



**Quarterly Interim Progress Report  
January – March 1999**

**Full-Scale Operations  
Bioremediation Of Explosives-Contaminated Soil  
NSWC Crane  
Crane, Indiana**

**Unit Identification Code: N00164  
Contract No. N62467-93-D-1106**

**June 1999**

**Southern Division  
Naval Facilities Engineering Command  
North Charleston, South Carolina  
29419-9010**

## EXECUTIVE SUMMARY

This interim progress report has been prepared by Morrison Knudsen Corporation (MK) for Southern Division, Naval Facilities Engineering Command. This is the fourth quarterly report that has been prepared to document the progress of the full-scale bioremediation operation of explosives-contaminated soil at Naval Surface Warfare Center (NSWC) Crane, Crane, Indiana. It summarizes the work actions performed from January through March 1999 pursuant to the requirements of the approved *Full-Scale Operational Plan* and the *Quality Assurance Project Plan*. Full-scale bioremediation operations started in April 1998.

The scope of work includes initial site characterization by sampling and analysis, excavation and screening of explosives-contaminated soil, transportation of screened soil for treatment at the Biofacility, process monitoring and confirmatory sampling, and disposal of treated soil.

All initial characterization sampling at Mine Fill "A" (MFA) is now complete. Initial characterization sampling at Mine Fill "B" (MFB), in support of a construction project by others, indicated the presence of TNT. Results of initial characterization sampling at Ammunition Burning Ground (ABG), in support of another construction project by others, did not require any immediate excavation activity. In process and post excavation sampling for several grids in MFA have been completed, indicating that industrial clean-up goals have been achieved.

A total of 1,251 cubic yards of screened soil was transported to the Biofacility during this reporting period. This quantity continues the improved productivity experienced with the new screener.

Sufficient straw is in stock to carry out operations to the next straw harvest season. The chicken manure supplier is under contract and manure is trucked to the project on an as needed basis.

A total of 13 new windrows were constructed during this reporting period. Twelve windrows reached Day Last during this period. A total of 2,142 cubic yards of contaminated soil was reduced to residential or industrial clean up levels for explosive compounds contamination during the reporting period. Windrow processing is now almost seven months ahead of schedule.

A total of 20,814 cubic yards (47 windrows) of compost have been returned to MFA either for temporary staging or used as backfill in open excavation areas.

All interim measures work actions have been performed in accordance with the approved plans.

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## ACRONYMS

ABG	Ammunition Burning Ground
CAAA cfu/m <sup>3</sup>	Crane Army Ammunition Activity colony forming units per cubic meter
EPD	Environmental Protection Division
FCR	Field Change Request
HMX	cyclotermethylenetetranitramine
LCS	laboratory control sample
LCSD	laboratory control sample duplicate
LOQ	limit of quantitation
MFA	Mine Fill "A"
MFB	Mine Fill "B"
MK	Morrison Knudsen Corporation
MS	matrix spike
MSD	matrix spike duplicate
NSWC	Naval Surface Warfare Center
OSHA	Occupational Safety and Health Administration
PEL	permissible exposure limit
PID	photoionization detector
ppm	parts per million
QAPP	Quality Assurance Project Plan
QC	quality control
RDX	cyclotrimethylene trinitramine
SWMU	solid waste management unit
TLV	Threshold Limit Value
TNT	2,4,6-trinitrotoluene
USEPA	United States Environmental Protection Agency

This interim progress report has been prepared by Morrison Knudsen Corporation (MK) for Southern Division, Naval Facilities Engineering Command. This is the fourth quarterly report that has been prepared to document the progress of the full-scale bioremediation operation of explosives-contaminated soil at Naval Surface Warfare Center (NSWC) Crane, Crane, Indiana. It summarizes the work actions performed by MK during January 01 through March 26, 1999 pursuant to the requirements of the approved *Full-Scale Operational Plan* [MK, 1998a] and the *Quality Assurance Project Plan* [MK, 1998b]. Full-scale bioremediation operations started in April 1998. Toltest, Inc., will continue the bioremediation operations after March 26, 1999.

NSWC Crane, located in southwestern Indiana, provides support for equipment shipboard weapons systems, and ordnance. This site also supports Crane Army Ammunition Activity (CAAA), which includes production and renovation, storage, shipment, and demilitarization and disposal of conventional ammunition. Explosive-compounds contaminated soils resulting from the above operations have been identified at four solid waste management units (SWMUs): Ammunition Burning Ground (ABG) (SWMU-03/10); Rockeye Munitions Facility (SWMU-10/15); Mine Fill "A" (MFA) – (SWMU-12/14); and Mine Fill "B" (MFB) – (SWMU-13/14).

On-site bioremediation of the explosive-compounds contaminated soil utilizing a windrow composting process has been selected as the preferred treatment alternative for the Interim Measures (IM) at these four SWMUs.

The scope of work includes initial site characterization by sampling and analysis, excavation and screening of explosives-contaminated soil, transportation of screened soil for treatment at the Biofacility, process monitoring and confirmatory sampling, and disposal of treated soil.

## **1.0 EXCAVATION**

During this reporting period field work activities were conducted at MFA. Work activities at the excavation site included: in-process sampling, post-excavation sampling, soil excavation, and screening. Specifics for each SWMU site are discussed below.

All field work activities were performed in accordance with procedures included in the *Full-Scale Operational Plan* [MK, 1998a] and the *Quality Assurance Project Plan (QAPP)* [MK, 1998b].

Drawings showing the sampling and excavation grids of various locations were provided in the third quarterly report. Final drawings will be included in the Interim Measures Report for Bioremediation.

## **1.1 Pre-Excavation Sampling**

Pre-excavation sampling is performed to provide initial site characterization to delineate excavation efforts and to establish that clean-up goals have been achieved if no excavation is required. Pre-excavation samples are analyzed for SWMU-specific compounds by an off-site analytical laboratory.

A minimum of three soil samples were obtained from each grid for characterization of the soil prior to excavation. Explosive compounds and metals analysis were completed on composite samples obtained from zero to 12-inches in depth and 24 to 36-inches in depth. Volatile analysis was completed on grab samples obtained at 12-inches. Additional samples were obtained for volatile analysis based on photoionization detector (PID) screening.

The horizontal boundaries of explosive constituents have been delineated by buildings, roads, railroad tracks, and grids with either no detectable levels of the respective constituent or levels that are below the clean-up action. To date, no metals or volatile compounds have been detected above clean-up action levels in any sample.

### **1.1.1 Mine Fill "A"**

There has been no change in the status of pre-excavation soil sampling for MFA this quarter. No additional pre-excavation samples were collected this quarter.

### **1.1.2 Mine Fill "B"**

Pre-excavation sampling has been completed in eight grids at Building No. 166. Explosives compounds were detected as follows: HMX ranged from non-detect to 159 ppm, RDX ranged from non-detect to 5,940 ppm, and TNT ranged from non-detect to 5320 ppm.

Pre-excavation sampling has been completed in seven grids at Building No. 168. Explosives compounds were detected as follows: HMX ranged from non-detect to 107 ppm, RDX ranged from non-detect to 10,400 ppm, and TNT ranged from non-detect to 16,600 ppm.

Pre-excavation sampling has been completed in seventeen grids at Building No. 171. Explosives compounds were detected as follows: HMX ranged from non-detect to 116 ppm, RDX ranged from non-detect to 528 ppm, and TNT ranged from non-detect to 34 ppm.

Pre-excavation sampling has been completed in sixteen grids at Building No. 173. Explosives compounds were detected as follows: HMX ranged from non-detect to

11,100 ppm, RDX ranged from non-detect to 32,000 ppm, and TNT ranged from non-detect to 8,960 ppm.

Pre-excavation sampling has been completed in twenty-one grids at Building No. 2501. Explosives compounds were detected as follows: HMX ranged from non-detect to 4,090 ppm, RDX ranged from non-detect to 16,100 ppm, and TNT ranged from non-detect to 4,290 ppm.

## **1.2 In-Process Excavation Soil Sampling**

In-process excavation soil sampling is performed to assist the field crew in planning excavation activities. Field screening test kits are used for testing TNT and RDX levels in the in-process soil samples to provide quick analytical results.

### **1.2.1 Mine Fill "A"**

There has been no change in the status of in-process soil sampling for MFA this quarter. No additional in-process samples were collected this quarter.

## **1.3 Post-Excavation Soil Sampling**

Post-excavation soil sampling (i.e., confirmation samples) is performed to provide confirmation that the excavation meets established industrial clean-up goals. Confirmation samples are analyzed for SWMU-specific compounds by an off-site analytical laboratory.

### **1.3.1 Mine Fill "A"**

There has been no change in the status of post-excavation soil sampling for MFA this quarter. No additional post-excavation samples were collected this quarter.

### **1.3.2 Mine Fill "B"**

No post-excavation soil characterization has been initiated at MFB.

## **1.4 Soil Excavation and Screening**

Soil excavation continued at MFA around buildings 152, 153/154, and 158/159. A total of 1,251 cubic yards of soil were excavated and screened during this reporting period. To date, 10,937 cubic yards of soil have been excavated and screened versus 9,400 cubic yards planned. The new screener continues to process soil at a higher rate than originally planned. Production during this quarter was 1,251 cubic yards versus 400 cubic yards planned. A stockpile of screened soil is available to continue uninterrupted composting operations.

The planned and actual screened soil quantities are shown in Figure 1. Table 1 entitled "Full-Scale Operations Soil Excavations and Screening at MFA" included in Appendix A provides the production data.

## 2.0 COMPOSTING OPERATIONS

Treatment of explosive-compounds contaminated soil by composting involves microbial degradation of explosive-compounds by optimizing the availability of organic material, temperature, moisture content, pH, and oxygen. The composting operation process description is provided in Section 5.0 of the approved *Full-Scale Operational Plan* [MK, 1998a].

This section provides details of procurement and delivery of amendments, quantity of amendments used in the treatment operations, construction and treatment of windrows, and analytical data interpretation.

### 2.1 Amendments

The compost mix used in full-scale operations consists of 25% soil, 15% chicken manure, and 60% straw by volume.

Straw deliveries have been received by the project satisfying all of the bulk straw order. A large stockpile of straw is available to satisfy composting needs into mid summer. A total of 2,000 tons will assure the project has sufficient straw in stock to support operations until the 1999 harvest is available in June.

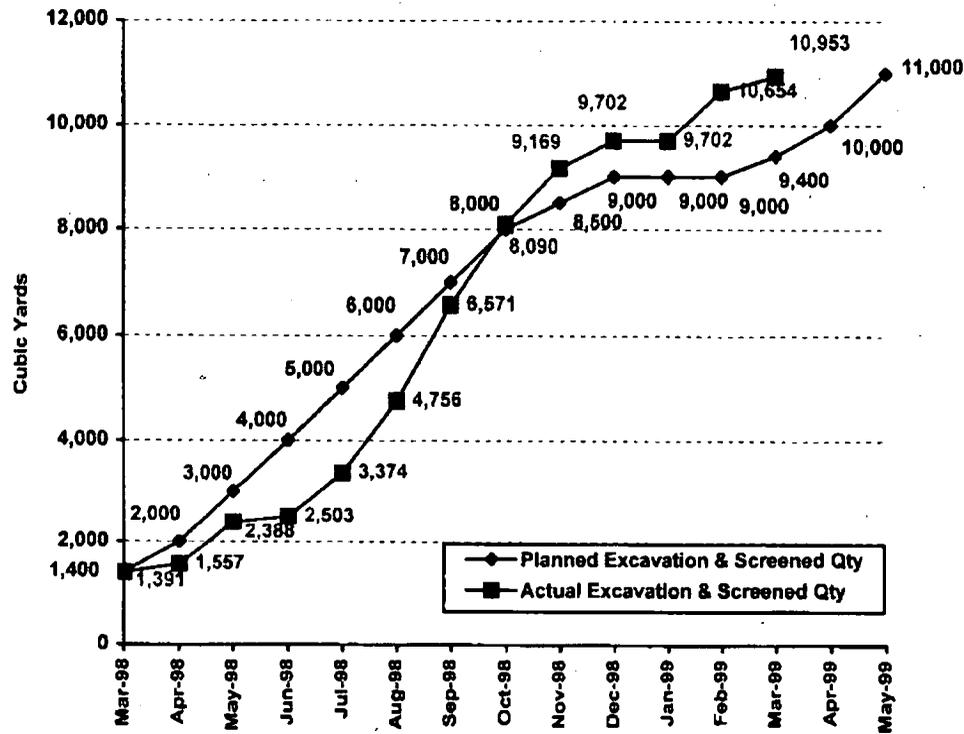
Chicken manure continues to be trucked to the Biofacility on an as needed basis. Contract quantities of chicken manure are sufficient to support operations.

### 2.2 Quantity of Amendments Used

The following summarizes the amendments used during this reporting period.

- Chicken manure received this period: 1,199 tons  
Cumulative received for full-scale: 5,327 tons
- Chicken manure used this period: 1,417 yd<sup>3</sup>  
Cumulative used for full-scale: 5,920 yd<sup>3</sup>
- Straw received this period: 445 tons  
Cumulative received for full-scale: 2,976 tons
- Straw used this period: 6,348 yd<sup>3</sup>  
Cumulative used for full-scale: 17,733 yd<sup>3</sup>

**FIGURE 1**  
**NSWC CRANE MFA - SOIL EXCAVATION AND SCREENING VOLUMES**  
**(cumulative values)**



### **2.3 Windrow Construction and Treatment**

Field screening has been performed at least weekly to monitor the RDX and TNT levels. Final compost samples have been collected once the field test kits indicated RDX and TNT readings are below detectable levels. The day that final compost samples are collected for off-site laboratory confirmation analysis is referred to as Day Last.

Twelve windrows achieved Day Last status during the fourth quarter of full-scale operations. Forty-eight windrows have achieved Day Last status since the beginning of full-scale operations. Two additional windrows have been constructed and are processing toward their Day Last. Laboratory results have been received for windrows one through 48. Day Last laboratory data is handled on a priority basis by MK and the off-site laboratory. The time between Day Last sample collection and receipt of analytical data varies from windrow to windrow. Lately, the time has ranged from seven to 13 days with an average time of ten days. Residential or industrial clean-up levels for explosive compounds were achieved for these windrows. Analytical data regarding windrows that achieved Day Last during this period are discussed in Section 2.4.

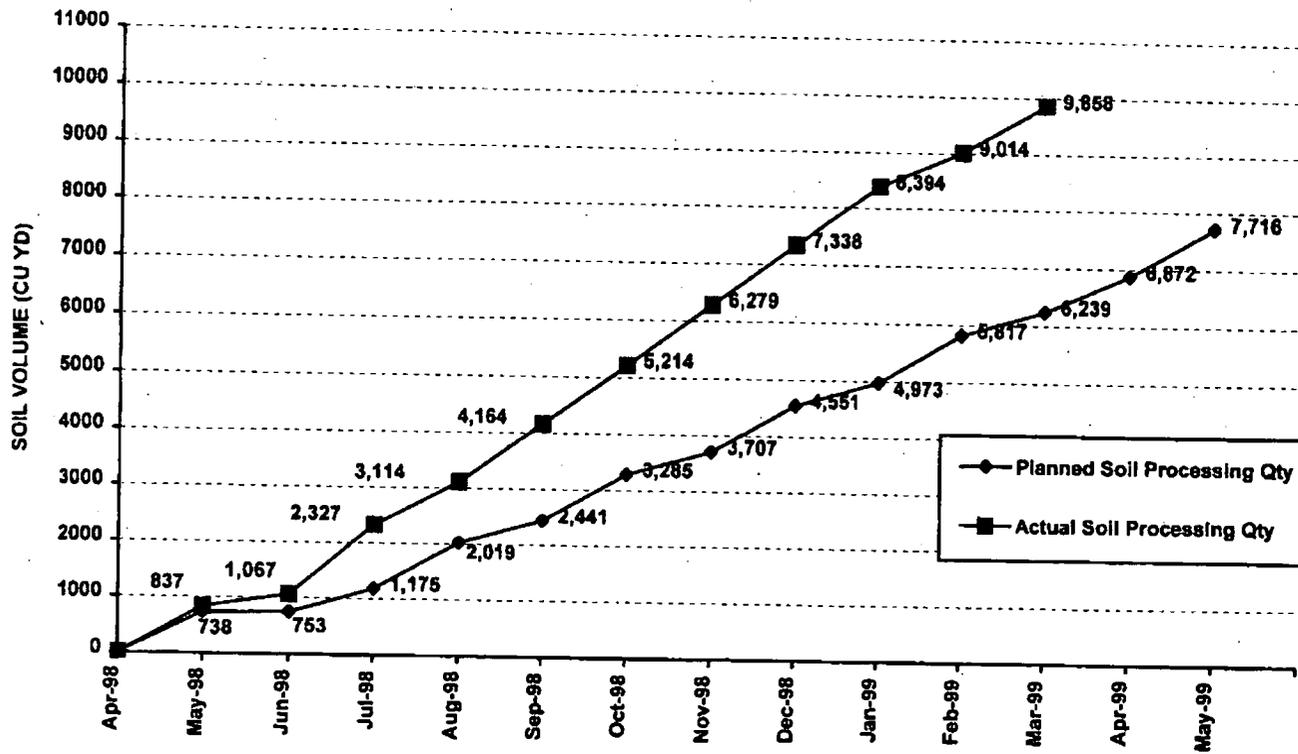
Actual schedule performance continues significantly ahead of the planned dates. This is primarily due to the relatively short bio-degradation period. The average number of days between Day Zero and Day Last for the first forty-four windrows is eleven days. The schedule planned this period to be thirty days. MK continues to closely monitor the bioremediation of the windrows with the use of available data including field test kits. Windrows reaching clean-up goals are sampled for Day Last laboratory analysis. The details of the progress of windrows are included as Table 2, Appendix A.

Operations remediated 2,520 cubic yards of contaminated soil during the fourth quarter. Cumulative operations since the beginning of full-scale have remediated 9,858 cubic yards of contaminated soil versus 6,239 cubic yards planned. Figure 2 charts the progress of composting operations.

### **2.4 Analytical Data Interpretation and Validation**

Table 3 (see Appendix A) provides this quarter's laboratory analytical results for HMX, RDX, and TNT. All windrow results represent an average of 15 individual data points (five cross sections, three sample locations per cross section). Day Zero and Day Last results are given for each windrow, demonstrating the effectiveness of the bio-degradation.

**FIGURE 2**  
**NSWC CRANE BIOFACILITY SOIL PROCESSED VOLUMES**  
**(cumulative values)**



All data associated with windrow monitoring was verified, and at least 10% of the samples were validated, and compared with field and laboratory quality control (QC) sample data to assess the data's usability for supporting full-scale operations. Data was verified by reviewing chain-of-custody forms, sample preservation records, analytical holding times, requested turnaround times, sample data in comparison to QC data, and reporting requirements. In addition, more than 10% of the data was validated using the validation procedures specified in Section 9.2.2 of the QAPP.

Analytical results for the trip blanks, field blanks, equipment rinsates, and field duplicates were evaluated to identify potential sources of error introduced during sampling, transportation and storage. Field QC performed with the monitoring of Windrow No. 37 through Windrow No. 50 during this quarter have been performed according to the requirements defined in the QAPP.

Laboratory QC consists of method blank, sample matrix spike (MS), sample matrix spike duplicate (MSD), surrogate, laboratory control sample (LCS), and laboratory control sample duplicate (LCSD) analyses to evaluate laboratory accuracy and precision. Laboratory quality control was performed consistent with the requirements of the QAPP. Method blanks, LCS, LCSD, and surrogates were acceptable in almost every analytical batch. MS and MSD data was generally acceptable. In some of the Day 0 data, consistent elevated MS and MSD recoveries of RDX and HMX are often seen in the analytical data because of the high levels of these compounds initially present in the sample. The Day 0 samples often require dilutions to bring the concentration of RDX and HMX to a quantifiable level. This dilution which occurs after spiking of the sample, dilutes the concentration of the spiking solution to a low level which cannot often be distinguished from the variability of the sample itself. Day Last data did not show similar interferences because initial concentrations were low in comparison to the concentration of spiking solution added to the sample. Other MS and MSD recoveries, which did not meet the established criteria in the QAPP include recoveries for tetryl. This compound often suffers from degradation, which results in low recovery of the compound in the MS and MSD. However, based upon the undetectable levels of tetryl found in these samples and the relation of the analytical reporting limits to the industrial and residential clean-up levels, the data is determined to be acceptable to show that clean-up goals have been successfully met. Based on technical review of the field and laboratory QC data, analyses were performed within acceptable accuracy and precision requirements specified in the QAPP. The confirmation data meets the project's data quality objectives and are therefore considered usable to support full-scale operations.

Table 4 (see Appendix A) provides the average explosive compound levels for Day Zero and Day Last for the laboratory results received this quarter. Table 5 (see Appendix A) lists the clean up goals for HMX, RDX and TNT. All windrows to date have met the project objective of meeting industrial clean-up goals. In addition, most of the windrows processed this quarter also meet residential clean-up objectives. Windrows

28, 35, and 36 are the only windrows where residential levels were not obtained for RDX. The bio-degradation has been efficient, and residential goals are readily being achieved.

### **3.0 DISPOSAL OF TREATED SOIL**

Treated soil has been transported back to MFA either to the temporary staging area or used as backfill. Disposal activity to date is shown in Table 6, Appendix A.

### **4.0 BACKFILLING AND SITE RESTORATION**

Backfill of forty windrows has been completed in excavated areas of MFA. Five windrows have been spread at MFA compost staging area as directed by EPD. Field-generated drawings showing backfill placement are included in Appendix B. Two windrows remain staged at the MFA for top dressing to support vegetative growth as a later date.

### **5.0 STATUS OF VARIOUS REPORTS**

Various MK generated reports have been drafted and are undergoing review and approval as discussed below.

#### **A. Initial Batch Performance**

The report confirms the performance of the full-scale composting operation, based on windrow S-001, as compared to pilot-scale testing and recommends continuance of full-scale operations. This report is being reviewed by the USEPA.

#### **B. 30% Soil Demonstration**

This report summarizes the windrow composting operation using 30% soil loading. The results indicate that a 30% soil loading meet the performance and remedial goals established for this project. USEPA comments were incorporated and the report re-issued for approval.

#### **C. Toxicity Report**

The report concludes that treated compost is suitable for use as a top dressing for general land application and does not contain leachable contaminants. The Microtox® and earthworm toxicity results conclude that bioremediated explosive compounds-contaminated soil is no more toxic than non-contaminated soil, which has been subjected to similar windrow composting activities. This report is being reviewed by the Navy.

#### **D. Audit Demonstration Report**

The report recommends against the use of the Wiley Mill/Riffle splitter at the site prior to laboratory testing. The report also recommends that the current practice of using the

field test kits as an indicator prior to laboratory testing be continued. This report is being reviewed by the USEPA.

**E. MFB Excavation Plan**

This plan provides methods and controls for excavation, screening, transportation, and storage of explosive compounds-contaminated soils from MFB. This document has been approved by the USEPA.

**F. Pilot-Scale Treatability Test Report**

The results of the pilot-scale testing of bioremediation of explosive compounds-contaminated soils at NSWC Crane are documented in this report. This document is under review by the USEPA.

**G. Full-Scale QAPP Revision No. 3**

This revision incorporates the standard operating procedures of the next proposed off-site laboratory. This document is under review by the USEPA.

## **6.0 QUALITY CONTROL**

Quality control inspections included excavation site operations, composting operations, sampling activities, field test kit analyses, and facility maintenance. Quality control checks were performed at required intervals using the field inspection checklists provided in Appendix F of the approved *Full-Scale Operational Plan* [MK, 1998a]. Copies of all inspection records are maintained at the Biofacility office.

During this quarter 982 individual items were verified and 3 deficiencies were identified. One deficiency is minor, retention pond level with less than two feet freeboard remaining immediately after a major rain event. This deficiency has been corrected satisfactorily. Two other deficiencies have not yet been corrected and have been reported to the Navy. Hairline cracks in process building floor and a water line leak below the asphalt in the process area. The cracks will be repaired during warmer weather periods by Toltest. The water line leak will be repaired by TolTest.

## **7.0 SAFETY AND INDUSTRIAL HYGIENE**

### **7.1 General Safety**

During this period 6,850 man-hours were expended. This brings the project to a cumulative total of 147,189 man-hours with one OSHA recordable injury. One first aid case was reported during this period.

Thirteen formal safety inspections were performed during this quarter. No significant findings of an imminent or serious nature were found. Immediate actions were taken to

correct any minor findings observed. Daily informal walk around safety inspections reinforced and improved the worker safety performance.

## **7.2 Industrial Hygiene Sampling**

During this period total dust, airborne explosive compounds, and ammonia monitoring were performed.

Ammonia samples were taken at the Biofacility by colorimetric methods. Sampling indicates ammonia levels greater than the occupational exposure limits of 50 ppm permissible exposure limit (PEL) and 25 ppm (TLV). During windrow construction, and during the first three to five days of the windrow life cycle, sixteen grab samples and two personnel samples were taken. The chicken manure amendment is the primary contributor to the ammonia concentrations. Full-face air purifying respirators with ammonia cartridges were worn during windrow formation and during the first five to seven days of the windrow life cycle. Ammonia is localized near each pile and is significantly affected by natural ventilation of the building, moisture in the windrow, and turning of the windrow. The maximum ammonia level detected was 86 ppm. The average maximum for a new windrow is approximately 42 ppm.

Airborne explosive compounds dust sampling was also performed at the Biofacility. Three area samples and two personnel samples were taken. Results of all samples were far below any occupational exposure limits for applicable explosive compounds.

Nuisance dust measurements, using a laser dust monitor, were taken during activities that have the greatest potential to generate dust. During these activities water is used to prevent and suppress any dust that could be generated. The average dust level detected was 0.72 mg/m<sup>3</sup>. The maximum dust level detected was 0.98 mg/m<sup>3</sup> during loading activities. All dust samples were well below the 10 mg/m<sup>3</sup> non-respirable limit and the 3 mg/m<sup>3</sup> respirable limit.

A total of ten wipe samples were taken to identify any spread of explosive compounds contamination out of work zones. Samples were taken in the clothing change, shower, laboratory, office, and lunch areas. No occupational exposure limit exists for explosive compounds contamination. However, an administration control level of 1 ppm has been established. Sample results show some trackout of explosives occur primarily at the personnel decon facility. A more aggressive housekeeping practice coupled with worker training has been instituted to prevent reoccurrence.

In summary, monitoring during this period indicates no airborne explosive compounds hazard and adequate dust controls. Ammonia monitoring indicates respiratory protection is warranted during the first three to five days of the windrow life cycle. Wipe sampling for explosive compounds, coupled with aggressive housekeeping activities,

are required to prevent any detectable spread of explosive compounds outside work zones.

## **8.0 FACILITY MAINTENANCE AND REPAIRS**

There were no significant repairs made to the facility during this period. Routine maintenance and housekeeping activities were performed.

## **9.0 REFERENCES**

- MK, 1998a. *Full-Scale Operational Plan for Soils Bioremediation Facility, NSWC Crane, Crane, Indiana*. Delivery Order Number 0009, Contract Number N62467-93-D-1106. Prepared by Morrison Knudsen Corporation, Environmental Services Group. Revision 2, March 12, 1998.
- MK, 1998b. *Quality Assurance Project Plan for Full-Scale Operations, Soils Bioremediation Facility, NSWC Crane, Crane, Indiana*. Delivery Order Number 0009, Contract Number N62467-93-D-1106. Prepared by Morrison Knudsen Corporation, Environmental Services Group. Revision 2, March 12, 1998.

**Appendix A  
List of Tables**

**Table 1: Full-Scale Operations Soil Excavation and Screening at MFA**

**Table 2: Operations Schedule**

**Table 3: Explosive Compounds Analytical Data**

**Table 4: Average Explosive Compounds Levels**

**Table 5: Explosive Compounds Clean-Up Levels**

**Table 6: Completed Compost Disposal**

**TABLE 1  
FULL-SCALE OPERATIONS SOIL EXCAVATION AND SCREENING AT MFA**

PLANNED QUANTITY (cu. yds.)		ACTUAL QUANTITY (cu. yds.)		VARIANCE QUANTITY (cu. yds.)		
Period	Period	Cum	Period	Cum	Period	Cum
Nov 97-Mar 98	1,400	1,400	1,391	1,391	-9	-9
Apr-98	600	2,000	166	1,557	-434	-443
May-98	1,000	3,000	831	2,388	-169	-612
Jun-98	1,000	4,000	115	2,503	-885	-1,497
Jul-98	1,000	5,000	871	3,374	-129	-1,626
Aug-98	1,000	6,000	1,382	4,756	382	-1,244
Sep-98	1,000	7,000	1,815	6,571	815	-429
Oct-98	1,000	8,000	1,519	8,090	519	90
Nov-98	500	8,500	1,079	9,169	579	669
Dec-98	500	9,000	533	9,702	33	702
Jan 99	0	9,000	0	9,702	0	702
Feb-99	0	9,000	952	10,654	952	1,654
Mar-99	400	9,400	299	10,953	-101	1,553
Apr-99	600	10,000				

**TABLE 2  
OPERATIONS SCHEDULE**

Windrow No.	Schedule	Start Date	Complete	Day Zero	Day Last	Lab	Complete Unload	Qty Soil Processed	Cumulative Soil Qty
	Actual		Load			Results			
1	Schedule	4/13/98	4/15/98	4/15/98	5/15/98	5/30/98	6/11/98	211	211
1	Actual	4/13/98	4/15/98	4/15/98	5/11/98	5/29/98	6/24/98	211	211
2	Schedule	4/15/98	4/17/98	4/17/98	5/17/98	6/1/98	6/11/98	211	422
2	Actual	4/15/98	4/17/98	4/17/98	5/8/98	5/29/98	6/25/98	211	422
3	Schedule	4/20/98	4/22/98	4/22/98	5/22/98	6/6/98	6/30/98	211	633
3	Actual	4/20/98	4/22/98	4/22/98	5/7/98	5/29/98	6/26/98	215	637
4	Schedule	4/22/98	4/24/98	4/24/98	5/24/98	6/8/98	6/30/98	105	738
4	Actual	4/22/98	4/24/98	4/24/98	5/8/98	5/29/98	6/30/98	200	837
30%	Schedule	4/27/98	4/27/98	4/27/98	6/28/98	7/11/98	7/13/98	15	753
30%	Actual	4/27/98	4/27/98	4/27/98	6/26/98	7/13/98	9/1/98	20	857
Control	Schedule	4/27/98	4/27/98	4/27/98	5/27/98	6/17/98	6/28/98		Clean soil used
Control	Actual	4/24/98	4/24/98	4/24/98	5/20/98	6/21/98	9/1/98		
5	Schedule	6/15/98	6/17/98	6/17/98	7/17/98	8/1/98	8/3/98	211	964
5	Actual	6/1/98	6/3/98	6/3/98	6/18/98	7/2/98	7/2/98	210	1067
6	Schedule	6/17/98	6/19/98	6/19/98	7/19/98	8/3/98	8/5/98	211	1175
6	Actual	6/15/98	6/17/98	6/17/98	7/1/98	7/13/98	7/14/98	210	1277
7	Schedule	7/1/98	7/3/98	7/3/98	8/2/98	8/17/98	8/19/98	211	1386
7	Actual	6/22/98	6/24/98	6/24/98	7/7/98	7/15/98	7/16/98	210	1487
8	Schedule	7/3/98	7/5/98	7/5/98	8/4/98	8/19/98	8/21/98	211	1597
8	Actual	6/29/98	7/1/98	7/1/98	7/9/98	7/23/98	7/24/98	210	1697
9	Schedule	8/4/98	8/6/98	8/6/98	8/27/98	9/11/98	9/13/98	211	1808
9	Actual	7/6/98	7/8/98	7/8/98	7/16/98	7/27/98	7/28/98	210	1907
10	Schedule	8/6/98	8/8/98	8/8/98	8/29/98	9/13/98	9/15/98	211	2019
10	Actual	7/15/98	7/17/98	7/17/98	7/27/98	8/6/98	8/7/98	210	2117
11	Schedule	8/20/98	8/22/98	8/22/98	9/12/98	9/27/98	9/29/98	211	2230
11	Actual	7/20/98	7/22/98	7/22/98	7/31/98	8/12/98	8/14/98	210	2327
12	Schedule	8/22/98	8/24/98	8/24/98	9/14/98	9/29/98	10/1/98	211	2441
12	Actual	7/27/98	7/28/98	7/28/98	8/4/98	8/13/98	8/17/98	52	2379

TABLE 2 (continued)

Windrow No.	Schedule Actual	Start Date	Complete Load	Day Zero	Day Last	Lab Results	Complete Unload	Qty Soil Processed	Cumulative Soil Qty
13	Schedule	9/14/98	9/16/98	9/16/98	10/7/98	10/22/98	10/24/98	211	2652
13	Actual	8/3/98	8/4/98	8/4/98	8/11/98	8/21/98	8/24/98	120	2499
14	Schedule	9/16/98	9/18/98	9/18/98	10/9/98	10/24/98	10/26/98	211	2863
14	Actual	8/4/98	8/6/98	8/6/98	8/14/98	8/24/98	8/26/98	210	2709
15	Schedule	9/30/98	10/2/98	10/2/98	10/23/98	11/7/98	11/9/98	211	3074
15	Actual	8/10/98	8/12/98	8/12/98	8/19/98	8/31/98	9/4/98	200	2909
16	Schedule	10/2/98	10/4/98	10/4/98	10/25/98	11/9/98	11/11/98	211	3285
16	Actual	8/13/98	8/15/98	8/15/98	8/21/98	9/4/98	9/8/98	205	3114
17	Schedule	10/25/98	10/27/98	10/27/98	11/17/98	12/2/98	12/4/98	211	3496
17	Actual	8/24/98	8/26/98	8/26/98	9/2/98	9/16/98	9/17/98	205	3319
18	Schedule	10/27/98	10/29/98	10/29/98	11/19/98	12/4/98	12/6/98	211	3707
18	Actual	8/26/98	8/28/98	8/28/98	9/3/98	9/16/98	9/18/98	210	3529
19	Schedule	11/10/98	11/12/98	11/12/98	12/3/98	12/18/98	12/20/98	211	3918
19	Actual	9/8/98	9/9/98	9/9/98	9/16/98	9/23/98	9/25/98	215	3744
20	Schedule	11/12/98	11/14/98	11/14/98	12/5/98	12/20/98	12/22/98	211	4129
20	Actual	9/10/98	9/11/98	9/11/98	9/18/98	9/25/98	9/28/98	210	3954
21	Schedule	12/5/98	12/7/98	12/7/98	12/28/98	1/12/99	1/14/99	211	4340
21	Actual	9/16/98	9/18/98	9/18/98	9/25/98	10/5/98	10/6/98	210	4164
22	Schedule	12/7/98	12/9/98	12/9/98	12/30/98	1/14/99	1/16/99	211	4551
22	Actual	9/21/98	9/23/98	9/23/98	10/14/98	10/26/98	10/27/98	210	4374
23	Schedule	12/21/98	12/23/98	12/23/98	1/13/99	1/28/99	1/30/99	211	4762
23	Actual	9/28/98	9/30/98	9/30/98	10/13/98	10/22/98	10/23/98	210	4584
24	Schedule	12/23/98	12/25/98	12/25/98	1/15/99	1/30/99	2/1/99	211	4973
24	Actual	9/30/98	10/2/98	10/2/98	10/12/98	10/21/98	10/22/98	210	4794
25	Schedule	1/15/99	1/17/99	1/17/99	2/7/99	2/22/99	2/24/99	211	5184
25	Actual	10/6/98	10/8/98	10/9/98	10/16/98	10/28/98	10/29/98	210	5004
26	Schedule	1/17/99	1/19/99	1/19/99	2/9/99	2/24/99	2/26/99	211	5395
26	Actual	10/22/98	10/23/98	10/24/98	10/30/98	11/12/98	11/14/98	210	5214

TABLE 2 (continued)

Windrow No.	Schedule	Start Date	Complete			Lab	Complete Unload	Qty Soil Processed	Cumulative Soil Qty
	Actual		Load	Day Zero	Day Last	Results			
27	Schedule	1/31/99	2/2/99	2/2/99	2/23/99	3/10/99	3/12/99	211	5606
27	Actual	10/26/98	10/28/98	10/28/98	11/4/98	11/12/98	11/14/98	220	5214
28	Schedule	2/2/99	2/4/99	2/4/99	2/25/99	3/12/99	3/14/99	211	5817
28	Actual	10/28/98	10/30/98	10/30/98	11/6/98	11/20/98	11/23/98	210	5644
29	Schedule	2/25/99	2/27/99	2/27/99	3/20/99	4/4/99	4/6/99	211	6028
29	Actual	11/2/98	11/4/98	11/4/98	11/12/98	11/24/98	11/24/98	210	5854
30	Schedule	2/27/99	3/1/99	3/1/99	3/22/99	4/6/99	4/8/99	211	6239
30	Actual	11/16/98	11/17/98	11/18/98	11/30/98	12/8/98	12/9/98	215	6069
31	Schedule	3/13/99	3/15/99	3/15/99	4/5/99	4/20/99	4/22/99	211	6450
31	Actual	11/18/98	11/19/98	11/20/98	11/30/98	12/8/98	12/10/98	210	6279
32	Schedule	3/15/99	3/17/99	3/17/99	4/7/99	4/22/99	4/24/99	211	6661
32	Actual	11/23/98	11/24/98	11/25/98	12/2/98	12/9/98	12/11/98	211	6490
33	Schedule	4/7/99	4/9/99	4/9/99	4/30/99	5/15/99	5/17/99	211	6872
33	Actual	11/30/98	12/2/98	12/2/98	12/8/98	12/18/98	12/22/98	211	6701
34	Schedule	4/9/99	4/11/99	4/11/99	5/2/99	5/17/99	5/19/99	211	7083
34	Actual	12/9/98	12/10/98	12/11/98	12/18/98	1/5/99	1/13/99	215	6916
35	Schedule	4/23/99	4/25/99	4/25/99	5/16/99	5/31/99	6/2/99	211	7294
35	Actual	12/11/98	12/13/98	12/13/98	12/22/98	1/5/99	1/7/99	211	7127
36	Schedule	4/25/99	4/27/99	4/27/99	5/18/99	6/2/99	6/4/99	211	7505
36	Actual	12/13/98	12/15/98	12/15/98	12/28/98	1/12/99	1/14/99	211	7338

TABLE 2 (continued)

Windrow No.	Schedule	Start Date	Complete	Day Zero	Day Last	Lab	Complete Unload	Qty Soil Processed	Cumulative Soil Qty
	Actual		Load			Results			
37	Schedule	5/18/99	5/20/99	5/20/99	5/30/99	6/14/99	6/16/99	211	7716
37	Actual	12/28/98	12/30/98	12/30/98	1/8/99	1/21/99	1/21/99	211	7549
38	Schedule	5/20/99	5/22/99	5/22/99	6/1/99	6/16/99	6/18/99	211	7927
38	Actual	1/6/99	1/11/99	1/12/99	1/19/99	1/28/99	1/29/99	214	7763
39	Schedule	6/3/99	6/5/99	6/5/99	6/15/99	6/30/99	7/2/99	211	8138
39	Actual	1/12/99	1/15/99	1/15/99	1/21/99	1/29/99	1/31/99	210	7973
40	Schedule	6/5/99	6/7/99	6/7/99	6/17/99	7/2/99	7/4/99	211	8349
40	Actual	1/15/99	1/17/99	1/17/99	1/24/99	2/5/99	2/8/99	210	8183
41	Schedule	6/17/99	6/19/99	6/19/99	6/29/99	7/14/99	7/16/99	211	8560
41	Actual	1/22/99	1/24/99	1/24/99	1/31/99	2/10/99	2/12/99	211	8394
42	Schedule	6/19/99	6/21/99	6/21/99	7/1/99	7/16/99	7/18/99	211	8771
42	Actual	1/29/99	1/31/99	2/1/99	2/8/99	2/18/99	2/19/99	201	8595
43	Schedule	7/3/99	7/5/99	7/5/99	7/15/99	7/30/99	8/1/99	211	8982
43	Actual	2/1/99	2/3/99	2/5/99	2/12/99	2/24/99	2/25/99	209	8804
44	Schedule	7/5/99	7/7/99	7/7/99	7/17/99	8/1/99	8/3/99	211	9193
44	Actual	2/8/99	2/10/99	2/11/99	2/18/99	2/25/99	2/26/99	210	9014
45	Schedule	7/17/99	7/19/99	7/19/99	7/29/99	8/13/99	8/15/99	211	9404
45	Actual	2/16/99	2/18/99	2/18/99	3/8/99	3/16/99	3/17/99	211	9225
46	Schedule	7/19/99	7/21/99	7/21/99	7/31/99	8/15/99	8/17/99	211	9615
46	Actual	2/20/99	2/22/99	2/22/99	3/3/99	3/18/99	3/19/99	211	9436
47	Schedule	8/2/99	8/4/99	8/4/99	8/14/99	8/29/99	8/31/99	211	9826
47	Actual	3/2/99	3/4/99	3/4/99	3/17/99	3/25/99		211	9647
48	Schedule	8/4/99	8/6/99	8/6/99	8/16/99	8/31/99	9/2/99	211	10037
48	Actual	3/4/99	3/6/99	3/6/99	3/23/99	3/30/99		211	9858

All soil quantities are in cubic yards.

TABLE 2 (continued)

Windrow No.	Schedule	Start Date	Complete			Lab	Complete Unload	Qty Soil Processed	Cumulative Soil Qty
	Actual		Load	Day Zero	Day Last	Results			
49	Schedule	8/16/99	8/18/99	8/18/99	8/28/99	9/12/99	9/14/99	211	10248
49	Actual	3/20/99	3/22/99	3/22/99					
50	Schedule	8/18/99	8/20/99	8/20/99	8/30/99	9/14/99	9/16/99	211	10459
50	Actual	3/22/99	3/24/99	3/24/99					
51	Schedule	9/1/99	9/3/99	9/3/99	9/13/99	9/28/99	9/30/99	211	10670
51	Actual								
52	Schedule	9/3/99	9/5/99	9/5/99	9/15/99	9/30/99	10/2/99	211	10881
52	Actual								
53	Schedule	9/15/99	9/17/99	9/17/99	9/27/99	10/12/99	10/14/99	211	11092
53	Actual								
54	Schedule	9/17/99	9/19/99	9/19/99	9/29/99	10/14/99	10/16/99	211	11303
54	Actual								
55	Schedule	10/1/99	10/3/99	10/3/99	10/13/99	10/28/99	10/30/99	211	11514
55	Actual								
56	Schedule	10/3/99	10/5/99	10/5/99	10/15/99	10/30/99	11/1/99	211	11725
56	Actual								
57	Schedule	10/15/99	10/17/99	10/17/99	10/27/99	11/11/99	11/13/99	211	11936
57	Actual								
58	Schedule	10/17/99	10/19/99	10/19/99	10/29/99	11/13/99	11/15/99	211	12147
58	Actual								
59	Schedule	10/31/99	11/2/99	11/2/99	11/12/99	11/27/99	11/29/99	211	12358
59	Actual								
60	Schedule	11/2/99	11/4/99	11/4/99	11/14/99	11/29/99	12/1/99	211	12569
60	Actual								

**TABLE 3  
EXPLOSIVE COMPOUNDS ANALYTICAL DATA**

	Windrow No. 37		Windrow No. 38		Windrow No. 39		Windrow No. 40	
	Day 0	Day 12	Day 0	Day 7	Day 0	Day 6	Day 0	Day 7
HMX	13.5	2.83	10.1	3.88	16.4	5.22	29.0	5.83
RDX	89.0	6.78	69.0	7.23	120	13.1	208	5.24
TNT	16.6	0.46	53.4	11.0	18.5	1.18	6.85	1.12

	Windrow No. 41		Windrow No. 42		Windrow No. 43		Windrow No. 44	
	Day 0	Day 7	Day 0	Day 7	Day 0	Day 6	Day 0	Day 7
HMX	33.9	5.52	42.4	7.10	32.1	2.87	27.8	4.67
RDX	238	8.91	299	14.7	248	8.29	182	7.17
TNT	6.41	0.31	4.39	0.38	5.46	0.34	9.71	0.295

	Windrow No.45		Windrow No.46		Windrow No.47		Windrow No.48	
	Day 0	Day 18	Day 0	Day 16	Day 0	Day 13	Day 0	Day 6
HMX	18.8	3.41	11.6	2.82	8.28	2.13	14.1	2.37
RDX	122	4.44	59.7	2.86	49.6	1.46	88.2	2.15
TNT	17.0	0.27	3.97	.25	2.74	0.27	6.32	0.28

	Windrow No.49*		Windrow No.50*	
	Day 0	Day Last	Day 0	Day Last
HMX	9.51		15.7	
RDX	50.9		97.7	
TNT	3.65		6.47	

NOTES: All results in ppm  
 \* Day Last data not yet received for Windrow Nos. 49 and 50. This data will be reported in the next quarterly report by Toltest, Inc.

**TABLE 4  
AVERAGE EXPLOSIVE COMPOUNDS LEVELS**

	<b>Day 0</b>	<b>Day Last</b>
<b>HMX</b>	22	4.5
<b>RDX</b>	162	7.9
<b>TNT</b>	13	1.9

(All results in ppm)

**TABLE 5  
EXPLOSIVE COMPOUNDS CLEAN-UP LEVELS**

	Clean-Up Goals (ppm)	
	Residential	Industrial
HMX	3,300	34,000
RDX	4	17
TNT	15	64

**TABLE 6  
COMPLETED COMPOST DISPOSAL**

Windrow	Soil Source	Soil Quantity	Day Zero	Day Last	Process Duration	Level Attained	Compost Quantity	Date Disposed	Compost Disposal Location
1	MFA	211	4/15/98	5/11/98	26	Residential	475	6/24/98	West Berm Bldg. 159
2	MFA	211	4/17/98	5/8/98	21	Residential	475	6/25/98	West Berm Bldg. 159
3	MFA	215	4/22/98	5/7/98	15	Residential	475	6/26/98	MFA staging area
4	MFA	200	4/24/98	5/8/98	14	Residential	475	6/30/98	West Berm Bldg. 159
30%	MFA	20	4/27/98	6/26/98	60	Residential	45	9/1/98	Reprocessed as soil
5	MFA	210	6/3/98	6/18/98	15	Residential	475	7/2/98	Backberm Bldg 159
6	MFA	210	6/17/98	7/1/98	14	Residential	475	7/14/98	MFA staging area
7	MFA	210	6/24/98	7/7/98	13	Residential	475	7/16/98	West Berm Bldg. 159
8	MFA	210	7/1/98	7/9/98	8	Residential	475	7/24/98	West Berm 153/154
9	MFA	210	7/8/98	7/16/98	8	Residential	475	7/28/98	NW Swale 153/154
10	MFA	210	7/17/98	7/27/98	10	Residential	475	8/7/98	West Berm Bldg. 159
11	MFA	210	7/22/98	7/31/98	9	Residential	475	3/21/99	Field Applied
12	MFA	52	7/28/98	8/4/98	7	Residential	118	8/17/98	South of Bldg. 157
13	MFA	120	8/4/98	8/11/98	7	Residential	271	3/21/99	Field Applied
14	MFA	210	8/6/98	8/14/98	8	Residential	475	3/21/99	Field Applied
15	MFA	200	8/12/98	8/19/98	7	Residential	475	9/4/98	Steam Line Bldg. 2793
16	MFA	205	8/15/98	8/21/98	6	Residential	475	9/8/98	Streamline Bldg 2793
17	MFA	205	8/26/98	9/2/98	7	Residential	475	9/17/98	Streamline Bldg 2793
18	MFA	210	8/28/98	9/3/98	6	Residential	475	9/18/98	NW Bldg 153/154
19	MFA	215	9/9/98	9/16/98	7	Residential	475	9/15/98	NW Bldg 153/154
20	MFA	210	9/11/98	9/18/98	7	Residential	475	9/28/98	Steam Line Bldg. 2793
21	MFA	210	9/18/98	9/25/98	7	Residential	475	10/6/98	NW Bldg 153/154
22	MFA	210	9/23/98	10/14/98	21	Residential	475	10/27/98	RR Ditch Bldg 153/154
23	MFA	210	9/30/98	10/13/98	13	Residential	475	10/23/98	Bldg 158/159 Backside

**TABLE 6  
COMPLETED COMPOST DISPOSAL (continued)**

Windrow	Soil Source	Soil Quantity	Day Zero	Day Last	Process Duration	Level Attained	Compost Quantity	Date Disposed	Compost Disposal Location
24	MFA	210	10/2/98	10/12/98	10	Residential	475	3/21/99	Field Applied
25	MFA	210	10/9/98	10/16/98	7	Residential	475	10/29/98	Steam Line Bldg 2793
26	MFA	210	10/24/98	10/30/98	6	Residential	475	11/14/98	Steam Line Bldg 2793
27	MFA	220	10/28/98	11/4/98	7	Residential	475	3/17/99	West Berm Bldg 153/154
28	MFA	210	10/30/98	11/6/98	7	Industrial	475	11/23/98	East Berm Bldg. 159
29	MFA	210	11/4/98	11/12/98	8	Residential	475	11/24/98	North Bldg 153
30	MFA	215	11/18/98	11/30/98	12	Industrial	475	12/9/98	West Berm Bldg. 159
31	MFA	210	11/20/98	11/30/98	10	Residential	475	12/10/98	North Berm 152
32	MFA	211	11/25/98	12/2/98	7	Residential	475	12/11/98	Stream Line Bldg 2793
33	MFA	211	12/2/98	12/8/98	6	Residential	475	12/22/98	North/East Bldg. 157
34	MFA	215	12/11/98	12/18/98	7	Residential	475	1/13/99	Back berm Bldg. 159
35	MFA	211	12/13/98	12/22/98	9	Industrial	475	1/7/99	Back berm Bldg. 159
36	MFA	211	12/15/98	12/28/98	13	Industrial	475	1/14/99	NW swale Bldg. 153
37	MFA	211	12/28/98	1/8/99	11	Industrial	475	1/21/99	West Berm Bld.g 153
38	MFA	214	1/12/99	1/19/99	7	Industrial	475	1/21/99	NW Berm Bldg. 153
39	MFA	210	1/15/99	1/21/99	6	Industrial	475	1/31/99	West Berm Bldg. 153
40	MFA	214	1/12/99	1/19/99	7	Industrial	475	1/21/99	NW Berm Bldg. 153
38	MFA	214	1/12/99	1/19/99	7	Industrial	475	1/21/99	NW Berm Bldg. 153
38	MFA	214	1/12/99	1/19/99	7	Industrial	475	1/21/99	NW Berm Bldg. 153
38	MFA	214	1/12/99	1/19/99	7	Industrial	475	1/21/99	NW Berm Bldg. 153
38	MFA	214	1/12/99	1/19/99	7	Industrial	475	1/21/99	NW Berm Bldg. 153
38	MFA	214	1/12/99	1/19/99	7	Industrial	475	1/21/99	NW Berm Bldg. 153
38	MFA	214	1/12/99	1/19/99	7	Industrial	475	1/21/99	NW Berm Bldg. 153
38	MFA	214	1/12/99	1/19/99	7	Industrial	475	1/21/99	NW Berm Bldg. 153
38	MFA	214	1/12/99	1/19/99	7	Industrial	475	1/21/99	NW Berm Bldg. 153
38	MFA	214	1/12/99	1/19/99	7	Industrial	475	1/21/99	NW Berm Bldg. 153
38	MFA	214	1/12/99	1/19/99	7	Industrial	475	1/21/99	NW Berm Bldg. 153
38	MFA	214	1/12/99	1/19/99	7	Industrial	475	1/21/99	NW Berm Bldg. 153
40	MFA	210	1/17/99	1/24/99	7	Industrial	475	2/8/99	West Berm Bldg. 153
41	MFA	211	1/24/99	1/31/99	7	Industrial	475	2/12/99	West Berm Bldg. 153

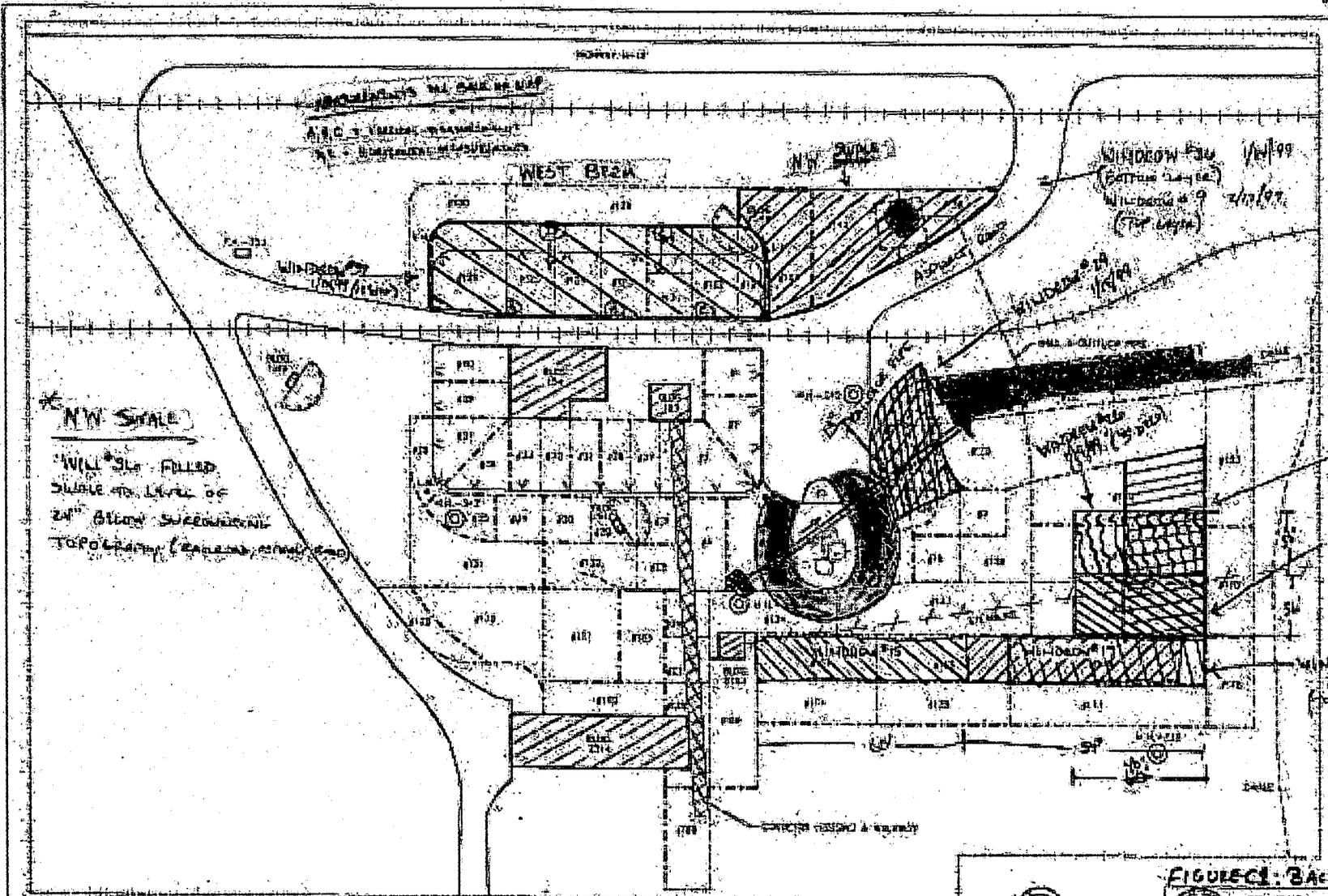
**TABLE 6  
COMPLETED COMPOST DISPOSAL (continued)**

Windrow	Soil Source	Soil Quantity	Day Zero	Day Last	Process Duration	Level Attained	Compost Quantity	Date Disposed	Compost Disposal Location
42	MFA	201	2/1/99	2/8/99	7	Industrial	475	2/19/99	SE Berm Bldg. 158/159
43	MFA	209	2/5/99	2/12/99	7	Industrial	475	2/25/99	North Berm Bldg. 152
44	MFA	210	2/11/99	2/18/99	7	Industrial	475	2/26/99	North Berm Bldg. 152
45	MFA	211	2/18/99	2/24/99	6	Industrial	475	3/20/99	North Berm Bldg. 152
46	MFA	211	2/22/99	3/3/99	10	Residential	475	3/20/99	North Berm Bldg. 152 1/3 <sup>rd</sup> and Field Applied 2/3 <sup>rd</sup>
47	MFA	211	3/4/99	3/17/99	14	Industrial	475	3/20/99	MFA Staging Area
48	MFA	211	3/6/99	3/23/99	18	Industrial	475		
49	MFA	211	3/22/99						
50	MFA	211	3/24/99						

NOTE: Process duration is in days.  
 All quantities are in cubic yards.  
 Level attained is for explosive compounds.

**Appendix B**  
**Backfill Location Drawings for Mine Fill A**

- Figure C1: Backfill Locations for Mine Fill A, Bldg. 153/154 (3 pages)
- Figure C2: Backfill Locations for Mine Fill A, Bldg. 158/159 (3 pages)
- Figure C3: Backfill Locations for Mine Fill A, Bldg. 152 (1 page)



**N.W. SWALE**  
 WILL BE FILLED  
 TO LEVEL OF  
 24" BELOW SURROUNDING  
 TOPOGRAPHY (ELEVATION 100.00)

**LEGEND**

	EXISTING		PROPOSED		UTILITIES (EXISTING)	SCALE: 1"=50'
	EXISTING		EXISTING		EXISTING	
	EXISTING		EXISTING		EXISTING	
	EXISTING		EXISTING		EXISTING	

**FIGURE 1: BACKFILL LOCATIONS**

As of 03/26/99

SCALE: 1"=50'

DATE: 03/26/99

BY: [Signature]

FOR: [Signature]

APPROVED: [Signature]

DATE: 03/26/99

WINDROW #30 (BOTTOM) 1/18/99  
 WINDROW #31 (TOP) 1/18/99  
 WINDROW #32 (TOP) 1/18/99  
 WINDROW #33 (TOP) 1/18/99  
 WINDROW #34 (TOP) 1/18/99  
 WINDROW #35 (TOP) 1/18/99  
 WINDROW #36 (TOP) 1/18/99  
 WINDROW #37 (TOP) 1/18/99  
 WINDROW #38 (TOP) 1/18/99  
 WINDROW #39 (TOP) 1/18/99  
 WINDROW #40 (TOP) 1/18/99  
 WINDROW #41 (TOP) 1/18/99  
 WINDROW #42 (TOP) 1/18/99  
 WINDROW #43 (TOP) 1/18/99  
 WINDROW #44 (TOP) 1/18/99  
 WINDROW #45 (TOP) 1/18/99  
 WINDROW #46 (TOP) 1/18/99  
 WINDROW #47 (TOP) 1/18/99  
 WINDROW #48 (TOP) 1/18/99  
 WINDROW #49 (TOP) 1/18/99  
 WINDROW #50 (TOP) 1/18/99

BLDG 153/154 West Beam

WINDOW # 37 1/21/99

A = 12'  
 B = 12'  
 C = 12'  
 D = 37'  
 E = 37'

WINDOW # 41 2/12/99  
~~WINDOW # 8~~ ~~2/16/99~~

A = 7'  
 B = 7'  
 C = 8'  
 D = 42'  
 E = 42'

WINDOW # 39 1/31/99

A = 11'  
 B = 11'  
 C = 11'  
 D = 50'  
 E = 50'

WINDOW # 8 2/16/99  
~~2/17/99~~

A = 5'5"  
 B = 3'7"  
 C = 2'10"  
 D = 5'  
 E = 52'

WINDOW # 40

A = 10'  
 B = 10'  
 C = 11'  
 D = 29'  
 E = 28'

WINDOW # 27 3/17/99

A = 2'  
 B = 2'  
 C = 2'  
 D = 53'  
 E = 53'

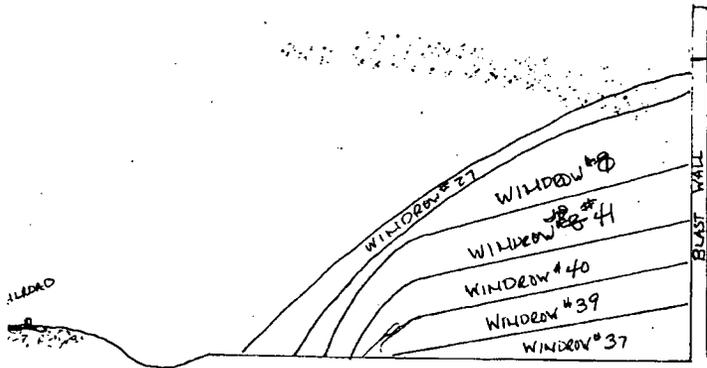
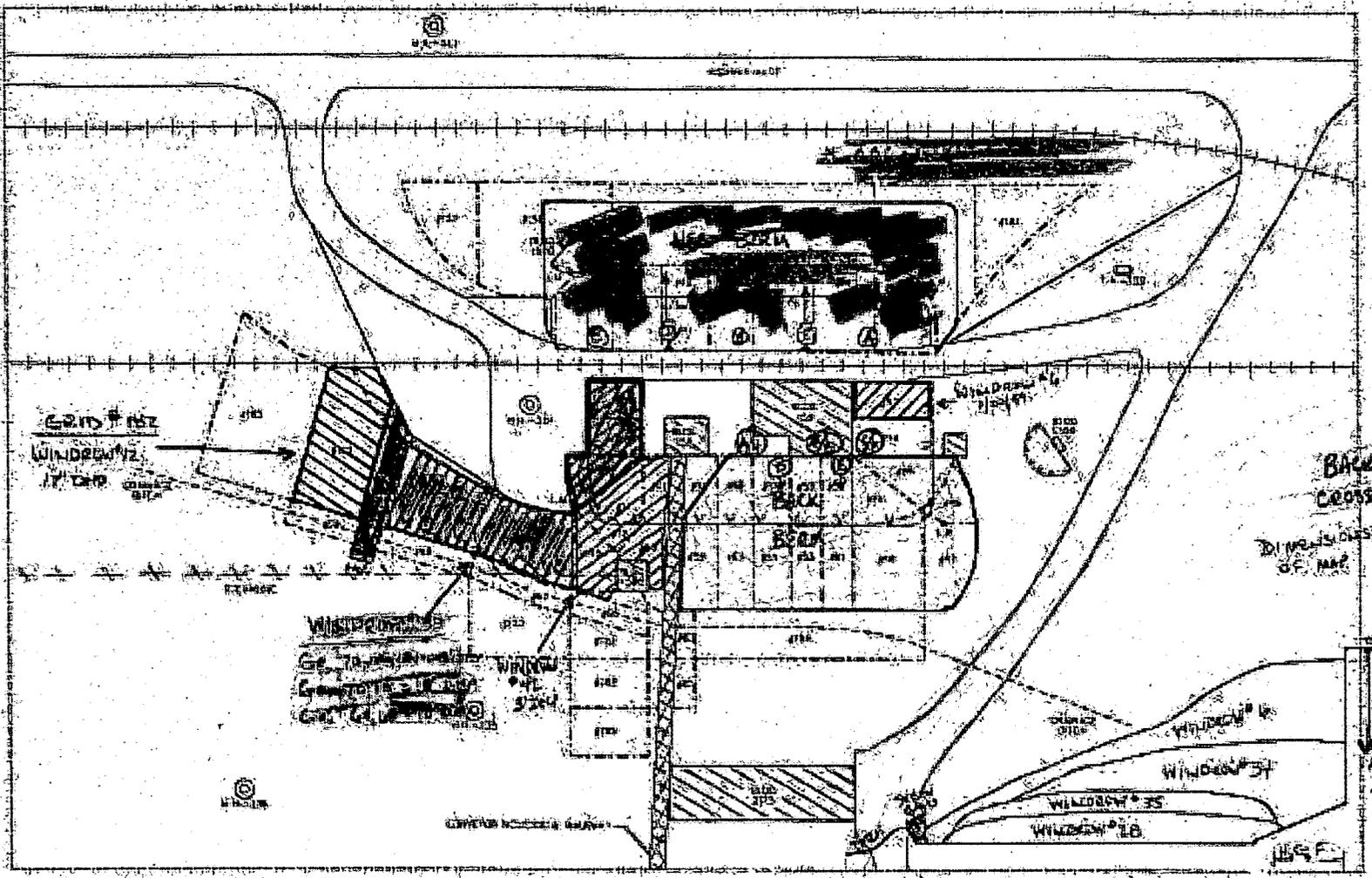


FIGURE-C1:  
 BACKFILL LOCATIONS  
 Pg 2 of 3  
 Mine Fill A, Bldg. 153/154  
 As of 03/26/99





- FENCE
- CONCRETE
- STEEL USE
- CONCRETE ROOFING AND FACILITY
- FILL
- ASPHALT
- GRAVEL
- DIRT
- ROADWAY
- CONCRETE ROOFING AND FACILITY
- CONCRETE ROOFING AND FACILITY

SCALE: 1"=50'

FIGURE 22 - BACKFILL LOCATIONS

As of 02/26/99

AMERICAN LANDS IN CONNECTION WITH

CHANGE FILE # 21, BLOCK # 10, LOT # 1

3/93

### BACK BERM

WINDROW # 28 12/31/98

A = 13'  
 B = 13'  
 C = 15'  
 D = 46'  
 E = 46'  
 F = 5'  
 G = 11'  
 H = 16'

WINDROW # 35 1/11/99

A = 10'  
 B = 11'  
 C = 13'  
 D = 46'  
 E = 46'  
 F = 5'  
 G = 11'  
 H = 16'

WINDROW # 34 1/13/99

A = 4'  
 B = 4'  
 C = 4' NO F, E, H MEASUREMENTS RECD.  
 D = 52'  
 E = 52'

WINDROW # 6 1/20/99

A = 1.5'  
 B = 1.5'  
 C = 1.5' NO F, E, H MEASUREMENTS RECD.  
 D = 55'  
 E = 59'

### WEST BERM

WINDROW # 1 12/9/98

A = 8'  
 B = 9'  
 C = 10'  
 D = 40'  
 E = 39'

WINDROW # 10 12/10/98

A = 7'  
 B = 7'  
 C = 10'  
 D = 45'  
 E = 38'

WINDROW # 4 12/23/98

A = 5'8"  
 B = 6'  
 C = 9'  
 D = 47'  
 E = 44'

WINDROW # 30 12/28/98

A = 5'8"  
 B = 6'  
 C = 6'  
 D = 48'  
 E = 49'

WINDROW # 2 12/29/98

A = 18"  
 B = 4'  
 C = 7'  
 D = 53'  
 E = 54'

PILOT SCALE MIXES 12/29/98

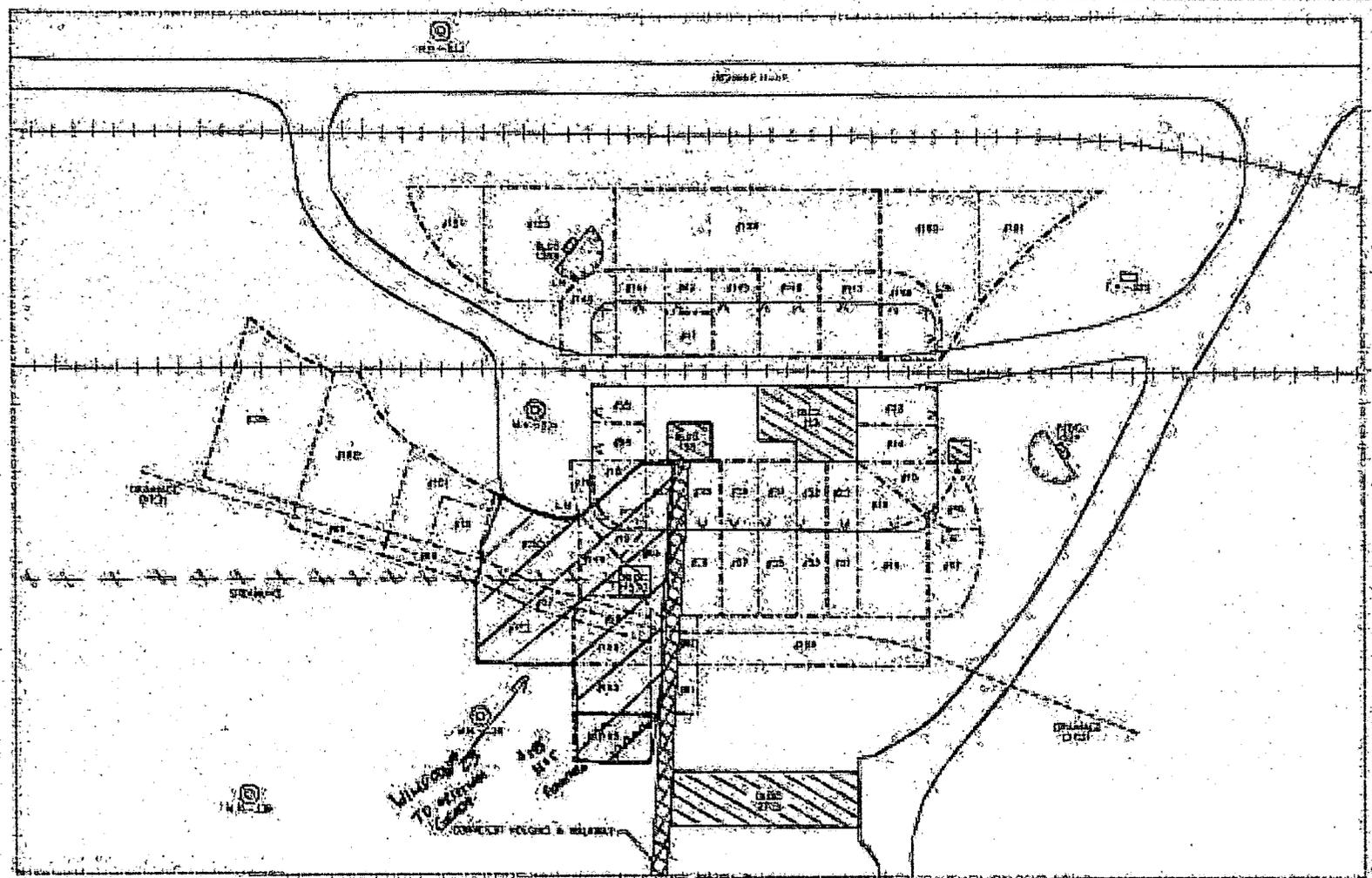
A = 12"  
 B = 12"  
 C = 7'  
 D = 54'  
 E = 48'

WINDROW # 7 12/30/98

A = 12"  
 B = 12"  
 C = 12"  
 D = 54'  
 E = 54'



FIGURE - C2:  
 BACKFILL LOCATIONS  
 Pg 2 of 3  
 Mine Fill A, Bldg. 158/159  
 As of 03/26/99



- ROOM
- FENCE
- LIGHT POLE
- WATER
- GAS METER
- ROAD
- BUILDING FOOT
- CONCRETE PAVEMENT
- CONC. SIDEWALK
- CONC. DRIVEWAY
- CONC. DRIVEWAY

SCALE: 1"=50'

AS of 03/26/99

SEARCH ENGINEERED BY

FIGURE-C21 BACK FILL

181-SCALE: 1"=50'

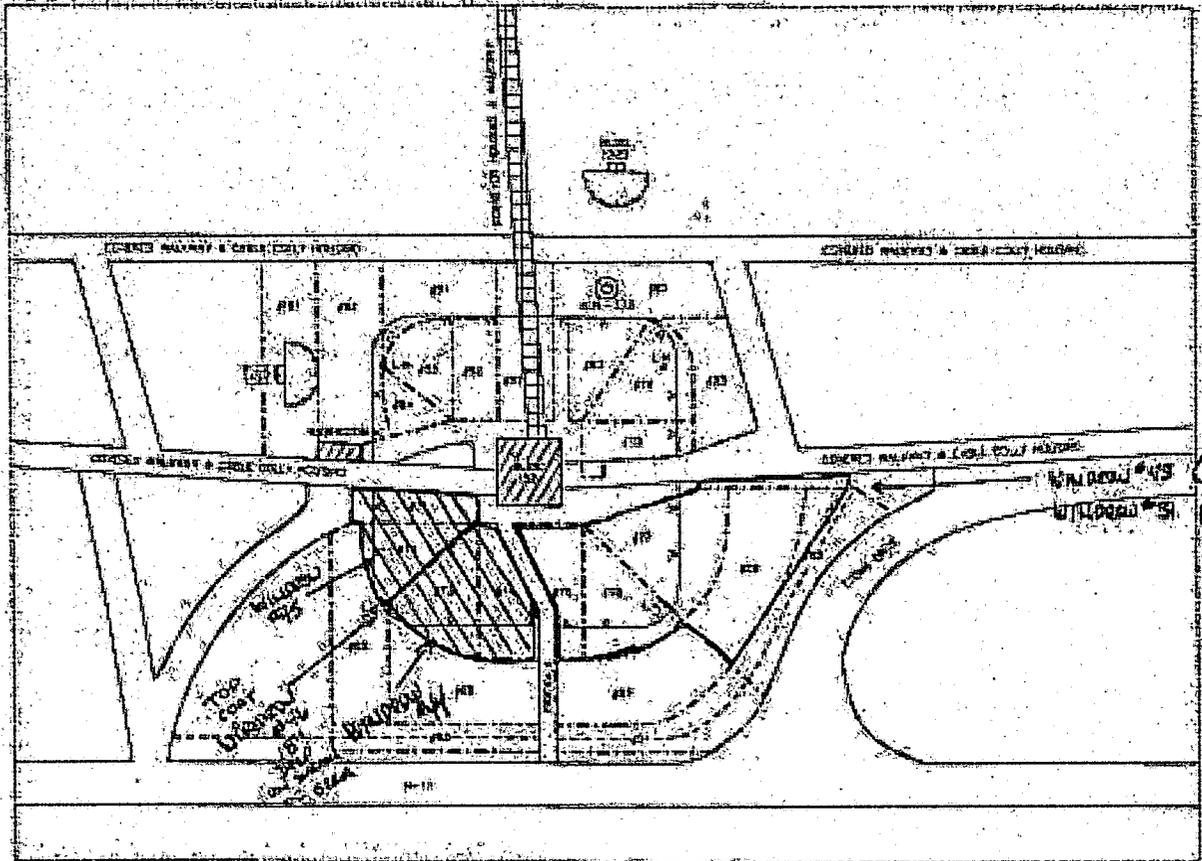
181-SCALE: 1"=50'

181-SCALE: 1"=50'

181-SCALE: 1"=50'

LOCATIONS

B303



Bottom Layer  
Top Layer

*2-1/4" x 4" x 8"  
2" STEEL CONCRETE  
ALONG WALK TOP*

- LEGEND**
- DRIVEWAY
  - SEAM LINE
  - MAN HOLE
  - CURB NUMBER
  - VERGE
  - CONCRETE WALK
  - CONCRETE DRIVEWAY AND DRIVEWAY
  - NOTE:** GRID COORDINATES ARE APPROXIMATE & TO BE USED ONLY FOR GENERAL REFERENCE

SCALE - 1"=50'

As of 03/26/99

FIGURE-C3: BACKFILL LOCATIONS

5/1/81