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THE MEMPHIS DEPOT
TENNESSEE

ADMINISTRATIVE RECORD
COVER SHEET

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REMEDIAL ACTION WORK PLAN
ADDENDUM 1
DUNN FIELD DISPOSAL SITES

Defense Depot Memphis, Tennessee

Defense Logistics Agency

MACTEC

MACTEC Engineering and Consulting, Inc.
Project No. 6301-05-0004

Air Force Center for Environmental Excellence
Contract No. FA8903 04 D 8690
Task Order No. 0009

February 2006
Revision 1

TABLE OF CONTENTS

LIST OF TABLES

Table

LIST OF FIGURES

Figure

LIST OF APPENDICES

Appendix

LIST OF ACRONYMS AND ABBREVIATIONS

AFCEE	Air Force Center for Environmental Excellence
ALs	Action Levels
BCT	BRAC Cleanup Team
Bennett	Bennett Environmental, Inc.
bgs	Below Ground Surface
BRAC	Base Realignment and Closure
CERCLA	Comprehensive Environmental Restoration, Compensation, and Liability Act
CFR	Code of Federal Regulations
Clean Harbors	Clean Harbors Deer Park, LP
COC	Constituent of Concern
COPC	Constituent of Potential Concern
CSF	Carcinogenic Slope Factors
CVOC	Chlorinated Volatile Organic Compound
CY	Cubic yards
DDMT	Defense Depot Memphis, Tennessee
DLA	Defense Logistics Agency
DoD	Department of Defense
EPA	Environmental Protection Agency
ETC	Environmental Testing & Consulting, Inc.
FID	Flame Ionization Detector
FTX	FTX Environmental, LLC
GC/MS	Gas chromatography/mass spectrometry
IDW	Investigation Derived Waste
Laguna	Laguna Construction Company
MACTEC	MACTEC Engineering and Consulting, Inc.
m^3/day	cubic meter per day
m^3/kg	cubic meters per kilogram
mg/m^3	microgram per cubic meter
mg/m^3	milligram per cubic meter
mg/kg	milligram per kilogram
mg/L	milligram per liter

LIST OF ACRONYMS AND ABBREVIATIONS
(Continued)

Onyx	Onyx Environmental Services, LLC
PPE	Personal Protective Equipment
RACR	Remedial Action Completion Report
RAWP	Remedial Action Work Plan
RBC	Risk-based concentration
RCRA	Resource Conservation and Recovery Act
RGs	Remediation Goals
RI	Remedial Investigation
ROD	Record of Decision
SSHP	Site-Specific Safety and Health Plan
SSHO	Site Safety and Health Officer
SRC	Soil Removal Criteria
SVOC	Semi-Volatile Organic Compound
TCLP	Toxicity Characteristic Leaching Procedure
TDEC	Tennessee Department of Environmental Control
TWA	Time-Weighted Average
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound

1.0 INTRODUCTION

This Remedial Action Work Plan (RAWP) Addendum 1 has been prepared by MACTEC Engineering and Consulting, Inc. (MACTEC) to describe the activities planned to excavate the area of Disposal Site 3 containing glass bottles on Dunn Field at Defense Depot Memphis, Tennessee (DDMT). This document has been prepared by MACTEC as subcontractor to Laguna Construction Company (Laguna) as part of contract number FA8903-04-D-8690, Task Order 0009, Modification 01 with the Air Force Center for Environmental Excellence (AFCEE), which is working on behalf of the Defense Logistics Agency (DLA). This document is intended to comply with Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) guidance for remedial actions and to satisfy requirements outlined by the Base Realignment and Closure (BRAC) Act and the BRAC Cleanup Team (BCT) for DDMT. The BCT, which is composed of representatives of DLA, Tennessee Department of Environment and Conservation (TDEC), and the U.S. Environmental Protection Agency (USEPA), monitors the progress of remedial action and reviews all documents prior to finalization. DLA is the lead agency for site activities at DDMT. The regulatory oversight agencies are USEPA Region 4 and TDEC. The Memphis Depot's USEPA Identification Number is TN4210020570.

1.1 PURPOSE AND ORGANIZATION

The purpose of this RAWP Addendum 1 is to outline the procedures that will be followed to excavate, characterize, transport, and properly dispose of buried waste materials associated with liquid containers from Disposal Site 3 located on the western portion of Dunn Field. Excavation of Disposal Site 3 was initiated in March 2005, following USEPA approval of the RAWP, Revision 1 (MACTEC, 2004) for the Dunn Field Disposal Sites in November 2004. Due to the unanticipated presence of numerous intact liquid containers, excavation at Disposal Site 3 was halted. Additional procedures for completing the excavation and properly characterizing and disposing of the excavated material have been developed and are presented in this RAWP Addendum 1. This Addendum is intended to address requirements specific to the removal and disposal of the liquid containers and associated materials from Disposal Site 3. Work practices and procedures established in the original RAWP generally remain applicable. Section 1 of this document provides background on the Disposal Site 3 remedial action. Section 2 describes the planned activities to be conducted during the field implementation of the remedial action. Section 3 describes waste characterization and management procedures. Section 4 describes the reporting procedures Section 5 presents the schedule.

1.2 BACKGROUND

Excavation of approximately 225 cubic yards of soil and debris from Disposal Site 3 was specified in the Remedial Design, Revision 1 (CH2M HILL, 2004). Previous investigations had identified the presence of buried glass bottles and crushed metal drums at Disposal Site 3. The excavation was estimated to be approximately 30 feet long by 20 feet wide by 10 feet deep.

During the initial excavation of Disposal Site 3 in March 2005, numerous 1-quart amber glass containers with plastic screw-on caps were encountered at a depth of approximately 5 feet below ground surface (bgs). The plastic caps on the containers appeared brittle, but were not observed to be leaking. The containers, which held a clear liquid, were not labeled and did not have any identification markings. Some of the containers were broken as a result of the excavation, but numerous intact containers were in the soil matrix at the base of the excavation. Excavation at Disposal Site 3 was halted to identify the liquid and develop a strategy for safely proceeding with the excavation. Materials excavated from Disposal Site 3 were placed on a liner and covered with plastic. The intact liquid containers were segregated from the excavated soils and placed in a drum layered with vermiculite to provide packing for the containers. The plastic soil cover was secured with hay bales and orange construction fencing was placed around the stockpile area. The drum was properly labeled and placed inside the orange construction fencing. Visual inspections of the stockpile and drum have been conducted weekly since excavation activities were interrupted. Prior to demobilization, a plastic liner was placed in the excavation and the remainder of Disposal Site 3 was backfilled to grade with clean backfill material. The estimated area of the liquid containers within Disposal Site 3 is shown on Figure 1-1.

A review of available documents (listed below) indicates that 3,000 quarts of unknown chemicals and 5 cubic feet of ortho-toluidine dihydrochloride were buried in Disposal Site 3 in 1955.

- Administrative Record (AR) file #02, *Installation Assessment of Defense Depot Memphis, Tennessee – Report #191*, Chemical Systems Laboratory, 1982 (page 51)
- AR file #15, *RCRA Facilities Assessment Report*, 1990, AT Kearney (page 23)
- AR file #56, *Electromagnetic and Magnetic Survey Report*, 1994, Army COE
- AR file #123, *OU1 Field Sampling Plan*, 1995, CH2M HILL
- AR file #281, *Geophysical Survey Work TM*, 1998, OHM
- AR File #474, *Final OU1 FSP Addenda TM*, CH2M HILL

- 1995 *Archives Search Report*

Three of the intact containers excavated from Disposal Site 3 were randomly selected, placed in buckets packed with vermiculite, and transported to the laboratory for analysis. A two-step laboratory analytical process was developed to evaluate the physical and chemical characteristics of the containerized liquids. The first round of analysis included pH, water reactivity, and solubility. The second round of analysis included ignitability, oxidizer screening, percent water, percent solids, specific gravity, chlorides, and gas chromatography/mass spectrometry (GC/MS) for volatile organic compound (VOC) and semivolatile organic compound (SVOC) constituents.

The two rounds of laboratory analyses indicated that the materials in the containers were characteristically similar. The results are summarized on Table 1-1. All three samples had pH values <2, total solids content of 0.05 - 0.18% and water content ranging from approximately 87 to 100%, and contained a tentatively identified compound (3,3-dimethylbenzidine) at 150 to 1,060 parts per million (ppm).

3,3-Dimethylbenzidine was identified in the GC/MS SVOC analysis. It is suspected to have been produced from the derivatization and coupling of ortho-toluidine hydrochloride and/or formed from simple derivatization of ortho-toluidine dihydrochloride during the sample preparation after the pH was adjusted to >12 prior to extraction No compounds were observed in the GC/MS SVOC analyses in sample extracts prepared from the pH <2 aliquots. The available physical and chemical analysis data indicates that the three liquid samples were basically acidified water with a small amount of soluble ortho-toluidine hydrochloride and/or dihydrochloride present. Ortho-toluidine, ortho-toluidine hydrochloride and 3,3-dimethylbenzidine are listed hazardous wastes, U328, U095 and U222, respectively.

Action levels (ALs) have been developed for concentrations of ortho-toluidine and 3, 3-dimethylbenzidine in air that would not be expected to adversely impact human health. The evaluation of the potential airborne emissions is included as **Appendix A**. A human health risk evaluation for potential airborne exposures during remediation is included in **Appendix B**.

Attachment 1 to Site Safety and Health Plan (SSHP) Addendum 2 (which was previously prepared for the Disposal Sites Remedial Action) has been prepared to address specific health and safety requirements for

site workers during the excavation of the liquid containers from Disposal Site 3. Attachment 1 to the SSHP Addendum 2 is included in **Appendix E**.

1.3 REMEDIAL GOALS

The approved remediation goals (RGs) for the Dunn Field Disposal Sites, which are listed in Table 5-5 of the Remedial Design (CH2M HILL, 2004), show a remediation goal (RG) for ortho-toluidine (also known as 2-methylaniline) of 0.04 milligram per kilogram. MACTEC has conducted additional risk evaluation to establish an RG for 3,3-dimethylbenzidine, as described in **Appendix C**.

2.0 DISPOSAL SITE 3 EXCAVATION ACTIVITIES

Details regarding site preparation, soil excavation, and staging activities are described below.

2.1 SITE PREPARATION

Prior to beginning work, MACTEC personnel will establish an exclusion zone, a support zone, contaminant reduction zone, and air monitoring stations in general accordance with the RAWP (MACTEC, 2004) and the SSHP Addendum 2 (MACTEC, 2005). Prior to performing any intrusive activities, site personnel will implement Attachment 1 of the SSHP Addendum 2 (**Appendix E**).

Based on the identified presence of dissolved ortho-toluidine hydrochloride and/or dihydrochloride, and because of the possibility that the contents of the containers may vary from those analyzed, all work performed in the area of glass containers will be done in Level B personal protective equipment (PPE). Dry chemical extinguishers and/or water spray will be readily available to control odors or mist that might be generated during the excavation of these containers.

2.2 EXCAVATION METHODS

Mechanical excavation with a trackhoe will be used to remove the glass containers and surrounding soils. Mechanical excavation will allow for removal of the glass containers in a safe and efficient manner, although glass containers will be broken during excavation. In order to limit the mobilization of liquids to the surrounding soils when containers are broken, vermiculite (which can absorb 4.2 times its weight of water) will be used to contain liquids during the excavation process. The equipment operator will perform the excavation in Level B PPE from an enclosed cab to reduce exposure to the contents of the containers. The working area breathing zone and work site perimeter will be monitored during excavation to protect against exposures to harmful vapor or particulate concentrations.

The trackhoe will be positioned upwind of the excavation to the degree possible. Excavation will begin in the area where the glass containers are expected. The equipment operator will pay close attention to the distribution of bottles encountered during excavation. As the glass containers are encountered, vermiculite will be introduced to the excavation and worked into the excavated material matrix with the trackhoe bucket to absorb liquid as excavation proceeds. After the liquid containers have been excavated, spillage in the surrounding soil will be excavated based on visual observation.

The area of Disposal Site 3 with the glass containers is estimated to measure 25 feet by 15 feet by 5 feet (depth of 5 to 10 feet bgs) or a volume of approximately 69 cubic yards. Accounting for bulking of the material upon excavation, the addition of vermiculite, and the amount of material that will be used as bedding for the roll-off containers, we anticipate that up to 150 cubic yards of material will placed in the trailers or roll-off containers.

The excavated materials will be directly loaded into lined hazardous materials dump trailers or roll-off containers, which will be positioned adjacent to the excavation and managed as hazardous waste. Caution will be used when depositing the materials in the trailers or containers to avoid damage to the liners. A 3- to 4-inch-thick layer of overburden material removed from Disposal Site 3 will be placed in the bottom of each trailer or roll-off container to protect the liner from broken glass. Tarps will be used to cover the trailers or roll-off containers after they are filled. It should be noted that the historical documents indicate that unknown chemicals, as well as ortho-toluidine dihydrochloride, may be buried in Disposal Site 3. Although the previous random samples indicated that the containers had similar contents (water and low concentrations of ortho-toluidine hydrochloride and/or dihydrochloride), there is a potential to encounter materials other than that identified. The equipment operator will discontinue excavation activities if glass containers differing in size, shape or color are encountered or if the contents of the containers change in color or consistency. If any of these observations occur, the equipment operator will immediately notify the Site Superintendent, who in turn will notify the Project Manager and Project Certified Industrial Hygienist (CIH). Procedures for continuing work are provided in Attachment 1 of SSHP Addendum 2 (**Appendix E**). The equipment operator will also rely on air monitoring to be performed by the Site Safety and Health Officer (SSHO) during excavation to monitor the work area. If air monitoring measurements approach the action levels in Attachment 1 of SSHP Addendum 2, additional vermiculite will be introduced to the excavation and/or dry chemical extinguishers or water spray will be used to suppress emissions. If air monitoring measurements reach the action levels, work will be stopped. Work will not resume until the air monitoring reaches acceptable levels, as specified in Attachment 1 of SSHP Amendment 2. If excavated materials are staged at the site prior to being transported off-site for treatment/disposal, detector tube monitoring for ortho-toluidine concentrations in air will be performed immediately downwind of the shipping containers to monitor air quality within the breathing zone. Detector tube monitoring will be performed once each afternoon as long as the shipping containers remain at the site. After excavation of the area of liquid containers is complete, the SSHO will coordinate with the Project CIH to determine whether excavation activities can be resumed in Level D PPE for the remainder of the Disposal Site 3 excavation.

2.3 WASTE TREATMENT

Since the contents of the liquid containers are identified as U listed wastes, a facility that is permitted to accept these wastes will be required. EQ Industrial Services, Inc. (EQ) is a USEPA approved facility for these wastes and, under subcontract to Laguna, has been chosen as the preferred facility because the liquid containers do not have to be intentionally broken before transport from Dunn Field and because the waste can be pre-characterized for approval. All necessary reviews have been made and the waste can be approved for disposal once the waste profile is signed by the DLA following approval of this Addendum.

Excavated materials associated with the liquid containers from Disposal Site 3 will be transported to EQ's Michigan Disposal Industrial Treatment Plant (Michigan Disposal, Inc.) for staging and handling. Upon arriving at Michigan Disposal, Inc., the materials will be placed in a 250 ton capacity concrete lined vault. After placement in the vault, mechanical equipment will be used to ensure that all of the liquid containers excavated from Disposal Site 3 are broken. Lime will be added to amend the materials as necessary prior to loading the materials on trucks for transport to the Clean Harbors Canada, Inc. Lambton Secure Landfill for disposal.

Michigan Disposal, Inc. operates under USEPA permit number MID 000 724 831 and is approved by the USEPA to accept wastes from response actions taken under CERCLA. The Clean Harbors Canada, Inc. Lambton Secure Landfill (Lambton Landfill) operates under USEPA permit number MIR 000 035 204 and is approved for the transfer and disposal of hazardous wastes. The landfill is operated in accordance with the Ministry of the Environment Waste Disposal Site Certificate of Approval No. A031806.

The materials will be transported from Michigan Disposal, Inc. to the Lambton Landfill under a blanket EPA Notification to Export dated 14 September 2005. The physical addresses for these facilities are provided below:

- Michigan Disposal, Inc.
  USEPA Permit No.: MID 000 724 831
  49350 N I-94 Service Drive
  Belleville, Michigan 48111

- Lambton Landfill
  USEPA Permit No.: MIR 000 035 204
  Ministry of the Environment Certificate of Approval No.: A031806
  4090 Telfer Road

Corunna, Ontario, Canada, N0N 1G0

EQ has pre-characterized the waste and will provide approval to accept the wastes at Michigan Disposal, Inc. upon receipt of the signed waste profile. No other additional sampling and analysis is required. This allows the materials to be excavated, live-loaded, and transported off-site to Michigan Disposal, Inc. in the same day.

EQ will accept intact glass containers as well as broken containers. This will allow the containers to be excavated without having to intentionally break each container, which will reduce the amount of liquid that will need to be managed during excavation. Each of the shipping containers will be lined with a polyethylene liner and then a layer of overburden material will then be placed in the bottom of each container to provide containment barriers. Vermiculite will be added to the excavation materials and the shipping containers to absorb any liquids that might leak from the intact containers. The amount of Vermiculite has been calculated to absorb 100 percent of the liquids assuming each of the 3,000 one-quart containers is full. If some of the intact containers leak during shipment, Vermiculite and soils will absorb and contain the liquids.

2.4 AIR MONITORING

Air monitoring will be conducted in accordance with the guidelines established in Attachment 1 of the SSHP Addendum 2 (**Appendix E**). Ambient air monitoring will be performed in the work area as well as upwind and downwind during excavation, stockpiling, and load-out activities. Real-time (direct-reading) instruments will be used to measure concentrations of organic vapors and airborne particulates (dust).

2.5 CONFIRMATION SAMPLING

Confirmation samples will be collected after the excavation activities at Disposal Site 3 are complete to determine whether RGs have been met. The confirmation sampling protocol presented in the approved RAWP (MACTEC, 2004) will be followed. In accordance with the sampling protocol, three floor samples and six wall samples will be collected. The floor samples will be collected at the total depth of the excavation. The depth at which the wall samples will be collected will be field-determined. Samples will be collected from area of discoloration, if present. If soil discoloration is not observed, depths for the wall samples will be varied across the excavation. Field personnel will have the option to shift the confirmation sampling locations, both floor samples and wall samples, based upon visual observations of

the excavation. Confirmation samples will be analyzed using USEPA Method 8270C. Laboratory turnaround time for confirmation samples will be 24 hours to minimize construction crew standby time.

Since conventional test methods cannot detect ortho-toluidine hydrochloride or dihydrochloride directly, the confirmation sample analyses will include ortho-toluidine and 3,3-dimethylbenzidine so a correlation to ortho-toluidine hydrochloride or dihydrochloride can be made. The laboratory performed a method detection limits (MDL) study for ortho-toluidine and 3,3-dimethylbenzidine. The results of this study are summarized in **Appendix D**. These analytes are not included in the routine SVOC analysis (SW8270C).

Results of the confirmation samples will be compared to the RGs shown on Table 5-5 of the Remedial Design, as well as to the constituent-specific soil RG for 3,3-dimethylbenzidine. If the analytical results for a confirmation sample indicate an area exceeds the RGs, the area will be over-excavated and re-sampled. The extent of over-excavation will use visual criteria and/or a 2-foot step-out approach. Additional confirmation sampling will be performed following over-excavation.

2.6 BACKFILL AND SITE RESTORATION

Prior to transport of backfill to the site, a borrow area will be identified and soil samples will be collected to qualify the backfill material. In accordance with the RAWP (MACTEC, 2004), a soil sample will be collected for every 500 cubic yards (CYs) of backfill material. Backfill material will be analyzed for the following:

1) Target Compound List (TCL) VOCs
2) TCL SVOCs
3) TCL Pesticides
4) TCL Herbicides
5) Polychlorinated Biphenyls
6) Target Analyte List (TAL) Metals

The analytical results for the backfill samples will be compared to the RGs listed in Table 5-5 of the Remedial Design. Any detected constituent not listed in Table 5-5 will be compared with the USEPA Region 9 Preliminary Remediation Goal Table (October 2004). If an industrial Direct Contact Exposure values and a Migration to Groundwater values are both listed, the lower of the two values will be used for comparison. If the backfill sample constituents are below the comparison criteria, the material will be accepted.

The backfill will be placed in 2-foot loose lifts compacted to an unyielding surface with the excavator bucket prior to placing succeeding lifts until a depth of 4 feet bgs is reached. For the final two lifts, a compactor or loader will be used to compact the material such that it will support loaded dump trucks without forming ruts or depressions. The backfilled sites will be graded and shaped to match the approximate original grade and establish positive surface drainage. When the backfill and grading are complete, the security fencing and silt fencing will be removed, and the area will be seeded and strawed. A mixture of ryegrass and fescue seed will be distributed with a seed spreader across the disturbed areas and covered with straw by hand.

3.0 WASTE CHARACTERIZATION AND MANAGEMENT

3.1 WASTE CHARACTERIZATION PROCEDURES

Analytical results and samples of the waste have been provided to EQ for evaluation. Based on EQ's review of the analytical data and physical evaluation of the materials, EQ has provided approval to accept the wastes contingent upon receipt of the signed waste profile.

3.2 WASTE TRANSPORTATION AND DISPOSAL

Laguna will subcontract EQ to transport and dispose of the wastes generated during the Disposal Site 3 excavation. MACTEC, as a subcontractor to Laguna, will coordinate with EQ on logistical matters such as truck scheduling. Laguna will coordinate waste manifesting and sign the disposal manifest on behalf of the government.

The transportation and disposal contractor will generate manifests that will track the waste from the point of origin to Michigan Disposal, Inc. EQ will provide Certificates of Disposal that will be included in the Remedial Action Completion Report to be prepared by MACTEC.

The excavation of materials outside the area of glass containers will follow the waste characterization, transportation, and disposal procedures in accordance with the existing RAWP.

4.0 REPORTING

The excavation, transportation, and disposal of liquid containers and associated materials from Disposal Site 3 will be presented in the Remedial Action Completion Report as provided in the RAWP Rev. 1 (MACTEC, 2004).

5.0 SCHEDULE

Excavation of the containers from Disposal Site 3 is scheduled to begin on or before 20 March 2006 and take approximately 15 days. Immediately after excavation is completed, backfilling and restoration of the area will be performed with demobilization from the site anticipated on 12 April 2006. The Dunn Field Disposal Sites Remedial Action Completion Report (RACR) will be initiated immediately after demobilization and is scheduled to be completed by 27 May 2006. Review comments are expected by 26 July 2006 and Revision 1 of the RACR is anticipated to be delivered on 24 September 2006. Project closeout is scheduled for 24 October 2006. The schedule for activities included in this RAWP Addendum is included as **Figure 5-1**.

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TABLES

TABLE 1-1

SUMMARY OF ANALYTICAL RESULTS
LIQUID WASTE SAMPLES
REMEDIAL ACTION WORK PLAN ADDENDUM 1
DDMT DISPOSAL SITE 3
Defense Depot Memphis Tennessee

PHYSICAL AND CHEMICAL CHARACTERISTICS	UNITS	SAMPLE IDs		
		DSRA-032505-DR/053-G-01	DSRA-032505-DR/053-G-02	DSRA-032505-DR/053-G-03
Density,	g/mL	1.01	1.00	1.01
Ignitability	°C	>96	>96	>96
pH	Std Units	<2	<2	<2
Water Reactive	---	No	No	No
Water Reaction Color Change	---	No	No	No
Soluble/Miscible in Water	---	Yes	Yes	Yes
Oxidizer Screening Test	---	No	No	No
Chlorides	%	0.20	0.094	0.41
Total Solids	%	0.13	0.05	0.18
VOCs,	µg/L	None detected	None detected	None detected
SVOCs (3,3-Dimethylbenzidene)	mg/L	395	150	1,060
Water, %	%	87[a]	100	95
COMPOSITION	%	87.3[b]	100.2[b]	95.5[b]

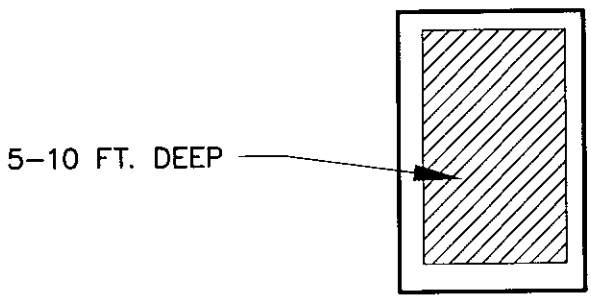
Notes:
(a) The reported Karl Fischer Moisture result is an estimated value due to the presence of sample matrix interferences.
(b) Based on the similarity of the physical and chemical characteristics of the all 3 samples, it is my professional judgement these samples are basically acidified water with a small amount of dissolved 3,3-Dimethylbenzidene present.

PREPARED/DATE: WPB 4/13/05
CHECKED/DATE: DDP 11/10/05

FIGURES

878 24

J:\DDMT\PRESENTATION\DISPOSAL-SITE-3.dwg - Layout1 11/17/2005 4:06pm ralexand



DISPOSAL SITE 3

LEGEND

ANTICIPATED EXTENT OF LIQUID WASTE CONTAINERS

SCALE IN FEET

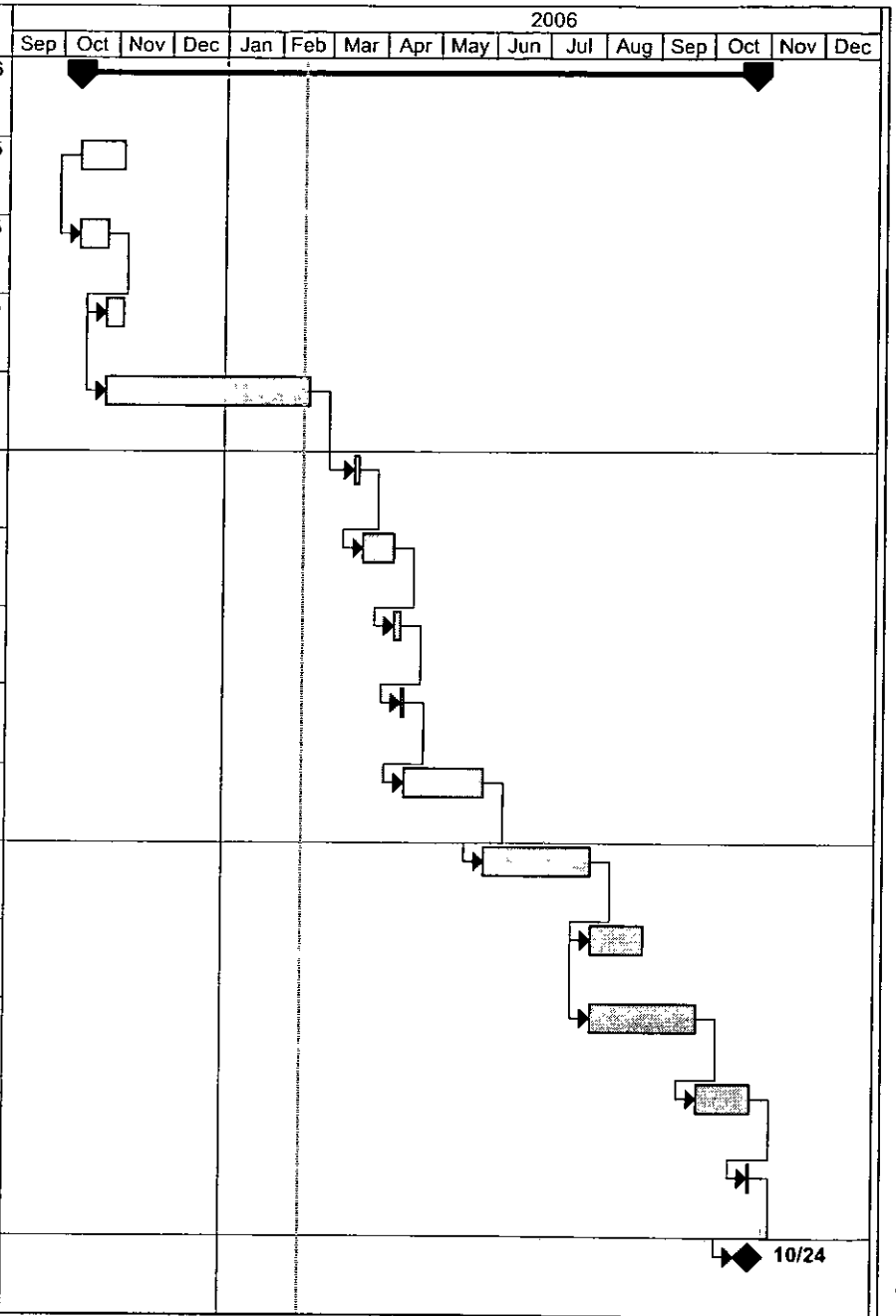
0 20 40

DEFENSE DISTRIBUTION DEPOT (MEMPHIS)	MACTEC MACTEC Engineering and Consulting, Inc. 3200 TOWN POINT DRIVE, SUITE 100 KENNESAW, GEORGIA 30144 (770) 421-3400	DISPOSAL SITE 3 JOB NO. 6301-05-0004 FIGURE 1-1

PREPARED BY/DATE

CHECKED BY/DATE

ID	%	Task Name	Duration	Start	Finish
1	**0%**	**DDMT Dunn Field Disposal Sites**	**379 d**	**10/11/05**	**10/24/06**
2	0%	MDL Study	25 d	10/11/05	11/4/05
3	0%	Risk-Based Study	16 d	10/11/05	10/26/05
4	0%	Risk Assessment	10 d	10/26/05	11/4/05
5	0%	RAWP Addendum	115 d	10/26/05	2/17/06
6	0%	Mobilization	3 d	3/15/06	3/17/06
7	0%	Sites 3 & 10 Excavation	18 d	3/20/06	4/6/06
8	0%	Backfill and Restoration	4 d	4/7/06	4/10/06
9	**0%**	Demobilization	2 d	4/11/06	4/12/06
10	0%	Prepare Rev. 0 RACR	45 d	4/13/06	5/27/06
11	0%	BCT Review of Rev. 0 RACR	60 d	5/28/06	7/26/06
12	0%	Respond to Comments	30 d	7/27/06	8/25/06
13	**0%**	Prepare Rev 1 RACR	60 d	7/27/06	9/24/06
14	0%	BCT Review of Rev. 1 RACR	30 d	9/25/06	10/24/06
15	0%	EPA Approval of RACR	1 d	10/24/06	10/24/06
16	0%	Project Closeout	0 d	10/24/06	10/24/06



DDMT Dunn Field Disposal Sites Schedule.mpp

Former Defense Distribution Depot at Memphis, Tennessee
Dunn Field Disposal Sites, RAWP Addendum 1

Figure 5-1

APPENDIX A

EMISSIONS EVALUATION FOR ORTHO-TOLUIDINE AND 3,3-DIMETHYLBENZIDINE

APPENDIX A

EMISSIONS EVALUATION FOR ORTHO-TOLUIDINE AND 3,3-DIMETHYLBENZIDINE

BASIS FOR THE EXPOSURE ASSESSMENT

To assess the potential public exposure to airborne emissions due to the excavation activities at Disposal Site 3, MACTEC developed a worst case scenario analysis. Accepted USEPA emission and air dispersion models were used to estimate the maximum concentration of pollutants in air downwind of Disposal Site 3. The site is understood to contain approximately 3,000 one-quart glass containers of water containing ortho-toluidine and/or 3,3-dimethylbenzidine. Laboratory analysis of three representative samples of the glass containers identified 3,3-dimethylbenzidine at concentrations of 100 parts per million (ppm) to 1,060 ppm. Ortho-toluidine was not identified in any of the samples.

The Remedial Action Work Plan (RAWP) Addendum 1 calls for the site to be excavated and the contaminated waste and soil to be placed in containers and transported off-site for treatment and disposal. The excavation dimensions are expected to be 15 feet by 25 feet. There will be no special precautions taken to prevent breakage of the glass bottles, so all the bottles are assumed to be broken, and, as a worst case scenario, the entire 15-foot by 25-foot pit will be saturated with water containing 1,060 ppm of both components. The area is fenced, and the nearest distance from the excavation to the fence is estimated to be 250 feet, although residences are farther from the fence line.

EMISSIONS ESTIMATES

These two compounds are dissolved in water, and we have assumed as a worst case scenario that the entire surface of the pit is saturated in water. Emissions of these compounds would occur by evaporation of the compounds and wind carrying the vapors downwind. USEPA has developed an emissions model (WATER 9) that calculates air emissions from wastewater treatment units. Two units in that software package, the open sump model and the open trench model, are a good match to the saturated open pit conditions that will exist during the remediation. Physical property data for these two compounds are available in WATER 9. To be conservative, both model units were run, and the unit providing the highest emission levels was used. Table A-1 provides the input parameters for both the open sump and open trench models. Table A-2 provides the results of the model runs. The open trench model resulted in a

slightly higher emission rate for both compounds, and that model unit was used in the next step of the assessment, dispersion modeling.

AIR DISPERSION MODELING

With the emissions rates determined, the ground-level concentrations were calculated using another USEPA model, SCREEN 3, which predicts ground-level concentrations of gases due to either point, area, or volume sources. The model prediction is based on a Gaussian plume model that cycles through all potential wind conditions and calculates maximum ground-level concentrations for the worst case conditions. Downwind distance is input into the model; therefore, we provided numerous points downwind to calculate with 75 meters being the closest. We input emissions into this model as an area source, which means the model assumes the emissions occur at ground level evenly dispersed over the open pit. A model run was made for each compound. Tables A-3 and A-4 provide those model outputs. The maximum ground-level concentrations of each compound predicted by the model are summarized below:

Maximum Ground Level Concentrations for Ortho-toluidine and 3,3-dimethylbenzidine

Compound	Receptor Distance (Meters)			
	75	100	200	300
Ortho-Toluidine	290 $\mu g/m^3$	227 $\mu g/m^3$	91 $\mu g/m^3$	48 $\mu g/m^3$
3,3-Dimethylbenzidine	0.0066 $\mu g/m^3$	0.0051 $\mu g/m^3$	0.0021 $\mu g/m^3$	0.0011 $\mu g/m^3$

The concentrations listed above are instantaneous concentrations. Typically, in air quality work the concentrations are reduced by a factor for longer averaging time (such as multiplied by 0.4 to convert to a 24-hour average). The results of this emissions evaluation were used in the human health risk evaluation for potential airborne exposures during remediation (included in **Appendix B**).

Table A-1
Water 9 Modeled Conditions
Memphis Depot Dunn Field Remedial Action Work Plan Addendum 1

open sump (no. 1)

Description of unit	def.open sump
Underflow T (C)	25
Total water added at the unit (l/s)	
Area of openings at unit (cm2)	232000
Radius of drop pipe (cm)	5
Drop length to conduit (cm)	61
Open surface=1	1
Subsurface entrance=1	1
subsurface exit =1	1
radius of underflow conduit (cm)	12
distance to next unit (cm)	3000
slope of underflow conduit	0.015
Open surface of liquid at the unit (cm2)	232000
flow entrance depth under surface (cm)	10
depth of liquid in sump (cm)	1
velocity air at opening (ft/min)	88
municipal waste in conduit =1	
Assume equilibrium in unit, =1	
pH	7

open trench (no. 1)

Description of unit	def.open trench
Underflow T (C)	25
Total water added at the unit (l/s)	
Subsurface entrance=1	1
subsurface exit =1	1
width of trench (m)	3.7
distance to next unit (cm)	762
slope of underflow conduit	0.015
depth of trench (m)	0.5
pH	7

Table A-2
Water 9 Model Results
Memphis Depot Dunn Field Remedial Action Work Plan Addendum 1

WASTEWATER TREATMENT SUMMARY I 11-04-2005 14:29:51
Open Trench Model
Project C:\Program Files\Wastewater treatment models\waste2 11/1/2005 2:29:36 PM

COMPOUND	RATE (g/s)	Fraction Air	Removal	Exit	Adsorb	error	emissions
3,3' DIMETHYLBENZIDINE	2.32E-07	.00	.	1.	0.0000	0.0000	(7.30E-06 Mg/yr)
o TOLUIDINE	1.03E-02	.48	.	.5158	0.0000	0.0000	(3.24E-01 Mg/yr)
TOTAL ALL COMPOUNDS	1.03E-02 g/s air emissions						
TOTAL ALL COMPOUNDS	3.24E-01 Mg/yr air emissions						

WASTEWATER TREATMENT SUMMARY I 11-03-2005 11:34:32
Open Sump Model
Project C:\Program Files\Wastewater treatment models\wastel 11/1/2005 2:31:58 PM

COMPOUND	RATE (g/s)	Fraction Air	Removal	Exit	Adsorb	error	emissions
3,3' DIMETHYLBENZIDINE	1.91E-07	.00	.	1.	0.0000	0.0000	(6.01E-06 Mg/yr)
o TOLUIDINE	3.40E-03	.16	.	.8398	0.0000	0.0000	(1.07E-01 Mg/yr)
TOTAL ALL COMPOUNDS	3.40E-03 g/s air emissions						
TOTAL ALL COMPOUNDS	1.07E-01 Mg/yr air emissions						

878 30

Table A-3
SCREEN3 Run for Ortho-Toluidine Concentrations
Memphis Depot Dunn Field Remedial Action Work Plan Addendum 1

```
 11/04/05
 15:41:28
  ***  SCREEN3 MODEL RUN  ***
  *** VERSION DATED 96043 ***

 DDMT Disposal Site 3 O- Toluidine concentrations

 SIMPLE TERRAIN INPUTS:
    SOURCE TYPE                =          AREA
    EMISSION RATE (G/(S-M**2)) =      .296000E-03
    SOURCE HEIGHT (M)          =        .0000
    LENGTH OF LARGER SIDE (M)  =       7.6200
    LENGTH OF SMALLER SIDE (M) =       4.5700
    RECEPTOR HEIGHT (M)        =       2.0000
    URBAN/RURAL OPTION         =        RURAL
 THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
 THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

    MODEL ESTIMATES DIRECTION TO MAX CONCENTRATION


 BUOY. FLUX =      .000 M**4/S**3;  MOM. FLUX =      .000 M**4/S**2.

 *** FULL METEOROLOGY ***

 ************************************
 *** SCREEN AUTOMATED DISTANCES ***
 ************************************

 *** TERRAIN HEIGHT OF     0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES
***

   DIST      CONC                 U10M    USTK   MIX HT    PLUME   MAX DIR
    (M)    (UG/M**3)    STAB    (M/S)   (M/S)     (M)    HT (M)    (DEG)
 -------   ----------   ----   -----   -----   ------   ------   -------
     75.    290.4          6     1.0     1.0  10000.0      .00       0.
    100.    227.4          6     1.0     1.0  10000.0      .00       0.
    200.    90.74          6     1.0     1.0  10000.0      .00       0.
    300.    48.43          6     1.0     1.0  10000.0      .00       0.

 MAXIMUM 1-HR CONCENTRATION AT OR BEYOND     75. M:
     75.    290.4          6     1.0     1.0  10000.0      .00       0.

       ****************************************
       *** SUMMARY OF SCREEN MODEL RESULTS ***
       ****************************************

  CALCULATION          MAX CONC     DIST TO    TERRAIN
   PROCEDURE          (UG/M**3)     MAX (M)     HT (M)
 --------------      -----------   -------   -------
 SIMPLE TERRAIN        290.4           75.         0.
```

Table A-4
3,3-DimethylBenzidine Concentrations
Memphis Depot Dunn Field Remedial Action Work Plan Addendum 1

11/04/05
15:31:25

```
  ***  SCREEN3 MODEL RUN  ***
  *** VERSION DATED 96043 ***

 DDMT Disposal Site 3 DMBZ concentrations

 SIMPLE TERRAIN INPUTS:
    SOURCE TYPE                =          AREA
    EMISSION RATE (G/(S-M**2)) =      .670000E-08
    SOURCE HEIGHT (M)          =        .0000
    LENGTH OF LARGER SIDE (M)  =       7.6200
    LENGTH OF SMALLER SIDE (M) =       4.5700
    RECEPTOR HEIGHT (M)        =       2.0000
    URBAN/RURAL OPTION         =        RURAL
 THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
 THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

    MODEL ESTIMATES DIRECTION TO MAX CONCENTRATION

 BUOY. FLUX =      .000 M**4/S**3;  MOM. FLUX =      .000 M**4/S**2.

 *** FULL METEOROLOGY ***

 ************************************
 *** SCREEN AUTOMATED DISTANCES ***
 ************************************

 *** TERRAIN HEIGHT OF     0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES
***

   DIST      CONC                 U10M    USTK   MIX HT    PLUME   MAX DIR
    (M)    (UG/M**3)    STAB    (M/S)   (M/S)    (M)     HT (M)    (DEG)
 -------  ----------   ----   -------  -------  ------   ------   -------
     75.    .6572E-02     6       1.0      1.0 10000.0      .00       0.
    100.    .5147E-02     6       1.0      1.0 10000.0      .00       0.
    200.    .2054E-02     6       1.0      1.0 10000.0      .00       0.
    300.    .1096E-02     6       1.0      1.0 10000.0      .00       0.

 MAXIMUM 1-HR CONCENTRATION AT OR BEYOND     75. M:
     75.    .6572E-02     6       1.0      1.0 10000.0      .00       0.

      ****************************************
      *** SUMMARY OF SCREEN MODEL RESULTS ***
      ****************************************

  CALCULATION          MAX CONC     DIST TO    TERRAIN
   PROCEDURE          (UG/M**3)     MAX (M)     HT (M)
 --------------      -----------   -------    -------
 SIMPLE TERRAIN       .6572E-02        75.         0.
```

APPENDIX B

HUMAN HEALTH RISK EVALUATION FOR POTENTIAL AIRBORNE EXPOSURES DURING REMEDIATION

APPENDIX B

HUMAN HEALTH RISK EVALUATION FOR POTENTIAL AIRBORNE EXPOSURES DURING REMEDIATION

This human health risk evaluation has been performed in accordance with USEPA's *Risk Assessment Guidance for Superfund* (USEPA, 1989) and associated CERCLA risk assessment guidance (USEPA, 2004). Supplemental guidance includes the USEPA Region 4 Risk Assessment Memorandums (USEPA Region 4, 2000) and the existing risk assessment performed for the Memphis Depot Dunn Field in the Remedial Investigation (RI) Report (CH2M HILL, 2002).

This risk assessment evaluation includes the following steps:

- Exposure Assessment
- Toxicity Assessment
- Risk Characterization

EXPOSURE ASSESSMENT

Two potentially volatile constituents of concern (COCs) have been identified in liquid containers at Disposal Site 3 based on site history and liquid waste analyses: 3,3-dimethylbenzidine and ortho-toluidine. Residents downwind of Disposal Site 3 may be exposed to volatile emissions during excavation activities. An emissions evaluation (Appendix A) was performed to estimate air concentrations at various distances from Disposal Site 3 corresponding to points where residential receptors may be present.

In the exposure assessment step of the risk evaluation, exposure-point concentrations derived from the air model are multiplied by residential exposure assumptions to estimate lifetime average daily doses for residential children and adults (Table B-1). During the risk evaluation, the highest modeled concentrations for each compound were used. The exposure assumptions used in this evaluation were adapted from the human health risk assessment completed for off-site residential receptors during the RI (CH2M HILL, 2002) and from the USEPA Region 9 Preliminary Risk Goals table (USEPA, 2004). The excavation is assumed to remain open 4 days for 24 hours per day. It is more likely that the remedial excavation at Dunn Field will be completed in a 1- to 2-day period. Therefore, the exposure duration has been conservatively estimated to occur for 0.01143 years (4 days/350 days in a residence during 1 year). The exposure frequency is assumed

to be 350 days for the year the activity is performed (USEPA, 2004). The inhalation rate for children and adults is assumed to be 10 cubic meters per day (m^3/day) and 20 m^3/day (USEPA, 2004), respectively. The body weights of the children and adults are assumed to be 15 kilograms (kg) and 70 kg, respectively (USEPA, 2004).

TOXICITY ASSESSMENT

Toxicity values, such as reference doses and carcinogenic slope factors (CSFs), are based primarily on human and animal studies with supportive evidence for pharmokinetics, mutagenicity, and chemical structure studies. USEPA has developed toxicity values that reflect the magnitude of adverse non-carcinogenic and carcinogenic effects from exposure to specific chemicals. Inhalation toxicity values for the two COCs were not published by USEPA sources (i.e., IRIS, PPRTV, HEAST). However, oral CSFs for the two COCs are provided in the USEPA Region 9 Preliminary Remediation Goal Table (USEPA, 2004) and/or the Oak Ridge National Laboratories' Risk Assessment Information System (ORNL, 2005). The values and sources of the chemical-specific oral CSFs are listed in Table B-1. Because this risk evaluation addresses inhalation exposures, oral CSFs were used as surrogate inhalation CSFs to calculate excess cancer risks. Both 3,3-dimethylbenzidine and ortho-toluidine are considered potential human carcinogens. These compounds have not been evaluated for non-carcinogenic effects because reference doses are not published for these compounds.

RISK CHARACTERIZATION

In the risk characterization step, the average daily doses or intakes estimated in the exposure assessment are multiplied by the cancer slope factors to predict the health effects response for each COC (Table B-1). These responses, in the form of individual upper bound excess lifetime cancer risks, are compared to a target risk goal of 10^{-5}. This risk goal is the midpoint of the target risk range for CERCLA sites (USEPA Region 4, 2000). The cumulative excess cancer risk associated for a worst-case potential release during remediation is 7×10^{-6}. This worst case estimate is based on child excess cancer risk and is less than the target risk goal for off-site receptors. Actual releases during remedial excavations are expected to be considerably less than estimated for the worst-case scenario. Therefore, perimeter air monitoring to assess exposures for off-site residential receptors is not indicated.

REFERENCES

CH2M HILL, 2002. *Memphis Depot Dunn Field Remedial Investigation Report, Defense Distribution Center (Memphis)*, July 2002 – Revision 2.

ORNL, 2005. Risk Assessment Information System (RAIS), Oak Ridge National Laboratories, October 2005.

USEPA, 1989. *Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A)*, Interim Final, December 1989.

USEPA, 2000. "*Supplemental Guidance to RAGS: Human Health and Ecological Risk Assessment Bulletins*", USEPA Region IV.

USEPA, 2004, *USEPA Region IX Preliminary Remediation Goals*, USEPA Region IX, October 2004.

TABLE B-1

RISK EVALUATION
INHALATION OF VOLATILE CHEMICALS IN AMBIENT AIR
RESIDENTIAL ADULT AND CHILD
REMEDIAL ACTION WORK PLAN ADDENDUM 1
DDMT DISPOSAL SITE 3
Defense Depot Memphis Tennessee

$$\text{Inhalation Intake (mg/kg-day)} = \frac{\text{Carcinogen: } CA \times EF \times ED \times IR_{air} \times CF}{BW \times AT}$$

Where:

CA	=	Concentration in Air (µg/m3)
IR_{air}	=	Inhalation Rate (m^3/day)
EF	=	Exposure Frequency (days/year)
ED	=	Exposure Duration (years)
BW	=	Body Weight (kg)
AT	=	Averaging Time (days)
CF	=	Conversion Factor, mg/µg

Exposure Variable	Resident Child		Resident Adult	
IR_{air}	10	(a)	20	(a)
EF	350	(a)	350	(a)
ED	0.01143	(b)	0.01143	(b)
BW	15	(a)	70	(a)
AT (Carcinogen)	25,550		25,550	
CF	0.001		0.001	

Child:	CA x	1.04E-07	(mg/kg-day)	= Intake
Adult:	CA x	4.47E-08	(mg/kg-day)	= Intake

Parameter	Modeled CA (µg/m3) (c)	RfD_i	CSF_i (d)	Source	Child Excess Cancer Risk (e)	Adult Excess Cancer Risk (e)
3,3-Dimethylbenzidine	0.0066	NA	23	PPRTV	1.6E-09	6.8E-10
o-Toluidine	290	NA	0.24	HEAST	7.3E-06	3.1E-06
				Total:	**7E-06**	**3E-06**

Notes:
NA Not available
Exposure assumptions from USEPA Region 9 Preliminary Remediation Goals, except ED which is project-specific
(a) USEPA Region 9 Preliminary Remediation Goals Table, USEPA, 2004
(b) ED = 4 days/350 days = 0.01143 year
(c) From Modeling Calculations.
(d) Oral CSFs used as surrogate values for inhalation CSFs
(e) Excess Cancer Risk = Intake x CSF_i
Provisional Peer Reviewed Toxicity Value (PPRTV)
Health Exposure Assessment Summary Tables (HEAST)

PREPARED/DATE: LMS 10/17/05
CHECKED/DATE: MKB 10/18/05

APPENDIX C

REMEDIATION GOALS FOR 3,3-DIMETHYLBENZIDINE

APPENDIX C

RISK-BASED CONCENTRATION FOR SOIL CONSTITUENT

A risk-based concentration (RBC) has been calculated for a potential soil constituent at Disposal Site 3. This RBC is the acceptable concentration in soil that would not be associated with adverse impacts to human health under a long-term occupational exposure scenario. The RBCs are designed to protect on-site industrial workers at Dunn Field.

INTRODUCTION

In addition to ortho-toluidine, another constituent of potential concern (COPC) has been identified based on sample analyses: 3,3-dimethylbenzidine. This constituent has not been previously detected at the site and may be a laboratory artifact created during sample preparation prior to analysis. As a conservative measure, an RBC has been calculated for this COPC that is designed to address potential exposures via soil ingestion, dermal absorption, and inhalation of volatile emissions and fugitive dust.

EXPOSURE ASSESSMENT

Conservative default exposure assumptions from USEPA risk assessment guidance documents (USEPA Region 9, 2004; USEPA, 1991; 1997; 2002; 2004) and the *Dunn Field Remedial Investigation Report* (CH2M HILL, 2002) were used to calculate the RBC. These assumptions are presented on Table C-1 and described in the following paragraph.

Occupational workers are assumed to be present at the site for 250 days per year for 25 years (USEPA, 1991). Workers are assumed to ingest 50 milligrams of soil per day (USEPA, 2000) and inhale 20 cubic meters of air per day (USEPA, 1991). Workers are assumed to expose 2,679 cubic centimeters of skin surface area, which includes half of the head, and the hands and forearms (CH2M HILL, 2002; USEPA, 1997).

The soil to skin adherence factor is assumed to be 0.03 mg/square centimeter (USEPA, 1997) and an absorption efficiency of 0.1 (USEPA, 2004). The particulate emission factor, 1.32×10^{9} cubic meters per kilogram (m^3/kg), is based USEPA guidance (USEPA, 1991). A site-specific volatile emission factor (8.21×10^{6} m^3/kg) was calculated for 3,3-dimethylbenzidene as shown on Table C-2. The default values

for soil characteristics, e.g., dry bulk density and f_{oc}, are based on USEPA guidance (USEPA, 2002). Additional chemical-specific parameters were obtained from the *Technical Support Document for the Hazardous Waste Identification Rule: Risk Assessment for Human and Ecological Receptors, Appendix A* (USEPA, 1995).

TOXICITY ASSESSMENT

Toxicity values, such as reference doses and carcinogenic slope factors (CSFs), are based primarily on human and animal studies with supportive evidence for pharmokinetics, mutagenicity, and chemical structure studies. USEPA has developed toxicity values that reflect the magnitude of adverse non-carcinogenic and carcinogenic effects from exposure to specific chemicals. Inhalation toxicity values for the COPC are not published by USEPA sources (i.e., IRIS, PPRTV, HEAST). However, an oral CSF is provided in the USEPA Region 9 Preliminary Remediation Goal Table (USEPA, 2004) and/or the Oak Ridge National Laboratories' Risk Assessment Information System (ORNL, 2005). The value and source of the oral CSF is listed in Table C-1. Because this risk evaluation addresses oral, dermal, and inhalation exposures, the oral CSF was used as a surrogate CSF for the inhalation and dermal pathways in order to calculate the RBC. The COPC, 3,3-dimethylbenzidine, is considered to be a potential human carcinogen. This compound has not been evaluated for non-carcinogenic effects because a reference dose has not published for this compound.

A CSF quantitatively defines the relationship between the dose and the carcinogenic response. The CSF is generally expressed as a plausible upper-bound estimate of the probability of response occurring per unit of chemical.

DEVELOPMENT OF THE RBC

RBCs are risk-based levels that are protective of human health. The RBC calculated in accordance with the guidelines given in USEPA Region 4's *Supplemental Guidance to RAGS: Human Health Risk Assessment Bulletins* (USEPA, 2000) and *Risk Assessment for Superfund, Volume 1-Human Health Evaluation Manual (Part B, Development of Risk-Based Preliminary Remediation Goals)* (USEPA, 1991). A target risk goal of 1×10^{-5} was used for occupational exposures.

Table C-1 lists the equation used to calculate the carcinogenic occupational RBC and the exposure assumptions used in the equations. The chemical-specific CSF is also listed on Table C-1. The calculated soil RBC for industrial workers (20.6 mg/kg) is listed on Table C-3. By moving the decimal point one place to the left, the 10^{-6} risk based concentration can be obtained (2.06 mg/kg).

REFERENCES

CH2M HILL, 2002. *Memphis Depot Dunn Field Remedial Investigation Report*, Defense Distribution Center (Memphis), July 2002 – Rev. 2.

ORNL, 2005. *Risk Assessment Information System* (RAIS), Oak Ridge National Laboratories, October 2005.

USEPA, 1991. *Risk Assessment Guidance for Superfund, Volume I-Part B, Development of Risk-based Preliminary Remediation Goals*, Office of Emergency and Remedial Response, Publication 9285.7-01B, October 1991.

USEPA, 1995. *Technical Support Document for the Hazardous Waste Identification Rule: Risk Assessment for Human and Ecological Receptors, Appendix A.* Office of Solid Waste. August 1995.

USEPA, 2000. *Supplemental Guidance to RAGS. Human Health and Ecological Risk Assessment Bulletins*, USEPA Region IV.

USEPA, 2002. *Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites*, OSWER 9355.4-24, December 2002.

USEPA, 2004, *USEPA Region IX Preliminary Remediation Goals, USEPA Region IX*, October 2004.

TABLE C-1

CALCULATION OF SOIL EXPOSURES
CARCINOGENIC EFFECTS FOR INDUSTRIAL WORKERS
INGESTION, DERMAL CONTACT, AND INHALATION
REMEDIAL ACTION WORK PLAN ADDENDUM 1
DDMT DISPOSAL SITE 3
Defense Depot Memphis, Tennessee

$$TR = \frac{C * IR_{soil} * EF * ED * FI * CF * SF_o}{BW * AT} + \frac{C * SA * SAF * AE * EF * ED * FI * CF * SF_a}{BW * AT} + \frac{C * IRair * EF * ED * FI * SF_i}{BW * AT * (PEF + VF)}$$

$$C\ (mg/kg,\ risk\text{-}based) = \frac{TR * BW * AT}{EF * ED * FI * [(SF_o * IR_{soil} * CF) + (SF_a * SA * SAF * AE * CF) + (SF_i * IR_{air} * (1/PEF + 1/VF))]}$$

Where:

Parameters		Definition (units)	Parameter (Industrial Worker)	Source
TR	=	target risk (unitless)	1.00E-05	USEPA Region 4, 2000
C	=	concentration in soil (mg/kg)	chemical specific	USEPA Region 4, 2000
IR_{soil}	=	daily soil ingestion rate (mg/day)	50	USEPA Region 4, 2000
IR_{air}	=	air inhalation rate (m^3/day)	20	USEPA, 1991
EF	=	exposure frequency (days/year)	250	USEPA, 1991
ED	=	exposure duration (years)	25	USEPA, 1991
FI	=	fraction ingested, inhaled, or absorbed (unitless)	1	Site-Specific
CF	=	conversion factor (kg/mg)	1.00E-06	USEPA, 1991
SA	=	surface area of exposed skin (cm^2/event)	2,679	USEPA, 1997 (1/2 head, hands & forearms)
SAF	=	soil to skin adherence factor (mg/cm^2)	0.03	USEPA, 1997
AE	=	absorption efficiency (unitless)	0.1	USEPA, 2004 (Semivolatile organic compound)
SF_o	=	oral cancer slope factor (kg-day/mg)	2.3	PPRTV
SF_a	=	adjusted oral cancer slope factor (kg-day/mg)	2.3	PPRTV
SF_i	=	inhalation cancer slope factor (kg-day/mg)	2.3	PPRTV
BW	=	body weight (kg)	70	USEPA, 1991
AT	=	averaging time (days)	25,550	USEPA, 1991
PEF	=	particulate emission factor (m^3/kg)	1.32E+09	USEPA, 2002
VF	=	volatilization factor (m^3/kg)	8.21E+06	USEPA, 2002 / 1995

Notes:

Assumptions from CH2M HILL, 2002, *Memphis Depot Dunn Field Remedial Investigation Report* **, Defense Distribution Center (Memphis), July 2002 - Rev. 2.**

PPRTV Provisional Peer-Reviewed Toxicity Values Database, USEPA, 2005

USEPA Region 4, 2000 Supplement to RAGS A. Human Health Risk Assessment Bulletins

USEPA, 1991. Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors OSWER Directive 9285.6-03 March 1991

USEPA, 1995 Technical Support Document for the Hazardous Waste Identification Rule Risk Assessment for Human and Ecological Receptors, Appendix A.

USEPA, 1997 Exposure Factors Handbook, National Center for Exposure Assessment, US Environmental Protection Agency, August 1997.

USEPA, 2002 Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites, OSWER 9355.4-24, December 2002

USEPA, 2004. Risk Assessment Guidance for Superfund Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment, OSWER 9285.7-02EP, July 2004

PREPARED/DATE: MKB 11/01/05
CHECKED/DATE: LMS 11/1/05

TABLE C-2

CALCULATION OF VOLATILIZATION FACTOR
REMEDIAL ACTION WORK PLAN ADDENDUM 1
DDMT DISPOSAL SITE 3
Defense Depot Memphis Tennessee

Parameter	Definition (units)	Value
VF	Volatilization factor (m^3/kg)	8.21E+06
D_A	Apparent diffusivity (cm^2/s)	1.93E-08
Q/C	Inverse of mean conc. At the center of a 0.5-acre square source (g/m^2-s per kg/m^3)	68.81
T	Exposure interval (s)	7.88E+08
ρ_b	Dry soil bulk density (g/cm^3)	1.5
θ_a	Air filled soil porosity (L_{air}/L_{soil})	0.28
n	Total soil porosity (L_{pore}/L_{soil})	0.43
θ_w	Water-filled soil porosity (L_{water}/L_{soil})	0.15
ρ_s	Soil particle density (g/cm^3)	2.65
Di	Diffusivity in air (cm^2/s)	8.00E-02
H	Henry's Law constant (atm-m^3/mol)	8.60E-11
H'	Dimensionless Henry's Law Constant	3.53E-09
D_w	Diffusivity in water (cm^2/s)	8.00E-06
K_d	Soil-water partition coefficient (cm^3/g) = $K_{oc}f_{oc}$	2.58
K_{oc}	Soil organic carbon-water partition coefficient (cm^3/g)	430
f_{oc}	Fraction organic carbon in soil (g/g)	0.006

Where:

$$VF\ (m^3/kg) = (Q/C) \times \frac{(3.14 \times D_A \times T)^{1/2}}{2 \times \rho_b \times D_A} \times 10^{-4}\ (m^2/cm^2)$$

$$D_A = \frac{[(\theta_a^{10/3} DiH' + \theta_w^{10/3} D_W)/n^2]}{\rho_b K_d + \theta_W + \theta_a H'}$$

PREPARED/DATE: MKB 10/31/05
CHECKED/DATE: LMS 10/31/05

TABLE C-3

SITE-SPECIFIC RISK-BASED CONCENTRATIONS
REMEDIAL ACTION WORK PLAN ADDENDUM 1
DDMT DISPOSAL SITE 3
Defense Depot Memphis Tennessee

Parameter	Industrial Worker Carcinogenic TR = 1 x 10^{-5} mg/kg
3,3-Dimethylbenzidine	2.06E+01

Notes:
mg/kg = milligrams per kilogram
TR = Target Risk

PREPARED/DATE: MKB 11/1/05
CHECKED/DATE: LMS 11/1/05

APPENDIX D

METHOD DETECTION LIMIT STUDY

APPENDIX D

METHOD DETECTION LIMIT STUDY

Environmental Testing & Consulting, Inc. (ETC) performed a Method Detection Limit (MDL) study for ortho-toluidine and 3,3-dimethylbenzidine in a soil matrix to evaluate the applicability of USEPA Method 8270C for analysis of confirmation samples to be collected from Disposal Site 3. The MDL is defined as the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero. The MDL study was performed in general accordance with the *Procedure for the Determination of the Method Detection Limit* as described in Appendix B – Revision 1.11, Part 136 of the Code of Federal Regulations. The MDL procedure includes processing a minimum of seven aliquots of the same matrix fortified with ortho-toluidine and 3,3-dimethylbenzidine through the entire analytical method. The variance and standard deviation are calculated from the seven replicate measurements and are used to compute the MDL. ETC calculated the ortho-toluidine MDL in the soil matrix to be 44.5 micrograms/kilogram (µg/kg) and the 3,3-dimethylbenzidine MDL in the soil to be 189 µg/kg.

The results of the MDL study for ortho-toluidine and 3,3-dimethylbenzidine were compared with the confirmation sample remediation goals to determine whether the MDL values were of sufficient sensitivity. The ortho-toluidine remedial goal is 0.04 milligram/kilogram (mg/kg), and the MDL result is 0.0445 mg/kg. The 3,3-dimethylbenzidine remediation goal is 2.06 mg/kg, and the MDL result is 0.189 mg/kg. This comparison indicates that USEPA Method 8270C is applicable for the analysis of ortho-toluidine and 3,3-dimethylbenzidine and that their MDLs are of sufficient sensitivity to be used for comparison with proposed remediation goals.

APPENDIX E

ATTACHMENT 1 SITE SAFETY & HEALTH PLAN ADDENDUM

APPENDIX E
Attachment 1 Site Safety & Health Plan Addendum 2

for

Project Name: Dunn Field Disposal Site 3
Project Location: Defense Depot Memphis, Tennessee
Project No.: 6301-05-0004

Attachment 1 to the Site Safety & Health Plan (SSHP) Addendum 2 (hereinafter referred to as SSHP Attachment 1), which must be kept on site, addresses the health and safety hazards for excavation of the liquid containers for Disposal Site 3, including the requirements and procedures for worker protection (per 29 the Code of Federal Regulations [CFR] 1910.120). The Site Health and Safety Officer (SHSO) can change or amend this document only with agreement from the Project Certified Industrial Hygienist and Environmental Health and Safety Officer. The SHSO must initial any change made to SSHP Attachment 1 at the relevant section and document the amendment date below. SSHP Attachment 1 shall be used by MACTEC personnel only in conjunction with the *Health and Safety Plan: Main Installation and Dunn Field Addendum 2, Defense Depot Memphis, Tennessee* and not as a stand alone health and safety plan.

Prepared by: Emmet F. Curtis, CHMM MACTEC Managing Office: Kennesaw

Approved by:

SHSO	DATE
PROJECT COORDINATOR	DATE
PROJECT MANAGER	DATE
CERTIFIED INDUSTRIAL HYGIENIST	DATE

Date(s) of Amendment(s): _____

All site workers shall read SSHP Attachment 1. A pre-entry briefing conducted by the SHSO shall be held prior to initiating this project. All applicable sections of SSHP Attachment 1 shall be reviewed during this briefing. The SHSO shall review the information covered in the pre-entry briefing meeting with any worker not in attendance at the initial meeting prior to commencing work. Brief meetings will be held at the beginning of each work day to discuss important safety and health issues concerning tasks performed on that day. A brief description of topics discussed in the meetings shall be documented in the Field Logbook. After reading SSHP Attachment 1 and attending a pre-entry briefing, workers shall sign the following acknowledgment statement:

SSHP Attachment 1
Dunn Field Disposal Site 3 Remedial Action
Defense Depot Memphis, Tennessee

I have read and understand the information set forth in SSHP Attachment 1, the Revision 0 Health and Safety Plan, and SSHP Addendum 2. I have also attended a pre-entry briefing. I agree to perform my work in accordance with the aforementioned documents.

NAME	DATE	NAME	DATE

TABLE OF CONTENTS

LIST OF ATTACHMENTS

ATTACHMENT

LIST OF TABLES

Table

LIST OF FIGURES

Figure

1.0 INTRODUCTION AND SITE OBJECTIVE

MACTEC Engineering and Consulting, Inc. (MACTEC), who will function as a subcontractor to Laguna Construction Company, Inc., was retained by the United States Air Force Center for Environmental Excellence (AFCEE) to perform excavation activities outlined in the *Remedial Action Work Plan (RAWP) Addendum 1 Dunn Field Disposal Sites* dated November, 2005. This removal action will include the excavation, characterization, transport, and treatment/disposal of liquid containers and associated materials from Disposal Site 3.

SSHP Attachment 1 is written to address excavation work associated with the removal of liquid containers as described in the RAWP Addendum 1. SSHP Attachment 1 shall be used by MACTEC personnel only in conjunction with the *Health and Safety Plan: Main Installation and Dunn Field* for Task Order No. 38 April 2004 (MACTEC, 2004) and *SSHP Addendum 2: Dunn Field* for Task Order 0009 March 2005 (MACTEC, 2005). *Defense Depot Memphis, Tennessee* and not as a stand-alone health and safety plan.

1.1 FIELD WORK SUMMARY

Field activities will include excavation of liquid containers and associated materials from Disposal Site 3 located in Dunn Field, confirmation sampling at the completion of the excavation of the liquid containers, characterization of the excavated materials, and loading of the excavated materials into dump trailers or roll-containers. Disposal Site 3 is being excavated to remove soils potentially containing principal threat wastes (primarily broken drums and broken glass bottles). During the initial excavation of Disposal Site 3 in March 2005, numerous 1-quart amber glass containers with plastic screw-on caps were encountered at a depth of approximately 5 feet below ground surface. Excavation at Disposal Site 3 was halted so that efforts to identify the material and develop a strategy for safely proceeding with the excavation could be developed, which are presented in RAWP Addendum 1 and this document.

In order to evaluate the contents of the liquid containers, three of the intact containers were randomly selected, placed in buckets packed with vermiculite, and transported to the laboratory for analyses. A two-step laboratory analytical process was developed to evaluate the physical and chemical characteristics of the containerized liquids. The first round of analysis included pH, water reactivity, and solubility. The second round of analysis included ignitability, oxidizer screening, percent water, percent solids, specific

gravity, chlorides, and gas chromatography/mass spectrometry (GC/MS) for VOC and SVOC constituents.

The two rounds of laboratory analyses indicated that the materials in the containers were characteristically similar. All three samples had pH values <2, total solids content of 0.05 – 0.18%, water content ranging from approximately 87 to 100%, and contained a tentatively identified compound of 3,3-dimethylbenzidine in concentrations ranging from 150 to 1,060 parts per million (ppm).

The 3,3-dimethylbenzidine was identified in the GC/MS SVOC analysis and is suspected to have been produced from the derivatization and coupling of ortho-toluidine hydrochloride and/or formed from simple derivatization of ortho-toluidine dihydrochloride during the sample preparation after the pH was adjusted to >12 prior to extraction. No compounds were observed in the GC/MS SVOC analyses in sample extracts prepared from the pH <2 aliquots. The available physical and chemical analysis data indicates that the 3 liquid samples were basically acidified water with a small amount of soluble ortho-toluidine hydrochloride and/or dihydrochloride present.

Ortho-toluidine hydrochloride and 3,3-dimethylbenzidine are both listed as hazardous waste (U095 and U222, respectively). Therefore, the procedures outlined in RAWP Addendum 1 provide guidance for safely excavating and properly disposing of this material. The excavated liquid containers and associated materials will be transported off-site for thermal incineration. Additionally, action levels (ALs) for allowable concentrations of ortho-toluidine and 3,3-dimethylbenzidine in air that would not be expected to adversely impact human health have been developed. A technical memorandum on the development of the ALs is included as **Appendix A**.

During the course of field activities, a Personal Protective Equipment (PPE) Assessment Form (Attachment 1) will need to be completed the first day work is to begin. In addition, the Subcontractor Daily Safety Review form (Attachment 2) will need to be completed by the SHSO at least once during each day of field work.

Mechanical excavation using a trackhoe will be used to remove the glass containers and surrounding soils. Mechanical excavation will allow for removal of the glass containers in a safe and efficient manner, although glass containers will be broken during excavation. In order to limit the mobilization of liquids to the surrounding soils when containers are broken, vermiculite, which can absorb 4.2 times its

weight of water, will be used to absorb liquids during the excavation process. The equipment operator will perform the excavation in Level B PPE from an enclosed cab to reduce exposure to the contents of the containers. Air monitoring of the working area breathing zone and work site perimeter will be conducted during excavation to protect against exposures to harmful vapor or particulate concentrations.

The trackhoe will be positioned upwind of the excavation as much as possible. The excavation will begin in the area where the glass containers are expected. The equipment operator will pay close attention to the distribution of bottles encountered during excavation. Vermiculite will be introduced to the excavation as the glass containers are encountered and worked into the excavated material matrix with the trackhoe bucket to absorb liquid as excavation proceeds.

2.0 KEY PERSONNEL AND HEALTH & SAFETY RESPONSIBILITIES

Key personnel responsibilities are the provided in Table 2-1. The résumé for the Certified Industrial Hygienist (CIH), Darrell Hunt, is in the *Health and Safety Plan: Main Installation and Dunn Field, Defense Depot Memphis, Tennessee* (MACTEC, 2004).

TABLE 2-1

KEY PERSONNEL HEALTH AND SAFETY RESPONSIBILITIES AND REQUIREMENTS

CERTIFIED INDUSTRIAL HYGIENIST **Darrell Hunt**	**PROJECT MANAGER (PM)** **David Price**	**SITE HEALTH & SAFETY OFFICER (SHSO)** **Michael LaPrade**	**FIELD STAFF/FIELD TEAM LEADER** **Lane Smith**	**PROJECT PERSONNEL AND OBSERVERS**
Responsibilities: • Approve Site Health and Safety Plan (SSHP) and Amendments/Attachments • Notify RHSO in the event of an emergency situation • Verify that corrective actions recommended on Incident Response Form have been implemented Requirements: • Certified Industrial Hygienist • Minimum of 3 years experience in the chemical or hazardous waste industry	Responsibilities • See that personnel receive this plan, are aware of its provisions, and are aware of the potential hazards associated with site operations, are instructed in safe work practices, and are familiar with emergency procedures, and these actions are documented • Determine that appropriate monitoring and personnel protective equipment are available • Monitor the Field Logbooks to ensure the health and safety work practices are employed • Coordinate with SHSO so that emergency response procedures are implemented • Ensure corrective actions recommended on Incident Response Form are implemented Requirements: • 40-hour certification • Annual 8-hour refresher training	Responsibilities: • Implement project SSHP, Amendments and Attachments, report to the Project Manager for action if any deviations from the anticipated conditions exist; and authorize the cessation of work at site investigations if necessary • Update the SHSO (Attachment 8) summary after the completion of each task. • Confirm that prior to a hazardous waste site visit, site personnel meet the proper medical requirements and have the health and safety training to qualify them to perform their assigned tasks Identify all site personnel with special medical conditions • Conduct pre-entry briefing and tailgate safety meetings • Verify that all monitoring equipment and personal protective equipment (PPE) is operating correctly according to manufacturer's instructions and such equipment is utilized by on-site personnel. Calibrate or verify calibration of all monitoring equipment and record results. • Implement site emergency and follow-up procedures • May not be required to be on-site at all times and may appoint SHSO duties to the Field Team Leader Requirements: • 40-hour certification • Annual 8-hour refresher training	Responsibilities: • Be familiar with and abide by the SSHP, Amendments and Attachments • Notify the SHSO of any special medical conditions (e g., allergies) • Immediately report any accidents and/or unsafe conditions to the SHSO • No individual shall go on site where he/she does not have the required safety training Requirements • 40-hour certification • Annual 8-hour refresher training • 8-hour supervisor training • Two employees with first aid and CPR training **FIELD TEAM LEADER** • Will have all of the above responsibilities and requirements • Will act as representative for the SHSO	Responsibilities: • Be familiar with and abide by the SSHP, Amendments and Attachments • Notify the SSHO of any special medical conditions (e.g., allergies) • Immediately report any accidents and/or unsafe conditions to the SSHO • Only allowed in PPE restricted areas where exposure to hazardous waste will not occur • Must be under supervision of project personnel during training and/or observation activities Requirements: • HAZCOM training

878 56

3.0 JOB HAZARD ANALYSIS

Hazard analyses have been performed for the excavation of the liquid containers at Disposal site 3 and are included as Attachment 3 of this SSHP Attachment 1. These activities include:

- Excavations and Backfilling
- Loading and Transporting Material

The hazards expected to be encountered by personnel specific to excavation of the liquid containers will be mitigated by the use of Level B PPE. Some of the hazards and their applicable OSHA regulations include:

1. Fall Protection (1926.500)
2. Heavy Equipment (1926.600-604)
3. Excavations (1926.650-652)

This project involves potential contact with benzene, copper, lead, ortho-toluidine and 3,3-dimethylbenzidine. *Addendum 2* of the *Health and Safety Plan: Dunn Field Remedial Action, Defense Depot Memphis, Tennessee* (MACTEC, 2004) contains contaminant fact sheets for benzene, copper and lead. The contaminant fact sheets for ortho-toluidine and 3,3-dimethylbenzidine are located in Attachment 4 of this document.

4.0 WORKER TRAINING

Worker training is the same as in Section 4 of the Health and Safety Plan: Main Installation and Dunn Field, Defense Depot, Memphis, Tennessee (MACTEC, 2004).

5.0 MEDICAL SURVEILLANCE

Medical surveillance is the same as in Section 5 of the Health and Safety Plan: Main Installation and Dunn Field, Defense Depot, Memphis, Tennessee (MACTEC, 2004).

6.0 SITE CONTROL AND ACCIDENT PREVENTION

Site control and accident prevention is the same as in Section 6 of the *Health and Safety Plan: Main Installation and Dunn Field, Defense Depot, Memphis, Tennessee* (MACTEC, 2004) with the exception of work zones. Work zones (i.e., exclusion zone, PPE restricted zones, contaminant reduction zone, and support zone) will be determined at the site by the SHSO. At this time, it is anticipated that the work zones will be defined relative to the location of the work activity, i.e. around the excavation area of Disposal Site 3.

The exclusion zone is generally defined as the area directly surrounding the excavation location, which may be contaminated by site operations or in this case by excavation activities. This area will encompass the excavation equipment including excavators, transport vehicles, and stockpiled soils. The exclusion zone will be defined as approximately 50-foot radius surrounding the excavation and stockpile soil areas. The exclusion zone will be defined using red tape. The contaminant reduction zone shall serve as a buffer between the exclusion zone and the support zone and is intended to prevent the spread of contaminants from work areas. The contaminant reduction zone shall be set using yellow caution tape. The support zone shall consist of a staging area in the non-contaminated or clean area. It shall contain the command post for field operations, a first aid station, and other elements necessary to support site activities.

The PPE free zone is generally defined as an area surrounding an investigative location in which contamination is not present or expected. However, for this work activity, untrained personnel and/or observers will not be allowed within 250 feet of the exclusion zone.

7.0 AIR MONITORING PROGRAM

Real-time air monitoring will provide data to define if, and when, additional engineering measures are required to control fugitive emissions. Air monitoring will document site conditions and provide a means to verify that the engineering controls and personal protective equipment are effective in limiting exposures. In this manner, the air monitoring program will provide a means to actively control, as well as document the control of potential risk.

A real-time monitoring program has been designed to promptly identify potential problems and prevent worker exposure to site constituent concentrations above OSHA permissible exposure limits (PELs), American Conference of Governmental Industrial Hygienist (ACGIH) threshold limit vales (TLVs), and National Institute for Occupational Safety and Health (NIOSH) Recommended Exposure Limits (RELs) and Immediately Dangerous to Life and Health (IDLH) limits, which are summarized in Table 7-1 below.

TABLE 7-1
OCCUPATIONAL EXPOSURE STANDARDS

	OSHA	NIOSH		ACGIH
	PEL	REL	IDLH	TLV
Ortho-Toluidine	5 ppm (22 mg/m^3)	--	50 ppm (220 mg/m^3)	2 ppm (8.8 mg/m^3)
3,3-Dimethylbenzidine	--	ceiling 0.02 mg/m^3 (60 min) (0.0035 ppm)	--	--

Real-time measurements will be conducted throughout the work period including detector tubes, and PID and particulate monitoring in order to address a number of screening parameters. The results from these measurements will be compared to a set of site-specific "action levels" (i.e., the concentration/level at which additional control measures are required, to ensure that emissions do not pose a health risk). Appropriate responses to exceedances of the action levels are required, which include the SHSO's ability to stop work. Following an exceedance, monitoring for the appropriate parameter(s) will continue at a frequency and appropriate duration to document that the controls have been effective.

Work to be performed at the site will be performed in Level B personal protective equipment with tight fitting, full-face, pressure-demand, supplied air respirators with SCBA escape capabilities. A quantitative fit test will be performed for the respirators, which will give the mask a protection factor of 10,000.

Field notes regarding sampling activities will be documented in project notebooks. Monitoring data generated on-site, including field log sheets and field notebooks, will be filed and secured in the on-site office. Subsequent to field activities, the field data will be transferred to the office project files.

7.1 WORST CASE EXPOSURE FORECASTS

Worst case emission and work zone exposure scenarios were conservatively modeled using the same models used in evaluating potential fence line public exposures and assuming that all liquid containers are broken at one time. The modeled worst case scenario for ortho-toluidine yields a maximum air concentration of 0.072 ppm (318 $\mu g/m^3$) versus the 2 ppm TLV and 50 ppm IDLH. Similarly, the modeled worst case scenario for 3,3-dimethylbenzidine yields a maximum air concentration of 0.0000012 ppm (0.007 $\mu g/m^3$) versus the 0.02 mg/m3 (20 $\mu g/m^3$) or 0.0035 ppm (3.5 ppb) ceiling REL. Thus, concentrations of 3,3-dimethylbenzidine and ortho-toluidine should not theoretically reach any of the established unprotected exposure criteria, even without consideration of personal protective equipment (PPE). Therefore, Level B PPE with a respirator protection factor of 10,000 appears to establish a significant safety factor in appropriately protecting worker health.

7.2 DETECTOR TUBE (VAPOR) MONITORING

Historical documents indicate that ortho-toluidine was present in the glass containers at the time of disposition in 1955. The use of detector tubes will be employed to monitor for vapor concentrations of ortho-toluidine during liquid container excavation using a Gastec model No. 181 detector tube for aniline. These tubes also detect other amines such as 3,3-dimethylbenzidine. They will be used to measure the ortho-toluidine concentration every fifteen minutes initially during the first hour of liquid container excavation and loading activities. After the first hour, measurements may be made less frequently if the early measurements are below the lower detection limit (< 5 ppm), but not less than once per hour. The detector tube will be used with a Gastec hand pump type sampler, which requires two pump strokes to complete tube sampling. Each pump stroke time from compression to expansion of the sampler should be three minutes in length. The correction factor from aniline to ortho-toluidine for the detector tube is two. The concentration represented by the pale green line on the yellow tube should be multiplied by two to

get the ortho-toluidine concentration in the air grab sample. The measuring range of the tube is 5 ppm to 60 ppm.

Thus, detector tube monitoring with the Gastec 181 detector tube and a concentration that exceeds 25 ppm (1/2 of the IDLH for ortho-toluidine) will cause a stop work order to be issued. At the 25 ppm "stop work" threshold, the effective protected exposure level within the PPE should be less than 0.0025 ppm, and significantly below the TLV or PEL.

7.3 PARTICULATE MONITORING

An aerosol meter will be used to provide screening results for ambient concentrations of particulates. The meter continuously senses the population of particles present in the atmosphere using an infrared detector that has a detection limit of approximately 0.01 mg/m^3 of total particulate. The action level established for this site is the OSHA occupational 8-hour exposure standard for nuisance dust (15 mg/m^3), which is protective of human health.

The action level will also be used as a surrogate action level for any particulate-related constituents such as ortho-toluidine and 3,3-dimethylbenzidine that might be tied to soil particles and which cannot be readily measured on a real-time basis. Its applicability for this purpose can be demonstrated using calculations to estimate the maximum potential ambient particulate or aerosol concentration of a constituent at the proposed action level. Table 7-2 provides the predicted ambient concentrations from particulate-related constituents at an action level of 15 mg/m^3 total measured particulate.

In the example provided below, the proposed action level of 15 mg/m^3 is multiplied by the maximum potential concentration of ortho-toluidine or 3,3-dimethylbenzidine in soil (assumption that the maximum aqueous concentration is equal to the maximum soil concentration, i.e. any airborne particle has a maximum constituent concentration of the liquid material in the containers) of 1,060 mg/kg to calculate the maximum potential concentration of ortho-toluidine or 3,3-dimethylbenzidine in ambient air. A factor of 10^{-6} is used to convert the units of measurement from kg to mg.

Example:

$$C_{air} = (\text{Action Level}_{dust} \times C_{Soil}) \times (10^{-6}\ \text{kg/mg})$$

where:

C_{air} = maximum predicted constituent concentration in air (mg/m^3)
$\text{Action Level}_{dust}$ = maximum particulate concentration in air (mg/m^3)
C_{Soil} = maximum constituent concentration in soil (mg/kg)
C_{air} = (15 mg/m^3 x 1060 mg/kg) x (10^{-6} kg/mg) = 0.016 mg/m^3

In this instance, the maximum potential exposure concentration for ortho-toluidine or 3,3-dimethylbenzidine at a total measured particulate level of 15 mg/m^3 would be 0.016 mg/m^3, which is less than any of the established OSHA, NIOSH or ACGIH exposure criteria, even without regard for the Level B PPE protection.

TABLE 7-2
MAXIMUM PREDICTED AMBIENT CONCENTRATIONS
PARTICULATE-RELATED CONSTITUENTS

Constituent	Maximum Soil Concentration (mg/kg)	Maximum Air Concentration (mg/m^3)	Occupational Standard (mg/m^3)	IDLH Standard (mg/m^3)
ortho-Toluidine	1,060	0.016	8.8	220
3,3-Dimethylbenzidine	1,060	0 016	0 02 ceiling	-------

Thus, the applied 15 mg/m^3 action level for this work in Level B PPE is appropriately safe for these constituents.

7.4 PID MONITORING

Concentrations of other volatile organics were not detected in the aqueous materials in the vials. However, some soils at Dunn Field have exhibited concentrations of benzene, vinyl chloride, and cis-1,2-dichloroethene. Thus, PID monitoring will be performed during excavation activities.

Environmental monitoring with a PID will be conducted during earth-moving events (to include excavation and loading activities), and actions will follow those outlined in Table 7-3. At a PID maintained reading of 0.5 parts per million (ppm) or greater above background levels for 1-minute or

more and /or peaks (any time duration) above 25 ppm in the breathing zone (which is sufficiently protective for cis-1,2-dichloroethene), detector tubes for benzene and vinyl chloride will be utilized.

TABLE 7-3
AIR MONITORING ACTION LEVEL GUIDELINES

* PID (ppm)	Benzene/Vinyl chloride (ppm)	Action	PPE
< 0.5	---	Continue PID	Modified D
> 0.5 – < 25	< 0.5	Continue PID/DT	Modified D
> 0.5 – < 25	> 0.5 – < 5	Stop Work, Notify PM	Level C
> 0.5 – < 25	> 5	Stop Work, Notify PM	Level B
> 25	---	Stop Work, Notify PM	
---	> 5	Stop Work, Notify PM	

* Sustained 1 minute or more above background levels or peaks (anytime duration) above 25 ppm

DT Detector Tubes

The above table shows the acceptable PPE levels for different monitored levels in the absence of ortho-toluidine or 3,3-dimethylbenzidine and excavation activities possibly involving these two constituents. After all of the glass containers and associated soils have been excavated, loaded into containers and covered with tarps, and if the use of detector tubes becomes necessary for the remainder of the excavation at Disposal Site 3 and the benzene and vinyl chloride detector tube readings are less than 0.5 ppm, then workers may convert to modified Level D Personal Protective Equipment (PPE) with periodic detector tube monitoring. If the benzene or vinyl chloride concentration is greater than 0.5 ppm, but less than 5 ppm, then Level C PPE and continued periodic detector tube monitoring will be required. If the concentration is greater than 5 ppm for benzene or vinyl chloride, work will proceed in Level B PPE.

8.0 HEAT/COLD STRESS

Heat/cold stress is the same as in Section 8 of the *Health and Safety Plan: Main Installation and Dunn Field, Defense Depot, Memphis, Tennessee* (MACTEC, 2004).

9.0 PERSONAL PROTECTIVE EQUIPMENT

Based on the identified presence of dissolved ortho-toluidine hydrochloride and/or dihydrochloride, and because of the possibility that the contents of the containers may vary from the ones analyzed, all work performed in the area of glass containers will be done in Level B PPE. Dry chemical extinguishers and/or water spray will be readily available to control odors or mist that might be generated during the excavation of these containers.

As previously mentioned, the equipment operator will perform the excavation in Level B PPE from an enclosed cab to reduce exposure to the contents of the liquid containers. The equipment operator will use supplied air from a breathing air cylinder and will also be equipped with a 5-minute emergency escape bottle.

Other site personnel will also be dressed in Level B PPE to perform work activities associated with sampling and air monitoring for excavation of the liquid containers. However, since excavation of the liquid containers will be performed using mechanical excavation, entry into the exclusion zone will only be necessary by other site personnel when performing periodic air monitoring while the liquid containers are being excavated. Confirmation sampling will be performed after all of the liquid containers have been excavated and the excavated materials have been loaded into the dump trailers or roll-off containers and covered with tarps.

10.0 DECONTAMINATION

Decontamination is the same as in Section 10 of the *Health and Safety Plan: Main Installation and Dunn Field, Defense Depot, Memphis, Tennessee* (MACTEC, 2004) with the exception of a job hazard analysis for decontamination, which has been included in Attachment 3.

11.0 EMERGENCY RESPONSE

Emergency Response is the same as in Section 11 of the Health and Safety Plan: Main Installation and Dunn Field, Defense Depot, Memphis, Tennessee (MACTEC, 2004).

12.0 CONFINED SPACE ENTRY

Confined Space Entry is the same as in Section 12 of the *Health and Safety Plan: Main Installation and Dunn Field, Defense Depot, Memphis, Tennessee* (MACTEC, 2004).

13.0 SPILL CONTAINMENT

Excavation of the liquid containers will result in release of some of the liquids. Vermiculite will be introduced to the excavation as the glass containers are encountered and worked into the excavated material matrix with the trackhoe bucket to absorb liquid as excavation proceeds. After the limits of excavation for the liquid containers are achieved, the equipment operator will use visual observations to remove any areas that appear to have been impacted by the liquids.

In the event of an uncontrolled hazardous material spill or release, the Spill Containment procedures provided in the *SSHP Addendum 2: Dunn Field* for Task Order 0009 March 2005 (MACTEC, 2005), *Defense Depot Memphis, Tennessee* will be followed.

14.0 HAZARD COMMUNICATION

Hazard Communication is the same as in Section 14 of the *Health and Safety Plan: Main Installation and Dunn Field, Defense Depot, Memphis, Tennessee* (MACTEC, 2004).

15.0 RECORD KEEPING

Record Keeping is the same as in Section 15 of the *Health and Safety Plan: Main Installation and Dunn Field, Defense Depot, Memphis, Tennessee* (MACTEC, 2004).

16.0 HEAVY EQUIPMENT OPERATION

Heavy equipment operation is the same as in Section 16 of the *SSHP Addendum 2: Dunn Field* for Task Order 0009 March 2005 (MACTEC, 2005), *Defense Depot Memphis, Tennessee.*

17.0 REFERENCES

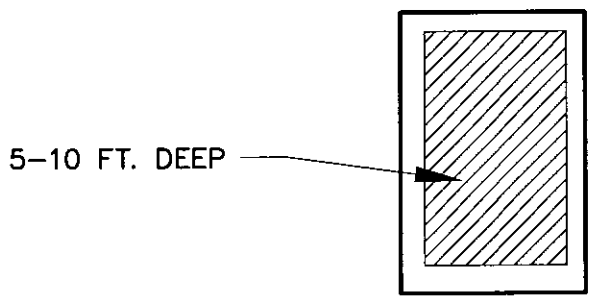
MACTEC, 2004. *Health and Safety Plan: Main Installation and Dunn Field, Defense Depot, Memphis, Tennessee* MACTEC Engineering and Consulting, Inc. April 2004.

MACTEC, 2005. *SSHP Addendum 2: Dunn Field for Task Order 0009 March 2005 (MACTEC, 2005), Defense Depot Memphis, Tennessee* MACTEC Engineering and Consulting, Inc. March 2005.

FIGURES

878 68

J:\DDMT\PRESENTATION\DISPOSAL-SITE-3.dwg - Layout1 11/17/2005 4:06pm ralexand



DISPOSAL SITE 3

LEGEND

ANTICIPATED EXTENT OF LIQUID WASTE CONTAINERS

SCALE IN FEET

0 20 40

DEFENSE DISTRIBUTION DEPOT (MEMPHIS)	MACTEC MACTEC Engineering and Consulting, Inc 3200 TOWN POINT DRIVE, SUITE 100 KENNESAW, GEORGIA 30144 (770) 421-3400	DISPOSAL SITE 3 JOB NO. 6301-05-0004 FIGURE 6-1

PREPARED BY/DATE

CHECKED BY/DATE

ATTACHMENT 1

PPE ASSESSMENT FORM

878 70

MACTEC

PPE ASSESSMENT AND CERTIFICATION

PART 1: ASSESSMENT AND SELECTION

Date: _____

Description of process, task or operation:

Description of engineering and administrative controls to be used:

Employee(s) affected by this assessment:

Eye/Face Protection:	YES	NO	COMMENTS
Potential for flying objects?			
Potential for chemical splash hazard?			
Potential for airborne dust?			
Potential for glare problems?			
Welding, cutting, torch work?			
Laser use?			
Potential of pressure release?			
Other eye or face hazard(s)?			
Eye/Face Protection Required?			If yes, indicate selection below

Safety glasses with side shields	Welding goggles – lens shade →		Welding helmet – lens shade →
Safety goggles – unvented	Welding shield – lens shade →		
Safety goggles – indirect venting	Laser safety glasses Describe the glasses and identify person who selected the glasses		
Safety goggles – vented			
Faceshield with selection above	Other (describe)		
Describe conditions of use			

Foot/Lower Leg Protection:	YES	NO	COMMENTS
Potential for handling or carrying heavy objects?			
Potential for heavy objects to roll over foot?			
Potential for heavy objects to fall on foot?			
Potential to step on sharp objects?			
Uneven terrain or other potential twist hazards?			
Use of chain saw or machete?			
Work in poisonous snake area?			
Other hazards to feet or lower leg?			
Foot/Lower Leg Protection required?			If yes, indicate selection below – multiple selections indicate multiple requirements

Safety toe shoes	Chemical resistant boots – specify type	Snake boots or leggings
Safety toe boots		Cut resistant chaps or leggings
Penetration resistant soles	Chemical resistant overboots – specify type	Chain saw blade jamming chaps
Metatarsal guards		Welders' quick removal boots
Electrical protective	Ice slip resist clamp– or pull-ons	
Other (describe)		
Describe conditions of use		

Hand Protection:	YES	NO	COMMENTS
Potential for contact with liquid chemicals?			
Potential for contact with dry chemicals?			
Work with vibrating equipment?			
Welding, cutting or torch work?			
Work with open blade knives?			
Potential for cuts, abrasions, blisters, etc.?			
Other potential hand hazard(s)?			
Hand Protection Required?			If yes, indicate selection below

Cotton work gloves	Chemical resist gloves – spec below by material and thickness or make and model		
Leather work gloves	Nitrile		Butyl
Cut resist – specify	Neoprene		Other – specify
Welding gloves	Polyvinyl chloride		Specific make and model
Vibration protective	Polyvinyl alcohol		
Other (describe)			
Describe conditions of use			

PPE ASSESSMENT AND CERTIFICATION

Skin and Body Protection:	YES	NO	COMMENTS
Potential for contact with liquid chemicals?			
Potential for contact with dry chemicals?			
Potential for exposure to non-ionizing radiation?			
Potential for exposure to ionizing radiation?			
Potential for exposure to other skin/body hazards?			
Skin/Body Protection Required?			If yes, indicate selection below

Uncoated Tyvek®		High visibility		Nomex®	
Coated Tyvek®		Welder's outerwear		Other heat/fire resist – specify	
Saranex					
Other (describe):					
Describe conditions of use					

Respiratory Protection:	YES	NO	COMMENTS
Are airborne contaminants anticipated?			
Are levels and types of contaminants known?*			
If known, do they exceed Action Levels or Company established Exposure Limits?			
Respiratory Protection Required?			If yes, indicate selection below – check all that apply

1/2 facepiece		Continuous flow regulator		SCBA emergency escape - spec minimum time	
Full facepiece		Pressure demand regulator			
Hood or helmet – select one		Air line – compressor system			
Powered air purifying respiratory (PAPR)		Air line – bottle (cascade) system		Air purifying emergency escape	
Type of air purifying cartridge		SCBA – spec minimum time		Type of air purifying cartridge	
Other (describe):					
Describe conditions of use:					

* Determine by monitoring or predictive calculations? By whom and when?

Head Protection:	YES	NO	COMMENTS
Will construction activities take place?			
Potential for falling objects?			
Will work take place at levels above other personnel?			
Potential for side impact? (If Yes, select Class II below)			
Will work take place in heat or cold?			
Head Protection Required?			If yes, indicate selection below

Class I		Class II		Other (describe)
Describe conditions of use.				

Hearing Protection:	YES	NO	COMMENTS	
Sound level measured during peak operations				dBA
Eight hour time weighted average (TWA)				dBA
Other hazard(s) to hearing?				
Hearing Protection Required?			If yes, indicate selection below	
Minimum acceptable Noise Protection Rating (NRR)			dB	

Inserts		Muffs		Combined
Other (describe):				
Describe conditions of use				

PART 2: CERTIFICATION

	Date
The undersigned has performed a hazard assessment and evaluation for the task(s) described on the first page of this form on the date shown above. The personal protective equipment selected for use shall be based on this hazard assessment and evaluation unless overridden by another hazard assessment and evaluation performed and certified at a later date.	
Name	Signature

Number of additional pages attached: _

ATTACHMENT 2

SUBCONTRACTOR DAILY SAFETY REVIEW FORM

MACTEC

DAILY SAFETY REVIEWS OF SUBCONTRACTORS

To be completed by SHSO at least once during each day of field work. During the work covered by this Site Safety and Health Plan, there were:

(check one)

☐ No violations of the Safety Plan provisions and no incidents involving injury, illness or personnel contamination occurred.

☐ No violations of the Safety Plan however the following incidents involving injury, illness, or personal contamination occurred.

☐ The following violations of the Safety Plan (Provide details of type of violation or incident and who was involved).

If violation or incident occurred, describe corrective actions taken to prevent recurrence.

Project/Task Name:

Project/Task Number:

Date:

Time:

SHSO:

Signature:

ATTACHMENT 3

JOB HAZARD ANALYSES

JOB HAZARD ANALYSIS **Excavation and Backfilling of Liquid Containers**	**Name of Job:** Dunn Field Disposal Site Remedial Action	**Page** 01 **of** 02	**Date:** 11/17/2005	X	**New**
					Revised
	Title of person who does job: Field Personnel	**Project Manager:** David Price	**Analysis by:** Emmet Curtis		
Company/Organization: MACTEC Engineering and Consulting, Inc.		**Plant/Location:** Memphis, Tennessee	**Reviewed by:** Darrell Hunt		

Required and/or recommended
Personal Protective Equipment: Hard hat, steel-toe boots, safety glasses, hearing protection, tyvek suit, full-face supplied-air respirator with air hose, double nitrile gloves

Sequence and Description of Basic Job Steps	Potential Hazards	Recommended Action or Procedure
1). Location of underground utilities	1). Encountering electrical, gas, communications, water, or other underground utility lines	1). Identify utility locations prior to mobilizing; use facility engineers and/or employ a private utility locator; work at adequate offsets from utility locations; identify area medical facilities, emergency travel routes and phone numbers.
2). Excavation of liquid containers and adjacent unsaturated zone soils	2A). Underground Utilities	2A). Underground Utilities • Call "Dig Safe" or one call center to have underground utilities located and marked.
	2B). Vapor/Dust Exposure	2B). Vapor/Dust Exposure • Conduct air monitoring. • Wear proper PPE (full-face supplied-air respirator).
	2C). Heavy Equipment	2C). Heavy Equipment • See General Site Hazards
	2D). Cave-ins	2D). The walls and faces of trenches 4 feet or more deep, and all excavations in which employees may be exposed to danger from moving ground or cave-in shall be guarded by a shoring system, sloping of the ground, or some other equivalent means. • Excavation per OSHA – (1926.650-652). • Perimeter of excavation will be cordoned off to delineate cave-in hazard area.

878 25

Sequence and Description of Basic Job Steps	Potential Hazards	Recommended Action or Procedure
	2E). Slips/Trips/Falls	2E). Slips/Trips/Falls • Maintain work areas safe and orderly. • Site SHSO inspect the entire work area to identify and remove hazards.
	2F). Broken Glass Fragments	2F). Broken Glass Fragments • Instruct personnel on Emergency Action Plan. Seek medical attention as necessary. • Be aware of work area. Use caution with placement of body • Be aware of PPE condition at all times. Change out PPE as necessary.
3). Backfilling of Soils	3A). Heavy Equipment	3A). Backfilling will be accomplished by placing backfill in 18-inch loose lifts, which will be compacted using the trackhoe bucket or bulldozer. • See General Site Hazards (Heavy Equipment)
	3B). Cave-ins	3B). The walls and faces of trenches 4 feet or more deep, and all excavations in which employees may be exposed to danger from moving ground or cave-in shall be guarded by a shoring system, sloping of the ground, or some other equivalent means. • Excavation per OSHA – (1926.650-652)
Equipment Used	**Inspection Requirements**	**Requirements**
1). Heavy Equipment 2). Appropriate PPE 3). First Aid Kits 4). Portable Eyewash 5). Fire Extinguishers 6) Air Monitoring Equipment	1). Inspections will be performed on equipment prior to each use. 2). Inspections will be performed on PPE prior to each use. 3). Inspections will be performed on first aid kits. 4). Portable eye wash will be inspected. 5). Inspections will be performed on fire extinguishers. 6). Air monitoring equipment will be pre- and post calibrated according to manufacturer's specifications.	1). Personnel have read and comply with HASP. 2). Site specific training. 3). Qualified operators will be used for equipment operation. 4). At least two individuals on-site will have current CPR and First Aid training. 5). Instruct personnel on proper use of fire extinguishers. 6). Qualified individuals will use air monitoring equipment. 7). Daily safety meetings.
Date of field verification and validation:	**Names of personnel that completed field verification and validation:**	

JOB HAZARD ANALYSIS Loading and Transporting Liquid Containers	Name of Job: Dunn Field Disposal Site Remedial Action	Page 01 of 02	Date: 11/17/2005	X	New
					Revised
	Title of person who does job: Field Personnel	Project Manager: David Price	Analysis by: Emmet Curtis		
Company/Organization: MACTEC Engineering and Consulting, Inc.		Plant/Location: Memphis, Tennessee	Reviewed by: Darrell Hunt		

Required and/or recommended
Personal Protective Equipment: Hard hat, steel-toe boots, safety glasses, hearing protection, tyvek suit, full-face supplied-air respirator with air hose, double nitrile gloves

Sequence and Description of Basic Job Steps	Potential Hazards	Recommended Action or Procedure
1) Loading and transporting	1A). Entering/exiting the site	1A). Entering/exiting the site • Drivers shall assure that all lights and backup alarms are in working order prior to startup each day and shall display appropriate turn signals while entering and exiting the site.
	1B). Speed	1B). Speed • Speed limits will be enforced at all times.
	1C). Foot traffic	1C). Foot traffic • Workers or visitors working near the haul roads and heavy equipment will be required to wear orange vests. • Drivers must be aware of location of all workers on foot.
	1D). Contaminated vehicles	1D). Contaminated vehicles • Truck beds shall be lined, by drivers, with plastic in the support zone prior to loading of soils for transportation off-site. Truck drivers shall remain in their vehicles at all times while in the exclusion zone.

8728 77

Sequence and Description of Basic Job Steps	Potential Hazards	Recommended Action or Procedure
	1E). Congested areas	1E). Congested areas • Equipment and vehicles not in use will be removed from the immediate area of excavation to allow free space for loading and heavy equipment operation. • Haul routes shall be determined that avoid as many congested traffic areas and residential neighborhoods as possible.
	1F). Loading trucks	1F). Loading trucks • The operation of heavy equipment and heat/cold stress issues will be routinely discussed in daily safety meetings. • See also General Site Hazards.
Equipment Used	**Inspection Requirements**	**Requirements**
1). Heavy Equipment	1). Inspections will be performed on equipment prior to each use	1). Personnel have read and comply with SHSP. 2). Site specific training completed. 3). Qualified operators will be used for equipment operation. 4). Two individuals on-site will have current CPR and First Aid training. 5). Daily safety meetings held.
2.) Appropriate PPE (Level B)	1). Inspections will be performed on equipment prior to each use 2). Inspections will be performed on PPE prior to each use 3). Inspections will be performed on first aid kits. 4). Portable eye wash will be inspected.	1) Site specific training completed. 2). Boots will be washed at the end of each shift. 3). Respirators will be soaked overnight after every day of use. 4). Disposable PPE will be double bagged and properly disposed.
Date of field verification and validation:	**Names of personnel that completed field verification and validation:**	

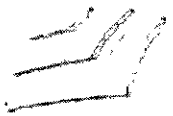
878 78

ATTACHMENT 4

CONTAMINANT FACT SHEETS

ATTACHMENT A

CONTAMINANT FACT SHEET



CONTAMINANT FACT SHEET

Chemical Name
ortho-Toluidine
CAS Number 95-53-4
Synonyms
0-aminotoluene, 2-aminotoluene
1-methyl-2-aminobenzene
0-methylaniline, 2-methylanilin

HEALTH HAZARD DATA

Color	Colorless to pale yellov	
Physical State	Solid	
	Liquid	X
	Gas	
Odor:	aromatic; aniline-like	
Odor Threshold	N/A	
Vapor Density	1	
Ionization Potential (IP)	7 44 eV	
IDLH	Ca (50 ppm)	

Carcinogen	OSHA	
	IARC	X
	NTP	X
	ACGIH	X
	NIOSH	X
Skin absorbable	yes X no	
Skin corrosive	yes X no	

Signs/Symptoms of Acute Exposure
Irritates eyes, anoxia, headache, cyanosi
lassitude, dizziness, drowniness
eye burns, dermititis, potential bladde
carcinogen, micro hematuri

Source	TWA (units)	STEL (units)	C (units)
OSHA PELs	5 ppm (skin) 22 mg/m3		
ACGIH TLVs	2 ppm (skin) 8 8 mg/m3		
NIOSH RELs	Ca (skin)		

DIRECT AIR MONITORING

Type	Brand/Mode No	Calibrations Method/Media	Relative Response or Conversior Factor	Meter Specific Action Leve
Detector Tube (aniline	Gastec 181	2 pump strokes	2	12 5 (SA)

Checked by: Emmet F. Curtis Date. 11/17/2005

PERSONAL PROTECTIVE EQUIPMENT

Recommended Protective Clothing Material:
Suits
Gloves Nitrile, Viton, Rubber
Boots Rubber

Service Limit Concentration (ppm) NA

Supplied Air = 1/2 of IDLH = 25 ppm
MUC Full-Face APR = TWA x 10 = 20 ppm

FIRE/REACTIVITY DATA

Flash Point 185°F

LEL/UEL unknown/unknowr

Fire Extinguishing Media

Dry Chemica	X	Foam	X
Water Spray	X	CO_2	X

Incompatibilities
strong oxidizers, nitric acid, base

Note The recommended protective clothing materials assumes that potential for direct contact (by splashing, dust inhalation, or other means) with the contaminants exists. Professional judgment and knowledge of on-site hazards should be used in selecting PPE appropriate to the concentration of the contaminant (trace vs percentage) to which the individual is likely to be exposed.

ATTACHMENT A

CONTAMINANT FACT SHEET

CONTAMINANT FACT SHEET

Chemical Name:
3,3-Dimethylbenzidine
CAS Number: 119-93-7
Synonyms:
o-tolidine; diaminoditolyl;
4,4'-diamino-3,3'-dimehtyl-biphenyl
3,3'-tolidine

HEALTH HAZARD DATA

Color: White to reddish crystals darkens w/ air exposure
Physical State: Solid X; Liquid ___; Gas ___
Odor: na
Odor Threshold: na
Vapor Density: na
Ionization Potential (IP): Unknown
IDLH: Ca (N D.)

Carcinogen: OSHA X; IARC X; NTP X; ACGIH X; NIOSH X
Skin absorbable: yes X no ___
Skin corrosive: yes X no ___

Signs/Symptoms of Acute Exposure:
Eye and nose irritant; liver and kidney damage in animals, suspected carcinogen

Source	TWA (units)	STEL (units)	C (units)
OSHA PELs			
ACGIH TLVs	(skin) A3		
NIOSH RELs			0.02 mg/m³ Ca (60 min)

DIRECT AIR MONITORING

Type	Brand/Model No.	Calibrations Method/Media	Relative Response or Conversion Factor	Meter Specific Action Level
Not Applicable				

Checked by: Emmet F. Curtis Date: 11/17/2005

PERSONAL PROTECTIVE EQUIPMENT

Recommended Protective Clothing Materials:
Suits: ___
Gloves: Nitrile, Viton, Rubber
Boots: Rubber

Service Limit Concentration (ppm): NA
SCBA = TWA x 10,000 = 200 mg/m³
MUC PAPR = TWA x 50 = 1 mg/m³
MUC Full-Face APR = TWA x 10 = 0.2 mg/m³

FIRE/REACTIVITY DATA

Flash Point: na
LEL/UEL: na/na

Fire Extinguishing Media:
Dry Chemical X; Foam X
Water Spray X; CO_2 X

Incompatibilities:
strong oxidizers

Note. The recommended protective clothing materials assumes that potential for direct contact (by splashing, dust inhalation, or other means) with the contaminants exists. Professional judgment and knowledge of on-site hazards should be used in selecting PPE appropriate to the concentration of the contaminant (trace vs percentage) to which the individual is likely to be exposed

ATTACHMENT 5

EQUIPMENT CALIBRATION SHEETS

PHOTOIONIZATION DETECTOR CALIBRATION FORM

Serial # / ID # _____ Model # _____

CALIBRATION INFORMATION

LOT #			
CAL GAS	Isobutylene	CONCENTRATION	100PPM
SPAN SETTING	1.0		

PARTS LIST	RESPONSE	DATE CHECKED	CHECKED BY
Case			
Moisture Filter			
Charcoal Filter			
Charger			
Manual			
Extension Tip			
Calibration Gas			
Regulator & Tubing			
Alkaline Battery Pack			
Wrist Strap			

Additional Information _____

Equipment Problems _____

Work Performed _____

ATTACHMENT 6

PID AND PARTICULATE MONITORING RECORDS

ATTACHMENT 6

PID MONITORING FORM

AOC/Trench:
Date:

Location	Instrument	7:00	7:30	8:00	8:30	9:00	9:30	10:00	10:30	11:00	11:30	12:00	12:30	13:00	13:30	14:00	14:30	15:00	15:30	16:00	16:30	17:00	17:30	18:00	18:30
Upwind																									
Work Area																									
Downwind																									

Notes:

Notes: 1) Air monitoring will be performed during excavation and documented by recording the values to the nearest half-hour.
2) Air monitoring may also be performed periodically throughout the day during the beginning of each new work activity.
3) Activities in progress during monitoring will be recorded in Notes.

ATTACHMENT 6

PARTICULATE MONITORING FORM

AOC/Trench: _____

Date: _____

Location	Instrument	7 00	7 30	8 00	8·30	9 00	9 30	10 00	10 30	11 00	11 30	12 00	12 30	13.00	13·30	14 00	14 30	15 00	15 30	16 00	16 30	17 00	17.30	18 00	18:30
Upwind																									
Work Area																									
Downwind																									

Notes:

_____

_____

_____

_____

_____

_____

_____

_____

Notes: 1) Air monitoring will be performed during excavation and documented by recording the values to the nearest half-hour.
2) Air monitoring may also be performed periodically throughout the day during the beginning of each new work activity.
3) Activities in progress during monitoring will be recorded in Notes.

ATTACHMENT 7

DAILY EQUIPMENT INSPECTION CHECKLIST

878 88

MACTEC Daily Equipment Inspection Checklist

This inspection form is to be filled out at the start of the work shift by the Equipment Operator to ensure that equipment is safe to operate, necessary preventative maintenance has been completed, and it is free from damage. Once completed, this form is to be given to the Site Manager and kept on file. Consult the rental company and/or manufacturer's documents to ensure compliance with all inspection criteria which may be indicated below.

Make / Description_____		Model / Series_____
OK?	**Item**	**Comments / Explanation / Action Taken**
Mechanical		
	Brakes	
	Tires / Tracks	
	Steering	
	Transmission	
	Hydraulic cylinders & lines / Air hoses	
	Cooling system	
	Roll-over protection & emergency equip.	
	Frame and boom (cracks, dents, or bent)	
	Hitches, hooks, bucket, blade, and cables	
Maintenance		
	Fuel level	
	Fluid levels (engine oil, hydraulic, coolant)	
	Grease and lubrication	
	Filters (fuel, oil, air)	
	Battery	
	Preventative maintenance or service due?	
Other		
	Cab (general condition and cleanliness)	
	Doors	
	Windshield / Window glass	
	Seat / Seat belt	
	Wipers and defroster	
	Mirrors	
	Decals and paint	
	Body damage	
	Ladders, steps, rails, and hand holds	
	Instruments and gauges	
	Operating controls and levers	
	Fire extinguisher	
	Back-up alarm & horn	
	Lights (brake lights, head lights & signals)	
Odometer _____		Hour Meter _____
Operator Name / Signature_____		Date _____ Time _____

ATTACHMENT 8

SITE HEALTH AND SAFETY OFFICER SUMMARY

878 90

ATTACHMENT 8

SHSO SUMMARY

To be completed by SHSO following completion of each phase of field work.

During the work covered by this Site Specific Health and Safety Plan, there were:

(check one)

____ No violations of the Safety Plan provisions and no incidents involving injury, illness or personnel contamination.

____ The following violations of the Safety plan provisions or incidents involving injury, illness or personnel contamination occurred. (Provide details of type of violation or incident, who was involved, circumstances, and first aid or medical treatment required.)

_____

_____

_____

_____

If violation or incident occurred, describe corrective actions taken to prevent reoccurrence.

_____

_____

_____

_____

Project/Task Name: Dunn Field Disposal Site 3

Project/Task Number: 6301-05-0004, 2301.0200

Dates in Field: _____

Signature: _____

(SHSO)

Date: _____

FINAL PAGE

ADMINISTRATIVE RECORD

FINAL PAGE