UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

VIA UPS OVERNIGHT MAIL
AND EMAIL

AUG 27 2013

Mr. William Murray
Project Coordinator
URS Corporation
335 Commerce Drive, Suite 300
Fort Washington, PA 19034

Re: Effective Date of Central Chemical Site Administrative Settlement Agreement and Order on Consent for Remedial Design
Docket No. CERC-03-2013-0044

Dear Bill:

Pursuant to Section XXVII of the Administrative Settlement Agreement and Order on Consent for Remedial Design ("Settlement Agreement"), Docket No. CERC-03-2013-0044, I enclose a fully executed true and correct copy of said agreement. As provided in Section XXVII, Paragraph 111, the effective date of the Settlement Agreement is Friday, August 23, 2013.

Thank you in advance for providing copies of the Settlement Agreement to the Respondents' representatives.

Sincerely,

Robin E. Eiseman
Senior Assistant Regional Counsel
U.S. EPA Region III

Encl.

UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY
REGION III

IN THE MATTER OF:	:	
	:	
CENTRAL CHEMICAL SITE	:	
Hagerstown, Maryland	:	
	:	
ARKEMA, INC., et al.,	:	
	:	**Docket No.: CERC-03-2013-0044**
Respondents.	:	
	:	
Proceeding Under Sections 104, 106, 107	:	
and 122 of the Comprehensive	:	
Environmental Response, Compensation,	:	
and Liability Act, 42 U.S.C. §§ 9604, 9606,	:	
9607 and 9622.	:	

ADMINISTRATIVE SETTLEMENT AGREEMENT AND ORDER ON CONSENT FOR REMEDIAL DESIGN

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I. JURISDICTION AND GENERAL PROVISIONS

1. The Administrative Settlement Agreement and Order on Consent ("Settlement Agreement") is entered into voluntarily by the United States Environmental Protection Agency ("EPA") and those parties identified in Appendix A (collectively "Respondents"). This Settlement Agreement provides that Respondents shall undertake a Remedial Design ("RD"), including various procedures and technical analyses, and produce a detailed set of plans and specifications for implementation of the remedial action selected in EPA's September 30, 2009 Record of Decision for the Central Chemical Superfund Site ("Site"), Operable Unit No.1 ("OU-1") ("ROD"). The Site is located generally on Mitchell Avenue within the city limits of Hagerstown, Washington County, Maryland. In addition, Respondents shall pay the United States for certain response costs that it incurs, as provided in this Settlement Agreement.

2. This Settlement Agreement is issued under the authority vested in the President of the United States by Sections 104, 106, 107, and 122 of the Comprehensive Environmental Response, Compensation, and Liability Act, as amended ("CERCLA"), 42 U.S.C. §§ 9604, 9606, 9607, and 9622. This authority was delegated to the EPA Administrator by Executive Order 12580 (52 Fed. Reg. 2923, Jan. 29, 1987) and further delegated to EPA Regional Administrators by EPA Delegation No. 14-14-C. This authority was further re-delegated by the Regional Administrator of EPA Region III to the Director of the Hazardous Site Cleanup Division on April 27, 1999, by EPA Region III Delegation No. 14-14-C.

3. EPA and Respondents recognize that this Settlement Agreement has been negotiated in good faith and that the actions undertaken by Respondents in accordance with this Settlement Agreement do not constitute an admission of any liability. Respondents do not admit, and retain the right to controvert in any subsequent proceedings other than proceedings to implement or enforce this Settlement Agreement, the validity of the findings of fact, conclusions of law, and determinations in Sections IV and V of this Settlement Agreement. Respondents agree to comply with, and be bound by, the terms of this Settlement Agreement and further agree that they will not contest the basis or validity of this Settlement Agreement or its terms.

4. The objectives of EPA and Respondents in entering into this Settlement Agreement are to protect public health or welfare or the environment at the Site by the design of remedial action at the Site by Respondents, to pay certain response costs of EPA, and to resolve the claims of EPA against Respondents as provided in this Settlement Agreement.

5. In accordance with the National Oil and Hazardous Substances Pollution Contingency Plan, 40 C.F.R. Part 300 ("NCP") and Section 121(f)(1)(F) of CERCLA, 42 U.S.C. § 9621(f)(1)(F), EPA notified the State of Maryland (the "State") on June 16, 2008, of negotiations with potentially responsible parties regarding the implementation of the remedial design for the Site, and EPA has provided the State with an opportunity to participate in such negotiations.

6. In accordance with Section 122(j)(1) of CERCLA, 42 U.S.C. § 9622(j)(1), EPA notified the United States Department of the Interior, the Maryland Department of the Environment, and the Maryland Department of Natural Resources on August 20, 2008, of negotiations with potentially responsible parties regarding the release of hazardous substances that may have resulted in injury to the natural resources under federal trusteeship and encouraged the trustee(s) to participate in the negotiation of this Settlement Agreement.

II. PARTIES BOUND

7. This Settlement Agreement applies to and is binding upon EPA and upon Respondents and their heirs, successors, and assigns. Any change in ownership or corporate status of a Respondent including, but not limited to, any transfer of assets or real or personal property shall not alter such Respondent's responsibilities under this Settlement Agreement. The signatories to this Settlement Agreement certify that they are authorized to execute and legally bind the parties they represent.

8. EPA asserts that Respondents are jointly and severally liable for carrying out all activities required by this Settlement Agreement. In the event of the insolvency or other failure of any one or more Respondents to implement the requirements of this Settlement Agreement, the remaining Respondents shall complete all such requirements.

9. Respondents shall ensure that their contractors, subcontractors, and representatives receive a copy of this Settlement Agreement and comply with this Settlement Agreement. Respondents shall be responsible for any noncompliance with this Settlement Agreement. With regard to the activities undertaken pursuant to this Settlement Agreement, each contractor and subcontractor of Respondents shall be deemed to be in a contractual relationship with Respondents within the meaning of Section 107(b)(3) of CERCLA, 42 U.S.C. § 9607(b)(3).

III. DEFINITIONS

10. Unless otherwise expressly provided in this Settlement Agreement, terms used in this Settlement Agreement that are defined in CERCLA or in regulations promulgated under CERCLA shall have the meaning assigned to them in CERCLA or in such regulations. Whenever terms listed below are used in this Settlement Agreement or its attached appendices, the following definitions shall apply:

"Central Chemical Special Account" shall mean the special account, within the EPA Hazardous Substance Superfund, established for the Site by EPA pursuant to Section 122(b)(3) of CERCLA, 42 U.S.C. § 9622(b)(3), and the Administrative Order on Consent for Remedial Investigation/Feasibility Study, Docket No. 97-105-DC.

"CERCLA" shall mean the Comprehensive Environmental Response, Compensation, and Liability Act, as amended, 42 U.S.C. §§ 9601-9675.

"Day" or "day" shall mean a calendar day. In computing any period of time under this Settlement Agreement, where the last day would fall on a Saturday, Sunday, or federal or state holiday, this period shall run until the close of business of the next working day.

"DOJ" shall mean the United States Department of Justice and its successor departments, agencies, or instrumentalities.

"Effective Date" shall mean the effective date of this Settlement Agreement as provided in Section XXVII (Effective Date, Subsequent Modification and Termination).

"EPA" shall mean the United States Environmental Protection Agency and its successor departments, agencies, or instrumentalities.

"EPA Hazardous Substance Superfund" shall mean the Hazardous Substance Superfund established by the Internal Revenue Code, 26 U.S.C. § 9507.

"Interest" shall mean interest at the rate specified for interest on investments of the EPA Hazardous Substance Superfund established by 26 U.S.C. § 9507, compounded annually on October 1 of each year, in accordance with CERCLA § 107(a), 42 U.S.C. § 9607(a). The applicable rate of interest shall be the rate in effect at the time the interest accrues. The rate of interest is subject to change on October 1 of each year.[1]

"MDE" shall mean the Maryland Department of the Environment and any successor departments or agencies of the State.

"National Contingency Plan" or "NCP" shall mean the National Oil and Hazardous Substances Pollution Contingency Plan promulgated pursuant to Section 105 of CERCLA, 42 U.S.C. § 9605, codified at 40 C.F.R. Part 300, and any amendments thereto.

"Paragraph" shall mean a portion of this Settlement Agreement identified by an Arabic numeral or an upper or lower case letter.

"Parties" shall mean EPA and Respondents.

"Performance Standards" shall mean the cleanup standards and other measures of achievement of the goals of the remedial action, set forth in the ROD, and any modified standards established pursuant to this Settlement Agreement.

"Proprietary Controls" shall mean easements or covenants running with the land that (a) limit land, water, or resource use and/or provide access rights and (b) are created pursuant to common law or statutory law by an instrument that is recorded by the owner in the appropriate land records office.

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[1] The Superfund currently is invested in 52-week MK notes. The interest rate for these MK notes changes on October 1 of each year. Current and historical rates are available online at http://www.epa.gov/ocfopage/finstatement/superfund/int_rate.htm.

"RCRA" shall mean the Solid Waste Disposal Act, 42 U.S.C. §§ 6901-6992 (also known as the Resource Conservation and Recovery Act).

"Record of Decision" or "ROD" shall mean the EPA Record of Decision relating to Operable Unit 1 at the Site, signed on September 30, 2009, by the Director of the Hazardous Site Cleanup Division, EPA Region III, and all attachments thereto. The ROD is attached as Appendix B.

"Remedial Design" or "RD" shall mean those activities to be undertaken by Respondents to develop the final plans and specifications for the remedial action pursuant to the Remedial Design Work Plan.

"Remedial Design Oversight Response Costs" or "RD Oversight Response Costs" shall mean all costs, including, but not limited to, direct and indirect costs, that the United States incurs in reviewing or developing plans, reports, and other deliverables submitted pursuant to this Settlement Agreement, in overseeing implementation of the Work, or otherwise implementing, overseeing, or enforcing this Settlement Agreement, including, but not limited to, payroll costs, contractor costs, travel costs, laboratory costs, the costs incurred pursuant to Paragraph 46 (Emergency Response), Paragraph 53 (including, but not limited to, cost of attorney time and any monies paid to secure access, including, but not limited to, the amount of just compensation), Paragraph 91 (Work Takeover), community relation costs, and the costs incurred by the United States in enforcing the terms of this Settlement Agreement, including all costs incurred in connection with Dispute Resolution pursuant to Section XVI (Dispute Resolution) and all litigation costs. RD Oversight Response Costs shall also include Agency for Toxic Substances and Disease Registry ("ATSDR") costs regarding the Site.

"Remedial Design Work Plan" shall mean the document developed pursuant to Paragraph 37 (Work Plan and Implementation) and approved by EPA, and any modifications thereto.

"Respondents" shall mean those Parties identified in Appendix A.

"Section" shall mean a portion of this Settlement Agreement identified by a Roman numeral.

"Settlement Agreement" shall mean this Administrative Settlement Agreement and Order on Consent and all appendices attached hereto (listed in Section XXVI). In the event of conflict between this Settlement Agreement and any appendix, this Settlement Agreement shall control.

"Site" shall mean the Central Chemical Superfund Site, encompassing approximately 19 acres, located on Mitchell Avenue within the city limits of Hagerstown, Washington County, Maryland, and any areas where Site-related hazardous substances have come to be located. The Site is depicted generally on the map attached as Appendix C.

"State" shall mean the State of Maryland.

"United States" shall mean the United States of America and each department, agency, and instrumentality of the United States, including EPA.

"Waste Material" shall mean (1) any "hazardous substance" under Section 101(14) of CERCLA, 42 U.S.C. § 9601(14); (2) any pollutant or contaminant under Section 101(33) of CERCLA, 42 U.S.C. § 9601(33); (3) any "solid waste" under Section 1004(27) of RCRA, 42 U.S.C. § 6903(27); and (4) any "hazardous material" under Title 7 of the Maryland Environment Article.

"Work" shall mean all activities and obligations Respondents are required to perform under this Settlement Agreement, except those required by Section XIII (Record Retention).

IV. EPA FINDINGS OF FACT

11. Each of the Respondents is a corporation.

12. The Site consists of the Central Chemical property, a 19-acre parcel of land owned by the Central Chemical Corporation, located on Mitchell Avenue within the city limits of Hagerstown in Washington County, Maryland at 39° 39' 23" north latitude and 77° 43' 27" west longitude, and any areas where Site-related hazardous substances have come to be located. The Site is depicted generally on the map attached as Appendix C. Land use in the area is a mixture of residential, commercial and industrial-uses. The Central Chemical property is bordered on the south and east by Mitchell Avenue, beyond which lies "Maryland Metals," an industrial property; on the west by active railroad tracks, beyond which are commercial and residential properties; on the northwest by the Brighton Manor residential sub-division; and on the northeast by residential townhouses. An electrical substation, owned by the City of Hagerstown, is also located to the northeast of the Central Chemical property, beyond which lies a partially empty shopping center.

13. From the early 1930s until the mid-1960s, the chemical plant at the Site functioned as a blender of agricultural pesticides and fertilizers. An insecticide plant was located on the northern portion of the Site. A fertilizer plant was located on the southern portion of the Site. The pesticide blending operation included the use of raw pesticides manufactured at other locations, such as Dichlorodiphenyltrichloroethane (DDT), Sevin, Dichlorodiphenyldichloroethane (DDD), Daconil (fungicide), Guthion (an organophosphate pesticide), Aldrin, Dieldrin, Chlordane, Toxaphene, lead arsenate, and Omite (insecticide), which were blended with inert materials to produce commercial grade products using air and hammer mills and wetting agents. In 1965, the air mills at the plant were destroyed by fire. Much but not all pesticide production at the plant ceased at that time. Central Chemical Corporation continued its fertilizer operations at the plant until 1984. Waste materials from the manufacturing processes, including waste generated during the cleaning of the processing equipment, were disposed of onsite. The Central Chemical property is currently vacant, and is occupied by concrete slabs associated with former buildings.

14. Contaminated soils are present at the Site. Based on the results of the EPA-accepted risk assessment for the Site, the following contaminants of concern are present in soils on the Central Chemical property at the following maximum concentrations:

Compound	Maximum Concentration (ug/kg)	Mean Concentration (ug/kg)
2,4-DDT	1,900,000	551,551
2,4-DDD	1,900,000	43,165
4,4-DDT	85,000,000	1,391,867
4,4-DDD	3,900,000	138,062
Aldrin	3,100,000	340,118
alpha-Chlordane	120,000	9,242
Arsenic	1,080,000	39,980
Benzo(a)pyrene	3,800	572
alpha-BHC	730,000	56,642
beta-BHC	92,000	10,985
delta-BHC	170,000	22,966
gamma-BHC	640,000	47,601
Dieldrin	670,000	55,555
Heptachlor Epoxide	83,000	15,059
Heptachlor	130,000	27,906
gamma-Chlordane	120,000	9,697
Toxaphene	6,200,000	854,494

Contaminated waste materials (including powders) are also present in an on-Site former waste lagoon. The former waste lagoon is present in the northern portion of the Central Chemical property. The waste materials present in the former waste lagoon contain hazardous substances, including total DDX (summation of DDT isomers and breakdown products; 144,700 parts per million ("ppm")); and total BHC (summation of BHC isomers; 1,300 ppm).

15. The Site includes surface and subsurface soil contamination, the presence of a former waste lagoon, and a plume of ground water contamination which extends at least 2,700 feet to the southwest and 2,200 feet to the northeast of the Site. The former waste lagoon is believed by EPA to be the primary source of ground water contamination at the Site. Exposures to Site contamination include trespassers, and future workers at the Site. Also, wildlife are currently exposed to Site contamination.

16. Based on the EPA-accepted human health risk assessment, unacceptable risk to human health is associated with current trespassers, and future workers at the Site. Based on the EPA-accepted ecological risk assessment, exposure to soil contamination at the Site may pose a risk to wildlife inhabiting the Central Chemical property, including small birds and mammals (e.g. short-tailed shrew, American robin).

17. The hazardous substances found onsite include human and environmental toxins as well as known or suspected carcinogens and mutagens. They have been shown to cause a variety of adverse effects to exposed populations, including the following. Arsenic is a known human carcinogen implicated in skin cancer in humans. Benzo(a)pyrene is a probable human carcinogen that has been associated with lung and scrotal cancer. Aldrin is a probable human carcinogen that can cause birth defects, damage to the reproductive, system, liver toxicity, and central nervous system abnormalities and is highly toxic to aquatic organisms. DDT is a probable human carcinogen that accumulates in fatty tissue and damages the reproductive

system, central nervous system, and liver. It is also highly toxic to aquatic organisms, and is believed responsible for the decreased reproductive success of many bird species.

18. All Respondents have arranged for the disposal of hazardous substances at the Site. Central Chemical Corporation was the owner/operator of the Site during the time of disposal and is the current owner of the Site.

19. Pursuant to Section 105 of CERCLA, 42 U.S.C. § 9605, EPA placed the Site on the National Priorities List ("NPL"), set forth at 40 C.F.R. Part 300, Appendix B, by publication in the Federal Register on September 25, 1997, 62 Fed. Reg. 50442.

20. In response to a release or a substantial threat of a release of a hazardous substance(s) at or from the Site, EPA entered into an Administrative Order on Consent for Remedial Investigation/Feasibility Study, Docket No. 97-105-DC ("RI/FS AOC"), with a group of PRPs, including Allied Signal, Inc., FMC Corporation, Novartis Corporation, Olin Corporation, Shell Oil Company, Union Carbide Corporation, and Wilmington Securities, Inc., (collectively, "RI/FS Respondents") and commenced a Remedial Investigation and Feasibility Study ("RI/FS") for the Site in March 2003 pursuant to 40 C.F.R. § 300.430.

21. In cooperation with EPA and MDE, the RI/FS Respondents completed a Remedial Investigation ("RI") Report, dated December 20, 2006, and approved by EPA on February10, 2009. On April 1, 2009, the RI/FS Respondents completed a Feasibility Study ("FS") Report that was approved by EPA on April 22, 2009. In addition, the RI/FS Respondents have completed a removal action to address waste materials present on the ground surface, demolished the Site buildings, and established a Community Liaison Panel to provide information to the community regarding the Site and to receive feedback from community members.

22. Pursuant to Section 117 of CERCLA, 42 U.S.C. § 9617, EPA published notice of the completion of the FS and of the proposed plan for remedial action for OU-1 on April 15, 2009, in a major local newspaper of general circulation. EPA provided an opportunity for written and oral comments from the public on the proposed plan for remedial action. A copy of the transcript of the public meeting is available to the public as part of the administrative record upon which the Director of the Hazardous Cleanup Division, EPA Region III, based the selection of the response action for OU-1 at the Site.

23. The decision by EPA on the remedial action to be implemented at the Site is embodied in a final ROD for OU-1, executed on September 30, 2009, on which the State has given its concurrence. The ROD includes a responsiveness summary to the public comments. Notice of the final plan was published in accordance with Section 117(b) of CERCLA, 42 U.S.C. § 9617(b).

24. The RI/FS Respondents have been performing a treatability study and pre-Remedial Design Investigation ("pre-RDI") at the Site, as set forth in the ROD, but under the authority of the RI/FS AOC, to determine design parameters for the selected remedy.

V. EPA CONCLUSIONS OF LAW AND DETERMINATIONS

Based on the Findings of Fact set forth above, as well as the Administrative Record supporting this Settlement Agreement, EPA has determined that:

25. The Central Chemical Superfund Site is a "facility" as defined in Section 101(9) of CERCLA, 42 U.S.C. § 9601(9).

26. The contamination found at the Site, as identified in the Findings of Fact above, includes "hazardous substance(s)" as defined in Section 101(14) of CERCLA, 42 U.S.C. § 9601(14).

27. Each Respondent is a "person" as defined in Section 101(21) of CERCLA, 42 U.S.C. § 9601(21).

28. Each Respondent is a responsible party as defined in Section 107(a) of CERCLA, 42 U.S.C. § 9607(a), and is jointly and severally liable for performance of response actions and for response costs incurred and to be incurred at the Site.

29. The conditions described in the Findings of Fact above constitute an actual or threatened "release" of a hazardous substance from the facility as defined by Section 101(22) of CERCLA, 42 U.S.C. § 9601(22).

VI. SETTLEMENT AGREEMENT AND ORDER

30. Based upon the foregoing Findings of Fact, Conclusions of Law, Determinations, and the Administrative Record for this Site, it is hereby Ordered and Agreed that Respondents shall comply with all provisions of this Settlement Agreement, including, but not limited to, all attachments to this Settlement Agreement and all documents incorporated by reference into this Settlement Agreement.

VII. DESIGNATED PROJECT MANAGER AND COORDINATORS

31. Respondents shall select one or more contractor(s) to perform the Work and shall notify EPA of the name(s) and qualifications of such contractor(s) within thirty (30) days after the Effective Date. Respondents shall also notify EPA of the name(s) and qualification(s) of any other contractor(s) or subcontractor(s) selected to perform the Work at least ten (10) days prior to commencement of such Work. EPA retains the right to disapprove of any or all of the contractors and/or subcontractors selected by Respondents, after a reasonable opportunity for review and comment by the State. If EPA disapproves of a selected contractor, Respondents shall select a different contractor and shall notify EPA of that contractor's name and qualifications within thirty (30) days after EPA's disapproval. With respect to any contractor proposed to be Supervising Contractor, Respondents shall demonstrate that the proposed contractor has a quality system that complies with ANSI/ASQC E4-1994, "Specifications and

Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology Programs" (American National Standard, January 5, 1995), by submitting a copy of the proposed contractor's Quality Management Plan ("QMP"). The QMP should be prepared in accordance with "EPA Requirements for Quality Management Plans (QA/R-2)" (EPA/240/B-01/002, March 2001, reissued May 2006) or equivalent documentation as required by EPA. Any decision not to require submission of the contractor's QMP should be documented in a memorandum from the OSC and Regional Quality Assurance personnel to the Site file.

32. Respondents have designated, and EPA has not disapproved, the following individual as Project Coordinator, who shall be responsible for administration of all actions by Respondents required by this Settlement Agreement: William G. Murray, URS Corporation, 335 Commerce Drive, Fort Washington, PA 19034; 215-367-2460; william.g.murray@urs.com. To the greatest extent possible, the Project Coordinator or a designated and EPA-accepted representative shall be present on-Site or readily available during Site work. If EPA disapproves of the designated Project Coordinator, Respondents shall select a different Project Coordinator and shall notify EPA of that person's name, address, telephone number, and qualifications within twenty (20) days following EPA's disapproval. Receipt by Respondents' Project Coordinator of any notice or communication from EPA relating to this Settlement Agreement shall constitute receipt by all Respondents. Receipt by Respondents' Project Coordinator of any notice or communication from EPA relating to this Settlement Agreement shall constitute receipt by all Respondents.

33. EPA has designated Remedial Project Manager ("RPM") Mitch Cron of the EPA Region III, Hazardous Site Cleanup Division, as the EPA Project Coordinator. Except as otherwise provided in this Settlement Agreement, Respondents shall direct all submissions required by this Settlement Agreement to the EPA Project Coordinator at 1650 Arch Street (3HS22), Philadelphia, PA 19103.

34. The EPA Project Coordinator shall have the authority lawfully vested in a RPM and On-Scene Coordinator ("OSC") by the NCP. In addition, the EPA Project Coordinator shall have the authority, consistent with the NCP, to halt, conduct, or direct any Work required by this Settlement Agreement, or to take or direct any other necessary response action when the EPA Project Coordinator determines that conditions at the Site may present an immediate endangerment to public health, welfare, or the environment. Absence of the EPA Project Coordinator from the Site shall not be cause for stoppage or delay of Work unless specifically directed by the EPA Project Coordinator.

35. EPA and Respondents shall have the right, subject to Paragraph 32, to change their respective designated Project Coordinators. Respondents shall notify EPA at least five (5) working days before such a change is made. The initial notification may be made orally, but shall be promptly followed by a written notice.

VIII. WORK TO BE PERFORMED

36. Respondents shall complete the Remedial Design as set forth in paragraph 37 below.

37. Work Plan and Implementation.

a. Within ninety (90) days after approval of the Pre-remedial Design Investigation Report (including the Treatability Study) or within ninety (90) days of the Effective Date, whichever is sooner, Respondents shall submit to EPA and the State a work plan for the design of the remedial action as set forth in the ROD ("Remedial Design Work Plan"). The Remedial Design Work Plan shall provide for design of the remedy set forth in the ROD, and for achievement of the Performance Standards and other requirements set forth in the ROD and this Settlement Agreement, taking into account the results of the Pre-remedial Design Investigation. Upon its approval by EPA pursuant to Section IX (EPA Approval of Plans, Reports, and Other Deliverables), the Remedial Design Work Plan shall be incorporated into and become enforceable under this Settlement Agreement.

b. The Remedial Design Work Plan shall include plans, schedules, and methodologies for implementation of all remedial design and pre-design tasks, including, but not limited to, plans and schedules for the completion of:

(1) plans and schedules for the preparation and submission of a Preliminary Design Submittal containing, at a minimum:

(a) a preliminary Design Criteria Report, including:

i. project description;

ii. performance standard verification plan to define performance standards, points of compliance, measurement domains, and measurement parameters;

iii. design requirements and provisions;

iv. preliminary process flow diagrams;

v. general operation & maintenance requirements;

(b) a preliminary Basis of Design Report, including:

i. identification of design assumptions;

ii. identification of uncertainties that could affect achievement of performance standards;

iii. a project delivery strategy;

iv. remedial action plan for required permits; and

v. preliminary easement/access requirements.

(c) Preliminary Drawings and Specifications, including:

i. outline of general specifications and Construction Quality Assurance Plan ("CQAP");

ii. preliminary schematics and drawings; and

iii. chemical, geotechnical, and geologic data (including data from pre-design activities).

(d) a preliminary Remedial Design Contingency Plan;

(e) a preliminary Value Engineering Analysis;

(f) preliminary Remedial Action schedule;

(g) a preliminary Remedial Action contingency plan;

(h) an annotated outline of the Remedial Action Health and Safety Plan ("HASP");

(i) an annotated outline of the Remedial Action waste management plan;

(j) an annotated outline of the Remedial Action Sampling and Analysis Plan;

(l) a preliminary Remedial Action decontamination plan;

(m) a preliminary Operation & Maintenance Plan; and

(n) a preliminary project delivery strategy.

(2) plans and schedules for the preparation and submission of a draft-final design submittal which shall be submitted at approximately 90% of the design effort and shall address all of EPA's comments to the Preliminary Design Submittal, and, at a minimum, additionally include:

(a) a draft-final Design Criteria Report;

(b) a draft-final Basis of Design Report;

(c) a draft-final Drawings and Specifications

(d) a draft-final CQAP (the CQAP, which shall detail the approach to quality assurance during construction activities at the Site, shall specify a quality assurance official ("QA Official"), independent of the Supervising Contractor, to conduct a quality assurance program during the construction phase of the project);

(e) a draft-final Remedial Design Contingency Plan;

(f) a draft-final Value Engineering Analysis

(g) a draft-final Remedial Action schedule;

(h) a draft-final Remedial Action contingency plan;

(i) a draft-final Remedial Action HASP for EPA acceptance;

(j) a draft-final Remedial Action Waste Management Plan;

(k) a draft-final Remedial Action Sampling and Analysis Plan;

(l) a draft-final Remedial Action decontamination plan;

(m) a draft-final Operation & Maintenance Plan; and

(n) draft-final project delivery strategy.

(3) plans and schedules for the preparation and submission of a final design submittal which shall be submitted at 100% of the design effort and shall address all of EPA's comments to the draft-final design, and, at a minimum, additionally include:

(a) a final Design Criteria Report;

(b) a final Basis of Design Report;

(c) final Drawings and Specifications;

(d) a final CQAP;

(e) a final Remedial Design Contingency Plan;

(f) a final Value Engineering Analysis

(g) a final Remedial Action schedule;

(h) a final Remedial Action contingency plan;

(i) a final Remedial Action HASP for EPA acceptance;

(j) a final Remedial Action waste management plan;

(k) a final Remedial Action Sampling and Analysis Plan (directed at measuring progress towards meeting the Performance Standards);

(l) a final Remedial Action decontamination plan;

(m) a final Operation & Maintenance Plan; and

(n) a final project delivery strategy.

(4) a Remedial Design schedule.

c. Upon approval of the Remedial Design Work Plan by EPA pursuant to Section IX (EPA Approval of Plans, Reports, and Other Deliverables), after a reasonable opportunity for review and comment by the State, and submission of the Health and Safety Plan for all field activities to EPA and the State, Respondents shall implement the Remedial Design Work Plan. Respondents shall submit to EPA and the State all plans, reports, and other deliverables required under the approved Remedial Design Work Plan in accordance with the approved schedule for review and approval pursuant to Section IX (EPA Approval of Plans and Other Submissions). Unless otherwise directed by EPA, Respondents shall not commence further Remedial Design activities at the Site prior to approval of the Remedial Design Work Plan.

d. The preliminary design submittal shall include, at a minimum, the requirements outlined in Paragraph 37.b.(1)(a)–(n).

e. The draft-final/final design submittals shall include, at a minimum, the requirements outlined in Paragraph 37.b.(2)(a)–(n) and 37.b.(3)(a)–(n), respectively.

38. Health and Safety Plan. As part of the RI/FS, Respondents submitted, and EPA accepted, a HASP to ensure the protection of worker and public health and safety during performance of on-Site sampling activities. The HASP shall be incorporated into and enforceable under this Settlement Agreement. Respondents shall incorporate all changes to the plan recommended by EPA and shall continue to implement the plan during the pendency of the remedial design.

39. Respondents shall conduct all work in accordance with the ROD, CERCLA, the NCP, and all applicable EPA guidance.

40. Respondents shall perform the tasks and submit the deliverables set forth in this Settlement Agreement and the Remedial Design Work Plan. EPA will approve, approve with conditions, modify, or disapprove each deliverable that Respondents submit under this Settlement Agreement and the Remedial Design Work Plan, pursuant to Section IX (EPA Approval of Plans, Reports, and Other Deliverables). Each deliverable must include all listed

items as well as items that the Remedial Design Work Plan indicates Respondents shall prepare and submit to EPA for review and approval.

41. Upon EPA's approval, this Settlement Agreement incorporates any reports, plans, specifications, schedules, and attachments that this Settlement Agreement requires. With the exception of extensions that EPA allows in writing or certain provisions within Section XVII of this Settlement Agreement (Force Majeure), any non-compliance with such EPA-approved reports, plans, specifications, schedules, and attachments shall be considered a violation of this Settlement Agreement and will subject Respondents to stipulated penalties in accordance with Section XVIII of this Settlement Agreement (Stipulated Penalties).

42. If any unanticipated or changed circumstances exist at the Site that may significantly affect the Work or schedule, Respondents shall notify the EPA Project Coordinator by telephone within 24 hours of discovery of such circumstances. Such notification is in addition to any notification required by Section XVII (Force Majeure).

43. If EPA determines that additional tasks associated with the Pre-remedial Design Investigation and Remedial Design, including, but not limited to, additional investigatory work or engineering evaluation, are necessary to complete the Work, EPA shall notify Respondents in writing. Respondents shall submit a work plan to EPA for the completion of such additional tasks within forty-five (45) days after receipt of such notice, or such longer time as EPA agrees. The work plan shall be completed in accordance with the same standards, specifications, and requirements of other deliverables pursuant to this Settlement Agreement. EPA will review and comment on, as well as approve, approve with conditions, modify, or disapprove the work plan pursuant to Section IX (EPA Approval of Plans and Other Submissions). Upon approval or approval with modifications of the work plan, Respondents shall implement the additional work in accordance with the schedule of the approved work plan. Failure to comply with this Paragraph, including, but not limited to, failure to submit a satisfactory work plan, shall subject Respondents to stipulated penalties as set forth in Section XVIII (Stipulated Penalties).

44. Quality Assurance and Sampling.

a. Respondents shall use quality assurance, quality control, and other technical activities and chain of custody procedures for all design, compliance, and monitoring samples in accordance with "EPA Requirements for Quality Assurance Project Plans (QA/R5)" (EPA/240/B-01/003, March 2001, reissued May 2006), "Guidance for Quality Assurance Project Plans (QA/G-5)" (EPA/240/R-02/009, December 2002), and subsequent amendments to such guidelines upon notification by EPA to Respondents of such amendment. Amended guidelines shall apply only to procedures conducted after such notification.

b. Prior to the commencement of any sampling project under this Settlement Agreement, Respondents shall submit to EPA for approval, after a reasonable opportunity for review and comment by the State, a Quality Assurance Project Plan ("QAPP") for the Work that is consistent with the NCP, and the guidance documents cited above. If relevant to the proceeding, the Parties agree that validated sampling data generated in accordance with the QAPP(s) and reviewed and approved by EPA shall be admissible as evidence, without objection,

in any proceeding under this Settlement Agreement. Respondents shall ensure that EPA and State personnel and their authorized representatives are allowed access at reasonable times to all laboratories utilized by Respondents in implementing this Settlement Agreement. In addition, Respondents shall ensure that such laboratories shall analyze all samples submitted by EPA pursuant to the QAPP for quality assurance monitoring. Respondents shall ensure that the laboratories they utilize for the analysis of samples taken pursuant to this Settlement Agreement perform all analyses according to accepted EPA methods. Accepted EPA methods consist of those methods that are documented in the "USEPA Contract Laboratory Program Statement of Work for Inorganic Analysis, ILM05.4," and the "USEPA Contract Laboratory Program Statement of Work for Organic Analysis, SOM01.2," and any amendments made thereto during the course of the implementation of this Settlement Agreement; however, upon approval by EPA, after a reasonable opportunity for review and comment by the State, Respondents may use other analytical methods that are as stringent as or more stringent than the CLP-approved methods. Respondents shall ensure that all laboratories they use for analysis of samples taken pursuant to this Settlement Agreement participate in an EPA or EPA-equivalent quality assurance/quality control ("QA/QC") program. Respondents shall use only laboratories that have a documented Quality System that complies with ANSI/ASQC E4-1994, "Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology Programs" (American National Standard, January 5, 1995), and "EPA Requirements for Quality Management Plans (QA/R-2)" (EPA/240/B-01/002, March 2001, reissued May 2006) or equivalent documentation as determined by EPA. EPA may consider laboratories accredited under the National Environmental Laboratory Accreditation Program ("NELAP") as meeting the Quality System requirements. Respondents shall ensure that all field methodologies utilized in collecting samples for subsequent analysis pursuant to this Settlement Agreement are conducted in accordance with the procedures set forth in the QAPP approved by EPA.

c. Upon request, Respondents shall allow split or duplicate samples to be taken by EPA and the State or its authorized representatives. Respondents shall notify EPA and the State not less than twenty-eight (28) days in advance of any sample collection activity unless shorter notice is agreed to by EPA. In addition, EPA and the State shall have the right to take any additional samples that EPA or the State deem necessary. Upon request, EPA and the State shall allow Respondents to take split or duplicate samples of any samples they take as part of EPA's oversight of Respondents' implementation of the Work.

d. Respondents shall submit to EPA and the State, in the next monthly progress report as described in Paragraph 51.a, copies of the results of all sampling and/or tests or other data obtained or generated by or on behalf of Respondents with respect to the Site and/or the implementation of this Settlement Agreement unless EPA agrees otherwise.

e. Notwithstanding any provision of this Settlement Agreement, the United States and the State retain all of their information gathering and inspection authorities and rights, including enforcement actions related thereto, under CERCLA, RCRA, and any other applicable statutes or regulations.

45. Community Involvement Plan. EPA will prepare a community involvement plan, in accordance with EPA guidance and the NCP. As requested by EPA, Respondents shall

provide information supporting EPA's community involvement plan and shall participate in the preparation of such information for dissemination to the public and in public meetings that may be held or sponsored by EPA to explain activities at, or concerning, the Site.

46. Emergency Response and Notification of Releases.

a. In the event of any action or occurrence during performance of the Work that causes or threatens a release of Waste Material from the Site that constitutes an emergency situation or may present an immediate threat to public health or welfare or the environment, Respondents shall immediately take all appropriate action to prevent, abate, or minimize such release or threat of release and shall immediately notify the EPA Project Coordinator, or, in the event of his/her unavailability, Respondents shall notify the EPA Region III Hotline at (215) 814-3255. Respondents shall take such actions in consultation with the EPA Project Coordinator, or other available authorized EPA officer, and in accordance with all applicable provisions of this Settlement Agreement, including, but not limited to, the Health and Safety Plans, the Contingency Plans, and any other applicable plans or documents developed pursuant to this Settlement Agreement. In the event that Respondents fail to take appropriate response action as required by this Paragraph, and EPA takes such action instead, Respondents shall reimburse EPA all costs of the response action not inconsistent with the NCP pursuant to Section XV (Payment of Response Costs).

b. In addition, in the event of any release of a hazardous substance from the Site, Respondents shall immediately notify the Project Coordinator at (215) 814-3255 and the National Response Center at (800) 424-8802. Respondents shall submit a written report to EPA within 7 days after each release, setting forth the events that occurred and the measures taken, or to be taken, to mitigate any release or endangerment caused or threatened by the release and to prevent the reoccurrence of such a release. This reporting requirement is in addition to, and not in lieu of, reporting under Section 103(c) of CERCLA, 42 U.S.C. § 9603(c), and Section 304 of the Emergency Planning and Community Right-To-Know Act of 1986, 42 U.S.C. § 11004, et seq.

IX. EPA APPROVAL OF PLANS, REPORTS AND OTHER DELIVERABLES

47. Initial Submissions.

a. After review of any plan, report, or other deliverable that is required to be submitted for approval pursuant to this Settlement Agreement, EPA, after reasonable opportunity for review and comment by the State, shall: (1) approve, in whole or in part, the submission; (2) approve the submission upon specified conditions; (3) disapprove, in whole or in part, the submission; or (4) any combination of the foregoing.

b. EPA also may modify the initial submission to cure deficiencies in the submission if: (1) EPA determines that disapproving the submission and awaiting a resubmission would cause substantial disruption to the Work; or (2) previous submission(s) have been disapproved due to material defects and the deficiencies in the initial submission under

consideration indicate a bad faith lack of effort to submit an acceptable plan, report, or deliverable.

48. Resubmissions. Upon receipt of a notice of disapproval under Paragraph 47.a(3) or (4), or if required by a notice of approval upon specified conditions under Paragraph 47.a(2), Respondents shall, within thirty (30) days or such longer time as specified by EPA in such notice, correct the deficiencies and resubmit the plan, report, or other deliverable for approval. After review of the resubmitted plan, report, or other deliverable, EPA may: (a) approve, in whole or in part, the resubmission; (b) approve the resubmission upon specified conditions; (c) modify the resubmission; (d) disapprove, in whole or in part, the resubmission, requiring Respondents to correct the deficiencies; or (e) any combination of the foregoing.

49. Material Defects. If an initially submitted or resubmitted plan, report, or other deliverable contains a material defect, and the plan, report, or other deliverable is disapproved or modified by EPA under Paragraph 47.b(2) or 48 due to such material defect, then the material defect shall constitute a lack of compliance for purposes of Paragraph 78. The provisions of Section XVI (Dispute Resolution) and Section XVIII (Stipulated Penalties) shall govern the accrual and payment of any stipulated penalties regarding Respondents' submissions under this Section.

50. Implementation. Upon approval, approval upon conditions, or modification by EPA under Paragraph 47 (Initial Submissions) or Paragraph 48 (Resubmissions), of any plan, report, or other deliverable, or any portion thereof: (a) such plan, report, or other deliverable, or portion thereof, shall be incorporated into and enforceable under this Settlement Agreement; and (b) Respondents shall take any action required by such plan, report, or other deliverable, or portion thereof, subject only to their right to invoke the Dispute Resolution procedures set forth in Section XVI (Dispute Resolution) with respect to the modifications or conditions made by EPA. The implementation of any non-deficient portion of a plan, report, or other deliverable submitted or resubmitted under Paragraph 47 or 48 shall not relieve Respondents of any liability for stipulated penalties under Section XVIII (Stipulated Penalties).

X. REPORTING REQUIREMENTS

51. Reporting.

a. In addition to any other requirement of this Settlement Agreement, Respondents shall submit electronically to EPA a monthly progress report that: (a) describe the actions that have been taken toward achieving compliance with this Settlement Agreement during the previous [month]; (b) include a summary of all results of sampling and tests and all other data received or generated by Respondents or their contractors or agents in the previous month; (c) identify all plans, reports, and other deliverables required by this Settlement Agreement completed and submitted during the previous month; (d) describe all actions, including, but not limited to, data collection and implementation of work plans, that are scheduled for the next six weeks and provide other information relating to the progress of construction, including, but not limited to, critical path diagrams, Gantt charts and Pert charts; (e) include information regarding percentage of completion, unresolved delays encountered or

anticipated that may affect the future schedule for implementation of the Work, and a description of efforts made to mitigate those delays or anticipated delays; and (f) include any modifications to the work plans or other schedules that Respondents have proposed to EPA or that have been approved by EPA. Respondents shall submit these progress reports to EPA by the tenth day of every month following the Effective Date until EPA notifies Respondents pursuant to Paragraph 115 of Section XXVIII (Notice of Completion of Work). If requested by EPA, Respondents shall also provide briefings for EPA to discuss the progress of the Work.

b. Respondents shall submit electronically all plans, reports, or other deliverables required by this Settlement Agreement, or any approved work plan. Upon request by EPA, Respondents shall submit such documents in hard copy form. All data evidencing Site conditions shall be submitted to EPA in electronic form.

52. Final Report. Within sixty (60) days after completion of all Work required by this Settlement Agreement, Respondents shall submit for EPA review and approval a final report summarizing the actions taken to comply with this Settlement Agreement. The final report shall conform, at a minimum, with the requirements set forth in Section 300.165 of the NCP entitled "OSC Reports." The final report shall include the following certification signed by a responsible corporate official of a Respondent or Respondents' Project Coordinator:

> I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

XI. SITE ACCESS

53. If any Respondent owns or controls the Site, or any other property where access is needed to implement this Settlement Agreement, such Respondent shall, commencing on the Effective Date, provide EPA, the State, and its/their representatives, including contractors, with access at all reasonable times to the Site, or such other property, to conduct any activity related to this Settlement Agreement. Respondents who own or control property at the Site shall, at least 30 days prior to the conveyance of any interest in real property at the Site, give written notice to the transferee that the property is subject to this Settlement Agreement and written notice to EPA and the State of the proposed conveyance, including the name and address of the transferee. Respondents who own or control property at the Site also agree to require that their successors comply with the immediately preceding sentence, this Section, and Section XII (Access to Information).

54. Where any action under this Settlement Agreement is to be performed in areas owned by, or in possession of, someone other than Respondents, Respondents shall use their best efforts to obtain all necessary access agreements within thirty (30) days after the Effective Date,

or as otherwise specified in writing by the Project Coordinator. Respondents shall within five (5) days notify EPA if, after using their best efforts, they are unable to obtain such agreements. For purposes of this Paragraph, "best efforts" includes the payment of reasonable sums of money in consideration of access. Respondents shall describe in writing their efforts to obtain access. EPA may then assist Respondents in gaining access, to the extent necessary to effectuate the response actions described in this Settlement Agreement, using such means as EPA deems appropriate. Respondents shall reimburse EPA for all costs and attorney's fees incurred by the United States in obtaining such access, in accordance with the procedures in Section XV (Payment of Response Costs).

55. Notwithstanding any provision of this Settlement Agreement, EPA and the State retain all of their access authorities and rights, including enforcement authorities related thereto, under CERCLA, RCRA, and any other applicable statutes or regulations.

56. If Respondents cannot obtain access agreements, EPA may obtain access for Respondents, perform those tasks or activities with EPA contractors, or terminate the Settlement Agreement. If EPA performs those tasks or activities with EPA contractors and does not terminate the Settlement Agreement, Respondents shall perform all other activities not requiring access to that site and shall reimburse EPA for all costs incurred in performing such activities. Respondents shall integrate the results of any such tasks undertaken by EPA into its reports and deliverables.

XII. ACCESS TO INFORMATION

57. Respondents shall make available to EPA and the State, upon request, copies of all records, reports, documents and other information consistent with Paragraph 61 below (including records, reports, documents and other information in electronic form) (hereinafter referred to as "Records") within their possession or control or that of their contractors or agents relating to activities at the Site or to the implementation of this Settlement Agreement, including, but not limited to, sampling, analysis, chain of custody records, manifests, trucking logs, receipts, reports, sample traffic routing, correspondence, or other documents or information related to the Work. Respondents shall also make available to EPA and the State, for purposes of investigation, information gathering, or testimony, their employees, agents, or representatives with knowledge of relevant facts concerning the performance of the Work.

58. Respondents may assert business confidentiality claims covering part or all of the documents or information submitted to EPA and the State under this Settlement Agreement to the extent permitted by and in accordance with Section 104(e)(7) of CERCLA, 42 U.S.C. § 9604(e)(7), and 40 C.F.R. § 2.203(b). Records determined to be confidential by EPA will be afforded the protection specified in 40 C.F.R. Part 2, Subpart B. If no claim of confidentiality accompanies Records when they are submitted to EPA and the State, or if EPA has notified Respondents that the Records are not confidential under the standards of Section 104(e)(7) of CERCLA or 40 C.F.R. Part 2, Subpart B, the public may be given access to such Records without further notice to Respondents. Respondents shall segregate and clearly identify all Records submitted under this Settlement Agreement for which Respondents assert business confidentiality claims.

59. Respondents may assert that certain Records are privileged under the attorney-client privilege or any other privilege recognized by federal law. If Respondents assert such a privilege in lieu of providing Records, they shall provide EPA and the State with the following: (a) the title of the Record; (b) the date of the Record; (c) the name, title, affiliation (e.g., company or firm), and address of the author of the Record; (d) the name and title of each addressee and recipient; (e) a description of the contents of the Record; and (f) the privilege asserted by Respondents. If a claim of privilege applies only to a portion of a Record, the Record shall be provided to EPA in redacted form to mask the privileged portion only. Respondents shall retain all Records that they claim to be privileged until EPA has had a reasonable opportunity to challenge the privilege claim and any such challenge has been resolved in Respondents' favor. However, no Records created or generated pursuant to the requirements of this Settlement Agreement shall be withheld on the grounds that they are privileged or confidential.

60. No claim of confidentiality shall be made with respect to any data, including, but not limited to, all sampling, analytical, monitoring, hydrogeologic, scientific, chemical, or engineering data, or any other documents or information evidencing conditions at, or around, the Site.

XIII. RECORD RETENTION

61. During the pendency of this Settlement Agreement and for a minimum of 10 years after the Respondents' receipt of EPA's notification pursuant to Section XXVIII (Notice of Completion of Work), each Respondent shall preserve and retain all non-identical copies of Records (including Records in electronic form) now in its possession or control or that come into its possession or control that relate in any manner to the liability of any person under CERCLA with respect to the Site. Each Respondent must also retain, and instruct its contractors and agents to preserve, for the same period of time specified above, all non-identical copies of the last draft or final version of any Records (including Records in electronic form) now in its possession or control or that come into its possession or control that relate in any manner to the performance of the Work, provided, however, that each Respondent (and its contractor and agents) must retain, in addition, copies of all data generated during performance of the Work and not contained in the aforementioned Records to be retained. Each of the above record retention requirements shall apply regardless of any corporate retention policy to the contrary.

62. At the conclusion of this document retention period, Respondents shall notify EPA and the State at least 90 days prior to the destruction of any such Records and, upon request by EPA or the State, Respondents shall make available any such Records to EPA or the State. Respondents may assert that certain Records are privileged under the attorney-client privilege or any other privilege recognized by federal law. If Respondents assert such a privilege, they shall provide EPA or the State with the following: (a) the title of the Record; (b) the date of the Record; (c) the name, title, affiliation (e.g., company or firm) of the author of the Record; (d) the name and title of each addressee and recipient; (e) a description of the subject of the Record; and (f) the privilege asserted by Respondents. If a claim of privilege applies only to a portion of a Record, the Record shall be provided to EPA in redacted form to mask the privileged portion

only. Respondents shall retain all Records that they claim to be privileged until EPA has had a reasonable opportunity to challenge the privilege claim and any such challenge has been resolved in Respondents' favor. However, no Records created or generated pursuant to the requirements of this Settlement Agreement shall be withheld on the grounds that they are privileged or confidential.

63. Each Respondent certifies individually that to the best of its knowledge and belief, after thorough inquiry, it has not altered, mutilated, discarded, destroyed, or otherwise disposed of any Records (other than identical copies) relating to its potential liability regarding the Site since the earlier of notification of potential liability by EPA or the State or the filing of suit against it regarding the Site, and that it has fully complied with any and all EPA and State requests for information regarding the Site pursuant to Sections 104(e) and 122(e) of CERCLA, 42 U.S.C. §§ 9604(e) and 9622(e), and Section 3007 of RCRA, 42 U.S.C. § 6927, and state law.

XIV. COMPLIANCE WITH OTHER LAWS

64. Respondents shall undertake all action that this Settlement Agreement requires in accordance with the requirements of all applicable state and federal laws and regulations, unless an exemption from such requirements is specifically provided by law or in this Settlement Agreement. The activities conducted pursuant to this Settlement Agreement, if approved by EPA, shall be considered consistent with the NCP.

65. Except as provided in Section 121(e) of CERCLA, 42 U.S.C. § 9621(e), and the NCP, no permit shall be required for any portion of the Work conducted entirely on-site. Where any portion of the Work requires a federal or state permit or approval, Respondents shall submit timely applications and take all other actions necessary to obtain and to comply with all such permits or approvals.

66. This Settlement Agreement is not, and shall not be construed to be, a permit issued pursuant to any federal or state statute or regulation.

XV. PAYMENT OF REMEDIAL DESIGN OVERSIGHT RESPONSE COSTS

67. Payment for Remedial Design Oversight Response Costs:

a. Respondents shall pay EPA all RD Oversight Response Costs not inconsistent with the NCP. On a periodic basis, EPA will send Respondents a bill requiring payment that includes a cost summary, which includes direct and indirect costs incurred by EPA, its contractors, and DOJ. Respondents shall make all payments within thirty (30) days after receipt of each bill requiring payment, except as otherwise provided in Paragraph 69.

b. Respondents shall make all payments required by this Paragraph to EPA by Fedwire Electronic Funds Transfer ("EFT") to:

Federal Reserve Bank of New York
ABA = 021030004
Account = 68010727
SWIFT address = FRNYUS33
33 Liberty Street
New York, NY 10045
Field Tag 4200 of the Fedwire message should read "D 68010727 Environmental Protection Agency"

and shall reference Site/Spill ID Number 03EQ and the EPA docket number for this action.

c. At the time of payment, Respondents shall send notice that payment has been made to EPA's Project Coordinator, in accordance with Paragraph 33, and to the EPA Cincinnati Finance Office by email at acctsreceivable.cinwd@epa.gov, or by mail at 26 Martin Luther King Drive, Cincinnati, Ohio 45268, and to the Docket Clerk (3RC00), United States Environmental Protection Agency, Region III, 1650 Arch Street, Philadelphia, Pennsylvania 19103. Such notice shall reference Site/Spill ID Number 03EQ and the EPA docket number for this action.

d. The total amount to be paid by Respondents pursuant to Paragraph 67 shall be deposited by EPA in the Central Chemical Special Account to be retained and used to conduct or finance response actions at or in connection with the Site, or to be transferred by EPA to the EPA Hazardous Substance Superfund, provided, however, that EPA may deposit a RD Oversight Response Costs payment directly into the EPA Hazardous Substance Superfund if, at the time the payment is received, EPA estimates that the Central Chemical Special Account balance is sufficient to address all anticipated future response actions to be conducted or financed by EPA at or in connection with the Site. Any decision by EPA to deposit a RD Oversight Response Costs payment directly into the EPA Hazardous Substance Superfund for this reason shall not be subject to challenge by Respondents pursuant to the dispute resolution provisions of this Settlement Agreement or in any other forum.

68. Interest. In the event that the payments for RD Oversight Response Costs are not made within thirty (30) days after Respondents' receipt of a bill, Respondents shall pay Interest on the unpaid balance. The Interest on RD Oversight Response Costs shall begin to accrue on the date of the bill and shall continue to accrue until the date of payment. Payments of Interest made under this Paragraph shall be in addition to such other remedies or sanctions available to the United States by virtue of Respondents' failure to make timely payments under this Section, including but not limited to, payment of stipulated penalties pursuant to Section XVIII (Stipulated Penalties).

69. Respondents may contest payment of any RD Oversight Response Costs billed under Paragraph 67 if they determine that EPA has made a mathematical error or included a cost item that is not within the definition of RD Oversight Response Costs, or if they believe EPA incurred excess costs as a direct result of an EPA action that was inconsistent with a specific provision or provisions of the NCP. Such objection shall be made in writing within thirty (30) days after receipt of the bill and must be sent to the EPA Project Coordinator. Any such

objection shall specifically identify the contested RD Oversight Response Costs and the basis for objection. In the event of an objection, Respondents shall within the 30-day period pay all uncontested RD Oversight Response Costs to EPA in the manner described in Paragraph 67. Simultaneously, Respondents shall establish, in a duly chartered bank or trust company, an interest-bearing escrow account that is insured by the Federal Deposit Insurance Corporation ("FDIC"), and remit to that escrow account funds equivalent to the amount of the contested RD Oversight Response Costs. Respondents shall send to the EPA Project Coordinator a copy of the transmittal letter and check paying the uncontested RD Oversight Response Costs, and a copy of the correspondence that establishes and funds the escrow account, including, but not limited to, information containing the identity of the bank and bank account under which the escrow account is established as well as a bank statement showing the initial balance of the escrow account. Simultaneously with establishment of the escrow account, Respondents shall initiate the Dispute Resolution procedures in Section XVI (Dispute Resolution). If EPA prevails in the dispute, within five (5) days after the resolution of the dispute, Respondents shall pay the sums due (with accrued interest) to EPA in the manner described in Paragraph 67. If Respondents prevail concerning any aspect of the contested costs, Respondents shall pay that portion of the costs (plus associated accrued interest) for which they did not prevail to EPA in the manner described in Paragraph 67. Respondents shall be disbursed any balance of the escrow account. The dispute resolution procedures set forth in this Paragraph in conjunction with the procedures set forth in Section XVI (Dispute Resolution) shall be the exclusive mechanisms for resolving disputes regarding Respondents' obligation to reimburse EPA for its RD Oversight Response Costs.

XVI. DISPUTE RESOLUTION

70. Unless otherwise expressly provided for in this Settlement Agreement, the dispute resolution procedures of this Section shall be the exclusive mechanism for resolving disputes arising under this Settlement Agreement. The Parties shall attempt to resolve any disagreements concerning this Settlement Agreement expeditiously and informally.

71. If Respondents object to any EPA action taken pursuant to this Settlement Agreement, including billings for RD Oversight Response Costs, they shall notify EPA in writing of their objection(s) within fourteen (14) days after such action, unless the objection(s) has/have been resolved informally. EPA and Respondents shall have thirty (30) days from EPA's receipt of Respondents' written objection(s) to resolve the dispute through formal negotiations (the "Negotiation Period"). The Negotiation Period may be extended at the sole discretion of EPA.

72. Any agreement reached by the parties pursuant to this Section shall be in writing and shall, upon signature by both parties, be incorporated into and become an enforceable part of this Settlement Agreement. If the Parties are unable to reach an agreement within the Negotiation Period, the position advanced by EPA shall prevail unless within fifteen (15) business days after the conclusion of the Negotiation Period, Respondents shall serve on EPA a written Statement of Position. The Statement of Position shall include, but not necessarily be limited to, any data, analysis, or opinion supporting Respondents' position and any supporting documentation. Within fifteen (15) business days after receipt of Respondents' Statement of

Position, EPA shall serve its Statement of Position upon Respondents, which shall include, but not necessarily be limited to, any data, analysis, or opinion supporting EPA's position and any supporting documentation. Within thirty (30) days after receipt of EPA's Statement of Position, an EPA management official at the level of Associate Director, Office of Superfund Site Remediation, Hazardous Site Cleanup Division or higher will issue a written decision on the dispute to Respondents. EPA's decision shall be incorporated into and become an enforceable part of this Settlement Agreement. Following resolution of the dispute, as provided by this Section, Respondents shall fulfill the requirement that was the subject of the dispute in accordance with the agreement reached or with EPA's decision, whichever occurs.

73. The invocation of formal dispute resolution procedures under this Section shall not extend, postpone, or affect in any way any obligation of Respondents under this Settlement Agreement, not directly in dispute, unless EPA states otherwise in writing. Stipulated penalties with respect to the disputed matter shall continue to accrue but payment shall be stayed pending resolution of the dispute as provided in Paragraph 82. Notwithstanding the stay of payment, stipulated penalties shall accrue from the first day of noncompliance with any applicable provision of this Settlement Agreement. In the event that Respondents do not prevail on the disputed issue, stipulated penalties shall be assessed and paid as provided in Section XVIII (Stipulated Penalties).

XVII. FORCE MAJEURE

74. "Force majeure," for purposes of this Settlement Agreement, is defined as any event arising from causes beyond the control of Respondents, or any entity controlled by Respondents, or of Respondents' contractors that delays or prevents the performance of any obligation under this Settlement Agreement despite Respondents' best efforts to fulfill the obligation. The requirement that Respondents exercise "best efforts to fulfill the obligation" includes using best efforts to anticipate any potential force majeure and best efforts to address the effects of any potential force majeure (a) as it is occurring and (b) following the potential force majeure such that the delay and any adverse effects of the delay are minimized to the greatest extent possible. "Force majeure" does not include financial inability to complete the Work or increased cost of performance.

75. If any event occurs or has occurred that may delay the performance of any obligation under this Settlement Agreement for which Respondents intend or may intend to assert a claim of force majeure, Respondents shall notify the EPA Project Coordinator orally or, in his or her absence, EPA's Alternate Project Coordinator or, in the event both of EPA's designated representatives are unavailable, the Director of the EPA Region III Hazardous Site Cleanup Division, within forty-eight (48) hours of when Respondents first knew that the event might cause a delay. Within five (5) days thereafter, Respondents shall provide in writing to EPA an explanation and description of the reasons for the delay; the anticipated duration of the delay; all actions taken or to be taken to prevent or minimize the delay; a schedule for implementation of any measures to be taken to prevent or mitigate the delay or the effect of the delay; Respondents' rationale for attributing such delay to a force majeure; and a statement as to whether, in the opinion of Respondents, such event may cause or contribute to an endangerment to public health or welfare, or the environment. Respondents shall include with any notice all

available documentation supporting their claim that the delay was attributable to a force majeure. Respondents shall be deemed to know of any circumstance of which Respondents, any entity controlled by Respondents, or Respondents' contractors knew or should have known. Failure to comply with the above requirements regarding an event shall preclude Respondents from asserting any claim of force majeure regarding that event, provided, however, that if EPA, despite the late notice, is able to assess to its satisfaction whether the event is a force majeure under Paragraph 74 and whether Respondents have exercised their best efforts under Paragraph 74, EPA may, in its unreviewable discretion, excuse in writing Respondents' failure to submit timely notices under this Paragraph.

76. If EPA agrees that the delay or anticipated delay is attributable to a force majeure, the time for performance of the obligations under this Settlement Agreement that are affected by the force majeure will be extended by EPA for such time as is necessary to complete those obligations. An extension of the time for performance of the obligations affected by the force majeure shall not, of itself, extend the time for performance of any other obligation. If EPA does not agree that the delay or anticipated delay has been or will be caused by a force majeure, EPA will notify Respondents in writing of its decision. If EPA agrees that the delay is attributable to a force majeure, EPA will notify Respondents in writing of the length of the extension, if any, for performance of the obligations affected by the force majeure.

77. If Respondents elect to invoke the dispute resolution procedures set forth in Section XVI (Dispute Resolution), they shall do so no later than 15 days after receipt of EPA's notice. In any such proceeding, Respondents shall have the burden of demonstrating by a preponderance of the evidence that the delay or anticipated delay has been or will be caused by a force majeure, that the duration of the delay or the extension sought was or will be warranted under the circumstances, that best efforts were exercised to avoid and mitigate the effects of the delay, and that Respondents complied with the requirements of Paragraphs 74 and 75. If Respondents carry this burden, the delay at issue shall be deemed not to be a violation by Respondents of the affected obligation of this Settlement Agreement identified to EPA.

XVIII. STIPULATED PENALTIES

78. Respondents shall be liable to EPA for stipulated penalties in the amounts set forth in Paragraphs 79 and 80 for failure to comply with the requirements of this Settlement Agreement specified below, unless excused under Section XVII (Force Majeure). "Compliance" by Respondents shall include completion of the all payments and activities under this Settlement Agreement, or any plan, report, or other deliverable approved under this Settlement Agreement, in accordance with all applicable requirements of law, this Settlement Agreement, and any plans, reports, or other deliverables approved by EPA pursuant to this Settlement Agreement and within the specified time schedules established by, and approved under, this Settlement Agreement.

79. Stipulated Penalty Amounts - Work (Including Payments and Excluding Plans, Reports, and Other Deliverables).

a. The following stipulated penalties shall accrue per violation per day for any noncompliance identified in Paragraph 79.b:

Penalty Per Violation Per Day	***Period of Noncompliance***
$ 1,000.00	1st through 14th day
$2,000.00	15th through 30th day
$3,000.00	31st day and beyond

b. Failure to comply with requirements of Section VII (Work to be Performed), Section IX (Approval of Plans), and Section XV (Payment of Response Costs).

80. Stipulated Penalty Amounts - Plans, Reports, and Other Deliverables.

a. The following stipulated penalties shall accrue per violation per day for failure to submit timely or adequate reports or other plans or deliverables pursuant to the Settlement Agreement:

Penalty Per Violation Per Day	***Period of Noncompliance***
$ 750.00	1st through 14th day
$1,500.00	15th through 30th day
$3,000.00	31st day and beyond

81. In the event that EPA assumes performance of all or any portion(s) of the Work pursuant to Paragraph 91 (Work Takeover), Respondents shall be liable for a stipulated penalty in the amount of $150,000.

82. All penalties shall begin to accrue on the day after the complete performance is due, or the day a violation occurs and shall continue to accrue through the final day of the correction of the noncompliance or completion of the activity. However, stipulated penalties shall not accrue: (a) with respect to a deficient submission under Section IX (EPA Approval of Plans, Reports, or Other Deliverables), during the period, if any, beginning on the 31st day after EPA's receipt of such submission until the date that EPA notifies Respondents of any deficiency; and (b) with respect to a decision by the Associate Director of the Hazardous Site Cleanup Division, EPA Region III, under Paragraph 72 of Section XVI (Dispute Resolution), during the period, if any, beginning on the 21st day after the Negotiation Period begins until the date that the EPA management official issues a final decision regarding such dispute. Penalties shall continue to accrue during any dispute resolution period, and shall be paid within fifteen (15) days after the agreement or the receipt of EPA's decision or order.

83. Following EPA's determination that Respondents have failed to comply with a requirement of this Settlement Agreement, EPA may give Respondents written notification of the failure and describe the noncompliance. EPA may send Respondents a written demand for payment of the penalties. However, penalties shall accrue as provided in the preceding Paragraph regardless of whether EPA has notified Respondents of a violation.

84. All penalties accruing under this Section shall be due and payable to EPA within thirty (30) days after Respondents' receipt from EPA of a demand for payment of the penalties, unless Respondents invoke the dispute resolution procedures under Section XVI (Dispute Resolution) within the thirty (30)-day period. All payments to EPA under this Section shall indicate that the payment is for stipulated penalties and shall be made in accordance with Paragraph 67 (Payments for RD Oversight Response Costs).

85. The payment of penalties and Interest, if any, shall not alter in any way Respondents' obligation to complete performance of the Work required under this Settlement Agreement.

86. Penalties shall continue to accrue during any dispute resolution period but need not be paid until fifteen (15) days after the dispute is resolved by agreement or by receipt of EPA's decision.

87. If Respondents fail to pay stipulated penalties when due, Respondents shall pay Interest on the unpaid stipulated penalties as follows: (a) if Respondents have timely invoked dispute resolution such that the obligation to pay stipulated penalties has been stayed pending the outcome of dispute resolution, Interest shall accrue from the date stipulated penalties are due pursuant to Paragraph 82 until the date of payment; and (b) if Respondents fail to timely invoke dispute resolution, Interest shall accrue from the date of demand under Paragraph 84 until the date of payment. If Respondents fail to pay stipulated penalties and Interest when due, the United States may institute proceedings to collect the penalties and Interest. Nothing in this Settlement Agreement shall be construed as prohibiting, altering, or in any way limiting the ability of EPA to seek any other remedies or sanctions available by virtue of Respondents' violation of this Settlement Agreement or of the statutes and regulations upon which it is based, including, but not limited to, penalties pursuant to Sections 106(b) and 122(l) of CERCLA, 42 U.S.C. §§ 9606(b) and 9622(*l*), and punitive damages pursuant to Section 107(c)(3) of CERCLA, 42 U.S.C. § 9607(c)(3); provided, however, that EPA shall not seek civil penalties pursuant to Section 106(b) or 122(*l*) of CERCLA or punitive damages pursuant to Section 107(c)(3) of CERCLA for any violation for which a stipulated penalty is provided in this Settlement Agreement, except in the case of a willful violation of this Settlement Agreement or in the event that EPA assumes performance of a portion or all of the Work pursuant to Section XX (Reservation of Rights by EPA), Paragraph 91. Notwithstanding any other provision of this Section, EPA may, in its unreviewable discretion, waive any portion of stipulated penalties that have accrued pursuant to this Settlement Agreement.

XIX. COVENANTS BY EPA

88. In consideration of the actions that Respondents will perform and the payments that Respondents will make under the terms of this Settlement Agreement, and except as otherwise specifically provided in this Settlement Agreement, EPA covenants not to sue or to take administrative action against Respondents pursuant to Sections 106 and 107(a) of CERCLA, 42 U.S.C. §§ 9606 and 9607(a), for the Work and RD Oversight Response Costs. These covenants shall take effect upon the Effective Date and are conditioned upon Respondents' complete and satisfactory performance of all obligations under this Settlement Agreement, including, but not limited to, payment of RD Oversight Response Costs pursuant to Paragraph 67 (Payment for RD Oversight Response Costs) and any Interest or stipulated penalties due thereon under Paragraph 68 (Interest) or Section XVIII (Stipulated Penalties). These covenants extend only to Respondents and do not extend to any other person.

XX. RESERVATION OF RIGHTS BY EPA

89. Except as specifically provided in this Settlement Agreement, nothing in this Settlement Agreement shall limit the power and authority of EPA or the United States to take, direct, or order all actions necessary to protect public health, welfare, or the environment or to prevent, abate, or minimize an actual or threatened release of hazardous substances, pollutants or contaminants, or hazardous or solid waste on, at, or from the Site. Further, nothing in this Settlement Agreement shall prevent EPA from seeking legal or equitable relief to enforce the terms of this Settlement Agreement, from taking other legal or equitable action as it deems appropriate and necessary, or from requiring Respondents in the future to perform additional activities pursuant to CERCLA or any other applicable law.

90. The covenants set forth in Section XIX (Covenants by EPA) above do not pertain to any matters other than those expressly identified therein. EPA reserves, and this Settlement Agreement is without prejudice to, all rights against Respondents with respect to all other matters, including, but not limited to:

a. liability for failure by Respondents to meet a requirement of this Settlement Agreement;

b. liability for costs not included within the definition of RD Oversight Response Costs;

c. liability for performance of response actions other than the Work;

d. criminal liability;

e. liability for violations of federal or state law that occur during or after implementation of the Work;

f. liability for damages for injury to, destruction of, or loss of natural resources, and for the costs of any natural resource damage assessments;

g. liability arising from the past, present, or future disposal, release, or threat of release of Waste Materials outside of the Site; and

h. liability for costs incurred, or to be incurred, by the Agency for Toxic Substances and Disease Registry related to the Site not paid as RD Oversight Response Costs under this Settlement Agreement.

91. Work Takeover. In the event EPA determines that Respondents have ceased implementation of any portion of the Work, are seriously or repeatedly deficient or late in their performance of the Work, or are implementing the Work in a manner that may cause an endangerment to human health or the environment, EPA may issue a written notice ("Work Takeover Notice") to Respondents and assume the performance of all or any portion(s) of the Work as EPA deems necessary ("Work Takeover"). Respondents may invoke the procedures set forth in Section XVI (Dispute Resolution) to dispute EPA's determination that takeover of the Work is warranted under this Paragraph. However, notwithstanding Respondents' invocation of such dispute resolution procedures, and during the pendency of any such dispute, EPA may in its sole discretion commence and continue a Work Takeover until the earlier of the date that Respondents remedy, to EPA's satisfaction, the circumstances giving rise to EPA's issuance of the relevant Work Takeover Notice, or the date that a written decision terminating such Work Takeover is rendered. Costs that the United States incurs in performing the Work pursuant to this Paragraph shall be considered RD Oversight Response Costs that Respondents shall pay pursuant to Section XV (Payment of Response Costs). Notwithstanding any other provision of this Settlement Agreement, EPA retains all authority and reserves all rights to take any and all response actions authorized by law.

XXI. COVENANTS BY RESPONDENTS

92. Except as set forth in Paragraph 94.b below, Respondents covenant not to sue and agree not to assert any claims or causes of action against the United States, or its contractors or employees, with respect to the Work, past response actions, RD Oversight Response Costs, or this Settlement Agreement, including, but not limited to:

a. any direct or indirect claim for reimbursement from the Hazardous Substance Superfund established by 26 U.S.C. § 9507, based on Sections 106(b)(2), 107, 111, 112, or 113 of CERCLA, 42 U.S.C. §§ 9606(b)(2), 9607, 9611, 9612, or 9613, or any other provision of law;

b. any claim arising out of response actions at or in connection with the Site, including any claim under the United States Constitution, the [State] Constitution, the Tucker Act, 28 U.S.C. § 1491, the Equal Access to Justice Act, 28 U.S.C. § 2412, or at common law; or

c. any claim pursuant to Sections 107 and 113 of CERCLA, 42 U.S.C. §§ 9607 and 9613, RCRA Section 7002(a), 42 U.S.C. § 6972(a), or state law relating to the Work or payment of RD Oversight Response Costs.

93. Except as expressly provided in Paragraph 96 (Claims Against De Micromis Parties), these covenants shall not apply in the event the United States brings a cause of action or issues an order pursuant to any of the reservations set forth in Section XX (Reservations of Rights by EPA), other than in Paragraph 90.a (claims for failure to meet a requirement of the Settlement Agreement) or 90.d (criminal liability), but only to the extent that Respondents' claims arise from the same response action, response costs, or damages that the United States is seeking pursuant to the applicable reservation.

94. a. Respondents reserve, and this Settlement Agreement is without prejudice to, claims against the United States, subject to the provisions of Chapter 171 of Title 28 of the United States Code, and brought pursuant to any statute other than CERCLA or RCRA and for which the waiver of sovereign immunity is found in a statute other than CERCLA or RCRA, for money damages for injury or loss of property or personal injury or death caused by the negligent or wrongful act or omission of any employee of the United States, as that term is defined in 28 U.S.C. § 2671, while acting within the scope of his or her office or employment under circumstances where the United States, if a private person, would be liable to the claimant in accordance with the law of the place where the act or omission occurred. However, the foregoing shall not include any claim based on EPA's selection of response actions, or the oversight or approval of Respondents' plans, reports, other deliverables, or activities.

b. Respondents reserve, and this Settlement Agreement is without prejudice to, any potential CERCLA contribution claims Respondents may have against the United States for response costs incurred in performing the Work under this Settlement Agreement.

95. Nothing in this Agreement shall be deemed to constitute approval or preauthorization of a claim within the meaning of Section 111 of CERCLA, 42 U.S.C. § 9611, or 40 C.F.R. § 300.700(d).

96. Claims Against De Micromis Parties. Respondents agree not to assert any claims and to waive all claims or causes of action (including but not limited to claims or causes of action under Sections 107(a) or 113 of CERCLA) that they may have for all matters relating to the Site against any person where the person's liability to Respondents with respect to the Site is based solely on having arranged for disposal or treatment, or for transport for disposal or treatment, of hazardous substances at the Site, or having accepted for transport for disposal or treatment of hazardous substances at the Site, if all or part of the disposal, treatment, or transport occurred before April 1, 2001, and the total amount of material containing hazardous substances contributed by such person to the Site was less than 110 gallons of liquid materials or 200 pounds of solid materials.

97. The waiver in Paragraph 96 (Claims Against De Micromis Parties) shall not apply with respect to any defense, claim, or cause of action that a Respondent may have against any person meeting the above criteria, if such person asserts a claim or cause of action relating to the Site against such Respondent. This waiver also shall not apply to any claim or cause of action against any person meeting the above criteria, if EPA determines:

a. that such person has failed to comply with any EPA requests for information or administrative subpoenas issued pursuant to Section 104(e) or 122(e) of CERCLA, 42 U.S.C. §§ 9604(e) or 9622(e), or Section 3007 of RCRA, 42 U.S.C. § 6927, or has impeded or is impeding, through action or inaction, the performance of a response action or natural resource restoration with respect to the Site, or has been convicted of a criminal violation for the conduct to which this waiver would apply and that conviction has not been vitiated on appeal or otherwise; or

b. that the materials containing hazardous substances contributed to the Site by such person have contributed significantly, or could contribute significantly, either individually or in the aggregate, to the cost of response action or natural resource restoration at the Site.

XXII. OTHER CLAIMS

98. By issuance of this Settlement Agreement, the United States and EPA assume no liability for injuries or damages to persons or property resulting from any acts or omissions of Respondents. The United States or EPA shall not be deemed a party to any contract entered into by Respondents or their directors, officers, employees, agents, successors, representatives, assigns, contractors, or consultants in carrying out actions pursuant to this Settlement Agreement.

99. Except as expressly provided in Paragraph 96 (Claims Against De Micromis Parties), and Section XIX (Covenants by EPA), nothing in this Settlement Agreement constitutes a satisfaction of, or release from, any claim or cause of action against Respondents or any person not a party to this Settlement Agreement, for any liability such person may have under CERCLA, other statutes, or common law, including, but not limited to, any claims of the United States for costs, damages, and interest under Sections 106 and 107 of CERCLA, 42 U.S.C. §§ 9606 and 9607.

100. No action or decision by EPA pursuant to this Settlement Agreement shall give rise to any right to judicial review, except as set forth in Section 113(h) of CERCLA, 42 U.S.C. § 9613(h).

XXIII. EFFECT OF SETTLEMENT/CONTRIBUTION

101. Except as provided in Paragraph 96 (Claims Against De Micromis Parties), nothing in this Settlement Agreement shall be construed to create any rights in, or grant any cause of action to, any person not a Party to this Settlement Agreement. Except as provided in Section XXI (Covenants by Respondents), each of the Parties expressly reserves any and all rights (including, but not limited to, pursuant to Section 113 of CERCLA, 42 U.S.C. § 9613), defenses, claims, demands, and causes of action which each Party may have with respect to any matter, transaction, or occurrence relating in any way to the Site against any person not a Party hereto. Nothing in this Settlement Agreement diminishes the right of the United States, pursuant to Section 113(f)(2) and (3) of CERCLA, 42 U.S.C. § 9613(f)(2)-(3), to pursue any such persons

to obtain additional response costs or response action and to enter into settlements that give rise to contribution protection pursuant to Section 113(f)(2).

102. The Parties agree that this Settlement Agreement constitutes an administrative settlement for purposes of Sections 113(f)(2) and 122(h)(4) of CERCLA, 42 U.S.C. §§ 9613(f)(2) and 9622(h)(4), and that Respondents are entitled, as of the Effective Date, to protection from contribution actions or claims as provided by Sections 113(f)(2) and 122(h)(4) of CERCLA, 42 U.S.C. §§ 9613(f)(2) and 9622(h)(4), or as may be otherwise provided by law, for "matters addressed" in this Settlement Agreement. The "matters addressed" in this Settlement Agreement are the Work and RD Oversight Response Costs. The Parties further agree that this Settlement Agreement constitutes an administrative settlement for purposes of Section 113(f)(3)(B) of CERCLA, 42 U.S.C. § 9613(f)(3)(B), pursuant to which each Respondent has, as of the Effective Date, resolved liability to the United States for some or all of a response action or some or all of the costs of such action.

103. Each Respondent shall, with respect to any suit or claim brought by it for matters related to this Settlement Agreement, notify EPA in writing no later than sixty (60) days prior to the initiation of such suit or claim. Each Respondent also shall, with respect to any suit or claim brought against it for matters related to this Settlement Agreement, notify EPA in writing within ten (10) days after service of the complaint or claim upon it. In addition, each Respondent shall notify EPA within ten (10) days after service or receipt of any Motion for Summary Judgment and within 10 days after receipt of any order from a court setting a case for trial, for matters related to this Settlement Agreement.

104. In any subsequent administrative or judicial proceeding initiated by EPA, or by the United States on behalf of EPA, for injunctive relief, recovery of response costs, or other relief relating to the Site, Respondents shall not assert, and may not maintain, any defense or claim based upon the principles of waiver, res judicata, collateral estoppel, issue preclusion, claim-splitting, or other defenses based upon any contention that the claims raised in the subsequent proceeding were or should have been brought in the instant case; provided, however, that nothing in this Paragraph affects the enforceability of the covenant by EPA set forth in Section XIX (Covenants by EPA).

105. Effective upon signature of this Settlement Agreement by a Respondent, such Respondent agrees that the time period commencing on the date of its signature and ending on the date EPA receives from such Respondent the payment(s) required by Section XVIII (Payment of Response Costs) and, if any, Section XVI (Stipulated Penalties) shall not be included in computing the running of any statute of limitations potentially applicable to any action brought by the United States related to the "matters addressed" as defined in Paragraph 102 and that, in any action brought by the United States related to the "matters addressed," such Respondent will not assert, and may not maintain, any defense or claim based upon principles of statute of limitations, waiver, laches, estoppel, or other defense based on the passage of time during such period. If EPA gives notice to Respondents that it will not make this Settlement Agreement effective, the statute of limitations shall begin to run again commencing ninety days after the date such notice is sent by EPA.

XXIV. INDEMNIFICATION

106. Respondents shall indemnify, save, and hold harmless the United States, its officials, agents, contractors, subcontractors, employees, and representatives from any and all claims or causes of action arising from, or on account of, negligent or other wrongful acts or omissions of Respondents, their officers, directors, employees, agents, contractors, or subcontractors, in carrying out actions pursuant to this Settlement Agreement. In addition, Respondents agree to pay the United States all costs incurred by the United States, including, but not limited to, attorneys fees and other expenses of litigation and settlement, arising from, or on account of, claims made against the United States based on negligent or other wrongful acts or omissions of Respondents, their officers, directors, employees, agents, contractors, subcontractors, and any persons acting on their behalf or under their control, in carrying out activities pursuant to this Settlement Agreement. The United States shall not be held out as a party to any contract entered into, by, or on behalf of Respondents in carrying out activities pursuant to this Settlement Agreement. Neither Respondents nor any such contractor shall be considered an agent of the United States.

107. The United States shall give Respondents notice of any claim for which the United States plans to seek indemnification pursuant to this Section and shall consult with Respondents prior to settling such claim.

108. Respondents waive all claims against the United States for damages or reimbursement or for set-off of any payments made, or to be made, to the United States, arising from, or on account of, any contract, agreement, or arrangement between any one or more of Respondents and any person for performance of Work on, or relating to, the Site, including, but not limited to, claims on account of construction delays. In addition, Respondents shall indemnify and hold harmless the United States with respect to any and all claims for damages or reimbursement arising from, or on account of, any contract, agreement, or arrangement between any one or more of Respondents and any person for performance of Work on, or relating to, the Site.

XXV. INSURANCE

109. At least fifteen (15) days prior to commencing any on-Site Work under this Settlement Agreement, Respondents shall secure, and shall maintain for the duration of this Settlement Agreement, commercial general liability insurance with limits of five million dollars, for any one occurrence, and automobile insurance with limits of one million dollars, combined single limit, naming the EPA as an additional insured with respect to all liability arising out of the activities performed by or on behalf of Respondents pursuant to this Settlement Agreement. Within the same period, Respondents shall provide EPA with certificates of such insurance and a copy of each insurance policy. Respondents shall submit such certificates and copies of policies each year on the anniversary of the Effective Date. In addition, for the duration of the Settlement Agreement, Respondents shall satisfy, or shall ensure that their contractors or subcontractors satisfy, all applicable laws and regulations regarding the provision of worker's compensation insurance for all persons performing the Work on behalf of Respondents in furtherance of this Settlement Agreement. If Respondents demonstrate by evidence satisfactory to EPA that any

contractor or subcontractor maintains insurance equivalent to that described above, or insurance covering some or all of the same risks but in an equal or lesser amount, then Respondents need provide only that portion of the insurance described above that is not maintained by such contractor or subcontractor.

XXVI. INTEGRATION/APPENDICES

110. This Settlement Agreement and its appendices constitute the final, complete, and exclusive agreement and understanding among the Parties with respect to the settlement embodied in this Settlement Agreement. The parties acknowledge that there are no representations, agreements, or understandings relating to the settlement other than those expressly contained in this Settlement Agreement. The following appendices are attached to and incorporated into this Settlement Agreement:

"Appendix A" is the complete list of Respondents.

"Appendix B" is the ROD.

"Appendix C" is the description and/or map of the Site.

XXVII. EFFECTIVE DATE, SUBSEQUENT MODIFICATION AND TERMINATION

111. The effective date of this Settlement Agreement shall be the date on which it is signed by EPA.

112. The EPA Project Coordinator may modify any plan or schedule in writing. Any other requirements of this Settlement Agreement may be modified in writing by mutual agreement of the parties. If Respondents seek permission to deviate from any approved work plan or schedule, Respondents' Project Coordinator shall submit a written request to EPA for approval outlining the proposed modification and its basis. Respondents may not proceed with the requested deviation until receiving written approval from the EPA Project Coordinator pursuant to this Paragraph.

113. No informal advice, guidance, suggestion, or comment by the EPA Project Coordinator or other EPA representatives regarding reports, plans, specifications, schedules, or any other writing submitted by Respondents shall relieve Respondents of their obligation to obtain any formal approval required by this Settlement Agreement, or to comply with all requirements of this Settlement Agreement, unless it is formally modified.

114. This Settlement Agreement shall terminate at the time a Consent Decree for the Remedial Design/Remedial Action for OU-1 is lodged in the U.S. District Court for the District of Maryland and a corresponding settlement agreement for remedial design becomes effective.

XXVIII. NOTICE OF COMPLETION OF WORK

115. When EPA determines, after EPA's review of the Final Report required pursuant to Paragraph 52, that all Work has been fully performed in accordance with this Settlement Agreement, with the exception of any continuing obligations required by this Settlement Agreement, including those requirements specified in Sections XX (Reservation of Rights), XXII (Other Claims), XIV (Indemnification), XIII (Record Retention) and XV (Payment of Response Costs), EPA will provide written notice to Respondents. If EPA determines that any such Work has not been completed in accordance with this Settlement Agreement, EPA will notify Respondents, provide a list of the deficiencies, and require that Respondents modify the Work Plan if appropriate in order to correct such deficiencies. Respondents shall implement the modified and approved Work Plan and shall submit a modified Final Report in accordance with the EPA notice. Failure by Respondents to implement the approved modified Work Plan shall be a violation of this Settlement Agreement.

IT IS SO AGREED AND ORDERED.

AUG 23 2013

KATHRYN A. HODGKISS
Acting Director, Hazardous Site Cleanup Division
U.S. Environmental Protection Agency
Region III

Date

FOR ARKEMA INC., formerly known as The Pennsylvania Salt Manufacturing Company, Pennsalt Chemicals Corporation, and Pennsalt Corporation, and successor by merger to The Pennsylvania Salt Manufacturing Company of Washington:

The undersigned hereby certifies that he or she is authorized to execute this Settlement Agreement on behalf of the Respondent for which he or she has signed and to bind said Respondent to the terms and conditions of this Settlement Agreement.

Danny Kite 5-23-13

Arkema Inc. Date

Name: Danny Kite

Title: President-Legacy Site Services LLC (agent for Arkema Inc.)

FOR BAYER CROP SCIENCE, LP:

The undersigned hereby certifies that he or she is authorized to execute this Settlement Agreement on behalf of the Respondent for which he or she has signed and to bind said Respondent to the terms and conditions of this Settlement Agreement.

L. U. Fr. July 2, 2013

Bayer Crop Science, LP Date

Name: L. U. Fruss

Title: VP, General Counsel and Secretary

FOR E. I. DU PONT DE NEMOURS AND COMPANY:

The undersigned hereby certifies that he or she is authorized to execute this Settlement Agreement on behalf of the Respondent for which he or she has signed and to bind said Respondent to the terms and conditions of this Settlement Agreement.

Tom A. Ei — 5-28-2013

E. I. Du Pont de Nemours and Company — Date

Name: Tom A. Ei

Title: Remediation Team Manager

FOR FMC CORPORATION:

The undersigned hereby certifies that he or she is authorized to execute this Settlement Agreement on behalf of the Respondent for which he or she has signed and to bind said Respondent to the terms and conditions of this Settlement Agreement.

Robert T. Forbes 6-17-13

FMC Corporation Date

Name: Robert T. Forbes

Title: Director, Remediation/Goverance

FOR HONEYWELL INTERNATIONAL, INC.:

The undersigned hereby certifies that he or she is authorized to execute this Settlement Agreement on behalf of the Respondent for which he or she has signed and to bind said Respondent to the terms and conditions of this Settlement Agreement.

John J. Morris

Honeywell International, Inc.

Name: John J. Morris

Title: Remediation Dir

6/17/13

Date

FOR LEBANON SEABOARD CORPORATION:

The undersigned hereby certifies that he or she is authorized to execute this Settlement Agreement on behalf of the Respondent for which he or she has signed and to bind said Respondent to the terms and conditions of this Settlement Agreement.

Richard J Newmaster Jr 7/1/13

Lebanon Seaboard Corporation — Date

Name: Richard J Newmaster Jr

Title: CFO

FOR MONTROSE CHEMICAL CORPORATION OF CALIFORNIA:

The undersigned hereby certifies that he or she is authorized to execute this Settlement Agreement on behalf of the Respondent for which he or she has signed and to bind said Respondent to the terms and conditions of this Settlement Agreement.

6/20/13
Date

Montrose Chemical Corporation of California
Name: Joseph C Kelly
Title: President

FOR NEWS AMERICA INCORPORATED (SUCCESSOR TO NEWS PUBLISHING AUSTRALIA LIMITED):

The undersigned hereby certifies that he or she is authorized to execute this Settlement Agreement on behalf of the Respondent for which he or she has signed and to bind said Respondent to the terms and conditions of this Settlement Agreement.

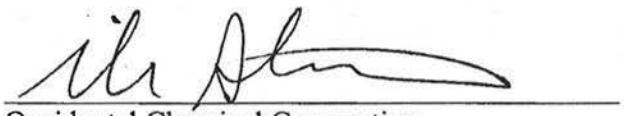
Peter Simshauser

6/25/13
Date

News America Incorporated
(Successor to News Publishing Australia Limited)
Name: Peter Simshauser
Title: Counsel

FOR OCCIDENTAL CHEMICAL CORPORATION:

The undersigned hereby certifies that he or she is authorized to execute this Settlement Agreement on behalf of the Respondent for which he or she has signed and to bind said Respondent to the terms and conditions of this Settlement Agreement.



7/16/2013

Occidental Chemical Corporation — Date

Name: MIKE ANDERSON

Title: VICE PRESIDENT

FOR OLIN CORPORATION:

The undersigned hereby certifies that he or she is authorized to execute this Settlement Agreement on behalf of the Respondent for which he or she has signed and to bind said Respondent to the terms and conditions of this Settlement Agreement.

SKR 5/20/13

Curtis M Richards

Olin Corporation

6/28/13

Date

Name: CURTIS M. RICHARDS

Title: CORP. VP ENVIRONMENT, HEALTH & SAFETY

FOR ROHM AND HAAS COMPANY:

The undersigned hereby certifies that he or she is authorized to execute this Settlement Agreement on behalf of the Respondent for which he or she has signed and to bind said Respondent to the terms and conditions of this Settlement Agreement.

Edward F. Tokarsick 5/30/13

Rohm and Haas Company — Date

Name: EDWARD F. TOKARSICK

Title: REMEDIATION LEADER

FOR RHONE-POULENC:

The undersigned hereby certifies that he or she is authorized to execute this Settlement Agreement on behalf of the Respondent for which he or she has signed and to bind said Respondent to the terms and conditions of this Settlement Agreement.

	7/1/13
Rhone-Poulenc	Date
Name: Peter Alpert	
Title: Counsel, duly authorized	

FOR SHELL OIL COMPANY:

The undersigned hereby certifies that he or she is authorized to execute this Settlement Agreement on behalf of the Respondent for which he or she has signed and to bind said Respondent to the terms and conditions of this Settlement Agreement.

Wm E Platt

Shell Oil Company

Name: Wm E Platt

Title: Sr. Mgr.

5-28-13

Date

FOR SYNGENTA CROP PROTECTION, LLC:

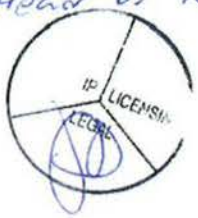
The undersigned hereby certifies that he or she is authorized to execute this Settlement Agreement on behalf of the Respondent for which he or she has signed and to bind said Respondent to the terms and conditions of this Settlement Agreement.

Syngenta, LLC George W Crouse 5/31/2013

Syngenta Crop Protection, LLC — Date

Name: George Crouse

Title: Head of Remediation



FOR UNION CARBIDE CORPORATION:

The undersigned hereby certifies that he or she is authorized to execute this Settlement Agreement on behalf of the Respondent for which he or she has signed and to bind said Respondent to the terms and conditions of this Settlement Agreement.

Mary F Draves — 6/5/13

Union Carbide Corporation — Date

Name: Mary Draves

Title: Authorized Representative

FOR WILMINGTON SECURITIES, INC.:

The undersigned hereby certifies that he or she is authorized to execute this Settlement Agreement on behalf of the Respondent for which he or she has signed and to bind said Respondent to the terms and conditions of this Settlement Agreement.

Malcolm Mitchell

Wilmington Securities, Inc.
Name: Malcolm Mitchell
Title: Vice President

June 10, 2013
Date

APPENDIX A

Appendix A

List of Respondents

1. Arkema, Inc.
2. Bayer Crop Science, LP
3. E. I. Du Pont de Nemours and Company
4. FMC Corporation
5. Honeywell International, Inc.
6. Lebanon Seaboard Corporation
7. Montrose Chemical Corporation of California
8. News Publishing Australia Limited
9. Occidental Chemical Corporation
10. Olin Corporation
11. Rohm and Haas Company
12. Rhone-Poulenc
13. Shell Oil Company
14. Syngenta Crop Protection, LLC
15. Union Carbide Corporation
16. Wilmington Securities, Inc.

APPENDIX B

EPA SUPERFUND PROGRAM
RECORD OF DECISION
CENTRAL CHEMICAL SUPERFUND SITE
HAGERSTOWN, MARYLAND

Prepared by:

Environmental Protection Agency Region III
1650 Arch Street
Philadelphia, PA 19103

September 2009

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LIST OF ACRONYMS AND ABBREVIATIONS

$(mg/kg/day)^{-1}$	per milligram per kilogram per day
ARAR	applicable or relevant and appropriate requirements
ASTM	American Society for Testing and Materials
ATSDR	Agency for Toxic Substances and Disease Registry
B&W	Baker & Wibberly
bgs	below ground surface
CAS_RN	Chemical Abstracts Service Registry Number
CCSPG	Central Chemical Site Participation Group
Central Chemical	Central Chemical Corporation
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CERCLIS	Comprehensive Environmental Response, Compensation and Liability Information System
CFR	Code of Federal Regulations
cfs	cubic foot per second
CLP	Contract Lab Program
cm/sec	centimeters per second
CNS	central nervous system
COC	contaminant of concern
COMAR	Code of Maryland Regulations
COPCs	contaminants of potential concern
CSM	conceptual site model
CW	construction worker
cy	cubic yards
DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloroethylene
DDT	Dichlorodiphenyltrichloroethane
ECO	ecological receptor
EPA	United States Environmental Protection Agency
EPC	exposure point concentration
ERA	ecological risk assessment
ESI	Expanded Site Inspection
FS	Feasibility Study
GW	ground water
HEAST	Health Effects Assessment Summary Table

LIST OF ACRONYMS AND ABBREVIATIONS (continued)

HHRA	Human Health Risk Assessment
HI	hazard index
HQ	hazard quotient
IRIS	Integrated Risk Information System
ISW	indoor site worker
lb/in^2	pounds per square inch
LOAEL	lowest observed adverse effects level
MDE	Maryland Department of the Environment
MDWR	Maryland Department of Water Resources
µg/kg	micrograms per kilogram
$\mu g/m^3$	micrograms per cubic meter
mg/kg	milligrams per kilogram
mg/kg/day	milligrams per kilogram per day
m/s	meters per second
msl	mean sea level
NCEA	EPA National Center for Environmental Assessment
NCP	National Contingency Plan
NE	northeast
NOAEL	no observed adverse effects level
NPDES	National Pollutant Discharge Elimination System
NW	northwest
O&M	Operation and Maintenance
OU	Operable Unit
%	percent
POTW	publicly owned treatment works
ppm	parts per million
PPRTV	EPA provisional peer-reviewed toxicity value
PRAP	Proposed Remedial Action Plan
PRG	preliminary remediation goal
PRP	Potentially Responsible Party
RAO	remedial action objectives
RCRA	Resource Conservation and Recovery Act
RDI	Remedial Design Investigation
RI	Remedial Investigation
RME	reasonable maximum exposure
ROD	Record of Decision

SE	southeast
Site	Central Chemical Superfund Site
SPLP	Synthetic Precipitation Leaching Procedure
S/S	solidification/stabilization
SSI	Screening Site Investigation
SVOC	semi-volatile organic compound
SW	southwest
TRV	toxicity reference value
UCL	upper confidence limit
URS	URS Corporation
USGS	United States Geological Survey
VOC	volatile organic compound
WCHD	Washington County Health Department
Weston	Roy F. Weston, Inc.
WRA	Maryland Water Resource Administration

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EPA SUPERFUND PROGRAM
RECORD OF DECISION
CENTRAL CHEMICAL SUPERFUND SITE
HAGERSTOWN, MARYLAND

1.0 DECLARATION

1.1 SITE NAME AND LOCATION

Central Chemical Superfund Site
Hagerstown, Washington County, Maryland
Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS) ID#: MDD003061447

This Record of Decision (ROD) pertains to Operable Unit 1 (OU-1) of the Central Chemical Superfund Site (Site). OU-1 addresses contaminated soils, and principal threat wastes at the Site, including a Former Waste Lagoon. The Site is located along Mitchell Avenue in the City of Hagerstown, Washington County, Maryland.

1.2 STATEMENT OF BASIS AND PURPOSE

This decision document presents the Selected Remedy for OU-1 of the Central Chemical Superfund Site (Site), in Hagerstown, Maryland, which was chosen in accordance with Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended, and, to the extent practicable, the National Contingency Plan (NCP). This decision is based on the Administrative Record File for this Site.

The State of Maryland concurs with the Selected Remedy identified for OU-1 (Figure 14).

1.3 ASSESSMENT OF THE SITE

The response action selected in this ROD is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

1.4 DESCRIPTION OF THE SELECTED REMEDY

This ROD addresses contaminated soils and principal threat wastes at the Site which pose a threat to human health and the environment (ecological receptors and ground water). As discussed in Section 2.11 of this ROD, the contents of the Former Waste Lagoon, which include powders and sludge, are considered to be principal threat waste. The overall cleanup strategy for the Site is:

1. Treat the principal threat waste present in the Former Waste Lagoon using In-Situ Solidification/Stabilization (S/S) technology. S/S of the Former Waste Lagoon

will prevent the leaching of hazardous substances from the wastes, and will mitigate the threat these wastes pose to ground water. Contents of the Former Waste Lagoon which cannot be successfully solidified/stabilized (based on the results of a treatability study to be performed during the pre-Remedial Design Investigation) will be excavated and transported off-Site, with treatment as necessary, and disposed of off-Site at an off-Site waste disposal facility in accordance with CERCLA §121(d)(3).

2. After the Former Waste Lagoon has been addressed, the contaminated soils from the remainder of the Site (outside of the footprint of the Former Waste Lagoon) will be excavated and consolidated in the area of the treated Former Waste Lagoon. A low permeability cover system will be placed over the consolidated contaminated soils. The treated Former Waste Lagoon, the consolidated contaminated soils, and the low permeability cover system will constitute a permanent Consolidation Area on the Site for contaminated media (soils, treated principal threat waste). This area is referred to in the ROD as the "Consolidation Area." A ground water monitoring, extraction, and treatment system will be installed around the Consolidation Area to prevent contaminant migration beyond the boundaries of the Consolidation Area.

The overall objective of the cleanup actions required by this ROD is to prevent contact between human and ecological receptors and contaminated soils; treat the principal threat waste present in the Former Waste Lagoon; and prevent contaminant migration via ground water beyond the boundaries of the Consolidation Area.

Based on the results of the currently available information, including the human health risk assessment (HHRA) and ecological risk assessment (ERA), response actions to address the presence of Site-related hazardous substances in surface water and sediment are not warranted.

The NCP establishes an expectation that EPA will use treatment to address the principal threats posed by a site wherever practicable (40 Code of Federal Regulations [CFR] §300.430(a)(1)(iii)(A)). The "principal threat" concept is applied to the characterization of "source materials" at a Superfund Site. A source material is material that includes or contains hazardous substances, pollutants or contaminants that act as a reservoir for migration of contamination to ground water, surface water or air, or acts as a source for direct exposure. Contaminated ground water generally is not considered to be a source material. Principal threat wastes are those materials considered to be highly toxic or highly mobile that generally cannot be reliably contained, or would present a significant risk to human health or the environment should exposure occur. EPA considers the contents of the Former Waste Lagoon to be principal threat waste (discussed in Section 2.11).

EPA's Selected Remedy consists of the following:

1. Conduct a pre-Remedial Design Investigation.

2. Perform Solidification/Stabilization treatment of the contents of the Former Waste Lagoon.

3. Contents of the Former Waste Lagoon which cannot be successfully treated by Solidification/Stabilization (i.e. do not achieve the Solidification/Stabilization performance standards described in the Selected Remedy) will be excavated and transported off-Site, with treatment as necessary, and disposed of off-Site at an off-Site waste disposal facility in accordance with CERCLA §121(d)(3).

4. Excavate contaminated soils above Site-specific Soil Remediation Standards from Domain 1, Domain 2 (outside footprint of Former Waste Lagoon) and Domain 3. Confirmation sampling will be performed at the completion of excavation activities to demonstrate compliance with the Soil Remediation Standards (specified in the Selected Remedy).

5. Consolidate the excavated soils from #4 above on the footprint of the solidified/stabilized Former Waste Lagoon area. If it is determined during the remedial design, or during the remedial action, that the volume of contaminated soil at the Site cannot be consolidated within the boundaries of the cover system (Consolidation Area) set forth in #6, below, then the excess contaminated soil will be disposed of off-Site at an appropriate off-Site waste disposal facility in accordance with CERCLA §121(d)(3).

6. Construct, maintain, and periodically inspect an engineered low permeability cover system over the consolidated contaminated soils and Former Waste Lagoon area ("Consolidation Area").

7. Capture contaminated ground water/leachate in the vicinity of the Consolidation Area by installation, operation, maintenance, and periodic monitoring of a ground water monitoring, extraction and treatment system.

8. The discharge point for the treated ground water will be the Hagerstown public sewer system in accordance with applicable Federal pre-treatment standards.

9. Use of the Central Chemical property shall be limited to commercial/industrial use, and ensure maintenance and prevent disturbance of the low permeability cover system and ground water monitoring, extraction, and treatment system, through establishment and implementation of institutional controls.

10. Principal threat wastes identified outside of the Former Waste Lagoon area on the Site shall be excavated and transported off-Site, with treatment as necessary, and disposed of off-Site at an off-Site waste disposal facility in accordance with CERCLA §121(d)(3). Principal threat wastes include containers of hazardous substances, non-aqueous phase liquids, powders, and sludge.

11. No further action is included in the Selected Remedy for OU-1 with regard to sediments and surface water.

The estimated cost of the Selected Remedy is $14,350,772.

1.5 STATUTORY DETERMINATION

1.5.1 Selected Remedy

The Selected Remedy is protective of human health and the environment, complies with Federal and State requirements that are applicable or relevant and appropriate to the remedial action (unless justified by a waiver), is cost-effective, and utilizes permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable.

This remedy also satisfies the statutory preference for treatment as a principal element of the remedy (i.e., reduces the toxicity, mobility, or volume of hazardous substances, pollutants, or contaminants as a principal element through treatment).

Because this remedy will result in hazardous substances, pollutants, or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within five years after initiation of the remedial action to ensure that the remedy is, or will be, protective of human health and the environment.

1.6 ROD DATA CERTIFICATION CHECKLIST

The following information is included in the Decision Summary section of this ROD. Additional information can be found in the Administrative Record File for the Site.

- Contaminants of concern (COCs) and their respective concentrations (Section 2.7.1.1 and Table 9)
- Baseline risk represented by the COCs (Tables 1, 2 and 3)
- Cleanup levels established for COCs and the basis for these levels (Table 13)
- How source materials constituting principal threats are addressed (Section 2.11)
- Current and reasonable anticipated future land use assumptions and current and potential future beneficial uses of ground water used in the baseline risk assessment and ROD (Section 2.6)
- Potential land and ground water use that will be available at the site as a result of the Selected Remedy (Section 2.12.2.2)
- Estimated capital, annual operation and maintenance (O&M), and total present worth costs, discount rate, and the number of years over which the remedy cost estimates are projected (Table 14)
- Key factor(s) that led to selecting the remedy (Section 2.10.4)

Dennis F. Carney

Kathyrn A. Hodgkiss, Acting Director
Hazardous Site Cleanup Division
EPA Region III

9/30/09
Date

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2.0 DECISION SUMMARY

2.1 SITE NAME, LOCATION, AND BRIEF DESCRIPTION

The Central Chemical Superfund Site (Site) is located in Hagerstown, Washington County, Maryland. The Site is located along the north side of Mitchell Avenue, to the west of the intersection of Mitchell Avenue and North Burhans Boulevard. The Site consists of the Central Chemical property and any areas where Site-related hazardous substances have come to be located.

The Site is depicted on the Hagerstown, Maryland-Pennsylvania United States Geological Survey (USGS) quadrangle. The Site coordinates are 39°, 39', 23" north latitude and 77°, 43', 27" west longitude. The CERCLIS identification number for the Site is MDD003061447.

The Site location is shown on Figure 1.

The EPA is the lead agency for Site activities and the Maryland Department of the Environment (MDE) is the support agency.

Central Chemical Corporation ("Central Chemical") is the current owner of the Central Chemical property. Central Chemical's predecessors obtained the Central Chemical property from the Citizens Development Company of Hagerstown, Washington County on April 4, 1911.

The Central Chemical property was initially developed in the 1930s for fertilizer blending and manufacturing operations which continued until 1984. Pesticide blending operations occurred at the property between approximately the 1940s and 1960s. The pesticide blending operation included use of various compounds such as Dichlorodiphenyltrichloroethane (DDT), Sevin, Dichlorodiphenyldichloroethane (DDD), Daconil (fungicide), Guthion (an organophosphate pesticide), Aldrin, Dieldrin, Chlordane, Toxaphene, lead arsenate, and Omite (insecticide), which were blended with inert materials at the property. The raw pesticides were manufactured at other locations. The grinding and blending was accomplished using air and hammer mills and wetting agents, followed by dry packaging of the material. From the 1940s to the 1960s, Central Chemical also produced liquid pesticides containing various components such as Aldrin, Endrin, DDT, Dieldrin, miscible oils, Chlordane, Methoxychlor, and Toxaphene, which were prepared with organic solvents. Liquid pesticide activities are believed to have been performed in the Liquid Pesticide Building in the northwestern portion of the Site. The air mill pesticide operations building was destroyed by fire in 1965. Central Chemical filed an application with the Maryland Department of Health for registration of the Site as a fertilizer manufacturing plant in December 1968. Fertilizer manufacturing continued at the Site until 1984. The Central Chemical property is currently vacant, and is occupied by concrete slabs associated with former buildings.

Review of previous environmental investigations for the Site (Section 2.2) indicates that at least two areas of the Site are believed to be former waste disposal areas. In the northeast corner of the Site lies a backfilled Former Waste Lagoon. In approximately the central portion of the Site lies a potential sinkhole. The Remedial Investigation (RI) performed at the Site has identified highly contaminated soils and waste materials (powders, sludge) in the Former Waste Lagoon,

and an isolated lens of white/grey "impacted material" (which turned to liquid during handling) in the subsurface in the vicinity of the potential sinkhole.

The two on-Site waste disposal areas are depicted on Figure 2 (the potential sinkhole is located in the area of Figure 2 labeled "drainage swale").

Certain Potentially Responsible Parties (PRPs) conducted the RI/FS. During the RI/FS, the PRPs divided the Site into three areas for evaluation, as follows:

- "Domain 1" is the western portion of the Site which was formerly occupied by Site buildings. Domain 1 is currently occupied by the concrete slabs of former Site buildings, and roadways.

- "Domain 2" is the northeastern portion of the Site, and is occupied by a Former Waste Lagoon (which is described further in this ROD).

- "Domain 3" is the southeastern portion of the Site, which is currently undeveloped and is partially wooded. The potential sinkhole is located along the western boundary of this area.

For consistency with the RI/FS documents, the same designations for different areas of the Site are included in this ROD. A map depicting the boundaries of the three "Domain Areas" is included as Figure 3.

2.2 SITE HISTORY AND ENFORCEMENT ACTIVITIES

Numerous environmental investigations of the Site have been conducted. A summary of the environmental investigations of the Site follows.

In the early 1960's, the State of Maryland and Washington County Health Department (WCHD) were notified of complaints by local residents that pesticide odors were migrating from the plant. Air samples collected by the State on October 18, 1962 revealed 7.5 milligrams per cubic meter (mg/m^3) of Guthion. This concentration was deemed not to pose a hazard at the time by the State Health Department.

Following transfer of pesticide operations to a new location in Elkton, Maryland in 1968, Central Chemical filed an application for registration of the Hagerstown Site as a Fertilizer Manufacturing Plant with the Maryland Department of Health on December 6, 1968.

State and county health departments were notified of complaints by local residents concerning emission of dust and smoke for the Number 2 stack at the Central Chemical property in 1970. These emissions were due to oil-burning dryers, which were used in the fertilizer manufacturing operations. (The Number 1 stack emitted waste material from the ammoniator used in the fertilizer manufacturing, and records described it as usually non-visible).

On June 8, 1970, the WCHD sent a certified letter to Central Chemical, indicating that the Site had been inspected on May 28, 1970. The WCHD identified on-Site dumping of refuse, and a

pool of dark, odorous liquid. The WCHD required Central Chemical to consolidate the on-Site dumped refuse, cover the refuse with two feet of soil, and grade the area to promote surface water runoff away from the "dumping site."

On August 5, 1970 the Maryland Department of Water Resources (MDWR) performed a field inspection at the Site. The Water Resources Engineer identified a small "dump" outside of the plant area which contained water and sacks of "Omite" (reportedly a powdered insecticide used for mite control).

In response to air quality concerns, Central Chemical signed a Plan for Compliance with the State on April 30, 1971. The Plan stated that Central Chemical would be in compliance with State Air Regulations by December 31, 1971. This compliance included the installation of vibrating bag filters and an economic study of the fertilizer granulator in order to determine whether to cease operation or install emission control equipment. State records indicate that the Plan for Compliance was complete by February 14, 1972. These records indicate that Central Chemical opted to cease operation of the fertilizer granulator.

The State of Maryland began monitoring the Site for DDT contamination in 1976, following identification of DDT in sediments of the Antietam Creek during a study of the Potomac River watershed conducted by the U.S. Geological Survey. Sediment sampling conducted in 1976 revealed elevated concentrations of lead and DDT in an unnamed tributary located downstream of surface water drainage from the Site.

Samples were collected from Antietam Creek in June 1976. These samples indicated that DDT and lead were migrating to Antietam Creek from the Hagerstown Area. As part of the effort to locate the source of the DDT, soil samples were collected from the Site and vicinity in August and October 1976. The samples revealed DDT concentrations from 0.2 to 1,646.4 parts per million (ppm), lead from 14.8 to 395 ppm, and arsenic from 2.2 to 300 ppm. Environmental concerns were addressed by the State through Consent Order C-0-77-432, with subsequent amendments, issued during the period of 1977-1978. As a result of these actions, Central Chemical contracted to have the quarry (Former Waste Lagoon) and potential sinkhole areas covered with clay and soil. This action included vegetative stabilization (seeding and mulching of the Site) in order to reduce migration of soils from the Site.

Soil samples were collected by the Maryland Water Resource Administration (WRA) in August, and October 1976 from surface water drainage areas on-Site or near the Site. The WRA's soil samples revealed elevated concentrations of DDT, arsenic, and lead.

Following the identification of elevated concentrations of pesticides and heavy metals at the Site in 1976, a Complaint and Order (C-0-77-432) was issued to Central Chemical Corporation by the WRA in 1977. This action directed Central Chemical to submit a hydrogeologic investigation of the Site. Through Supplemental Orders C-0-77-432A,B,C, the State continued to direct investigation and stabilization of the Site by Central Chemical to prevent further migration of contaminated soils. The State issued a Notice of Compliance on December 14, 1979.

Pursuant to WRA's Supplemental Order C-0-77-432A, Central Chemical contracted with Baker & Wibberly (B&W) to conduct a hydrologic assessment of the Site in 1977. This hydrologic assessment included collection of soil samples, ground water, and ponded surface water from the Site and vicinity. These samples were analyzed for DDT, arsenic and lead.

Based on the B&W study, and a consent agreement with the State of Maryland, Central Chemical closed the Former Waste Lagoon, and a potential sinkhole located on-Site by covering those areas with clay and soil, and vegetative stabilization.

In March 1987, during the excavation of a trench for a sewer line by a third party, excavation workers unearthed what appeared to be buried chemical materials in the area of the Former Waste Lagoon (located in Domain 2). Soil samples collected at that time revealed pesticides, naphthalene and volatile organic compounds (VOCs).

After the identification of the on-Site dump in 1987 (during sewer line excavation), MDE began negotiating a Consent Order with Central Chemical. Though Central Chemical did not sign the proposed Consent Order with the State, they did hire Weston (a contractor) to undertake some investigatory work at the Site.

Following the March 1987 incident, the MDE directed Central Chemical to conduct an environmental investigation of the Site. Central Chemical engaged Roy F. Weston, Inc. (Weston) to perform a Phase I Environmental Investigation, which was completed in 1989. Weston's investigation included aerial photograph analysis, fracture trace analysis, soil sampling, ground water sampling, aquifer tests, and geophysical investigations. The Phase I Environmental Investigation included soil borings into the Former Waste Lagoon. Soil samples collected from the Former Waste Lagoon revealed DDT contamination.

The MDE prepared a Screening Site Investigation (SSI) for the Site in 1989. The MDE provided oversight of the soil borings that were advanced into the Former Waste Lagoon by Weston. MDE described the contents of the Former Waste Lagoon, as follows: *"The borings were drilled as deep as thirty-six (36) feet and encountered black material, yellow powder, and gray waste material, green seams, black and gray silt and clay, brown sand and silt and white powder. Strong petroleum odors were noted during the drilling."* The MDE SSI indicated that VOCs, pesticides, and heavy metals were detected in the soil and ground water at the Site. The highest concentrations of contaminants were present in the Former Waste Lagoon; however, lower contaminant concentrations were also detected off of the Central Chemical property. MDE concluded that the Site represented a threat to public health, and should be further evaluated.

Central Chemical was issued a Site Complaint (SC-O-92-185) on May 22, 1992 by MDE. Central Chemical was cited for improper storage of materials, including two 5-gallon containers, which reportedly contained "prohibited pesticides." The materials were subsequently removed and a Notice of Compliance was issued.

Federal, State, and local officials requested that Central Chemical install a fence around the quarry (Former Waste Lagoon) in 1992. Central Chemical agreed to construct the fence, which was completed by October 1992.

EPA performed an evaluation of the Site in 1992, to determine if a removal action was warranted at the Site. Samples were collected from the monitoring wells, shallow soils, and interior building surfaces (the buildings were not demolished until 2005). Based on the samples collected, EPA determined that removal action was not warranted at that time.

The MDE issued a draft Expanded Site Inspection (draft ESI) in 1993. The draft ESI included a review of historical Site data, and soil, ground water, surface water, and sediment sampling. The draft ESI indicated that pesticide soil contamination at the Site posed a risk to trespassers slightly above EPA's acceptable cancer risk range.

An EPA contractor conducted soil and sediment sampling on April 14, 1994. Pesticides were detected in six of the seven soil/sediment samples collected. At the request of EPA, the Agency for Toxic Substances and Disease Registry (ATSDR) reviewed the Site data and made the following recommendations:

- Since a large discrepancy exists between MDE and EPA data for samples collected outside the fence line, additional surface soil sampling (0 to 3 inches) should be conducted at this location to determine if pesticides are present at levels of health concern.

- Restrict dirt biking and other activities on the western part of the Site until surface soil contamination has been adequately characterized.

- Given the proximity of the encroaching housing development on the northeast border of the Site, consider collection of off-Site surface and subsurface soil samples at this location to determine if migration of Site related contaminants has occurred at levels of health concern.

- Determine if subsistence fishing is occurring at Antietam Creek. If so, consider fish sampling for analysis of DDT concentrations in the edible portion of the fish.

To address the issues identified by ATSDR, the MDE prepared an Expanded Site Inspection (ESI) in 1996. The ESI included additional soil and fish-tissue sampling. The ESI determined that pesticides in surface soils on and near the Site do not pose a significant increase in cancer risk to adult or child pedestrians walking or playing in the area. A slightly increased risk of adverse health effects was identified, however, for young children who play frequently along the footpaths along the fence near the railroad tracks (west side of Site). The fish tissue data revealed the presence of DDT (Site-related pesticide), and DDD/ Dichlorodiphenyldichloroethylene (DDE) (DDT breakdown products), however, the concentrations present were not of immediate health concern.

An EPA contractor collected 45 soil samples to the northwest of the Central Chemical property in August 1996. In 1996, that property was an open field, which was subsequently developed by residential housing. EPA collected samples parallel to the existing Central Chemical fence line in sampling lines 3 feet, 13 feet, and 40 feet from the Central Chemical fence. DDT

contamination was identified in the 3 feet, and 13 feet sampling lines. In February 1997, EPA and Central Chemical entered into an Administrative Order on Consent (AOC) for Removal Response Action, Docket No. 111-97-08-DC, to construct a fence beyond the existing fence that would result in DDT contaminated soil being present within the Central Chemical fence line. Central Chemical complied with the order and extended the fence to contain the contaminated soils on approximately February 28, 1997.

An EPA contractor performed confirmation sampling of soils located outside the extended Central Chemical fence in February 1997. A total of 15 confirmation soil samples were collected. DDT, DDD, and DDE were detected in the confirmation soil samples, albeit at concentrations below removal action levels. MDE reviewed the soil sample results and concluded that the current concentrations of pesticides in the surface soil near the Central Chemical property did not pose a significant increase in cancer risk to construction workers, adults or children from incidental ingestion of soil. A slight potential increase for non-carcinogenic health effects for children from incidental ingestion of soil was noted. MDE concluded that because the soil samples which exhibited elevated contaminant concentrations were now within the Central Chemical fence, access to this area should be limited, reducing the potential for adverse health effects to children.

An MDE contractor performed additional soil sampling outside of the Central Chemical fence line to the northwest of the Site in June 1997. A total of eight soil samples were collected outside of the Central Chemical fence to the northwest of the Site. DDT, DDD, and DDE were detected in the soil samples at low concentrations. MDE determined that the contaminant concentrations did not represent a carcinogenic risk above EPA's acceptable cancer risk range.

The Site was proposed to the CERCLA National Priorities List on June 17, 1996, and was listed as Final on the National Priorities List on September 25, 1997.

A group of Potentially Responsible Parties (PRPs) for the Site, known as the Central Chemical Site Participation Group (CCSPG), performed an RI/FS at the Site. The RI/FS was completed in 2009.

In 2002, two areas were identified on the Site where elevated concentrations of pesticides were present. The first area included a pile of light brown powdery pesticide material. A second area consisted of a tarry residue that was present on the ground surface. These two areas were excavated and the materials were shipped offsite for disposal by incineration. The amount of material involved in this voluntary action was approximately 3.2 tons.

In 2003, an interim remedial measure was performed to reduce the mobility of site constituents that could be subject to transport in rainfall runoff. The interim measure consisted of installation of silt fencing along the Mitchell Avenue frontage of the site and the installation of a clean gravel drive area at the Site entrance.

In 2005, the CCSPG removed all remaining structures from the Site at a cost of approximately $3,000,000. Although the demolition of the Site buildings would have typically been performed as part of the Site remedial action and not the RI/FS, the Group elected to perform this interim

remedial action. The demolition program resulted in the offsite disposal of approximately 1,100 tons of material at a Resource Conservation and Recovery Act (RCRA) Subtitle C landfill, approximately 3,900 tons of material at a RCRA Subtitle D landfill, 176 tons of asbestos containing materials at a RCRA Subtitle D landfill, and the recycling of over 550 tons of steel. In addition, 12.5 tons of scrap tires were recycled.

2.3 COMMUNITY PARTICIPATION

The RI/FS and Proposed Remedial Action Plan for the Site were made available to the public in April 2009. They can be found in the Administrative Record file and the information repository maintained at the EPA Docket Room in Region III and at the Washington County Free Library. The notice of the availability of these two documents was published in the Herald-Mail. A public comment period was held from April 15, 2009 to May 14, 2009. Two requests for extensions of the public comment period were received by EPA. As a result, the public comment period was extended to July 15, 2009. In addition, a public meeting was held on April 28, 2009 to present the Proposed Remedial Action Plan to a broader community audience than those that had already been involved at the Site. At this meeting, representatives from EPA and the MDE answered questions about the remedial alternatives evaluated, and EPA's Preferred Alternative. EPA's response to comments received during the public comment period is included in the Responsiveness Summary, which is part of this ROD.

A community liaison panel was also formed as part of the community participation activities at the Site. The community liaison panel is comprised of local citizens, members of local government, local elected officials, the PRPs at the Site, EPA staff, and MDE staff. During the RI/FS, periodic meetings with the community liaison panel were held to discuss Site conditions, RI/FS findings, advantages/disadvantages associated with the available remedial options, and community concerns.

2.4 SCOPE AND ROLE OF OPERABLE UNIT OR RESPONSE ACTION

As with many Superfund sites the problems at the Central Chemical Site are complex. As a result, EPA has organized the work into two operable units (OUs):

- Operable Unit 1: Contaminated soils and principal threat waste. Also, the results of the RI for sediments and surface water are included in this ROD (OU-1).
- Operable Unit 2: Contaminated ground water

This ROD addresses contaminated soils and principal threat wastes at the Site which pose a threat to human health and the environment (ecological receptors, and ground water). As discussed in Section 2.11 of this ROD, the contents of the Former Waste Lagoon, which include powders and sludge, are considered to be principal threat waste. The overall cleanup strategy for the Site is:

1. Treat the principal threat waste present in the Former Waste Lagoon using In-Situ S/S technology. S/S of the Former Waste Lagoon will prevent the leaching of hazardous substances from the wastes, and will mitigate the threat these wastes

pose to ground water. Contents of the Former Waste Lagoon which cannot be successfully solidified/stabilized (based on the results of a treatability study to be performed during the pre-Remedial Design Investigation) will be excavated and transported off-Site, with treatment as necessary, and disposed of off-Site at an off-Site waste disposal facility in accordance with CERCLA §121(d)(3).

2. After the Former Waste Lagoon has been addressed, the contaminated soils from the remainder of the Site (outside of the footprint of the Former Waste Lagoon) will be excavated and consolidated in the area of the treated Former Waste Lagoon. A low permeability cover system will be placed over the consolidated contaminated soils. The treated Former Waste Lagoon, the consolidated contaminated soils, and the low permeability cover system will constitute a permanent Consolidation Area on the Site for contaminated media (soils, treated principal threat waste). A ground water monitoring, extraction and treatment system will be installed around the Consolidation Area to prevent contaminant migration beyond the boundaries of the Consolidation Area.

The overall objective of the cleanup actions required by this ROD is to prevent contact between human and ecological receptors and contaminated soils; treat the principal threat waste present in the Former Waste Lagoon; and prevent contaminant migration via ground water beyond the boundaries of the Consolidation Area.

As discussed below in Section 2.7 and Section 2.12, additional soil samples will be collected on the properties adjacent to the Central Chemical property during the pre-Remedial Design Investigation to determine if there is an unacceptable risk posed by the soils. EPA conclusions on the need for response actions beyond the boundaries of the Central Chemical property will be documented in an appropriate EPA decision document.

The delineation of ground water contamination at the Site is not complete. Once the delineation of contaminated ground water is complete, EPA will issue a proposed remedial action plan and a subsequent ROD for OU-2 (contaminated ground water). Ground water contamination at the Site is discussed further below in Section 2.5 (Site Characteristics).

Based on the results of the HHRA and ERA, response actions to address the presence of Site-related hazardous substances in surface water and sediment are not warranted.

2.5 SITE CHARACTERISTICS

2.5.1 Physical Characteristics and Land Use

The Site includes the Central Chemical property, a single 19.02-acre parcel situated in an area of mixed industrial, commercial, and residential uses, and any areas where Site-related hazardous substances have come to be located. The Site also includes a ground water contamination plume which extends to the northeast and southwest of the Central Chemical property. As discussed elsewhere in this ROD, ground water contamination at the Site is being addressed as a separate OU (OU-2). Therefore, a separate proposed remedial action plan will be prepared by EPA which discusses the extent of ground water contamination, and ground water remedial alternatives.

Finally, the Site includes downstream sediments and surface water which may have been contaminated by activities on the Central Chemical property. The results of the RI for sediments and surface water are included in this ROD (OU-1).

The Site is bordered on the south and east by Mitchell Avenue, beyond which lies "Maryland Metals," an industrial property; on the west by active railroad tracks, beyond which are commercial and residential properties; on the northwest by the Brighton Manor residential sub-division; and on the northeast by residential townhouses. An electrical substation, owned by the City of Hagerstown, is also located to the northeast of the Site, beyond which lies a partially empty shopping center. Central Chemical Corporation sold the substation property to the Hagerstown Municipal Light Company in 1985.

Buildings associated with the former fertilizer blending and manufacturing operations were located in the southwestern portion of the Site. Several smaller structures associated with the pesticide blending operations were located on the northwestern portion of the Site. Due to their deteriorating condition, the Site buildings were demolished in 2005; however, the building foundations and floor slabs were left intact and are currently present on-Site. A fence encloses the Central Chemical property and two gates are located along Mitchell Avenue to control access to the property.

2.5.2 Site Geology and Hydrogeology

The Central Chemical Site of Hagerstown, Maryland is located in the Great Valley (Hagerstown Valley in Maryland) of the Appalachian Ridge and Valley Province. The Ridge and Valley Province is composed of strongly folded and faulted sedimentary rocks. The Hagerstown Valley, which is located in the eastern portion of the Ridge and Valley Province, is a wide valley of karst terrain that was formed on predominantly carbonate bedrock of Cambrian and Ordovician age. As described by the Maryland Geologic Survey, "*The Hagerstown Valley is characterized by enormous folds of the rock layers ...[with] the South Mountain Anticlinorium located to the east and the Massanutten Synclinorium in the west. ... Numerous smaller folds are superimposed on this basic pair of folds, which have been eroded away, and the area has been broken and rearranged by normal and thrust faults. The result is a north-northeast-south-southwest fabric, strata that dip in various directions and to varying degrees, and fault-controlled interruptions and juxtapositions of strata.*" (Duigon, 2001).

Three carbonate formations are located in the vicinity of the Central Chemical Site (Figures 4 & 7). The Rockdale Run Formation is composed of stromatolitic silty limestones and dolomites over a basal chert. The Stonehenge Limestone underlies the Rockdale Run Formation and is composed of an upper, thin-bedded, course-grained oolitic limestone with flat pebble conglomerate over massively bedded algal limestones. The Conococheague Formation underlies the Stonehenge Limestone and is comprised of three members. The Upper Member includes sets of alternating, thin, planar beds of limestone and dolomite, narrow beds of blue and pink marble, and thin bedded, flat pebble limestone and conglomerate. The Middle Member is comprised of limestone and interbedded dolomite (the Upper and Middle Members outcrop at the Site). The Lower Member consists of narrow sets of siltstone and massive dolomite intercalated with algal and stromatolitic limestones, ribbony carbonate and flat pebble conglomerate beds.

The Conococheague Formation is a karst aquifer that is over 1,500 feet in thickness. Karst aquifers are characterized by the enlargement of secondary features and voids by the solvent action of circulating water creating tertiary porosity. Bedrock aquifers have little intergranular, or primary porosity. Secondary porosity is provided by rock fractures, faults and bedding plane separations. Ground water moves through most karst aquifers principally through tertiary porosity provided by the interconnection of network of conduits and voids. Conduits greater than 5 to 10 millimeters (mm) in diameter can result in rapid flow where velocities generally exceed 0.001 meters per second (m/s) (ASTM, 1995). Ground water flow in the rock mass is also both primary and secondary; however, such flow is typically slow (less than 0.001 m/s) and is usually only a small percentage of the volume of water discharging through the aquifer, though it provides most of the storage (ASTM, 1995).

Karst aquifers can store large volumes of water in the unsaturated (vadose) zone known as the epikarst, which is the uppermost portion of carbonate bedrock (commonly 20 to 45 feet in thickness). The epikarst in the Conococheague Formation at the Central Chemical Site consists of highly fractured and dissolved bedrock, which is expressed on the surface as a type of karst known as pinnacle-and-grike karst where contact between bedrock and the soil overburden is very irregular (Figure 5). Highly permeable vertical pathways are formed along intersections of isolated vertical fractures. According to the ASTM, *"The epikarst behaves as a locally saturated, sometimes perennial, storage zone that functions similarly to a leaky capillary barrier or a perched aquifer. Flow into this zone is more rapid than flow out of it, as only limited vertical pathways transmit water downwards."* (ASTM, 1995). See Figure 6.

Fractures containing ground water at monitoring wells drilled the Central Chemical Site were first encountered at approximately 48 feet below ground surface (bgs). However, the average elevation of ground water at the time of installation was 28.2 feet bgs indicating semi-confined conditions typical of karst aquifers. The average depth to ground water as measured at the same wells in May 2008 (a period of high ground water) was 24.64 feet bgs. The difference between the level where ground water was first encountered and the higher static elevation of ground water in monitoring wells indicates that on a small scale (the vicinity of a well), there are unfractured blocks of rocks having negligible permeability (Duigon, 2001).

The Central Chemical Site is located near the axis of a north northeast (NNE) trending, southwest (SW) plunging, asymmetric anticline with very steeply dipping beds (55° to 90° +) on the NW limb and shallower dipping beds (25° to 45°) on the SE limb. A thrust fault is located approximately 1,000 feet to the west NW of the site (See Figure 7 Cross-Section). The Site geology and hydrogeology are complicated by a secondary anticline, which mimics the primary anticline, and bisects the Site near the former lagoon (Figure 8). The secondary "Site" anticline and primary anticline provide structural hydraulic controls on contaminant migration. Contaminant migration is limited to the west by steeply dipping bedding planes of the secondary anticline and facilitated to the east (with depth) by the shallow dipping bedding planes of the primary and secondary anticlines.

Hydrogeology at the Central Chemical Site is further complicated by a ground water divide that coincides with the secondary "Site" anticline. Hydraulic contours of ground water elevation indicate flow radiating from the central anticline; however, the actual flow path of ground water

is parallel to the NE/SW strike only deviating to the SE and NE along fractures in a stair step type of flow pattern. Structural control of contaminant migration is influenced both horizontally and vertically by asymmetric bedding planes of the "Site" anticline. However, it appears that varying degrees of interconnection exist locally on a small scale between shallow and deeper hydraulic zones. These hydraulic zones may be somewhat continuous parallel to strike, but are discontinuous perpendicular to strike because horizontal and vertical conductivity are reversed due to the anticline.

Ground water contaminant plumes from the former lagoon extend approximately one half mile to the southwest and one half mile to the northeast (Figure 9). It is possible that irrigation wells located approximately one mile to the northeast (Fountainhead Country Club) draw ground water from the Site to the northeast.

Soils at the Central Chemical Site are mainly composed of clayey silts resulting from the chemical weathering of in-situ limestone and dolomite bedrock. Some thin sand lenses occur, but are horizontally discontinuous due to weathering of steeply dipping bedrock strata. The thickness of the soil overburden ranges from 44 feet at monitoring well (MW)-J to 0 feet where bedrock outcrops occur. The average thickness of soil is 19.05 feet based on the depth of 26 current and historic on-site wells.

It is important to note that the most contaminated area of the Site is the former pesticide and fertilizer waste lagoon, which was located in the northern portion of the Site. When operational, the former lagoon was over an acre in size with an estimated depth between 20 and 30 feet bgs. The former lagoon was backfilled in the late 1960s with construction debris, contaminated soils and principal threat wastes. The depth to ground water in the vicinity of the Former Waste Lagoon is expected to vary seasonally in response to rainfall and snow melt conditions. There is a potential that the ground water level may seasonally rise into the contaminated soils and wastes present in the Former Waste Lagoon. The estimated elevation range for the bottom of the former lagoon is 590 to 605 feet above mean sea level (msl). The measured ground water elevation (msl) in monitoring wells surrounding the former lagoon in May 2008 ranged from 605.49 feet at MW-M to 595.89 feet at MW-K indicating that ground water was likely within the basin of the Former Waste Lagoon thus providing a continuing contaminant source mass for ground water transport.

2.5.3 Site Drainage and Surface Water

Generally, the Site slopes from north to south. Surface drainage from the northern (higher) portion of the Site flows south through a drainage swale that runs through the eastern portion of the Site. Surface runoff from the drainage swale then enters a pipe that runs under the Site entrance road to the grassy area in front of the former fertilizer building. This conveyance system was noted in the 1982 topographic map that was prepared by the City of Hagerstown. This drainage feature was also discussed in Maryland Water Pollution Control Commission correspondence and field reports obtained from the Maryland Archives. The drainage swale was constructed in the early 1950s. The pipe outlet for the drainage swale is now apparently covered and is no longer visible at the surface. Any water that enters the pipe likely dissipates underground. Surface drainage that does not enter this system flows overland and enters a storm drain to the south of the Site on Mitchell Avenue.

Surface water runoff from a small portion (approximately 0.3 acres) of the Site enters a storm drain on Mitchell Avenue. Runoff flows southward from the drain through the underground storm water system for approximately one mile, where it discharges from a box culvert into Marsh Run 2 in City Park, near Walnut Street Marsh Run 2 flows through City Park along an improved channel. The natural channel has been modified with rip-rap and other engineering techniques. The channel itself is about 8 to 12 feet wide. Flow varies from a rivulet to more than one cubic foot per second (cfs), depending on weather conditions. Marsh Run 2 is not a fishery or recreational stream. Several inflows discharge to Marsh Run 2 on its course through City Park. As Marsh Run 2 flows through Hagerstown, it is contained through segments of concrete-lined conduits. Several storm drains and tributaries contribute to flow along this segment. Marsh Run 2 follows Memorial Boulevard southeast past Potomac Street, and continues eastward along Memorial Boulevard to Eastern Boulevard, where it is joined by a tributary contained in a separate concrete-lined conduit. Marsh Run 2 then turns south and flows around a former power plant (Maryland Electric Light and Power). Marsh Run 2 then discharges into Antietam Creek, approximately 1.8 miles downstream from the box culvert in City Park.

Based on the information from the MDE, Marsh Run 2 qualifies as a Class 3 stream, capable of supporting a reproducing trout population. This is the highest water quality rating. However, owing to the engineered nature of Marsh Run 2, it is not expected to be suitable for trout.

Antietam Creek is a tributary of the Potomac River that drains the north-central portion of Washington County. It is located about 2 miles south of the Site, and converges with the Potomac River 15 miles downstream from its junction with Marsh Run 2. Antietam Creek is estimated to flow between 100 and 1,000 cubic feet per second (cfs). Antietam Creek is used for fishing and recreational purposes. There are no municipal surface water intakes located on Antietam Creek within 15 miles downstream from the point of convergence with Marsh Run 2.

For the length of the stream in the vicinity of Marsh Run 2, Antietam Creek is a Class 4 stream, only able to support a stocked population of trout for sport fishing.

2.5.4 Remedial Investigation

EPA accepted the RI report in 2009. The RI report is included in the Administrative Record. This ROD presents the Selected Remedy for contaminated soils and principal threat wastes at the Site (OU-1).

Field work was performed during the RI in three separate phases, as follows:

> Phase I of the RI occurred in 2003. Phase I sampling included the following media: soil, ground water, surface water and sediment, storm water, and on-Site buildings (which were demolished and disposed of off-Site in 2005).
>
> Phase II of the RI occurred in 2004. Phase II sampling included the following media: soil, ground water, surface water and sediment, and storm water.

Phase III of the RI included supplemental ground water investigations which were performed in 2005, and included sampling of nearby springs.

Soil samples collected during Phase I were analyzed, as follows:

- Target Compound List Volatile Organic Compounds by EPA Contract Lab Program (CLP) Method OLM04.2
- Target Compound List Semi-Volatile Organic Compounds by EPA CLP Method OLM04.2
- Target Analyte Metals by EPA CLP ILM04.1
- Target Compound List Pesticides by EPA CLP Method OLM04.2
- Site specific pesticides: Propargite, Aramite, Diphenamid, Sevin, Cournaphos, Delnav, Guthion, Karathane by EPA Method 8270 Selected Ion Monitoring
- 2,4-DDD Series: 2,4-DDD, 2,4DDE, 2,4-DDT by EPA Method 8081.

Soil samples collected during Phase II were analyzed for a similar list of compounds, identified on Tables 3-2 and 3-3 of the RI report (URS Corporation [URS], 2007 with 2008 change pages).

2.5.5 RI Objectives

The objectives of the RI for the Central Chemical Site included:

- Characterizing the nature and extent of Site-related contamination in the ground water, surface water, sediments and soil.
- Collecting the data necessary to complete a comprehensive assessment of the actual and potential health and environmental risks associated with the Site.
- Obtaining the information necessary to develop and evaluate remedial alternatives.

2.5.6 RI Results

2.5.6.1 Soils and Wastes

Overburden soils at the Site (classified as Hagerstown Site Loam) consist of an uppermost fill layer of brown silt with varying amounts of coarse to fine sand and gravel, underlain by natural soil that generally consists of light orange brown silt and clayey silt. Fill at the Site varies in thickness from 0 to approximately 12 feet bgs. Natural soil varies at the Site from 0 feet (bedrock outcrops are present on the Site) to 44 feet bgs. This variability is typical of weathering of steeply dipping limestone bedrock terrain.

The RI included soil sampling and analysis. A total of 207 surface soil samples and 156 subsurface soil samples were collected at the Site and submitted for laboratory analysis. The locations of the soil samples and specific laboratory analyses are discussed in the RI report, included in the Administrative Record for the Site. The soil sampling identified surface soil and

subsurface soil contamination at the Site. The area of the plant formerly occupied by the Site buildings (Domain 1) primarily exhibits surface soil contamination. The area of the Former Waste Lagoon (Domain 2) exhibits surface soil contamination, as well as subsurface soil contamination and the presence of buried powders and sludge. Limited soil contamination has been identified in Domain 3, however, a relatively isolated lens of potential pesticide related waste was identified in the drainage swale (potential sinkhole) located along the western side of this domain.

2.5.6.2 Surface Water, Sediments, Fish Tissue

An evaluation was performed during the RI, to determine whether contamination from the Site has migrated to surface water and sediments via storm water transport.

During the RI, environmental sampling was performed to determine if contamination was migrating from the Site as a result of storm water runoff from the Site. The following media were sampled and analyzed to evaluate the potential for off-Site contaminant migration via this pathway: storm water samples, surface water samples, sediment samples, and fish-tissue samples. Because other sources of pesticide contamination may be present in the Hagerstown Area (agricultural areas, other facilities involved in the manufacture of pesticide products), environmental samples were collected downstream from the Site (Marsh Run 2, Antietam Creek), as well as at locations upstream from the Site (above confluence of Marsh Run 2 and Antietam Creek).

A detailed description of the number and location of samples, the specific laboratory analyses, and analytical results are included in the RI, which is included in the Administrative Record.

Downstream surface water samples, collected in Marsh Run and Antietam Creek, exhibited three Site-related pesticides at low concentrations, 2,4'-DDT, alpha-BHC, and beta-BHC. One of the nine upstream surface water samples, the sample collected within Antietam Creek immediately above the confluence of Marsh Run exhibited two of the three pesticides detected in the downgradient samples; 2,4'-DDT and alpha-BHC.

Pesticides, semi-volatile organic compounds (SVOCs), volatile organic compounds (VOCs), and metals were detected at low concentrations in sediment samples collected downstream from the Central Chemical property (within Marsh Run and Antietam Creek), and upstream of Central Chemical property (upstream of the confluence of Marsh Run and Antietam Creek). In general, the highest organic analyte concentrations were detected in the sediment samples collected from Marsh Run and from Antietam Creek downgradient of Marsh Creek confluence. The metals concentrations were generally similar upstream and downstream with some metals such as chromium and lead being slightly higher in the Marsh Run and downstream Antietam Creek samples.

Fish tissue collected upstream and downstream from the Site exhibited pesticides including 4,4'-DDT and 2,4'-DDT breakdown products, alpha-chlordane, dieldrin, endrin ketone, and gamma chlordane. For rock bass, pesticide concentrations were generally higher upstream of the Site. For foraging fish, pesticide concentrations were generally higher downstream of the Site.

Broadly, environmental data collected as part of the RI, including surface water, sediment, and fish tissue samples, indicate that contamination may have migrated from the Site to surface water, sediment, and fish tissue. A risk assessment was performed to evaluate the potential threat to human health and the environment posed by the Site-related contaminants identified in surface water, sediment, and fish tissue. The risk assessment is discussed below in Section 2.7 (Summary of Site Risk).

2.5.6.3 Storm Water

Samples of storm water were collected during storm events in June 2003. The storm water samples indicated that Site-related pesticides and heavy metals were migrating from the Site via storm water sheet flow. To address this condition, the PRP installed silt fencing at the Site in an attempt to prevent contaminated sediments from migrating from the Site. In addition, the PRPs installed a gravel area at the Site entrance, in an attempt to prevent migration of contaminated soils from the Central Chemical property on vehicle tires. Storm water samples collected in September 2004, after the installation of the silt fencing and gravel area, indicated substantial reduction in concentrations of Site-related pesticides and metals.

2.5.6.4 Ground Water

A Site-related ground water contamination plume was identified during the RI. OU-2 of the Site includes ground water contamination. Delineation of the ground water contamination plume is being performed as part of OU-2. A separate OU-2 RI/FS document will be prepared, and a separate proposed remedial action plan and ROD will be issued by EPA to address ground water contamination.

Based on the RI, ground water contamination plume present beyond the boundaries of the Central Chemical property includes the following potential COCs:

- Aldrin
- Alpha-BHC
- Beta-BHC
- Delta-BHC
- Dieldrin
- Gamma-BHC
- Heptachlor
- Heptachlor epoxide
- Toxaphene
- Atrazine
- Diphenamid
- 1,2-dichloroethane
- 1,4-dichlorobenzene
- 1,2,4-trichlorobenzene
- Chlorobenzene
- Tetrachloroethylene
- Arsenic

- Manganese
- Thallium

Based on the human health risk assessment (HHRA), ground water contamination poses a $5.57x10^{-3}$ cancer risk as well as non-cancer risks to receptors who consume Site-related contaminated ground water obtained from off of the Central Chemical property (although, it should be noted, such receptors are not known to currently exist because of the presence of the public water supply). A depiction of the BHC-portion (all isomers) of the ground water contamination plume is included as Figure 9. The Site-related ground water contamination plume extends at least 2,700 feet to the southwest, and 2,200 feet to the northeast of the Site.

Sources of ground water contamination at the Central Chemical property are believed by EPA to include:

- The Former Waste Lagoon.
- Contaminated soils.
- Potentially other areas of buried principal threat waste not identified during the RI.

The remedial action objectives for the Site (Section 2.8), and the Selected Remedy (Section 2.12) address sources of ground water contamination on the Central Chemical property.

2.5.7 Conceptual Site Model

During the RI/FS, a conceptual site model (CSM) was established to evaluate potential routes of exposure between Site-related contaminants and human and ecological receptors. The CSM for the HHRA and ERA are described further below in Section 2.7 (Summary of Site Risk), and on Figure 10 (HHRA CSM), and Figures 11 and 12 (terrestrial and aquatic ERA CSM, respectively).

2.6 CURRENT AND POTENTIAL FUTURE LAND AND RESOURCE USES

The Central Chemical property is currently vacant land, occupied by concrete slabs associated with former Central Chemical buildings. The reasonably anticipated future use of the Site is light industrial development and/or commercial office park development. These Site uses are consistent with the recommendations of the Central Chemical Superfund Redevelopment Pilot Project, prepared by the City of Hagerstown in 2003, and current zoning at the Site.

The Site is bordered on the south and east by Mitchell Avenue, beyond which lies "Maryland Metals," an industrial property; on the west by active railroad tracks, beyond which are commercial and residential properties; on the northwest by the Brighton Manor residential sub-division; and on the northeast by residential townhouses. An electrical substation, owned by the City of Hagerstown, is also located to the northeast of the Site, beyond which lies a partially empty shopping center. Central Chemical Corporation sold the substation property to the Hagerstown Municipal Light Company in 1985.

Ground water is not currently used on the Central Chemical property for any purpose, or within one-mile of the Site for consumption purposes. The source of potable water in the vicinity of the Site is the Hagerstown/Williamsport Municipal System. The system, which serves a total of approximately 75,000 persons, draws water from an intake located on the Potomac River northwest of Williamsport, Maryland. This intake is upstream from the confluence of Antietam Creek and the Potomac River. The service area of the public water supply system extends beyond a 3-mile radius from the Site. Prior to distribution, municipal water is treated at the Richard Wilson Filtration Plant located on the Potomac River in Williamsport, Maryland.

Currently, domestic use of ground water in the Site vicinity is limited to areas farther than one-mile northwest of the Central Chemical property. However, as part of the OU-2 (ground water) RI/FS, EPA is evaluating the use of ground water in the vicinity of the Site for irrigation purposes. Additional information and evaluation regarding ground water usage in the vicinity of the Site will be included in the OU-2 proposed remedial action plan and subsequent ROD, when issued by EPA.

2.7 SUMMARY OF SITE RISK

2.7.1 Summary of Human Health Risk Assessment

The baseline risk assessment estimates what risks the Site poses if no action were taken. It provides the basis for taking action and identifies the contaminants and exposure pathways that need to be addressed by the remedial action. This section of the ROD summarizes the results of the baseline risk assessment for this Site.

WHAT IS HUMAN HEALTH RISK AND HOW IS IT CALCULATED?

A Superfund HHRA estimates the "baseline risk." This is an estimate of the likelihood of developing cancer or non-cancer health effects if no cleanup action were taken at a site. To estimate baseline risk at a Superfund site, EPA undertakes a four-step process:

Step 1: Analyze Contamination
Step 2: Estimate Exposure
Step 3: Assess Potential Health Dangers
Step 4: Characterize Site Risk

In Step 1, EPA looks at the concentrations of contaminants found at a site as well as past scientific studies on the effects these contaminants have had on people (or animals, when human studies are unavailable). Comparisons between site-specific concentrations, and concentrations reported in past studies helps EPA to determine which concentrations are most likely to pose the greatest threat to human health.

In Step 2, EPA considers the different ways that people might be exposed to the contaminants identified in Step 1, the concentrations that people might be exposed to, and the potential frequency and duration of exposure. Using this information, EPA calculates a "reasonable maximum exposure" (RME) scenario, which portrays the highest level of exposure that could reasonably be expected to occur.

In Step 3, EPA uses the information from Step 2 combined with information on the toxicity of each chemical to assess potential health risks. In Step 3, EPA compiles and interprets information about the potential adverse health effects of the Site-related chemicals of concern and develops quantitative relationships between exposure levels and potential human responses in sensitive populations.

In Step 4, EPA determines whether site risks are great enough to cause health problems for people at or near the

Superfund site. The results of the three previous steps are combined, evaluated and summarized. EPA adds up the potential risks from the individual contaminants and exposure pathways and calculates a total site risk. EPA considers two types of risk: cancer and non-cancer risk. The likelihood of any kind of cancer resulting from a Superfund site is generally expressed as an upper bound probability; for example, a "1 in 10,000 chance." In other words, for every 10,000 people that could be exposed, one extra cancer may occur as a result of exposure to site contaminants. An extra cancer case means that one more person could get cancer than would normally be expected to from all other causes. For non-cancer health effects, EPA calculates a "hazard index." The key concept here is that a "threshold level" (measured usually as a hazard index of less than 1) exists below which non-cancer health effects are no longer predicted.

Potential receptors and exposure pathways were identified based on the current and future land use and the impacted media (soil, ground water, etc) identified by the RI findings. The populations evaluated during the human health portion of the risk assessment were trespassers, commercial/light industrial workers, construction workers, residents, and recreational users of the Antietam Creek (discussed further below). Exposure routes (i.e. ingestion, dermal contact, and inhalation) were evaluated as appropriate for the receptors potentially affected by the impacted media. EPA's acceptable risk range for carcinogenic risks is $1x10^{-4}$ to $1x10^{-6}$, and the benchmark for non-carcinogenic risks is a hazard index (HI) of less than 1. In other words, the Agency considers a cancer risk greater than 1 in 10,000 and an HI of greater than 1 to be unacceptable. A cancer risk of 1 in 10,000 can also be written as "$1x10^{-4}$", or "1E-4" in scientific notation. Carcinogenic and non-carcinogenic risks were estimated for potential human exposures with affected soil, ground water, sediment, and surface water at the Site.

The conceptual site model used for the HHRA is attached to this ROD as Figure 10.

2.7.1.1 Soil on the Central Chemical property

Based on the results of the risk assessment, the following COCs are present in soils on the Central Chemical property:

- 2,4-DDT
- 4,4-DDT
- Aldrin
- alpha-Chlordane
- Dieldrin
- gamma-BHC
- Heptachlor Epoxide
- Toxaphene
- Heptachlor
- 2,4-DDD
- Arsenic
- Delta-BHC
- Benzo(a)pyrene (a SVOC)
- 4,4-DDD
- Gamma chlordane
- Beta-BHC
- Alpha-BHC

Table 9, attached to the ROD, includes a summary of information pertaining to the COCs identified at the Site, including range of detected concentrations, frequency of detection, and exposure point concentration used to estimate risk. In addition, Tables 10 and 11, attached to the ROD, include a summary of toxicity data for the COCs at the Site.

Contaminated soils on the Central Chemical property were evaluated for risk to the following groups:

- Trespassers: Individuals (juveniles (age 5 to 18) or adults) who might be exposed to Site surface soils or airborne chemicals released from or associated with soil/dust, on an infrequent basis during unauthorized trespass.
- Commercial/Light Industrial Site workers: Full-time workers who could be exposed to Site surface soils or airborne chemicals released from or associated with soil/dust, on a daily basis, throughout the year, over multiple years.
- Construction workers: Individuals who might be exposed to Site surface and subsurface soils, or airborne chemicals released from or associated with soil/dust, during typical excavation activities such as construction, or utility repair.
- Future Residents: This scenario includes both small children (0 to 6) and adults who would live on the Site and who would be exposed to Site surface and subsurface soils. This scenario is not consistent with the anticipated reuse of the Central Chemical property (see above), however it was evaluated as part of the RI.

Each risk group was evaluated separately for each of the three Domain areas (see Figure 3).

Based on the risk assessment, unacceptable risks were identified in each of the three Site Domain Areas. Risks in Domain 1 were unacceptable for each group evaluated (trespassers, Site workers, construction workers, future residents). Risks in Domain 2 were also unacceptable for each group evaluated (trespassers, Site workers, construction workers, future residents).

Risks in Domain 3 were unacceptable for three of the groups evaluated (trespassers, Site workers, and future residents). The calculated risk levels are included in Table 1. The risks posed to people in Domains 1, 2 and 3 were attributable to surface soil contamination (top 6 inches of soil), whereas the risks in Domain 2 were also influenced by the presence of contaminated soils in the Former Waste Lagoon. As indicated in Section 2.11 of this ROD, principal threat wastes are present in the Former Waste Lagoon, including powders and sludge.

2.7.1.2 Soil in Residential Areas Adjacent to the Central Chemical Property

The HHRA included an evaluation of risk for residents who live adjacent to the Central Chemical property. This scenario includes both small children (0 to 6 years old) and adults who would live adjacent to the Site and who would be exposed to surface and subsurface soils on a daily basis.

Previous investigations included the collection of soil samples from current residential areas to the northwest and northeast of the Central Chemical property, and along the railroad tracks adjacent to the west of the Central Chemical property. Site-related contaminants were identified in the soil samples collected adjacent to the Central Chemical property, including 4,4'-DDE, 4-4'-DDD, 4-4'-DDT. Although the risk assessment did not reveal unacceptable cancer risks at the adjacent residential properties for exposure to soils, the risk assessment did determine that non-cancer risks may exceed acceptable levels. Specifically, the reasonable maximum exposure (RME) hazard index from exposure to soil for current adjacent residents is slightly above the threshold of 1.0. This is due to elevated laboratory detection limits increasing the exposure point concentration for the pesticide "heptachlor epoxide." This potential concern will be addressed during the pre-remedial design investigation, as discussed below in Section 2.12.

The calculated risk levels for residents adjacent to the Site are included in Table 2.

During the pre-RDI, additional soil samples will be collected at adjacent properties and analyzed for Site-related contaminants to determine if there is an unacceptable risk posed by the soils.

2.7.1.3 Surface Water, Sediment, Fish Tissue

As described above, environmental data collected as part of the RI, including surface water, sediment, and fish tissue samples, indicates that some contamination (pesticides, metals, SVOCs) may have migrated from the Central Chemical property to surface water, sediment, and fish tissue. Therefore, as part of the HHRA, the following groups were evaluated for exposure to Site contamination in Antietam Creek, at locations upstream, and downstream from the Site:

- Swimming/wading users of the Antietam Creek: Swimming/wading users of the Antietam Creek are assumed to be members of the local community. As such, risks associated with this scenario should be representative of off-Site residents who live near the creek. Risks for upstream and downstream swimming/wading users were evaluated separately to address background (non Site-related) and potentially Site-related risk. This scenario includes both juveniles (age 5 to 18) and adults who could be exposed to surface water or sediment in the creek on an infrequent basis while wading, playing, or swimming in the creek.

- Anglers who catch and consume fish from Antietam Creek: Anglers are assumed to be members of the local community. As such, risks associated with this scenario should be representative of off-Site residents who live near the creek. Risks for upstream and downstream anglers are evaluated separately to address background (non Site-related) and potentially Site-related risk. Upstream fish samples were collected above a dam upstream of the Site to ensure that the upstream and downstream samples represented two distinct populations of fish. This scenario includes both juveniles (age 5 to 18) and adults who would ingest fish caught in Antietam Creek.

Based on the risk assessment, unacceptable cancer or non-cancer risks associated with Site-related contaminants were not identified for the swimmers/waders and anglers using Antietam

Creek at upstream or downstream locations and no Site-related response actions are required at this time for surface water or sediment.

2.7.2 Summary of Ecological Risk Assessment

WHAT IS ECOLOGICAL RISK AND HOW IS IT CALCULATED?
An ERA evaluates the potential for contaminants at a site to adversely affect the plants and animals that make up the local ecosystem. The ERA process follows a phased approach similar to that of the HHRA. The risk assessment results are used to help determine what measures, if any, are necessary to protect plants and animals.

ERA includes three steps:

Step 1: Problem Formulation
Step 2: Risk Analysis
Step 3: Risk Characterization

The problem formulation includes:

- Compiling and reviewing existing information on the site habitat, plants, and animals.
- Evaluating how the plants and animals may be exposed to the chemicals detected at the site. Routes of exposure (e.g., ingestion of soil; uptake of chemicals into worms and ingestion of worms by birds) are identified during this step.
- Selecting receptors for the risk evaluation. Instead of attempting to evaluate every species that may be present at the site, representative species are used for the quantitative evaluation. For example, insect-eating birds may be represented by an American robin, while carnivorous mammals may be represented by the red fox.
- Developing how the risk will be estimated for the complete exposure pathways. A complete exposure pathway is one for which the selected receptor will take into its body or tissue the site chemicals. If the exposure pathway is not complete, then there is no potential risk.

The second step of the ERA is the risk analysis. During this step, the potential exposure of an ecological receptor to the site chemicals is estimated.

The third step in the ERA is risk characterization, in which the potential exposure for each receptor is combined with toxicity information to estimate the potential for an adverse effect. This evaluation takes into account the fact that the metals present at the site may be due to background conditions and not to any industrial or waste disposal activities. Also considered in this step are the uncertainties (potential degree of error) that are associated with the predicted risk evaluation and their effects on the conclusions that have been made.

Similar to the non-cancer hazard analysis for human health, exposure levels for ecological receptors were compared to protective levels in order to calculate a hazard quotient (HQ). HQs are used to estimate whether risk or harmful effects are likely due to the contaminant. An HQ greater than 1 is considered by EPA to be indicative of potential unacceptable risk. HQs were developed for ecological receptors by dividing maximum and average exposure levels by the No Observed Adverse Effects Levels (NOAELs) and the Lowest Observed Adverse Effects Levels (LOAELs).

The ERA concluded that Site-related contaminants in surface water and sediment did not pose a significant threat to ecological receptors. With respect to soil, the ERA concluded that the Site contaminants may pose a risk to wildlife inhabiting the Central Chemical property, including small birds and mammals (e.g. short-tailed shrew, American robin). The following soil COCs were identified for ecological receptors:

- 4,4-DDT
- Aldrin
- Toxaphene

- Endrin ketone

The conceptual Site models used for ERA are attached to this ROD as Figures 11 and 12.

2.7.3 Basis for Taking Action

Based on the results of the HHRA and ERA, the response action selected in this ROD is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

2.8 REMEDIAL ACTION OBJECTIVES

To protect the public and the environment from potential current and future health risks, the RAOs, listed in Table 4, have been developed to address the contaminated soils and principal threat wastes which constitute OU-1.

2.9 DESCRIPTION OF ALTERNATIVES

During the FS, alternatives were prepared to achieve the RAOs identified above. A complete description of the evaluated alternatives is included in the FS, which is in the Administrative Record for the Site. A summary of each of these remedial alternatives is presented below. The alternatives are numbered to correspond with the numbering used in the FS report.

EPA's Preferred Alternative is *Alternative 2A – S/S treatment of Former Waste Lagoon; excavation/on-Site consolidation/capping of contaminated soils; near-lagoon ground water monitoring, extraction and treatment system.*

Several of the remedial alternatives considered as part of the FS, except the "no action" alternative, contain certain common elements that were considered in the evaluation process. These common elements include a pre-Remedial Design Investigation, institutional controls, the use of low-permeability cover systems, the use of ground water monitoring, extraction, and treatment systems, excavation and off-Site disposal of contaminated media (soil, waste), management of the concrete slabs and foundations that remain on the Site, and long-term operation, maintenance and monitoring activities. These common elements are described further, as follows:

1. Pre-Remedial Design Investigation: A pre-RDI would be necessary for any of the remedial alternatives (excluding Alternative 1, the no action alternative). The pre-RDI would be specific to each remedial alternative, but could include additional soil sampling and analysis to define soil excavation areas, aquifer pump testing for design of the ground water monitoring, extraction, and treatment system, etc.

2. Institutional Controls: The reasonably anticipated future use of the Site is light industrial development and/or commercial office park development. These Site uses are consistent with the recommendations of the Central Chemical Superfund Redevelopment Pilot Project, prepared by the City of Hagerstown in 2003, and

current zoning at the Site. As discussed above in Section 7 (Summary of Site Risk), current concentrations of Site-related contaminants on the Central Chemical property pose an unacceptable threat to the health of future workers at the Site. Therefore, EPA has established Site-specific Soil Remediation Standards (Table 13) that will be protective of future workers at the Site. Excavation will be performed at the Site to reduce contaminant concentrations in soils on the Site to meet the Site-specific Soil Remediation Standards. However, the Site-specific Soil Remediation Standards would not be protective of residents living on the Central Chemical property. Therefore, it is necessary to establish institutional controls at the Site to limit future use of the property to commercial/industrial land uses.

Institutional controls will also be necessary to protect low permeability cover systems and ground water extraction and treatment systems, which may limit the reusable area of the Site. For Alternatives 2, 2A, 3 and 4, contaminated soils will be consolidated beneath cover systems on the Central Chemical property, therefore permanent markers or monuments may be possible tools to prevent damage to the cover system, and future exposure of people to the consolidated contaminated soils.

3. Low Permeability Cover System: Several of the remedial alternatives discussed below require that a low permeability cover system be constructed over contaminated soil and the Former Waste Lagoon area on the Central Chemical property. The cover system would be constructed to prevent exposure of human and ecological receptors (e.g. birds, mammals) to contaminated soil and waste. In addition, the cover system would minimize infiltration of precipitation into the contaminated soil and waste, decreasing the potential for further migration of contaminants to ground water. Construction materials for the cover system would be synthetic materials, clays, or other materials, and the cover system would require long-term maintenance. A cover system would incorporate, as necessary, a landfill gas management system, which could include landfill gas vents, and landfill gas monitoring points.

   Remedies which include a low permeability cover system will comply with Federal and State Applicable or Relevant and Appropriate Requirements (ARARs).

4. Ground Water Monitoring, Extraction, and Treatment System: Five of the six remedial alternatives discussed below include the use of a ground water monitoring, extraction and treatment system in the vicinity of the Former Waste Lagoon. The ground water monitoring, extraction, and treatment system would be used to ensure that the principal threat wastes present within and potentially below the bottom of the Former Waste Lagoon (e.g. in bedrock fractures) do not act as a continuing source of ground water contamination through generation of contaminated leachate. The ground water monitoring, extraction and treatment system will ensure that the selected remedy achieves the remedial action objective

of preventing further contaminant migration to ground water from principal threat waste by extracting and treating contaminated leachate/ground water in the vicinity of the Former Waste Lagoon.

Remedies which include a ground water monitoring, extraction and treatment system will comply with Federal and State ARARs.

5. Excavation and Off-Site Treatment/Disposal of Contaminated Soils and Principal Threat Wastes: Several of the alternatives discussed below include excavation of contaminated soils and wastes and off-Site treatment and/or disposal of those materials at appropriate off-Site waste disposal facilities. In addition, excavation and off-Site disposal of contaminated media from the Site is included in EPA's Selected Remedy (Section 2.12). It is expected that most of the contaminated soils in Domain 1 and 3 would not be considered hazardous waste in accordance with the Resource Conservation and Recovery Act (RCRA). However, it is expected that certain waste materials present in the Former Waste Lagoon (e.g. powders, sludge) in Domain 2 may be classified as hazardous waste because of the toxicity characteristic associated with high concentrations of pesticides/heavy metals. Off-Site treatment and/or disposal of contaminated soils and principal threat wastes would be performed at appropriate waste disposal facilities, depending on waste classification.

   Alternatives which include excavation of contaminated soils and principal threat wastes would incorporate dust suppression using water/foaming agents. If necessary, a containment structure could be constructed over the Former Waste Lagoon in Domain 2 during remedial activities.

6. Concrete Slabs and Foundations: With the exceptions of Alternatives 1 and 4, each of the remedial alternatives includes removal of existing floor slabs and foundations in order to facilitate the performance of response actions at the Site.

   Characterization of the concrete slabs and foundations will be dependent upon their final disposition. If the slabs and foundations are to be disposed off-Site waste characterization activities prior to off-Site disposal will be necessary. If re-use of apparently non-contaminated concrete slabs and foundations on-Site or off-Site is found to be desirable during the Remedial Design, characterization activities will be necessary to confirm that on-Site or off-Site reuse of the concrete slabs and foundations will be protective of human health and the environment.

7. Operation and Maintenance and long-term monitoring: Alternatives 2, 2A, 3, 4, and 5 require that operation and maintenance (O&M) be performed for on-Site remedy features, including the low permeability cover system or earthen cap (the exception being Alternative 5, for which no cover system is included), and the ground water monitoring, extraction, and treatment system. In addition, long-term monitoring activities will be required after the remedial action is complete

including monitoring of leachate/ground water concentrations around the Former Waste Lagoon, appropriate monitoring for treated effluent from the ground water monitoring, extraction, and treatment system, etc. Long-term monitoring of ground water, and surface water/sediment (as potential discharge points for contaminated ground water) will be addressed in the proposed remedial action plan for OU2 (ground water contamination).

The following section is a summary of the cleanup alternatives that were considered during the Feasibility Study and the Proposed Remedial Action Plan and their associated costs.

2.9.1 Alternative 1

No Action

Capital Cost:	$0
Annual O&M Costs:	$0
Total O&M Costs:	$0
Total Present Worth Cost:	$0

Under Alternative 1, no remedial action would be taken at the Site. The "no action" alternative is included because the NCP requires that a "no action" alternative be developed as a baseline for evaluating other remedial alternatives.

This alternative would not reduce human health or ecological risks to acceptable levels, and would not achieve the remedial action objectives. This alternative would not be protective of human health, and will not be considered further.

2.9.2 Alternative 2

Excavation/on-Site consolidation/capping of contaminated soils and Former Waste Lagoon; near-lagoon ground water monitoring, extraction and treatment system

Capital Cost:	$ 7,576,289
Annual O&M Costs:	$ 465,000
Total O&M Costs:	$ 2,642,687
Total Present Worth Cost:	$10,408,289

Under Alternative 2, the following remedial actions would take place:

Pre-Remedial Design Investigation

- Perform a pre-RDI.

Floor Slabs and Foundations

- Remove, decontaminate and dispose off-Site the existing floor slabs and foundations.

- Perform characterization of the soils beneath the slabs for contamination.

Soils

- Excavate contaminated soils above Site-specific remediation standards from each of the three Domains Areas (1, 2 and 3) and consolidate the excavated soils in the Former Waste Lagoon area. The Site-specific remediation standards for soil are included in this ROD in the description of the Selected Remedy (Section 2.12).
- Perform confirmation testing to ensure that all contaminated soils have been excavated.
- Backfill excavated areas with clean fill and re-vegetate.

Low Permeability Cover System

- Construct a low permeability cover system over the area of the consolidated soils and Former Waste Lagoon.

Ground Water Monitoring, Extraction and Treatment System

- Install a ground water monitoring, extraction and treatment system around the Former Waste Lagoon to capture and treat contaminated ground water or leachate in the vicinity of the Former Waste Lagoon.

Institutional Controls

- Limit the reuse of the Central Chemical property to commercial/industrial use. Prevent disturbance of the low permeability cover system and ground water monitoring, extraction and treatment system, through establishment and implementation of institutional controls.

Implementation of Alternative 2 would allow for reuse of the Site in accordance with institutional controls.

2.9.3 Alternative 2A

S/S treatment of the contents of the Former Waste Lagoon; excavation/on-Site consolidation/capping of contaminated soils; near-lagoon ground water monitoring, extraction and treatment system

Capital Cost:	$11,518,772
Annual O&M Costs:	$ 465,000
Total O&M Costs:	$ 2,642,687
Total Present Worth Cost:	$14,350,772

Under Alternative 2A, the following remedial actions would take place:

Pre- Remedial Design Investigation

- Perform a pre-RDI.

Floor Slabs and Foundations

- Remove, decontaminate and dispose off-Site the existing floor slabs and foundations.
- Perform characterization of the soils beneath the slabs for contamination.

Solidification/Stabilization of Former Waste Lagoon

- Prior to consolidation of soils from the three Domain areas, the contents of the Former Waste Lagoon will be treated through the use of in-situ S/S technology. S/S refers to a group of cleanup methods that prevent or slow the release of harmful chemicals from contaminated materials, such as soil or waste. These methods usually don't destroy the chemicals; rather they prevent them from moving into the surrounding environment. Solidification refers to a process that binds the polluted soil or waste and cements it into a solid block. Stabilization refers to changing the chemicals so they become less harmful or less mobile.

Soils

- Excavate contaminated soils above Site-specific remediation standards from each of the three Domains Areas (1, 2, and 3) and consolidate the excavated soils in the Former Waste Lagoon area. The Site-specific remediation standards for soil are included in this ROD in the description of the Selected Remedy (Section 2.12).
- Perform confirmation testing to ensure that all contaminated soils have been excavated.
- Backfill excavated areas with clean fill and re-vegetate.

Low Permeability Cover System

- Construct a low permeability cover system over the area of the consolidated soils and Former Waste Lagoon (Consolidation Area).

Ground Water Monitoring, Extraction and Treatment System

- Install a ground water monitoring, extraction and treatment system around the Former Waste Lagoon to capture contaminated ground water or leachate in the vicinity of the Former Waste Lagoon area.

Institutional Controls

- Limit the reuse of the Central Chemical property to commercial/industrial use. Prevent disturbance of the low permeability cover system and ground water

monitoring, extraction and treatment system, through establishment and implementation of institutional controls.

Implementation of Alternative 2A would allow for reuse of the Site in accordance with institutional controls.

2.9.4 Alternative 3

Excavation and off-Site disposal of contaminated soils from Domains 1 and 3; capping of Former Waste Lagoon; near-lagoon ground water monitoring, extraction and treatment system.

Capital Cost:	$11,254,559
Annual O&M Costs:	$ 480,000
Total O&M Costs:	$ 2,698,972
Total Present Worth Cost:	$14,142,844

Pre- Remedial Design Investigation

- Perform a pre-RDI.

Floor Slabs and Foundations

- Remove, decontaminate and dispose off-Site the existing floor slabs and foundations.
- Perform characterization of the soils beneath the slabs for contamination.

Soils

- Excavate contaminated soils above Site-specific remediation standards from Domains 1 and 3. Dispose of these excavated soils off-Site. The Site-specific remediation standards for soil are included in this ROD in the description of the Selected Remedy (Section 2.12).
- Excavate contaminated soils above Site-specific remediation standards from Domain 2, outside the foot print of the Former Waste Lagoon. Consolidate these excavated soils in the area of the Former Waste Lagoon. The Site-specific remediation standards for soil are included in this ROD in the description of the Selected Remedy (Section 2.12).
- Perform confirmation testing to ensure that all contaminated soils have been excavated.
- Backfill excavated areas with clean fill and re-vegetate.

Low Permeability Cover System

- Construct a low permeability cover system over the area of the consolidated soils and Former Waste Lagoon.

Ground Water Monitoring, Extraction and Treatment System

- Install a ground water monitoring, extraction and treatment system around the Former Waste Lagoon to capture and treat contaminated ground water or leachate in the vicinity of the Former Waste Lagoon area.

Institutional Controls

- Limit the reuse of the Central Chemical property to commercial/industrial use. Prevent disturbance of the low permeability cover system and ground water monitoring, extraction and treatment system, through establishment and implementation of institutional controls.

Implementation of Alternative 3 would allow for reuse of the Site in accordance with institutional controls.

2.9.5 Alternative 4

Excavation and off-Site disposal of the contents of the Former Waste Lagoon; excavation/on-Site consolidation/capping of contaminated soils; near-lagoon ground water monitoring, extraction and treatment system.

Capital Cost:	$30,618,451
Annual O&M Costs:	$ 491,000
Total O&M Costs:	$ 4,567,875
Total Present Worth Cost:	$35,375,639

Pre- Remedial Design Investigation

- Perform a pre-RDI.

Floor Slabs and Foundations

- Leave in-place existing floor slabs and foundations.

Soils

- Excavate contaminated soils above Site-specific remediation standards from Domains 2 and 3. Consolidate these excavated soils in Domain 1. The Site-specific remediation standards for soil are included in this ROD in the description of the Selected Remedy (Section 2.12).
- Perform confirmation testing to ensure that all contaminated soils have been excavated from Domains 2 and 3.
- Backfill excavated areas with clean fill and re-vegetate.

Cover System

- Once contaminated soils from Domain 2 and 3 have been consolidated in Domain 1, construct an earthen cap over the contaminated soils in Domain 1.

Former Waste Lagoon

- Excavate the contents of the Former Waste Lagoon in Domain 2, and dispose off-Site the contents of the Former Waste Lagoon.

Ground Water Monitoring, Extraction and Treatment System

- Install a ground water monitoring, extraction and treatment system around the Former Waste Lagoon to capture and treat contaminated ground water or leachate in the vicinity of the Former Waste Lagoon Area.

Institutional Controls

- Limit the reuse of the Central Chemical property to commercial/industrial use. Prevent disturbance of the earthen cap and ground water monitoring, extraction and treatment system, through establishment and implementation of institutional controls.

Implementation of Alternative 4 would allow for reuse of the Site in accordance with institutional controls.

2.9.6 Alternative 5

Excavation and off-Site disposal of the contents of the Former Waste Lagoon; excavation and off-Site disposal of contaminated soils; near-lagoon ground water monitoring, extraction and treatment system.

Capital Cost:	$33,342,456
Annual O&M Costs:	$ 425,000
Total O&M Costs:	$ 3,369,353
Total Present Worth Cost:	$36,901,122

Pre- Remedial Design Investigation

- Perform a pre-RDI.

Floor Slabs and Foundations

- Remove, decontaminate and dispose off-Site the existing floor slabs and foundations.
- Perform characterization of the soils beneath the slabs for contamination.

Soils

- Excavate contaminated soils above Site-specific remediation standards from the three Domain Areas. Dispose of these excavated soils off-Site. The Site-specific remediation standards for soil are included in this ROD in the description of the Selected Remedy (Section 2.12).
- Perform confirmation testing to ensure that all contaminated soils have been excavated.
- Backfill excavated areas with clean fill and re-vegetate.

Former Waste Lagoon

- Excavate the contents of the Former Waste Lagoon in Domain 2, and dispose off-Site the contents of the Former Waste Lagoon.

Ground Water Monitoring, Extraction and Treatment System

- Install a ground water monitoring, extraction and treatment system around the Former Waste Lagoon to capture and treat contaminated ground water or leachate in the vicinity of the Former Waste Lagoon area.

Institutional Controls

- Limit the reuse of the Central Chemical property to commercial/industrial use. Prevent disturbance of the ground water monitoring, extraction and treatment system, through establishment and implementation of institutional controls.

Implementation of Alternative 5 would allow for reuse of the Site in accordance with institutional controls. Contaminated soils would no longer be present on the Site. To the extent practicable, principal threat waste would be removed from the Former Waste Lagoon, and no low permeability cover system would be required. Overall, implementation of Alternative 5 is expected to return the largest portion of the Site to commercial/industrial reuse, with the least property use restrictions, relative to the other alternatives under consideration.

2.10 SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

As part of the remedy selection process, EPA evaluates each proposed remedy against the nine criteria specified in the NCP, 40 CFR §300.430(e)(9)(iii). The alternative selected must first satisfy the threshold criteria set out in the NCP. Next, the primary balancing criteria are used to weigh the tradeoffs or advantages and disadvantages of each of the alternatives. The modifying criteria, which are State and community acceptance, will be evaluated at the end of the public comment period. This section of the ROD summarizes the relative performance of each alternative against the seven criteria, noting how it compares with the other options under consideration. For additional information on the comparison of the remedial alternatives, refer to the FS report.

Below is a summary of the nine criteria used to evaluate remedial alternatives.

2.10.1 Threshold Criteria

2.10.1.1 Overall Protection of Human Health and the Environment

Evaluates whether an alternative provides adequate protection and how risks posed through each pathway are eliminated, reduced or controlled through treatment, engineering controls, or institutional controls.

2.10.1.2 Compliance with Applicable or Relevant and Appropriate Requirements

Evaluates whether or not an alternative will meet all ARARs of Federal and State environmental statutes and/or justifies a waiver.

2.10.2 Primary Balancing Criteria

2.10.2.1 Long-Term Effectiveness and Permanence

Addresses the ability of an alternative to afford long term, effective and permanent protection to human health and the environment over time.

2.10.2.2 Reduction of Toxicity, Mobility or Volume

Addresses the extent to which an alternative will reduce the toxicity, mobility, or volume of the contaminants causing the Site risks.

2.10.2.3 Short Term Effectiveness

Considers the length of time until protection is achieved and the short term risk or impact to the community, on-Site workers and the environment that may be posed during the construction and implementation of the alternative.

2.10.2.4 Implementability

Considers the technical and administrative feasibility of an alternative, including the availability of materials and services needed to implement that remedy.

2.10.2.5 Cost

Includes estimated capital, O&M, and net present worth costs.

2.10.3 Modifying Criteria

2.10.3.1 State Acceptance

Addresses whether the State concurs with, opposes, or has no comment on the Preferred Alternative.

2.10.3.2 Community Acceptance

Considers whether the public agrees with EPA's analyses of the Preferred Alternative described in the PRAP.

These evaluation criteria relate directly to the requirements of Section 121 of CERCLA, 42 USC §9621, for determining the overall feasibility and acceptability of an alternative. Threshold criteria must be satisfied for an alternative to be eligible for selection. Primary balancing criteria are used to weigh major trade-offs between alternatives. The modifying criteria are formally taken into account after public comment is received on the PRAP.

2.10.4 Detailed Analysis of the Remedial Alternatives

2.10.4.1 Overall Protectiveness of Human Health and the Environment

Based on the risk assessment that was performed during the RI, contaminated soils and wastes at the Site pose unacceptable risks to human health and ecological receptors based on reasonably anticipated future uses of the Site. Alternative 1, the no further action alternative developed in accordance with the NCP, would not require remedial action at the Site to address contaminated soil and waste. Because the threats to human health and the environment would not be addressed by Alternative 1, this remedial alternative is not considered to be acceptable and will not be evaluated further.

Alternatives 2 and 3 include capping of the contaminated soils and wastes present in the Former Waste Lagoon without further treatment. Because of their high concentrations of toxic compounds, the contaminated soils and wastes within the Former Waste Lagoon area are considered to be principal threat wastes (described in Section 2.11). Implementation of Alternatives 2 or 3 would result in permanent capping of these principal threat wastes in place without treatment to reduce toxicity, volume, or mobility. The depth to ground water in the vicinity of the Former Waste Lagoon is expected to vary seasonally in response to rainfall and snow melt conditions. There is a potential that the ground water level may seasonally rise into the contaminated soils and wastes present in the Former Waste Lagoon. If this condition occurs, the contaminated soils and wastes within the Former Waste Lagoon are expected to act as long-term sources of ground water contamination. EPA recognizes that this source of ground water contamination could be mitigated through long-term use of a near-lagoon pump and treat system. However, given the limestone karst geologic environment within which the Site lies, and its resultant tertiary porosity which may result in ground water flow in unanticipated directions and velocities, EPA considers Alternatives 2 and 3 to not provide sufficient protectiveness of the environment, specifically the ground water in the vicinity of the Site. Therefore, Alternatives 2 and 3 will not be evaluated further.

Upon implementation, Alternatives 2A, 4, and 5 are expected to be protective of human health and the environment. For each of these three alternatives, contaminated soils at the Site will be excavated and either consolidated on-Site beneath a low permeability cover system (Alternative 2A), or earthen cap (Alternative 4), or disposed of off-Site at an appropriate off-Site waste disposal facility (Alternatives 4 and 5). In addition, for alternatives 2A, 4, and 5, the highly contaminated soil and waste within the Former Waste Lagoon is either treated in-situ (in the

ground) via S/S (Alternative 2A), or is excavated and treated and/or disposed of at an appropriate off-Site waste disposal facilities (Alternatives 4 and 5). Finally, to address contaminated soils and residual wastes which may be left in-place at the bottom or beneath the bottom of the Former Waste Lagoon (e.g. in bedrock fractures), each of the three remaining alternatives includes a near-lagoon pump and treat system. Institutional controls will be implemented at the Site to restrict land use, and to prevent disturbance of remedy features (cover systems, ground water monitoring, extraction, and treatment system, etc).

Alternatives 4 and 5 will include off-Site disposal of contaminated soil/waste, much of which is expected to be classified as non-hazardous waste, without further treatment. Table 5 summarizes the estimates on what volumes of material will be classified as hazardous and non-hazardous from the FS (URS, 2008).

As demonstrated in the table above, Alternatives 4 and 5 will generate an estimated 23,900 cubic yards (cy), and 51,050 cy, respectively, of contaminated soils/waste that is expected to be characterized as non-hazardous and would be disposed of off-Site without further treatment. The NCP §300.430(f) indicates that remedy selection should consider the remedy selection process's preference for treatment as a principal element and the bias against the off-site land disposal of untreated waste.

2.10.4.2 Compliance with Applicable or Relevant and Appropriate Requirements

Based on a review of ARARs generated as part of the FS, it is expected that Alternatives 2A, 4, and 5 will meet Federal and State ARARs. ARARs waivers are not expected to be necessary.

As discussed above, Alternative 2A includes S/S treatment of the contents of the Former Waste Lagoon. Contaminated soils from the Site would be consolidated on top of the solidified/stabilized lagoon, and covered with a low permeability cover system. As stated above, remedies which include a low permeability cover system will comply with Federal and State ARARs. ARARs for the low permeability cover system are included in the ROD (Table 8).

Alternatives 2A, 4, and 5 each include a near-lagoon ground water monitoring, extraction and treatment system which may be required to comply with National Pollutant Discharge Elimination System (NPDES) requirements, or other requirements of the Clean Water Act. The system will include ground water monitoring wells, ground water extraction wells, a treatment plant, and a discharge either to surface water or the sewer system. The treatment system would be designed based on additional information collected during the pre-RDI. Remedies which include a ground water monitoring and extraction system will comply with Federal and State ARARs. ARARs for the ground water monitoring and extraction system are included in the ROD (Table 8).

2.10.4.3 Long-Term Effectiveness and Permanence

Alternative 2A includes the treatment of contaminated soils and wastes within the Former Waste Lagoon with in-situ (in the ground) S/S. Alternative 2A also includes the excavation and on-Site consolidation and capping of the contaminated soils present in Domain 1, Domain 2 (outside the footprint of the Former Waste Lagoon), and Domain 3 on top of the solidified/stabilized area.

After implementation of Alternative 2A, the contaminated soils beneath the low permeability cover system in Domain 2 will have to be managed such that the remedy continues to protect human health and the environment. Performance uncertainties are associated with Alternative 2A, such as overall viability of the treatment technology to reduce the permeability and leachability of the contaminated soils and wastes, such that these materials will not represent a long-term source of ground water contamination. In addition, uncertainty is associated with the long term durability of the solidified/stabilized materials. These uncertainties will be addressed during the pre-RDI by treatability testing of S/S treatment with contaminated materials from the Former Waste Lagoon.

One concern for Alternative 2A is the long-term potential for volatile compounds to accumulate beneath the low permeability cover. This concern will be evaluated as part of the pre-RDI. This evaluation will inform the design of the landfill gas management system, which is contemplated as part of the low permeability cover system included in Alternative 2A (and as discussed in Section 2.9.3).

Alternative 4 includes the excavation of the contaminated soils present in Domain 2 (outside the footprint of the Former Waste Lagoon) and Domain 3, and on-Site consolidation of these excavated soils within Domain 1 (beneath an earthen cap). Alternative 4 also includes the excavation and off-Site treatment and/or disposal of the contaminated soils and wastes present in the Former Waste Lagoon. After implementation of Alternative 4, the contaminated soils beneath the earthen cap in Domain 1 will have to be managed such that the earthen cap continues to prevent contact between the contaminated soils and human or ecological receptors (such as birds, and mammals). In addition, the earthen cap would have to prevent infiltration of precipitation into the contaminated soils, if the contaminated soils would act as a continuing source of ground water contamination. For this reason, Alternative 4 offers a lower degree of long-term effectiveness and permanence in comparison to Alternative 5.

Alternative 5 includes the excavation and off-Site disposal of the contaminated soils present in Domain 1, Domain 2 (outside the footprint of the Former Waste Lagoon), and Domain 3. Alternative 5 also includes the excavation and off-Site treatment and/or disposal of the contaminated soils and wastes present in the Former Waste Lagoon. With the exception of contaminated media (soil, waste) trapped in fractures at and below the bottom of the waste lagoon in bedrock (for which excavation is not expected to be feasible), the majority of contaminated soil and waste would be removed from the Site, treated if necessary, and disposed of at appropriate off-Site waste disposal facilities. For these reasons, Alternative 5 represents the greatest degree of long-term effectiveness and permanence for the alternatives evaluated.

2.10.4.4 Reduction of Toxicity, Mobility or Volume though Treatment

Alternative 2A involves S/S treatment of the principal threat wastes at the Site, including the contaminated soils and waste present within the Former Waste Lagoon. S/S treatment will not reduce the toxicity or volume of hazardous substances present in these principal threat wastes. However, the goal of the S/S treatment is to significantly reduce the mobility of the hazardous substances (pesticides, heavy metals, etc.) within the contaminated soils and wastes, such that the solidified/stabilized materials will not represent a continuing source of ground water contamination. Reduction in mobility of hazardous substances from the solidified/stabilized

material will be effected by reducing the permeability and leachability of the treated materials. Specific performance standards for the S/S treatment (specifically, permeability, leachability and strength) are identified below in Section 2.12.

Alternatives 4 and 5 both involve excavation and off-Site treatment and/or disposal of the contents of the Former Waste Lagoon. Waste characterization would be performed to classify the contents of the waste lagoon as hazardous waste or non-hazardous waste. Non-hazardous wastes would be disposed of at an appropriate off-Site waste disposal facility without further treatment. Hazardous waste would be treated, as necessary and in accordance with RCRA, and disposed of at an appropriate off-Site waste management facility. The FS indicates that the hazardous waste portion of the contents of the Former Waste Lagoon would be incinerated, the resultant ash would be subject to stabilization treatment, followed by disposal. Therefore, the toxicity and volume of hazardous substances in the hazardous waste portion would be greatly reduced; however, the hazardous substances present in the non-hazardous portion would not undergo treatment. However, by placement of the excavated materials in appropriate waste disposal facilities, Alternative 4 and 5 would significantly decrease residual contaminant mobility.

2.10.4.5 Short Term Effectiveness

Concerns exist for Alternatives 2A, 4 and 5 regarding air emissions from the Site during excavation and S/S activities. Air emissions could be comprised of dusts, airborne hazardous substances (e.g. pesticides, heavy metals), and odors. Air emissions represent a potential health threat to workers involved in the cleanup of the Site, as well as nearby residents.

For any alternative implemented at the Site, air emissions will be controlled using engineering controls, such as dust suppression and air monitoring. For Alternative 2A, engineering controls to control air emissions could include S/S equipment (auger equipment, excavator equipment, etc.) equipped with vacuum hoods. The vacuum hoods would draw air from the area in the immediate vicinity of the equipment and filter the air prior to discharge, limiting air emissions during the treatment activities. For Alternatives 2A, 4 or 5, it is possible to build a large containment structure over the entire Former Waste Lagoon, such that cleanup work could be performed within an enclosed space (although it should be noted that such a containment structure was not included in the detailed analysis of Alternative 2A in the FS). Engineering controls within the containment structure would allow for climate control, lighting, and air filtration prior to discharge. Although such a structure has the potential to limit air emissions created while addressing the Former Waste Lagoon, it may also pose serious risks to cleanup workers, including working in an enclosed space with high concentrations of airborne hazardous substances, the potential for accidents associated with working with heavy equipment in enclosed spaces, etc. These potential risks to the cleanup workers would be managed through the use of personal protective equipment and worker training.

The in-situ S/S treatment included in Alternative 2A would be performed in the ground, without complete excavation of the contaminated soil and waste in the Former Waste Lagoon. Therefore, Alternative 2A is expected to generate the lowest overall amount of air emissions relative to Alternatives 4 and 5. Alternatives 4 and 5 would involve the complete excavation and loading into trucks for off-Site disposal of the contaminated soil and waste present in the Former

Waste Lagoon. Excavation of these materials is expected to generate more overall air emissions than the in-situ treatment included in Alternative 2A.

A concern with Alternative 2A is the potential volatilization of hazardous substances present within the contents of the Former Waste Lagoon during S/S, and the risk such vapor-phase contaminants may pose to remediation workers on the Central Chemical property and nearby residents. This concern will be evaluated during the pre-RDI, as part of the S/S treatability study.

2.10.4.6 Implementability

S/S, included in Alternative 2A, is a technology used to limit the mobility of contaminants in contaminated media (soil, waste, etc). The effectiveness of S/S will have to be evaluated by performance of a treatability study during the pre-RDI. If it is determined during the pre-RDI that S/S cannot be successfully implemented for the contents of the Former Waste Lagoon, then the contents of the Former Waste Lagoon which cannot be successfully treated by S/S will be excavated and transported off-Site for treatment, as necessary, and disposed of off-Site at an appropriate off-Site waste disposal facility in accordance with CERCLA §121(d)(3). This determination will be made during the pre-RDI. Otherwise, Alternative 2A is expected to be implementable, in terms of available equipment, materials, etc.

Alternatives 4 and 5 include the excavation and off-Site treatment and/or disposal of the contents of the Former Waste Lagoon. No treatability study is required for these two alternatives. It is expected that Alternatives 4 and 5 are implementable with readily available equipment and materials. Materials classified as hazardous waste would require shipment to an appropriate off-Site waste management facility for treatment/disposal. The analysis completed by the PRPs as part of the FS based the costs and implementability of these two alternatives on the treatment/disposal of hazardous wastes at a facility located in the State of Michigan. If these alternatives were implemented, the actual receiving facility would be selected in accordance with 40 CFR §300.440 and other applicable criteria. Although feasible, the appropriate management of the hazardous wastes would require substantial shipping, with associated cost, fuel use, potential for accidents, etc.

2.10.4.7 Cost

The cost estimates for Alternatives 2A, 4 and 5 are summarized in Table 6.

The thirty-year net present worth was calculated based on a 3.52 percent (%) discount rate. Costs for long-term monitoring and Five-Year Reviews are included in the annual O&M costs above.

The detailed cost estimates of remedial alternatives are presented in the FS report.

2.10.4.8 State Acceptance

The State of Maryland concurs with the Selected Remedy identified for OU-1 in this ROD (letter included as Figure 14).

2.10.4.9 Community Acceptance

The local community in the vicinity of the Site expressed overall support for the Preferred Alternative that EPA selected in the PRAP. Some community members, including the City of Hagerstown government, expressed concern with the potential size of the capped area associated with consolidation of contaminated soils on top of the Former Waste Lagoon and placement of a low permeability cover system. Specific concerns raised by the community, and EPA's responses to those concerns, with regard to the Preferred Alternative are discussed in Section 3 of the ROD (Responsiveness Summary).

The PRPs for the Site expressed numerous concerns with regard to the Preferred Alternative. The PRPs' concerns, and EPA's response, are also included in Section 3 of the ROD (Responsiveness Summary).

2.11 PRINCIPAL THREAT WASTE

The NCP establishes an expectation that EPA will use treatment to address the principal threats posed by a site wherever practicable (40 CFR §300.430(a)(1)(iii)(A)). The "principal threat" concept is applied to the characterization of "source materials" at a Superfund Site. A source material is material that includes or contains hazardous substances, pollutants or contaminants that act as a reservoir for migration of contamination to ground water, surface water or air, or acts as a source for direct exposure. Contaminated ground water generally is not considered to be a source material. Principal threat wastes are those materials considered to be highly toxic or highly mobile that generally cannot be reliably contained, or would present a significant risk to human health or the environment should exposure occur.

Based on the results of the prior investigations, summarized below, EPA considers the contents of the Former Waste Lagoon to be principal threat waste.

Review of the contents of the Administrative Record, including the RI, the MDE Expanded Site Inspection (1996), the Phase I Environmental Investigation prepared by Weston (1989), the MDE Screening Site Investigation (1989), and the EPA Aerial Photographic Analysis (1997), indicate that the Former Waste Lagoon was used for the disposal of various liquid and solid waste streams generated by Central Chemical, including waste streams from fertilizer and pesticide-related activities.

MDE has summarized the various borings that have been advanced at the Former Waste Lagoon. Review of the these boring logs indicates that contents of the Former Waste Lagoon are not homogenous, but rather consists of a heterogeneous mixture of materials including fill materials and solid wastes (including wood, glass, concrete, paper), soil and soil-like materials, and other waste materials described variously in boring logs as: white pasty material; white powder; black waste/clayey ooze; multi-colored dumped materials; white clayey powders; black, brown and white powders; white clay powder; black waste/clayey ooze; gray powdery material with rock fragments; green seams (powder) and white powder; yellow powder; gray and black waste material with layered white powder seams; yellow crystalline material; cream colored powder. Various odors have been noted by the personnel advancing soil borings in the Former Waste Lagoon. Descriptions of the odors include: pesticide/fertilizer odor; chemical odor; sweet odor;

fuel-like odor. Fumes were identified during the advancement of certain soil borings, and several soil borings were halted because of health and safety concerns. The MDE summation of boring logs is included in the Administrative Record.

Not all of the waste materials identified within the Former Waste Lagoon during the advancement of soil borings were sampled and analyzed for contaminants. Samples of the waste materials collected from the Former Waste Lagoon and analyzed for pesticide contamination are identified in Table 7.

The bottom of the Former Waste Lagoon is at or near the top of bedrock. No liner system is present beneath the contents of the Former Waste Lagoon. As discussed above, the Former Waste Lagoon and the Site as a whole are located in a karst terrain setting. Aquifers within karst terrain settings may be particularly vulnerable to ground water contamination because of the potential for direct connections of the aquifer to the land surface, and the presence of relatively wide fracture apertures or channel within the bedrock (owing to enlargement by solvent action of circulating ground water) that provide rapid ground water flow with negligible adsorption or breakdown of contaminants (Duigon, 2001). One of the hazardous substances identified in the Former Waste Lagoon (BHC isomers) has been identified in a Site-related ground water contamination plume which extends at least 2,700 feet to the southwest, and 2,200 feet to the northeast of the Site (the ground water RI is currently on-going).

Based on the HHRA, ground water contamination poses a 5.57×10^{-3} cancer risk as well as non-cancer risks to receptors who consume Site-related contaminated ground water obtained from off of the Central Chemical property (although, it should be noted, such receptors are not known to currently exist because of the presence of the public water supply).

Therefore, in the context of the Site, hazardous substances present in the Former Waste Lagoon are considered to exhibit high mobility and toxicity, and constitute principal threat waste.

2.12 SELECTED REMEDY

2.12.1 Summary of the Rationale for the Selected Remedy

Upon completion, EPA's Selected Remedy for OU-1 will be protective of human health and the environment. The contents of the Former Waste Lagoon will undergo S/S treatment in order to minimize future contaminant migration from these wastes. Contaminated soils at the Site will be consolidated on the treated Former Waste Lagoon, and a low permeability cover system will be constructed over the contaminated soils and treated Former Waste Lagoon. The low permeability cover system will serve to prevent contact between human and ecological receptors and the contaminated soils, and will minimize infiltration of precipitation through the contaminated soils. The area of the low permeability cover system will serve as a permanent Consolidation Area for contaminated media (soil, treated principal threat waste) on the Central Chemical property. To the extent that additional principal threat wastes may be present beneath the bottom of the Former Waste Lagoon (e.g. within bedrock fractures), a ground water monitoring, extraction and treatment system will be constructed around the Consolidation Area and operated to capture residual ground water contamination/leachate, as necessary. The ground

water monitoring, extraction, and treatment system will prevent ground water contamination from migrating beyond the boundaries of the Consolidation Area.

The contents of the Former Waste Lagoon are considered to be principal threat wastes. Treatment of these principal threat wastes is considered to be practicable, either by in-situ S/S or by off-Site treatment/disposal. If the contents of the Former Waste Lagoon are not treated, EPA believes that these waste materials will continue to represent a threat to human health and the environment.

With regard to treatment of the contents of the Former Waste Lagoon, two options had been evaluated as part of the FS: in-situ S/S and excavation with off-Site treatment and disposal. Overall, EPA believes that treatment of the contents of the Former Waste Lagoon by in-situ S/S will represent less of a threat to workers performing the remediation and the nearby community by minimizing air emissions during the remedial action, and minimizing the necessary transportation effort. Successful treatment of the contents of the Former Waste Lagoon by S/S treatment will be evaluated during the treatability study and based upon achievement of specific S/S performance standards (discussed below, #2 of the Selected Remedy). Also, provided that S/S can successfully reduce the mobility of hazardous substances within the Former Waste Lagoon, treatment of the Former Waste Lagoon via in-situ S/S is cost-effective relative to excavation of the contents of the Former Waste Lagoon and off-Site treatment/disposal. It is noted that although S/S will not reduce the toxicity or volume of hazardous substances present in the Former Waste Lagoon, it will be performed to reduce mobility of the contaminants. As described in the Selected Remedy, principal threat waste materials present within the Former Waste Lagoon which are determined not to be able to be successfully solidified/stabilized during the pre-RDI, will be excavated, treated if necessary, and disposed of off-Site.

2.12.2 Description of Selected Remedy and Performance Standards

EPA's Selected Remedy consists of the following:

1. Conduct a pre-RDI. The pre-RDI will include:

    a.) Additional soil sampling and analyses to further define extent of soil excavation areas in Domains 1, 2, and 3.

    b.) Subsurface investigation to evaluate areas of the Site where Site-related principal threat waste materials may have been buried. These areas are located within Domain 2 and Domain 3, and will be identified by EPA during the pre-RDI work planning. Principal threat wastes include containers of hazardous substances, non-aqueous phase liquids, powders, and sludge.

    c.) Additional characterization in the vicinity of the Liquid Pesticide building, and an area of petroleum impacted soil that was identified during the RI.

    d.) Perform a treatability study of Solidification/Stabilization technology on the contents of the Former Waste Lagoon. The lagoon contents include contaminated soil, sludge and powders. The treatability study will be performed by collecting

samples of the contents of the Former Waste Lagoon and treating the samples with Solidification/Stabilization agents. The treated samples will be subject to permeability testing, leaching tests, and strength tests to determine if satisfactory Solidification/Stabilization results can be achieved. The goal of the treatability study is to determine if the contents of the Former Waste Lagoon can be treated to achieve the Solidification/Stabilization performance standards listed in #2 below and also to determine the appropriate Solidification/Stabilization agents necessary to achieve such performance standards.

e.) Additional characterization of the physical dimensions and materials present in the Former Waste Lagoon.

f.) Aquifer testing to assist with the design of the ground water monitoring, extraction and treatment system discussed in #7, below.

g.) Additional soil samples will be collected at adjacent properties and analyzed for Site-related contaminants to determine if there is an unacceptable risk posed by the soils.

2. Perform Solidification/Stabilization treatment of the contents of the Former Waste Lagoon which meet the following performance standards (based on the results of the treatability study):

a.) Unconfined compressive strength: Treat the contents of the Former Waste Lagoon using Solidification/Stabilization such that the solidified/stabilized monolith exhibits an average unconfined compressive strength equal to or greater than 50 pounds per square inch (lb/in^2) as measured by ASTM D1633 (or substantial equivalent) with no performance sample testing less than 40 lb/in^2.

b.) Permeability: Treat the contents of the Former Waste Lagoon using Solidification/Stabilization such that the solidified/stabilized monolith exhibits an average permeability equal to or less than $1x10^{-6}$ centimeters per second (cm/sec) as measured by ASTM D5084 (or substantial equivalent). No sample will exhibit permeability greater than $1x10^{-5}$ cm/sec.

c.) Leachability: Treat the contents of the Former Waste Lagoon using Solidification/Stabilization such that leaching of contaminants from the Former Waste Lagoon, as measured by Synthetic Precipitation Leaching Procedure (SPLP) (EPA SW846 Method 1312, or substantial equivalent), is significantly reduced and contaminated leachate from the Former Waste Lagoon will not create ground water contamination above ground water remediation standards at the boundary of the Central Chemical property.

The RI/FS for ground water contamination at the Site is currently being developed. However, for the purposes of the treatability study, interim ground water remediation standards at the Site are included in Table 12.

3. Contents of the Former Waste Lagoon which cannot be successfully treated by Solidification/Stabilization (i.e. do not achieve the Solidification/Stabilization performance standards described in #2, above) will be excavated and transported off-Site, with treatment as necessary, and disposed of off-Site at an off-Site waste disposal facility in accordance with CERCLA §121(d)(3).

4. Excavate contaminated soils above Site-specific Soil Remediation Standards, set forth in Table 13, from Domain 1, Domain 2 (outside footprint of Former Waste Lagoon) and Domain 3. Confirmation sampling will be performed at the completion of excavation activities to demonstrate compliance with the Soil Remediation Standards included in Table 13.

   a.) Concrete slabs and foundations. Remove concrete slabs and foundations to the extent needed to promote efficient remediation of soils. If the concrete slabs and foundations present in Domain 1 are to remain in-place, confirmation sampling beneath the concrete slabs and foundations will be necessary. If the removed slabs or foundations are contaminated, they shall be disposed off-Site in accordance with CERCLA §121(d)(3).

   b.) Demonstration of Attainment of Soil Remediation Standards. A description of the Soil Remediation Standards, included in Table 13, and the method to demonstrate attainment of the Soil Remediation Standards is included as follows:

   Soil Remediation Standards for protection of human health (direct contact)

   Soil Remediation Standards for protection of human health (direct contact) have been established for future indoor site workers on the Central Chemical property (identified as "ISW" on Table 13), and future construction workers on the Central Chemical property (identified as "CW" on Table 13).

   As indicated on Table 13, the Soil Remediation Standards for protection of human health (direct contact) are 95% Upper Confidence Limit (UCL) values. At the completion of excavation of contaminated soil in accordance with the Selected Remedy, attainment of the Soil Remediation Standards will be demonstrated by collection of confirmation soil samples, and generation of a 95% UCL value for each COC based upon protection of human health (direct contact). If the 95% UCL values generated for each COC are less than or equal to their respective Soil Remediation Standard, the Soil Remediation Standards will be deemed attained. However, no single location on the Central Chemical property can exhibit COC concentrations greater than ten times (10x) their respective Soil Remediation Standards.

   A maximum depth of excavation for achievement of the Soil Remediation Standards for protection of human health (direct contact) has been established as 10' below ground surface.

Soil Remediation Standards for protection of ecological receptors

Soil Remediation Standards for protection of ecological receptors have been established for Central Chemical property (identified as "ECO" on Table 13).

As indicated on Table 13, the Soil Remediation Standards for protection of ecological receptors are 95% UCL values. At the completion of excavation of contaminated soil in accordance with the Selected Remedy, attainment of the Soil Remediation Standards will be demonstrated by collection of confirmation soil samples, and generation of a 95% UCL value for each COC based upon protection of ecological receptors. If the 95% UCL values generated for each COC are less than or equal to their respective Soil Remediation Standard, the Soil Remediation Standards will be deemed attained. However, no single location on the Central Chemical property can exhibit COC concentrations greater than ten times (10x) their respective Soil Remediation Standards.

A maximum depth of excavation for achievement of the Soil Remediation Standards for protection of ecological receptors has been established as 2' below ground surface.

Soil Remediation Standards for protection of ground water

Soil Remediation Standards for protection of ground water have been established for Central Chemical property (identified as "GW" on Table 13).

As indicated on Table 13, the Soil Remediation Standards for protection of ground water are not-to-exceed values.

c.) Restoration. The excavated areas shall be backfilled with clean fill and compacted in 6-inch lifts to the original grade. A minimum 4-inch layer of topsoil should be applied, a vegetative cover established, and complete restoration performed over the affected area.

5. Consolidate the excavated soils from #4 above on the footprint of the solidified/stabilized Former Waste Lagoon area. If it is determined during the remedial design, or during the remedial action, that the volume of contaminated soil at the Site cannot be consolidated within the boundaries of the cover system (Consolidation Area) set forth in #6, below, then the excess contaminated soil will be disposed of off-Site at an appropriate off-Site waste disposal facility in accordance with CERCLA §121(d)(3).

6. Construct, maintain, and periodically inspect an engineered low permeability cover system over the consolidated contaminated soils and Former Waste Lagoon area ("Consolidation Area"). The approximate extent of the low permeability cover system/Consolidation Area is depicted in Figure 13, attached to this ROD. As depicted in

Figure 13, the low permeability cover system/Consolidation Area will be present in the northern portion of the Central Chemical property. The approximate dimension of the low permeability cover system/Consolidation Area is 380 feet by 480 feet. The maximum height of the low permeability cover system will be approximately seven to twelve feet above existing grade. Maximum slopes of the cover system will be approximately 18 degrees.

Performance standards for the low permeability cover system are:

a.) Have a permeability of less than or equal to $1x10^{-7}$ cm/sec.

b.) Provide long-term minimization of migration of liquids through cover system, consolidated soils and treated Former Waste Lagoon.

c.) Function with minimum maintenance, for example through the use of warm season grasses and other native vegetation.

d.) Promote drainage and minimize erosion or abrasion of the cover system.

e.) Accommodate settling and subsidence to maintain the cover system's integrity.

7. Capture contaminated ground water/leachate in the vicinity of the Consolidation Area by installation, operation, maintenance, and periodic monitoring of a ground water monitoring, extraction and treatment system. The ground water monitoring, extraction and treatment system shall be designed and operated to ensure that contaminated ground water in the vicinity of the Consolidation Area is captured to prevent migration of contaminated ground water which exceeds the standards on Table 12, beyond the boundary of the Consolidation Area. Treat captured ground water to meet applicable Federal pre-treatment standards.

8. The discharge point for the treated ground water will be the Hagerstown public sewer system in accordance with applicable Federal pre-treatment standards.

9. Use of the Central Chemical property shall be limited to commercial/industrial use, and ensure maintenance and prevent disturbance of the low permeability cover system and ground water monitoring, extraction, and treatment system, through establishment and implementation of institutional controls.

10. Principal threat wastes identified outside of the Former Waste Lagoon area on the Site shall be excavated and transported off-Site, with treatment as necessary, and disposed of off-Site at an off-Site waste disposal facility in accordance with CERCLA §121(d)(3). Principal threat wastes include containers of hazardous substances, non-aqueous phase liquids, powders, and sludge.

11. No further action is included in the Selected Remedy for OU-1 with regard to sediments and surface water.

2.12.2.1 Summary of the Estimated Remedy Costs

A summary of the estimated costs of the Selected Remedy is included in Table 14. The information in this cost estimate summary table is based on the best available information regarding the anticipated scope of the remedial alternative. Changes in the cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative. Major changes may be documented in the form of a memorandum in the Administrative Record file, an Explanation of Significant Differences, or a ROD Amendment. This is an order of magnitude engineering cost estimate that is expected to be within +50 to -30% of the actual project cost.

Two primary sources of uncertainty exist with regard to the cost of the Selected Remedy. The first source of uncertainty is the extent to which the contents of the Former Waste Lagoon can be successfully treated via S/S. The treatability study for S/S will be performed as part of the pre-RDI. Principal threat wastes present in the Former Waste Lagoon which cannot be successfully treated via in-situ S/S will be excavated, treated if necessary, and disposed of off-Site, the potential costs of which are currently unknown and are not included in the estimated costs of the Selected Remedy. The second major source of uncertainty is the potential presence of other principal threat wastes which may be buried on the Site. This uncertainty will also be evaluated during the pre-RDI by the performance of a subsurface investigation in areas of potential concern.

2.12.2.2 Expected Outcome of the Selected Remedy

At the completion of the Selected Remedy, the contents of the Former Waste Lagoon, which constitute principal threat waste, will be treated by S/S and the mobility of hazardous substances within the Former Waste Lagoon will be significantly reduced. Contents of the Former Waste Lagoon which cannot be successfully treated, as determined by the S/S treatability study, will be excavated and disposed of off-Site in accordance with CERCLA §121(d)(3). If other principal threat wastes are identified on the Site during the pre-RDI, they will be excavated and disposed of off-Site in accordance with CERCLA §121(d)(3). Contaminated soils present on the Site will be consolidated on the solidified/stabilized Former Waste Lagoon, and a low permeability cover system will be constructed over the consolidated contaminated soils. The low permeability cover system will serve to act as a barrier between the contaminated soils and human and ecological receptors, and will prevent infiltration of rainwater into the contaminated soils, which will prevent leaching of hazardous substances from the contaminated soils to ground water. A ground water monitoring, extraction and treatment system will be constructed around the Former Waste Lagoon and consolidated and capped contaminated soils (the Consolidation Area). The ground water monitoring, extraction and treatment system will be operated to capture contaminated ground water and leachate in the vicinity of the Former Waste Lagoon, and prevent migration of contaminated ground water beyond the boundary of the Consolidation Area. The need for continued operation of the ground water monitoring, extraction and treatment system will be evaluated over time. Institutional controls will be implemented at the Site to restrict the Site use to industrial/commercial use only, and to prevent disturbance of the low permeability cover system and ground water monitoring, extraction and treatment system. Ultimately, implementation of the Selected Remedy will allow for the reuse of the Central Chemical property.

2.13 STATUTORY DETERMINATION

Under CERCLA §121 and the NCP, the lead agency must select remedies that are protective of human health and the environment, comply with ARARs (unless a statutory waiver is justified), are cost-effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, CERCLA includes a preference for remedies that employ treatment that permanently and significantly reduces the volume, toxicity, or mobility of hazardous wastes as a principal element and a bias against off-site disposal of untreated wastes. The following sections discuss how the Selected Remedy meets these statutory requirements.

2.13.1 Protection of Human Health and the Environment

The Selected Remedy will protect human health and the environment, as follows:

- Principal Threat Waste: Principal threat waste present in the Former Waste Lagoon will be treated via S/S. This treatment will significantly reduce the mobility of hazardous substances present in the Former Waste Lagoon. Contents of the Former Waste Lagoon which cannot be successfully treated via S/S, as determined by the treatability study, will be excavated and disposed of off-Site in accordance with CERCLA §121(d)(3). If other principal threat wastes are identified on-Site during the pre-RDI, those principal threat wastes will be excavated and disposed of off-Site in accordance with CERCLA §121(d)(3). Implementation of the Selected Remedy will either reduce the mobility (on-Site S/S) or the volume and toxicity (excavation; off-Site treatment, if necessary; off-Site disposal) of principal threat waste present on the Site, which will serve to significantly reduce the threats those principal threat wastes pose to human health and the environment. As stated above, excavated materials which are classified as non-hazardous waste are not expected to undergo treatment prior to off-Site disposal; however, by placement of the excavated materials in appropriate waste disposal facilities, residual contaminant mobility of those materials will be significantly reduced.

- Contaminated Soil: Contaminated soil on the Site will be excavated and consolidated on the solidified/stabilized Former Waste Lagoon. A low permeability cover system will be constructed over the consolidated contaminated soils. The cover system will prevent contact between the hazardous substances present in contaminated soils and human and ecological receptors. The cover system will also prevent infiltration of precipitation into the contaminated soils and potential leaching of hazardous substances from contaminated soil which will minimize the potential for future generation of contaminated ground water.

- Contaminated ground water/leachate: Installation and operation of a ground water monitoring, extraction and treatment system around the solidified/stabilized Former Waste Lagoon will serve to capture contaminated leachate and ground water which may be generated during and after the remedial action by un-treated principal threat waste at the bottom and/or below the bottom of the Former Waste

Lagoon (e.g. in bedrock fractures). The ground water monitoring, extraction and treatment system shall be designed and operated to ensure that contaminated ground water in the vicinity of the Consolidation Area is captured to prevent migration of contaminated ground water beyond the boundary of the Consolidation Area.

2.13.2 Compliance with Applicable or Relevant and Appropriate Requirements

The Selected Remedy of S/S of the Former Waste Lagoon, consolidating contaminated soils on the treated Former Waste Lagoon, constructing a low permeability cover system over the consolidated contaminated soils, and installation and operation of a ground water monitoring, extraction and treatment system will comply with the ARARs identified in Table 8.

2.13.3 Cost Effectiveness

The Selected Remedy is cost-effective and represents a reasonable value for the money to be spent. In making this determination, the following definition was used: "A remedy shall be cost-effective if its costs are proportional to its overall effectiveness." (NCP §300.430(f)(1)(ii)(D)). This was accomplished by evaluating the "overall effectiveness" of those alternatives that satisfied the threshold criteria (i.e., were both protective of human health and the environment and ARAR-compliant). Overall effectiveness was evaluated by assessing three of the five balancing criteria in combination (long-term effectiveness and permanence; reduction in toxicity, mobility, and volume through treatment; and short-term effectiveness). Overall effectiveness was then compared to costs to determine cost effectiveness. The relationship of the overall effectiveness of this remedial alternative was determined to be proportional to its cost and hence this alternative represents a reasonable value for the money to be spent.

During EPA's remedy selection, Alternatives 2A, 4, and 5 were considered to be protective of human health and the environment and ARAR-compliant. Alternative 4 and 5 were considered to be superior to Alternative 2A with regard to long-term effectiveness and permanence, because the contents of the Former Waste Lagoon would be excavated to the extent practicable and treated and disposed of at an off-Site facility. However, Alternatives 4 and 5 are significantly more expensive than Alternative 2A, and are associated with concerns pertaining to the transportation effort involved, and the potential for creation of air emissions which may be a threat to remediation workers and the nearby community. Although containment structures were considered during the FS to address air emission concerns for the nearby community, the same containment structures were considered to pose a potentially elevated threat for the remediation workers.

Although S/S will not reduce the toxicity or volume of the hazardous substances present in the Former Waste Lagoon, this in-situ treatment will significantly reduce the mobility of the hazardous substances. In combination with the low permeability cover system, and the ground water monitoring, extraction, and treatment system, the Selected Remedy will provide an overall level of protection of human health and the environment comparable to Alternatives 4 and 5, at significantly lower cost.

2.13.4 Utilization of Permanent Solutions and Alternative Treatment Technologies (or Resource Recovery Technologies) to the Maximum Extent Practicable

EPA has determined that the Selected Remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a practicable manner at the Site. Of those alternatives that are protective of human health and the environment and comply with ARARs, EPA has determined that the Selected Remedy provides the best balance of trade-offs in terms of the five balancing criteria, while also considering the statutory preference for treatment as a principal element and bias against off-site treatment and disposal and considering State and community acceptance.

The Selected Remedy will include treatment of the contents of the Former Waste Lagoon, which are considered to be principal threat waste, using S/S technology. The S/S treatment will not decrease the toxicity or volume of the hazardous substances present in the Former Waste Lagoon; however, S/S treatment will significantly reduce the mobility of the hazardous substances present in the Former Waste Lagoon. In combination with the low permeability cover system, and the ground water monitoring, extraction and treatment system, the S/S of the Former Waste Lagoon will offer a comparable level of long-term effectiveness and permanence when compared with Alternatives 4 and 5, at significantly less cost. The Selected Remedy will minimize off-Site disposal of untreated hazardous substances by including on-Site, in-situ S/S of the contents of the Former Waste Lagoon, and on-Site consolidation and capping of the contaminated soils. The Selected Remedy will offer superior short-term protectiveness when compared with Alternatives 4 and 5 in that the potential for air emissions during remediation of the Former Waste Lagoon will be minimized to the extent possible (because the treatment will be performed in-situ (in the ground)), and the necessary transportation effort will be significantly less than would be required by excavation and off-Site treatment and disposal of the contents of the Former Waste Lagoon. There are no special implementability issues that set the Selected Remedy apart from the other alternatives that were evaluated.

2.13.5 Preference for Treatment as a Principal Element

By treating the Former Waste Lagoon, which is considered to be principal threat waste, using S/S, the Selected Remedy addresses principal threats posed by the Site through the use of treatment technologies. By utilizing treatment as a significant portion of the remedy, the statutory preference for remedies that employ treatment as a principal element is satisfied. It should be noted that if principal threat wastes are present beneath the bottom of the Former Waste Lagoon, for example in bedrock fractures, those materials are not expected to be treated via S/S as part of the Selected Remedy.

2.13.6 Five-Year Review Requirements

Because the Selected Remedy will result in hazardous substances, pollutants, or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure, a statutory-review will be conducted within five years after the initiation of remedial action to ensure that the remedy is, or will be, protective of human health and the environment pursuant to CERCLA §121(c), and the NCP, 40 CFR §300.430(f)(5)(iii)(c).

2.14 DOCUMENTATION OF SIGNIFICANT CHANGES

The PRAP for the Central Chemical Site was released for public comment in April 2009. The PRAP identified Alternative 2A as the Preferred Alternative for contaminated soil and waste at the Site. EPA reviewed all written and verbal comments submitted during the public comment period. It was determined that no significant changes to the remedy, as originally identified in the PRAP, were necessary or appropriate.

3.0 RESPONSIVENESS SUMMARY

This Responsiveness Summary documents public participation in the remedy selection process for the Central Chemical Site. It contains a summary of the significant comments received by EPA on the PRAP for the Site and EPA's responses to those comments.

3.1 STAKEHOLDER COMMENTS AND LEAD AGENCY RESPONSES

Comments on the PRAP were received from private citizens, the City of Hagerstown, MD, and the Technical Support Provider associated with the Community Liaison Panel for the Site. Issues identified by these Stakeholders and EPA's responses are included below. Stakeholder comments are *italicized*, and EPA responses are **bolded**:

Comment #1: *A private citizen asked if her home would be destroyed or if she would have to move elsewhere.*

Response: **No. Implementation of the remedy will not include acquisition of private property, or permanent relocation of residents.**

Comment #2: *A private citizen requested that EPA evaluate potential vapor intrusion at the Site.*

Response: **As discussed briefly during the public meeting in April 2009 for the PRAP, EPA will evaluate the potential for vapor intrusion at the Site as part of the OU-2 (ground water) RI.**

Comment #3: *The City of Hagerstown expressed concern regarding the size of the capped area that would consist of the treated Former Waste Lagoon, the consolidated contaminated soils from the Site, and the low permeability cover system.*

Response: **EPA understands and recognizes this issue as being a concern. Performance standards for the capped area are included in the description of the Selected Remedy (Section 2.12) as follows:**

The approximate dimension of the low permeability cover system is 380 feet by 480 feet. The maximum height of the low permeability cover system will be approximately seven to twelve feet above existing grade. Maximum slopes of the cover system will be approximately 18 degrees.

As appropriate, the final dimensions of the capped area will be discussed with the Community Liaison Panel (of which the City's Planning Director is a member). During the Remedial Design, EPA will consider and incorporate, to the extent practicable, the community's input on the final capped area.

Comment #4: *The City of Hagerstown requested that EPA take measures to ensure that future owner/occupants of the Site and local government plan reviewers are alerted*

about the presence of the capped remediation area and the need to avoid this area with Site improvement activities. The City suggested that the capped area be marked in the field with some type of permanent markers/monuments and that a plat be recorded delineating this area by easement, or whatever legal means are appropriate, and prescribing what can and cannot occur on top of this area.

Response: **EPA understands and agrees with the City of Hagerstown regarding this issue. Institutional controls must be established as part of the Selected Remedy to prevent disturbance of constructed features of the remedy, including the low permeability cover system and ground water monitoring, extraction and treatment system. As described in Section 2.9 (Description of Alternatives) of the ROD, this may include the use of permanent markers and/or monuments. The legal means necessary to prevent disturbance of the constructed features of the Selected Remedy (e.g. recording of a plat, establishment of an easement as suggested by the City) will be evaluated during the remedial design, and implemented during the remedial action.**

Comment #5: *The City's Water and Wastewater Divisions expressed concerns about discharge of wastewater from the ground water monitoring, extraction and treatment system, as follows:*

"The City's Water and Wastewater Divisions have concerns about the plan for discharge of the treated contaminated ground water/leachate and for the removal of the contaminated soils. The City would prefer that the treated ground water not be sent to the public sewer system, since that impacts our plant capacity which is constrained and it would involve permitting issues and pre-treatment discussions."

Response: **The City's comment regarding this issue is noted. The public sewer system was identified within the FS as a viable option for discharge of treated water from the ground water monitoring, extraction and treatment system. During the RD the City's concerns regarding such discharge will be evaluated and incorporated into the final Remedial Design, to the extent considered practicable by EPA. If a discharge point is selected other than the public sewer system, then that decision by EPA will be documented in a separate EPA decision document in accordance with the NCP.**

Comment #6: *The City of Hagerstown Water and Wastewater Divisions expressed concerns about contaminated soils at the Site, as follows:*

"The City's Water and Wastewater Divisions have concerns about the plan for discharge of the treated contaminated ground water/leachate and for the removal of the contaminated soils...The City would like to be assured that contaminated soils will be removed to a sufficient depth that future utility

construction will not have lines placed within contaminated soils. If the removal depth is insufficient, the City is concerned about contamination into the water and sewer systems if water lines break or there is inflow and infiltration into the sewer lines."

Response: **Excavation depths and locations on the Central Chemical property will be guided by the Soil Remediation Standards identified in Table 13. The Soil Remediation Standards for the Central Chemical property are protective of human health (future indoor site workers, and construction workers) and the environment (ecological receptors, and ground water). The Soil Remediation Standards have been established to be protective of ground water, specifically to disallow contaminated soil at the Site from acting as a future source of ground water contamination. Therefore, it is not expected that residual soil contaminant levels will be present at the Site at the completion of the remedial action which will have the potential to represent a threat to human health or the environment via broken water or sewer lines. With regard to protection of construction workers who would be installing/repairing such lines, the Soil Remediation Standards have been calculated to be protective of future construction workers to a depth of 10 feet bgs. As stated in Table 13 of the ROD, if COC concentrations remain in-place beneath 10 feet at the completion of contaminated soil excavation, the establishment of institutional controls may be necessary to ensure that subsurface soil contamination does not act as a potential future threat to human health (for example during future deep construction-related activities). Such institutional controls would be selected by EPA in an appropriate EPA decision document.**

Comment #7: *The City of Hagerstown inquired as to whether a long-term ground water monitoring network would require wells on the Central Chemical property and off of the Central Chemical property.*

Response: **The ground water contamination associated with the Site is currently being evaluated as part of OU-2. However, based on EPA's current knowledge of the Site, ground water contamination currently extends well beyond the SW and NE boundaries of the Central Chemical property. Therefore, at this time, EPA expects that the long-term ground water monitoring network for the Site will include monitoring wells on the Central Chemical property and off of the Central Chemical property.**

Comment #8: *The Technical Support Provider for the Community Liaison Panel provided EPA with the following comments (identified below as (a), (b), and (c)), regarding the S/S of the former waste lagoon:*

(a) "The intent is to perform the processing in-situ, i.e., without removing the waste from the ground. This will be a technical challenge for a number of reasons and introduces a measure of uncertainty into Option 2A. One

difficulty may result from the presence of construction debris mixed with the high concentration of finely divided contaminated materials."

Response: **EPA agrees that in-situ S/S of the contents of the Former Waste Lagoon will represent technical challenges. As indicated in the description of the Selected Remedy, a pre-RDI, including a treatability study, will be performed prior to the treatment of the Former Waste Lagoon via S/S. The results of the pre-RDI will be used to determine how the S/S can be successfully performed, in terms of S/S amendments, equipment, etc. The pre-RDI will better define the geometry and the contents of the Former Waste Lagoon in terms of physical state, contamination levels, etc. To address the comment directly, EPA will evaluate the need to remove debris from the Former Waste Lagoon, prior to S/S treatment, based on the results of the pre-RDI.**

(b) *"A second problem is that the location of 100% of the contamination cannot practically be determined, so some material may evade treatment. Once the treatment is completed, it may be difficult to measure its effectiveness against an established performance standard. Nevertheless, EPA has concluded that treatment is preferred over the former Option 2 which involved no treatment prior to capping."*

Response: **As stated above, a pre-RDI will be performed prior to S/S of the Former Waste Lagoon to determine the geometry of the lagoon and characterize the lagoon contents. If waste materials are present beneath the bottom of the lagoon, for example in bedrock fractures, those materials will not be treated by S/S. However, a ground water monitoring, extraction and treatment system will be installed around the Former Waste Lagoon to address contaminated ground water/leachate that may continue to be present after the S/S treatment is complete. The pre-RDI, and specifically the S/S treatability study, will be performed to confirm that S/S can significantly reduce the potential for the contents of the Former Waste Lagoon to pose a threat to human health and the environment in the future. This confirmation will be obtained by comparing S/S results from the treatability study to performance standards for the solidified/stabilized materials established in the ROD (Section 2.12). As stated above in the description of the Selected Remedy (Section 2.12), contents of the Former Waste Lagoon that cannot be successfully solidified/stabilized (based on the results of the treatability study), will be excavated and disposed of off-Site. During the remedial action, a construction quality assurance/quality control program will be established to confirm that the solidified/stabilized contents of the Former Waste Lagoon meet the S/S performance standards established in the ROD.**

(c) *"Finally, the addition of stabilization materials, usually concrete, will increase the volume of contaminated material and may increase the size of the final capped repository"*

Response: **EPA agrees that S/S can cause a "swell" effect which will increase the volume of the treated contents of the Former Waste Lagoon. The size performance standards for the capped area (Consolidation Area) are included in the description of the Selected Remedy (Section 2.12) and in response to a comment from the City of Hagerstown (above, Comment #3). As stated above, during the Remedial Design, EPA will consider and seek to incorporate to the extent practicable the community's input on the final capped area.**

Comment #9: *During a public meeting a community member asked whether the capped area of the Selected Remedy (*Consolidation Area covered by low permeability cover system) *would be covered with grass, or if a parking area was possible.*

Response: **The final disposition of the low permeability cover system will be determined during the Remedial Design. Depictions of the capped area, prepared during the FS, exhibited a grass-covered capped area.**

3.2 TECHNICAL AND LEGAL COMMENTS

Comments on the PRAP were received from the PRPs (or Respondents) for the Site. A summary of the comments received from the PRPs follows. The PRPs comments are *italicized*, and EPA's responses are **bolded**:

Major Concern #1: *The PRPs requested that the contingency remedy be removed from the Selected Remedy. (*The contingency remedy that the PRPs are referring to is included in the Selected Remedy, and states that principal threat waste present in the Former Waste Lagoon which cannot be successfully solidified/stabilized (based on the S/S treatability study, and achievement of performance standards) will be excavated and disposed of off-site*). The PRPs have indicated that inclusion of the contingency remedy introduces financial uncertainty in the Selected Remedy which will make it difficult for many of the Respondents to commit to performing the Selected Remedy. The PRPs stated in their comments, "...that the contingency remedy should be eliminated from Alternative 2A in the ROD. In the event that EPA continues to insist on a contingent remedy, then remedies other than excavation and off-site disposal should be allowed to be considered in the event that S/S is needed or fails to meet ROD requirements, including the option of a pumping well system."*

Response: **The FS evaluated options for addressing the principal threat waste present in the Former Waste Lagoon. Ultimately, three basic options were included in the detailed analysis: capping the materials without further treatment, solidifying/stabilizing the materials, and excavating**

the materials and disposing of the principal threat waste present in the Former Waste Lagoon off-Site. The contents of the Former Waste Lagoon are considered by EPA to be principal threat wastes for reasons included in the ROD (Section 2.11). As stated in the NCP, EPA expects to use treatment to address the principal threats posed by a site, wherever practicable. The principal threat wastes associated with the Former Waste Lagoon are presently in an un-lined lagoon, the bottom of which consists of the bedrock surface. The Former Waste Lagoon is sited in karst terrain, which is particularly vulnerable to ground water contamination (Duigon, 2001). Site-related hazardous substances present in the Former Waste Lagoon have been identified in a ground water contamination plume which extends at least 2,700 feet horizontally to the southwest, 2,200 feet horizontally to the northeast, and hundreds of feet vertically into the aquifer at concentrations of concern (the exact dimension of the ground water contamination plume are currently unknown, but are being evaluated as part of the OU-2 RI/FS). Based on the results of the FS, EPA has concluded that it is practicable to treat the principal threat waste present in the Former Waste Lagoon, and capping of these materials without treatment is not appropriate, or consistent with the NCP. As described in the ROD, EPA considers in-situ S/S to be the most appropriate form of treatment for the contents of the Former Waste Lagoon. Although the volume and toxicity of the principal threat wastes will not be reduced by S/S, the mobility of the hazardous substances will be significantly reduced, which will mitigate the threats to human health and the environment posed by the principal threat waste. In-situ treatment of the principal threat wastes will also mitigate potential concerns to the nearby community and remediation workers by minimizing air emissions during the remediation of the Former Waste Lagoon, and by minimizing the transportation effort and associated truck traffic. Successful treatment of the principal threat wastes will be measured by application of specific S/S performance standards during the S/S treatability study (which will be part of the pre-RDI). Although the extent to which the contents of the Former Waste Lagoon can be successfully treated by S/S is not currently known, it will be determined based on the treatability study performed during the pre-RDI. Based on the results of the FS, EPA considers that two options exist for management of the contents of the Former Waste Lagoon: S/S or excavation and off-Site disposal (or a combination of the two approaches, as necessary). The extent to which excavation of the principal threat waste present in the Former Waste Lagoon will be necessary, if at all, will be known at the completion of the pre-RDI. If at the completion of the pre-RDI, the PRPs wish to propose other remedial options for the principal threat waste present in the Former Waste Lagoon which cannot be successfully solidified/stabilized, EPA

will consider them at that time. EPA notes that other remedial options for the Former Waste Lagoon mentioned in the PRPs' comments were not included in the EPA-approved FS report. However, based on the FS, and EPA's review of Site conditions, the option for excavation and off-Site disposal of the contents of the Former Waste Lagoon remains as part of the Selected Remedy.

Major Concern #2: *The PRPs do not feel the contents of the Former Waste Lagoon are principal threat wastes, nor do they require treatment.*

Response: **EPA considers the contents of the Former Waste Lagoon to be principal threat waste, as discussed in Section 2.11 of the ROD.**

Based on the FS report, treatment of the principal threat wastes present in the Former Waste Lagoon is considered to be practicable. As part of the Selected Remedy, the contents of the Former Waste Lagoon will be solidified/stabilized to significantly reduce the mobility of hazardous substances present within the principal threat waste. The extent to which such hazardous substances can be successfully solidified/stabilized will be determined as part of the pre-RDI (specifically the S/S treatability study). Contents of the Former Waste Lagoon which cannot be successfully solidified/stabilized will be excavated, and transported off-Site for treatment, as necessary, and disposed of off-Site at an off-Site waste disposal facility in accordance with CERCLA §121(d)(3).

Major Concern #3: *The PRPs do not feel it is appropriate to establish numeric performance standards for the S/S treatment at this time. Rather, the PRPs feel that performance standards should be established at the conclusion of the pre-RDI. The PRPs comments package states, "The Respondents believe that the ROD should allow flexibility to develop the S/S recipe that best supports the overall goal and addresses source control without being restricted by multiple performance criteria set at the PRP stage. This development could best be done following the pre-RDI stage."*

Response: **The purpose of the ROD is to set forth standards to be attained. The numeric performance standards for the S/S treatment of the principal threat wastes present in the Former Waste Lagoon were established after consultation with the EPA Engineering Technical Support Center within the National Risk Management Research Laboratory, Office of Research and Development. Based on EPA's experience with S/S of waste materials, achievement of the S/S performance standards is considered to be necessary to significantly reduce the mobility of hazardous substances present in the Former Waste Lagoon. EPA does not consider it appropriate to perform a treatability study of S/S treatment, and then establish performance**

standards after review of the testing results. However, EPA recognizes that flexibility with the numeric performance standards may be appropriate at the completion of the treatability study, specifically with regard to the unconfined compressive strength performance standard.

Major Concern #4: *The PRPs feel that the Site-specific remediation standard values are inappropriately set. The PRPs state, "The Respondents believe that the remediation standards for soil in the ROD should reflect ARARs including MDE cleanup guidance and address the entire dataset for each Domain to be consistent with risk assessment practices and EPA guidance."*

Response: **ARARs are substantive cleanup requirements, criteria, or limitations that are promulgated under Federal or State law. MDE cleanup standards represent "To Be Considered" criteria, not ARARs because they are guidance documents and are not promulgated under State law. The Soil Remediation Standards included in the PRAP were developed to meet a cumulative cancer risk of $1x10^{-4}$ and a target organ HI of 1 for direct contact with soil. The cumulative cancer risk represents the upper end of the EPA target risk range, which is generally considered to be protective of human health. The target organ HI of 1 is the commonly accepted threshold value for non-cancer effects.**

The PRPs state that the remediation standards should be applied on a domain basis and that the objective is to address unacceptable risks within a given domain. Although the HHRA evaluated the data with this domain approach, in reality, a receptor may be exposed to soil from more than one domain. For example, it is unlikely that a future industrial worker would experience exposure only to Domain 3 soils and would never venture into Domain 2 or Domain 1. For this reason, one set of Preliminary Remediation Goals (PRGs) was developed to be applied across the Site. The overall goal is not to be protective on a domain-by-domain basis, but to be protective on a Site-wide basis.

The PRPs claim that development of the Soil Remediation Standards was based on the assumptions that all COCs contribute equally to current risks and that COCs are distributed independently across the Site. This is not an accurate statement. The Soil Remediation Standards were based on the assumption that all COCs would contribute equally to future risks. This assumption was necessary for the calculation of specific numeric goals. In addition, the actual distribution of COCs did not enter into the Soil Remediation Standard calculations. As noted above, a receptor may not confine his/her exposure to a single portion of the Site. Thus it should be assumed that a receptor may be exposed to the entire site.

The PRPs assert that the Soil Remediation Standards are not consistent with risk assessment practices or EPA guidance. The primary concern appears to be that the Soil Remediation Standards are being treated as not-to-exceed levels, while baseline risk assessments typically use the 95% upper confidence limit (UCL) as the exposure point concentration. It is agreed that the EPA Risk Assessment Guidance for Superfund identifies the exposure point concentration for the reasonable maximum exposure to be the 95% UCL. However, application of a PRG to a site determined to have actionable risk is not the same process as completion of a baseline risk assessment. EPA guidance on application of remedial goals to soil and sediment (Methods for Evaluating the Attainment of Cleanup Standards, Volume 1: Soils and Solid Media, EPA 230/02-89-042, February 1989) allows the risk manager to select whether a remedial goal represents a not-to-exceed level or the upper-bounding estimate of the mean exposure.

Based on a review of Site conditions, and after consideration of the PRPs' comments, EPA has established Soil Remediation Standards for the Central Chemical property that are included in Table 13 of the ROD. The Soil Remediation Standards are part of the Selected Remedy. A description of the Soil Remediation Standards and the method to demonstrate attainment of the Soil Remediation Standards is included as follows:

<u>Soil Remediation Standards for protection of human health (direct contact)</u>

Soil Remediation Standards for protection of human health (direct contact) have been established for future indoor site workers on the Central Chemical property (identified as "ISW" on Table 13), and future construction workers on the Central Chemical property (identified as "CW" on Table 13).

As indicated on Table 13, the Soil Remediation Standards for protection of human health (direct contact) are 95% UCL values. At the completion of excavation of contaminated soil in accordance with the Selected Remedy, attainment of the Soil Remediation Standards will be demonstrated by collection of confirmation soil samples, and generation of a 95% UCL value for each COC based upon protection of human health (direct contact). If the 95% UCL values generated for each COC are less than or equal to their respective Soil Remediation Standard, the Soil Remediation Standards will be deemed attained. However, no single location on the Central Chemical property can exhibit COC concentrations greater than ten

times (10x) their respective Soil Remediation Standards. This not-to-exceed value has been established at approximately the upper end of EPA's acceptable risk range for cancer and non-cancer risk for protection of human health.

A maximum depth of excavation for achievement of the Soil Remediation Standards for protection of human health (direct contact) has been established as 10 feet bgs.

Soil Remediation Standards for protection of ecological receptors

Soil Remediation Standards for protection of ecological receptors have been established for Central Chemical property (identified as "ECO" on Table 13).

As indicated on Table 13, the Soil Remediation Standards for protection of ecological receptors are 95% UCL values. At the completion of excavation of contaminated soil in accordance with the Selected Remedy, attainment of the Soil Remediation Standards will be demonstrated by collection of confirmation soil samples, and generation of a 95% UCL value for each COC based upon protection of ecological receptors. If the 95% UCL values generated for each COC are less than or equal to their respective Soil Remediation Standard, the Soil Remediation Standards will be deemed attained. However, no single location on the Central Chemical property can exhibit COC concentrations greater than ten times (10x) their respective Soil Remediation Standards.

A maximum depth of excavation for achievement of the Soil Remediation Standards for protection of ecological receptors has been established as 2 feet bgs.

Soil Remediation Standards for protection of ground water

Soil Remediation Standards for protection of ground water have been established for Central Chemical property (identified as "GW" on Table 13).

As indicated on Table 13, the Soil Remediation Standards for protection of ground water are not-to-exceed values. The Soil Remediation Standards for protection of ground water have been established as not-to-exceed values because each location where the Soil Remediation Standards are exceeded may act as a source of ground water contamination which would result in the remedy not attaining the following Remedial Action Objective (Section 2.8 of the ROD): "Prevent migration of contaminants from soils that would

result in ground water contamination that exceeds ground water performance standards that are protective of human health and the environment." Therefore, the Soil Remediation Standards for protection of ground water must not be exceeded at any location on the Site at the completion of soil remediation activities.

Specific Comment #1: *The PRPs noted that the concrete slab material may be able to be recycled by a local Hagerstown company. Also, the PRPs note that the concrete slabs may be able to be crushed and used as a type of gravel during cleanup of the Site. The PRPs have concluded that off-Site disposal of the slabs may be unnecessary and requested that the requirement for off-Site disposal of the concrete slabs be removed.*

Response: **EPA concurs with this comment, and the comment has been reflected in EPA's Selected Remedy.**

Specific Comment #2: *The PRPs objected to the use of the terms "sinkhole" and "quarry" to describe a drainage swale in the central portion of the Site, and the Former Waste Lagoon, respectively.*

Response: **As the PRPs have indicated, the term "quarry" is used in several historical documents, including the Maryland Department of Natural Resources publication, "Karst Hydrogeology of the Hagerstown Valley, Maryland" (Duigon, 2001), in reference to the area of the Site identified in the RI as the Former Waste Lagoon. The original disposition of the Former Waste Lagoon is not able to be determined from a review of aerial photographs. The term "quarry" is used in two paragraphs of the ROD, in sections referring to Site history. For clarification, where the term "quarry" is used, the location is clarified by adding "Former Waste Lagoon" in parentheses. Based on a review of historical aerial photographs, specifically the 1937 aerial photograph included in the Administrative Record, there is no indication that the "drainage swale" was excavated. Rather the drainage swale appears to be comprised of a closed topographic contour land surface feature which appeared naturally before the occurrence of the Former Waste Lagoon. Although EPA continues to believe that a solution sinkhole or similar karst-related feature may exist in the area of the drainage swale, and although "sinkhole" is referenced in historical documents related to the Site, EPA has revised the ROD text to indicate "potential sinkhole" where the "sinkhole" term is used.**

Specific Comment #3: *The PRPs requested that a paragraph be removed from the ROD, which pertains to a 1970 field inspection by the MDWR.*

Response: **The paragraph was included as part of the Site history, and is factual. The paragraph cited does not impact the Selected Remedy, and has not been deleted.**

Specific Comment #4: *The PRAP stated, "Based on the B&W study, and a consent agreement with the State of Maryland, Central Chemical closed the Former Waste Lagoon, and a sinkhole located on-site by covering those areas with clay and soil, and vegetative stabilization." The PRPs noted that a notice of compliance was issued by the State of Maryland in December 1979 with regard to the consent agreement. The PRPs also objected to the use of the word "sinkhole."*

Response: **The "sinkhole" issue is addressed in Specific Comment #3 (above). EPA has not been able to locate the Notice of Compliance referenced by the PRPs, nor have the PRPs provided the referenced document for the Administrative Record.**

Specific Comment #5: *The PRPs objected to the use of the term "discovery" in reference to the 1987 sewer line excavation which encountered the Former Waste Lagoon.*

Response: **EPA has revised the text, the term "identification" is used.**

Specific Comment #6: *The PRPs believed the PRAP's description of ground water movement in karst aquifers was oversimplified, in the context of the Site.*

Response: **This section of the ROD has been modified to address the PRP's comment (Section 2.5).**

Specific Comment #7: *The PRPs provided comment on the description of structural geology features identified within the PRAP.*

Response: **This section of the ROD has been modified to address the PRP's comment (Section 2.5).**

Specific Comment #8: *The PRPs objected to the following statement in the PRAP: "It is possible that irrigation wells located approximately one mile to the NE (Fountainhead Country Club) influence ground water flow to the NE." The PRPs indicate that there is no specific evidence to support this statement and it could create the impression that EPA believes there is a concern with Site contaminants at the Country Club.*

Response: **EPA believes there is sufficient evidence to support the statement, which states that it is <u>possible</u> (emphasis added) that irrigation wells influence ground water flow to the NE. At this time, ground water**

contamination which extends to the NE and SW from the Site is being evaluated by EPA as OU-2 of the Site.

Specific Comment #9: *The PRPs objected to the following statement in the PRAP: "The depth to ground water in the vicinity of the Former Waste Lagoon is expected to vary seasonally in response to rainfall and snow melt conditions. There is a potential that the ground water level may seasonally rise into the contaminated soils and waste present in the Former Waste Lagoon (and possibly beneath the bottom of the Former Waste Lagoon." The PRPs indicated that there were no overburden wells screened within the bottom interval of the former lagoon to substantiate this statement. The PRPs also identified that the evaluation of ground water levels within the Former Waste Lagoon, which was identified as a task in the pre-RDI discussed in the FS, was not included in the PRAP's description of the pre-RDI.*

Response: **EPA believes the statements referenced in the PRAP are correct. Ground water level measurements collected in May 2005 indicated that ground water levels rise above the bottom of the Former Waste Lagoon. Therefore, the evaluation of ground water levels within the Former Waste Lagoon proposed by the PRPs is a moot point.**

Specific Comments #10, 11, 12: The PRPs identified several statements in the PRAP which were incorrect with regard to the identification of Site-related contaminants in surface water, sediment, and fish tissue.

Response: **The statements referenced by the PRPs have been corrected in the ROD.**

Specific Comment #13: *The PRPs indicated that they do not feel that the contents of the Former Waste Lagoon constitute principal threat waste.*

Response: **This issue is addressed in Major Concern #2 above.**

Specific Comment #14: *The PRPs sought to clarify that areas of Antietam Creek, are not part of the "Site." The PRPs seem to believe that the term "Site" refers to the Central Chemical property only.*

Response: **The use of the term "Site" in the ROD is meant to be consistent with the definition of "on-site" in the NCP, as follows: "On-site means the areal extent of contamination and all suitable areas in very close proximity to the contamination necessary for implementation of the response action." Therefore, areas where Site-related contamination has been identified are described in the ROD as part of the "Site."**

Specific Comment #15: The PRPs objected to the RAOs included in the PRAP, as being not consistent with those included in the FS report. Also, the PRPs have indicated that there is no basis for establishing a RAO for treatment of what EPA refers to as principal threat waste.

Response: **As described elsewhere in this Responsiveness Summary, EPA considers the contents of the Former Waste Lagoon to be principal threat waste. The NCP indicates that EPA expects to use treatment to address the principal threats posed by a site, where practicable. Based on the FS, and EPA's evaluation of the Site, and available remedial options, EPA considers treatment of the contents of the Former Waste Lagoon to be practicable. The RAOs are general statements about what the remedial action will accomplish. One of the primary objectives of the cleanup at the Central Chemical Site is the treatment of principal threat wastes at the Site. Such treatment will reduce the toxicity, mobility or volume of the principal threat waste. S/S will be used, to the extent practicable based on the results of the treatability study, to reduce the mobility of the principal threat waste present in the Former Waste Lagoon. Contents of the Former Waste Lagoon which cannot be successfully treated via S/S will be excavated and disposed of off-Site. Prior to such disposal, the principal threat wastes will be subject to characterization and treatment, as necessary pursuant to the requirements of the RCRA. EPA believes that the RAOs included in the PRAP, and ROD, are appropriate for the Site and reflect what implementation of the Selected Remedy is meant to accomplish.**

Specific Comments #16, 17, 18, 21, and 29: These comments indicate that the ground water monitoring, extraction and treatment system are meant to provide temporary hydraulic control in the vicinity of the Former Waste Lagoon.

Response: **The Selected Remedy is meant to address the contaminated soils, and principal threat waste at the Site.**

The purpose of the ground water monitoring, extraction and treatment system is to provide capture of Site-related hazardous substances from the area of the Former Waste Lagoon, and to prevent migration of contaminated ground water beyond the boundary of the Consolidation Area (treated Former Waste Lagoon, consolidated contaminated soils, low permeability cover system). EPA recognizes that treatment of principal threat waste at or below the bottom of the Former Waste Lagoon may not be practicable, for example if principal threat waste is present beneath the Former Waste Lagoon in bedrock fractures. Therefore, dependent on hydrogeological conditions at the Site, hazardous substances present in untreated principal threat waste at or near the bottom of the

Former Waste Lagoon may continue to migrate to ground water and result in ground water contamination. The ground water monitoring, extraction and treatment system will include a monitoring component to determine if this possibility is in fact occurring. If ground water monitoring indicates that unacceptable concentrations of hazardous substances are migrating from the Former Waste Lagoon area, the resultant ground water contamination will be captured via operation of the ground water monitoring, extraction, and treatment system to prevent contaminated ground water from migrating beyond the boundary of the Consolidation Area. The timeframe during which operation of the ground water monitoring, extraction and treatment system will be operated is dependent upon the results of ground water monitoring in the vicinity of the Former Waste Lagoon. As appropriate, the ground water monitoring, extraction and treatment system included in the Selected Remedy for OU-1 (soils, principal threat wastes) may constitute a portion of the strategy for ground water cleanup which will be described in a proposed remedial action plan, and subsequent ROD for OU-2 (ground water).

Specific Comment #19: *The PRPs indicate that the hazardous waste classification activities described in the pre-RDI would only be necessary if materials were being excavated and disposed of off-site.*

Response: **EPA agrees with the comment and that portion of the description of the pre-RDI has been revised.**

Specific Comment #20: *The PRP's entire comment #20 pertaining to the PRAP, and specifically to performance standards for S/S treatment and Soil Remediation Standards is included in this Responsiveness Summary, as follows:*

Comment: *Although the PRAP indicates that a "complete description of the evaluated alternatives is included in the FS", the Respondents believe that the Preferred Alternative described in the PRAP contains significant differences from Alternative 2A in the FS. The new remedy components and performance metrics that are included in the PRAP will result in the following changes from Alternative 2A as evaluated in the FS.*

* *Significantly increase the volume of soil to be managed from Domains 1 and 3.*
* *Excavation of Domains 1 and 3 potentially extending to bedrock or as much as 25 feet below ground surface.*
* *Potential increase in the size of the capped area in Domain 2 to accommodate the excavated materials.*

* *Additional solidification mixture additives to achieve performance standards that will not contribute to the objective of protecting ground water.*
* *Potentially excavating Domain 2.*

These changes produce a remedy of unknown cost that potentially exceeds the $25 million threshold for review at higher levels within EPA (National Remedy Review Board).

The Preferred Alternative in the PRAP calls for excavation of all "contaminated soils about Site-specific remediation standards" from each of three domains. The Site-specific remediation standards were developed based on assumptions that all COCs contribute equally to risk at the Site and that all COCs are distributed independently across the Site. Neither of these assumptions is correct. As evaluated in the RI and the Risk Assessment and proposed in the FS for the Site, areas of contamination were identified based on the evaluation of risk. As part of the risk assessment process, exposure point concentrations for COCs are developed based on procedures described in EPA Guidance (EPA, 1989b) and use the 95% UCL of the mean for the entire dataset for each Domain. Since the overall objective related to the remediation standards for soil is to address risk calculated using the entire dataset for the Domain, evaluation of success should do the same and be based on the entire post-remedy dataset for each Domain. The application of Site-specific standards to each and every particle of soil at the Site is not consistent with this approach and with EPA's overall risk assessment process. The Respondents do not agree with applying numeric criteria as provided in the PRAP to soil data from individual locations. The NCP addresses the evaluation of residual risk remaining at the conclusion of the remedial activities (NCP 300.430 (e)(9)(iii)(c)1). An evaluation using the PRGs as presented in the PRAP indicates that the residual risk is significantly lower than the target risk levels of $1x10^{-4}$. In fact, for most potential exposure pathways, the residual risk using the PRAP PRGs would be below $1x10^{-6}$. This is largely due to the co-location of compounds of concern such that management of compounds that contribute significantly to risk also addresses other Site-related compounds. We also note that the current description of the application of the PRGs to Site cleanup does not distinguish between compounds that are accessible under the defined risk exposure scenarios and compounds that occur below the depths of exposure that are considered in the Risk Assessment. This effectively provides no limit on the depth to which excavation potentially would occur. This uncertainty with regards to depth of excavation will make implementation very difficult and potentially very costly.

A detailed evaluation of the residual risk following remediation of soils at various PRG levels is provided in Attachment No. 3.

Response:

EPA has selected a remedy for the Site in accordance with CERCLA, and the NCP. The Selected Remedy is Alternative 2A, as described in the FS. However, there are unknowns associated with the Selected Remedy. The greatest unknown is the extent to which S/S can successfully reduce the mobility of contaminants within the Former Waste Lagoon. That unknown has been addressed whereby waste materials within the Former Waste Lagoon which cannot be successfully treated by S/S will be excavated and transported off-Site, with treatment as necessary, and disposed of off-Site at an off-Site waste disposal facility in accordance with CERCLA §121(d)(3). EPA notes that the Selected Remedy is based upon the entire Administrative Record, not solely the FS.

EPA agrees with the PRPs that a maximum excavation depth to achieve direct contact human health remediation standards is appropriate for the Central Chemical property. Table 13 includes the Soil Remediation Standards for the Central Chemical property. The maximum depth of excavation to protect future workers at the Site (indoor site workers, and construction workers) is 10 feet bgs. The depth of 10 feet bgs is expected to address soils that future construction workers will come in contact with during excavation activities, and is expected to be the maximum depth from which subsurface soils may be transported to the surface by drilling, excavating, etc. during future construction activities at the Site. As discussed in Table 13, if soil contamination is present beneath 10 feet at the completion of the remedial action that may represent a future threat to human health or ecological receptors, the establishment of institutional controls to address this condition may be required. However, Soil Remediation Standards which are protective of ground water should be achieved through excavation, because contaminated soils which exceed these Soil Remediation Standards may continue to act as an on-going source of ground water contamination at the Site. Therefore, no maximum excavation depth has been established for achievement of the Soil Remediation Standards based on ground water protection.

The PRPs claim that the development of performance criteria for the S/S mixture has changed Alternative 2A from how it was evaluated in the FS. EPA does not agree with this assertion and feels that there is no basis for this claim. A FS provides a preliminary cost estimate with a level of uncertainty ranging from -30% to +50%. Other than the requirement to meet PRGs, performance criteria generally are not developed at the FS stage. If a remedial alternative is selected as the

preferred alternative, then it becomes necessary to develop performance criteria in order to support the remedial design process. As noted in the response to Major Concern #3, the PRAP and ROD are the appropriate documents to identify initial performance criteria, particularly since the primary goal of the criteria is to ensure long-term attainment of the RAO to protect the environment (ground water). With Alternative 2A, the treated Former Waste Lagoon contents will be left in place in perpetuity.

The PRPs comments pertaining to the derivation of Soil Remediation Standards are addressed in response to Major Concern #4, above.

An evaluation of the residual risk evaluation provided by the PRPs (identified as Attachment No. 3), is included below (Specific Comment #32).

Specific Comment #22: The PRPs referenced an earlier comment on ground water flow and ground water contamination fate and transport

Response: **This issue is addressed in Specific Comment #11.**

Specific Comment #23: The PRPs noted the concerns with long-term durability of solidified/stabilized wastes can only be somewhat reduced during the treatability study, as extrapolations will need to be made regarding long-term strength, permeability, and leachability. The PRPs also indicate that S/S at other Sites provides confidence regarding long-term performance of this technology.

Response: **This comment has been considered.**

Specific Comment #24: The PRPs pointed out that a containment structure over the Former Waste Lagoon was not included in the FS as part of Alternative 2A.

Response: **EPA agrees with this comment and has revised the section referenced by the PRPs.**

Specific Comment #25: The PRPs objected to the use of numeric performance standards for the S/S element of the Selected Remedy. The PRPs proposed qualitative performance standards for the ROD.

Response: **A purpose of the ROD is to set forth standards to be achieved. The alternate performance criteria suggested by the PRPs are not acceptable. First, the PRPs desire the unconfined compressive strength and permeability criteria to depend on the test results. Generally, performance criteria are developed prior to testing to ensure that the process meets the project requirements, as opposed**

to defining the project requirements based on what the process can achieve. Because the leachability criterion suggested by the PRPs omits the requirement that leachate not result in ground water contamination that exceeds performance standards, use of the PRPs' criterion may result in failure to attain the RAO to protect the environment.

Specific Comment #26: The PRPs requested some degree of flexibility in the selection of test methods that will be used to demonstrate compliance with S/S leachability performance standard.

Response: **The Selected Remedy includes the following language regarding the leachability performance standard associated with S/S treatment:**

"Leachability: Treat the contents of the Former Waste Lagoon using S/S such that leaching of contaminants from the Former Waste Lagoon, as measured by SPLP (EPA SW846 Method 1312, or substantial equivalent), is significantly reduced and contaminated leachate from the Former Waste Lagoon will not create ground water contamination above ground water remediation standards at the boundary of the Central Chemical property."

The testing method identified in the Selected Remedy is "EPA SW846, Method 1312, or substantial equivalent." The language "or substantial equivalent" allows flexibility during the pre-RDI for selection of the testing methodology used to demonstrate compliance with the leachability performance standard, at the discretion of EPA.

Specific Comment #27: The PRPs requested that the contingency remedy be removed from the Selected Remedy, which requires excavation and off-site treatment of the principal threat waste in the Former Waste Lagoon which cannot be successfully treated via S/S, as evidenced by the pre-RDI (and specifically the S/S treatability study), based on the application of the S/S performance standards.

Response: **This comment is addressed above as Major Concern #1.**

Specific Comment #28: The PRPs indicated that soil samples have been collected at locations adjacent to the Central Chemical property in the past and analyzed for contaminants. The PRPs indicated that EPA and MDE reviewed the analytical results associated with such soil samples and informed the property developer that the pesticide concentrations on the adjacent properties were within acceptable limits for residential use. The PRPs indicate that the inclusion of residential-based soil remediation standards within the ROD is not necessary. The PRPs also indicate that

air monitoring will be performed during "intrusive activities" to minimize the potential for airborne migration of contaminants.

Response: **As stated in the Selected Remedy (Section 2.12), additional soil samples will be collected at adjacent properties and analyzed for Site-related contaminants to determine if there is an unacceptable risk posed by the soils. The purpose of this task is to verify that excavation of contaminated soils is not necessary beyond the boundary of the Central Chemical property in order for the OU-1 remedy to be protective of human health and the environment.**

Specific Comment #30: *The PRPs suggested that one of the elements of the Preferred Alternative be modified to indicate that principal threat wastes identified at the Site outside of the Former Waste Lagoon area be excavated and disposed of off-site, as opposed to all principal threat waste at the Site requiring excavation and off-site disposal.*

Response: **EPA agrees with the comment and has revised the appropriate element of the Selected Remedy.**

Specific Comment #31: *The PRPs provided a comment that the definitions of surface soil and subsurface soil in the PRAP were not the same as those in the HHRA of the RI.*

Response: **The performance of a HHRA as part of a remedial investigation is not the same task as establishing Soil Remediation Standards in a ROD. Surface soil is defined in the ROD as 0-2 feet bgs in order to be protective of ecological receptors (the top 2 feet of soil represents the zone of biological activity). For direct contact of workers with subsurface soil, the ROD defines subsurface soil as 2-10 feet as this is the maximum depth of soil that future construction workers on the Site are expected to encounter, and is the maximum depth from which subsurface soil is expected to be transported to the surface during future construction activities at the Central Chemical property.**

Specific Comment #32: *The PRPs entire comment is included:*

Tables 4, 5, and 6 – Central Chemical Interim Ground water Remediation Standards (Table 4) and Central Chemical Soil Remediation Standards (Table 5)

Remediation Standards were calculated with the assumption that all contaminants of potential concern (COPCs) equally contribute to risk, which is not the case. For example, of the 16 carcinogenic COPCs listed in Table A.9 of the PRG calculations for soil (separate document from

HGL), 2,4-DDT, 4,4-DDT, Aldrin, Dieldrin, and Toxaphene contribute over 90% of the carcinogenic risk for the site worker (Table 9.1.4 RME from the HHRA [URS, 2007 with 2008 change pages]). Appropriate remediation standards should focus on the primary risk drivers, especially since the drivers tend to be co-located with other COPCs in soil. In applying the PRGs, the PRAP moves from a domain averaging approach to evaluation risk and deciding which areas of the Site require remediation to an approach requiring comparison of individual data points to risk-based concentrations. This is not consistent with risk assessment practice or with the approach that was used in the approved HHRA that was incorporated in the RI. The result is higher remedy costs for no additional protection of human health and the environment. As provided in Attachment No. 3 of these comments, we have compared the residual risk of the PRGs and the approach indicated in the PRAP to the residual risk using only a threshold value for 4,4-DDT. The results of the comparison indicate that the residual risk in both cases was below $1x10^{-5}$ and the hazard index was below 0.1. However, the approach described in the PRAP results in the management of an additional 7,960 cubic yards of material considering only the upper two feet of soil (see details in Attachment No. 3). Therefore, the costs associated with the approach used in the PRAP greatly exceed any potential benefit in terms of reduced risks.

Response:

The PRGs were not calculated with the assumption that all COCs contribute equally to current risk, but that all contribute equally to future risk. The PRGs were established to attain a cumulative cancer risk of $1x10^{-4}$ and a target organ HI equal to 1. In addition, the PRGs consider ecological receptors and the soil-to-ground water migration pathway. The analysis provided by the PRPs considers only direct contact and not the other RAOs which the preferred alternative must also achieve. While a few compounds contribute greater than 90% of the risk, if the other compounds also result in unacceptable health effects, they too must be considered in the PRGs. If, as the PRPs contest, it is not necessary to consider the secondary risk drivers because they are collocated with the greatest risk drivers, then the inclusion of PRGs for the secondary risk drivers should not substantially affect the remedial volume. As noted in responses to previous comments, the PRPs' statement that PRGs should be developed for individual domains is flawed. Attainment of RAOs should be considered on a Site-wide basis, not a domain basis. It would be odd indeed to have two sets of PRGs applied to soil separated by a distance of 100 feet, when the potential ecological and human receptors would not necessarily confine their activities to the boundaries of a given domain.

The PRPs' analysis provided in Attachment No. 3 was reviewed. First, the analysis reflects the PRPs' contention that the PRGs should be applied as a 95% UCL. Table 13 of the ROD establishes that the direct contact Soil Remediation Standards (future indoor site workers, and future construction workers) are 95% UCL values. Second, the data set used in Attachment 3 for each compound consists of estimated concentrations in grids not excavated combined with a large number of zero values to represent excavated grids. For example, based on the information provided by the PRPs, it appears that the data set for remediation based on 11.1 milligrams per kilogram (mg/kg) 4,4'-DDT would contain 187 zeros for each COC, and 72 nonzero values. This approach dilutes the residual contamination (because the excavated grids may not in fact exhibit COC contaminant concentrations of zero) to allow the PRPs the opportunity to decrease the remedial area to be less than the actual area of contamination above PRGs. This approach is not appropriate.

Based on a review of Site conditions, and after consideration of the PRPs' comments, EPA has established Soil Remediation Standards for the Central Chemical property that are included in Table 13 of the ROD. A description of the Soil Remediation Standards and the method to demonstrate attainment of the Soil Remediation Standards is included in response to Major Comment #4, above.

Specific Comment #33: The PRPs provided several comments (listed below as a), b), c) etc.) on the preparation and application of Soil Remediation Standards for ecological receptors, as follows:

a) The PRPs indicated that a Soil Remediation Standard protective of ecological receptors does not need to be calculated for dieldrin, because the concentrations of dieldrin identified at the Site do not represent a concern to ecological receptors.

Response: **EPA concurs with this comment.**

b) The PRPs indicated that a Soil Remediation Standard for only one COC (4,4-DDT) is necessary to protect ecological receptors.

Response: **Based on a review of the PRPs' comment, EPA believes that the PRPs' request that ecological PRGs should be limited to 4,4'-DDT only for the following reasons:**

- **Aldrin, dieldrin, endrin ketone, and toxaphene were detected in only a few samples. The detection limits for non-detect results were elevated due to the need to dilute the samples because of**

4,4'-DDT. The elevated detection limits likely resulted in overestimation of the exposure point concentration.

- **Aldrin, dieldrin, endrin ketone, and toxaphene are in large part collocated with 4,4'-DDT.**

With respect to the first bullet, the conclusion that the elevated detection limits artificially increased the exposure point concentration cannot be supported by the data. The fact that their detection limits were high means that other pesticides could have been present at substantial concentrations, but their presence was masked by the 4,4'-DDT. In this situation, the absence of a detection does not necessarily equate to the absence of the compound, and the exposure point concentration based on one-half the detection limit may underestimate the actual concentration. As noted in Table 9 of the ROD, aldrin, dieldrin, endrin ketone and toxaphene were detected in soils at the Site.

With respect to the second bullet, if the pesticides are primarily collocated, then the development of PRGs for each compound should have a limited effect on the remedial volume. If these pesticides are not collocated with the 4,4'-DDT, then PRG development is required to ensure that residual pesticide contamination does not pose a threat to ecological receptors.

c) The PRPs indicated in their comments that Soil Remediation Standards for ecological receptors should not be developed for soil invertebrates.

Response:

For this part of the comment, the PRPs focused on 4,4'-DDT. The PRG selected for 4,4'-DDT is based on exposure by a shrew, not a soil invertebrate. The only PRG listed in Tables 5 and 6 that is based on the soil invertebrate is the one for toxaphene. The toxaphene toxicity reference value (TRV) used in the baseline ERA and PRG development for the soil invertebrate was 3 mg/kg. A study by Bezchlebova, et. al. (2007) identified a no observed effects concentration of 2.5 mg/kg and a lowest observed effects concentration of 3.7 mg/kg for reproduction impacts associated with exposure of *Folsomia candida* to toxaphene. Based on this study, 3 mg/kg appears to be an appropriate TRV for toxaphene. While the toxaphene in the Site soils may not be fully bioavailable, the baseline risk assessment provides no mean of ascertaining the contaminant's degree of bioavailability. Finally, depending on how the toxaphene is distributed relative to the 4,4'-DDT, risk management decisions based solely on exposure of mammals and birds to 4,4'-DDT may not be an effective means of ensuring that the terrestrial

invertebrate population at the Site is not adversely affected by toxaphene.

d) The PRPs indicated that Soil Remediation Standards for surface soil should be based on LOAEL, and not NOAEL endpoints.

Response: **EPA guidance indicates that cleanup goals should be between the LOAEL and the NOAEL. On sites such as this where risk is present for multiple endpoints, the NOAEL to LOAEL range must be considered for all receptors (i.e., endpoints). This is particularly true when Site-specific toxicity values are not established and cannot be used to develop Site-specific cleanup goals as recommended by EPA guidance. In instances such as this, the selection of PRGs within the NOAEL-LOAEL range is more heavily influenced by the uncertainty associated with the lack of Site-specific values, resulting in the selection of PRGs at the NOAEL end of the range. Given the overall remedial strategy for the Site, the establishment of PRGs based on NOAELs is appropriate and does not result in an inappropriate increase in the remedial footprint when compared with the other cleanup criteria.**

e) The PRPs indicated that Soil Remediation Standards for ecological receptors should be based on a 0-1 feet bgs depth.

Response: **EPA does not agree with the PRPs on this point. Typically, the top 2 feet of soil is considered to be the primary zone of biological activity.**

f) The PRPs indicated that Soil Remediation Standards for protection of ecological receptors should be developed only for the portion of the Site identified as the "Undeveloped Exposure Domain."

Response: **Simply because the ERA did not consider the residential areas beyond the boundary of the Central Chemical property does not mean that there is no potential risk posed by Site-related pesticides. The adjacent residences have grassy backyards in which terrestrial invertebrates, robins, and other animals could live and/or forage. While the PRPs provided no calculations to assess the potential threat posed by the potential for endrin ketone contamination beyond the boundary of the Central Chemical property, it is reasonable to assume that this contamination could pose a similar threat to that found on the Central Chemical property. As stated in the ROD, during the pre-RDI soil samples will be collected beyond the boundary of the Central Chemical property to determine if an unacceptable risk is present.**

The Soil Remediation Standards (included on Table 13 of the ROD), which are protective of ecological receptors apply to the Central Chemical property.

g) The PRPs concluded that a concentration of 11.1 ppm of 4,4-DDT would be a sufficient Soil Remediation Standard for protection of ecological receptors.

Response:

As described in the above responses to the comment subparts, development of a single ecological PRG for 4,4'-DDT is not appropriate. Due to elevated detection limits, other pesticides may be present at relatively high concentrations. 4,4'-DDT toxicity to birds and mammals should not be used as a surrogate for the toxicity of other pesticides, such as toxaphene, to soil invertebrates.

4.0 REFERENCES

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URS, 2008. Feasibility Study Report, Central Chemical Site, Hagerstown, Maryland.

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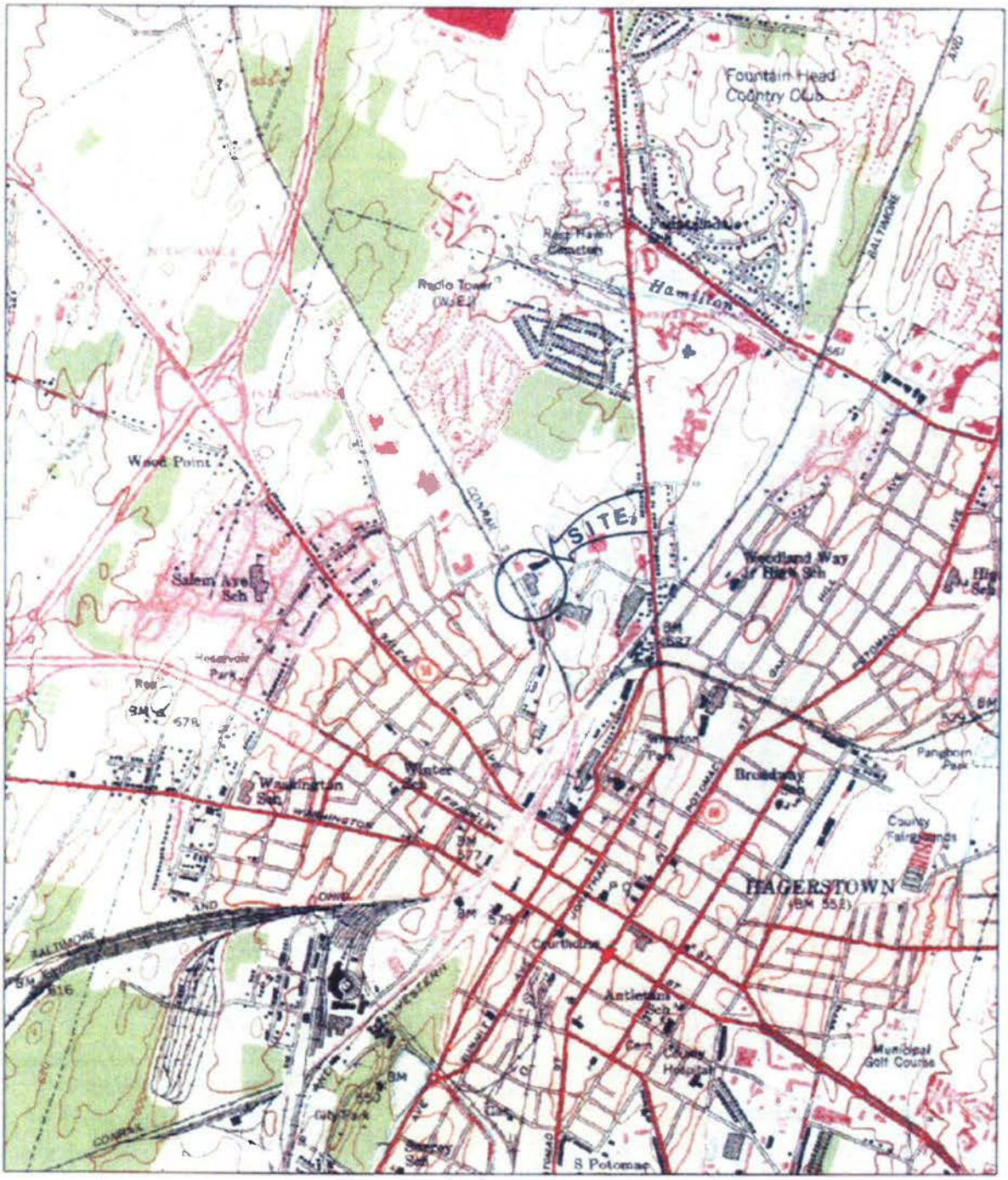
FIGURES



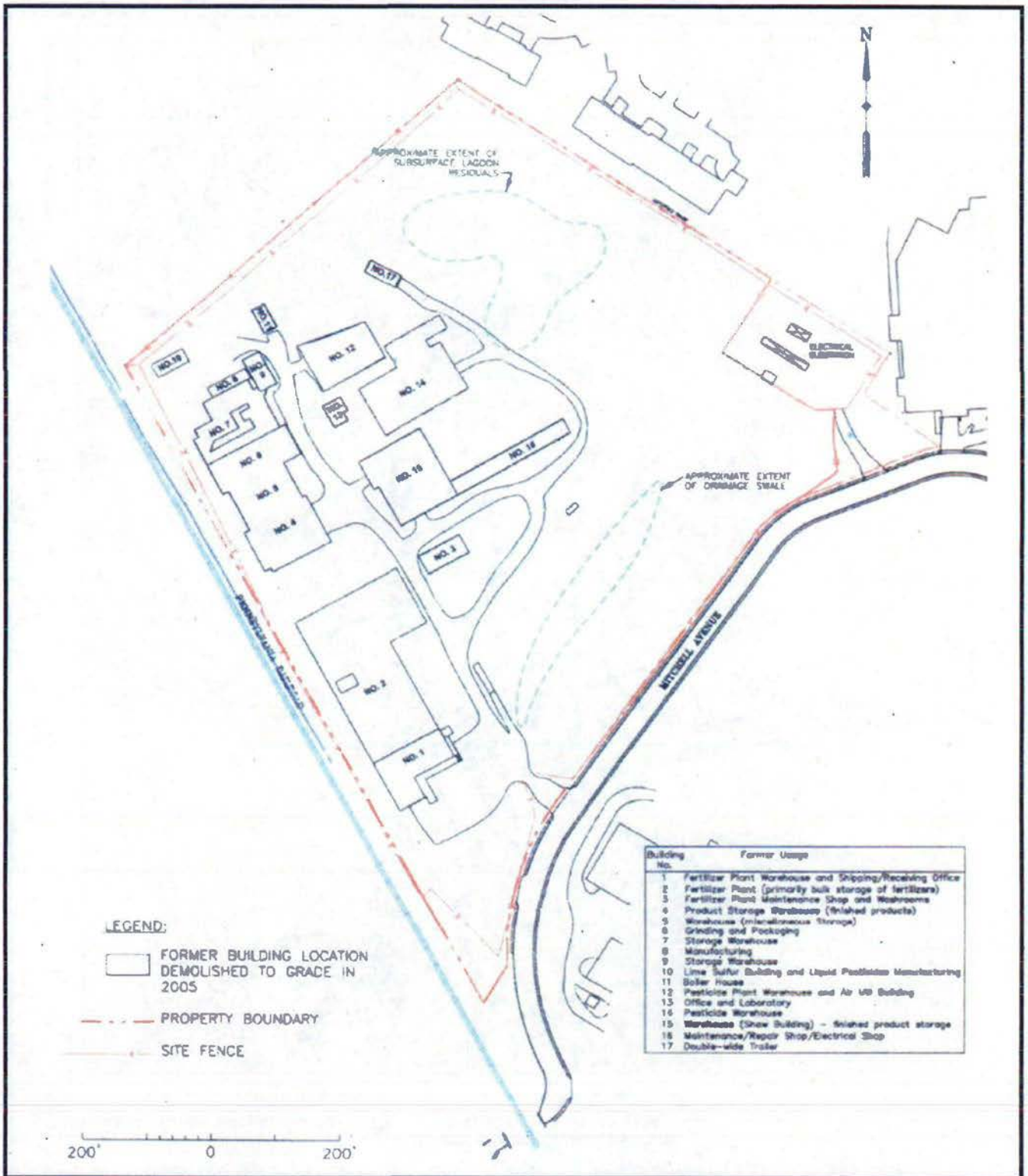
MAP SOURCE

HAGERSTOWN, MD–PA QUADRANGLE,
U.S. GEOLOGICAL SURVEY, 1953
PHOTOREVISED 1971

X:\EPA010\Central_Chemical\Final_ROD Site_Location.cdr
Revised: 09/18/09 TH
Source: Figure 2-1, Remedial Investigation Report, Vol.1(URS, 2007 with 2008 Change pages)

QUADRANGLE LOCATION

Figure 1
Site Location
Central Chemical NPL Site
Hagerstown, Maryland



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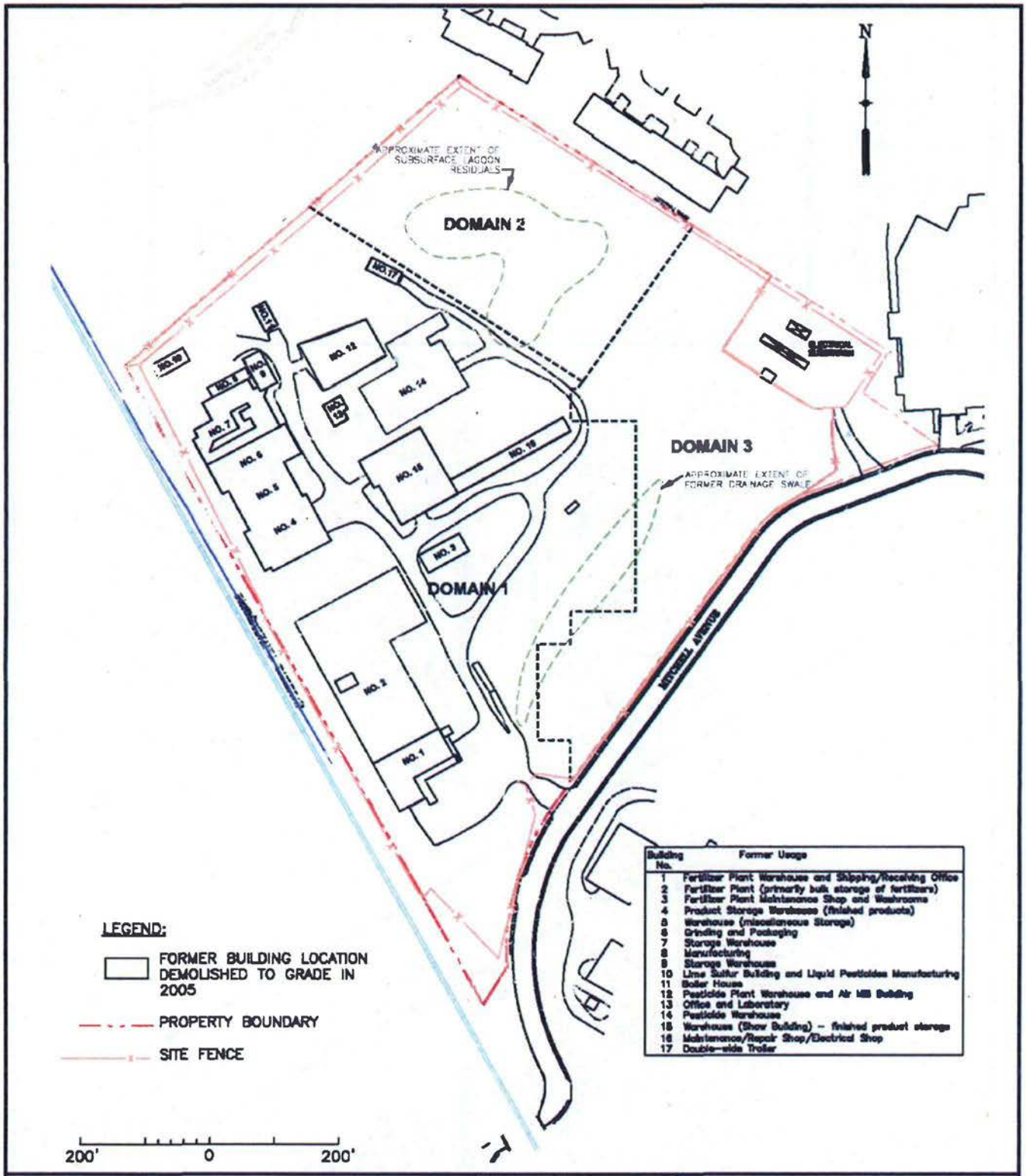
Revised: 09/21/09 TB
Source: Figure 2-2, Remedial Investigation Report, Vol.1 (URS, 2007 with 2008 Change pages)

Figure 2
Waste Disposal Areas
Central Chemical NPL Site
Hagerstown, Maryland



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Revised: 09/25/09 TH
Source: Figure 2-2, Remedial Investigation Report, Vol.1 (URS, 2007 with 2008 Change pages)

Figure 3
Depiction of "Domain" Areas
Central Chemical NPL Site
Hagerstown, Maryland

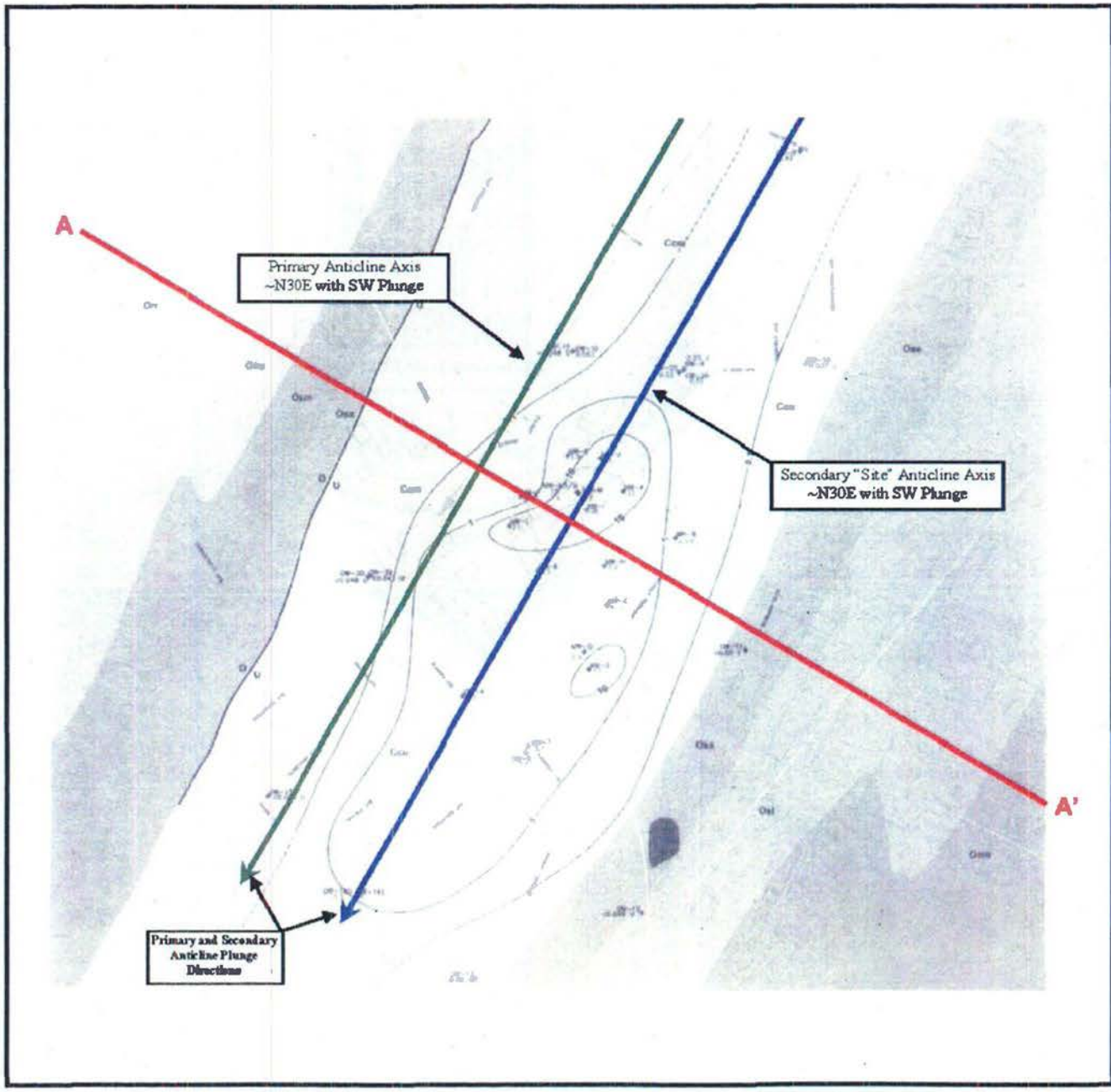
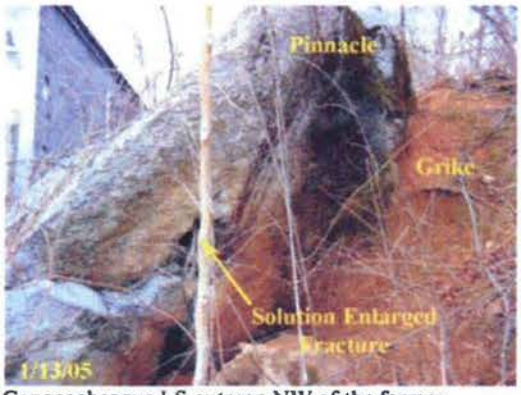


Figure 4
Geologic and Cross-section Map
Central Chemical NPL Site
Remedial Investigation
Hagerstown, Maryland

Legend

X:\EPA010\Central_Chemical\Final_ROD Geology.cdr
Revised: 09/25/09 TH
Maryland Department of the Environment

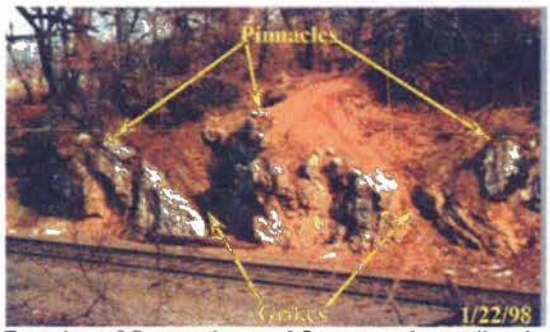


Conococheague LS outcrop NW of the former pesticide plant showing a pinnacle, grike, and solution cavity. This outcrop is most likely on the western limb of the anticline that trends NE across the site.

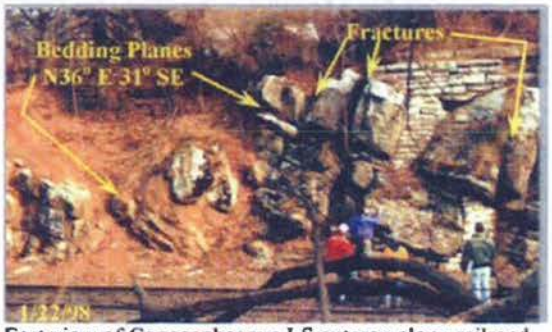
View of Conococheague LS outcrop NW of the former pesticide plant showing a pinnacles and grikes. This outcrop is most likely on the western limb of the anticline that trends NE across the site.

Conococheague LS outcrop SE of the former pesticide plant. This outcrop is on the eastern limb of the anticline that trends NE across the site.

Another view of Conococheague LS outcrop SE of former pesticide plant. This outcrop is on the eastern limb of the anticline that trends NE across the site.



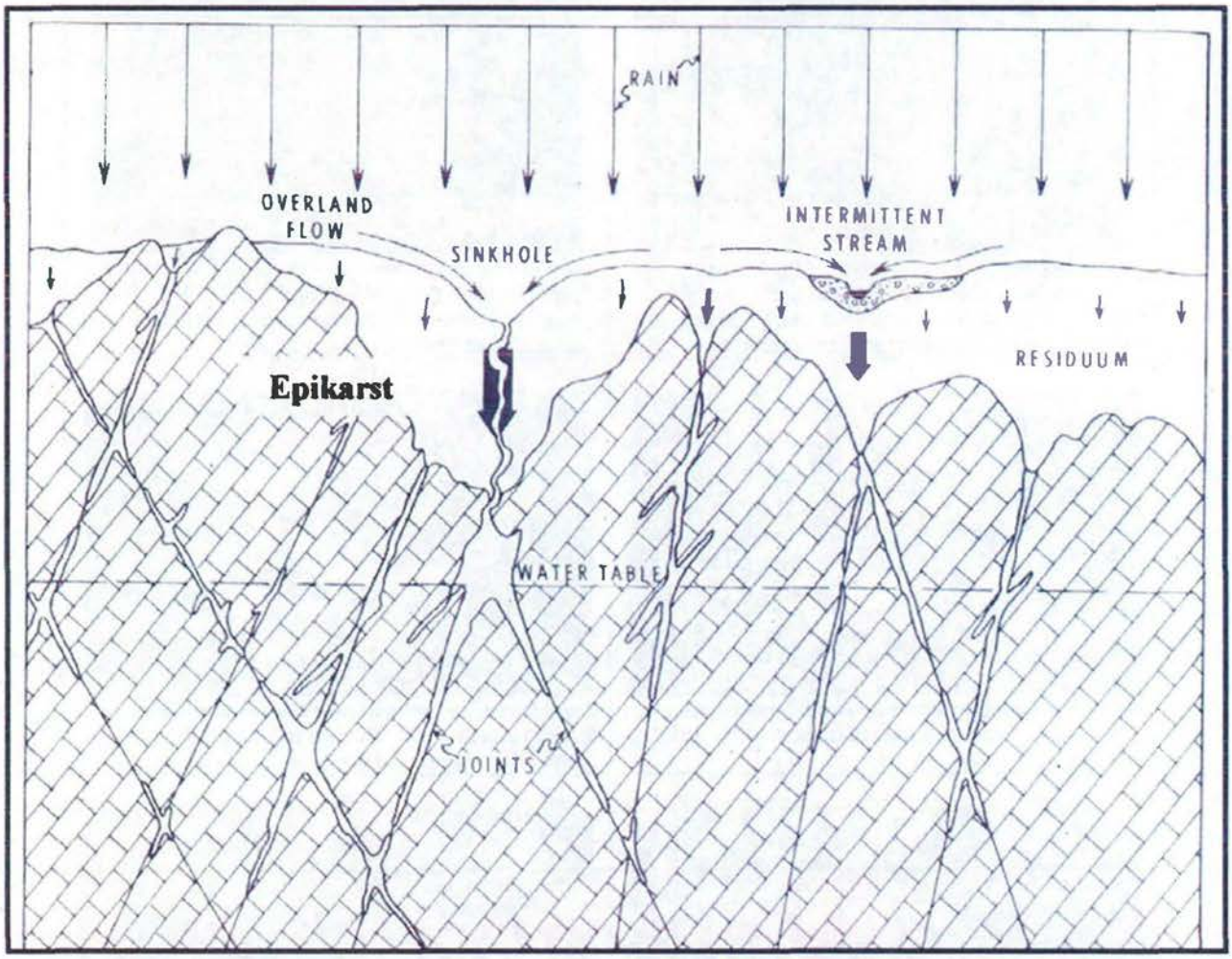
East view of Conococheague LS outcrop along railroad tracks adjacent to and west of NW corner of site.



East view of Conococheague LS outcrop along railroad tracks adjacent to and west NW corner of site. Note bedding planes and multiple fracture directions.

X:\EPA010\Central_Chemical\Final_ROD
Outcrops.cdr
Revised: 09/25/09 TH
Source: Maryland Department of the Environment

Figure 5
Depiction of "Pinnacle and Grike" Karst Terrain Features
Central Chemical NPL Site
Hagerstown, Maryland



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Geology_Profile.cdr
Revised: 09/25/09 TH
Source: Nutter, L.J., 1973
Maryland Department of the Environment

Figure 6
Depiction of Epikarst
Central Chemical NPL Site
Hagerstown, Maryland

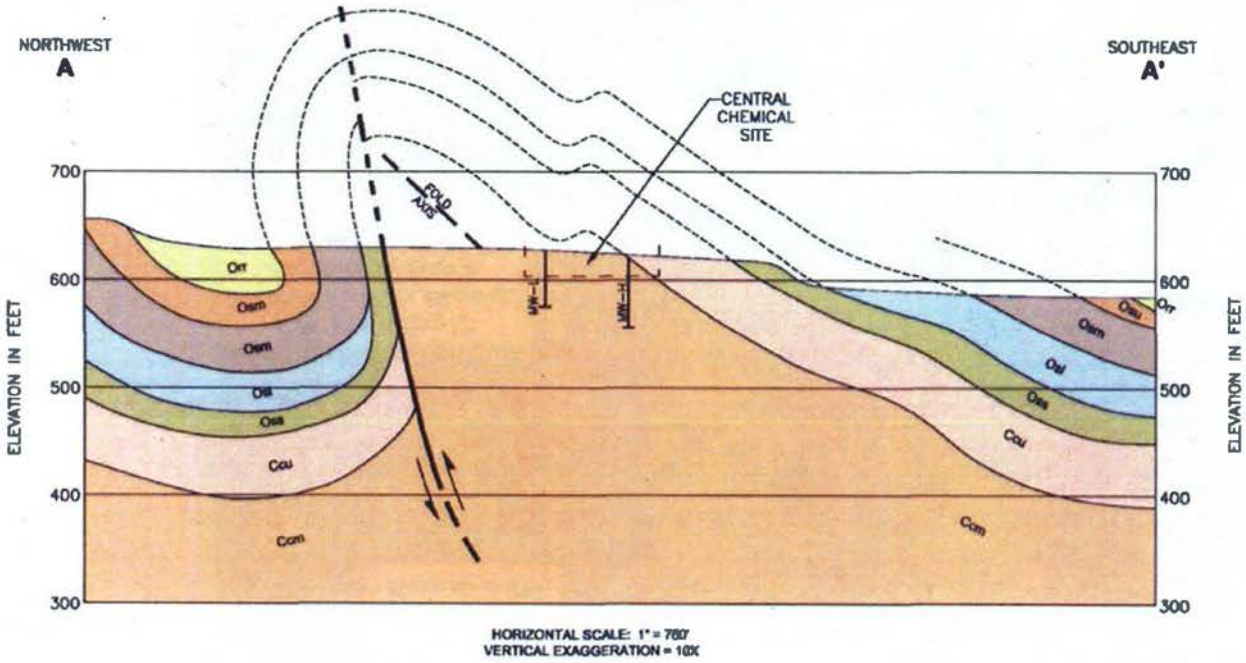

Figure 7
Geologic Cross-section
Central Chemical NPL Site
Hagerstown, Maryland

Legend

GEOLOGY

- Orr - Rockdale Run Formation

STONEHENGE FORMATION

- Osu - Upper Limestone Facies
- Osm - Middle Ribbon Carbonate Facies
- Osl - Lower Biohermal Limestone Facies
- Oss - Stoufferstown Member

CONOCOCHEAGUE FORMATION

- Ccu - Upper Member
- Ccm - Middle Member

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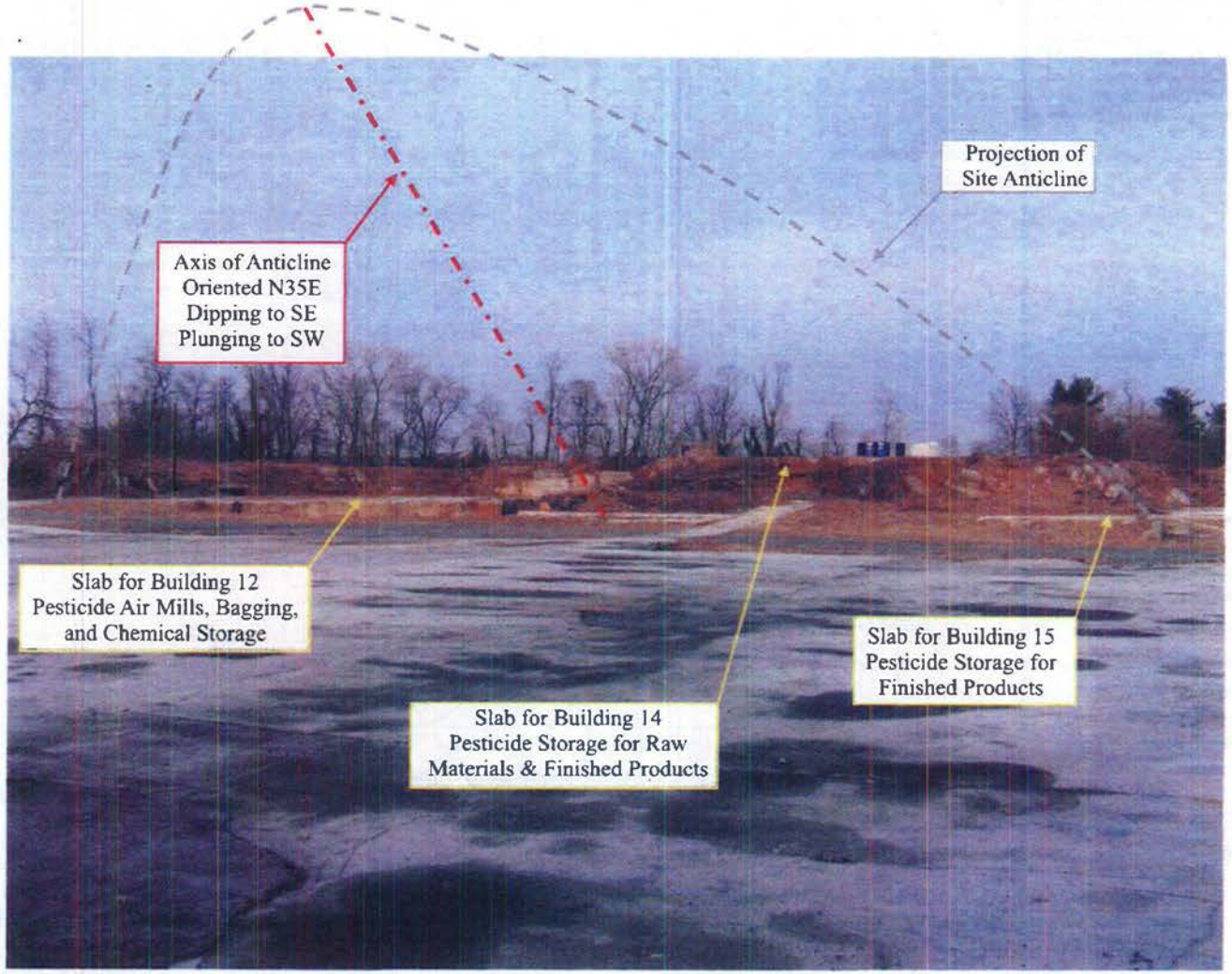
Revised: 09/25/09 TB
Source: Figure 4-8B,
Remedial Investigation Report, Vol.I
(URS, 2007 with 2008 Change pages)



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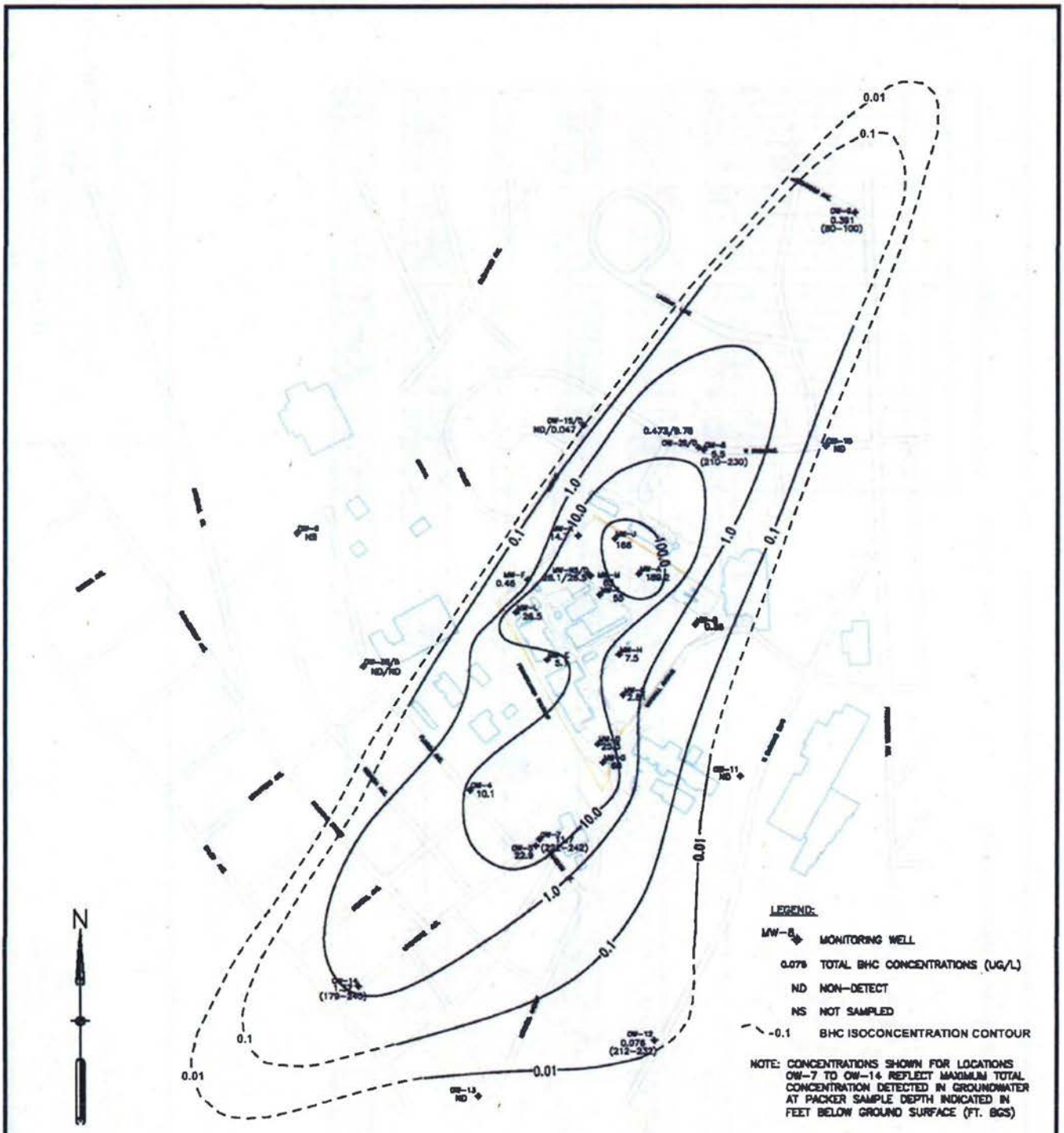
Anticline.cdr
Revised: 09/18/09 TH
Source: Maryland Department of the Environment

Figure 8
Depiction of Anticline Feature
Central Chemical NPL Site
Hagerstown, Maryland



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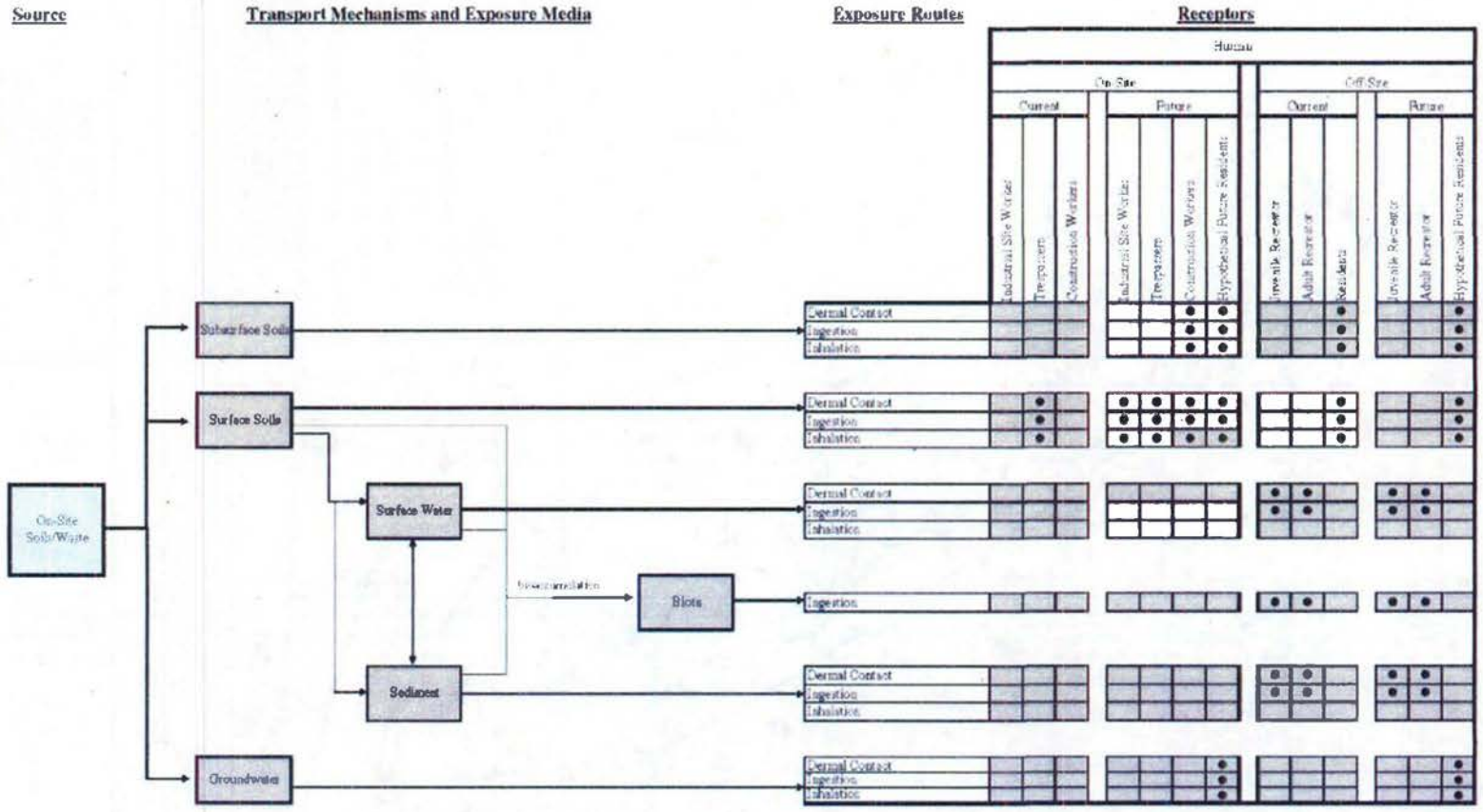
BHC_Extent.cdr
Revised: 09/21/09 TB
Source: Modified Figure 1: Groundwater Summary Report (April 2003 to August 2006) (URS, 2007)

Figure 9
Depiction of Site-related Ground Water Contamination Plume
Central Chemical NPL Site
Hagerstown, Maryland

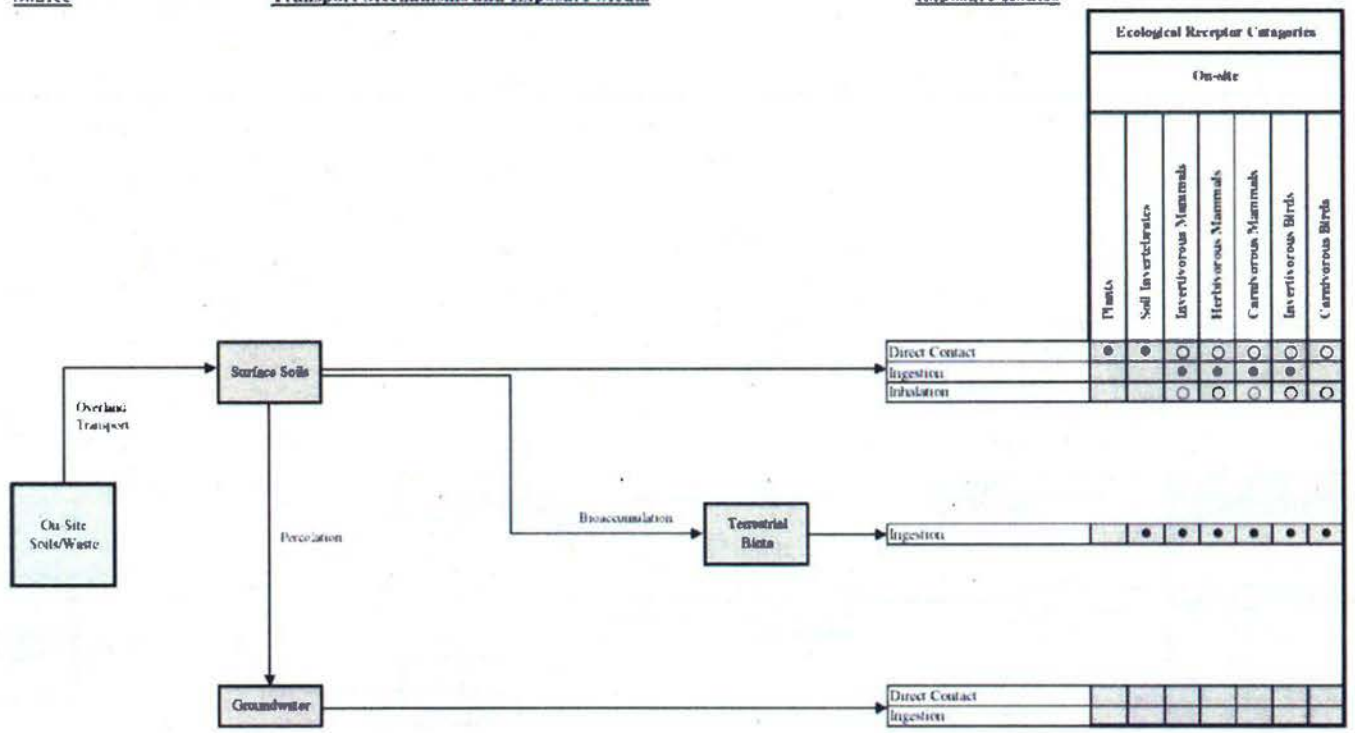


NOTE:
● = POTENTIAL EXPOSURE PATHWAY
BLANK = INCOMPLETE OR INSIGNIFICANT PATHWAY

DATA PRESENTED AS FIGURE W-1 IN REMEDIAL INVESTIGATION REPORT VOL. 3
APPENDIX W NOVEMBER 2007 WITH MARCH 2008 CORRECTED PAGES

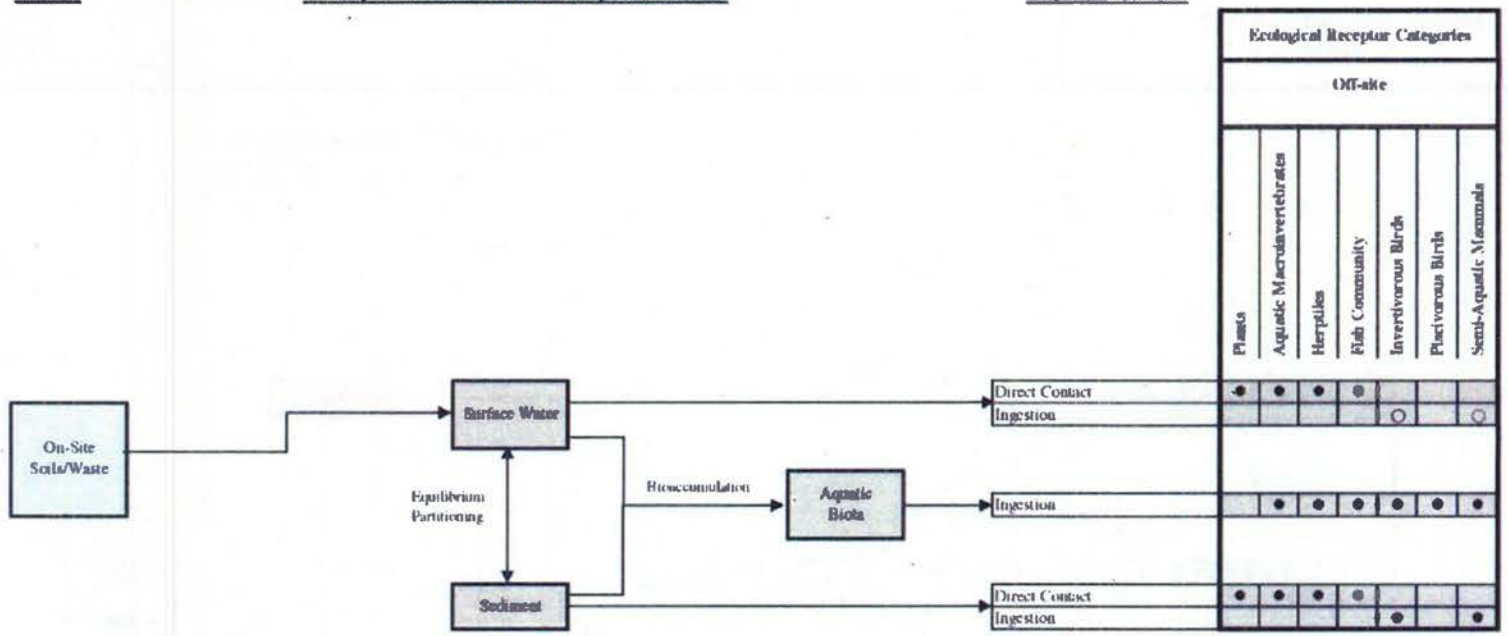
X:\EPA010\Central_Chemical\Final_ROD
Conceptual_Model.cdr
Revised: 09/25/09 TH
Source: Figure W-1, Remedial Investigation Report, Vol.3
Appendix W (URS, 2007 with 2008 Change pages)

Figure 10
Conceptual Site Model
Human Health Risk Assessment
Central Chemical NPL Site
Hagerstown, Maryland



X:\EPA010\Central_Chemical\Final_ROD
Terrestrial_Mode.cdr
Revised: 09/25/09 TH
Source: Figure 3-1, Remedial Investigation Report, Vol.4
Appendix X (URS, 2007 with 2008 Change pages)

Figure 11
Conceptual Site Model
Terrestrial Ecological Risk Assessment
Central Chemical NPL Site
Hagerstown, Maryland



NOTE:

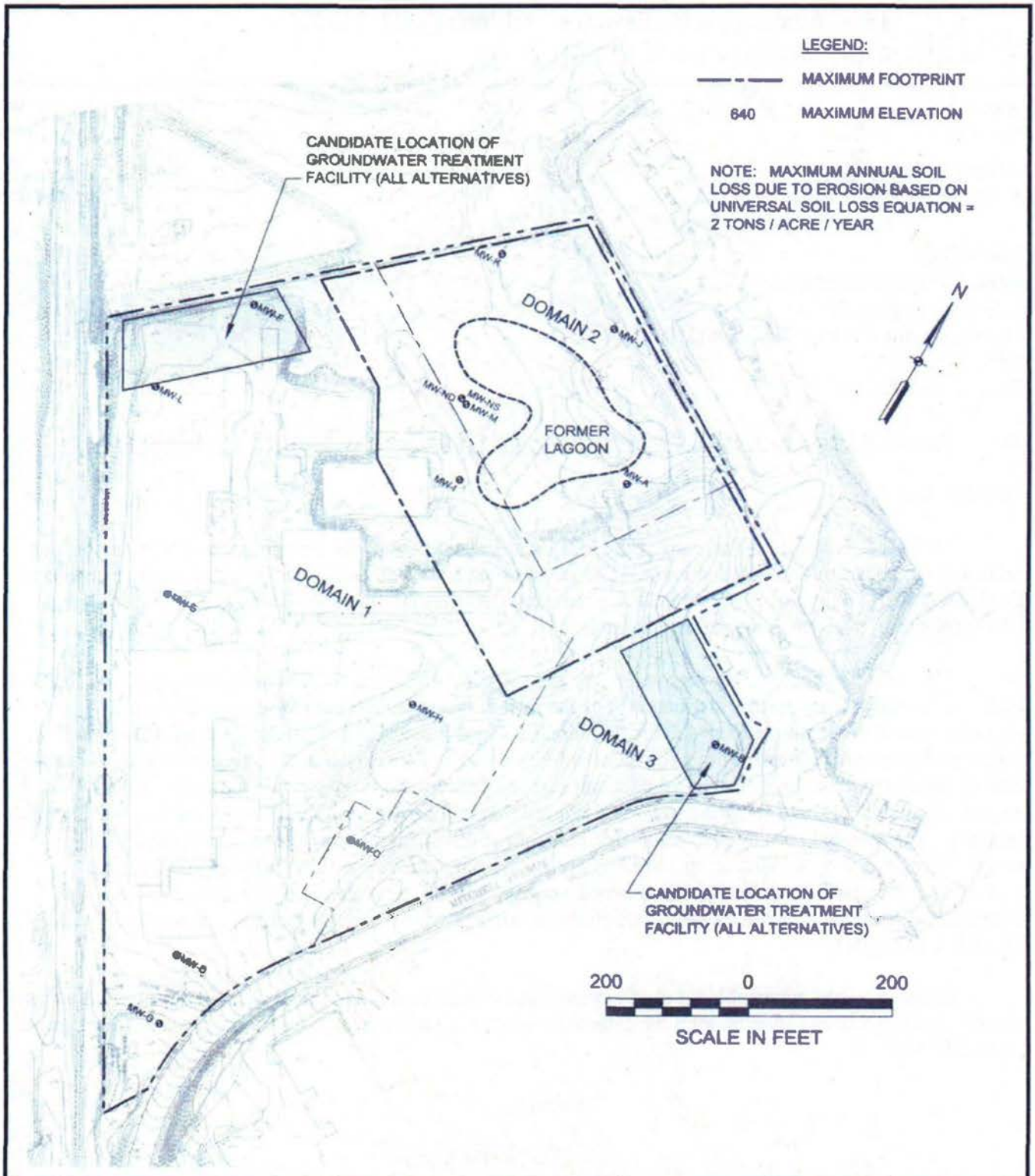
● = POTENTIAL EXPOSURE PATHWAY

○ = MINOR PATHWAY

BLANK = INCOMPLETE OR INSIGNIFICANT PATHWAY

X:\EPA010\Central_Chemical\Final_ROD
Aquatic_Model.cdr
Revised: 09/25/09 TH
Source: Figure 3-2, Remedial Investigation Report, Vol.4
Appendix X (URS, 2007 with 2008 Change pages)

Figure 12
Conceptual Site Model
Aquatic Ecological Risk Assessment
Central Chemical NPL Site
Hagerstown, Maryland



X:\EPA010\Central_Chemical\Final_ROD Cover_System.cdr
Revised: 09/25/09 TH
Source: Drawing 3-1A, Feasibility Study Report (URS, 2008)

Figure 13
Depiction of Low-Permeability Cover System
Central Chemical NPL Site
Hagerstown, Maryland

MARYLAND DEPARTMENT OF THE ENVIRONMENT
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MDE 410-537-3000 • 1-800-633-6101

Martin O'Malley
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Anthony G. Brown
Lieutenant Governor

Shari T. Wilson
Secretary

Robert M. Summers, Ph.D.
Deputy Secretary

Mitch Cron
Remedial Project Manager
U.S. EPA Region III
Hazardous Site Cleanup Division (3HS22)
1650 Arch Street
Philadelphia PA 19103-2029

Re: Record of Decision, Central Chemical Superfund Site – Operable Unit 1, Hagerstown, MD

Dear Mr. Cron:

The Land Restoration Program of the Maryland Department of the Environment (Department) has reviewed the above-referenced document. The Department issued an earlier letter regarding this Record of Decision (ROD) which documents the EPA's remedial decision for Operable Unit 1 (OU1) at the Central Chemical site. This letter supersedes that letter.

The remedy selected (Alternative 2A) by the EPA as outlined in the Central Chemical OU-1 ROD includes the solidification/stabilization (S/S) of the former waste lagoon contents, excavation and consolidation of contaminated site soils from Domains 1 and 2 over the S/S materials within Domain 3, capping of contaminated soils with a low permeability cover system, installation of a groundwater/leachate containment system in the vicinity of the former lagoon, pre-remedial design investigations (pre-RDI) as described in the ROD, and implementation of institutional controls to limit the reuse of the Central Chemical property. The selected remedy also states that contents of the former waste lagoon which cannot be successfully treated by solidification/stabilization (i.e. do not achieve the solidification/stabilization performance standards described in the selected remedy) will be excavated and transported off-site for treatment, as necessary, and disposed of off-site at an off-site waste disposal facility in accordance with CERCLA §121(d)(3).

Based upon the acceptable level of protection to human health and the environment provided by the remedy, the Department concurs with the selected remedy. If you have any questions, please contact me at (410) 537-3437.

Sincerely,

James Carroll
Program Administrator
Land Restoration Program

cc: Mr. Horacio Tablada

TABLES

Table 1
Risk Levels on Central Chemical Property

Area of the Site	Receptor	Media	Exposure	Hazard Index*	Cancer Risk*
Domain 1	Juvenile Trespasser	Surface soil	Incidental Ingestion Dermal Contact Inhalation (dust)	16.7	$1.18x10^{-3}$
Domain 1	Adult Trespasser	Surface soil	Incidental Ingestion Dermal Contact Inhalation (dust)	1.96	$1.4x10^{-3}$
Domain 1	Combined Juvenile and Adult Trespasser	Surface soil	Incidental Ingestion Dermal Contact Inhalation (dust)	Not evaluated**	$1.956x10^{-3}$
Domain 1	Site Worker	Surface soil	Incidental Ingestion Dermal Contact Inhalation (dust)	17.5	$2.53x10^{-3}$
Domain 1	Construction/Excavation Worker	Surface and subsurface soil	Incidental Ingestion Dermal Contact Inhalation (dust)	42.8	$1.47x10^{-4}$
Domain 1	Hypothetical Future Resident	Surface and subsurface soil	Incidental Ingestion Dermal Contact Inhalation (dust)	474	$1.36x10^{-2}$
Domain 2	Juvenile Trespasser	Surface soil	Incidental Ingestion Dermal Contact Inhalation (dust)	0	$7.58x10^{-5}$
Domain 2	Adult Trespasser	Surface soil	Incidental Ingestion Dermal Contact Inhalation (dust)	0	$9.19x10^{-5}$
Domain 2	Combined Juvenile and Adult Trespasser	Surface soil	Incidental Ingestion Dermal Contact Inhalation (dust)	Not evaluated**	$1.33x10^{-4}$
Domain 2	Site Worker	Surface soil	Incidental Ingestion Dermal Contact Inhalation (dust)	0	$1.81x10^{-4}$
Domain 2	Construction/Excavation Worker	Surface and subsurface soil	Incidental Ingestion Dermal Contact Inhalation (dust)	21.1	$2.79x10^{-4}$
Domain 2	Hypothetical Future Resident	Surface and subsurface soil	Incidental Ingestion Dermal Contact Inhalation (dust)	218	$2.42x10^{-2}$
Domain 3	Juvenile Trespasser	Surface soil	Incidental Ingestion Dermal Contact Inhalation (dust)	0	$5.86x10^{-5}$
Domain 3	Adult Trespasser	Surface soil	Incidental Ingestion Dermal Contact Inhalation (dust)	0	$7.04x10^{-5}$

Table 1
Risk Levels on Central Chemical Property (continued)

Area of the Site	Receptor	Media	Exposure	Hazard Index*	Cancer Risk*
Domain 3	Combined Juvenile and Adult Trespasser	Surface soil	Incidental Ingestion Dermal Contact Inhalation (dust)	Not evaluated**	1.02×10^{-4}
Domain 3	Site Worker	Surface soil	Incidental Ingestion Dermal Contact Inhalation (dust)	0	1.31×10^{-4}
Domain 3	Construction/Excavation Worker	Surface and subsurface soil	Incidental Ingestion Dermal Contact Inhalation (dust)	0	6.94×10^{-6}
Domain 3	Hypothetical Future Resident	Surface and subsurface soil	Incidental Ingestion Dermal Contact Inhalation (dust)	13.3	6.22×10^{-4}

*Based on Reasonable Maximum Exposure parameters.
**The cumulative non-cancer hazard indices were not evaluated for combined juvenile and adult receptor scenarios because the separate evaluations of the adult and juvenile scenarios provided a sufficient evaluation of non-cancer hazards.

Table 2
Risk Levels on Adjacent Residential Properties

Area of the Site	Receptor	Media	Exposure	Hazard Index*	Cancer Risk*
Adjacent residential properties to NW and NE of Central Chemical property	Resident	Surface and subsurface soil	Incidental Ingestion Dermal Contact Inhalation (dust)	1.99	6.01×10^{-5}

*Based on Reasonable Maximum Exposure parameters.

Table 3
Risk Levels – Antietam Creek

Area of the Site	Receptor	Media	Exposure	Hazard Index*	Cancer Risk
Antietam Creek – Upstream of Site	Juvenile recreator/swimmer (combined small child and juvenile)	Surface water and sediment	Incidental Ingestion Dermal Contact	0	3.86×10^{-6}
Antietam Creek – Upstream of Site	Adult recreator/swimmer	Surface water and sediment	Incidental Ingestion Dermal Contact	0	2.48×10^{-5}
Antietam Creek – Upstream of Site	Combined Juvenile and adult recreator/swimmer	Surface water and sediment	Incidental Ingestion Dermal Contact	Not evaluated*	1.44×10^{-5}
Antietam Creek – Upstream of Site	Juvenile recreator/angler (combined small child and juvenile)	Fish tissue	Ingestion	0	2.19×10^{-5}
Antietam Creek – Upstream of Site	Adult recreator/angler	Fish tissue	Ingestion	0	3.08×10^{-5}
Antietam Creek – Upstream of Site	Combined Juvenile and adult recreator/angler	Fish tissue	Ingestion	Not evaluated*	3.61×10^{-5}
Antietam Creek – downstream of Site	Juvenile recreator/swimmer (combined small child and juvenile)	Surface water and sediment	Incidental Ingestion Dermal Contact	0	6.29×10^{-6}
Antietam Creek – downstream of Site	Adult recreator/swimmer	Surface water and sediment	Incidental Ingestion Dermal Contact	0	3.53×10^{-5}
Antietam Creek – downstream of Site	Combined Juvenile and adult recreator/swimmer	Surface water and sediment	Incidental Ingestion Dermal Contact	Not evaluated*	2.67×10^{-5}
Antietam Creek – downstream of Site	Juvenile recreator/angler (combined small child and juvenile)	Fish tissue	Ingestion	0	1.15×10^{-5}
Antietam Creek – downstream of Site	Adult recreator/angler	Fish tissue	Ingestion	0	1.67×10^{-5}
Antietam Creek – downstream of Site	Combined Juvenile and adult recreator/angler	Fish tissue	Ingestion	Not evaluated*	2.18×10^{-5}

* The cumulative non-cancer hazard indices were not evaluated for certain combined juvenile and adult receptor scenarios because the juvenile scenario provided a more conservative evaluation for non-cancer hazards.

Table 4
Remedial Action Objectives

Environmental Media	Remedial Action Objective
Soil	For Human Health: Prevent exposure (direct contact, ingestion, inhalation) to contaminated soils that would result in unacceptable levels of risk to human health. For Environmental Protection: Prevent exposure (direct contact, ingestion, inhalation) of ecological receptors to contaminated soils that would result in unacceptable levels of risk. For Environmental Protection: Prevent migration of contaminants from soils that would result in ground water contamination that exceeds ground water performance standards that are protective of human health and the environment.
Principal Threat Waste (including contents of the Former Waste Lagoon, powder, sludge, etc.) – Discussed further in Section 2.11	For Human Health: Prevent exposure (direct contact, ingestion, inhalation) to contaminated principal threat wastes that would result in unacceptable levels of risk to human health. For Environmental Protection: Prevent exposure (direct contact, ingestion, inhalation) of ecological receptors to contaminated principal threat wastes that would result in unacceptable levels of risk. For Environmental Protection: Prevent migration of contaminants from principal threat waste that would result in ground water contamination that exceeds ground water performance standards that are protective of human health and the environment. For Environmental Protection: Treat principal threat wastes identified at the Site to reduce the toxicity, volume, and/or mobility of Site wastes.

Table 5
Off-Site Remediation Volumes for Alternatives 4 and 5

Alternative	Hazardous Waste – Requiring Treatment Prior to Disposal	Non-Hazardous Waste – Off-Site Disposal Only without Treatment
4	15,100 cubic yards (cy)	23,900 cy
5	15,100 cy	51,050 cy

Table 6
Cost Estimates for Remedial Alternatives

	Alternative 2A	Alternative 4	Alternative 5
Capital Costs:	$11,518,772	$30,618,451	$33,342,456
Annual Operation and Maintenance (O&M) Costs	$465,000	$491,000	$425,000
Total O&M costs	$2,642,687	$4,567,875	$3,369,353
Present Worth for Capital and 30-year O&M costs	$14,350,772*	$35,375,639	$36,901,122

*Costs associated with Alternative 2A assume that solidification/stabilization treatment will be effective for addressing the Former Waste Lagoon contents.

Table 7
Summary of Borings in Former Waste Lagoon

Boring Installer	Boring ID#	Depth of Sample (feet bgs)	Material Sampled	Contaminant Concentrations (ppm)
URS	B-1	3-5	White pasty material	Total DDX*: 30,000 Total Chlordane** : 4,000 Toxaphene: 37,000
URS	B-5	7.5-9.5	Soil with a trace of decomposing paper (exhibited pesticide/fertilizer odor)	Total DDX: 10,200 Total BHC***: 5,660 Total Chlordane: 109 Toxaphene: 9,100
Weston	BH-4	4-6	White clayey powder	Total DDX – 96,840
Weston	BH-2	12-14	Black fibrous shiny goopy clay	Total DDX – 31,000
Weston	BH-1	6-8	Yellow powder (exhibiting very strong pesticide odor)	Total DDX: 6,840 Total BHC: 370
URS	B-3	9.5-11.5	Yellow crystalline material	Total DDX: 144,700 Total BHC: 1,300
URS	B-7	5-7	Soil, decomposing paper, "impacted material"	Total DDX: 17,000 Total BHC: 2,330 Total Chlordane: 930 Dieldrin <100 Heptachlor 230 Toxaphene: 140,000

* Total DDX: summation of DDT isomers and breakdown products (4,4-DDT, 2,4-DDT, 4,4-DDD, 2,4-DDD, 4,4-DDE, 2,4-DDE)
** Total Chlordane: summation of chlordane isomers.
*** Total BHC: summation of BHC isomers
ID# = identification number
URS = URS Corporation
Weston = Roy F. Weston, Inc.
bgs = below ground surface
ppm = parts per million

Table 8
Description of ARARS for Selected Remedy

Authority	Medium	Requirement	Status	Synopsis of Requirement	Action to be Taken to Attain Requirement
Contaminant-Specific Applicable or Relevant and Appropriate Requirements (ARARS)					
Federal	Ground water	Clean Water Act – National Pretreatment Standards 40 Code of Federal Regulations (CFR) Part 403, Sections 403.5 and 403.6(c) through (e)	Applicable	Sets standards to control pollutants which pass through or interfere with treatment processes in publicly owned treatment works (POTW) or which may contaminate sewage sludge.	The Selected Remedy will comply with the substantive portions of these ARARs by treating extracted ground water/leachate prior to discharge to a POTW.
State	Principal threat waste	Hazardous Waste Regulations Code of Maryland Annotated Relations (COMAR) 26.13.02.04(A)(2),.07 thru .09, and .15 - .19	Applicable	Establishes criteria for identification, classification, etc. of hazardous waste in Maryland.	Principal threat waste will be classified, as necessary, in accordance with the substantive portions of this ARAR.
Action-Specific ARARS					
State	Remedial design, remedial action and operation and maintenance (O&M)	COMAR 26.13.05.02E	Relevant and Appropriate	Establishes security requirements for Hazardous Waste Treatment, Storage, Disposal facilities.	The substantive portions of this requirement will be complied with during the remedial action and during long-term O&M activities to ensure that access to the Site is restricted as necessary, that the remedy is protective of human health, and that the integrity of the constructed elements of the Selected Remedy are maintained.
State	Remedial design, remedial action and O&M	COMAR 26.13.05.02F	Relevant and Appropriate	Establishes inspection requirements for Hazardous Waste Treatment, Storage, Disposal facilities.	The substantive portions of this requirement will be complied with during long-term O&M to ensure that the remedy is protective of human health and the integrity of the constructed elements of the Selected Remedy is maintained.
State	Remedial design, remedial action and O&M	COMAR 26.13.05.03B	Relevant and Appropriate	Establishes design and operation requirements for Hazardous Waste Treatment, Storage, Disposal facilities.	The substantive portions of this requirement will be complied with during the remedial design of the constructed elements of the Selected Remedy, and during long-term O&M activities associated with the low permeability cover system, and the ground water monitoring, extraction, and treatment system.

Table 8 (continued)
Description of ARARS for Selected Remedy

Authority	Medium	Requirement	Status	Synopsis of Requirement	Action to be Taken to Attain Requirement
State	Remedial design, remedial action and O&M	COMAR 26.13.05.04	Relevant and Appropriate	Establishes contingency plan and emergency procedure requirements for Hazardous Waste Treatment, Storage, Disposal facilities.	The substantive portions of this requirement will be complied with to establish a contingency plan during the remedial action, and during long-term O&M activities.
State	Remedial design, remedial action and O&M	COMAR 26.13.05.06–.06-7	Relevant and Appropriate	Establishes requirements for releases from Solid Waste Management Units at Hazardous Waste Treatment, Storage, Disposal facilities.	The substantive portions of these requirements will be complied with during preparation of the long-term O&M plan for the Site.
State	Remedial design, remedial action and O&M	COMAR 26.13.05.07	Relevant and Appropriate	Establishes closure and post-closure requirements for Hazardous Waste Treatment, Storage, Disposal facilities.	The substantive portions of these requirements will be complied with during the remedial design, remedial action, and long-term O&M activities at the Site.
State	Remedial design, remedial action and O&M	COMAR 26.13.05.09	Relevant and Appropriate	Establishes requirements for use of containers at Hazardous Waste Treatment, Storage, Disposal facilities.	To the extent the use of on-Site containers is necessary on-Site the substantive portions of these requirements will be complied with during the remedial action, and long-term O&M activities.
State	Remedial design, remedial action and O&M	COMAR 26.13.05.11G	Relevant and Appropriate	Establishes closure requirements for surface impoundments at Hazardous Waste Treatment, Storage, Disposal facilities.	The substantive portions of these requirements will be complied with during response actions at the Former Waste Lagoon.
State	Remedial design, remedial action and O&M	COMAR 26.13.05.12	Relevant and Appropriate	Establishes requirements for waste piles at Hazardous Waste Treatment, Storage, Disposal facilities.	The substantive portions of these requirements will be complied with during the remedial design and remedial action, to the extent those activities involve waste piles.
State	Remedial design, remedial action and O&M	COMAR 26.13.05.13B–D, K	Relevant and Appropriate	Establishes requirements for land treatment at Hazardous Waste Treatment, Storage, Disposal facilities.	The substantive portions of these requirements will be complied with during the solidification/ stabilization (S/S) treatability study and subsequent S/S treatment of the Former Waste Lagoon
State	Remedial design, remedial action and O&M	COMAR 26.13.05.14B–C, J	Relevant and Appropriate	Establishes requirements for landfills at Hazardous Waste Treatment, Storage, Disposal facilities.	The substantive portions of these requirements will be complied with during the construction of the low permeability cover system and ground water monitoring, extraction, and treatment system and subsequent long-term O&M activities involving this feature of the Selected Remedy.

Table 8 (continued)
Description of ARARS for Selected Remedy

Authority	Medium	Requirement	Status	Synopsis of Requirement	Action to be Taken to Attain Requirement
State	Remedial design, remedial action and O&M	COMAR 26.13.02.16–19	Applicable	Defines those solid wastes that are subject to regulation as hazardous wastes.	As necessary, waste classification during the remedial design and remedial action will comply with the substantive portions these requirements.
Federal	Remedial design, remedial action and O&M	40 CFR Part 50, Sections 50.4 through 50.13	Applicable	Establishes standards from ambient air quality to protect public health and welfare.	The substantive portions of these requirements will be met when there are air emissions during the remedial action, and during certain portions of the pre-remedial design investigation (e.g. treatability study).
State	Remedial design, remedial action and O&M	COMAR 26.17.01.05 and .11 Erosion and Sediment Control	Applicable	Establishes standards and specifications for erosion and sediment control for projects involving ground disturbance.	The substantive portions of these requirements will be complied with during response actions at the Site.
State	Remedial design, remedial action and O&M	COMAR 26.17.02.06A(3); COMAR 26.17.02.08; COMAR 26.17.02.09	Applicable	Requires a storm water management plan. Provides for specific minimum control requirements for storm water management. Describes specific storm water management design criteria.	The substantive portions of these requirements will be complied with during response actions at the Site.
Federal	Remedial action and O&M	40 CFR Part 50, Sections 50.4 through 50.14	Applicable	Establishes standards for ambient air quality to protect public health and welfare.	The substantive portions of these requirements will be complied with for air emission control during the remedial action (e.g. excavation activities), and during long-term operation of the ground water monitoring, extraction and treatment system.
State	Remedial design, remedial action and O&M	COMAR 26.11.06.02 (Visible emissions) COMAR 26.11.06.03 (Particulate matter) COMAR 26.11.06.04 (Carbon Monoxide) COMAR 26.11.06.05 (Sulfur Compounds) COMAR 26.11.06.06 (Volatile Organic Compound) COMAR 26.11.06.09 (Odors)	Applicable	Provides air quality standards, general emission standards and restrictions for air emissions from articles, machines, equipment, etc. capable of generating, causing, or reducing emissions.	Any equipment or construction activities capable of generating, causing, or reducing emissions (e.g. excavation, air-stripper) shall meet the substantive requirements of these regulations. However, no permit will be required.

Table 8 (continued)
Description of ARARS for Selected Remedy

Authority	Medium	Requirement	Status	Synopsis of Requirement	Action to be Taken to Attain Requirement
State	Remedial design, remedial action and O&M	COMAR 26.11.15.03.B (Exemptions) COMAR 26.11.15.04 A and C (Requirements to quantify emissions) COMAR 26.11.15.05 (Control Technology requirements) COMAR 26.11.15.06 (Ambient Impact requirements) COMAR 26.11.15.07 (Demonstrating compliance with Regulation .06) COMAR 26.11.16.03 (Screening Levels) COMAR 26.11.16.06 (Class I Toxic Air Pollutants) COMAR 26.11.16.07 (Existing Sources) COMAR 26.11.16.08 (Nuisance particles) COMAR 26.11.16.09 (Levels Used To Review Ambient Impacts)	Applicable	Requires air emissions of Toxic Air Pollutants ("TAPs") from new and existing sources to be quantified (also describes method of quantification); establishes ambient air quality standards and emission limitations for TAP emissions from new sources; requires best available control technology for toxics for new sources.	The ground water monitoring, extraction and treatment system will be designed and operated to meet these standards. No permit will be obtained (only the substantive requirements shall be complied with).
Federal	N/A	National Historic Preservation Act (NHPA), 16 USC Section 470, et seq., 36 CFR Part 800	Relevant and Appropriate	Establishes policy and procedures for historic preservation of archaeological, historic and other cultural resources.	The substantive portions of these requirements will be complied with to "avoid, minimize, or mitigate" any potential adverse effect on archaeological, historic and other cultural resources.
To Be Considered					
Federal	Air	OSWER Directive 9355.0-28, "Control of Air Emissions from Superfund Air Strippers at Superfund Ground water Sites"	To be considered	Addresses air emissions from air-strippers at Superfund sites.	This To-Be-Considered will be considered during the Remedial Design, and operation of the ground water monitoring, extraction, and treatment system.
Federal	Remedial design, remedial action and O&M	40 CFR 264.19	To be considered	Establishes requirements for a Construction quality assurance program for constructed features at Hazardous Waste Treatment, Storage, Disposal facilities.	This To-Be-Considered will be complied with during the remedial action to ensure that the remedial action is performed in accordance with the remedial design documents.

Table 8 (continued)
Description of ARARS for Selected Remedy

Authority	Medium	Requirement	Status	Synopsis of Requirement	Action to be Taken to Attain Requirement
MDE	Soil/Ground water	State of Maryland – Department of the Environment – Cleanup Standards for Soil and Groundwater, June 2008 (Interim Final Guidance, Update No 2.1)	To be considered	Cleanup standards for soil and ground water	This To-Be-Considered will be considered during the evaluation of background concentrations of metals in Hagerstown area soils.

Table 9
Summary of Remedial Investigation Soil Sample Results

Analyte	CAS_RN	Units	Frequency Detection	Minimum Detection	Maximum Detection	EPC (RME)
DOMAIN 1 – Subsurface Soils						
Pesticides						
2,4-DDD	53-19-0	µg/kg	45/84	0.99	28,000	95,500
2,4-DDE	3424-82-6	µg/kg	14/84	0.45	10,000	17,200
2,4-DDT	78-02-6	µg/kg	71/84	0.74	190,000	2,360,000
4,4-DDD	72-54-8	µg/kg	38/84	0.49	110,000	50,100
4,4-DDE	72-55-9	µg/kg	65/84	0.6	76,000	26,600
4,4-DDT	50-29-3	µg/kg	81/84	2.4	1,400,000	12,800,000
Aldrin	309-00-2	µg/kg	17/84	1.2	17,000	61,400
alpha-BHC	319-84-6	µg/kg	32/84	0.59	58,000	16,000
alpha-Chlordane	5103-71-9	µg/kg	23/84	1.6	4,700	7,370
beta-BHC	319-85-7	µg/kg	55/84	1.1	21,000	6,440
delta-BHC	319-86-8	µg/kg	25/84	1	22,000	5,010
Dieldrin	60-57-1	µg/kg	34/84	2.2	4,100	22,500
Diphenamid	957-51-7	µg/kg	11/84	1.3	270	--
Endrin	72-20-8	µg/kg	9/84	2.5	44	860
Endrin Ketone	53494-70-5	µg/kg	8/84	2.1	2,300	10,200
gamma-BHC	58-89-9	µg/kg	28/84	1.2	3,400	5,020
gamma-Chlordane	5103-74-2	µg/kg	41/84	0.29	280,000	7,280
Heptachlor	76-44-8	µg/kg	18/84	0.37	210,000	5,790
Heptachlor Epoxide	1024-57-3	µg/kg	15/84	1.2	4,600	5,080
Toxaphene	8001-35-2	µg/kg	12/84	120	200,000	539,000
Herbicides						
2,4-D	94-75-7	µg/kg	1/24	28	28	--
SVOCs						
Benzo(a)pyrene	50-32-8	µg/kg	4/60	99	4,500	1,280
Hexachlorobenzene	118-74-1	µg/kg	0/60	0	0	1,580
Metals						
Antimony	7440-36-0	mg/kg	6/63	0.58	29	7.93
Arsenic	7440-38-2	mg/kg	84/84	3.9	118	42.1
Thallium	7440-28-0	mg/kg	44/84	0.16	4.1	1.23
DOMAIN 2 – Subsurface Soils						
Pesticides						
2,4-DDD	53-19-0	µg/kg	26/62	3.2	2,300,000	125,000
2,4-DDE	3424-82-6	µg/kg	13/62	1.5	120,000	62,600
2,4-DDT	78-02-6	µg/kg	54/62	2.5	33,000,000	898,000
4,4-DDD	72-54-8	µg/kg	26/62	0.95	10,000,000	299,000
4,4-DDE	72-55-9	µg/kg	51/62	2.8	920,000	88,600
4,4-DDT	50-29-3	µg/kg	60/62	3.8	130,000,000	5,280,000
Aldrin	309-00-2	µg/kg	11/62	1.1	2,600	25,100
alpha-BHC	319-84-6	µg/kg	25/62	1.1	3,100,000	175,000
alpha-Chlordane	5103-71-9	µg/kg	14/62	2	2,000,000	85,100
beta-BHC	319-85-7	µg/kg	41/62	1.3	240,000	20,400
delta-BHC	319-86-8	µg/kg	15/62	1.2	750,000	40,300
Dieldrin	60-57-1	µg/kg	27/62	3.7	140	31,500
Diphenamid	957-51-7	µg/kg	0/48	0	0	--

Analyte	CAS RN	Units	Frequency Detection	Minimum Detection	Maximum Detection	EPC (RME)
Endrin	72-20-8	µg/kg	6/62	2.4	22	270
Endrin Ketone	53494-70-5	µg/kg	8/62	7.5	42	270
gamma-BHC	58-89-9	µg/kg	17/62	1.2	1,700,000	78,500
gamma-Chlordane	5103-74-2	µg/kg	18/62	2	2,000,000	9,000
Heptachlor	76-44-8	µg/kg	9/62	0.45	840,000	38,600
Heptachlor Epoxide	1024-57-3	µg/kg	5/62	1.5	2.1	230
Toxaphene	8001-35-2	µg/kg	8/62	300	140,000,000	6,510,000
Herbicides						
2,4-D	94-75-7	µg/kg	0/6	0	0	--
SVOCs						
Benzo(a)pyrene	50-32-8	µg/kg	3/56	60	220	3,000
Hexachlorobenzene	118-74-1	µg/kg	1/56	56	56	--
Metals						
Antimony	7440-36-0	mg/kg	7/56	0.59	18.1	7.91
Arsenic	7440-38-2	mg/kg	62/62	3.2	3,440	159
Thallium	7440-28-0	mg/kg	14/62	0.16	5.5	1.1
DOMAIN 1 – Surface Soil						
Pesticides						
2,4-DDD	53-19-0	µg/kg	192/251	2.2	1,900,000	167,000
2,4-DDE	3424-82-6	µg/kg	37/251	2.3	61,000	24,900
2,4-DDT	78-02-6	µg/kg	242/251	6.9	39,000,000	1,270,000
4,4-DDD	72-54-8	µg/kg	75/251	2	3,900,000	73,900
4,4-DDE	72-55-9	µg/kg	234/251	2.6	490,000	34,800
4,4-DDT	50-29-3	µg/kg	251/251	2.8	85,000,000	6,500,000
Aldrin	309-00-2	µg/kg	15/125	3.2	3,100,000	122,000
alpha-BHC	319-84-6	µg/kg	33/125	1.3	730,000	33,900
alpha-Chlordane	5103-71-9	µg/kg	60/125	1.1	120,000	71,700
beta-BHC	319-85-7	µg/kg	53/125	1.1	92,000	12,900
delta-BHC	319-86-8	µg/kg	16/125	1.4	170,000	10,700
Dieldrin	60-57-1	µg/kg	47/125	2.2	670,000	43,700
Diphenamid	957-51-7	µg/kg	19/125	1.5	1,700	--
Endrin	72-20-8	µg/kg	6/125	26	860	860
Endrin Ketone	53494-70-5	µg/kg	10/125	2.2	98,000	20,800
gamma-BHC	58-89-9	µg/kg	24/125	1.7	640,000	10,700
gamma-Chlordane	5103-74-2	µg/kg	67/125	1.3	120,000	87,500
Heptachlor	76-44-8	µg/kg	19/125	1.4	130,000	12,100
Heptachlor Epoxide	1024-57-3	µg/kg	10/125	9.6	83,000	10,800
Toxaphene	8001-35-2	µg/kg	12/125	650	6,200,000	1,150,000
Herbicides						
2,4-D	94-75-7	µg/kg	1/8	36	36	--
SVOCs						
Benzo(a)pyrene	50-32-8	µg/kg	31/117	37	3,800	2,540
Hexachlorobenzene	118-74-1	µg/kg	4/117	63	27,000	2,980
Metals						
Antimony	7440-36-0	mg/kg	30/117	0.51	27.5	8.83
Arsenic	7440-38-2	mg/kg	251/251	2.3	1,080	52.5
Thallium	7440-28-0	mg/kg	41/125	0.13	1.6	1.19
DOMAIN 2 – Surface Soil						
Pesticides						
2,4-DDD	53-19-0	µg/kg	26/43	2.4	460,000	970

Analyte	CAS RN	Units	Frequency Detection	Minimum Detection	Maximum Detection	EPC (RME)
2,4-DDE	3424-82-6	µg/kg	5/43	19	4,000	1,710
2,4-DDT	78-02-6	µg/kg	42/43	4.5	1,700,000	29,500
4,4-DDD	72-54-8	µg/kg	10/43	150	1,500,000	1,710
4,4-DDE	72-55-9	µg/kg	42/43	4.2	270,000	12,400
4,4-DDT	50-29-3	µg/kg	43/43	17	8,600,000	194,000
Aldrin	309-00-2	µg/kg	13/43	1	390,000	6,210
alpha-BHC	319-84-6	µg/kg	9/43	1.1	270,000	38
alpha-Chlordane	5103-71-9	µg/kg	14/43	4.4	2,100	2,100
beta-BHC	319-85-7	µg/kg	21/43	2.5	130,000	2,880
delta-BHC	319-86-8	µg/kg	7/43	1.9	17,000	887
Dieldrin	60-57-1	µg/kg	20/43	4.7	150,000	9,200
Diphenamid	957-51-7	µg/kg	3/35	2.7	6	--
Endrin	72-20-8	µg/kg	2/43	7.6	270	1,710
Endrin Ketone	53494-70-5	µg/kg	3/43	4.9	270	270
gamma-BHC	58-89-9	µg/kg	8/43	8.2	48,000	887
gamma-Chlordane	5103-74-2	µg/kg	15/43	1.4	30,000	1,900
Heptachlor	76-44-8	µg/kg	3/43	29	230	887
Heptachlor Epoxide	1024-57-3	µg/kg	4/43	1.4	230	887
Toxaphene	8001-35-2	µg/kg	4/43	420	3,700	3,700
Herbicides						
2,4-D	94-75-7	µg/kg	0/2	0	0	--
SVOCs						
Benzo(a)pyrene	50-32-8	µg/kg	15/41	49	45,000	10,100
Hexachlorobenzene	118-74-1	µg/kg	3/41	130	290	--
Metals						
Antimony	7440-36-0	mg/kg	4/41	0.57	1	--
Arsenic	7440-38-2	mg/kg	43/43	2.5	152	13.7
Thallium	7440-28-0	mg/kg	5/43	0.069	1.1	--
DOMAIN 3 – Surface Soil						
Pesticides						
2,4-DDD	53-19-0	µg/kg	8/17	8.2	9,500	2,240
2,4-DDE	3424-82-6	µg/kg	3/17	7.7	70	70
2,4-DDT	78-02-6	µg/kg	17/17	56	100,000	45,300
4,4-DDD	72-54-8	µg/kg	2/17	42	9,700	2,190
4,4-DDE	72-55-9	µg/kg	17/17	490	25,000	13,800
4,4-DDT	50-29-3	µg/kg	17/17	250	550,000	284
Aldrin	309-00-2	µg/kg	0/17	0	0	1,200
alpha-BHC	319-84-6	µg/kg	0/17	0	0	1,200
alpha-Chlordane	5103-71-9	µg/kg	3/17	4	460	460
beta-BHC	319-85-7	µg/kg	7/17	1.2	150	150
delta-BHC	319-86-8	µg/kg	0/17	0	0	1,200
Dieldrin	60-57-1	µg/kg	8/17	4.9	860	860
Diphenamid	957-51-7	µg/kg	0/17	0	0	--
Endrin	72-20-8	µg/kg	1/17	5.1	5.1	5.13
Endrin Ketone	53494-70-5	µg/kg	0/17	0	0	2,340
gamma-BHC	58-89-9	µg/kg	0/17	0	0	1,200
gamma-Chlordane	5103-74-2	µg/kg	3/17	2.9	240	240
Heptachlor	76-44-8	µg/kg	0/17	0	0	1,200
Heptachlor Epoxide	1024-57-3	µg/kg	0/17	0	0	1,200
Toxaphene	8001-35-2	µg/kg	2/17	44,000	810,000	158,000

Analyte	CAS_RN	Units	Frequency Detection	Minimum Detection	Maximum Detection	EPC (RME)
Herbicides						
2,4-D	94-75-7	µg/kg	0/0	0	0	--
SVOCs						
Benzo(a)pyrene	50-32-8	µg/kg	5/17	47	1,500	511
Hexachlorobenzene	118-74-1	µg/kg	0/17	0	0	--
Metals						
Antimony	7440-36-0	mg/kg	2/17	8.6	29.9	11.5
Arsenic	7440-38-2	mg/kg	17/17	2.7	25.9	16.2
Thallium	7440-28-0	mg/kg	2/17	1.2	1.9	1.45

Notes:
CAS_RN = Chemical Abstracts Service registry number
µg/kg = micrograms per kilograms
mg/kg = milligrams per kilogram
EPC = exposure point concentration based upon RME
SVOCs = semivolatile organic compounds
-- = not applicable
RME = reasonable maximum exposure

Table 10
Cancer Toxicity Data Summary

Chemical of Concern	CAS RN	Oral Cancer Slope Factor	Dermal Cancer Slope Factor	Slope Factor Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YYYY)
Pathway: Ingestion, Dermal							
2,4-DDD	53-19-0	2.4E-01	2.4E-01	$(mg/kg/day)^{-1}$	B2	IRIS	10/25/2005
2,4-DDE	3424-82-6	3.4E-01	3.4E-01	$(mg/kg/day)^{-1}$	B2	IRIS	10/25/2005
2,4-DDT	789-02-6	3.4E-01	3.4E-01	$(mg/kg/day)^{-1}$	B2	IRIS	10/25/2005
4,4-DDD	72-54-8	2.4E-01	2.4E-01	$(mg/kg/day)^{-1}$	B2	IRIS	10/25/2005
4,4-DDE	72-55-9	3.4E-01	3.4E-01	$(mg/kg/day)^{-1}$	B2	IRIS	10/25/2005
4,4-DDT	50-29-3	3.4E-01	3.4E-01	$(mg/kg/day)^{-1}$	B2	IRIS	10/25/2005
Aldrin	309-00-2	1.7E+01	1.7E+01	$(mg/kg/day)^{-1}$	B2	IRIS	10/25/2005
alpha-BHC	319-84-6	6.3E+00	6.3E+00	$(mg/kg/day)^{-1}$	B2	IRIS	10/25/2005
alpha-Chlordane[2]	5103-71-9	3.5E-01	3.5E-01	$(mg/kg/day)^{-1}$	B2	IRIS	10/25/2005
beta-BHC	319-85-7	1.8E+00	1.8E+00	$(mg/kg/day)^{-1}$	C	IRIS	10/25/2005
delta-BHC	319-86-8	1.8E+00	1.8E+00	$(mg/kg/day)^{-1}$	D	IRIS	10/25/2005
Dieldrin	60-57-1	1.6E+01	1.6E+01	$(mg/kg/day)^{-1}$	B2	IRIS	10/25/2005
Endrin	72-20-8	--	--	--	--	--	--
Endrin Ketone[3]	53494-70-5	--	--	--	--	--	--
gamma-BHC (Lindane)	58-89-9	1.3E+00	1.3E+00	$(mg/kg/day)^{-1}$	B2-C	HEAST	7/31/1997
gamma-Chlordane[2]	5103-74-2	3.5E-01	3.5E-01	$(mg/kg/day)^{-1}$	B2	IRIS	10/25/2005
Heptachlor	76-44-8	4.5E+00	4.5E+00	$(mg/kg/day)^{-1}$	B2	IRIS	10/25/2005
Heptachlor Epoxide	1024-57-3	9.1E+00	9.1E+00	$(mg/kg/day)^{-1}$	B2	IRIS	10/25/2005
Toxaphene	8001-35-2	1.1E+00	1.1E+00	$(mg/kg/day)^{-1}$	B2	IRIS	10/25/2005
2,4-Dichlorophenol	120-83-2	--	--	--	--	--	--
2,4,6-Trichlorophenol	88-06-2	1.1E-02	1.1E-02	$(mg/kg/day)^{-1}$	B2	IRIS	10/25/2005
Atrazine	1912-24-9	2.2E-01	2.2E-01	$(mg/kg/day)^{-1}$	C	HEAST	10/25/2005
Benzo(a)pyrene	50-32-8	7.3E+00	7.3E+00	$(mg/kg/day)^{-1}$	B2	IRIS	10/25/2005
Bis(2-ethyhexyl)phthalate	117-81-7	1.4E-02	2.5E-02	$(mg/kg/day)^{-1}$	B2	IRIS	10/25/2005
Diphenamid	957-51-7	--	--	--	--	--	--
Hexachlorobenzene	118-74-1	1.6E+00	1.6E+00	$(mg/kg/day)^{-1}$	B2	IRIS	10/25/2005
Pentachlorophenol	87-86-5	1.2E-01	1.2E-01	$(mg/kg/day)^{-1}$	B2	IRIS	10/25/2005
1,4-Dichlorobenzene	106-46-7	2.4E-02	2.4E-02	$(mg/kg/day)^{-1}$	C	HEAST	10/25/2005

Table 10 (continued)
Cancer Toxicity Data Summary

Chemical of Concern	CAS RN	Oral Cancer Slope Factor	Dermal Cancer Slope Factor	Slope Factor Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YYYY)
1,2-Dichloroethane	107-06-2	9.1E-02	9.1E-02	$(mg/kg/day)^{-1}$	B2	IRIS	10/25/2005
1,2,4-Trichlorobenzene	120-82-1	--	--	--	--	--	--
Benzene	71-43-2	5.5E-02	5.5E-02	$(mg/kg/day)^{-1}$	A	IRIS	10/25/2005
Chlorobenzene	108-90-7	--	--	--	--	--	--
Chloroform	67-66-3	--	--	--	--	--	--
Tetrachloroethene	127-18-4	5.4E-01	5.4E-01	$(mg/kg/day)^{-1}$	B2	IRIS	10/25/2005
Aluminum	7429-90-5	--	--	--	--	--	--
Antimony	7440-36-0	--	--	--	--	--	--
Arsenic	7440-38-2	1.5E+00	1.5E+00	1/mg/kg/day	A	IRIS	10/25/2005
Beryllium	7440-41-7	--	--	--	--	--	--
Iron	7439-89-6	--	--	--	--	--	--
Manganese	7439-96-5	--	--	--	--	--	--
Thallium	7440-28-0	--	--	--	--	--	--
Vanadium	7440-62-2	--	--	--	--	--	--
Zinc	7440-66-6	--	--	--	--	--	--

Chemical of Concern	CAS RN	Unit Risk	Unit Risk Units	Inhalation Cancer Slope Factor	Inhalation Cancer Slope Factor Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YYYY)
Pathway: Inhalation								
2,4-DDD	53-19-0	--	--	--	--	--	--	--
2,4-DDE	3424-82-6	--	--	--	--	--	--	--
2,4-DDT	789-02-6	9.7E-05	$1/\mu g/m^3$	3.4E-01	$(mg/kg/day)^{-1}$	B2	IRIS	10/25/2005
4,4-DDD	72-54-8	--	--	--	--	--	--	--
4,4-DDE	72-55-9	--	--	--	--	--	--	--
4,4-DDT	50-29-3	9.7E-05	$1/\mu g/m^3$	3.4E-01	$(mg/kg/day)^{-1}$	B2	IRIS	10/25/2005
Aldrin	309-00-2	4.9E-03	$1/\mu g/m^3$	1.7E+01	$(mg/kg/day)^{-1}$	B2	IRIS	10/25/2005

Table 10 (continued)
Cancer Toxicity Data Summary

Chemical of Concern	CAS RN	Unit Risk	Unit Risk Units	Inhalation Cancer Slope Factor	Inhalation Cancer Slope Factor Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YYYY)
alpha-BHC	319-84-6	1.8E-03	$1/\mu g/m^3$	6.3E+00	$(mg/kg/day)^{-1}$	B2	IRIS	10/25/2005
alpha-Chlordane[2]	5103-71-9	1.0E-04	$1/\mu g/m^3$	3.5E-01	$(mg/kg/day)^{-1}$	B2	IRIS	10/25/2005
beta-BHC	319-85-7	5.3E-04	$1/\mu g/m^3$	1.8E+00	$(mg/kg/day)^{-1}$	C	IRIS	10/25/2005
delta-BHC	319-86-8	5.1E-04	$1/\mu g/m^3$	1.8E+00	$(mg/kg/day)^{-1}$	B2	IRIS	10/25/2005
Dieldrin	60-57-1	4.6E-03	$1/\mu g/m^3$	1.6E+01	$(mg/kg/day)^{-1}$	B2	IRIS	10/25/2005
Endrin	72-20-8	--	--	--	--	--	--	--
Endrin Ketone[3]	53494-70-5	--	--	--	--	--	--	--
gamma-BHC (Lindane)	58-89-9	--	--	--	--	--	--	--
gamma-Chlordane[2]	5103-74-2	1.0E-04	$1/\mu g/m^3$	3.5E-01	$(mg/kg/day)^{-1}$	B2	IRIS	10/25/2005
Heptachlor	76-44-8	1.3E-03	$1/\mu g/m^3$	4.5E+00	$(mg/kg/day)^{-1}$	B2	IRIS	10/25/2005
Heptachlor Epoxide	1024-57-3	2.6E-03	$1/\mu g/m^3$	9.1E+00	$(mg/kg/day)^{-1}$	B2	IRIS	10/25/2005
Toxaphene	8001-35-2	3.2E-04	$1/\mu g/m^3$	1.1E+00	$(mg/kg/day)^{-1}$	B2	IRIS	10/25/2005
2,4-Dichlorophenol	120-83-2	--	--	--	--	--	--	--
2,4,6-Trichlorophenol	88-06-2	3.1E-06	$1/\mu g/m^3$	1.0E-02	$(mg/kg/day)^{-1}$	B2	IRIS	10/25/2005
Atrazine	1912-24-9	--	--	--	--	--	--	--
Benzo(a)pyrene	50-32-8	8.9E-04	$1/\mu g/m^3$	3.1E+00	$(mg/kg/day)^{-1}$	B2	NCEA	10/25/2005
Bis(2-ethyhexyl)phthalate	117-81-7	4.0E-06	$1/\mu g/m^3$	1.4E-02	$(mg/kg/day)^{-1}$	B2	NCEA	10/25/2005
Diphenamid	957-51-7	--	--	--	--	--	--	--
Hexachlorobenzene	118-74-1	4.6E-04	$1/\mu g/m^3$	1.6E+00	$(mg/kg/day)^{-1}$	B2	IRIS	10/25/2005
Pentachlorophenol	87-86-5	--	--	--	--	--	--	--
1,4-Dichlorobenzene	106-46-7	6.29E-06	$1/\mu g/m^3$	2.2E-02	$(mg/kg/day)^{-1}$	C	NCEA	10/25/2005
1,2-Dichloroethane	107-06-2	2.6E-05	$1/\mu g/m^3$	9.1E-02	$(mg/kg/day)^{-1}$	B2	IRIS	10/25/2005
1,2,4-Trichlorobenzene	120-82-1	--	--	--	--	--	--	--
Benzene	71-43-2	7.8E-06	$1/\mu g/m^3$	2.7E-02	$(mg/kg/day)^{-1}$	A	IRIS	10/25/2005
Chlorobenzene	108-90-7	--	--	--	--	--	--	--
Chloroform	67-66-3	2.31E-05	$1/\mu g/m^3$	8.1E-02	$(mg/kg/day)^{-1}$	B2	IRIS	10/25/2005
Tetrachloroethene	127-18-4	5.71E-06	$1/\mu g/m^3$	2.0E-02	$(mg/kg/day)^{-1}$	B2	IRIS	10/25/2005
Aluminum	7429-90-5	--	--	--	--	--	--	--
Antimony	7440-36-0	--	--	--	--	--	--	--

Table 10 (continued)
Cancer Toxicity Data Summary

Chemical of Concern	CAS RN	Unit Risk	Unit Risk Units	Inhalation Cancer Slope Factor	Inhalation Cancer Slope Factor Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YYYY)
Arsenic	7440-38-2	4.3E-03	$1/\mu g/m^3$	1.5E+01	$(mg/kg/day)^{-1}$	A	IRIS	10/25/2005
Beryllium	7440-41-7	2.4E-03	$1/\mu g/m^3$	8.4E+00	$(mg/kg/day)^{-1}$	B1	IRIS	10/25/2005
Iron	7439-89-6	--	--	--	--	--	--	--
Manganese	7439-96-5	--	--	--	--	--	--	--
Thallium	7440-28-0	--	--	--	--	--	--	--
Vanadium	7440-62-2	--	--	--	--	--	--	--
Zinc	7440-66-6	--	--	--	--	--	--	--

(1) Data provided in Tables 6.1 and 6.2 in Appendix E of the URS 2007 (with 2008 corrected pages) HHRA, Appendix W of the Remedial Investigation Report
(2) Toxicity values for Chlordaneare used for alpha and gamma Chlordane
(3) Toxicity values for Endrin are used for Endrin Ketone
HEAST: Health Effects Assessment Summary Table
IRIS: Integrated Risk Systems
NCEA: EPA National Center for Environmental Assessment
CAS RN: Chemical Abstracts Service Registry Number
--: No information available
$(mg/kg/day)^{-1}$: per milligram per kilogram per day
$1/\mu g/m^3$: per microgram per cubic meter
A: Known Human Carcinogen
B1: Probable Human Carcinogen (Limited Human Data)
B2: Probable Human Carcinogen (Inadequate Human Data)
C: Possible Human Carcinogen
D: Not Classifiable as to Human Carcenogenity

Table 11
Non-Cancer Toxicity Data Summary

Chemical of Concern	CAS RN	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Dermal RfD	Dermal RfD Units	Primary Target Organ	Combined Uncertainty/ Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YYYY)
Pathway: Ingestion, Dermal[1]										
2,4-DDD	53-19-0	Chronic	2.0E-03	mg/kg/day	2.0E-03	mg/kg/day	Spleen	10000	PPRTV	4/16/2007
2,4-DDE	3424-82-6	--	--	--	--	--	--	--	--	--
2,4-DDT	789-02-6	Chronic	5.0E-04	mg/kg/day	5.0E-04	mg/kg/day	Liver	100	PPRTV	10/25/2005
4,4-DDD	72-54-8	Chronic	2.0E-03	mg/kg/day	2.0E-03	mg/kg/day	Spleen	10000	PPRTV	4/16/2007
4,4-DDE	72-55-9	--	--	--	--	--	--	--	--	--
4,4-DDT	50-29-3	Chronic	5.0E-04	mg/kg/day	5.0E-04	mg/kg/day	Liver	100	IRIS	10/25/2005
Aldrin	309-00-2	Chronic	3.0E-05	mg/kg/day	3.0E-05	mg/kg/day	Liver	1000	IRIS	10/25/2005
alpha-BHC	319-84-6	--	--	--	--	--	--	--	--	--
alpha-Chlordane[2]	5103-71-9	Chronic	5.0E-04	mg/kg/day	5.0E-04	mg/kg/day	Liver	300	IRIS	10/25/2005
beta-BHC	319-85-7	--	--	--	--	--	--	--	--	--
delta-BHC	319-86-8	Chronic	3.0E-04	mg/kg/day	3.0E-04	mg/kg/day	Liver, Kidney	1000	IRIS	10/25/2005
Dieldrin	60-57-1	Chronic	5.0E-05	mg/kg/day	5.0E-05	mg/kg/day	Liver	100	IRIS	10/25/2005
Endrin	72-20-8	Chronic	3.0E-04	mg/kg/day	3.0E-04	mg/kg/day	Liver	100	IRIS	10/25/2005
Endrin Ketone[3]	53494-70-5	Chronic	3.0E-04	mg/kg/day	3.0E-04	mg/kg/day	Liver	100	IRIS	10/25/2005
gamma-BHC (Lindane)	58-89-9	Chronic	3.0E-04	mg/kg/day	3.0E-04	mg/kg/day	Liver, Kidney	1000	IRIS	10/25/2005
gamma-Chlordane[2]	5103-74-2	Chronic	5.0E-04	mg/kg/day	5.0E-04	mg/kg/day	Liver	300	IRIS	10/25/2005
Heptachlor	76-44-8	Chronic	5.0E-04	mg/kg/day	5.0E-04	mg/kg/day	Liver	300	IRIS	10/25/2005
Heptachlor Epoxide	1024-57-3	Chronic	1.3E-05	mg/kg/day	1.3E-05	mg/kg/day	Liver	1000	IRIS	10/25/2005
Toxaphene	8001-35-2	--	--	--	--	--	--	--	--	--
2,4-Dichlorophenol	120-83-2	Chronic	3.0E-03	mg/kg/day	3.0E-03	mg/kg/day	Blood	100	IRIS	10/8/2004
2,4,6-Trichlorophenol	88-06-2	--	--	--	--	--	--	--	--	--
Atrazine	1912-24-9	Chronic	3.5E-02	mg/kg/day	3.5E-02	mg/kg/day	Body Weight, Heart	100	IRIS	10/8/2004
Benzo(a)pyrene	50-32-8	--	--	--	--	--	--	--	--	--
Bis(2-ethyhexyl)phthalate	117-81-7	Chronic	2.0E-02	mg/kg/day	1.0E-02	mg/kg/day	Liver	1000	IRIS	10/8/2004
Diphenamid	957-51-7	Chronic	3.0E-02	mg/kg/day	3.0E-02	mg/kg/day	Liver	100	IRIS	10/8/2004
Hexachlorobenzene	118-74-1	Chronic	8.0E-04	mg/kg/day	8.0E-04	mg/kg/day	Liver	100	IRIS	10/8/2004
Pentachlorophenol	87-86-5	Chronic	3.0E-02	mg/kg/day	3.0E-02	mg/kg/day	Liver, Kidney	100	IRIS	10/8/2004
1,2-Dichloroethane	107-06-2	Chronic	--	--	--	--	--	--	--	--

Table 11 (continued)
Non-Cancer Toxicity Data Summary

Chemical of Concern	CAS RN	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Dermal RfD	Dermal RfD Units	Primary Target Organ	Combined Uncertainty/ Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YYYY)
1,2,4-Trichlorobenzene	120-82-1	Chronic	1.0E-02	mg/kg/day	1.0E-02	mg/kg/day	Kidney, Adrenal	1000	IRIS	10/8/2004
1,4-Dichlorobenzene	106-46-7	Chronic	3.0E-02	mg/kg/day	3.0E-02	mg/kg/day	Liver, Developmental	1000	NCEA	4/16/2007
Benzene	71-43-2	Chronic	4.0E-03	mg/kg/day	4.0E-03	mg/kg/day	Blood, Immune System	300	IRIS	10/8/2004
Chlorobenzene	108-90-7	Chronic	2.0E-02	mg/kg/day	2.0E-02	mg/kg/day	Liver	1000	IRIS	10/8/2004
Chloroform	67-66-3	Chronic	1.0E-02	mg/kg/day	1.0E-02	mg/kg/day	Liver	1000	IRIS	10/8/2004
Tetrachloroethene	127-18-4	Chronic	1.0E-02	mg/kg/day	1.0E-02	mg/kg/day	Liver	1000	IRIS	10/8/2004
Aluminum	7429-90-5	Chronic	1.0E+00	mg/kg/day	5.0E-03	mg/kg/day	CNS-Developmental	100	PPRTV	10/23/2006
Antimony	7440-36-0	Chronic	4.0E-04	mg/kg/day	6.0E-05	mg/kg/day	Blood, Liver	1000	IRIS/ HEAST	10/25/2005
Arsenic	7440-38-2	Chronic	3.0E-04	mg/kg/day	3.0E-04	mg/kg/day	Skin, Vascular System	3	IRIS	10/25/2005
Beryllium	7440-41-7	Chronic	2.0E-03	mg/kg/day	1.4E-05	mg/kg/day	Gastrointestinal	300	IRIS	10/25/2005
Iron	7439-89-6	Chronic	7.0E-01	mg/kg/day	7.0E-01	mg/kg/day	Gastrointestinal	1.5	PPRTV	9/11/2006
Manganese	7439-96-5	Chronic	2.0E-02	mg/kg/day	8.0E-04	mg/kg/day	CNS	1	IRIS	10/25/2005
Thallium	7440-28-0	Chronic	7.0E-05	mg/kg/day	7.0E-05	mg/kg/day	Liver	3000	Other	10/25/2005
Vanadium	7440-62-2	Chronic	1.0E-03	mg/kg/day	2.6E-05	mg/kg/day	Kidney	300	NCEA	4/16/2007
Zinc	7440-66-6	Chronic	3.0E-01	mg/kg/day	3.0E-01	mg/kg/day	Blood Chemistry	3	IRIS	10/25/2005

Table 11 (continued)
Non-Cancer Toxicity Data Summary

Chemical of Concern	CAS RN	Chronic/ Subchronic	Inhalation RfC	Inhalation RfC units	Inhalation RfD	Inhalation RfD Units	Primary Target Organ	Combined Uncertainty/ Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YYYY)
Pathway: Inhalation[1]										
2,4-DDD	53-19-0	--	--	--	--	--	--	--	--	--
2,4-DDE	3424-82-6	--	--	--	--	--	--	--	--	--
2,4-DDT	789-02-6	--	--	--	--	--	--	--	--	--
4,4-DDD	72-54-8	--	--	--	--	--	--	--	--	--
4,4-DDE	72-55-9	--	--	--	--	--	--	--	--	--
4,4-DDT	50-29-3	--	--	--	--	--	--	--	--	--
Aldrin	309-00-2	--	--	--	--	--	--	--	--	--
alpha-BHC	319-84-6	--	--	--	--	--	--	--	--	--
alpha-Chlordane[2]	5103-71-9	Chronic	7.0E-04	mg/m^3	2.0E-04	mg/kg/day	Liver	1000	IRIS	10/8/2004
beta-BHC	319-85-7	--	--	--	--	--	--	--	--	--
delta-BHC	319-86-8	--	--	--	--	--	--	--	--	--
Dieldrin	60-57-1	--	--	--	--	--	--	--	--	--
Endrin	72-20-8	--	--	--	--	--	--	--	--	--
Endrin Ketone[3]	53494-70-5	--	--	--	--	--	--	--	--	--
gamma-BHC (Lindane)	58-89-9	--	--	--	--	--	--	--	--	--
gamma-Chlordane[2]	5103-74-2	Chronic	7.0E-04	mg/m^3	2.0E-04	mg/kg/day	Liver	1000	IRIS	10/8/2004
Heptachlor	76-44-8	--	--	--	--	--	--	--	--	--
Heptachlor Epoxide	1024-57-3	--	--	--	--	--	--	--	--	--
Toxaphene	8001-35-2	--	--	--	--	--	--	--	--	--
2,4-Dichlorophenol	120-83-2	--	--	--	--	--	--	--	--	--
2,4,6-Trichlorophenol	88-06-2	--	--	--	--	--	--	--	--	--
Atrazine	1912-24-9	--	--	--	--	--	--	--	--	--
Benzo(a)pyrene	50-32-8	--	--	--	--	--	--	--	--	--
Bis(2-ethyhexyl)phthalate	117-81-7	--	--	--	--	--	--	--	--	--
Diphenamid	957-51-7	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	118-74-1	--	--	--	--	--	--	--	--	--
Pentachlorophenol	87-86-5	--	--	--	--	--	--	--	--	--
1,2-Dichloroethane	107-06-2	Chronic	2.0E+00	mg/m^3	7.0E-01	mg/kg/day	Liver	90	ATSDR	4/16/2007

Table 11 (continued)
Non-Cancer Toxicity Data Summary

Chemical of Concern	CAS RN	Chronic/ Subchronic	Inhalation RfC	Inhalation RfC units	Inhalation RfD	Inhalation RfD Units	Primary Target Organ	Combined Uncertainty/ Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YYYY)
1,2,4-Trichlorobenzene	120-82-1	Chronic	3.5E-03	mg/m^3	1.0E-03	mg/kg/day	Liver	1000	PPRTV	10/8/2004
1,4-Dichlorobenzene	106-46-7	Chronic	8.0E-01	mg/m^3	2.29E-01	mg/kg/day	Liver	100	IRIS	10/8/2004
Benzene	71-43-2	Chronic	3.0E-02	mg/m^3	8.6E-03	mg/kg/day	Blood, Immune System	300	IRIS	10/8/2004
Chlorobenzene	108-90-7	Chronic	5.0E-02	mg/m^3	1.4E-02	mg/kg/day	Liver, Kidney	1000	PPRTV	10/12/2006
Chloroform	67-66-3	Chronic	4.9E-02	mg/m^3	1.4E-02	mg/kg/day	CNS, Liver, Kidney	100	NCEA	4/16/2007
Tetrachloroethene	127-18-4	Chronic	3.0E-01	mg/m^3	8.0E-02	mg/kg/day	Neurologic	100	ATSDR	4/16/2007
Aluminum	7429-90-5	Chronic	5.0E-03	mg/m^3	1.4E-03	mg/kg/day	CNS	300	PPRTV	10/23/2006
Antimony	7440-36-0	--	--	--	--	--	--	--	--	--
Arsenic	7440-38-2	--	--	--	--	--	--	--	--	--
Beryllium	7440-41-7	Chronic	2.0E-05	mg/m^3	5.7E-06	mg/kg/day	Lungs, Immune System	10	IRIS	10/25/2005
Iron	7439-89-6	--	--	--	--	--	--	--	--	--
Manganese	7439-96-5	Chronic	5.0E-05	mg/m^3	1.43E-05	mg/kg/day	CNS	1000	IRIS	10/25/2005
Thallium	7440-28-0	--	--	--	--	--	--	--	--	--
Vanadium	7440-62-2	--	--	--	--	--	--	--	--	--
Zinc	7440-66-6	--	--	--	--	--	--	--	--	--

(1) Data provided in Tables 5.1 and 5.2 in Appendix E of the URS 2007 (with 2008 corrected pages) HHRA, Appendix W of the Remedial Investigation Report
(2) Toxicity values for Chlordane are used for alpha and gamma Chlordane
(3) Toxicity values for Endrin are used for Endrin Ketone
ATSDR: Agency for Toxic Substances and Disease Registry
PPRTV: United States Environmental Protection Agency provisional peer-reviewed toxicity value
HEAST: Health Effects Assessment Summary Table
IRIS: Integrated Risk Information System
NCEA: EPA National Center for Environmental Assessment
Other: No source listed in the Region III RBC Table, 10/25/2005
--: No information available
mg/kg/day: milligrams per kilogram per day
CNS: Central Nervous System
mg/m^3: milligrams per cubic meter

Table 12
Interim Ground Water Remediation Standards

Contaminant of Concern	Interim Ground Water Remediation Standard (mg/L)
4,4-DDT	3.59E-5
2,4,5-T	3.70E-1
2,4-D	7.00E-2
2,4-DDD	1.43E-4
2,4-DDE	1.16E-4
2,4-DDT	3.56E-5
4,4-DDD	1.45E-4
4,4-DDE	1.16E-4
Aldrin	1.35E-5
Alpha Chlordane	1.3E-4
Alpha-BHC	2.77E-5
Atrazine	1.01E-3
Beta BHC	9.51E-5
Delta BHC	9.66E-5
Dieldrin	9.58E-6
Diphenamid	1.97E-2
Endrin	1.42E-4
Endrin Ketone	1.42E-4
Gamma BHC (Lindane)	1.42E-4
Heptachlor	3.89E-5
Heptachor epoxide	6.96E-6
Toxaphene	1.28E-4
Bis(2-ethylhexyl)phthalate	4.25E-3
Pentachlorophenol	1.75E-4
1,4-Dichlorobenzene	1.2E-3
2,4,6-Trichlorophenol	1.37E-2
Benzene	9.22E-4
1,2-Dichloroethane	3.14E-4
Tetrachloroethene	2.56E-4
Chloroform	4.0E-4
Arsenic	1.65E-4
Chlorobenzene	8.58E-4
1,2,4-Trichlorobenzene	6.64E-5
2,4-Dichlorophenol	1.2E-2
Aluminum*	4.16
Beryllium	9.96E-3
Iron*	5.49
Manganese*	1.35E-1
Thallium	5.2E-5
Vanadium*	9.19E-3
Zinc	1.56

*Verification of these compounds as ground water COCs may be appropriate.

Table 13
Soil Remediation Standards

Contaminant of Concern	Soil Remediation Standard – 0-2 feet bgs	Source	Soil Remediation Standard – 2-10 feet bgs	Source	Soil Remediation Standard – greater than 10 feet bgs	Source
2,4-DDD	55.3	ISW	55.3	ISW		
2,4-DDT	15.8	CW	15.8	CW		
4,4-DDD	55.3	ISW	55.3	ISW		
4,4-DDT	2.2	ECO	15.8	CW		
Aldrin	0.32	ECO	0.781	ISW		
Alpha-BHC	1.63	GW	1.63	GW	1.63	GW
Alpha-Chlordane	14.5	CW	14.5	CW		
Beta-BHC	6.91	GW	6.91	GW	6.91	GW
Delta-BHC	7.37	ISW	7.37	ISW	407	GW
Dieldrin	0.829	ISW	0.829	ISW		
Gamma-BHC	7.94	CW	7.94	CW	645	GW
Gamma-Chlordane	14.5	CW	14.5	CW		
Heptachlor	2.95	ISW	2.95	ISW		
Heptachlor Epoxide	0.465	CW	0.465	CW		
Toxaphene	3	ECO	12.1	ISW		
Benzo(a)pyrene	1.55	ISW	1.55	ISW		
Arsenic	12	GW	12	GW	12	GW
Endrin Ketone	0.26	ECO				
Manganese	272	GW	272	GW	272	GW
Thallium	0.675	GW	0.675	GW	0.675	GW
Atrazine	6.47	GW	6.47	GW	6.47	GW

NOTES: (1) ISW – indoor site worker (2) CW – construction worker (3) ECO – ecological receptor (4) GW – protection of ground water
(5) The Soil Remediation Standards generated for the Central Chemical property have been established to be protective of human heath and the environment.
(6) The Soil Remediation Standards for protection of human health have been established for non-residential exposures based on the reasonably anticipated future land use of the Central Chemical property, specifically future construction workers performing construction tasks, and indoor site workers performing commercial or industrial work; primarily indoors.
(7) The soil remediation standards for protection of the environment considered ecological receptors (including birds and animals), and protection of ground water.
(8) For the Soil Remediation Standards based on protection of human health (ISW and CW), the Soil Remediation Standards are 95% UCL values. However, no single location on the Central Chemical property can exhibit COC concentrations greater than ten times (10x) their respective Soil Remediation Standards (this not-to-exceed value has been established at approximately the upper end of EPA's acceptable risk range for cancer and non-cancer risk).
(9) For the Soil Remediation Standards based on protection of ecological receptors (ECO), the Soil Remediation Standards are 95% UCL values. However, no single location on the Central Chemical property can exhibit COC concentrations greater than ten times (10x) their respective Soil Remediation Standards.
(10) For the Soil Remediation Standards based on protection of ground water (GW), the Soil Remediation Standards are not-to-exceed values.
(11) As outlined in Table 14, the maximum excavation depth at the Site for protection of human health (ISW and CW) is 10' below ground surface. If COC concentrations remain in-place beneath 10' at the completion of contaminated soil excavation, the establishment of institutional controls may be necessary to ensure that subsurface soil contamination does not act as a potential future threat to human health (for example during future deep construction-related activities). Such institutional controls would be selected by EPA in an appropriate EPA decision document.
(12) The Soil Remediation Standards are in parts per million.
(13) The Soil Remediation Standard for Arsenic was generated by EPA and MDE as a background concentration for the Hagerstown area, based on soil sampling data collected in the Hagerstown area. A Soil Remediation Standard generated for the Site for protection of ground water by EPA using the Soil Screening & Remediation Goal (SSRG) Tool (Version 2.0, January 2009) was less than background; therefore, EPA has selected the calculated background concentration for arsenic in soil in the Hagerstown area as the Soil Remediation Standard for Arsenic that will be protective of ground water.
(14) The Soil Remediation Standards for Manganese and Thallium were generated using the Soil Screening & Remediation Goal (SSRG) Tool (Version 2.0, January 2009). However, the values generated for Manganese and Thallium are expected to be less than background concentrations of these metals in western Maryland, based on review of the document, "Cleanup Standards for Soil and Groundwater" (State of Maryland, MDE, June 2008). Therefore, an evaluation of background concentrations of these metals will have be performed during the Remedial Design. If necessary, these Soil Remediation Standards will be revised in an appropriate EPA decision document.

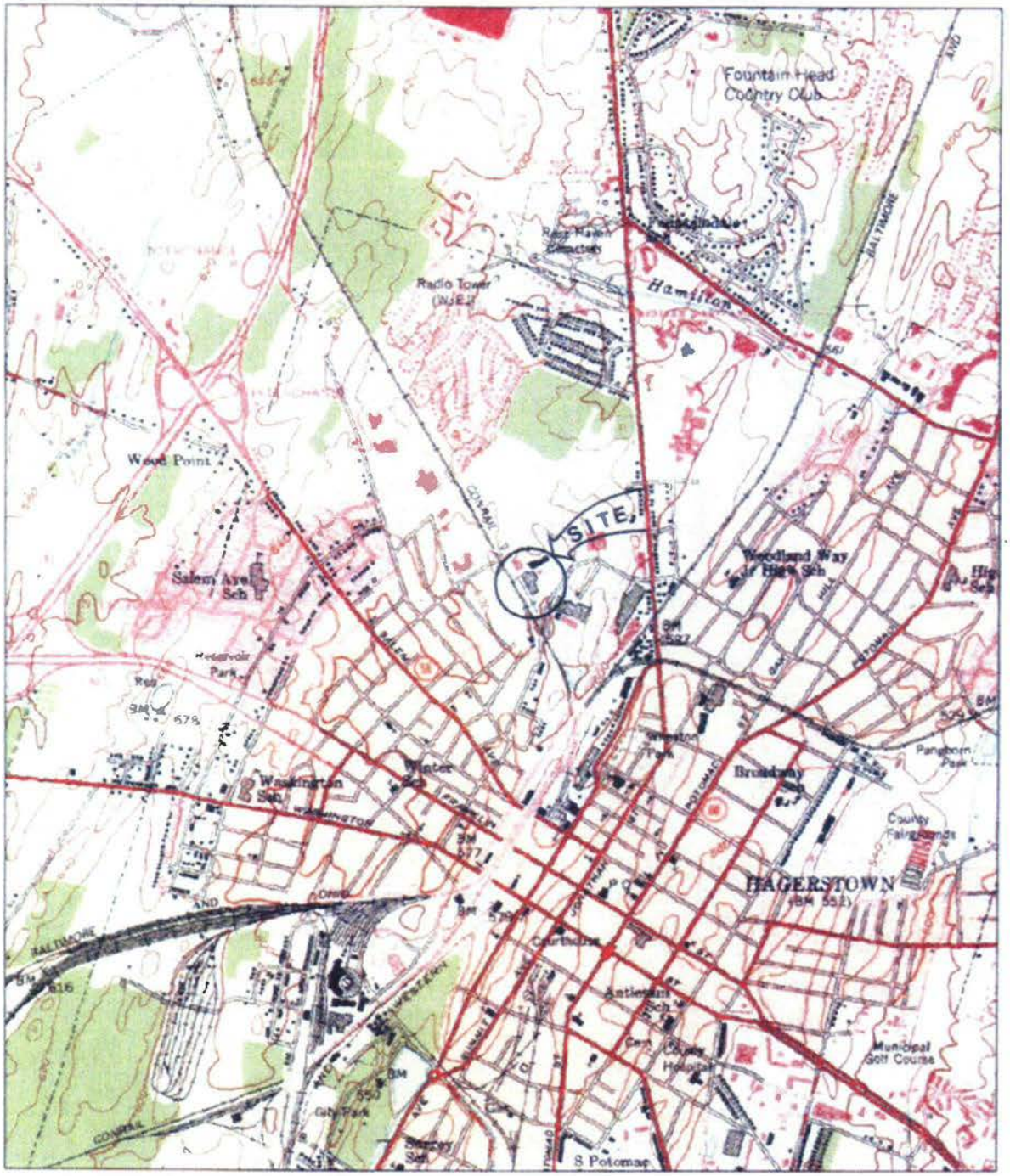
Table 14
Alternative 2A Cost and Present Cost Summary

Phase No.	Phase Description	Alternative 2A
Current Dollar and Escalation Value		
01	Study (Pre-Design Investigation	$520,935
02	Design-Detail	$545,546
03	Remedial Action	$9,003,722
	Institutional Controls	
	Domain 2 Soil Stabilization	
	Foundation Demolition and Offsite Disposal	
	Consolidate and Cap (Domains 1, 2, and 3)	
	Ground Water Extraction System	
04	Operation & Maintenance	$3,531,190
	Ground Water Extraction System O&M (5 Years)	
	Domain 2 RCRA Cap O&M (30 Years)	
05	Long Term Monitoring	$2,449,981
	Five Year Reviews	
	Ground Water Monitoring (5 Years)	
06	Site Closeout	$268,409
	Subtotal in Current Dollars	**$16,319,783**
	Escalation Costs	**$2,240,055**
	Total with Escalation	**$18,559,838**
Present Value of Future Costs		
	Present Value of Capital Costs (Pre-design investigation, design, remedial action, and long-term monitoring)	$11,518,772
	Present Value of O&M Costs (O&M of extraction system [5 years]) and Domain 2 RCRA cap (30 years)	$2,642,687
	Present Value of Periodic Costs (6 Five Year Reviews)	$189,313
	Present Value Combined Cost[1]	**$14,350,772**
Average Annual O&M Costs		
	Ground Water Extraction System (5 years)	$416,000
	Domain 2 RCRA cap (30 years)	$4,900
Average Annual Monitoring Costs		
	Ground Water Extraction System (5 years)	$161,000

(1) Real Discount = 3.52%; Nominal Discount = 6.02%; Inflation = 2.50%

O&M - Operation and Maintenance
RCRA - Resource Conservation and Recovery Act

APPENDIX C



MAP SOURCE

HAGERSTOWN, MD-PA. QUADRANGLE,
U.S. GEOLOGICAL SURVEY, 1953
PHOTOREVISED 1971

X:\EPA010\Central_Chemical\Final_ROD Site_Location.cdr
Revised: 09/18/09 TH
Source: Figure 2-1, Remedial Investigation Report, Vol.1(URS, 2007 with 2008 Change pages)

QUADRANGLE LOCATION

Figure 1
Site Location
Central Chemical NPL Site
Hagerstown, Maryland