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at presentation of study to OEPA & NASA

RESULTS OF THE 1998 TNT AREA B REMEDIAL INVESTIGATION AT THE FORMER PLUM BROOK ORDNANCE WORKS

AS REPORTED IN THE DRAFT REMEDIAL INVESTIGATION
REPORT

Team Meeting

Ohio EPA, USACE, NASA and IT Corporation

September 14, 1999



Purpose and Objectives

- Define site physical features and characteristics
- Determine the nature and extent of source areas
- Determine whether contaminant distribution is consistent with DOD activities
- Characterize the risk to current and future human and/or ecological receptors

NOTE: TNT Area B Remedial Investigation Report issued as Draft in June 1999. Therefore, findings, recommendations, and conclusions presented herein are subject to revision.



Surface Soil Sampling

- A total of 395 surface soil samples collected for IMS screening
- One sediment sample was collected for IMS screening
- Twenty-nine confirmation soil samples were collected for both field screening and off-site analysis



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Subsurface Soil Sampling

- A total of 87 samples were collected via direct-push methodology
 - 63 samples were collected for IMS screening
 - 24 confirmation samples were collected for both IMS screening and off-site analysis
- Boreholes were grouted and staked for later land surveying



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Confirmation Analysis

■ Full suite analysis of selected samples based on field screening results

- Nitroaromatics (Method 8330)
- VOCs (Method 8260)
- SVOCs (Method 3550B/8270C)
- PCBs (Method 3550B/8082)
- Metals (Method 3050B/6010B)



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Field Screening Analysis

■ Sampled Areas

- DNT Process Buildings
 - Building 412, DNT Sweating and Graining Building (20 surface / 2 subsurface)
 - Building 415, DNT Nitrating Building(11 surface)
- Wastewater Settling Tanks and Associated Pipelines
 - Building 417, Wastewater Disposal Settling Tanks (25 surface / 2 subsurface)
 - Wastewater Pipelines (5 surface / 10 subsurface)



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Confirmation Sampling Analysis

■ Sampled Areas

→ TNT Area B

- Sample locations selected based on field screening analysis
- Data used to confirm IMS results and support risk assessments

→ Ransom Brook

- Two surface water samples and five sediment samples collected based on field conditions
 - number of samples reduced based on site walkover by risk assessors
 - number of surface water samples reduced due to lack of water
- Data used to support risk assessments



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Investigation Conclusions

■ Building 412, DNT Sweating and Graining Building

→ Site Features

- Site is level with drainage ditch located immediately to the north
- Building foundation not present but location adequately outlined by vegetation

→ Nature and Extent of Contamination

- Primarily low surface concentrations of 2,4-DNT
- Contamination by nitroaromatics restricted to the north end of building foundation near historical borings
- Nitroaromatics decrease rapidly with depth and is limited to the 3 ft to 5 ft in depth
- Nitroaromatics detected (2,4-DNT) consistent with historical use of building



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Investigation Conclusions

■ Building 451, Mono House

→ Site Features

- Site is level
- Building foundation not present and area heavily vegetated
- Building foundation not present and area heavily vegetated

→ Nature and Extent of Contamination

- IMS Screening
 - Nitroaromatics detected in limited number of samples at low concentrations
- Confirmation Analysis
 - Only one SVOC (fluoranthene) detected



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Investigation Conclusions

■ Building 451, Mono House

→ Site Features

- Site is level
- Building foundation not present and area heavily vegetated

→ Nature and Extent of Contamination

- IMS Screening
 - Nitroaromatics detected in limited number of samples at low concentrations
- Confirmation Analysis
 - Only one SVOC (fluoranthene) detected



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Investigation Conclusions

■ Building 453, Fortifier House

→ Site Features

- Site is level
- Building foundation not present and area vegetated with grass and brush
- Overburden thickness is at least 8 ft



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Investigation Conclusions

■ Building 453, Fortifier House

→ Nature and Extent of Contamination

- IMS Screening
 - Nitroaromatics detected in limited number of surface soil samples at concentrations below 1 mg/kg
 - TNT detected at higher levels in near (4-5 ft bgs) subsurface sample with concentrations decreasing with depth (7.5 ft to 8.5 ft sample nondetect)
 - Nitroaromatics appear to be limited to a single isolated area of subsurface soil
- Confirmation Analysis
 - TNT detected at concentrations considerably higher than IMS screening data
 - PCBs are possibly site related; however, their use at the site has not been documented.
 - Lead exceeded established background concentrations and may be site related.



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Investigation Conclusions

■ Northeast Nail House

→ Site Features

- Site is level
- Half of building foundation present and area heavily vegetated
- Building located within 75 ft of major road



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Investigation Conclusions

■ Northeast Nail House

→ Nature and Extent of Contamination

- IMS Screening
 - Nitroaromatics detected in limited number of samples at low concentrations
 - Discernable pattern of contamination not evident
- Confirmation Analysis
 - Carbon disulfide and fuel-related compounds (ethyl benzene, toluene and xylenes) detected are interpreted to be the result of road runoff
 - Twenty SVOCs, primarily PAHs, interpreted to be result of atmospheric deposition and/or road runoff
 - Nitroaromatics detected at concentrations up to one order of magnitude higher than IMS data
 - PCBs are possibly site related; however, their use at the site has not been documented
 - Lead and copper may be site related



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Investigation Conclusions

■ Building 462, Bi-Tri House

→ Site Features

- Site is level
- Building foundation not present and area vegetated with maintained grass

→ Nature and Extent of Contamination

- IMS Screening
 - Nitroaromatics detected in all soil of samples at low concentrations
 - No discernable pattern of contamination was evident
- Confirmation Analysis
 - Only 7 SVOCs, primarily PAHs, were detected. These are not interpreted to be site related



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Investigation Conclusions

■ Building 463, Fortifier House

→ Site Features

- Site is level
- Building foundation not present and area heavily vegetated with grass and brush
- Aboveground nitrogen line runs near site



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Investigation Conclusions

■ Building 466, Wash House

→ Nature and Extent of Contamination

- IMS Screening
 - Nitroaromatics detected in majority of samples at low (< 1.0 mg/kg) concentrations
 - Elevated concentrations (>100 mg/kg) of nitroaromatics detected in subsurface along south side of catch basin
- Confirmation Analysis
 - VOCs and SVOCs detected are not interpreted to be site related
 - Nitroaromatics detected at concentrations consistent with IMS screening
 - PCBs are possibly site related; however, their use at the site has not been documented
 - Lead and beryllium detected may be site related



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Investigation Conclusions

■ Northwest Nail House

→ Site Features

- Site is level
- Building foundation present and area vegetated with maintained grass
- Building located within 75 ft of major road
- Topography on south side of building has been modified by construction activities associated with the HTF



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Investigation Conclusions

■ Building 471, Mono House

→ Site Features

- Site is level
- Building foundation not present and area heavily vegetated

→ Nature and Extent of Contamination

- IMS Screening
 - Nitroaromatics detected in one sample at low concentrations
 - No discernable pattern of contamination evident



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Investigation Conclusions

■ Building 472, Bi-Tri House

→ Site Features

- Site is level
- Building foundation not present and area sparsely vegetated with grass

→ Nature and Extent of Contamination

- IMS Screening
 - Nitroaromatics detected in limited number of surface samples at low concentrations
 - Elevated (18 mg/kg to 27 mg/kg) concentrations of TNT detected in subsurface samples
- Confirmation Analysis
 - VOCs detected are not interpreted to be site related
 - Nitroaromatics detected are at concentrations consistent with IMS screening
 - Selenium marginally exceeds established background concentrations and is not interpreted to be site related



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Investigation Conclusions

■ Building 476, Wash House

→ Site Features

- Site is level
- Building foundation not present and area vegetated with grass and brush
- Drainage ditch runs through former location of catch basin
- Most of the former site is covered by buildings and asphalt associated with the HTF
- Overburden thickness likely limited in this area
- Potential underground utilities in the area restricted sampling to surface soils



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Investigation Conclusions

■ Building 476, Wash House

→ Nature and Extent of Contamination

- IMS Screening
 - Nitroaromatics detected in most of the surface samples; only three samples had detections above 1 mg/kg
 - Contamination restricted to south side of catch basin (no other areas were available for sampling)
- Confirmation Analysis
 - SVOCs detected are not interpreted to be site related
 - Nitroaromatics detected are at concentrations an order of magnitude higher than the IMS screening
 - PCBs are possibly site related; however, their use at the site has not been documented



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Human Health Risk Assessment Results

■ Human Health Risk Assessment

→ Groundskeeper Scenario

- Site related Incremental Lifetime Cancer Risk (ILCR) for exposure to soil of $1.05E-04$ does not exceed OEPA limits.
- Hazard Index (HI) total value of 16 do exceed the OEPA limit of 1, with 2,4,6 TNT being the only significant contributor.

→ Construction Worker Scenario

- Site related ILCR for exposure to soil of $1.47E-05$ does not exceed OEPA limits.
- Hazard Index (HI) total value of 67.4 do exceed the OEPA limit of 1, with 2,4,6 TNT being the predominant contributor, along with significant contributions from 2A-4,6 DNT, 4A-2,6 DNT, 2,4 DNT and 2,6 DNT



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Human Health Risk Assessment Results

■ Human Health Risk Assessment

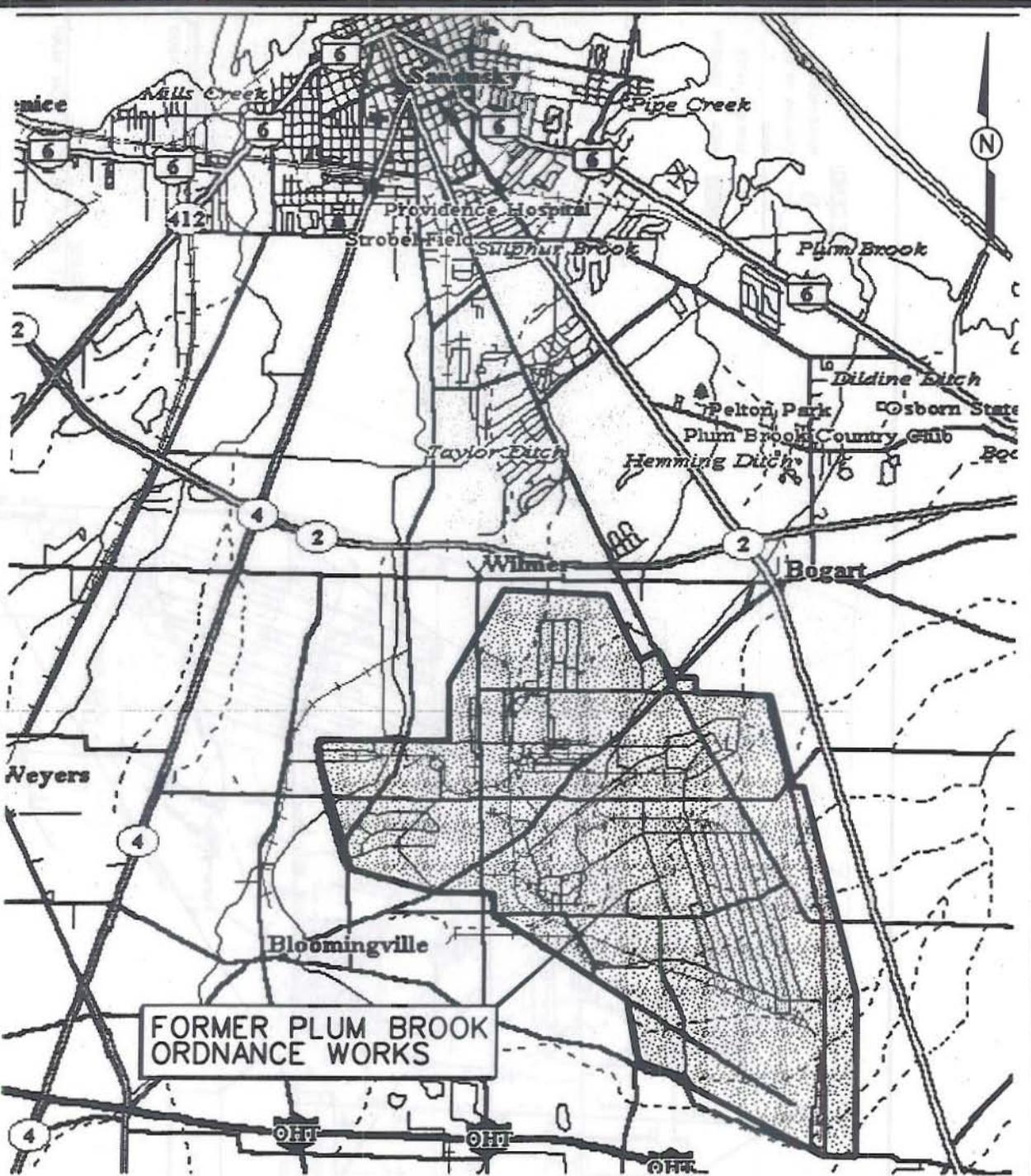
→ On-Site Resident Scenario

- Site related ILCR ($1.1E-03$) and HI (233) values for exposure to soil do exceed OEPA limits. Contributors to site-related risk are nitroaromatics, PCB's and PAH's (as in the above scenarios).
- It should be noted that the HI for this scenario was calculated using potential exposure pathways for children, which involve higher ingestion and dermal contact rates than would be associated with an adult.

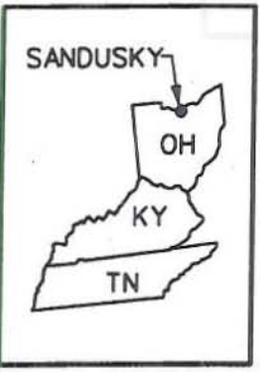


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09: 20: 21
 25 JUN 1999
 C:\CADD\DESIGN\773701 ES. 001
 BVANDERB
 STARTING DATE: 12/16/97
 DRAWN BY: D. BILLINGSLEY
 DATE LAST REV: JUN 1999
 DRAFT, CHCK. BY:
 BVANDERB ENGR. CHCK. BY: D. KESSLER
 INITIATOR: D. KESSLER
 DWG. NO.: 773701 ES. 001
 PROJ. MGR.: M.SPANGBERG
 PROJ. NO.: 773701



FORMER PLUM BROOK
 ORDNANCE WORKS

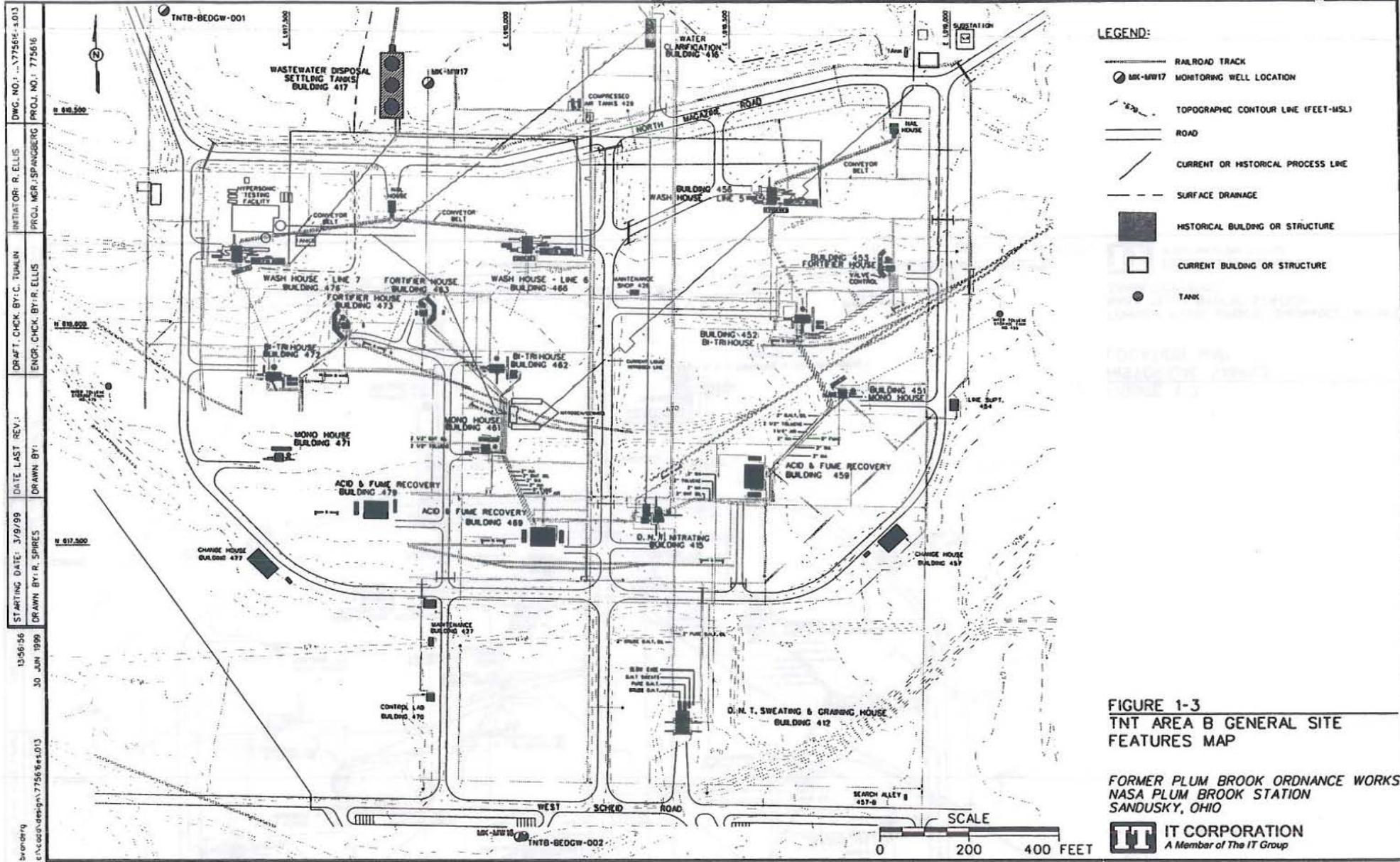


NOT TO SCALE

FIGURE 1-1
 VICINITY MAP

FORMER PLUM BROOK ORDNANCE WORKS
 SANDUSKY, OHIO





DWG. NO.: 177561E-1013
 INTIATOR: R. ELLIS
 PROJ. MGR./SPANGBERG
 PROJ. NO.: 775616
 DRAFT, CHCK. BY: C. TUMLIN
 ENGR. CHCK. BY: R. ELLIS
 DATE LAST REV.:
 DRAWN BY:
 STARTING DATE: 3/9/99
 DRAWN BY: R. SPIRES
 13:56:56
 30 JUN 1999
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EP-12-D 14 Sept 77 - B Rec'd at CBS
at presentation of study to OEP & NASA

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Sampling Results Summary

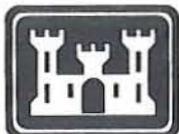


Sampling Results

■ DNT Process Buildings

→ Building 412, DNT Sweating and Graining Building

- ◆ IMS Screening (20 surface samples / 2 subsurface samples)
 - 2,4-DNT detected in 3 surface soil samples at concentrations ranging from 8.2 mg/kg to 23 mg/kg.
 - One subsurface (2.5-3.0 ft bgs) detection of 2,4-DNT at 17.3 mg/kg with deeper (5.0-6.0 ft bgs) sample nondetect
- ◆ Confirmation Analysis
 - No confirmation samples collected



Sampling Results

■ DNT Process Buildings

→ Building 415, DNT Nitrating Building

- ◆ IMS Screening (11 surface samples)
 - Two trace detections of TNT (less than 0.2 mg/kg) in surface soil samples
 - No subsurface soil samples collected based on limited detections in surface soil
- ◆ Confirmation Analysis
 - No samples collected due to limited trace detections in surface soil



Sampling Results

■ Wastewater Settling Tanks and Associated Pipelines

→ Building 417, Wastewater Disposal Settling Tanks

- ◆ IMS Screening (25 surface samples / 2 subsurface samples)
 - TNT detected in 22 of 25 surface soil samples with only two samples exceeding 1 mg/kg (3.4 mg/kg and 6.1 mg/kg).
 - 2A4,6-DNT detected in 13 of 25 surface soil samples with a maximum concentration of 0.60 mg/kg
 - Two subsurface (3-4 ft bgs) samples collected at the former location of the settling tanks with TNT detected in one sample at 0.28 mg/kg.
 - Both borings terminated on concrete, interpreted to be the bottom of the former settling tank. Two other borings attempted but were abandoned due to thickness of overburden soil

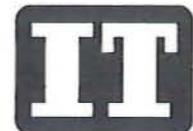


Sampling Results

■ Wastewater Settling Tanks and Associated Pipelines

→ Building 417, Wastewater Disposal Settling Tanks

- ◆ Confirmation Analysis (5 surface soil samples)
 - VOCs were not detected in any of the five confirmation samples
 - Fifteen SVOCs (primarily PAHs) were detected in soil samples
 - TNT, 2,4-DNT, 2A4,6-DNT and 4A2,6-DNT detected at similar concentrations as observed in IMS screening data
 - PCBs were detected in all samples with a maximum concentration of 0.53 mg/kg
 - Only lead (54.8 mg/kg) in one sample exceeded established PBOW background concentrations

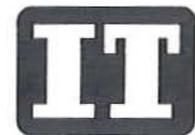


Sampling Results

■ Wastewater Settling Tanks and Associated Pipelines

→ Wastewater Pipelines

- ◆ IMS Screening (5 surface samples / 10 subsurface samples)
 - TNT detected in one surface soil sample at 0.12 mg/kg
 - TNT detected in four subsurface samples and 2,4,6-DNT detected in three subsurface samples with only one sample near Building 466 Wash House exceeding 1.0 mg/kg
- ◆ Confirmation Analysis (1 surface sample / 1 subsurface sample)
 - Acetone (0.56 mg/kg) and toluene 0.0034 mg/kg detected in the surface and subsurface confirmation samples, respectively
 - 2,4-DNT (0.66 mg/kg), 2,6-DNT (0.15 mg/kg), 2-methylnaphthalene (0.12 mg/kg), and phenanthrene (0.048 mg/kg) were the only SVOCs detected in the subsurface soil sample
 - TNT (0.27 mg/kg), 2,4-DNT (1.6 mg/kg), and 2,6-DNT (0.49 mg/kg) detected in one subsurface sample near Building 466 (Wash House)
 - PCB detected in the subsurface sample at 0.14 mg/kg
 - Metals detected did not exceed established background concentrations.

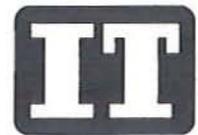


Sampling Results

■ Process Line 5

→ Building 451, Mono House

- ◆ IMS Screening (21 surface samples / 6 subsurface samples)
 - TNT detected in 2 and 2A4,6-DNT detected in 1 of 21 surface samples and 1 of 6 subsurface samples.
 - The maximum concentrations detected for TNT and 2A4,6-DNT were 0.84 mg/kg and 0.06 mg/kg, respectively.
- ◆ Confirmation Analysis (1 surface sample)
 - VOCs and nitroaromatics were not detected
 - Fluoranthene was the only SVOC detected at 0.039 mg/kg.
 - Metals were not detected above established background concentrations

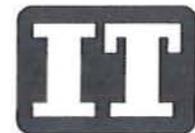


Sampling Results

■ Process Line 5

→ Building 452, Bi-Tri House

- ◆ IMS Screening (32 surface samples / 6 subsurface samples)
 - TNT was detected in 16 surface soil samples. Only two samples exceeded 1 mg/kg (14 mg/kg and 66 mg/kg)
 - 2A4,6-DNT was detected in 4 surface samples with all concentrations at or below 0.23 mg/kg
 - 2,4-DNT was detected in one surface sample at 1.3 mg/kg
 - Elevated concentrations of TNT (up to 6100 mg/kg) were observed in one soil boring down to a depth of 7 ft bgs.

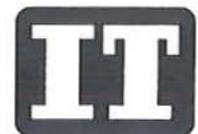


Sampling Results

■ Process Line 5

→ Building 452, Bi-Tri House

- ◆ Confirmation Analysis (2 surface samples / 1 subsurface sample)
 - Subsurface confirmation sample not analyzed for VOCs, SVOCs, PCBs, and metals due to high concentration of TNT in sample
 - VOCs, SVOCs and metals (above background) were not detected in 2 samples analyzed.
 - Nitroaromatics were detected at concentrations consistent with IMS screening data
 - PCBs were detected in both samples analyzed at concentrations of 0.14 mg/kg and 0.54 mg/kg.

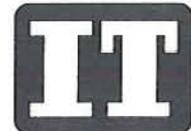


Sampling Results

■ Process Line 5

→ Building 453, Fortifier House

- ◆ IMS Screening (10 surface samples / 2 subsurface samples)
 - TNT and 2A4,6-DNT detected in 1 of 10 surface soil samples at 0.77 mg/kg and 0.05 mg/kg, respectively
 - TNT detected at 18 mg/kg in 1 of 2 subsurface soil samples collected
- ◆ Confirmation Analysis (1 subsurface sample)
 - Acetone detected at 0.022 mg/kg
 - SVOCs detected were 2,4-DNT (3.6 mg/kg), 2,6-DNT (2.4 mg/kg), 4,6-diinitro-2-methylphenol (0.17 mg/kg) and benzo(b)fluoranthene (0.041 mg/kg)
 - TNT was detected at 2200 mg/kg, considerably higher than the IMS data
 - PCBs were detected at 2.8 mg/kg
 - Lead (61.4 mg/kg) exceeded established background concentrations



Sampling Results

■ Process Line 5

→ Building 456, Wash House

- ◆ Field Observations
 - Presence of aboveground nitrogen line and associated underground utilities prevented sampling subsurface soils south of former catch basin

- ◆ IMS Screening (39 surface samples / 2 subsurface samples)
 - Nitroaromatics were detected in 35 of 39 surface soil samples with field screening concentrations of up to 2800 mg/kg.
 - Maximum concentrations of TNT and 2A4,6-DNT were 2800 mg/kg and 3.1 mg/kg, respectively

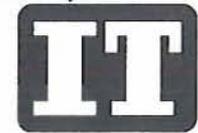


Sampling Results

■ Process Line 5

→ Building 456, Wash House

- ◆ Confirmation Analysis (7 surface samples / 1 subsurface samples)
 - Acetone, toluene and trichloroethene were detected at concentrations below 0.1 mg/kg
 - Low levels (less than 0.30 mg/kg) of SVOCs were detected in 6 surface soil samples. SVOCs were not detected in the 1 subsurface soil sample.
 - Nitroaromatics were detected in all surface soil samples with TNT detected at up to 490 mg/kg, 2A4,6-DNT at up to 7.6 mg/kg and 4A2,6-DNT at up to 8.8 mg/kg.
 - Nitroaromatics detected in the subsurface soil sample were TNT (44 mg/kg), 2A4,6-DNT (12 mg/kg), and 4A2,6-DNT (15 mg/kg).
 - PCB's were detected in 6 confirmation surface soil samples at concentrations generally less than 0.5 mg/kg, with the concentration in one sample at 15 mg/kg.
 - Lead was present in excess of background levels for 4 surface samples



Sampling Results

■ Process Line 5

→ Northeast Nail House

- ◆ IMS Screening (19 surface samples)
 - TNT and 2A4,6-DNT were detected in 7 of 19 surface soil samples with maximum concentrations detected of 0.22 mg/kg and 0.20 mg/kg
- ◆ Confirmation Analysis (1 surface sample)
 - Carbon disulfide ethyl benzene, toluene and total xylenes were detected in the single confirmation surface soil sample at concentrations below 0.02 mg/kg
 - Twenty SVOCs, primarily PAHS, were detected in the confirmation sample at concentrations up to 5 mg/kg
 - TNT (7.6 mg/kg), 2,4-DNT (0.38 mg/kg), 2A4,6-DNT (3.7 mg/kg) and 4A2,6-DNT (4 mg/kg) were detected at higher concentrations than those observed in the IMS data
 - PCBs were detected at 0.99 mg/kg
 - Copper and lead exceeded established background concentrations



Sampling Results

■ Process Line 5

→ Building 459, Acid and Fume Recovery

- ◆ IMS Screening (11 surface samples)
 - Trace levels of TNT were detected in three surface soil samples along with 2,4-DNT at 7.0 mg/kg in one surface soil sample and 2A4,6 DNT in two samples
- ◆ Confirmation Analysis
 - No confirmation samples were collected



Sampling Results

■ Process Line 6

→ Building 461, Mono House

- ◆ IMS Screening (10 surface samples/ 7 subsurface samples)
 - TNT was present in 9 of 10 surface samples at a maximum value of 1.2 mg/kg. 2,4-DNT was detected in three surface soil samples ranging from 0.3 mg/kg to 6.2 mg/kg. TNT was present in 2 of 7 subsurface samples at a maximum level of 2.4 mg/kg.
- ◆ Confirmation Analysis
 - No confirmation samples were collected



Sampling Results

■ Process Line 6

→ Building 462, Bi-Tri House

- ◆ IMS Screening (13 surface / 2 subsurface samples)
 - TNT was detected at low (less than 0.90 mg/kg) concentrations in 12 of 13 surface soil screening samples.
 - TNT and 2A4,6-DNT were detected in both subsurface soil samples at concentrations below 0.70 mg/kg
- ◆ Confirmation Analysis (1 surface sample/1 subsurface sample)
 - VOCs, nitroaromatics, PCBs and metals (above background) were not detected in the 1 confirmation sample
 - Seven SVOC's, primarily PAHs, were not detected at concentrations up to 0.54 mg/kg.



Sampling Results

■ Process Line 6

→ Building 463, Fortifier House

- ◆ IMS Screening (6 surface / 6 subsurface samples)
 - TNT was detected at low (less than 0.50 mg/kg) concentrations in all 6 surface soil screening samples.
 - 2A4,6-DNT was detected in 3 of 6 surface soil samples with a maximum concentration detected of 0.06 mg/kg
 - TNT and/or 2A4,6-DNT were detected in 4 of 6 subsurface soil samples at concentrations up to 46 mg/kg and 42 mg/kg, respectively.
 - TNT and 2A4,6-DNT detected in subsurface soil samples with highest concentrations (up to 43 mg/kg TNT) in the deeper (8-10 ft bgs) samples.

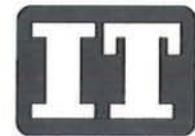


Sampling Results

■ Process Line 6

→ Building 463, Fortifier House

- ◆ Confirmation Analysis (1 surface sample/ 2 subsurface samples)
 - 2-butanone, acetone, toluene, and total xylenes detected at low (less than 0.2 mg/kg) concentrations
 - Twenty SVOCs were detected in the surface soil confirmation with concentrations as high as 3.9 mg/kg.
 - TNT, 2,4-DNT, 2,6-DNT, 2,4,6-DNT, 2-nitrotoluene, 4,2,6-DNT and 4-nitrotoluene were detected in the deepest subsurface soil confirmation sample at concentrations up to 240 mg/kg
 - PCBs were detected only in the surface soil sample at a concentration of 0.041 mg/kg
 - Metals did not exceed established background concentrations



Sampling Results

■ Process Line 6

→ Building 466, Wash House

- ◆ IMS Screening (23 surface / 4 subsurface samples)
 - Low levels (<1.0 mg/kg) of nitroaromatics were detected in 15 of 23 surface samples. TNT (up to 110 mg/kg) and 2,4,6-DNT (up to 17 mg/kg) were detected in 2 of 4 subsurface samples.

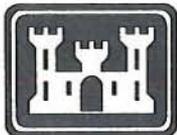


Sampling Results

■ Process Line 6

→ Building 466, Wash House

- ◆ Confirmation Analysis (2 surface / 2 subsurface samples)
 - VOCs were not detected in two surface soil samples; acetone and total xylenes were detected at concentrations below 0.10 mg/kg in two subsurface soil samples
 - Four SVOCS were detected in 1 surface soil sample at concentrations up to 0.045 mg/kg. Thirteen SVOCS were detected in one subsurface sample at concentrations up to 0.96 mg/kg.
 - TNT (up to 7.6 mg/kg), 2A4,6-DNT (1.7 mg/kg), 4A2,6-DNT (1.1 mg/kg) and 2,6-DNT (0.26 mg/kg) detected in surface soils. Subsurface samples detected TNT (up to 620 mg/kg), 2,4-DNT (27 mg/kg), and 2A4,6-DNT (93 mg/kg) and 4A2,6-DNT (1.7 mg/kg).
 - PCBs were detected in both surface soil sample and both subsurface soil samples at concentrations up to 1.3 mg/kg
 - Lead (1 surface soil and 1 subsurface soil sample) and beryllium (both subsurface soil samples) exceeded established background concentrations

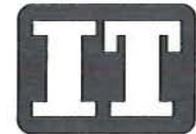


Sampling Results

■ Process Line 6

→ Northwest Nail House

- ◆ IMS Screening (18 surface samples / 1 subsurface sample)
 - TNT was detected in 12 surface soil samples; however, only two samples exceeded 1 mg/kg (1.4 mg/kg and 23 mg/kg)
 - 2A4,6-DNT was detected in 7 samples; only one sample exceeded 0.30 mg/kg (1.6 mg/kg)
- ◆ Confirmation Analysis (2 surface samples)
 - VOCs were not detected in any samples.
 - Eight SVOCs were detected in both samples at concentrations up to 0.372 mg/kg
 - TNT (up to 0.56 mg/kg) and 4A2,6-DNT (0.34 mg/kg) were detected
 - PCBs were detected in both samples at 0.048 mg/kg and 0.19 mg/kg
 - Metals were not detected above established background concentrations

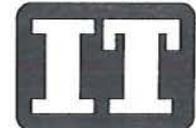


Sampling Results

■ Process Line 6

→ Building 469, Acid and Fume Recovery

- ◆ IMS Screening (14 surface samples / 1 sediment sample)
 - TNT was detected in 7 of 14 surface soil samples with a maximum concentration of 0.39 mg/kg
 - 2,4-DNT was detected in two soil samples at 2.6 mg/kg and 4.3 mg/kg
- ◆ Confirmation Analysis
 - Confirmation samples were not collected.

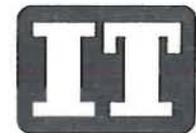
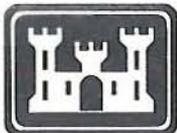


Sampling Results

■ Process Line 7

→ Building 471, Mono House

- ◆ IMS Screening (7 surface samples)
 - TNT (0.11 mg/kg) was detected in 1 of 7 surface soil samples.
- ◆ Confirmation Analysis
 - No confirmation samples were collected.



Sampling Results

■ Process Line 7

→ Building 472, Bi-Tri House

- ◆ IMS Screening (12 surface samples / 7 subsurface samples)
 - TNT was detected in trace (<0.01 mg/kg) concentrations in four surface soil samples
 - 2A4,6-DNT was detected in three surface soil samples at concentrations up to 0.25 mg/kg
 - TNT was detected in 4 of 7 subsurface samples at concentrations ranging from .15 mg/kg to 27 mg/kg
 - 2A4,6-DNT was detected in two subsurface samples at concentrations ranging from 2.4 mg/kg to 3.07 mg/kg

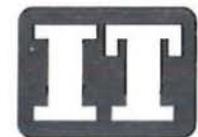


Sampling Results

■ Process Line 7

→ Building 472, Bi-Tri House

- ◆ Confirmation Analysis (1 surface sample / 1 subsurface sample)
 - Acetone (0.010 mg/kg) and toluene (0.0032 mg/kg) were detected in the surface and subsurface confirmation samples, respectively
 - 2,4-DNT (0.054 mg/kg) was the only SVOC detected in the surface soil sample
 - 2,4-DNT and 2,6-DNT were the only SVOCs detected in the subsurface soil sample at 4.4 mg/kg and 0.62 mg/kg, respectively.
 - PCBs were not detected in either sample
 - Only selenium (2.4 mg/kg) exceeded the established background concentration (2.39 mg/kg)



Sampling Results

■ Process Line 7

→ Building 473, Fortifier House

- ◆ IMS Screening (8 surface samples / 5 subsurface samples)
 - TNT and 2A4,6-DNT were detected in 5 surface soil samples with maximum concentrations of 0.83 mg/kg and 0.13 mg/kg
 - TNT was detected in 1 subsurface screening samples at 5.2 mg/kg. In the other 4 subsurface samples, TNT and 2A4,6-DNT were detected but at concentrations below 0.30 mg/kg



Sampling Results

■ Process Line 7

→ Building 473, Fortifier House

- ◆ Confirmation Analysis (2 surface samples/ 1 subsurface sample)
 - VOCs were not detected in the three confirmation soil samples
 - Thirteen SVOCs were detected in the two surface soil samples at concentrations up to 0.53 mg/kg.
 - Two SVOCs (2,4-DNT and 2,6-DNT) were detected in the subsurface sample at 0.43 mg/kg and 0.15 mg/kg, respectively
 - TNT, 2,4-DNT, 2,6-DNT, 2A4,6-DNT and 4A2,6-DNT were detected in surface soil samples at concentrations ranging from 0.83 mg/kg to 4.3 mg/kg
 - TNT, 2A4,6-DNT and 4A4,6-DNT were detected in the subsurface sample at concentrations between 5 mg/kg and 6 mg/kg. 2,4-DNT was also detected at 1.9 mg/kg.
 - PCBs were detected in all three samples ranging from 0.45 mg/kg to 4.6 mg/kg
 - Lead exceeded established background concentrations in one surface and one subsurface soil sample

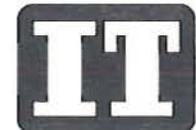


Sampling Results

■ Process Line 7

→ Building 476, Wash House

- ◆ Field Observations
 - Most of former site covered by buildings and asphalt associated with the Hypersonic Testing Facility (HTF)
 - Only southern area of catch basin available to sample
 - Overburden thickness limited in area
 - Subsurface borings could not be completed due to potential underground utilities associated with HTF
- ◆ IMS Screening (17 surface samples)
 - TNT was detected in 16 surface soil samples, with all but 3 detections below 1 mg/kg. Maximum TNT detected was 720 mg/kg.
 - 2A4,6-DNT was detected in 11 samples at concentrations up to 2 mg/kg.

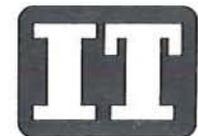
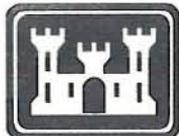


Sampling Results

■ Process Line 7

→ Building 476, Wash House

- ◆ Confirmation Analysis (3 surface samples)
 - VOCs were not detected
 - Twelve SVOCs were detected at concentrations below 0.41 mg/kg
 - TNT was detected in all samples at concentrations up to 2.5 mg/kg
 - 2A4,6-DNT and 4A2,6-DNT were detected with maximum concentrations of 2.6 mg/kg and 2.0 mg/kg respectively
 - PCBs were detected in all samples with concentrations ranging from 0.10 to 0.27 mg/kg
 - Metals were not detected above established background concentrations

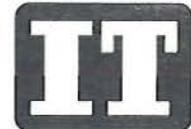
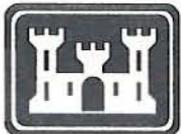


Sampling Results

■ Process Line 7

→ Building 479, Acid and Fume Recovery

- ◆ IMS Screening (11 surface samples)
 - Trace levels of TNT were found in 3 of 11 surface soil samples at concentrations below 0.2 mg/kg.
- ◆ Confirmation Analysis
 - Confirmation samples were not collected.

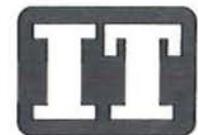


Sampling Results

■ Ransom Brook

→ Surface Water

- ◆ IMS Screening
 - IMS screening samples were not collected
- ◆ Off-Site Analysis
 - Carbon disulfide (1.2 $\mu\text{g/L}$), 2-butanone (1.2 $\mu\text{g/L}$), and 1,1-dichloroethane (0.51 $\mu\text{g/L}$) were detected in surface water samples
 - SVOCs, nitroaromatics and PCBs were not detected
 - Metals detected were aluminum, arsenic, calcium, chromium, copper, iron lead, magnesium, manganese, nickel, potassium, selenium, sodium and zinc.

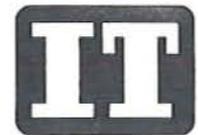
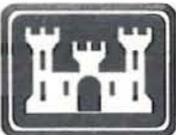


Sampling Results

■ Ransom Brook

→ Sediment

- ◆ IMS Screening
 - IMS screening samples were not collected
- ◆ Off-Site Analysis
 - 2-butanone (0.0072 mg/kg) and acetone (0.048 mg/kg to 0.27 mg/kg) were detected in 4 of 5 sediment samples
 - Carbon disulfide was detected in one sediment sample at 0.0025 mg/kg
 - Six SVOCs were detected in two of five samples at concentrations below 0.40 mg/kg.
 - Nitroaromatics were not detected in any samples
 - PCBs were not detected in any samples
 - Sixteen metals were detected at least one sediment sample.



Analytical Data Summary Tables



Summary of Fixed Base Analytical Detections in Soil, TNT B RI Report Presentation Former Plum Brook Ordnance Works, Sandusky, Ohio

ASSOCIATED BLDG. NO.	Wastewater Pipelines		Process Line 5		Process Line 6		Process Line 7	
	Maximum Concentration (PPM)	Frequency of Detection						
Parameter								
Volatile Organics								
2-Butanone					0.015	1/10	0.01	1/8
Acetone	0.56	1/7	0.044	2/15	0.11	2/10	0.01	
Carbon disulfide			0.0022	1/15				
Ethylbenzene			0.0017	1/15				
Toluene			0.011	2/15	0.021	4/10	0.0032	1/8
Total xylenes	0.0034	1/7	0.0084	1/15	0.0025	2/10		
Trichloroethene			0.0018	1/15				
Semivolatile Organics								
2,4-Dinitrotoluene	0.66	5/7	3.6	8/15	110	6/10	4.4	6/8
2,6-Dinitrotoluene	0.15	4/7	2.4	5/15	68	3/10	0.62	4/8
2-Methylnaphthalene	0.12	1/7	0.17	4/15	0.96	2/10	0.054	1/8
4,6-Dinitro-2-methylphenol			0.17	2/15				
Acenaphthene			0.093	1/15	0.068	1/10		
Acenaphthylene	0.075	1/7	0.3	1/15	0.38	1/10		
Anthracene	0.058	3/7	0.92	2/15	0.56	1/10		
Benzo(a)anthracene	0.16	4/7	2.4	6/15	1.6	4/10	0.06	3/8
Benzo(a)pyrene	0.21	4/7	2	7/15	1.7	5/10	0.077	5/8
Benzo(b)fluoranthene	0.18	4/7	1.8	8/15	1.8	5/10	0.1	4/8
Benzo(ghi)perylene	0.13	3/7	0.88	5/15	0.88	1/10	0.068	3/8
Benzo(k)fluoranthene	0.25	4/7	2	5/15	1.5	4/10	0.093	3/8
Carbazole			0.2	1/15	0.25	1/10		
Chrysene	0.19	4/7	2.4	7/15	1.8	4/10	0.093	5/8
Dibenz(a,h)anthracene	0.068	2/7	0.55	1/15	0.48	1/10		
Dibenzofuran			0.18	1/15	0.13	2/10		
Fluoranthene	.24	4/7	5	8/15	3.9	6/10	0.16	5/8
Fluorene			0.36	1/15	0.17	1/10		
Indeno(1,2,3-cd)pyrene	0.13	3/7	1	4/15	0.96	1/10	0.069	3/8
Naphthalene	0.063	5/7	0.073	2/15	0.28	2/10		
Phenanthrene	0.21	4/7	3	5/15	2.3	2/10	0.083	4/8
Pyrene			3.6	7/15	2.7	5/10	0.11	5/8
Nitroaromatics								
2,4,6-Trinitrotoluene	4.6	5/7	6000	13/15	620	9/10	39	7/8
2,4-Dinitrotoluene	1.6	3/7	0.88	1/15	240	5/10	2.6	5/8
2,6-Dinitrotoluene	0.49	1/7			180	3/10	0.83	1/8
2-Amino-4,6-dinitrotoluene	4.4	4/7	12	8/15	93	5/10	5.1	6/8
2-Nitrotoluene					82	1/10		
4-Amino-2,6-dinitrotoluene	4.2	4/7	15	9/15	45	4/10	11	6/8
4-Nitrotoluene					67	1/10		
PCBs								
Aroclor 1254	0.53	3/7	0.32	3/15	0.19	2/10		
Aroclor 1260	0.11	3/7	15	8/15	1.3	5/10	4.6	6/8
Metals								
Barium	496	1/7			1.2	2/10		
Beryllium	1.6	1/7						
Copper	54.8	1/7	445	1/15	80.7	1/10	58.4	2/8
Lead	3.9	1/7	245	7/15			2.4	1/8
Selenium								



**Summary of Field Screening Detections for Nitroaromatics in Soil, TNT B RI Report Presentation
Former Plum Brook Ordinance Works, Sandusky, Ohio**

Building	2,4,6 DNT		2,4,6 TNT		2,4 DNT	
	Maximum Concentration (ppm)	Frequency of Detection	Maximum Concentration (ppm)	Frequency of Detection	Maximum Concentration (ppm)	Frequency of Detection
412, DNT Sweating and Graining	---	0/22	---	0/22	23	4/22
415, DNT Nitration	---	0/11	0.15	2/11	---	0/11
417, Waste water Tanks	1.4	17/32	6.10	28/32	---	0/32
Waste water Pipe lines	0.38	3/20	25	7/20	---	0/20
451, Mono House	0.06	2/28	0.84	3/28	---	0/28
452, Bi-Tri House	0.23	7/41	6100	22/41	1.3	1/41
453, Fortifier House	0.05	1/13	650	3/13	---	0/13
456, Wash House	4.9	26/49	2800	45/49	7.6	1/49
NE Nail House	0.22	4/20	1.1	8/20	---	0/20
459, Acid and Fume Recovery	<0.01	2/11	0.31	3/11	7	1/11
461, Mono House	0.1	4/17	2.4	11/17	6.2	3/17
462, Bi-Tri House	0.37	2/17	0.87	14/17	---	0/17
463, Fortifier House	42	7/15	46	13/15	254.5	1/15
466, Wash House	17	10/31	110	21/31	---	0/31
NW Nail House	1.6	7/21	23	14/21	---	0/21
469, Acid and Fume Recovery	---	0/15	0.39	7/15	4.3	2/15
471, Mono House	---	0/7	0.11	1/7	---	0/7
472, Bi-Tri House	3.07	5/21	27	9/21	---	0/21
473, Fortifier House	1.2	7/16	5.2	11/16	---	0/16
476, Wash House	2	14/20	720	19/20	---	0/20
479, Acid and Fume Recovery	---	0/11	0.14	3/11	---	0/11



Ransom Brook Sediment Sample Analytical Results

LOCATION		TNTB-SD01	TNTB-SD02	TNTB-SD03	TNTB-SD04	TNTB-SD05
SAMPLE NO.		11000	11010	11020	11030	11040
SAMPLE DATE		4-Nov-98	4-Nov-98	4-Nov-98	4-Nov-98	4-Nov-98
SAMPLE DEPTH (FT)		0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5
Parameter	Units	Result Qual	Result Qual	Result Qual		Result Qual
VOCs						
2-Butanone	mg/kg	0.062 J	0.012 J	0.047 J		0.0072 J
Acetone	mg/kg	0.27 J	0.061 J	0.24 J		0.048 J
Carbon disulfide	mg/kg		0.0025 J			
SVOCs						
2-Methylnaphthalene	mg/kg		0.38 J			
Benzo(a)pyrene	mg/kg					0.047 J
Fluoranthene	mg/kg					0.082 J
Naphthalene	mg/kg		0.078 J			
Phenanthrene	mg/kg		0.17 J			
Pyrene	mg/kg					0.059 J
Metals						
Aluminum	mg/kg	10200	4210	20000	19500	10700
Arsenic	mg/kg	15.9 J	17.4 J	26.4 J	19.2 J	32.5 J
Barium	mg/kg	91.7	57.4	174	116	71.1
Beryllium	mg/kg			6.9	6.9	1.4
Calcium	mg/kg	3650	1580	6290	10200	2240
Chromium	mg/kg	14.4	11.3	24.9	19.1	15.8
Cobalt	mg/kg			137	74.2	
Copper	mg/kg	43.5	40.2	58.9	54.3	66
Iron	mg/kg	28800	26400	175000	196000	42800
Lead	mg/kg	22.7 J	15.4 J	24.8 J	16.4 J	25.8 J
Magnesium	mg/kg					1350
Manganese	mg/kg	58.1	89.2	2060	542	104
Nickel	mg/kg	31.2	15.9	165	178	36.4
Potassium	mg/kg	1710	1450		3320	1810
Selenium	mg/kg		0.86 J	3.4 J	4 J	1.8 J
Zinc	mg/kg	31.7	31.3	313	340	90.2



Ransom Brook Surface Water Analytical Results

LOCATION		TNTB-SW01	TNTB-SW02
SAMPLE NO.		12000	12010
SAMPLE DATE		4-Nov-98	4-Nov-98
Parameter	Units	Result Qual	Result Qual
VOCs			
1,1-Dichloroethane	µg/L		0.51 J
2-Butanone	µg/L	1.2 J	
Carbon disulfide	µg/L	1.2	
Metals			
Aluminum	µg/L	14900 J	969 J
Arsenic	µg/L	21.1	30.9 J
Calcium	µg/L	132000	124000
Chromium	µg/L	18.8	11.5 J
Copper	µg/L	34.2	
Iron	µg/L	267	683 J
Lead	µg/L	20.5	7.8 J
Magnesium	µg/L	31900	24400
Manganese	µg/L	555	855
Nickel	µg/L	43.1	
Potassium	µg/L	13300	
Selenium	µg/L		6 J
Sodium	µg/L	20700	18500
Zinc	µg/L	58.8	57.8 J

