



THE MEMPHIS DEPOT TENNESSEE

ADMINISTRATIVE RECORD COVER SHEET

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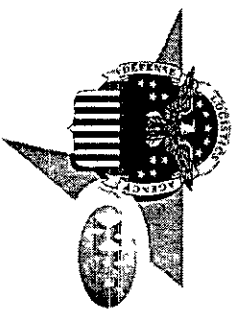
Main Installation Remedial Investigation Baseline Risk Assessment

Presented to

Restoration Advisory Board

July 20, 2000

Presented by



Overview of Presentation

Dr. Ted W. Simon, Environmental Protection Agency (EPA) Risk Assessor

- What is a Risk Assessment? What does it tell us?
- The Risk Assessment Process
- Acceptable vs. Unacceptable Risk

Dr. Vijaya Mylavarapu, CH2M Hill Risk Assessor

- Major Conclusions
- How was the Risk Assessment performed?
- Conclusions for each Functional Unit
- Next Steps in Cleanup Process

Dr. Ted W. Simon
Risk Assessor
Environmental Protection Agency

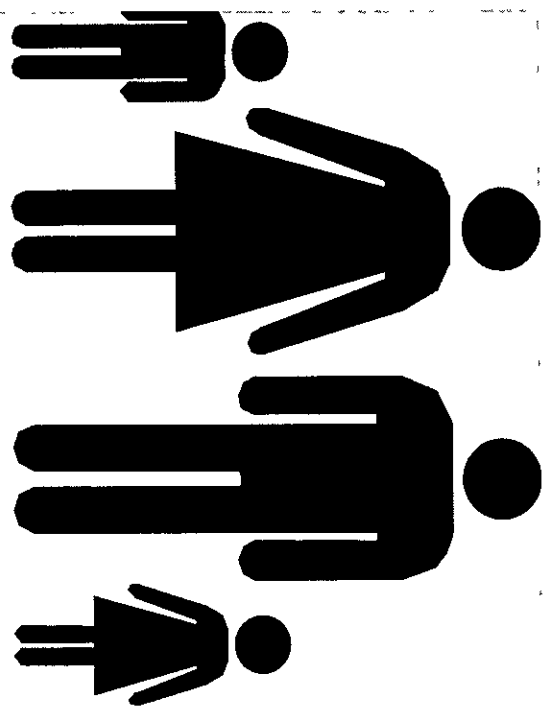
A Risk Assessment Is...

- **A process developed by the EPA and used at all National Priorities List (NPL) sites**
- **A science-based tool that provides decision-makers a high level of confidence in making cleanup decisions**
- **A method to evaluate risk of health effects due to environmental exposures to soil, sediment, surface water and groundwater**
- **A protective estimate of potential risk**
- **A method to identify areas that require cleanup and to determine acceptable cleanup levels**

A Risk Assessment Answers the Questions:

- **Is the site safe?**
 - **If not, how “risky” is the site? And what chemical makes it “risky”?**
 - **What kind of land use is appropriate for the site?**
 - **Which location should be cleaned up for a specific land use?**
 - **What needs to be cleaned (soil, sediment, surface water, groundwater)?**
- What are acceptable cleanup levels?**

**THERE IS NO SUCH THING
AS ZERO RISK!**



Acceptable vs. Unacceptable Risk CANCER

Acceptable Risk

- *1 chance to 100 chances in a million*

Unacceptable Risk

- *More than 100 chances in a million*

Acceptable vs. Unacceptable Risk

NON-CANCER HEALTH EFFECTS

Acceptable Risk

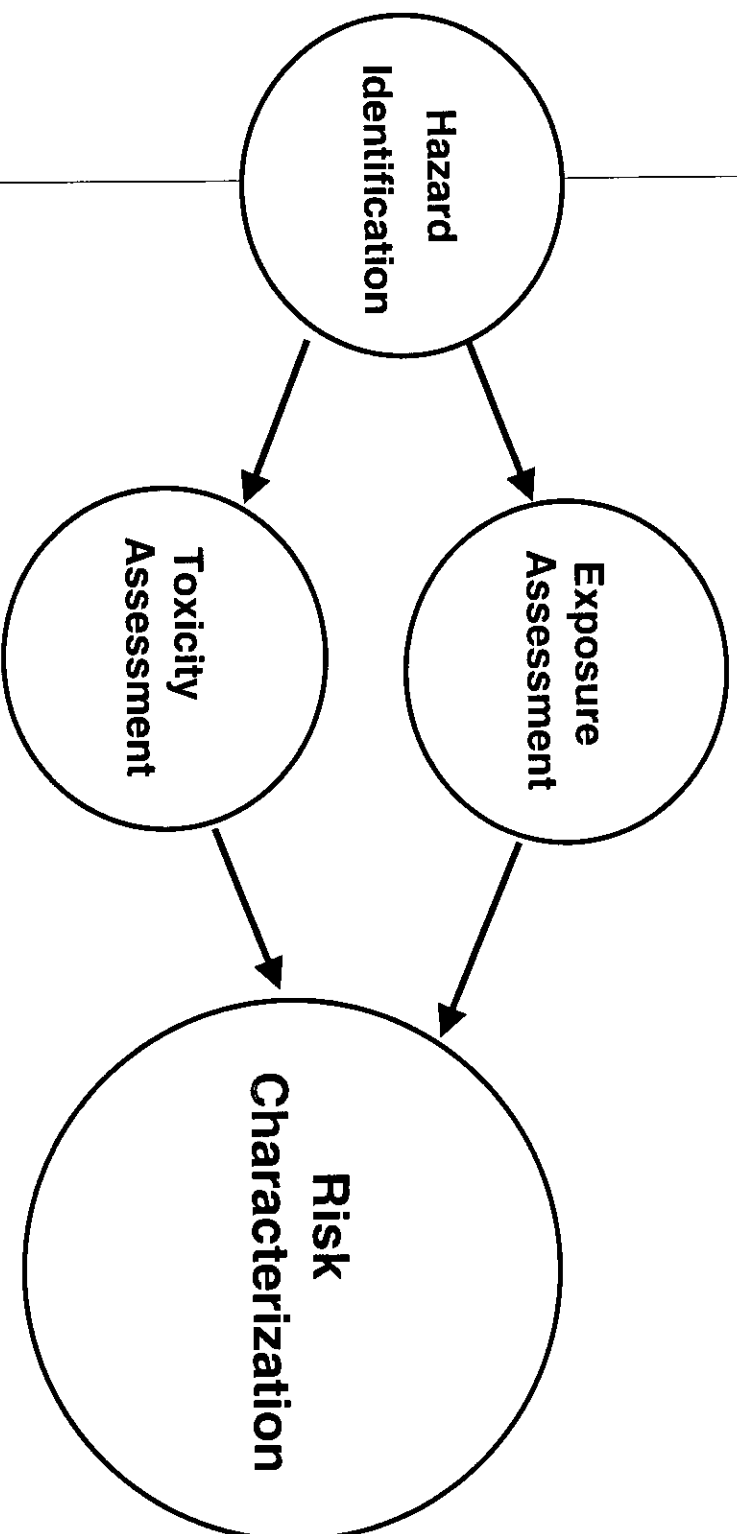
- *0.0 to 1.0 Hazard Index*

Unacceptable Risk

- *More than 1.0 Hazard Index*

“Hazard Index” refers to the EPA-approved threshold at which chemical levels are safe

EPA Risk Assessment Process



HAZARD IDENTIFICATION

Begins with Remedial Investigation results

Identifies chemicals in soil, sediment, surface water and groundwater that are higher than background or screening values

Develops a list of Chemicals of Potential Concern (COPCs) for evaluation in the Risk Assessment

HAZARD IDENTIFICATION (cont)

COPC SELECTION

Background values

- levels that occur in nature or that result from human activities and are found across the Memphis area
- PAHs (polynuclear aromatic hydrocarbons) result from auto and diesel exhaust, creosote application and asphalt. They are common in cities and around railroads.

Screening values = levels considered by EPA to be safe

- based on a 1 in a million risk or an HI of 0.1

EXPOSURE ASSESSMENT

Evaluates how people could come into contact with chemicals in the soil, sediment, surface water and groundwater

- Based on current and future land use and activities
- Depot zoned for Industrial land use, now and in the future
- Uses assumptions about how much chemical would enter the body (dose) and about the length of time (hours/days/years) a person would spend in the area

Exposure Assessment (cont)

Exposure Pathway

- the way in which a chemical gets from an environmental medium (e.g., soil, sediment, surface water, groundwater) into a person's body

Exposure Route

- three specific ways in which a chemical enters the body (ingestion, inhalation, dermal)

EXPOSURE ASSESSMENT (cont'd)

Exposure Unit:

– an area in which a person might come into contact with chemicals in environmental media (soil, sediment, surface water and groundwater)

– Examples:

- *Industrial Worker Exposure Unit* = 15-acre industrial site
- *Residential Exposure Unit* = 1/3-acre backyard
- *Recreational Exposure Unit* = 5-acre park

Exposure Assessment (cont)

- Exposure Scenario
- A person’s behavior patterns leading to exposure to environmental media

Scenario	Water Consumption	Soil Contact	Body Weight
Residential Adult	2 L/day	100 mg/day	70 kg
Residential Child	1 L/day	200 mg/day	15 kg
Industrial Worker	1 L/day	50 mg/day	70 kg
Recreational Teen	1 L/day	50 mg/day	45 kg

TOXICITY ASSESSMENT

**Estimates of chemical intakes (doses)
developed by EPA that are considered safe**

*All substances are poisons. There is
none that is not a poison. The right dose
differentiates a remedy from a poison.*

Paracelsus
1493-1541

RISK CHARACTERIZATION

**Combines the results of Exposure and Toxicity Assessment to provide estimates of risk
COPCs with unacceptable risk become
Chemicals of Concern (COCs)**

- A residential scenario is always included in a risk assessment for comparison purposes
- An industrial scenario is used for clean up decisions
- A high level of confidence that risks are not understated
- Results used for decision-making
- Cleanup levels are developed for COCs and continue through the Feasibility Study

Summary

Main Installation

Baseline Risk Assessment

Dr. Vijaya Mylavarapu
Risk Assessor
CH2M Hill

Conclusions of the Risk Assessment

- **The Depot's Main Installation (MI) is safe for workers except in limited areas:**
 - Near the Paint Shop and sandblasting area where lead is elevated in soil
 - South of Buildings 949 and 702 where lead is elevated in soil
- **Recreational activities can be safely continued in the southeast portion of the MI (golf course and recreation area)**
- **Some areas of the Depot are not safe for residential land use**
 - pesticides, arsenic, and railroad/asphalt related chemicals (PAHs)
- **Shallow groundwater under the Depot should not be used as drinking water and is not currently used for drinking water**
- **Deep groundwater is safe for drinking**
- **Risks to off-site residents are acceptable**

Depot Risk Assessment Process

About 40 percent of the samples were analyzed for the complete list of chemicals

- EPA recommends 20 percent of samples**

Any chemical higher than background or screening values became a chemical of Potential Concern (COPC) and was evaluated

Depot Risk Assessment Process (cont)

Depot Exposure Units

Each Functional Unit was evaluated as a separate exposure unit

- the area in which a person may come into contact with affected soil, sediment, groundwater or surface water

Three exposure units within each Functional Unit

- Industrial Worker - Functional Unit-wide
 - *Exposure Unit = Size of Functional Unit*
- Industrial Worker - Small Area
 - *Exposure Unit = Area within Functional Unit with Highest Concentrations (about 0.5 acre in size)*
- Hypothetical Future Resident
 - *Exposure Unit = Sampling location with Highest Concentrations (about 0.3 acres in size)*

Depot Risk Assessment Process (cont)

- **Exposure scenarios based on the anticipated future industrial use of the property as outlined in the *Memphis Depot Redevelopment Plan***
 - Depot zoned for Industrial use, now and in the future
 - Industrial scenarios for all Functional Units
 - The Residential scenario was also evaluated at each Functional Unit for comparison purposes only
 - Recreational scenario for Functional Unit 2

Depot Risk Assessment Process (cont)

- **In exposure scenarios, the person with the potential to receive the highest dose was selected to represent other similar potential receptors**
 - If risks are acceptable for maintenance worker who regularly contacts affected soil, then risks are acceptable for office worker who seldom contacts affected soil

For each exposure scenario, risks from soil, surface water and sediment were added together to determine total risk

Conclusions: Functional Unit 1

20 Typical Warehouses

Conclusions of Remedial Investigation

- Metals, PAHs, and Pesticides are restricted to surface soil and are not moving through the soil

Chemicals of Potential Concern (COPCs)

- Soil: Metals, PAHs, PCBs, Pesticides, Dioxins

Conclusions: Functional Unit 1

20 Typical Warehouses

Exposure Scenarios	Cancer Risk Safe = 1 to 100 in a million	Hazard Index Safe = Less than 1.0	Safe Y/N
Maintenance Worker	7 in a million	0.008	Y
Utility Worker	10 in a million	0.003	Y
Future Industrial Worker	80 in a million	0.09	Y
Future Resident	1,000 in a million	0.08	N

Conclusions: Functional Unit 1

20 Typical Warehouses

Risk Assessment Conclusions

- Risks to current and future industrial workers are within acceptable level
 - *No COCs for Industrial Scenario*
- Risks to hypothetical future residents are unacceptable due to PAHs along railroad tracks

Conclusions: Functional Unit 2

Southeast Golf Course/Recreational Area

Conclusions of Remedial Investigation

- Metals, PAHs, and Pesticides are restricted to surface soil and are not moving through the soil

Chemicals of Potential Concern (COPCs)

- Soil: Metals, PAHs, Pesticides
- Sediment: Metals, PAHs, Pesticides
- Surface water: Metals, Pesticides

Conclusions: Functional Unit 2

Southwest Golf Course/Recreational Area

Exposure Scenarios	Cancer Risk Safe = 1 to 100 in a million	Hazard Index Safe = Less than 1.0	Safe Y/N
Golfers	20 in a million	0.1	Y
Children at Playground	9 in a million	0.3	Y
Maintenance Worker	5 in a million	0.02	Y
Utility Worker	0.09 in a million	0.0003	Y
Future Industrial Worker	30 in a million	0.1	Y
Future Resident	200 in a million	0.4	N

Conclusions: Functional Unit 2

Southeast Golf Course/Recreational Area

Risk Assessment Conclusions

- Risks to recreational users are within acceptable levels
 - *No COCs for Recreational Scenario*
- Risks to current and future industrial workers are within acceptable levels
 - *No COCs for Industrial Scenario*
- Risks to hypothetical future residents are unacceptable due to arsenic and dieldrin

Conclusions: Functional Unit 3

Southwest Open Area

Conclusions of Remedial Investigation

- Metals, PAHs, and Pesticides are restricted to surface soil and are not moving through the soil
- Solvents found in one surface and two subsurface soil samples are not above screening levels

Chemicals of Potential Concern (COPCs)

- Soil: Metals, PAHs, Pesticides and Solvents

Conclusions: Functional Unit 3

Southwest Open Area

Exposure Scenarios	Cancer Risk Safe = 1 to 100 in a million	Hazard Index Safe = Less than 1.0	Safe Y/N
Maintenance Worker	1 in a million	0.005	Y
Utility Worker	6 in a million	0.007	Y
Future Industrial Worker	9 in a million	0.5	Y
Future Resident	6,000 in a million	0.0	N

Conclusions: Functional Unit 3

Southwest Open Area

Risk Assessment Conclusions

- Risks to current and future industrial workers are within acceptable levels. Lead at paint shop and maintenance area is at unacceptable levels and currently being removed
 - *Lead is a COC for Industrial Scenario*
- Risks to hypothetical future residents are unacceptable due to PAHs along railroad tracks and lead at paint shop and maintenance area

Conclusions: Functional Unit 4

Northern and Open Areas

Conclusions of Remedial Investigation

- Metals, PAHs, and Pesticides are restricted to surface soil and are not moving through the soil
- Solvent levels found in one subsurface soil sample higher than screening values

Chemicals of Potential Concern

- Soil: Metals, Pesticides, PAHs, and Solvents
- Stormwater and Sediments: Metals, PAHs and Pesticides

Conclusions: Functional Unit 4

Northern and Open Area

Exposure Scenarios	Cancer Risk Safe = 1 to 100 in a million	Hazard Index Safe = Less than 1.0	Safe Y/N
Maintenance Worker	7 in a million	0.01	Y
Utility Worker	0.7 in a million	0.006	Y
Future Industrial Worker	40 in a million	0.1	Y
Future Resident	30 in a million	0.00005	Y

Conclusions: Functional Unit 4

Northern and Open Areas

Risk Assessment Conclusions

- Across most of Functional Unit 4, risks to current and future industrial workers as well as hypothetical future residents are within acceptable levels
- Two locations (Building 949 and Building 702) have unacceptable lead levels
 - *Lead is a COC for Industrial and Residential Scenarios*

Conclusions: Functional Unit 5 Newer Warehouses

Conclusions of Remedial Investigation

- Metals, PAHs, and Pesticides are restricted to surface soil and are not moving through the soil
- Solvents found in subsurface soil samples higher than screening values

Chemicals of Potential Concern

- Soil: Metals, PAHs, Pesticides, and Solvents

Conclusions: Functional Unit 5

Newer Warehouses

Exposure Scenarios	Cancer Risk Safe = 1 to 100 in a million	Hazard Index Safe = Less than 1.0	Safe Y/N
Maintenance Worker	4 in a million	0.006	Y
Utility Worker	10 in a million	0.005	Y
Future Industrial Worker	30 in a million	0.05	Y
Future Resident	400 in a million	0.0	N

Conclusions: Functional Unit 5

Newer Warehouses

Risk Assessment Conclusions

- Risks to current and future industrial workers are within acceptable levels
 - *No COCs for Industrial Scenario*
- Risks to hypothetical future residents are unacceptable due to PAHs at the railroad tracks

Conclusions: Functional Unit 6

Administrative and Residential Areas

Conclusions of Remedial Investigation

- Metals, PAHs, and Pesticides are restricted to surface soil and are not moving through the soil
- Solvents in subsurface soil samples higher than screening values
- TCE (solvent) in deeper (18 to 20 feet) subsurface soil samples at levels that indicate no movement to groundwater

Chemicals of Potential Concern

- Soil: Metals, Pesticides, PAHs, PCBs, and Solvents

Conclusions: Functional Unit 6

Administrative and Residential Areas

Exposure Scenarios	Cancer Risk Safe = 1 to 100 in a million	Hazard Index Safe = Less than 1.0	Safe Y/N
Maintenance Worker	4 in a million	0.1	Y
Future Industrial Worker	30 in a million	0.5	Y
Future Resident	100 in a million	0.0	Y at housing area; N at parking lots, railroad tracks and maintenance areas

Conclusions: Functional Unit 6

Administrative and Residential Areas

Risk Assessment Conclusions

- Risks to current and future industrial workers are within acceptable levels
 - *No COCs for Industrial Scenario*
- Pesticides at Housing Area and PCBs at Cafeteria have been removed
- Risks to hypothetical future residents are unacceptable due to PAHs at parking lots, railroad tracks and vehicle maintenance area

Conclusions: Functional Unit 7

Groundwater

Conclusions of Remedial Investigation

- Solvents found in shallow groundwater; Metals found in shallow groundwater at the southwest corner near the paint shop and maintenance area
- Shallow groundwater flow patterns in this area indicate potential off-site sources for VOCs
- Three plumes: southwest corner, southeast corner and north-central area

Chemicals of Potential Concern

- Metals and Solvents (PCE, TCE and 1,1,2,2-PCA)

Conclusions: Functional Unit 7

Groundwater

Exposure Scenarios	Cancer Risk	Hazard Index	Safe
	Safe = 1 to 100 in a million	Safe = Less than 1.0	Y/N
Future Industrial Worker	20 to 40 in a million	0.5 to 0.6	Y
Future Resident	80 to 200 in a million	1 to 4	N
Groundwater from the shallow water-bearing layer (fluvial aquifer) should not be used for drinking.			

Conclusions: Functional Unit 7

Groundwater

Risk Assessment Conclusions

- Shallow groundwater currently not used for drinking, so no current exposure
- Risks to industrial workers from the shallow groundwater under the Main Installation are within acceptable levels
 - *No COCs for Industrial Scenario*
- Risks to future resident presented from the shallow groundwater under the Main Installation are unacceptable
 - *PCE and TCE are COCs for Residential Scenario*

Conclusions of the Risk Assessment

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- **The Depot's Main Installation (MI) is safe for workers except in limited areas:**
 - Near the Paint Shop and sandblasting area where lead is elevated in soil South of Buildings 949 and 702 where lead is elevated in soil
- **Recreational activities can be safely continued in the southeast portion of the MI (golf course and recreation area)**
- **Some areas of the Depot are not safe for residential land use**
 - pesticides, arsenic, and railroad/asphalt related chemicals (PAHs)
- **Shallow groundwater under the Depot should not be used as drinking water and is not currently used for drinking water**
- **Deep groundwater is safe for drinking**
- **Risks to off-site residents are acceptable**

Next Steps in Cleanup Process

Identify cleanup levels for industrial land-use scenario

Prepare Feasibility Study to evaluate different alternatives for addressing up soil and groundwater

Select the Preferred Alternatives for soil and groundwater

Next Steps in Cleanup Process

Provide cleanup alternatives and Preferred Alternatives to the public in the Proposed Plan (Available in August at the Information Repositories)

Conduct a Public Comment Period for the Proposed Plan

Conduct a Public Comment Meeting on the Proposed Plan

FINAL PAGE

ADMINISTRATIVE RECORD

FINAL PAGE