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HUNTERS POINT
SSIC NO.5090.3

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105

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13 April 1995

William Radzevich
Engineering Field Activity, West
900 Commodore Drive 09AR1WR
San Bruno, CA 94066-2402

Subject: Parcel A Remedial Investigation Report

Dear Mr. Radzevich:

Enclosed are U.S. EPA's comments on the outline prepared by PRC for the Parcel A Remedial Investigation/Feasibility Study (RI/FS) report, as well as the example write-up for PA-43. In general, we are very pleased with the work produced by the Navy and PRC and believe the example provides a good basis from which to develop the RI/FS report for Parcel A. However, some significant modifications are recommended, nonetheless. The following are our comments on the proposed outline for the report. Enclosed as Attachments A and B are marked up copies of the outline and PA-43 write-up.

Comments on Proposed RI/FS Report Outline

1. Some minor modifications to Chapters 1.0 and 2.0 are recommended. Primarily, Chapter 1.0 should serve to introduce the reader the **site** and the **report**. Chapter 2.0 should serve to introduce the reader the **work** which is being performed at the site. The discussion of PA-45, PA-51, and PA-77 need only outline the scope of the investigations. This section should rely heavily on references to the Site Inspection (SI) report. We recommend that the section on air sampling results be moved into the body of the report into Chapter 5.0.

2. A chapter entitled "Study Area Investigations" should be inserted between Chapter 2.0 and a chapter on physical characteristics. This chapter (a new chapter 3.0) should identify and discuss the various investigatory tools used by the Navy/PRC/HLA to investigate Parcel A. The discussion need only be a summary and should rely heavily on references to the SI report. One of the focuses of this section should be to explain the "investigation by excavation" process, both practically and procedurally.

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3. Chapter 3.0, Physical Characteristics, should become Chapter 4.0. It should provide the results of those tools described in Chapter 3.0, Study Area Investigations, as regards the physical characteristics of the site. A section regarding soils should be added between "Geology and Hydrogeology" and "Ecology."

4. Chapter 4.0, Parcel A Soil Investigations, should become Chapter 5.0, Nature and Extent of Contamination. This chapter should be divided into three main sections: sources, groundwater, and air sampling. Under the section on sources, each excavation site should be discussed. The currently proposed section on "Method of Investigation," however, should be modified and moved to the new Chapter 3.0 (Site Area Investigations). Similarly, the currently proposed section on "Contaminant Fate and Transport" should be modified and moved to a new Chapter 6.0, Contaminant Fate and Transport. What should remain in this section is a discussion of the individual suspected source areas within each excavation site, a discussion of the process of investigation and excavation with clear references to the appropriate SI addenda, and a summary of the results, both before and after excavation.

   The section which describes SI-78 should be in much more detail than the discussion of the rest of the sites. It should, for example, retain the section on "Methods of Investigation" and thoroughly discuss the field screening method, areas of excavation, etc.

5. Under the section on groundwater in the new Chapter 5.0, the geology and hydrogeology findings should be moved to Chapter 4.0, Physical Characteristics. As with SI-78, the discussion of groundwater should retain the section on "Methods of Investigation," thoroughly discussing the use of open borings and various well constructions to evaluate groundwater conditions.

6. Under the section on air sampling in the new Chapter 5.0, the discussion need only summarize the purpose, methods and results of the sampling with clear references to a more detailed report.

7. A chapter on contaminant fate and transport should be added between Chapter 5.0 and the chapter on risk assessment. This chapter should be the most significant section of the report. This is the section which will provide clear justification that no further action is necessary in soil and that no future impacts to groundwater are expected. This new Chapter 6.0, Contaminant Fate and Transport, should contain sections covering the following subjects: potential routes of migration, contaminant persistence, and contaminant migration. This chapter should be written to cover the parcel, overall, by drawing together the results from each of the areas of investigation and outlining a conceptual model of the sites' environmental condition and characteristics. While this is only to be a paper study, generalities are not sufficient. Clear evidence must be given to support any claims that contaminants which were once on the site or are remaining on the site have not and will not contact a receptor to cause harm.

8. The chapter on risk assessment can be modified in several ways. First, a summary of each risk assessment contained in the SI is not necessary. Instead, the RI should

evaluate the parcel-wide health impacts by looking at the sites all together. This should not require a separate risk assessment; but rather, a conceptual evaluation, identifying all assumptions, of the meaning of the individual risk assessments in the context of the whole parcel. One of the parcel-wide issues to consider in this conceptual evaluation is the impact on residents of gardening in Parcel A soil.

Second, a screening health risk assessment, comparing site values to PRGs, should be presented for SI-78.

Third, a risk assessment for groundwater should be deleted. Since no CERCLA-regulated substances were identified in groundwater, a risk assessment is unnecessary.

9. The currently proposed chapters on ARARs and the Feasibility Study for groundwater should also be deleted. Since no CERCLA regulated substances were identified in groundwater, an ARARs analysis is unnecessary, as is a CERCLA action. This, however, will not impact the State of California's ability to regulate the motor oil found in groundwater.

10. In the chapter containing the summary and conclusions, the sections on ARARs and Remedial Alternative Selection can be deleted for the reasons stated above.

As you can see, several recommendations are offered here which differ from our earlier agreements, namely: the necessity for an ARARs analysis and feasibility study for groundwater. While we continue to believe that petroleum should be folded into the CERCLA process where practical, and when all parties agree, in this case where no CERCLA contaminants were identified at levels of concern in groundwater, we believe petroleum can be better handled as a separate matter. In the event that the second round of groundwater sampling at the parking lot spring indicates a CERCLA problem which was not detected in the first round, then the comment made above may have to be revisited.

If you should have any questions regarding these comments, please contact me at (415) 744-2385.

Sincerely,

Alydda Mangelsdorf

Alydda Mangelsdorf
Remedial Project Manager

Enclosures

cc: C. Shabahari, DTSC
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Enclosure A

PRELIMINARY DRAFT OUTLINE
PARCEL A RI/FS REPORT
HUNTERS POINT ANNEX

1.0 INTRODUCTION

- 1.1 Purpose and Scope of Work
- 1.2 Facility-Wide Investigation Program
- 1.3 Report Organization

2.0 ~~BACKGROUND AND SITE HISTORY~~ Site Investigations

- 2.1 Site Description and History
- 2.2 Previous Investigations (scope of)
  - ~~2.2.1~~ 2.3.1 SI-45 Steam Line
    - 2.2.1.1 Field Investigation
    - 2.2.1.2 Summary of Results
    - 2.2.1.3 Conclusion and Recommendation
  - ~~2.2.2~~ 2.3.2 SI-51 Transformer Locations
    - 2.2.2.1 Field Investigation
    - 2.2.2.2 Summary of Results
    - 2.2.2.3 Conclusion and Recommendation
  - ~~2.2.3~~ 2.3.3 SI-77 UST 812
  - 2.2.4 Air Sampling Results → move to Chapter 5.0

2.3 Summary of No Further Investigation PA Sites

3.0 Study Area Investigations
- 3.1 surface features
- 3.2 contaminant source investigations
- 3.3 storm drain investigations/San. sewers
- 3.4 geological investigations
- 3.5 soil & vadose zone investigations
- 3.6 groundwater investigations
- 3.7 ecological investigations
- 3.8 analytical program

4.0 ~~3.0~~ PHYSICAL CHARACTERISTICS

- 4.1 ~~3.1~~ Land Use and Topography
- 4.2 ~~3.2~~ Surface Water Drainage
- 4.3 ~~3.3~~ Geology and Hydrogeology
- 4.4 soils
- 4.5 ~~3.4~~ Ecology

5.0 ~~4.0~~ ~~PARCEL A SOIL INVESTIGATIONS~~ Nature and Extent of Contamination

5.1 Sources

- 5.1.1 ~~4.1~~ SI-19 Building 901
  - 5.1.1.1 source areas
  - ~~4.1.1~~ Method of Investigation → move to Chapter 3.0
    - 4.1.1.1 Source Area Evaluation
    - 4.1.1.2 Soil Sampling
    - 4.1.1.3 Excavation Activities
    - 4.1.1.4 Analytical Program
  - 5.1.1.2 ~~4.1.2~~ Nature and Extent of Contamination
    - 5.1.1.2.1 ~~4.1.2.1~~ Pesticides, PCBs, and Herbicides
    - 5.1.1.2.2 ~~4.1.2.2~~ SVOCs
    - 5.1.1.2.3 ~~4.1.2.3~~ Metals
  - 4.1.3 Contaminant Fate and Transport → move to Chapter 6.0
  - 5.1.1.3 ~~4.1.4~~ Conclusion and Recommendation

- 5.1.2 ~~4.2~~ SI-41 Buildings 818 and 816
  - 5.1.2.1 source areas
  - 4.2.1 Method of Investigation → move to Chapter 3.0
    - 4.2.1.1 Source Area Evaluation
    - 4.2.1.2 Soil Boring and Soil Sampling
    - 4.2.1.3 Excavation Activities
    - 4.2.1.4 Analytical Program
  - 5.1.2.2 ~~4.2.2~~ Nature and Extent of Contamination

PRELIMINARY DRAFT OUTLINE
PARCEL RI/FS REPORT
HUNTERS POINT ANNEX
(continued)

5.1.2.2.1 ~~4.2.2.1~~ VOCs
5.1.2.2.2 ~~4.2.2.2~~ SVOCs
5.1.2.2.3 ~~4.2.2.3~~ Metals
5.1.2.2.4 ~~4.2.2.4~~ Radiation
4.2.3 Contaminant Fate and Transport → move to Chapter 6.0
5.1.2.3 ~~4.2.4~~ Conclusion and Recommendation

5.1.3 ~~4.3~~ SI-43 Building 906

5.1.3.1 Source areas
4.3.1 Method of Investigation → move to Chapter 3.0
4.3.1.1 Source Area Evaluation
4.3.1.2 Soil Drilling and Sampling
4.3.1.3 Excavation Activities
4.3.1.4 Analytical Program
5.1.3.2 ~~4.3.2~~ Nature and Extent of Contamination
5.1.3.2.1 ~~4.3.2.1~~ Pesticides, PCBs, and Herbicides
5.1.3.2.2 ~~4.3.2.2~~ SVOCs
5.1.3.2.3 ~~4.3.2.3~~ Metals
4.3.3 Contaminant Fate and Transport → move to Chapter 6.0
5.1.3.3 ~~4.3.4~~ Conclusion and Recommendation

5.1.4 ~~4.4~~ SI-50 Storm Drain and Sanitary Sewer Lines

5.1.4.1 Source areas
4.4.1 Method of Investigation → move to Chapter 3.0
4.4.1.1 Source Area Evaluation
4.4.1.2 Soil Drilling and Sampling
4.4.1.3 Maintenance Activities
4.4.1.4 Analytical Program
5.1.4.2 ~~4.4.2~~ Nature and Extent of Contamination
5.1.4.2.1 ~~4.4.2.1~~ Pesticides, PCBs, and Herbicides
5.1.4.2.2 ~~4.4.~~2.2 VOCs and SVOCs
5.1.4.2.3 ~~4.4.2.3~~ Metals
4.1.3 Contaminant Fate and Transport → move to Chapter 6.0
5.1.4.3 ~~4.4.4~~ Conclusion and Recommendation

5.1.5 ~~4.5~~ SI-78 Sandblast and Pesticide Investigation at Jerrold Avenue Lot

5.1.5.1 ~~4.5.1~~ Method of Investigation
5.1.5.1.1 ~~4.5.1.1~~ Source Area Evaluation
~~4.5.1.2~~ Soil Drilling and Sampling
5.1.5.1.2 ~~4.5.1.3~~ Excavation Activities
5.1.5.1.3 ~~4.5.1.4~~ Analytical Program
5.1.5.2 ~~4.5.2~~ Nature and Extent of Contamination
5.1.5.2.1 ~~4.5.2~~.1 Pesticides
5.1.5.2.2 ~~4.5.2.2~~ Metals
4.5.3 Contaminant Fate and Transport → move to Chapter 6.0
5.1.5.3 ~~4.5.4~~ Conclusion and Recommendation

PRELIMINARY DRAFT OUTLINE
PARCEL RI/FS REPORT
HUNTERS POINT ANNEX
(continued)

5.2 ~~6.0~~ PARCEL A GROUNDWATER INVESTIGATION

5.2.1 ~~5.1~~ Method of Investigation
- 5.2.1.1 ~~5.1.1~~ Source Area Evaluation
- 5.2.1.2 ~~5.1.2~~ Soil Drilling and Sampling
- 5.2.1.3 ~~5.1.3~~ Analytical Program

include: borings on Coleman St.
wells on hill top
parking lot spring/seep sample results

5.2.2 ~~5.2~~ Nature and Extent of Contamination
- 5.2.2.1 ~~5.2.1~~ Source of Motor Oil
- 5.2.2 Geology Findings
- 5.2.3 Hydrogeology Findings
  - 5.2.3.1 Groundwater Hydraulics and Flow
  - 5.2.3.2 Groundwater Quality
  - 5.2.3.3 Surface Water Flow and Quality

→ move to Chapter 4.0

- 5.2.2.2 ~~5.2.3~~ Groundwater Contamination

5.3 Contaminant Fate and Transport → move to Chapter 6.0

5.2.3 ~~5.4~~ Conclusion and Recommendation

5.3 Summary of Air Sampling

7.0 ~~6.0~~ RISK ASSESSMENT SUMMARY

7.1 ~~6.1~~ Soil Risk Assessment
- 7.1.1 6.1.1 Risk Assessment Procedures and Assumptions
- ~~6.1.2 Health Risk Associated with SI-19~~
- ~~6.1.3 Health Risk Associated with SI-41~~
- ~~6.1.4 Health Risk Associated with SI-43~~
- ~~6.1.5 Health Risk Associated with SI-50~~
- 7.1.2 6.1.6 Health Risk Associated with Sandblast and Pesticides at Jerrold Avenue

7.2 ~~6.1.7~~ Potential Hazardous to Ecological Receptors ← 7.1.3 Summary of Parcel wide Risk Assessment

~~6.2 Groundwater Risk Assessment~~
- ~~6.2.1 Health Risk Associated with Groundwater Contamination~~
- ~~6.2.2 Potential Hazardous to Ecological Receptors~~
- ~~6.2.3 Derivation of Target Remedial Goals (?)~~

6.0 Contaminant Fate + Transport
- 6.1 Potential Routes of Migration
- 6.2 Contaminant Persistence
- 6.3 Contaminant Migration

~~7.0 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS~~
- ~~7.1 Definition of ARARs~~
- ~~7.2 ARAR Categories~~
- ~~7.3 ARARs Related to Soil Excavation Activities~~
- ~~7.4 ARARs Related to Groundwater Alternatives~~

~~8.0 GROUNDWATER FEASIBILITY STUDY~~
- ~~8.1 Definition of Remedial Units~~
- ~~8.2 Remedial Action Objectives~~
- ~~8.3 Initial Screening and Evaluation of Remedial Technologies~~
- ~~8.4 Detailed Analysis of Remedial Alternatives~~
  - ~~8.4.1 Alternative 1 - No Action~~
    - ~~8.4.1.1 Overall Protection of Human Health and the Environmental~~

PRELIMINARY DRAFT OUTLINE
PARCEL RI/FS REPORT
HUNTERS POINT ANNEX
(continued)

8.4.1.2 Compliance with ARARs
8.4.1.3 Long-Term Effectiveness and Permanence
8.4.1.4 Reduction of Toxicity, Mobility, and Volume of Contaminants
8.4.1.5 Short-Term Effectiveness
8.4.1.6 Implementability
8.4.1.7 Cost
8.4.1.8 State (Support Agency) Acceptance
8.4.1.9 Community Acceptance

8.4.2 Alternative 2 - Groundwater Extraction, Treatment, and Disposal
8.4.2.1 Overall Protection of Human Health and the Environmental
8.4.2.2 Compliance with ARARs
8.4.2.3 Long-Term Effectiveness and Permanence
8.4.2.4 Reduction of Toxicity, Mobility, and Volume of Contaminants
8.4.2.5 Short-Term Effectiveness
8.4.2.6 Implementability
8.4.2.7 Cost
8.4.2.8 State (Support Agency) Acceptance
8.4.2.9 Community Acceptance

8.5 Comparison of Remedial Alternatives and Selection of Preferred Alternative

8.5.1 Comparison Based on CERCLA Criteria: Alternatives 1 and 2
8.5.2 Selection of Preferred Alternative

8.0 9.0 SUMMARY AND CONCLUSIONS

9.1 Physical Characteristics
9.2 Nature and Extent of Contamination
9.3 Fate and Transport of Contaminants
9.4 Risk Assessment
9.6 ARARs
9.7 Remedial Alternative Selection

REFERENCES

Enclosure B

DRAFT

CLEAN

Contract No. N62474-88-D-5086

Contract Task Order 0142

Base Environmental Coordinator: Michael McClelland

Head, Environmental Restoration Section I: Richard E. Powell

Navy Engineer-in-Charge: William Radzevich

PRC Project Manager: James M. Sickles

ENGINEERING FIELD ACTIVITY WEST
NAVAL FACILITIES ENGINEERING COMMAND
HUNTERS POINT ANNEX
SAN FRANCISCO, CALIFORNIA

DRAFT SI-43 WRITE-UP
PARCEL A REMEDIAL INVESTIGATION REPORT

Prepared by

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April 3, 1995

DRAFT

5.1.3 ~~4.3~~ SI-43 GARDENING TOOL HOUSE, BUILDING 906

5.1.3.1 Source Areas

Site SI-43 consists of the area surrounding the former Gardening Tool House, also known as Building 906, the former Green house known as Building 905 and the Potting Shed known as Building 904. The former Gardening Tool House was approximately 60 by 20 feet and was located near the intersection of Coleman Street and Jerrold Avenue. This building was removed by the Navy's Public Works Center (PWC) in early 1993. An exterior terra cotta rinse basin and drain line were located in the front of the building and led to the sanitary sewer under Coleman Street. The former Green house was approx. — and was located SW of the Gardening Tool House. A ~~pile of debris to the southwest of the former building was removed as part of the investigation at SI-43.~~ The locations of the ~~this~~ former buildings, rinse basin, drain line, sump and the pile of debris are shown on Figure 21. These are the areas of suspected contamination.

(1)

~~In 1993, when the Navy began this investigation of SI-43, the only standing structures were the Gardening Tool House and a portable roofed-storage cage approximately 15 by 10 feet located near Coleman Street. A 1956 Navy facility map shows a wood-lattice structure southwest of the Gardening Tool House that was a green house, listed as Building 905 (Figure 21).~~ When the green house was demolished, the contents and structure were left as a debris pile, which was removed as part of the investigation ~~(Figure 21)~~. A ~~The~~ 1956 Navy map ~~also~~ shows a small building used as a potting shed which was approx. — and ~~listed as Building 904, and was~~ located northwest of the Gardening Tool House (~~Figure 21~~). It contained a sump which was also removed(?) as part of the investigation.

~~Serpentinite and sheared metasedimentary rocks of the Franciscan Assemblage underlay SI-43 at a shallow depth. Several feet thick clayey soil covers the bedrock.~~

~~4.3.1 Method of Investigation~~

~~Investigation by excavation was used at SI-43 to immediately reduce any potential environmental risks and facilitate the transfer of the property. To determine the extent of the excavation, the analytical results for the soil samples were compared to the health-based levels (HBL) or interim ambient levels (IAL) that were developed specifically for HPA.~~

The subst. of this section should be augmented and moved to Chapter 3.0

During the SI-43 investigation, chemicals of concern in soil were evaluated in two (?) general areas. First, an investigation by excavating the soils beneath and near the former Gardening Tool House (Potting Shed? Greenhouse?) after it was demolished was completed. Second, the soils adjacent to the terra cotta drain pipe were

(6)

evaluated through excavation and soil borings. Borehole sampling along the sanitary sewer line, which runs adjacent to the site and connects to the drain pipe, was performed as part of the SI-50 investigation. SI-50 is discussed in Section 4.4.

4.3.1.1 Source Area Evaluation

Based on the historical use of the site, potential contamination sources at SI-43 are the Former Gardening Tool House, the rinse basin and drain line, and the debris pile to the southwest of the building.

Although limited historical information is available, it is likely that the former Gardening Tool House was used for the storage and repair of gardening and landscaping equipment. Signs indicated that pesticides and fertilizers were stored and mixed in the building. The area could also have been used to clean pesticide containers. An inventory conducted on January 6, 1988, indicated that approximately 24 gallons of pesticides, 1 gallon of thinner, 10 gallons of suspected alkali and lime wastes, and empty oil cans were stored in the building. These wastes were removed from the area after the inventory.

The rinse basin and drain line could have been a contamination source if water containing any contaminants were discharged to it and leaked from the line to the adjacent soils.

The sump....

The removed debris pile consisted of a mixture of wood building rubble, landscaping debris such as dead brush and plants, a few empty oil cans, and two used car batteries. The debris pile measured approximately 14 by 24 feet and was 3 to 4 feet in high. The debris pile could have acted as a contamination source if contaminants leached from the pile into the soil.

4.3.1.2 Soil Sampling

5.1.3.2 Nature + Extent of Contamination

Approximately 100 soil samples were collected at the surface and at various depths at SI-43 to characterize the extent of soil contamination and to verify the excavation of the contaminated soil. The sample locations are shown on Figure 22. The chronology of events and associated sample identification numbers are described in Table 13.

4.3.1.3 Investigation by Excavation

To accelerate the site investigation, prior to the demolition of the former Gardening Tool House, a few surface soil samples were collected and analyzed. The first phase of excavation occurred in early 1993, after the demolition and removal of the former Gardening and Tool House, and the removal of the debris pile and the portable roofed storage cage. Six inches of surface soil were excavated from the area where the former Gardening Tool House had been and from the adjacent areas as shown on Figure 22. During this phase, the terra cotta drain line was traced to Coleman Street and excavated. Sampling was performed along the utility trench of the terra cotta line. Borings were drilled and soil samples were collected along the sanitary sewer line below Coleman Street as part of the SI-50 investigation.

(7)

Analytical results from the first phase of the investigation indicated the presence of arsenic, beryllium, and 4,4'-DDT and breakdown products such as 4,4'-DDD and 4,4'-DDE at elevated levels with respect to HBLs. During this phase, 6 inches of soil were removed. The second phase of the investigation was conducted west and southwest of the Gardening Tool House and consisted of excavating an additional 6 inches of soil (1 foot below the original ground surface). The excavated area is shown as the medium-shaded area on Figure 22. Soil samples were collected at various locations and depths to confirm that sufficient soil had been excavated.

(8)

The last phase of investigation consisted of the excavation of a 4-foot-square by 3-foot-deep concrete sump associated with the pottery shed. The sump and soil were excavated to approximately 4 feet below the original ground surface. The darkest shaded area on Figure 22 identifies the excavated area.

(9)

Approximately 550 cubic yards of soil were excavated and disposed of at an appropriate landfill. The excavated site was backfilled with clean soil to its original ground surface..

(10)

4.3.1.4 Analytical Program

Soil samples were analyzed for EPA's Contract Laboratory Program (CLP) volatile organic compounds (VOC), CLP semivolatile organic compounds (SOC), CLP pesticides/polychlorinated

Subst. of this section will be ~~cw~~ rewrited and moved to Chapter 3.0.

biphenyls (PCB), CLP metals, organic lead, total petroleum hydrocarbon (TPH)-purgeables (as gasoline), TPH-extractables (as diesel and motor oil), total oil and grease (TOG), organophosphorus pesticides (EPA Method 8140), and organochlorine herbicides (EPA Method 8150).

4.3.2 Nature and Extent of Contamination

This section discusses the nature and extent of the soil contamination at SI-43. The discussion will focus on the residual contamination at the site as the top 6 to 60 inches of contaminated soil have been excavated and disposed of at an appropriate landfill, and the site has been backfilled with clean soil.

4.3.2.1 Pesticides, PCBs, and Herbicides

Discussion must be expanded to include ALL COPCs. Also, numbers here don't match Spring FSP table. Double check.

Table 14 summarizes analytical results for samples in which pesticides or PCBs were detected. As shown in Table 14, the three most frequently detected pesticides were 4,4'-DDD, 4,4'-DDE, and 4,4'-DDT. Figure 13 shows the residual concentrations of 4,4'-DDD, 4,4'-DDE and 4,4'-DDT after soil excavation at the site. In general, samples collected from 24 inches below the original ground surface or deeper have pesticide concentrations that were substantially lower than those in samples collected from shallower depths (Figure 13). After excavation of the contaminated soil, the detected pesticide concentrations in all samples are less than the residential soil HBLs. All residual pesticide concentrations are also less than the residential soil PRGs except for 4,4'-DDD (2,100 μg/kg) in sample No. 14243022, exceeding the residential soil PRG of 1,900 μg/kg (EPA Region IX 1994). The soil in the area around sample No. 14243022 was left in place because the values for the PRGs changed between the excavation and the report preparation. The investigation by excavation for SI-43 was completed in 1993. The residential soil PRG published by EPA Region IX in April 1993 for 4-4'-DDD was 7,100 μg/kg, well above the residual 4,4'-DDD concentration (2,100 μg/kg) that remained at the site. Sample No. 14243022 was collected within the former Gardening Tool House, at a depth 6 to 12 inches from the original surface. Aroclor-1260 (PCB) was detected in five confirmation samples with concentrations at or less than 150 μg/kg, well below the residential soil HBL of 150,000 μg/kg. PRGs have not been established for Aroclor-1260.

Analytical results for samples in which chlorinated herbicides were detected are summarized in Table 15. The herbicide 2,4,5-T was only detected in one soil sample (No. 14243104), at a concentration of 14 μg/kg. The concentrations of the herbicide 2,4-D ranged from 74 to 1,300 μg/kg. However, 2,4-D was not detected in soil samples collected from 24 to 30 inches below the original ground surface, except in sample No. 14243055 in which 2,4-D was detected at 80 μg/kg. The detected herbicide concentrations in all confirmation samples following the excavation were less than their respective residential soil PRGs and HBLs.

All analytical results for the herbicides MCPA and MCPP shown in Table 15 were detected by using an electron capture detector (ECD), which is not very sensitive to these two compounds. Because false positive (a value showing the presence of a chemical that is not accurate) were suspected for MCPP and MCPA, a gas chromatography/mass spectrometry (GC/MS) technique (selective ion monitoring mode [SIM]) was performed on soil extracts from two samples (No. 9318A840 from PA50B001 at 6.75 feet and No. 9318A857 from PA50B005 at 15.75 feet below ground surface) that were collected at SI-50. Using the SIM mode, these two compounds were not detected. Because the MCPP and MCPA results were not confirmed, the previous false positive results were prescribed to matrix interferences. All MCPP and MCPA concentrations for soil samples were below their respective HBLs or PRGs.

4.3.2.2 VOCs and SOCs

Analytical results for samples in which VOCs and SOCs were detected are summarized in Table 16. As shown in Table 16, after soil excavation, low levels of 4-methyl-2-pentanone and 2-butanone were detected in one confirmation soil sample. Benzene, toluene, and total xylenes were also detected in three confirmation samples, at concentrations of less than 1 μg/kg. The detected VOC concentrations in all confirmation samples were less than their respective PRGs and HBLs for residential soil.

Nineteen SOCs were detected at concentrations not exceeding 3,300 μg/kg (Table 16). After the excavation of the contaminated soil, the detected SOC concentrations in all confirmation soil samples were less than their respective residential soil HBLs. All residual SOC concentrations are also less than their respective residential soil PRGs except some polynuclear aromatic hydrocarbons (PAH) in sample No. 14243100. This sample was collected within the excavation trench of the terra cotta drain line, at 30 to 36 inches below the original surface. Benzo(a)anthracene (1,600 μg/kg), benzo(a)pyrene (1,200 μg/kg), benzo(b)fluoranthene (1,400 μg/kg), dibenzo(a,h)anthracene (300 μg/kg) and indeno(1,2,3-cd)pyrene (1,000 μg/kg) in sample No. 14243100 exceeded the residential soil PRGs.

4.3.2.3 TPH

Analytical results for samples in which TPH was detected are summarized in Table 17. Low levels of toluene (8 μg/kg) and xylene (17 μg/kg) were detected by TPH-purgeables as gasoline analysis in one confirmation soil sample at concentrations below the residential soil HBL or PRG. Motor oil was detected in soil samples at concentrations ranging from 7.1 to 200 mg/kg, and TOG was detected at concentrations ranging from 35 to 1,100 mg/kg. Figure 16 shows the motor oil and TOG concentrations that were detected. PRGs have not been established for motor oil or TOG. All motor oil and TOG concentrations detected in the confirmation soil samples are well below the HBLs.

4.3.2.4 Metals

Table 18 summarizes the detection frequency and concentrations for metals above IALs in soil samples. Figure 23 shows the residual arsenic and lead contamination at the site following the soil excavation. As shown in Table 18, after the excavation of the contaminated soil, metal concentrations in all confirmation soil samples were less than IALs except for aluminum, arsenic, lead, and zinc. Arsenic exceeds IAL (16 mg/kg) only in sample No. 14243101 at a concentration of 35.7 mg/kg. The sample was collected within the excavation trench for the terra cotta drain line, from 36 to 42 inches below the original surface. Arsenic was also detected in several post-excavation samples at concentrations ranging from 1 to 8.9 mg/kg, which are above the PRG (0.32 mg/kg) but below the IAL (16 mg/kg) and HBL (17 mg/kg). Aluminum, lead, and zinc exceeded the respective IALs in one or more samples. However, the aluminum, lead, and zinc concentrations in all confirmation samples are less than their residential soil PRGs (Table 18). Beryllium was detected in several pre- and post-excavation soil samples at concentrations ranging from 0.26 to 0.67 mg/kg, which are above the PRG (0.14 mg/kg) but below the IAL (1.3 mg/kg). Lead was detected in all post-excavation samples ranging in concentration from 4.9 to 311 mg/kg. All of these concentrations are below the

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PRG (400 mg/kg). Most of the soils had lead concentrations above the IAL (14 mg/kg). An HBL for lead has not yet been determined thus far.

6.0 ~~4.3.3~~ Contaminant Fate and Transport

Rewrite to include all of Panel A with clear listing of COPCs, their properties + their potential to migrate/impact based on local soil characteristics. Distinctions between before & after soil results should be made here but MOST specifically in risk assess. section.

The fate and transport of the contaminants present at SI-43 is directly related to the characteristics of the chemicals of potential concern (COPC) and the properties of the soil in which the contaminants are present. The COPC at SI-43 are residual cancer-causing chemicals with risk levels equal to or higher than 10^{-6} or residual noncancer-causing chemicals with a hazardous index equal to or greater than 1. A risk level of 10^{-6} indicates the potential for 1 extra case of cancer in a population of 1 million above naturally occurring level. COPCs at SI-43 are the PAHs (benzo[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, benzo[k]fluoranthene, dibenzo[a,h]anthracene, and indeno[1,2,3-cd]pyrene) and metals (arsenic and beryllium). These COPCs are in a localized area of the drain line trench excavation, at a depth of 36 to 42 inches below ground surface.

Because SI-43 was backfilled with clean soil, the migration of COPCs by surface-water runoff is unlikely. Since volatile organic compounds are not chemicals of concern, and the site is backfilled with clean soil, the air migration pathway is considered insignificant.

In the vicinity of SI-43, groundwater has been measured at a depth of approximately 70 feet below ground surface in fractured bedrock. The COPCs at SI-43 in general, have very low mobility and have a low water solubility factor. Therefore, surface water, groundwater, and air are not considered media of concern. Soil is the only media that will be discussed in the following sections.

4.3.3.1 Organics

Table 19 summarizes the chemical and physical characteristics of organic COPC in soil at SI-43. The following section provides a brief description of each of the characteristics, highlights the relevance to the fate and transport of the contaminants, and discusses the fate and transport of organics in soil at SI-43. Table 19 details the molecular weight, solubility factor, vapor pressure, and soil/water partition coefficient for the COPCs at SI-43.

The molecular weight is an indication of a compound's relative size. The molecular weight affects how easily a compound is adsorbed onto to soil or dissolved in groundwater. Generally as the molecular weight of a compound increases, the tendency for a compound to be adsorbed onto soil increases and it's stability in water decreases. All COPCs at SI-43 have high molecular weights, indicating that the COPCs have the tendency to be adsorbed onto soil.

How easily a compound dissolves in water (water solubility) is an important factor in estimating a chemical's fate and transport in water. Compounds with high water solubilities enter the water table more easily than their less soluble counterparts and are less likely to volatilize once in water. Dissolved compounds are more easily consumed by microorganisms in the groundwater and saturated soils, therefore, they are more easily to degrade than compounds that are adsorbed onto soil such as clay particles. The solubilities of all COPCs at SI-43 are low, and these compounds are not dissolved easily in water.

Vapor pressure measures the tendency of a chemical to volatilize. As the vapor pressure of a compound increases, the tendency of the compound to volatilize also increases. All COPCs at SI-43 have very low vapor pressures and will not significantly volatilize.

The soil/water partition coefficient (K_{oc}) for a compound measures the extent to which the compound will adhere (adsorb) to soil or remain dissolved in water. Generally, as K_{oc} increases, adsorption to soil increases. Based on the classification of soil mobility potential, developed by McCall and others (1980), compounds with a K_{oc} value above 5000 may be considered immobile, while compounds with a K_{oc} value below 150 may be considered mobile. The K_{oc} values for all COPC in soil at SI-43 are very high (greater than 10,000), indicating that these compounds are highly immobile.

In addition to the characteristics of COPC, the clay and organic carbon content of soil is also an important factor affecting the fate and transport of compounds. The soils at SI-43 are clayey. Clayey soils contain more particles in a given area, therefore, there is more surface area for compounds to attach.

Because of the high molecular weights, low solubilities, low vapor pressures, high soil/water partition coefficient for all COPC, and the clayey soil at SI-43, sorption onto soil is probably the most important fate of PAHs at SI-43. Since the site is backfilled with clean soil, it is unlikely that surface water runoff will come in contact with the residual COPC at SI-43. The migration pathway for COPC to surface water is considered insignificant. Due to the low solubilities of COPC, it is unlikely that infiltrating water will dissolve residual COPC and transport them into deep soil or to groundwater (if present). The migration pathway for compounds to groundwater is considered insignificant. Because the site is backfilled with clean soil and the vapor pressures of COPC are very low, the potential for these compounds to be transported from the soil to the atmosphere through an air migration pathway is very low.

4.3.3.2 Metals

Unlike organic COPC, compound-specific fate and transport parameters are generally not applicable to inorganic compounds. The fate of inorganic compounds is primarily dependent on the solubility of the individual compound, which is determined by the pH, reduction-oxidation potential, and temperature of the environment. The following section discusses the fate and transport of metals at SI-43.

Sorption onto clay particle and organic materials may be the most important fate of metals (arsenic and beryllium) in the soil at SI-43. These metals can be leached from soil and mobilized into groundwater when they are subjected to a low pH (less than 4) environment. The soil at SI-43 has pH values ranging from 6.5 to 11. Therefore, the potential for these metals to leach from the soil to groundwater is very low. Because the site is backfilled with clean soil, it is unlikely that soil with the metals will be transported by wind erosion or surface-water runoff.

4.3.4 Conclusions and Recommendations

Contaminated soil at SI-43 was excavated and disposed of at an appropriate landfill during the SI and the excavated site was backfilled with clean soil. After the contaminated soil was excavated, the risk levels of the confirmatory soil samples are considered minimal at this site. Therefore, ~~no further~~ the investigation of SI-43 is ~~recommended~~. completed.

After excavation of the contaminated soil, only PAHs remain at a depth of 36 to 42 inches below ground surface in a localized area of the drain line trench. The detected pesticide concentrations in all confirmation samples are less than the residential soil HBLs. All residual pesticide concentrations are also less than the residential soil PRGs except for 4,4'-DDD in one sample. This is slightly above the current residential soil PRG published by EPA in August 1994. The 4,4'-DDD concentration is below the PRG published by EPA in April 1993, when this investigation by excavation was completed.

The detected VOC and SOC in all confirmation samples are less than the residential soil PRGs except for some PAHs (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene) in one sample that exceeded the current residential soil PRGs. However, all VOC and SOC in all confirmation samples are below the residential soil HBLs.

Motor oil was detected at a maximum concentration of 200 mg/kg and TOG was detected at a maximum concentration of 1,100 mg/kg. In these ranges these chemicals do not appear to present a concern.

Sorption onto soil is the dominant fate of COPC at SI-43. It is very unlikely that the COPC will migrate into surface water, air, or groundwater (if present) due to the physical and chemical characteristics of the COPC and the site conditions.

Risk levels were reduced by excavating the soil containing elevated levels of metals, pesticides, and PAHs. The potential for COPC to migrate into the air and surface water was reduced to an insignificant level by backfilling the site with clean soil. Due to high molecular weight, low solubility, high soil/water partition coefficients, and clayey soils, the organic constituents are immobile and migration from soil to groundwater is unlikely. The investigation by excavation was successful and no further investigation of SI-43 is ~~recommended.~~ required.