DEPARTMENT OF THE NAVY
CRANE DIVISION
NAVAL SURFACE WARFARE CENTER
300 HIGHWAY 361
CRANE INDIANA 47522-5001

N00164.AR.000936
NSWC CRANE
5090.3a

IN REPLY REFER TO
5090/S4.7.1
Ser RP3/5132

20 APR 2005

4-1-2005

Indiana Department of Environmental Management
Corrective Action Section
Office Of Land Quality
Hazardous Waste Permits
100 N Senate Ave
PO Box 6015
Indianapolis, In 46206-6015

Dear Mr. Griffin:

Crane Division, Naval Surface Warfare Center submits the Draft Round 2 Sampling Locations Background and Rationale at the Building 106 Pond, Solid Waste Management Unit (SWMU) 08. One copy is provided as enclosure (1). The permit required Certification Statement is provided as enclosure (2).

If you require any further information, my point of contact is Mr. Thomas J. Brent, Code RP3-TB, at 812-854-6160, email thomas.brent@navy.mil.

Sincerely,

JAMES M. HUNSICKER
Manager, Environmental Protection
By direction of the Commanding Officer

Enclosures: 1. Draft Round 2 Sampling Plan for SWMU 08
2. Certification Statement

Copy to:
ADMINISTRATIVE RECORD
SOUTHNAVFACENGCOM (Code ES31) (w/o encl)
USEPA (Pete Ramanauskas)
TTNUS (Ralph Basinski) (w/o encl)

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

James Hunsucker

SIGNATURE

Manager, Environmental Protection

TITLE

4/20/05

DATE

Round 2 Sampling Locations Background and Rationale

at

SWMU 8 (Building 106 Pond)

Naval Surface Warfare Center

Crane, Indiana

NAVFAC
Naval Facilities Engineering Command

Southern Division Naval Facilities Engineering Command

Contract Number N62467-94-D-0888

Contract Task Order 0331

April 2005

040504/P

ROUND 2 SAMPLING LOCATIONS BACKGROUND AND RATIONALE AT SWMU 8 (BUILDING 106 POND)

NAVAL SURFACE WARFARE CENTER CRANE, INDIANA

COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

Submitted to:
Southern Division
Naval Facilities Engineering Command
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North Charleston, South Carolina 29406

Submitted by:
Tetra Tech NUS, Inc.
661 Andersen Drive
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CONTRACT NUMBER N62467-94-D-0888
CONTRACT TASK ORDER 0331

APRIL 2005

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1.0 BACKGROUND

A Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) is under way at Naval Surface Warfare Center (NSWC) Crane SMWU 8. The investigation is being conducted in accordance with the Quality Assurance Project Plan for RCRA Facility Investigation at Building 106 Pond (SWMU 8) and Roads and Grounds Area (SWMU 15) and Environmental Indicator investigations for SWMU 18, SWMU 19, SWMU 20, and The Old Gun Tub Storage Lot dated September 2004. This planning document was approved by the Indiana Department of Environmental Management (IDEM). This investigation is designed to determine the following:

- Whether site-related contamination is present at SWMU 8.
- If contamination is present, the lateral and vertical extent of the contamination.
- If contamination is present, the degree of risk posed by the contaminants to human health and the environment.

Round 1 sampling was completed at SMWU 8 in January, 2005. The preliminary findings are presented in the next section of this document. These findings are based on data which has been received from the laboratory, but which has not yet been validated. Therefore, some of the analytical results may change somewhat. However, the proposed Round 2 investigation, which is described in Section 5, is not expected to change. The proposed Round 2 program primarily addresses installation and sampling of wells to determine whether groundwater is contaminated with chlorinated solvents and further delineation of surface water and sediment contamination. It is not anticipated that the validated database would result in any changes to the proposed program.

2.0 ROUND 1 DATA

Figures 1 and 2 show results of Round 1 sampling at SWMU 8 for select chemicals. Groundwater (GW) from temporary wells, soil, surface water (SW), and sediment (SD) were sampled.

On Figure 1 the concentrations in soil borings (hand-written SB on the figure) are plotted for bis(2-ehtylhexyl)phthalate (abbreviated "bis" on the figure), 1,1,1-trichloroethane, trichloroethene and vinyl chloride. For groundwater the plotted concentrations are for 1,4-dioxane, 1,1,1-trichloroethane, trichloroethene, and vinyl chloride. The chemicals are listed from top to bottom in the order in which their concentrations are plotted. The concentrations either appear at the sampled location or an arrow is drawn from the sampled location to the corresponding concentrations. Where there were no detections of any of the listed chemicals, this is shown as "no hits" or something similar. The chemicals whose concentrations are plotted were the chemicals detected most frequently and at the highest concentrations in the respective environmental media. They also represent a cross-section of the chemical groups detected at this site.

On Figure 2 the concentrations in surface water (hand-written SW on the figure) are plotted for 1,4-dioxane, 1,1,1-trichloroethane, trichloroethene, and vinyl chloride. For sediment the concentrations plotted on Figure 2 are for bis(2-ehtylhexyl)phthalate (abbreviated "bis" on the figure), 1,1,1-trichloroethane, trichloroethene and vinyl chloride. The chemicals are listed from top to bottom in the order in which their concentrations are plotted. The concentrations either appear at the sampled location or an arrow is drawn from the sampled location to the corresponding concentrations. Where there were no detections of any of the listed chemicals, this is shown as "no hits" or something similar. The chemicals whose concentrations are plotted were the chemicals detected most frequently and at the highest concentrations in the respective environmental media. They also represent a cross-section of the chemical groups detected at this site.

Based on the data in Figures 1 and 2, the following is evident:

- SD, especially, and SW in the Building 106 Pond (sampling locations 08SW/SD004 and 08SW/SD005) are contaminated with chlorinated volatile organic compounds (VOCs). Maximum concentrations in sediment approach percent levels and maximum concentrations in deep pond water approach 50,000 µg/L in sample 08SW00401.

- If the Building 106 Pond is assumed to be the primary or only source of chlorinated VOC contamination, chlorinated VOCs have migrated to the gully and unnamed creek (locations 08SW/SD006, 08SW/SD007, and 08SW/SD009) located downgradient of the pond.

- Some other miscellaneous organic chemical contamination is also present at several locations downgradient of the pond, although at much lower concentrations.

- Total zinc concentrations are greater than 800 µg/L in GW (08MWTW004) taken from soil boring 08SB13. Dissolved zinc was about 60 percent this value in the same soil boring. These high concentrations warrant further investigation. A few other metals (arsenic, chromium, cobalt, and iron) also had elevated concentrations in GW. The elevated concentrations could be caused by suspended solids but further investigation is necessary to help us understand that.

- High explosives and many other organic chemicals that were analyzed were either undetectable or were present in low concentrations at various locations.

- The detection of chlorinated VOCs in GW taken from 08MWTW004 (soil boring 08SB013) suggests that VOC contamination is either migrating laterally from the pond to that location or that there could be another source of contamination upgradient of the pond.

- The presence of relatively high concentrations of cis-1,2-dichloroethene (cis-DCE) and vinyl chloride (VC) at several locations suggests that TCE is degrading naturally by way of reductive dechlorination.

3.0 CONCLUSIONS

The following bullets summarize current knowledge about SWMU 8 and its contamination.

- The Building 106 Pond appears to be the primary contaminant source for Chlorinated VOCs, minor amounts of ketones and miscellaneous organic chemicals, and possibly a few metals such as zinc. Because soil borings in the former drum storage area (08SB010 through 08SB013) also are slightly contaminated but are side gradient to the pond, there is slight evidence that another contamination source could be present upgradient of those borings.

- The groundwater flow direction is generally from the Building 106 Pond is probably toward the southeast or south, based on topography.

- The bedrock geology, and hence groundwater flow patterns, have not been investigated yet at SMWU 8.

- The vertical extent of contamination in groundwater is unknown and the lateral extent is not well understood. Because the pond is contaminated with dense chlorinated solvents, it is expected that the solvents have migrated vertically downward underneath the pond and have contaminated the groundwater in the bedrock.

- The available groundwater data were obtained from soil borings. The samples represent concentrations in groundwater in the overburden but not in the bedrock. It is important to understand better the levels of GW contamination in the bedrock.

4.0 QUESTIONS REMAINING TO BE ANSWERED

To complete the RCRA RFI, the following questions must be answered:

- What is the horizontal and vertical extent of contamination in groundwater at SWMU 8?
- Can the pond be shown to be the source of GW contamination?
- Can the lateral groundwater contamination boundary be more precisely delineated?
- What is the lateral extent of groundwater contamination at SMWU 8, especially in the downgradient directions from the Building 106 Pond.
- Is a significant amount of VOC contamination present in the drainage channels downgradient of VOC contaminant source(s)?

5.0 SAMPLING LOCATIONS AND RATIONALES

To answer the outstanding questions, the following plan for additional sampling during Round 2 is proposed:

- Install 11 permanent groundwater monitoring wells (08MWT001 through 08MWT011) to characterize groundwater in overburden soils and shallow bedrock around the Building 106 Pond and downgradient of the pond. These wells will be placed to detect contaminant concentration gradients and to allow for delineation of the extent of contamination. Figure 3 shows the proposed locations of these wells. Table 1 lists the wells, the proposed well depths, the rationales for their installation, and other information characteristic of the proposed wells. Groundwater samples collected from these locations will be analyzed for metals, VOCs, and groundwater quality parameters. Table 2 lists the wells and analyses.

- Collect up to six discretionary perched groundwater samples (08TW005 through 08TW007) at soil/ bedrock interface if encountered during installation of permanent wells 08MWT007 through 08MWT011, or at other discretionary locations. Data from samples collected from these temporary wells will provide information regarding the vertical profile of contamination. Groundwater samples collected from these locations will be analyzed for metals, VOCs, and groundwater quality parameters. Table 2 lists the temporary wells and analyses.

- Collect up to six soil samples at well drilling locations 08MWT001 through 08MWT009 in cases where perched groundwater is not encountered and not sampled in those boreholes. Table 3 lists the soil sample numbers and analyses to be performed.

Note: Accessibility constraints for areas downgradient of the Building 106 Pond may prevent installation of wells on the relatively steep hillside between the pond and the roadway to the south and southeast of the pond.

- The hillsides to the south and east of the B106 pond will be traversed in an attempt to locate groundwater seeps and springs. Up to three seep samples will be collected. Samples collected from these locations will be analyzed for metals, VOCs, and groundwater quality parameters. Table 2 also lists the seep samples and analyses.

- Collect 12 additional surface water and 12 additional sediment samples to delineate the extent of SW and SD contamination more precisely than is possible with available data. Figure 3 shows the proposed locations of these SW/SD sampling points. Table 4 lists the samples and analyses.

Following is a discussion of the samples that will be collected, analysis, and rationales for collection and analyses.

- Sediment samples will be collected at seven existing locations (08SW/SD001 through 08SW/SD003 and 08SW/SD006 through 08SW/SD009) and analyzed for SVOCs. Data from samples collected at these locations will provide additional information on the distribution of bis(2-ethylhexyl)phthalate in the drainage way and creek sediments and the identification of potential sources of bis(2-ethylhexyl)phthalate.

- Sediment samples will be collected at five new locations (08SW/SD010 through 08SW/SD014). Each of these samples will be analyzed for metals, VOCs, SVOCs, and water quality parameters. Data from samples collected at these new locations will provide additional information on the distribution of contamination (including contaminant concentrations in upgradient samples 08SW/SD010 and 08SW/SD013).

- Surface water samples will be collected at seven existing locations (08SW/SD001 through 08SW/SD003 and 08SW/SD006 through 08SW/SD009) and analyzed for metals (total and dissolved), VOCs, SVOCs, and water quality parameters. These data will provide a second round of surface water data and will be used to determine whether groundwater, if contaminated, is impacting surface waters.

- Surface water samples will be collected at five new locations (08SW/SD010 through 08SW/SD014) and analyzed for metals (total and dissolved), VOCs, SVOCs, and water quality parameters. The data from new sampling locations will be used to better characterize upgradient water quality and extent of contamination further down the creek.

- One water sample (08SU001) and one sludge sample (08SL001) will be collected from the sump located approximately twenty-five feet south of the Building 106 Pond. Data from these samples will be used to determined whether interconnections exist between this sump, the pond, and the drainageway. These samples will be analyzed for metals, VOCs, SVOCs, and coliform bacteria (Table 4).

Note: It could be necessary, after reviewing the groundwater contamination patterns delineated in Round 2 to install additional soil borings, temporary monitoring wells, and/or permanent monitoring wells to more precisely or completely delineate sources of contamination that have not been adequately characterized.

All fieldwork and sample analyses will be conducted in accordance with procedures described in the IDEM-approved September 2004 Quality Assurance Project Plan. However, to obtain lower detection and reporting limits for 1,4-dioxane, and to eliminate PAH, pentachlorophenol, hexachlorophene analyses, changes were made to the analysis scheme. The changes are reflected in Tables 2, 4, and 5. These changes focus the analyte lists on those chemicals of greatest importance while optimizing the choice of analytical methods to yield the greatest possible sensitivity from routine analyses.

TABLE 1

PHYSICAL CHARACTERISTICS OF PROPOSED GROUNDWATER MONITORING WELLS
SWMU 8 (BUILDING 106 POND)
NSWC CRANE
CRANE, INDIANA

Monitoring Well Number	Total Depth, approximate (ft bgs)	Screen Interval, approximate (ft bgs)	Screen Length (ft)	Interval Screened	Purpose of Well
08MWT001	40	30-40	10	1st bedrock aquifer unit	Monitor bedrock groundwater east of pond (suspected direction of groundwater flow) to determine if contaminants migrating from pond.
08MWT002	17	7-17	10	Overburden	Monitor perched groundwater in overburden soils east of pond (suspected direction of groundwater flow) to determine if contaminants migrating from pond.
08MWT003	40	30-40	10	1st bedrock aquifer unit	Monitor bedrock groundwater southeast of pond (suspected direction of groundwater flow) to determine if contaminants migrating from pond.
08MWT004	17	7-17	10	Overburden	Monitor perched groundwater in overburden soil southeast of pond (suspected direction of groundwater flow) to determine if contaminants migrating from pond.
08MWT005	40	30-40	10	1st bedrock aquifer unit	Monitor bedrock groundwater in drum storage area to determine if storage area and/or Building 108 are sources of contaminants
08MWT006	17	7-17	10	Overburden	Monitor perched groundwater in overburden soils to din drum storage area to determine if storage area and/or Building 108 are sources of contaminants
08MWT007	45	35-45	10	1st bedrock aquifer unit	To determine if Building 107, Building 108, sewers, and/or drain lines are sources of contaminants
08MWT008	45	35-45	10	1st bedrock aquifer unit	To establish water levels and ambient groundwater quality upgradient of Buildings 107 and 108.
08MWT009	30	20-30	10	1st bedrock aquifer unit	To determine if contaminants have migrated significantly southeastward toward the unnamed creek.
08MWT010	30	20-30	10	1st bedrock aquifer unit	To determine if contaminants have migrated significantly southeastward toward the unnamed creek.
08MWT011	30	20-30	10	1st bedrock aquifer unit	To determine if contaminants have migrated significantly southeastward toward the unnamed creek.
08TW005	17	7-17	10	Overburden	To determine quality of groundwater perched on bedrock surface if encountered during drilling of bedrock wells 08MWT007-08MWT011.
08TW006	17	7-17	10	Overburden	To determine quality of groundwater perched on bedrock surface if encountered during drilling of bedrock wells 08MWT007-08MWT011.
08TW007	17	7-17	10	Overburden	To determine quality of groundwater perched on bedrock surface if encountered during drilling of bedrock wells 08MWT007-08MWT011.

ft - feet.
bgs - below ground surface.

TABLE 2

LISTING OF GROUNDWATER AND SEEP SAMPLES AND LABORATORY ANALYSES[1]
SWMU 8 (BUILDING 106 POND)
NSWC CRANE
CRANE, INDIANA

Sample Location	Sample Number	Metals		VOCs		
		TAL Metals + Tin (total) (6020)	TAL Metals + Tin (dissolved)[2] (6020)	8260B	8270C (1,4-dioxane only)	Water Quality Parameters[3]
08MWT001	08GWT001	1	1	1	1	1
08MWT002	08GWT002	1	1	1	1	1
08MWT003	08GWT003	1	1	1	1	1
08MWT004	08GWT004	1	1	1	1	1
08MWT005	08GWT005	1	1	1	1	1
08MWT006	08GWT006	1	1	1	1	1
08MWT007	08GWT007	1	1	1	1	1
08MWT008	08GWT008	1	1	1	1	1
08MWT009	08GWT009	1	1	1	1	1
08MWT010	08GWT010	1	1	1	1	1
08MWT011	08GWT011	1	1	1	1	1
08TW005	08GWTW00501	1	1	1	1	1
08TW006	08GWTW00601	1	1	1	1	1
08TW007	08GWTW00701	1	1	1	1	1
08TW008	08GWTW00801	1	1	1	1	1
08TW009	08GWTW00901	1	1	1	1	1
08TW010	08GWTW01001	1	1	1	1	1
08SP001[4]	08SP00101	1	1	1	1	1
08SP002[4]	08SP00102	1	1	1	1	1
08SP003[4]	08SP00103	1	1	1	1	1
NA	Field Duplicate	1	1	1	1	NA
NA	Matrix Spike	1	1	1	1	NA
NA	Trip Blank	NA	NA	1	NA	NA
NA	Rinsate Blank	1	1	1	1	NA
NA	Source Blank	1	1	1	1	NA
Total GW Samples		**24**	**24**	**25**	**24**	**20**

1 See Table 1-5 of the QAPP for specific analysis requirements and analyte lists if not specified above. Table 5 lists 1,4-dioxane detection limits (threshold values) and reporting limits.
2 Sample aliquot for dissolved metals will only be collected and analyzed if turbidity of groundwater exceeds 10 Nephelometric Turbidity Units (NTUs).
3 Water quality parameters are presented in Table 3-1 of the QAPP.
4 Seep sample will also be analyzed for coliform bacteria.
GW - Groundwater.
NA - Not applicable.
QAPP - Quality Assurance Project Plan.
TAL - Target Analyte List.
VOC - Volatile organic compound.

TABLE 3

LISTING OF SUBSURFACE SOIL SAMPLES AND LABORATORY ANALYSES[1]
SWMU 8 (BUILDING 106 POND)
NSWC CRANE
CRANE, INDIANA

Sample Location	Sample Number	METALS	VOCs	SVOCs
		6020 TAL Metals + Tin (total)	8260B	8270C, including 1,-4dioxane but excluding PAHs , pentachlorophenol, and hexachlorophene
SWMU 8 Samples				
08SB015	08SB015xxxx	1	1	1
08SB016	08SB016xxxx	1	1	1
08SB017	08SB017xxxx	1	1	1
08SB018	08SB018xxxx	1	1	1
08SB019	08SB019xxxx	1	1	1
08SB020	08SB020xxxx	1	1	1
Subsurface QC Samples				
NA	Field Duplicate	1	1	1
NA	Matrix Spike	1	1	1
NA	Trip Blank	NA	1	NA
NA	Rinsate Blank	1	1	1
NA	Source Blank	1	1	1
	Total Subsurface Samples	**10**	**11**	**10**

x = depth to be determined in the field.

1 See Table 1-5 of the QAPP for specific analysis requirements and analyte lists for all parameters except 1,4-dioxane.

2 See Table 5 for 1,4-dioxane detection limits (threshold values) and reporting limits.

NA - not applicable.
QAPP - Quality Assurance Project Plan.
SVOC - Semivolatile organic compound.
VOC - Volatile organic compound.
TAL - Target Analyte List.

TABLE 4

LISTING OF SURFACE WATER AND SEDIMENT SAMPLES AND LABORATORY ANALYSES[1]
SWMU 8 (BUILDING 106 POND)
NSWC CRANE
CRANE, INDIANA

Sample Location	Sample Number[2]	Metals		VOCs	SVOCs[3]	Water Quality Parameters[4]
		6020 TAL Metals + Tin (total)	6020 TAL Metals + Tin (dissolved)	8260B	8270C Including 1,4-dioxane but excluding PAHs, pentachlorophenol, and hexachlorophene	
SWMU 8 Samples						
08SW/SD001	08SW00102	1	1	1	1	1
(upgradient)	08SD00102				1	
08SW/SD002	08SW00201	1	1	1	1	1
(downgradient)	08SD00202				1	
08SW/SD003	08SW00302	1	1	1	1	1
(downgradient)	08SD00302				1	
08SW/SD006	08SW00602	1	1	1	1	1
(downgradient)	08SD00602				1	
08SW/SD007	08SW00702	1	1	1	1	1
(downgradient)	08SD00702				1	
08SW/SD008	08SW00802	1	1	1	1	1
(downgradient)	08SD00802				1	
08SW/SD009	08SW00902	1	1	1	1	1
(downgradient)	08SD00902				1	
08SW/SD010	08SW01001	1	1	1	1	1
(upgradient)	08SD01001	1		1	1	
08SW/SD011	08SW01101	1	1	1	1	1
(downgradient)	08SD01101	1		1	1	
08SW/SD012	08SW01201	1	1	1	1	1
(pond inlet)	08SD01201	1		1	1	
08SW/SD013	08SW01301	1	1	1	1	1
(upgradient)	08SD01301	1		1	1	
08SW/SD014	08SW01401	1	1	1	1	1
(downgradient)	08SD01401	1		1	1	
08SU/SL001	08SU001[5]	1	1	1	1	1
(sump)	08SL001	1		1	1	
Surface Water QC Samples						
NA	Field Duplicate	1	1	1	1	
NA	Matrix Spike	1	1	1	1	
NA	Trip Blank			1		
NA	Rinsate Blank	1	1	1	1	
NA	Source Blank	1	1	1	1	
Sediment QC Samples						
NA	Field Duplicate	1		1	1	
NA	Matrix Spike	1		1	1	
NA	Trip Blank			1		
NA	Rinsate Blank	1		1	1	
Total Surface Water Samples		17	17	18	17	13
Total Sediment Samples		9	0	10	16	0

1 See Table 1-5 of the QAPP for specific analysis requirements and analyte lists for all parameters other than 1,4-dioxane
2 Sample numbers include media and round designations.
3 See Table 5 for 1,4-dioxane detection limits (threshold values) and reporting limits.
4 See Table 3-1 of the QAPP for Water Quality Parameters.
5 Sample will also be analyzed for coliform bacteria.

NA - Not applicable
QAPP - Quality Assurance Project Plan.
SVOC - Semivolatile organic compound.
TAL - Target Analyte List.
SU - Water Sample from the sump.
SL - Sediment sample from the sump.

TABLE 5

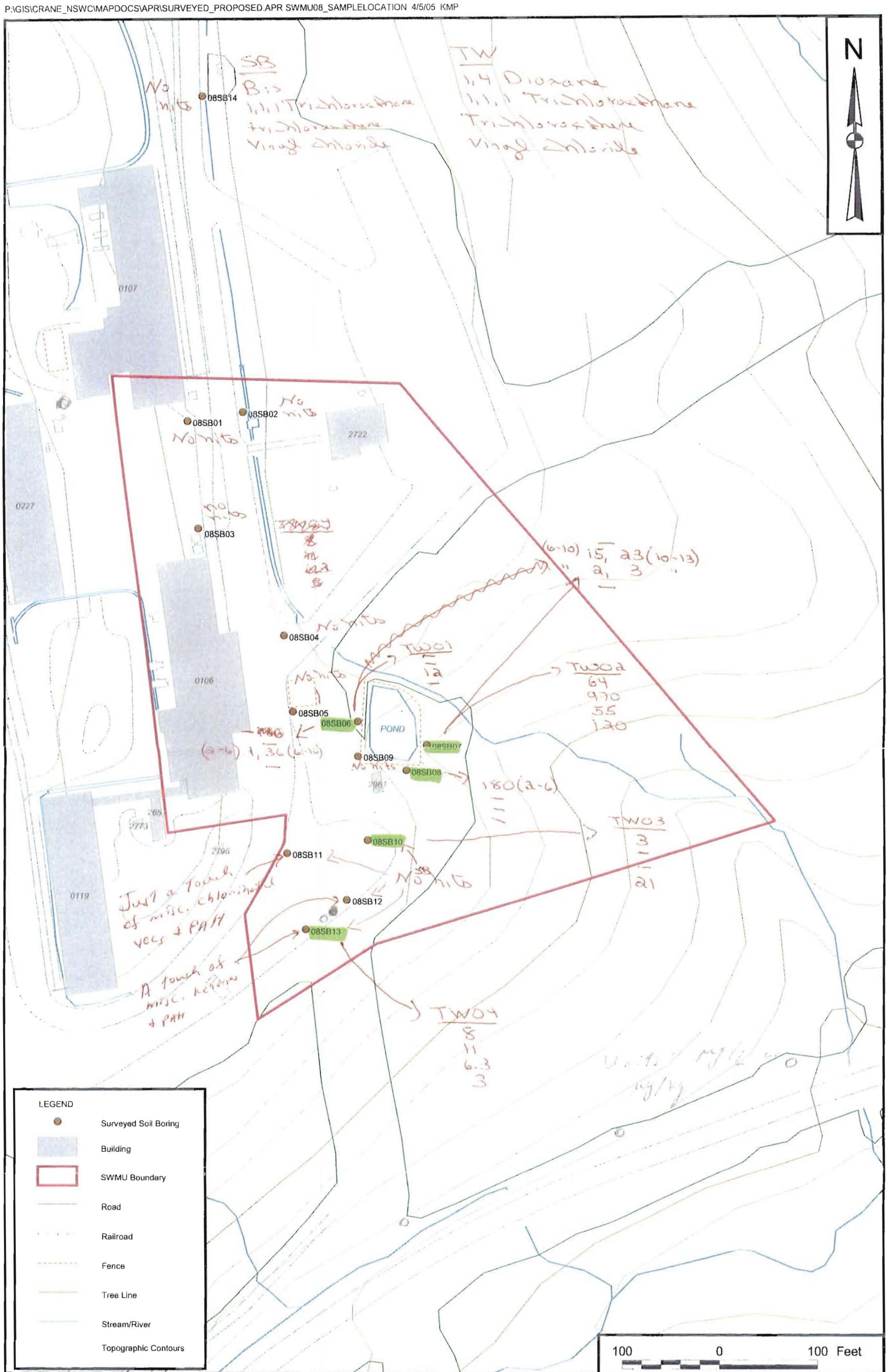
DETECTION LIMITS VERSES RISK CRITERIA
SWMU 8 (BUILDING 106 POND)
NSWC CRANE
CRANE, INDIANA

PARAMETER	CAS NUMBER	Aqueous Matrix			Solid Matrix			
		Laboratory TV[1] (µg/L)	Laboratory RL[1] (µg/L)	Risk-Base Target Level[2] (µg/L)	Laboratory TV[1] (mg/kg)	Laboratory RL[1] (mg/kg)	Risk-Base Soil Target Level[2] (mg/kg)	Risk-Base Sediment Target Level[2] (mg/kg)
Volatile Organic Compounds (SW-846 Method 8270C)								
1,4-Dioxane	123-91-1	1	5	6.1	0.1	0.2	0.0017	0.00000543

µg/L - micrograms per liter.
CAS - Chemical Abstract Service.
mg/kg - milligrams per kilogram.
NA - not applicable.
RL - reporting limit.
TV - threshold value.

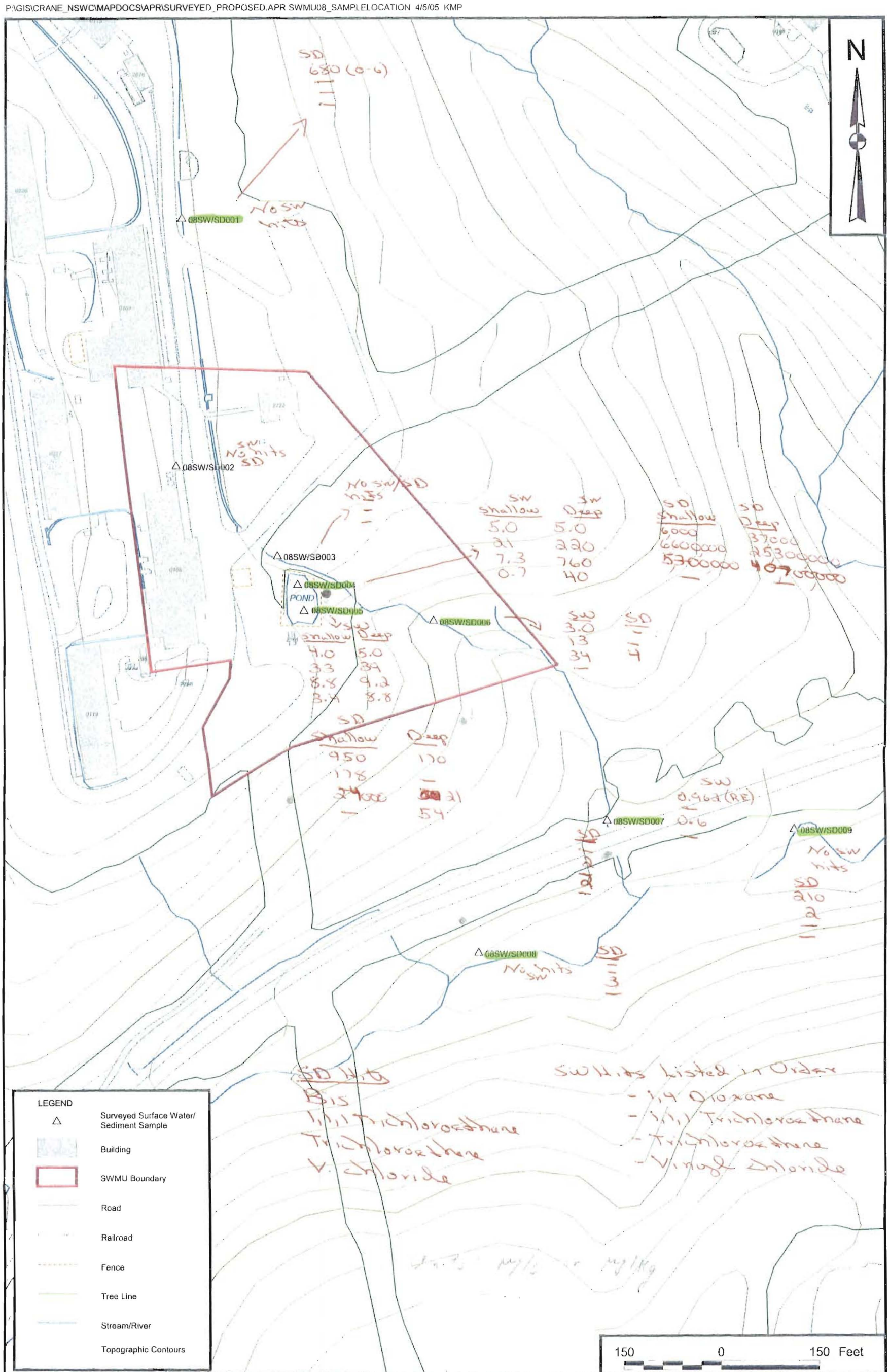
1 Threshold values and reporting limits may change prior to commencement of sampling activies.
2 Value is based on the lowest human health or ecological risk-based criteria.
3 Shading indicates those parameters for which the threshold value and/or reporting limit exceed the risk-based target level for the project.

P:\GIS\CRANE_NSWC\MAPDOCS\APR\SURVEYED_PROPOSED.APR SWMU08_SAMPLELOCATION 4/5/05 KMP



DRAWN BY K. PEILA	DATE 3/23/05	~~SURVEYED~~ SOIL ~~BORING LOCATIONS~~ DATA	CONTRACT NUMBER CTO 0331
CHECKED BY J. GOERDT	DATE 3/23/05	SWMU 8 - ~~LOAD AND FILL AREA~~ Building 106 Pond	APPROVED BY — DATE —
COST/SCHEDULE-AREA		NSWC CRANE	APPROVED BY — DATE —
SCALE AS NOTED	NAVFAC	CRANE, INDIANA	DRAWING NO. — Figure 1 / REV 0

P:\GIS\CRANE_NSWC\MAPDOCS\APR\SURVEYED_PROPOSED.APR SWMU08_SAMPLELOCATION 4/5/05 KMP



DRAWN BY K. PEILA	DATE 3/23/05	~~SURVEYED~~ SURFACE WATER/SEDIMENT ~~LOCATIONS~~ DATA	CONTRACT NUMBER CTO 0331
CHECKED BY J. GOERDT	DATE 3/23/05	SWMU 8 - ~~LOAD AND FILL AREA~~ Building 106 Pond	APPROVED BY — DATE —
COST/SCHEDULE-AREA		NSWC CRANE	APPROVED BY — DATE —
SCALE AS NOTED	NAVFAC	CRANE, INDIANA	DRAWING NO. — Figure 2 / REV 0

● Monitoring Well Screened in Bedrock
○ Monitoring Well Screened in Overburden
△ Surface Water/Sediment Sampling Location
□ Sump Sampling Location

Surface Water Flow Direction

Inferred Groundwater Flow Direction

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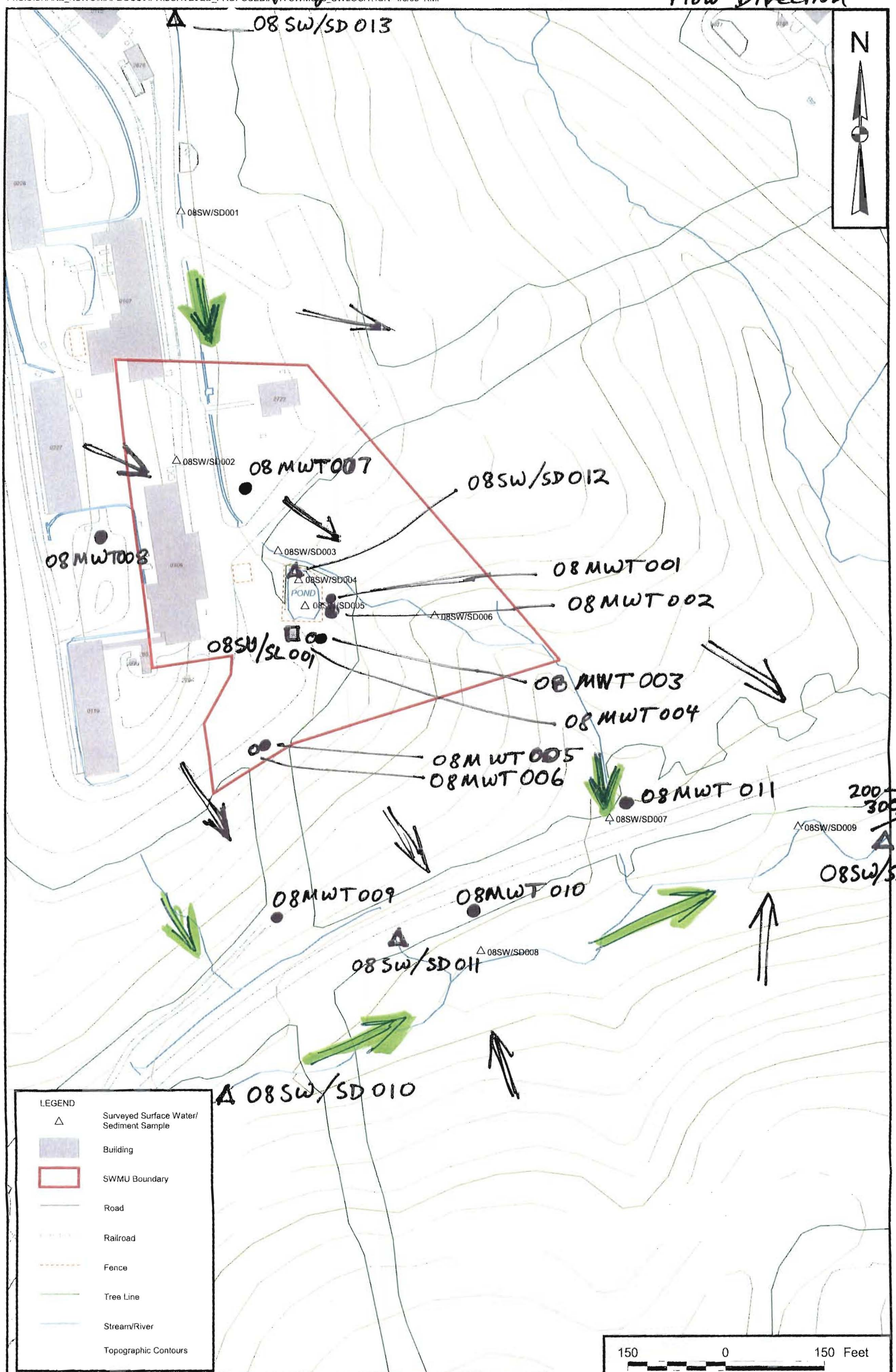

DRAWN BY K. PEILA	DATE 3/23/05	Proposed Wells and Sampling Locations ~~SURVEYED SURFACE WATER/SEDIMENT LOCATIONS~~ SWMU 8 (~~Building~~ 106 Pond)	CONTRACT NUMBER CTO 0331
CHECKED BY J. GOERDT	DATE 3/23/05	NSWC CRANE CRANE, INDIANA	APPROVED BY — DATE —
COST/SCHEDULE-AREA			APPROVED BY — DATE —
SCALE AS NOTED			DRAWING NO. Figure 3 REV 0