



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

N00164.AR.000537  
NSWC CRANE  
5090.3a

51-200  
IN REPLY REFER TO

5090  
Ser 095/0101

09 MAY 2000

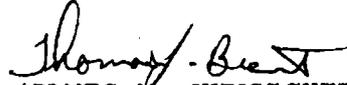
U.S. Environmental Protection Agency, Region V  
Waste, Pesticides, & Toxics Division  
Waste Management Branch  
Illinois, Indiana, and Michigan Section  
Attn: Mr. Peter Ramanauskas (DW-8J)  
77 West Jackson Blvd.  
Chicago, IL 60604

Dear Mr. Ramanauskas:

Crane Division, Naval Surface Warfare Center (NAVSURFWARCENDIV Crane) submits for review and approval three (3) copies of the Draft Sampling and Analysis Plan (SAP) for Supplemental Toxicity Sampling of Composted Material from Mine Fill A and B (MFA&B) as enclosure (1). Enclosure (2) is the required certification statement.

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

Sincerely,

  
JAMES M. HUNSICKER

Director Environmental Protection  
Department  
By Direction  
of The Commander

Encl:

- (1) Draft SAP for Supplemental Biofacility Toxicity Testing of Composted Material from MFA&B
- (2) Certification Statement

Copy to: (w/o encls)  
ADMINISTRATIVE RECORD (w/encls)  
IDEM (D. Griffin)  
MK Cleveland  
SOUTHNAVFACENGCOC (Code 1864)  
TOLTEST Crane

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.

*Thomas J. Brent, acting*  
\_\_\_\_\_  
SIGNATURE

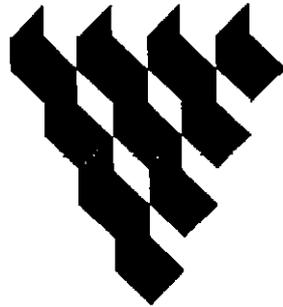
DIRECTOR, ENVIRONMENTAL PROTECTION DEPARTMENT  
BY DIRECTION OF THE COMMANDER  
\_\_\_\_\_  
TITLE

*5/2/00*  
\_\_\_\_\_  
DATE

**DRAFT**

Sampling and Analysis Plan  
for  
Supplemental Toxicity Sampling of Composted  
Material from Mine Fill A and Mine Fill B

NSWC CRANE  
CRANE, INDIANA



SOUTHERN DIVISION  
NAVAL FACILITIES ENGINEERING COMMAND  
Contract #N62467-93-D-1106  
Delivery Order #0009  
Statement of Work #007

June 2000

**COMMENT-RESOLUTION**

**DRAFT SAMPLING AND ANALYSIS PLAN FOR  
SUPPLEMENTAL TOXICITY SAMPLING OF COMPOSTED MATERIAL FROM  
MINE FILL A & MINE FILL B**

*Commentor: Peter Ramanauskas, U.S. EPA Region V and Peggy Donnelly, Biologist, RMD, CRL*

COMMENT 1: Section 2.2.2. refers to sample collection in accordance with the approved FS-QAPP. Note that the sampling procedures in the QAPP are for sampling of windrows while still at the Biofacility. As this supplemental sampling is done on windrows that have been backfilled, we need to include the sampling procedures for backfilled "mature" windrows. This information should include depth of sampling within the target windrow, sampling equipment information, etc.

RESPONSE 1: A standard operating procedure has been developed for mature windrows. This procedure has been incorporated into the Supplemental Toxicity Sampling and Analysis Plan as Appendix D.

COMMENT 2: Table 2-1 mistakenly refers to Figures H2 and H4 instead of I2 & I4.

RESPONSE 2: Table 2-1 has been corrected to refer to I2 and I4.

**RESPONSE TO COMMENTS ON THE INTERNAL DRAFT SAP FOR  
SUPPLEMENTAL TOXICITY SAMPLING OF COMPOSTED MATERIAL  
FROM MINE FILL A AND MINE FILL B**

*Commentor: TolTest, Inc. and NAVSURFWARCENDIV, Crane*

**GENERAL COMMENTS**

COMMENT 1: This plan should include information for Rockeye and the Ammunition Burning Grounds. Stating that maps (including MFB) will be added when the maps become available. Add Appendices for MFB, Rockeye, & ABG maps.

RESPONSE 1: Appendix G was written to describe the toxicity testing to be performed at MFA, MFB, Rockeye, and ABG. The purpose of the initial testing was to show that treated compost did not show a greater toxicity than non-contaminated compost. It was not designed to evaluate the effects on toxicity of compost over time. This supplemental toxicity has been agreed upon between the Navy and EPA to evaluate the toxicity effects of compost over time. However, once this supplemental toxicity has been performed for MFA and MFB, toxicity tests for Rockeye and ABG would be performed according to the approved Appendix G toxicity analysis. The results from this supplemental toxicity testing should be applicable for the other sites. Unless it is the Navy's desire to perform this test to prove the effects of time on the compost at each and every site, the additional information for Rockeye and ABG will not be incorporated.

COMMENT 2: Remove signature line for NSWC Crane Public Works Officer.

RESPONSE 2: Signature line has been removed.

COMMENT 3: Include Navy letter 5090 Ser 095/0036 dated 2/24/00 and U.S.EPA letter dated 3/3/00 in this plan (copies of the letters are provided with these comments). References will need to be added in §1.1 ¶2 on p.1-1 to include the letters.

RESPONSE 3: Letters have been included. References to these letters have also been added in the text.

COMMENT 4: In §1.3 ¶2 add the acronym for "Standard Operating Procedure" in parenthesis. Find and replace "Standard Operating Procedure" with "SOP" throughout plan.

RESPONSE 4: The acronym has been added.

### SPECIFIC COMMENTS

COMMENT 1: p. ii Add U.S. to the EPA to the acronyms listing.

RESPONSE 1: The acronym has been updated.

COMMENT 2a: p. 1-1 §1.1 ¶1 Spell out NSWCR Crane and U.S.EPA, then add acronym in parenthesis.

COMMENT 2b: Rewrite second sentence as, "...Region V, ~~it is~~ of concern ~~as to~~ is the toxic...".

RESPONSE 2: The acronyms have been defined, and the text has been revised as directed.

COMMENT 3a p. 1-1 §1.2 ¶1 Delete the first sentence.

COMMENT 3b Rewrite third sentence as, "...over time, a minimum of four additional samples..."

RESPONSE 3: The first sentence has been deleted and the text has been revised.

COMMENT 4: p. 2-1 Table 2-1 Reference where maps can be found (maybe Appendix C - A will be Navy/EPA letters and B will be MFA maps).

RESPONSE 4: References have been added, and Appendices have been modified.

COMMENT 5: p. 3-1 ¶2 Rewrite second sentence as, "...on the duration of time that has elapsed since the last day a windrow was monitored (day last)."  
[Wording can be changed, just explain day last]

RESPONSE 5: Additional wording has been added to explain day last.

COMMENT 6: p. 3-1 ¶3 Add a little more detail to this paragraph, especially concerning the "elutriate compost concentration".

RESPONSE 6: Additional information has been provided in the paragraph.

COMMENT 7: p. 3-1 ¶4 Last sentence state the acronym for "Most Probable Number" and replace the second usage in the sentence with the acronym.

RESPONSE 7: The acronym has been added.

COMMENT 8: p. 3-2 Table 3-1 Table border is not consistent.

RESPONSE 8: The table border has been revised.

COMMENT 9a: p. 4-1 §4.1 Rewrite last sentence as, "...field logbook or on a Field Data Sheet."

COMMENT 9b: p. 4-1 §4.1 Clarification: Will the duplicate be identified, i.e., will the lab be aware of the duplicate? Please insert an example of a sample identification number.

RESPONSE 9: The last sentence has been revised. Additionally, wording to clarify the requirements of the field duplicate has been added. The lab will be unaware of the duplicate because it will receive the next consecutive number. An example of the identification number has been added to the text.

COMMENT 10: p. 4-1 §4.2.1 Is the acronym for standard unit s.u. or S.U.? Please make this section consistent with the acronym listing.

RESPONSE 10: The acronym has been corrected and s.u. has been used consistently throughout the document.

**WORK PLAN**

**SAMPLING AND ANALYSIS PLAN  
FOR  
SUPPLEMENTAL TOXICITY SAMPLING OF COMPOSTED  
MATERIAL FROM MINE FILL A AND MINE FILL B**

**NSWC CRANE  
Crane, Indiana**

**June 7, 2000**

**Draft**

**CONTRACT N62467-93-D-1106  
DELIVERY ORDER #0009  
STATEMENT OF WORK #007**

**Prepared by:**

**MORRISON KNUDSEN CORPORATION  
1500 WEST THIRD STREET  
CLEVELAND OHIO 44113**

**PREPARED/APPROVED BY:**

\_\_\_\_\_  
Steven J. Travis  
MK Project Engineer

\_\_\_\_\_  
Date

**APPROVALS:**

\_\_\_\_\_  
Alan Fosdick  
MK Program Manager

\_\_\_\_\_  
Date

**CLIENT ACCEPTANCE:**

\_\_\_\_\_  
U. S. Navy Responsible Authority

\_\_\_\_\_  
Date

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#### APPENDIX

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## ACRONYMS AND ABBREVIATIONS

CFR	Code of Federal Regulations
COC	Chain of Custody
°C	degrees Centigrade
DQOs	Data Quality Objectives
EC	effective concentration
EC-50	the effective concentration that causes a 50% reduction in the illuminance of the test organisms
FS-OP	Full-Scale Operations Plan for Soils Bioremediation Facility
FS-QAPP	Full-Scale Quality Assurance Project Plan
HDPE	high density polyethylene
LC	lethal concentration
LC-50	concentration that is lethal to 50% of the tested worm population
MFA	Mine Fill A
MFB	Mine Fill B
MPN	most probable number
NSWC	Naval Surface Warfare Center
SAP	Sampling and Analysis Plan
SOP	Standard Operating Procedure
s.u.	standard unit
SSHP	Site Safety and Health Plan
U.S. EPA	U.S. Environmental Protection Agency

# 1.0 INTRODUCTION

## 1.1 BACKGROUND

Explosive compound contaminated soil at Naval Surface Warfare Center (NSWC) Crane, Indiana, is being treated through a composting bioremediation process. Full-scale operations of the Soils Bioremediation Facility began April 13, 1998. While treatment of the soil in this process results in contaminant reduction to industrial use clean-up levels as established by the United States Environmental Protection Agency (U.S. EPA) Region V, of concern is the toxic effect of the treated soil, or compost, on the environment. Acute toxicity testing was performed on composted soil from Mine Fill A (MFA) to determine the toxic affects of the composted soil on the environment. The findings were reported in the Toxicity Report Full-Scale Bioremediation NSWC Crane, Crane, Indiana [MK, 1999a].

The previous toxicity testing performed at MFA [MK, 1999a] verified that treated contaminated soil compost did not show a greater toxicity than treated non-contaminated soil compost. However, the testing program was not designed to evaluate the effects on toxicity of treated and field placed compost over time. Supplemental toxicity testing was agreed upon during a conversation on February 8, 2000. A follow up letter was sent to Mr. Peter Ramanauskas, U.S. EPA Region V project manager, (5090 Ser 095/0036), provided in Appendix A, that was subsequently approved by Mr. Ramanauskas. A copy of this approval is also provided in Appendix A.

This Sampling and Analysis Plan (SAP) presents the organization, objectives, and planned activities associated with the supplemental toxicity testing for MFA and Mine Fill B (MFB) at the NSWC Crane Bioremediation facility (Biofacility), Crane, Indiana. Specific protocols for sampling, sample handling and storage, chain-of-custody, and laboratory and field analyses will be summarized in this SAP and are based on the procedures described in the approved Appendix G [MK, 1999b] of the approved *Quality Assurance Project Plan for Full-Scale Operations (FS-QAPP)* [MK, 1998a].

## 1.2 PROJECT OBJECTIVES

The objective of the supplemental toxicity testing is to demonstrate that there is a reduction in the toxicity of treated compost over time when compared to the initial full scale windrow (compost windrow S001) toxicity testing. In order to determine if there is a reduction in toxicity over time, a minimum of four additional samples will be collected with duplicates from areas backfilled with composted material at various time intervals since the placement of Windrow S001. Sampling and testing will be in accordance with the *Full-Scale Operational Plan - Soils Bioremediation Facility (FS-OP)*, [MK, 1998b] except as noted below.

Compost testing will consist of collecting grab samples from previously processed compost at varying stages of maturity. Samples will be collected from areas backfilled with composted material from MFA or MFB as applicable to obtain the desired age. Mature compost testing will be limited to earthworm toxicity, pathogen, and Microtox™.

## 1.3 DATA QUALITY OBJECTIVES

Data Quality Objectives (DQOs) are qualitative and quantitative statements which specify the quality of the data required to support decisions made during process closure actions. DQOs are based on the end uses of the data to be collected. Therefore, the level of data quality required under the scope of work for this project will be dependent on the ultimate data use. Under the scope of work for this project, data is required to evaluate the residual toxicity of the composted material after degradation occurs.

Analytical data will be collected in a manner that is consistent with approved laboratory standard

operating procedures (SOP) found in Appendix G [MK, 1999b] of the FS-QAPP [MK, 1998a]. All data will meet the DQOs specified in section 1.4.4 of the FS-QAPP.

## 2.0 SAMPLING PROCEDURES AND TESTING REQUIREMENTS

This section contains sampling procedures.

### 2.1 PREPARATION FOR SAMPLING

Prior to sample collection, the following tasks will be completed:

1. Review the Site Safety and Health Plan (SSHP). All field personnel will attend a Health and Safety training meeting at the beginning of each task. Field personnel will be asked to document that training was completed and that they will abide by the provisions of the SSHP.
2. Establish an equipment locker or staging area. Maintain an inventory of all sample supplies. Check supply lists daily to determine if additional items will be needed.
3. Obtain all necessary documentation materials, including field data logging forms, field logbooks, sample labels and chain-of-custody (COC) forms, etc.
4. Obtain sample bottles from the analytical laboratory. These bottles will arrive at the site in sealed boxes or coolers. Certification of cleanliness will accompany each box of bottles. The exception to this would be if any bottles were pre-preserved by the lab.

### 2.2 SITE SAMPLING PROCEDURES

#### 2.2.1 Sampling Locations

Table 2-1 lists the windrows that have been selected to provide representative samples of aged compost for the purpose of this supplemental toxicity testing. The selected windrows represent compost that has aged approximately two years, 11 to 15 months, five to seven months, and two to four months. Actual sample locations will be documented in the field. Windrow selections may be changed if necessary to meet the age criteria established above.

TABLE 2-1 SAMPLE LOCATIONS		
Windrow Number / location	Day Zero Date	Approximate Compost Age
S001, Mine Fill A West Berm Building 159 See Figure 12 (map in Appendix B)	4/15/1998	Two plus years
S050, Mine Fill A, Building 157, See Figure 14 (map in Appendix B)	4/2/1999	11 - 15 months
Windrow 108, Mine Fill B, Placement at Mine Fill B near Building 173 Grids 81 & 82 on top (map in Appendix C)	9/14/99	5 - 7 months
Windrow 128, Mine Fill B, Placement at Mine Fill B near Building 2501, Grids 262, 250, 249, 251, 236, 237, 235, 211, 210, 204, 169, 168, on top (map in Appendix C)	12/16/99	2 - 4 months

## 2.2.2 Sample Collection

Sample collection will be in accordance with the approved FS-QAPP and associated Appendix G [MK, 1999b] for toxicity testing. In addition the SOP for sampling mature compost which has been backfilled is included in Appendix D of this plan. Table 2-2 summarizes the testing methods and container size.

<b>Test and Test Method</b>	<b>Holding Time</b>	<b>Preservative</b>	<b>Sample Size/ Container</b>
Microtox™ (Proprietary method of AZUR Environmental)	14 days	4°C	8 ounce glass
Earthworm Toxicity (EPA Method 600/3-88/029)	3 days	4°C	3.5 gallon HDPE plastic container lined with 2 plastic bags
Pathogen Testing (40 CFR 503.32)	3 days	4°C	8 ounce glass

Samples will be maintained from collection through receipt until testing at 4°C and then brought to 20°C immediately prior to testing.

## 2.3 SAMPLE IDENTIFICATION

The sample identification for placed compost material will require a modification of the established number system described in Section 5.1.2 of the FS-QAPP [MK, 1998a]. The sample identification will be consistent with the procedures for non-compost sample identification. The sample identification number for non-compost samples consists of up to three sets of characters and/or letters. The first set of three characters represent the type of sample; the second set of three numbers represent unique sample number; and the last two characters (FD) will be used to designate field duplicate of the field sample. Document all field duplicates with their associated samples and locations in the field logbook. Note: The designation FD will be used only when a field duplicate is collected. A generic sample name would be:

XXX-NNN-FD

### Non-Compost Sample Type

Samples collected will consist of the types listed in section 5.1.2.2 in addition to:

- PCS - Placed Compost Sample

### 3.0 REMEDIAL GOALS AND OBJECTIVES

The supplemental testing is intended to determine the long term toxic effects that the treated compost material may have on the environment. These effects will be studied using two toxicity methods: Microtox™ and Earthworm Toxicity, and two pathogen tests: fecal coliform, and salmonella.

Samples will be collected from aged compost that originated from MFA or MFB. Sample locations will be determined based on the duration of time that has elapsed since the last day a windrow was monitored and confirmation samples were collected (Day Last). Toxicity data of the samples collected will be used to compare the age of the compost relative to the residual toxicity. A trend will be developed to document the residual toxicity due to the composting process verses time.

The objective of the toxicity testing is to assess the acute toxicity of the aged compost to worms and to the bacteria. In the Microtox™ testing, marine bacterium, *Photobacterium phosphoreum*, which glow are subjected to varying concentrations of a liquid extract of the compost to determine the effective concentration that causes a 50% reduction in the illuminance of the test organisms (EC-50). The EC-50 will be estimated to determine the elutriate compost concentration which causes a 50% decrease in the illuminance of the test organisms. The EC-50 will be compared to the EC-50 for the previously obtained toxicity results for windrow S001 [MK, 1998a]. For the earthworm toxicity, the compost concentration that causes 50% mortality of earthworms (LC-50) will be estimated. The LC-50 for the samples will be compared to the LC-50 for the previous toxicity results for S001.

Pathogen objectives were based on specifications found in Title 40 Code of Federal Regulations (CFR) 503.32 which pertains to the disposal of sewage sludge. These specifications show that sewage sludge may be prepared for sale or given away as an application to the land if the sludge meets the requirements of fecal coliform and salmonella. The treated compost is intended to be returned to the land for similar purpose, and therefore these same standards will be applied to the compost material. Objectives for the density of fecal coliform shall be less than 1000 Most Probable Number (MPN) per gram of dry solids, and Salmonella shall be less than 3 MPN per 4 grams of dry solids.

**TABLE 3-1  
TOXICITY OBJECTIVE SUMMARY**

Test and Test Method	Result to be Obtained	Objective	Result will demonstrate
Microtox™ (Proprietary method of AZUR Environmental)	EC-50 for each sample and average EC-50	Compare EC-50 values to that of un-aged compost	Toxicity of compost is reduced over time until approaching an asymptotic level.
Earthworm Toxicity (EPA Method 600/3-88/029)	LC-50 for each sample and average LC-50	Compare LC-50 values to that of un-aged compost	Toxicity of compost is reduced over time until approaching an asymptotic level.
Pathogen Testing (40 CFR 503.32)	Fecal Coliform	Less than 1000 MPN/g dry solids	Toxicity of compost is reduced over time until approaching an asymptotic level.
	Salmonella	Less than 3 MPN/4g dry solids	

## 4.0 QUALITY CONTROL PROCEDURES

### 4.1 FIELD QUALITY CONTROL

Field duplicate samples will be collected to allow determination of analytical and sampling precision. One duplicate sample will be collected from one of the selected windrows. Duplicates will be submitted for the same tests as the original samples. The duplicate sample will be collected simultaneously with the original sample. The duplicate will be collected using the same sampling equipment, at the same location, and labeled with the next consecutive number. The location of the original sample and its duplicate will be documented in the field logbook or on a Field Data Sheet.

### 4.2 ANALYTICAL TESTING QUALITY CONTROL

Detailed SOPs for each analytical test are included in Attachment A of Appendix G [MK, 1999b] of the FS-QAPP [MK, 1998a]. These procedures describe the specific quality control measures required by the analytical method. A summary of the procedures are provided in Section 4.2 of Appendix G [MK, 1999b] of the FS-QAPP.

#### 4.2.1 Earthworm Toxicity

Earthworm analysis will be performed using the test organism, *Eisenia Foetida* supplied from Carolina Biological Supply Company or other documented source as described in Appendix G [MK, 1999b] of the FS-QAPP [MK, 1998a]. For this testing, artificial soil, prepared from a homogenous mixture of 10% sphagnum peat, 20% colloidal kaolinite clay, and 70% grade 70 silica sand will be used as a blank and also as a dilutant to the compost mixture. Calcium carbonate will be added to the artificial soil to adjust the pH up to within  $\pm 1.0$  s.u. of the average pH of the compost samples. Other specific requirements of the testing environment are described in Section 4.2.1 of Appendix G [MK, 1999b] of the FS-QAPP.

#### 4.2.2 Pathogen Analysis

Pathogen analysis will be performed according to the laboratory SOP and as summarized in Appendix G [MK, 1999b] of the FS-QAPP [MK, 1998a].

#### 4.2.3 Microtox™ Analysis

The EC-50 value will be determined as the concentration of elutriate compost material which causes the effect of a 50% decrease in the light output of the Microtox™ reagent organisms created from a strain of the marine bacterium, *Photobacterium phosphoreum* as described in Appendix G [MK, 1999b] of the FS-QAPP [MK, 1998a].

## 5.0 LABORATORY INFORMATION

### 5.1 STANDARD OPERATING PROCEDURES

Refer to Attachment A of Appendix G [MK, 1999b] of the FS-QAPP [MK, 1998a] for the SOPs for each test performed for the toxicity analysis.

### 5.2 LABORATORY SHIPMENTS AND CONTACTS

Samples for the analysis of Microtox™ and Earthworm Toxicity will be shipped to Aqua Survey, Inc., at the following location:

Mr. James Todd  
Sample Receiving  
499 Point Breeze Road  
Flemington, NJ 08822

Samples for the analysis of Pathogens will be shipped to Pure Earth Environmental Laboratory at the following address:

Dr. Ted Passon  
Sample Receiving  
7184 North Park Drive  
Pennsauken, NJ 08110

## 6.0 REFERENCES

- MK, 1998a *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, October 5, 1998, Revision 3.*
- MK, 1998b *Full-Scale Operational Plan - Soils Bioremediation Facility - NSWC Crane, Crane, Indiana. Delivery Order Number 0009, Contract Number N62467-93-D-1106. Prepared by Morrison Knudsen Corporation, March 12, 1998.*
- MK, 1999a *Toxicity Report - Full-Scale Bioremediation - NSWC Crane, Crane, Indiana. Delivery Order Number 0009, Contract Number N62467-93-D-1106. Prepared by Morrison Knudsen Corporation, February 1999.*
- MK, 1999b *Appendix G of the 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, September 27, 1999.*

**APPENDIX A**  
**EPA CORRESPONDENCE**

DEPARTMENT OF THE NAVY

CRANE DIVISION

NAVAL SURFACE WARFARE CENTER

300 HIGHWAY 361

CRANE, INDIANA 47522-5000

IN REPLY REFER TO:

5090

Ser 095/0036

24 FEB 2000

U.S. Environmental Protection Agency, Region V  
Waste, Pesticides, & Toxics Division  
Waste Management Branch  
Illinois, Indiana, and Michigan Section  
Attn: Mr. Peter Ramanauskas (DW-8J)  
77 West Jackson Blvd.  
Chicago, IL 60604

RECEIVED

FEB 29 2000

MORRISON KNUDSEN

Dear Mr. Ramanauskas:

The purpose of this letter is to document the supplemental toxicity testing requirements agreed upon in our telephone conversation February 8, 2000 for Mine Fill A (MFA) and Mine Fill B (MFB) at the NSWC Crane Bioremediation Facility (Biofacility), Crane, Indiana. Previous toxicity testing performed at MFA (MK, 1998) verified that treated contaminated soil compost did not show a greater toxicity than treated non-contaminated soil compost. However, the testing program was not designed to evaluate the effects on toxicity of treated and field placed compost over time, as we discussed. Naval Surface Warfare Center Crane proposes to collect four additional samples which will be analyzed for select toxicity tests in order to provide additional toxicity information from previously composted windrows.

The objective of the supplemental toxicity testing is to demonstrate that there is a reduction in the toxicity of treated compost over time when compared to the initial full scale windrow (compost windrow S001) toxicity testing. In order to determine if there is a reduction in toxicity over time, the four minimum additional samples will be collected with duplicates from areas backfilled with composted material at various time intervals since the placement of windrow S001. Sampling and testing will be in accordance with the *Full-Scale Operational Plan (OP)* [MK, 1998a] and the *Quality Assurance Project Plan for Full-Scale Operations at the Bioremediation Facility (QAPP)*, [MK, 1998b] except as noted below.

Compost testing will consist of collecting grab samples from previously processed compost at varying stages of maturity. Samples will be collected from areas backfilled with composted material from MFA or MFB as applicable in order to obtain the desired age. Mature compost testing will be limited to earthworm toxicity, pathogen, and Microtox<sup>®</sup>. Other toxicity tests, described in QAPP, will not be performed because acceptable results were obtained for the previous toxicity testing on windrow S001 compost.

**SUBJ: SUPPLEMENTAL TOXICITY TESTING REQUIREMENTS**

Based upon the current Biofacility processing production, it is necessary to collect samples from MFA and MFB as follows:

- MFB, 2 to 4 month aged compost
- MFB, 5 to 7 month aged compost
- MFA or MFB, 11 to 15 month aged compost
- MFA compost from S001

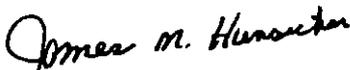
Number of samples and sample locations will be field selected to provide a representative sample of the desired compost material. At a minimum, the top two inches of compost will be discarded before sample collection.

At the request of US EPA, the standard soil used for the earthworm toxicity testing will have its pH adjusted, if necessary, to have a similar pH to that of the compost samples. This is a change from the Standard Operating Procedures (SOPs) included in the QAPP. However, a revised SOP is not required to be issued.

Upon completion of the supplemental toxicity testing outlined above, no additional toxicity testing will be required at MFB since the soil types and contaminants of concern are similar to that of MFA. The remaining MFA soil will be excavated, composted, and returned to the excavation area once the clean-up criteria have been met. Once written approval of this supplemental toxicity testing requirements is received, revision pages for the appropriate OP and QAPP sections will be submitted. Complete toxicity testing for soils at Rockeye, ABG, and any other site selected to be remediated for explosives contaminated soils will be performed as outlined in the approved revisions to the OP & QAPP, including earthworm toxicity, Microtox<sup>®</sup>, pathogen, & leachability.

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

Sincerely,



JAMES M. HUNSICKER, DIRECTOR  
ENVIRONMENTAL PROTECTION DEPARTMENT  
BY DIRECTION OF THE COMMANDER

Copy to:  
ADMINISTRATIVE RECORD  
MK Cleveland  
SOUTHNAVFACENGCOM  
TOLTEST Crane



**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY**  
REGION 5  
77 WEST JACKSON BOULEVARD  
CHICAGO, IL 60604-3590

**MAR 03 2000**

REPLY TO THE ATTENTION OF:

**DW-8J**

Ms. Christine Freeman  
Naval Surface Warfare Center  
EPD, Code 095 B-3260  
300 Highway 361  
Crane, IN 47522-5001

Re: Supplemental Toxicity Testing  
Bioremediation of Explosives  
Contaminated Soils

Dear Ms. Freeman:

The United States Environmental Protection Agency (U.S. EPA) has received and reviewed the Naval Surface Warfare Center's letter dated February 24, 2000 regarding the supplemental toxicity testing requirements for explosives composted soils at the Crane facility. The requirements as outlined in your letter, as well as the revisions to Appendix G, including the revised Aqua Survey, Inc. Laboratory SOP for earthworm toxicity testing, submitted September 27, 1999 are approved.

Please submit the Full-Scale Operational Plan (OP) and Quality Assurance Project Plan for Full-Scale Operations at the Bioremediation Facility (QAPP) revision pages reflecting the changes made to toxicity testing requirements at the Mine Fill A, Mine Fill B, Rockeye, and Ammunition Burning Ground Solid Waste Management Units for U.S. EPA review and approval. In addition, submit copies of any additional documents (e.g. work plans; sampling plans) prepared in relation to planning and execution of the supplemental toxicity testing.

If you have any questions regarding this matter, please contact me at (312) 886-7890.

Regards,

A handwritten signature in black ink, appearing to read "Peter Ramanauskas".

Peter Ramanauskas  
Environmental Engineer  
WMB, Corrective Action Section

Filename: Supl to Test Ltr.wpd

cc: Core Team Members:

Bill Gates, SOUTHDIV  
Doug Griffin, IDEM



**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY**  
REGION 5  
77 WEST JACKSON BOULEVARD  
CHICAGO, IL 60604-3590

REPLY TO THE ATTENTION OF:

March 16, 2000

DW-8J

Ms. Christine Freeman  
Naval Surface Warfare Center  
EPD, Code 095 B-3260  
300 Highway 361  
Crane, IN 47522-5001

Re: Letter of Approval  
Draft Toxicity Report  
Full Scale Bioremediation

Dear Ms. Freeman:

The United States Environmental Protection Agency (U.S. EPA) has reviewed the Draft Toxicity Report for Full Scale Bioremediation dated February 1999.

The U.S. EPA hereby approves the report. Please continue preparations for supplemental toxicity testing at the Mine Fill A and Mine Fill B Solid Waste Management Units.

If you have any questions regarding this matter, please contact me at (312) 886-7890.

Regards,

A handwritten signature in black ink, appearing to read "Peter Ramanauskas", written over a horizontal line.

Peter Ramanauskas  
Environmental Engineer  
WMB, Corrective Action Section

Filename: F8 Tox Report Approval.vpd

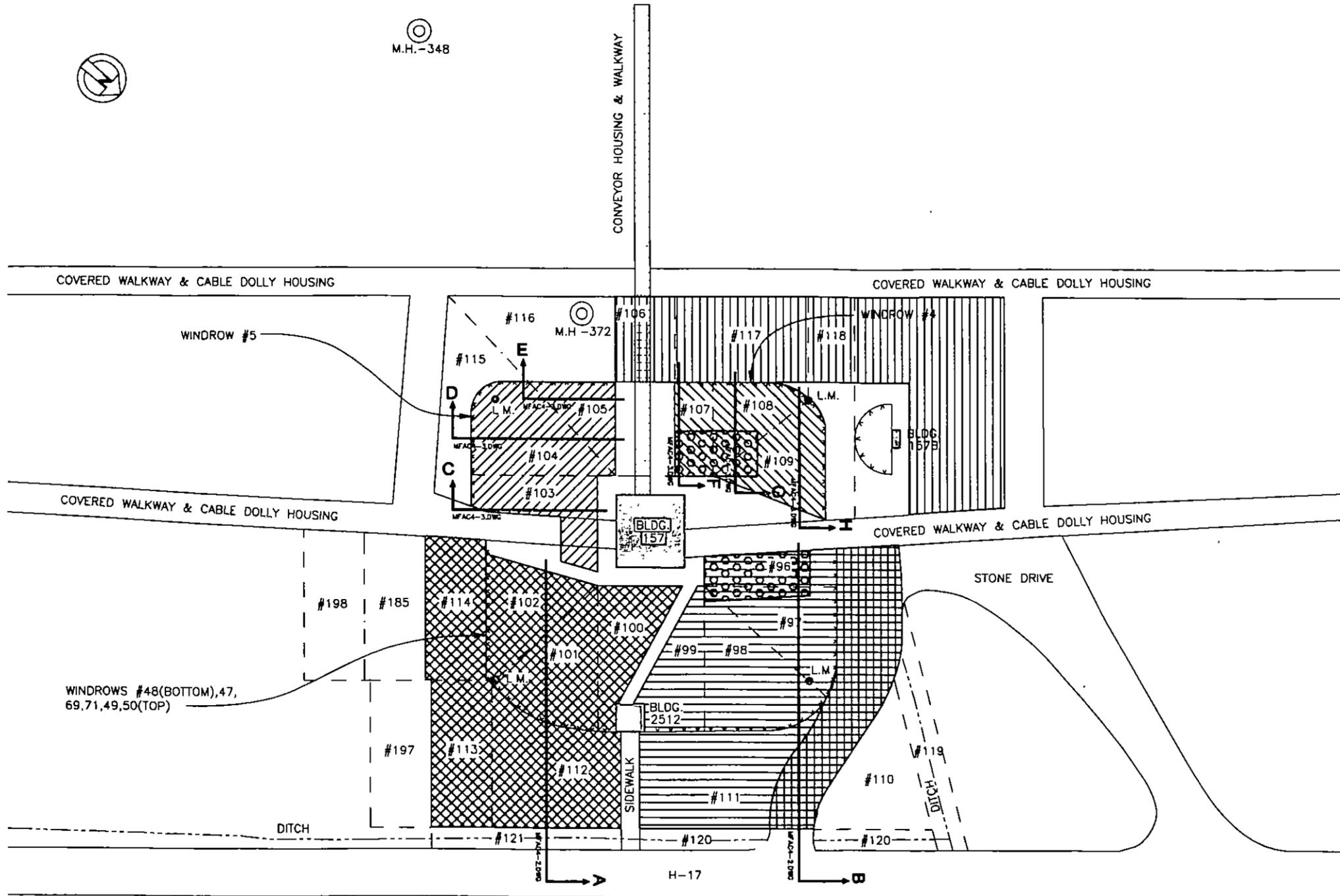
cc: Core Team Members: Bill Gates, SOUTHDIV

**APPENDIX B**  
**MINE FILL "A" DRAWINGS**

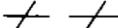
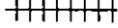
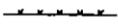


M.H.-348

CONVEYOR HOUSING & WALKWAY



### LEGEND

-  BUILDING
-  STEAM LINE
-  RAILROAD
-  GRID BOUNDARY
-  SWALE/DITCH
-  EDGE OF BERM
-  L.M. LIGHTNING MAST
-  MAN HOLE
-  #9 GRID NUMBER
-  CONVEYOR HOUSING AND WALKWAY
-  DECONTAMINATED ROCKS
-  WINDROWS #5 & 53
-  WINDROWS #3, PART OF 48, 49 & 60
-  WINDROW #4
-  WINDROWS #62, 65, 67 & PART OF 48
-  WINDROWS #47, PART OF 48, 49, 50, 69 & 71
-  PART OF WINDROW #48

### NOTES:

1. GRID LOCATIONS ARE APPROXIMATE BASED ON FIELD MEASUREMENTS.



FULL-SCALE  
BIOREMEDIATION  
OPERATIONS  
NSWC CRANE  
CRANE, IN

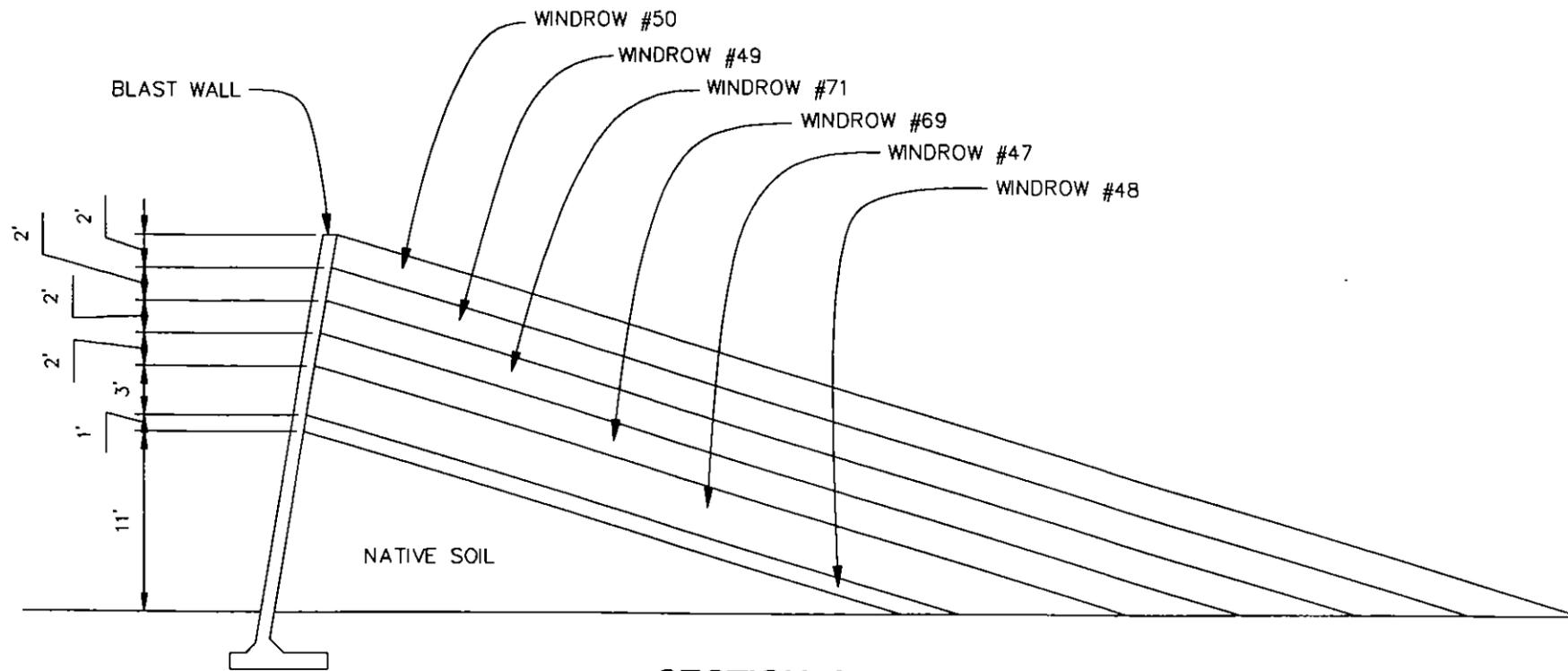
FIGURE I4  
BACKFILL LOCATIONS  
MINE FILL A, BUILDING 157  
PAGE 1 OF 3



MORRISON KNUDSEN CORPORATION  
ENVIRONMENTAL SERVICES

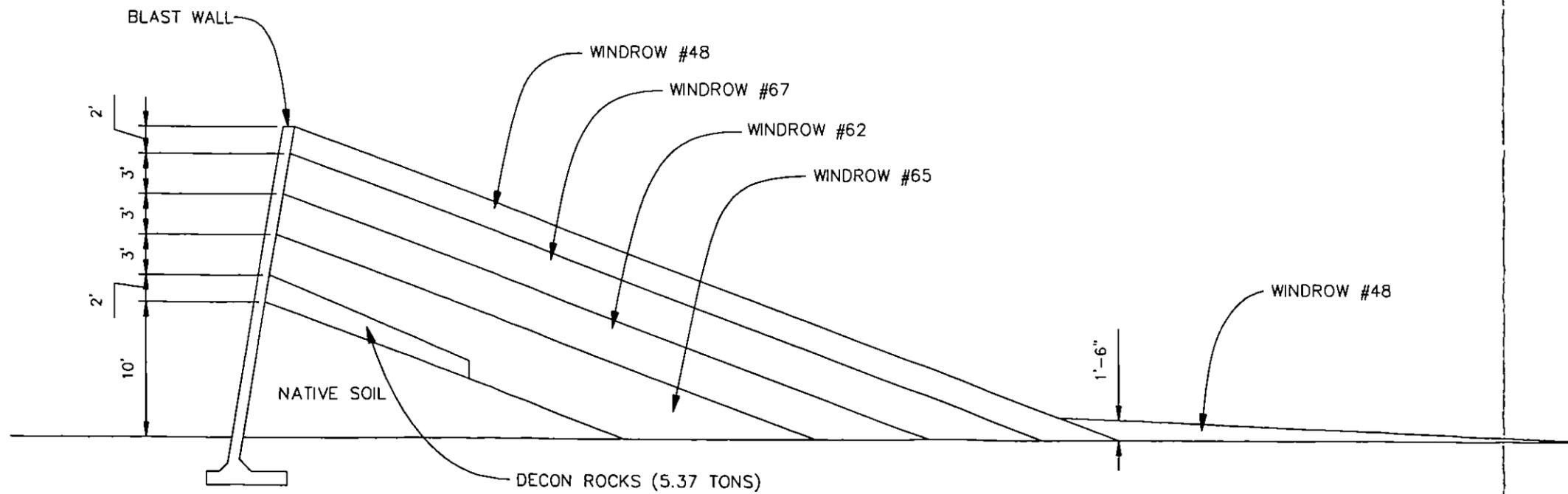
DWG DATE: 4/26/00

FILE NAME: MFAC-1.DWG



**SECTION A**

MFAC4-1.DWG  
GRIDS #100, 101, 102, 112, 113, & 104  
(NTS)



**SECTION B**

MFAC4-1.DWG  
GRIDS #96, 97, 98, 99, & 111  
(NTS)

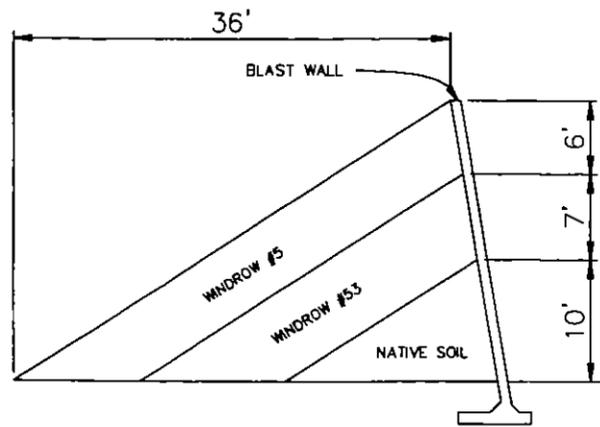


FULL-SCALE  
BIOREMEDIATION  
OPERATIONS  
NSWC CRANE  
CRANE, IN

FIGURE I4  
BACKFILL LOCATIONS  
MINE FILL A, BUILDING 157  
PAGE 2 OF 3

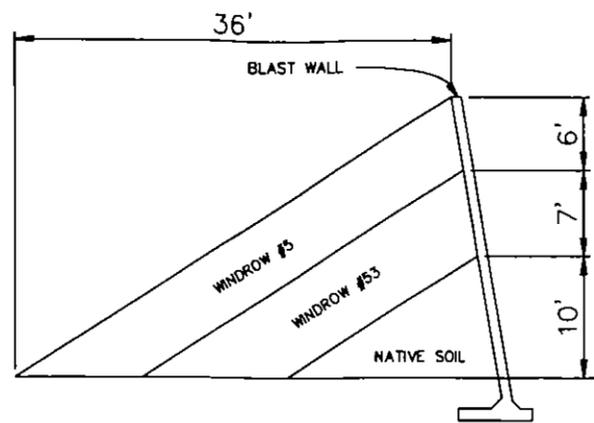


MORRISON KNUDSEN CORPORATION  
ENVIRONMENTAL SERVICES



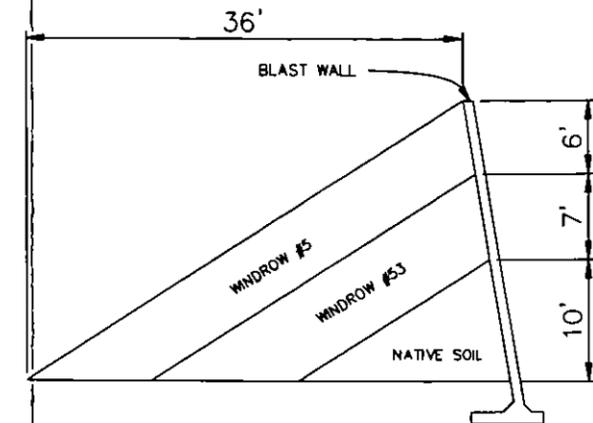
**SECTION C**

MFAC4-1.DWG  
GRID #103  
(NTS)



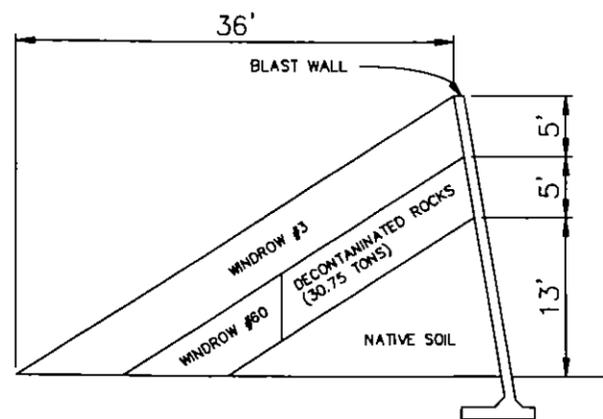
**SECTION D**

MFAC4-1.DWG  
GRID #104  
(NTS)



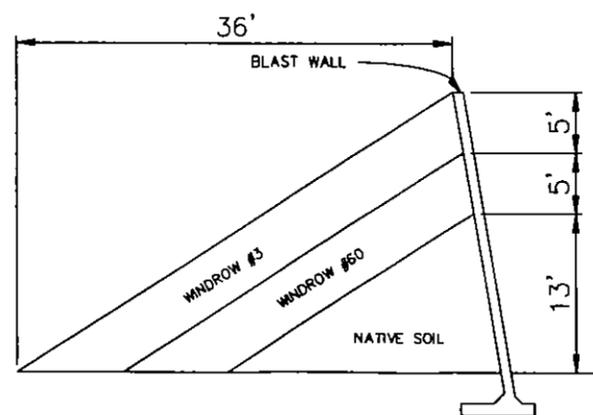
**SECTION E**

MFAC4-1.DWG  
GRID #105  
(NTS)



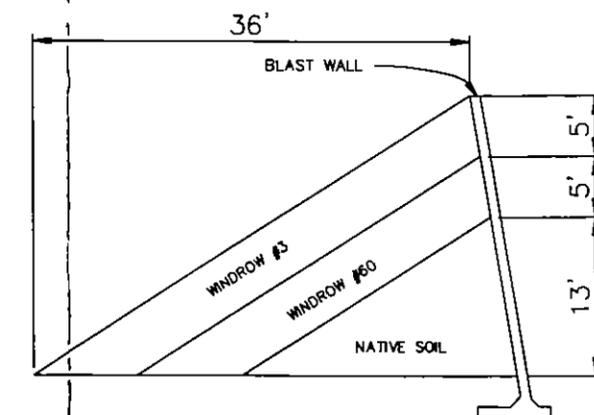
**SECTION F**

MFAC4-1.DWG  
GRID #107  
(NTS)



**SECTION G**

MFAC4-1.DWG  
GRID #108  
(NTS)



**SECTION H**

MFAC4-1.DWG  
GRID #109  
(NTS)



FULL-SCALE  
BIOREMEDIATION  
OPERATIONS  
NSWC CRANE  
CRANE, IN

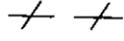
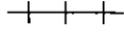
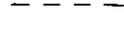
FIGURE I4  
BACKFILL LOCATIONS  
MINE FILL A, BUILDING 157  
PAGE 3 OF 3

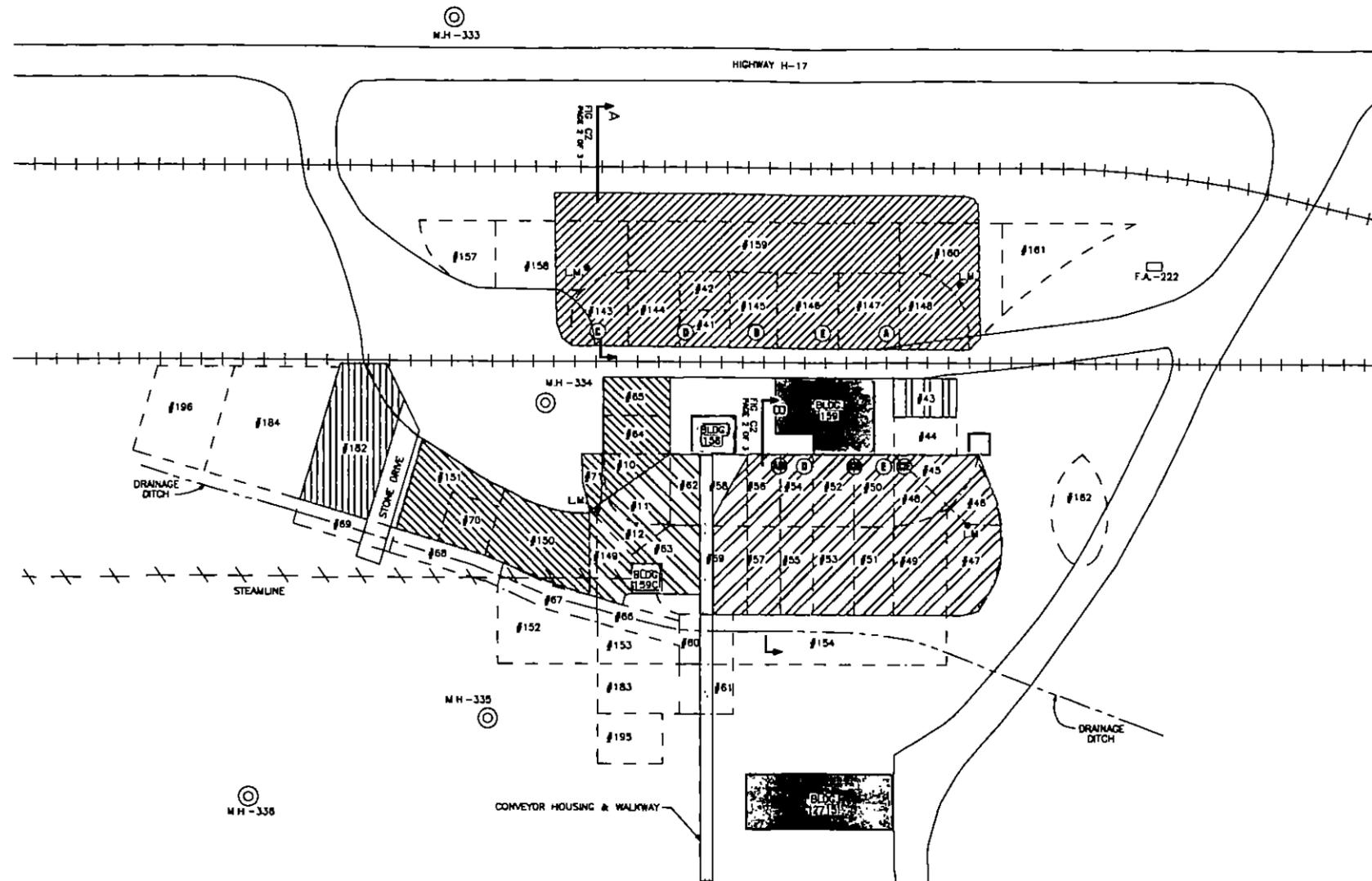


MORRISON KNUDSEN CORPORATION  
ENVIRONMENTAL SERVICES



LEGEND

-  BUILDING
-  STEAM LINE
-  RAILROAD
-  GRID BOUNDARY
-  SWALE/DITCH
-  MAN HOLE
-  #9 GRID NUMBER
-  L.M. LIGHTNING MAST
-  WINDROW DIMENSION LOCATION
-  CONVEYOR HOUSING AND WALKWAY
-  WEST BERM WINDROWS #1,2,4, 7,10,30,PILOT SCALE MIXES
-  WINDROW #12 GRID #182 12" DEEP
-  WINDROW #33 GRID #70,150,151 3' DEEP GRIDS #71,10 18" DEEP GRIDS #64,65 10" DEEP
-  BACK BERM WINDROWS #6, 28,34,35
-  WINDROW #6 (1/20/99)
-  WINDROW #42 3' DEEP

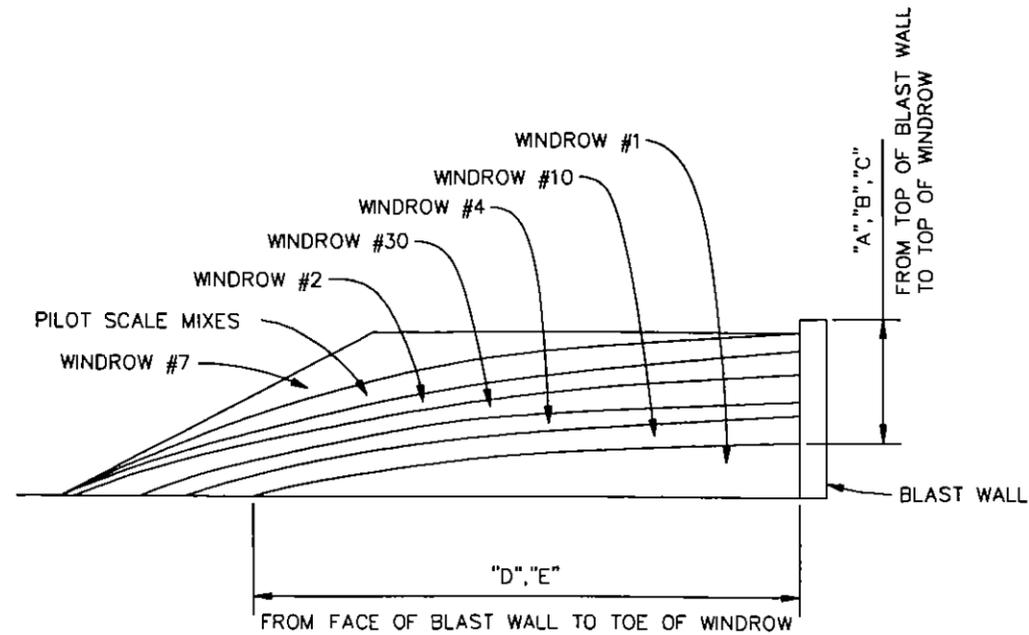


NOTES.  
 1. GRID LOCATIONS ARE APPROXIMATE BASED ON FIELD MEASUREMENTS.



FULL-SCALE BIOREMEDIATION OPERATIONS  
 NSWC, CRANE CRANE, IN

FIGURE I2  
 BACKFILL LOCATIONS  
 MINE FILL A. BUILDING 158/159  
 PAGE 1 OF 3



**SECTION A**

MFAC2-1 DWG

WINDROW #1 12/9/98  
 A=8'  
 B=9'  
 C=10'  
 D=40'  
 E=39'

WINDROW #2 12/29/98  
 A=18"  
 B=4'  
 C=7"  
 D=53'  
 E=54'

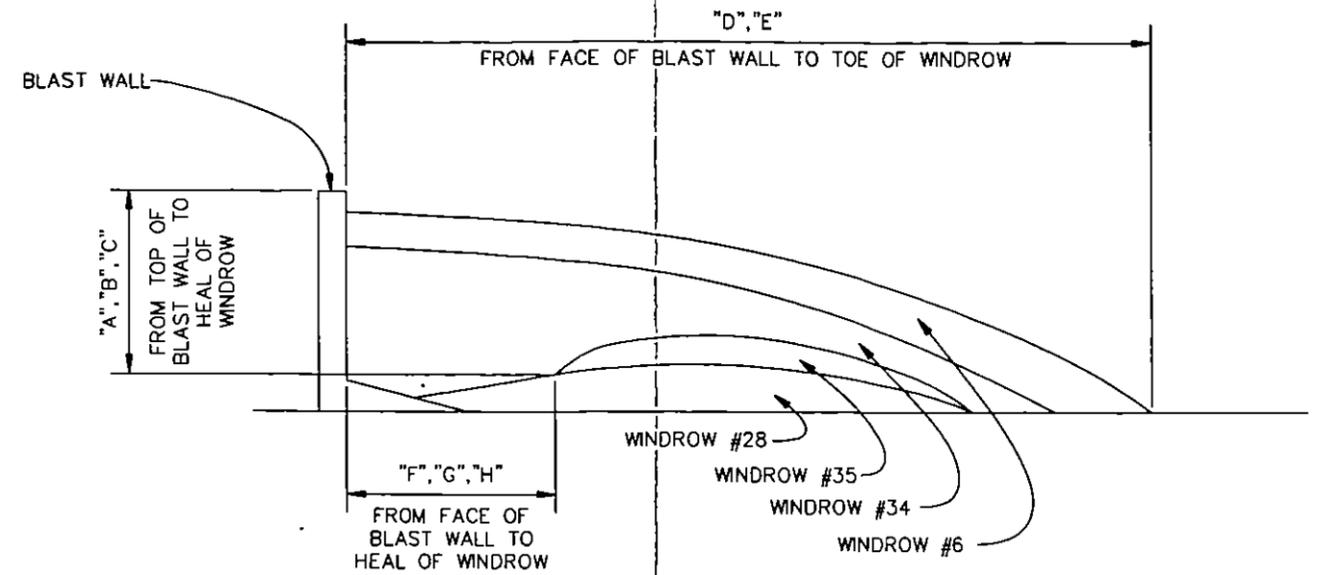
WINDROW #10 12/10/98  
 A=7'  
 B=7'  
 C=10'  
 D=45'  
 E=38'

PILOT SCALE MIXES 12/29/98  
 A=12"  
 B=12"  
 C=7"  
 D=54'  
 E=48'

WINDROW #4 12/23/98  
 A=5'-8"  
 B=6'  
 C=9'  
 D=47'  
 E=44'

WINDROW #7 12/30/98  
 A=12"  
 B=12"  
 C=12"  
 D=54'  
 E=54'

WINDROW #30 12/28/98  
 A=5'-8"  
 B=6'  
 C=6'  
 D=48'  
 E=49'



**SECTION B**

MFAC2-1 DWG

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'  
 D=52'  
 E=52'

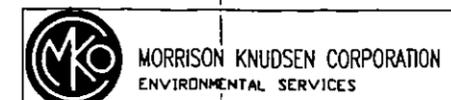
WINDROW #6 1/20/99  
 A=18"  
 B=18"  
 C=18"  
 D=55'  
 E=59'

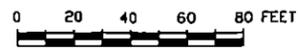
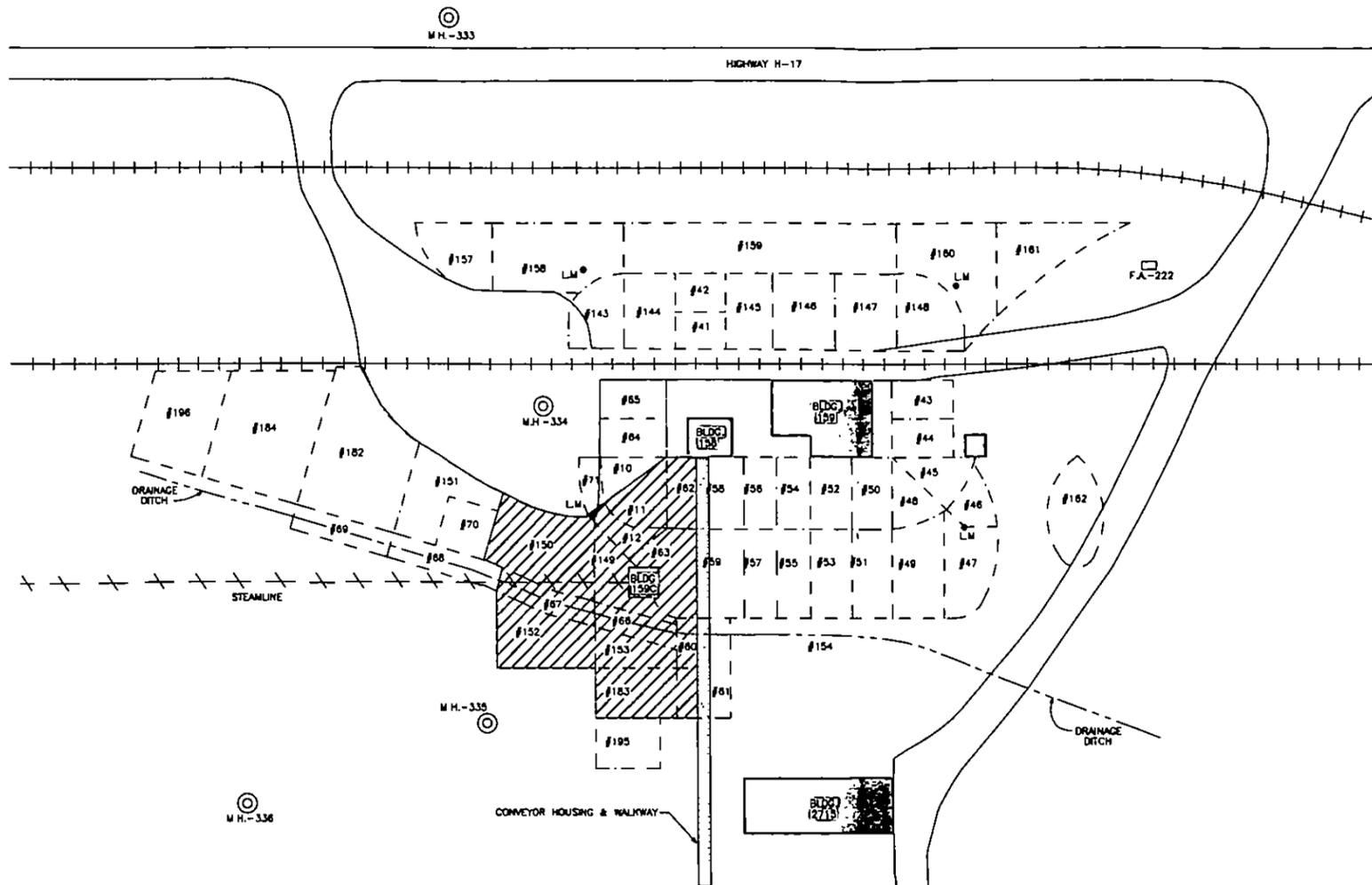
AS OF 3/26/99



FULL-SCALE  
 BIOREMEDIATION  
 OPERATIONS  
 NSWC, CRANE  
 CRANE, IN

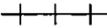
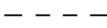
FIGURE 12  
 BACKFILL LOCATIONS  
 MINE FILL A BUILDING 158/159  
 PAGE 2 OF 3





SCALE

LEGEND

-  BUILDING
-  STEAM LINE
-  RAILROAD
-  GRID BOUNDARY
-  SWALE/DITCH
-  MAN HOLE
-  #9 GRID NUMBER
-  LIGHTNING MAST
-  CONVEYOR HOUSING AND WALKWAY
-  WINDROW #23 TO ORIGINAL GRADE

NOTE: GRID LOCATIONS ARE APPROXIMATE BASED ON FIELD MEASUREMENTS.

AS OF 3/26/99



FULL-SCALE  
BIOREMEDIATION  
OPERATIONS  
NSWC, CRANE  
CRANE, IN

FIGURE I2  
BACKFILL LOCATIONS  
MINE FILL A, BUILDING 158/159  
PAGE 3 OF 3



MORRISON KNUDSEN CORPORATION  
ENVIRONMENTAL SERVICES

DWG DATE: 4/26/00

FILE NAME: MFAC2-3.DWG

**APPENDIX C**

**MINE FILL "B" DRAWINGS**



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FIELD SOP: STT-SAP-1.0  
TITLE: SAMPLING OF BACKFILLED MATURE COMPOST FOR TOXICITY TESTING

---

## 1.0 PURPOSE

This procedure applies to the Naval Surface Warfare Center, Crane, Indiana site for Bioremediation Facility full-scale operations. This procedure describes the methods that will be used to establish sampling locations and to collect compost samples. Samples will be collected and analyzed from mature compost which has been treated and backfilled at Mine Fill A (MFA) or Mine Fill B (MFB) excavations.

## 2.0 ESTABLISH SAMPLING LOCATIONS

Windrows selected for sampling have been identified in Section 2.2.1 of the Supplemental Toxicity Testing Sampling and Analysis Plan (STT-SAP). Refer to maps provided in Appendix B and C of that plan to determine locations.

One composite sample will be collected from each windrow selected. The four composite samples (one from each windrow) will represent compost at varying ages from 2 to 4 months to more than 2 years old. Each sample will be a composite of three subsamples. The three subsamples will be collected from discreet locations throughout the entire disbursement of the windrow placed at MFA or MFB.

## 3.0 SAMPLE COLLECTION

The section describes the procedure to be followed for collecting sample material from the placed compost windrows for laboratory analysis.

At each location, approximately one gallon of sample material will be collected. Each sample location will be exposed by first digging with a backhoe, shovel, or equivalent tool to the upper depth of the placed windrow location. After the desired windrow has been exposed, an additional two inches of material will be removed using a stainless steel hand shovel or trowel. A clean five-gallon bucket is then filled with about one gallon of material. This process will be repeated at two additional locations throughout the designated windrow disposal area. The bucket, containing a three gallon sample will be homogenized and split in order to obtain a representative sample. This sample will be containerized for each analytical method as specified in Table 2-2 of the STT-SAP.

### 3.1 Tools and Materials

large shovel  
stainless steel trowel, hand shovel, spoon

---

FIELD SOP: STT-SAP-1.0  
TITLE: SAMPLING OF BACKFILLED MATURE COMPOST FOR TOXICITY TESTING

---

flagging and pins  
measuring stick  
appropriate sample containers (see Section 2.2.2 of STT-SAP)  
Disposable gloves  
stainless steel bowl or plastic bucket  
logbook  
indelible pen  
sample tags  
sample labels  
coolers  
preservatives  
chain of custody forms  
sealable, disposable plastic bags

All non-disposable sample extraction tools which come in contact with the sample shall be decontaminated prior to use as described in Field SOP 7.0 of the *Full Scale Operational Plan - Soils Bioremediation Facility (FS-OP)*, Appendix D [MK, 1998b].

### 3.2 Sample Collection Procedure

1. Locate the backfilled windrow using the maps provided in Appendix B and C of the STT-SAP. Mark the exterior boundaries of the windrow. Divide the area of the selected windrow into three approximately equal subsections. From the center of each subsection collect one sample.
2. Using a backhoe, auger, shovel, or equivalent tool clear all soil to the depth of the desired placed windrow. After the upper depth of the desired windrow has been exposed, clear an additional two inches of material using a hand shovel.
3. Place approximately one gallon of compost material into a decontaminated bucket or bowl.
4. Repeat process at the remaining two areas of the selected windrow to form a composite sample. A bucket containing three gallons of treated compost from the selected windrow will result.
5. To ensure a homogenized sample from the windrow, place the collected material into a large stainless steel bowl or bucket. Mix the sample thoroughly in the bowl using a pestle or spoon.
6. Split the sample using a riffle splitter, cone-and-quartering, or equivalent

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FIELD SOP: STT-SAP-1.0  
TITLE: SAMPLING OF BACKFILLED MATURE COMPOST FOR TOXICITY TESTING

---

method. Then take a representative aliquot of the required volume and containerize for each analytical method as specified in Table 2-2 of the STT-SAP. Return any unused portion of material to the placed windrow location.

7. The samples will be taken to the on-site laboratory for preparation before shipment or field analysis. Follow the sample labeling, tagging, identification, chain of custody, and shipping and handling procedures described in Section 4.0 of the approved *FS-QAPP* [MK, 1998a] Document all sampling activities in the logbook.
8. New sample containers shall be used for each sample. Decontamination procedures are described in Field SOP 7.0 of the *FS-OP*, Appendix D [MK, 1998b].