological)	Critical Pathways & Chemicals of Concern
Future Recreational User (Lifelong)	Surface Soil	3E-03 (3E-03)[2]	NA	NA	Ingestion of soil (**Benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene**, chromium)
	Subsurface Soil	2E-06	NA	NA	NA
Future Resident (Adult)	Surface Soil	4E-03 (4E-03)[2]	0.2	NA	Ingestion of soil (**Benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene**, chromium)
	Subsurface Soil	2E-06	0.09	NA	NA
	Groundwater (Direct Contact)	3E-04 (7E-05)[2]	26 (26)[2]	NA	Ingestion of groundwater (**trichloroethene, vinyl chloride**, aluminum, **arsenic**, chromium, **cobalt**, and **manganese**)

TABLE D-2

SUMMARY OF RECEPTOR-SPECIFIC HUMAN RISKS AND HAZARDS AN ECOLOGICAL RISKS
SUBAREA D - SP AREA
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Receptor Population	Environmental Media	Overall Carcinogenic Risk (Human)	Overall Hazard Index (Human)	Overall Risk (Ecological)	Critical Pathways & Chemicals of Concern
Future Resident (Adult) (cont.)	Groundwater (Vapor Intrusion)	4E-08	0.009	NA	NA
Future Resident (Child)	Surface Soil	3E-02 (3E-02)[2]	2[1]	NA	Ingestion of soil (**Benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene,** chromium)
	Subsurface Soil	1E-05	0.8	NA	NA
	Groundwater (Direct Contact)	6E-04 (8E-05)[2]	62 (61)[2]	NA	Ingestion of groundwater (trichloroethene, **vinyl chloride**, aluminum, **arsenic**, beryllium, chromium, **cobalt, iron**, and **manganese)**
	Groundwater (Vapor Intrusion)	4E-08	0.009	NA	NA

TABLE D-2

SUMMARY OF RECEPTOR-SPECIFIC HUMAN RISKS AND HAZARDS AN ECOLOGICAL RISKS
SUBAREA D - SP AREA
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Receptor Population	Environmental Media	Overall Carcinogenic Risk (Human)	Overall Hazard Index (Human)	Overall Risk (Ecological)	Critical Pathways & Chemicals of Concern
Future Resident (Lifelong)	Surface Soil	3E-02 (3E-02)[2]		NA	Ingestion of soil (**Benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene**, chromium)
	Subsurface Soil	2E-05	NA	NA	NA
	Groundwater (Direct Contact)	9E-04 (1E-04)[2]	NA	NA	Ingestion of groundwater (trichloroethene, vinyl chloride, arsenic, and chromium)
	Groundwater (Vapor Intrusion)	8E-08	NA	NA	NA
Terrestrial Plants and Invertebrates	Surface Soil	NA	NA	Unacceptable	Terrestrial plants and invertebrates contacting soils **(PAHs)**
Mammals and Birds	Surface Soil	NA	NA	Unacceptable	Invertivorous/herbivorous mammals and birds through the food chain **(PAHs)**

TABLE D-2

SUMMARY OF RECEPTOR-SPECIFIC HUMAN RISKS AND HAZARDS AN ECOLOGICAL RISKS
SUBAREA D - SP AREA
SWMU 18 - LOAD AND FILL AREA
NSA CRANE
CRANE, INDIANA

Receptor Population	Environmental Media	Overall Carcinogenic Risk (Human)	Overall Hazard Index (Human)	Overall Risk (Ecological)	Critical Pathways & Chemicals of Concern

Notes
NA = Not Applicable

Shaded cells have unacceptable risk or hazard.
Bolded parameters represent significant contributor to overall risk or hazard.

(1) Target organs hazard index is less than 1.
(2) Chromium was evaluated in the human health risk assessment as hexavalent chromium. Value in parenthesis is cancer risk or hazard index if chromium is evaluated as trivalent chromium.

TABLE D-3

GROUNDWATER QUALITY DATA
SUBAREA D - SP AREA
SWMU 18 - LOAD AND FILL AREA
NSA CRANE, IN

Well Number	Sample ID	Sample Date	pH	Spec Cond (mS/cm)	Temp (dC)	Turb (NTU)	Diss Oxygen (mg/L)	ORP (mV)
18DMWT001	18DGWT001	1/17/2012	6.44	0.527	11.55	13.9	3.59	-2
18DMWT002	18DGWT002	1/18/2012	5.84	0.680	7.66	10	1.30	199
18DMWT003	18DGWT003	1/18/2012	4.59	1.24	13.37	9.1	2.89	364
18DMWT004	18DGWT004	1/17/2012	4.26	0.886	11.90	3.5	0.78	386
18DMWT005	18DGWT005	1/17/2012	3.90	0.279	13.64	4.8	1.16	369
18DMWT006	18DGWT006	1/19/2012	5.55	2.24	8.16	34	0.99	176

TABLE D-4

PROPOSED SUPPLEMENTAL SAMPLING AND ANALYSIS
SWMU 18 - LOAD AND FILL AREA
SUBAREA D - SP AREA
NAVAL SUPPORT ACTIVITY, CRANE, INDIANA

Sampling Location	ID Number	Matrix	Depth (feet bgs)	Analysis	Number of Samples	Sampling SOP Reference[1]
18DSB009	18DSB0090002	Soil	0 - 2'	VOCs	1 + 1 FD	SOP-08, SOP-09, SOP-10
				PAHs	1 + 1 FD	
	18DSB009XXXX[2]		X - X'	VOCs	1	
				PAHs	1	
18DSB012	18DSB0120001	Soil	0 - 1'	PAHs	1	SOP-08, SOP-09, SOP-10
	18DSB0120102		1 - 2'		1	
	18DSB0120203		2 - 3'		1	
18DSB013	18DSB0130001	Soil	0 - 1'	PAHs	1	SOP-08, SOP-09, SOP-10
	18DSB0130102		1 - 2'		1	
	18DSB0130203		2 - 3'		1	
18DSB015	18DSB0150001	Soil	0 - 1'	PAHs	1	SOP-08, SOP-09, SOP-10
	18DSB0150102		1 - 2'		1	
	18DSB0150203		2 - 3'		1	
18DSB016	18DSB0160002	Soil	0 - 2'	VOCs	1	SOP-08, SOP-09, SOP-10
				PAHs	1	
	18DSB016XXXX		X - X'	VOCs	1	
				PAHs	1	

TABLE D-4

PROPOSED SUPPLEMENTAL SAMPLING AND ANALYSIS
SWMU 18 - LOAD AND FILL AREA
SUBAREA D - SP AREA
NAVAL SUPPORT ACTIVITY, CRANE, INDIANA

Sampling Location	ID Number	Matrix	Depth (feet bgs)	Analysis	Number of Samples	Sampling SOP Reference[1]
18DSB019	18DSB0190002	Soil	0 - 2'	PAHs	1	SOP-08, SOP-09, SOP-10
18DSB020	18DSB0200002	Soil	0 - 2'	PAHs	1	SOP-08, SOP-09, SOP-10
18DSB021	18DSB0210002	Soil	0 - 2'	PAHs	1	SOP-08, SOP-09, SOP-10
18DSB022	18DSB0220002	Soil	0 - 2'	PAHs	1	SOP-08, SOP-09, SOP-10
18DSB023	18DSB0230002	Soil	0 - 2'	PAHs	1	SOP-08, SOP-09, SOP-10
18DSB024	18DSB0240002	Soil	0 - 2'	PAHs	1	SOP-08, SOP-09, SOP-10
18DSB025	18DSB0250001	Soil	0 - 1'	PAHs	1 + 1 FD	SOP-08, SOP-09, SOP-10
	18DSB0250102		1 - 2'		1	
	18DSB0250203		2 - 3'		1	

TABLE D-4

PROPOSED SUPPLEMENTAL SAMPLING AND ANALYSIS
SWMU 18 - LOAD AND FILL AREA
SUBAREA D - SP AREA
NAVAL SUPPORT ACTIVITY, CRANE, INDIANA

Sampling Location	ID Number	Matrix	Depth (feet bgs)	Analysis	Number of Samples	Sampling SOP Reference[1]
18DSB026	18DSB0260001	Soil	0 - 1'	PAHs	1	SOP-08, SOP-09, SOP-10
	18DSB0260102		1 - 2'		1	
	18DSB0260203		2 - 3'		1	
18DSB027	18DSB0270001	Soil	0 - 1'	PAHs	1	SOP-08, SOP-09, SOP-10
	18DSB0270102		1 - 2'	VOCs	1	
				PAHs	1	
	18DSB0270203		2 - 3'	PAHs	1	
	18DSB009XXXX[2]		X - X'	VOCs	1	
				PAHs	1	
18DSB028	18DSB0280001	Soil	0 - 1'	PAHs	1	SOP-08, SOP-09, SOP-10
	18DSB0280102		1 - 2'		1	
	18DSB0280203		2 - 3'		1	
18DSB029	18DSB0290001	Soil	0 - 1'	PAHs	1	SOP-08, SOP-09, SOP-10
	18DSB0290102		1 - 2'		1	
	18DSB0290203		2 - 3'		1	

TABLE D-4

PROPOSED SUPPLEMENTAL SAMPLING AND ANALYSIS
SWMU 18 - LOAD AND FILL AREA
SUBAREA D - SP AREA
NAVAL SUPPORT ACTIVITY, CRANE, INDIANA

Sampling Location	ID Number	Matrix	Depth (feet bgs)	Analysis	Number of Samples	Sampling SOP Reference[1]
18DSB030	18DSB0300001	Soil	0 - 1'	PAHs	1	SOP-08, SOP-09, SOP-10
	18DSB0300102		1 - 2'		1	
	18DSB0300203		2 - 3'		1	

Note:

(1) Sampling SOP reference from SWMU 18 RFI UFP-SAP (Tetra Tech, September 2011)

(2) XXXX and X – X' represents the interval of the sample from below 2 feet bgs and above top of bedrock. Depth will be determined in the field based on visual and olfactory observations and where bedrock is encountered. For example, if sample is collected from 8 to 10 feet bgs, the depth will be recorded as 0810.