DEPARTMENT OF THE NAVY
CRANE DIVISION
NAVAL SURFACE WARFARE CENTER
300 HIGHWAY 361
CRANE, INDIANA 47522-5000

IN REPLY REFER TO:

5090 2-1-2001
Ser 095/1022

01 FEB 2001

Indiana Department of Environmental Management
Hazardous Waste Permit Section
Office of Solid and Hazardous Waste Management
Attn: Mr. Victor P. Windle, Chief
100 North Senate Avenue
P.O. Box 6015
Indianapolis, Indiana 46206-6015

Dear Mr. Windle:

Crane Division, Naval Surface Warfare Center (NAVSURFWARCENDIV Crane) submits for review and approval four copies of the Revised Modified Ammunition Burning Grounds (ABG) Surface Impoundment (SI) Closure Plan dated February 2001 as enclosure (1). Enclosure (2) is the 40 CFR 270.11 required certification statement. The written response to the comments received in the December 4, 2000 Indiana Department of Environmental Management (IDEM) Revised Modified ABG SI Closure Plan Notice of Deficiency (NOD) are included as enclosure (3).

NAVSURFWARCENDIV Crane point of contact is Ms. Christine D. Freeman, Code 09511, telephone 812-854-4423.

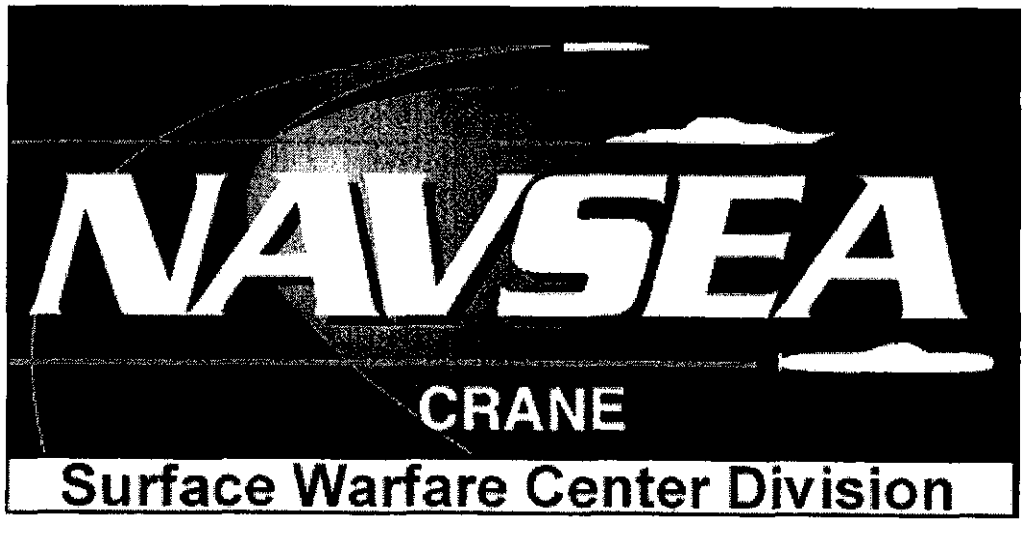
Sincerely,

James M. Hunsicker

JAMES M. HUNSICKER
Director Environmental Protection Department
By Direction
Of The Commander

Encls:
(1) Revised Modified ABG SI Closure Plan - February 2001
(2) Closure Plan Certification Statement
(3) Comment Response to IDEM NOD

Revised Modified Closure Plan for Surface Impoundments and Associated Contamination within the Ammunition Burning Grounds at Crane Division, Naval Surface Warfare Center Crane, Indiana



FEBRUARY 2001

Revised Modified Closure Plan for Surface Impoundments
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Acronym Listing

ABG	Ammunition Burning Grounds
BOM	Bureau of Mines
CA	Corrective Action
CAAA	Crane Army Ammunition Activity
EWW	Explosive Waste Water
HPLC	High Performance Liquid Chromatography
IDEM	Indiana Department of Environmental Management
IDLs	Instrument Detection Limits
MDLs	Method detection limits
NPDES	National Pollutant Discharge Elimination Systems
NSWC Crane	Crane Division Naval Surface Warfare Center
PRG	Preliminary Remedial Goal
PWW	Phosphorous Waste Water
QAPP	Quality Assurance Project Plan
RCRA	Resource Conservation Recovery Act
RFI	RCRA Facility Investigation
RISC	Risk Integrated System of Closure
RLs	Reporting Limits
SIs	Surface Impoundments
SWMU	Solid Waste Management Unit
U.S. EPA	U.S. Environmental Protection Agency, Region V

I. INTRODUCTION

It is the intent of this document to provide partial closure of the three Surface Impoundments (SIs) located within the Ammunition Burning Grounds (ABG) at Crane Division Naval Surface Warfare Center (NSWC Crane) in accordance with the provisions of 40 CFR Subpart G and 329 IAC 3.1-9;15.

NSWC Crane will close the facility in a matter that:

- Minimizes the need for further maintenance,
- Controls, minimizes or eliminates, to the extent necessary to protect human health and the environment, post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated run-on and run-off, waste decomposition products to the ground or surface waters or to the atmosphere, and
- Complies with the closure requirements of this subpart, including, but not limited to the requirements of 265.197, 265.228, 265.258, 265.280, 265.310, 265.351, 265.381, 265.404, and 264.1102.

Closure of the SIs and their associated contaminated area is considered to be only a partial closure. Final closure of the NSWC Crane hazardous waste facility will be accomplished when all of the hazardous waste management units have been certified as closed in accordance with the closure plan for the units. The maximum extent of operations that will be unclosed during the active life of the facility is indicated in Table 1.

Table 1. Maximum Extent of Operations.

Hazardous Waste Mgmt. Unit	Estimated Year of Closure
Three Surface Impoundments (ABG)	Currently undergoing closure
Waste Ash Pile (ABG)	Currently undergoing closure
ABG	2015
Demolition Range	2015
Control Storage Facility (Bldg. 2993)	2015

II. FACILITY DESCRIPTION

NSWC Crane is a federally owned military facility located in southwest Indiana approximately 75 miles southwest of Indianapolis and 71 miles northwest of Louisville, Kentucky. NSWC Crane occupies 62,463 acres (approximately 100 square miles) of mostly wooded, rolling terrain. Located primarily in the northern portion of Martin County, NSWC Crane also extends into neighboring Greene, Daviess, and Lawrence Counties. NSWC Crane was constructed quickly to meet an urgent need for an inland ammunition depot. Construction began in 1940, and was accelerated by the beginning of World War II. The majority of the buildings and infrastructure were constructed between 1940 and 1945. The site has a total of approximately 3,300 buildings and structures; approximately 2,300 of these are munitions storage magazines. Approximately 3,863 people are employed at Crane in 18 departments and five tenant activities. Of these, approximately 655 personnel work for the Army, with 3,208 working for the Navy. NSWC Crane engages these people in a variety of processes and functions to accomplish the missions of the Navy and Army. Hazardous wastes are generated during mission accomplishment. These wastes are generated and treated and/or stored at NSWC Crane.

NSWC Crane's mission is to "Provide quality and responsive engineering, technical and material support to the Fleet for combat subsystems, equipment and components, Microelectronic Technology, Microwave Components, Electronic Warfare, Acoustic Sensors Test, Electrochemical Power Systems, Conventional Ammunition Engineering, Pyrotechnics, Small Arms, Electronic Module Test and Repair and Electronic Warfare as assigned by the Commander, Naval Sea System Command." Under the Single Service Management Program, a segment of the facility's mission includes support of the Crane Army Ammunition Activity (CAAA). The CAAA is tasked with manufacturing, engineering, and product quality assurance to support production, storage, shipment, and/or demilitarization and disposal of conventional ammunition and related components.

NSWC Crane is fully enclosed in fencing to deter unauthorized entry. Signs are attached to the fencing warning of the facility boundary. The perimeter of the facility is patrolled seven days a week, 24 hours a day, by facility Security personnel. Manned guard shacks with lockable, automatic gates restrict access through the facility's access points. Figure 1 depicts the location of NSWC Crane. Employees are also issued and must wear identification badges.

The Navy retains ownership of all real estate and facilities, and is responsible for overall safety, security, and environmental compliance. The Standard Industrial Code for NSWC Crane is 9711-National Security. The U.S. Environmental Protection Agency, Region V Identification number is IN5170023498.

A final Resource Conservation Recovery Act (RCRA) Part B Permit was issued to the facility in December 1989 by the U.S. Environmental Protection Agency, Region V (U.S. EPA) and the Indiana Department of Environmental Management (IDEM). The permit renewal was approved on July 31, 1995. The next permit renewal is expected to be approved in July or August 2000. Other permitted activities include:

- National Pollutant Discharge Elimination Systems (NPDES) Discharge permit for 12 outfalls (Permit Number SW IN0021539),
- Operation of a solid waste landfill (Permit Number SW 239, OPP 51-2),
- Final RCRA Subpart X permit for open-burning and open-detonation operations issued 29 NOV 99.
- Small arms munitions incinerator permit (modification to December 1989 permit issued June 17, 1994),
- NPDES General Permit for Storm Water (Permit Number INR00C083),
- Sludge Application Permit (Permit Number INLA00073), and
- Title V Air Pollution Source Permit Application (Application Number T101734100005);

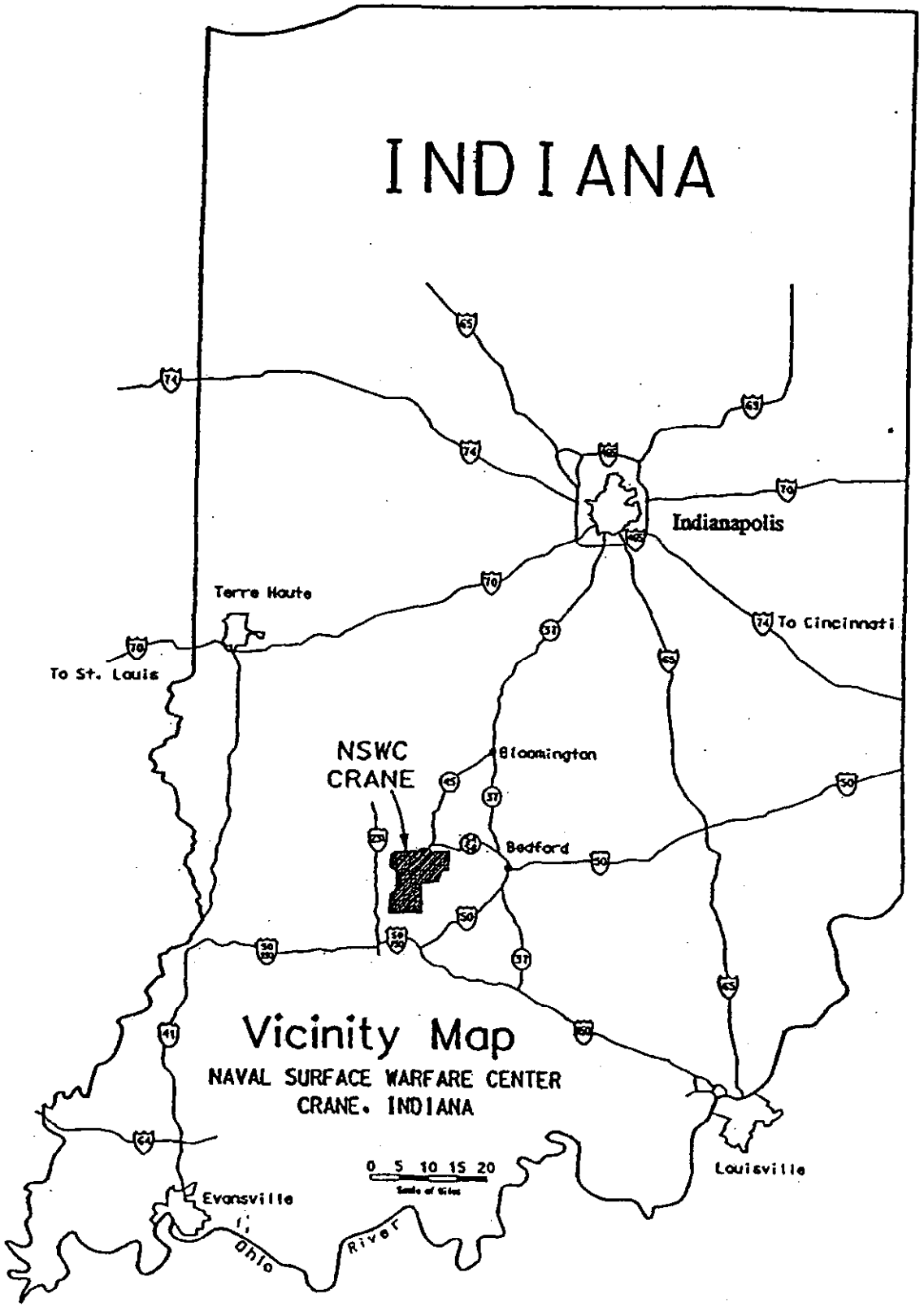

Figure 1 NSWC, Crane

III. DESCRIPTION OF WASTE UNIT TO BE CLOSED

The waste management units to be closed are the three SIs and surrounding area. The area is located within the ABG, Solid Waste Management Unit (SWMU) 03/10. The area to be closed is located in Mitcheltree township, NW 1/4 portion of section 28, T5N R3W, Martin County, Indiana.

The three SIs at ABG were used to dewater and concentrate explosive and pyrotechnic contaminated sludges to facilitate thermal treatment of these sludges by open burning. The SIs, when constructed in 1975 did not have liners. The SIs were modified in 1982 to include a 30-mil PVC liner, removable/40' diameter galvanized steel cover, and a leachate collection system in order to comply with 40 CFR 264.221. A fine/coarse 18 inch sand layer was located on the sides and bottom of each SI unit on top of a 12 inch compacted clay covering above the 30 mil PVC liner in addition to a 6 inch clay layer below. Surface burning of ordnance was formerly conducted on the ground surface, but burning pans are now used to prevent contact with the ground. Figure 2 depicts the location of the ABG and access gates to the facility.

The Surface Impoundments Progress Report for Work Completed Between 9/25/87 and 1/31/96 (dated February 1996), submitted to IDEM was completed under the previously approved Closure Plan. The report details those activities previously undertaken for SI closure at ABG as produced and signed by a certified engineer. Between October 21 and December 1, 1994, approximately 44,800 lbs. of contaminated soil was removed from SI #1 and 11,200 lbs. was removed from SI #2 from above the 30 mil PVC liner and thermally treated. The total amount of soil flash burned was 56,000 lbs. The flashed soil or ash from the SIs was transported by Peoria Disposal Company and landfilled (D81) at the Peoria Disposal Company Landfill, a permitted off-site hazardous waste landfill. Approximately 90 cubic yards of ash were loaded into containers for transport between 11/29/93 and 9/21/95. The ash was moistened with water spray before being loaded into the containers and the containers were located as close as possible to the SIs to minimize the distance over which the ash was exposed to gusts of wind. Loading occurred on relatively calm days. The 30-mil PVC liners in each of the SIs were also excavated and decontaminated by flashing and disposed of as hazardous waste to the aforementioned Peoria Disposal Company Landfill.

Explosive contaminated water from SI #1 and #2 was pumped via an explosives pump truck and transported to one of the two carbon treatment facilities where it was treated and discharged to the NSWC's sanitary sewer system. The water from SI #1 and #2 was considered to be a listed hazardous waste (K047). Outfalls for these facilities were permitted under NPDES permit number IN0021539. The wastewater treatment sludge from these on-site facilities was analyzed for the hazardous constituents of concern that are identified in the waste analysis section of the previously approved closure plan. The sludge was treated by flash burning at the on-site pad prior to disposal at a permitted off-site hazardous waste TSD facility.

Pyrotechnic contaminated waste from SI #3 was sampled and analyzed using the sampling procedures and analyses described in the waste analysis section of the closure plan modifications (May 14, 1993). The water rinsate was transported and managed through Carbon Adsorption at B-3110, Explosive Wastewater Treatment at NSWC, Crane.

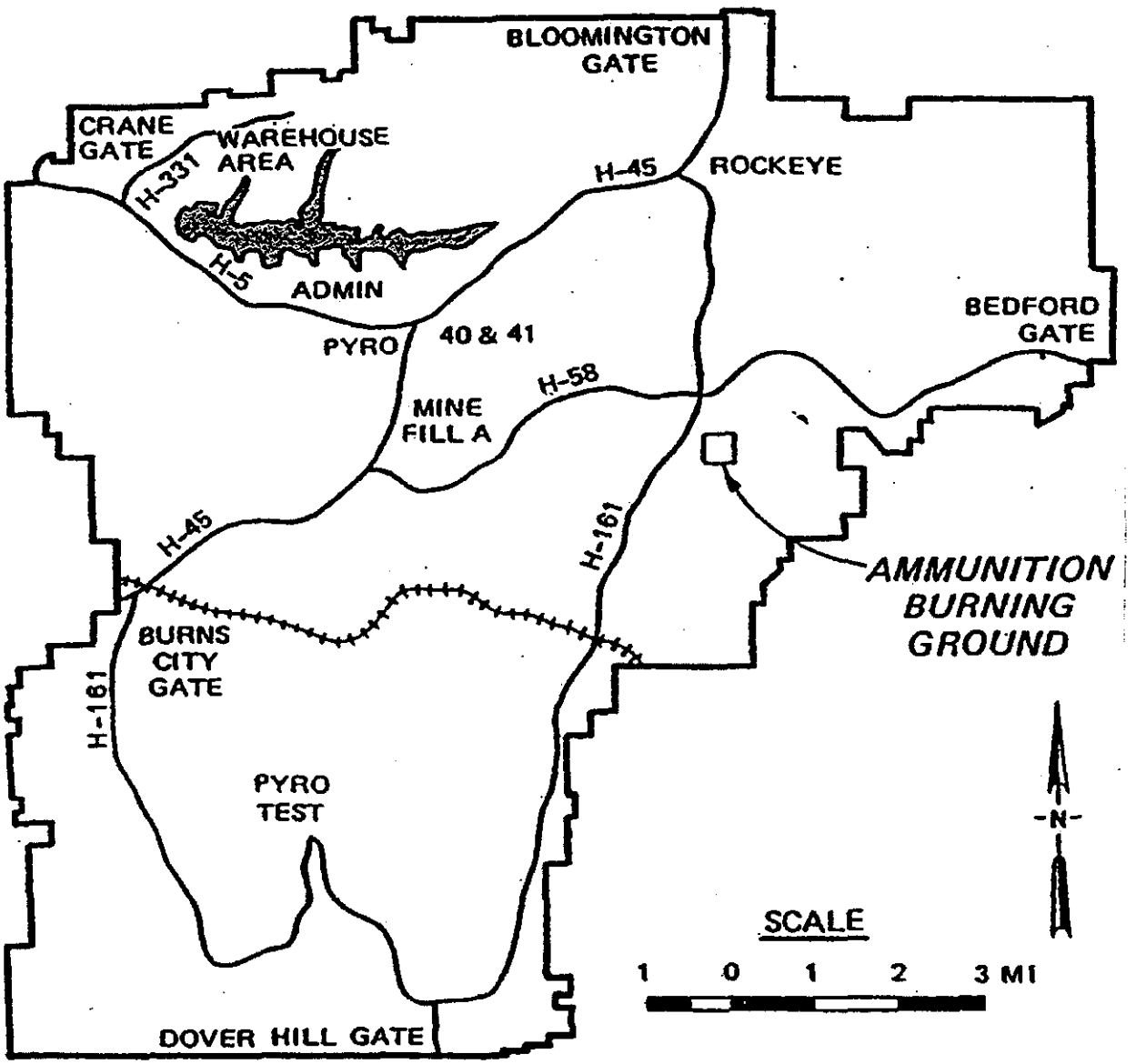

Figure 2 Ammunition Burning Ground at NSWC, Crane

Soil sampling below the explosive waste water (EWW) tank resulted in constituent concentrations below cleanup targets. Furthermore, as the phosphorous waste water (PWW) tank held only phosphorous waste water, the closure criterion for reactivity (phosphorous) has been met. Remaining explosive contamination is most likely associated with previous operations and is linked with the Corrective Action (CA) RCRA Facility Investigation (RFI) and will be remediated according to Federal and State CA regulations.

In SI #1, the results of verification sampling and analysis indicate that the remaining contamination (the soil under the clay layer) is most likely due to open burning that took place in trenches in the area prior to the construction of the lined SIs. This residual contamination is most likely associated with operations in the ABG prior to the construction of the lined SIs and is being investigated under the RFI. NSWC Crane proposes to sample, analyze and remove the remaining clay layer and associated soils for SI #1 according to Federal and State CA regulations. Explosives contaminated soil will be sampled, analyzed, excavated, and remediated under approved Federal and State CA measures. Therefore, upon removal of these soils SI #1 will meet the requirements of clean closure.

In SI #2, the clay layer under the PVC liner will be sampled and if the results reveal contamination, the clay will also be removed and decontaminated according to Federal and State CA regulations. Therefore, upon removal of these soils SI #2 will be considered clean closed.

During the period of use, SI #3 contained only phosphorous wastewater, and any explosive contamination is most likely accredited to previous operations. Sampling and analysis completed for SI #3 show that the closure criterion for reactivity (phosphorous) has been met. Soils determined as having metals or explosive contamination detected in SI #3 will be remediated according to Federal and State CA regulations. Therefore, Crane proposes that SI #3 will be considered clean closed.

This Modified Closure Plan for the SI at ABG does not address ground water contamination. Ground water contamination at ABG will be addressed through Permit Condition IV of the Subpart X (Miscellaneous Unit) Permit issued by the U.S. EPA (effective January 13, 2000).

Table 2 lists the maximum inventory of wastes handled for each SI and tank area

Table 2: Maximum Inventory of Wastes		
Unit	**Volume of Waste**	**Type of Waste**
Surface Impoundment No.1	16,000 gals. 4,785 cu. ft. 240 gals. 160 lin. ft. 50 cu. ft.	Explosive cont. water/sludge Explosive cont. soils Explosive cont. water in piping Contaminated piping Ash
Surface Impoundment No.2	14,500 gals. 4,785 cu. ft. 240 gals. 160 lin. ft. 50 cu. ft.	Explosive cont. water/sludge Explosive cont. soils Explosive cont. water in piping Contaminated piping Ash
Surface Impoundment No.3	14,500 gals. 4,785 cu. ft. 75 gals. 50 lin. ft. 50 cu. ft.	Phosphorous cont. water/sludge Phosphorous cont. soils Phosphorous cont. water in piping Contaminated piping Ash
25,000 gal. Explosive Waste Water Tank	25,000 gals. 9,550 cu. ft.	Filtered explosives wastewater Soil, sand, concrete, tank
12,000 gal. Phosphorous Waste Water Tank	12,000 gals. 8,000 cu. ft.	Filtered explosives wastewater Soil, sand, concrete, tank

The constituents of concern are Total Metals (D004 – D011), reactivity, and explosives HMX, RDX, TNT, and PETN for SIs #1 and #2, and Total Metals and reactivity for SI #3. The Surface Impoundments Progress Report for Work Completed Between 9/25/87 and 1/31/96 includes Uniform Hazardous Waste Manifests and Hazard Component Safety Data Statements on the material burned in each of the SIs.

According to the Soil Survey of Martin County, Indiana, the soil underlying the site is classified as the Burnside Series (Bu), 0 to 2 percent slope. Bu series soils consist of deep, well-drained, moderately permeable soils on bottomland. These soils formed in loamy, skeletal alluvium derived from sandstone, siltstone, and shale residuum. Figure 3 illustrates the underlying soil types at ABG.

These soils are less acidic in the underlying material than is definitive for the Burnside series. However, this difference does not alter the usefulness or behavior of the soils. Burnside soils are on wide, low-lying bottomland. The depth to bedrock ranges from 40 to 60 inches. Site specific topography features, surface run-on/runoff directions, and building structures around the area are depicted in Figure

Figure 3 Underlying Soil Types at ABG

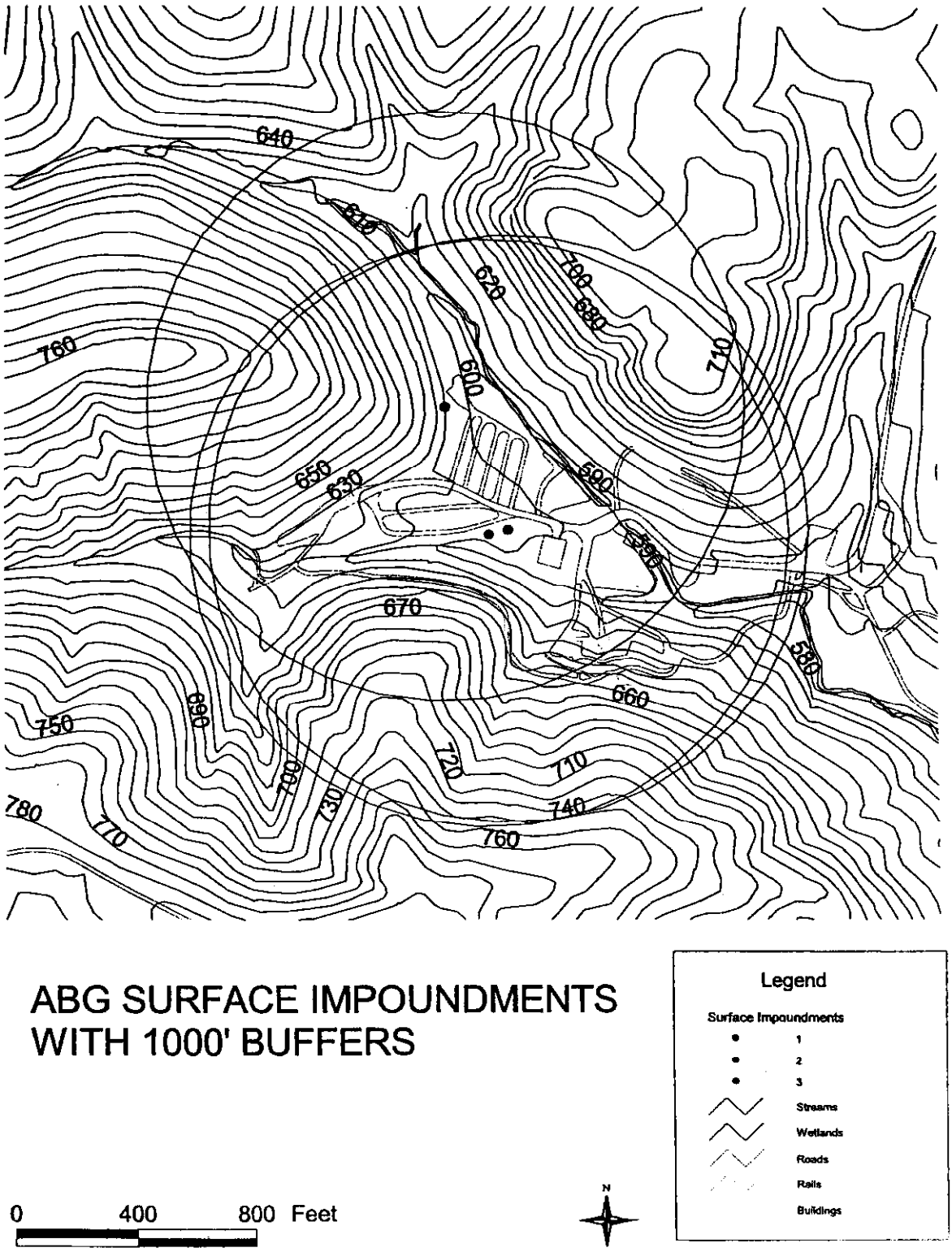

Figure 4 Topographic Features

IV. CONTAINMENT DESCRIPTION

The SIs, when constructed in 1975 did not have liners. The SIs were modified in 1982 to include a 30 mil PVC liner, 40' diameter removable galvanized steel cover, and a leachate collection system in order to comply with 40 CFR 264.221. A fine/coarse 18 inch sand layer was located on the sides and bottom of each SI unit on top of a 12 inch compacted clay covering above the 30 mil PVC liner in addition to a 6 inch clay layer below. Details for activities previously undertaken for each SI described above are included in the Surface Impoundments Progress Report for Work Completed Between 9/25/87 and 1/31/96.

V. HAZARDOUS WASTE LIST

The constituents of concern are Total Metals (D004 – D011), reactivity, and explosives HMX, RDX, TNT, and PETN for SIs #1 and #2, and Total Metals and reactivity for SI #3. Table 2 illustrates the maximum inventory of wastes handled at each SI at ABG.

VI. AIR EMISSIONS

Due to the size of the area, air emissions are difficult to minimize. The SIs were modified in 1982 to include removable galvanized steel covers to prohibit waste dispersal. The remaining contaminated clay/soil layers proposed for excavation and remediation will be treated according to Federal and State CA regulations. All work will be conducted in a way that minimizes pollution of air, water and land. Noise and the disposal of solid waste materials will be controlled to protect human health and the environment. All excavations, stockpiles, access roads, and other work areas will be maintained free from excess dust to avoid causing a hazard. Furthermore, dust at the excavation sites will be controlled with a wetting spray from a potable water source to minimize air emissions.

VII. PERSONNEL SAFETY AND FIRE PREVENTION

All closure activities shall comply with all Federal, State, and local health and safety regulations, including the Occupational Safety and Health Administration requirements, found in 29 CFR 1910, and U.S. EPA hazardous waste requirements of 40 CFR 260-270. Closure will also comply with NSWC Crane safety and fire policies. All personnel working on site will be trained in accordance with 29 CFR 1910.120.

VIII. CLOSURE SCHEDULE

Closure will be completed in accordance with the approved closure plan and all Federal and State CA regulations after approval of the closure plan by IDEM. A schedule for closure activities is presented in Table 3.

Table 3. Closure Schedule.

Time Period (weeks)	Activity Description
Weeks 1 through 4	Decontamination of contaminated area and associated fixtures in accordance with the approved plan. Perform sampling and analysis in accordance with approved plan.
Weeks 5 through 7	Receipt and interpretation of analysis.
Weeks 8 through 11	Additional decontamination of contaminated area and associated fixtures, along with sampling and analysis, if needed.
Weeks 12 through 14	Additional receipt and interpretation of analysis, if needed.
Weeks 15 through 20	Prepare and file closure certification with IDEM and the U.S. EPA.

IX. DECONTAMINATION OF TANKS, EQUIPMENT, AND STRUCTURES

It is the intent of NSWC Crane to remove residual contaminated materials from each SI unit through the procedures listed below. Figure 5 is a flow diagram depicting a schematic approach for decontamination.

A. Sampling to confirm contaminant presence and characterize for disposal.
   1. *Background soil sampling to account for background metals concentrations resulting from natural metals occurrences.* Background sampling will be completed in accordance with Section X.B.I.{c} of this plan. The cleanup value for the metals of concern (D004-D011) will be determined by one of the following, whichever is higher:
      a. Results from the Background sampling,
      b. Risk Integrated System of Closure values,
      c. Values obtained from the U.S. EPA Approved Base-Wide Background Soils Report for NSWC Crane, or
      d. Back calculations of Subpart X ground water compliance monitoring target levels.
   2. *Directed sampling of surface soils including sediments of any nearby run-off ditches.* Directed soil sampling within each SI has been completed and documented within the Surface Impoundments Progress Report for Work Completed Between 9/25/87 and 1/31/96 Section III-F-I.

3. *Grid sampling of subsurface soils.* Grid sampling of subsurface soils has been conducted for SI #1, while SI #2 will be sampled in accordance with closure plan specifications. Sampling and analysis for SI #3 indicate the closure criterion for reactivity (phosphorous) has been met.

B. Cleanup obvious contamination
   1. *Mechanical removal of soil if contaminated to a depth in which contamination is no longer present or at an accepted concentration level.* The clay layer in SI #1 has been found to be contaminated above the target level and will be excavated and undergo remediation according to Federal and State CA regulations. Residual soil explosives contamination below this clay layer is below the target level for contamination and most likely associated with operations in the ABG prior to the construction of the lined SIs. These soils will also be remediated according to Federal and State CA regulations. Pending sampling results for SI #2, the contaminated clay layer will also be excavated and remediated. Due to the proximity of SI #1 and SI #2, it is expected that residual soil contamination most likely associated with prior ABG operations will be found below the sampled clay layer in SI #2, of which will also be remediated Federal and State CA regulations .
   2. *Visual inspection of the surface impoundments*

C. Confirmation sampling to confirm contamination is removed will be conducted in accordance with approved Federal and State CA regulations and Ground Water Monitoring Plan/QAPP.
   1. *Grid sampling*
   2. *Directed sampling (optional).*

D. Prevent off-site contamination in accordance with Federal and State CA regulations and Ground Water Monitoring Plan/QAPP.
   1. *Contaminated equipment will be washed with a high-pressure low volume wash producing approximately 300 gallons of wash water.*
   2. *Wash water will be collected and managed as hazardous waste and treated thru the NSWC explosives water treatment plant.*
   3. *Visual inspection of equipment for remaining contamination before removal off-site.*
   4. *All small equipment which is not disposable will be decontaminated prior to leaving the site by washing with a nonphosphatic soap and rinsing with water.*
   5. *All disposable equipment will be disposed of properly as special waste.*

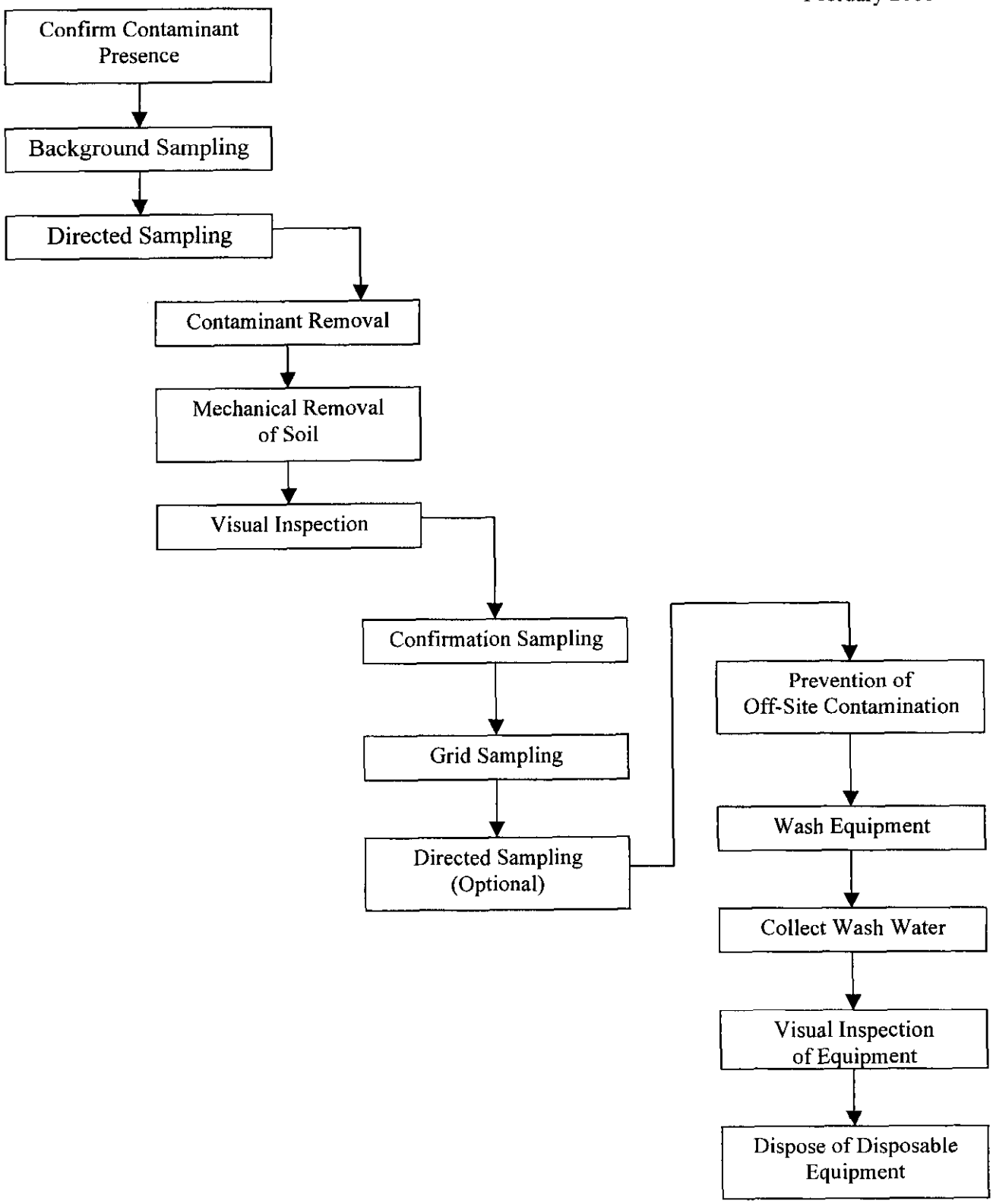

Figure 5 Flow Diagram for Decontamination of Surface Impoundments

X. SAMPLING AND ANALYSIS PLAN

A. Soil Sampling Requirements

Closures of units where there is any evidence or possibility of a leak or spill, or a potential for hazardous waste or hazardous waste constituents (40 CFR 261 Appendix VIII) migration must include investigative soil sampling of the soil to determine the nature and extent of contamination. Investigative soil sampling must also be provided for container or tank storage areas that are found on soil, gravel, or paved padded areas that contain cracks, gaps, or unsealed joints that are not watertight, or do not have curbs or other forms of secondary treatment containment. Sampling should be performed in accordance with the sampling methods listed in 40 CFR 261, Appendix 1 or SW-846, Chapter 9.

In the event of soil contamination, ground water monitoring may be conducted to determine the nature and extent of contamination in accordance with 40 CFR 264.90, 265.90 and the Subpart X Permit issued November 29, 1999 using the QAPP for Ground Water Monitoring. Established procedures and sampling protocols will be followed as described in the Ground Water Monitoring Plan and Ground Water Field Sampling Plan of the Subpart X Permit.

B. Sampling Procedures

Due to the possible dispersion of contaminant throughout the area, further soil sampling will be conducted to determine if the surrounding area is contaminated. Figure 6 illustrates a cross section of the SI soil sampling horizons.

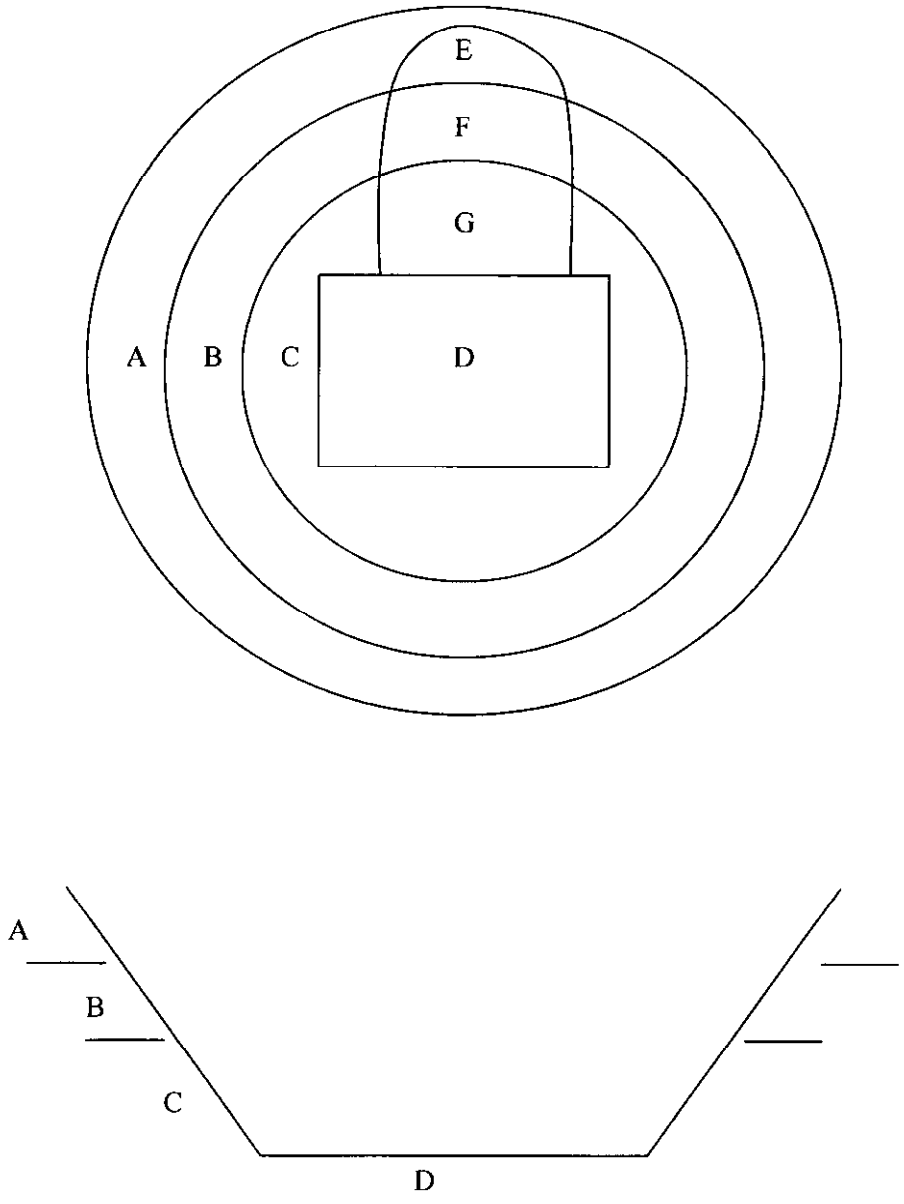

Figure 6 SI Soil Sampling Horizons

1. **Soil Sampling.**
Investigative soil borings and samples will continue to be selected to determine, with a high level of confidence, whether contamination of any hazardous constituents is present. Soil samples will be tested and analyzed for HMX, RDX, PETN, TNT, Arsenic, Barium, Cadmium, Chromium (Total), Lead (Total), Mercury and Selenium. SI #3 has undergone sampling and analysis for reactivity as described in the Surface Impoundments Progress Report for Work Completed Between 9/25/87 and 1/31/96 Appendix D.

The RCRA Reactivity Characteristic for a material is defined in 40 CFR Section 261 Subpart C. RCRA Reactivity is defined as the property of being capable of detonation or explosive reaction if subjected to a strong initiation source or if heated under confinement. In this work, two energetic material sensitivity tests (friction and impact) were used as a screening tool to determine if the accepted Bureau of Mines (BOM) RCRA Reactivity Tests are required. The assumption behind the screening tool concept is that if the explosive concentration is sufficiently high to fail the accepted BOM tests, the material is also likely to exhibit high sensitivity to friction and/or impact stimuli. For the screening tool application, test failure is based on statistically high sensitivity over a wide range of test parameters. The Surface Impoundments Progress Report for Work Completed Between 9/25/87 and 1/31/96Appendix D contains further analysis and soil sample results.

{a} **Directed Sampling.**
Directed sampling has been completed for surface soils within each SI. Surface soils were collected with disposable scoops by scraping the surface. To obtain a representative sample, individual scoops were disposed of after each single sample, and disposable latex gloves were worn and disposed of after each different individual sample to prevent cross-contamination. Direct body contact with the soil samples was minimized.

{b} **Grid Sampling**
Grid sampling will continue to be used for subsurface soil sampling. A grid will be constructed that slightly overlaps the unit. A maximum grid interval length no longer than 10 feet will be used. The amount of soil borings will be determined when the total number of grid intersection points is determined. If determined that the number of sample borings is less than three, a minimum number of three borings will be conducted.

{c} **Background Metals Sampling**
Preliminary background samples have been taken and are described within the Surface Impoundments Progress Report for Work Completed Between 9/25/87 and 1/31/96. The ABG soil samples 03/10-06a, 06b, 06c, 06d and 06e were collected from the equivalent soil horizon as the soils that were taken from the SIs. These samples were considered background samples for the SIs in the ABG area and were collected before the collection of samples from within the SI areas to minimize the chance of cross-contamination. Soil samples 03/10-06a, 06b, 06c,

06d and 06e were collected from the following depths below the surface: 0.3-0.5 foot, 1-1.5 foot, 2-3 foot, 4.5-5 foot and 5.5-6 foot, respectively.

Additional background samples will be taken to determine background concentrations that are related to natural occurrences and variability within each distinctive soil horizon. Background concentrations found in soils will be used to compare the natural conditions to the potentially contaminated soils at the units undergoing closure. Background borings will be performed in areas unaffected by past or present hazardous waste operations, by the hazardous waste unit, or by the facility itself. At a minimum, four background borings will be performed, with the composite samples being taken in each soil horizon encountered in each boring.

Number and locations for all of the soil samples taken including background samples will be provided on a detailed map or diagram of the facility along with additional information that is required by IDEM concerning the soil sampling plan. Also, analytical results will be provided to IDEM once sampling is finished and the information is organized. Surface Impoundments Progress Report for Work Completed Between 9/25/87 and 1/31/96 includes the aforementioned analysis for those soil samples previously taken from the SIs, as well as any background sampling completed to date.

Additional background sampling information will be taken from the Final Base-Wide Background Soil Investigation.

2. **Wash Water Sampling.**
Wash water samples were collected from SI tanks and associated piping and analyzed for the constituents of concern. The amount of wash water/rinsate collected allowed sample analysis to include the performance of matrix spike and matrix spike duplicates, as well as duplicate sample and blank results. Any further wash water generated will be assumed to be contaminated and disposed of thru the NSWC Crane explosives water treatment plant.

Surface Impoundments Progress Report for Work Completed Between 9/25/87 and 1/31/96 Appendix D includes a copy of the laboratory analytical results for wash water rinsate samples previously collected and analyzed for the constituents of concern.

C. Sampling Quality Assurance

To achieve sampling quality assurance, sampling methods and equipment will continue to follow guidance in "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods" (SW-846) and 40 CFR 261 appendix I.

D. Analytical Requirements

All sampling and analysis will be performed and completed within the approved scope and methods of the Federal and State CA regulations, Ground Water Monitoring Plan and Ground Water QAPP and Field Sampling Plan.

Upon receipt of analytical data, NSWC Crane will provide the following information to IDEM (as applicable):

- Summary report of results,
- Sampling, preparation, and analysis dates,
- Analytical and preparation methods used,
- Estimated quantitation limits (detection limits for non-SW-846 methods),
- Sample; duplicate sample, and blank results,
- Method blanks (for all analyses),
- HPLC retention time windows,
- Calibration results (whichever is applicable),
  - calibration curves,
  - correlation coefficients,
  - continuing calibration verification,
  - linear range report (for ICP analyses),
  - response factors for each level, the mean response factor, and percent relative standard deviations (for GC, GC/MS, and HPLC),
  - calibration check compounds and system performance check compounds results (for GC/MS),
- Standard addition method results (if applicable),
- Laboratory control sample results,
- Matrix spike/matrix spike duplicate results,
- BFB or DFTPP tuning criteria results (for GC/MS),
- Surrogate recoveries (for GC, GC/MS, and HPLC), and
- Signed chain-of-custody sheets for all samples (signatures by samplers, handlers, and laboratory personnel are required).

XI. DESCRIPTION OF SOIL REMEDIATION ACTIVITIES

NSWC Crane proposed that the specific details of how the soil remediation activities will occur be addressed at a future time when additional remediation activities will take place at the ABG under Federal and State regulatory CA approval. The remediation workplan will include:

- a detailed description of the treatment process (sampling, excavation, disposal/remediation, confirmation sampling, backfill material);
- justification of applicability and feasibility of the process to ABG (including discussion of site conditions and contaminants);
- schedule of activities;
- periodic testing to verify progress;
- periodic status reports indicating progress made;
- description of efforts to minimize air emissions (volatiles and dust)
- sampling (location and depths) and analysis procedures for periodic and final verification; and
- final verification sampling and analysis t confirm complete remediation to cleanup levels.

XII. CLEANUP LEVELS

NSWC Crane will decontaminate soils and groundwater associated with the SIs following U.S. EPA and IDEM approved analytical methods and in accordance with established industrial cleanup level goals.

The cleanup values for the metals of concern (D004-D011) will be determined by using one of the following from Table 4, whichever is higher:

a. Results from the Background sampling,
b. Industrial Risk Integrated System of Closure values,
c. Values obtained from the U.S. EPA Approved Base-Wide Background Soils Report for NSWC Crane, or
d. Back calculations of Subpart X ground water compliance monitoring target levels.

The cleanup values for the explosives of concern will be determined by using one of the following from Table 4, whichever is higher:

a. Risk Integrated System of Closure values (to be established)
b. Risk Assessment (to be established), or
c. Back calculations of Subpart X ground water compliance monitoring target levels.

Table 4
SWMU-Specific Chemicals of Concern Clean Up Levels

Parameter	RISC Industrial Closure (mg/kg)	Site-Specific Risk Based Level (mg/kg)*	Risk Assessment	Base-Wide Background	Background
Explosives					
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	N/A**	7.48	To Be Determined	N/A	N/A
Pentaerythritol tetranitrate (PETN)	N/A**	--	To Be Determined	N/A	N/A
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	N/A**	0.00262	To Be Determined	N/A	N/A
2,4,6-Trinitrotoluene (TNT)	N/A**	0.00889	To Be Determined	N/A	N/A
Metals					
Arsenic	20	1.168	To Be Determined	To Be Determined	To Be Determined
Barium	5,900	3.2136	To Be Determined	To Be Determined	To Be Determined
Cadmium	77	1.6566	To Be Determined	To Be Determined	To Be Determined
Chromium	120	3.84	To Be Determined	To Be Determined	To Be Determined
Lead	230	45.01	To Be Determined	To Be Determined	To Be Determined
Mercury	32	1.35825	To Be Determined	To Be Determined	To Be Determined
Selenium	53	0.52	To Be Determined	To Be Determined	To Be Determined
Silver	87	0.697	To Be Determined	To Be Determined	To Be Determined

* - Equal to C_{sbsin} (See Appendix 1 for formulas and values)
** - Not provided in the RISC Technical Guide Appendix 1 Table A.

XIII. DESCRIPTION OF EQUIPMENT DECONTAMINATION AND DISPOSAL OF WASTE

Any equipment, including heavy earth movers or small tools, will be scraped and washed to remove waste residues. Contaminated equipment will be washed with a high-pressure low volume wash. All wash water will be collected and managed as hazardous waste and disposed of thru the NSWC Crane explosives water treatment plant. Small tools which are not disposable will be decontaminated prior to leaving the site by washing with a nonphosphatic soap and rinsing with water. All residues, liquid or solid, will be handed as hazardous waste until analysis proves it to be otherwise.

Disposal of waste is determined on the results of the analytical data. If results are above the values set in 40 CFR 261.24 Table 1, the waste will be managed as hazardous waste. Samples will be analyzed for parameters listed in Table 4.

XIV. CLOSURE AND POST-CLOSURE COST ESTIMATE/FINANCIAL ASSURANCE

In accordance with 264.140(c), this section does not apply to this closure plan because the various hazardous waste units at NSWC Crane are an entity of the Federal Government and are therefore granted a specific exemption from Subpart H requirements.

APPENDIX

Commercial/Industrial Migration to GW Contact (Non-carcinogens)*

$$C_{sbsin} = C_{igwn} \times 20 \left(K_d + \frac{\theta wp + (\theta ap \times H')}{P_b} \right)$$

Table 1

Symbol	Parameter	Value
θap	Air Filled Soil Porosity Partitioning model	0.134 l air/l soil
θwp	Water Filled Soil Porosity Partitioning model	0.3 l water/l soil
C_{igwn}	Default Level Commercial/Industrial Groundwater Concentration for Non-carcinogen	Chemical Specific mg/l
C_{sbsin}	Default Closure Level Subsurface Soil Commercial/Industrial Non-carcinogen	Chemical Specific (mg/kg)
f_{oc}	Fraction Soil Organic Carbon (Fraction)	0.002 for subsurface soil 0.006 for surface soil
H'	Henry's Law Constant x 41	Chemical Specific (unitless)
K_d	Soil/Water Partition Coefficient(See Table B) K_d = Table Values for Metals(See Table B) $K_d = K_{oc} \times f_{oc}$ for Organics (See Table B)	Chemical Specific (l/kg) Chemical Specific (l/kg) Chemical Specific (l/kg)
K_{oc}	Soil Organic Carbon/Water Partition Coefficient (See Table B)	Chemical Specific (l/kg)
P_b	Dry Soil Bulk Density	1.5 kg/l

* From RISC Technical Guide Appendix 1.

Table 2

Parameter	C_{igwn} (mg/l)*	H'	K_{oc} (l/kg)	K_d (l/kg)
Explosives				
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	1.8	--	3.8041	--
Pentaerythritol tetranitrate (PETN)	--	--		--
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	0.00061	--	7.1695	--
2,4,6-Trinitrotoluene (TNT)	0.0022	0.00056170	1.0006	--
Metals				
Arsenic	0.002	0.0	--	29
Barium	0.0039	0.0	--	41
Cadmium	0.0011	0.0	--	75
Chromium	0.010	0.0	--	19
Lead	0.0025	0.0	--	900
Mercury	0.0013	0.45	--	52
Selenium	0.005	0.0	--	5
Silver	0.0041	0.0	--	8.3

*From NSWC Crane Subpart X Permit Table 1-3 Compliance Monitoring Target Value.

CLOSURE PLAN CERTIFICATION STATEMENT

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.

IN5170023498
U.S. EPA I.D. Number

Crane Division, Naval Surface Warfare Center
Facility Name

James M. Hursit
Signature of Owner/Operator

JAMES M. HURSIT JR
Dir Env
Prot Depa
Name and Title

2/01/01
Date

Response to IDEM Notice of Deficiency dated 12/4/00
for ABG Surface Impoundments
Modified Closure Plan dated June 2000
U.S. Naval Surface Warfare Center
Crane, Indiana
IN5170023498

Section III. Description of Waste Units to be Closed.

Comment

1. This section must be revised to indicate that ground water contamination will be addressed through Permit Condition IV of the Subpart X (Miscellaneous Unit) permit issued by Environmental Protection Agency, Region 5 (effective January 13, 2000).

Response

1. The text in Section III has been changed to reflect that the ground water contamination at ABG will be addressed through Permit Condition IV of the Subpart X (Miscellaneous Unit) Permit issued by the U.S. EPA.

Section IX. Decontamination of Tanks, Equipment, and Structures.

Comment

2. Correct the statement in Part A "Background sampling has been completed for portions of the area surrounding the surface impoundments..." Background values for metals were incorrectly calculated from only one boring. The February 8, 2000 Notice of Deficiency (NOD) notes that this is not acceptable. If cleanup levels for metals will be determined by background values, the correct procedure for calculating background values must be used. The correct procedure is described in Section X.B.I.{c} of the plan.

Response

2. The statement has been corrected to read, "Background sampling will be completed in accordance with Section X.B.I.{c} of this plan. Background sampling will be completed in accordance with Section X.B.I.{c} of this plan. The cleanup value for the metals of concern (D004-D011) will be determined by one of the following, whichever is higher:
    a. Results from the Background sampling,
    b. Risk Integrated System of Closure values,
    c. Back calculations of Subpart X ground water compliance monitoring target levels, or
    d. Values obtained from the U.S. EPA Approved Base-Wide Background Soils Report for NSWC Crane.

Section XII. Cleanup Levels

Comment

3. A specific statement indicating the cleanup levels for metals or how they will be determined must be included in this section. Crane indicates in their NOD response that cleanup levels have been removed from the closure plan "to allow flexibility if acceptable levels should change between the plan approval and actual work beginning under

Corrective Action." Corrective Action is likely to use the same strategy to set cleanup levels as a closure plan (i.e., either background or a Risk Integrated System of Closure (RISC) based level). If Corrective Action uses a different strategy (e.g. a site specific RISC closure level) the Closure Plan may still be amended to use that value. The Closure Plan must state the cleanup levels. However, the statement may be conditional (e.g., closure levels for metals may be based on background or RISC default closure levels, whichever is higher).

Response

3. This section has been amended to include the cleanup level strategy for metals as follows: The cleanup values for the metals of concern (D004-D011) will be determined by using one of the following from Table 4, whichever is higher:
    a. Results from the Background sampling,
    b. Industrial Risk Integrated System of Closure values,
    c. Values obtained from the U.S. EPA Approved Base-Wide Background Soils Report for NSWC Crane, or
    d. Back calculations of Subpart X ground water compliance monitoring target levels.

Comment

4. The are no RISC closure levels for the explosive compounds and background does not apply. The facility may either propose closure levels from an acceptable source, indicate that a risk assessment will be performed, or indicate that they will use Corrective Action closure values being developed for explosive compounds at military facilities statewide. Crane may use the ground water compliance monitoring values established in the Subpart X permit to calculate appropriate closure levels for explosive compounds contained in the soil.

Response

4. This section has been amended to include the explosives cleanup level strategy as follows: The cleanup values for the explosives of concern will be determined by using one of the following from Table 4, whichever is higher:
    a. Risk Integrated System of Closure values (to be established)
    b. Risk Assessment (to be established), or
    c. Back calculations of Subpart X ground water compliance monitoring target levels.

Additional changes made to the text:

1. Risk Integrated System of Closure (RISC) was added to the Acronym listing on page i.
2. An Appendix was added to show the formulas and values used in calculating the site-specific cleanup values.
3. Table 4 SWMU-Specific Chemicals of Concern Clean Up Levels was moved from section XIII Description of equipment decontamination and disposal of waste to XII Cleanup levels to eliminate the need for duplication.
4. Silver was inadvertently excluded from Table 4. Silver was added to Table 4 SWMU-Specific Chemicals of Concern Clean Up Levels due to listings in the text for Constituents of Concern being Total Metals (D004-D011).