UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 3

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| **IN THE MATTER OF:**<br>**KOPPERS CO., INC. (NEWPORT)**<br><br>**SUPERFUND SITE**<br><br>**Beazer East, Inc.**<br><br>**Respondent**<br><br>**Proceeding under Section 106(a) of the Comprehensive Environmental Response, Compensation, and Liability Act, 42 U.S.C. § 9606(a).** | **CERCLA Docket No.**<br>**CERCLA-03-2023-0064DC** |

**ADMINISTRATIVE ORDER FOR REMEDIAL DESIGN/REMEDIAL ACTION; REVOCATION OF ADMINISTRATIVE ORDER NO. CERC-03-2006-0266-DC SUBJECT TO CERTAIN CONTINUING REQUIREMENTS**

# MASTER INDEX

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## I. JURISDICTION AND GENERAL PROVISIONS

1. This Administrative Order ("Order") is issued under the authority vested in the President of the United States by Section 106(a) of the Comprehensive Environmental Response, Compensation, and Liability Act, as amended ("CERCLA"). This authority was delegated to the Administrator of the United States Environmental Protection Agency ("EPA") by Executive Order No. 12580, 52 Fed. Reg. 2923 (Jan. 23, 1987), redelegated to the Regional Administrators by EPA Delegation Nos. 14-14-A and 14-14-B, and further redelegated by the Regional Administrator of EPA Region 3 to the Director of the EPA Region 3 Superfund & Emergency Management Division by EPA Region 3 Delegation Nos. 14-14-A and 14-14-B.

2. This Order pertains to property located in the northern part of New Castle County, Delaware, southwest of the town of Newport and northwest of the Interstate-95 and Route 141 interchange in New Castle County, Delaware, and further described in *the Record of Decision Amendment for the Koppers Co. Inc. (Newport Plant) Superfund Site* attached hereto as Appendix A (such property shall be referred to as the "Koppers Site" or the "Site"). This Order (a) revokes, in accordance with Section XXIV, EPA Administrative Order No. CERC-03-2006-0266-DC which, among other things, directed Respondent to perform the remedial design and remedial action ("RD/RA") described in a Record of Decision issued for the Site on September 30, 2005; and (b) directs Respondent to perform the RD/RA described in the Record of Decision Amendment ("ROD Amendment") issued for the Site on August 4, 2022.

3. EPA has notified the State of Delaware ("State") of this action pursuant to Section 106(a) of CERCLA, 42 U.S.C. § 9606(a).

## II. PARTIES BOUND

4. This Order applies to and is binding upon Respondent and its successors and assigns. Any change in ownership or control of the Site or change in corporate or partnership status of Respondent including, but not limited to, any transfer of assets or real or personal property, shall not alter Respondent's responsibilities under this Order.

5. Reserved.

6. Respondent shall provide a copy of this Order to each contractor hired to perform the Work required by this Order and to each person representing Respondent with respect to the Site or the Work, and shall condition all contracts entered into hereunder upon performance of the Work in conformity with the terms of this Order. Respondent or its contractors shall provide written notice of the Order to all subcontractors hired to perform any portion of the Work required by this Order. Respondent shall nonetheless be responsible for ensuring that their contractors and subcontractors perform the Work in accordance with the terms of this Order.

## III. DEFINITIONS

7. Unless otherwise expressly provided in this Order, terms used in this Order 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 Order or in its appendices, the following definitions shall apply solely for the purposes of this Order:

"Affected Property" shall mean all real property at the Site and any other real property where EPA determines, at any time, that access; land, water, or other resource use restrictions; Institutional Controls; or any combination thereof, are needed to implement the Remedial Action.

"CERCLA" shall mean the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended, 42 U.S.C. §§ 9601-9675.

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

"Effective Date" shall mean the effective date of this Order as provided in Section VIII.

"EPA" shall mean the United States Environmental Protection Agency.

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

"Institutional Controls" or "ICs" shall mean (a) Proprietary Controls (*i.e.*, easements or covenants running with the land that (i) limit land, water, or other resource use, provide access rights, or both, and (ii) are created under common law or statutory law by an instrument that is recorded, or for which notice is recorded, in the appropriate land records office); and (b) state or local laws, regulations, ordinances, zoning restrictions, or other governmental controls or notices that: (i) limit land, water, or other resource use to minimize the potential for human exposure to Waste Material at or in connection with the Site; (ii) limit land, water, or other resource use to implement, ensure noninterference with, or ensure the protectiveness of the Remedial Action; (iii) provide information intended to modify or guide human behavior at or in connection with the Site; or (iv) any combination thereof.

"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.

"Non-Respondent Owner" shall mean any person, other than Respondent, that owns or controls any Affected Property. The phrase "Non-Respondent Owner's Affected Property" means Affected Property owned or controlled by Non-Respondent Owner.

"Operation and Maintenance" or "O&M" shall mean all activities required to operate, maintain, and monitor the effectiveness of the Remedial Action as specified in the Statement of Work or any EPA-approved O&M Plan.

"Order" shall mean this Unilateral Administrative Order, all appendices attached hereto, and all documents incorporated into this document. In the event of conflict between this Order and any appendix, this Order shall control.

"Paragraph" or "¶" shall mean a portion of this Order identified by an Arabic numeral or an upper- or lower-case letter.

"Parties" shall mean EPA and Respondent.

"Performance Standards" shall mean the cleanup standards and other measures of achievement of the goals of the remedial action objectives, as set forth in the ROD Amendment.

"Programmatic Agreement" shall mean the fully executed *Programmatic Agreement Between the U.S. Environmental Protection Agency, Region III; the Delaware State Historical Preservation Office; and the Advisory Council on Historic Preservation Regarding Cleanup of the Koppers Newport Superfund Site, Newport, New Castle County, Delaware* attached as Exhibit 1 to the Statement of Work ("SOW") attached hereto as Appendix B.

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

"Record of Decision Amendment" or "ROD Amendment" shall mean the EPA Record of Decision Amendment relating to the Site signed on August 4, 2022, and all attachments thereto. The ROD Amendment is attached as Appendix A.

"Remedial Action" or "RA" shall mean the remedial action selected in the ROD Amendment.

"Remedial Design" or "RD" shall mean those activities to be undertaken by Respondent to develop final plans and specifications for the RA as stated in the Statement of Work.

"Respondent" shall mean Beazer East, Inc.

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

"Site" shall mean the Koppers (Newport) Superfund Site described in the ROD Amendment.

"State" shall mean the State of Delaware.

"Statement of Work" or "SOW" shall mean the document describing the activities Respondent must perform to implement the RD, the RA, and O&M regarding the Site, and which is attached hereto as Appendix B.

"Supervising Contractor" shall mean the principal contractor retained by Respondent to supervise and direct the implementation of the Work under this Order.

"Transfer" shall mean to sell, assign, convey, lease, mortgage, or grant a security interest in, or where used as a noun, a sale, assignment, conveyance, or other disposition of any interest by operation of law or otherwise.

"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: (a) any "hazardous substance" under Section 101(14) of CERCLA, 42 U.S.C. § 9601(14); (b) any pollutant or contaminant under Section 101(33) of CERCLA, 42 U.S.C. § 9601(33); (c) any "solid waste" under Section 1004(27) of RCRA, 42 U.S.C. § 6903(27); and (d) any "hazardous waste" under 7 Del. C. Part 261.

"Work" shall mean all activities Respondent is required to perform under this Order, except those required by Section XVII (Record Retention).

## IV. FINDINGS OF FACT

EPA incorporates the Findings of Fact set forth in Appendix D of this Order and makes the additional findings of fact below:

8. On September 30, 2005, EPA issued a Record of Decision selecting remedial action for implementation at the Site ("2005 ROD").

9. On September 25, 2006, EPA issued the 2006 Order (Appendix C) directing Respondent to implement the remedy selected in the 2005 ROD ("2005 Selected Remedy").

10. From 2007-2010, Respondent conducted an extensive investigation of Site conditions which produced new information previously unavailable to EPA ("2007-2010 Investigation").

11. On August 16, 2010, EPA issued *Modification No. 1* to the 2006 Order (Appendix C) incorporating modifications to the 2005 Selected Remedy selected by EPA in a May 28, 2010, Explanation of Significant Differences ("ESD"). The ESD made clear that certain provisions of the National Historic Preservation Act of 1966, 16 U.S.C. § 470 et. seq., and its implementing regulations ("NHPA") were applicable requirements with respect to the 2005 Selected Remedy within the meaning of Section 121(d) of CERCLA, 42 U.S.C. § 9621(d).

12. On August 19, 2014, EPA issued *Modification No. 2* to the 2006 Order (Appendix C) which (1) suspended certain requirements under the 2006 Order, and (2) required Respondent

to perform a Focused Feasibility Study ("FFS") to identify and evaluate alternatives for remedial action to prevent, mitigate, or otherwise respond to or remedy the release or threatened release of hazardous substances, pollutants, or contaminants at the Site. EPA took this action because it determined that the information supplied by Respondent in the 2007-2010 Investigation called into question the appropriateness of the 2005 Selected Remedy and that additional information was necessary in order to evaluate an alternative remedial action and select such action in a manner not inconsistent with the National Oil and Hazardous Substances Pollution Contingency Plan ("NCP"), 40 C.F.R. Part 300.

13. On April 30, 2019, EPA issued *Modification No. 3* to the 2006 Order (Appendix C) which permitted Respondent to submit, to EPA for approval, a *Request for ROD Amendment* in lieu of the FFS required by *Modification No. 2*.

14. In August 2019, Respondent submitted to EPA its "Final Remedy Modification and Record of Decision Amendment Technical Document" which EPA subsequently accepted as the Request for ROD Amendment required by *Modification No. 3*.

15. On August 4, 2022, EPA issued a ROD Amendment selecting a remedial action ("2022 Selected Remedy") to replace the 2005 Selected Remedy (Appendix A).

16. On July 6, 2023, the Programmatic Agreement (Appendix B, Exhibit 1) became effective. The Programmatic Agreement obligates EPA to take certain steps to mitigate adverse effects to historic property at the Site in the course of implementing the 2022 Selected Remedy. This Order directs Respondent to implement provisions of the Programmatic Agreement as described in Section 5.0 of the SOW.

17. Reserved.

18. Reserved.

19. Reserved.

## V. CONCLUSIONS OF LAW AND DETERMINATIONS

20. Based on the Findings of Fact set forth above and the administrative record, EPA has determined that:

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

b. Respondent is a "person" within the meaning of Section 101(21) of CERCLA, 42 U.S.C. § 9601(21).

c. Respondent is an "owner or operator," as defined in Section 101(20) of CERCLA, 42 U.S.C. § 9601(20), of the Site and is "the owner and operator of ... a facility" within the meaning of Section 107(a)(l), 42 U.S.C. § 9607(a)(l). In addition, Respondent is "a person who at the time of disposal of any hazardous substance owned or operated any facility at which such hazardous substances were disposed of" within the meaning of section 107(a)(2) of CERCLA, 42 U.S.C. § 9607(a)(2).

d. The contamination found at the Site includes "hazardous substances" as defined by Section 101(14) of CERCLA, 42 U.S.C. § 9601(14).

e. Conditions at the Site constitute an actual and/or threatened "release" of a hazardous substance from the facility as defined by Section 101(22) of CERCLA, 42 U.S.C.§ 9601(22).

f. The conditions at the Site may constitute a threat to public health or welfare or the environment, based on the factors set forth in the ROD Amendment.

g. Solely for purposes of Section 113(j) of CERCLA, 42 U.S.C. § 9613(j), the remedy set forth in the ROD Amendment and the Work to be performed by Respondent shall constitute a response action taken or ordered by the President for which judicial review shall be limited to the administrative record.

h. Conditions at the Site may constitute an imminent and substantial endangerment to the public health or welfare or the environment because of an actual or threatened release of a hazardous substance from the facility within the meaning of Section 106(a) of CERCLA, 42 U.S.C. § 9606(a).

i. The actions required by this Order are necessary to protect the public health, welfare, or the environment.

## VI. ORDER

21. Based on the Findings of Fact, Conclusions of Law, and Determinations set forth above, and the administrative record supporting issuance of this Order, Respondent is hereby ordered to comply with this Order and any modifications to this Order, including, but not limited to, all appendices and all documents incorporated by reference into this Order.

## VII. OPPORTUNITY TO CONFER

22. No later than 10 days after the Order is signed by EPA, Respondent may, in writing, (a) request a conference with EPA to discuss this Order, including its applicability, the factual findings and the determinations upon which it is based, the appropriateness of any actions

Respondent is ordered to take, or any other relevant and material issues or contentions that Respondent may have regarding this Order, or (b) notify EPA that it intends to submit written comments or a statement of position in lieu of requesting a conference.

23. If a conference is requested, Respondent may appear in person or by an attorney or other representative. Except as otherwise directed by EPA, any such conference shall be held no later than 5 days after the conference is requested. Any written comments or statements of position on any matter pertinent to this Order must be submitted no later than five 5 days after the conference or 15 days after this Order is signed if Respondent does not request a conference. This conference is not an evidentiary hearing, does not constitute a proceeding to challenge this Order or the RA, and does not give Respondent a right to seek review of this Order or the RA. Any request for a conference or written comments or statements should be submitted *via email* to:

Andrew S. Goldman (3RC10)
Sr. Assistant Regional Counsel
U.S. Environmental Protection Agency
Four Penn Center
1600 John F. Kennedy Boulevard
Philadelphia, PA 19103-2029
Goldman.andrew@epa.gov
(215) 814-2487

## VIII. EFFECTIVE DATE

24. This Order shall be effective 10 days after the Order is signed by EPA unless a conference is requested or notice is given that written materials will be submitted in lieu of a conference in accordance with Section VII (Opportunity to Confer). If a conference is requested or such notice is submitted, this Order shall be effective on the tenth day after the day of the conference, or if no conference is requested, on the tenth day after written materials, if any, are submitted, unless EPA determines that the Order should be modified based on the conference or written materials. In such event, EPA shall notify Respondent, within the applicable 10-day period, that EPA intends to modify the Order. The modified Order shall be effective 5 days after it is signed by EPA.

## IX. NOTICE OF INTENT TO COMPLY

25. On or before the Effective Date, Respondent shall notify EPA in writing of Respondent's irrevocable intent to comply with this Order. Such written notice shall be sent to EPA as provided in ¶ 23.

26. Respondent's written notice shall describe, using facts that exist on or prior to the Effective Date, any "sufficient cause" defense(s) asserted by Respondent under Sections 106(b) and 107(c)(3) of CERCLA, 42 U.S.C. §§ 9606(a) and 9607(c)(3). The absence of a response by EPA to the notice required by this Section shall not be deemed to be acceptance of Respondent's assertions. Failure by the Respondent to provide such notice of intent to comply within this time period shall, as of the Effective Date, be treated as a violation of this Order by the Respondent.

## X. PERFORMANCE OF THE WORK

27. **Compliance with Applicable Law**. Nothing in this Order limits Respondent's obligations to comply with the requirements of all applicable federal and state laws and regulations. Respondent must also comply with all applicable or relevant and appropriate requirements of all federal and state environmental laws as set forth in the ROD Amendment and the SOW.

28. **Permits**

a. As provided in Section 121(e) of CERCLA, 42 U.S.C. § 9621(e), and Section 300.400(e) of the NCP, no permit shall be required for any portion of the Work conducted entirely on-site (*i.e.*, within the areal extent of contamination or in very close proximity to the contamination and necessary for implementation of the Work). Where any portion of the Work that is not on-Site requires a federal or state permit or approval, Respondent shall submit timely and complete applications and take all other actions necessary to obtain all such permits or approvals.

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

29. **Coordination and Supervision**

a. **Project Coordinators**

(1) Respondent's Project Coordinator must have sufficient technical expertise to coordinate the Work. Respondent's Project Coordinator may not be an attorney representing Respondent in this matter and may not act as the Supervising Contractor. Respondent's' Project Coordinator may assign other representatives, including other contractors, to assist in coordinating the Work.

(2) EPA designates the following persons as its Project Coordinator and Alternate Project Coordinator:

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| **Project Coordinator:**<br><br>Daniel Taylor<br>U.S. Environmental Protection Agency<br>Four Penn Center<br>1600 JFK Blvd.<br>Philadelphia, PA 19103-2029<br>Taylor.daniel@epa.gov<br>(215) 814-3326 |
| **Alternate Project Coordinator:**<br><br>Evelyn Sorto<br>U.S Environmental Protection Agency<br>Four Penn Center<br>1600 JFK Blvd<br>Philadelphia, PA 19103-2029<br>Sorto.evelyn@epa.gov<br>(215) 814-2123 |

EPA may change its Project Coordinator and/or Alternate Project Coordinator upon providing notice to Respondent. EPA may designate other representatives, which may include its employees, contractors, and/or consultants, to oversee the Work. EPA's Project Coordinator and Alternate Project Coordinator shall have the same authority as a remedial project manager and/or an on-scene coordinator, as described in the NCP. This includes the authority to halt the Work and/or to conduct or direct any necessary response action when he or she determines that conditions at the Site constitute an emergency or may present an immediate threat to public health or welfare or the environment due to a release or threatened release of Waste Material.

(3) Except as otherwise provided by EPA, Respondent's Project Coordinator shall meet with EPA's Project Coordinator at least monthly.

b. **Supervising Contractor**. Respondent's proposed Supervising Contractor must have sufficient technical expertise to supervise the Work and a quality assurance system that complies with ASQ/ANSI E4:2014, "Quality management systems for environmental information and technology programs – Requirements with guidance for use" (American Society for Quality, February 2014).

c. **Procedures for Disapproval/Notice to Proceed**

(1) Respondent shall designate, and notify EPA, within 10 days after the Effective Date, of the names, titles, contact information, and qualifications of the Respondent's proposed Project Coordinator and Supervising Contractor, whose qualifications

shall be subject to EPA's review for verification based on objective assessment criteria (*e.g.*, experience, capacity, technical expertise) and that they do not have a conflict of interest with respect to the project.

(2) EPA shall issue notices of disapproval and/or authorizations to proceed regarding the proposed Project Coordinator and Supervising Contractor, as applicable. If EPA issues a notice of disapproval, Respondent shall, within 30 days, submit to EPA a list of supplemental proposed Project Coordinators and/or Supervising Contractors, as applicable, including a description of the qualifications of each. EPA shall issue a notice of disapproval or authorization to proceed regarding each supplemental proposed coordinator and/or contractor. Respondent may select any coordinator/contractor covered by an authorization to proceed and shall, within 21 days, notify EPA of Respondent's selection.

(3) Respondent may change its Project Coordinator and/or Supervising Contractor, as applicable, by following the procedures of ¶¶ 29.c(1) and 29.c(2).

30. **Performance of Work in Accordance with SOW.** Respondent shall: (a) develop the RD; (b) perform the RA; (c) operate, maintain, and monitor the effectiveness of the RA; and (d) support EPA's periodic review efforts; all in accordance with the SOW and all EPA-approved, conditionally-approved, or modified deliverables as required by the SOW. All deliverables required to be submitted for approval under the Order or SOW shall be subject to approval by EPA in accordance with ¶ 7.6 (Approval of Deliverables) of the SOW.

31. **Emergencies and Releases**. Respondent shall comply with the emergency and release response and reporting requirements under ¶ 4.4 (Emergency Response and Reporting) of the SOW.

32. **Community Involvement**. If requested by EPA, Respondent shall conduct community involvement activities under EPA's oversight as provided for in, and in accordance with, Section 2 (Community Involvement) of the SOW. Such activities may include, but are not limited to, designation of a Community Involvement Coordinator.

33. **Modification**

a. EPA may, by written notice from the EPA Project Coordinator to Respondent, modify, or direct Respondent to modify, the SOW and/or any deliverable developed under the SOW, if such modification is necessary to achieve or maintain the Performance Standards or to carry out and maintain the effectiveness of the RA, and such modification is consistent with the Scope of the Remedy set forth in ¶ 1.3 of the SOW. Any other requirements of this Order may be modified in writing by EPA.

b. Respondent may submit written requests to modify the SOW and/or any deliverable developed under the SOW. If EPA approves the request in writing, the modification shall be effective upon the date of such approval or as otherwise specified in the approval. Respondent shall modify related deliverables in accordance with EPA's approval.

c. 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 Respondent shall relieve Respondent of its obligation to obtain any formal approval required by this Order, or to comply with all requirements of this Order, unless it is formally modified.

d. Nothing in this Order, the attached SOW, any deliverable required under this Order or the SOW, or any approval by EPA constitutes a warranty or representation of any kind by EPA that compliance with the work requirements set forth in this Order or the SOW or related deliverables will achieve the Performance Standards**.**

## XI. PROPERTY REQUIREMENTS

34. **Agreements Regarding Access and Non-Interference**. Respondent shall immediately, with respect to Affected Property owned by Respondent: (i) provide EPA and its representatives, contractors, and subcontractors with access at all reasonable times to such Affected Property to conduct any activity regarding the Order, including those listed in ¶ 34.0 (Access Requirements); and (ii) refrain from using such Affected Property in any manner that EPA determines will pose an unacceptable risk to human health or to the environment due to exposure to Waste Material, or interfere with or adversely affect the implementation, integrity, or protectiveness of the Remedial Action, including the restrictions listed in ¶ 34.b (Land, Water, or Other Resource Use Restrictions). Respondent shall, with respect to Non-Respondent Owners' Affected Property, use best efforts to secure agreements providing the access and use restrictions required by this Paragraph from Non-Respondent Owners and shall provide a copy of such access and use restriction agreements to EPA.

**a. Access Requirements**. The following is a list of activities for which access is required regarding the Affected Property:

(1) Monitoring the Work;

(2) Verifying any data or information submitted to EPA;

(3) Conducting investigations regarding contamination at or near the Site;

(4) Obtaining samples;

(5) Assessing the need for, planning, or implementing additional response actions at or near the Site;

(6) Assessing implementation of quality assurance and quality control practices as defined in the approved construction quality assurance quality control plan as provided in the SOW;

(7) Implementing the Work pursuant to the conditions set forth in ¶ I (Work Takeover);

(8) Inspecting and copying records, operating logs, contracts, or other documents maintained or generated by Respondent or its agents, consistent with Section XVI (Access to Information);

(9) Assessing Respondent's compliance with the Order;

(10) Determining whether the Affected Property is being used in a manner that is prohibited or restricted, or that may need to be prohibited or restricted under the Order; and

(11) Implementing, monitoring, maintaining, reporting on, and enforcing any land, water, or other resource use restrictions and any Institutional Controls regarding the Affected Property.

b. **Land, Water, or Other Resource Use Restrictions**. The following is a list of land, water, or other resource use restrictions applicable to the Affected Property and for which implementation is required under this Order:

(1) Prohibit excavation and other activities and uses that adversely impact the integrity of the cap, barrier walls, and other components installed during implementation of the remedial action at the Containment Area without prior approval of EPA, in consultation with the State of Delaware.

(2) Prohibit excavation and other activities and uses that adversely impact the integrity of clean fill, reactive core mats, geotextile demarcations, and other components installed over underlying impacted soil and sediments at the Site without prior approval of EPA, in consultation with the State of Delaware.

(3) Prohibit interference with the structure and function of restored wetlands and wetlands created as part of mitigation without prior approval of EPA, in consultation with the State of Delaware.

(4) Prohibit residential development or use at the Site without prior approval of EPA, in consultation with the State of Delaware.

(5) Prevent human contact with and exposure to groundwater contaminated by the Site via ingestion, vapor inhalation, or dermal contact.

(6) Prohibiting such activities and uses as may be required by the EPA-approved Treatment Plan submitted under ¶ 5.2 of the SOW.

35. Reserved.

36. **Best Efforts**. As used in this Section, "best efforts" means the efforts that a reasonable person in the position of Respondent would use to achieve the goal in a timely manner, including the cost of employing professional assistance and the payment of reasonable sums of money to secure access and/or use restriction agreements. If, within the timeframes provided in this Section XI, Respondent is unable to accomplish what is required through "best efforts," Respondent shall notify EPA, and include a description of the steps taken to comply with the requirements. If EPA deems it appropriate, it may assist Respondent, or take independent action, in obtaining such access and/or use restrictions. EPA reserves the right to pursue cost recovery regarding all costs incurred by the United States in providing such assistance or taking such action, including the cost of attorney time and the amount of monetary consideration or just compensation paid.

37. **Notice to Successors-in-Title**

a. Respondent shall, within 15 days after the Effective Date, submit for EPA approval a notice to be filed regarding its Affected Property in the appropriate land records. The notice must: (1) include a proper legal description of the Affected Property; (2) provide notice to all successors-in-title: (i) that the Affected Property is part of, or related to, the Site; (ii) that EPA has selected a remedy for the Site; and (iii) that EPA has issued an order requiring implementation of such remedy; and (3) identify the EPA docket number and Effective Date of this Order. Owner Respondent shall record the notice within 10 days after EPA's approval of the notice and submit to EPA, within 10 days thereafter, a certified copy of the recorded notice.

b. Respondent shall, prior to entering into a contract to Transfer its Affected Property, or 60 days prior to Transferring its Affected Property, whichever is earlier:

(1) Notify the proposed transferee that EPA has selected a remedy regarding the Site, and that EPA has issued an order requiring implementation of such remedy, and identifying this Order and the date it was issued by EPA; and

(2) Notify EPA of the name and address of the proposed transferee and provide EPA with a copy of the notice that it provided to the proposed transferee.

38. In the event of any Transfer of the Affected Property, unless EPA otherwise consents in writing, Respondent shall continue to comply with its obligations under the Order, including its obligation to secure access and ensure compliance with any land, water, or other resource use restrictions regarding the Affected Property, and to implement, maintain, monitor, and report on Institutional Controls.

## XII. FINANCIAL ASSURANCE

39. In order to ensure completion of the Work, Respondent shall secure financial assurance, initially in the amount of $39,645,546.00 ("Estimated Cost of the Work"). The financial assurance must be one or more of the mechanisms listed below, in a form substantially identical to the relevant sample documents available from EPA or under the "Financial

Assurance – Orders" category on the Cleanup Enforcement Model Language and Sample Documents Database at https://cfpub.epa.gov/compliance/models/, and satisfactory to EPA. Respondent may use multiple mechanisms if they are limited to trust funds, surety bonds guaranteeing payment, and/or letters of credit.

a. A trust fund: (1) established to ensure that funds will be available as and when needed for performance of the Work; (2) administered by a trustee that has the authority to act as a trustee and whose trust operations are regulated and examined by a federal or state agency; and (3) governed by an agreement that requires the trustee to make payments from the fund only when the Director of the EPA Region 3 Superfund & Emergency Management Division or his/her delegatee advises the trustee in writing that: (i) payments are necessary to fulfill the Respondent's obligations under the Order; or (ii) funds held in trust are in excess of the funds that are necessary to complete the performance of Work in accordance with this Order;

b. A surety bond, issued by a surety company among those listed as acceptable sureties on federal bonds as set forth in Circular 570 of the U.S. Department of the Treasury, guaranteeing payment or performance in accordance with ¶ 45 (Access to Financial Assurance);

c. An irrevocable letter of credit, issued by an entity that has the authority to issue letters of credit and whose letter-of-credit operations are regulated and examined by a federal or state agency, guaranteeing payment in accordance with ¶ 45 (Access to Financial Assurance);

d. A demonstration by Respondent that it meets the relevant financial test criteria of ¶ 42; or

e. A guarantee to fund or perform the Work executed by a company (1) that is a direct or indirect parent company of Respondent or has a "substantial business relationship" (as defined in 40 C.F.R. § 264.141(h)) with Respondent; and (2) can demonstrate to EPA's satisfaction that it meets the financial test criteria of ¶ 42.

40. **Standby Trust**. If Respondent seeks to establish financial assurance by using a surety bond, a letter of credit, or a corporate guarantee, Respondent shall at the same time establish and thereafter maintain a standby trust fund, which must meet the requirements specified in ¶ 39.a, and into which payments from the other financial assurance mechanism can be deposited if EPA so requires in accordance with the terms and conditions of the financial assurance mechanism and ¶ 45 (Access to Financial Assurance). An originally signed duplicate of the standby trust agreement must be submitted, with the other financial mechanism, to EPA in accordance with ¶ 41. Until the standby trust fund is funded pursuant to ¶ 45 (Access to Financial Assurance), neither payments into the standby trust fund nor annual valuations are required.

41. Within 45 days after the Effective Date, Respondent shall submit to EPA proposed financial assurance mechanisms in draft form in accordance with ¶ 39 for EPA's review. Within 60 days after the Effective Date, or 30 days after EPA's approval of the form and

substance of Respondent's financial assurance, whichever is later, Respondent shall secure all executed and/or otherwise finalized mechanisms or other documents consistent with the EPA-approved form of financial assurance and shall submit such mechanisms and documents to:

Joanne Marinelli, Chief
Cost Recovery Section
Program Support & Cost Recovery Branch
Superfund & Emergency Management Division
U.S. Environmental Protection Agency
Four Penn Center
1600 JFK Blvd.
Philadelphia, PA 19103-2029
Marinelli.joanne@epa.gov
(215) 814-3134

42. If Respondent seeks to provide financial assurance by means of a demonstration or guarantee under ¶ 39.d or 39.e, Respondent must, within 45 days of the Effective Date:

a. Demonstrate that:

(1) the Respondent or guarantor has:

i. Two of the following three ratios: a ratio of total liabilities to net worth less than 2.0; a ratio of the sum of net income plus depreciation, depletion, and amortization to total liabilities greater than 0.1; and a ratio of current assets to current liabilities greater than 1.5; and

ii. Net working capital and tangible net worth each at least six times the sum of the Estimated Cost of the Work and the amounts, if any, of other federal, state, or tribal environmental obligations financially assured through the use of a financial test or guarantee; and

iii. Tangible net worth of at least $10 million; and

iv. Assets located in the United States amounting to at least 90 percent of total assets or at least six times the sum of the Estimated Cost of the Work and the amounts, if any, of other federal, state, or tribal environmental obligations financially assured through the use of a financial test or guarantee; or

(2) The Respondent or guarantor has:

i. A current rating for its senior unsecured debt of AAA, AA, A, or BBB as issued by Standard and Poor's or Aaa, Aa, A or Baa as issued by Moody's; and

ii. Tangible net worth at least six times the sum of the Estimated Cost of the Work and the amounts, if any, of other federal, state, or tribal environmental obligations financially assured through the use of a financial test or guarantee; and

iii. Tangible net worth of at least $10 million; and

iv. Assets located in the United States amounting to at least 90 percent of total assets or at least six times the sum of the Estimated Cost of the Work and the amounts, if any, of other federal, state, or tribal environmental obligations financially assured through the use of a financial test or guarantee; and

b. Submit to EPA for the Respondent or guarantor: (1) a copy of an independent certified public accountant's report of the entity's financial statements for the latest completed fiscal year, which must not express an adverse opinion or disclaimer of opinion; and (2) a letter from its chief financial officer and a report from an independent certified public accountant substantially identical to the sample letter and reports available from EPA or under the "Financial Assurance – Orders" subject list category on the Cleanup Enforcement Model Language and Sample Documents Database at https://cfpub.epa.gov/compliance/models/.

43. Respondent shall diligently monitor the adequacy of the financial assurance. If Respondent becomes aware of any information indicating that the financial assurance provided under this Section is inadequate or otherwise no longer satisfies the requirements of this Section, Respondent shall notify EPA of such information within 30 days. If EPA determines that the financial assurance provided under this Section is inadequate or otherwise no longer satisfies the requirements of this Section, EPA will notify the Respondent of such determination. Respondent shall, within 30 days after notifying EPA or receiving notice from EPA under this Paragraph, secure and submit to EPA for approval a proposal for a revised or alternative financial assurance mechanism that satisfies the requirements of this Section. Respondent shall follow the procedures of ¶ 46 (Modification of Amount, Form, or Terms of Financial Assurance) in seeking approval of, and submitting documentation for, the revised or alternative financial assurance mechanism. Respondent's inability to secure financial assurance in accordance with this Section does not excuse performance of any other obligation under this Order.

44. If providing financial assurance by means of a demonstration or guarantee under ¶ 39.d or 39.e, Respondent must also:

a. Annually resubmit the documents described in ¶ 42.b within 90 days after the close of the Respondent's or guarantor's fiscal year;

b. Notify EPA within 30 days after the Respondent or guarantor determines that it no longer satisfies the relevant financial test criteria and requirements set forth in this Section; and

c. Provide to EPA, within 30 days of EPA's request, reports of the financial condition of the Respondent or guarantor in addition to those specified in ¶ 42.b; EPA may make such a request at any time based on a belief that the Respondent or guarantor may no longer meet the financial test requirements of this Section.

45. **Access to Financial Assurance**

a. If EPA determines that Respondent (1) has ceased implementation of any portion of the Work, (2) is seriously or repeatedly deficient or late in its performance of the Work, or (3) is implementing the Work in a manner that may cause an endangerment to human health or the environment, EPA may issue a written notice ("Performance Failure Notice") to both Respondent and the financial assurance provider regarding the Respondent's failure to perform. Any Performance Failure Notice issued by EPA will specify the grounds upon which such notice was issued and will provide Respondent a period of 10 days within which to remedy the circumstances giving rise to EPA's issuance of such notice. If, after expiration of the 10-day period specified in this Paragraph, Respondent has not remedied to EPA's satisfaction the circumstances giving rise to EPA's issuance of the relevant Performance Failure Notice, then, in accordance with any applicable financial assurance mechanism, EPA may at any time thereafter direct the financial assurance provider to immediately: (i) deposit any funds assured pursuant to this Section into the standby trust fund; or (ii) arrange for performance of the Work in accordance with this Order.

b. If EPA is notified by the provider of a financial assurance mechanism that it intends to cancel the mechanism, and the Respondent fails to provide an alternative financial assurance mechanism in accordance with this Section at least 30 days prior to the cancellation date, EPA may, prior to cancellation, direct the financial assurance provider to deposit any funds guaranteed under such mechanism into the standby trust fund for use consistent with this Section.

46. **Modification of Amount, Form, or Terms of Financial Assurance**. Respondent may submit, on any anniversary of the Effective Date or following Respondent's request for, and EPA's approval of, another date, a request to reduce the amount, or change the form or terms, of the financial assurance mechanism. Any such request must be submitted to the EPA individual(s) referenced in ¶ 41, and must include an estimate of the cost of the remaining Work, an explanation of the bases for the cost calculation, a description of the proposed changes, if any, to the form or terms of the financial assurance, and any newly proposed financial assurance documentation in accordance with the requirements of ¶¶ 39 and 40 (Standby Trust). EPA will notify Respondent of its decision to approve or disapprove a requested reduction or change. Respondent may reduce the amount or change the form or terms of the financial assurance only in accordance with EPA's approval. Within 30 days after receipt of EPA's approval of the requested modifications pursuant to this Paragraph, Respondent shall submit to the EPA

individual(s) referenced in ¶ 41 all executed and/or otherwise finalized documentation relating to the amended, reduced, or alternative financial assurance mechanism. Upon EPA's approval, the Estimated Cost of the Work shall be deemed to be the estimate of the cost of the remaining Work in the approved proposal.

47. **Release, Cancellation, or Discontinuation of Financial Assurance**. Respondent may release, cancel, or discontinue any financial assurance provided under this Section only: (a) after receipt of documentation issued by EPA certifying completion of the Work; or (b) in accordance with EPA's written approval of such release, cancellation, or discontinuation.

## XIII. INSURANCE

48. Not later than 15 days before commencing any on-site Work, Respondent shall secure, and shall maintain until the first anniversary after the Notice of RA Completion pursuant to ¶ 4.7 of the SOW, commercial general liability insurance with limits of liability of $1 million per occurrence, and automobile insurance with limits of liability of $1 million per accident, and umbrella liability insurance with limits of liability of $5 million in excess of the required commercial general liability and automobile liability limits, naming the United States as an additional insured with respect to all liability arising out of the activities performed by or on behalf of Respondent pursuant to this Order. In addition, for the duration of the Order, Respondent shall satisfy, or shall ensure that its contractors or subcontractors satisfy, all applicable laws and regulations regarding the provision of worker's compensation insurance for all persons performing Work on behalf of Respondent in furtherance of this Order. Within the same time period, Respondent shall provide EPA with certificates of such insurance and a copy of each insurance policy. Respondent shall submit such certificate and copies of policies each year on the anniversary of the Effective Date. If Respondent demonstrates 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 a lesser amount, then, with respect to that contractor or subcontractor, Respondent need provide only that portion of the insurance described above that is not maintained by the contractor or subcontractor. Respondent shall ensure that all submittals to EPA under this Paragraph identify the "Koppers Site, New Castle County, Delaware" and the EPA docket number for this Order.

## XIV. DELAY IN PERFORMANCE

49. Respondent shall notify EPA of any delay or anticipated delay in performing any requirement of this Order. Such notification shall be made by telephone and email to the EPA Project Coordinator within 48 hours after Respondent first knew or should have known that a delay might occur. Respondent shall adopt all reasonable measures to avoid or minimize any such delay. Within 7 days after notifying EPA by telephone and email, Respondent shall provide to EPA written notification fully describing the nature of the delay, the anticipated duration of the delay, any justification for the delay, all actions taken or to be taken to prevent or minimize the delay or the effect of the delay, a schedule for implementation of any measures to be taken to mitigate the effect of the delay, and any reason why Respondent should not be held strictly accountable for failing to comply with any relevant requirements of this Order. Increased costs

or expenses associated with implementation of the activities called for in this Order is not a justification for any delay in performance.

50. Any delay in performance of this Order that, in EPA's judgment, is not properly justified by Respondent under the terms of ¶ 49 shall be considered a violation of this Order. Any delay in performance of this Order shall not affect Respondent's obligations to fully perform all obligations under the terms and conditions of this Order.

## XV. RESERVED

51. Reserved.

52. Reserved.

## XVI. ACCESS TO INFORMATION

53. Respondent shall provide to EPA, upon request, copies of all records, reports, documents, and other information (including records, reports, documents, and other information in electronic form) (hereinafter referred to as "Records") within Respondent's possession or control or that of their contractors or agents relating to activities at the Site or to the implementation of this Order, 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 regarding the Work. Respondent shall also make available to EPA, for purposes of investigation, information gathering, or testimony, their employees, agents, or representatives with knowledge of relevant facts concerning the performance of the Work.

54. **Privileged and Protected Claims**

a. Respondent may assert that all or part of a Record requested by EPA is privileged or protected as provided under federal law, in lieu of providing the Record, provided Respondent comply with ¶ 54.b, and except as provided in ¶ 54.c.

b. If Respondent asserts a claim of privilege or protection, it shall provide EPA with the following information regarding such Record: its title; its date; the name, title, affiliation (*e.g.*, company or firm), and address of the author, of each addressee, and of each recipient; a description of the Record's contents; and the privilege or protection asserted. If a claim of privilege or protection applies only to a portion of a Record, Respondent shall provide the Record to EPA in redacted form to mask the privileged or protected portion only. Respondent shall retain all Records that it claims to be privileged or protected until EPA has had a reasonable opportunity to dispute the privilege or protection claim and any such dispute has been resolved in the Respondent's favor.

c. Respondent may make no claim of privilege or protection regarding: (1) any data regarding the Site, including, but not limited to, all sampling, analytical, monitoring, hydrogeologic, scientific, chemical, radiological, or engineering data, or the portion of any other

Record that evidences conditions at or around the Site; or (2) the portion of any Record that Respondent is required to create or generate pursuant to this Order.

55. **Business Confidential Claims**. Respondent may assert that all or part of a Record provided to EPA under this Section or Section XVII (Record Retention) is business confidential 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). Respondent shall segregate and clearly identify all Records or parts thereof submitted under this Order for which Respondent asserts business confidentiality claims. Records claimed as confidential business information will be afforded the protection specified in 40 C.F.R. Part 2, Subpart B. If no claim of confidentially accompanies Records when they are submitted to EPA, or if EPA has notified Respondent that the Records are not confidential under the standards of CERCLA § 104(e)(7) or 40 C.F.R. Part 2, Subpart B, the public may be given access to such Records without further notice to Respondent.

## XVII. RECORD RETENTION

56. During the pendency of this Order and for a minimum of 10 years after EPA provides Notice of Work Completion under ¶ 4.9 of the SOW, 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 (a) its liability under CERCLA with respect to the Site, or (b) the liability of any other person under CERCLA with respect to the Site. 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 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.

57. At the conclusion of this document retention period, Respondent shall notify EPA at least 90 days prior to the destruction of any such Records, and, upon request by EPA, and except as provided in ¶ 54, Respondent shall deliver any such Records to EPA.

58. Within 30 days after the Effective Date, Respondent shall submit a written certification to EPA's Project Coordinator 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 notification of potential liability by the United States or the State and that it has fully complied with any and all EPA 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. If Respondent is unable to so certify it shall submit a modified certification that explains in detail why it is unable to certify in full with regard to all Records.

## XVIII. ENFORCEMENT/WORK TAKEOVER

59. Any willful violation, or failure or refusal to comply with any provision of this Order may subject Respondent to civil penalties up to the maximum amount authorized by law. As of the date of issuance of this Order, the statutory maximum amount is $67,544.00 per violation per day. This maximum amount may increase in the future, as EPA amends its civil penalty amounts through rulemaking pursuant to the 1990 Federal Civil Penalties Inflation Adjustment Act (Public Law 101-410, codified at 28 U.S.C. § 2461), as amended by the 2015 Federal Civil Penalties Inflation Adjustment Act Improvement Act (Section 701 of Public Law 114-74)). The maximum amount to be applied to this violation will be set as the most recent maximum amount set forth in 40 C.F.R. § 19.4 as of the date that the U.S. District Court assesses any such penalty. In the event of such willful violation, or failure or refusal to comply, EPA may unilaterally carry out the actions required by this Order, pursuant to Section 104 of CERCLA, 42 U.S.C. § 9604, and/or may seek judicial enforcement of this Order pursuant to Section 106 of CERCLA, 42 U.S.C. § 9606. In addition, nothing in this Order shall limit EPA's authority under Section XII (Financial Assurance). Respondent may also be subject to punitive damages in an amount up to three times the amount of any cost incurred by the United States as a result of such failure to comply, as provided in Section 107(c)(3) of CERCLA, 42 U.S.C. § 9607(c)(3).

## XIX. RESERVATIONS OF RIGHTS

60. Nothing in this Order limits the rights and authorities of EPA and the United States:

a. To take, direct, or order all actions necessary, including to seek a court order, to protect public health, welfare, or the environment or to respond to an actual or threatened release of Waste Material on, at, or from the Site;

b. To select further response actions for the Site in accordance with CERCLA and the NCP;

c. To seek legal or equitable relief to enforce the terms of this Order;

d. To take other legal or equitable action as they deem appropriate and necessary, or to require Respondent in the future to perform additional activities pursuant to CERCLA or any other applicable law;

e. To bring an action against Respondent under Section 107 of CERCLA, 42 U.S.C. § 9607, for recovery of any costs incurred by EPA or the United States regarding this Order or the Site;

f. Regarding access to, and to require land, water, or other resource use restrictions and/or Institutional Controls regarding the Site under CERCLA, RCRA, or other applicable statutes and regulations; or

g. To obtain information and perform inspections in accordance with CERCLA, RCRA, and any other applicable statutes or regulations.

## XX. OTHER CLAIMS

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

62. Nothing in this Order constitutes a satisfaction of or release from any claim or cause of action against Respondent or any person not a party to this Order, 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 under Sections 106 and 107 of CERCLA, 42 U.S.C. §§ 9606 and 9607.

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

64. No action or decision by EPA pursuant to this Order 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).

## XXI. ADMINISTRATIVE RECORD

65. EPA has established an administrative record that contains the documents that form the basis for the issuance of this Order. A copy of the administrative record is available for viewing at https://semspub.epa.gov/src/collections/03/AR.

## XXII. APPENDICES

66. The following appendices are attached to and incorporated into this Order:

| | | |
|---|---|---|
| Appendix A | ROD Amendment | |
| Appendix B | Statement of Work | |
| | Exhibit 1 | Programmatic Agreement |
| Appendix C | EPA Administrative Order No. CERC-03-2006-0266-DC | |
| Appendix D | Incorporated Findings of Facts | |

## XXIII. SEVERABILITY

67. If a court issues an order that invalidates any provision of this Order or finds that Respondent has sufficient cause not to comply with one or more provisions of this Order, Respondent shall remain bound to comply with all provisions of this Order not invalidated or determined to be subject to a sufficient cause defense by the court's order.

## XXIV. REVOCATION OF EPA ORDER NO. CERC-03-2006-0255DC ("2006 ORDER") SUBJECT TO CERTAIN CONTINUING REQUIREMENTS

68. The 2006 Order is hereby revoked subject to the following:

a. Respondent's obligations under Section XVII (Record Retention) of the 2006 Order shall survive the revocation until 10 years after EPA provides Notice of Work Completion under this Order;

b. Respondent's obligations under Section XVIII (Access to Information) of the 2006 Order shall survive the revocation and continue for the duration of Respondent's obligations under Section XVI (Access to Information) of this Order; and

c. Respondent's obligations under Section XV (Insurance) of the 2006 Order shall survive the revocation until the date EPA approves Respondent's insurance submissions under Section XIII of this Order.

**IT IS SO ORDERED.**

PAUL LEONARD
Digitally signed by PAUL LEONARD
Date: 2023.08.21 11:13:17 -04'00'

Paul Leonard, Director
Superfund & Emergency Management Division
EPA Region 3

# APPENDIX A

# [ROD AMENDMENT]

# RECORD OF DECISION AMENDMENT
# KOPPERS CO., INC. (NEWPORT PLANT)
# SUPERFUND SITE

## NEWPORT / NEW CASTLE COUNTY, DELAWARE

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION 3, PHILADELPHIA, PENNSYLVANIA
August 2022

# TABLE OF CONTENTS

## 1 Contents

# LIST OF ACRONYMS:

| | |
|---|---|
| ACHP | Advisory Council of Historical Preservation |
| AR | Administrative Record |
| ARARs | Applicable or Relevant and Appropriate Requirements |
| BHHRA | Baseline Human Health Risk Assessment |
| CERCLA | Comprehensive Environmental Response, Compensation and Liability Act |
| COCs | Contaminants of Concern |
| DESHPO | Delaware State Historic Preservation Office |
| DELDOT | Delaware Department of Transportation |
| DNAPL | Dense Non-Aqueous Phase Liquid |
| DNREC-RS | Delaware Department of Natural Resources and Environmental Control, Remediation Section |
| DWSC | Dry Weathered Surface Creosote |
| EPA | Environmental Protection Agency |
| ERA | Ecological Risk Assessment |
| ESD | Explanation of Significant Difference |
| FFS | Focused Feasibility Study |
| FYR | Five Year Review |
| FS | Feasibility Study |
| HDPE | High Density Polyethylene |
| HI | Hazard Index |
| LPU | Low Permeability Unit |
| MCLs | Maximum Contaminant Levels |
| MCLGs | Maximum Contaminant Level Goals |
| NAPL | Non-Aqueous Phase Liquid |
| NCP | National Oil and Hazardous Substances Pollution Contingency Plan |
| NPDES | National Pollutant Discharge Elimination System |
| NPL | National Priority List |

| | |
|---|---|
| NHPA | National Historic Preservation Act |
| NRHP | National Register of Historic Places |
| PAH | Polycyclic Aromatic Hydrocarbons |
| PCP | Pentachlorophenol |
| PPM | Parts per Million |
| RA | Remedial Action |
| RAO | Remedial Action Objective |
| RBCs | Risk Based Concentrations |
| RCRA | Resource Conservation and Recovery Act |
| RD | Remedial Design |
| RI | Remedial Investigation |
| ROD | Record of Decision |
| TBC | To Be Considered |
| TPAHs | Total Polycyclic Aromatic Hydrocarbons |
| USFWS | United States Fish and Wildlife Survey |

# I. DECLARATION

# KOPPERS CO., INC. (NEWPORT PLANT) SUPERFUND SITE RECORD OF DECISION AMENDMENT NEWPORT / NEW CASTLE COUNTY, DELAWARE

## 1 SITE NAME AND LOCATION

Koppers Co., Inc. (Newport Plant) Superfund Site
Newport, New Castle County, Delaware
EPA ID Number: DED980552244

## 2 STATEMENT OF BASIS AND PURPOSE

This Record of Decision (ROD) Amendment replaces the remedy selected by the U.S. Environmental Protection Agency (EPA) for the Koppers Co., Inc. (Newport Plant) Superfund Site (the Site) in a ROD issued on September 30, 2005 (2005 ROD) (hereafter the 2005 Remedy). In this ROD Amendment EPA selects both an interim action (for groundwater) and a final action (for the remainder of the Site). The interim and final actions selected herein (Selected Remedial Action) were chosen in accordance with the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended (CERCLA), 42 U.S.C. §§ 9601-9675; and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 C.F.R Part 300, as amended.

This decision document is based on an Administrative Record (AR) which was developed in accordance with CERCLA §113(k). This AR is available for review online at: https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0300092. The AR is also available online at the EPA Region 3 Records Center, 1600 JFK Boulevard, Philadelphia, Pennsylvania, and the Kirkwood Public Library at 6000 Kirkwood Highway Wilmington, Delaware 19808 (302-995-7663). The AR Index identifies each document contained in the AR. When signed, this ROD Amendment will become part of the AR for the Site.

## 3 ASSESSMENT OF THE SITE

The Site is located on a parcel of approximately 300 acres in the northern part of New Castle County, Delaware, southwest of the town of Newport and northwest of the Interstate-95 and Route 141 interchange (New Castle County Parcel No. 07-046.40-310). The Site previously contained a wood treatment facility that was last operational in 1971. Soil, sediments, and groundwater at the Site are contaminated as a result of past wood-treatment activities.

The Site was identified as a potential hazardous waste site in 1979. Following multiple investigations, EPA proposed the Site to the CERCLA National Priorities List (NPL) in 1989 and finalized the listing on August 30, 1990.

In 1991, Beazer East, Inc. (Beazer) and E.I duPont de Nemours and Company, Inc. (DuPont) (the Site landowner at that time) signed an agreement with EPA under which the companies were to conduct a Remedial Investigation/Feasibility Study (RI/FS). The RI was completed in 2003 and the FS was completed in 2004.

EPA issued the 2005 ROD to address contaminated soils, sediments, and groundwater. On September 25, 2006, EPA issued an administrative order directing Beazer to implement the 2005 Remedy (2006 Order); Beazer agreed to comply. During the Remedial Design (RD), Beazer collected data showing that Site conditions were different than previously characterized and understood at the time the 2005 ROD was issued. This new data influenced design details for the excavation, consolidation, containment, and capping of soil, sediment, and Dense Non-Aqueous Phase Liquids (DNAPL). In addition, wetland banking, a future use of the Site that played a major role for including the extensive excavation of upland soil in the 2005 ROD, was no longer an intended use for the Site. EPA modified the 2006 Order in August 2014 to require that Beazer perform a Focused Feasibility Study (FFS) and in April 2019 to permit Beazer to submit a Request for ROD Amendment in lieu of an FFS. Beazer submitted a Request for ROD Amendment in August 2019.

This ROD Amendment modifies the 2005 Remedy.

# 4 DESCRIPTION OF INTERIM AND FINAL ACTIONS

The actions selected in this ROD Amendment constitute a final remedial action (Final Action) with respect to soils, sediments, and DNAPL in the saturated zone serving as a source for groundwater contamination. The actions selected herein for groundwater constitute an interim remedial action (Interim Action) and will not restore the groundwater to beneficial use. A final groundwater remedy will be selected in a subsequent decision document. This approach allows for evaluation of groundwater conditions during and following the removal of Principal Threat Waste.

The Final Action includes the following:

- Construction of a containment area on-Site for the placement of excavated materials and debris (Containment Area).
- Realignment of Hershey Run around the Containment Area.
- Installation of barrier walls around all sides of the Containment Area with monitoring to ensure the barrier walls function as designed.
- Excavation of contaminated soils, placement of a geotextile demarcation layer, and backfilling.
- Excavation of contaminated sediments (including channels and marsh/wetland areas), placement of a reactive core mat, and backfilling.
- Placement of excavated soils, sediments, and collected debris into the Containment Area.
- Capping the Containment Area.

- Recovery and off-Site treatment and disposal, or recyling, of the recoverable DNAPL in the saturated zone outside of the Containment Area.
- Mitigation of effects to wetlands impacted by the remediation.
- Implementation of institutional controls to protect the components of the remedy and to prevent residential development.
- Monitoring of surface water, sediment, biota, groundwater, porewater, and caps/covers.

The Interim Action includes the following:
- Institutional controls to prevent use of groundwater.

# 5 STATUTORY DETERMINATIONS

The Final Action selected in this ROD Amendment meets the mandates of CERCLA § 121 and the regulatory requirements of the NCP. The Final Action is protective of human health and the environment, is cost effective, complies with Federal and State requirements that are applicable or relevant and appropriate (ARARs) that are not waived, and utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable. This remedy also satisfies the statutory preference for treatment as a principal element of the remedy (i.e., reduction of toxicity, mobility, or volume of hazardous substances). In accordance with CERCLA § 121(c), a remedy review will be conducted no less than every five years after the initiation of the Final Action to ensure it continues to provide adequate protection of human health and the environment (such reviews are known as Five-Year Reviews (FYRs)). These reviews will continue until hazardous substances are no longer present above levels that allow for unlimited use and unrestricted exposure.

The Interim Action selected in this ROD Amendment is protective of human health and the environment in the short term and is intended to provide adequate protection until a final action is selected for groundwater. This Interim Action complies with federal and state ARARs that are not waived.

# 6 ROD AMENDMENT CERTIFICATION CHECKLIST

The information in the chart below is addressed in detail in the Decision Summary (Part II) of this ROD Amendment. Additional information can be found in the AR for this ROD Amendment.

| **ROD CERTIFICATION CHECKLIST** | |
|---|---|
| **Information** | **Location** |
| Chemicals of concern (COCs) and respective concentrations | Section 6.3 |
| Baseline risk represented by the COCs | Section 6 |
| Performance Standards established for COCs and the basis for these levels | Sections 12.2 & 12.3 |
| How source materials constituting principal threat are addressed | Section 3 & 11 |

| | |
|---|---|
| Current and reasonably anticipated future land use assumptions and potential future beneficial uses of groundwater | Section 5 |
| Potential future land and groundwater uses that will be available at the Site as a result of the Final Action | Section 5 |
| Estimated capital, annual operation and maintenance, and total present worth costs, discount rate, and the number of years over which the remedial action cost estimates are projected | Sections 10.7, 12.4 & IV |
| Key factors that led to selecting the Final Action | Section 7 |

# 7 AUTHORIZING SIGNATURE

This ROD Amendment documents the selection of a Final Action with respect to soils, sediments, and DNAPL serving as a source for groundwater contamination, and an Interim Action with respect to groundwater. EPA selected these actions with the concurrence of the Delaware Department of Natural Resources and Environmental Control, Remediation Section (DNREC-RS).

Approved by:

PAUL LEONARD Digitally signed by PAUL LEONARD
Date: 2022.08.04 12:05:18 -04'00'

Paul Leonard, Director
Superfund & Emergency Management Division
EPA Region III

# II. DECISION SUMMARY

# KOPPERS CO., INC. (NEWPORT PLANT) SUPERFUND SITE RECORD OF DECISION AMENDMENT NEWPORT / NEW COUSTLE COUNTY, DELAWARE

## 1 SITE NAME, LOCATION, DESCRIPTION, & BACKROUND

### 1.1 Site Location & Features

The Site is located on a parcel of approximately 300 acres in the northern part of New Castle County, Delaware, southwest of the town of Newport and northwest of the Interstate-95 and Route 141 interchange (Figures 1 and 4). To the north, the Site is bordered by high-speed railroad lines. Beyond the rail lines are a former municipal sewage treatment facility, an industrial property, and a residential area. To the east, the Site is bordered by the former DuPont Holly Run Plant, the BASF plant, and the Christina River. To the south and west, the Site is bordered by White Clay Creek and Hershey Run, respectively. To the west of the Site, across Hershey Run, lies Bread and Cheese Island.

The Site contains approximately 163 acres of upland areas and 136 acres of wetlands, and three ponds. The Site previously contained a wood treatment facility that was last operational in 1971. Soil, sediments, and groundwater at the Site are contaminated as a result of past wood treatment activities. Contamination at the Site is present in the following areas: (a) upland soils, (b) Hershey Run, (c) the Fire Pond, (d) the South Pond area (the non-tidal South Pond itself and the tidal West Central Drainage area), and (e) groundwater (Figure 2). The East Central and Central Drainage Areas (the marshes bordering the Christina River) and the wooded uplands to the south of the former wood treatment facility are generally free of Site-related contaminants.

### 1.2 History of Contamination

In 1929, a group of parcels comprising the Site was conveyed by Lynam and Wright to the Delaware Wood Preserving Company, which began conducting wood treatment operations on these parcels. In 1931, the Site property was sold to Century Wood Preserving Company (Century). Four years later, in 1935, the Wood Preserving Company acquired the Site property and all associated stock from Century. Through liquidation of the Wood Preserving Company, Koppers Company acquired the Site property in 1940 and reorganized in 1944 into Koppers Company, Inc. (Koppers). Koppers then continued wood-treatment operations at the Site until 1971, when the Site property was sold to DuPont. DuPont deeded the property to Beazer East, Inc. (Beazer), the current owner, in or around 2004.

From 1974 to 1977, the New Castle County Department of Public Works leased the northern part of the Site and built and operated a wastewater treatment facility to temporarily handle the County's wastewater treatment needs until permanent facilities were built. In 1977, the County sold the building to DuPont and discontinued wastewater treatment operations at the Site. Demolition of the wastewater treatment facility was completed in 2021. Except for the County's wastewater treatment operations, the Site has remained largely inactive since wood treating operations ceased in 1971.

The primary material used in wood treatment processes at the Site was a creosote/coal tar solution which was used to preserve railroad ties, telephone poles, and other wood products. Pentachlorophenol (PCP) was also used to treat the wood, although to a much smaller degree. An array of rail tracks located throughout the operations area was used to move wood and materials to, from, and within the Site. Creosote handling occurred in, among other places, the Process Area and Drip Track Area (Figure 2).

Located in the northwestern portion of the Site, the Process Area (where wood preservatives were applied) contained various types of wood treatment equipment and associated structures. This area also provided storage for approximately one million gallons of creosote and other process-related materials. Wood treatment consisted of heating and pressurizing tanks filled with creosote and wood, forcing creosote into the wood. After treatment, freshly treated wood products were temporarily allowed to cure and drip dry in the Drip Track Area prior to transfer to the Wood Storage Area. The Fire Pond was created as a source of water for firefighting purposes.

Operations, including spills and leaks, allowed contaminants to seep into the soil. It is likely that the contaminants escaped into Hershey Run by flowing as a separate phase with the shallow groundwater, or by being washed toward Hershey Run during storm events.

The Site was identified as a potential hazardous waste site in 1979. Following multiple investigations, EPA proposed the Site to the NPL in 1989 and finalized the listing on August 30, 1990.

## 1.3 Remedial Investigation/Feasibility Study and Record of Decision

In 1991, Beazer and DuPont (the Site landowner at that time) signed an agreement with EPA under which the companies were to conduct an RI/FS to investigate the nature and extent of contamination at the Site and identify alternatives for remediation. The Remedial Investigation was completed in 2003; the Feasibility Study was completed in 2004.

EPA issued the 2005 ROD on September 30, 2005 to address contaminated soils, sediments, and groundwater. The contaminants of concern (COCs) identified in the 2005 ROD were polycyclic aromatic hydrocarbons (PAHs). The Remedial Action Objectives (RAOs) identified in the 2005 ROD included the following:

- Prevent current or future direct contact with contaminated soils and sediments that would result in unacceptable levels of risk to ecological receptors by reducing total PAHs (TPAHs) to below 150 parts per million (ppm) in sediment and 600 ppm in soil (150 ppm in soil that was to be converted to wetlands);

- Prevent unacceptable human health risks due to exposure to contaminated groundwater;

- Minimize the on-going contamination of groundwater from the presence of Non-Aqueous Phase Liquid (NAPL) through removal and/or containment;

- Prevent direct contact threats to an adult or child trespasser and to an industrial worker;

- Protect potential future residents from contact with contaminated soil and/or groundwater by preventing the construction of residential buildings on any part of the Site; and

- Restore groundwater at the Site to its beneficial use.

The 2005 Remedy included the following components:

- Excavation of soils and sediments with TPAHs greater than 600 ppm in soil and with TPAHs greater than 150 ppm in sediments;
- In areas where wetlands were to be created, excavation of soils containing TPAHs greater than 150 ppm;
- Consolidation of excavated soils and sediments into one or two on-Site containment area(s);
- Construction of groundwater barrier walls and collection systems (*e.g.,* passive recovery trenches) in the containment area(s). The barrier walls would not fully enclose the containment area(s), but would instead be open on the upgradient side to allow groundwater flow into the containment area(s);
- Installation, operation, and maintenance of a groundwater extraction and treatment system to prevent migration of impacted groundwater from the containment area(s) and to prevent the discharge of impacted groundwater from the extraction operation. In addition, an oil-water separator would be installed to facilitate the recovery of free-phase DNAPL as well as to prevent DNAPL from reaching the groundwater treatment system;
- Separation of creosote from groundwater and transportation of creosote off-Site for disposal or recycling;

- Management of the hydraulic head of groundwater and collection of DNAPL through the use of passive recovery trenches in the containment area(s);
- Treatment of groundwater as necessary to meet discharge requirements;
- Movement of debris to containment area(s);
- Installation of a modified Resource Conservation and Recovery Act (RCRA) cap atop the containment area(s);
- Relocation of a portion of the existing channel of Hershey Run;
- Creation of wetlands to replace wetlands filled as part of the containment area(s) construction and for wetland mitigation banking;
- Monitoring groundwater, surface water, sediments, and wetlands to ensure the effectiveness of the remedy;
- Prevention of exposure to contamination inside of the containment area(s) or in groundwater beneath the Site, and prevention of the drawdown of contamination into the deeper aquifer or elsewhere, through land and groundwater use restrictions; and
- Protection of remedial components through implementation of institutional controls (ICs).

## 1.4 Administrative Order, Explanation of Significant Differences, and First Modification of the Administrative Order

On September 26, 2006, EPA issued an Administrative Order for Remedial Design/Remedial Action (RD/RA) (EPA Docket No. CERC-03-2006-0266DC) (2006 Order) to Beazer. The 2006 Order directed Beazer to implement the 2005 ROD.

On May 28, 2010, EPA modified the 2005 Remedy by issuing an Explanation of Significant Difference (ESD) to clarify that the substantive provisions of the National Historic Preservation Act (NHPA) and its implementing regulations were applicable to all activities performed to implement the Selected Remedial Action.

On August 16, 2010, EPA issued a modification to the 2006 Order incorporating the ESD into the 2006 Order (Modification No. 1).

## 1.5 Cultural Investigations, Consultation with Tribes, and NHPA Consultation

As part of the Remedial Design work, Beazer, in consultation with Delaware State Historic Preservation Office (DESHPO) and EPA, performed investigations at the Site to determine archaeological significance and to evaluate eligibility for the National Register of Historic Places (NRHP). This work included Phase 1A, Phase 1B, and Phase 2 archaeological investigations, and the recovery of over 24,000 artifacts. Based on investigations, specific areas at the Site were recommended by Beazer for NRHP-eligibility.

EPA identified Federally Recognized Tribes associated with the Site for purposes of performing government-to-government consultation consistent with EPA policy.[1] EPA and DESHPO additionally identified State Tribes and other stakeholders, together with the Federally Recognized Tribes, for consultation under Section 106 of the NHPA, 54 U.S.C. § 300101 *et seq.*, and its implementing regulations at 36 C.F.R. Part 800. These consultation efforts will lead to the consummation of a document setting forth procedures for mitigation of adverse effects to historic property from implementation of the remedial action at the Site. A draft of that document, the *"Programmatic Agreement Between the U.S. Environmental Protection Agency, Region III; The Delaware State Historic Preservation Office; and the Advisory Council on Historic Preservation Regarding Cleanup of the Koppers Newport Superfund Site, Newport, New Castle County, Delaware"* (Programmatic Agreement) will be made available for public comment prior to finalization. The Programmatic Agreement and any plans describing steps to be taken to minimize adverse effects to historic property will be finalized prior to commencement of remedial action activities.

## 1.6 Events Leading to Remedy Modification, and Second & Third Modification of the Administrative Order

Beazer began Remedial Design work following issuance of the 2006 Order. New data collected during the Remedial Design showed that Site conditions were different than previously characterized and understood at the time the 2005 ROD was issued. In addition, wetland banking was no longer an intended reuse of the Site.[2] The new data and changed Site use significantly influenced design details for excavation, consolidation, containment, and capping resulting in a divergence from the 2005 Remedy.

On August 19, 2014, EPA issued a second modification to the 2006 Order (Modification No. 2). This modification (a) suspended work in aid of design and construction of the 2005 Remedy, and (b) required Beazer to submit an FFS to provide information to enable EPA to evaluate changes to the 2005 Remedy based on Beazer's design work.

On April 30, 2019, EPA issued a third modification to the 2006 Order (Modification No. 3), which permitted Beazer to provide the information that would have been supplied to EPA in the FFS in a Request for ROD Amendment. Beazer provided its Request for ROD Amendment to EPA in the August 2019 "Final Remedy Modification and Record of Decision Amendment Technical Document" (Request for ROD Amendment Technical Document).

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1 Government-to-government consultation provides the opportunity for Federally Recognized Tribes associated with the Site to provide meaningful input in the selection of a remedy. This consultation is described in "EPA Policy on Consultation and Coordination with Indian Tribes" (May 4, 2011) (https://www.epa.gov/sites/production/files/2013-08/documents/cons-and-coord-with-indian-tribes-policy.pdf) .

2 In the 2005 ROD, EPA acknowledged that future use of the Site included development of wetlands for banking purposes associated with highway construction to be performed by the Delaware Department of Transportation (DELDOT). Wetlands' banking was a driver for the remedy's inclusion of deep upland soil excavation (to depths of up to 30 feet in saturated conditions). However, DELDOT's wetland needs were ultimately satisfied through other means and banking was no longer desired for the Site.

# 2 COMMUNITY PARTICIPATION

The Proposed Plan for this ROD Amendment and the AR supporting selection of the remedy can be viewed online at https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0300092, or at the EPA Region III Records Center in Philadelphia, Pennsylvania. If a member of the community does not have a computer readily available, the Kirkwood Public Library at 6000 Kirkwood Highway Wilmington, Delaware 19808 (302-995-7663) has computers available to review the AR. EPA held a 30-day public comment period from March 2, 2021 through March 31, 2021 and held a telephonic public availability session on March 17, 2021, during which no members from the community called in to raise questions or concerns. Because of a request for an extension to the public comment period, EPA reopened the public comment period from April 14, 2021 through May 14, 2021. A summary of the significant public comments received is included in the Responsiveness Summary in Part III of this ROD Amendment.

# 3 SCOPE AND ROLE OF THE RESPONSE ACTION

In the 2005 ROD, EPA selected a comprehensive remedy for the Site which included a groundwater cleanup component. In this ROD Amendment, EPA replaces the 2005 remedy with a final remedy for soils, sediments, and DNAPL in the saturated zone serving as a source for groundwater contamination; and an interim remedy for groundwater that will address certain risks presented by contamination but will not restore the groundwater to beneficial use. Selection of a comprehensive (final) groundwater remedy will take place in a subsequent decision document subject to the requisite public participation. EPA chose this approach because it permits use of data obtained during implementation of the final remedy for soil, sediment, and DNAPL in the saturated zone with associated monitoring to support the selection of a final groundwater remedy.

EPA characterizes waste as either principal threat waste or low-level threat waste. While contaminated groundwater is generally not considered to be a source material, NAPL in groundwater may be viewed as source material. By addressing the principal threat waste (i.e., the DNAPL in the saturated zone and the surface soils and sediments that act as a source for direct exposure), EPA can further evaluate groundwater outside the Containment Area after the principal threat waste is removed and or contained in a final remedy.

**WHAT IS A "PRINCIPAL THREAT"?**

The NCP establishes an expectation that EPA will use treatment to address the principal threats posed by a site wherever practicable (NCP § 300.430(a)(1)(iii)(A)). The "principal threat" concept is applied to the characterization of "source material" at a Superfund site. Source material is material that includes or contains hazardous substances or pollutants or contaminants that act as a reservoir for migration of contamination to groundwater, surface water, or air, or acts as a source for direct exposure. In general, contaminated groundwater is not considered to be source material; however, Non-Aqueous Phase Liquids (NAPLs) in groundwater may be viewed as source material. Principal threat wastes are those source 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. The decision to treat these wastes is made on a site-specific basis through a detailed analysis of the alternatives using the nine remedy selection criteria. This analysis provides a basis for making a statutory finding that the remedy employs treatment as a principal element.

# 4 SITE CHARACTERISTICS

The Site is located in the Coastal Plain Physiographic Province in New Castle County, Delaware, near the fall line with the Piedmont Physiographic Province.

Access to the Site is restricted through the use of guarded 24-hour security gates at the adjacent facility, fencing, and posting. Natural barriers such as the Christina River, White Clay Creek, Hershey Run, and the surrounding marshes and wetlands also limit access to the Site, as does the high-speed Amtrak rail line to the north.

The Site contains approximately 163 acres of upland areas and 136 acres of wetlands, and three ponds. The wetlands are comprised of freshwater tidal marsh, non-tidal emergent wetlands, non-tidal forested wetlands, and non-tidal scrub/shrub wetlands. Tidal wetlands at the Site individually drain into Hershey Run, White Clay Creek, and the Christina River. Non-tidal wetlands occur in the South Pond Area, Fire Pond Area, and smaller disjunct non-tidal wetlands in the low-lying areas in the uplands of the Process and Wood Storage Areas.

Three distinct hydrostratigraphic units are present at the Site. The first hydrostratigraphic unit includes the Fill, the Quaternary Deposits, and the Columbia Formation. The second hydrostratigraphic unit is a low-permeability unit that exists transitionally between the Columbia Formation and the Potomac aquifer. The third hydrostratigraphic unit is the Potomac aquifer. Data obtained by Beazer during its design efforts indicates that the low-permeability unit is an effective hydraulic barrier that inhibits vertical migration from the Columbia Formation to the Potomac Aquifer at the Site.

Fill is the uppermost unit encountered in the uplands area and varies in thickness from 0 to approximately 9 feet with greater thickness observed in the Process Area and the Fire Pond Area.

The fill is composed primarily of silts with lesser amounts of sands, gravels, and clays. In addition, the fill contains various anthropogenic materials including stone fill, brick and concrete fragments, asphalt pavement, railroad tie pieces, coal and ash debris, wood, steel, and iron debris. Dry weathered surface creosote is present within the fill.

The Quaternary Deposits overlie most of the unconsolidated Columbia Formation. The Quaternary Deposits are generally comprised of silts, with lesser amounts of sand, gravel, and clays as well as organic matter in the form of roots, peat, reeds, and other organic debris. These deposits range in thickness from 0 feet to upwards of approximately 10 to 15 feet and generally decrease in thickness near drainage areas.

The Columbia Formation is composed of primarily silty sands and gravels with seams and thin beds (up to 2 feet in thickness) of silts. The Columbia Formation was encountered in thickness ranging from 0 feet to approximately 20 to 25 feet and is generally thicker near the Process Area and Drip Track Area.

The Potomac Aquifer is composed of silts and clays interlayered with medium to fine sands. At the Site, a lower-permeability layer is typically observed at the top of this unit and can vary from clay to clayey silt or clayey sand. The Potomac Formation is distinguished from the Columbia Formation by smaller grain sizes and the usual presence of the lower-permeability clayey layer at the contact point with the Columbia Formation.

The 2015 gauging data from wells in the Columbia and Potomac formations indicates that groundwater flow in the Columbia and Potomac is generally to the west and south, toward surface drainage areas at Hershey Run, White Clay Creek, and the Christina River. Relative groundwater heads in the Columbia and underlying Potomac indicate potential downward vertical gradients from the Columbia to the Potomac in the northern upland areas and upward gradients from the Potomac to the Columbia in the discharge areas.

No drinking water wells are located within the Site boundaries.

# 5 CURRENT AND POTENTIAL FUTURE LAND USE AND RESOURCE USE

Land use in the area of the Site includes a mix of industrial, commercial, and residential parcels. The Site is zoned for industrial use. The adjacent properties include the DuPont Newport Superfund Site and BASF, an active industrial facility. The Site is bounded to the north by the Amtrak rail line. Beyond the Amtrak rail line are additional industrial facilities and residential properties. Because access to the Site is very limited and the Site is zoned industrial, EPA assumes that future use of portions of the Site will be industrial in nature, and that given the limited access and presence of wetlands, much of the Site will remain undeveloped and used for ecological purposes.

# 6 SUMMARY OF SITE RISKS

Prior to issuing the 2005 ROD, EPA oversaw performance of analyses to estimate the human health and environmental risks that could result if contamination at the Site was not addressed. These analyses, commonly referred to as risk assessments, identify existing and potential future risks that could occur if conditions at the Site do not change. The Baseline Human Health Risk Assessment (BHHRA) evaluated human health risks and the Ecological Risk Assessment (ERA) evaluated environmental impacts from Site contamination. The risk assessments performed for the Koppers Site demonstrated that actual or threatened releases of hazardous substances from the Site, if not addressed, may present a current or potential threat to public health, welfare, or the environment. *See* Section 7 (Site Risks) of the 2005 ROD for details of the BHHRA and ERA.

## 6.1 Human Health Assessment

As set forth in NCP § 300.430(e)(2), EPA has set a target risk range of $10^{-4}$ to $10^{-6}$ for a lifetime excess carcinogenic risk. For non-carcinogenic risk, EPA has set a target Hazard Index (HI) of no greater than 1.

During the Remedial Investigation, a number of organic and inorganic chemicals were detected in Site soils, sediments, and groundwater. Chemicals with maximum concentrations and/or analytical method detection limits of less than Risk-Based Concentrations (RBCs) (currently referred to as Regional Screening Levels (RSLs)) were eliminated from further consideration in the risk assessment. This analysis concluded that PAHs were the primary COCs at the Site. Potential human health effects associated with exposure to PAHs were estimated quantitatively or qualitatively through the evaluation of several actual or potential exposure pathways developed to reflect the potential for exposure to hazardous substances at the Site. Five different exposure scenarios were considered in the Koppers BHHRA: (1) on-Site construction worker; (2) on-Site industrial worker; (3) adolescent trespasser; (4) adolescent swimmer; and (5) angler. The BHHRA considered the effects of ingestion of, and dermal contact with, soils, sediments, surface water, and groundwater at the Site. The BHHRA also considered the inhalation of chemical volatilization from groundwater and dermal contact while showering.

The BHHRA documented risks to human health exceeding EPA's target risk range. For example, the BHHRA revealed that the carcinogenic risk for an industrial worker from ingestion and dermal exposure to soils was $3 \times 10^{-4}$, with a majority of the risk caused by the incidental ingestion of soil ($2 \times 10^{-4}$). The contaminant contributing most heavily to the risk was benzo(a)pyrene, with other PAHs including benzo(a)anthracene, benzo(b)fluoranthene, and dibenz(a,h)anthracene also contributing. EPA concluded that risks to industrial workers exceeded the carcinogenic risk level. Risk to adolescent trespassers were at the carcinogenic risk point of departure in soils and surface water.

For groundwater, the BHHRA documented carcinogenic risk from dermal ($1.3 \times 10^{-3}$) and ingestion ($4.6 \times 10^{-1}$) exposure for a future industrial worker. Scenarios evaluating exposure to groundwater without NAPL present did not result in carcinogenic risk outside of the acceptable range. The non-carcinogenic risks from groundwater to a future industrial worker resulted in an HI of 115 from dermal exposure and an HI of 170 from ingestion scenario. The risk to a future industrial worker where NAPL was not present in the groundwater produced an HI of 1.3 when the ingestion, dermal, and inhalation pathways were combined. The HI exceedance of 1 was largely caused by high background levels of metals that occur in Columbia Aquifer groundwater, which contributed to the ingestion pathway risks.

A summary of the risk calculations for all of the scenarios evaluated (including groundwater) is presented in Table 5 of the 2005 ROD.

EPA recalculated the risks at the Koppers Site in 2017 using EPA's most current toxicity values and guidance documents. All data concentrations used to recalculate risk were taken from the 2005 ROD. Results showed cancer risks exceed EPA's acceptable levels for cumulative carcinogenic risk for the industrial worker. Risks were primarily contributed by benzo(a)pyrene and benzo(b)fluoranthene, with dibenzo(a,h)anthracene and indeno(1,2,3-cd)pyrene being contributing contaminants. Cumulative carcinogenic risk is within EPA's acceptable risk range for the adolescent trespasser. Non-cancer risks were exceeded for all receptors (construction worker, industrial worker, and adolescent trespasser) due to metals (thallium and manganese). However, when metals were evaluated individually, non-cancer risk is at EPA's acceptable benchmark level.

## 6.2 Ecological Risk Assessment

An ERA serves to evaluate the potential for risks due to exposure to Site contaminants specific to ecological receptors (such as wildlife, fish, and plants). ERA conclusions were largely based upon the results of Site-specific toxicity tests conducted with Site sediment on the amphipod (*Hyalella azteca)* and the midge (a small fly) (*Chironomus tentans),* and with Site soil on the earthworm (*Eisenia foetida)*, as supplemented with plant community observations.

At the Koppers Site, a total of 12 assessment endpoints were evaluated, six related to direct exposure and six related to exposure to contamination through the food chain for non-aquatic receptors. Only the six related to direct exposure identified risks associated with the creosote contamination. Table 7 of the 2005 ROD provides additional information.

Where adverse effects were found, the concentration of contaminants in test sediments were used to determine the concentration at which minimal or no adverse effects may occur (the NOAEL), and above what contaminant levels adverse effects would be expected (the LOAEL). In addition, the type of adverse effect (*e.g*., death or reduced growth) was taken into consideration in evaluating the certainty and severity of risk.

In summary, EPA concluded that PAHs posed ecological risks to the upland, wetland, and aquatic communities at the Site, specifically to organisms low in the food chain (*i.e.,* earthworms, insects, shelled organisms, fish and frog embryos, and both upland and aquatic plants). In general, the aquatic assessment endpoints were more sensitive than the terrestrial assessment endpoints with respect to the calculated NOAEL and LOAEL levels. For the aquatic assessment endpoints the NOAEL was calculated to be 82.87 ppm total PAHs and the LOAEL was calculated to be 197.6 ppm. For the terrestrial assessment endpoints, the NOAEL was determined to be 587 ppm TPAHs, with a LOAEL of 1,264 ppm.

### 6.3 Basis for Remedial Action

The basis for taking remedial action at the Site is the unacceptable human health and environmental risks from PAHs. Because there are unacceptable risks from PAHs to upland, wetland, and aquatic communities at the Site and unacceptable risks to an industrial worker, EPA is taking an action. Based on the results of the risk assessments, EPA determined that a sediment cleanup level of 150 ppm TPAHs (approximately the geometric mean between the sediment NOAEL of 83 and the LOAEL of 198) and a soil cleanup level of 600 ppm TPAHs (just above the NOAEL of 587) were appropriate levels to provide protection to human health and the environment in the 2005 ROD. These levels will be used in this ROD Amendment. The COCs are PAHs as identified in the 2005 ROD.

EPA has determined that implementation of the Selected Remedial Action is necessary to reduce the risks for these receptors to levels at or below EPA's risk range.

## 7 REASONS FOR ISSUING ROD AMENDMENT

During the Remedial Design, Beazer collected data showing that Site conditions were different than previously characterized and understood at the time the 2005 ROD was issued. This new data influenced design details for the excavation, consolidation, containment, and capping of soil, sediment, and DNAPL in the saturated zone. In addition, wetland banking, a future use of the Site which played a major role for including the extensive excavation of upland soil in the 2005 Remedy, was no longer an intended use for the Site.

In the Request for ROD Amendment Technical Document, Beazer identified how new data and changes to the future use of the Site would impact the design of the 2005 Remedy. These impacts are discussed below.

### 7.1 Soils

Under the 2005 Remedy, soil excavation in areas not designated for wetlands creation and which were contaminated above 600 ppm TPAHs would be excavated. Where wetlands were to be created (for wetland banking and to restore wetlands damaged by the cleanup at the Site), soils contaminated above 150 ppm TPAHs would be excavated. The excavated material would be consolidated on-Site into one or two containment area(s). During excavations, DNAPL in the saturated zone was to be collected and disposed at an off-Site RCRA facility (this waste had been determined to be a RCRA hazardous waste). EPA estimated excavations ranging from 5-15 feet to achieve cleanup goals, with some areas excavated to a depth up to 30 feet.

Beazer's design investigations showed that areas where TPAHs exceeded 600 ppm were limited to dry weathered surface creosote areas. This dry weathered surface creosote is immobile but presents a direct contact threat to humans and ecological receptors. In addition, the investigations identified DNAPL in the saturated zone in additional locations than identified in the 2005 ROD, therefore increasing the amount of excavation necessary for removal.

In the 2005 ROD, the need for deep excavations was driven by the assumption that wetland banking would occur at the Site and to remove DNAPL in the saturated zone. Because wetland banking is no longer an intended reuse of the Site, deeper excavations to remove contamination for purposes of creating wetlands are no longer needed. Shallower excavations would satisfy remediation goals by eliminating the direct contact threat to humans and ecological receptors on the surface, and DNAPL in the saturated zone could be removed via DNAPL recovery wells in a more controlled manner (see subsection 7.4 below, for additional discussion of DNAPL recovery). Shallow excavations would reduce the volume of material to be removed by an estimated 640,000 cubic yards.

## 7.2 Sediment & Marshes

Under the 2005 ROD, sediments with TPAHs exceeding 150 ppm were to be excavated and consolidated into one or two containment area(s). At the time the 2005 ROD was issued, EPA assumed that a majority of the excavations would average 2 to 4 feet, with some areas excavated up to 13 feet. Sediment excavation would be conducted in Hershey Run, Fire Pond, and the West Central Drainage Canal and associated marshes.

Beazer's investigations found significantly deeper impacts in lower Hershey Run (depths commonly more than 5 feet and in multiple areas greater than 10 feet) and that the impacts were variable across the length and width of the channel.

Deep excavations in a saturated environment presents a panoply of technical complications and takes longer to implement because the excavation areas are affected by tidal conditions leading to limitations on the timing of such excavations. These issues could be avoided through shallow excavation of contaminated sediments and placement of a reactive core mat over the underlying sediments. The reduction in volume of material to be removed is estimated at 37,000 cubic yards.

The DNAPL observed in the subsurface outside of areas subject to DNAPL recovery (Hershey Run Channel outside the confines of the Containment Area and the West Central Drainage Channel) exist as discontinuous blebs or small thin seams and any impacts from the blebs and thin seams are expected to be localized and to migrate upwards. Any upward migration of contaminants would be addressed with the reactive core mats.

## 7.3 Consolidation of Soils/Sediments into Containment Area

Under the 2005 Remedy, excavated soils, sediments, and debris were to be consolidated and placed into one or two containment area(s) to be built on the Site. Because a significantly smaller volume of material would need to be excavated and consolidated, only one containment area would be necessary.

## 7.4 DNAPL Recovery

Under the 2005 Remedy, soils were to be excavated where TPAHs exceeded 600 ppm (where wetlands were not being created) or 150 ppm (where wetlands were to be created). EPA estimated that excavations would range on average between 5-15 feet. Any DNAPL in the saturated zone was to be collected and disposed at an off-Site RCRA facility.

During Beazer's investigations, DNAPL in the saturated zone was found in additional locations, commonly at depths 30 feet below ground surface. Excavations of soils at these depths in a saturated environment presents numerous technical complications. Such contamination could be addressed with fewer complications and in a more controlled manner using DNAPL recovery wells. This approach would be easier to implement and control and would limit the amount of excavation necessary in a saturated environment while still extracting the recoverable DNAPL impacting groundwater. Beazer conducted a DNAPL recovery pilot program at the Site, which verified the effectiveness of this approach.

The areas with DNAPL in the saturated zone that is impacting groundwater, and which is recoverable, are located in the Former Process and South Pond Areas. DNAPL within the confines of the Containment Area would be encapsulated by barrier walls and therefore recovery would be unnecessary. Subsurface DNAPL in other locations of the Site (for example West Central Drainage Channel and Hershey Run Channel outside the confines of the Containment Area) exists as discontinuous blebs or small thin seams and any impacts from the blebs and thin seams are expected to be localized and expected to migrate upwards. Any upward migration of contaminants would be addressed by the reactive core mats.

Under the 2005 Remedy, the containment area(s) would be designed to prevent the horizontal migration of contaminated groundwater by means of groundwater barrier walls installed to surround the containment area(s) on all down-gradient sides. A groundwater treatment system, using a collection system such as passive recovery trenches (*e.g.,* stone-filled passive trenches and piping) would be installed upgradient of the groundwater barrier walls.

Beazer's investigations revealed benefits to constructing barrier walls around all sides of what would now be a single Containment Area. This new design would enable control of hydraulic head (water levels) within the Containment Area and eliminate the need for the collection of DNAPL and groundwater within that area unless monitoring indicates the barrier walls are not functioning as designed.

## 7.5 Realignment of Hershey Run

Under the 2005 Remedy, if the containment area(s) extended into wetlands areas, Hershey Run would be relocated away from such areas. An evaluation of the hydrodynamics of Hershey Run was to be included in the remedial design to determine the optimal configuration of the new channel. The new channel would not alter in any negative way the existing capacity of Hershey Run for the conveyance of water and would not cause drainage changes that promote flooding upstream.

Beazer's investigations yielded information on the areas where the greatest impacts of DNAPL are located. This information aided in developing the optimal location of the single Containment Area, as well as the realignment strategy of the portion of Hershey Run that is affected by the location of the Containment Area.

From a hydraulic standpoint, sea level rise and larger storm events would result in higher tail water, which would in turn reduce velocities from the storms. Additionally, extreme floods would inundate the area creating a still (or standing) pool of water in the stream and floodplain. Because of the standing/still pool during such events, erosive velocities would likely not occur in the stream or on-Site and floodwaters would dissipate over the course of a few days and would not pose any lasting impact on the function of the Containment Area. Additional evaluation will be necessary (see Section 9.2.3.5 of this document).

## 7.6 Wetlands

Under the 2005 Remedy, excavation of contaminated sediments, the relocation of the Hershey Run channel away from the containment area(s), and construction of the containment area(s) would damage existing wetlands. Wetlands would be created to replace those damaged by the cleanup. At the time the 2005 ROD was issued, EPA anticipated that future Site use included the creation of wetlands for wetlands mitigation banking purposes. Where wetlands were to be created, TPAHs in soils and sediments would be reduced to below 150 ppm.

The Site will no longer be used for a wetland mitigation bank. Therefore, the removal of deep contamination that would have been necessary to create wetlands for banking purposes is no longer necessary. However, wetlands that are negatively impacted by cleanup activities would still be addressed through on-Site or off-Site mitigation to ensure no net loss of wetland function.

## 7.7 Groundwater

Under the 2005 Remedy, groundwater would be collected and treated from the containment area(s) to achieve National Pollutant Discharge Elimination System (NPDES) discharge requirements. Outside the containment area(s), soils were expected to be excavated on average between 5-15 feet. DNAPL in the saturated zone encountered during excavations would be collected and disposed at an off-Site RCRA facility. The groundwater cleanup would meet Safe Drinking Water Act Maximum Contaminant Levels (MCLs) and non-zero Maximum Contaminant Level Goals (MCLGs) and restore the groundwater to beneficial use.

EPA has decided to defer a final groundwater cleanup for a subsequent decision document. By deferring selection of a final remedy to restore the groundwater to beneficial use, EPA can consider data on groundwater conditions during and following implementation of this remedy that will inform the decision on selection of a final groundwater remedy.

# 8 REMEDIAL ACTION OBJECTIVES

The 2005 ROD established RAOs to mitigate and/or prevent unacceptable existing and future threats to human health and the environment. Data collected during efforts to design the 2005 Remedy led to consideration of changes to that action. In considering those changes, EPA determined that the ROD Amendment will address (a) risks from contaminated soil, sediments, and DNAPL in the saturated zone serving as a source for groundwater contamination as a final remedy, and (b) certain risks presented by groundwater contamination via an interim remedy that will not restore groundwater to beneficial use. Although a comprehensive (final) groundwater remedy will be considered in a subsequent final decision document, this ROD Amendment includes RAOs for the groundwater risks to be addressed through this action. The chart below identifies the RAOs in the 2005 ROD and changes to those RAOs made in this ROD Amendment.

| 2005 ROD | ROD Amendment | Explanation of Difference |
|---|---|---|
| Prevent current or future direct contact with contaminated soils and sediments that would result in unacceptable levels of risk to ecological receptors by reducing levels of total PAH concentrations to below 150 ppm in sediment and 600 ppm in soil (150 ppm in soil that is to be converted to wetlands).[3] | Prevent current or future direct contact with contaminated soils and sediments that would result in unacceptable levels of risk to ecological receptors (this will be accomplished by reducing contaminated surface soil to below 600 ppm TPAHs and reducing contaminated surface sediments to below 150 ppm TPAHs). If wetlands are created, TPAHs cleanup to below 150 ppm is required.[4] | Deeper excavations to remove contaminated soils and sediments are not needed to protect human health and the environment. Wetland banking is no longer an intended reuse and therefore excavation of soils containing TPAHs between 150-600 ppm is no longer needed; however, wetlands that are negatively impacted by cleanup activities will still be addressed through on-Site or off-Site mitigation to ensure no net loss of wetland function. |
| Prevent unacceptable human health risks due to exposure to contaminated groundwater. | Prevent unacceptable human health and ecological risks due to exposure to contaminated groundwater. | Preventing unacceptable risk to ecological receptors from groundwater is necessary. |

[3] The 2005 ROD combined RAOs with Performance Standards in this instance. Here, the RAO was "prevent current or future direct contact with contaminated soils and sediments that would result in unacceptable levels of risk to ecological receptors" and the Performance Standard necessary to meet this RAO was reduction of total PAH concentrations to below 150 ppm in sediment and 600 ppm in soil (150 ppm in soil to be converted to wetlands).

[4] The RAO itself has not changed, but the Performance Standard necessary to achieve the RAO has changed. In this instance the "Explanation of Difference" section explains the change to the Performance Standard.

| | | |
|---|---|---|
| Minimize the ongoing contamination of groundwater from the presence of NAPL through removal and/or containment. | Minimize the ongoing contamination of groundwater from the presence of NAPL in the saturated zone through removal and/or containment. | By specifically addressing removal of NAPL in the saturated zone, EPA addresses the NAPL serving as a source material for groundwater in the subsurface and will limit the source material that can contribute to ongoing groundwater contamination. This RAO specifically discusses NAPL in the saturated zone to distinguish it from the removal of soils and sediments in the RAO above. The recovery of NAPL below the water table will occur outside of the Containment Area. |
| Prevent any direct contact threat to an adult or child trespasser and to an industrial worker. | Prevent any direct contact threat to industrial workers. | The 2005 risk assessment and the 2017 recalculation indicate that risk does not exceed the acceptable benchmarks for an adult or child trespasser. The 2005 ROD RAO included preventing a direct contact threat to an adult or child trespasser; this was not needed given the conclusions of the risk assessment. Risk to industrial workers continues to be present. |
| Protect potential future residents from contact with contaminated soil and/or groundwater, by preventing the construction of residential buildings on any part of the Site (which is currently prohibited by local zoning; a future zoning change and potential residential use of the | Protect human health by restricting contact with contaminated soil, sediments, and groundwater; including preventing future excavations into the contaminated material (this will be accomplished using land and | Restricting contact with contaminated sediments was not included in the 2005 RAO. Contaminated material will be left in place at the Site below various covers. |

| | | |
|---|---|---|
| Site would require a residential risk assessment scenario and an evaluation by EPA). | groundwater use restrictions (institutional controls)). | |
| Restore groundwater at the Site to its beneficial use. | | This RAO has been removed because decisions on a comprehensive groundwater cleanup will be made in a future decision document. |

# 9 DESCRIPTION OF REMEDIAL ALTERNATIVES

CERCLA § 121 requires that any selected remedial action (a) be protective of human health and the environment; (b) be cost effective; (c) attain applicable and relevant and appropriate requirements that are not waived; and (d) be compliant with the NCP to the extent practicable. The provision further states that permanent solutions that reduce the volume, toxicity, or mobility of the contaminants through treatment are preferred. This section identifies the remedial alternatives considered to meet these requirements.

With this ROD Amendment, EPA is selecting (1) a Final Action to address soils, sediments, and DNAPL in the saturated zone serving as a source for groundwater contamination and (2) an Interim Action to address certain risks presented by groundwater contamination (but which will not restore the groundwater to beneficial use). A final groundwater remedy will be selected in a subsequent decision document subject to public participation requirements. This approach allows for evaluation of groundwater conditions during and following the Principal Threat Waste removal and will facilitate selection of an appropriate final groundwater remedy at a later date.

## 9.1 Alternatives Considered in the 2005 ROD, Reasons for Development of ROD Amendment

EPA compared five alternatives in the 2005 ROD:

| No. | **Description**[5] |
|---|---|
| 1 | *No Action.* |
| 2 | *Covering upland soils; Sediment cap in Fire Pond, South Pond and K Pond; Sheetpile and NAPL collection at Fire Pond and South Pond; Monitored Natural Recovery (MNR) in Hershey Run and tidal wetlands, Monitored Natural Attenuation of ground water contamination.* |
| 3 | *Excavate, consolidate and cap shallow soils and shallow tidal sediments; Cap Fire, K and South Ponds; Sheetpile and NAPL collection at Fire Pond and South Ponds areas;* |

[5] These descriptions are taken verbatim from the 2005 ROD. Section 9.2 of the 2005 ROD identified groundwater and institutional controls components common to all alternatives except No Action.

| | |
|---|---|
| | *Rechannelization of Hershey Run; Wetlands mitigation; Monitored Natural Attenuation of ground water contamination.* |
| 4 | *Excavate, consolidate and cap all contaminated soils and sediments; Subsurface ground water barrier wall around consolidation area(s) with passive NAPL recovery; Restoration of ground water through excavation of NAPL-contaminated aquifer material outside of consolidation areas; Rechannelization of Hershey Run; Wetlands mitigation; Monitoring of ground water contamination.* |
| 5 | *In-situ steam-enhanced extraction of subsurface NAPL; excavation and off-site treatment of sediments and certain soils; Wetland restoration; Monitored Natural Attenuation of ground water contamination.* |

Factors explained in Section 7 of this ROD Amendment led to development of a new alternative which is a modification of Alternative 4 from the 2005 ROD in fundamental ways. The modified Alternative 4 (New Alternative) is an alternative considered in this ROD Amendment and is described below.

## 9.2 Alternatives Considered in this ROD Amendment

### 9.2.1 No Action

Under this alternative, no remedial measures would be implemented at the Site to prevent exposure to contamination in sediments, soil, and DNAPL in the saturated zone. 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.

### 9.2.2 2005 Remedy

A description of the 2005 Remedy is summarized above in Section 1.3 of this ROD Amendment. A complete description of the 2005 Remedy is provided in Section 9.2 (Remedial Alternatives) and Section 11.2 (Description of the Selected Remedy and Performance Standards) of the 2005 ROD.

### 9.2.3 New Alternative

The New Alternative consists of the following elements:

#### *9.2.3.1 Excavation and Consolidation of Contaminated Soils, Sediments, and Marshes*

The New Alternative involves excavation of contaminated soils to two feet below ground surface, placement of a geotextile demarcation layer over the underlying soil, and installation of two feet of clean fill consisting of at least six inches of a vegetative soil layer. These activities will occur in areas with dry weathered surface creosote and areas where TPAHs exceed 600 ppm (wetland mitigation banking is no longer an intended reuse of the Site; however, where wetlands are created the TPAHs cleanup will be to below 150 ppm). The geotextile demarcation will serve as a warning liner that contaminated soil may be present below. By replacing the top two feet with clean fill/vegetative layer, direct contact with contaminants will be minimized (implementation of institutional controls discussed later will further reduce or eliminate such contact). Excavated soil will be consolidated on-Site into a single Containment Area with amendments for geotechnical stabilization added as necessary to achieve adequate compaction and slope stability.

The New Alternative includes excavation of contaminated sediments (including sediments in the channels and marsh/wetland areas) to a depth of two feet below current sediment surface, installation of a reactive core mat over the underlying sediments, and installation of two feet of clean fill that is comparable in composition to the native sediment and consisting of at least six inches of a vegetative layer (a vegetative layer will not be necessary within the Hershey Run Channel and West Central Drainage Channel). These activities will occur where sediments in the channels, wetlands, and marsh sediments are contaminated with greater than 150 ppm TPAHs. Activities at the Upper South Pond will be similar, but excavation will be to five feet (or to greater depth to provide stabilization) because the softer sludge-like material in this area requires deeper excavation for proper stabilization. Excavated material will be consolidated on-Site into the Containment Area with amendments for geotechnical stabilization added as necessary to achieve adequate compaction and slope stability. Areas in channels (West Central Drainage Channel and Hershey Run Channel) will include excavation extending over the top of the bank and beyond the channel to allow adequate anchorage of the reactive core mats and to ensure contamination is not migrating along the perimeter of the covers and through un-remediated banks. Shallow groundwater samples will be collected to evaluate if groundwater contamination is present outside the boundary of the reactive core mat and if contamination is migrating along the perimeter of the covers over time.

The New Alternative will include filling in a portion of the existing Hershey Run that will not be within the Containment Area and will not be tied into the realignment of Hershey Run. Within this portion of Hershey Run (between the realignment tie-in and the Containment Area) a reactive core mat will be installed at the base of the channel and excavated area, with the installation of clean fill that is comparable in composition to the native sediment, with at least six inches of a vegetative layer.

The reactive core mat will serve as an effective barrier between any underlying impacted sediments and will inhibit upward migration of residual TPAHs in porewater by acting as a permeable adsorptive barrier. The clean two feet of fill will allow for the reestablishment of an ecologically diverse wetland system. The root system of the wetland plant community is expected to facilitate biodegradation of PAHs. By replacing the top two feet with clean fill, direct contact with contamination will be minimized

#### *9.2.3.2 Consolidation/Containment Area*

A Containment Area will be constructed to receive various contaminated media and debris from the Site. The Containment Area will be located where the greatest DNAPL impacts are found on the Site (it will occupy an estimated 10.5 acres and extend around the Fire Pond and Upper Hershey Run). The barrier walls surrounding the Containment Area will be designed to extend vertically into the low permeability unit (LPU) to achieve hydraulic control and groundwater migration control without the need for pumping or other active measures. Barrier walls will surround all sides of the Containment Area. If monitoring indicates the barrier walls are not functioning as designed, contingencies (*e.g.,* installation of a drain to discharge groundwater, pumping of the Containment Area, or other active measures), with necessary treatment as appropriate, will be implemented to prevent contaminated groundwater from exiting the Containment Area and/or to control the groundwater hydraulics within the Containment Area.

The consolidated materials within the Containment Area will be capped with a low permeability cap. The cap is intended to prevent direct contact between contaminated materials within the Containment Area and prevent infiltration of rain and surface water and withstand flood events. Final grading will promote drainage from the Containment Area and vegetative cover will prevent erosion.

A monitoring plan will be implemented to gather data regarding hydraulic control and migration of contaminated groundwater from inside the Containment Area. Monitoring will occur both inside and outside of the Containment Area to evaluate potential groundwater rise within the Containment Area that may pose a hydraulic pressure threat. Monitoring will also be used to evaluate whether contamination posing a risk to human health or the environment is exiting the Containment Area. If data shows pressure build up inside the Containment Area and/or the migration of contamination from inside the Containment Area to outside the Containment Area, contingencies such as those described above will be implemented. Additionally, groundwater levels upgradient of the Containment Area will be monitored to provide sufficient information to evaluate if the Containment Area is causing a rise in the groundwater elevation upgradient of the Containment Area that may affect potential flooding and action taken (e.g., a groundwater collection trench) to reduce such levels if needed.

Debris at the Site that is suspected of containing hazardous substances or pollutants or contaminants from historical Site operations (such as old railroad ties, underground storage tanks, underground piping, and concrete from old foundations) or which interferes with the cleanup will be consolidated and placed into the Containment Area. This action will remove the potential hazard posed to workers by the debris and enable excavation and grading of contaminated areas of the Site without the need to send truck traffic off-Site for debris disposal.

Additionally, underground piping previously discovered and discovered during remedy implementation that may act as a conduit for contamination migration will be managed (e.g., adequately, plugged, grouted, or removed as debris) to prevent hazardous substances or pollutants or contaminants from being released to the environment. During remedial investigation activities, underground piping was found from the South Pond Areas to the Former Process Area.

#### *9.2.3.3 DNAPL Recovery Outside of the Containment Area*

DNAPL in the saturated zone that is recoverable and impacting groundwater is known to occur in three locations at the Site - the Containment Area, the Former Process Area, and the South Pond Areas. DNAPL will not be recovered in the Containment Area, but will rather be held in place along with the contaminants consolidated via barrier walls and a cap. The DNAPL in the saturated zone in the Former Process Area and South Pond Areas will be extracted to the extent practicable, as discussed below. Recovered DNAPL will be treated or recycled and disposed off-Site.

Extraction to the extent practicable will require a demonstration that DNAPL recovery has reached an asymptotic state, meaning the amount of DNAPL recovered in a given time period is approaching zero or is relatively insignificant. Existing wells within the Former Process Area and South Pond Areas where measurable DNAPL was encountered during the sampling identified in the *"Supplemental Remedial Design Investigation- 2/2018 Sampling of Installed Delineation Wells"* report will be monitored to determine if measurable DNAPL is entering these wells to further evaluate progress.

Additional DNAPL recovery wells may be added after DNAPL recovery begins to further target and remove source material in the subsurface.

DNAPL below the reactive core mats in the channels (West Central Drainage Channel and Hershey Run Channel) exists as discontinuous blebs or small thin seams and the impacts are localized. The reactive core mats will prevent the upward migration of contamination to the surface. Monitoring of shallow groundwater outside of the channels will occur to confirm groundwater contamination is limited to the confines of the channels.

#### *9.2.3.4 Groundwater*

The DNAPL in the saturated zone that is recoverable and contributing to groundwater contamination will be removed using recovery wells as described in Section 9.2.3.3 of this document. ICs will be implemented to prevent exposure to contaminated groundwater. Groundwater will be evaluated to (1) characterize the dissolved-phase groundwater conditions downgradient of areas subject to DNAPL recovery to facilitate the development of a future groundwater final remedy, (2) determine if contamination is migrating outside of the Containment Area, and (3) determine if groundwater outside of the West Central Drainage Channel and Hershey Run Channel is impacted by contamination below the reactive core mats.

A comprehensive groundwater cleanup plan will be the subject of a subsequent decision document. Deferring a comprehensive decision on groundwater cleanup allows for a more informed evaluation of conditions during and following Principal Threat Waste removal, which will better support selection of an appropriate final groundwater remedy.

#### *9.2.3.5 Realignment of Hershey Run*

Hershey Run will be rechanneled to avoid high contamination areas and areas where the Containment Area extends into the wetland areas and Upper Hershey Run.

A hydraulic analysis for the realignment of Hershey Run was performed to analyze the potential impacts on the Hershey Run flow conditions resulting from (1) realigning the northern stretch of Hershey Run, (2) excavating and backfilling a southern stretch of Hershey Run, and (3) constructing the barrier wall and Containment Area. The hydraulic analysis was also used to evaluate which sections of Hershey Run could be exposed to erosive velocities. The data was used in conjunction with the requirements in the Delaware Erosion and Sediment Control Handbook to propose appropriate outlet and channel protection for Hershey Run. The study demonstrated that the proposed realignment of Hershey Run will not produce erosive velocities, will not negatively impact surface water elevations (which are largely impacted by tidal elevations), and will not produce a net change in waterway hydraulics from the existing conditions at the Site. The design will additionally consider the potential for changed site conditions resulting from an increase in surface water velocity, consistent inundation, and other effects from rising sea levels and from increased intensity and prevalence of storms (including hurricanes and 500-year flow). A climate vulnerability assessment will be performed, and the design will incorporate the findings.

##### *9.2.3.6 Wetlands*

Construction of the Containment Area and barrier wall, realignment of Hershey Run, and excavation in specific areas will impact wetland resources at the Site. Coordination with the appropriate regulatory agencies will be conducted to ensure that mitigation efforts satisfy applicable or relevant and appropriate substantive requirements in state and federal laws and regulations pertaining to impacted wetlands at the Site.

Implementation of the New Alternative will impact both tidal and freshwater wetlands. The New Alternative will result in a total of approximately 8.59 acres of permanent impacts due to the construction of the barrier wall and Containment Area and realignment of Hershey Run (approximately 8.18 acres of tidal areas and 0.41 acres of non-tidal freshwater wetland/Fire Pond). The remaining wetland impacts due to the removal of impacted sediments and dry weathered surface creosote are expected to be temporary. Areas where wetlands are negatively impacted by cleanup activities will be addressed through on-Site or off-Site mitigation to ensure no net loss of wetland function. Wetland mitigation will be accomplished through on-Site mitigation or mitigation within the Christina River Watershed, to the extent practicable.

##### *9.2.3.7 Use Restrictions (Institutional Controls)*

Land use restrictions will be established to restrict excavation of contaminated soils and sediments, restrict excavation in the Containment Area, protect remedy components, and prohibit residential development at the Site. Temporary Site-wide groundwater use restrictions will be implemented to restrict the extraction of groundwater and to prevent exposure to contaminated groundwater as part of the interim groundwater remedy until a final groundwater remedy is selected.

##### *9.2.3.8 Monitoring of Groundwater, Surface Water, Sediments, Biota, Porewater, Channels, and Caps/Covers to Ensure the Effectiveness of the Remedy*

Water levels and analytical data will be collected to evaluate performance of the Containment Area. Data will be obtained from the groundwater in the dissolved-phase plume(s) downgradient of areas where DNAPL is being recovered to evaluate the effectiveness of the DNAPL recovery. Additionally, shallow groundwater sampling outside of the Hershey Run Channel and West Central Drainage Channel will occur to verify groundwater is not impacted outside of the channels from contamination left below the reactive core mats. Surface water, sediments, porewater (above and below the reactive core mats), and biota will be monitored to evaluate the effectiveness of the remedy. Monitoring of the caps/covers (over the Containment Area and excavated areas) will occur to ensure they remain effective. A comprehensive monitoring plan will be developed as part of the Remedial Design to, among other things, establish the nature and frequency of monitoring activities. The monitoring plan will be evaluated and, if necessary, updated at least every five years as part of the FYR process.

# 10 SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

In this section, the 2005 Remedy alternative, the New Alternative, and No Action are compared to each other using the nine criteria set forth in 40 C.F.R § 300.430(e)(9)(iii). During the remedial decision process, EPA analyzes the relative performance of each alternative against the evaluation criteria, noting how each alternative compares to the other options under consideration. Additional information supporting this analysis of remedy alternatives can be found in the AR supporting this ROD Amendment. The nine criteria fall into three groups described as follows:

***Threshold criteria*** must be satisfied for a remedy to be eligible for selection.
***Primary balancing criteria*** are used to weigh major tradeoffs between remedies.
***Modifying criteria*** are considered after public comment is received on the Proposed Plan.

| Evaluation Criteria for Superfund Remedial Alternatives | |
|---|---|
| *Threshold Criteria* | 1. **Overall Protection of Human Health and the Environment** determines whether an alternative can adequately protect human health and the environment by eliminating, reducing, or controlling exposures to hazardous substances and pollutants or contaminants to levels that do not pose an unacceptable risk. |
| | 2. **Compliance with ARARs** evaluates whether an alternative meets Federal and more stringent State environmental laws or facility siting laws, or whether a waiver is justified. |
| *Primary Balancing Criteria* | 3. **Long-term Effectiveness and Permanence** considers the ability of an alternative to maintain protection of human health and the environment over time. |
| | 4. **Reduction of Toxicity, Mobility, or Volume of Contaminants through Treatment** evaluates an alternative's use of treatment to reduce the harmful effects of principal contaminants, their ability to move in the environment, and the amount of contamination present. |
| | 5. **Short-term Effectiveness** considers the length of time needed to implement an alternative and the risks the alternative poses to workers, residents, and the environment during construction. |

| | |
|---|---|
| | **6. Implementability** considers the technical and administrative feasibility of implementing an alternative, including factors such as the relative availability of goods and services. |
| | **7. Cost** includes the estimated capital and annual operation and maintenance costs, as well as present worth cost of an alternative. Present-worth cost is the total cost of an alternative over time in today's dollar value. Cost estimates are expected to be accurate within a range of +50 to -30 percent. |
| ***Modifying Criteria*** | **8. State/Support Agency Acceptance** considers whether the State agrees with EPA's analyses and recommendations, as described in the Feasibility Study and Proposed Plan. |
| | **9. Community Acceptance** considers whether the local community agrees with EPA's analyses and preferred alternative. Comments received on the Proposed Plan are an important indicator of community acceptance. |

The following subsections summarize the comparative analysis evaluation of the remedial alternatives developed for the Site against the nine evaluation criteria.

## 10.1 Overall Protection of Human Health and the Environment

This criterion addresses whether each alternative provides adequate protection of human health and the environment and describes how risks posed through each exposure pathway are eliminated, reduced, or controlled through treatment, engineering controls, and/or institutional controls.

As determined in the 2005 ROD, the No Action alternative does not meet this threshold criteria. The No Action alternative was eliminated from consideration under the remaining eight criteria in the 2005 ROD and is eliminated from consideration under the remaining eight criteria in this evaluation.

Both the 2005 Remedy and the New Alternative would protect human health and the environment by eliminating contact with contaminated soils, sediments, and groundwater by humans and biological receptors. The specific methodology for each alternative is described below.

| 2005 ROD | New Alternative |
|---|---|
| This alternative addresses soil-related risks by removing and replacing all soil contaminated above the Site-specific cleanup level of 600 ppm TPAHs, and all soils that were to be converted to wetlands by removing all TPAHs greater than 150 ppm. Removed soil will be consolidated on-Site into one or two containment areas which will be covered. ICs will protect the cover(s). These actions eliminate the contact threat. | This alternative addresses soil-related risks by removing and replacing the top two feet of soil contaminated with TPAHs above 600 ppm (if wetlands are created on-Site, TPAHs cleanup below 150 ppm is required). Removed soil will be consolidated into a single Containment Area, which will be covered. A geotextile demarcation will be placed on the underlying soils below two feet of clean fill. ICs will protect these covers. These actions will eliminate the contact threat. |
| This alternative addresses sediment-related risks by excavating sediments above the Site-specific cleanup level of 150 ppm TPAHs in the South Pond Areas, Hershey Run and adjacent marshes and the West Central Drainage Area. Risks in the Fire Pond will be addressed by filling the Fire Pond as part of the consolidation of contaminated soils and sediments. These actions eliminate the contact threat. | This alternative addresses sediment-related risks by removing the upper two feet of sediment containing TPAHs above 150 ppm within channels and adjacent marshes (the upper five feet of material in the upper South Pond will be removed because the softer sludge-like material in this area requires deeper excavation for proper stabilization). A reactive core mat and clean fill will be placed atop remaining contaminated sediments. ICs will protect these covers. These actions eliminate the contact threat. |
| This alternative addresses risks from groundwater by removing DNAPL in the saturated zone and addressing groundwater under a single decision document. | This alternative will mitigate risks from groundwater using ICs. Data from DNAPL removal from the saturated zone and monitoring at downgradient areas will be used in selecting a comprehensive groundwater remedy at a later time. |

## 10.2 Compliance with ARARs

CERCLA § 121(d) and NCP § 300.430(f)(1) (ii)(B), require that remedial actions at CERCLA sites at least attain legally applicable or relevant and appropriate Federal and state requirements, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under Federal or state law (ARARs) unless waived under CERCLA § 121(d)(4) and NCP § 300.430(f)(1)(ii)(C).

“Applicable requirements” are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under Federal environmental or state environmental or facility-siting laws that specifically address a hazardous substance or pollutant or contaminant, remedial action, location, or other circumstance at a CERCLA site. Only those state standards that are identified by a state in a timely manner and that are more stringent than Federal requirements may be applicable.

"Relevant and appropriate requirements" are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under Federal environmental or state environmental or facility-siting laws that, while not "applicable" to a hazardous substance, pollutant or contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well-suited to the particular site. Only those state standards that are identified by a state in a timely manner and that are more stringent than Federal requirements may be relevant and appropriate.

The "To Be Considered" (TBC) category consists of advisories, criteria, or guidance that EPA, other federal agencies, or states developed that may be useful in developing CERCLA remedies. TBCs are identified on an as-appropriate basis.

Both the 2005 Remedy and the New Alternative will meet ARARs that are not waived.

The 2005 Remedy addresses all media as a final remedy; ARARs are identified in Table 8 of the that document.

The major ARARs for the New Alternative include:

- *State and Federal Water and Air Discharge Requirements.* This includes air emissions requirements for any excavation or on-Site treatment, water discharge or re-injection for dewatering during construction activities, and for groundwater collected in the recovery of NAPL.

- *State Water Quality Standards.* Any surface water discharge would meet the substantive requirements of the NPDES program and would be monitored to ensure compliance with these standards.

- *National Historic Preservation Act*. Adverse impacts to historic properties arising from implementation of the remedial action would be mitigated.

- *RCRA Hazardous Waste Disposal Regulations.* All excavated creosote (a listed waste) would be consolidated within an "area of contamination" without triggering RCRA's "land-ban" regulations.

- *Generators of Hazardous Waste and Owners and Operators of Hazardous Waste Treatment Storage and Disposal Facilities.* Establishes standards and regulations to generators of hazardous waste and acceptable management of hazardous waste.

- *Wetlands Regulations*. Mitigation steps (*e.g.*, replacement of wetlands) would be implemented to address impacts to wetlands.

The New Alternative consists of a final remedy to address soils, sediments, and DNAPL in the saturated zone serving as a source for groundwater contamination (Final Action) and an interim action to address certain risks presented by groundwater contamination (Interim Action). The New Alternative assumes that a final groundwater remedy will be selected in a subsequent decision document.

CERCLA §121(d)(4)(A) provides that EPA may select an action that does not meet an ARAR if the selected action "is only part of a total remedial action that will attain such level or standard of control when completed." The Interim Action under the New Alternative would be an interim remedial action and would be part of a total remedial action for contaminated groundwater at the Site. While the final action for groundwater (to be selected in a later decision document) would seek to restore the aquifer to beneficial use, the Interim Action component of the New Alternative includes limited action to prevent contact with contaminated groundwater. Because the Interim Action component of the New Alternative is an interim action which does not seek to restore the groundwater to beneficial use, EPA would waive, and the Interim Action component of the New Alternative would not meet, ARARs establishing groundwater cleanup standards. Specifically, EPA would waive the requirement that contaminants of concern in Site groundwater meet their respective MCLs and non-zero MCLGs established under the Safe Drinking Water Act, 40 U.S.C. §§ 300f, et seq.

A more complete presentation of ARARs for the New Alternative can be found in Table 2 of Section IV of this document.

## 10.3 Long-Term Effectiveness and Permanence

Long-Term Effectiveness and Permanence refers to expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time, once performance standards have been met. This criterion includes consideration of the magnitude and effectiveness of measures that may be required to manage the risk posed by treatment residuals and/or untreated wastes that will remain on-site following remediation.

Both the 2005 Remedy and the New Alternative achieve long-term effectiveness and permanence. The 2005 Remedy achieves long-term effectiveness and permanence through deep excavations, monitoring, maintenance, and ICs. The New Alternative does this via shallow excavations, installation of respective covers, recovery of DNAPL in the saturated zone, monitoring, maintenance, and ICs. The specific means for such achievement for each alternative is described below.

| 2005 ROD | New Alternative |
|---|---|
| By consolidating all impacted soil and sediment into the containment area(s) and conducting long-term maintenance of the containment area(s), long-term effectiveness and permanence are achieved. | By consolidating the upper two feet (5 feet in Upper South Pond) of impacted soil and sediment into the Containment Area, conducting long term maintenance of the Containment Area and cap/soil covers, conducting long term-monitoring of groundwater in downgradient areas, and |

| | |
|---|---|
| | evaluating COC concentrations in various media to ensure remedy effectiveness, long-term effectiveness and permanence are achieved. |
| By controlling DNAPL flow from within the containment area(s) over time, long-term effectiveness and permanence is achieved. | Containing DNAPL within the Containment Area, routine maintenance of the Containment Area, monitoring to detect migration of contamination from the Containment Area and hydraulic control within the Containment Area, implementing contingencies to address any such migration or to achieve hydraulic control (if necessary), and implementing ICs to protect barrier walls and the cap achieve long-term effectiveness and permanence. |
| By excavating DNAPL source material in the subsurface outside of the containment area(s), long-term effectiveness and permanence is achieved. | DNAPL recovery via recovery wells removes potentially mobile and recoverable DNAPL in the saturated zone outside the Containment Area that serves as an ongoing source of contamination to groundwater. Removal of principal threat waste outside of the Containment Area, monitoring groundwater to evaluate effectiveness, and implementing groundwater use restrictions accomplishes long-term effectiveness and permanence until a final groundwater remedy is implemented. |
| Institutional controls achieve long-term effectiveness and permanence by protecting the integrity of the containment area(s) and cap(s), and restricting contact with contaminated soil, sediment, and groundwater. | Institutional controls achieve long-term effectiveness and permanence by protecting the integrity of the respective covers and the Containment Area; preventing contact with contaminated soil, sediment, and groundwater; and prohibiting residential use. |

## 10.4 Reduction of Toxicity, Mobility, or Volume Through Treatment

Reduction of toxicity, mobility, or volume through treatment refers to the anticipated performance of the treatment technologies that may be included as part of a remedy. Both the 2005 Remedy and the New Alternative reduce the toxicity, mobility, or volume of contaminants through treatment.

The 2005 Remedy includes passive recovery of groundwater within the containment area(s). This recovered groundwater would be collected and treated.

Under the New Alternative, DNAPL in the saturated zone extracted outside the Containment Area will be recycled or treated and disposed at an off-site RCRA facility. Groundwater restoration outside of the Containment Area will be determined in a subsequent decision document.

## 10.5 Short-Term Effectiveness

Short-Term Effectiveness addresses the period of time needed to implement the remedy and achieve protection, as well as any adverse impacts that may be posed to workers, the community, and the environment during construction and operation of the remedy until the performance standards are achieved.

Both the 2005 Remedy and the New Alternative are effective in the short-term, but the New Alternative is more effective in the short-term for several reasons. A comparison of short-term effectiveness for the 2005 ROD and New Alternative is described below.

| 2005 ROD | New Alternative |
|---|---|
| Significantly more soils and sediment would need to be excavated; requiring extensive excavations below the water table and therefore causing continuous storage, treatment, and disposal of wastewater to be required to prevent releases to the environment. | Shallower excavations will result in fewer complications associated with removal of contaminants beneath the water table. The estimated decrease in volume resulting from the use of shallow excavations in the soils and sediments is approximately 680,000 cubic yards. This reduction in volume will shorten the project duration. |
| Excavating to great depths to remove DNAPL in the saturated zone gives rise to technical difficulties that will extend project duration. | Removing DNAPL in the saturated zone that is an ongoing source to groundwater contamination via recovery wells minimizes excavations beneath the water table. This would result in shorter project duration to address these implications. |
| Greater level of effort regarding erosion and surface water controls to minimize releases into Hershey Run and White Clay Creek. | Less excavation reduces risk of release into Hershey Run and White Clay Creek. |
| Greater level of effort regarding monitoring and controlling release of dust and airborne contaminants during excavation and stockpiling. | Less excavation reduces risk of dust and airborne contaminants during excavation and stockpiling. |
| Greater volume of excavated materials will require larger and/or a second containment area/barrier walls. | Less volume of excavated soil and sediment results in the need for a single containment area of simpler construction which will reduce project duration. |

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| Significant amount of clean fill needed for excavation areas. This was not contemplated at the time the 2005 ROD was issued because the intended reuse of the Site was for wetland mitigation banking. Because this is no longer an intended reuse, a significant amount of clean fill would be required. | Less clean fill needed, reducing project duration. |

## 10.6 Implementability

Implementability addresses the technical and administrative feasibility of a remedy from design through construction and operation. Factors such as availability of services and materials, administrative feasibility, and coordination with other governmental entities are also considered.

Both the 2005 Remedy and the New Alternative are readily implementable, but the reduction in excavation volume and depths (especially in areas originally intended for wetland banking); the reduction in the number of containment areas to be constructed and capped; the more practicable method for extracting DNAPL in the saturated zone; less demanding slope stabilization efforts; less excavation below the water table; and less construction time in the tidal marshes give a significant implementability advantage to the New Alternative. A comparison of implementability for the 2005 ROD and New Alternative is below.

| 2005 ROD | New Alternative |
|---|---|
| Requires coordination with the local authorities and adjacent property owners for access. Requires deep excavations in upland areas and in channels. Deep excavations would be difficult to implement because of slope stability and water infiltration while excavating below the water table. Deep excavations in channels would be further complicated by the twice-daily tide cycles that affect the channels and flood the adjacent marshes. Requires large volume of clean material from off-Site sources to fill in excavation areas and Containment Area. | Requires coordination with the local authorities and adjacent property owners for access, but because the amount of clean fill required to implement the remedy is significantly reduced as a result of shallow excavations, coordination efforts are likely reduced. Minimizes the amount of soil and sediment to be excavated. Excavation depths would be shallow, and the excavations and installation of associated covers will be easier to implement than deep excavations. Less material would be moved, making this alternative easier to implement. Less imported clean material is needed because the excavation would be shallower and because only one containment area would be constructed. The estimated decrease in excavations necessary as a result of shallow excavations in the soils and sediments is approximately 680,000 cubic yards. |
| Results in construction of one or two containment areas with associated caps. | Results in construction of a single containment area and cap and multiple covered areas (geotextile demarcation and |

| | |
|---|---|
| | reactive core mats) of simpler construction than a second or larger containment area. |
| Removes all impacted sediments from the channels, which would be difficult given the variable excavation depths, tidal environment, and difficulties excavating in a saturated environment. | Removes shallow sediments and installs reactive core mats, which are easier to implement than complete removal of contaminated sediments given the tidal environment. |
| Removes all impacted soils. During excavation, DNAPL encountered in the saturated zone would be collected and disposed of off-Site. Deeper excavations to remove the DNAPL in the saturated zone in the Former Process Area and South Pond Area are harder to implement due to the inherent difficulties of excavating in a saturated environment. Additionally, continuous storage, treatment, and disposal of wastewater due to excavation below the water table would be necessary. | Removes shallow impacted soils via excavations and installs a geotextile demarcation. Removes DNAPL in the saturated zone that is recoverable and is a contributing source to groundwater contamination via recovery wells. Minimizing excavation of soils in a saturated environment reduces the technical difficulties and the storage, treatment, and disposal of wastewater due to excavation below the water table. |
| Requires slope stability controls for deep upland excavations and deep channel excavations. | Requires fewer slope stability controls during excavation and capping of shallow sediment and upland excavations. |
| Deeper excavations increase the potential for soil and sediment washout during an extreme weather event. | Shallow excavations present a reduced potential for washout during an extreme weather event. |
| Deeper excavations increase the need for dewatering of excavated or dredged materials. | Shallow excavations present a reduced need for dewatering of excavated materials. |

## 10.7 Cost

Both the 2005 Remedy and the New Alternative are cost-effective, but the New Alternative is less expensive. A summary of each alternative under this criterion is discussed below.

| 2005 ROD | New Alternative |
|---|---|
| The 2005 ROD estimated capital and O&M costs at $51,760,000 with an additional $8,530,000 for wetland creation. Based on a 2018 estimate, capital and O&M costs were estimated at $103,207,000; this estimate accounts for uncertainty associated with the | Based on a 2018 estimate, and further detailed in December of 2021 (Table 1 of this document) capital and O&M costs are estimated at $39,645,546. This estimate has less uncertainty than that in the 2005 ROD because the extent of remediation is more |

| | |
|---|---|
| extent of remediation and groundwater cleanup. | fully defined and uncertainties identified in the 2005 ROD were resolved during Remedial Design investigations. |

## 10.8 State Acceptance

EPA and DNREC have consulted closely during preparation of the PRAP and ROD Amendment. DNREC concurred with the Selected Remedial Action in a letter dated June 29, 2022.

## 10.9 Community Acceptance

EPA held a 30-day public comment period from March 2, 2021, through March 31, 2021. Due to the public health concerns at that time, an in-person public meeting was not held. As a substitute for the public meeting:

1. EPA published, on the internet, a recorded video presentation containing information EPA would have shared at the public meeting had the meeting been held in person.
2. EPA hosted a question and answer session on March 17, 2021 from 6:00pm-7:00pm. This session provided an opportunity for the public to raise, with EPA personnel and others on the call, questions and issues regarding the Proposed Plan. No members from the community called in to raise questions or concerns.

Because of a request for an extension to the public comment period, EPA extended the public comment period from April 14, 2021 through May 14, 2021. A summary of the public comments and EPA's responses is included in the Responsiveness Summary as a Part III of this ROD Amendment.

# 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 (NCP § 300.430(a)(1)(iii)(A)). The principal threat concept is applied to the characterization of source materials at a Superfund site. Source material is material that includes or contains hazardous substances and/or pollutants or contaminants that act as a reservoir for migration of contamination (e.g., to groundwater). Principal threat wastes are those source materials considered to be highly toxic or highly mobile which would present a significant risk to human health or the environment should exposure occur. The decision to treat these wastes is made on a site-specific basis through a detailed analysis of the alternatives using the nine remedy selection criteria.

EPA characterizes waste as either principal threat waste or low-level threat waste. While contaminated groundwater is generally not considered to be a source material, NAPL in groundwater may be viewed as source material. The New Alternative addresses the principal threat waste in the soils, sediments, groundwater, and the subsurface (the DNAPL in the saturated zone and the surface soils and sediments that act as a source for direct exposures). The resulting cleanup will facilitate further evaluation for a final remedy of groundwater outside the Containment Area after the principal threat waste is removed or contained.

The New Alternative addresses principal threat waste by (1) extracting, for treatment or recycling, using recovery wells, DNAPL in the saturated zone outside of the Containment Area serving as an ongoing source to groundwater contamination, and (2) eliminating direct contact threat by excavating shallow soils and sediments that are contaminated, placing the appropriate cover over the underlying soils/sediments, and placing excavated material into the Containment Area.

Treatment of material inside the Containment Area is not necessary because a cap will be placed atop the Containment Area to prevent direct contact and barrier walls will surround the Containment Area on all sides to prevent contamination migration from exiting the Containment Area.

# 12 SELECTED REMEDIAL ACTION

Following review and consideration of the information in the AR file and the requirements of CERCLA and the NCP, EPA has selected the New Alternative as the remedy to replace the action selected in the 2005 ROD. The Selected Remedial Action consists of a Final Action for soils, sediments, and DNAPL in the saturated zone serving as a source for groundwater contamination and an Interim Action for groundwater. The estimated cost to implement the New Alternative is $39,645,546.

The Final Action includes the following:

- Construction of a containment area on-Site for the placement of excavated materials and debris (Containment Area).
- Realignment of Hershey Run around the Containment Area.
- Installation of barrier walls around all sides of the Containment Area with monitoring to ensure the barrier walls function as designed.
- Excavation of contaminated soils, placement of a geotextile demarcation layer, and backfilling.
- Excavation of contaminated sediments (including channels and marsh/wetland areas), placement of a reactive core mat, and backfilling.
- Placement of excavated soils, sediments, and collected debris into the Containment Area.
- Capping the Containment Area.
- Recovery and off-Site treatment and disposal, or recyling, of the recoverable DNAPL in the saturated zone outside of the Containment Area.
- Mitigation of effects to wetlands impacted by the remediation.
- Implementation of institutional controls to protect the components of the remedy and to prevent residential development.
- Monitoring of, surface water, sediment, biota, groundwater, porewater, and caps/covers.

The Interim Action includes the following:

- Institutional controls to prevent use of groundwater.

The major components are shown visually on Figure 3. The Selected Remedial Action and performance standards are described in detail below.

## 12.1 Rationale

The Selected Remedial Action best satisfies the threshold and balancing evaluation criteria explained in Section 10 of this ROD Amendment. Both the 2005 Remedy and the Selected Remedial Action are readily implementable, but the reduction in excavation volume and depths, less demanding slope stabilization efforts, less excavation below the water table, and less construction time in the tidal marshes gives a significant implementability advantage to the Selected Remedial Action. The Selected Remedial Action also provides a more practicable method for extracting DNAPL in the saturated zone. The Selected Remedial Action is also more effective in the short-term because less excavation is required. Excavations below the water table are significantly reduced, thereby increasing the short-term effectiveness of the Selected Remedial Action when compared to the 2005 Remedy. This would result in a shorter construction duration, thereby reducing potential risks and impacts to the community from construction vehicles and operations in the area.

The Selected Remedial Action defers a comprehensive groundwater action to allow for evaluation of groundwater conditions during and following principal threat waste removal. Such information may inform the selection of the final action for groundwater.

## 12.2 Final Action Components and Performance Standards

The Final Action portion of the Selected Remedial Action includes the components and performance standards identified below. The Final Action shall be designed, implemented, operated, and maintained consistent with the requirements of the Programmatic Agreement identified in Section 1.5, any amendments to the Programmatic Agreement, and any replacement to the Programmatic Agreement that may be executed in connection with the Selected Remedial Action.

### 12.2.1 Relocate a Portion of the Existing Channel of Hershey Run Around the Containment Area

The Containment Area will extend into the Hershey Run channel; therefore, the portion of Hershey Run impacted by the construction and operation of the Containment Area will be relocated away from the Containment Area.

#### *12.2.1.1 Performance Standards for Relocating a Portion of the Existing Channel of Hershey Run Around the Containment Area*

1. Relocate the portion of the existing channel to be impacted by the construction and operation of the Containment Area.

2. Configure the relocated channel so that the capacity of Hershey Run conveys both normal water levels (including the incoming and outgoing tides) and storm water runoff in a manner similar to the original channel to prevent any increased negative effects to the area (e.g., abnormal flooding). The design will consider the potential for changed site conditions resulting from an increase in surface water velocity, consistent inundation, and other effects from rising sea levels and from increased intensity and prevalence of storms (including hurricanes and 500-year flow). A climate vulnerability assessment will be performed, and the design will incorporate the findings.

3. Construct the relocated portion of the channel to restore and preserve the environmental nature, quality, and function of the original channel to protect fish and other wildlife resources.

### 12.2.2 Construction of the Containment Area

Construct a single Containment Area in the location identified in Figure 3.

#### *12.2.2.1 Performance Standards for the Construction of the Containment Area*

1. The Containment Area shall be of sufficient size and build to hold

    a. all contaminants currently in the footprint of the Containment Area;
    b. all contaminated soils, sediments, and debris excavated as part of the remedy that are to be consolidated into the Containment Area; and
    c. any amendments needed to meet compaction and slope requirements

until EPA, in consultation with the State of Delaware, determines that containment of such materials is no longer necessary to protect human health or the environment.

### 12.2.3 Construction of Groundwater Barrier Wall

Construct a continuous groundwater barrier wall using a slurry wall(s) and/or sealed sheet piling around all sides of the Containment Area to prevent the migration of Containment Area contents from inside to outside the Containment Area.

#### *12.2.3.1 Performance Standards for Groundwater Barrier Wall*

1. The barrier wall shall be constructed and maintained to prevent migration of contaminated groundwater and NAPL from inside the Containment Area to outside the Containment Area until EPA, in consultation with the State of Delaware, determines that containment of contaminated groundwater and DNAPL in the Containment Area is no longer necessary to protect human health and the environment.

2. The barrier wall shall surround all sides of the Containment Area, shall be impermeable ($10^{-7}$ cm/sec) to groundwater, and shall extend to such depth as to key into the clayey low

permeability unit (LPU) layers in the subsurface (at a minimum 10 feet into the LPU) to prevent groundwater from entering or exiting the Containment Area.

### 12.2.4 Monitor the Elevation of Groundwater Inside and Outside the Containment Area and Monitor Groundwater Outside the Containment Area; Implement Actions to Address the Migration of Contamination from Inside to Outside the Containment Area and Mounding in the Containment Area (if Necessary).

The groundwater inside the Containment Area shall be monitored in such a way as to provide sufficient information to evaluate if mounding inside the Containment Area is occurring, and to evaluate if contamination is migrating from inside to outside of the Containment Area. In the event that contamination is found to be migrating from inside to outside of the Containment Area, or mounding inside the Containment Area is occuring, action shall be taken to prevent further migration or mounding. Such actions may consist of, among other things, installation of a drain to discharge groundwater, pumping of the Containment Area, or other active measures. Additionally, groundwater elevations upgradient of the Containment Area shall be evaluated and actions taken in the event that rising elevations create a potential for flooding. Such actions may consist of, among other things, a groundwater collection trench.

#### *12.2.4.1 Performance Standards for Monitoring the Elevation of Groundwater Inside and Outside the Containment Area and Monitoring Groundwater Outside of the Containment Area; Implementing Actions to Address the Migration of Contamination from Inside to Outside the Containment Area and Mounding in the Containment Area (if Necessary).*

1. Monitor the hydraulic head of groundwater inside and outside of the Containment Area to evaluate if groundwater inside the Containment Area is lower than the surrounding areas outside the Containment Area (thereby creating an inward gradient which will minimize the risk of contaminated groundwater entering into the deeper aquifer or exiting the Containment Area). The nature and frequency of this monitoring shall be sufficient to permit periodic evaluation of the effectiveness of the Containment Area and shall be determined during the Remedial Design. Such monitoring shall continue until EPA, in consultation with the State of Delaware, determines that this monitoring is no longer necessary to ensure the effectiveness of the Containment Area.

2. Monitor the groundwater outside the Containment Area to evaluate if groundwater contamination is migrating from the Containment Area. The nature and frequency of this monitoring shall be sufficient to permit periodic evaluation of the effectiveness of the Containment Area and shall be determined during the Remedial Design. Such monitoring shall continue until EPA, in consultation with the State of Delaware, determines that this monitoring is no longer necessary to ensure the effectiveness of the Containment Area.

3. Actions taken in the event groundwater elevations upgradient of the Containment Area cause a potential for flooding shall eliminate such potential.

4. Actions taken if hydraulic head risks are detected, or groundwater is found to be migrating from inside to outside of the Containment Area, shall eliminate such risks and migration.

### 12.2.5 Excavate and Consolidate Shallow Contaminated Soils and Sediments into the Containment Area

Construct roadways necessary to access areas to be excavated and to access the Containment Area. Translocate rare, threatened, or endangered flora populations present in excavation areas and areas within the limits of disturbance from the remedial action to alternate suitable locations in advance of excavation activities. Shallow soils and sediments exceeding cleanup levels and with visible dry weathered surface creosote shall be excavated and consolidated on-Site into the Containment Area with amendments for geotechnical stabilization added as necessary to achieve adequate compaction and slope stability.

#### *12.2.5.1 Performance Standards for Excavating and Consolidating Shallow Contaminated Soils and Sediments into the Containment Area*

1. Roadways needed in order to permit adequate access to areas to be excavated and to the Containment Area shall be constructed in a manner that minimizes disturbance to wetlands. Such roadways shall also be constructed to facilitate construction of the remedial action as well as such monitoring as may be necessary in the future in order to assess the continuing effectiveness of the remedy.
2. For soils outside of the boundary of the Containment Area:
    a. Soils Outside the Upper South Pond Area Where No Wetlands Will Be Created.
        i. Excavate, to two feet, (1) areas of visible dry weathered surface creosote, and (2) areas with soil containing TPAHs at concentrations greater than 600 ppm.
    b. Soils Inside the Upper South Pond Area Where No Wetlands Will Be Created.
        i. Excavate, to five feet (or to such greater depth that allows for proper stabilization), (1) areas of dry weathered surface creosote, and (2) areas with soil containing TPAHs at concentrations greater than 600 ppm.
    c. Soils Where Wetlands Will Be Created.
        i. If wetlands are created on-Site, excavation of soil with TPAHs above 150 ppm is required prior to construction of the wetland.
    d. For All Soil Excavations.
        i. Place a geotextile demarcation layer at the bottom of the soil excavations and install two feet of clean fill over the geotextile demarcation to meet the existing adjacent grade, which includes at least six inches of a vegetative layer (except for Upper South Pond). Upper South Pond shall

include the placement of a permeable reactive core mat at the bottom of the soil excavations and install five feet of clean fill (or proper amount of clean fill dependent upon depth of excavation) over the reactive core mat to meet the existing adjacent grade, which includes at least six inches of vegetation.

3. For sediments outside the boundary of the Containment Area (besides Hershey Run Channel and West Central Drainage Channel):

    a. Excavate, to two feet, (1) areas of visible dry weathered surface creosote, and (2) areas with sediment containing TPAHs greater than 150 ppm.

    b. Place a permeable reactive core mat layer at the bottom of the sediment excavation and install two feet of clean fill that is comparable in composition to the native sediment over the reactive core mat, which includes at least six inches of a vegetative layer. The reactive core mats shall prevent the contamination of the clean fill and adjacent soil and sediment that did not exceed cleanup levels prior to remediation.

4. For sediments inside the Hershey Run Channel and West Central Drainage Channel:

    a. Excavate, to two feet, (1) areas of visible creosote, and (2) areas with sediment containing TPAHs at concentrations greater than 150 ppm.

    b. Excavate over the top of the bank and beyond the channel to allow adequate anchorage of the reactive core mats and to ensure contamination is not migrating along the perimeters of the covers and through un-remediated banks.

    c. Place a reactive core mat layer at the bottom of the sediment excavation and install two feet of clean fill that is comparable in composition to the native sediment. The reactive core mats shall prevent the contamination of the clean fill and adjacent soil and sediment that did not exceed cleanup levels prior to remediation.

5. Consolidate all excavated material into the Containment Area.

6. Porewater, surface water and sediment samples shall be collected and analyzed throughout the Site to monitor the effectiveness of the reactive core mats. Porewater samples shall be taken from above and below the reactive core mat.

#### 12.2.6 Move Debris Necessary to Implement the Remedial Action and/or Debris that May be Contaminated from Site Operations into the Containment Area

Debris at the Site that is suspected of containing hazardous substances or pollutants or contaminants from historical operations at the Site (such as old railroad ties, underground storage tanks, underground piping, and concrete from old foundations), or which interferes with the cleanup shall be consolidated and placed into the Containment Area. Underground piping that may act as a conduit for contamination shall be managed (*e.g.,* treated as debris for consolidation into the Containment Area, plugging/grouting, etc.) to prevent hazardous substances from being released to the environment.

#### *12.2.6.1 Performance Standards for Moving Debris Necessary to Implement the Remedial Action and/or that may be Contaminate from Site Operations into the Containment Area*

1. All debris at the Site that (1) must be removed to facilitate implementation of the Selected Remedial Action, or (2) is suspected of being contaminated from historical operations at the Site shall be removed and placed into the Containment Area.

2. Cover debris with consolidated soil and sediment sufficiently to prevent debris from penetrating the sub-base of the Containment Area cap.

3. Underground piping that was discovered during the Remedial Investigation or found during the Remedial Action that may act as a conduit for contamination will be managed by treating as debris or adequately plugging or grouting to prevent hazardous substances from being released to the environment.

### 12.2.7 Install a Cap Atop the Containment Area

After debris and contaminated soils, sediments, and other materials required to be placed into the Containment Area have been consolidated into the Containment Area, install a cap atop the Containment Area. The cap will prevent direct contact with contaminated soils, sediments, and groundwater which would result in unacceptable exposure risks and divert rainwater. Final grading shall promote drainage off the cap. A vegetative cover shall be established on top of the cap to prevent erosion. Plants that provide habitat value shall be used to establish the vegetative cover.

#### *12.2.7.1 Performance Standards for Installing a Cap Atop the Containment Area*

1. The cap system to be installed shall be of such size and construction to:
    a. prevent direct contact with contaminated soils, sediments, debris, and groundwater within the Containment Area and
    b. prevent infiltration of surface water and rain into the Containment Area

until EPA, in consultation with the State of Delaware, determines that containment of the materials in the Containment Area is no longer necessary to protect human health and the environment.

2. Prepare the sub-base for the cap.

    a. Stockpiled soils, sediments, and debris shall be graded prior to installation of the sub-base to prevent penetration of the sub-base and aid in effective placement of the cap.

b. The sub-base (e.g., clean soil fill) shall be placed over consolidated material in the Containment Area and shall provide a clean base for the cap and shall be at least 6 inches thick.

c. The sub-base shall be graded and compacted to properly facilitate the diversion of water off of the cap.

d. The graded sub-base soils shall not contain stones or debris that could cause a puncture in the cap.

e. The sub-base shall cover the Containment Area in its entirety.

3. A geotextile layer shall be installed above the compacted sub-base layer as a measure of protection to the overlying geomembrane. The geotextile layer shall be installed across the entirety of the Containment Area and shall be constructed to protect the integrity of the overlying geomembrane.

4. A geomembrane/cap with a permeability of $1x10^{-7}$ cm/sec or less over the sub-base/geotextile shall be installed. The geomembrane shall be a low-permeability material (e.g., 40-mil high density polyethylene (HDPE)). The cap shall be installed to completely cover the sub-base.

5. A Geocomposite Drainage Layer shall be placed above the geomembrane to promote surface water infiltration drainage to the exterior of the Containment Area. The Geocomposite drainage material shall be installed across the entirety of the Containment Area.

6. Install a common fill layer to provide a base for vegetation and to protect the cap. The common fill shall be free of sharp objects or debris of any kind which could potentially damage the geosynthetics. The common fill layer shall be at least 12 inches thick that includes at least 6 inches of topsoil to vegetate the cap.

7. Vegetate and maintain the cap in such a way as to prevent erosion of soils. The vegetation on the cap shall use native grasses and forbs and shall be controlled so as to prevent or limit the growth of any plants which would damage the cap with deep root systems.

8. The cap shall be designed and constructed to function with minimum maintenance, to promote drainage and minimize erosion or abrasion of the cover, to accommodate settling so that the cover’s integrity is maintained, and to provide adequate freeze protection.

9. The cap shall be designed and constructed to accommodate access to piezometers and/or monitoring wells at the Containment Area.

10. The cap shall be designed to permit gas venting to prevent air emissions exceeding levels that require control under Federal and State regulations unless field data obtained during

the remedial design determines VOC emissions beneath the cap would not exceed Federal and State regulations.

### 12.2.8 DNAPL Recovery in the Former Process Area and South Pond Areas and Evaluation of Groundwater Outside of Channels

DNAPL in the saturated zone in the Former Process Area and South Pond Areas shall be recovered via recovery wells. The recovered DNAPL shall be treated and disposed off-site or recycled. During and following DNAPL recovery, groundwater monitoring will be conducted to evaluate groundwater conditions downgradient from DNAPL-impacted areas and assess the performance of DNAPL recovery. Additional DNAPL recovery wells may be added after DNAPL recovery begins to further target and remove source material in the subsurface. Additionally, evaluation of groundwater outside of the Hershey Run Channel and West Central Drainage Channel will occur to evaluate impacts to groundwater, if any, from contamination left below the reactive core mats.

#### *12.2.8.1 Performance Standards for DNAPL Recovery in the Former Process Area and South Pond Areas and Evaluation of Groundwater Outside of Channels*

1. DNAPL recovery in the Former Process Area and South Pond Areas will continue until the DNAPL in the saturated zone is extracted to the extent practicable. Extraction to the extent practicable will require a demonstration that DNAPL recovery has reached an asymptotic cumulative recovery state.

2. Targeted wells that have been previously installed will be monitored to determine if measurable DNAPL is entering these wells. These wells are within the Former Process Area and South Pond Areas where measurable DNAPL was encountered during the sampling reported in the *"Supplemental Remedial Design Investigation- 2/2018 Sampling of Installed Delineation Wells"* report.

3. Groundwater monitoring shall be conducted to evaluate groundwater conditions downgradient from DNAPL-impacted areas and assess the performance of DNAPL recovery. The number and location of monitoring wells will be determined during the Remedial Design.

4. Monitoring of groundwater conditions outside of the West Central Drainage Channel and Hershey Run Channel shall occur to evaluate whether groundwater contamination impacts areas outside the confines of the channels.

5. DNAPL recovered shall be separated from groundwater (to the extent practicable), and treated and disposed of or recycled off-site, in accordance with CERCLA § 121(d)(3) and NCP § 300.440. DNAPL that is stored on-Site while awaiting off-site disposal or recycling shall be managed in accordance with RCRA requirements.

6. Monitoring reports shall be submitted to EPA at such frequency and in such detail to allow EPA to evaluate the DNAPL recovery rates, and groundwater contaminant

concentrations downgradient of DNAPL-impacted areas over time. The frequency of such monitoring reports shall be determined during the Remedial Design.

### 12.2.9 Mitigation of Wetlands

Construction of the Containment Area and barrier wall, realignment of Hershey Run, and excavation in specific areas will impact wetland resources at the Site. Coordination with the appropriate regulatory agencies will be conducted to ensure that mitigation efforts satisfy applicable or relevant and appropriate substantive requirements in state and federal laws and regulations pertaining to impacted wetlands at the Site. Wetland mitigation will be accomplished through on-Site mitigation or mitigation within the Christina River Watershed, to the extent practicable, and shall be included as part of the Remedial Design.

#### *12.2.9.1 Performance Standards for Mitigation of Wetlands*

1. Wetlands that are temporarily impacted due to the remedial activities will be restored so that such wetlands are of similar type, function, and ecological diversity as they were before commencement of remedial activities.

2. Wetlands that are permanently impacted (e.g., the Containment Area and realigned portion of Hershey Run) will be evaluated for off-site and on-Site mitigation efforts and mitigation shall be performed. Mitigation shall ensure similar type, function, and ecological diversity. To the extent practicable, mitigation shall occur within the Christina River Watershed.

3. Implementation of the Selected Remedial Action shall result in a no net loss of wetlands or wetland function.

### 12.2.10 Land Use Restrictions

Land use restrictions shall be implemented to (a) protect the remedial action components, including the Containment Area and covers installed atop excavations where geotextile demarcations or reactive core mats have been installed, and (b) prevent exposure to unacceptable risks associated with contaminants remaining at the Site.

#### *12.2.10.1 Performance Standards for Land Use Restrictions*

1. Land use restrictions shall:

    a. Prohibit excavations and other activities and uses that adversely impact the integrity of the cap, barrier walls, and other components installed during implementation of the remedial action at the Containment Area without prior written approval of EPA, in consultation with the State of Delaware.

    b. Prohibit excavations and other activities and uses that adversely impact the integrity of clean fill, reactive core mats, geotextile demarcations, or other components installed over underlying impacted soil and sediments at the Site without prior written approval of EPA, in consultation with the State of Delaware.

  c. Prohibit interference with the structure and function of restored wetlands and wetlands created as part of mitigation without prior written approval of EPA, in consultation with the State of Delaware.

  d. Prohibit residential development or use at the Site without prior written approval of EPA, in consultation with the State of Delaware.

2. The land use restrictions shall be implemented in such a way that are enforceable by the State of Delaware and run with the land under the laws of the State of Delaware.

3. Land use restrictions shall remain in place until EPA, in consultation with the State of Delaware, determines that they are no longer necessary to protect human health and the environment.

### 12.2.11 Monitor Groundwater, Surface Water, Sediments, Biota, Porewater, Containment Area, Channels, and Caps/Covers to Permit Evaluation of the Remedy Performance

Collect and analyze information and data from the groundwater, surface water, sediments, biota, Containment Area, caps/covers, and other locations and media (including but not limited to monitoring addressed in the above performance standards) to facilitate the evaluation of the performance of the remedial action.

#### *12.2.11.1 Performance Standards for Monitoring Groundwater, Surface Water, Sediments, Biota, Containment Area, Channels, and Caps/Covers to Permit Evaluation of the Remedy Performance*

1. The location, frequency, and media for monitoring shall be sufficient to enable EPA to evaluate remedy performance for purposes of:

   a. determining if changes to the remedy are required to protect human health and the environment;

   b. conducting FYRs required by CERCLA or EPA policy; and

   c. evaluating remedy performance.

   The location, frequency, and media for monitoring shall be developed during the Remedial Design.

Adjustments to the monitoring plans shall be made as necessary in order to facilitate the evaluation of remedy performance over time.

## 12.3 Interim Remedial Action Components and Performance Standards

The Interim Remedy portion of the Selected Remedial Action includes the actions identified below. The Interim Action shall be designed, implemented, operated, and maintained consistent with the requirements of the Programmatic Agreement identified in Section 1.5, any amendments to the Programmatic Agreement, and any replacement to the Programmatic Agreement that may be executed in connection with the Selected Remedial Action.

### 12.3.1 Groundwater Use Restrictions

Implement institutional controls to prevent exposure to contaminated groundwater at the Site.

#### *12.3.1.1 Performance Standards for Groundwater Use Restrictions.*

1. Institutional Controls shall prevent human exposure to groundwater contaminated by the Site. Such controls shall prevent use of, and contact with, contaminated ground via ingestion, vapor inhalation, or dermal contact.
2. The Institutional Controls shall be implemented in such a way that they are enforceable and run with the land under the laws of the State of Delaware.
3. The Institutional Controls shall remain in place until EPA, in consultation with the State of Delaware, determines that they are no longer necessary to protect public health and/or the environment.
4. Creation, by the State of Delaware, of a groundwater management zone prohibiting the uses, at the locations, and for the duration identified above shall satisfy the requirement for Institutional Controls.

## 12.4 Cost Estimate

The estimated present worth of the total cost of the remedial action in this ROD Amendment is $39,645,546. A breakdown of the costs is provided in Table 1 Cost Breakdown.

## 12.5 Expected Outcomes of the Selected Remedial Action

Implementation of the Selected Remedial Action is expected to protect human health and the environment by mitigating unacceptable risks and satisfying the RAOs. The Selected Remedial Action includes a Final Action to address risks from soils, sediments, and DNAPL in the saturated zone serving as a source for groundwater contamination, and an Interim Action to address risks from groundwater contamination.

Implementation of the Final Action is expected to prevent current and future direct contact with contaminated soils and sediments that would result in unacceptable levels of risk and to minimize the ongoing contamination of groundwater from the presence of DNAPL in the saturated zone through removal and/or containment.

Implementation of the Interim Action is expected to prevent unacceptable risks due to exposure to contaminated groundwater.

# 13 STATURTORY DETERMINATION

## 13.1 Protection of Human Health and Environment

The Selected Remedial Action will achieve protection of human health and the environment by preventing direct contact with contaminated soils, sediments, and groundwater at the Site. This will be accomplished by (1) shallow excavation of contaminated soils and sediments with appropriate covers over the underlying soils and sediments, (2) consolidating excavated materials into a Containment Area to be capped, (3) implementing Institutional Controls to protect the remedy components, and (4) implementing Institutional Controls to prevent contact with groundwater contamination. A final action for groundwater will be selected in a separate decision document subject to public participation requirements.

## 13.2 Compliance with ARARs

The Selected Remedial Action will comply with ARARs that are not waived. Because groundwater is addressed in an Interim Action which will not restore the groundwater to beneficial use, EPA is waiving, and the Interim Action portion of the Selected Remedial Action will not meet, ARARs establishing groundwater cleanup standards.

## 13.3 Cost Effectiveness

NCP § 300.430(f)(1)(ii)(D) requires EPA to evaluate cost-effectiveness by comparing all the alternatives meeting the threshold criteria (protection of human health and the environment and compliance with ARARs) against long-term effectiveness; reduction of toxicity, mobility, or volume through treatment; and short-term effectiveness (collectively referred to as “overall effectiveness”). The NCP further states that overall effectiveness is then compared to cost to ensure that the remedy is cost-effective and that a remedy is cost-effective if its costs are proportional to its overall effectiveness. EPA has determined, following an evaluation of these criteria, that the Selected Remedial Action is cost-effective in providing overall protection in proportion to cost.

## 13.4 Utilization of Permanent Solutions to the Maximum Extent

The Final Action utilizes permanent solutions to the maximum extent practicable. The removal of DNAPL in the saturated zone, via recovery wells, provides a permanent solution to contamination in the subsurface that leads to an ongoing source to groundwater contamination. Additionally, the removal of shallow contaminated soils and sediments, installation of covers over the underlying soils and sediments, and placement of excavated soils and sediments into the on-Site Containment Area allows for a permanent solution to direct contact to the contamination.

The Interim Action for groundwater (institutional controls to prevent contact with contaminated groundwater) is not intended as a permanent solution and will be supplemented by a future remedy to be selected at a later date.

### 13.5 Five Year Review Requirements

Because the Selected Remedial Action will result in hazardous substances remaining on-Site above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted every five years after initiation of the remedial action pursuant to CERCLA § 121(c) and NCP § 300.430(f)(4)(ii) to determine if the remedial action remains protective of human health and the environment.

## 14 DOCUMENTATION OF SIGNIFICANT CHANGES

While not a fundamental or significant change, EPA notes that in the "Request for ROD Amendment Technical Document" and the Proposed Plan, the estimated cost was identified as $41,402,000, but the revised estimate documented in this ROD Amendment is $39,645,546. Costs were slightly modified for the following reasons:

1. Archaeological Evaluations costs were reduced because of more clarity on the range of mitigation alternatives and associated estimated costs for those measures;
2. Wetlands Construction/Mitigation costs were adjusted to reflect the possibility for on-Site restoration of temporary impacts and enhancements of existing on-Site waterways and wetlands to accomplish mitigation of permanent wetland impacts; and
3. Reduced decree of uncertainty in the final remedial action scope, thus reduction of Administration and Engineering from 15% to 10%.

There are no additional significant or fundamental changes to EPA's preferred remedial action as a result of public comments.

# III. RESPONSIVENESS SUMMARY KOPPERS CO., INC. (NEWPORT PLANT) SUPERFUND SITE RECORD OF DECISION AMENDMENT NEWPORT / NEW COUSTLE COUNTY, DELAWARE

This section summarizes the questions and comments received during the public comment period on the Proposed Remedial Action Plan for ROD Amendment for the Koppers Superfund Site issued March 2021. A thirty-day public comment period was held from March 2, 2021 to March 31, 2021 and an extension to that comment period was held from April 14, 2021 to May 14, 2021. Due to public health concerns at that time, an in-person public meeting was not held. As a substitute for the public meeting:

1. EPA published, on the internet, a recorded video presentation containing information EPA would have shared at the public meeting had the meeting been held in person; and
2. EPA hosted a question-and-answer session on March 17, 2021 from 6:00pm-7:00pm. This session provided an opportunity for the public to raise, with EPA personnel and others on the call, questions and issues regarding the Proposed Plan. No members from the public called into this public availability session.

The written comments received during the public comment period for the Proposed Plan and EPA's responses are below.

## 1 Comments Received from the National Oceanic and Atmospheric Administration (NOAA)

- **COMMENT #1:**
  NOAA is providing the following comments on the Proposed Remedial Action Plan for the ROD Amendment at the Koppers Inc (Newport Plant) Superfund Site. These comments are provided as part of CERCLA coordination by lead remedial agencies with natural resource agencies in the remedial selection process. NOAA's primary concern as a natural resource trustee are the resources and habitats in Koppers Marsh. The ROD Amendment, especially as it relates to groundwater, indicates that there are no current migration pathways from the Site to the marsh. NOAA accepts this conclusion based on the technical review of EPA hydrologists and recognizes this pathway will be monitored in the future.
  - ***EPA RESPONSE:***
    *EPA acknowledges your statement.*

- **COMMENT #2:**

The wetlands at the site include non-tidal and tidal freshwater wetlands. It should be clearly presented whether the potential wetland mitigation bank referenced numerous times in the Plan was intended for non-tidal or tidal wetlands or both. It appears it was just for non-tidal wetlands. Mitigation banking for DE DOT is no longer being explored at the site. Section II.F states that "Beazer is no longer interested in using the site for mitigation banking". This should not be confused with EPA and Beazer's requirements for wetland mitigation for impacts at the site from the remedy which should be done on site. The impacts to the marsh from remedial construction, although modified in this proposed plan, are significant and have been known for well over a decade. Natural resource trustees (NOAA, USFWS, and DNREC) have presented their concerns regarding wetland impacts and wetland mitigation strategies to EPA and Beazer on numerous occasions, including a formal presentation at a Koppers Site meeting in 2008. To date, EPA and Beazer have been non-committal in a wetland mitigation approach and it is further deferred in this proposed plan. That should not be acceptable and is not consistent with the intent of CWA Section 404 ARARs.

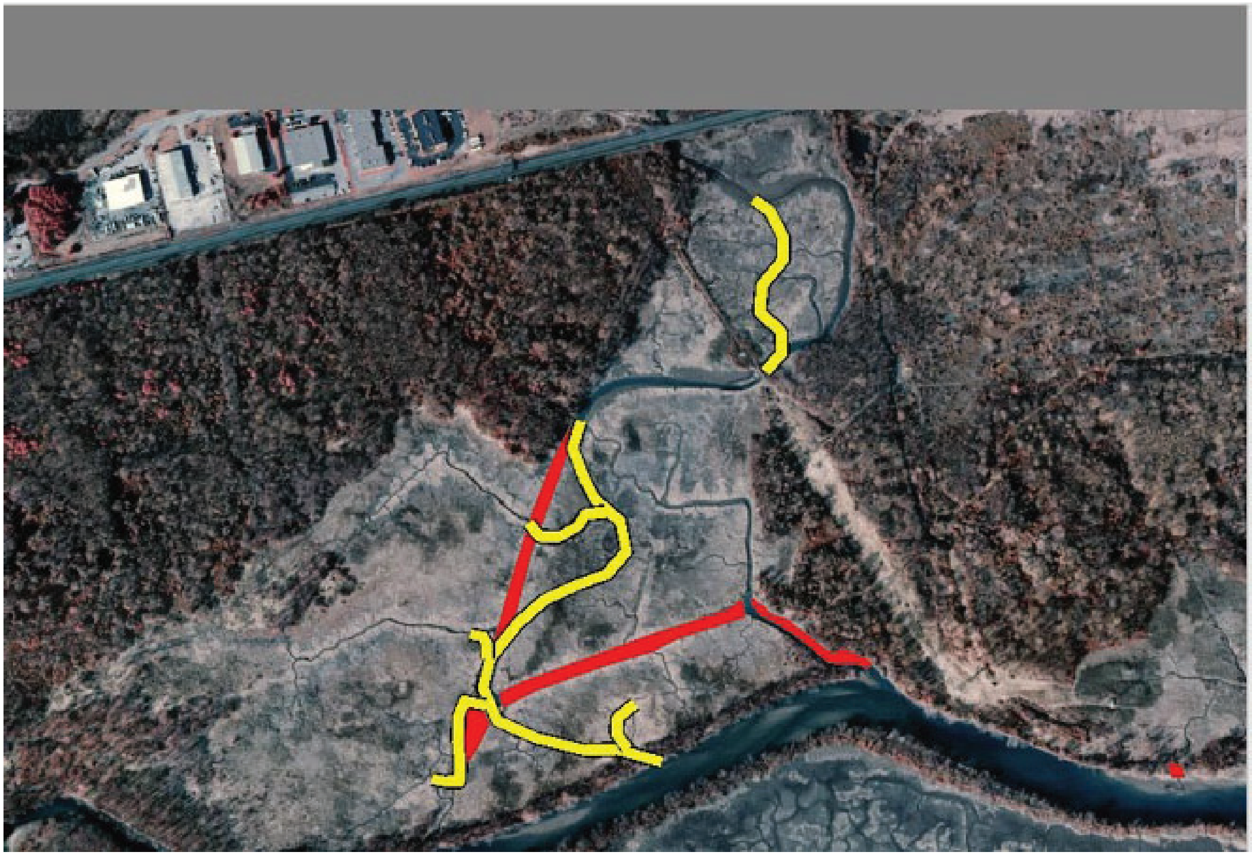
  - ***EPA RESPONSE:***

    *This ROD Amendment has made it clear to clarify that the mitigation goals will include ensuring no net loss of wetlands and that the preference will be to target in-kind (i.e., type and function) mitigation within the Christina River watershed. Implementation of the remedy will result in no net loss of wetlands or their functionality. EPA will continue to work with the appropriate Federal and State regulators to ensure all appropriate and applicable regulations are complied with.*

    *The appropriate wetland regulations have been identified as ARARs. Upon finalization of the ROD Amendment, a final remedial design will be developed to address the components of this ROD Amendment. The remedial design will include the development of wetland mitigation strategies. Until a remedial approach has been approved, it is premature to move any mitigation planning beyond a conceptual phase.*

- **COMMENT #3:**

The Koppers Site current conditions allow for a more comprehensive approach to the Site remediation which includes benefits to site wetlands. Contamination in Koppers Marsh is largely reported to be in the wetland channels. These wetland channels have been significantly altered historically (straightened and dredged with raised banks from spoils) and the current wetland channel network does not allow for good tidal wetland hydrological processes for the marsh plain. Capping the sediments in place and maintaining the current channel network will further impact the marsh and significantly impact potential future tidal wetland restoration efforts. Tidal freshwater wetlands are some of the most impacted wetlands in the Delaware Estuary. The Koppers Marsh is the highest priority freshwater tidal marsh restoration project in New Castle County and the State.



The EPA and Beazer should consider completely filling in the contaminated, highly altered, non-functioning existing channels (in red above) using clean material from Koppers Marsh as part of a comprehensive marsh cleanup and wetland mitigation project. This material would come from newly excavated channels (in yellow) that would restore the marsh hydrology and functionality and a healthy channel network. It would also provide better containment of the contamination in the existing channels by taking flow out of those channels; it would also minimize and/or potentially eliminate the need to bring new capping/fill material to the site.

- ***EPA RESPONSE****:*
  *EPA's remedial action targets specific releases and threatened releases of hazardous substances contributing to risks to human health and the environment from operations at the former wood treatment facility. Some of the contamination that is the subject of the remedial action is found in marsh areas and EPA selected action by considering the selection criteria established in the National Contingency Plan. The selected action to address contamination in the marsh areas does not include complete filling of channels as described in your comment. The comprehensive marsh cleanup project to which you refer is not needed to address the human health and environmental risks to which the EPA's Superfund program must respond. Though there may be value in completing such work (we make no judgement about that here) it is not within the Superfund program's jurisdiction.*

- **COMMENT #4:**

Wetland mitigation is not just required for permanent losses and the mitigation is not limited to new "creation". Creation of new tidal wetlands will be very difficult. There are no wetland banks appropriate for mitigation needs for this site in the State. In addition, if mitigation is not conducted at the site this could present environmental justice concerns for the Newport community. Note the Koppers site is adjacent to another Superfund Site, DuPont Newport, where some mitigation was performed "on site".

  - ***EPA RESPONSE:***

    *EPA acknowledges NOAA's concerns. See the response to Comment #2.*

- **COMMENT #5:**

Page 8 indicates that previously in the 2005 ROD wetland mitigation would be performed on site (for non-tidal wetlands) ... "Where wetlands were to be created (for wetland banking and to restore wetlands damaged by the cleanup at the Site) excavation would remove TPAH concentrations exceeding 150 ppm." Note these new wetlands would not have addressed tidal wetlands however the concept of addressing wetland avoidance, minimization, and mitigation on Site was included. It should be included in the current ROD Amendment; tidal wetland mitigation can no longer be pushed off into the future with an unknown outcome.

  - ***EPA RESPONSE:***

    *EPA acknowledges NOAA's concerns. See the response to Comment #2.*

- **COMMENT #6:**

Page 10 "Under the 2005 Remedy, if the containment area(s) extended into wetlands areas, Hershey Run would be relocated away from such areas. An evaluation of the hydrodynamics of Hershey Run was to be included in the remedial design to determine the optimal configuration of the new channel. The new channel would not alter in any negative way the existing capacity of Hershey Run for the conveyance of water and would not cause drainage changes that promote flooding upstream." Note the function of a tidal wetland channel is not to "convey water" out of the wetland but to allow for flooding of the wetland on a periodic basis. Without this the function of a tidal wetland is significantly reduced eliminating aquatic habitats and encouraging invasive species as well as transmitting sediments/solids out of the marsh and into the Creeks and Rivers. This is another important function of a marsh that is being lost (water quality and sediment/nutrient retention).

  - ***EPA RESPONSE****:*

    *The text cited is referring to the concern that channel alterations would have impacts upstream of the Site, negatively impacting flow into the downstream portions of Hershey Run. One of the functions of a tidal wetland channel draining an upstream watershed is to convey water, particularly during storm events. The capacity issue was raised by both EPA and NOAA representatives during planning meetings and, in part, resulted in the hydrodynamic evaluation that was performed. The study demonstrated that the proposed realignment of Hershey Run will not produce erosive velocities, will not negatively impact surface water elevations, and will not produce a net change in waterway hydraulics from the existing conditions at the Site. Additional* *evaluation of channel stability will be conducted, as indicated in the performance standards in this ROD Amendment.*

- **COMMENT #7:**

Off-site tidal wetland creation will be extremely difficult; there are no mitigation banks for this type of wetland restoration in DE. Restoration of wetlands (versus creation) is an acceptable mitigation approach. The Koppers Marsh is one of the few remaining areas in NCC and the State to perform freshwater tidal wetland restoration. The proposed plan needs to address this requirement as part of the overall plan and not keep deferring the 404 requirements. "The Site will no longer be used for a wetland mitigation bank. Therefore, the removal of deep contamination that would have been necessary to create wetlands for banking purposes is no longer necessary. However, wetlands that are negatively impacted by cleanup activities would still be addressed through on-Site or off-Site mitigation strategies." The wetland mitigation needs to be evaluated now!

  - ***EPA RESPONSE:***

  *EPA acknowledges NOAA's concerns. See the response to Comment #2*

- **COMMENT #8:**
  Page 19 "Coordination with the appropriate regulatory agencies will be conducted to ensure that mitigation efforts satisfy applicable or relevant and appropriate substantive requirements in state and federal laws and regulations pertaining to impacted wetlands at the Site." Please identify who these agencies are (ACOE, NOAA, USFWS, and DNREC) and when EPA/Beazer anticipates this occurring. Trustee agencies have been trying to coordinate on wetland issues at the site for over a decade or more. The time to coordinate is now!!

  - ***EPA RESPONSE:***
    *EPA will continue to communicate and coordinate with the appropriate USACE and DNREC wetland personnel to ensure that the substantive wetland requirements will be met.*

- **COMMENT #9:**
  Page 19: "Areas where wetlands are negatively impacted will be addressed using on-Site or off-Site mitigation strategies to result in a no net loss of wetlands." The requirement is not just no net loss but no loss in function. The functionality of the marsh has been impacted for several decades from activities from the Site and won't just begin with the construction of the remedy

  - ***EPA RESPONE****:*
    *Please refer to EPA's Response to Comment #2 in regard to addressing the loss of wetland function. The amount of compensatory mitigation that may be required will be addressed during the development of the wetland mitigation plan and will be subject to regulatory review.*

- **COMMENT #10:**
Page 20 ... "Surface water, sediments, and biota will be monitored to demonstrate that risk has been reduced to acceptable levels and that the remedy continues to be effective. A comprehensive monitoring plan will be developed as part of the Remedial Design, which will include monitoring and maintenance of the respective covers associated with the ROD Amendment."

  A new baseline of ecological conditions should be conducted before and after the remedy implementation. There has been limited, if any, characterization of the Koppers Marsh since the previous ROD and the baseline conditions, in terms of sediment quality and biological communities in the Marsh, are not well characterized. A baseline will be required to evaluate impacts, positive or negative, from remedial activities in the Marsh. Monitoring of site ecological restoration will be required as part of the Remedy. I am not suggesting the baseline ecological risk assessment be re-done however it should be updated based upon the elapsed time.

  - ***EPA RESPONSE:***
*An ecological monitoring program will be developed during the remedial design process as part of the overall site monitoring program. The program will include the establishment of current pre-remedial or baseline conditions, which will be used to help assess the effectiveness of the Final Action. The ecological monitoring program will be informed by the findings of the Baseline Ecological Risk Assessment.*

- **COMMENT #11:**
Page 21 Table: "The ROD Amendment includes excavation of contaminated sediments and marshes to a depth of two feet below ground surface, installation of a reactive core mat over the underlying sediments, and installation of two feet of clean fill consisting of at least 6" of a vegetative layer." A 6" vegetative layer in a freshwater tidal wetland channel will be difficult to maintain and is not a natural type of habitat feature.

  - ***EPA RESPONSE:***
*EPA understands there will be areas that may not be suitable for a six-inch vegetative layer (for example, where there is active running water/where vegetation would be submerged completely underwater). It is not EPA's intent to include a 6" inch vegetation layer in areas where it is not suitable. The performance standards for the 6" inch vegetation layer have been updated to include this requirement where applicable.*

- **COMMENT #12:**
Page 27. Long Term Effectiveness: The suggested approach to completely capping the contaminated channels and restoring a marsh channel network will be more permanent than capping the material in an open channel. It would also eliminate the need to bring capping material on site (short term effectiveness - Page 28) and allow for one

construction event in the Marsh if wetland mitigation were to be performed in the Marsh as suggested.

- ***EPA RESPONSE****:*
  *The Selected Remedial Action is intended to address identified contamination and risks presented thereby without impacting other areas of the marsh. Because the Selected Remedial Action focuses on identified contamination, it will be effective in both the short-term and long-term. It will also be implementable as it will address the contamination directly. Please see response to Comment #3 for additional information.*

- **COMMENT #13:**
  Page 30 - The Costs should include the "costs" for wetland mitigation. Off-site wetland mitigation opportunities will be more limited and likely much more expensive to meet the mitigation requirements

  - ***EPA RESPONSE:*** *A cost breakdown of the Selected Remedial Action is provided in Table 1: Cost Breakdown and includes costing for wetland mitigation.*

# 2 Comments Received by the Delaware Ornithological Society (DOS)

- **COMMENT #1:**

The Delaware Ornithological Society (DOS) is an all-volunteer, 501(c)3 nonprofit representing hundreds of members in Delaware and adjacent states. Our mission is the promotion of the study of birds, the advancement and diffusion of ornithological knowledge, and the conservation of birds and their environment.

DOS respectfully requests a 60-day extension of the Public Comment Period for the Koppers Inc. Newport, Delaware Proposed Remedial Action Plan in accordance with 40 CFR§300.430(f)(3)(i)(C), viz. "Upon timely request, the lead agency will extend the public comment period by a minimum of 30 additional days."

A 60-day extension is necessary in order to allow our organization to better assess the potential impacts of the Proposed Plan and the long-term effectiveness and permanence of the EPA's preferred alternative on biotic resources and habitats at the site and in the adjacent tidal marshes of the Christina River watershed.

In light of the complexity of the issues associated with the Site, the long history of the Administrative Record on this Site, the proposed change in end use of the Site (no longer proposed for wetland banking), and the extensive associated changes to the proposed preferred alternative as compared with that of the prior ROD (including significantly more impact to tidal marshes as a result of the reconfigured onsite containment area), an extension is necessary for community organizations like ours to be able to conduct a thorough review and prepare meaningful comments on the Proposed Remedial Action Plan.

In addition, the unusual circumstances associated with the Covid-19 pandemic require an extension of the comment period to allow members of the public and interested community organizations time to further explore questions associated with Proposed Plan. A 30-day comment period following a prerecorded video in lieu of a Public Meeting is insufficient. Further, it is concerning that although a virtual question and answer session was apparently held by phone on March 17th (only two weeks before the comment period expiration) no recording or transcript of that session appears to have been made available to the public via the EPA website.

We also feel it is important to emphasize that the ecological investigation activities at the site (summarized in the May 2003 Remedial Investigation Report) were conducted at least 17 years ago at this point, and the conservation and regulatory status of many species and habitats has changed since then. In addition, in our preliminary review of the 2003 Remedial Investigation Report, we note that the off-site reference marsh (Churchman's Marsh) that was chosen was one that had been heavily impacted by past use (prior impoundment) and thus was an inappropriate choice of reference site for the ecological investigation and risk assessment.

The Christina River marshes are now the *only* remaining completely freshwater tidal marsh systems in Delaware, and their conservation importance has increased accordingly over the past two decades. Much new scientific literature has also become available since 2005 that is relevant to this project in terms of impacts of contaminants of concern to relevant ecological receptors (e.g. Bianchini and Morrisey 2018, Bonisoli-Alquati 2020, Wallace et al. 2020), further necessitating an extended period of public review and comment.

In light of all of these concerns, we urge you to extend the Public Comment Period on this Proposed Remedial Action Plan by no less than 60 days. Thank you for considering this request.

- ***EPA RESPONSE:***
  *In response to the request for additional comment period, EPA extended the comment period from April 17, 2021 through May 17, 2021. The virtual question and answer session provided an opportunity for all members of the community to raise concerns on the Proposed Plan. If the question and answer session had been in person, the date would likely have been similar, as EPA prefers holding the comment period near the mid-way point of the review period to allow the public an opportunity to review the Proposed Plan and formulate questions they may have. Furthermore, during the question and answer session, no members of the community joined the call, including DOS. The transcript is available in the administrative record; however, the transcript merely includes time checks as there were no questions asked.*

## 2.1 Additional Comments Received from the Delaware Ornithological Society

The Delaware Ornithological Society (DOS) is an all-volunteer, 501(c)3 nonprofit representing hundreds of members in Delaware and adjacent states. Our mission is the promotion of the study of birds, the advancement and diffusion of ornithological knowledge, and the conservation of birds and their environment. DOS has a long history of leadership in the study and conservation of birds and bird habitats in the Christina River main stem watershed, including extensive avian surveys conducted at Churchman's Marsh just upstream of the Site, and at the Russell W. Peterson Wildlife Refuge (Wilmington Marsh) downstream near Wilmington. DOS welcomes the opportunity to comment on the Proposed Remedial Action Plan (PRAP) for Record of Decision (ROD) Amendment. As Chair of the DOS Conservation Committee, I have prepared the following comments on behalf of the organization.

Our concerns with the PRAP and ROD Amendment are summarized as follows:

- ***COMMENT #1: Single Containment Area Located in Current Tidal Wetland***
  We question the movement of contaminated material that is currently located in upland areas of the site to a single containment unit that will be created from (and ultimately surrounded on three sides by) tidal wetlands of Hershey Run. Moving additional contaminated soil and sediment material (beyond that which already occurs within the tidal wetlands) into a unit that would expose wetland receptors to immediate contamination should barrier walls leak or fail reduces the long-term effectiveness and permanence of the remedy and may not adequately protect the most sensitive ecological receptors in the future. A separate containment area located in the upland as far as practicable from the tidal marsh or other surface waters would be a more cautious approach for materials not already occurring in the existing marsh and channel and would result in significantly less contaminant load available for potential release into the surrounding marshes should failure of the containment unit occur.

    - ***EPA RESPONSE****:*
      *EPA selected the location for the Containment Area because it is where the greatest extent of Site contamination is located. The remedy is more effective in the short term with the Containment Area in this location because it will reduce the amount of excavation that will be necessary, and limits the extent of DNAPL recovery via recovery wells because the DNAPL in the saturated zone in this area will be confined by the Containment Area and the barrier walls. This approach is also more implementable, as it reduces the amount of excavation, and places the Containment Area in a location that encapsulates the greatest extent of contamination. Additionally, monitoring of the Containment Area/barrier walls will occur to evaluate the Containment Area/barrier walls effectiveness and ensure it does not allow for contamination inside the Containment Area/barrier walls from migrating outside of the Containment Area/barrier walls. This approach ensures the long-term performance of the remedy as well.*

- ***COMMENT #2: Permanent Loss of Over 8 acres of Tidal Wetland Without Local Mitigation Commitment***

The tidal wetlands of Hershey Run are significant resources since the Christina River holds the last remaining freshwater tidal systems in Delaware. These marshes are important foraging habitat for colonial waterbird Species of Greatest Conservation Need including Snowy Egret, Glossy Ibis, and Black-crowned Night Heron. The modified remedy would permanently destroy 8.18 acres of tidal wetlands, and the realignment and armoring of Hershey Run would permanently impair the ecological function of a significant reach of tidal creek channel.

If technical approaches cannot be identified to protect these wetlands from permanent destruction, then DOS strongly urges mitigation for all wetland and channel impacts from remedial actions at the site to be ecologically and functionally equivalent and for mitigation to be conducted as close as possible to the Site (either on site, or at a minimum, within the Christina River mainstem watershed) to maintain available habitat and system-wide ecological function within the immediate area of the Site.

  - ***EPA RESPONSE***:
    *EPA anticipates that remediating contaminants present in the wetland which pose an unacceptable risk will increase the ecosystem services provided by the wetlands as well as their overall heath. If negative impacts to wetlands, including loss of acreage, occur during that remediation, EPA will address those impacts, as required by the substantive state and federal regulations. The details of such wetland mitigation planning will be further evaluated after the ROD Amendment is issued and during the development/finalization of the Remedial Design. EPA understands DOS's concerns with maintaining ecologically and functionally equivalent wetland mitigation as close to the Site as possible and it is EPA's preference (but not obligation) to conduct wetland mitigation on-Site or within the Christina River watershed.*

- **COMMENT #3: Major Changes to Remedial Alternative Without Update of Ecological Risk Assessment Data**
  Much new scientific literature has also become available since 1997 that is relevant to this project in terms of impacts of contaminants of concern on relevant ecological receptors (e.g. Bianchini and Morrisey 2018, Bonisoli-Alquati 2020, Wallace et al. 2020).

  We assert that the avian NOAEL (No Observable Adverse Effect Limit) and LOAEAL [sic] (Lowest Observable Adverse Effect Limit) used in the 1997 Ecological Risk Assessment (ERA) are no longer accurate based upon currently available science, which may affect the conclusions for three of the twelve Assessment Endpoints (Endpoints 7-9). The Effects Limits for birds for the ERA were based upon a single study of non-native European Starlings that is now nearly thirty years old (Trust 1993).

  Recent work by Bianchini (2018) found dramatic sublethal effects of TPAHs on weight gain of Sanderlings (a native bird and more relevant receptor species for tidal wetland sites) at doses as low as 12.6 µg total PAH/kg body weight/day. Thus, experimentally demonstrated NOAELs and LOAELs for TPAHs based upon more current and relevant literature are *at least four orders of magnitude lower* than was used in the 1997 ERA. The PAHs used in the Bianchini (2018) study included a nearly identical set of low and high molecular weight PAHs as those documented at the Koppers site. Using updated LOAEALs based on relevant studies such as this would be particularly important for Assessment Endpoint 8, Protection from Direct Toxicity Effects and Reproductive Impairment of Worm-eating Birds Utilizing the Site.

Because of new data available on important sublethal effects to birds of low-dose PAHs, sediment and soil cleanup criteria levels for the Koppers site should be reevaluated to assure adequate protection of both resident and migratory birds. American Woodcock, the species selected for receptor assessment endpoint 8, has declined sharply throughout the region and within Delaware and is now a species of conservation concern, indicating additional importance of updating ERA data and reevaluating cleanup criteria with current science in mind.

- ***EPA RESPONSE:***
  *EPA agrees that new scientific literature has become available that is applicable to understanding PAH exposure and the resultant effects. EPA has reviewed the cited studies, considering their methods and results as they apply to site conditions, the baseline ecological risk assessment that informed the 2005 ROD, and this ROD Amendment. The remedial footprint as defined in this ROD Amendment is expected to result in significant reductions in receptor exposure to bioavailable Site contaminants resulting in the reduction of unacceptable ecological risk by either removal or containment. Post-remedial monitoring will be designed to ensure that the remedy is protective of ecological receptors and exposure to any residual site contaminants will not result in an unacceptable risk.*

- **COMMENT #4: Major Changes to Remedial Alternative without updating Ecological Investigations**

We also feel it is important to emphasize that the ecological investigation activities at the site (summarized in the May 2003 Remedial Investigation Report) were conducted at least 17 years ago at this point and updates to this data would better inform design and construction of remedial action with regard to minimizing construction and post-construction impacts to species of conservation concern occurring on site, including the species of birds mentioned above, as well as other birds documented on site including the State Endangered American Kestrel, and Species of Greatest Conservation Need such as Wood Thrush, Scarlet Tanager, Worm-eating Warbler and others. This applies to non-avian species of concern as well, including Spotted Turtle and Box Turtle, among others.

- ***EPA RESPONE:***
  *EPA strongly recommends that the determination of the potential presence of species of special status occur prior to every major project milestone. EPA will ensure that the appropriate consultations will be performed as part of the design process, and as part of the planning of remedial activities.*

- **COMMENT #5: Inappropriate Specified Soil and Plant Materials for Proposed Restoration**
  The 2013 Pre-Final Design Report prepared by Langan indicates the use of coarse sands to backfill excavated areas of Hershey Run channel, as well as 18” of “select fill” to restore the marsh platform. According to design documents, “select fill shall consist of crusher run aggregate with a gradation that meets Maryland Department of Transportation CR-6, DelDOT Type B Crusher Run, PennDOT 2A or Engineer-approved alternate.” Neither of these material types are appropriate for ecological restoration of tidal wetlands and would not constitute restoration in kind for this wetland community. The tidal marshes of this area are composed of fine-textured organic soils with complex biogeochemical properties and restoration soils would need to be specifically designed to closely mimic natural marsh soils in texture, bulk density, and organic carbon content in order for the tidal marsh to be considered successfully restored to ecologically functional condition. In addition, the plant specifications proposed by Langan in the Pre-Final Design Report for revegetation contain numerous inappropriate species for the local site conditions. For example, *Juncus roemerianus*, *Kosteletzkya virginica*, and *Myrica pensylvanica* do not occur in the fresh tidal marshes of the Christina River. Ample reference sites are available along the river from which to derive appropriate plant materials specifications for each habitat. The extensive botanical plot data collected as part of the Remedial Investigation Report is also helpful here, and consultation with local experts, including Delaware’s State Botanist would be warranted for these plant communities. The combination of inappropriate soil and vegetation specifications indicates a lack of understanding of the system to be remediated and warrants a lack of confidence in the quality of any restoration work undertaken. If these habitats are not correctly restored, they will be of little future value to birds or other wildlife.

  We recommend that EPA require that a qualified ecological restoration professional with expertise in tidal freshwater marsh systems and knowledge of local conditions and plant communities supervise final design and implementation of ecological restoration at the site. This could be a Professional Wetland Scientist (PWS) or Certified Ecological Restoration Practitioner (CERP) with knowledge of Mid-Atlantic tidal freshwater marsh restoration. It is of critical importance that post-remediation ecological restoration of these tidal wetlands is designed and carried out by competent ecological professionals with the advice and input of local experts from the Delaware Department of Natural Resources.

  - ***EPA RESPONSE:***
    *EPA will review the remedial design required to be submitted under the ROD Amendment to ensure that it identifies appropriate materials, including plant materials, to be used for the restoration. It must be noted that the materials selected for restoration of the remediated areas may not necessarily be consistent with what would typically be selected for ecological restoration projects as the goals of permanence and long- term stability of the remedy take precedence. The EPA has used, and will continue to use, appropriate and qualified professionals.*

# 3 Comments Received by the United States Fish and Wildlife Service (USFWS)

- **COMMENT #1:**
  The Service concurs with the comment letter sent by [redacted] of the National Oceanic and Atmospheric Administration. Key points from that letter focus on the opportunities for wetland restoration. As the NOAA notes, "Capping the sediments in place and maintaining the current channel network will further impact the marsh and significantly impact potential future tidal wetland restoration efforts. Tidal freshwater wetlands are some of the most impacted wetlands in the Delaware Estuary. The Koppers Marsh is the highest priority freshwater tidal marsh restoration project in New Castle County and the State."

  - ***EPA RESPONSE:***
    *Please refer to EPA's response to NOAA Comment #2 under Section 1 of this Responsiveness Summary section. Capping the sediments is intended to address the levels of contamination in the sediments which pose unacceptable risk to ecological receptors. If negative impacts to the marsh occurs during the remediation, EPA will address those impacts, as required by the substantiative state and federal regulations.*

- **COMMENT #2:**
  The Service agrees with [redacted] statements, "A new baseline of ecological conditions should be conducted before and after the remedy implementation. There has been limited, if any, characterization of the Koppers Marsh since the previous ROD and the baseline conditions, in terms of sediment quality and biological communities in the Marsh, are not well characterized. A baseline will be required to evaluate impacts, positive or negative, from remedial activities in the Marsh. Monitoring of site ecological restoration will be required as part of the Remedy."

  - ***EPA RESPONSE:***
    *Please Refer to EPA's Response to NOAA Comment #10 under Section 1 of this Responsiveness Summary section.*

- **COMMENT #3:**
  The Service recognizes that a Baseline and Performance Monitoring Plan will be developed as part of the Remedial Design. The key monitoring indicators should include benthic community abundance and diversity; sediment chemistry; sediment toxicity tests with invertebrates and larval fish; and evaluation of histopathology in resident mummichogs (*Fundulus heteroclitus*) compared with collections from reference areas.

  - ***EPA RESPONSE:***
    *Please Refer to NOAA Comment #10 under Section 1 of this Responsiveness Summary section. The monitoring indicators will be discussed during the development of the ecological monitoring program development.*

# 4 Comments Received by Christina Conservancy, Inc.

I am writing you on behalf of the Christina Conservancy in response to the request for public comment on EPA's Proposed Remedial action Plan (PRAP) for Record of Decision (ROD) Amendment for the Koppers Inc. superfund site located in Newport, DE.

The Christina Conservancy is a non-profit organization dedicated to promoting the preservation, restoration, and appreciation of the historic and natural resources of the Christina River watershed. We seek to achieve this by providing financial support, advocacy support, communication, education, and leadership in cooperation with state and local agencies, other non-profit organizations, businesses, residents, landowners, and user groups to:

- Provide appropriate and responsible access to the river and associated natural areas;
- Reduce water pollution to the Christina and its tributaries;
- Protect and enhance important natural and heritage areas of the watershed; and
- Engage people in stewardship of the watershed.

In light of this mission, we submit the following comments regarding the Koppers Site PRAP / ROD Amendment. Christina Conservancy is pleased to see that actionable remedies for the Koppers Site are moving forward, and we hope to continue to engage with EPA and Beazer East, Inc. with regard to the process of remediation and restoration of this important site.

- **COMMENT #1: CBR4 Initiative**
  We would like to make the parties aware of a relevant initiative, the Christina Brandywine River Remediation, Restoration, and Resilience (CBR4) Initiative, a collaborative project of business, nonprofit, and state entities.

  CBR4 is a river-scale remediation, restoration, and resilience initiative to address legacy toxic contamination, restore native ecology and prepare for the changing climate as well as other threats to river health in the lower Christina River and tidal Brandywine River. In alignment with DNREC's WATAR program, the project goal is to make the rivers fishable, swimmable and drinkable in the shortest timeframe possible. CBR4 success will take multiple years to achieve, will require the efforts of various partners and will continue stepwise as project funding becomes available. The current phase, from 2021 through 2022, has two projects advancing simultaneously: a sediment remediation feasibility study and a planning effort that seeks to articulate the strategies, projects, and framework needed to restore the lower Christina and Brandywine Rivers to health.

  In the fall of 2020, American Rivers and the Christina Conservancy were awarded a two-year grant from the National Fish and Wildlife Foundation (NFWF) to engage with experts, the public, and stakeholders to create a long term remediation, restoration and resiliency plan for the lower Christina and Brandywine Rivers. The plan will provide both a compelling vision for a future Christina-Brandywine Riverfront that thrives economically and environmentally, and a practical blueprint to guide decision-making and to leverage resources for key projects and activities. The project area for this grant is from Newport downstream to the mouth of the Christina, with a similar planning effort anticipated in the near future for the next reach upstream.

- ***EPA RESPONSE:***
  *EPA acknowledges the statement provided by the Christina Conservancy.*

- **COMMENT #2: Wetland Impacts**
  In the context of this initiative as well as our organization's mission, Christina Conservancy is understandably concerned about the proposed permanent loss of over 8 acres of freshwater tidal wetland by placement of a single containment unit at the Site the footprint of which falls mostly within the current tidal marsh. It is our understanding that there are DNAPL removal technologies using well-based recovery to be implemented elsewhere on site and we are curious as to whether those technologies could also be employed to remove deep saturated DNAPL from the Hershey Run marsh, in combination with partial channel and marsh excavation, reactive core mat placement, backfilling and marsh restoration, as opposed to a permanent loss of tidal wetlands. It is unclear from the current documents whether the feasibility of a wetland restoration approach has been assessed.

  We urge Beazer and EPA to prioritize minimizing permanent impacts to tidal wetlands and for those impacts that are unavoidable, to locate any wetland mitigation required as a result of this project either on site, or as close as practical to the site within the lower Christina River watershed. We are willing and able to help identify potential mitigation areas and projects that would restore functionally and ecologically meaningful freshwater tidal wetlands in the watershed while fulfilling the mitigation requirement for this project. We also strongly urge that mitigation be in the form of restoration of historic or degraded wetlands, as opposed to de nova wetland creation. Created wetlands are almost never able to achieve the ecological and functional properties of intact or even restored wetlands, and this is especially true when mitigating for tidal wetland loss.

  We also encourage the use of green infrastructure and ecologically sensitive design approaches along the armored stretch of Hershey Run after realignment. Creating living shorelines or other "softening" in association with the riprap hardened banks will help restore ecological function to this artificial channel conveyance.

  - ***EPA RESPONSE***:
    *The Final Action incorporates the elements of shallow channel and marsh excavation, reactive core mat placement, backfilling and marsh restoration. In regard to the extent of contamination within the footprint of the Containment Area, please refer to EPA's Responses to Comment #1 of Section 2.1 of the Responsiveness Summary section and Comment #2 of Section 1 of the Responsiveness Summary section.*

    *EPA appreciates the Conservancy's offer to assist with identifying potential mitigation areas and will strongly encourage such outreach during the development of the wetland mitigation strategy and plan.*

*EPA has, and will continue to, strongly advocate for the use of green infrastructure, the minimization of hardscaping, and the integration of design elements which provide ecosystem services.*

- **COMMENT #3: Site Biodiversity**
  Christina Conservancy works to protect the imperiled biodiversity of our watershed through education, surveys (bioblitzes conducted throughout the watershed), and advocacy. We applaud Beazer for committing to the protection of a rare plant species (*Gentiana andrewsiz)* with protective fencing during construction.

  In an urbanized and impacted watershed like the lower Christina, we are encouraged that biotic surveys conducted during the remedial investigations at the Koppers site in the 1990s revealed persisting populations of a number of species of state and regional conservation concern. While most of these species lack legal protection at the state or federal level, we strongly urge Beazer and EPA to work with us to develop a proactive protection plan for these species that would minimize construction impacts and provide suitable postconstruction habitat.

  Species of particular concern include Tier 1 Species of Greatest Conservation Need in Delaware that are terrestrial (Eastern Box Turtle) and vernal wetland (Spotted Turtle) species that are limited in their ability to escape extensive construction impacts at the site, but that could be protected by appropriate drift fencing in combination with trapping and location to undisturbed portions of the site. We appreciate EPA's inclusion of Performance Standard #2 "Translocate faunal populations present in intended excavation areas to alternate suitable locations in advance of excavation activities" (2005 ROD, p.36). Significant mitigation of impacts to these species could be achieved by collaboration with our organization as well as experts from the Delaware Department of Natural Resources Species Conservation and Research program.

  Lastly, we request that EPA and Beazer consult with Delaware's state botanist and other appropriate experts regarding plant species to be used in any revegetation or seeding of the site after construction. Our organization can also provide lists of site appropriate plants for this project. Too often, remediation projects are revegetated without regard for locally appropriate ecological reference communities and plant choices.

  We look forward to the completion of this project and to a healthier future for the Christina River. Please reach out to our organization to discuss any of these proposed approaches further and we will be glad to be of assistance.

  - ***EPA RESPONSE:***
    *EPA will encourage the inclusion of the considerations noted and further collaborate within the context and limitations of a remedial action on a Superfund site. It should be noted that the state must provide concurrence on the ROD Amendment and representatives of the state are active participants on the regulatory review team.*

*EPA will continue to consult with team personnel with local experience and expertise. EPA will also continue to encourage the state to continue to utilize the expertise available to them during the review process.*

# 5 Comments Received by Beazer East, Inc.

## 5.1 General Comments:

As to certain statements made by EPA in its Proposed Remedial Action Plan and the related Fact Sheet, Beazer respectfully requests EPA to be more precise and accurate in how it refers to the following three entities:

- ***COMMENT #1: Koppers Company, Inc.***
  Koppers Company, Inc. is the same legal entity as Beazer East, Inc. Koppers Company, Inc. (now known as Beazer East, Inc.) was and remains incorporated in Delaware and is commonly referred to in shorthand as Koppers. One of its predecessors, Koppers Company, was founded in 1902. Koppers Company, Inc. came into existence in 1944 when several different affiliated companies, including Koppers Company, merged together. Koppers Company, Inc. changed its name to Beazer Materials and Services, Inc. in 1989 and then to its current name, Beazer East, Inc. in 1990.

  - ***EPA RESPONSE:***
    *EPA acknowledges this statement. No changes to the description of the Koppers Company, Inc. as presented in the Proposed Plan were necessary in that the Proposed Plan's description was accurate. However, EPA notes the pre-recorded video made available during the public comment period of the PRAP may have incorrectly used the entity names.*

- ***COMMENT #2: Beazer East, Inc.***
  Beazer East, Inc. is the same legal entity as Koppers Company, Inc., is a Delaware corporation, and is commonly referred to in shorthand as Beazer

  - ***EPA RESPONSE:***
    *EPA acknowledges this statement. See EPA's Response to Beazer's Comment #1, above.*

- ***COMMENT #3: Koppers Inc.***
  Koppers Inc**., is not the same entity as Koppers Company, Inc**. Koppers Inc. is a Pennsylvania corporation that was originally incorporated in October 1988 under the name Pittsburgh Acquisition Corporation, Inc., and then changed its name to Koppers Industries, Inc. on December 23, 1988. On December 29, 1988, Koppers Industries, Inc. purchased certain wood treating, tar, and coke business assets from Beazer, including all trade rights to the name "Koppers." In February 2003, Koppers Industries, Inc. changed its name to Koppers Inc., which today is a publicly traded company wholly separate from

Beazer and not a successor-in-interest to Beazer. Koppers Inc. never owned or operated the former Newport, DE wood-treating plant.

- ***EPA RESPONSE:***
  *EPA acknowledges this statement. See EPA's Response to Beazer's Comment #1, above.*

## 5.2 Specific Comments

***EPA NOTE:*** *The comments below and the particular sections are in reference to the PRAP. Sections in the ROD Amendment may not be the same sections of the PRAP*

- ***COMMENT #1: Section II.A***
  Beazer suggests this section also mention the BASF plant to the east.

  - ***EPA RESPONSE:***
    *In response to this comment, EPA has included in the ROD Amendment the fact that the BASF plant is located to the east.*

- ***COMMENT #2: Section II.***
  Beazer suggests that this section describe general or specific time frames for (1) when operations ceased and (2) when wood treatment process equipment and structures were dismantled.

  - ***EPA RESPONSE:***
    *The ROD Amendment includes language that is generally consistent with what is in the Remedial Investigation Report. EPA does not have additional information to provide in this ROD Amendment.*

- ***COMMENT #3: Section II.C***
  "In 1991, Beazer, the successor corporation to Koppers, and DuPont, the Site landowner at that time, signed an agreement with EPA…"

  See Beazer's General Comment above. Beazer is not "the successor corporation to Koppers." Beazer requests the sentence to be redrafted *as "In 1991, Beazer and DuPont (the Site landowner at that time) signed an agreement with EPA".*

  - ***EPA RESPONSE:***
    *EPA acknowledges this comment and has included language in the ROD Amendment to reflect the above comment.*

- ***COMMENT #4: Section II.E***
  "As part of the Remedial Design work, Beazer, in consultation with Delaware State Historic Preservation Office (DESHPO) and EPA, performed investigations at the Site to

determine archeological significance and to evaluate eligibility for the National Register of Historic Places (NRHP)."

Beazer proposes **archaeological** for archeological.

- ***EPA RESPONSE:***
  *EPA has replaced archeological with archaeological in the ROD Amendment.*

- ***COMMENT #5: Section II.F***
  Beazer suggests that the caption to section II. F be changed to reflect that the First Modification (referenced in the caption to Section II. D) was succeeded in time by a Second and Third Modification.

  - ***EPA RESPONSE:***
    *EPA has changed this heading in the ROD Amendment to "Events Leading to Remedy Modification, and Second & Third Modification of the Administrative Order." This section now falls under section 1.6 of this ROD Amendment.*

- ***COMMENT #6: Section II.F***
  Beazer notes that this sentence is both inaccurate and inconsistent with what Footnote 2 describes. Abandonment of wetlands banking was not driven by Beazer's "lack of interest" but because (1) DELDOT's wetland requirements had been otherwise satisfied and (2) data collected during the RD changed what was then-understood about site conditions.

  - ***EPA RESPONSE:***
    *EPA acknowledges this comment and has included language in the ROD Amendment to reflect this comment.*

- ***COMMENT #7: Section III***
  "Non-tidal wetlands occur in…. K Area…."

  Beazer notes that while this statement appears in the 2005 ROD, Beazer suggests correcting for the record that the wetland delineation plan shows K Area not to be a mapped wetland area.

  - ***EPA RESPONSE:***
    *Language associated with the K Area in the ROD Amendment has been removed due to the fact the K Area is not a mapped wetland area. According to the 2007 wetland delineation report, the drawings depicting wetland areas used nomenclature/designations that follow the alphabet (A,B,C,D, and K). The designation of Area K wetlands is unrelated with the area of dry weathered surface creosote designated as the "K-area". While K-Area is nearby, it is in the uplands and is not within the delineated boundaries of the wetlands area designated as Area K. Below provides a figure from the 2007 Wetland*

*Delineation report showing wetland areas, and Figure 2 from this ROD Amendment is included to depict the K-area.*

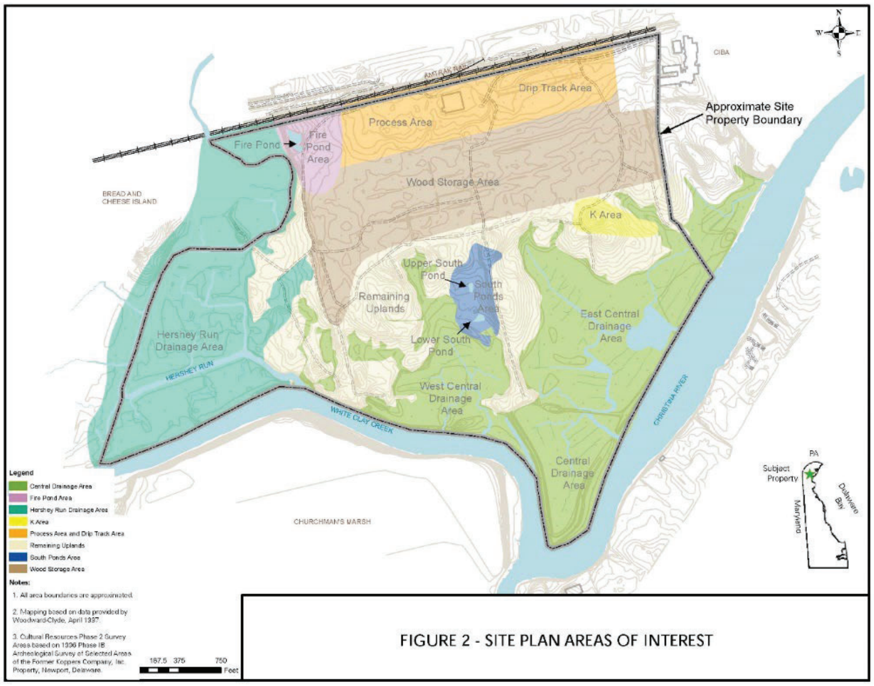



FIGURE 2 - SITE PLAN AREAS OF INTEREST

- ***COMMENT #8: Section IV A.***
  "In the 2005 Remedy, the need for deep excavations was driven by the assumption that wetland banking would occur at the Site and also to remove saturated DNAPL in the subsurface."

  Beazer questions the vague and potentially confusing use of the term "saturated DNAPL" here and throughout the PRAP (IV.D, IV.G, VII, VIII.B.c, VIII.B.d, VIII.C, IX.A.2, IX.A.6, X). The term "saturated DNAPL is not defined in the PRAP, and to Beazer's knowledge the term "saturated DNAPL" does not occur in the 2005 ROD or subsequent documents. If it corresponds with EPA's intended meaning, Beazer proposes EPA concur with and adopt "DNAPL in the saturated zone."

  - **EPA RESPONSE:**
    *The term "saturated DNAPL" and "DNAPL in the saturated zone" hold the same meaning. Therefore, EPA has incorporated DNAPL in the saturated zone in applicable areas of the ROD Amendment.*

- ***COMMENT #9: Section IV.***
  "Excavation of sediments at these deeper depths would have the potential to negatively impact the hydrogeology of the area."

  Beazer is unclear what is meant by the phrase "negatively impact the hydrogeology of the area and respectfully requests that EPA clarify and/or expand upon its use of the phrase both here and elsewhere in the PRAP (IV. D, VIII.B.a, VIII.C.1)

- ***EPA RESPONSE***:
  *After careful consideration, EPA has decided to strike this language from the ROD Amendment. The intent of the referenced language was to explain that excavations to greater depths to remove the DNAPL in the saturated zone increase the potential to induce changes to the subsurface conditions.*

- ***COMMENT #10: Section IV. D.***
  "Beazer's investigations revealed benefits to constructing barrier walls around all four sides of what would now be a single containment area."

  As the containment area is more properly described as an irregular hexagon or polygon, Beazer suggests eliminating the word "four" from the sentence here and elsewhere in the PRAP (VIII.B.2.b, VIII.C.3, IX.A.4).

  - ***EPA RESPONSE:***
    *EPA agrees and has included language in the ROD Amendment to address this comment.*

- ***COMMENT #11: Section IV.G.***
  "EPA has determined that the modified cleanup will focus on soil, sediments, and DNAPL source material in a final remedy, and groundwater in an interim remedy to addresses certain identified risks."

  Beazer is unclear what is meant by the phrase "certain identified risks." Beazer suggests incorporation by reference to other documents of record (e.g. 2005 ROD) or a more fulsome discussion of the risks EPA has in mind in this paragraph.

  - ***EPA RESPONSE:***
    *EPA's intention in using "certain identified risks" in groundwater was to address unacceptable risk to contaminated groundwater through use restrictions to be implemented via institutional controls to satisfy the RAOs of this ROD Amendment. EPA has included language in the ROD Amendment to clarify this issue. Beazer has a later comment requesting "Groundwater use restrictions will be implemented to restrict the extraction of groundwater" be removed because the groundwater remedy is yet to be finalized. This comment is addressed in said comment.*

- ***COMMENT #12: Section V.***
  "By addressing the principal threat waste (NAPL) in the soils, sediments, and subsurface, groundwater can be further evaluated after the principal threat waste is removed in a final remedy."

  Because the proposed remedy contemplates that NAPL will be addressed via a combination of removal and containment Beazer suggests that the phrase "removed in a final remedy" be replaced by "removed and/or contained in a final remedy."

- ***EPA RESPONSE:***
  *EPA understands the clarification Beazer proposes and has included clarifying language in the ROD Amendment in the Principal Threat Waste section. EPA has made additional clarifications to address Principal Threat Waste is (1) the DNAPL in the saturated and (2) the surface soils and sediments that act as a source for direct exposures. However, it is important to note that the DNAPL in the saturated zone outside of the Containment Area is to be removed via recovery wells as selected in this ROD Amendment.*

- ***COMMENT #13: Section VII***
  Table Row 2: "Prevent unacceptable human health and ecological risks due to exposure to contaminated groundwater."

  Beazer is confused by EPA's addition of ecological risks to the remedial action objectives for groundwater. Sections VI.B and VI.C describe ecological risks and cleanup criteria related to soils and sediments, and no ecological risk posed by exposure to groundwater. Beazer respectfully requests EPA reconsider its classification of this RAO and designate it as "No Significant Difference."

  - ***EPA RESPONSE:***
    *The referenced addition reflects the groundwater to surface water exposure pathway and considers the potential exposure of ecological receptors to the groundwater to surface water interface. O&M activities will be conducted at surface water bodies to ensure the remedy continues to protect ecological receptors from exposure to contaminated groundwater. Therefore, no change has been made in response to this comment.*

- ***COMMENT #14: Section VIII.B.a.***
  "As TPAH migrates upward through the reactive core mat, biodegradation will be enhanced. … wetland plant community is expected to further facilitate biodegradation…"

  The principle of operation and design of Reactive Core Mats are intended not to enhance biodegradation but to inhibit migration of TPAH by acting as an adsorptive barrier. Beazer requests that the statement be corrected so as to avoid creating the perception that employment of reactive core mats can or should serve as a future performance standard or design basis for biodegradation of TPAH at the Site. This comment also applies to IX.A.6.

  - ***EPA RESPONSE****:*
    *EPA acknowledges the intended purpose of the reactive core mat and has included language in the ROD Amendment to reflect the purpose of the reactive core mats is to inhibit migration of TPAHs by acting as an adsorptive barrier.*

- ***COMMENT #15: Section VIII.B.b.***
  "If monitoring indicates the barrier walls are not functioning as designed, contingencies will be in place to control DNAPL migration such as pumping or other active measures."

  Beazer is concerned about the lack of precision in this statement. As far back as the 2005 ROD, active controls were never contemplated as a response to *DNAPL migration*, but as a way to mitigate potential threat caused by too great a hydraulic pressure gradient across the barrier wall. Active controls, then, were contemplated as a contingency plan for *groundwater* hydraulic control within the Containment Area and to inhibit potential contaminant migration outside the Containment Area*, if necessary*.

  - ***EPA RESPONSE***:
    *EPA's intention in this section is to ensure contamination from the Containment Area is not migrating from inside the Containment Area to outside of the Containment Area, and if there is evidence of such migration, contingencies will need to be established to address the threat. In this same section, it is noted a monitoring plan will be implemented to gather data regarding hydraulic control inside and outside the Containment Area and data outside of the Containment Area will be collected to evaluate if contaminated groundwater is migrating from the Containment Area. Monitoring will occur both inside and outside of the Containment Area to evaluate potential groundwater rise within the Containment Area that may pose a hydraulic pressure threat. Groundwater data will be collected outside of the Containment Area to evaluate groundwater contamination migration that may pose a risk to human health or the environment. If data shows increased hydraulic head inside the Containment Area or groundwater contamination migrating from inside to outside of the Containment Area, additional actions will be taken (e.g., installation of a drain to discharge groundwater or pumping of the containment area), with necessary treatment as appropriate."*

    *EPA has further clarified in this document.*

- ***COMMENT #16: Section VIII.B.b.***
  "The consolidated materials within the containment area will be capped with a low-permeability RCRA-modified cap."

  "RCRA-modified cap" should be struck and replaced by "Modified RCRA cap"

  - ***EPA RESPONSE:***
    *In response to this comment, the ROD Amendment uses "Modified RCRA cap" when referring to the 2005 ROD. With respect to the Selected Remedial Action selected in the ROD Amendment, the term "cap" is used instead of "Modified RCRA cap"*

- ***COMMENT #17: Section VIII.B.c***
  "In addition, targeted wells will be monitored to determine if measurable DNAPL is entering these wells. Additional DNAPL recovery wells may be added after DNAPL recovery begins to further target and remove source material in the subsurface."

  Beazer questions use of the term "targeted wells" and requests additional clarification about which wells are "targeted wells" or how such a determination is to be made. Beazer further requests the second sentence to be modified such that "Additional DNAPL recovery wells" be added if and only if there is new occurrence of DNAPL in existing wells.

  - ***EPA RESPONSE:***
    *The "targeted wells" are those wells within the Former Process Area and South Pond Areas where measurable DNAPL was encountered during the sampling reported in the "Supplemental Remedial Design Investigation- 2/2018 Sampling of Installed Delineation Wells" report. Further, EPA disagrees with and declines to add the suggested language indicating that additional DNAPL recovery wells will be installed solely if there are new occurrences of DNAPL. During the DNAPL recovery, the data will be analyzed and determinations for additional DNAPL recovery wells will be made based on the results.*

- ***COMMENT #18: Section VIII.B.e.***
  "Hershey Run will be rechanneled to avoid high contamination areas and where the containment area extends into the wetlands area and Upper Hershey Run."

  Because Section VIII.B.b already discusses the Containment Area, Beazer suggests rephrasing this sentence as "Hershey Run will be rechanneled to avoid the Containment Area described in VIII.B.b."

  - ***EPA RESPONSE:***
    *Making this adjustment does not add or take away from the content of the document. Further, the sections in the ROD Amendment have changed from the PRAP and therefore there were no changes made to address this comment.*

- ***COMMENT #19: Section VIII.B.e.***
  "The study demonstrated that because the water elevations at the Site are dictated by the tidal elevations, the proposed realignment of Hershey Run will not have a negative impact on the surface water elevations."

  Beazer suggests expanding this sentence with additional detail. "The study demonstrated that the proposed realignment of Hershey Run will not produce erosive velocities, will not negatively impact surface water elevations (which are largely dictated by tidal elevations), and will not produce a net change in waterway hydraulics from the existing conditions at the Site."

  - ***EPA RESPONSE****:*
    *EPA has included language proposed by Beazer in the ROD Amendment to address this comment. Additionally, EPA has included language in this ROD Amendment to note the design will consider the potential for changed site conditions resulting from an increase in surface water velocity, consistent inundation, and other effects from rising sea levels and from increased intensity and prevalence of storms (including hurricanes and 500-year flow). A climate vulnerability assessment will be performed, and the design will incorporate the findings.*

- ***COMMENT #20: Section VIII.B.f.***
  "The remaining wetland impacts are expected to be temporary due to the removal of impacted sediment and dry weathered surface creosote."

  Beazer suggests: "The remaining wetland impacts due to the removal of impacted sediment and dry weathered creosote are expected to be temporary."

  - ***EPA RESPONSE:***
    *EPA has included language proposed by Beazer in the ROD Amendment.*

- ***COMMENT #21: Section VIII.B.g***
  "Land use restrictions will be established to restrict excavation in areas where clean soil or other fill and vegetation has been placed atop contaminated soils or sediments; restrict excavation in the in the containment area, protect remedy components, and prohibit residential development at the Site. Groundwater use restrictions will be implemented to restrict the extraction of groundwater."

  The first sentence contains a duplicate: "in the in the." Beazer also requests that the second sentence be deleted due to the fact that the groundwater remedy is yet to be finalized

  - ***EPA RESPONSE:***
    *EPA has removed the duplicate "in the in the." EPA disagrees that the second sentence should be deleted. EPA is requiring groundwater use restrictions be implemented to restrict the extraction of groundwater as part of the Interim Action to address human health and ecological risks due to exposure to contaminated groundwater, an RAO in the ROD Amendment. Groundwater use restrictions will prevent the unacceptable exposure and therefore are appropriate for this ROD Amendment.*

- ***COMMENT #22: Section VIII.B.h.***
  "Surface water, sediments, and biota will be monitored to demonstrate that risk has been reduced to acceptable levels and that the remedy continues to be effective. A comprehensive monitoring plan will be developed as part of the Remedial Design, which will include monitoring and maintenance of the respective covers associated with The ROD Amendment."

Beazer questions the addition of biota monitoring, which was not contemplated as part of the 2005 ROD and which is further corroborated by VIII.C.9's comparison between the 2005 ROD Component and The ROD Amendment of the same "Monitoring" remedy as "No Change." Beazer requests EPA remove biota monitoring from VIII.B.h.

- ***EPA RESPONSE:***
  *The 2005 ROD entailed full excavation of all contaminated sediments. Because there will be contaminated material left in place below the reactive core mat, biota monitoring will be necessary to ensure the Selected Remedial Action continues to operate as intended. Furthermore, as explained in EPA's Response to Comment #10 of Section 1 of the Responsiveness Summary, an ecological monitoring program will be developed during the remedial design process as part of the overall Site monitoring program. The program will include the establishment of current pre-remedial or baseline conditions, which will be used to help assess the effectiveness of the Selected Remedial Action. Biota monitoring is necessary in order to establish the effectiveness of the Selected Remedial Action.*

# 6 Received from Nearby Resident #1

- **COMMENT #1:**

My concern has to do with the traffic impact.

How will the EPA move its equipment to the site? There are no roads available, it seems, except for those in Silview. Additionally, where will the equipment be kept and staged for the cleanup?? Silview is a very small neighborhood, with very old houses, with plaster walls, small roads and many, many children.

We are currently fighting an illegal factory that moved into a vacant building several years ago on Crowell Road and has resulted in over 400 tractor trailers traveling down the small road of Lindberg Avenue in a monthly period. Speeding and ignoring our stop signs. These tractor trailers have cracked our walls, our water pipes and our gas lines. They are additionally storing unknown chemicals in several silos that were erected without notice to the community and without disclosure of their contents. The last thing this neighborhood needs is more truck and heavy equipment on our small roads and more undisclosed, dangerous chemicals.

Please let me know the plan for moving equipment in and out of Silview.

- **EPA RESPONSE:**
  *Mobilization routes and access routes will be determined as part of the remedial design and prior to the implementation of the Selected Remedial Action. To the extent possible, equipment that will be used on the Site will be kept on the Site. However, prior to commencement of the Selected Remedial Action, equipment and materials*

*will need to be mobilized to the Site. During implementation of the Selected Remedial Action, there may be situations where demobilization activities will occur, and bringing equipment to and from the Site may occur. EPA understands your concern, and all the appropriate permitting and procedures will be followed to minimize the impact on the local community during the implementation of the Selected Remedial Action. EPA is committed to keeping the community informed of progress at the Site. Below is a link to the Koppers Superfund Site webpage, where more information about the current status of the Site can be found.*
https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0300092

# 7 Comment Received from Nearby Resident #2

- **COMMENT #1:**
  I have some questions and concerns regarding the Koppers Co., Inc. Superfund Site cleanup plan that was presented on your video. I live in Silview which is basically right across the railroad tracks from the site. My main questions and concerns are as follows: How long is it expected to take?

  - ***EPA RESPONSE***:
    *At this time, it is difficult to provide a precise timeline for implementation of the Selected Remedial Action. However, after the remedial design is finalized and the Selected Remedial Action is underway, EPA anticipates that the "construction" portion of the action (i.e., excavation, consolidation, cover installation, capping, etc.) will take approximately 3-4 years to complete. It is important to note that part of the Selected Remedial Action includes groundwater monitoring during and after recovery of DNAPL in the saturated zone to evaluate groundwater conditions during said recovery and to assist in the selection of a final groundwater remedy. The timeline and selection of a final groundwater remedy is unknown currently as this evaluation has yet to begin.*

- **COMMENT #2:**
  What is the proposed use of the site once remediated since it cannot be used for residential?

  - ***EPA RESPONSE:***
    *As the comment correctly states, the Site property is restricted to non-residential use. While EPA is not aware of how the property will ultimately be used, any future use would have to comply with land and groundwater use restrictions to ensure the remedy remains intact and that there is no unacceptable risk presented by contamination remaining on-Site.*

- **COMMENT #3:**
  Is it only to clean up Hershey Run creek for the habitat? Or will another horrible business such as Twinco be allowed to be established there? Or one that requires regular trains such as Amazon? Reason for asking is that lately the trains going by here are already annoying the residents with their day and night incessant train whistles all day.

- **EPA RESPONSE:**
  *The Selected Remedial Action will address threats to human health and the environment posed by numerous areas of the Site. See EPA's Response to Comment #2 regarding future use of the Site property.*

- **COMMENT #4:**
  How will access to the site be given since there are currently no roads going to it and the current truck traffic to Twinco (20+ tractor trailers daily currently!!!) is already a nightmare and, if the plan is to extend Lindbergh over the tracks to give that site access, it is absolutely opposed by all residents of Silview because of even more increased traffic.

  - ***EPA RESPONSE:***
    *Access to and from the Site to implement the Selected Remedial Action has not yet been finalized and will be part of the remedial design, which occurs after the issuance of the ROD Amendment. EPA will give careful consideration to access needed for the Selected Remedial Action, will keep the community informed, and be available as a resource to all interested community members.*

- **COMMENT #5:**
  I assume the train that has been "parked" on the tracks currently with heavy equipment may have something to do with the cleanup. And since there are no road crossings in this area for the trains to have to whistle prior, I'm assuming they are whistling because of that parked train. If that is correct and the Federal train whistle laws require trains to whistle when approaching another train (parked or not) as they pass by Stanton/Silview/Newport, when will it be gone??? The whistles go all through the night also as I have been lately and will continue to be awakened by them every night until they stop.

  - ***EPA RESPONSE**:*
    *The train parked on the tracks at the time of this comment is not associated with EPA's Selected Remedial Action for the Site.*

- **COMMENT #6:**
  If there will be a train parked during the entire cleanup or if there will be a lot of equipment/workers near the railroad tracks at all times, I am begging you to have the area declared a "quiet zone" by whoever is authorized to do so to assure that this isn't going to continue throughout the entire process. Please??

  - **EPA RESPONSE:**
    *It is unlikely a train will be parked on the train tracks in association with the Selected Remedial Action. However, coordination with all appropriate private entities and local, state, and federal agencies will occur prior if this occurs. Work associated with the implementation of the Selected Remedial Action will take into account the proximity to residential homes and careful consideration will be given to minimize the disturbance to the community.*

- **COMMENT #7:**

We, the residents of Silview, are already inundated with many situations that have deteriorated our quality of life and are not looking forward to adding more. We already have multitudes of truck traffic, illegal dirt bikes/ATV's racing through the neighborhood ignoring the "All Way" Stop Signs, low flying C5's and C7's doing training exercises, low flying and hovering helicopters, and annoying barking dogs (that bark even more now with the incessant train whistles). And now because of the safety of President Biden when he is home in Wilmington, we get to deal with the horrific traffic jams that his trips between his home and the airport cause at rush hour on Fridays and occasionally at rush hour on Monday mornings. Enough is enough. Please help. I'm hoping that the Koppers Superfund Cleanup will not be the cause of even more noise and traffic than we are already subjected to and that you can give me information that will set my mind at ease.

Thank you for listening and I hope to hear something positive from you as soon as possible.

- ***EPA RESPONSE**:*
  *EPA understands and respects your concerns and will take into careful consideration the potential noise and construction traffic for nearby residents while preparing for the construction of the Selected Remedial Action. Moreover, EPA is committed to keeping the community informed of progress at the Site. Below is a link to the Koppers Superfund Site webpage, where more information about the current status of the Site Can be found.*
  https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0300092

# IV. FIGURES AND TABLES

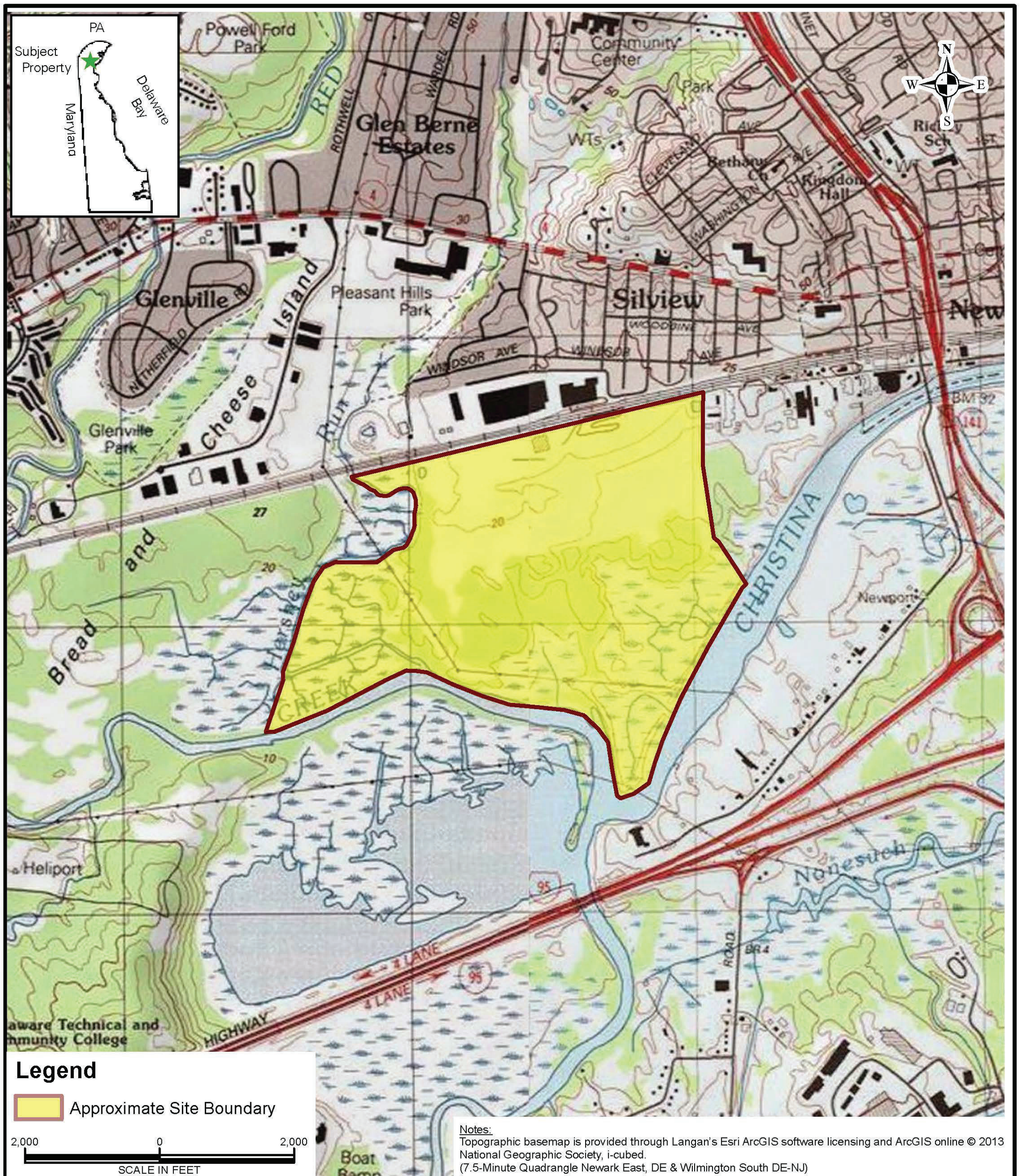



FIGURE 1 - SITE LOCATION

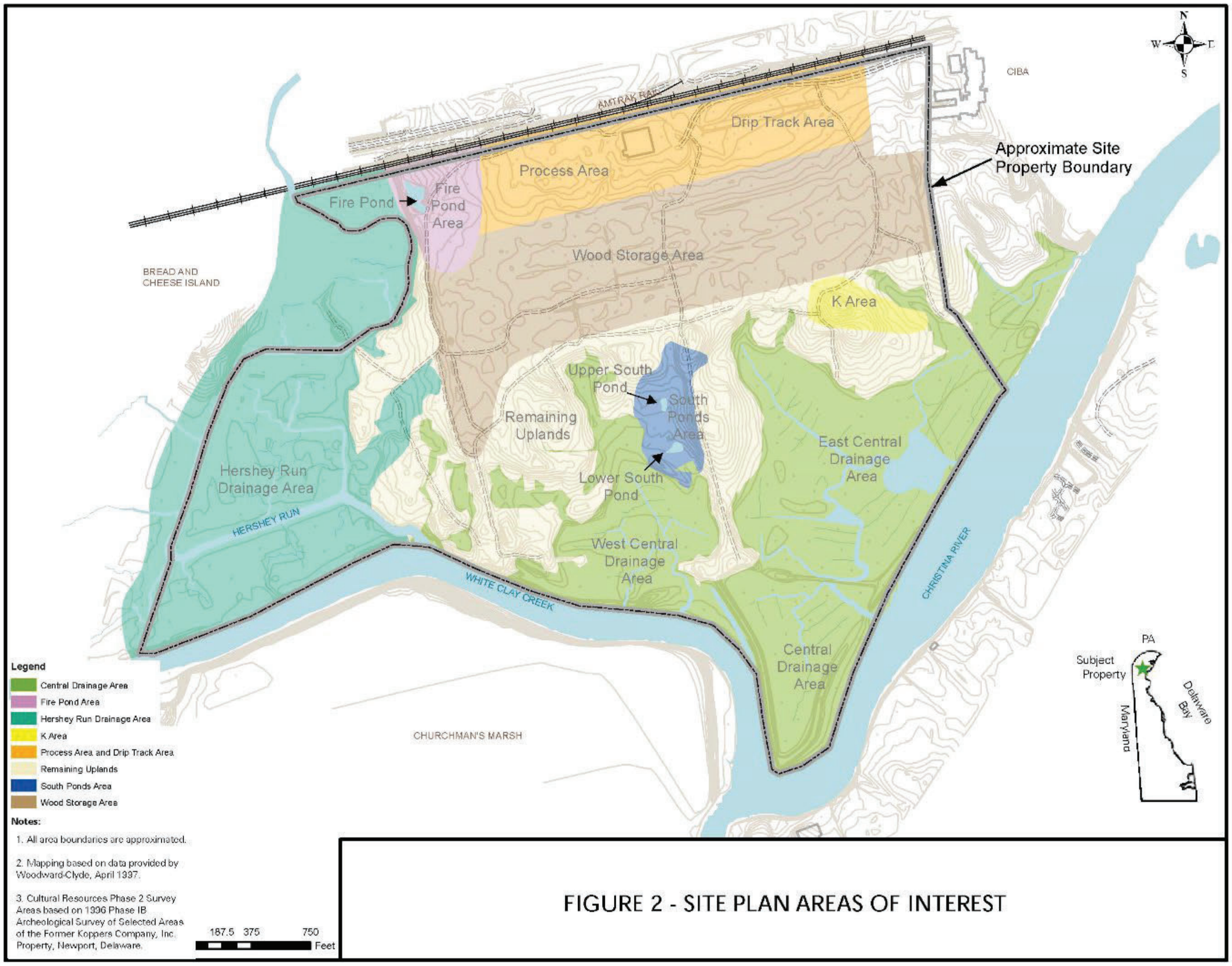



FIGURE 2 - SITE PLAN AREAS OF INTEREST

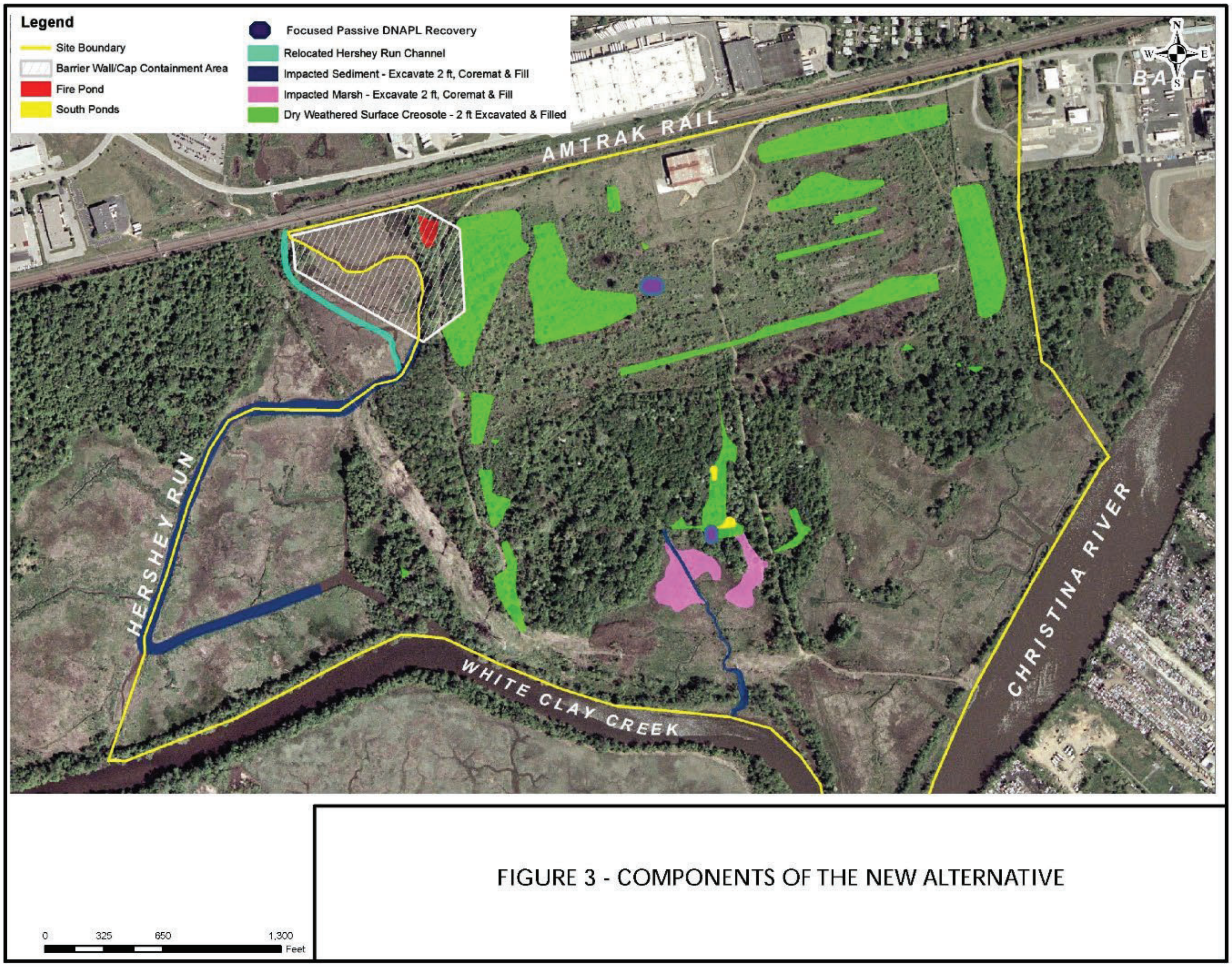



FIGURE 3 - COMPONENTS OF THE NEW ALTERNATIVE

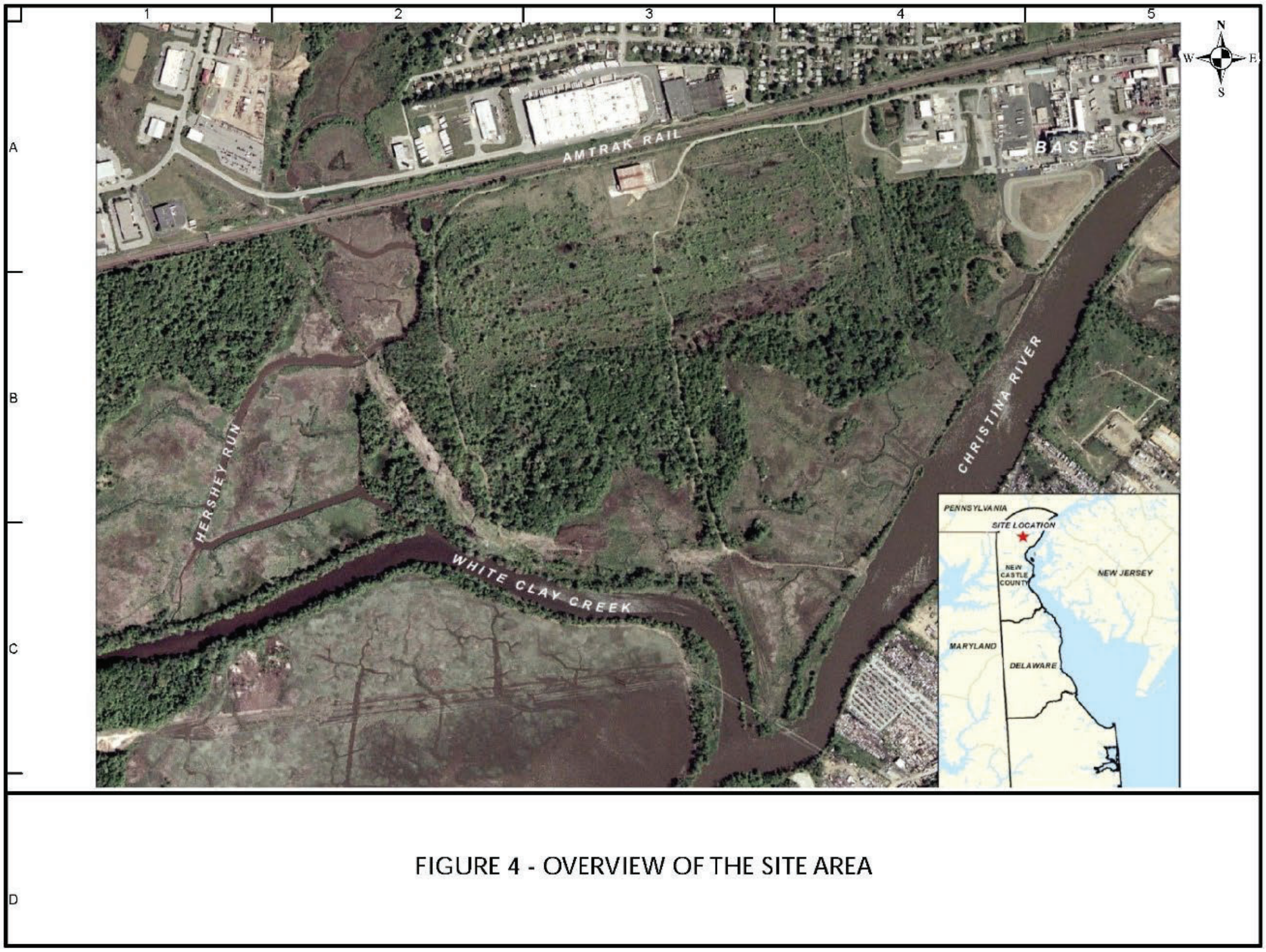



FIGURE 4 - OVERVIEW OF THE SITE AREA

# Table 1:Cost Breakdown

Capital Costs

| | Item | Unit Price | Units | Recommended Remedy Estimated Quantity | Estimated Cost |
|---|---|---|---|---|---|
| 1 | **Mobilization/Demobilization** | $100,000 | Lump Sum | 1 | **$100,000** |
| 2 | **Site Preparation** | | | | **$522,620** |
| 2a | Clearing | $5,670 | Acre | 86 | $487,620 |
| 2b | Erosion/Sedimentation Control | $35,000 | Lump Sum | 1 | $35,000 |
| 3 | **WCDA Channel** | | | | **$934,293** |
| 3a | Erosion and Sedimentation Control | $5 | LF | 1,250 | $6,078 |
| 3b | Marsh Mat Road and Platform Installation/Removal | $500,000 | LS | 1 | $500,000 |
| 3c | Excavate to 2 feet, Transport and Solidify Sediments | $64 | CY | 2,100 | $133,703 |
| 3d | Install Reactive Mat | $6 | SF | 31,000 | $186,000 |
| 3e | Import Clean Fill | $30 | CY | 2,100 | $63,000 |
| 3f | Transport, Stockpile, Place Fill | $22 | CY | 2,100 | $45,512 |
| 4 | **WCDA Remediation (Marsh Areas)** | | | | **$1,280,510** |
| 4a | Soil Removal Excavate/Transport/Consolidation or Stockpile | $6 | CY | 8,230 | $49,380 |
| 4b | Install Reactive Mat | $6 | SF | 122,000 | $732,000 |
| 4c | Compaction of Clean Soil Used to Fill in NAPL Excavations | $6 | CY | 6,170 | $37,020 |
| 4d | Clean Imported Backfill | $25 | CY | 6,170 | $154,250 |
| 4e | 6-Inch Topsoil/Organic Soil | $30 | CY | 2,060 | $61,800 |
| 4f | Transport, Stockpile, Place Fill | $22 | CY | 8,230 | $181,060 |
| 4g | Seeding | $25,000 | Acre | 2.60 | $65,000 |
| 5 | **DWSC Remediation** | | | | **$4,924,050** |
| 5a | Soil Removal Excavate/Transport/Consolidation or Stockpile | $6 | CY | 73,400 | $440,400 |
| 5b | Compaction of Clean Soil Used to Fill in NAPL Excavations | $6 | CY | 55,250 | $331,500 |
| 5c | Clean Imported Backfill | $25 | CY | 55,250 | $1,381,250 |
| 5d | 6-Inch Topsoil/Organic Soil | $30 | CY | 18,170 | $545,100 |
| 5e | Seeding | $25,000 | Acre | 22.7 | $567,500 |
| 5f | Geotextile | $2,550 | Acre | 10.0 | $25,500 |
| 5g | Reactive Core Mat | $6 | SF | 3,000 | $18,000 |
| 5h | Transport, Stockpile, Place Fill | $22 | CY | 73,400 | $1,614,800 |
| 6 | **Barrier Wall Platform Construction** | | | | **$1,675,750** |
| 6a | Excavate, Transport & Solidify Marsh | $64 | CY | 5,000 | $320,000 |
| 6b | Import Clean Fill to fill low areas to el +2 | $30 | CY | 5,000 | $150,000 |
| 6c | Import Clean Fill to construct the Working Platform to el+7 | $30 | CY | 12,000 | $360,000 |
| 6d | Import Clean Fill to widen Working Platform for access | $30 | CY | 4,000 | $120,000 |
| 6e | Import Clean Fill for Working Platform Surcharge to el +11 | $30 | CY | 7,500 | $225,000 |
| 6f | Geotextile | $2,550 | Acre | 5 | $12,750 |
| 6g | Instrumentation | $50,000 | LS | 1 | $50,000 |
| 6h | Amtrak Fill/Grading | $30 | CY | 7,000 | $210,000 |

| | | | | | |
|---|---|---|---|---|---|
| 6i | Reactive Core Mat in Amtrak Swale | $6 | SF | 38,000 | $228,000 |
| 7 | **Barrier Wall** | | | | **$1,490,000** |
| 7a | Excavate, & Transport Excavated Soils | $30 | CY | 8,000 | $240,000 |
| 7b | Construct Cement Bentonite Wall | $10 | SF | 125,000 | $1,250,000 |
| 8 | **Hershey Run Remediation** | | | | **$3,981,482** |
| 8a | Erosion and Sedimentation Control | $5 | LF | 9,000 | $43,758 |
| 8b | Marsh Mat Road and Platform Installation/Removal | $500,000 | LS | 1 | $500,000 |
| 8c | Excavate to 2 feet, Transport and Solidify Sediments | $64 | CY | 16,800 | $1,069,626 |
| 8d | Install Reactive Mat | $6 | SF | 250,000 | $1,500,000 |
| 8e | Import Clean Fill | $30 | CY | 16800 | $504,000 |
| 8f | Transport, Stockpile, Place Fill | $22 | CY | 16800 | $364,098 |
| 9 | **Excavation and Upper Hershey Run Rechannelization** | | | | **$440,500** |
| 9a | Excavation of Channel | $6 | CY | 14,000 | $84,000 |
| 9b | Stilling Basin | $25 | SF | 8,000 | $200,000 |
| 9c | Reactive Core Mat | $6 | SF | 9,000 | $54,000 |
| 9d | Tidal Marsh Wetlands - Vegetation-Restoration | $25,000 | Acre | 4.10 | $102,500 |
| 10 | **Wetlands Construction/Mitigation** | | | | **$4,664,000** |
| 10a | Tidal Marsh Wetlands - Restoration - West Central Drainage | $25,000 | Acre | 4.88 | $122,000 |
| 10b | Freshwater Wetland-DWSC Wetland Restoration | $25,000 | Acre | 1.68 | $42,000 |
| 10c | On-site Enhancements of Existing Waterways/Marshes | $4,500,000 | LS | 1 | $4,500,000 |
| 11 | **On-Site Consolidation** | | | | **$6,604,710** |
| 11a | Grading/Compaction of Surface | $6 | CY | 17,000 | $102,000 |
| 11b | Grading and Compaction of Impacted Soils/Sediments | $7 | CY | 127,530 | $892,710 |
| 11c | Stabilization of Excavated Material | $20 | CY | 120,000 | $2,400,000 |
| 11d | Placement & Compaction of Stabilized Material | $8 | CY | 120,000 | $960,000 |
| 11e | Disposal of Excess Water from Excavated Material | $15 | Gal | 150,000 | $2,250,000 |
| 12 | **Low-Permeability Cap with Vegetative Cover** | | | | **$2,013,972** |
| 12a | Geotextile | $2,220 | Acre | 10.4 | $23,088 |
| 12b | HDPE Geomembrane Liner | $25,700 | Acre | 10.4 | $267,280 |
| 12c | Geocomposite Drainage Layer | $41,385 | Acre | 10.4 | $430,404 |
| 12d | 18-Inch Clean Imported Backfill and Compaction | $31 | CY | 25,200 | $781,200 |
| 12e | 6-Inch Topsoil/Organic Soil | $30 | CY | 8,400 | $252,000 |
| 12f | Seeding | $25,000 | Acre | 10.4 | $260,000 |
| 13 | **Miscellaneous (Site restoration, waste management)** | | | | **$620,000** |
| 13a | Miscellaneous Site Restoration | $20,000 | Lump Sum | 1 | $20,000 |
| 13b | Miscellaneous Waste Disposal | $600,000 | Lump Sum | 1 | $600,000 |
| 14 | **Groundwater (Evaluation & Sampling)** | | | | **$252,500** |
| 14a | Groundwater Sampling | $25,000 | Event | 8 | $200,000 |
| 14b | Reporting | $10,500 | Report | 5 | $52,500 |
| 15 | **Passive NAPL Recovery** | | | | **$105,000** |
| 15a | Oil Separator Units/Manual or Passive Recovery | $20,000 | Each | 5 | $100,000 |
| 15b | NAPL Storage Tanks | $5,000 | Each | 1 | $5,000 |
| 16 | **Indirects** | $20,540 | Week | 52 | **$1,068,080** |
| 17 | **Archaeological Evaluations** | $750,000 | Lump Sum | 1 | **$750,000** |
| | **Subtotal** | | | | **$31,427,467** |
| 18 | **Administration and Engineering** | | | 10% | $3,142,747 |
| 19 | **Contingency** | | | 10% | $3,457,021 |

| | Total Capital Cost | | | | $38,027,235 |
|---|---|---|---|---|---|
| | **Operation and Maintenance (O&M) Costs - 30 Year Costs** | | | | |
| | | | | Recommended Remedy | |
| | **Item** | **Unit Price** | **Units** | **Estimated Quantity** | **Estimated Cost** |
| 20 | Site Inspections | $20,000 | Annual | 0.5 | $10,000 |
| 21 | Landfill Maintenance (i.e., mowing) | $100 | Acre/Year | 10.4 | $1,040 |
| 22 | Misc Erosion Control and Repairs | $1,500 | Annual | 1 | $1,500 |
| 23 | NAPL Monitoring | $15,000 | Annual | 1 | $15,000 |
| 24 | NAPL Transport and Disposal from Monitoring | $100 | Gal/Year | 25 | $2,500 |
| 25 | NAPL Recovery - Oil Separator Unit Maintenance | $30,000 | Annual | 1 | $30,000 |
| 26 | NAPL Recovery - NAPL Disposal | $100 | Gal/Year | 40 | $4,000 |
| 27 | Hydraulic Monitoring | $7,500 | Annual | 2 | $15,000 |
| | **Subtotal** | | | Annually | **$79,040** |
| | | A-Annual Payment | | | $79,040 |
| | | i - Interest Rate | | | 7% |
| | | n - # years | | | 30 |
| | P-Present Worth = A((((1+i)^n)-1))/(i(1+i)^n) | | | | $980,811 |
| 28 | Wetland Monitoring - 5 Year Costs | $7,500 | Acre/Year | 17.00 | $637,500.00 |
| | **Subtotal** | | | | **$1,618,311** |
| | | A-Annual Payment | | | |
| | | i - Interest Rate | | | 7% |
| | | n - # years | | | 5 |
| | P-Present Worth = A((((1+i)^n)-1))/(i(1+i)^n) | | | | $0 |
| | **Total O&M Cost** | | | | **$1,618,311** |
| | | | | | |
| | **TOTAL ESTIMATED COST** | | | | **$39,645,546** |

WCDA = West Central Drainage Area
DWSC = Dry Weathered Surface Creosote

# Table 2: ARARs

| ARAR | Citation | Class | Synopsis | Relevance to Remedy |
|---|---|---|---|---|
| Chemical-Specific | | | | |
| Clean Water Act, National Pollutant Discharge Elimination System Requirements | 40 C.F.R. § 122.41(a)(1), (d), (e); 122.44(a)(1), (b)(1) (first sentence), (d), (e), (i)(1), and (k); 122.45(a), (c)-(f) | Applicable | Effluent limits and standards, duty to mitigate, proper operation and maintenance of facilities to achieve compliance, water quality standards. | Excavations may result in discharges to surface water. There is a potential for storm water runoff into Hershey Run, White Clay Creek or the Christina River. Substantive requirements pertaining to discharges to surface water will be followed. No permit will be obtained. |
| Delaware Regulations Governing Control of Water Pollution, amended September 1, 2012 | 7 Del. Admin. Code § 7201; Subsections 7, 8 , 9.1.4 through 9.1.7, 9.2.4 through 9.2.6, 11 | | Standards to ensure that the surface and ground waters of the State exhibit a quality that is consistent with established criteria by preventing, managing, and/or controlling the pollution from activities that affect or have the reasonable potential to affect the quality of these waters. | |
| Delaware Water Quality Standards, as amended, September 1, 2017 | 7 Del. Admin. Code § 7401, subsections 3-4, 5.1 (relevant and appropriate), 5.2 (first two sentences relevant and appropriate), 6, 8 | Applicable (except as otherwise stated) | Standards to regulate the discharge into state waters in order to maintain the integrity of the water. | |

| | | | | |
|---|---|---|---|---|
| Delaware Air Quality Management Regulations | 7 Del. Admin. Code § 1103, subsections 3, 11<br><br>7 Del. Admin. Code § 1106, subsections 2.1-2.2, 3, 4, 6;<br><br>7 Del. Admin. Code § 1119, subsection 2 | Relevant and appropriate | Standards for ambient air quality, particulate emissions, odorous air contaminants, and VOC emissions. | Excavation will result in particulate release. |
| Identification and Listing of Hazardous Wastes | 40 C.F.R. Part 261<br><br>7 Del. Admin. Code § 1302, Part 261 | Applicable | Identifies solid wastes that are hazardous wastes. | Wastes at the Site are F034 hazardous wastes. Some hazardous waste may be temporarily stored at the Site in containers or tanks (e.g., DNAPL waste); other hazardous waste (e.g., creosote waste) will be placed into an on-Site containment system. The substantive requirements of these regulations will apply.<br><br>The provisions of 7 Del. Admin. Code § 1302 that are part of Delaware's Federally authorized program would apply instead of the Federal RCRA regulations. Additionally, any provision that is not a part of the authorized program but is more stringent than the Federal requirement would also apply. |
| Standards Applicable to Generators of Hazardous Waste | 40 C.F.R. §§ 262.10-.11<br><br>Corresponding sections of 7 Del. Admin. Code § 1302, Part 262. | Relevant and Appropriate | Establishes standards applicable to generators of hazardous waste | |
| Standards Applicable for Owners and Operators of Hazardous Waste Treatment Storage and Disposal Facilities | 40 C.F.R. §§ 264.1, .13-.15, .17-.19, .31, .33, .34, .51, .97, .98(a)-(b), .111, .114, .221, .226, .228, .171-178, .190-199, .1084-1086<br><br>Corresponding sections of 7 Del. Admin. Code § 1302, Part 264. | Relevant and Appropriate | Regulations for owners and operators of TSDFs which define acceptable management of hazardous wastes. | |
| Land Disposals Restrictions | 40 C.F.R. Part 268 | Applicable | Restrictions on land disposal of hazardous wastes. | These restrictions do not apply regarding consolidation of wastes |

| | | | | |
|---|---|---|---|---|
| | | | | into the Containment Area as these wastes and the Containment Area are in the same area of contamination. |
| Location-Specific | | | | |
| Coastal Zone Management Act of 1972, Coastal Zone Act Reauthorization Amendments of 1990 | 16 U.S C. §§ 1451 et. seq.<br>15 C.F.R. Part 930, subpart C | Applicable | Requires that Federal agencies conducting activities directly affecting the coastal zone conduct those activities in a manner consistent with the approved State coastal zone management program. | The Koppers Site is in a Coastal Zone. The substantive requirements of these laws will be followed. |
| Delaware Coastal Zone Act; Delaware Regulations Governing the Coastal Zone | 7 Delaware Code, Chapter 70, Sections 7002-7003; Del. Admin. Code Title 7, Chapter 2201 (Delaware Coastal Management Program), Section 5 | Applicable | Governs permissible Activities and land uses for properties located in Delaware's Coastal Zone. | |
| National Historic Preservation Act | 16 U.S.C. §§ 470-1, 470f, 470w<br><br>36 C.F.R. §§ 800.1(a), 800.2, 800.3, 800.4, 800.5, 800.6, 800.7, 800.9, 800.11, 800.13, 800.14, 800.16, and Appendix A to Part 800 | Applicable<br><br>The procedures in 36 C.F.R. Part 800 are Relevant and Appropriate | Requires that federal projects take into account effects on properties included on or eligible for inclusion on the National Register of Historic Places. | Properties that are eligible for inclusion on the National Registry of Historic Places may be adversely impacted by remediation at the Site. |

| | | | | |
|---|---|---|---|---|
| Protection of Floodplains | 44 C.F.R. § 9.11(b)(1), (b)(3) | Relevant and Appropriate | Requires minimization of harm to or within the floodplain.<br><br>Requires restoration and preservation of natural and beneficial floodplain values. | Remedial action will take place within both the 100-year and 500-year floodplains.[6] |
| | 44 C.F.R. § 9.11(c)(1), (c)(3) | Relevant and Appropriate | Requires minimization of harm to lives and the investment at risk from the base flood or 500-year floods.<br><br>Requires minimization of adverse impact on floodplain and wetland values. | |
| Protection of Wetlands | 44 C.F.R. § 9.11(b)(2), (b)(4) | Relevant and Appropriate | Requires the minimization of the destruction, loss, or degradation of wetlands.<br><br>Requires the preservation and enhancement of the natural and beneficial wetlands values. | |
| | 44 C.F.R. § 9.11(c)(3) | | Requires the minimization of potential adverse impact the | |

[6] See also (1) Executive Order 11988, Section 1 (which requires action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health and welfare, and to restore and preserve the natural and beneficial values served by floodplains) and 2(a)(2) (which requires consideration of alternatives to avoid adverse effects and incompatible development in floodplains); (2) Executive Order 13690, Section 2(c) (which requires use of natural systems, ecosystem processes, and nature-based approaches when developing alternatives for consideration). Federal Agencies are required to comply with executive order requirements.

| | | | | |
|---|---|---|---|---|
| | | | action may have on wetland values. | Remedial action will impact wetlands.[7] |
| | 40 C.F.R. § 230.93(a) | Relevant and Appropriate | General compensatory mitigation requirements. | |
| | 40 C.F.R. § 230.94(c) | Relevant and Appropriate | Requirement for mitigation plans. | |
| | 40 C.F.R. § 230.95 | Relevant and Appropriate | Ecological performance standards for mitigation plans. | |
| | 40 C.F.R. § 230.96(a)(1), (b) | Relevant and Appropriate | Monitoring requirements, monitoring period. | |
| | 40 C.F.R. § 230.97(a)(1), (c) | Relevant and Appropriate | Protection of sites using real estate instruments or alternatives, sustainability. | |
| Delaware Wetlands Regulations, amended November 1, 2018 | 7 Del. Admin. Code § 7502, subsection 12 | Applicable | Identifies factors to be considered in issuing permits for activities impacting wetlands. | |
| Delaware Executive Order 56 on Freshwater Wetlands (1988)[8] | | To Be Considered | General policy to minimize the adverse effects to freshwater wetlands. | |
| Delaware Regulations Governing the Use of Subaqueous Lands, amended September 2, 1992 | 7 Del. Admin. Code § 7504, subsection 4 | Relevant and Appropriate | Identifies factors to be considered in issuing permits for activities impacting subaqueous lands | |

[7] See also Executive Order 11990, Section 1(a) (which requires action to minimize the destruction, loss, or degradation of wetlands and to preserve and enhance beneficial values of wetlands) and 2(a) (which requires taking action to avoid construction in wetlands unless there is no practicable alternative to such construction and the proposed action includes all practicable measures to minimize harm to wetlands which may result from such use). Federal Agencies are required to comply with executive order requirements.

[8] https://archivesfiles.delaware.gov/Executive-Orders/Castle/Castle_EO56.pdf

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|---|---|---|---|---|
| Wild and Scenic Rivers Act | 16 U.S.C. § 1271<br><br>36 C.F.R. § 297.5(a)(1)-(2) | Relevant and Appropriate | Federal project will not have a direct and adverse effect on the values for which a Wild and Scenic River was designated, nor invade nor unreasonably diminish the scenic, recreational, and fish wildlife values of a Wild and Scenic River. | The substantive requirements will be considered in taking action impacting subaqueous lands. |
| **Action-Specific** | | | | |
| Rivers and Harbors Act § 10, Clean Water Act § 404 | 33 C.F.R. § 320.2, .4<br><br>33 U.S.C. § 403 | Relevant and Appropriate | Standards for regulation of discharge of dredged or fill material into waters of the United States, including wetlands. | A portion of Hershey Run's channel will be changed during remediation. |
| Delaware Sediment and Stormwater Regulations, January 23, 1991 as amended February 2, 2019 | 7 Del. Admin. Code § 5101, subsections 4-5 | Applicable | To provide control and management of stormwater runoff consistent with sound water and land use practices in order to reduce to the extent possible any adverse effects of stormwater runoff on the water and lands of the State. | The remediation will involve land disturbing activities. The substantive provisions of this regulation are applicable to stormwater from the construction area. No permits or plans will be sought or obtained. |
| Regulations Governing the Construction and Use of Wells | 7 De Admin. Code § 7301, subsections 5, 7, 10 | Applicable | Standards governing the location, design, installation, use, disinfection, modification, repair, and sealing of all wells and associated pumping equipment. | The remediation will potentially involve the installation of wells for purposes of monitoring or DNAPL removal. No permits will be obtained for on-site wells. |

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| Delaware Land Use Restrictive Covenants | Title 7, Delaware Code Chapter 79, Subchapter II | To Be Considered | Specifies the requirements of an environmental covenant established under Delaware law. | This subchapter will be consulted if a state-law environmental covenant is used to implement institutional controls at the Site. |

# APPENDIX B

# [STATEMENT OF WORK]

**REMEDIAL DESIGN/REMEDIAL ACTION**

**STATEMENT OF WORK**

**KOPPERS (NEWPORT) SUPERFUND SITE**

**New Castle County, Delaware**

**EPA Region 3**

**TABLE OF CONTENTS**

# 1. INTRODUCTION

**1.1 Purpose/Function of the SOW; Relationship to Other Documents**. This Statement of Work (SOW) sets forth the procedures and requirements for implementing the Work required by the Order to which it is an appendix. Exhibit 1 to this SOW is the fully executed *Programmatic Agreement Between the U.S. Environmental Protection Agency, Region III; the Delaware State Historical Preservation Office; and the Advisory Council on Historic Preservation Regarding Cleanup of the Koppers Newport Superfund Site, Newport, New Castle County, Delaware* ("Programmatic Agreement") obligating EPA to take certain steps to mitigate adverse effects to historic property at the Site in the course of implementing the ROD Amendment. Certain obligations placed upon EPA via the Programmatic Agreement are hereby passed through to Respondent via the Order and appear in Section 5 of this SOW and in various other places in this SOW. To the extent there is a conflict between the provisions of Section 5 of this SOW and other provisions of this SOW or the Order, the provisions of Section 5 of this SOW shall govern.

**1.2 Structure of the SOW**

- Section 2 (Community Involvement) sets forth EPA's and Respondent's responsibilities for community involvement.
- Section 3 (Remedial Design) sets forth the process for developing the RD, which includes the submission of specified primary deliverables.
- Section 4 (Remedial Action) sets forth requirements regarding the completion of the RA, including primary deliverables related to completion of the RA.
- Section 5 (Programmatic Agreement Obligations) sets forth certain requirements regarding implementation of the Programmatic Agreement.
- Section 6 (Reporting) sets forth Respondent's reporting obligations.
- Section 7 (Deliverables) describes the content of the supporting deliverables and the general requirements regarding Respondent's submission of, and EPA's review of, approval of, comment on, and/or modification of, the deliverables.
- Section 8 (Schedules) sets forth the schedule for submitting the primary deliverables, specifies the supporting deliverables that must accompany each such primary deliverable, and sets forth the schedule of milestones regarding the completion of the RA.
- Section 9 (State Participation) addresses State participation.
- Section 10 (References) provides a list of references, including URLs.
- Exhibit 1 is the Programmatic Agreement.

**1.3** The Scope of the 2022 Selected Remedy includes the actions described in Section 12 of the ROD, including without limitation:

(a) Construction of a containment area on-Site for the placement of excavated materials and debris (Containment Area);

(b) Realignment of Hershey Run around the Containment Area;

(c) Installation of barrier walls around all sides of the Containment Area with monitoring to ensure the barrier walls function as designed;

(d) Excavation of contaminated soils, placement of a geotextile demarcation layer, and backfilling;

(e) Excavation of contaminated sediments (including channels and marsh/wetland areas), placement of a reactive core mat, and backfilling;

(f) Placement of excavated soils, sediments, and collected debris into the Containment Area;

(g) Capping the Containment Area;

(h) Recovery and off-Site treatment and disposal, or recyling, of the recoverable DNAPL in the saturated zone outside of the Containment Area;

(i) Mitigation of effects to wetlands impacted by the remediation;

(j) Implementation of institutional controls to protect the components of the remedy and to prevent residential development;

(k) Monitoring of, surface water, sediment, biota, groundwater, porewater, and caps/covers; and

(l) Institutional controls to prevent use of groundwater.

**1.4** The terms used in this SOW that are defined in CERCLA, in regulations promulgated under CERCLA, or in the Order, have the meanings assigned to them in CERCLA, in such regulations, or in the Order, except that the term “Paragraph” or “¶” means a paragraph of the SOW, and the term “Section” means a section of the SOW, unless otherwise stated.

## 2. COMMUNITY INVOLVEMENT

**2.1** As requested by EPA, Respondent shall conduct community involvement activities under EPA’s oversight as provided for in, and in accordance with this Section. Such activities must include designation of a Community Involvement Coordinator (“CI Coordinator”).

### 2.2 Community Involvement Responsibilities

(a) EPA has the lead responsibility for developing and implementing community involvement activities at the Site. EPA has developed a Community Involvement Plan (CIP) for the Site. In accordance wth 40 C.F.R. § 300.435(c), EPA shall (1) review the existing CIP and determine whether it should be revised to describe further public involvement activities during the Work that are not already addressed or provided for in the existing CIP, or (2) develop a CIP for the Site. The CIP shall include, if applicable, any Technical Assistance Grant (TAG), and/or any use of the Technical Assistance Services for Communities (TASC) contract.

(b) As requested by EPA, Respondent shall participate in community involvement activities, including participation in (1) public meetings that may be held or sponsored by EPA to explain activities at or relating to the Site (with interpreters present for community members with limited English proficiency); and (2) the preparation of information regarding the Work for dissemination to the public, and Paragraph 5.15 of this SOW. Respondent's support of EPA's community involvement activities may include providing online access to initial submissions and updates of deliverables to (1) any Community Advisory Groups, (2) any Technical Assistance Grant (TAG) recipients and their advisors, and (3) other entities to provide them with a reasonable opportunity for review and comment. EPA may describe in its CIP Respondent's responsibilities for community involvement activities. All community involvement activities conducted by Respondent at EPA's request are subject to EPA's oversight. Upon EPA's request, Respondent shall establish, as early as feasible, a community information repository at or near the Site, as provided in the CIP, to house one copy of the administrative record.

(c) **Information for the Community**. As requested by EPA, Respondent shall develop and provide to EPA information about the design and implementation of the remedy including: (1) any validated data from monitoring of impacts to communities as provided in the Community Impact Mitigation Plan under ¶ 7.7(f); (2) results from unvalidated sampling as provided under ¶ 7.7(e)(9); (3) a copy of the Community Impacts Mitigation Plan required under ¶ 7.7(f); (4) schedules prepared under Section 8; (5) dates that Respondent completed each task listed in the schedules; and (6) digital photographs of the Work being performed, together with descriptions of the Work depicted in each photograph, the purpose of the Work, the equipment being used, and the location of the Work. The EPA Project Coordinator may use this information for communication to the public via EPA's website, social media, or local and mass media. The information provided to EPA should be suitable for sharing with the public and the education levels of the community as indicated in EJ Screen. Translations should be in the dominant language(s) of community members with limited English proficiency.

(d) **Respondent's CI Coordinator**. As requested by EPA, Respondent shall, within 15 days, designate and notify EPA of Respondent's Community Involvement Coordinator (Respondent's CI Coordinator). Respondent may hire a contractor for this purpose. Respondent's notice must include the name, title, and qualifications of the Respondent's CI Coordinator. Respondent's CI Coordinator shall coordinate his/her activities with EPA's CI Coordinator, provide support regarding EPA's community involvement activities and, as requested by EPA's

CI Coordinator, provide draft responses to the public's inquiries including requests for information or data about the Site. The Respondent's CI Coordinator has the responsibility to ensure that when they communicate with the public, the Respondent protects any "Personally Identifiable Information" ("PII") (*e.g.* sample results from residential properties) in accordance with "EPA Policy 2151.0: Privacy Policy."

## 3. REMEDIAL DESIGN

**3.1 RD Work Plan**. Respondent shall submit a Remedial Design (RD) Work Plan (RDWP) for EPA approval. The RDWP must include, at a minimum:

(a) A description of updated elements of the design that have been modified since the approval of the Pre-Final Design submitted in April 2013;

(b) Plans and schedules for implementing all RD activities identified in this SOW (including, but not limited to, Section 5 of this SOW), in the RDWP, or required by EPA to be conducted to develop the RD;

(c) A description of the overall management strategy for performing the RD, including a proposal for phasing of design and construction, if applicable;

(d) A description of the proposed general approach to contracting, construction, operation, maintenance, and monitoring of the Remedial Action (RA) as necessary to implement the Work;

(e) A description of the responsibility and authority of all organizations and key personnel involved with the development of the RD;

(f) Descriptions of any areas requiring clarification and/or anticipated problems (*e.g.*, data gaps);

(g) Description of any pre-design investigation proposed by Respondent;

(h) Description of any treatability study proposed by Respondent;

(i) Descriptions of any applicable permitting requirements and other regulatory requirements;

(j) Description of plans for obtaining access in connection with the Work, such as property acquisition, property leases, and/or easements; and

(k) Preliminary versions of the following supporting deliverables described in ¶ 7.7 (Supporting Deliverables): Health and Safety Plan; Emergency Response Plan; Field Sampling Plan; Quality Assurance Project Plan; Community Impact

Mitigation Plan; Site Wide Monitoring Plan; and other applicable supporting deliverables.

**3.2** **Institutional Controls Implementation and Assurance Plan (ICIAP)**. Respondent shall submit a proposed ICIAP for EPA approval. The ICIAP shall describe plans to implement, maintain, monitor, and enforce the Institutional Controls (ICs) at the Site. The ICIAP shall include plans to commence implementing ICs as early as is feasible, including before EPA approval of the Pre-Final (99%) RD design under ¶ 3.8. The ICIAP also shall include procedures for effective and comprehensive review of implemented ICs, procedures for the solicitation of input from affected communities regarding the implementation of ICs, procedures to periodically review and determine if the ICs are having their intended effect, and if not, procedures for the development, approval and implementation of alternative, more effective ICs. Respondent shall develop the ICIAP in accordance with *Institutional Controls: A Guide to Planning, Implementing, Maintaining, and Enforcing Institutional Controls at Contaminated Sites*, OSWER 9355.0-89, EPA/540/R-09/001 (Dec. 2012), and *Institutional Controls: A Guide to Preparing Institutional Controls Implementation and Assurance Plans at Contaminated Sites*, OSWER 9200.0-77, EPA/540/R-09/02 (Dec. 2012). Respondent also shall consider including in the ICIAP the establishment of effective Long-Term Stewardship procedures including those described in EPA Memorandum: *Advanced Monitoring Technologies and Approaches to Support Long-Term Stewardship* (July 20, 2018). The ICIAP must include the following additional requirements:

(a) Locations of recorded real property interests (e.g., easements, liens) and resource interests in the property that may affect ICs (e.g., surface, mineral, and water rights) including accurate mapping and geographic information system (GIS) coordinates of such interests; and

(b) Legal descriptions and survey maps that are prepared according to current American Land Title Association (ALTA) Survey guidelines and certified by a licensed surveyor.

Respondent shall implement the ICIAP.

**3.3** Respondent shall meet regularly with EPA to discuss design issues as necessary, as directed or determined by EPA.

**3.4** **Pre-Design Investigation**. This Section 3.4 shall apply if EPA agrees that Pre-Design Investigation (PDI) activities are needed.

(a) **PDI Work Plan**. If EPA so directs, or if EPA agrees with Respondent's proposal for PDI activities, Respondent shall submit a PDI Work Plan (PDIWP) for EPA approval. The PDIWP must include:

(1) An evaluation and summary of existing data and description of data gaps;

(2) A sampling plan including media to be sampled, contaminants or parameters for which sampling shall be conducted, location (areal extent and depths), and number of samples;

(3) Cross references to quality assurance/quality control (QA/QC) requirements set forth in the Quality Assurance Project Plan (QAPP) as described in ¶ 7.7(d); and

(4) Plan for minimizing adverse effects to historic properties from Pre-Design Investigation work if it is conducted prior to finalization of the Treatment Plan required by Section 5.2 of this SOW.

(b) Following the PDI, Respondent shall submit a PDI Evaluation Report. This report must include:

(1) Summary of the investigations performed;

(2) Summary of investigation results;

(3) Summary of validated data (*i.e.*, tables and graphics);

(4) Data validation reports and laboratory data reports;

(5) Narrative interpretation of data and results;

(6) Results of statistical and modeling analyses;

(7) Photographs documenting the work conducted; and

(8) Conclusions and recommendations for RD, including design parameters and criteria.

(c) EPA may require Respondent to supplement the PDI Evaluation Report and/or to perform additional pre-design studies.

**3.5 Treatability Study.** If EPA notifies Respondent that Treatability Study work is required:

(a) Respondents shall perform a Treatability Study (TS) for the purposes identified by EPA.

(b) Respondent shall submit a TS Work Plan (TSWP) for EPA approval. Respondent shall prepare the TSWP in accordance with EPA's *Guide for Conducting Treatability Studies under CERCLA, Final* (Oct. 1992), as supplemented for RD by the *Remedial Design/Remedial Action Handbook*, EPA 540/R-95/059 (June 1995). In addition, the TSWP shall include a plan for minimizing adverse effects to historic properties if Treatability Study activities occur prior to finalization of the Treatment Plan required by Section 5.2 of this SOW.

(c) Following completion of the TS, Respondent shall submit a TS Evaluation Report for EPA comment.

(d) EPA may require Respondent to supplement the TS Evaluation Report and/or to perform additional treatability studies.

**3.6 Reserved.**

**3.7 Pre-Final (95%) Remedial Design (95% RD)**.

(a) Respondent submitted a draft design to EPA in April 2014 ("2014 Design"). Respondent shall update the 2014 Design for EPA comment to, among other things:

(1) Address relevant comments received from EPA on previous designs leading to the 2014 Design that were not addressed by Respondent, if any;

(2) Conform the 2014 Design to the ROD Amendment;

(3) Incorporate all relevant requirements of the Programmatic Agreement identified in Section 5 of this SOW for which information is currently known (including, among other things, the Treatment Plan, if approved prior to submittal of the draft 95% RD); and

(4) Identify all portions of the design that may potentially be modified after additional information relevant to the Programmatic Agreement is obtained (*e.g.*, design changes that could be driven by the Treatment Plan).

(b) The 95% RD must include:

(1) A complete set of construction drawings and specifications that are: (a) certified by a registered professional engineer; (b) suitable for procurement; and (c) follow the Construction Specifications Institute's MasterFormat 2012;

(2) A survey and engineering drawings showing existing Site features, such as elements, property borders, easements, and Site conditions;

(3) Draft Final versions of the same elements and deliverables as are required for a Pre-Final RD;

(4) A specification for photographic documentation of the RA; and

(5) Updates of all supporting deliverables required to accompany the RDWP and the following additional supporting deliverables described in ¶ 7.7

(Supporting Deliverables): Construction Quality Assurance/Quality Control Plan; O&M Plan; and O&M Manual.

**3.8 Pre-Final (99%) RD**.

(a) Respondent shall submit the 99% RD for EPA approval after the Treatment Plan required by the Programmatic Agreement has been approved and in accordance with the schedule set forth in Section 8.2 of this SOW. The 99% RD must address EPA's comments on the 95% RD, must incorporate any design changes necessitated by the approved Treatment Plan, and must include final versions of all 95% RD deliverables.

(b) Upon approval by EPA, the Draft 99% RD shall become the Final 99% RD and Respondent shall relabel or otherwise mark the EPA-approved design as the Final 99% RD.

(c) A copy of the Final 99% RD will be distributed pursuant to Section 5.8 of this SOW.

**3.9 Draft 100% RD and Final 100% RD, Award of Remedial Action Contract**

(a) If, at the end of the comment opportunity provided in Section 5.8 of this SOW, EPA determines that no changes to the Final 99% RD are required:

(1) EPA will so notify Respondent; and

(2) Respondent shall relabel or otherwise mark the Final 99% RD as the Final 100% RD.

(b) If, at the end of the comment opportunity provided in Section 5.8 of this SOW, EPA determines that changes to the Final 99% RD are required:

(1) EPA will so notify Respondent;

(2) Respondent shall submit a Draft 100% RD for EPA approval; and

(3) Upon EPA approval, EPA shall so notify Respondent, the Draft 100% RD shall become the Final 100% RD, and Respondent shall relabel or otherwise mark the EPA-approved design as the Final 100% RD.

(c) Respondent shall award a Remedial Action construction contract and notify EPA that the contract has been awarded.

# 4. REMEDIAL ACTION

**4.1 RA Work Plan**. Respondent shall submit a RA Work Plan (RAWP) for EPA approval and commence and complete implementation of the EPA-approved RAWP. The draft RAWP must include:

(a) A proposed RA Construction Schedule using the critical path method, Gantt chart, PERT, or other format approved by EPA;

(b) An updated health and safety plan that covers activities during the RA; and

(c) If applicable, plans for satisfying permitting requirements, including obtaining permits for off-site activity and for satisfying substantive requirements of permits for on-site activity.

**4.2 Independent Quality Assurance Team**. Respondent shall notify EPA of Respondent's designated Independent Quality Assurance Team (IQAT). The IQAT shall be independent of, and cannot include the Supervising Contractor. Respondent may hire a third party for this purpose. Respondent's notice must include the names, titles, contact information, and qualifications of the members of the IQAT. The IQAT shall have the responsibility to determine whether Work is of expected quality and conforms to applicable plans and specifications. The IQAT shall have the responsibilities as described in ¶ 2.1.3 of the *Guidance on EPA Oversight of Remedial Designs and Remedial Actions Performed by Potentially Responsible Parties*, EPA/540/G-90/001 (Apr. 1990).

**4.3 Meetings and Inspections**

(a) **Preconstruction Conference**. Respondent shall hold a preconstruction conference with EPA and others as directed or approved by EPA and as described in the *Remedial Design/Remedial Action Handbook*, EPA 540/R-95/059 (June 1995). Respondent shall prepare minutes of the conference and shall distribute the minutes to all Parties.

(b) **Periodic Meetings**. During the construction portion of the RA (RA Construction), Respondents shall meet at least weekly, or as otherwise directed by EPA, with EPA and others as directed or determined by EPA, to discuss construction issues. Respondent shall distribute an agenda and list of attendees to all Parties prior to each meeting. Respondent shall prepare minutes of the meetings and shall distribute the minutes to all Parties.

(c) **Inspections**

(1) EPA or its representative shall conduct periodic inspections of, or have an on-site presence during, the Work. At EPA's request, the Supervising Contractor or other designee shall accompany EPA or its representative during inspections.

(2) If needed, Respondent shall provide on-site office space for EPA personnel to perform their oversight duties. Unless otherwise directed by EPA, the minimum office requirements are a private lockable office with at least 150 square feet of floor space; an office desk with chair; a four-drawer file cabinet; and a telephone with a private line, access to facsimile, reproduction, and personal computer equipment; wireless internet access; sanitation facilities; and heating/cooling.

(3) If needed, Respondent shall provide personal protective equipment needed for EPA personnel and any oversight officials to perform their oversight duties.

(4) Upon notification by EPA of any deficiencies in the RA Construction, including noncompliance with the requirements of Section 5 of this SOW, Respondent shall take all necessary steps to correct the deficiencies and/or bring the RA Construction into compliance with the Final 100% RD, any approved design changes, and/or the approved RAWP. If applicable, Respondent shall comply with any schedule provided by EPA in its notice of deficiency.

## 4.4 Emergency Response and Reporting

(a) **Emergency Response and Reporting**. If any event occurs during performance of the Work that causes or threatens to cause a release of Waste Material on, at, or from the Site and that either constitutes an emergency situation or that may present an immediate threat to public health or welfare or the environment, Respondent shall: (1) immediately take all appropriate action to prevent, abate, or minimize such release or threat of release; (2) immediately notify the authorized EPA officer (as specified in ¶ 4.4(c)) orally; and (3) take such actions in consultation with the authorized EPA officer and in accordance with all applicable provisions of the Health and Safety Plan, the Emergency Response Plan, and any other deliverable approved by EPA under the SOW.

(b) **Release Reporting**. Upon the occurrence of any event during performance of the Work that Respondent is required to report pursuant to Section 103 of CERCLA, 42 U.S.C. § 9603, or Section 304 of the Emergency Planning and Community Right-to-know Act (EPCRA), 42 U.S.C. § 11004, Respondent shall immediately notify the authorized EPA officer orally.

(c) The “authorized EPA officer” for purposes of immediate oral notifications and consultations under ¶ 4.4(a) and ¶ 4.4(b) is the EPA Project Coordinator, the EPA Alternate Project Coordinator (if the EPA Project Coordinator is unavailable), or the EPA Superfund Hotline (800-553-2509) (if neither EPA Project Coordinator is available).

(d) For any event covered by ¶ 4.4(a) and ¶ 4.4(b), Respondent shall: (1) within 7 days after the onset of such event, submit a report to EPA describing the actions or events that occurred and the measures taken, and to be taken, in response thereto; and (2) within 30 days after the conclusion of such event, submit a report to EPA describing all actions taken in response to such event.

(e) The reporting requirements under ¶ 4.4 are in addition to the reporting required by CERCLA § 103 or EPCRA § 304.

### 4.5 Off-Site Shipments

(a) Respondent may ship hazardous substances, pollutants, and contaminants from the Site to an off-Site facility only if it complies with Section 121(d)(3) of CERCLA, 42 U.S.C. § 9621(d)(3), and 40 C.F.R. § 300.440. Respondent shall be deemed to be in compliance with CERCLA § 121(d)(3) and 40 C.F.R. § 300.440 regarding a shipment if Respondent obtains a prior determination from EPA that the proposed receiving facility for such shipment is acceptable under the criteria of 40 C.F.R. § 300.440(b).

(b) Respondent may ship Waste Material from the Site to an out-of-state waste management facility only if, prior to any shipment, it provides notice to the appropriate state environmental official in the receiving facility's state and to the EPA Project Coordinator. This notice requirement shall not apply to any off-Site shipments when the total quantity of all such shipments does not exceed 10 cubic yards. The notice must include the following information, if available: (1) the name and location of the receiving facility; (2) the type and quantity of Waste Material to be shipped; (3) the schedule for the shipment; and (4) the method of transportation. Respondent also shall notify the state environmental official referenced above and the EPA Project Coordinator of any major changes in the shipment plan, such as a decision to ship the Waste Material to a different out-of-state facility. Respondent shall provide the notice after the award of the contract for RA construction and before the Waste Material is shipped.

(c) Respondent may ship Investigation Derived Waste (IDW) from the Site to an off-Site facility only if it complies with Section 121(d)(3) of CERCLA, 42 U.S.C. § 9621(d)(3), 40 C.F.R. § 300.440, EPA's *Guide to Management of Investigation Derived Waste*, OSWER 9345.3-03FS (Jan. 1992), and any IDW-specific requirements contained in the ROD Amendment. Wastes shipped off-Site to a laboratory for characterization, and RCRA hazardous wastes that meet the requirements for an exemption from RCRA under 40 CFR § 261.4(e) shipped off-site for treatability studies, are not subject to 40 C.F.R. § 300.440.

### 4.6 RA Construction Completion

(a) For purposes of this ¶ 4.6, "RA Construction" comprises, for any RA component that involves the construction and operation of a system to achieve Performance Standards (*e.g.*, groundwater or surface water restoration remedies), the construction of such system and the performance of all activities necessary for the system to function properly and as designed.

(1) The RA selected in the ROD amendment may include components falling into this category as well as components which do not.

(2) Respondent shall identify, in the RAWP, those remedial components that shall be subject to the requirements of this Paragraph 4.6.

(3) Those components which EPA agrees shall be subject to this Paragraph 4.6 shall be reviewed in accordance with this Paragraph 4.6 and Paragraph 4.7(a), below. Those components which EPA agrees shall not be subject to this Paragraph 4.6 shall be reviewed in accordance with Paragraph 4.7(b), below.

(b) **Inspection of Constructed Remedy Component**. Respondent shall schedule an inspection to review the construction and operation of the system and to review whether the system is functioning properly and as designed. The inspection must be attended by Respondent and EPA and/or their representatives. A re-inspection must be conducted if requested by EPA.

(c) **Shakedown Period**. There shall be a shakedown period of up to one year for EPA to review whether the remedy component is functioning properly and performing as designed. Respondent shall provide such information as EPA requests for such review.

(d) **RA Report**. Following the shakedown period, Respondent shall submit an "RA Report" requesting EPA's determination that RA Construction has been completed for the remedy component. The RA Report must: (1) include statements by a registered professional engineer and by Respondent's Project Coordinator that construction of the system is complete and that the system is functioning properly and as designed; (2) include a demonstration, and supporting documentation, that construction of the system is complete and that the system is functioning properly and as designed; (3) include as-built drawings signed and stamped by a registered professional engineer; (4) be prepared in accordance with Chapter 2 (Remedial Action Completion) of EPA's *Close Out Procedures for NPL Sites* guidance (May 2011), as supplemented by *Guidance for Management of Superfund Remedies in Post Construction*, OLEM 9200.3-105 (Feb. 2017); and (5) be certified in accordance with ¶ 7.5 (Certification).

(e) If EPA determines that RA Construction is not complete for the component, EPA shall so notify Respondent. EPA's notice must include a description of the activities that Respondent must perform to complete RA Construction for the component. EPA's notice may include a schedule for completion of such activities or may require Respondent to submit a proposed schedule for EPA approval. Respondent shall perform all activities described in the EPA notice in accordance with the schedule.

(f) If EPA determines, based on the initial or any subsequent RA Report, that RA Construction is complete for the component, EPA shall so notify Respondents.

(g) Respondent may combine remedy components for purposes of satisfying this Paragraph 4.6.

**4.7 Notice of RA Completion**

(a) **For Remedy Components That Have Been Evaluated Under Paragraph 4.6**.

(1) **Monitoring Report**. Respondent shall submit a Monitoring Report to EPA requesting EPA's Notice of RA Completion for the component. The report must: (1) include certifications by a registered professional engineer and by Respondent's Project Coordinator that the RA is complete; (2) be prepared in accordance with Chapter 2 (Remedial Action Completion) of EPA's *Close Out Procedures for NPL Sites* guidance (May 2011), as supplemented by *Guidance for Management of Superfund Remedies in Post Construction*, OLEM 9200.3-105 (Feb. 2017); (3) contain monitoring data to demonstrate that Performance Standards have been achieved; and (4) be certified in accordance with ¶ 7.5 (Certification).

(2) If EPA concludes that the RA is not Complete for the component, EPA shall so notify Respondent. EPA's notice must include a description of any deficiencies. EPA's notice may include a schedule for addressing such deficiencies or may require Respondents to submit a schedule for EPA approval. Respondent shall perform all activities described in the notice in accordance with the schedule.

(3) If EPA concludes, based on the initial or any subsequent Monitoring Report requesting Notice of RA Completion, that the RA is Complete for the component, EPA shall so notify the Respondent. This notice shall constitute the Notice of RA Completion for the component for purposes of the Order. Issuance of the Notice of RA Completion shall not affect Respondent's remaining obligations under the Order.

(b) **For Remedy Components That Have Not Been Evaluated Under Paragraph 4.6.**

(1) The RA is "Complete" for a remedy component for purposes of this ¶ 4.7 when the component has been fully performed and the Performance Standards have been achieved. Respondent shall schedule an inspection for the purpose of obtaining EPA's Notice of RA Completion for the component. The inspection must be attended by Respondent and EPA and/or their representative.

(2) **RA Report**. Following the inspection, Respondent shall submit an RA Report to EPA requesting EPA's Notice of RA Completion for the component. The report must: (1) include certifications by a registered

professional engineer and by Respondent's Project Coordinator that the RA is complete; (2) include as-built drawings signed and stamped by a registered professional engineer; (3) be prepared in accordance with Chapter 2 (Remedial Action Completion) of EPA's *Close Out Procedures for NPL Sites* guidance (May 2011), as supplemented by *Guidance for Management of Superfund Remedies in Post Construction*, OLEM 9200.3-105 (Feb. 2017); (4) contain monitoring data to demonstrate that Performance Standards have been achieved; and (5) be certified in accordance with ¶ 7.5 (Certification).

(3) If EPA concludes that the RA is not Complete for the component, EPA shall so notify Respondent. EPA's notice must include a description of any deficiencies. EPA's notice may include a schedule for addressing such deficiencies or may require Respondent to submit a schedule for EPA approval. Respondent shall perform all activities described in the notice in accordance with the schedule.

(4) If EPA concludes, based on the initial or any subsequent RA Report requesting Notice of RA Completion for the component, that the RA is Complete, EPA shall so notify the Respondent. This notice shall constitute the Notice of RA Completion for the component for purposes of the Order. Issuance of the Notice of RA Completion shall not affect Respondent's remaining obligations under the Order.

(5) Respondent may combine remedy components for purposes of satisfying this Paragraph 4.7.

**4.8 Periodic Review Support Plan**. Respondent shall submit the periodic review support plan (PRSP) for EPA approval. The PRSP addresses the studies and investigations that Respondent shall conduct to support EPA's reviews of whether the RA is protective of human health and the environment in accordance with Section 121(c) of CERCLA, 42 U.S.C. § 9621(c) (also known as "Five-year Reviews"). Respondent shall develop the plan in accordance with *Comprehensive Five-year Review Guidance*, OSWER 9355.7-03B-P (June 2001), and any other relevant five-year review guidances.

**4.9 Notice of Work Completion**

(a) **Work Completion Inspection**. Respondent shall schedule an inspection for the purpose of obtaining EPA's Notice of Work Completion. The inspection must be attended by Respondent and EPA and/or their representatives.

(b) **Work Completion Report**. Following the inspection, Respondent shall submit a report to EPA requesting EPA's Notice of Work Completion. The report must: (1) include certifications by a registered professional engineer and by Respondent's Project Coordinator that the Work, including all RA components and all O&M activities pertaining to such components, is complete; and (2) be certified in accordance with ¶ 7.5 (Certification).

(c) If EPA concludes that the Work is not complete, EPA shall so notify Respondent. EPA's notice must include a description of the activities that Respondent must perform to complete the Work. EPA's notice must include specifications and a schedule for such activities or must require Respondent to submit specifications and a schedule for EPA approval. Respondent shall perform all activities described in the notice or in the EPA-approved specifications and schedule.

(d) If EPA concludes, based on the initial or any subsequent report requesting Notice of Work Completion, that the Work is complete, EPA shall so notify Respondent. Issuance of the Notice of Work Completion does not affect continuing obligations under the Order, including but not limited to the following: (1) activities under the Periodic Review Support Plan/Site Wide Management Plan; (2) obligations under Sections **XI** (Property Requirements), **XVI** (Access to Information), and **XVII** (Record Retention) of the Order; (3) Institutional Controls obligations as provided in the ICIAP.

## 5. OBLIGATIONS FROM PROGRAMMATIC AGREEMENT

**5.1** (a) **Programmatic Agreement.** On July 6, 2023, the *Programmatic Agreement Between the U.S. Environmental Protection Agency, Region III; the Delaware State Historical Preservation Office; and the Advisory Council on Historic Preservation Regarding Cleanup of the Koppers Newport Superfund Site, Newport, New Castle County, Delaware* ("Programmatic Agreement") became effective. The Programmatic Agreement obligates EPA to take certain steps to mitigate adverse effects to historic property at the Site in the course of implementing the remedial action selected in the 2022 ROD ("2022 Selected Remedy"). This SOW, and the Order to which it is an appendix, directs Respondent to implement provisions of the Programmatic Agreement as described herein. The Programmatic Agreement is attached as Exhibit 1 to this SOW.

**(b)** **Definitions.** The definitions in Section I of the Programmatic Agreement are incorporated herein by reference. The following additional terms used in this SOW are defined as follows:

(1) "Ground Disturbing Activities" shall mean activities that involve digging or excavation below the surface of the ground that is reasonably likely to reveal previously undiscovered items that may be Historic Property and/or human remains.

**5.2** **Resolution of Adverse Effects on Historic Properties/Development of Treatment Plan**.

(a) To mitigate adverse effects to Historic Properties at Affected Sites which may arise from implementation of the 2022 Selected Remedy, Respondent shall develop a Treatment Plan in accordance with this Section 5.2. The Treatment Plan shall include elements of data recovery and/or alternative mitigation plans to address adverse effects to Historic Properties at the Affected Sites and measures to ensure that the Unaffected Sites remain preserved in place. The Treatment Plan shall also address the curation and disposition of archaeological collections (including plans for disposition of artifacts recovered and to be recovered by Respondent) and records.

(b) EPA shall invite Respondent (and the DE SHPO, Consulting Tribes, and Other Consulting Parties) to one or more meetings or conference calls to discuss the contents of the draft Treatment Plan including, but not limited to, mitigation alternatives for each of the Affected Sites, measures to ensure that the Unaffected Sites remain preserved in place, curation, and the disposition of archaeological collections (including plans for disposition of artifacts recovered and to be recovered by Respondent) and records.

(c) Following the completion of discussions, Respondent shall submit a draft Treatment Plan to EPA for preliminary approval that takes into account the discussions and issues raised during the meetings and conference calls. EPA shall review and respond to the draft Treatment Plan in accordance with Paragraph 7 of this SOW. Preliminary approval of the Treatment Plan shall not constitute final approval of the Treatment Plan.

(d) EPA shall submit, via Electronic Delivery, the draft Treatment Plan that has been preliminary approved by EPA to the DE SHPO, Consulting Tribes, and the Other Consulting Parties for their review and comment.

(1) The DE SHPO, Consulting Tribes, and Other Consulting Parties shall have sixty (60) days, or such longer period as EPA may designate, to submit comments to EPA ("First Comment Period"). EPA shall provide a copy of all comments received to Respondent.

(2) Following the completion of the First Comment Period, EPA shall schedule a meeting or call with Respondent and the DE SHPO, Consulting Tribes, and Other Consulting Parties to discuss all comments received by EPA during the First Comment Period.

(3) Respondent shall revise the draft Treatment Plan, taking into account all comments received during the First Comment Period and the meeting or call and submit, to EPA for further preliminary approval in accordance with Paragraph 7 of this SOW, a revised draft Treatment Plan.

(4) EPA shall submit the revised draft Treatment Plan which has received further preliminary approval, via Electronic Delivery, to the DE SHPO,

Consulting Tribes, and the Other Consulting Parties for their review and comment.

(5) The DE SHPO, Consulting Tribes, and Other Consulting Parties shall have thirty (30) days, or such longer period as EPA may designate, to submit comments to EPA ("Second Comment Period"). EPA shall provide a copy of all comments received to Respondent.

(6) Respondent shall prepare, for EPA approval pursuant to Paragraph 7 of this SOW, a final draft of the Treatment Plan, taking into account all comments received during the comment periods and meetings/calls.

(7) EPA, in its discretion, may (a) arrange for additional meetings/calls and/or comment periods with the DE SHPO, Consulting Tribes, and Other Consulting Parties to discuss the draft Treatment Plan as EPA deems necessary to ensure that the concerns of the DE SHPO, Consulting Tribes, and Other Consulting Parties have been heard and considered, and (b) require Respondent to modify the draft Treatment Plan to take into account all comments received during the such meetings/calls and/or comment periods in accordance with a schedule provided by EPA.

(8) Upon approval by EPA pursuant to Paragraph 7 of this SOW, (a) EPA shall submit the Final Treatment Plan, via Electronic Delivery, to the Respondent, DE SHPO, Consulting Tribes, and the Other Consulting Parties, and (b) Respondent shall implement the Final Treatment Plan in accordance with its terms.

(e) If Respondent intends the Treatment Plan to include data recovery, Respondent shall ensure that a Data Recovery Plan is developed and included with the Treatment Plan drafts submitted to EPA. The Data Recovery Plan shall comply with Section II.K of the Programmatic Agreement and shall address, at a minimum, the factors identified in Section II.A.4 of the Programmatic Agreement.

(f) If Respondent intends the Treatment Plan to include preservation in place of all or part of a Historic Property, Respondent shall include in such plan recommendations for use of legal instruments that would ensure long-term preservation or protection of the Historic Property, keeping in mind that any such legal instrument must include, at a minimum, the elements set forth in Section II.A.5 of the Programmatic Agreement.

(g) Alternative mitigation strategies included in the Treatment Plan may include, among other things, protection of portion(s) of the Affected Sites and Unaffected Sites; updating and/or creating relevant DE SHPO and EPA archaeological websites and geographical databases with relevant information collected during previous and/or ongoing investigations; analysis and synthesis of past data accumulated through either DE SHPO and EPA projects; statewide and/or region-wide predictive models; histories of the project APE; virtual tours and/or websites detailing Historic Properties in the APE; illustrated books; and online exhibits that introduce the history of the Koppers Site.

(h) All schedules submitted to EPA for approval shall take into account that, except as may be provided in the Treatment Plan, Respondent shall complete all necessary data recovery fieldwork prior to commencement of Ground Disturbing Activities associated wth the 2022 Selected Remedy at any Affected Site where data recovery will be performed. Alternative mitigation may or may not be completed prior to commencing Ground Disturbing Activities associated with the Project at any Affected Site where alternative mitigation will be performed.

**5.3 Effects to Unsurveyed Areas.**

(a) Identification and Evaluation Surveys

(1) If EPA determines that design changes result in the potential for effects to Historic Properties that may be located in unsurveyed areas, and EPA so directs, Respondent shall, in consultation with EPA, the DE SHPO, the Consulting Tribes, and the Other Consulting Parties, (1) conduct identification (Phase I) archaeological surveys, (2) formulate recommendations regarding whether identified properties will require a Phase II level archaeological survey to evaluate their NRHP eligibility, and (3) conduct Phase II level archaeological surveys. Phase II surveys may require additional background research and/or additional field excavations.

(2) Respondent shall prepare reports on findings of the additional identification/evaluation surveys and shall submit draft and final reports to EPA, the DE SHPO, Consulting Tribes, and Other Consulting Parties for comment. The review period shall be thirty-five (35) days from the date Respondent transmits the reports, or such longer period as determined by EPA in its unreviewable discretion. Respondent shall take into account any comments received, amend the reports accordingly, and submit the reports to EPA for approval. All final reports shall meet the standards described in Section II.K of the Programmatic Agreement.

(3) During the Phase II surveys, Respondent, in consultation with EPA, the Consulting Tribes, and the Other Consulting Parties, shall apply the NRHP criteria (36 C.F.R. § 60.4) in accordance with 36 C.F.R. § 800.4(c), taking into account applicable historic contexts and management plans developed for Delaware for historic and pre-contact archaeological resources.

(4) If Respondent determines that any of the NRHP criteria are met, and EPA, the DE SHPO, the Consulting Tribes, and the Other Consulting Parties agree, the properties shall be deemed eligible for the NRHP. If Respondent determines that the NRHP criteria are not met, and EPA, the

DE SHPO, the Consulting Tribes, and the Other Consulting Parties agree, the properties shall be considered not eligible for the NRHP. If Respondent, EPA, the DE SHPO, the Consulting Tribes, and the Other Consulting Parties have not reached a consensus, or if the ACHP or the Secretary of the Interior so request, Respondent shall, in consultation with EPA, obtain a determination of eligibility from the Secretary of the Interior pursuant to 36 C.F.R. Part 63. Respondent shall in such case provide EPA with information and documents requested by EPA and otherwise assist EPA if EPA assumes lead responsibility for coordinating with the Secretary of Interior for such determination of eligibility.

(b) Findings of Effects, Finding of Adverse Effects, Resolution of Adverse Effects

Respondent shall assist EPA in following the steps set forth in 36 C.F.R. §§ 800.4(d), 800.5, and 800.6 in connection with making findings regarding effects on Historic Properties in previously unsurveyed areas, making findings of adverse effects on Historic Properties in previously unsurveyed areas, and resolving adverse effects on Historic Properties in previously unsurveyed areas, and shall submit modifications to the Treatment Plan to EPA. Respondent shall provide EPA with information and documents requested by EPA and otherwise assist EPA in meeting the requirements of Section II.A of the Programmatic Agreement.

**5.4 Public Involvement**.

(a) Respondent shall provide EPA with information and documents requested by EPA for purposes of EPA compliance with Paragraph II.C of the Programmatic Agreement in accordance with schedules provided by EPA. In preparing information and documents so requested by EPA, Respondent shall take all reasonable steps to ensure that the information and documents do not endanger the archaeological or Historic Properties at the Koppers Site.

(b) Respondent shall not release, to the public, information or documents relating to implementation of the 2022 Selected Remedy, the Programmatic Agreement, or this Order without approval from EPA following consultation with EPA, the DE SHPO, Consulting Tribes, and Other Consulting Parties.

**5.5 Curation.** All archaeological records, and any artifacts identified for curation pursuant to the approved Treatment Plan required by Section II.A of the PA, shall be curated in a repository qualified for this purpose, and shall be processed and prepared for curation following the policies of the qualified repository.

**5.6 Discovery of and Treatment of Human Remains and Burials.**

(a) Respondent shall provide its contractors and subcontractors with a copy of this SOW prior to their performance of any field work and shall ensure that they are familiar with the requirements of this ¶ 5.6.

(b) Respondent shall provide, on-site during Ground Disturbing Activities conducted to implement the 2022 Selected Remedy, a qualified archaeologist on-site ("On-Site Archaeologist") who shall be accessible to consult with the EPA Remedial Project Manager or his/her delegate regarding encounters with objects that are previously undiscovered items that may be Historic Property and/or human remains.

(c) Respondent shall ensure that its contractors and subcontractors immediately cease work at the location of a discovery of human remains or burial sites and notify EPA of such discovery within 24 hours of each such discovery.

(d) Respondent shall (1) comply with all instructions provided by EPA to ensure that all activities that may disturb or damage the remains, and activities in a reasonable buffer to permit inspection and protection of remains, are temporarily ceased, and (2) provide EPA with information and documents requested by EPA for purposes of EPA compliance with Paragraph II.E of the Programmatic Agreement in accordance with schedules provided by EPA.

(e) EPA will consult with the On-Site Archaeologist to confirm whether human remains or burial sites have been encountered. If EPA concludes that human remains or burial sites have been encountered, EPA will:

(1) notify the DE SHPO, the Consulting Tribes, and Other Consulting Parties of the discovery;

(2) notify the Delaware State Police of the discovery and the requirements of this PA;

(3) in consultation with the On-Site Archaeologist, establish a Stop Work Zone;

(4) issue a Stop Work Order to Respondent covering the Stop Work Zone;

(5) in consultation with the On-Site Archaeologist, identify reasonable efforts to be taken to avoid further impacts to the remains;

(6) conduct government-to-government consultation with federally recognized Tribes regarding such discovery;

(7) ensure that the disposition of discovered human remains is consistent with applicable Federal and State laws, regulations, and policies.

(f) If EPA concludes that human remains or burial sites have been encountered, Respondent shall:

(1) assist EPA in implementing the actions identified in (e)(1)-(e)(7), above, as requested by EPA;

(2) comply with any Stop Work Order issued by EPA; and

(3) implement reasonable efforts to be taken to avoid further impacts to the remains.

(g) If Respondent is aware that human remains of Native American affiliation are discovered, or is advised by EPA of the same, Respondent shall ensure that the steps detailed in Paragraph II.E.6 of the Programmatic Agreement are taken until a plan for appropriate disposition of such remains has been established.

**5.7 Unexpected Discoveries**.

(a) If, during the implementation of the 2022 Selected Remedy, Respondent encounters what it determines, in consultation with its On-Site Archaeologist, to be previously unidentified Historic Property which may be adversely affected by the 2022 Selected Remedy, or determines, in consultation with its On-Site Archaeologist, that the 2022 Selected Remedy will affect a known Historic Property in an unanticipated manner, Respondent shall (i) cease activities in the immediate area, (ii) make every reasonable effort to avoid further impacts to the resources, (iii) notify EPA within 24 hours of the encounter or determination, and (iv) comply with the requirements of Paragraph 5.7(c), below.

(b) If EPA agrees or determines that Respondent has encountered previously unidentified Historic Property which may be adversely affected by the 2022 Selected Remedy, or that the 2022 Selected Remedy will affect a known Historic Property in an unanticipated manner, EPA may:

(1) establish a Stop Work Zone;

(2) issue a Stop Work Order covering the Stop Work Zone;

(3) identify reasonable efforts to avoid further impacts to the discovery;

(4) notify the DE SHPO, the Consulting Tribes, and Other Consulting Parties of the nature of the discovery; of the Stop Work Zone established by EPA; that EPA has issued a Stop Work Order covering the Stop Work Zone; that reasonable efforts are being taken to avoid further impacts to the discovery; that EPA will issue a second notice addressing EPA's assessment of the National Registry eligibility of the property and the proposed actions to resolve adverse effects;

(5) notify the DE SHPO, the Consulting Tribes, and Other Consulting Parties of EPA's findings after EPA has, in consultation with the On-Site Archaeologist, developed its assessment of the National Register eligibility of the property and the proposed actions to resolve adverse effects (the second notice);

(6) provide the DE SHPO, the Consulting Tribes, and the Other Consulting Parties with an opportunity to respond to EPA's second notice;

(7) take into account any recommendations received regarding National Register eligibility and proposed mitigation plans;

(8) where EPA determines that mitigation activities must be completed before resuming the work, direct Respondent to implement the mitigation plans selected by EPA and then rescind the Stop Work Order;

(9) where EPA determines that mitigation activities need not be completed before resuming the work, rescind the Stop Work Order and direct Respondent to implement the selected mitigation activities; and

(10) provide the DE SHPO, the Consulting Tribes, and the Other Consulting Parties with a report of the actions taken with respect to the discovery.

(c) Respondent shall:

(1) assist EPA in implementing the actions identified in (b)(1)-(b)(10), above, as requested by EPA;

(2) comply with any Stop Work Order issued by EPA as well as any suspension or revocation of such Stop Work Order;

(3) implement reasonable efforts to be taken to avoid further impacts to the discovery;

(4) propose actions to resolve adverse effects;

(5) participate in consultation with the DE SHPO, the Consulting Tribes, and the Other Consulting Parties to identify actions to resolve adverse effects;

(6) in accordance with a schedule provided by EPA, submit plans to EPA for approval regarding implementation of actions approved by EPA to resolve adverse effects; and

(7) submit to EPA a report of the actions taken with respect to the discovery.

(d) Respondent shall, in accordance with a schedule provided by EPA, provide EPA with information and documents requested by EPA to facilitate EPA's timely notices to the DE SHPO, the Consulting Tribes, and Other Consulting Parties in accordance with Paragraph II.F of the Programmatic Agreement.

**5.8 Review of Remedial Design Plans.**

(a) Following EPA's receipt of a Final 99% RD from Respondent pursuant to Section 3.8 of this SOW, EPA will (1) provide a copy of such plans to the DE SHPO for review and comment; (2) notify the Consulting Tribes of the availability of the plans and provide copies as requested; and (3) notify the Other Consulting Parties of the availability of the plans and provide copies as requested for their review and comment solely on the issue whether the Final 99% RD necessitates a change to the determination of effects on Historic Properties or gives rise to a need to evaluate a potential for effects to unsurveyed areas.

(b) EPA will take into account any comments received and provide notice to the Respondent, DE SHPO, Consulting Tribes, and Other Consulting Parties of EPA's assessment regarding whether the Final 99% RD necessitates a change to the determination of effects on Historic Properties or gives rise to a need to evaluate a potential for effects to unsurveyed areas.

(c) If, as a result of this review, EPA and the DE SHPO agree that any change to the determination of effects on Historic Properties is warranted, or there is a need to evaluate a potential for effects to unsurveyed areas, EPA will notify Respondent of changes, if any, that are needed to the Final 99% RD. Respondent shall modify the Final 99% RD and submit it as the Draft 100% RD for approval by EPA pursuant to Paragraph 7 of this SOW in accordance with a schedule provided by EPA. The EPA-approved RD shall be the Final 100% RD.

**5.9 Subsequent Changes to the Project.** Respondent shall comply with instructions provided by EPA, and requests for information and documents from EPA, arising from EPA's compliance with Paragraph II.I.1 and .2 of the Programmatic Agreement.

**5.10 Personnel Qualifications.** Except as provided herein, all actions prescribed by this Paragraph 5 of the SOW that involve the identification, evaluation, analysis, recording, treatment, monitoring, or disposition of Historic Properties, and/or that involve reporting or documentation of such actions in the form of reports, forms, or other records, shall be carried out by or under the direct supervision of a person or persons who meets, at a minimum, the Secretary of the Interior's Historic Preservation Professional Qualifications Standards in the appropriate discipline as specified in the 1997 revised and updated proposed standards (62 Fed. Reg. 33708 (June 20, 1997)). Respondent shall ensure that the work required under this Paragraph 5 is conducted by individuals meeting these qualifications standards.

**5.11 Survey and Data Recovery Standards.**

(a) Respondent shall ensure that any and all cultural resource surveys and/or data recovery plans conducted pursuant to this Paragraph 5 of the SOW are done in accordance with the versions of the documents identified below in effect as of the Effective Date of the Programmatic Agreement:

1. "Secretary of the Interior's Standards for Identification;"
2. "Secretary of the Interior's Standards for Evaluation;"
3. "Secretary of the Interior's Standards for Historical Documentation;"
4. "Secretary of the Interior's Standards for Archaeological Documentation;"

and

5. "Archaeological Survey in Delaware, February 2015."

In addition, all data recovery plans shall take into account the Advisory Council on Historic Preservation's guidance for "Recommended Approach for Consultation on Recovery of Significant Information from Archaeological Sites Synopsis." Reports shall meet professional standards set forth by the Department of the Interior's "Format Standards for Final Reports of Data Recovery Program'' (42 Fed. Reg. 5377-79 (January 28, 1977)).

(b) Survey proposals and data recovery plans shall include a research design that identifies, among other things, objectives, methods, and expected results; production of draft and final reports; and preparation of materials for curation in accordance with Paragraph 5.5 of this SOW. Additional requirements for data recovery plans are found in Section II.A.4 of the Programmatic Agreement.

**5.12 Changes to Regulations, Guidance Documents, or Requirements.** EPA will consider any changes to laws, regulations, guidance documents, guidelines, or other materials relevant to implementation of the Programmatic Agreement of which it becomes aware. Respondent shall incorporate any such changes as notified by EPA.

**5.13 Review of Programmatic Agreement Implementation**.

(a) Respondent shall provide EPA with information and documents requested by EPA for purposes of EPA compliance with Paragraph II.O of the Programmatic Agreement including, without limitation, attendance in meetings.

(b) At the annual meeting or conference held pursuant to Paragraph II.O.2 of the Programmatic Agreement, Respondent shall report on:

(1) its progress, including problems or issues encountered and anticipated future actions to be taken to implement this Paragraph 5 of the SOW; and

(2) its progress in implementing the 2022 Selected Remedy in general.

**5.14 Amendment or Termination of Programmatic Agreement.** In the event the Programmatic Agreement is amended or terminated, EPA shall notify Respondent of such action and may amend this SOW or the Order in response thereto.

**5.15 Confidentiality.**

(a) Respondent shall manage information about the location, character, and ownership of Historic Properties the disclosure of which may cause a significant invasion of privacy, risk harm to the Historic Properties, or impede the use of a traditional religious site by practitioners, in a confidential manner and shall not disseminate such information to the public without approval by EPA.

(b) To the extent Respondent must include, in documents submitted to EPA under the Order, information about the location, character, or ownership of Historic

Properties the disclosure of which may cause a significant invasion of privacy, risk harm to the Historic Properties, or impede the use of a traditional religious site by practitioners, Respondent shall take all reasonable precautions to ensure that such information is segregated and labelled to facilitate redaction of such information by EPA.

## 6. REPORTING

**6.1 Progress Reports**. Commencing with the month following the Effective Date of the Order and until EPA approves the RA Completion for all remedy components, Respondent shall submit progress reports to EPA on a monthly basis, or as otherwise requested by EPA. The reports must cover all activities that took place during the prior reporting period, including:

(a) The actions that have been taken toward achieving compliance with the Order including, but not limited to, actions taken to satisfy the requirements of the Programmatic Agreement provisions included in Section 5 of the SOW;

(b) A summary of all results of sampling, tests, and all other data received or generated by Respondent;

(c) A description of all deliverables that Respondent submitted to EPA;

(d) A description of all activities relating to the RD or RA Construction that are scheduled for the next reporting period;

(e) An updated RD or RA Construction Schedule, together with information regarding percentage of completion, 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;

(f) A description of any modifications to the work plans or other schedules that Respondent has proposed or that have been approved by EPA; and

(g) A description of all activities undertaken in support of the Community Involvement Plan (CIP) during the reporting period and those to be undertaken in the next reporting period.

**6.2 Notice of Progress Report Schedule Changes**. If the schedule for any activity described in the Progress Reports, including activities required to be described under ¶ 6.1(d), changes, Respondent shall notify EPA of such change at least 7 days before performance of the activity.

## 7. DELIVERABLES

**7.1 Applicability**. Respondent shall submit deliverables for EPA approval or for EPA comment as specified in the SOW. If neither is specified, the deliverable does not require EPA's approval or comment. Paragraphs 7.2 (In Writing) through 7.4 (Technical

Specifications) apply to all deliverables. Paragraph 7.5 (Certification) applies to any deliverable that is required to be certified. Paragraph 7.6 (Approval of Deliverables) applies to any deliverable that is required to be submitted for EPA approval.

**7.2** **In Writing**. All deliverables under this SOW must be in writing unless otherwise specified.

**7.3** **General Requirements for Deliverables**

(a) Except as otherwise provided in this Order, Respondent shall direct all deliverables required by this Order to the EPA Project Coordinator via email.

(b) All deliverables provided to the State in accordance with ¶ 9 (State Participation) shall be directed to Morgan McGee-Solomon, (302) 395-2600, Morgan.McGee-Solomon@delaware.gov.

(c) All deliverables must be submitted by the deadlines in the RD Schedule or RA Schedule, as applicable. Respondent shall submit all deliverables to EPA in electronic form, or a paper copy if directed by EPA. Technical specifications for sampling and monitoring data and spatial data are addressed in ¶ 7.4. All other deliverables shall be submitted to EPA in the electronic form specified by the EPA Project Coordinator. If any deliverable includes maps, drawings, or other exhibits that are larger than 8.5" by 11", Respondent shall also provide EPA with paper copies of such exhibits if directed by EPA.

**7.4** **Technical Specifications**

(a) Sampling and monitoring data should be submitted in standard Regional Electronic Data Deliverable (EDD) format Respondent should follow guidance outlined in the EPA Region 3 website https://www.epa.gov/superfund/region-3-superfund-electronic-data-submission. Note that EPA Region 3's website links to a developer's site to download the Electronic Data Processor, which currently states that EPA Region 3 is in the process of finalizing the preferred EDD format; until the EPA Region 3 format is finalized, the Settling Defendants should follow the guidance outlined in the EPA Region 2 website at https://www.epa.gov/superfund/region-2-superfund-electronic-data-submission. At a minimum, all electronic data deliverables are to be submitted to EPA in the Staged Electronic Data Deliverable (SEDD) 2a, 2b or SEDD 3 format (https://www.epa.gov/clp/staged-electronic-data-deliverable-sedd). The Settling Defendants are responsible for ensuring the laboratory can generate a compliant SEDD file. Other delivery methods may be allowed if electronic direct submission presents a significant burden or as technology changes. Other delivery methods may be allowed if electronic direct submission presents a significant burden or as technology changes.

(b) Spatial data, including spatially-referenced data and geospatial data, should be submitted: (1) in the ESRI File Geodatabase format; and (2) as unprojected geographic coordinates in decimal degree format using North American Datum

1983 (NAD83) or World Geodetic System 1984 (WGS84) as the datum. If applicable, submissions should include the collection method(s). Projected coordinates may optionally be included but must be documented. Spatial data should be accompanied by metadata, and such metadata should be compliant with the Federal Geographic Data Committee (FGDC) Content Standard for Digital Geospatial Metadata and its EPA profile, the EPA Geospatial Metadata Technical Specification. An add-on metadata editor for ESRI software, the EPA Metadata Editor (EME), complies with these FGDC and EPA metadata requirements and is available at https://www.epa.gov/geospatial/epa-metadata-editor.

(c) Each file must include an attribute name for each site unit or sub-unit submitted. Consult http://www.epa.gov/geospatial/geospatial-policies-and-standards for any further available guidance on attribute identification and naming.

(d) Spatial data submitted by Respondent does not, and is not intended to, define the boundaries of the Site.

**7.5 Certification**. All deliverables that require compliance with this ¶ 7.5 must be signed by the Respondent's Project Coordinator, or other responsible official of Respondents, and must contain the following statement:

"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 have no personal knowledge that the information submitted is other than 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."

**7.6 Approval of Deliverables.** Some of the deliverables required by Section 5 of this SOW require preliminary approval by EPA before EPA transmits such deliverables to others as part of the consultation requirements in the Programmatic Agreement. Approval by EPA of such deliverables prior to completion of consultation requirements set forth in Section 5 shall not constitute final approval by EPA of such submittals. Unless otherwise provided in Section 5 of this SOW, (1) the process described in Paragraphs 7.6(a) and (b) shall be used for purposes of obtaining preliminary EPA approval of such documents, and (2) final EPA approval shall not occur until consultation has been completed and EPA provides notice to Respondent of the version of the document that has been approved by EPA following the completion of consultation.

(a) **Initial Submissions**

(1) After review of any deliverable that is required to be submitted for EPA approval under the Order or the SOW, EPA shall: (i) approve, in whole or

in part, the submission; (ii) approve the submission upon specified conditions; (iii) disapprove, in whole or in part, the submission; or (iv) any combination of the foregoing.

(2) EPA also may modify the initial submission to cure deficiencies in the submission if: (i) EPA determines that disapproving the submission and awaiting a resubmission would cause substantial disruption to the Work; or (ii) 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 deliverable.

(b) **Resubmissions**. Upon receipt of a notice of disapproval under ¶ 7.6(a) (Initial Submissions), or if required by a notice of approval upon specified conditions under ¶ 7.6(a), Respondent shall, within 10 days or such longer time as specified by EPA in such notice, correct the deficiencies and resubmit the deliverable for approval. After review of the resubmitted deliverable, EPA may: (1) approve, in whole or in part, the resubmission; (2) approve the resubmission upon specified conditions; (3) modify the resubmission; (4) disapprove, in whole or in part, the resubmission, requiring Respondents to correct the deficiencies; or (5) any combination of the foregoing.

(c) **Implementation**. Upon approval, approval upon conditions, or modification by EPA under ¶ 7.6(a) (Initial Submissions) or ¶ 7.6(b) (Resubmissions), of any deliverable, or any portion thereof: (1) such deliverable, or portion thereof, shall be incorporated into and enforceable under the Order; and (2) Respondent shall take any action required by such deliverable, or portion thereof.

**7.7** **Supporting Deliverables**. Respondent shall submit each of the following supporting deliverables for EPA approval, except as specifically provided. Respondent shall develop the deliverables in accordance with all applicable regulations, guidances, and policies (see Section 10 (References)). Respondent shall update each of these supporting deliverables as necessary or appropriate during the course of the Work, and/or as requested by EPA.

(a) **Health and Safety Plan**. The Health and Safety Plan (HASP) describes all activities to be performed to protect on site personnel and area residents from physical, chemical, and all other hazards posed by the Work. Respondent shall develop the HASP in accordance with EPA's Emergency Responder Health and Safety and Occupational Safety and Health Administration (OSHA) requirements under 29 C.F.R. §§ 1910 and 1926. The HASP should cover RD activities and should be, as appropriate, updated to cover activities during the RA and updated to cover activities after RA completion. EPA does not approve the HASP, but will review it to ensure that all necessary elements are included and that the plan provides for the protection of human health and the environment.

(b) **Emergency Response Plan**. The Emergency Response Plan (ERP) must describe procedures to be used in the event of an accident or emergency at the Site (*e.g.*, power outages, water impoundment failure, treatment plant failure, slope failure, etc.). The ERP must include:

(1) The name of the person or entity responsible for responding in the event of an emergency incident;

(2) Plan and date(s) for meeting(s) with the local community, including local, State, and federal agencies involved in the cleanup, as well as local emergency squads and hospitals;

(3) Spill Prevention, Control, and Countermeasures (SPCC) Plan (if applicable), consistent with the regulations under 40 C.F.R. Part 112, describing measures to prevent, and contingency plans for, spills and discharges;

(4) Notification activities in accordance with ¶ 4.4(b) (Release Reporting) in the event of a release of hazardous substances requiring reporting under Section 103 of CERCLA, 42 U.S.C. § 9603, or Section 304 of the Emergency Planning and Community Right-to-know Act (EPCRA), 42 U.S.C. § 11004; and

(5) A description of all necessary actions to ensure compliance with ¶ 4.4 in the event of an occurrence during the performance of the Work that causes or threatens a release of Waste Material from the Site that constitutes an emergency or may present an immediate threat to public health or welfare or the environment.

(c) **Field Sampling Plan**. The Field Sampling Plan (FSP) addresses all sample collection activities. The FSP must be written so that a field sampling team unfamiliar with the project would be able to gather the samples and field information required. Respondent shall develop the FSP in accordance with *Guidance for Conducting Remedial Investigations and Feasibility Studies*, EPA/540/G 89/004 (Oct. 1988).

(d) **Quality Assurance Project Plan**. The Quality Assurance Project Plan (QAPP) augments the FSP and addresses sample analysis and data handling regarding the Work. The QAPP must include a detailed explanation of Respondent's quality assurance, quality control, and chain of custody procedures for all treatability, design, compliance, and monitoring samples. Respondent shall develop the QAPP in accordance with *EPA Requirements for Quality Assurance Project Plans*, QA/R-5, EPA/240/B-01/003 (Mar. 2001, reissued May 2006); *Guidance for Quality Assurance Project Plans*, QA/G-5, EPA/240/R 02/009 (Dec. 2002); and *Uniform Federal Policy for Quality Assurance Project Plans*, Parts 1-3, EPA/505/B-04/900A though 900C (Mar. 2005). The QAPP also must include procedures:

(1) To ensure that EPA and its authorized representative have reasonable access to laboratories used by Respondent in implementing the Work (Respondent's Labs);

(2) To ensure that Respondent's Labs analyze all samples submitted by EPA pursuant to the QAPP for quality assurance monitoring;

(3) To ensure that Respondent's Labs perform all analyses using EPA-accepted methods (i.e., the methods documented in *USEPA Contract Laboratory Program Statement of Work for Inorganic Analysis*, ILM05.4 (Dec. 2006); *USEPA Contract Laboratory Program Statement of Work for Organic Analysis*, SOM01.2 (amended Apr. 2007); and *USEPA Contract Laboratory Program Statement of Work for Inorganic Superfund Methods (Multi-Media, Multi-Concentration)*, ISM01.2 (Jan. 2010)) or other methods acceptable to EPA;

(4) To ensure that Respondent's Labs participate in an EPA-accepted QA/QC program or other program QA/QC acceptable to EPA;

(5) For Respondent to provide EPA with notice at least 30 days prior to any sample collection activity;

(6) For Respondent to provide split samples and/or duplicate samples to EPA upon request;

(7) For EPA to take any additional samples that it deems necessary;

(8) For EPA to provide to Respondent, upon request, split samples and/or duplicate samples in connection with EPA's oversight sampling; and

(9) For Respondent to submit to EPA all sampling and tests results and other data in connection with the implementation of the Work.

(e) **Site Wide Monitoring Plan**. The purpose of the Site Wide Monitoring Plan (SWMP) is to obtain information, through short- and long- term monitoring, about the movement of and changes in contamination throughout the Site, during and following implementation of the RA; to obtain information regarding contamination levels to determine whether Performance Standards (PS) are achieved; and to obtain information to determine whether to perform additional actions, including further Site monitoring. The SWMP must include:

(1) Description of the media to be monitored, including, but not limited to, groundwater, soil, surface water, sediment, porewater, and biota;

(2) A biological monitoring program replicating key site-specific activities, or elements of those activities, of the ecological risk assessment. These elements shall include, but shall not be limited to:

(i) 14-day sediment (solid-phase) toxicity tests using the amphipod, *Hyalella azteca*, and the midge, *Chironomus tentans*;

(ii) a 10-day solid-phase sediment toxicity test using embryos of the salt marsh killifish, *Fundulus heteroclitus*;

(iii) Forage fish collection (reduction of body burden and upper trophic level exposure; examination for DELT Anomalies); and,

(iv) Benthic community evaluations/field benthic surveys

(3) Identification of proposed sampling/monitoring locations and the rational for their selection.

(4) Description of the data collection parameters including existing and proposed monitoring devices and locations, schedule and frequency of monitoring, analytical parameters to be monitored, and analytical methods employed;

(5) Description of how performance data will be analyzed, interpreted, and reported, and/or other Site-related requirements;

(6) Description of verification sampling procedures;

(7) Description of deliverables that will be generated in connection with monitoring, including:

(i) sampling schedules,

(ii) laboratory records,

(iii) monitoring reports,

(iv) monthly and annual reports to EPA and State agencies;

(v) summary of investigations performed;

(vi) summary of investigation results;

(vii) summary of validation reports and laboratory data reports;

(viii) data validation reports and laboratory data reports;

(ix) photographs documenting the work conducted; and

(x) conclusions of the work completed and results

(8) Description of proposed additional monitoring and data collection actions (such as increases in frequency of monitoring, and/or installation of

additional monitoring devices in the affected areas) in the event that results from monitoring devices indicate changed conditions (such as higher than expected concentrations of the contaminants of concern or groundwater contaminant plume movement);

(9) A plan to immediately provide to EPA any unvalidated sampling data from Community Areas as defined in ¶ 7.7(f) affected by the remedy that exceed removal management levels or three times remedial cleanup levels, whichever is lower; and

(10) A plan to expedite sampling and analysis in Community Areas as defined in ¶ 7.7(f) affected by the remedy (particularly in situations where EPA determines that unvalidated sampling data indicates substantial exceedances of cleanup standards), including procedures for expedited analysis, validation, and communication of sampling results to affected communities.

(f) **Community Impact Mitigation Plan ("CIMP")**. The CIMP describes all activities, to be performed: (1) to reduce and manage the impacts from remedy implementation (*e.g.*, air emissions, traffic, noise, odor, temporary or permanent relocation) to residential areas, schools, playgrounds, healthcare facilities, or recreational or impacted public areas ("Community Areas") from and during remedy implementation, (2) to conduct monitoring in Community Areas of impacts from remedy implementation, (3) to expeditiously communicate validated remedy implementation monitoring data, (4) to make adjustments during remedy implementation in order to further reduce and manage impacts from remedy implementation to affected Community Areas, and (5) to expeditiously restore community resources damaged during remediation such as roads and culverts. The CIMP should contain information about impacts to Community Areas that is sufficient to assist EPA's Project Coordinator in performing the evaluations recommended under the *Superfund Community Involvement Handbook*, OLEM 9230.0-51 (March 2020), pp. 53-56.

(g) **Construction Quality Assurance/Quality Control Plan (CQA/QCP)**. The purpose of the Construction Quality Assurance Plan (CQAP) is to describe planned and systemic activities that provide confidence that the RA construction will satisfy all plans, specifications, and related requirements, including quality objectives. The purpose of the Construction Quality Control Plan (CQCP) is to describe the activities to verify that RA construction has satisfied all plans, specifications, and related requirements, including quality objectives. The CQA/QCP must:

(1) Identify, and describe the responsibilities of, the organizations and personnel implementing the CQA/QCP;

(2) Describe the PS required to be met to achieve Completion of the RA;

(3) Describe the activities to be performed: (i) to provide confidence that the PS will be met; and (ii) to determine whether PS have been met;

(4) Describe verification activities, such as inspections, sampling, testing, monitoring, and production controls, under the CQA/QCP;

(5) Describe industry standards and technical specifications used in implementing the CQA/QCP;

(6) Describe procedures for tracking construction deficiencies from identification through corrective action;

(7) Describe procedures for documenting all CQA/QCP activities; and

(8) Describe procedures for retention of documents and for final storage of documents.

(h) **O&M Plan**. The O&M Plan describes the requirements for inspecting, operating, and maintaining the RA. Respondents shall develop the O&M Plan in accordance with *Guidance for Management of Superfund Remedies in Post Construction*, OLEM 9200.3-105 (Feb. 2017). The O&M Plan must include the following additional requirements:

(1) Description of PS required to be met to implement the ROD Amendment;

(2) Description of activities to be performed: (i) to provide confidence that PS will be met; and (ii) to determine whether the PS have been met;

(3) **O&M Reporting**. Description of records and reports that will be generated during O&M, such as daily operating logs, laboratory records, records of operating costs, reports regarding emergencies, personnel and maintenance records, monitoring reports, and monthly and annual reports to EPA and State agencies;

(4) Description of corrective action in case of systems failure, including: (i) alternative procedures to prevent the release or threatened release of Waste Material which may endanger public health and the environment or may cause a failure to achieve PS; (ii) analysis of vulnerability and additional resource requirements should a failure occur; (iii) notification and reporting requirements should O&M systems fail or be in danger of imminent failure; and (iv) community notification requirements; and

(5) Description of corrective action to be implemented in the event that PS are not achieved; and a schedule for implementing these corrective actions.

(i) **O&M Manual**. The O&M Manual serves as a guide to the purpose and function of the equipment and systems that make up the remedy. Respondents shall develop the O&M Manual in accordance with *Guidance for Management of Superfund Remedies in Post Construction*, OLEM 9200.3-105 (Feb. 2017).

## 8. SCHEDULES

**8.1 Applicability and Revisions**. All deliverables and tasks required under this SOW must be submitted or completed by the deadlines or within the time durations listed in the schedule set forth below or as otherwise provided in this SOW or Order. Respondent may submit proposed revised schedule(s) for EPA approval. Upon EPA's approval, the revised schedule(s) supersede the existing schedules and any previously-approved schedules. The absence of a deadline, in Paragraph 8.2, below, for a particular requirement of the Order shall not be construed as a waiver of the deadline provided for such requirement elsewhere in the Order.

**8.2 Schedule**.

| SOW Reference | Deliverable/Activity | Deadline |
|---|---|---|
| 2.1<br>2.2(b) | Conduct community involvement activities | Per schedule provided by EPA at the time |
| 2.2(c) | Develop and provide to EPA information about the design and implementation of the remedy | Per schedule provided by EPA at the time |
| 2.2(d) | Designate and notify EPA of Respondent's Community Involvement Coordinator | Within 15 days of EPA request |
| 3.1 | Submit RD Workplan | 70 days after the date of EPA's Authorization to Proceed regarding Supervising Contractor under ¶ 29(c)(2) of the Order |
| 3.2 | Submit ICIAP | 70 days after the date of EPA's Authorization to Proceed regarding Supervising Contractor under ¶ 29(c)(2) of the Order |
| 3.2 | Commence to Implement ICIAP | Within 30 days after EPA approval of the ICIAP |
| 3.3 | Meet regularly with EPA to discuss design issue | Per schedule provided by EPA at the time |
| 3.4(a) | Submit Pre-Design Investigation Work Plan | Within 30 days after directed by EPA to submit |
| 3.4(b) | Submit Pre-Design Investigation Evaluation Report | Within 30 days after PDI work is completed and if applicable, validated data is received |

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| 3.4(c) | Supplement the PDI Evaluation Report | Per schedule provided by EPA at the time |
| 3.5(b) | Submit Treatability Study Work Plan | Within 30 days after directed by EPA to submit |
| 3.5(c) | Submit Treatability Study Evaluation Report | Within 30 days after Treatability Study work is completed and if applicable, validated data is received |
| 3.5(d) | Supplement the TS Evaluation Report | Per schedule provided by EPA at the time |
| 3.7(a) | Submit Draft Pre-Final 95% Remedial Design | 90 days after the date EPA approves the RD Work Plan, or if applicable, 60 days after approval of the PDI Evaluation Report |
| 3.8(a) | Submit Draft Pre-Final 99% Remedial Design | If the Treatment Plan has been approved, 45 days after the date of EPA's comments on the 95% RD. If the Treatment Plan has not been approved, per schedule provided by EPA at the time of Treatment Plan approval. |
| 3.8(b) | Relabel or otherwise mark the EPA-approved design as the Final 99% RD | Upon receipt of EPA approval of the Draft 99% RD |
| 3.9(a)(2) | Relabel or otherwise mark the Final 99% RD as the Final 100% RD | Within 2 days after receipt of EPA's notice under ¶ 3.9(a)(1). |
| 3.9(b)(2) | Submit Draft 100% Remedial Design | Within 45 days after the date of EPA's notice under ¶ 3.9(b)(1). |
| 3.9(b)(3) | Relabel or otherwise mark the EPA-approved design as the Final 100% RD | Within 2 days after receipt of EPA's notice under ¶ 3.9(b)(3) |
| 3.9(c) | Award RA Construction Contract | With 60 days after EPA approval of the Draft 100% RD |
| 3.9(c) | Notify EPA that Construction Contract has been awarded | Within 5 days after the award. |
| 4.1 | Submit Remedial Action Work Plan | 60 days after Award of RA Construction Contract |
| 4.1 | Commence and complete implementation of the EPA-approved RAWP | In accordance with the schedule in the EPA-approved RAWP |
| 4.2 | Notification to EPA of Designate IQAT | 60 days after Award of RA Construction Contract |
| 4.3(a) | Pre-Construction Conference with EPA | In accordance with schedule in approved RAWP, but at a minimum no less than 45 days |

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| | | prior to commencement of on-Site construction |
| 4.3(a) | Distribute Minutes from Conference | Within 5 days after the date of the conference. |
| 4.3(b) | Distribute Minutes from Meetings | Within 5 days after the date of each meeting. |
| 4.3(c)(2) | Provide Office Space | Upon request by EPA |
| 4.3(c)(3) | Provide Personal Protective Equipment | Upon request by EPA |
| 4.3(c)(4) | Take all necessary steps to correct the deficiencies and/or bring the RA Construction into compliance | Per schedule provided by EPA at the time |
| 4.4 | Emergency Response notifications, actions, reporting | In accordance with stated deadlines or instructions provided by EPA. |
| 4.6(b) | Schedule Inspection of Constructed Remedy Component | 30 days after completion of construction of remedy component(s) for review under ¶ 4.6 |
| 4.6(b) | Schedule of Constructed Remedy Component Re-Inspection | Per schedule provided by EPA at the time |
| 4.6(c) | Provide information to EPA during shakedown period | Per schedule provided by EPA at the time |
| 4.6(d) | Submit Remedial Action Report | 60 days after receiving request from EPA |
| 4.6(e) | Actions to Cure Deficiencies | Per schedule provided by EPA at the time |
| 4.7(a)(1) | Submit Monitoring Report | When Respondent concludes that the Performance Standards have been achieved and Respondent seeks a Notice of RA Completion for that component |
| 4.7(a)(2) | Actions to cure deficiencies | Per schedule provided by EPA at the time |
| 4.7(b)(1) | Schedule inspection | When Respondent concludes that the component has been fully performed and Performance Standards have been achieved, and Respondent seeks a Notice of RA Completion for that component |
| 4.7(b)(2) | Submit RA Report | 30 days after the date of the RA Completion Inspection |

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| 4.7(b)(3) | Actions to cure deficiencies | Per schedule provided by EPA at the time |
| 4.8 | Periodic Review Support Plan | Five years after the start of construction, or included with the Site Wide Management Plan |
| 4.9(a) | Schedule Work Completion Inspection | 30 days after Respondent has determined Work is complete |
| 4.9(b) | Submit Work Completion Report | 30 days after Work Completion Inspection |
| 4.9(c) | Actions to cure | Per schedule provided by EPA at the time |
| 5.2(c) | Submit draft Treatment Plan to EPA for preliminary approval | 30 days after the final ¶ 5.2 meeting/call |
| 5.2(d)(3) | Submit revised draft Treatment Plan to EPA | 30 days after the final ¶ 5.2(d)(2) meeting/call |
| 5.2(d)(6) | Submit revised draft Treatment Plan to EPA | 30 days after the deadline for the ¶ 5.2(d)(5) comment period |
| 5.2(d)(7) | Submit subsequent revised draft Treatment Plan(s) to EPA | Per schedule provided by EPA at the time |
| 5.2(d)(8) | Commence implementation of the EPA-approved Treatment Plan | Upon EPA approval |
| 5.3(a)(1) | Conduct surveys, formulate recommendations | Per schedule provided by EPA at the time |
| 5.3(a)(2) | Submit draft and final reports | Per schedule provided by EPA at the time |
| 5.3(a)(4) | Obtain determination from Secretary of Interior, provide documents and assistance to EPA | Per schedule provided by EPA at the time |
| 5.3(b) | Assist EPA, provide information and documents | Per schedule provided by EPA at the time |
| 5.4(a) | Provide information and documents requested by EPA | Per schedule provided by EPA at the time |
| 5.5 | Curation in repository | Per EPA-approved schedule in Treatment Plan |
| 5.6(a) | Provide contractors and subcontractors with copy of Section II.E of the Programmatic Agreement | Prior to performance of field work |
| 5.6(b) | Provide On-Site Archaeologist | At all times during Ground Disturbing Activities |
| 5.6(c) | Notify EPA of discovery of human remains or burial sites | Within 24 hours of discovery |

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|---|---|---|
| 5.6(d) | Provide information and documents requested by EPA to comply with Para. II.E of the Programmatic Agreement | Per schedule provided by EPA at the time |
| 5.6(f)(1) | Assist EPA in implementing actions | Per schedule provided by EPA at the time |
| 5.6(f)(2) | Comply with Stop Work Order | Immediately upon receipt |
| 5.6(f)(3) | Implement reasonable efforts to be taken to avoid impacts to remains | Immediately upon discovery |
| 5.6(g) | Steps to be taken upon discovery of remains of Native American affiliation | Immediately upon discovery |
| 5.7(a)(i) | Cease activities in immediate area | Immediately upon discovery |
| 5.7(a)(ii) | Make reasonable efforts to avoid further impacts | Immediately upon discovery |
| 5.7(a)(iii) | Notify EPA | Within 24 hours of encounter or determination |
| 5.7(a)(iv) | Comply with 5.7(c) | Per deadlines provided for such requirements |
| 5.7(c)(1) | Assist EPA | Per schedule provided by EPA at the time |
| 5.7(c)(2) | Comply with Stop Orders, suspensions, revocations | In accordance with documents issued by EPA |
| 5.7(c)(3) | Implement reasonable efforts | Immediately upon discovery |
| 5.7(c)(4) | Propose actions to resolve adverse effects | Within 10 days of discovery |
| 5.7(c)(5) | Participate in consultation | Per schedule provided by EPA at the time |
| 5.7(c)(6) | Submit plans for actions to resolve adverse effects | Per schedule provided by EPA at the time |
| 5.7(c)(7) | Submit a report of the actions taken with respect to the discovery | Within 30 days of completion of actions taken to resolve adverse effects under EPA-approved plan |
| 5.7(d) | Provide information and documents to EPA | Per schedule provided by EPA at the time |
| 5.8(c) | Submit Draft 100% RD | IN accordance with ¶¶ 3.8 and 3.9 of this SOW |
| 5.12 | Incorporation of changes as a result of changes to law, regulations, guidance, etc. | Per schedule provided by EPA at the time |
| 5.13(a) | Provide information and documents to EPA | Per schedule provided by EPA at the time |

## 9. STATE AND TRIBAL PARTICIPATION

**9.1** **Copies**. Respondent shall, at any time they send a deliverable to EPA, send a copy of such deliverable to the State and the Consulting Tribes identified in the Programmatic Agreement. EPA shall, at any time it sends a notice, authorization, approval, disapproval, or certification to Respondent, send a copy of such document to the State and the Consulting Tribes identified in the Programmatic Agreement.

**9.2** **Review and Comment**. The State and the Consulting Tribes identified in the Programmatic Agreement shall have a reasonable opportunity for review and comment prior to:

(a) Any EPA approval or disapproval under ¶ 7.6 (Approval of Deliverables) of any deliverables that are required to be submitted for EPA approval; and

(b) Any approval or disapproval of the Construction Phase under ¶ 4.6 (RA Construction Completion), any disapproval of, or Notice of RA Completion under ¶ 4.7 (Notice of RA Completion), and any disapproval of, or Notice of Work Completion under ¶ 4.9 (Notice of Work Completion).

## 10. REFERENCES

**10.1** The following regulations and guidance documents, among others, apply to the Work. Any item for which a specific URL is not provided below is available on one of the two EPA Web pages listed in ¶ 10.2:

(a) A Compendium of Superfund Field Operations Methods, OSWER 9355.0-14, EPA/540/P-87/001a (Aug. 1987).

(b) CERCLA Compliance with Other Laws Manual, Part I: Interim Final, OSWER 9234.1-01, EPA/540/G-89/006 (Aug. 1988).

(c) Guidance for Conducting Remedial Investigations and Feasibility Studies, OSWER 9355.3-01, EPA/540/G-89/004 (Oct. 1988).

(d) CERCLA Compliance with Other Laws Manual, Part II, OSWER 9234.1-02, EPA/540/G-89/009 (Aug. 1989).

(e) Guidance on EPA Oversight of Remedial Designs and Remedial Actions Performed by Potentially Responsible Parties, OSWER 9355.5-01, EPA/540/G-90/001 (Apr.1990).

(f) Guidance on Expediting Remedial Design and Remedial Actions, OSWER 9355.5-02, EPA/540/G-90/006 (Aug. 1990).

(g) Guide to Management of Investigation-Derived Wastes, OSWER 9345.3-03FS (Jan. 1992).

(h) Permits and Permit Equivalency Processes for CERCLA On-Site Response Actions, OSWER 9355.7-03 (Feb. 1992).

(i) Guidance for Conducting Treatability Studies under CERCLA, OSWER 9380.3-10, EPA/540/R-92/071A (Nov. 1992).

(j) National Oil and Hazardous Substances Pollution Contingency Plan; Final Rule, 40 C.F.R. Part 300 (Oct. 1994).

(k) Guidance for Scoping the Remedial Design, OSWER 9355.0-43, EPA/540/R-95/025 (Mar. 1995).

(l) Remedial Design/Remedial Action Handbook, OSWER 9355.0-04B, EPA/540/R-95/059 (June 1995).

(m) EPA Guidance for Data Quality Assessment, Practical Methods for Data Analysis, QA/G-9, EPA/600/R-96/084 (July 2000).

(n) Comprehensive Five-year Review Guidance, OSWER 9355.7-03B-P, 540-R-01-007 (June 2001).

(o) Guidance for Quality Assurance Project Plans, QA/G-5, EPA/240/R-02/009 (Dec. 2002).

(p) Institutional Controls: Third Party Beneficiary Rights in Proprietary Controls (Apr. 2004).

(q) Quality management systems for environmental information and technology programs - Requirements with guidance for use, ASQ/ANSI E4:2014 (American Society for Quality, February 2014).

(r) Uniform Federal Policy for Quality Assurance Project Plans, Parts 1-3, EPA/505/B-04/900A though 900C (Mar. 2005).

(s) Superfund Community Involvement Handbook, SEMS 100000070 (January 2016). http://www.epa.gov/superfund/community-involvement-tools-and-resources.

(t) EPA Guidance on Systematic Planning Using the Data Quality Objectives Process, QA/G-4, EPA/240/B-06/001 (Feb. 2006).

(u) EPA Requirements for Quality Assurance Project Plans, QA/R-5, EPA/240/B-01/003 (Mar. 2001, reissued May 2006).

(v) EPA Requirements for Quality Management Plans, QA/R-2, EPA/240/B-01/002 (Mar. 2001, reissued May 2006).

(w) USEPA Contract Laboratory Program Statement of Work for Inorganic Analysis, ILM05.4 (Dec. 2006).

(x) USEPA Contract Laboratory Program Statement of Work for Organic Analysis, SOM01.2 (amended Apr. 2007).

(y) EPA National Geospatial Data Policy, CIO Policy Transmittal 05-002 (Aug. 2008), http://www.epa.gov/geospatial/geospatial-policies-and-standards and http://www.epa.gov/geospatial/epa-national-geospatial-data-policy.

(z) Summary of Key Existing EPA CERCLA Policies for Groundwater Restoration, OSWER 9283.1-33 (June 2009).

(aa) Principles for Greener Cleanups (Aug. 2009), http://www.epa.gov/greenercleanups/epa-principles-greener-cleanups.

(bb) USEPA Contract Laboratory Program Statement of Work for Inorganic Superfund Methods (Multi-Media, Multi-Concentration), ISM01.2 (Jan. 2010).

(cc) Close Out Procedures for National Priorities List Sites, OSWER 9320.2-22 (May 2011).

(dd) Groundwater Road Map: Recommended Process for Restoring Contaminated Groundwater at Superfund Sites, OSWER 9283.1-34 (July 2011).

(ee) Recommended Evaluation of Institutional Controls: Supplement to the "Comprehensive Five-Year Review Guidance," OSWER 9355.7-18 (Sep. 2011).

(ff) Construction Specifications Institute's MasterFormat, available from the Construction Specifications Institute, https://www.csiresources.org/home.

(gg) Updated Superfund Response and Settlement Approach for Sites Using the Superfund Alternative Approach , OSWER 9200.2-125 (Sep. 2012)

(hh) Institutional Controls: A Guide to Planning, Implementing, Maintaining, and Enforcing Institutional Controls at Contaminated Sites, OSWER 9355.0-89, EPA/540/R-09/001 (Dec. 2012).

(ii) Institutional Controls: A Guide to Preparing Institutional Controls Implementation and Assurance Plans at Contaminated Sites, OSWER 9200.0-77, EPA/540/R-09/02 (Dec. 2012).

(jj) EPA's Emergency Responder Health and Safety Manual, OSWER 9285.3-12 (July 2005 and updates), http://www.epaosc.org/_HealthSafetyManual/manual-index.htm

(kk) Broader Application of Remedial Design and Remedial Action Pilot Project Lessons Learned, OSWER 9200.2-129 (Feb. 2013).

(ll) Guidance for Evaluating Completion of Groundwater Restoration Remedial Actions, OSWER 9355.0-129 (Nov. 2013).

(mm) Groundwater Remedy Completion Strategy: Moving Forward with the End in Mind, OSWER 9200.2-144 (May 2014).

(nn) Guidance for Management of Superfund Remedies in Post Construction, OLEM 9200.3-105 (Feb. 2017), https://www.epa.gov/superfund/superfund-post-construction-completion.

**10.2** A more complete list may be found on the following EPA Web pages:

Laws, Policy, and Guidance: http://www.epa.gov/superfund/superfund-policy-guidance-and-laws

Test Methods Collections: http://www.epa.gov/measurements/collection-methods

**10.3** For any regulation or guidance referenced in the Order or SOW, the reference will be read to include any subsequent modification, amendment, or replacement of such regulation or guidance. Such modifications, amendments, or replacements apply to the Work only after Respondent receives notification from EPA of the modification, amendment, or replacement.

# EXHIBIT 1

[Programmatic Agreement]

**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY**
**REGION III**
**FOUR PENN CENTER – 1600 JOHN F. KENNEDY BLVD.**
**PHILADELPHIA, PENNSYLVANIA 19103-2852**

***Daniel Taylor (3SD23)***
*Remedial Project Manager*
*Phone: (215) 814-3326*
*Email: taylor.daniel@epa.gov*

*The date of the digital signature below is the date of this letter.*

**VIA EMAIL**

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Richard Hall
Tamica Evans
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New Castle County, Delaware

Jay McCutcheon
M H McGrath
Preservation Delaware, Inc.

**Re: Koppers (Newport) Programmatic Agreement**

Dear All:

I am pleased to attach an electronic version of the fully executed Programmatic Agreement for the Koppers (Newport) Superfund Site. According to Section II.V of the Programmatic Agreement, the effective date of this Programmatic Agreement is the date of this letter.

I would like to thank everyone for helping us achieve this significant milestone. I am excited to begin the next phase of this project and to continue to work with all of you through the remediation process.

Now that we have an executed Programmatic Agreement, EPA will begin the enforcement process to secure private performance of the selected remedial action consistent with the Programmatic Agreement. As discussed, we will share the results of the enforcement process with the group. Once this has been done, we will then begin the development of the Treatment Plan in accordance with Section II.A of the Programmatic Agreement.

Please do not hesitate to contact me if you have any questions.

Respectfully,

DANIEL TAYLOR

Digitally signed by DANIEL TAYLOR
Date: 2023.07.06 12:07:31 -04'00'

DANIEL TAYLOR
Remedial Project Manager

cc: Andrew Goldman (EPA)
Barbara Okorn (EPA)
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# PROGRAMMATIC AGREEMENT BETWEEN THE U. S. ENVIRONMENTAL PROTECTION AGENCY, REGION III; THE DELAWARE STATE HISTORIC PRESERVATION OFFICE; AND THE ADVISORY COUNCIL ON HISTORIC PRESERVATION REGARDING CLEANUP OF THE KOPPERS NEWPORT SUPERFUND SITE, NEWPORT, NEW CASTLE, DELAWARE

**WHEREAS,** the U.S. Environmental Protection Agency ("EPA") plans to select and implement or oversee implementation of remedial action at the Koppers Newport Superfund Site in Newport, New Castle County, Delaware ("Koppers Site"), pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended ("CERCLA"), 42 U.S.C. §§ 9601-9657; and

**WHEREAS,** EPA has issued a Record of Decision ("ROD") selecting remedial action to be implemented at the Koppers Site (the "Project") under CERCLA and the National Oil and Hazardous Substances Pollution Contingency Plan ("NCP"), 40 C.F.R. Part 300 (see Attachment A); and

**WHEREAS,** EPA has identified the procedural requirements of Section 106 of the National Historic Preservation Act of 1966 ("NHPA"), 54 U.S.C. § 300101 *et seq*., as amended, and its implementing regulations at 36 C.F.R. Part 800 as "relevant and appropriate" to the Project within the meaning of Section 121(d) of CERCLA, 42 U.S.C. § 9621(d); and

**WHEREAS,** EPA, in consultation with the Delaware State Historic Preservation Office ("DE SHPO"), has established the Project's Area of Potential Effects ("APE"), as defined in 36 C.F.R. § 800.16(d), as the area identified in Attachment B; and

**WHEREAS**, EPA has determined that the Project will have an adverse effect on Historic Properties within the APE within the meaning of 36 C.F.R. Part 800; and

**WHEREAS,** pursuant to 36 C.F.R. § 800.14(b), the Advisory Council on Historic Preservation ("ACHP"), EPA, and the DE SHPO have arranged for negotiation of this Programmatic Agreement ("PA") to provide for the ongoing review of the Project, the completion of the identification and evaluation of Historic Properties within the APE, assessment of the potential for adverse effects on Historic Properties from the Project, and consultation to resolve any adverse effects on Historic Properties from the Project; and

**WHEREAS**, Beazer East, Inc. ("Beazer"), by and through its consultants, produced, between September 2006 and November 2008, the following evaluations of the Koppers Site: (a) 2007-2008 Phase II Archaeological Evaluations; (b) June 2008 Phase IB archaeological survey along Hershey Run drainage; (c) November 2008 Supplemental Phase IB archaeological survey and shovel test survey on Bread and Cheese Island and a Phase IB auger survey in marsh areas adjacent to Hershey Run and Bread and Cheese Island; and

**WHEREAS**, Beazer represents that (a) its consultants and contractors have conducted all surveys to date according to guidance established by the DE SHPO, (b) it is currently storing 24,708 artifacts recovered from areas identified during the 2007 and 2008 field seasons at the Koppers Site, (c) it has processed this collection according to the Delaware Division of Historical and Cultural Affairs' Guidelines and Standards for the Curation of Archaeological Collections; (d) artifacts and cultural resources already recovered and to be recovered should be managed in a responsible manner; and (e) it is committed to the responsible management of the artifacts and associated records.

**WHEREAS,** Beazer retains any rights of ownership of the archaeological collection it may have under applicable law and does not waive such rights by participating in this consultation, signing this PA, implementing the Project, or otherwise participating in activities relating to the Koppers Site;

**WHEREAS**, Beazer, by and through its consultants, met with the DE SHPO in October 2008 to review the findings of the 2008 Phase IB and Phase II Archaeological Evaluation Report and discuss future steps, and provided archaeological evaluation results and recommendations to EPA on April 9, 2009; and

**WHEREAS,** Beazer has a demonstrated interest in the Project and is participating in this consultation due to the fact that it owns the Koppers Site and may be required to implement the Project; and

**WHEREAS,** Beazer, in consultation with EPA and the DE SHPO, has conducted the above-described cultural resource surveys within the Project

APE to identify and evaluate properties which may be eligible for listing on the National Register of Historic Places ("NRHP"); and

**WHEREAS,** EPA, in consultation with the DE SHPO pursuant to 36 C.F.R. § 800.4, has determined that the following archaeological sites identified within the APE are not eligible for listing on the NRHP: 7NC-E-156; 7NC-E-157; 7NC-E-168; 7NC-E-140; and 7NC-E-124; and

**WHEREAS,** EPA, in consultation with the DE SHPO pursuant to 36 C.F.R. § 800.4, has determined that within the APE, the following archaeological sites are eligible for listing on the NRHP: 7NC-E-135; 7NC-E-137; 7NC-E-139; 7NC-E-143; 7NC-E-155; 7NC-E-184; 7NC-E-188; 7NC-E-189; 7NC-E-187A; and 7NC-E-187B; and

**WHEREAS,** EPA contacted the Delaware Nation, the Stockbridge-Munsee Community Band of Mohican Indians, and the Delaware Tribe of Indians (collectively "Koppers FR Tribes") to determine their interest in being consulting parties within the meaning of 36 C.F.R. § 800.2(c) in connection with the Project; and

**WHEREAS,** the Stockbridge-Munsee Community Band of Mohican Indians advised EPA that it declined to consult with EPA regarding the Project; and

**WHEREAS,** the Delaware Nation and the Delaware Tribe of Indians (collectively "Consulting Tribes") advised EPA that they would like to consult with EPA regarding the Project; and

**WHEREAS,** in addition to contacting the Consulting Tribes, EPA contacted the following entities who advised EPA they wished to consult with EPA regarding the effects of the Project on Historic Properties: Beazer East, Inc.; Archaeological Society of Delaware; Delaware Department of Transportation; Delaware Department of Natural Resources and Environmental Control; Lenape Indian Tribe of Delaware; Nanticoke Indian Association; New Castle County; and Preservation Delaware, Inc. (collectively "Other Consulting Parties"); and

**WHEREAS,** in accordance with 36 C.F.R. § 800.6(a)(1), EPA notified the ACHP of its adverse effect determination, and the ACHP has chosen to participate in the consultation pursuant to 36 C.F.R. § 800.6(a)(1)(iii); and

**WHEREAS,** EPA, in consultation with DE SHPO, the Consulting Tribes, and the Other Consulting Parties, and after consideration of views provided by the public, has determined that the Project, as currently conceived, will have an adverse effect, within the meaning of 36 C.F.R. § 800.5, on Archaeological Sites 7-NC-E-135; 7-NC-E-137; 7-NC-E-143; 7-NC-E-188; 7-NC-E-189; 7-NC-E-187A; and 7-NC-E-187B ("Affected Sites"); and

**WHEREAS,** EPA, in consultation with DE SHPO, the Consulting Tribes, and the Other Consulting Parties, and after consideration of views provided by the public, has determined that the Project, as currently conceived, will have no adverse effect on Archaeological Sites 7-NC-E-139; 7-NC-E-155; and 7-NC-E-184 ("Unaffected Sites"); and

**WHEREAS,** EPA may require Beazer and/or one or more additional persons or entities to implement the Project under EPA oversight pursuant to its CERCLA authorities and require Beazer and/or such other party or parties to implement certain requirements placed upon EPA under this PA; and

**WHEREAS,** EPA will provide the persons/entities identified in Appendix C to this PA with a copy of all effective orders or settlements in which any of EPA's obligations under this PA will be implemented by others; and

**WHEREAS,** Beazer has been invited to be an "invited signatory" to this PA within the meaning of 36 C.F.R. § 800.6(c)(2);

**WHEREAS,** the following entities have been invited to concur on the PA within the meaning of 36 C.F.R. § 800.6(c)(3): the Delaware Nation; the Delaware Tribe of Indians; Archaeological Society of Delaware; Delaware Department of Transportation; Delaware Department of Natural Resources and Environmental Control; Lenape Indian Tribe of Delaware; Nanticoke Indian Association; New Castle County; and Preservation Delaware, Inc.;

**NOW, THEREFORE,** EPA, the ACHP, and the DE SHPO agree that the Undertaking shall be implemented in accordance with the following Stipulations in order to take into account the effect of the Undertaking on Historic Properties.

# I. DEFINITIONS

A. “ACHP” shall mean the Advisory Council on Historic Preservation.

B. “Affected Sites” shall mean those Historic Properties upon which the Project will have an adverse effect within the meaning of 36 C.F.R. § 800.5, and at the time of the execution of this PA include archaeological sites 7-NC-E-135; 7-NC-E-137; 7-NC-E-143; 7-NC-E-188; 7-NC-E-189; 7-NC-E-187A; and 7-NC-E-187B.

C. “APE” shall mean the Project’s Area of Potential Effect as defined in 36 C.F.R. § 800.16(d) and described in Attachment B.

D. “Beazer” shall mean Beazer East, Inc., which owns certain property within the APE.

E. “CERCLA” shall mean the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended (“CERCLA”), 42 U.S.C. §§ 9601-9657.

F. “Concurring Parties” shall mean those persons or entities concurring in this PA pursuant to 36 C.F.R. § 800.6(c)(3) by signing this PA as such parties.

G. “Consulting Tribes” shall mean the Delaware Nation and the Delaware Tribe of Indians.

H. “Day” shall mean a calendar day. In computing any period of time under this PA, where the last day would fall on a Saturday, Sunday, or federal or State holiday, the period shall run until the close of business of the next working day.

I. “DE SHPO” shall mean the Delaware State Historic Preservation Office, a section of the Delaware Division of Historical and Cultural Affairs.

J. “Division” shall mean the Delaware Division of Historical and Cultural Affairs.

K. "Electronic Delivery" shall mean the delivery of documents as described in Section X of this PA.

L. "EPA" shall mean the U.S. Environmental Protection Agency.

M. "EPA Remedial Project Manager" shall mean the official designated by EPA coordinate, monitor, or direct implementation of the Project within the meaning of section 300.5 of the National Oil and Hazardous Substances Pollution Contingency Plan, 40 C.F. R. § 300.5.

N. "Historic Property(ies)" shall have the meaning given at 36 C.F.R. § 800.16(l).

O. "Immediate Area" shall mean the location at which an unexpected discovery or human remains are found.

P. "Invited Signatories" shall means those parties described at 36 C.F.R. § 800.6(c)(2), who shall have rights with respect to this PA as described therein, and who have signed this PA as such parties.

Q. "Koppers FR Tribes" shall mean the Stockbridge-Munsee Community Band of Mohican Indians, the Delaware Nation, and the Delaware Tribe of Indians.

R. "Koppers Site" shall mean the Koppers Newport Superfund Site in Newport, New Castle County, Delaware.

S. "PA" shall mean this Programmatic Agreement.

T. "NHPA" shall mean the National Historic Preservation Act of 1966, 54 U.S.C. § 300101 *et seq*., as amended, and its implementing regulations at 36 C.F.R. Part 800.

U. "NRHP" shall mean the National Register of Historic Places.

V. "Other Consulting Parties" shall mean Beazer East, Inc.; Archaeological Society of Delaware; Delaware Department of Transportation;

Delaware Department of Natural Resources and Environmental Control; Lenape Indian Tribe of Delaware; Nanticoke Indian Association; New Castle County; and Preservation Delaware, Inc.

W. "Project" shall mean the remedial action selected in the ROD.

X. "Project Activities" shall mean the field activities that are part of the Project.

Y. "Progress Reports" shall mean written reports summarizing all significant developments relating to actions required by this PA during the reporting period, including the actions performed and any problems encountered, analytical and other data received during the reporting period, and the developments anticipated during the next reporting period, including a schedule of actions to be performed, anticipated problems, and planned resolutions of past or anticipated problems.

Z. "Reasonable Buffer Zone" shall mean an area, of no less than 25 feet in all directions outside the Immediate Area, which EPA determines is broad enough to allow for safe inspection, prevention of damage or disturbance, and protection of previously unidentified Historic Properties or human remains and narrow enough to allow other Project Activities that EPA determines will have no impact on previously unidentified Historic Properties to continue.

AA. "ROD" shall mean the Record of Decision attached hereto as Attachment A.

BB. "Signatories" shall mean those parties described at 36 C.F.R. § 800.6(c)(1), who shall have rights with respect to this PA as described therein, and whose signature is required for execution of this PA.

CC. "Stop-Work Order" shall mean an oral or written order by EPA to cease Project Activities within a Reasonable Buffer Zone.

DD. "Stop Work Zone" shall be the Immediate Area plus a Reasonable Buffer Zone.

EE. “Treatment Plan” shall mean a plan describing mitigation of adverse effects to Historic Properties within the APE.

FF. “Unaffected Sites” shall mean those Historic Properties within the APE upon which the Project will have no adverse effect and consist of 7-NC-E-139; 7-NC-E-155; and 7-NC-E-184.

## II. STIPULATIONS

EPA shall ensure that its contractors and subcontractors and any other person or entity implementing the Project is provided with a copy of the fully executed version of this PA and ensure that the following stipulations are implemented:

### A. Resolution of Adverse Effects on Historic Properties

1. To resolve adverse effects to Historic Properties that have been identified or which may be identified under this PA which may arise from implementation of the Project, EPA shall develop, or have developed, prior to commencement of on-site construction of the Project, a Treatment Plan. The Treatment Plan shall include elements of data recovery and/or alternative mitigation plans to address adverse effects to Historic Properties at the Affected Sites and measures to ensure that the Unaffected Sites remain preserved in place. The Treatment Plan shall also include a detailed plan for the disposition of archaeological collections (including plans for disposition of artifacts recovered and to be recovered from archaeological sites at the Koppers Site during implementation of the Project) and curation of records as described in Section II.D of this PA. Curation will be carried out in accordance with Section II.D of this PA.

2. EPA shall invite the DE SHPO, Consulting Tribes, and Other Consulting Parties to a meeting or conference call to discuss the contents of the Treatment Plan including, but not limited to, mitigation alternatives for each of the Affected Sites, measures to ensure that the Unaffected Sites remain preserved in place, and curation. EPA shall use reasonable efforts to schedule the meeting or call to accommodate the schedules of the representatives from the DE SHPO, Consulting Tribes, and Other Consulting Parties. EPA may, in its discretion, and in consultation with the DE SHPO, Consulting Tribes, and Other Consulting Parties, schedule one or more followup meetings or calls to discuss

the above-described matters.

3. Following the completion of discussions, EPA shall submit, via Electronic Delivery, a draft Treatment Plan to the DE SHPO, Consulting Tribes, and the Other Consulting Parties for their review and comment.

a. The DE SHPO, Consulting Tribes, and Other Consulting Parties shall have sixty (60) days, or such longer period as EPA may designate in its unreviewable discretion, to submit comments to EPA ("First Comment Period").

b. Following the completion of the First Comment Period, EPA shall schedule a meeting or call with the DE SHPO, Consulting Tribes, and Other Consulting Parties to discuss all comments received by EPA during the First Comment Period.

c. EPA shall revise the draft Treatment Plan, taking into account all comments received during the First Comment Period and the meeting or call and submit, via Electronic Delivery, a revised draft Treatment Plan to the DE SHPO, Consulting Tribes, and the Other Consulting Parties for their review and comment.

d. The DE SHPO, Consulting Tribes, and Other Consulting Parties shall have thirty (30) days, or such longer period as EPA may designate in its unreviewable discretion, to submit comments to EPA ("Second Comment Period").

e. EPA, in its discretion, and in consultation with the DE SHPO, Consulting Tribes, and Other Consulting Parties, may arrange for subsequent comment periods and/or issue additional drafts of the Treatment Plan as EPA deems necessary to ensure that the concerns of the DE SHPO, Consulting Tribes, and Other Consulting Parties regarding the draft Treatment Plan have been heard and considered.

f. EPA shall finalize the Treatment Plan, taking into account all comments received during the comment periods and meetings/calls, and submit the Final Treatment Plan, via Electronic Delivery, to the DE SHPO, Consulting Tribes, and the Other Consulting Parties.

4. If the Treatment Plan includes data recovery, EPA shall ensure that a Data Recovery Plan is developed in consultation with the DE SHPO, Consulting Tribes, and the Other Consulting Parties. The plan shall comply with Section II.K of this PA and shall specify, at a minimum:

a. the Affected Sites, or portions thereof, where data recovery is to be carried out;

b. research questions to be addressed through data recovery, with an explanation of their relevance and importance;

c. the research methods to be used, with an explanation of their relevance to the research questions;

d. the methods to be used in analysis, data management, and data dissemination to the public in accordance with Section II.C of this PA, including a schedule;

e. a provision for assessing materials (including artifacts) that may be in need of treatment prior to disposition;

f. proposed disposition of recovered materials (including artifacts), including both uncontaminated and contaminated materials;

g. a proposed schedule for the submission of Progress Reports to the DE SHPO, Consulting Tribes, and Other Consulting Parties;

h. provisions to meet at the Koppers Site in order to evaluate the success of the initial fieldwork phase of any data recovery program, and near the end of the fieldwork efforts to validate substantial completion; and

i. Strategies to implement Phase III data recovery where NRHP eligibility was determined without a Phase II investigation.

5. If the Treatment Plan includes preservation in place of all or a portion of a Historic Property, EPA and DE SHPO, in consultation with the Consulting Tribes and the Other Consulting Parties, shall determine the need for and negotiate the terms of any legal instruments that would ensure long-term

preservation or protection of the Historic Property. Any such legal instrument shall include, at a minimum, the following elements:

a. A clear definition of the boundaries of the area subject to preservation in place;

b. clearly defined list of allowed uses and prohibited uses of the Historic Property and an acknowledgement that protection measures are being instituted in order to minimize or mitigate the Project's adverse effects to a NRHP-listed or -eligible property; and

c. a prohibition on any party to such legal instrument, its successors, heirs, or assigns, from terminating, modifying, altering or otherwise setting aside any such legal instrument unless the party, prior to taking such action, first provides EPA and the DE SHPO with written justification for termination, and consults with EPA and the DE SHPO to develop a new treatment plan to address the potential adverse effects pursuant to 36 C.F.R. § 800.5, regardless of whether the term of this PA has expired or not. EPA and the DE SHPO shall consult with the Consulting Tribes and the Other Consulting Parties regarding any such new treatment plan.

6. Alternative mitigation strategies included in the Treatment Plan may include, among other things, protection of portion(s) of the Affected Sites and Unaffected Sites; updating and/or creating relevant DE SHPO and EPA archaeological websites and geographical databases with relevant information collected during previous and/or ongoing investigations; analysis and synthesis of past data accumulated through either DE SHPO and EPA projects; statewide and/or region-wide predictive models; histories of the Project APE; virtual tours and/or websites detailing Historic Properties in the APE; illustrated books; and online exhibits that introduce the history of the Koppers Site.

7. Except as may be provided in the Treatment Plan, EPA will complete, or have completed, all necessary data recovery fieldwork prior to commencement of ground disturbing activities associated with the Project at any Affected Site where data recovery will be performed. Alternative mitigation may or may not be completed prior to commencing ground disturbing activities associated with the Project at any Affected Site where alternative mitigation will be performed.

## B. Effects to Unsurveyed Areas

1. Identification and Evaluation Surveys

a. If Project design changes result in the potential for effects to Historic Properties that may be located in unsurveyed areas, EPA shall, in consultation with the DE SHPO, the Consulting Tribes, and the Other Consulting Parties, (1) conduct or oversee performance of identification (Phase I) archaeological surveys, and (2) determine if identified properties will require a Phase II level archaeological survey to evaluate their NRHP eligibility. Evaluation Studies (Phase II) may require additional background research and/or additional field excavations.

b. EPA shall prepare, or have prepared, reports on findings of the additional identification/evaluation surveys and shall submit draft and final reports, via Electronic Delivery, to the DE SHPO, Consulting Tribes, and Other Consulting Parties for comment. The review period shall be thirty-five (35) days from the date EPA transmits the reports via Electronic Delivery, or such longer period as determined by EPA in its unreviewable discretion. EPA will take into account any comments received. All final reports shall meet the standards described in Section II.K of this PA.

c. During the Evaluation Studies (Phase II), EPA, in consultation with the Consulting Tribes, which possess special expertise in assessing the National Register eligibility of properties with religious and cultural significance to them and the Other Consulting Parties, shall apply the NRHP criteria (36 C.F.R. § 60.4) in accordance with 36 C.F.R. § 800.4(c), taking into account applicable historic contexts and management plans developed for Delaware for historic and pre-contact archaeological resources.

d. If EPA determines that any of the NRHP criteria are met, and the DE SHPO, the Consulting Tribes, and the Other Consulting Parties agree, the properties shall be deemed eligible for the NRHP. If EPA determines that the NRHP criteria are not met, and the DE SHPO, the Consulting Tribes, and the Other Consulting Parties agree, the properties shall be considered not eligible for the NRHP. If EPA, the DE SHPO, the Consulting Tribes, and the Other Consulting Parties have not reached a consensus, or if the ACHP or the Secretary of the Interior so request, EPA shall obtain a determination of eligibility from the Secretary of the Interior pursuant to 36 C.F.R. Part 63.

2. Findings of Effects, Finding of Adverse Effects, Resolution of Adverse Effects

EPA shall follow the steps set forth in 36 C.F.R. §§ 800.4(d), 800.5, and 800.6 in connection with making findings regarding effects on Historic Properties in previously unsurveyed areas, making findings of adverse effects on Historic Properties in previously unsurveyed areas, and resolving adverse effects on Historic Properties in previously unsurveyed areas and the Treatment Plan shall be modified as appropriate in accordance with the process stipulated in Section II.A of this PA.

**C. Release of Documentation to the Public**

1. EPA may prepare, or have prepared, information or materials for dissemination to the public regarding this PA or the mitigation work performed under this PA. EPA will take all reasonable steps to ensure that information intended for public distribution does not endanger the archaeological or Historic Properties at the Koppers Site. The specific information and materials produced may include, among other things, pamphlets, videos, historical markers, brochures, websites, exhibits, displays for public buildings, booklets on the history or pre-contact history of the Project area, lectures or presentations at academic conferences, and/or public institutions such as schools and historical societies.

2. Unless otherwise mandated by law, before EPA releases such information or materials to the public, EPA shall submit the information and materials to be released, via Electronic Delivery, to the DE SHPO, Consulting Tribes, and the Other Consulting Parties for their review and comment. The review period will be specified by EPA and shall not exceed thirty-five (35) days from the date EPA transmits the information via Electronic Delivery unless extended by EPA in its unreviewable discretion. EPA will take into account any comments received.

**D. Curation**

All archaeological records, and any artifacts identified for curation pursuant to the approved Treatment Plan required by Section II.A of this PA, shall be curated in a repository qualified for this purpose, and will be processed and prepared for curation following the policies of the qualified repository.

## E. Discovery of and Treatment of Human Remains and Burials

1. EPA will ensure that a qualified archaeologist will be on-site ("On-Site Archaeologist") and accessible to consult with the EPA Remedial Project Manager or his/her delegate during Project-related ground disturbing activities reasonably likely to reveal previously undiscovered items that may be Historic Property and/or human remains.

2. EPA shall ensure that its contractors and subcontractors immediately cease work at the location of a discovery of human remains or burial sites and notify EPA of such discovery within 24 hours of each such discovery.

3. EPA shall consult with the On-Site Archaeologist as soon as possible after becoming aware of the possibility that human remains have been found to confirm the nature of the discovery. EPA shall exercise reasonable efforts to notify the DE SHPO, the Consulting Tribes, and Other Consulting Parties of the discovery within 24 hours after confirming with the On-Site Archaeologist that human remains have been encountered. EPA shall also:

a. Notify the Delaware State Police of the discovery and the requirements of this PA;

b. In consultation with the On-Site Archaeologist, establish a Stop Work Zone;

c. Issue a Stop Work Order covering the Stop Work Zone;

d. In consultation with the On-Site Archaeologist, make reasonable efforts to avoid further impacts to the remains; and

e. Conduct government-to-government consultation with federally recognized Tribes regarding such discovery consistent with EPA's "Policy on Consultation and Coordination with Indian Tribes" (May 4, 2011).

4. In establishing the Reasonable Buffer Zone, EPA shall consider, among other things:

a. the safety of workers;

b. Project Activities underway in the vicinity of the Immediate Area; and

c. the availability of land for a buffer.

5. EPA shall ensure that the disposition of discovered human remains is consistent with applicable Federal and State laws, regulations, and policies. Upon receipt of notice from EPA or its designee that human remains have been discovered, the DE SHPO shall work with EPA to effectuate such notice, consultation, and disposition of human remains as is appropriate.

6. If EPA is aware that human remains of Native American affiliation are discovered, EPA will, to the extent practicable, ensure that the following steps are taken until a plan for appropriate disposition of such remains has been established:

a. Place tobacco with the remains and funeral objects;

b. Cover remains and funeral objects with a natural fiber cloth such as cotton or muslin;

c. Take no photographs of the remains or objects;

d. Leave human remains and funeral objects in-situ and protect them from further disturbance;

e. Perform no destructive “in-field” documentation of the remains or funeral items; and

f. Withhold from the public the location of the remains and funeral objects.

**F. Unexpected Discoveries.**

1. If EPA, in consultation with the On-Site Archaeologist, determines that it has discovered a previously unidentified Historic Property which may be

adversely affected by the Project or evidence that the Project will affect known Historic Properties in an unanticipated manner, EPA shall

a. In consultation with the On-Site Archaeologist, establish a Stop Work Zone;

b. Issue a Stop Work Order covering the Stop Work Zone;

c. In consultation with the On-Site Archaeologist, make reasonable efforts to avoid further impacts to the discovery;

d. Make reasonable efforts to notify the DE SHPO, the Consulting Tribes, and Other Consulting Parties within 24 hours after making the determination described in Paragraph F.1:

1. of the nature of the discovery;

2. of the Stop Work Zone established by EPA;

3. that EPA has issued a Stop Work Order covering the Stop Work Zone;

4. that EPA is making reasonable efforts to avoid further impacts to the discovery;

5. that EPA will issue a second notice addressing EPA's assessment of the National Registry eligibility of the property and the proposed actions to resolve adverse effects; and

e. Make reasonable efforts to notify the DE SHPO, the Consulting Tribes, and Other Consulting Parties of EPA's findings within 24 hours after EPA has, in consultation with the On-Site Archaeologist, developed its assessment of the National Register eligibility of the property and the proposed actions to resolve adverse effects.

2. In establishing the Reasonable Buffer Zone, EPA shall consider, among other things:

a. the safety of workers;

b. Project Activities underway in the vicinity of the Immediate Area;

c. the availability of land for a buffer; and

d. the nature of the discovery.

3. EPA, the DE SHPO, the Consulting Tribes, and the Other Consulting Parties will have three business days, or such longer period as EPA designates in its unreviewable discretion, from the issuance of the notice described in Paragraph F.1.e, above, to respond to EPA's notice. EPA shall take into account any recommendations received regarding National Register eligibility and proposed mitigation plans. EPA shall, as appropriate: (a) where mitigation activities must be completed before resuming the Project, implement the mitigation plans selected by EPA and then rescind the Stop Work Order, or (b) where mitigation activities need not be completed before resuming the Project, rescind the Stop Work Order and ensure that the selected mitigation activities are implemented. EPA shall, as soon as practicable, provide the DE SHPO, the Consulting Tribes, and the Other Consulting Parties with a report of the actions taken with respect to the discovery.

### G. Emergency Response

Notwithstanding the processes described in Sections II.E and F of this PA, if EPA determines that previously unknown circumstances present a threat to human health or to the environment, EPA may take response action to respond to such circumstances, including action within the Stop Work Zone, to mitigate the threat despite the existence of a Stop Work Order. Emergency response conducted under CERCLA and the NCP shall be conducted consistent with Section VI of the *Programmatic Agreement on Protection of Historic Properties During Emergency Response Under the National Oil and Hazardous Substances Pollution Contingency Plan* (Updated April 30, 2002).

### H. Distribution/Review of Remedial Design Plans.

1. The Consulting Tribes and Other Consulting Parties understand that the remedial design is an extensive series of engineering reports, documents, specifications, and drawings that detail the steps to be taken during implementation of a remedial action; that the remedial design is often voluminous (*i.e.*, thousands of pages of material); that neither CERCLA nor the NCP require

that EPA provide the public with an opportunity to comment on the remedial design; that EPA routinely shares the remedial design with the State for comment in its role as support agency; and that EPA provides a copy of the remedial design to federally recognized Tribes for comment consistent with EPA's *Policy on Consultation and Coordination with Indian Tribes* (May 2011).

2. EPA will ensure that the remedial design is consistent with this PA and the Treatment Plan. EPA shall provide a copy of the final remedial design plans to the DE SHPO for review and comment.

3. EPA shall notify the Consulting Tribes of the availability of the final remedial design plans and provide copies as requested (hard copies, CDs, or electronic files depending on size and volume of plans) for their review and comment.

4. EPA shall notify the Other Consulting Parties of the availability of the final remedial design plans and provide copies as requested (hard copies, CDs, or electronic files depending on size and volume of plans) for their review and comment solely on the issue whether the final remedial design necessitates a change to the determination of effects on Historic Properties or gives rise to a need to evaluate a potential for effects to unsurveyed areas pursuant to Section II.B.

5. DE SHPO, Consulting Tribes, and the Other Consulting Parties shall have thirty-five (35) days from the date EPA transmits the remedial design plans to them, or such longer period as EPA may determine in its unreviewable discretion, to provide comments on the plans as provided in subparagraphs 2-4, above.

6. EPA shall take into account any comments received and provide notice to the DE SHPO, Consulting Tribes, and Other Consulting Parties of its assessment regarding whether the final design necessitates a change to the determination of effects to Historic Properties or gives rise to a need to evaluate a potential for effects to unsurveyed areas pursuant to Section II.B.

## I. Subsequent Changes to the Project

1. If the DE SHPO, Consulting Tribes, or Other Consulting Parties believe that EPA has made or will make any substantive change to the Project that is

likely to affect a Historic Property for which mitigation has not been resolved hereunder, such party(ies) shall notify EPA with their concerns. EPA and such party(ies) shall have ten (10) days, or such longer period of time agreed to by EPA in its unreviewable discretion, from the date of such notice to discuss the concerns identified to EPA. EPA shall take into account the concerns raised during this period and shall notify the party(ies) raising the concerns of its position. Should EPA determine, either before or after such consultation, that Project work should be stopped to prevent adverse effects to one or more Historic Properties not addressed by the Treatment Plan, EPA will issue a Stop Work Order as described in Section II.F.1 and .2 of this PA.

2. If EPA proposes any changes to the Project affecting Historic Properties for which mitigation has not been resolved hereunder, EPA shall provide the DE SHPO, Consulting Tribes, and Other Consulting Parties with information concerning the proposed changes. These parties will have thirty (30) days, or such longer period designated by EPA in its unreviewable discretion, from the date EPA notifies them of this information to comment on the proposed changes. EPA shall take into account any comments received prior to implementing such changes. Should EPA determine, either before or after such consultation, that Project work should be stopped to prevent adverse effects to one or more Historic Properties not addressed by the Treatment Plan, EPA will issue a Stop Work Order as described in Section II.F.1 and .2 of this PA.

3. With the exception of the remedial design, EPA shall not alter any document that has been reviewed and commented on pursuant to this PA (except to finalize documents commented on in draft form) without first affording the DE SHPO, Consulting Tribes, and Other Consulting Parties the opportunity to review the proposed change and determine whether it shall require that this PA be amended. If one or more of the Signatories determines than an amendment to this PA is needed, the Signatories shall follow the procedures in Paragraph II.P.

### J. Personnel Qualifications

1. Except as provided herein, all actions required by this PA that involve the identification, evaluation, analysis, recording, treatment, monitoring, or disposition of Historic Properties, and/or that involve reporting or documentation of such actions in the form of reports, forms, or other records, shall be carried out by or under the direct supervision of a person or persons who meets, at a minimum, the Secretary of the Interior's Historic Preservation

Professional Qualifications Standards in the appropriate discipline as specified in the 1997 revised and updated proposed standards (62 Fed. Reg. 33708 (June 20, 1997)). EPA will ensure that the work outlined in this PA is conducted by individuals meeting these qualifications standards.

2. EPA acknowledges that Tribes possess special expertise in assessing the National Register eligibility of properties with religious and cultural significance to them. Tribal leaders, and as appropriate, their representatives, shall decide who meets qualification standards as defined by their Tribes for matters pertaining to this PA.

**K. Survey and Data Recovery Standards**

1. EPA shall ensure that any and all cultural resource surveys and/or data recovery plans conducted pursuant to this PA are done in accordance with the versions of the documents identified below in effect as of the Effective Date of this PA:

a. “Secretary of the Interior's Standards for Identification;”
b. “Secretary of the Interior's Standards for Evaluation;”
c. “Secretary of the Interior's Standards for Historical Documentation;”
d. “Secretary of the Interior's Standards for Archaeological Documentation;” and
e. “Archaeological Survey in Delaware, February 2015.”

In addition, all data recovery plans shall take into account the Advisory Council on Historic Preservation’s guidance for “Recommended Approach for Consultation on Recovery of Significant Information from Archaeological Sites Synopsis.” Reports will meet professional standards set forth by the Department of the Interior’s “Format Standards for Final Reports of Data Recovery Program’’ (42 Fed. Reg. 5377-79 (January 28, 1977)).

2. Survey proposals and data recovery plans shall include a research design that identifies, among other things, objectives, methods, and expected results; production of draft and final reports; and preparation of materials for curation in accordance with Stipulation II.D. Additional requirements for data recovery plans are found in Stipulation II.A.4 of this Agreement.

## L. Changes to Regulations, Guidance Documents, or Requirements

EPA will consider any changes to laws, regulations, guidance documents, guidelines, or other materials relevant to implementation of this PA of which it becomes aware.

## M. Dispute Resolution

1. Unless otherwise provided in this PA or in 36 C.F.R. Part 800, should any Signatory or Invited Signatory object in writing to actions proposed or carried out pursuant to this PA, the disputing party shall provide notice of the dispute to EPA, the other Signatories, and the Invited Signatories. EPA shall then proceed as follows:

a. EPA, the Other Signatories, and the Invited Signatories shall have fifteen (15) days, or such longer period as EPA may designate in its unreviewable discretion, to resolve the dispute via agreement ("Initial Period"). If the dispute is so resolved, EPA shall proceed in accordance with the agreement resolving the dispute.

b. If, at the end of the Initial Period, EPA, the Other Signatories, and the Invited Signatories have not reached agreement to resolve the dispute, EPA shall forward all documentation relevant to the dispute, including EPA's proposed resolution of the dispute, to the ACHP via Electronic Delivery. At the time EPA transmits such documentation to the ACHP, EPA shall send a copy of the documentation to the DE SHPO, Consulting Tribes, and the Other Consulting Parties via Electronic Delivery.

1. Within fifteen days of EPA's transmittal of such documentation to the ACHP, the DE SHPO, Consulting Tribes, and Other Consulting Parties may provide their comments on EPA's proposed resolution to the ACHP, copying each other and EPA.

2. Within thirty (30) days after EPA's transmittal of the documentation to the ACHP, the ACHP will either:

a. Advise EPA that the ACHP concurs in EPA's proposed resolution of the dispute; or

b. Provide EPA with recommendations, which EPA will take into account in reaching a final decision on the dispute.

Should the ACHP not exercise one of the above options within thirty (30) days after EPA's transmittal of the documentation, EPA shall proceed in accordance with subparagraph, 3, below.

3. EPA shall issue its decision resolving the dispute, taking into account the comments and positions of the ACHP, DE SHPO, Consulting Tribes, and Other Consulting Parties, and shall act in accordance therewith.

2. EPA's responsibility to carry out all other actions subject to the terms of this PA that are not the subject of the dispute remain unchanged.

3. Nothing herein shall prevent the DE SHPO or ACHP from raising a dispute hereunder at the request of any person or entity.

4. Deadlines in this Section II.M may be extended by EPA in its unreviewable discretion.

**N. Duration**

This PA shall remain in force until the Stipulations in Section II have been fulfilled. This time period shall not exceed fifteen (15) years from the Effective Date as provided in Section II.V. If within six (6) months prior to the end of this fifteen (15) year period Stipulations remain unfulfilled, the Signatories and Invited Signatories will consult to determine if extension of the duration or other amendment of the PA is needed. No amendment to extend the duration or other amendment will be considered in effect unless the Signatories and Invited Signatories have agreed to it in writing.

**O. Review of Undertaking and Implementation**

1. No less than once per calendar year, EPA will report to ACHP, DE SHPO, Consulting Tribes, and Other Consulting Parties as to the progress in completing the Administrative Order or any other such instrument that may lead to commencement of consultation on the Treatment Plan under Stipulation II.A of this PA. This obligation shall end when the Treatment Plan

is finalized.

2. Starting 12 months after the Treatment Plan is finalized, EPA and the DE SHPO shall review the Project annually to monitor progress of the implementation of the terms of this PA.

a. EPA shall invite the ACHP, DE SHPO, Consulting Tribes, and Other Consulting Parties to a meeting or conference call for such purpose and shall make reasonable efforts to ensure that such meeting or call is held at a mutually agreeable time. EPA shall include in such invitation a report summarizing steps taken in the preceding year to implement the terms of this PA. At such meeting or call EPA and/or its representative shall report on progress in meeting the terms of this PA, problems or issues encountered, and anticipated future actions to be taken under this PA.

b. EPA will prepare a report summarizing each such meeting. EPA intends to distribute such report to the attendees within 60 days of the meeting.

**P. Amendments**

The Signatories and Invited Signatories may amend this PA pursuant to 36 C.F.R. § 800.6(c)(7). No amendment shall be effective until it has been signed by the Signatories and Invited Signatories.

**Q. Termination**

1. If a Signatory or Invited Signatory determines that the terms of this PA cannot be or are not being carried out, the Signatories and Invited Signatories shall consult to seek amendment of this PA. If this PA is not amended, any Signatory or Invited Signatory may propose to terminate it.

2. The party proposing to terminate this PA shall notify all other Signatories and Invited Signatories explaining its reasons for proposing termination and affording them at least thirty (30) days to consult to seek alternatives to termination. The Signatories and Invited Signatories shall then consult.

3. Should consultation fail to produce an agreeable alternative to termination, the Signatory or Invited Signatory proposing termination may terminate the PA by so notifying the other Signatories and Invited Signatories.

4. Should this PA be terminated under this provision before the Stipulations in Section II have been completed, EPA shall either:

a. Consult in accordance with 36 C.F.R. § 800.6(a)(1) to develop a new PA or;

b. Request the comments of the ACHP pursuant to 36 C.F.R. § 800.7(a).

**R. Effect of Persons Refusing to Sign This PA**

The refusal of any person invited to sign this PA as an Invited Signatory or Concurring Party does not invalidate this PA.

**S. Confidentiality**

EPA shall manage information about the location, character, and ownership of Historic Properties the disclosure of which may cause a significant invasion of privacy, risk harm to the Historic Properties, or impede the use of a traditional religious site by practitioners, in a manner consistent with the requirements of 36 C.F.R. § 800.11(c), Section 304 of the NHPA, 54 U.S.C. § 307103, the Freedom of Information Act, 5 U.S.C. § 552, and all other applicable laws.

**T. Coordination With Other Federal Reviews**

In the event that another federal agency not initially a party to or subject to this PA receives an application for funding/license/permit for the Project described in this PA, that agency may fulfill its Section 106 responsibilities by stating in writing that it concurs with the terms of this PA and notifying the EPA, DE SHPO, the ACHP, and all Signatories and Invited Signatories that it intends to do so. Such agreement shall be evidenced by it formal letter, signed by an agency official, which recognizes EPA as the lead federal agency for the purposes of Section 106 and agrees with all the findings and determinations of the EPA and the terms of this PA.

**U. Anti-Deficiency Act**

EPA's obligations under this PA are subject to the availability of appropriated funds, and the stipulations of this PA are subject to the provisions of the Anti-Deficiency Act. EPA shall make reasonable and good faith efforts to secure the necessary funds to implement this PA in its entirety. If compliance with the Anti-Deficiency Act alters or impairs EPA's ability to implement the stipulations of this agreement, EPA shall consult in accordance with the amendment and termination procedures of this PA.

**V. Effective Date**

This PA shall be effective on the date EPA transmits a fully executed copy of this PA to the ACHP, Signatories, and Invited Signatories.

**W. Execution in Counterparts**

This PA may be executed in counterparts, with a separate page for each signatory. EPA will ensure that each entity identified in Appendix C to this PA is provided with a copy of the fully executed PA.

**X. Document Transmittal From EPA**

1. The primary means of transmitting documents from EPA will be Electronic Delivery, as defined below. Each person, entity, or group identified in this PA as an intended recipient of documents from EPA, whether they sign this PA or not, must (1) provide a valid email address for EPA to use for Electronic Delivery, and (2) update that email address if it changes. A current list of such email addresses as of the Effective Date of this PA is appended hereto as Attachment C.

2. As used in this PA, "Electronic Delivery" shall mean:

a. Direct transmission via email; or

b. Notification via email that a document is available for review on, and download from, a computer system accessible by the recipient.

**Effect.** Execution of this PA by EPA, the DE SHPO, and the ACHP, and implementation of its terms is evidence that EPA has taken into account the effects of the Project on Historic Properties and afforded the ACHP an opportunity to comment.

**PROGRAMMATIC AGREEMENT BETWEEN THE U. S. ENVIRONMENTAL PROTECTION AGENCY, REGION III; THE DELAWARE STATE HISTORIC PRESERVATION OFFICE; AND THE ADVISORY COUNCIL ON HISTORIC PRESERVATION REGARDING CLEANUP OF THE KOPPERS NEWPORT SUPERFUND SITE, NEWPORT, NEW CASTLE, DELAWARE**

**SIGNATORY**

**The following is a "signatory" within the meaning of 36 C.F.R. § 800.6(c)(1).**

**FOR THE UNITED STATES ENVIRONMENTAL PROTECTION AGENCY**

ADAM ORTIZ

Digitally signed by ADAM ORTIZ
Date: 2023.06.01 16:41:37 -04'00'

| | |
|---|---|
| **Adam Ortiz**<br>**Regional Administrator**<br>**EPA Region III** | **Date** |

**The "Date" field does not need to be completed if an electronic signature bearing the signature date is used.**

**PROGRAMMATIC AGREEMENT BETWEEN THE U. S. ENVIRONMENTAL PROTECTION AGENCY, REGION III; THE DELAWARE STATE HISTORIC PRESERVATION OFFICE; AND THE ADVISORY COUNCIL ON HISTORIC PRESERVATION REGARDING CLEANUP OF THE KOPPERS NEWPORT SUPERFUND SITE, NEWPORT, NEW CASTLE, DELAWARE**

**SIGNATORY**

**The following is a "signatory" within the meaning of 36 C.F.R. § 800.6(c)(1).**

**FOR THE DELAWARE STATE HISTORIC PRESERVATION OFFICE**

Suzanne Savery, Director Digitally signed by Suzanne Savery, Director
Date: 2023.05.17 13:46:31 -04'00'

**SUZANNE SAVERY**, Director and State Historic Preservation Officer
Delaware Division of Historic Preservation and Cultural Affairs

**Date**

**The "Date" field does not need to be completed if an electronic signature bearing the signature date is used.**

**PROGRAMMATIC AGREEMENT BETWEEN THE U. S. ENVIRONMENTAL PROTECTION AGENCY, REGION III; THE DELAWARE STATE HISTORIC PRESERVATION OFFICE; AND THE ADVISORY COUNCIL ON HISTORIC PRESERVATION REGARDING CLEANUP OF THE KOPPERS NEWPORT SUPERFUND SITE, NEWPORT, NEW CASTLE, DELAWARE**

**SIGNATORY**

**The following is a "signatory" within the meaning of 36 C.F.R. § 800.6(c)(1).**

**FOR THE ADVISORY COUNCIL ON HISTORIC PRESERVATION**

7.5.2023

**REID NELSON**, Executive Director
Advisory Council on Historic Preservation

**Date**

**The "Date" field does not need to be completed if an electronic signature bearing the signature date is used.**

**PROGRAMMATIC AGREEMENT BETWEEN THE U. S. ENVIRONMENTAL PROTECTION AGENCY, REGION III; THE DELAWARE STATE HISTORIC PRESERVATION OFFICE; AND THE ADVISORY COUNCIL ON HISTORIC PRESERVATION REGARDING CLEANUP OF THE KOPPERS NEWPORT SUPERFUND SITE, NEWPORT, NEW CASTLE, DELAWARE**

**INVITED SIGNATORY**

**The following is an "invited signatory" within the meaning of 36 C.F.R. § 800.6(c)(2).**

**FOR BEAZER EAST, INC.**

**[signature]** ______________________________ **Date** ______________

**Print Name:** ______________________________

**Position:** ______________________________

**The "Date" field does not need to be completed if an electronic signature bearing the signature date is used.**

**PROGRAMMATIC AGREEMENT BETWEEN THE U. S. ENVIRONMENTAL PROTECTION AGENCY, REGION III; THE DELAWARE STATE HISTORIC PRESERVATION OFFICE; AND THE ADVISORY COUNCIL ON HISTORIC PRESERVATION REGARDING CLEANUP OF THE KOPPERS NEWPORT SUPERFUND SITE, NEWPORT, NEW CASTLE, DELAWARE**

**CONCURRING PARTY**

**The following is a "concurring party" within the meaning of 36 C.F.R. § 800.6(c)(3)**

**FOR THE DELAWARE DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL**

______________________________ 5/3/23
**Shawn M. Garvin, Secretary** **Date**

**The "Date" field does not need to be completed if an electronic signature bearing the signature date is used.**

# ATTACHMENT A

(ROD)

# RECORD OF DECISION AMENDMENT
# KOPPERS CO., INC. (NEWPORT PLANT)
# SUPERFUND SITE

## NEWPORT / NEW CASTLE COUNTY, DELAWARE

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION 3, PHILADELPHIA, PENNSYLVANIA
August 2022

# TABLE OF CONTENTS

## 1 Contents

# LIST OF ACRONYMS:

| | |
|---|---|
| ACHP | Advisory Council of Historical Preservation |
| AR | Administrative Record |
| ARARs | Applicable or Relevant and Appropriate Requirements |
| BHHRA | Baseline Human Health Risk Assessment |
| CERCLA | Comprehensive Environmental Response, Compensation and Liability Act |
| COCs | Contaminants of Concern |
| DESHPO | Delaware State Historic Preservation Office |
| DELDOT | Delaware Department of Transportation |
| DNAPL | Dense Non-Aqueous Phase Liquid |
| DNREC-RS | Delaware Department of Natural Resources and Environmental Control, Remediation Section |
| DWSC | Dry Weathered Surface Creosote |
| EPA | Environmental Protection Agency |
| ERA | Ecological Risk Assessment |
| ESD | Explanation of Significant Difference |
| FFS | Focused Feasibility Study |
| FYR | Five Year Review |
| FS | Feasibility Study |
| HDPE | High Density Polyethylene |
| HI | Hazard Index |
| LPU | Low Permeability Unit |
| MCLs | Maximum Contaminant Levels |
| MCLGs | Maximum Contaminant Level Goals |
| NAPL | Non-Aqueous Phase Liquid |
| NCP | National Oil and Hazardous Substances Pollution Contingency Plan |
| NPDES | National Pollutant Discharge Elimination System |
| NPL | National Priority List |

| | |
|---|---|
| NHPA | National Historic Preservation Act |
| NRHP | National Register of Historic Places |
| PAH | Polycyclic Aromatic Hydrocarbons |
| PCP | Pentachlorophenol |
| PPM | Parts per Million |
| RA | Remedial Action |
| RAO | Remedial Action Objective |
| RBCs | Risk Based Concentrations |
| RCRA | Resource Conservation and Recovery Act |
| RD | Remedial Design |
| RI | Remedial Investigation |
| ROD | Record of Decision |
| TBC | To Be Considered |
| TPAHs | Total Polycyclic Aromatic Hydrocarbons |
| USFWS | United States Fish and Wildlife Survey |

# I. DECLARATION

# KOPPERS CO., INC. (NEWPORT PLANT) SUPERFUND SITE RECORD OF DECISION AMENDMENT NEWPORT / NEW CASTLE COUNTY, DELAWARE

## 1 SITE NAME AND LOCATION

Koppers Co., Inc. (Newport Plant) Superfund Site
Newport, New Castle County, Delaware
EPA ID Number: DED980552244

## 2 STATEMENT OF BASIS AND PURPOSE

This Record of Decision (ROD) Amendment replaces the remedy selected by the U.S. Environmental Protection Agency (EPA) for the Koppers Co., Inc. (Newport Plant) Superfund Site (the Site) in a ROD issued on September 30, 2005 (2005 ROD) (hereafter the 2005 Remedy). In this ROD Amendment EPA selects both an interim action (for groundwater) and a final action (for the remainder of the Site). The interim and final actions selected herein (Selected Remedial Action) were chosen in accordance with the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended (CERCLA), 42 U.S.C. §§ 9601-9675; and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 C.F.R Part 300, as amended.

This decision document is based on an Administrative Record (AR) which was developed in accordance with CERCLA §113(k). This AR is available for review online at: https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0300092. The AR is also available online at the EPA Region 3 Records Center, 1600 JFK Boulevard, Philadelphia, Pennsylvania, and the Kirkwood Public Library at 6000 Kirkwood Highway Wilmington, Delaware 19808 (302-995-7663). The AR Index identifies each document contained in the AR. When signed, this ROD Amendment will become part of the AR for the Site.

## 3 ASSESSMENT OF THE SITE

The Site is located on a parcel of approximately 300 acres in the northern part of New Castle County, Delaware, southwest of the town of Newport and northwest of the Interstate-95 and Route 141 interchange (New Castle County Parcel No. 07-046.40-310). The Site previously contained a wood treatment facility that was last operational in 1971. Soil, sediments, and groundwater at the Site are contaminated as a result of past wood-treatment activities.

The Site was identified as a potential hazardous waste site in 1979. Following multiple investigations, EPA proposed the Site to the CERCLA National Priorities List (NPL) in 1989 and finalized the listing on August 30, 1990.

In 1991, Beazer East, Inc. (Beazer) and E.I duPont de Nemours and Company, Inc. (DuPont) (the Site landowner at that time) signed an agreement with EPA under which the companies were to conduct a Remedial Investigation/Feasibility Study (RI/FS). The RI was completed in 2003 and the FS was completed in 2004.

EPA issued the 2005 ROD to address contaminated soils, sediments, and groundwater. On September 25, 2006, EPA issued an administrative order directing Beazer to implement the 2005 Remedy (2006 Order); Beazer agreed to comply. During the Remedial Design (RD), Beazer collected data showing that Site conditions were different than previously characterized and understood at the time the 2005 ROD was issued. This new data influenced design details for the excavation, consolidation, containment, and capping of soil, sediment, and Dense Non-Aqueous Phase Liquids (DNAPL). In addition, wetland banking, a future use of the Site that played a major role for including the extensive excavation of upland soil in the 2005 ROD, was no longer an intended use for the Site. EPA modified the 2006 Order in August 2014 to require that Beazer perform a Focused Feasibility Study (FFS) and in April 2019 to permit Beazer to submit a Request for ROD Amendment in lieu of an FFS. Beazer submitted a Request for ROD Amendment in August 2019.

This ROD Amendment modifies the 2005 Remedy.

# 4 DESCRIPTION OF INTERIM AND FINAL ACTIONS

The actions selected in this ROD Amendment constitute a final remedial action (Final Action) with respect to soils, sediments, and DNAPL in the saturated zone serving as a source for groundwater contamination. The actions selected herein for groundwater constitute an interim remedial action (Interim Action) and will not restore the groundwater to beneficial use. A final groundwater remedy will be selected in a subsequent decision document. This approach allows for evaluation of groundwater conditions during and following the removal of Principal Threat Waste.

The Final Action includes the following:

- Construction of a containment area on-Site for the placement of excavated materials and debris (Containment Area).
- Realignment of Hershey Run around the Containment Area.
- Installation of barrier walls around all sides of the Containment Area with monitoring to ensure the barrier walls function as designed.
- Excavation of contaminated soils, placement of a geotextile demarcation layer, and backfilling.
- Excavation of contaminated sediments (including channels and marsh/wetland areas), placement of a reactive core mat, and backfilling.
- Placement of excavated soils, sediments, and collected debris into the Containment Area.
- Capping the Containment Area.

- Recovery and off-Site treatment and disposal, or recyling, of the recoverable DNAPL in the saturated zone outside of the Containment Area.
- Mitigation of effects to wetlands impacted by the remediation.
- Implementation of institutional controls to protect the components of the remedy and to prevent residential development.
- Monitoring of surface water, sediment, biota, groundwater, porewater, and caps/covers.

The Interim Action includes the following:

- Institutional controls to prevent use of groundwater.

# 5 STATUTORY DETERMINATIONS

The Final Action selected in this ROD Amendment meets the mandates of CERCLA § 121 and the regulatory requirements of the NCP. The Final Action is protective of human health and the environment, is cost effective, complies with Federal and State requirements that are applicable or relevant and appropriate (ARARs) that are not waived, and utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable. This remedy also satisfies the statutory preference for treatment as a principal element of the remedy (i.e., reduction of toxicity, mobility, or volume of hazardous substances). In accordance with CERCLA § 121(c), a remedy review will be conducted no less than every five years after the initiation of the Final Action to ensure it continues to provide adequate protection of human health and the environment (such reviews are known as Five-Year Reviews (FYRs)). These reviews will continue until hazardous substances are no longer present above levels that allow for unlimited use and unrestricted exposure.

The Interim Action selected in this ROD Amendment is protective of human health and the environment in the short term and is intended to provide adequate protection until a final action is selected for groundwater. This Interim Action complies with federal and state ARARs that are not waived.

# 6 ROD AMENDMENT CERTIFICATION CHECKLIST

The information in the chart below is addressed in detail in the Decision Summary (Part II) of this ROD Amendment. Additional information can be found in the AR for this ROD Amendment.

| **ROD CERTIFICATION CHECKLIST** | |
|---|---|
| **Information** | **Location** |
| Chemicals of concern (COCs) and respective concentrations | Section 6.3 |
| Baseline risk represented by the COCs | Section 6 |
| Performance Standards established for COCs and the basis for these levels | Sections 12.2 & 12.3 |
| How source materials constituting principal threat are addressed | Section 3 & 11 |

| | |
|---|---|
| Current and reasonably anticipated future land use assumptions and potential future beneficial uses of groundwater | Section 5 |
| Potential future land and groundwater uses that will be available at the Site as a result of the Final Action | Section 5 |
| Estimated capital, annual operation and maintenance, and total present worth costs, discount rate, and the number of years over which the remedial action cost estimates are projected | Sections 10.7, 12.4 & IV |
| Key factors that led to selecting the Final Action | Section 7 |

# 7 AUTHORIZING SIGNATURE

This ROD Amendment documents the selection of a Final Action with respect to soils, sediments, and DNAPL serving as a source for groundwater contamination, and an Interim Action with respect to groundwater. EPA selected these actions with the concurrence of the Delaware Department of Natural Resources and Environmental Control, Remediation Section (DNREC-RS).

Approved by:

PAUL LEONARD Digitally signed by PAUL LEONARD
Date: 2022.08.04 12:05:18 -04'00'

Paul Leonard, Director
Superfund & Emergency Management Division
EPA Region III

# II. DECISION SUMMARY

# KOPPERS CO., INC. (NEWPORT PLANT) SUPERFUND SITE RECORD OF DECISION AMENDMENT NEWPORT / NEW COUSTLE COUNTY, DELAWARE

## 1 SITE NAME, LOCATION, DESCRIPTION, & BACKROUND

### 1.1 Site Location & Features

The Site is located on a parcel of approximately 300 acres in the northern part of New Castle County, Delaware, southwest of the town of Newport and northwest of the Interstate-95 and Route 141 interchange (Figures 1 and 4). To the north, the Site is bordered by high-speed railroad lines. Beyond the rail lines are a former municipal sewage treatment facility, an industrial property, and a residential area. To the east, the Site is bordered by the former DuPont Holly Run Plant, the BASF plant, and the Christina River. To the south and west, the Site is bordered by White Clay Creek and Hershey Run, respectively. To the west of the Site, across Hershey Run, lies Bread and Cheese Island.

The Site contains approximately 163 acres of upland areas and 136 acres of wetlands, and three ponds. The Site previously contained a wood treatment facility that was last operational in 1971. Soil, sediments, and groundwater at the Site are contaminated as a result of past wood treatment activities. Contamination at the Site is present in the following areas: (a) upland soils, (b) Hershey Run, (c) the Fire Pond, (d) the South Pond area (the non-tidal South Pond itself and the tidal West Central Drainage area), and (e) groundwater (Figure 2). The East Central and Central Drainage Areas (the marshes bordering the Christina River) and the wooded uplands to the south of the former wood treatment facility are generally free of Site-related contaminants.

### 1.2 History of Contamination

In 1929, a group of parcels comprising the Site was conveyed by Lynam and Wright to the Delaware Wood Preserving Company, which began conducting wood treatment operations on these parcels. In 1931, the Site property was sold to Century Wood Preserving Company (Century). Four years later, in 1935, the Wood Preserving Company acquired the Site property and all associated stock from Century. Through liquidation of the Wood Preserving Company, Koppers Company acquired the Site property in 1940 and reorganized in 1944 into Koppers Company, Inc. (Koppers). Koppers then continued wood-treatment operations at the Site until 1971, when the Site property was sold to DuPont. DuPont deeded the property to Beazer East, Inc. (Beazer), the current owner, in or around 2004.

From 1974 to 1977, the New Castle County Department of Public Works leased the northern part of the Site and built and operated a wastewater treatment facility to temporarily handle the County's wastewater treatment needs until permanent facilities were built. In 1977, the County sold the building to DuPont and discontinued wastewater treatment operations at the Site. Demolition of the wastewater treatment facility was completed in 2021. Except for the County's wastewater treatment operations, the Site has remained largely inactive since wood treating operations ceased in 1971.

The primary material used in wood treatment processes at the Site was a creosote/coal tar solution which was used to preserve railroad ties, telephone poles, and other wood products. Pentachlorophenol (PCP) was also used to treat the wood, although to a much smaller degree. An array of rail tracks located throughout the operations area was used to move wood and materials to, from, and within the Site. Creosote handling occurred in, among other places, the Process Area and Drip Track Area (Figure 2).

Located in the northwestern portion of the Site, the Process Area (where wood preservatives were applied) contained various types of wood treatment equipment and associated structures. This area also provided storage for approximately one million gallons of creosote and other process-related materials. Wood treatment consisted of heating and pressurizing tanks filled with creosote and wood, forcing creosote into the wood. After treatment, freshly treated wood products were temporarily allowed to cure and drip dry in the Drip Track Area prior to transfer to the Wood Storage Area. The Fire Pond was created as a source of water for firefighting purposes.

Operations, including spills and leaks, allowed contaminants to seep into the soil. It is likely that the contaminants escaped into Hershey Run by flowing as a separate phase with the shallow groundwater, or by being washed toward Hershey Run during storm events.

The Site was identified as a potential hazardous waste site in 1979. Following multiple investigations, EPA proposed the Site to the NPL in 1989 and finalized the listing on August 30, 1990.

## 1.3 Remedial Investigation/Feasibility Study and Record of Decision

In 1991, Beazer and DuPont (the Site landowner at that time) signed an agreement with EPA under which the companies were to conduct an RI/FS to investigate the nature and extent of contamination at the Site and identify alternatives for remediation. The Remedial Investigation was completed in 2003; the Feasibility Study was completed in 2004.

EPA issued the 2005 ROD on September 30, 2005 to address contaminated soils, sediments, and groundwater. The contaminants of concern (COCs) identified in the 2005 ROD were polycyclic aromatic hydrocarbons (PAHs). The Remedial Action Objectives (RAOs) identified in the 2005 ROD included the following:

- Prevent current or future direct contact with contaminated soils and sediments that would result in unacceptable levels of risk to ecological receptors by reducing total PAHs (TPAHs) to below 150 parts per million (ppm) in sediment and 600 ppm in soil (150 ppm in soil that was to be converted to wetlands);

- Prevent unacceptable human health risks due to exposure to contaminated groundwater;

- Minimize the on-going contamination of groundwater from the presence of Non-Aqueous Phase Liquid (NAPL) through removal and/or containment;

- Prevent direct contact threats to an adult or child trespasser and to an industrial worker;

- Protect potential future residents from contact with contaminated soil and/or groundwater by preventing the construction of residential buildings on any part of the Site; and

- Restore groundwater at the Site to its beneficial use.

The 2005 Remedy included the following components:

- Excavation of soils and sediments with TPAHs greater than 600 ppm in soil and with TPAHs greater than 150 ppm in sediments;
- In areas where wetlands were to be created, excavation of soils containing TPAHs greater than 150 ppm;
- Consolidation of excavated soils and sediments into one or two on-Site containment area(s);
- Construction of groundwater barrier walls and collection systems (*e.g.,* passive recovery trenches) in the containment area(s). The barrier walls would not fully enclose the containment area(s), but would instead be open on the upgradient side to allow groundwater flow into the containment area(s);
- Installation, operation, and maintenance of a groundwater extraction and treatment system to prevent migration of impacted groundwater from the containment area(s) and to prevent the discharge of impacted groundwater from the extraction operation. In addition, an oil-water separator would be installed to facilitate the recovery of free-phase DNAPL as well as to prevent DNAPL from reaching the groundwater treatment system;
- Separation of creosote from groundwater and transportation of creosote off-Site for disposal or recycling;

- Management of the hydraulic head of groundwater and collection of DNAPL through the use of passive recovery trenches in the containment area(s);
- Treatment of groundwater as necessary to meet discharge requirements;
- Movement of debris to containment area(s);
- Installation of a modified Resource Conservation and Recovery Act (RCRA) cap atop the containment area(s);
- Relocation of a portion of the existing channel of Hershey Run;
- Creation of wetlands to replace wetlands filled as part of the containment area(s) construction and for wetland mitigation banking;
- Monitoring groundwater, surface water, sediments, and wetlands to ensure the effectiveness of the remedy;
- Prevention of exposure to contamination inside of the containment area(s) or in groundwater beneath the Site, and prevention of the drawdown of contamination into the deeper aquifer or elsewhere, through land and groundwater use restrictions; and
- Protection of remedial components through implementation of institutional controls (ICs).

## 1.4 Administrative Order, Explanation of Significant Differences, and First Modification of the Administrative Order

On September 26, 2006, EPA issued an Administrative Order for Remedial Design/Remedial Action (RD/RA) (EPA Docket No. CERC-03-2006-0266DC) (2006 Order) to Beazer. The 2006 Order directed Beazer to implement the 2005 ROD.

On May 28, 2010, EPA modified the 2005 Remedy by issuing an Explanation of Significant Difference (ESD) to clarify that the substantive provisions of the National Historic Preservation Act (NHPA) and its implementing regulations were applicable to all activities performed to implement the Selected Remedial Action.

On August 16, 2010, EPA issued a modification to the 2006 Order incorporating the ESD into the 2006 Order (Modification No. 1).

## 1.5 Cultural Investigations, Consultation with Tribes, and NHPA Consultation

As part of the Remedial Design work, Beazer, in consultation with Delaware State Historic Preservation Office (DESHPO) and EPA, performed investigations at the Site to determine archaeological significance and to evaluate eligibility for the National Register of Historic Places (NRHP). This work included Phase 1A, Phase 1B, and Phase 2 archaeological investigations, and the recovery of over 24,000 artifacts. Based on investigations, specific areas at the Site were recommended by Beazer for NRHP-eligibility.

EPA identified Federally Recognized Tribes associated with the Site for purposes of performing government-to-government consultation consistent with EPA policy.[1] EPA and DESHPO additionally identified State Tribes and other stakeholders, together with the Federally Recognized Tribes, for consultation under Section 106 of the NHPA, 54 U.S.C. § 300101 *et seq.*, and its implementing regulations at 36 C.F.R. Part 800. These consultation efforts will lead to the consummation of a document setting forth procedures for mitigation of adverse effects to historic property from implementation of the remedial action at the Site. A draft of that document, the *"Programmatic Agreement Between the U.S. Environmental Protection Agency, Region III; The Delaware State Historic Preservation Office; and the Advisory Council on Historic Preservation Regarding Cleanup of the Koppers Newport Superfund Site, Newport, New Castle County, Delaware"* (Programmatic Agreement) will be made available for public comment prior to finalization. The Programmatic Agreement and any plans describing steps to be taken to minimize adverse effects to historic property will be finalized prior to commencement of remedial action activities.

## 1.6 Events Leading to Remedy Modification, and Second & Third Modification of the Administrative Order

Beazer began Remedial Design work following issuance of the 2006 Order. New data collected during the Remedial Design showed that Site conditions were different than previously characterized and understood at the time the 2005 ROD was issued. In addition, wetland banking was no longer an intended reuse of the Site.[2] The new data and changed Site use significantly influenced design details for excavation, consolidation, containment, and capping resulting in a divergence from the 2005 Remedy.

On August 19, 2014, EPA issued a second modification to the 2006 Order (Modification No. 2). This modification (a) suspended work in aid of design and construction of the 2005 Remedy, and (b) required Beazer to submit an FFS to provide information to enable EPA to evaluate changes to the 2005 Remedy based on Beazer's design work.

On April 30, 2019, EPA issued a third modification to the 2006 Order (Modification No. 3), which permitted Beazer to provide the information that would have been supplied to EPA in the FFS in a Request for ROD Amendment. Beazer provided its Request for ROD Amendment to EPA in the August 2019 "Final Remedy Modification and Record of Decision Amendment Technical Document" (Request for ROD Amendment Technical Document).

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1 Government-to-government consultation provides the opportunity for Federally Recognized Tribes associated with the Site to provide meaningful input in the selection of a remedy. This consultation is described in "EPA Policy on Consultation and Coordination with Indian Tribes" (May 4, 2011) (https://www.epa.gov/sites/production/files/2013-08/documents/cons-and-coord-with-indian-tribes-policy.pdf) .

2 In the 2005 ROD, EPA acknowledged that future use of the Site included development of wetlands for banking purposes associated with highway construction to be performed by the Delaware Department of Transportation (DELDOT). Wetlands' banking was a driver for the remedy's inclusion of deep upland soil excavation (to depths of up to 30 feet in saturated conditions). However, DELDOT's wetland needs were ultimately satisfied through other means and banking was no longer desired for the Site.

# 2 COMMUNITY PARTICIPATION

The Proposed Plan for this ROD Amendment and the AR supporting selection of the remedy can be viewed online at https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0300092, or at the EPA Region III Records Center in Philadelphia, Pennsylvania. If a member of the community does not have a computer readily available, the Kirkwood Public Library at 6000 Kirkwood Highway Wilmington, Delaware 19808 (302-995-7663) has computers available to review the AR. EPA held a 30-day public comment period from March 2, 2021 through March 31, 2021 and held a telephonic public availability session on March 17, 2021, during which no members from the community called in to raise questions or concerns. Because of a request for an extension to the public comment period, EPA reopened the public comment period from April 14, 2021 through May 14, 2021. A summary of the significant public comments received is included in the Responsiveness Summary in Part III of this ROD Amendment.

# 3 SCOPE AND ROLE OF THE RESPONSE ACTION

In the 2005 ROD, EPA selected a comprehensive remedy for the Site which included a groundwater cleanup component. In this ROD Amendment, EPA replaces the 2005 remedy with a final remedy for soils, sediments, and DNAPL in the saturated zone serving as a source for groundwater contamination; and an interim remedy for groundwater that will address certain risks presented by contamination but will not restore the groundwater to beneficial use. Selection of a comprehensive (final) groundwater remedy will take place in a subsequent decision document subject to the requisite public participation. EPA chose this approach because it permits use of data obtained during implementation of the final remedy for soil, sediment, and DNAPL in the saturated zone with associated monitoring to support the selection of a final groundwater remedy.

EPA characterizes waste as either principal threat waste or low-level threat waste. While contaminated groundwater is generally not considered to be a source material, NAPL in groundwater may be viewed as source material. By addressing the principal threat waste (i.e., the DNAPL in the saturated zone and the surface soils and sediments that act as a source for direct exposure), EPA can further evaluate groundwater outside the Containment Area after the principal threat waste is removed and or contained in a final remedy.

**WHAT IS A "PRINCIPAL THREAT"?**

The NCP establishes an expectation that EPA will use treatment to address the principal threats posed by a site wherever practicable (NCP § 300.430(a)(1)(iii)(A)). The "principal threat" concept is applied to the characterization of "source material" at a Superfund site. Source material is material that includes or contains hazardous substances or pollutants or contaminants that act as a reservoir for migration of contamination to groundwater, surface water, or air, or acts as a source for direct exposure. In general, contaminated groundwater is not considered to be source material; however, Non-Aqueous Phase Liquids (NAPLs) in groundwater may be viewed as source material. Principal threat wastes are those source 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. The decision to treat these wastes is made on a site-specific basis through a detailed analysis of the alternatives using the nine remedy selection criteria. This analysis provides a basis for making a statutory finding that the remedy employs treatment as a principal element.

# 4 SITE CHARACTERISTICS

The Site is located in the Coastal Plain Physiographic Province in New Castle County, Delaware, near the fall line with the Piedmont Physiographic Province.

Access to the Site is restricted through the use of guarded 24-hour security gates at the adjacent facility, fencing, and posting. Natural barriers such as the Christina River, White Clay Creek, Hershey Run, and the surrounding marshes and wetlands also limit access to the Site, as does the high-speed Amtrak rail line to the north.

The Site contains approximately 163 acres of upland areas and 136 acres of wetlands, and three ponds. The wetlands are comprised of freshwater tidal marsh, non-tidal emergent wetlands, non-tidal forested wetlands, and non-tidal scrub/shrub wetlands. Tidal wetlands at the Site individually drain into Hershey Run, White Clay Creek, and the Christina River. Non-tidal wetlands occur in the South Pond Area, Fire Pond Area, and smaller disjunct non-tidal wetlands in the low-lying areas in the uplands of the Process and Wood Storage Areas.

Three distinct hydrostratigraphic units are present at the Site. The first hydrostratigraphic unit includes the Fill, the Quaternary Deposits, and the Columbia Formation. The second hydrostratigraphic unit is a low-permeability unit that exists transitionally between the Columbia Formation and the Potomac aquifer. The third hydrostratigraphic unit is the Potomac aquifer. Data obtained by Beazer during its design efforts indicates that the low-permeability unit is an effective hydraulic barrier that inhibits vertical migration from the Columbia Formation to the Potomac Aquifer at the Site.

Fill is the uppermost unit encountered in the uplands area and varies in thickness from 0 to approximately 9 feet with greater thickness observed in the Process Area and the Fire Pond Area.

The fill is composed primarily of silts with lesser amounts of sands, gravels, and clays. In addition, the fill contains various anthropogenic materials including stone fill, brick and concrete fragments, asphalt pavement, railroad tie pieces, coal and ash debris, wood, steel, and iron debris. Dry weathered surface creosote is present within the fill.

The Quaternary Deposits overlie most of the unconsolidated Columbia Formation. The Quaternary Deposits are generally comprised of silts, with lesser amounts of sand, gravel, and clays as well as organic matter in the form of roots, peat, reeds, and other organic debris. These deposits range in thickness from 0 feet to upwards of approximately 10 to 15 feet and generally decrease in thickness near drainage areas.

The Columbia Formation is composed of primarily silty sands and gravels with seams and thin beds (up to 2 feet in thickness) of silts. The Columbia Formation was encountered in thickness ranging from 0 feet to approximately 20 to 25 feet and is generally thicker near the Process Area and Drip Track Area.

The Potomac Aquifer is composed of silts and clays interlayered with medium to fine sands. At the Site, a lower-permeability layer is typically observed at the top of this unit and can vary from clay to clayey silt or clayey sand. The Potomac Formation is distinguished from the Columbia Formation by smaller grain sizes and the usual presence of the lower-permeability clayey layer at the contact point with the Columbia Formation.

The 2015 gauging data from wells in the Columbia and Potomac formations indicates that groundwater flow in the Columbia and Potomac is generally to the west and south, toward surface drainage areas at Hershey Run, White Clay Creek, and the Christina River. Relative groundwater heads in the Columbia and underlying Potomac indicate potential downward vertical gradients from the Columbia to the Potomac in the northern upland areas and upward gradients from the Potomac to the Columbia in the discharge areas.

No drinking water wells are located within the Site boundaries.

# 5 CURRENT AND POTENTIAL FUTURE LAND USE AND RESOURCE USE

Land use in the area of the Site includes a mix of industrial, commercial, and residential parcels. The Site is zoned for industrial use. The adjacent properties include the DuPont Newport Superfund Site and BASF, an active industrial facility. The Site is bounded to the north by the Amtrak rail line. Beyond the Amtrak rail line are additional industrial facilities and residential properties. Because access to the Site is very limited and the Site is zoned industrial, EPA assumes that future use of portions of the Site will be industrial in nature, and that given the limited access and presence of wetlands, much of the Site will remain undeveloped and used for ecological purposes.

# 6 SUMMARY OF SITE RISKS

Prior to issuing the 2005 ROD, EPA oversaw performance of analyses to estimate the human health and environmental risks that could result if contamination at the Site was not addressed. These analyses, commonly referred to as risk assessments, identify existing and potential future risks that could occur if conditions at the Site do not change. The Baseline Human Health Risk Assessment (BHHRA) evaluated human health risks and the Ecological Risk Assessment (ERA) evaluated environmental impacts from Site contamination. The risk assessments performed for the Koppers Site demonstrated that actual or threatened releases of hazardous substances from the Site, if not addressed, may present a current or potential threat to public health, welfare, or the environment. *See* Section 7 (Site Risks) of the 2005 ROD for details of the BHHRA and ERA.

## 6.1 Human Health Assessment

As set forth in NCP § 300.430(e)(2), EPA has set a target risk range of $10^{-4}$ to $10^{-6}$ for a lifetime excess carcinogenic risk. For non-carcinogenic risk, EPA has set a target Hazard Index (HI) of no greater than 1.

During the Remedial Investigation, a number of organic and inorganic chemicals were detected in Site soils, sediments, and groundwater. Chemicals with maximum concentrations and/or analytical method detection limits of less than Risk-Based Concentrations (RBCs) (currently referred to as Regional Screening Levels (RSLs)) were eliminated from further consideration in the risk assessment. This analysis concluded that PAHs were the primary COCs at the Site. Potential human health effects associated with exposure to PAHs were estimated quantitatively or qualitatively through the evaluation of several actual or potential exposure pathways developed to reflect the potential for exposure to hazardous substances at the Site. Five different exposure scenarios were considered in the Koppers BHHRA: (1) on-Site construction worker; (2) on-Site industrial worker; (3) adolescent trespasser; (4) adolescent swimmer; and (5) angler. The BHHRA considered the effects of ingestion of, and dermal contact with, soils, sediments, surface water, and groundwater at the Site. The BHHRA also considered the inhalation of chemical volatilization from groundwater and dermal contact while showering.

The BHHRA documented risks to human health exceeding EPA's target risk range. For example, the BHHRA revealed that the carcinogenic risk for an industrial worker from ingestion and dermal exposure to soils was $3 \times 10^{-4}$, with a majority of the risk caused by the incidental ingestion of soil ($2 \times 10^{-4}$). The contaminant contributing most heavily to the risk was benzo(a)pyrene, with other PAHs including benzo(a)anthracene, benzo(b)fluoranthene, and dibenz(a,h)anthracene also contributing. EPA concluded that risks to industrial workers exceeded the carcinogenic risk level. Risk to adolescent trespassers were at the carcinogenic risk point of departure in soils and surface water.

For groundwater, the BHHRA documented carcinogenic risk from dermal ($1.3 \times 10^{-3}$) and ingestion ($4.6 \times 10^{-1}$) exposure for a future industrial worker. Scenarios evaluating exposure to groundwater without NAPL present did not result in carcinogenic risk outside of the acceptable range. The non-carcinogenic risks from groundwater to a future industrial worker resulted in an HI of 115 from dermal exposure and an HI of 170 from ingestion scenario. The risk to a future industrial worker where NAPL was not present in the groundwater produced an HI of 1.3 when the ingestion, dermal, and inhalation pathways were combined. The HI exceedance of 1 was largely caused by high background levels of metals that occur in Columbia Aquifer groundwater, which contributed to the ingestion pathway risks.

A summary of the risk calculations for all of the scenarios evaluated (including groundwater) is presented in Table 5 of the 2005 ROD.

EPA recalculated the risks at the Koppers Site in 2017 using EPA's most current toxicity values and guidance documents. All data concentrations used to recalculate risk were taken from the 2005 ROD. Results showed cancer risks exceed EPA's acceptable levels for cumulative carcinogenic risk for the industrial worker. Risks were primarily contributed by benzo(a)pyrene and benzo(b)fluoranthene, with dibenzo(a,h)anthracene and indeno(1,2,3-cd)pyrene being contributing contaminants. Cumulative carcinogenic risk is within EPA's acceptable risk range for the adolescent trespasser. Non-cancer risks were exceeded for all receptors (construction worker, industrial worker, and adolescent trespasser) due to metals (thallium and manganese). However, when metals were evaluated individually, non-cancer risk is at EPA's acceptable benchmark level.

## 6.2 Ecological Risk Assessment

An ERA serves to evaluate the potential for risks due to exposure to Site contaminants specific to ecological receptors (such as wildlife, fish, and plants). ERA conclusions were largely based upon the results of Site-specific toxicity tests conducted with Site sediment on the amphipod (*Hyalella azteca)* and the midge (a small fly) (*Chironomus tentans),* and with Site soil on the earthworm (*Eisenia foetida)*, as supplemented with plant community observations.

At the Koppers Site, a total of 12 assessment endpoints were evaluated, six related to direct exposure and six related to exposure to contamination through the food chain for non-aquatic receptors. Only the six related to direct exposure identified risks associated with the creosote contamination. Table 7 of the 2005 ROD provides additional information.

Where adverse effects were found, the concentration of contaminants in test sediments were used to determine the concentration at which minimal or no adverse effects may occur (the NOAEL), and above what contaminant levels adverse effects would be expected (the LOAEL). In addition, the type of adverse effect (*e.g*., death or reduced growth) was taken into consideration in evaluating the certainty and severity of risk.

In summary, EPA concluded that PAHs posed ecological risks to the upland, wetland, and aquatic communities at the Site, specifically to organisms low in the food chain (*i.e.,* earthworms, insects, shelled organisms, fish and frog embryos, and both upland and aquatic plants). In general, the aquatic assessment endpoints were more sensitive than the terrestrial assessment endpoints with respect to the calculated NOAEL and LOAEL levels. For the aquatic assessment endpoints the NOAEL was calculated to be 82.87 ppm total PAHs and the LOAEL was calculated to be 197.6 ppm. For the terrestrial assessment endpoints, the NOAEL was determined to be 587 ppm TPAHs, with a LOAEL of 1,264 ppm.

### 6.3 Basis for Remedial Action

The basis for taking remedial action at the Site is the unacceptable human health and environmental risks from PAHs. Because there are unacceptable risks from PAHs to upland, wetland, and aquatic communities at the Site and unacceptable risks to an industrial worker, EPA is taking an action. Based on the results of the risk assessments, EPA determined that a sediment cleanup level of 150 ppm TPAHs (approximately the geometric mean between the sediment NOAEL of 83 and the LOAEL of 198) and a soil cleanup level of 600 ppm TPAHs (just above the NOAEL of 587) were appropriate levels to provide protection to human health and the environment in the 2005 ROD. These levels will be used in this ROD Amendment. The COCs are PAHs as identified in the 2005 ROD.

EPA has determined that implementation of the Selected Remedial Action is necessary to reduce the risks for these receptors to levels at or below EPA's risk range.

## 7 REASONS FOR ISSUING ROD AMENDMENT

During the Remedial Design, Beazer collected data showing that Site conditions were different than previously characterized and understood at the time the 2005 ROD was issued. This new data influenced design details for the excavation, consolidation, containment, and capping of soil, sediment, and DNAPL in the saturated zone. In addition, wetland banking, a future use of the Site which played a major role for including the extensive excavation of upland soil in the 2005 Remedy, was no longer an intended use for the Site.

In the Request for ROD Amendment Technical Document, Beazer identified how new data and changes to the future use of the Site would impact the design of the 2005 Remedy. These impacts are discussed below.

### 7.1 Soils

Under the 2005 Remedy, soil excavation in areas not designated for wetlands creation and which were contaminated above 600 ppm TPAHs would be excavated. Where wetlands were to be created (for wetland banking and to restore wetlands damaged by the cleanup at the Site), soils contaminated above 150 ppm TPAHs would be excavated. The excavated material would be consolidated on-Site into one or two containment area(s). During excavations, DNAPL in the saturated zone was to be collected and disposed at an off-Site RCRA facility (this waste had been determined to be a RCRA hazardous waste). EPA estimated excavations ranging from 5-15 feet to achieve cleanup goals, with some areas excavated to a depth up to 30 feet.

Beazer's design investigations showed that areas where TPAHs exceeded 600 ppm were limited to dry weathered surface creosote areas. This dry weathered surface creosote is immobile but presents a direct contact threat to humans and ecological receptors. In addition, the investigations identified DNAPL in the saturated zone in additional locations than identified in the 2005 ROD, therefore increasing the amount of excavation necessary for removal.

In the 2005 ROD, the need for deep excavations was driven by the assumption that wetland banking would occur at the Site and to remove DNAPL in the saturated zone. Because wetland banking is no longer an intended reuse of the Site, deeper excavations to remove contamination for purposes of creating wetlands are no longer needed. Shallower excavations would satisfy remediation goals by eliminating the direct contact threat to humans and ecological receptors on the surface, and DNAPL in the saturated zone could be removed via DNAPL recovery wells in a more controlled manner (see subsection 7.4 below, for additional discussion of DNAPL recovery). Shallow excavations would reduce the volume of material to be removed by an estimated 640,000 cubic yards.

## 7.2 Sediment & Marshes

Under the 2005 ROD, sediments with TPAHs exceeding 150 ppm were to be excavated and consolidated into one or two containment area(s). At the time the 2005 ROD was issued, EPA assumed that a majority of the excavations would average 2 to 4 feet, with some areas excavated up to 13 feet. Sediment excavation would be conducted in Hershey Run, Fire Pond, and the West Central Drainage Canal and associated marshes.

Beazer's investigations found significantly deeper impacts in lower Hershey Run (depths commonly more than 5 feet and in multiple areas greater than 10 feet) and that the impacts were variable across the length and width of the channel.

Deep excavations in a saturated environment presents a panoply of technical complications and takes longer to implement because the excavation areas are affected by tidal conditions leading to limitations on the timing of such excavations. These issues could be avoided through shallow excavation of contaminated sediments and placement of a reactive core mat over the underlying sediments. The reduction in volume of material to be removed is estimated at 37,000 cubic yards.

The DNAPL observed in the subsurface outside of areas subject to DNAPL recovery (Hershey Run Channel outside the confines of the Containment Area and the West Central Drainage Channel) exist as discontinuous blebs or small thin seams and any impacts from the blebs and thin seams are expected to be localized and to migrate upwards. Any upward migration of contaminants would be addressed with the reactive core mats.

## 7.3 Consolidation of Soils/Sediments into Containment Area

Under the 2005 Remedy, excavated soils, sediments, and debris were to be consolidated and placed into one or two containment area(s) to be built on the Site. Because a significantly smaller volume of material would need to be excavated and consolidated, only one containment area would be necessary.

## 7.4 DNAPL Recovery

Under the 2005 Remedy, soils were to be excavated where TPAHs exceeded 600 ppm (where wetlands were not being created) or 150 ppm (where wetlands were to be created). EPA estimated that excavations would range on average between 5-15 feet. Any DNAPL in the saturated zone was to be collected and disposed at an off-Site RCRA facility.

During Beazer's investigations, DNAPL in the saturated zone was found in additional locations, commonly at depths 30 feet below ground surface. Excavations of soils at these depths in a saturated environment presents numerous technical complications. Such contamination could be addressed with fewer complications and in a more controlled manner using DNAPL recovery wells. This approach would be easier to implement and control and would limit the amount of excavation necessary in a saturated environment while still extracting the recoverable DNAPL impacting groundwater. Beazer conducted a DNAPL recovery pilot program at the Site, which verified the effectiveness of this approach.

The areas with DNAPL in the saturated zone that is impacting groundwater, and which is recoverable, are located in the Former Process and South Pond Areas. DNAPL within the confines of the Containment Area would be encapsulated by barrier walls and therefore recovery would be unnecessary. Subsurface DNAPL in other locations of the Site (for example West Central Drainage Channel and Hershey Run Channel outside the confines of the Containment Area) exists as discontinuous blebs or small thin seams and any impacts from the blebs and thin seams are expected to be localized and expected to migrate upwards. Any upward migration of contaminants would be addressed by the reactive core mats.

Under the 2005 Remedy, the containment area(s) would be designed to prevent the horizontal migration of contaminated groundwater by means of groundwater barrier walls installed to surround the containment area(s) on all down-gradient sides. A groundwater treatment system, using a collection system such as passive recovery trenches (*e.g.,* stone-filled passive trenches and piping) would be installed upgradient of the groundwater barrier walls.

Beazer's investigations revealed benefits to constructing barrier walls around all sides of what would now be a single Containment Area. This new design would enable control of hydraulic head (water levels) within the Containment Area and eliminate the need for the collection of DNAPL and groundwater within that area unless monitoring indicates the barrier walls are not functioning as designed.

## 7.5 Realignment of Hershey Run

Under the 2005 Remedy, if the containment area(s) extended into wetlands areas, Hershey Run would be relocated away from such areas. An evaluation of the hydrodynamics of Hershey Run was to be included in the remedial design to determine the optimal configuration of the new channel. The new channel would not alter in any negative way the existing capacity of Hershey Run for the conveyance of water and would not cause drainage changes that promote flooding upstream.

Beazer's investigations yielded information on the areas where the greatest impacts of DNAPL are located. This information aided in developing the optimal location of the single Containment Area, as well as the realignment strategy of the portion of Hershey Run that is affected by the location of the Containment Area.

From a hydraulic standpoint, sea level rise and larger storm events would result in higher tail water, which would in turn reduce velocities from the storms. Additionally, extreme floods would inundate the area creating a still (or standing) pool of water in the stream and floodplain. Because of the standing/still pool during such events, erosive velocities would likely not occur in the stream or on-Site and floodwaters would dissipate over the course of a few days and would not pose any lasting impact on the function of the Containment Area. Additional evaluation will be necessary (see Section 9.2.3.5 of this document).

## 7.6 Wetlands

Under the 2005 Remedy, excavation of contaminated sediments, the relocation of the Hershey Run channel away from the containment area(s), and construction of the containment area(s) would damage existing wetlands. Wetlands would be created to replace those damaged by the cleanup. At the time the 2005 ROD was issued, EPA anticipated that future Site use included the creation of wetlands for wetlands mitigation banking purposes. Where wetlands were to be created, TPAHs in soils and sediments would be reduced to below 150 ppm.

The Site will no longer be used for a wetland mitigation bank. Therefore, the removal of deep contamination that would have been necessary to create wetlands for banking purposes is no longer necessary. However, wetlands that are negatively impacted by cleanup activities would still be addressed through on-Site or off-Site mitigation to ensure no net loss of wetland function.

## 7.7 Groundwater

Under the 2005 Remedy, groundwater would be collected and treated from the containment area(s) to achieve National Pollutant Discharge Elimination System (NPDES) discharge requirements. Outside the containment area(s), soils were expected to be excavated on average between 5-15 feet. DNAPL in the saturated zone encountered during excavations would be collected and disposed at an off-Site RCRA facility. The groundwater cleanup would meet Safe Drinking Water Act Maximum Contaminant Levels (MCLs) and non-zero Maximum Contaminant Level Goals (MCLGs) and restore the groundwater to beneficial use.

EPA has decided to defer a final groundwater cleanup for a subsequent decision document. By deferring selection of a final remedy to restore the groundwater to beneficial use, EPA can consider data on groundwater conditions during and following implementation of this remedy that will inform the decision on selection of a final groundwater remedy.

# 8 REMEDIAL ACTION OBJECTIVES

The 2005 ROD established RAOs to mitigate and/or prevent unacceptable existing and future threats to human health and the environment. Data collected during efforts to design the 2005 Remedy led to consideration of changes to that action. In considering those changes, EPA determined that the ROD Amendment will address (a) risks from contaminated soil, sediments, and DNAPL in the saturated zone serving as a source for groundwater contamination as a final remedy, and (b) certain risks presented by groundwater contamination via an interim remedy that will not restore groundwater to beneficial use. Although a comprehensive (final) groundwater remedy will be considered in a subsequent final decision document, this ROD Amendment includes RAOs for the groundwater risks to be addressed through this action. The chart below identifies the RAOs in the 2005 ROD and changes to those RAOs made in this ROD Amendment.

| 2005 ROD | ROD Amendment | Explanation of Difference |
|---|---|---|
| Prevent current or future direct contact with contaminated soils and sediments that would result in unacceptable levels of risk to ecological receptors by reducing levels of total PAH concentrations to below 150 ppm in sediment and 600 ppm in soil (150 ppm in soil that is to be converted to wetlands).[3] | Prevent current or future direct contact with contaminated soils and sediments that would result in unacceptable levels of risk to ecological receptors (this will be accomplished by reducing contaminated surface soil to below 600 ppm TPAHs and reducing contaminated surface sediments to below 150 ppm TPAHs). If wetlands are created, TPAHs cleanup to below 150 ppm is required.[4] | Deeper excavations to remove contaminated soils and sediments are not needed to protect human health and the environment. Wetland banking is no longer an intended reuse and therefore excavation of soils containing TPAHs between 150-600 ppm is no longer needed; however, wetlands that are negatively impacted by cleanup activities will still be addressed through on-Site or off-Site mitigation to ensure no net loss of wetland function. |
| Prevent unacceptable human health risks due to exposure to contaminated groundwater. | Prevent unacceptable human health and ecological risks due to exposure to contaminated groundwater. | Preventing unacceptable risk to ecological receptors from groundwater is necessary. |

[3] The 2005 ROD combined RAOs with Performance Standards in this instance. Here, the RAO was "prevent current or future direct contact with contaminated soils and sediments that would result in unacceptable levels of risk to ecological receptors" and the Performance Standard necessary to meet this RAO was reduction of total PAH concentrations to below 150 ppm in sediment and 600 ppm in soil (150 ppm in soil to be converted to wetlands).

[4] The RAO itself has not changed, but the Performance Standard necessary to achieve the RAO has changed. In this instance the "Explanation of Difference" section explains the change to the Performance Standard.

| | | |
|---|---|---|
| Minimize the ongoing contamination of groundwater from the presence of NAPL through removal and/or containment. | Minimize the ongoing contamination of groundwater from the presence of NAPL in the saturated zone through removal and/or containment. | By specifically addressing removal of NAPL in the saturated zone, EPA addresses the NAPL serving as a source material for groundwater in the subsurface and will limit the source material that can contribute to ongoing groundwater contamination. This RAO specifically discusses NAPL in the saturated zone to distinguish it from the removal of soils and sediments in the RAO above. The recovery of NAPL below the water table will occur outside of the Containment Area. |
| Prevent any direct contact threat to an adult or child trespasser and to an industrial worker. | Prevent any direct contact threat to industrial workers. | The 2005 risk assessment and the 2017 recalculation indicate that risk does not exceed the acceptable benchmarks for an adult or child trespasser. The 2005 ROD RAO included preventing a direct contact threat to an adult or child trespasser; this was not needed given the conclusions of the risk assessment. Risk to industrial workers continues to be present. |
| Protect potential future residents from contact with contaminated soil and/or groundwater, by preventing the construction of residential buildings on any part of the Site (which is currently prohibited by local zoning; a future zoning change and potential residential use of the | Protect human health by restricting contact with contaminated soil, sediments, and groundwater; including preventing future excavations into the contaminated material (this will be accomplished using land and | Restricting contact with contaminated sediments was not included in the 2005 RAO. Contaminated material will be left in place at the Site below various covers. |

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| Site would require a residential risk assessment scenario and an evaluation by EPA). | groundwater use restrictions (institutional controls)). | |
| Restore groundwater at the Site to its beneficial use. | | This RAO has been removed because decisions on a comprehensive groundwater cleanup will be made in a future decision document. |

# 9 DESCRIPTION OF REMEDIAL ALTERNATIVES

CERCLA § 121 requires that any selected remedial action (a) be protective of human health and the environment; (b) be cost effective; (c) attain applicable and relevant and appropriate requirements that are not waived; and (d) be compliant with the NCP to the extent practicable. The provision further states that permanent solutions that reduce the volume, toxicity, or mobility of the contaminants through treatment are preferred. This section identifies the remedial alternatives considered to meet these requirements.

With this ROD Amendment, EPA is selecting (1) a Final Action to address soils, sediments, and DNAPL in the saturated zone serving as a source for groundwater contamination and (2) an Interim Action to address certain risks presented by groundwater contamination (but which will not restore the groundwater to beneficial use). A final groundwater remedy will be selected in a subsequent decision document subject to public participation requirements. This approach allows for evaluation of groundwater conditions during and following the Principal Threat Waste removal and will facilitate selection of an appropriate final groundwater remedy at a later date.

## 9.1 Alternatives Considered in the 2005 ROD, Reasons for Development of ROD Amendment

EPA compared five alternatives in the 2005 ROD:

| No. | **Description**[5] |
|---|---|
| 1 | *No Action.* |
| 2 | *Covering upland soils; Sediment cap in Fire Pond, South Pond and K Pond; Sheetpile and NAPL collection at Fire Pond and South Pond; Monitored Natural Recovery (MNR) in Hershey Run and tidal wetlands, Monitored Natural Attenuation of ground water contamination.* |
| 3 | *Excavate, consolidate and cap shallow soils and shallow tidal sediments; Cap Fire, K and South Ponds; Sheetpile and NAPL collection at Fire Pond and South Ponds areas;* |

[5] These descriptions are taken verbatim from the 2005 ROD. Section 9.2 of the 2005 ROD identified groundwater and institutional controls components common to all alternatives except No Action.

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| | *Rechannelization of Hershey Run; Wetlands mitigation; Monitored Natural Attenuation of ground water contamination.* |
| 4 | *Excavate, consolidate and cap all contaminated soils and sediments; Subsurface ground water barrier wall around consolidation area(s) with passive NAPL recovery; Restoration of ground water through excavation of NAPL-contaminated aquifer material outside of consolidation areas; Rechannelization of Hershey Run; Wetlands mitigation; Monitoring of ground water contamination.* |
| 5 | *In-situ steam-enhanced extraction of subsurface NAPL; excavation and off-site treatment of sediments and certain soils; Wetland restoration; Monitored Natural Attenuation of ground water contamination.* |

Factors explained in Section 7 of this ROD Amendment led to development of a new alternative which is a modification of Alternative 4 from the 2005 ROD in fundamental ways. The modified Alternative 4 (New Alternative) is an alternative considered in this ROD Amendment and is described below.

## 9.2 Alternatives Considered in this ROD Amendment

### 9.2.1 No Action

Under this alternative, no remedial measures would be implemented at the Site to prevent exposure to contamination in sediments, soil, and DNAPL in the saturated zone. 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.

### 9.2.2 2005 Remedy

A description of the 2005 Remedy is summarized above in Section 1.3 of this ROD Amendment. A complete description of the 2005 Remedy is provided in Section 9.2 (Remedial Alternatives) and Section 11.2 (Description of the Selected Remedy and Performance Standards) of the 2005 ROD.

### 9.2.3 New Alternative

The New Alternative consists of the following elements:

#### *9.2.3.1 Excavation and Consolidation of Contaminated Soils, Sediments, and Marshes*

The New Alternative involves excavation of contaminated soils to two feet below ground surface, placement of a geotextile demarcation layer over the underlying soil, and installation of two feet of clean fill consisting of at least six inches of a vegetative soil layer. These activities will occur in areas with dry weathered surface creosote and areas where TPAHs exceed 600 ppm (wetland mitigation banking is no longer an intended reuse of the Site; however, where wetlands are created the TPAHs cleanup will be to below 150 ppm). The geotextile demarcation will serve as a warning liner that contaminated soil may be present below. By replacing the top two feet with clean fill/vegetative layer, direct contact with contaminants will be minimized (implementation of institutional controls discussed later will further reduce or eliminate such contact). Excavated soil will be consolidated on-Site into a single Containment Area with amendments for geotechnical stabilization added as necessary to achieve adequate compaction and slope stability.

The New Alternative includes excavation of contaminated sediments (including sediments in the channels and marsh/wetland areas) to a depth of two feet below current sediment surface, installation of a reactive core mat over the underlying sediments, and installation of two feet of clean fill that is comparable in composition to the native sediment and consisting of at least six inches of a vegetative layer (a vegetative layer will not be necessary within the Hershey Run Channel and West Central Drainage Channel). These activities will occur where sediments in the channels, wetlands, and marsh sediments are contaminated with greater than 150 ppm TPAHs. Activities at the Upper South Pond will be similar, but excavation will be to five feet (or to greater depth to provide stabilization) because the softer sludge-like material in this area requires deeper excavation for proper stabilization. Excavated material will be consolidated on-Site into the Containment Area with amendments for geotechnical stabilization added as necessary to achieve adequate compaction and slope stability. Areas in channels (West Central Drainage Channel and Hershey Run Channel) will include excavation extending over the top of the bank and beyond the channel to allow adequate anchorage of the reactive core mats and to ensure contamination is not migrating along the perimeter of the covers and through un-remediated banks. Shallow groundwater samples will be collected to evaluate if groundwater contamination is present outside the boundary of the reactive core mat and if contamination is migrating along the perimeter of the covers over time.

The New Alternative will include filling in a portion of the existing Hershey Run that will not be within the Containment Area and will not be tied into the realignment of Hershey Run. Within this portion of Hershey Run (between the realignment tie-in and the Containment Area) a reactive core mat will be installed at the base of the channel and excavated area, with the installation of clean fill that is comparable in composition to the native sediment, with at least six inches of a vegetative layer.

The reactive core mat will serve as an effective barrier between any underlying impacted sediments and will inhibit upward migration of residual TPAHs in porewater by acting as a permeable adsorptive barrier. The clean two feet of fill will allow for the reestablishment of an ecologically diverse wetland system. The root system of the wetland plant community is expected to facilitate biodegradation of PAHs. By replacing the top two feet with clean fill, direct contact with contamination will be minimized

#### *9.2.3.2 Consolidation/Containment Area*

A Containment Area will be constructed to receive various contaminated media and debris from the Site. The Containment Area will be located where the greatest DNAPL impacts are found on the Site (it will occupy an estimated 10.5 acres and extend around the Fire Pond and Upper Hershey Run). The barrier walls surrounding the Containment Area will be designed to extend vertically into the low permeability unit (LPU) to achieve hydraulic control and groundwater migration control without the need for pumping or other active measures. Barrier walls will surround all sides of the Containment Area. If monitoring indicates the barrier walls are not functioning as designed, contingencies (*e.g.,* installation of a drain to discharge groundwater, pumping of the Containment Area, or other active measures), with necessary treatment as appropriate, will be implemented to prevent contaminated groundwater from exiting the Containment Area and/or to control the groundwater hydraulics within the Containment Area.

The consolidated materials within the Containment Area will be capped with a low permeability cap. The cap is intended to prevent direct contact between contaminated materials within the Containment Area and prevent infiltration of rain and surface water and withstand flood events. Final grading will promote drainage from the Containment Area and vegetative cover will prevent erosion.

A monitoring plan will be implemented to gather data regarding hydraulic control and migration of contaminated groundwater from inside the Containment Area. Monitoring will occur both inside and outside of the Containment Area to evaluate potential groundwater rise within the Containment Area that may pose a hydraulic pressure threat. Monitoring will also be used to evaluate whether contamination posing a risk to human health or the environment is exiting the Containment Area. If data shows pressure build up inside the Containment Area and/or the migration of contamination from inside the Containment Area to outside the Containment Area, contingencies such as those described above will be implemented. Additionally, groundwater levels upgradient of the Containment Area will be monitored to provide sufficient information to evaluate if the Containment Area is causing a rise in the groundwater elevation upgradient of the Containment Area that may affect potential flooding and action taken (e.g., a groundwater collection trench) to reduce such levels if needed.

Debris at the Site that is suspected of containing hazardous substances or pollutants or contaminants from historical Site operations (such as old railroad ties, underground storage tanks, underground piping, and concrete from old foundations) or which interferes with the cleanup will be consolidated and placed into the Containment Area. This action will remove the potential hazard posed to workers by the debris and enable excavation and grading of contaminated areas of the Site without the need to send truck traffic off-Site for debris disposal.

Additionally, underground piping previously discovered and discovered during remedy implementation that may act as a conduit for contamination migration will be managed (e.g., adequately, plugged, grouted, or removed as debris) to prevent hazardous substances or pollutants or contaminants from being released to the environment. During remedial investigation activities, underground piping was found from the South Pond Areas to the Former Process Area.

#### *9.2.3.3 DNAPL Recovery Outside of the Containment Area*

DNAPL in the saturated zone that is recoverable and impacting groundwater is known to occur in three locations at the Site - the Containment Area, the Former Process Area, and the South Pond Areas. DNAPL will not be recovered in the Containment Area, but will rather be held in place along with the contaminants consolidated via barrier walls and a cap. The DNAPL in the saturated zone in the Former Process Area and South Pond Areas will be extracted to the extent practicable, as discussed below. Recovered DNAPL will be treated or recycled and disposed off-Site.

Extraction to the extent practicable will require a demonstration that DNAPL recovery has reached an asymptotic state, meaning the amount of DNAPL recovered in a given time period is approaching zero or is relatively insignificant. Existing wells within the Former Process Area and South Pond Areas where measurable DNAPL was encountered during the sampling identified in the *"Supplemental Remedial Design Investigation- 2/2018 Sampling of Installed Delineation Wells"* report will be monitored to determine if measurable DNAPL is entering these wells to further evaluate progress.

Additional DNAPL recovery wells may be added after DNAPL recovery begins to further target and remove source material in the subsurface.

DNAPL below the reactive core mats in the channels (West Central Drainage Channel and Hershey Run Channel) exists as discontinuous blebs or small thin seams and the impacts are localized. The reactive core mats will prevent the upward migration of contamination to the surface. Monitoring of shallow groundwater outside of the channels will occur to confirm groundwater contamination is limited to the confines of the channels.

#### *9.2.3.4 Groundwater*

The DNAPL in the saturated zone that is recoverable and contributing to groundwater contamination will be removed using recovery wells as described in Section 9.2.3.3 of this document. ICs will be implemented to prevent exposure to contaminated groundwater. Groundwater will be evaluated to (1) characterize the dissolved-phase groundwater conditions downgradient of areas subject to DNAPL recovery to facilitate the development of a future groundwater final remedy, (2) determine if contamination is migrating outside of the Containment Area, and (3) determine if groundwater outside of the West Central Drainage Channel and Hershey Run Channel is impacted by contamination below the reactive core mats.

A comprehensive groundwater cleanup plan will be the subject of a subsequent decision document. Deferring a comprehensive decision on groundwater cleanup allows for a more informed evaluation of conditions during and following Principal Threat Waste removal, which will better support selection of an appropriate final groundwater remedy.

#### *9.2.3.5 Realignment of Hershey Run*

Hershey Run will be rechanneled to avoid high contamination areas and areas where the Containment Area extends into the wetland areas and Upper Hershey Run.

A hydraulic analysis for the realignment of Hershey Run was performed to analyze the potential impacts on the Hershey Run flow conditions resulting from (1) realigning the northern stretch of Hershey Run, (2) excavating and backfilling a southern stretch of Hershey Run, and (3) constructing the barrier wall and Containment Area. The hydraulic analysis was also used to evaluate which sections of Hershey Run could be exposed to erosive velocities. The data was used in conjunction with the requirements in the Delaware Erosion and Sediment Control Handbook to propose appropriate outlet and channel protection for Hershey Run. The study demonstrated that the proposed realignment of Hershey Run will not produce erosive velocities, will not negatively impact surface water elevations (which are largely impacted by tidal elevations), and will not produce a net change in waterway hydraulics from the existing conditions at the Site. The design will additionally consider the potential for changed site conditions resulting from an increase in surface water velocity, consistent inundation, and other effects from rising sea levels and from increased intensity and prevalence of storms (including hurricanes and 500-year flow). A climate vulnerability assessment will be performed, and the design will incorporate the findings.

##### *9.2.3.6 Wetlands*

Construction of the Containment Area and barrier wall, realignment of Hershey Run, and excavation in specific areas will impact wetland resources at the Site. Coordination with the appropriate regulatory agencies will be conducted to ensure that mitigation efforts satisfy applicable or relevant and appropriate substantive requirements in state and federal laws and regulations pertaining to impacted wetlands at the Site.

Implementation of the New Alternative will impact both tidal and freshwater wetlands. The New Alternative will result in a total of approximately 8.59 acres of permanent impacts due to the construction of the barrier wall and Containment Area and realignment of Hershey Run (approximately 8.18 acres of tidal areas and 0.41 acres of non-tidal freshwater wetland/Fire Pond). The remaining wetland impacts due to the removal of impacted sediments and dry weathered surface creosote are expected to be temporary. Areas where wetlands are negatively impacted by cleanup activities will be addressed through on-Site or off-Site mitigation to ensure no net loss of wetland function. Wetland mitigation will be accomplished through on-Site mitigation or mitigation within the Christina River Watershed, to the extent practicable.

##### *9.2.3.7 Use Restrictions (Institutional Controls)*

Land use restrictions will be established to restrict excavation of contaminated soils and sediments, restrict excavation in the Containment Area, protect remedy components, and prohibit residential development at the Site. Temporary Site-wide groundwater use restrictions will be implemented to restrict the extraction of groundwater and to prevent exposure to contaminated groundwater as part of the interim groundwater remedy until a final groundwater remedy is selected.

##### *9.2.3.8 Monitoring of Groundwater, Surface Water, Sediments, Biota, Porewater, Channels, and Caps/Covers to Ensure the Effectiveness of the Remedy*

Water levels and analytical data will be collected to evaluate performance of the Containment Area. Data will be obtained from the groundwater in the dissolved-phase plume(s) downgradient of areas where DNAPL is being recovered to evaluate the effectiveness of the DNAPL recovery. Additionally, shallow groundwater sampling outside of the Hershey Run Channel and West Central Drainage Channel will occur to verify groundwater is not impacted outside of the channels from contamination left below the reactive core mats. Surface water, sediments, porewater (above and below the reactive core mats), and biota will be monitored to evaluate the effectiveness of the remedy. Monitoring of the caps/covers (over the Containment Area and excavated areas) will occur to ensure they remain effective. A comprehensive monitoring plan will be developed as part of the Remedial Design to, among other things, establish the nature and frequency of monitoring activities. The monitoring plan will be evaluated and, if necessary, updated at least every five years as part of the FYR process.

# 10 SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

In this section, the 2005 Remedy alternative, the New Alternative, and No Action are compared to each other using the nine criteria set forth in 40 C.F.R § 300.430(e)(9)(iii). During the remedial decision process, EPA analyzes the relative performance of each alternative against the evaluation criteria, noting how each alternative compares to the other options under consideration. Additional information supporting this analysis of remedy alternatives can be found in the AR supporting this ROD Amendment. The nine criteria fall into three groups described as follows:

***Threshold criteria*** must be satisfied for a remedy to be eligible for selection.
***Primary balancing criteria*** are used to weigh major tradeoffs between remedies.
***Modifying criteria*** are considered after public comment is received on the Proposed Plan.

| Evaluation Criteria for Superfund Remedial Alternatives | |
|---|---|
| ***Threshold Criteria*** | 1. **Overall Protection of Human Health and the Environment** determines whether an alternative can adequately protect human health and the environment by eliminating, reducing, or controlling exposures to hazardous substances and pollutants or contaminants to levels that do not pose an unacceptable risk. |
| | 2. **Compliance with ARARs** evaluates whether an alternative meets Federal and more stringent State environmental laws or facility siting laws, or whether a waiver is justified. |
| ***Primary Balancing Criteria*** | 3. **Long-term Effectiveness and Permanence** considers the ability of an alternative to maintain protection of human health and the environment over time. |
| | 4. **Reduction of Toxicity, Mobility, or Volume of Contaminants through Treatment** evaluates an alternative's use of treatment to reduce the harmful effects of principal contaminants, their ability to move in the environment, and the amount of contamination present. |
| | 5. **Short-term Effectiveness** considers the length of time needed to implement an alternative and the risks the alternative poses to workers, residents, and the environment during construction. |

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| | 6. **Implementability** considers the technical and administrative feasibility of implementing an alternative, including factors such as the relative availability of goods and services. |
| | 7. **Cost** includes the estimated capital and annual operation and maintenance costs, as well as present worth cost of an alternative. Present-worth cost is the total cost of an alternative over time in today's dollar value. Cost estimates are expected to be accurate within a range of +50 to -30 percent. |
| ***Modifying Criteria*** | 8. **State/Support Agency Acceptance** considers whether the State agrees with EPA's analyses and recommendations, as described in the Feasibility Study and Proposed Plan. |
| | 9. **Community Acceptance** considers whether the local community agrees with EPA's analyses and preferred alternative. Comments received on the Proposed Plan are an important indicator of community acceptance. |

The following subsections summarize the comparative analysis evaluation of the remedial alternatives developed for the Site against the nine evaluation criteria.

## 10.1 Overall Protection of Human Health and the Environment

This criterion addresses whether each alternative provides adequate protection of human health and the environment and describes how risks posed through each exposure pathway are eliminated, reduced, or controlled through treatment, engineering controls, and/or institutional controls.

As determined in the 2005 ROD, the No Action alternative does not meet this threshold criteria. The No Action alternative was eliminated from consideration under the remaining eight criteria in the 2005 ROD and is eliminated from consideration under the remaining eight criteria in this evaluation.

Both the 2005 Remedy and the New Alternative would protect human health and the environment by eliminating contact with contaminated soils, sediments, and groundwater by humans and biological receptors. The specific methodology for each alternative is described below.

| 2005 ROD | New Alternative |
|---|---|
| This alternative addresses soil-related risks by removing and replacing all soil contaminated above the Site-specific cleanup level of 600 ppm TPAHs, and all soils that were to be converted to wetlands by removing all TPAHs greater than 150 ppm. Removed soil will be consolidated on-Site into one or two containment areas which will be covered. ICs will protect the cover(s). These actions eliminate the contact threat. | This alternative addresses soil-related risks by removing and replacing the top two feet of soil contaminated with TPAHs above 600 ppm (if wetlands are created on-Site, TPAHs cleanup below 150 ppm is required). Removed soil will be consolidated into a single Containment Area, which will be covered. A geotextile demarcation will be placed on the underlying soils below two feet of clean fill. ICs will protect these covers. These actions will eliminate the contact threat. |
| This alternative addresses sediment-related risks by excavating sediments above the Site-specific cleanup level of 150 ppm TPAHs in the South Pond Areas, Hershey Run and adjacent marshes and the West Central Drainage Area. Risks in the Fire Pond will be addressed by filling the Fire Pond as part of the consolidation of contaminated soils and sediments. These actions eliminate the contact threat. | This alternative addresses sediment-related risks by removing the upper two feet of sediment containing TPAHs above 150 ppm within channels and adjacent marshes (the upper five feet of material in the upper South Pond will be removed because the softer sludge-like material in this area requires deeper excavation for proper stabilization). A reactive core mat and clean fill will be placed atop remaining contaminated sediments. ICs will protect these covers. These actions eliminate the contact threat. |
| This alternative addresses risks from groundwater by removing DNAPL in the saturated zone and addressing groundwater under a single decision document. | This alternative will mitigate risks from groundwater using ICs. Data from DNAPL removal from the saturated zone and monitoring at downgradient areas will be used in selecting a comprehensive groundwater remedy at a later time. |

## 10.2 Compliance with ARARs

CERCLA § 121(d) and NCP § 300.430(f)(1) (ii)(B), require that remedial actions at CERCLA sites at least attain legally applicable or relevant and appropriate Federal and state requirements, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under Federal or state law (ARARs) unless waived under CERCLA § 121(d)(4) and NCP § 300.430(f)(1)(ii)(C).

"Applicable requirements" are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under Federal environmental or state environmental or facility-siting laws that specifically address a hazardous substance or pollutant or contaminant, remedial action, location, or other circumstance at a CERCLA site. Only those state standards that are identified by a state in a timely manner and that are more stringent than Federal requirements may be applicable.

"Relevant and appropriate requirements" are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under Federal environmental or state environmental or facility-siting laws that, while not "applicable" to a hazardous substance, pollutant or contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well-suited to the particular site. Only those state standards that are identified by a state in a timely manner and that are more stringent than Federal requirements may be relevant and appropriate.

The "To Be Considered" (TBC) category consists of advisories, criteria, or guidance that EPA, other federal agencies, or states developed that may be useful in developing CERCLA remedies. TBCs are identified on an as-appropriate basis.

Both the 2005 Remedy and the New Alternative will meet ARARs that are not waived.

The 2005 Remedy addresses all media as a final remedy; ARARs are identified in Table 8 of the that document.

The major ARARs for the New Alternative include:

- *State and Federal Water and Air Discharge Requirements.* This includes air emissions requirements for any excavation or on-Site treatment, water discharge or re-injection for dewatering during construction activities, and for groundwater collected in the recovery of NAPL.

- *State Water Quality Standards.* Any surface water discharge would meet the substantive requirements of the NPDES program and would be monitored to ensure compliance with these standards.

- *National Historic Preservation Act*. Adverse impacts to historic properties arising from implementation of the remedial action would be mitigated.

- *RCRA Hazardous Waste Disposal Regulations.* All excavated creosote (a listed waste) would be consolidated within an "area of contamination" without triggering RCRA's "land-ban" regulations.

- *Generators of Hazardous Waste and Owners and Operators of Hazardous Waste Treatment Storage and Disposal Facilities.* Establishes standards and regulations to generators of hazardous waste and acceptable management of hazardous waste.

- *Wetlands Regulations*. Mitigation steps (*e.g*., replacement of wetlands) would be implemented to address impacts to wetlands.

The New Alternative consists of a final remedy to address soils, sediments, and DNAPL in the saturated zone serving as a source for groundwater contamination (Final Action) and an interim action to address certain risks presented by groundwater contamination (Interim Action). The New Alternative assumes that a final groundwater remedy will be selected in a subsequent decision document.

CERCLA §121(d)(4)(A) provides that EPA may select an action that does not meet an ARAR if the selected action "is only part of a total remedial action that will attain such level or standard of control when completed." The Interim Action under the New Alternative would be an interim remedial action and would be part of a total remedial action for contaminated groundwater at the Site. While the final action for groundwater (to be selected in a later decision document) would seek to restore the aquifer to beneficial use, the Interim Action component of the New Alternative includes limited action to prevent contact with contaminated groundwater. Because the Interim Action component of the New Alternative is an interim action which does not seek to restore the groundwater to beneficial use, EPA would waive, and the Interim Action component of the New Alternative would not meet, ARARs establishing groundwater cleanup standards. Specifically, EPA would waive the requirement that contaminants of concern in Site groundwater meet their respective MCLs and non-zero MCLGs established under the Safe Drinking Water Act, 40 U.S.C. §§ 300f, et seq.

A more complete presentation of ARARs for the New Alternative can be found in Table 2 of Section IV of this document.

## 10.3 Long-Term Effectiveness and Permanence

Long-Term Effectiveness and Permanence refers to expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time, once performance standards have been met. This criterion includes consideration of the magnitude and effectiveness of measures that may be required to manage the risk posed by treatment residuals and/or untreated wastes that will remain on-site following remediation.

Both the 2005 Remedy and the New Alternative achieve long-term effectiveness and permanence. The 2005 Remedy achieves long-term effectiveness and permanence through deep excavations, monitoring, maintenance, and ICs. The New Alternative does this via shallow excavations, installation of respective covers, recovery of DNAPL in the saturated zone, monitoring, maintenance, and ICs. The specific means for such achievement for each alternative is described below.

| 2005 ROD | New Alternative |
| --- | --- |
| By consolidating all impacted soil and sediment into the containment area(s) and conducting long-term maintenance of the containment area(s), long-term effectiveness and permanence are achieved. | By consolidating the upper two feet (5 feet in Upper South Pond) of impacted soil and sediment into the Containment Area, conducting long term maintenance of the Containment Area and cap/soil covers, conducting long term-monitoring of groundwater in downgradient areas, and |

| | |
|---|---|
| | evaluating COC concentrations in various media to ensure remedy effectiveness, long-term effectiveness and permanence are achieved. |
| By controlling DNAPL flow from within the containment area(s) over time, long-term effectiveness and permanence is achieved. | Containing DNAPL within the Containment Area, routine maintenance of the Containment Area, monitoring to detect migration of contamination from the Containment Area and hydraulic control within the Containment Area, implementing contingencies to address any such migration or to achieve hydraulic control (if necessary), and implementing ICs to protect barrier walls and the cap achieve long-term effectiveness and permanence. |
| By excavating DNAPL source material in the subsurface outside of the containment area(s), long-term effectiveness and permanence is achieved. | DNAPL recovery via recovery wells removes potentially mobile and recoverable DNAPL in the saturated zone outside the Containment Area that serves as an ongoing source of contamination to groundwater. Removal of principal threat waste outside of the Containment Area, monitoring groundwater to evaluate effectiveness, and implementing groundwater use restrictions accomplishes long-term effectiveness and permanence until a final groundwater remedy is implemented. |
| Institutional controls achieve long-term effectiveness and permanence by protecting the integrity of the containment area(s) and cap(s), and restricting contact with contaminated soil, sediment, and groundwater. | Institutional controls achieve long-term effectiveness and permanence by protecting the integrity of the respective covers and the Containment Area; preventing contact with contaminated soil, sediment, and groundwater; and prohibiting residential use. |

## 10.4 Reduction of Toxicity, Mobility, or Volume Through Treatment

Reduction of toxicity, mobility, or volume through treatment refers to the anticipated performance of the treatment technologies that may be included as part of a remedy. Both the 2005 Remedy and the New Alternative reduce the toxicity, mobility, or volume of contaminants through treatment.

The 2005 Remedy includes passive recovery of groundwater within the containment area(s). This recovered groundwater would be collected and treated.

Under the New Alternative, DNAPL in the saturated zone extracted outside the Containment Area will be recycled or treated and disposed at an off-site RCRA facility. Groundwater restoration outside of the Containment Area will be determined in a subsequent decision document.

## 10.5 Short-Term Effectiveness

Short-Term Effectiveness addresses the period of time needed to implement the remedy and achieve protection, as well as any adverse impacts that may be posed to workers, the community, and the environment during construction and operation of the remedy until the performance standards are achieved.

Both the 2005 Remedy and the New Alternative are effective in the short-term, but the New Alternative is more effective in the short-term for several reasons. A comparison of short-term effectiveness for the 2005 ROD and New Alternative is described below.

| 2005 ROD | New Alternative |
|---|---|
| Significantly more soils and sediment would need to be excavated; requiring extensive excavations below the water table and therefore causing continuous storage, treatment, and disposal of wastewater to be required to prevent releases to the environment. | Shallower excavations will result in fewer complications associated with removal of contaminants beneath the water table. The estimated decrease in volume resulting from the use of shallow excavations in the soils and sediments is approximately 680,000 cubic yards. This reduction in volume will shorten the project duration. |
| Excavating to great depths to remove DNAPL in the saturated zone gives rise to technical difficulties that will extend project duration. | Removing DNAPL in the saturated zone that is an ongoing source to groundwater contamination via recovery wells minimizes excavations beneath the water table. This would result in shorter project duration to address these implications. |
| Greater level of effort regarding erosion and surface water controls to minimize releases into Hershey Run and White Clay Creek. | Less excavation reduces risk of release into Hershey Run and White Clay Creek. |
| Greater level of effort regarding monitoring and controlling release of dust and airborne contaminants during excavation and stockpiling. | Less excavation reduces risk of dust and airborne contaminants during excavation and stockpiling. |
| Greater volume of excavated materials will require larger and/or a second containment area/barrier walls. | Less volume of excavated soil and sediment results in the need for a single containment area of simpler construction which will reduce project duration. |

| | |
|---|---|
| Significant amount of clean fill needed for excavation areas. This was not contemplated at the time the 2005 ROD was issued because the intended reuse of the Site was for wetland mitigation banking. Because this is no longer an intended reuse, a significant amount of clean fill would be required. | Less clean fill needed, reducing project duration. |

## 10.6 Implementability

Implementability addresses the technical and administrative feasibility of a remedy from design through construction and operation. Factors such as availability of services and materials, administrative feasibility, and coordination with other governmental entities are also considered.

Both the 2005 Remedy and the New Alternative are readily implementable, but the reduction in excavation volume and depths (especially in areas originally intended for wetland banking); the reduction in the number of containment areas to be constructed and capped; the more practicable method for extracting DNAPL in the saturated zone; less demanding slope stabilization efforts; less excavation below the water table; and less construction time in the tidal marshes give a significant implementability advantage to the New Alternative. A comparison of implementability for the 2005 ROD and New Alternative is below.

| 2005 ROD | New Alternative |
|---|---|
| Requires coordination with the local authorities and adjacent property owners for access. Requires deep excavations in upland areas and in channels. Deep excavations would be difficult to implement because of slope stability and water infiltration while excavating below the water table. Deep excavations in channels would be further complicated by the twice-daily tide cycles that affect the channels and flood the adjacent marshes. Requires large volume of clean material from off-Site sources to fill in excavation areas and Containment Area. | Requires coordination with the local authorities and adjacent property owners for access, but because the amount of clean fill required to implement the remedy is significantly reduced as a result of shallow excavations, coordination efforts are likely reduced. Minimizes the amount of soil and sediment to be excavated. Excavation depths would be shallow, and the excavations and installation of associated covers will be easier to implement than deep excavations. Less material would be moved, making this alternative easier to implement. Less imported clean material is needed because the excavation would be shallower and because only one containment area would be constructed. The estimated decrease in excavations necessary as a result of shallow excavations in the soils and sediments is approximately 680,000 cubic yards. |
| Results in construction of one or two containment areas with associated caps. | Results in construction of a single containment area and cap and multiple covered areas (geotextile demarcation and |

| | |
|---|---|
| | reactive core mats) of simpler construction than a second or larger containment area. |
| Removes all impacted sediments from the channels, which would be difficult given the variable excavation depths, tidal environment, and difficulties excavating in a saturated environment. | Removes shallow sediments and installs reactive core mats, which are easier to implement than complete removal of contaminated sediments given the tidal environment. |
| Removes all impacted soils. During excavation, DNAPL encountered in the saturated zone would be collected and disposed of off-Site. Deeper excavations to remove the DNAPL in the saturated zone in the Former Process Area and South Pond Area are harder to implement due to the inherent difficulties of excavating in a saturated environment. Additionally, continuous storage, treatment, and disposal of wastewater due to excavation below the water table would be necessary. | Removes shallow impacted soils via excavations and installs a geotextile demarcation. Removes DNAPL in the saturated zone that is recoverable and is a contributing source to groundwater contamination via recovery wells. Minimizing excavation of soils in a saturated environment reduces the technical difficulties and the storage, treatment, and disposal of wastewater due to excavation below the water table. |
| Requires slope stability controls for deep upland excavations and deep channel excavations. | Requires fewer slope stability controls during excavation and capping of shallow sediment and upland excavations. |
| Deeper excavations increase the potential for soil and sediment washout during an extreme weather event. | Shallow excavations present a reduced potential for washout during an extreme weather event. |
| Deeper excavations increase the need for dewatering of excavated or dredged materials. | Shallow excavations present a reduced need for dewatering of excavated materials. |

## 10.7 Cost

Both the 2005 Remedy and the New Alternative are cost-effective, but the New Alternative is less expensive. A summary of each alternative under this criterion is discussed below.

| 2005 ROD | New Alternative |
|---|---|
| The 2005 ROD estimated capital and O&M costs at \$51,760,000 with an additional \$8,530,000 for wetland creation. Based on a 2018 estimate, capital and O&M costs were estimated at \$103,207,000; this estimate accounts for uncertainty associated with the | Based on a 2018 estimate, and further detailed in December of 2021 (Table 1 of this document) capital and O&M costs are estimated at \$39,645,546. This estimate has less uncertainty than that in the 2005 ROD because the extent of remediation is more |

| | |
|---|---|
| extent of remediation and groundwater cleanup. | fully defined and uncertainties identified in the 2005 ROD were resolved during Remedial Design investigations. |

## 10.8 State Acceptance

EPA and DNREC have consulted closely during preparation of the PRAP and ROD Amendment. DNREC concurred with the Selected Remedial Action in a letter dated June 29, 2022.

## 10.9 Community Acceptance

EPA held a 30-day public comment period from March 2, 2021, through March 31, 2021. Due to the public health concerns at that time, an in-person public meeting was not held. As a substitute for the public meeting:

1. EPA published, on the internet, a recorded video presentation containing information EPA would have shared at the public meeting had the meeting been held in person.
2. EPA hosted a question and answer session on March 17, 2021 from 6:00pm-7:00pm. This session provided an opportunity for the public to raise, with EPA personnel and others on the call, questions and issues regarding the Proposed Plan. No members from the community called in to raise questions or concerns.

Because of a request for an extension to the public comment period, EPA extended the public comment period from April 14, 2021 through May 14, 2021. A summary of the public comments and EPA's responses is included in the Responsiveness Summary as a Part III of this ROD Amendment.

# 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 (NCP § 300.430(a)(1)(iii)(A)). The principal threat concept is applied to the characterization of source materials at a Superfund site. Source material is material that includes or contains hazardous substances and/or pollutants or contaminants that act as a reservoir for migration of contamination (e.g., to groundwater). Principal threat wastes are those source materials considered to be highly toxic or highly mobile which would present a significant risk to human health or the environment should exposure occur. The decision to treat these wastes is made on a site-specific basis through a detailed analysis of the alternatives using the nine remedy selection criteria.

EPA characterizes waste as either principal threat waste or low-level threat waste. While contaminated groundwater is generally not considered to be a source material, NAPL in groundwater may be viewed as source material. The New Alternative addresses the principal threat waste in the soils, sediments, groundwater, and the subsurface (the DNAPL in the saturated zone and the surface soils and sediments that act as a source for direct exposures). The resulting cleanup will facilitate further evaluation for a final remedy of groundwater outside the Containment Area after the principal threat waste is removed or contained.

The New Alternative addresses principal threat waste by (1) extracting, for treatment or recycling, using recovery wells, DNAPL in the saturated zone outside of the Containment Area serving as an ongoing source to groundwater contamination, and (2) eliminating direct contact threat by excavating shallow soils and sediments that are contaminated, placing the appropriate cover over the underlying soils/sediments, and placing excavated material into the Containment Area.

Treatment of material inside the Containment Area is not necessary because a cap will be placed atop the Containment Area to prevent direct contact and barrier walls will surround the Containment Area on all sides to prevent contamination migration from exiting the Containment Area.

# 12 SELECTED REMEDIAL ACTION

Following review and consideration of the information in the AR file and the requirements of CERCLA and the NCP, EPA has selected the New Alternative as the remedy to replace the action selected in the 2005 ROD. The Selected Remedial Action consists of a Final Action for soils, sediments, and DNAPL in the saturated zone serving as a source for groundwater contamination and an Interim Action for groundwater. The estimated cost to implement the New Alternative is $39,645,546.

The Final Action includes the following:

- Construction of a containment area on-Site for the placement of excavated materials and debris (Containment Area).
- Realignment of Hershey Run around the Containment Area.
- Installation of barrier walls around all sides of the Containment Area with monitoring to ensure the barrier walls function as designed.
- Excavation of contaminated soils, placement of a geotextile demarcation layer, and backfilling.
- Excavation of contaminated sediments (including channels and marsh/wetland areas), placement of a reactive core mat, and backfilling.
- Placement of excavated soils, sediments, and collected debris into the Containment Area.
- Capping the Containment Area.
- Recovery and off-Site treatment and disposal, or recyling, of the recoverable DNAPL in the saturated zone outside of the Containment Area.
- Mitigation of effects to wetlands impacted by the remediation.
- Implementation of institutional controls to protect the components of the remedy and to prevent residential development.
- Monitoring of, surface water, sediment, biota, groundwater, porewater, and caps/covers.

The Interim Action includes the following:

- Institutional controls to prevent use of groundwater.

The major components are shown visually on Figure 3. The Selected Remedial Action and performance standards are described in detail below.

## 12.1 Rationale

The Selected Remedial Action best satisfies the threshold and balancing evaluation criteria explained in Section 10 of this ROD Amendment. Both the 2005 Remedy and the Selected Remedial Action are readily implementable, but the reduction in excavation volume and depths, less demanding slope stabilization efforts, less excavation below the water table, and less construction time in the tidal marshes gives a significant implementability advantage to the Selected Remedial Action. The Selected Remedial Action also provides a more practicable method for extracting DNAPL in the saturated zone. The Selected Remedial Action is also more effective in the short-term because less excavation is required. Excavations below the water table are significantly reduced, thereby increasing the short-term effectiveness of the Selected Remedial Action when compared to the 2005 Remedy. This would result in a shorter construction duration, thereby reducing potential risks and impacts to the community from construction vehicles and operations in the area.

The Selected Remedial Action defers a comprehensive groundwater action to allow for evaluation of groundwater conditions during and following principal threat waste removal. Such information may inform the selection of the final action for groundwater.

## 12.2 Final Action Components and Performance Standards

The Final Action portion of the Selected Remedial Action includes the components and performance standards identified below. The Final Action shall be designed, implemented, operated, and maintained consistent with the requirements of the Programmatic Agreement identified in Section 1.5, any amendments to the Programmatic Agreement, and any replacement to the Programmatic Agreement that may be executed in connection with the Selected Remedial Action.

### 12.2.1 Relocate a Portion of the Existing Channel of Hershey Run Around the Containment Area

The Containment Area will extend into the Hershey Run channel; therefore, the portion of Hershey Run impacted by the construction and operation of the Containment Area will be relocated away from the Containment Area.

#### *12.2.1.1 Performance Standards for Relocating a Portion of the Existing Channel of Hershey Run Around the Containment Area*

1. Relocate the portion of the existing channel to be impacted by the construction and operation of the Containment Area.

2. Configure the relocated channel so that the capacity of Hershey Run conveys both normal water levels (including the incoming and outgoing tides) and storm water runoff in a manner similar to the original channel to prevent any increased negative effects to the area (e.g., abnormal flooding). The design will consider the potential for changed site conditions resulting from an increase in surface water velocity, consistent inundation, and other effects from rising sea levels and from increased intensity and prevalence of storms (including hurricanes and 500-year flow). A climate vulnerability assessment will be performed, and the design will incorporate the findings.

3. Construct the relocated portion of the channel to restore and preserve the environmental nature, quality, and function of the original channel to protect fish and other wildlife resources.

### 12.2.2 Construction of the Containment Area

Construct a single Containment Area in the location identified in Figure 3.

#### *12.2.2.1 Performance Standards for the Construction of the Containment Area*

1. The Containment Area shall be of sufficient size and build to hold

    a. all contaminants currently in the footprint of the Containment Area;
    b. all contaminated soils, sediments, and debris excavated as part of the remedy that are to be consolidated into the Containment Area; and
    c. any amendments needed to meet compaction and slope requirements

until EPA, in consultation with the State of Delaware, determines that containment of such materials is no longer necessary to protect human health or the environment.

### 12.2.3 Construction of Groundwater Barrier Wall

Construct a continuous groundwater barrier wall using a slurry wall(s) and/or sealed sheet piling around all sides of the Containment Area to prevent the migration of Containment Area contents from inside to outside the Containment Area.

#### *12.2.3.1 Performance Standards for Groundwater Barrier Wall*

1. The barrier wall shall be constructed and maintained to prevent migration of contaminated groundwater and NAPL from inside the Containment Area to outside the Containment Area until EPA, in consultation with the State of Delaware, determines that containment of contaminated groundwater and DNAPL in the Containment Area is no longer necessary to protect human health and the environment.

2. The barrier wall shall surround all sides of the Containment Area, shall be impermeable ($10^{-7}$ cm/sec) to groundwater, and shall extend to such depth as to key into the clayey low

permeability unit (LPU) layers in the subsurface (at a minimum 10 feet into the LPU) to prevent groundwater from entering or exiting the Containment Area.

### 12.2.4 Monitor the Elevation of Groundwater Inside and Outside the Containment Area and Monitor Groundwater Outside the Containment Area; Implement Actions to Address the Migration of Contamination from Inside to Outside the Containment Area and Mounding in the Containment Area (if Necessary).

The groundwater inside the Containment Area shall be monitored in such a way as to provide sufficient information to evaluate if mounding inside the Containment Area is occurring, and to evaluate if contamination is migrating from inside to outside of the Containment Area. In the event that contamination is found to be migrating from inside to outside of the Containment Area, or mounding inside the Containment Area is occuring, action shall be taken to prevent further migration or mounding. Such actions may consist of, among other things, installation of a drain to discharge groundwater, pumping of the Containment Area, or other active measures. Additionally, groundwater elevations upgradient of the Containment Area shall be evaluated and actions taken in the event that rising elevations create a potential for flooding. Such actions may consist of, among other things, a groundwater collection trench.

#### *12.2.4.1 Performance Standards for Monitoring the Elevation of Groundwater Inside and Outside the Containment Area and Monitoring Groundwater Outside of the Containment Area; Implementing Actions to Address the Migration of Contamination from Inside to Outside the Containment Area and Mounding in the Containment Area (if Necessary).*

1. Monitor the hydraulic head of groundwater inside and outside of the Containment Area to evaluate if groundwater inside the Containment Area is lower than the surrounding areas outside the Containment Area (thereby creating an inward gradient which will minimize the risk of contaminated groundwater entering into the deeper aquifer or exiting the Containment Area). The nature and frequency of this monitoring shall be sufficient to permit periodic evaluation of the effectiveness of the Containment Area and shall be determined during the Remedial Design. Such monitoring shall continue until EPA, in consultation with the State of Delaware, determines that this monitoring is no longer necessary to ensure the effectiveness of the Containment Area.

2. Monitor the groundwater outside the Containment Area to evaluate if groundwater contamination is migrating from the Containment Area. The nature and frequency of this monitoring shall be sufficient to permit periodic evaluation of the effectiveness of the Containment Area and shall be determined during the Remedial Design. Such monitoring shall continue until EPA, in consultation with the State of Delaware, determines that this monitoring is no longer necessary to ensure the effectiveness of the Containment Area.

3. Actions taken in the event groundwater elevations upgradient of the Containment Area cause a potential for flooding shall eliminate such potential.

4. Actions taken if hydraulic head risks are detected, or groundwater is found to be migrating from inside to outside of the Containment Area, shall eliminate such risks and migration.

### 12.2.5 Excavate and Consolidate Shallow Contaminated Soils and Sediments into the Containment Area

Construct roadways necessary to access areas to be excavated and to access the Containment Area. Translocate rare, threatened, or endangered flora populations present in excavation areas and areas within the limits of disturbance from the remedial action to alternate suitable locations in advance of excavation activities. Shallow soils and sediments exceeding cleanup levels and with visible dry weathered surface creosote shall be excavated and consolidated on-Site into the Containment Area with amendments for geotechnical stabilization added as necessary to achieve adequate compaction and slope stability.

#### *12.2.5.1 Performance Standards for Excavating and Consolidating Shallow Contaminated Soils and Sediments into the Containment Area*

1. Roadways needed in order to permit adequate access to areas to be excavated and to the Containment Area shall be constructed in a manner that minimizes disturbance to wetlands. Such roadways shall also be constructed to facilitate construction of the remedial action as well as such monitoring as may be necessary in the future in order to assess the continuing effectiveness of the remedy.
2. For soils outside of the boundary of the Containment Area:
    a. Soils Outside the Upper South Pond Area Where No Wetlands Will Be Created.
        i. Excavate, to two feet, (1) areas of visible dry weathered surface creosote, and (2) areas with soil containing TPAHs at concentrations greater than 600 ppm.
    b. Soils Inside the Upper South Pond Area Where No Wetlands Will Be Created.
        i. Excavate, to five feet (or to such greater depth that allows for proper stabilization), (1) areas of dry weathered surface creosote, and (2) areas with soil containing TPAHs at concentrations greater than 600 ppm.
    c. Soils Where Wetlands Will Be Created.
        i. If wetlands are created on-Site, excavation of soil with TPAHs above 150 ppm is required prior to construction of the wetland.
    d. For All Soil Excavations.
        i. Place a geotextile demarcation layer at the bottom of the soil excavations and install two feet of clean fill over the geotextile demarcation to meet the existing adjacent grade, which includes at least six inches of a vegetative layer (except for Upper South Pond). Upper South Pond shall

include the placement of a permeable reactive core mat at the bottom of the soil excavations and install five feet of clean fill (or proper amount of clean fill dependent upon depth of excavation) over the reactive core mat to meet the existing adjacent grade, which includes at least six inches of vegetation.

3. For sediments outside the boundary of the Containment Area (besides Hershey Run Channel and West Central Drainage Channel):

    a. Excavate, to two feet, (1) areas of visible dry weathered surface creosote, and (2) areas with sediment containing TPAHs greater than 150 ppm.

    b. Place a permeable reactive core mat layer at the bottom of the sediment excavation and install two feet of clean fill that is comparable in composition to the native sediment over the reactive core mat, which includes at least six inches of a vegetative layer. The reactive core mats shall prevent the contamination of the clean fill and adjacent soil and sediment that did not exceed cleanup levels prior to remediation.

4. For sediments inside the Hershey Run Channel and West Central Drainage Channel:

    a. Excavate, to two feet, (1) areas of visible creosote, and (2) areas with sediment containing TPAHs at concentrations greater than 150 ppm.

    b. Excavate over the top of the bank and beyond the channel to allow adequate anchorage of the reactive core mats and to ensure contamination is not migrating along the perimeters of the covers and through un-remediated banks.

    c. Place a reactive core mat layer at the bottom of the sediment excavation and install two feet of clean fill that is comparable in composition to the native sediment. The reactive core mats shall prevent the contamination of the clean fill and adjacent soil and sediment that did not exceed cleanup levels prior to remediation.

5. Consolidate all excavated material into the Containment Area.

6. Porewater, surface water and sediment samples shall be collected and analyzed throughout the Site to monitor the effectiveness of the reactive core mats. Porewater samples shall be taken from above and below the reactive core mat.

#### 12.2.6 Move Debris Necessary to Implement the Remedial Action and/or Debris that May be Contaminated from Site Operations into the Containment Area

Debris at the Site that is suspected of containing hazardous substances or pollutants or contaminants from historical operations at the Site (such as old railroad ties, underground storage tanks, underground piping, and concrete from old foundations), or which interferes with the cleanup shall be consolidated and placed into the Containment Area. Underground piping that may act as a conduit for contamination shall be managed (*e.g.,* treated as debris for consolidation into the Containment Area, plugging/grouting, etc.) to prevent hazardous substances from being released to the environment.

#### *12.2.6.1 Performance Standards for Moving Debris Necessary to Implement the Remedial Action and/or that may be Contaminate from Site Operations into the Containment Area*

1. All debris at the Site that (1) must be removed to facilitate implementation of the Selected Remedial Action, or (2) is suspected of being contaminated from historical operations at the Site shall be removed and placed into the Containment Area.

2. Cover debris with consolidated soil and sediment sufficiently to prevent debris from penetrating the sub-base of the Containment Area cap.

3. Underground piping that was discovered during the Remedial Investigation or found during the Remedial Action that may act as a conduit for contamination will be managed by treating as debris or adequately plugging or grouting to prevent hazardous substances from being released to the environment.

### 12.2.7 Install a Cap Atop the Containment Area

After debris and contaminated soils, sediments, and other materials required to be placed into the Containment Area have been consolidated into the Containment Area, install a cap atop the Containment Area. The cap will prevent direct contact with contaminated soils, sediments, and groundwater which would result in unacceptable exposure risks and divert rainwater. Final grading shall promote drainage off the cap. A vegetative cover shall be established on top of the cap to prevent erosion. Plants that provide habitat value shall be used to establish the vegetative cover.

#### *12.2.7.1 Performance Standards for Installing a Cap Atop the Containment Area*

1. The cap system to be installed shall be of such size and construction to:
    a. prevent direct contact with contaminated soils, sediments, debris, and groundwater within the Containment Area and
    b. prevent infiltration of surface water and rain into the Containment Area

until EPA, in consultation with the State of Delaware, determines that containment of the materials in the Containment Area is no longer necessary to protect human health and the environment.

2. Prepare the sub-base for the cap.

    a. Stockpiled soils, sediments, and debris shall be graded prior to installation of the sub-base to prevent penetration of the sub-base and aid in effective placement of the cap.

b. The sub-base (e.g., clean soil fill) shall be placed over consolidated material in the Containment Area and shall provide a clean base for the cap and shall be at least 6 inches thick.

c. The sub-base shall be graded and compacted to properly facilitate the diversion of water off of the cap.

d. The graded sub-base soils shall not contain stones or debris that could cause a puncture in the cap.

e. The sub-base shall cover the Containment Area in its entirety.

3. A geotextile layer shall be installed above the compacted sub-base layer as a measure of protection to the overlying geomembrane. The geotextile layer shall be installed across the entirety of the Containment Area and shall be constructed to protect the integrity of the overlying geomembrane.

4. A geomembrane/cap with a permeability of $1x10^{-7}$ cm/sec or less over the sub-base/geotextile shall be installed. The geomembrane shall be a low-permeability material (e.g., 40-mil high density polyethylene (HDPE)). The cap shall be installed to completely cover the sub-base.

5. A Geocomposite Drainage Layer shall be placed above the geomembrane to promote surface water infiltration drainage to the exterior of the Containment Area. The Geocomposite drainage material shall be installed across the entirety of the Containment Area.

6. Install a common fill layer to provide a base for vegetation and to protect the cap. The common fill shall be free of sharp objects or debris of any kind which could potentially damage the geosynthetics. The common fill layer shall be at least 12 inches thick that includes at least 6 inches of topsoil to vegetate the cap.

7. Vegetate and maintain the cap in such a way as to prevent erosion of soils. The vegetation on the cap shall use native grasses and forbs and shall be controlled so as to prevent or limit the growth of any plants which would damage the cap with deep root systems.

8. The cap shall be designed and constructed to function with minimum maintenance, to promote drainage and minimize erosion or abrasion of the cover, to accommodate settling so that the cover's integrity is maintained, and to provide adequate freeze protection.

9. The cap shall be designed and constructed to accommodate access to piezometers and/or monitoring wells at the Containment Area.

10. The cap shall be designed to permit gas venting to prevent air emissions exceeding levels that require control under Federal and State regulations unless field data obtained during

the remedial design determines VOC emissions beneath the cap would not exceed Federal and State regulations.

### 12.2.8 DNAPL Recovery in the Former Process Area and South Pond Areas and Evaluation of Groundwater Outside of Channels

DNAPL in the saturated zone in the Former Process Area and South Pond Areas shall be recovered via recovery wells. The recovered DNAPL shall be treated and disposed off-site or recycled. During and following DNAPL recovery, groundwater monitoring will be conducted to evaluate groundwater conditions downgradient from DNAPL-impacted areas and assess the performance of DNAPL recovery. Additional DNAPL recovery wells may be added after DNAPL recovery begins to further target and remove source material in the subsurface. Additionally, evaluation of groundwater outside of the Hershey Run Channel and West Central Drainage Channel will occur to evaluate impacts to groundwater, if any, from contamination left below the reactive core mats.

#### *12.2.8.1 Performance Standards for DNAPL Recovery in the Former Process Area and South Pond Areas and Evaluation of Groundwater Outside of Channels*

1. DNAPL recovery in the Former Process Area and South Pond Areas will continue until the DNAPL in the saturated zone is extracted to the extent practicable. Extraction to the extent practicable will require a demonstration that DNAPL recovery has reached an asymptotic cumulative recovery state.

2. Targeted wells that have been previously installed will be monitored to determine if measurable DNAPL is entering these wells. These wells are within the Former Process Area and South Pond Areas where measurable DNAPL was encountered during the sampling reported in the *"Supplemental Remedial Design Investigation- 2/2018 Sampling of Installed Delineation Wells"* report.

3. Groundwater monitoring shall be conducted to evaluate groundwater conditions downgradient from DNAPL-impacted areas and assess the performance of DNAPL recovery. The number and location of monitoring wells will be determined during the Remedial Design.

4. Monitoring of groundwater conditions outside of the West Central Drainage Channel and Hershey Run Channel shall occur to evaluate whether groundwater contamination impacts areas outside the confines of the channels.

5. DNAPL recovered shall be separated from groundwater (to the extent practicable), and treated and disposed of or recycled off-site, in accordance with CERCLA § 121(d)(3) and NCP § 300.440. DNAPL that is stored on-Site while awaiting off-site disposal or recycling shall be managed in accordance with RCRA requirements.

6. Monitoring reports shall be submitted to EPA at such frequency and in such detail to allow EPA to evaluate the DNAPL recovery rates, and groundwater contaminant

concentrations downgradient of DNAPL-impacted areas over time. The frequency of such monitoring reports shall be determined during the Remedial Design.

### 12.2.9 Mitigation of Wetlands

Construction of the Containment Area and barrier wall, realignment of Hershey Run, and excavation in specific areas will impact wetland resources at the Site. Coordination with the appropriate regulatory agencies will be conducted to ensure that mitigation efforts satisfy applicable or relevant and appropriate substantive requirements in state and federal laws and regulations pertaining to impacted wetlands at the Site. Wetland mitigation will be accomplished through on-Site mitigation or mitigation within the Christina River Watershed, to the extent practicable, and shall be included as part of the Remedial Design.

#### *12.2.9.1 Performance Standards for Mitigation of Wetlands*

1. Wetlands that are temporarily impacted due to the remedial activities will be restored so that such wetlands are of similar type, function, and ecological diversity as they were before commencement of remedial activities.

2. Wetlands that are permanently impacted (e.g., the Containment Area and realigned portion of Hershey Run) will be evaluated for off-site and on-Site mitigation efforts and mitigation shall be performed. Mitigation shall ensure similar type, function, and ecological diversity. To the extent practicable, mitigation shall occur within the Christina River Watershed.

3. Implementation of the Selected Remedial Action shall result in a no net loss of wetlands or wetland function.

### 12.2.10 Land Use Restrictions

Land use restrictions shall be implemented to (a) protect the remedial action components, including the Containment Area and covers installed atop excavations where geotextile demarcations or reactive core mats have been installed, and (b) prevent exposure to unacceptable risks associated with contaminants remaining at the Site.

#### *12.2.10.1 Performance Standards for Land Use Restrictions*

1. Land use restrictions shall:

    a. Prohibit excavations and other activities and uses that adversely impact the integrity of the cap, barrier walls, and other components installed during implementation of the remedial action at the Containment Area without prior written approval of EPA, in consultation with the State of Delaware.

    b. Prohibit excavations and other activities and uses that adversely impact the integrity of clean fill, reactive core mats, geotextile demarcations, or other components installed over underlying impacted soil and sediments at the Site without prior written approval of EPA, in consultation with the State of Delaware.

   c. Prohibit interference with the structure and function of restored wetlands and wetlands created as part of mitigation without prior written approval of EPA, in consultation with the State of Delaware.

   d. Prohibit residential development or use at the Site without prior written approval of EPA, in consultation with the State of Delaware.

2. The land use restrictions shall be implemented in such a way that are enforceable by the State of Delaware and run with the land under the laws of the State of Delaware.

3. Land use restrictions shall remain in place until EPA, in consultation with the State of Delaware, determines that they are no longer necessary to protect human health and the environment.

#### 12.2.11 Monitor Groundwater, Surface Water, Sediments, Biota, Porewater, Containment Area, Channels, and Caps/Covers to Permit Evaluation of the Remedy Performance

Collect and analyze information and data from the groundwater, surface water, sediments, biota, Containment Area, caps/covers, and other locations and media (including but not limited to monitoring addressed in the above performance standards) to facilitate the evaluation of the performance of the remedial action.

##### *12.2.11.1 Performance Standards for Monitoring Groundwater, Surface Water, Sediments, Biota, Containment Area, Channels, and Caps/Covers to Permit Evaluation of the Remedy Performance*

1. The location, frequency, and media for monitoring shall be sufficient to enable EPA to evaluate remedy performance for purposes of:

   a. determining if changes to the remedy are required to protect human health and the environment;

   b. conducting FYRs required by CERCLA or EPA policy; and

   c. evaluating remedy performance.

   The location, frequency, and media for monitoring shall be developed during the Remedial Design.

Adjustments to the monitoring plans shall be made as necessary in order to facilitate the evaluation of remedy performance over time.

## 12.3 Interim Remedial Action Components and Performance Standards

The Interim Remedy portion of the Selected Remedial Action includes the actions identified below. The Interim Action shall be designed, implemented, operated, and maintained consistent with the requirements of the Programmatic Agreement identified in Section 1.5, any amendments to the Programmatic Agreement, and any replacement to the Programmatic Agreement that may be executed in connection with the Selected Remedial Action.

### 12.3.1 Groundwater Use Restrictions

Implement institutional controls to prevent exposure to contaminated groundwater at the Site.

#### *12.3.1.1 Performance Standards for Groundwater Use Restrictions.*

1. Institutional Controls shall prevent human exposure to groundwater contaminated by the Site. Such controls shall prevent use of, and contact with, contaminated ground via ingestion, vapor inhalation, or dermal contact.
2. The Institutional Controls shall be implemented in such a way that they are enforceable and run with the land under the laws of the State of Delaware.
3. The Institutional Controls shall remain in place until EPA, in consultation with the State of Delaware, determines that they are no longer necessary to protect public health and/or the environment.
4. Creation, by the State of Delaware, of a groundwater management zone prohibiting the uses, at the locations, and for the duration identified above shall satisfy the requirement for Institutional Controls.

## 12.4 Cost Estimate

The estimated present worth of the total cost of the remedial action in this ROD Amendment is $39,645,546. A breakdown of the costs is provided in Table 1 Cost Breakdown.

## 12.5 Expected Outcomes of the Selected Remedial Action

Implementation of the Selected Remedial Action is expected to protect human health and the environment by mitigating unacceptable risks and satisfying the RAOs. The Selected Remedial Action includes a Final Action to address risks from soils, sediments, and DNAPL in the saturated zone serving as a source for groundwater contamination, and an Interim Action to address risks from groundwater contamination.

Implementation of the Final Action is expected to prevent current and future direct contact with contaminated soils and sediments that would result in unacceptable levels of risk and to minimize the ongoing contamination of groundwater from the presence of DNAPL in the saturated zone through removal and/or containment.

Implementation of the Interim Action is expected to prevent unacceptable risks due to exposure to contaminated groundwater.

# 13 STATURTORY DETERMINATION

## 13.1 Protection of Human Health and Environment

The Selected Remedial Action will achieve protection of human health and the environment by preventing direct contact with contaminated soils, sediments, and groundwater at the Site. This will be accomplished by (1) shallow excavation of contaminated soils and sediments with appropriate covers over the underlying soils and sediments, (2) consolidating excavated materials into a Containment Area to be capped, (3) implementing Institutional Controls to protect the remedy components, and (4) implementing Institutional Controls to prevent contact with groundwater contamination. A final action for groundwater will be selected in a separate decision document subject to public participation requirements.

## 13.2 Compliance with ARARs

The Selected Remedial Action will comply with ARARs that are not waived. Because groundwater is addressed in an Interim Action which will not restore the groundwater to beneficial use, EPA is waiving, and the Interim Action portion of the Selected Remedial Action will not meet, ARARs establishing groundwater cleanup standards.

## 13.3 Cost Effectiveness

NCP § 300.430(f)(1)(ii)(D) requires EPA to evaluate cost-effectiveness by comparing all the alternatives meeting the threshold criteria (protection of human health and the environment and compliance with ARARs) against long-term effectiveness; reduction of toxicity, mobility, or volume through treatment; and short-term effectiveness (collectively referred to as "overall effectiveness"). The NCP further states that overall effectiveness is then compared to cost to ensure that the remedy is cost-effective and that a remedy is cost-effective if its costs are proportional to its overall effectiveness. EPA has determined, following an evaluation of these criteria, that the Selected Remedial Action is cost-effective in providing overall protection in proportion to cost.

## 13.4 Utilization of Permanent Solutions to the Maximum Extent

The Final Action utilizes permanent solutions to the maximum extent practicable. The removal of DNAPL in the saturated zone, via recovery wells, provides a permanent solution to contamination in the subsurface that leads to an ongoing source to groundwater contamination. Additionally, the removal of shallow contaminated soils and sediments, installation of covers over the underlying soils and sediments, and placement of excavated soils and sediments into the on-Site Containment Area allows for a permanent solution to direct contact to the contamination.

The Interim Action for groundwater (institutional controls to prevent contact with contaminated groundwater) is not intended as a permanent solution and will be supplemented by a future remedy to be selected at a later date.

### 13.5 Five Year Review Requirements

Because the Selected Remedial Action will result in hazardous substances remaining on-Site above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted every five years after initiation of the remedial action pursuant to CERCLA § 121(c) and NCP § 300.430(f)(4)(ii) to determine if the remedial action remains protective of human health and the environment.

## 14 DOCUMENTATION OF SIGNIFICANT CHANGES

While not a fundamental or significant change, EPA notes that in the "Request for ROD Amendment Technical Document" and the Proposed Plan, the estimated cost was identified as $41,402,000, but the revised estimate documented in this ROD Amendment is $39,645,546. Costs were slightly modified for the following reasons:

1. Archaeological Evaluations costs were reduced because of more clarity on the range of mitigation alternatives and associated estimated costs for those measures;
2. Wetlands Construction/Mitigation costs were adjusted to reflect the possibility for on-Site restoration of temporary impacts and enhancements of existing on-Site waterways and wetlands to accomplish mitigation of permanent wetland impacts; and
3. Reduced decree of uncertainty in the final remedial action scope, thus reduction of Administration and Engineering from 15% to 10%.

There are no additional significant or fundamental changes to EPA's preferred remedial action as a result of public comments.

# III. RESPONSIVENESS SUMMARY KOPPERS CO., INC. (NEWPORT PLANT) SUPERFUND SITE RECORD OF DECISION AMENDMENT NEWPORT / NEW COUSTLE COUNTY, DELAWARE

This section summarizes the questions and comments received during the public comment period on the Proposed Remedial Action Plan for ROD Amendment for the Koppers Superfund Site issued March 2021. A thirty-day public comment period was held from March 2, 2021 to March 31, 2021 and an extension to that comment period was held from April 14, 2021 to May 14, 2021. Due to public health concerns at that time, an in-person public meeting was not held. As a substitute for the public meeting:

1. EPA published, on the internet, a recorded video presentation containing information EPA would have shared at the public meeting had the meeting been held in person; and
2. EPA hosted a question-and-answer session on March 17, 2021 from 6:00pm-7:00pm. This session provided an opportunity for the public to raise, with EPA personnel and others on the call, questions and issues regarding the Proposed Plan. No members from the public called into this public availability session.

The written comments received during the public comment period for the Proposed Plan and EPA's responses are below.

## 1 Comments Received from the National Oceanic and Atmospheric Administration (NOAA)

- **COMMENT #1:**
  NOAA is providing the following comments on the Proposed Remedial Action Plan for the ROD Amendment at the Koppers Inc (Newport Plant) Superfund Site. These comments are provided as part of CERCLA coordination by lead remedial agencies with natural resource agencies in the remedial selection process. NOAA's primary concern as a natural resource trustee are the resources and habitats in Koppers Marsh. The ROD Amendment, especially as it relates to groundwater, indicates that there are no current migration pathways from the Site to the marsh. NOAA accepts this conclusion based on the technical review of EPA hydrologists and recognizes this pathway will be monitored in the future.

    - ***EPA RESPONSE:***
      *EPA acknowledges your statement.*

- **COMMENT #2:**

The wetlands at the site include non-tidal and tidal freshwater wetlands. It should be clearly presented whether the potential wetland mitigation bank referenced numerous times in the Plan was intended for non-tidal or tidal wetlands or both. It appears it was just for non-tidal wetlands. Mitigation banking for DE DOT is no longer being explored at the site. Section II.F states that "Beazer is no longer interested in using the site for mitigation banking". This should not be confused with EPA and Beazer's requirements for wetland mitigation for impacts at the site from the remedy which should be done on site. The impacts to the marsh from remedial construction, although modified in this proposed plan, are significant and have been known for well over a decade. Natural resource trustees (NOAA, USFWS, and DNREC) have presented their concerns regarding wetland impacts and wetland mitigation strategies to EPA and Beazer on numerous occasions, including a formal presentation at a Koppers Site meeting in 2008. To date, EPA and Beazer have been non-committal in a wetland mitigation approach and it is further deferred in this proposed plan. That should not be acceptable and is not consistent with the intent of CWA Section 404 ARARs.

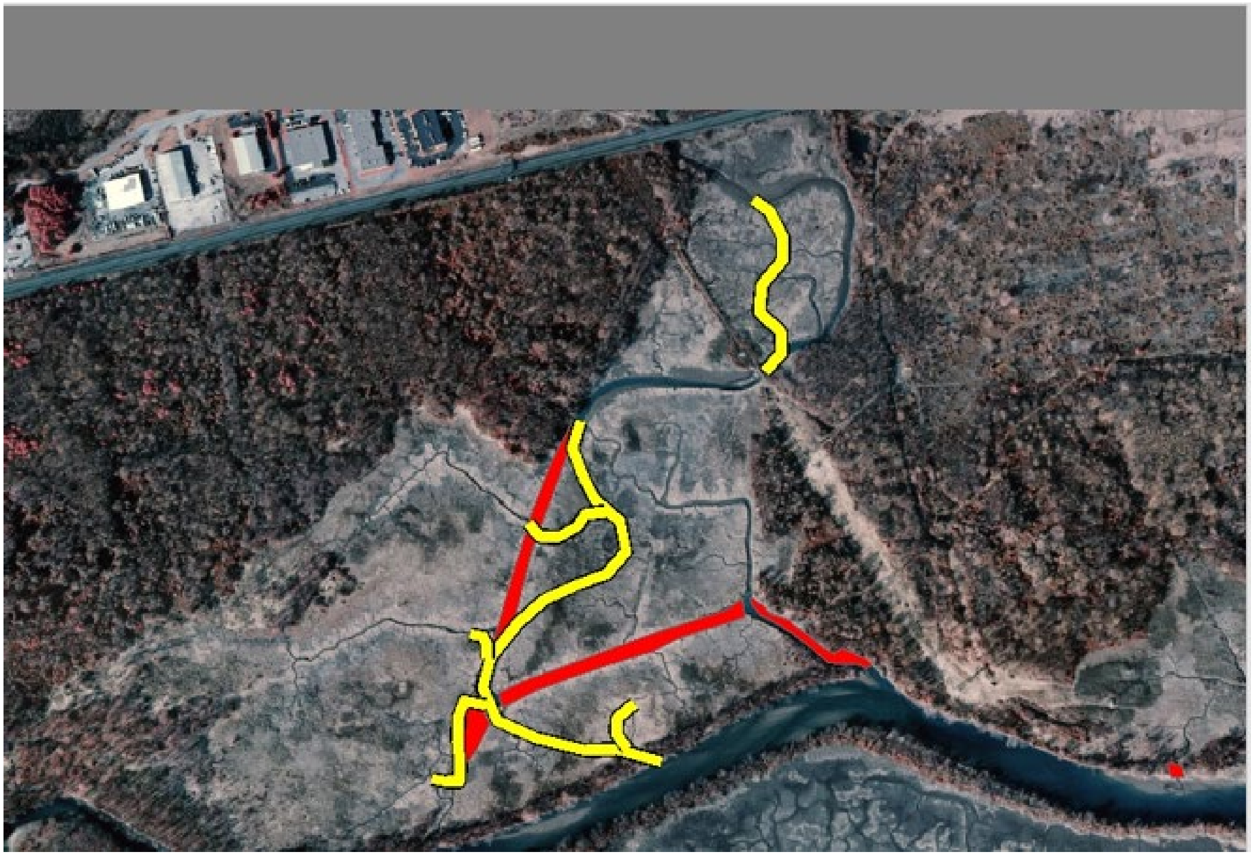
  - ***EPA RESPONSE:***

    *This ROD Amendment has made it clear to clarify that the mitigation goals will include ensuring no net loss of wetlands and that the preference will be to target in-kind (i.e., type and function) mitigation within the Christina River watershed. Implementation of the remedy will result in no net loss of wetlands or their functionality. EPA will continue to work with the appropriate Federal and State regulators to ensure all appropriate and applicable regulations are complied with.*

    *The appropriate wetland regulations have been identified as ARARs. Upon finalization of the ROD Amendment, a final remedial design will be developed to address the components of this ROD Amendment. The remedial design will include the development of wetland mitigation strategies. Until a remedial approach has been approved, it is premature to move any mitigation planning beyond a conceptual phase.*

- **COMMENT #3:**

The Koppers Site current conditions allow for a more comprehensive approach to the Site remediation which includes benefits to site wetlands. Contamination in Koppers Marsh is largely reported to be in the wetland channels. These wetland channels have been significantly altered historically (straightened and dredged with raised banks from spoils) and the current wetland channel network does not allow for good tidal wetland hydrological processes for the marsh plain. Capping the sediments in place and maintaining the current channel network will further impact the marsh and significantly impact potential future tidal wetland restoration efforts. Tidal freshwater wetlands are some of the most impacted wetlands in the Delaware Estuary. The Koppers Marsh is the highest priority freshwater tidal marsh restoration project in New Castle County and the State.



The EPA and Beazer should consider completely filling in the contaminated, highly altered, non-functioning existing channels (in red above) using clean material from Koppers Marsh as part of a comprehensive marsh cleanup and wetland mitigation project. This material would come from newly excavated channels (in yellow) that would restore the marsh hydrology and functionality and a healthy channel network. It would also provide better containment of the contamination in the existing channels by taking flow out of those channels; it would also minimize and/or potentially eliminate the need to bring new capping/fill material to the site.

- ***EPA RESPONSE***:
  *EPA's remedial action targets specific releases and threatened releases of hazardous substances contributing to risks to human health and the environment from operations at the former wood treatment facility. Some of the contamination that is the subject of the remedial action is found in marsh areas and EPA selected action by considering the selection criteria established in the National Contingency Plan. The selected action to address contamination in the marsh areas does not include complete filling of channels as described in your comment. The comprehensive marsh cleanup project to which you refer is not needed to address the human health and environmental risks to which the EPA's Superfund program must respond. Though there may be value in completing such work (we make no judgement about that here) it is not within the Superfund program's jurisdiction.*

- **COMMENT #4:**

Wetland mitigation is not just required for permanent losses and the mitigation is not limited to new "creation". Creation of new tidal wetlands will be very difficult. There are no wetland banks appropriate for mitigation needs for this site in the State. In addition, if mitigation is not conducted at the site this could present environmental justice concerns for the Newport community. Note the Koppers site is adjacent to another Superfund Site, DuPont Newport, where some mitigation was performed "on site".

  - ***EPA RESPONSE:***

    *EPA acknowledges NOAA's concerns. See the response to Comment #2.*

- **COMMENT #5:**

Page 8 indicates that previously in the 2005 ROD wetland mitigation would be performed on site (for non-tidal wetlands) ... "Where wetlands were to be created (for wetland banking and to restore wetlands damaged by the cleanup at the Site) excavation would remove TPAH concentrations exceeding 150 ppm." Note these new wetlands would not have addressed tidal wetlands however the concept of addressing wetland avoidance, minimization, and mitigation on Site was included. It should be included in the current ROD Amendment; tidal wetland mitigation can no longer be pushed off into the future with an unknown outcome.

  - ***EPA RESPONSE:***

    *EPA acknowledges NOAA's concerns. See the response to Comment #2.*

- **COMMENT #6:**

Page 10 "Under the 2005 Remedy, if the containment area(s) extended into wetlands areas, Hershey Run would be relocated away from such areas. An evaluation of the hydrodynamics of Hershey Run was to be included in the remedial design to determine the optimal configuration of the new channel. The new channel would not alter in any negative way the existing capacity of Hershey Run for the conveyance of water and would not cause drainage changes that promote flooding upstream." Note the function of a tidal wetland channel is not to "convey water" out of the wetland but to allow for flooding of the wetland on a periodic basis. Without this the function of a tidal wetland is significantly reduced eliminating aquatic habitats and encouraging invasive species as well as transmitting sediments/solids out of the marsh and into the Creeks and Rivers. This is another important function of a marsh that is being lost (water quality and sediment/nutrient retention).

  - ***EPA RESPONSE:***

    *The text cited is referring to the concern that channel alterations would have impacts upstream of the Site, negatively impacting flow into the downstream portions of Hershey Run. One of the functions of a tidal wetland channel draining an upstream watershed is to convey water, particularly during storm events. The capacity issue was raised by both EPA and NOAA representatives during planning meetings and, in part, resulted in the hydrodynamic evaluation that was performed. The study demonstrated that the proposed realignment of Hershey Run will not produce erosive velocities, will not negatively impact surface water elevations, and will not produce a net change in waterway hydraulics from the existing conditions at the Site. Additional* *evaluation of channel stability will be conducted, as indicated in the performance standards in this ROD Amendment.*

- **COMMENT #7:**

Off-site tidal wetland creation will be extremely difficult; there are no mitigation banks for this type of wetland restoration in DE. Restoration of wetlands (versus creation) is an acceptable mitigation approach. The Koppers Marsh is one of the few remaining areas in NCC and the State to perform freshwater tidal wetland restoration. The proposed plan needs to address this requirement as part of the overall plan and not keep deferring the 404 requirements. "The Site will no longer be used for a wetland mitigation bank. Therefore, the removal of deep contamination that would have been necessary to create wetlands for banking purposes is no longer necessary. However, wetlands that are negatively impacted by cleanup activities would still be addressed through on-Site or off-Site mitigation strategies." The wetland mitigation needs to be evaluated now!

  - ***EPA RESPONSE:***

  *EPA acknowledges NOAA's concerns. See the response to Comment #2*

- **COMMENT #8:**

  Page 19 "Coordination with the appropriate regulatory agencies will be conducted to ensure that mitigation efforts satisfy applicable or relevant and appropriate substantive requirements in state and federal laws and regulations pertaining to impacted wetlands at the Site." Please identify who these agencies are (ACOE, NOAA, USFWS, and DNREC) and when EPA/Beazer anticipates this occurring. Trustee agencies have been trying to coordinate on wetland issues at the site for over a decade or more. The time to coordinate is now!!

  - ***EPA RESPONSE:***

    *EPA will continue to communicate and coordinate with the appropriate USACE and DNREC wetland personnel to ensure that the substantive wetland requirements will be met.*

- **COMMENT #9:**

  Page 19: "Areas where wetlands are negatively impacted will be addressed using on-Site or off-Site mitigation strategies to result in a no net loss of wetlands." The requirement is not just no net loss but no loss in function. The functionality of the marsh has been impacted for several decades from activities from the Site and won't just begin with the construction of the remedy

  - ***EPA RESPONE****:*

    *Please refer to EPA's Response to Comment #2 in regard to addressing the loss of wetland function. The amount of compensatory mitigation that may be required will be addressed during the development of the wetland mitigation plan and will be subject to regulatory review.*

- **COMMENT #10:**
  Page 20 ... "Surface water, sediments, and biota will be monitored to demonstrate that risk has been reduced to acceptable levels and that the remedy continues to be effective. A comprehensive monitoring plan will be developed as part of the Remedial Design, which will include monitoring and maintenance of the respective covers associated with the ROD Amendment."

  A new baseline of ecological conditions should be conducted before and after the remedy implementation. There has been limited, if any, characterization of the Koppers Marsh since the previous ROD and the baseline conditions, in terms of sediment quality and biological communities in the Marsh, are not well characterized. A baseline will be required to evaluate impacts, positive or negative, from remedial activities in the Marsh. Monitoring of site ecological restoration will be required as part of the Remedy. I am not suggesting the baseline ecological risk assessment be re-done however it should be updated based upon the elapsed time.

  - ***EPA RESPONSE:***
    *An ecological monitoring program will be developed during the remedial design process as part of the overall site monitoring program. The program will include the establishment of current pre-remedial or baseline conditions, which will be used to help assess the effectiveness of the Final Action. The ecological monitoring program will be informed by the findings of the Baseline Ecological Risk Assessment.*

- **COMMENT #11:**
  Page 21 Table: "The ROD Amendment includes excavation of contaminated sediments and marshes to a depth of two feet below ground surface, installation of a reactive core mat over the underlying sediments, and installation of two feet of clean fill consisting of at least 6" of a vegetative layer." A 6" vegetative layer in a freshwater tidal wetland channel will be difficult to maintain and is not a natural type of habitat feature.

  - ***EPA RESPONSE:***
    *EPA understands there will be areas that may not be suitable for a six-inch vegetative layer (for example, where there is active running water/where vegetation would be submerged completely underwater). It is not EPA's intent to include a 6" inch vegetation layer in areas where it is not suitable. The performance standards for the 6" inch vegetation layer have been updated to include this requirement where applicable.*

- **COMMENT #12:**
  Page 27. Long Term Effectiveness: The suggested approach to completely capping the contaminated channels and restoring a marsh channel network will be more permanent than capping the material in an open channel. It would also eliminate the need to bring capping material on site (short term effectiveness - Page 28) and allow for one

construction event in the Marsh if wetland mitigation were to be performed in the Marsh as suggested.

- ***EPA RESPONSE**:*
  *The Selected Remedial Action is intended to address identified contamination and risks presented thereby without impacting other areas of the marsh. Because the Selected Remedial Action focuses on identified contamination, it will be effective in both the short-term and long-term. It will also be implementable as it will address the contamination directly. Please see response to Comment #3 for additional information.*

- **COMMENT #13:**
  Page 30 - The Costs should include the "costs" for wetland mitigation. Off-site wetland mitigation opportunities will be more limited and likely much more expensive to meet the mitigation requirements

  - ***EPA RESPONSE:*** *A cost breakdown of the Selected Remedial Action is provided in Table 1: Cost Breakdown and includes costing for wetland mitigation.*

# 2 Comments Received by the Delaware Ornithological Society (DOS)

- **COMMENT #1:**

The Delaware Ornithological Society (DOS) is an all-volunteer, 501(c)3 nonprofit representing hundreds of members in Delaware and adjacent states. Our mission is the promotion of the study of birds, the advancement and diffusion of ornithological knowledge, and the conservation of birds and their environment.

DOS respectfully requests a 60-day extension of the Public Comment Period for the Koppers Inc. Newport, Delaware Proposed Remedial Action Plan in accordance with 40 CFR§300.430(f)(3)(i)(C), viz. "Upon timely request, the lead agency will extend the public comment period by a minimum of 30 additional days."

A 60-day extension is necessary in order to allow our organization to better assess the potential impacts of the Proposed Plan and the long-term effectiveness and permanence of the EPA's preferred alternative on biotic resources and habitats at the site and in the adjacent tidal marshes of the Christina River watershed.

In light of the complexity of the issues associated with the Site, the long history of the Administrative Record on this Site, the proposed change in end use of the Site (no longer proposed for wetland banking), and the extensive associated changes to the proposed preferred alternative as compared with that of the prior ROD (including significantly more impact to tidal marshes as a result of the reconfigured onsite containment area), an extension is necessary for community organizations like ours to be able to conduct a thorough review and prepare meaningful comments on the Proposed Remedial Action Plan.

In addition, the unusual circumstances associated with the Covid-19 pandemic require an extension of the comment period to allow members of the public and interested community organizations time to further explore questions associated with Proposed Plan. A 30-day comment period following a prerecorded video in lieu of a Public Meeting is insufficient. Further, it is concerning that although a virtual question and answer session was apparently held by phone on March 17th (only two weeks before the comment period expiration) no recording or transcript of that session appears to have been made available to the public via the EPA website.

We also feel it is important to emphasize that the ecological investigation activities at the site (summarized in the May 2003 Remedial Investigation Report) were conducted at least 17 years ago at this point, and the conservation and regulatory status of many species and habitats has changed since then. In addition, in our preliminary review of the 2003 Remedial Investigation Report, we note that the off-site reference marsh (Churchman's Marsh) that was chosen was one that had been heavily impacted by past use (prior impoundment) and thus was an inappropriate choice of reference site for the ecological investigation and risk assessment.

The Christina River marshes are now the *only* remaining completely freshwater tidal marsh systems in Delaware, and their conservation importance has increased accordingly over the past two decades. Much new scientific literature has also become available since 2005 that is relevant to this project in terms of impacts of contaminants of concern to relevant ecological receptors (e.g. Bianchini and Morrisey 2018, Bonisoli-Alquati 2020, Wallace et al. 2020), further necessitating an extended period of public review and comment.

In light of all of these concerns, we urge you to extend the Public Comment Period on this Proposed Remedial Action Plan by no less than 60 days. Thank you for considering this request.

- ***EPA RESPONSE:***
  *In response to the request for additional comment period, EPA extended the comment period from April 17, 2021 through May 17, 2021. The virtual question and answer session provided an opportunity for all members of the community to raise concerns on the Proposed Plan. If the question and answer session had been in person, the date would likely have been similar, as EPA prefers holding the comment period near the mid-way point of the review period to allow the public an opportunity to review the Proposed Plan and formulate questions they may have. Furthermore, during the question and answer session, no members of the community joined the call, including DOS. The transcript is available in the administrative record; however, the transcript merely includes time checks as there were no questions asked.*

## 2.1 Additional Comments Received from the Delaware Ornithological Society

The Delaware Ornithological Society (DOS) is an all-volunteer, 501(c)3 nonprofit representing hundreds of members in Delaware and adjacent states. Our mission is the promotion of the study of birds, the advancement and diffusion of ornithological knowledge, and the conservation of birds and their environment. DOS has a long history of leadership in the study and conservation of birds and bird habitats in the Christina River main stem watershed, including extensive avian surveys conducted at Churchman's Marsh just upstream of the Site, and at the Russell W. Peterson Wildlife Refuge (Wilmington Marsh) downstream near Wilmington. DOS welcomes the opportunity to comment on the Proposed Remedial Action Plan (PRAP) for Record of Decision (ROD) Amendment. As Chair of the DOS Conservation Committee, I have prepared the following comments on behalf of the organization.

Our concerns with the PRAP and ROD Amendment are summarized as follows:

- ***COMMENT #1: Single Containment Area Located in Current Tidal Wetland***
We question the movement of contaminated material that is currently located in upland areas of the site to a single containment unit that will be created from (and ultimately surrounded on three sides by) tidal wetlands of Hershey Run. Moving additional contaminated soil and sediment material (beyond that which already occurs within the tidal wetlands) into a unit that would expose wetland receptors to immediate contamination should barrier walls leak or fail reduces the long-term effectiveness and permanence of the remedy and may not adequately protect the most sensitive ecological receptors in the future. A separate containment area located in the upland as far as practicable from the tidal marsh or other surface waters would be a more cautious approach for materials not already occurring in the existing marsh and channel and would result in significantly less contaminant load available for potential release into the surrounding marshes should failure of the containment unit occur.

    - ***EPA RESPONSE***:
    *EPA selected the location for the Containment Area because it is where the greatest extent of Site contamination is located. The remedy is more effective in the short term with the Containment Area in this location because it will reduce the amount of excavation that will be necessary, and limits the extent of DNAPL recovery via recovery wells because the DNAPL in the saturated zone in this area will be confined by the Containment Area and the barrier walls. This approach is also more implementable, as it reduces the amount of excavation, and places the Containment Area in a location that encapsulates the greatest extent of contamination. Additionally, monitoring of the Containment Area/barrier walls will occur to evaluate the Containment Area/barrier walls effectiveness and ensure it does not allow for contamination inside the Containment Area/barrier walls from migrating outside of the Containment Area/barrier walls. This approach ensures the long-term performance of the remedy as well.*

- ***COMMENT #2: Permanent Loss of Over 8 acres of Tidal Wetland Without Local Mitigation Commitment***

The tidal wetlands of Hershey Run are significant resources since the Christina River holds the last remaining freshwater tidal systems in Delaware. These marshes are important foraging habitat for colonial waterbird Species of Greatest Conservation Need including Snowy Egret, Glossy Ibis, and Black-crowned Night Heron. The modified remedy would permanently destroy 8.18 acres of tidal wetlands, and the realignment and armoring of Hershey Run would permanently impair the ecological function of a significant reach of tidal creek channel.

If technical approaches cannot be identified to protect these wetlands from permanent destruction, then DOS strongly urges mitigation for all wetland and channel impacts from remedial actions at the site to be ecologically and functionally equivalent and for mitigation to be conducted as close as possible to the Site (either on site, or at a minimum, within the Christina River mainstem watershed) to maintain available habitat and system-wide ecological function within the immediate area of the Site.

  - ***EPA RESPONSE**:*
    *EPA anticipates that remediating contaminants present in the wetland which pose an unacceptable risk will increase the ecosystem services provided by the wetlands as well as their overall heath. If negative impacts to wetlands, including loss of acreage, occur during that remediation, EPA will address those impacts, as required by the substantive state and federal regulations. The details of such wetland mitigation planning will be further evaluated after the ROD Amendment is issued and during the development/finalization of the Remedial Design. EPA understands DOS's concerns with maintaining ecologically and functionally equivalent wetland mitigation as close to the Site as possible and it is EPA's preference (but not obligation) to conduct wetland mitigation on-Site or within the Christina River watershed.*

- **COMMENT #3: Major Changes to Remedial Alternative Without Update of Ecological Risk Assessment Data**
  Much new scientific literature has also become available since 1997 that is relevant to this project in terms of impacts of contaminants of concern on relevant ecological receptors (e.g. Bianchini and Morrisey 2018, Bonisoli-Alquati 2020, Wallace et al. 2020).

  We assert that the avian NOAEL (No Observable Adverse Effect Limit) and LOAEAL [sic] (Lowest Observable Adverse Effect Limit) used in the 1997 Ecological Risk Assessment (ERA) are no longer accurate based upon currently available science, which may affect the conclusions for three of the twelve Assessment Endpoints (Endpoints 7-9). The Effects Limits for birds for the ERA were based upon a single study of non-native European Starlings that is now nearly thirty years old (Trust 1993).

  Recent work by Bianchini (2018) found dramatic sublethal effects of TPAHs on weight gain of Sanderlings (a native bird and more relevant receptor species for tidal wetland sites) at doses as low as 12.6 µg total PAH/kg body weight/day. Thus, experimentally demonstrated NOAELs and LOAELs for TPAHs based upon more current and relevant literature are *at least four orders of magnitude lower* than was used in the 1997 ERA. The PAHs used in the Bianchini (2018) study included a nearly identical set of low and high molecular weight PAHs as those documented at the Koppers site. Using updated LOAEALs based on relevant studies such as this would be particularly important for Assessment Endpoint 8, Protection from Direct Toxicity Effects and Reproductive Impairment of Worm-eating Birds Utilizing the Site.

Because of new data available on important sublethal effects to birds of low-dose PAHs, sediment and soil cleanup criteria levels for the Koppers site should be reevaluated to assure adequate protection of both resident and migratory birds. American Woodcock, the species selected for receptor assessment endpoint 8, has declined sharply throughout the region and within Delaware and is now a species of conservation concern, indicating additional importance of updating ERA data and reevaluating cleanup criteria with current science in mind.

- ***EPA RESPONSE:***
  *EPA agrees that new scientific literature has become available that is applicable to understanding PAH exposure and the resultant effects. EPA has reviewed the cited studies, considering their methods and results as they apply to site conditions, the baseline ecological risk assessment that informed the 2005 ROD, and this ROD Amendment. The remedial footprint as defined in this ROD Amendment is expected to result in significant reductions in receptor exposure to bioavailable Site contaminants resulting in the reduction of unacceptable ecological risk by either removal or containment. Post-remedial monitoring will be designed to ensure that the remedy is protective of ecological receptors and exposure to any residual site contaminants will not result in an unacceptable risk.*

- **COMMENT #4: Major Changes to Remedial Alternative without updating Ecological Investigations**

We also feel it is important to emphasize that the ecological investigation activities at the site (summarized in the May 2003 Remedial Investigation Report) were conducted at least 17 years ago at this point and updates to this data would better inform design and construction of remedial action with regard to minimizing construction and post-construction impacts to species of conservation concern occurring on site, including the species of birds mentioned above, as well as other birds documented on site including the State Endangered American Kestrel, and Species of Greatest Conservation Need such as Wood Thrush, Scarlet Tanager, Worm-eating Warbler and others. This applies to non-avian species of concern as well, including Spotted Turtle and Box Turtle, among others.

- ***EPA RESPONE:***
  *EPA strongly recommends that the determination of the potential presence of species of special status occur prior to every major project milestone. EPA will ensure that the appropriate consultations will be performed as part of the design process, and as part of the planning of remedial activities.*

- **COMMENT #5: Inappropriate Specified Soil and Plant Materials for Proposed Restoration**
  The 2013 Pre-Final Design Report prepared by Langan indicates the use of coarse sands to backfill excavated areas of Hershey Run channel, as well as 18" of "select fill" to restore the marsh platform. According to design documents, "select fill shall consist of crusher run aggregate with a gradation that meets Maryland Department of Transportation CR-6, DelDOT Type B Crusher Run, PennDOT 2A or Engineer-approved alternate." Neither of these material types are appropriate for ecological restoration of tidal wetlands and would not constitute restoration in kind for this wetland community. The tidal marshes of this area are composed of fine-textured organic soils with complex biogeochemical properties and restoration soils would need to be specifically designed to closely mimic natural marsh soils in texture, bulk density, and organic carbon content in order for the tidal marsh to be considered successfully restored to ecologically functional condition. In addition, the plant specifications proposed by Langan in the Pre-Final Design Report for revegetation contain numerous inappropriate species for the local site conditions. For example, *Juncus roemerianus*, *Kosteletzkya virginica*, and *Myrica pensylvanica* do not occur in the fresh tidal marshes of the Christina River. Ample reference sites are available along the river from which to derive appropriate plant materials specifications for each habitat. The extensive botanical plot data collected as part of the Remedial Investigation Report is also helpful here, and consultation with local experts, including Delaware's State Botanist would be warranted for these plant communities. The combination of inappropriate soil and vegetation specifications indicates a lack of understanding of the system to be remediated and warrants a lack of confidence in the quality of any restoration work undertaken. If these habitats are not correctly restored, they will be of little future value to birds or other wildlife.

  We recommend that EPA require that a qualified ecological restoration professional with expertise in tidal freshwater marsh systems and knowledge of local conditions and plant communities supervise final design and implementation of ecological restoration at the site. This could be a Professional Wetland Scientist (PWS) or Certified Ecological Restoration Practitioner (CERP) with knowledge of Mid-Atlantic tidal freshwater marsh restoration. It is of critical importance that post-remediation ecological restoration of these tidal wetlands is designed and carried out by competent ecological professionals with the advice and input of local experts from the Delaware Department of Natural Resources.

  - ***EPA RESPONSE:***
    *EPA will review the remedial design required to be submitted under the ROD Amendment to ensure that it identifies appropriate materials, including plant materials, to be used for the restoration. It must be noted that the materials selected for restoration of the remediated areas may not necessarily be consistent with what would typically be selected for ecological restoration projects as the goals of permanence and long- term stability of the remedy take precedence. The EPA has used, and will continue to use, appropriate and qualified professionals.*

# 3 Comments Received by the United States Fish and Wildlife Service (USFWS)

- **COMMENT #1:**
  The Service concurs with the comment letter sent by [redacted] of the National Oceanic and Atmospheric Administration. Key points from that letter focus on the opportunities for wetland restoration. As the NOAA notes, "Capping the sediments in place and maintaining the current channel network will further impact the marsh and significantly impact potential future tidal wetland restoration efforts. Tidal freshwater wetlands are some of the most impacted wetlands in the Delaware Estuary. The Koppers Marsh is the highest priority freshwater tidal marsh restoration project in New Castle County and the State."

  - ***EPA RESPONSE:***
    *Please refer to EPA's response to NOAA Comment #2 under Section 1 of this Responsiveness Summary section. Capping the sediments is intended to address the levels of contamination in the sediments which pose unacceptable risk to ecological receptors. If negative impacts to the marsh occurs during the remediation, EPA will address those impacts, as required by the substantiative state and federal regulations.*

- **COMMENT #2:**
  The Service agrees with [redacted] statements, "A new baseline of ecological conditions should be conducted before and after the remedy implementation. There has been limited, if any, characterization of the Koppers Marsh since the previous ROD and the baseline conditions, in terms of sediment quality and biological communities in the Marsh, are not well characterized. A baseline will be required to evaluate impacts, positive or negative, from remedial activities in the Marsh. Monitoring of site ecological restoration will be required as part of the Remedy."

  - ***EPA RESPONSE:***
    *Please Refer to EPA's Response to NOAA Comment #10 under Section 1 of this Responsiveness Summary section.*

- **COMMENT #3:**
  The Service recognizes that a Baseline and Performance Monitoring Plan will be developed as part of the Remedial Design. The key monitoring indicators should include benthic community abundance and diversity; sediment chemistry; sediment toxicity tests with invertebrates and larval fish; and evaluation of histopathology in resident mummichogs (*Fundulus heteroclitus*) compared with collections from reference areas.

  - ***EPA RESPONSE:***
    *Please Refer to NOAA Comment #10 under Section 1 of this Responsiveness Summary section. The monitoring indicators will be discussed during the development of the ecological monitoring program development.*

# 4 Comments Received by Christina Conservancy, Inc.

I am writing you on behalf of the Christina Conservancy in response to the request for public comment on EPA's Proposed Remedial action Plan (PRAP) for Record of Decision (ROD) Amendment for the Koppers Inc. superfund site located in Newport, DE.

The Christina Conservancy is a non-profit organization dedicated to promoting the preservation, restoration, and appreciation of the historic and natural resources of the Christina River watershed. We seek to achieve this by providing financial support, advocacy support, communication, education, and leadership in cooperation with state and local agencies, other non-profit organizations, businesses, residents, landowners, and user groups to:

- Provide appropriate and responsible access to the river and associated natural areas;
- Reduce water pollution to the Christina and its tributaries;
- Protect and enhance important natural and heritage areas of the watershed; and
- Engage people in stewardship of the watershed.

In light of this mission, we submit the following comments regarding the Koppers Site PRAP / ROD Amendment. Christina Conservancy is pleased to see that actionable remedies for the Koppers Site are moving forward, and we hope to continue to engage with EPA and Beazer East, Inc. with regard to the process of remediation and restoration of this important site.

- **COMMENT #1: CBR4 Initiative**
  We would like to make the parties aware of a relevant initiative, the Christina Brandywine River Remediation, Restoration, and Resilience (CBR4) Initiative, a collaborative project of business, nonprofit, and state entities.

  CBR4 is a river-scale remediation, restoration, and resilience initiative to address legacy toxic contamination, restore native ecology and prepare for the changing climate as well as other threats to river health in the lower Christina River and tidal Brandywine River. In alignment with DNREC's WATAR program, the project goal is to make the rivers fishable, swimmable and drinkable in the shortest timeframe possible. CBR4 success will take multiple years to achieve, will require the efforts of various partners and will continue stepwise as project funding becomes available. The current phase, from 2021 through 2022, has two projects advancing simultaneously: a sediment remediation feasibility study and a planning effort that seeks to articulate the strategies, projects, and framework needed to restore the lower Christina and Brandywine Rivers to health.

  In the fall of 2020, American Rivers and the Christina Conservancy were awarded a two-year grant from the National Fish and Wildlife Foundation (NFWF) to engage with experts, the public, and stakeholders to create a long term remediation, restoration and resiliency plan for the lower Christina and Brandywine Rivers. The plan will provide both a compelling vision for a future Christina-Brandywine Riverfront that thrives economically and environmentally, and a practical blueprint to guide decision-making and to leverage resources for key projects and activities. The project area for this grant is from Newport downstream to the mouth of the Christina, with a similar planning effort anticipated in the near future for the next reach upstream.

- ***EPA RESPONSE:***
  *EPA acknowledges the statement provided by the Christina Conservancy.*

- **COMMENT #2: Wetland Impacts**
  In the context of this initiative as well as our organization's mission, Christina Conservancy is understandably concerned about the proposed permanent loss of over 8 acres of freshwater tidal wetland by placement of a single containment unit at the Site the footprint of which falls mostly within the current tidal marsh. It is our understanding that there are DNAPL removal technologies using well-based recovery to be implemented elsewhere on site and we are curious as to whether those technologies could also be employed to remove deep saturated DNAPL from the Hershey Run marsh, in combination with partial channel and marsh excavation, reactive core mat placement, backfilling and marsh restoration, as opposed to a permanent loss of tidal wetlands. It is unclear from the current documents whether the feasibility of a wetland restoration approach has been assessed.

  We urge Beazer and EPA to prioritize minimizing permanent impacts to tidal wetlands and for those impacts that are unavoidable, to locate any wetland mitigation required as a result of this project either on site, or as close as practical to the site within the lower Christina River watershed. We are willing and able to help identify potential mitigation areas and projects that would restore functionally and ecologically meaningful freshwater tidal wetlands in the watershed while fulfilling the mitigation requirement for this project. We also strongly urge that mitigation be in the form of restoration of historic or degraded wetlands, as opposed to de nova wetland creation. Created wetlands are almost never able to achieve the ecological and functional properties of intact or even restored wetlands, and this is especially true when mitigating for tidal wetland loss.

  We also encourage the use of green infrastructure and ecologically sensitive design approaches along the armored stretch of Hershey Run after realignment. Creating living shorelines or other "softening" in association with the riprap hardened banks will help restore ecological function to this artificial channel conveyance.

  - ***EPA RESPONSE***:
    *The Final Action incorporates the elements of shallow channel and marsh excavation, reactive core mat placement, backfilling and marsh restoration. In regard to the extent of contamination within the footprint of the Containment Area, please refer to EPA's Responses to Comment #1 of Section 2.1 of the Responsiveness Summary section and Comment #2 of Section 1 of the Responsiveness Summary section.*

    *EPA appreciates the Conservancy's offer to assist with identifying potential mitigation areas and will strongly encourage such outreach during the development of the wetland mitigation strategy and plan.*

*EPA has, and will continue to, strongly advocate for the use of green infrastructure, the minimization of hardscaping, and the integration of design elements which provide ecosystem services.*

- **COMMENT #3: Site Biodiversity**
  Christina Conservancy works to protect the imperiled biodiversity of our watershed through education, surveys (bioblitzes conducted throughout the watershed), and advocacy. We applaud Beazer for committing to the protection of a rare plant species (*Gentiana andrewsiz)* with protective fencing during construction.

  In an urbanized and impacted watershed like the lower Christina, we are encouraged that biotic surveys conducted during the remedial investigations at the Koppers site in the 1990s revealed persisting populations of a number of species of state and regional conservation concern. While most of these species lack legal protection at the state or federal level, we strongly urge Beazer and EPA to work with us to develop a proactive protection plan for these species that would minimize construction impacts and provide suitable postconstruction habitat.

  Species of particular concern include Tier 1 Species of Greatest Conservation Need in Delaware that are terrestrial (Eastern Box Turtle) and vernal wetland (Spotted Turtle) species that are limited in their ability to escape extensive construction impacts at the site, but that could be protected by appropriate drift fencing in combination with trapping and location to undisturbed portions of the site. We appreciate EPA's inclusion of Performance Standard #2 "Translocate faunal populations present in intended excavation areas to alternate suitable locations in advance of excavation activities" (2005 ROD, p.36). Significant mitigation of impacts to these species could be achieved by collaboration with our organization as well as experts from the Delaware Department of Natural Resources Species Conservation and Research program.

  Lastly, we request that EPA and Beazer consult with Delaware's state botanist and other appropriate experts regarding plant species to be used in any revegetation or seeding of the site after construction. Our organization can also provide lists of site appropriate plants for this project. Too often, remediation projects are revegetated without regard for locally appropriate ecological reference communities and plant choices.

  We look forward to the completion of this project and to a healthier future for the Christina River. Please reach out to our organization to discuss any of these proposed approaches further and we will be glad to be of assistance.

  - ***EPA RESPONSE:***
    *EPA will encourage the inclusion of the considerations noted and further collaborate within the context and limitations of a remedial action on a Superfund site. It should be noted that the state must provide concurrence on the ROD Amendment and representatives of the state are active participants on the regulatory review team.*

*EPA will continue to consult with team personnel with local experience and expertise. EPA will also continue to encourage the state to continue to utilize the expertise available to them during the review process.*

# 5 Comments Received by Beazer East, Inc.

## 5.1 General Comments:

As to certain statements made by EPA in its Proposed Remedial Action Plan and the related Fact Sheet, Beazer respectfully requests EPA to be more precise and accurate in how it refers to the following three entities:

- ***COMMENT #1: Koppers Company, Inc.***
  Koppers Company, Inc. is the same legal entity as Beazer East, Inc. Koppers Company, Inc. (now known as Beazer East, Inc.) was and remains incorporated in Delaware and is commonly referred to in shorthand as Koppers. One of its predecessors, Koppers Company, was founded in 1902. Koppers Company, Inc. came into existence in 1944 when several different affiliated companies, including Koppers Company, merged together. Koppers Company, Inc. changed its name to Beazer Materials and Services, Inc. in 1989 and then to its current name, Beazer East, Inc. in 1990.

  - ***EPA RESPONSE:***
    *EPA acknowledges this statement. No changes to the description of the Koppers Company, Inc. as presented in the Proposed Plan were necessary in that the Proposed Plan's description was accurate. However, EPA notes the pre-recorded video made available during the public comment period of the PRAP may have incorrectly used the entity names.*

- ***COMMENT #2: Beazer East, Inc.***
  Beazer East, Inc. is the same legal entity as Koppers Company, Inc., is a Delaware corporation, and is commonly referred to in shorthand as Beazer

  - ***EPA RESPONSE:***
    *EPA acknowledges this statement. See EPA's Response to Beazer's Comment #1, above.*

- ***COMMENT #3: Koppers Inc.***
  Koppers Inc**., is not the same entity as Koppers Company, Inc**. Koppers Inc. is a Pennsylvania corporation that was originally incorporated in October 1988 under the name Pittsburgh Acquisition Corporation, Inc., and then changed its name to Koppers Industries, Inc. on December 23, 1988. On December 29, 1988, Koppers Industries, Inc. purchased certain wood treating, tar, and coke business assets from Beazer, including all trade rights to the name "Koppers." In February 2003, Koppers Industries, Inc. changed its name to Koppers Inc., which today is a publicly traded company wholly separate from

Beazer and not a successor-in-interest to Beazer. Koppers Inc. never owned or operated the former Newport, DE wood-treating plant.

- ***EPA RESPONSE:***
  *EPA acknowledges this statement. See EPA's Response to Beazer's Comment #1, above.*

## 5.2 Specific Comments

***EPA NOTE:*** *The comments below and the particular sections are in reference to the PRAP. Sections in the ROD Amendment may not be the same sections of the PRAP*

- ***COMMENT #1: Section II.A***
  Beazer suggests this section also mention the BASF plant to the east.

  - ***EPA RESPONSE:***
    *In response to this comment, EPA has included in the ROD Amendment the fact that the BASF plant is located to the east.*

- ***COMMENT #2: Section II.***
  Beazer suggests that this section describe general or specific time frames for (1) when operations ceased and (2) when wood treatment process equipment and structures were dismantled.

  - ***EPA RESPONSE:***
    *The ROD Amendment includes language that is generally consistent with what is in the Remedial Investigation Report. EPA does not have additional information to provide in this ROD Amendment.*

- ***COMMENT #3: Section II.C***
  "In 1991, Beazer, the successor corporation to Koppers, and DuPont, the Site landowner at that time, signed an agreement with EPA…"

  See Beazer's General Comment above. Beazer is not "the successor corporation to Koppers." Beazer requests the sentence to be redrafted *as "In 1991, Beazer and DuPont (the Site landowner at that time) signed an agreement with EPA".*

  - ***EPA RESPONSE:***
    *EPA acknowledges this comment and has included language in the ROD Amendment to reflect the above comment.*

- ***COMMENT #4: Section II.E***
  "As part of the Remedial Design work, Beazer, in consultation with Delaware State Historic Preservation Office (DESHPO) and EPA, performed investigations at the Site to

determine archeological significance and to evaluate eligibility for the National Register of Historic Places (NRHP)."

Beazer proposes **archaeological** for archeological.

- ***EPA RESPONSE:***
  *EPA has replaced archeological with archaeological in the ROD Amendment.*

- ***COMMENT #5: Section II.F***
  Beazer suggests that the caption to section II. F be changed to reflect that the First Modification (referenced in the caption to Section II. D) was succeeded in time by a Second and Third Modification.

  - ***EPA RESPONSE:***
    *EPA has changed this heading in the ROD Amendment to "Events Leading to Remedy Modification, and Second & Third Modification of the Administrative Order." This section now falls under section 1.6 of this ROD Amendment.*

- ***COMMENT #6: Section II.F***
  Beazer notes that this sentence is both inaccurate and inconsistent with what Footnote 2 describes. Abandonment of wetlands banking was not driven by Beazer's "lack of interest" but because (1) DELDOT's wetland requirements had been otherwise satisfied and (2) data collected during the RD changed what was then-understood about site conditions.

  - ***EPA RESPONSE:***
    *EPA acknowledges this comment and has included language in the ROD Amendment to reflect this comment.*

- ***COMMENT #7: Section III***
  "Non-tidal wetlands occur in…. K Area…."

  Beazer notes that while this statement appears in the 2005 ROD, Beazer suggests correcting for the record that the wetland delineation plan shows K Area not to be a mapped wetland area.

  - ***EPA RESPONSE:***
    *Language associated with the K Area in the ROD Amendment has been removed due to the fact the K Area is not a mapped wetland area. According to the 2007 wetland delineation report, the drawings depicting wetland areas used nomenclature/designations that follow the alphabet (A,B,C,D, and K). The designation of Area K wetlands is unrelated with the area of dry weathered surface creosote designated as the "K-area". While K-Area is nearby, it is in the uplands and is not within the delineated boundaries of the wetlands area designated as Area K. Below provides a figure from the 2007 Wetland*

*Delineation report showing wetland areas, and Figure 2 from this ROD Amendment is included to depict the K-area.*

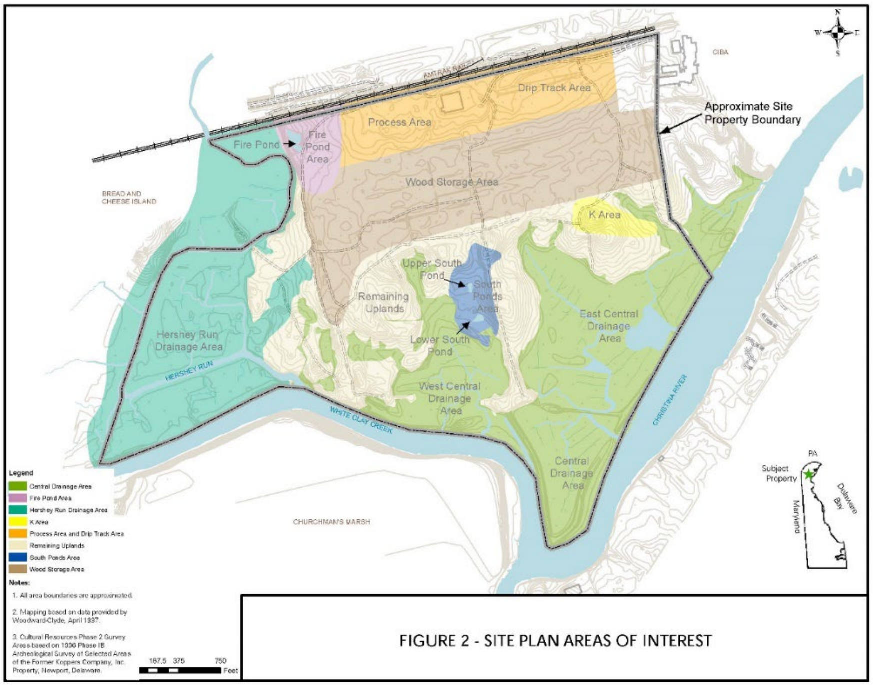



FIGURE 2 - SITE PLAN AREAS OF INTEREST

- ***COMMENT #8: Section IV A.***
  "In the 2005 Remedy, the need for deep excavations was driven by the assumption that wetland banking would occur at the Site and also to remove saturated DNAPL in the subsurface."

  Beazer questions the vague and potentially confusing use of the term "saturated DNAPL" here and throughout the PRAP (IV.D, IV.G, VII, VIII.B.c, VIII.B.d, VIII.C, IX.A.2, IX.A.6, X). The term "saturated DNAPL is not defined in the PRAP, and to Beazer's knowledge the term "saturated DNAPL" does not occur in the 2005 ROD or subsequent documents. If it corresponds with EPA's intended meaning, Beazer proposes EPA concur with and adopt "DNAPL in the saturated zone."

  - **EPA RESPONSE:**
    *The term "saturated DNAPL" and "DNAPL in the saturated zone" hold the same meaning. Therefore, EPA has incorporated DNAPL in the saturated zone in applicable areas of the ROD Amendment.*

- ***COMMENT #9: Section IV.***
  "Excavation of sediments at these deeper depths would have the potential to negatively impact the hydrogeology of the area."

  Beazer is unclear what is meant by the phrase "negatively impact the hydrogeology of the area and respectfully requests that EPA clarify and/or expand upon its use of the phrase both here and elsewhere in the PRAP (IV. D, VIII.B.a, VIII.C.1)

- ***EPA RESPONSE***:
  *After careful consideration, EPA has decided to strike this language from the ROD Amendment. The intent of the referenced language was to explain that excavations to greater depths to remove the DNAPL in the saturated zone increase the potential to induce changes to the subsurface conditions.*

- ***COMMENT #10: Section IV. D.***
  "Beazer's investigations revealed benefits to constructing barrier walls around all four sides of what would now be a single containment area."

  As the containment area is more properly described as an irregular hexagon or polygon, Beazer suggests eliminating the word "four" from the sentence here and elsewhere in the PRAP (VIII.B.2.b, VIII.C.3, IX.A.4).

  - ***EPA RESPONSE:***
    *EPA agrees and has included language in the ROD Amendment to address this comment.*

- ***COMMENT #11: Section IV.G.***
  "EPA has determined that the modified cleanup will focus on soil, sediments, and DNAPL source material in a final remedy, and groundwater in an interim remedy to addresses certain identified risks."

  Beazer is unclear what is meant by the phrase "certain identified risks." Beazer suggests incorporation by reference to other documents of record (e.g. 2005 ROD) or a more fulsome discussion of the risks EPA has in mind in this paragraph.

  - ***EPA RESPONSE:***
    *EPA's intention in using "certain identified risks" in groundwater was to address unacceptable risk to contaminated groundwater through use restrictions to be implemented via institutional controls to satisfy the RAOs of this ROD Amendment. EPA has included language in the ROD Amendment to clarify this issue. Beazer has a later comment requesting "Groundwater use restrictions will be implemented to restrict the extraction of groundwater" be removed because the groundwater remedy is yet to be finalized. This comment is addressed in said comment.*

- ***COMMENT #12: Section V.***
  "By addressing the principal threat waste (NAPL) in the soils, sediments, and subsurface, groundwater can be further evaluated after the principal threat waste is removed in a final remedy."

  Because the proposed remedy contemplates that NAPL will be addressed via a combination of removal and containment Beazer suggests that the phrase "removed in a final remedy" be replaced by "removed and/or contained in a final remedy."

- ***EPA RESPONSE:***
  *EPA understands the clarification Beazer proposes and has included clarifying language in the ROD Amendment in the Principal Threat Waste section. EPA has made additional clarifications to address Principal Threat Waste is (1) the DNAPL in the saturated and (2) the surface soils and sediments that act as a source for direct exposures. However, it is important to note that the DNAPL in the saturated zone outside of the Containment Area is to be removed via recovery wells as selected in this ROD Amendment.*

- ***COMMENT #13: Section VII***
  Table Row 2: "Prevent unacceptable human health and ecological risks due to exposure to contaminated groundwater."

  Beazer is confused by EPA's addition of ecological risks to the remedial action objectives for groundwater. Sections VI.B and VI.C describe ecological risks and cleanup criteria related to soils and sediments, and no ecological risk posed by exposure to groundwater. Beazer respectfully requests EPA reconsider its classification of this RAO and designate it as "No Significant Difference."

  - ***EPA RESPONSE:***
    *The referenced addition reflects the groundwater to surface water exposure pathway and considers the potential exposure of ecological receptors to the groundwater to surface water interface. O&M activities will be conducted at surface water bodies to ensure the remedy continues to protect ecological receptors from exposure to contaminated groundwater. Therefore, no change has been made in response to this comment.*

- ***COMMENT #14: Section VIII.B.a.***
  "As TPAH migrates upward through the reactive core mat, biodegradation will be enhanced. … wetland plant community is expected to further facilitate biodegradation…"

  The principle of operation and design of Reactive Core Mats are intended not to enhance biodegradation but to inhibit migration of TPAH by acting as an adsorptive barrier. Beazer requests that the statement be corrected so as to avoid creating the perception that employment of reactive core mats can or should serve as a future performance standard or design basis for biodegradation of TPAH at the Site. This comment also applies to IX.A.6.

  - ***EPA RESPONSE:***
    *EPA acknowledges the intended purpose of the reactive core mat and has included language in the ROD Amendment to reflect the purpose of the reactive core mats is to inhibit migration of TPAHs by acting as an adsorptive barrier.*

- ***COMMENT #15: Section VIII.B.b.***
  "If monitoring indicates the barrier walls are not functioning as designed, contingencies will be in place to control DNAPL migration such as pumping or other active measures."

  Beazer is concerned about the lack of precision in this statement. As far back as the 2005 ROD, active controls were never contemplated as a response to *DNAPL migration*, but as a way to mitigate potential threat caused by too great a hydraulic pressure gradient across the barrier wall. Active controls, then, were contemplated as a contingency plan for *groundwater* hydraulic control within the Containment Area and to inhibit potential contaminant migration outside the Containment Area*, if necessary*.

  - ***EPA RESPONSE***:
    *EPA's intention in this section is to ensure contamination from the Containment Area is not migrating from inside the Containment Area to outside of the Containment Area, and if there is evidence of such migration, contingencies will need to be established to address the threat. In this same section, it is noted a monitoring plan will be implemented to gather data regarding hydraulic control inside and outside the Containment Area and data outside of the Containment Area will be collected to evaluate if contaminated groundwater is migrating from the Containment Area. Monitoring will occur both inside and outside of the Containment Area to evaluate potential groundwater rise within the Containment Area that may pose a hydraulic pressure threat. Groundwater data will be collected outside of the Containment Area to evaluate groundwater contamination migration that may pose a risk to human health or the environment. If data shows increased hydraulic head inside the Containment Area or groundwater contamination migrating from inside to outside of the Containment Area, additional actions will be taken (e.g., installation of a drain to discharge groundwater or pumping of the containment area), with necessary treatment as appropriate."*

    *EPA has further clarified in this document.*

- ***COMMENT #16: Section VIII.B.b.***
  "The consolidated materials within the containment area will be capped with a low-permeability RCRA-modified cap."

  "RCRA-modified cap" should be struck and replaced by "Modified RCRA cap"

  - ***EPA RESPONSE:***
    *In response to this comment, the ROD Amendment uses "Modified RCRA cap" when referring to the 2005 ROD. With respect to the Selected Remedial Action selected in the ROD Amendment, the term "cap" is used instead of "Modified RCRA cap"*

- ***COMMENT #17: Section VIII.B.c***
  "In addition, targeted wells will be monitored to determine if measurable DNAPL is entering these wells. Additional DNAPL recovery wells may be added after DNAPL recovery begins to further target and remove source material in the subsurface."

  Beazer questions use of the term "targeted wells" and requests additional clarification about which wells are "targeted wells" or how such a determination is to be made. Beazer further requests the second sentence to be modified such that "Additional DNAPL recovery wells" be added if and only if there is new occurrence of DNAPL in existing wells.

  - ***EPA RESPONSE:***
    *The "targeted wells" are those wells within the Former Process Area and South Pond Areas where measurable DNAPL was encountered during the sampling reported in the "Supplemental Remedial Design Investigation- 2/2018 Sampling of Installed Delineation Wells" report. Further, EPA disagrees with and declines to add the suggested language indicating that additional DNAPL recovery wells will be installed solely if there are new occurrences of DNAPL. During the DNAPL recovery, the data will be analyzed and determinations for additional DNAPL recovery wells will be made based on the results.*

- ***COMMENT #18: Section VIII.B.e.***
  "Hershey Run will be rechanneled to avoid high contamination areas and where the containment area extends into the wetlands area and Upper Hershey Run."

  Because Section VIII.B.b already discusses the Containment Area, Beazer suggests rephrasing this sentence as "Hershey Run will be rechanneled to avoid the Containment Area described in VIII.B.b."

  - ***EPA RESPONSE:***
    *Making this adjustment does not add or take away from the content of the document. Further, the sections in the ROD Amendment have changed from the PRAP and therefore there were no changes made to address this comment.*

- ***COMMENT #19: Section VIII.B.e.***
  "The study demonstrated that because the water elevations at the Site are dictated by the tidal elevations, the proposed realignment of Hershey Run will not have a negative impact on the surface water elevations."

  Beazer suggests expanding this sentence with additional detail. "The study demonstrated that the proposed realignment of Hershey Run will not produce erosive velocities, will not negatively impact surface water elevations (which are largely dictated by tidal elevations), and will not produce a net change in waterway hydraulics from the existing conditions at the Site."

- *EPA RESPONSE:*
  *EPA has included language proposed by Beazer in the ROD Amendment to address this comment. Additionally, EPA has included language in this ROD Amendment to note the design will consider the potential for changed site conditions resulting from an increase in surface water velocity, consistent inundation, and other effects from rising sea levels and from increased intensity and prevalence of storms (including hurricanes and 500-year flow). A climate vulnerability assessment will be performed, and the design will incorporate the findings.*

- ***COMMENT #20: Section VIII.B.f.***
  "The remaining wetland impacts are expected to be temporary due to the removal of impacted sediment and dry weathered surface creosote."

  Beazer suggests: "The remaining wetland impacts due to the removal of impacted sediment and dry weathered creosote are expected to be temporary."

  - ***EPA RESPONSE:***
    *EPA has included language proposed by Beazer in the ROD Amendment.*

- ***COMMENT #21: Section VIII.B.g***
  "Land use restrictions will be established to restrict excavation in areas where clean soil or other fill and vegetation has been placed atop contaminated soils or sediments; restrict excavation in the in the containment area, protect remedy components, and prohibit residential development at the Site. Groundwater use restrictions will be implemented to restrict the extraction of groundwater."

  The first sentence contains a duplicate: "in the in the." Beazer also requests that the second sentence be deleted due to the fact that the groundwater remedy is yet to be finalized

  - ***EPA RESPONSE:***
    *EPA has removed the duplicate "in the in the." EPA disagrees that the second sentence should be deleted. EPA is requiring groundwater use restrictions be implemented to restrict the extraction of groundwater as part of the Interim Action to address human health and ecological risks due to exposure to contaminated groundwater, an RAO in the ROD Amendment. Groundwater use restrictions will prevent the unacceptable exposure and therefore are appropriate for this ROD Amendment.*

- ***COMMENT #22: Section VIII.B.h.***
  "Surface water, sediments, and biota will be monitored to demonstrate that risk has been reduced to acceptable levels and that the remedy continues to be effective. A comprehensive monitoring plan will be developed as part of the Remedial Design, which will include monitoring and maintenance of the respective covers associated with The ROD Amendment."

Beazer questions the addition of biota monitoring, which was not contemplated as part of the 2005 ROD and which is further corroborated by VIII.C.9's comparison between the 2005 ROD Component and The ROD Amendment of the same "Monitoring" remedy as "No Change." Beazer requests EPA remove biota monitoring from VIII.B.h.

- ***EPA RESPONSE:***
  *The 2005 ROD entailed full excavation of all contaminated sediments. Because there will be contaminated material left in place below the reactive core mat, biota monitoring will be necessary to ensure the Selected Remedial Action continues to operate as intended. Furthermore, as explained in EPA's Response to Comment #10 of Section 1 of the Responsiveness Summary, an ecological monitoring program will be developed during the remedial design process as part of the overall Site monitoring program. The program will include the establishment of current pre-remedial or baseline conditions, which will be used to help assess the effectiveness of the Selected Remedial Action. Biota monitoring is necessary in order to establish the effectiveness of the Selected Remedial Action.*

# 6 Received from Nearby Resident #1

- **COMMENT #1:**

My concern has to do with the traffic impact.

How will the EPA move its equipment to the site? There are no roads available, it seems, except for those in Silview. Additionally, where will the equipment be kept and staged for the cleanup?? Silview is a very small neighborhood, with very old houses, with plaster walls, small roads and many, many children.

We are currently fighting an illegal factory that moved into a vacant building several years ago on Crowell Road and has resulted in over 400 tractor trailers traveling down the small road of Lindberg Avenue in a monthly period. Speeding and ignoring our stop signs. These tractor trailers have cracked our walls, our water pipes and our gas lines. They are additionally storing unknown chemicals in several silos that were erected without notice to the community and without disclosure of their contents. The last thing this neighborhood needs is more truck and heavy equipment on our small roads and more undisclosed, dangerous chemicals.

Please let me know the plan for moving equipment in and out of Silview.

- **EPA RESPONSE:**
  *Mobilization routes and access routes will be determined as part of the remedial design and prior to the implementation of the Selected Remedial Action. To the extent possible, equipment that will be used on the Site will be kept on the Site. However, prior to commencement of the Selected Remedial Action, equipment and materials*

*will need to be mobilized to the Site. During implementation of the Selected Remedial Action, there may be situations where demobilization activities will occur, and bringing equipment to and from the Site may occur. EPA understands your concern, and all the appropriate permitting and procedures will be followed to minimize the impact on the local community during the implementation of the Selected Remedial Action. EPA is committed to keeping the community informed of progress at the Site. Below is a link to the Koppers Superfund Site webpage, where more information about the current status of the Site can be found.* https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0300092

# 7 Comment Received from Nearby Resident #2

- **COMMENT #1:**
  I have some questions and concerns regarding the Koppers Co., Inc. Superfund Site cleanup plan that was presented on your video. I live in Silview which is basically right across the railroad tracks from the site. My main questions and concerns are as follows: How long is it expected to take?

  - ***EPA RESPONSE**:*
    *At this time, it is difficult to provide a precise timeline for implementation of the Selected Remedial Action. However, after the remedial design is finalized and the Selected Remedial Action is underway, EPA anticipates that the "construction" portion of the action (i.e., excavation, consolidation, cover installation, capping, etc.) will take approximately 3-4 years to complete. It is important to note that part of the Selected Remedial Action includes groundwater monitoring during and after recovery of DNAPL in the saturated zone to evaluate groundwater conditions during said recovery and to assist in the selection of a final groundwater remedy. The timeline and selection of a final groundwater remedy is unknown currently as this evaluation has yet to begin.*

- **COMMENT #2:**
  What is the proposed use of the site once remediated since it cannot be used for residential?

  - ***EPA RESPONSE:***
    *As the comment correctly states, the Site property is restricted to non-residential use. While EPA is not aware of how the property will ultimately be used, any future use would have to comply with land and groundwater use restrictions to ensure the remedy remains intact and that there is no unacceptable risk presented by contamination remaining on-Site.*

- **COMMENT #3:**
  Is it only to clean up Hershey Run creek for the habitat? Or will another horrible business such as Twinco be allowed to be established there? Or one that requires regular trains such as Amazon? Reason for asking is that lately the trains going by here are already annoying the residents with their day and night incessant train whistles all day.

- **EPA RESPONSE:**
  *The Selected Remedial Action will address threats to human health and the environment posed by numerous areas of the Site. See EPA's Response to Comment #2 regarding future use of the Site property.*

- **COMMENT #4:**
  How will access to the site be given since there are currently no roads going to it and the current truck traffic to Twinco (20+ tractor trailers daily currently!!!) is already a nightmare and, if the plan is to extend Lindbergh over the tracks to give that site access, it is absolutely opposed by all residents of Silview because of even more increased traffic.

  - ***EPA RESPONSE:***
    *Access to and from the Site to implement the Selected Remedial Action has not yet been finalized and will be part of the remedial design, which occurs after the issuance of the ROD Amendment. EPA will give careful consideration to access needed for the Selected Remedial Action, will keep the community informed, and be available as a resource to all interested community members.*

- **COMMENT #5:**
  I assume the train that has been "parked" on the tracks currently with heavy equipment may have something to do with the cleanup. And since there are no road crossings in this area for the trains to have to whistle prior, I'm assuming they are whistling because of that parked train. If that is correct and the Federal train whistle laws require trains to whistle when approaching another train (parked or not) as they pass by Stanton/Silview/Newport, when will it be gone??? The whistles go all through the night also as I have been lately and will continue to be awakened by them every night until they stop.

  - ***EPA RESPONSE**:*
    *The train parked on the tracks at the time of this comment is not associated with EPA's Selected Remedial Action for the Site.*

- **COMMENT #6:**
  If there will be a train parked during the entire cleanup or if there will be a lot of equipment/workers near the railroad tracks at all times, I am begging you to have the area declared a "quiet zone" by whoever is authorized to do so to assure that this isn't going to continue throughout the entire process. Please??

  - **EPA RESPONSE:**
    *It is unlikely a train will be parked on the train tracks in association with the Selected Remedial Action. However, coordination with all appropriate private entities and local, state, and federal agencies will occur prior if this occurs. Work associated with the implementation of the Selected Remedial Action will take into account the proximity to residential homes and careful consideration will be given to minimize the disturbance to the community.*

- **COMMENT #7:**

We, the residents of Silview, are already inundated with many situations that have deteriorated our quality of life and are not looking forward to adding more. We already have multitudes of truck traffic, illegal dirt bikes/ATV's racing through the neighborhood ignoring the "All Way" Stop Signs, low flying C5's and C7's doing training exercises, low flying and hovering helicopters, and annoying barking dogs (that bark even more now with the incessant train whistles). And now because of the safety of President Biden when he is home in Wilmington, we get to deal with the horrific traffic jams that his trips between his home and the airport cause at rush hour on Fridays and occasionally at rush hour on Monday mornings. Enough is enough. Please help. I'm hoping that the Koppers Superfund Cleanup will not be the cause of even more noise and traffic than we are already subjected to and that you can give me information that will set my mind at ease.

Thank you for listening and I hope to hear something positive from you as soon as possible.

- ***EPA RESPONSE**:*
  *EPA understands and respects your concerns and will take into careful consideration the potential noise and construction traffic for nearby residents while preparing for the construction of the Selected Remedial Action. Moreover, EPA is committed to keeping the community informed of progress at the Site. Below is a link to the Koppers Superfund Site webpage, where more information about the current status of the Site Can be found.*
  https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0300092

# IV. FIGURES AND TABLES

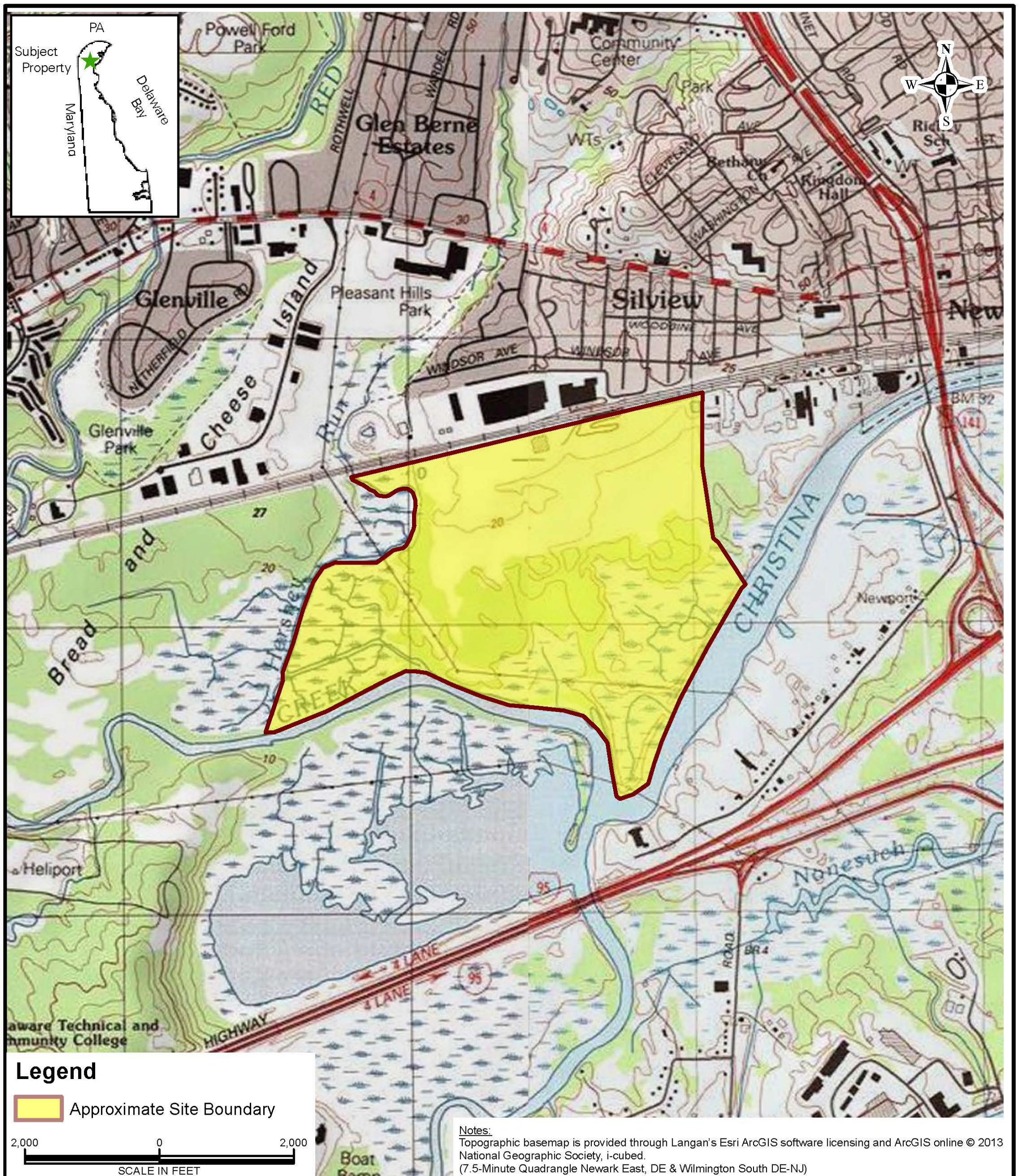



FIGURE 1 - SITE LOCATION

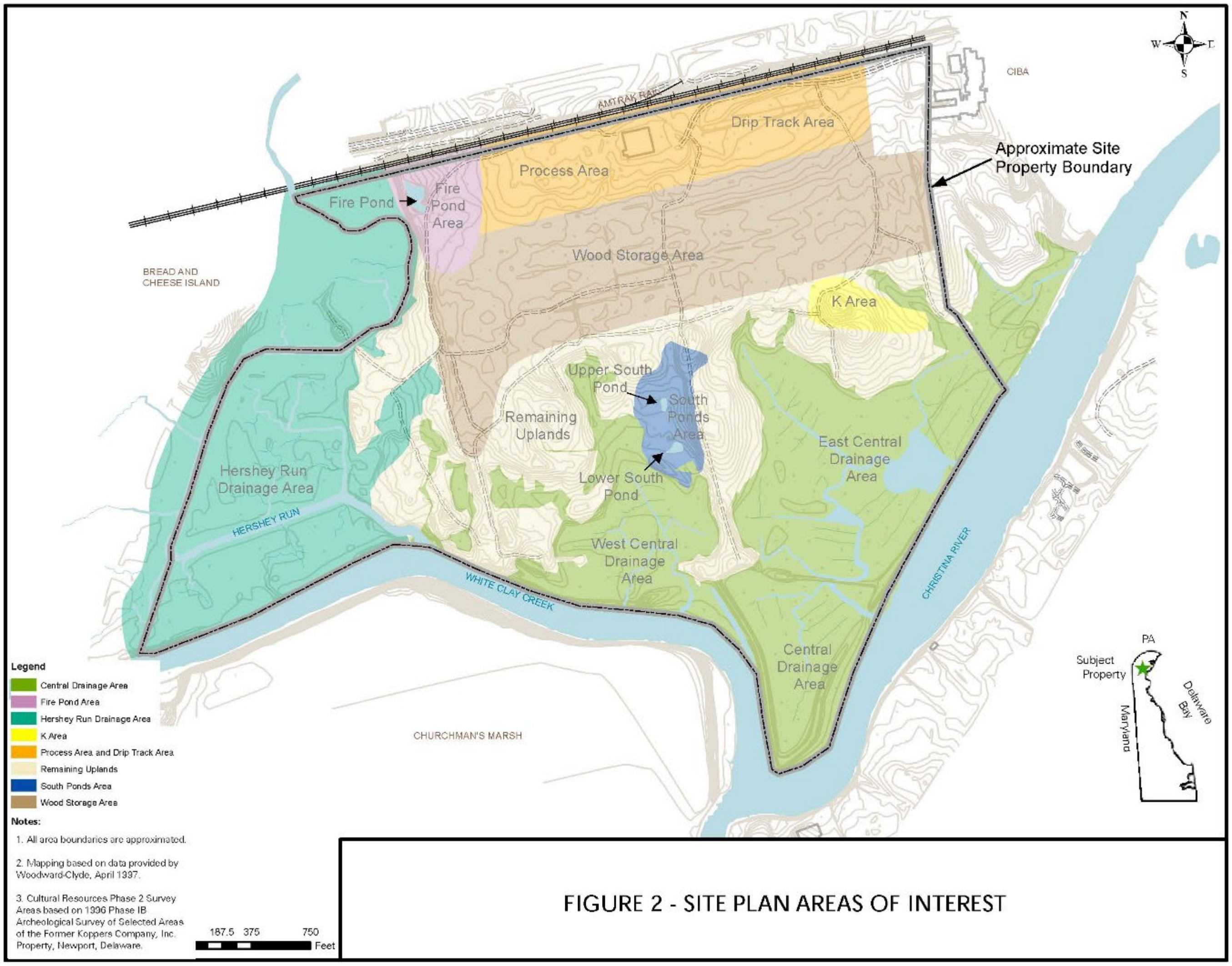



FIGURE 2 - SITE PLAN AREAS OF INTEREST

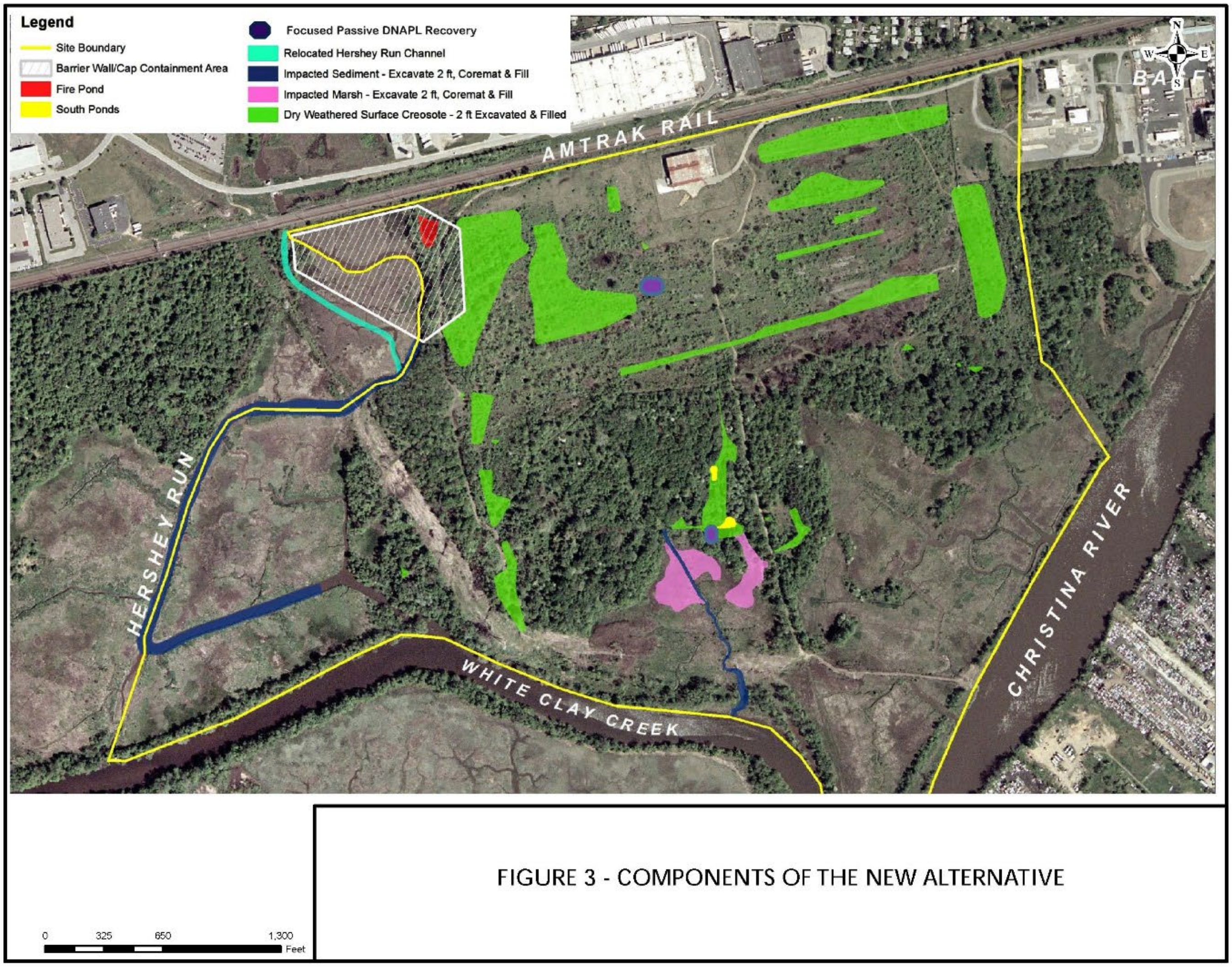



FIGURE 3 - COMPONENTS OF THE NEW ALTERNATIVE


FIGURE 4 - OVERVIEW OF THE SITE AREA

# Table 1:Cost Breakdown

Capital Costs

| | Item | Unit Price | Units | Recommended Remedy Estimated Quantity | Recommended Remedy Estimated Cost |
|---|---|---|---|---|---|
| 1 | **Mobilization/Demobilization** | $100,000 | Lump Sum | 1 | **$100,000** |
| 2 | **Site Preparation** | | | | **$522,620** |
| 2a | Clearing | $5,670 | Acre | 86 | $487,620 |
| 2b | Erosion/Sedimentation Control | $35,000 | Lump Sum | 1 | $35,000 |
| 3 | **WCDA Channel** | | | | **$934,293** |
| 3a | Erosion and Sedimentation Control | $5 | LF | 1,250 | $6,078 |
| 3b | Marsh Mat Road and Platform Installation/Removal | $500,000 | LS | 1 | $500,000 |
| 3c | Excavate to 2 feet, Transport and Solidify Sediments | $64 | CY | 2,100 | $133,703 |
| 3d | Install Reactive Mat | $6 | SF | 31,000 | $186,000 |
| 3e | Import Clean Fill | $30 | CY | 2,100 | $63,000 |
| 3f | Transport, Stockpile, Place Fill | $22 | CY | 2,100 | $45,512 |
| 4 | **WCDA Remediation (Marsh Areas)** | | | | **$1,280,510** |
| 4a | Soil Removal Excavate/Transport/Consolidation or Stockpile | $6 | CY | 8,230 | $49,380 |
| 4b | Install Reactive Mat | $6 | SF | 122,000 | $732,000 |
| 4c | Compaction of Clean Soil Used to Fill in NAPL Excavations | $6 | CY | 6,170 | $37,020 |
| 4d | Clean Imported Backfill | $25 | CY | 6,170 | $154,250 |
| 4e | 6-Inch Topsoil/Organic Soil | $30 | CY | 2,060 | $61,800 |
| 4f | Transport, Stockpile, Place Fill | $22 | CY | 8,230 | $181,060 |
| 4g | Seeding | $25,000 | Acre | 2.60 | $65,000 |
| 5 | **DWSC Remediation** | | | | **$4,924,050** |
| 5a | Soil Removal Excavate/Transport/Consolidation or Stockpile | $6 | CY | 73,400 | $440,400 |
| 5b | Compaction of Clean Soil Used to Fill in NAPL Excavations | $6 | CY | 55,250 | $331,500 |
| 5c | Clean Imported Backfill | $25 | CY | 55,250 | $1,381,250 |
| 5d | 6-Inch Topsoil/Organic Soil | $30 | CY | 18,170 | $545,100 |
| 5e | Seeding | $25,000 | Acre | 22.7 | $567,500 |
| 5f | Geotextile | $2,550 | Acre | 10.0 | $25,500 |
| 5g | Reactive Core Mat | $6 | SF | 3,000 | $18,000 |
| 5h | Transport, Stockpile, Place Fill | $22 | CY | 73,400 | $1,614,800 |
| 6 | **Barrier Wall Platform Construction** | | | | **$1,675,750** |
| 6a | Excavate, Transport & Solidify Marsh | $64 | CY | 5,000 | $320,000 |
| 6b | Import Clean Fill to fill low areas to el +2 | $30 | CY | 5,000 | $150,000 |
| 6c | Import Clean Fill to construct the Working Platform to el+7 | $30 | CY | 12,000 | $360,000 |
| 6d | Import Clean Fill to widen Working Platform for access | $30 | CY | 4,000 | $120,000 |
| 6e | Import Clean Fill for Working Platform Surcharge to el +11 | $30 | CY | 7,500 | $225,000 |
| 6f | Geotextile | $2,550 | Acre | 5 | $12,750 |
| 6g | Instrumentation | $50,000 | LS | 1 | $50,000 |
| 6h | Amtrak Fill/Grading | $30 | CY | 7,000 | $210,000 |

| | | | | | |
|---|---|---|---|---|---|
| 6i | Reactive Core Mat in Amtrak Swale | $6 | SF | 38,000 | $228,000 |
| 7 | **Barrier Wall** | | | | **$1,490,000** |
| 7a | Excavate, & Transport Excavated Soils | $30 | CY | 8,000 | $240,000 |
| 7b | Construct Cement Bentonite Wall | $10 | SF | 125,000 | $1,250,000 |
| 8 | **Hershey Run Remediation** | | | | **$3,981,482** |
| 8a | Erosion and Sedimentation Control | $5 | LF | 9,000 | $43,758 |
| 8b | Marsh Mat Road and Platform Installation/Removal | $500,000 | LS | 1 | $500,000 |
| 8c | Excavate to 2 feet, Transport and Solidify Sediments | $64 | CY | 16,800 | $1,069,626 |
| 8d | Install Reactive Mat | $6 | SF | 250,000 | $1,500,000 |
| 8e | Import Clean Fill | $30 | CY | 16800 | $504,000 |
| 8f | Transport, Stockpile, Place Fill | $22 | CY | 16800 | $364,098 |
| 9 | **Excavation and Upper Hershey Run Rechannelization** | | | | **$440,500** |
| 9a | Excavation of Channel | $6 | CY | 14,000 | $84,000 |
| 9b | Stilling Basin | $25 | SF | 8,000 | $200,000 |
| 9c | Reactive Core Mat | $6 | SF | 9,000 | $54,000 |
| 9d | Tidal Marsh Wetlands - Vegetation-Restoration | $25,000 | Acre | 4.10 | $102,500 |
| 10 | **Wetlands Construction/Mitigation** | | | | **$4,664,000** |
| 10a | Tidal Marsh Wetlands - Restoration - West Central Drainage | $25,000 | Acre | 4.88 | $122,000 |
| 10b | Freshwater Wetland-DWSC Wetland Restoration | $25,000 | Acre | 1.68 | $42,000 |
| 10c | On-site Enhancements of Existing Waterways/Marshes | $4,500,000 | LS | 1 | $4,500,000 |
| 11 | **On-Site Consolidation** | | | | **$6,604,710** |
| 11a | Grading/Compaction of Surface | $6 | CY | 17,000 | $102,000 |
| 11b | Grading and Compaction of Impacted Soils/Sediments | $7 | CY | 127,530 | $892,710 |
| 11c | Stabilization of Excavated Material | $20 | CY | 120,000 | $2,400,000 |
| 11d | Placement & Compaction of Stabilized Material | $8 | CY | 120,000 | $960,000 |
| 11e | Disposal of Excess Water from Excavated Material | $15 | Gal | 150,000 | $2,250,000 |
| 12 | **Low-Permeability Cap with Vegetative Cover** | | | | **$2,013,972** |
| 12a | Geotextile | $2,220 | Acre | 10.4 | $23,088 |
| 12b | HDPE Geomembrane Liner | $25,700 | Acre | 10.4 | $267,280 |
| 12c | Geocomposite Drainage Layer | $41,385 | Acre | 10.4 | $430,404 |
| 12d | 18-Inch Clean Imported Backfill and Compaction | $31 | CY | 25,200 | $781,200 |
| 12e | 6-Inch Topsoil/Organic Soil | $30 | CY | 8,400 | $252,000 |
| 12f | Seeding | $25,000 | Acre | 10.4 | $260,000 |
| 13 | **Miscellaneous (Site restoration, waste management)** | | | | **$620,000** |
| 13a | Miscellaneous Site Restoration | $20,000 | Lump Sum | 1 | $20,000 |
| 13b | Miscellaneous Waste Disposal | $600,000 | Lump Sum | 1 | $600,000 |
| 14 | **Groundwater (Evaluation & Sampling)** | | | | **$252,500** |
| 14a | Groundwater Sampling | $25,000 | Event | 8 | $200,000 |
| 14b | Reporting | $10,500 | Report | 5 | $52,500 |
| 15 | **Passive NAPL Recovery** | | | | **$105,000** |
| 15a | Oil Separator Units/Manual or Passive Recovery | $20,000 | Each | 5 | $100,000 |
| 15b | NAPL Storage Tanks | $5,000 | Each | 1 | $5,000 |
| 16 | **Indirects** | $20,540 | Week | 52 | **$1,068,080** |
| 17 | **Archaeological Evaluations** | $750,000 | Lump Sum | 1 | **$750,000** |
| | **Subtotal** | | | | **$31,427,467** |
| 18 | **Administration and Engineering** | | | 10% | $3,142,747 |
| 19 | **Contingency** | | | 10% | $3,457,021 |

| | | | | | |
|---|---|---|---|---|---|
| | **Total Capital Cost** | | | | **$38,027,235** |
| | **Operation and Maintenance (O&M) Costs - 30 Year Costs** | | | | |
| | | | | **Recommended Remedy** | |
| | **Item** | **Unit Price** | **Units** | **Estimated Quantity** | **Estimated Cost** |
| 20 | Site Inspections | $20,000 | Annual | 0.5 | $10,000 |
| 21 | Landfill Maintenance (i.e., mowing) | $100 | Acre/Year | 10.4 | $1,040 |
| 22 | Misc Erosion Control and Repairs | $1,500 | Annual | 1 | $1,500 |
| 23 | NAPL Monitoring | $15,000 | Annual | 1 | $15,000 |
| 24 | NAPL Transport and Disposal from Monitoring | $100 | Gal/Year | 25 | $2,500 |
| 25 | NAPL Recovery - Oil Separator Unit Maintenance | $30,000 | Annual | 1 | $30,000 |
| 26 | NAPL Recovery - NAPL Disposal | $100 | Gal/Year | 40 | $4,000 |
| 27 | Hydraulic Monitoring | $7,500 | Annual | 2 | $15,000 |
| | **Subtotal** | | | Annually | **$79,040** |
| | | A-Annual Payment | | | $79,040 |
| | | i - Interest Rate | | | 7% |
| | | n - # years | | | 30 |
| | P-Present Worth = A((((1+i)^n)-1))/(i(1+i)^n) | | | | $980,811 |
| 28 | Wetland Monitoring - 5 Year Costs | $7,500 | Acre/Year | 17.00 | $637,500.00 |
| | **Subtotal** | | | | **$1,618,311** |
| | | A-Annual Payment | | | |
| | | i - Interest Rate | | | 7% |
| | | n - # years | | | 5 |
| | P-Present Worth = A((((1+i)^n)-1))/(i(1+i)^n) | | | | $0 |
| | **Total O&M Cost** | | | | **$1,618,311** |
| | | | | | |
| | **TOTAL ESTIMATED COST** | | | | **$39,645,546** |

WCDA = West Central Drainage Area
DWSC = Dry Weathered Surface Creosote

# Table 2: ARARs

| ARAR | Citation | Class | Synopsis | Relevance to Remedy |
|---|---|---|---|---|
| | | Chemical-Specific | | |
| Clean Water Act, National Pollutant Discharge Elimination System Requirements | 40 C.F.R. § 122.41(a)(1), (d), (e); 122.44(a)(1), (b)(1) (first sentence), (d), (e), (i)(1), and (k); 122.45(a), (c)-(f) | Applicable | Effluent limits and standards, duty to mitigate, proper operation and maintenance of facilities to achieve compliance, water quality standards. | Excavations may result in discharges to surface water. There is a potential for storm water runoff into Hershey Run, White Clay Creek or the Christina River. Substantive requirements pertaining to discharges to surface water will be followed. No permit will be obtained. |
| Delaware Regulations Governing Control of Water Pollution, amended September 1, 2012 | 7 Del. Admin. Code § 7201; Subsections 7, 8 , 9.1.4 through 9.1.7, 9.2.4 through 9.2.6, 11 | | Standards to ensure that the surface and ground waters of the State exhibit a quality that is consistent with established criteria by preventing, managing, and/or controlling the pollution from activities that affect or have the reasonable potential to affect the quality of these waters. | |
| Delaware Water Quality Standards, as amended, September 1, 2017 | 7 Del. Admin. Code § 7401, subsections 3-4, 5.1 (relevant and appropriate), 5.2 (first two sentences relevant and appropriate), 6, 8 | Applicable (except as otherwise stated) | Standards to regulate the discharge into state waters in order to maintain the integrity of the water. | |

| | | | | |
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| Delaware Air Quality Management Regulations | 7 Del. Admin. Code § 1103, subsections 3, 11<br><br>7 Del. Admin. Code § 1106, subsections 2.1-2.2, 3, 4, 6;<br><br>7 Del. Admin. Code § 1119, subsection 2 | Relevant and appropriate | Standards for ambient air quality, particulate emissions, odorous air contaminants, and VOC emissions. | Excavation will result in particulate release. |
| Identification and Listing of Hazardous Wastes | 40 C.F.R. Part 261<br><br>7 Del. Admin. Code § 1302, Part 261 | Applicable | Identifies solid wastes that are hazardous wastes. | Wastes at the Site are F034 hazardous wastes. Some hazardous waste may be temporarily stored at the Site in containers or tanks (e.g., DNAPL waste); other hazardous waste (e.g., creosote waste) will be placed into an on-Site containment system. The substantive requirements of these regulations will apply.<br><br>The provisions of 7 Del. Admin. Code § 1302 that are part of Delaware's Federally authorized program would apply instead of the Federal RCRA regulations. Additionally, any provision that is not a part of the authorized program but is more stringent than the Federal requirement would also apply. |
| Standards Applicable to Generators of Hazardous Waste | 40 C.F.R. §§ 262.10-.11<br><br>Corresponding sections of 7 Del. Admin. Code § 1302, Part 262. | Relevant and Appropriate | Establishes standards applicable to generators of hazardous waste | |
| Standards Applicable for Owners and Operators of Hazardous Waste Treatment Storage and Disposal Facilities | 40 C.F.R. §§ 264.1, .13-.15, .17-.19, .31, .33, .34, .51, .97, .98(a)-(b), .111, .114, .221, .226, .228, .171-178, .190-199, .1084-1086<br><br>Corresponding sections of 7 Del. Admin. Code § 1302, Part 264. | Relevant and Appropriate | Regulations for owners and operators of TSDFs which define acceptable management of hazardous wastes. | |
| Land Disposals Restrictions | 40 C.F.R. Part 268 | Applicable | Restrictions on land disposal of hazardous wastes. | These restrictions do not apply regarding consolidation of wastes |

| | | | | |
|---|---|---|---|---|
| | | | | into the Containment Area as these wastes and the Containment Area are in the same area of contamination. |
| Location-Specific | | | | |
| Coastal Zone Management Act of 1972, Coastal Zone Act Reauthorization Amendments of 1990 | 16 U.S C. §§ 1451 et. seq.<br>15 C.F.R. Part 930, subpart C | Applicable | Requires that Federal agencies conducting activities directly affecting the coastal zone conduct those activities in a manner consistent with the approved State coastal zone management program. | The Koppers Site is in a Coastal Zone. The substantive requirements of these laws will be followed. |
| Delaware Coastal Zone Act;<br>Delaware Regulations Governing the Coastal Zone | 7 Delaware Code, Chapter 70, Sections 7002-7003; Del. Admin. Code Title 7, Chapter 2201 (Delaware Coastal Management Program), Section 5 | Applicable | Governs permissible Activities and land uses for properties located in Delaware's Coastal Zone. | |
| National Historic Preservation Act | 16 U.S.C. §§ 470-1, 470f,<br>470w<br><br>36 C.F.R. §§ 800.1(a), 800.2, 800.3, 800.4, 800.5, 800.6, 800.7, 800.9, 800.11, 800.13, 800.14, 800.16, and Appendix A to Part 800 | Applicable<br><br>The procedures in 36 C.F.R. Part 800 are Relevant and Appropriate | Requires that federal projects take into account effects on properties included on or eligible for inclusion on the National Register of Historic Places. | Properties that are eligible for inclusion on the National Registry of Historic Places may be adversely impacted by remediation at the Site. |

| | | | | |
|---|---|---|---|---|
| Protection of Floodplains | 44 C.F.R. § 9.11(b)(1), (b)(3) | Relevant and Appropriate | Requires minimization of harm to or within the floodplain.<br><br>Requires restoration and preservation of natural and beneficial floodplain values. | Remedial action will take place within both the 100-year and 500-year floodplains.[6] |
| | 44 C.F.R. § 9.11(c)(1), (c)(3) | Relevant and Appropriate | Requires minimization of harm to lives and the investment at risk from the base flood or 500-year floods.<br><br>Requires minimization of adverse impact on floodplain and wetland values. | |
| Protection of Wetlands | 44 C.F.R. § 9.11(b)(2), (b)(4) | Relevant and Appropriate | Requires the minimization of the destruction, loss, or degradation of wetlands.<br><br>Requires the preservation and enhancement of the natural and beneficial wetlands values. | |
| | 44 C.F.R. § 9.11(c)(3) | | Requires the minimization of potential adverse impact the | |

[6] See also (1) Executive Order 11988, Section 1 (which requires action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health and welfare, and to restore and preserve the natural and beneficial values served by floodplains) and 2(a)(2) (which requires consideration of alternatives to avoid adverse effects and incompatible development in floodplains); (2) Executive Order 13690, Section 2(c) (which requires use of natural systems, ecosystem processes, and nature-based approaches when developing alternatives for consideration). Federal Agencies are required to comply with executive order requirements.

| | | | | |
|---|---|---|---|---|
| | | | action may have on wetland values. | Remedial action will impact wetlands.[7] |
| | 40 C.F.R. § 230.93(a) | Relevant and Appropriate | General compensatory mitigation requirements. | |
| | 40 C.F.R. § 230.94(c) | Relevant and Appropriate | Requirement for mitigation plans. | |
| | 40 C.F.R. § 230.95 | Relevant and Appropriate | Ecological performance standards for mitigation plans. | |
| | 40 C.F.R. § 230.96(a)(1), (b) | Relevant and Appropriate | Monitoring requirements, monitoring period. | |
| | 40 C.F.R. § 230.97(a)(1), (c) | Relevant and Appropriate | Protection of sites using real estate instruments or alternatives, sustainability. | |
| Delaware Wetlands Regulations, amended November 1, 2018 | 7 Del. Admin. Code § 7502, subsection 12 | Applicable | Identifies factors to be considered in issuing permits for activities impacting wetlands. | |
| Delaware Executive Order 56 on Freshwater Wetlands (1988)[8] | | To Be Considered | General policy to minimize the adverse effects to freshwater wetlands. | |
| Delaware Regulations Governing the Use of Subaqueous Lands, amended September 2, 1992 | 7 Del. Admin. Code § 7504, subsection 4 | Relevant and Appropriate | Identifies factors to be considered in issuing permits for activities impacting subaqueous lands | |

[7] See also Executive Order 11990, Section 1(a) (which requires action to minimize the destruction, loss, or degradation of wetlands and to preserve and enhance beneficial values of wetlands) and 2(a) (which requires taking action to avoid construction in wetlands unless there is no practicable alternative to such construction and the proposed action includes all practicable measures to minimize harm to wetlands which may result from such use). Federal Agencies are required to comply with executive order requirements.

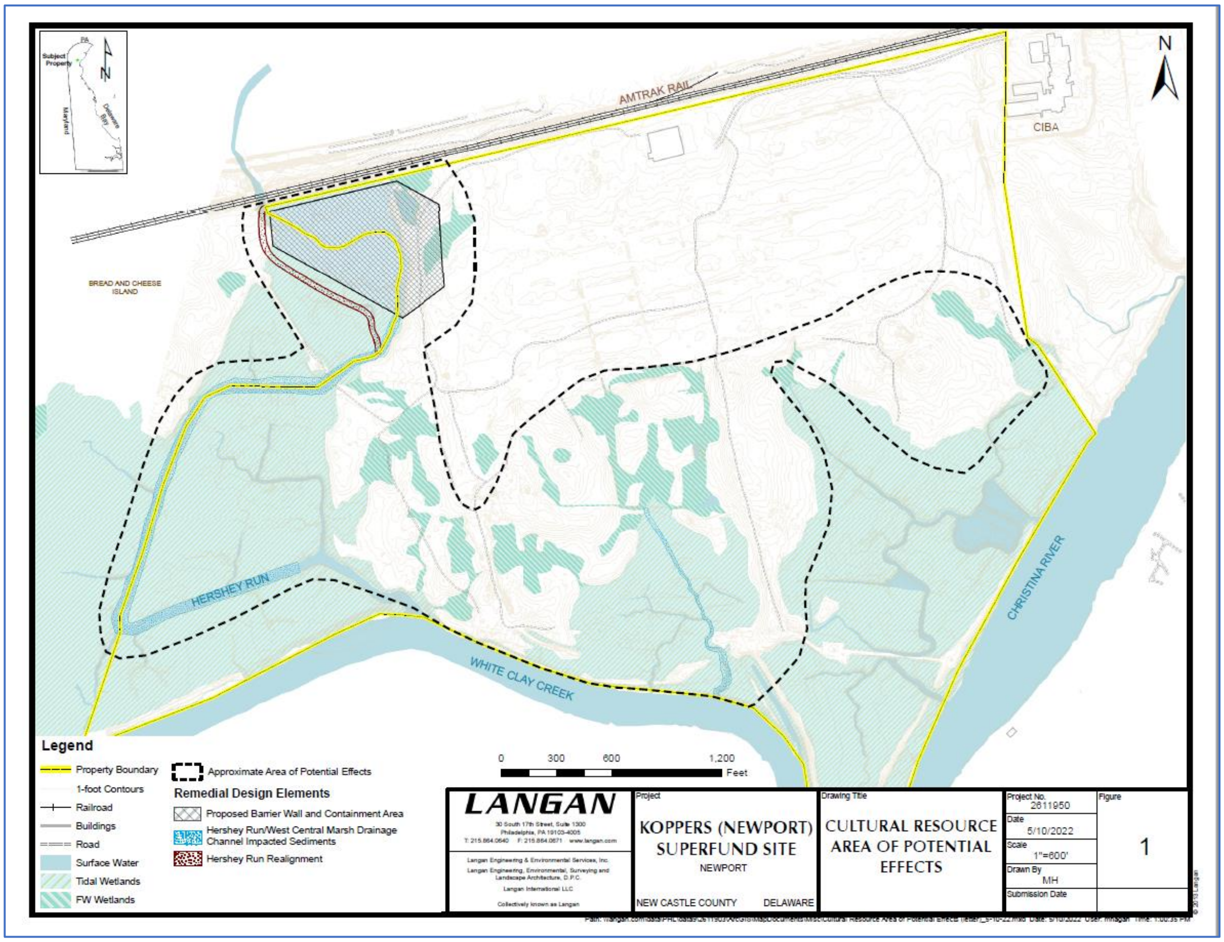
[8] https://archivesfiles.delaware.gov/Executive-Orders/Castle/Castle_EO56.pdf

| | | | | |
|---|---|---|---|---|
| Wild and Scenic Rivers Act | 16 U.S.C. § 1271<br><br>36 C.F.R. § 297.5(a)(1)-(2) | Relevant and Appropriate | Federal project will not have a direct and adverse effect on the values for which a Wild and Scenic River was designated, nor invade nor unreasonably diminish the scenic, recreational, and fish wildlife values of a Wild and Scenic River. | The substantive requirements will be considered in taking action impacting subaqueous lands. |
| **Action-Specific** | | | | |
| Rivers and Harbors Act § 10, Clean Water Act § 404 | 33 C.F.R. § 320.2, .4<br><br>33 U.S.C. § 403 | Relevant and Appropriate | Standards for regulation of discharge of dredged or fill material into waters of the United States, including wetlands. | A portion of Hershey Run's channel will be changed during remediation. |
| Delaware Sediment and Stormwater Regulations, January 23, 1991 as amended February 2, 2019 | 7 Del. Admin. Code § 5101, subsections 4-5 | Applicable | To provide control and management of stormwater runoff consistent with sound water and land use practices in order to reduce to the extent possible any adverse effects of stormwater runoff on the water and lands of the State. | The remediation will involve land disturbing activities. The substantive provisions of this regulation are applicable to stormwater from the construction area. No permits or plans will be sought or obtained. |
| Regulations Governing the Construction and Use of Wells | 7 De Admin. Code § 7301, subsections 5, 7, 10 | Applicable | Standards governing the location, design, installation, use, disinfection, modification, repair, and sealing of all wells and associated pumping equipment. | The remediation will potentially involve the installation of wells for purposes of monitoring or DNAPL removal. No permits will be obtained for on-site wells. |

| | | | | |
|---|---|---|---|---|
| Delaware Land Use Restrictive Covenants | Title 7, Delaware Code Chapter 79, Subchapter II | To Be Considered | Specifies the requirements of an environmental covenant established under Delaware law. | This subchapter will be consulted if a state-law environmental covenant is used to implement institutional controls at the Site. |

# ATTACHMENT B

## (Diagram of APE)



# ATTACHMENT C

| Organization/ Group | Email Address | Postal Address | Phone |
|---|---|---|---|
| EPA | Taylor.Daniel@epa.gov | Daniel Taylor (3SD23)<br>U.S. EPA<br>4 Penn Center<br>1600 John F Kennedy Blvd.,<br>Philadelphia, PA 19103-2852 | 215-814-3326 |
| DE SHPO | gwen.davis@delaware.gov | Gwenyth A. Davis,<br>Deputy SHPO<br>Delaware Division of Historical and Cultural Affairs<br>29 N. State Street<br>Dover DE 19901 | 302-736-7400 |
| | sarah.carr@delaware.gov | Sarah Carr, Archaeologist<br>Delaware Division of Historical and Cultural Affairs<br>29 N. State Street<br>Dover DE 19901 | 302-736-7400 |
| ACHP | jeddins@achp.gov | ACHP<br>Office of Federal Agency Programs<br>401 F Street, N.W.<br>Suite 308<br>Washington, D.C. 20001 | 202-517-0211 |
| Beazer East, Inc. | Jane.Patarcity@trmi.biz | Jane Patarcity<br>Senior Environmental Manager<br>Beazer East, Inc.<br>c/o Three Rivers Management, Inc.<br>600 River Avenue Suite 200<br>Pittsburgh PA 15212 | 412 -208- 8813 |
| Delaware Nation | klucas@delawarenation-nsn.gov | Katelyn Lucas | 405-544-8115 |
| Delaware Tribe of Indians | sbachor@ DelawareTribe.onmicrosoft.com | Susan Bachor, M.A.<br>Deputy THPO &<br>Archaeologist<br>Delaware Tribe Historic Preservation<br>5100 Tuxedo Blvd<br>Bartlesville, OK 74006 | 918-337-6590 |

| | | | |
|---|---|---|---|
| Archaeological Society of Delaware | danielgriffith@comcast.net | Daniel Griffith<br>The Archaeological Society of Delaware, Inc.<br>PO Box 1968<br>Dover, DE 19903 | 302-242-3918 |
| Delaware Department of Transportation | john.w.martin@delaware.gov | John Martin<br>Section 106 Supervisor<br>Box 788<br>Dover, DE 19903 | 302-760-2189 |
| Delaware Department of Natural Resources and Environmental Control | Morgan.Mcgee-Solomon@delaware.gov | Morgan McGee-Solomon<br>DNREC-Division of Waste and Hazardous Substances<br>Remediation Section<br>391 Lukens Drive<br>New Castle, DE 19720 | 302-395-2600 |
| Lenape Indian Tribe of Delaware | lenapedelaware@comcast.net | Dennis J Coker, Principle Chief<br>Lenape Indian Tribe of Delaware<br>4164 N. DuPont Hwy, Suite 6<br>PO Box 79<br>Cheswold, DE 19936 | 302-730-4601 |
| Nanticoke Indian Association | info@nanticokeindians.org | Nanticoke Indian Association<br>27073 John J. Williams Highway<br>Millsboro, DE 19966 | 302-945-3400 |
| New Castle County | Richard.hall@newcastlede.gov<br>Tamica.evans@newcastlede.gov<br>Elizabeth.Hatch@newcastle.gov | n/a | |
| Preservation Delaware, Inc. | jaymccutcheon@preservationde.org<br>mhmcgrath@preservationde.org | n/a | 302-322-7100 |

# APPENDIX C

## [2006 ORDER]

# UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
# REGION III

**IN THE MATTER OF:**
**KOPPERS CO., INC. (NEWPORT PLANT) SUPERFUND SITE**

**Beazer East, Inc.,**

**Respondent**

**Proceeding Under Section 106(a) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended, 42 U.S.C. § 9606(a)**

**Docket No. CERC-03-2006-0266DC**

## ADMINISTRATIVE ORDER FOR REMEDIAL DESIGN/REMEDIAL ACTION

**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY**
**REGION III**

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| **IN THE MATTER OF:**<br>**KOPPERS CO., INC. (NEWPORT PLANT) SUPERFUND SITE**<br><br>**Beazer East, Inc.,**<br><br>**Respondent**<br><br>**Proceeding Under Section 106(a) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended, 42 U.S.C. § 9606(a)** | **Docket No.**<br>**CERC-03-2006-0266DC** |

## ADMINISTRATIVE ORDER FOR REMEDIAL DESIGN/REMEDIAL ACTION

Having determined the necessity for implementation of response activities at the Koppers Co., Inc. Superfund Site in Newport, New Castle County, Delaware ("Koppers Site" or "Site"), the United States Environmental Protection Agency ("EPA") hereby Orders as follows:

## I. JURISDICTION

A. This Administrative Order ("Order") is issued to the Respondent by the United States Environmental Protection Agency ("EPA") under the authority vested in the President of the United States by Section 106(a) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended, ("CERCLA"), 42 U.S.C. § 9606(a). This authority was delegated to the Administrator of EPA by Executive Order No. 12580 (52 Fed. Reg. 2923, January 29, 1987), delegated to the EPA Regional Administrators by EPA Delegation No.

14-14-B (May 11, 1994), and further delegated to the Director of the Hazardous Site Cleanup Division, EPA Region 3, by EPA Region 3 Delegation 14-14-B (November 7, 2003).

B. Prior notice of this Order has been given to the State of Delaware pursuant to Section 106(a) of CERCLA, 42 U.S.C. § 9606(a).

## II. PARTIES BOUND

A. This Order is issued to Beazer East, Inc. ("Respondent").

B. This Order shall apply to and be binding upon the Respondent and its agents, successors and assigns.

C. Neither a change in ownership of any property covered by this Order, nor a change in the ownership or corporate or partnership status of Respondent, shall in any way alter, diminish, or otherwise affect the Respondent's obligations and responsibilities under this Order.

D. In the event of any change in majority ownership or control of the Respondent, the Respondent shall notify EPA, in writing, no later than thirty (30) days after such change, of the nature and effective date of such change. The Respondent shall provide a copy of this Order to the prospective owner(s) or successor(s) of the Respondent before any change of ownership or control becomes irrevocable.

E. In the event that the Respondent files for bankruptcy or is placed involuntarily in bankruptcy proceedings, the Respondent shall notify EPA in writing within three (3) working days of such filing.

F. Respondent shall provide a copy of this Order to all contractors, subcontractors, laboratories, consultants, and other persons retained to conduct or monitor any portion of the Work performed pursuant to this Order prior to execution of any agreements or contracts with such persons. If the Respondent is under contract or agreement with any contractor, subcontractor, laboratory, consultant or other person retained to conduct or monitor any portion of the Work required pursuant to this Order at the time this Order is issued, Respondent shall provide a copy of this Order to all such persons within five (5) days of receipt of this Order. Respondent shall condition all contracts and agreements with such persons on compliance with the terms of this Order. Notwithstanding the terms of such contracts or agreements, Respondent remains responsible for complying with the terms of this Order and for ensuring that its contractors, subcontractors, laboratories, consultants, and other persons retained to conduct or monitor any portion of the Work required by this Order comply with the terms of this Order.

## III. FINDINGS OF FACT

The following facts are a synopsis of information contained in the Administrative Record supporting issuance of this Order. That Administrative Record is incorporated by reference as if fully set forth herein:

### A. Site Location and Historical Use

1. The Koppers Site consists of over 300 acres of land located in the northern part of New Castle County, Delaware, southwest of the town of Newport and northwest of the Route

I-95 and Route 141 interchange; is generally depicted as the "Former Koppers Company, Inc. Site" in Attachment 1 to this Order; and includes all places and property to which hazardous substances, pollutants or contaminants have migrated from the "Former Koppers Company, Inc. Site" in Attachment 1. The Site was the location of wood treatment operations from approximately the 1930s through 1971.

2. To the north, the Site is bordered by high-speed railroad lines. Beyond the rail lines are a former municipal sewage treatment facility, an industrial property, and a residential area. To the east, the Site is bordered by the former DuPont Holly Run Plant and the Christina River. To the south and west, the Site is bordered by White Clay Creek and Hershey Run, respectively. To the west of the Site, across Hershey Run, lies the Bread and Cheese Island property. The Site contains approximately 163 acres of upland areas 136 acres of wetlands, and three ponds.

3. In or around April 1929, Delaware Wood Preserving Company ("DelWood") acquired two parcels which comprise much of the Site and conducted wood treatment operations there until 1932. In 1932, DelWood sold the property to Century Wood Preserving Company, which continued to conduct wood treatment operations until it sold the property to the Wood Preserving Company ("WPC") in 1935. WPC continued wood treatment operations until 1941, when Koppers Company acquired the property. Koppers Company merged into Koppers Company, Inc. ("Koppers") in 1944 and continued to use the Site for wood treatment activities until 1971. In 1971, Koppers sold the property to E.I. duPont de Nemours & Company

("DuPont").

4. In 1974, the New Castle County Department of Public Works ("DPW") leased land in the northern portion of the Site where it built and operated a sewage/sludge treatment facility from 1974 until 1977. In 1977, DPW sold the building which currently exists on-Site to DuPont and discontinued wastewater treatment operations at the Site. In December 2004, DuPont transferred ownership of the Site to Respondent.

5. Wood treatment operations, conducted at various areas of the Site generally depicted in Attachment 2 to this Order, took place in the northern half of the Site. The Process Area contained various types of treatment equipment and storage for approximately 1,000,000 gallons of creosote and other process-related materials. Wood was treated in the Process Area using a creosote coal/tar solution, though pentachlorophenol ("PCP") with number 2 fuel oil was also used. The creosote treatment consisted of heating and pressurizing tanks filled with creosote and wood, forcing the creosote into the wood. After treatment, the freshly-treated wood products were temporarily allowed to cure and drip dry in the Drip Track Area prior to transfer to the large Wood Storage Area. Spills and leaks, including drips from drying wood, allowed treatment chemicals to seep into the soil.

6. The Potomac Formation, a major aquifer in the region of the Site and a source of potable water, lies beneath the Site. Several municipal water supply wells are located within approximately one mile of the Site.

7. Present on-Site is a building and sewer line constructed by DPW in or around 1974, a partial fence enclosure, and a blacktopped area. After purchasing the Site in 1971, Du Pont expanded its adjacent Holly Run Facility onto approximately 5 acres of the eastern portion of the Site, but subsequently dismantled the facility. Additional current Site features include two culverts, several drainage ditches, piles of old railroad ties, an "old foundation," a "fill or mounded area," an "old fire pond" and a former sump where effluent was treated or stored and is now covered with sediment/soil.

**B. Environmental Investigations**

1. The Site was first identified as a potential hazardous waste site in or around November 1979 following a review of responses to the Waste Disposal Site Survey of 1979 developed by the Subcommittee on Oversight and Investigation of the House Interstate and Foreign Commerce Committee (commonly known as the "Eckhardt Report").

2. EPA and the State conducted a Site Inspection on May 28, 1980, at which time several surface water samples were collected. Results showed that surface water on the Site appeared to be contaminated with phenolic compounds and PAHs. Additional samples were collected from the Site, as well as from nearby municipal drinking water supply wells, in October 1980 by an EPA contractor. On-site samples showed PAHs present in soil and leachate, but no contamination was detected in the supply wells.

3. EPA and the State conducted a Site Inspection in December 1984. Analytical results revealed the presence of, among other things, anthracene, benzo(a)anthracene,

benzo(b)fluoranthene, benzo(b)pyrene, 2-butanone, chrysene, fluoranthene, phenanthrene, pyrene, aluminum, barium, lead and magnesium in the on-site soil/sediment samples and stream sediment samples.

4. EPA proposed the Site for inclusion on the National Priorities List ("NPL") in 1989, and formally listed the Site on the NPL on August 30, 1990.

5. In 1991, Respondent agreed to perform a Remedial Investigation/Feasibility Study ("RI/FS") under the terms of an Administrative Consent Order signed by Respondent and EPA. Initial Remedial Investigation ("RI") field work was completed in 1996, with supplemental investigations conducted in 2002 and 2003. The RI, which EPA accepted as final in April 2003, revealed the presence of creosote non-aqueous phase liquid in both subsurface soils and wetland sediments at the Site. Shallow soils, subsurface soils, groundwater, and sediments were also found to be contaminated to varying degrees with polynuclear aromatic hydrocarbons. Contamination at the Site was found to be present in the Process and Drip Track, Wood Storage, Remaining Upland, Hershey Run Drainage, Fire Pond, South Ponds, and K Areas depicted in Attachment 2 to this Order.

6. A Human Health Risk Assessment ("HHRA"), conducted during the RI by Respondent to evaluate the human health risks that could result if no remedial action were taken at the Site, found that risks to a construction worker, industrial worker, adolescent trespasser, adolescent swimmer or angler exceed target risk levels for carcinogenic and non-carcinogenic risks.

7. In an Ecological Risk Assessment for the Site conducted in 1996-1997, EPA concluded that PAHs pose ecological risks to the upland, wetland and aquatic communities at the Site.

8. In September 1999, a draft Feasibility Study ("FS") report was submitted to EPA by Respondent. After receiving comments, extensive revisions were made and the draft FS was resubmitted in April 2003. Respondent submitted an addendum to the FS in September 2004. EPA accepted the FS, as modified by the FS Addendum, in 2005.

**C. <u>EPA's Record of Decision</u>**

1. EPA published a notice of its Proposed Remedial Action Plan for the Site on October 7, 2004. A period of public review and comment was held from October 7, 2004 through December 7, 2004.

2. On September 30, 2005, EPA issued a Record of Decision ("ROD") in which the Agency selected remedial action for implementation at the Koppers Site. The remedial action selected in the ROD generally consists of the following components:

a. Excavation and consolidation of all contaminated soils and sediments (soils with total PAHs greater than 600 mg/kg and sediments with total PAHs greater than 150 mg/kg) into one or two on-site landfills or containment areas ("Containment Area") to be located in the areas of the worst NAPL contamination;

b. Installation, operation, and maintenance of a ground water treatment system to prevent the migration of contaminated ground water, as well as to prevent the discharge of contaminated ground water from the recovery operation, and an oil-water separator to facilitate the recovery of free-phase NAPL as well as to prevent NAPL from reaching the ground water treatment system;

c. Treatment of ground water as necessary to meet discharge requirements;

d. Construction of ground water barrier walls and collection systems in the Containment Area to prevent further migration of ground water contamination, including NAPL;

e. Management of the hydraulic head of ground water and collection of NAPL contamination in the ground water through the use of the passive recovery trenches;

f. Separation of creosote from ground water and off-site disposal or recycling;

g. Movement of debris to a location on-Site where it can be placed under a cap;

h. Installation of a cap across the Containment Area;

i. Relocation of a portion of the existing channel of Hershey Run if the Containment Area extends into the Hershey Run wetlands;

j. Creation of wetlands to replace any wetlands that are filled in as part of the landfill construction;

k. Monitoring of ground water, surface water, sediments and wetlands to ensure the effectiveness of the remedy; and

l. Prevention of exposure to contamination inside the Containment Area or in ground water beneath the Site, and prevention of the drawdown of contamination into the deeper aquifer or elsewhere through land and ground water use restrictions for the Site and surrounding area.

**D. Respondent**

1. Respondent Beazer East, Inc. is a Delaware corporation.

2. In or around 1988, approximately 17 years after it ceased wood treatment operations at the Site, Koppers was acquired by BNS Acquisition, Inc.

3. In or around 1989, BNS Acquisition, Inc. merged into Koppers, and Beazer East, Inc. was established as the new holding company. Also in 1989, Koppers changed its name to Beazer Materials and Services, Inc.

4. In or around 1990, Beazer Materials and Services, Inc. changed its name to Beazer East, Inc.

## IV. CONCLUSIONS OF LAW AND DETERMINATIONS

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

B. "Hazardous substances," as that term is defined in Section 101(14) of CERCLA, 42 U.S.C. § 9601(14), and 40 C.F.R. § 300.5, have been disposed of, deposited, stored, placed, or have otherwise come to be located on, and remain at, the Site.

C. The hazardous substances at the Site are being released, and/or threaten to be released, from the Site into the environment within the meaning of Section 101(8) and (22) of CERCLA, 42 U.S.C. § 9601(8) and (22).

D. Respondent is a "person" within the meaning of Section 101(21) of CERCLA, 42 U.S.C. § 9601(21).

E. Respondent is an "owner or operator," as defined in Section 101(20) of CERCLA, 42 U.S.C. § 9601(20), of the Site and is "the owner and operator of . . . a facility" within the meaning of Section 107(a)(1), 42 U.S.C. § 9607(a)(1). In addition, Respondent is "a person who at the time of disposal of any hazardous substance owned or operated any facility at which such hazardous substances were disposed of" within the meaning of section 107(a)(2) of CERCLA, 42 U.S.C. § 9607(a)(2).

F. The actual or threatened releases of hazardous substances from this Site may present an imminent and substantial endangerment to the public health or welfare or the environment.

G. The actual or threatened releases of hazardous substances from this Site, if not addressed by implementing the response actions selected in the ROD and by achieving and maintaining Performance Standards (as defined herein), may present an imminent and substantial endangerment to the public health or welfare or the environment.

H. EPA has determined that in order to implement the response actions selected in the ROD, the Work required by this Order must be performed.

## V. DEFINITIONS

Unless otherwise expressly provided herein, terms used in this Order that are defined in CERCLA or in regulations promulgated pursuant to CERCLA shall have the meaning assigned to them in the statute or its implementing regulations. Whenever terms listed below are used in this Order or in the documents attached to this Order or incorporated by reference into this Order, the following definitions shall apply:

A. "CERCLA" shall mean the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended, 42 U.S.C. §§ 9601-9657.

B. "Day" shall mean a calendar day unless expressly stated to be a working day. "Working day" shall mean a day other than a Saturday, Sunday, or Federal holiday. In computing any period of time under this Order, where the last day would fall on a Saturday, Sunday, or Federal holiday, the period shall run until the end of the next working day.

C. "DQOs" or “Data Quality Objectives” are qualitative and quantitative statements which specify the quality of the data required to support EPA decisions during the remedial response actions. DQOs are determined based on the end uses of the data to be collected.

D. "Duly Authorized Representative" shall mean a person designated in accordance with the procedures set forth in 40 C.F.R. § 270.11(b) and approved as a Duly Authorized Representative by EPA.

E. "EPA" shall mean the United States Environmental Protection Agency and any successor departments or agencies of the United States.

F. "National Contingency Plan" or "NCP" shall mean the National Oil and Hazardous Substances Pollution Contingency Plan, codified at 40 C.F.R. Part 300, including any amendments thereto.

G. "Operation and Maintenance" or "O&M" shall mean all activities that are required under the Operation and Maintenance Plan developed pursuant to this Order and the ROD, and approved by EPA.

H. "Order" shall mean this Administrative Order and all attachments appended hereto. In the event of conflict between the Order and any attachment, this Order shall control.

I. "Performance Standards" shall mean the cleanup standards and other measures of achievement of the goals of the Remedial Action, set forth in Section 11.2 of the ROD and those that are developed by the Respondent and approved by EPA during Remedial Design.

J. "ROD" shall mean, unless otherwise stated, the EPA Record of Decision for the Site signed on September 30, 2005, by the Director of the EPA Region 3 Hazardous Site Cleanup Division, and all attachments thereto. The ROD is appended hereto as Attachment 3 and is incorporated herein.

K. Remedial Action" or "RA" shall mean those activities, except for Operation and Maintenance ("O&M"), to be undertaken by Respondent to implement the final plans and specifications that are submitted by Respondent pursuant to the Remedial Design Work Plan and subsequently approved by EPA, including any additional activities required under Section VI (Performance of the Work) and Section XIII (Plans and Reports Requiring EPA Approval) of this

Order.

L. "Remedial Action Work Plan" or "RA Work Plan" shall mean a plan for Remedial Action, including a schedule for implementation of Remedial Action, submitted by Respondent pursuant to Paragraph VI.C.3 of this Order and approved by EPA.

M. "Remedial Design" shall mean those activities to be undertaken by Respondent to develop the final plans and specifications for the Remedial Action pursuant to the Remedial Design Work Plan.

N. "Remedial Design Work Plan" or "RD Work Plan" shall mean a plan for Remedial Design, including a schedule for remedial design work, submitted by Respondent pursuant to Paragraph VI.C.1 of this Order and approved by EPA.

O. "Respondent" shall mean Beazer East, Inc.

P. "Site" shall mean the Koppers Co., Inc. (Newport Plant) Superfund Site described in Section III.A.1 of this Order and for which EPA selected remedial action in the ROD.

Q. "State" shall mean the State of Delaware.

R. "Work" shall mean all activities Respondent is required to perform under this Order, including Remedial Design, Remedial Action, O&M, tasks to be performed in accordance with any EPA-approved Work Plan required by this Order, and any other activities required to be undertaken pursuant to this Order.

## VI. PERFORMANCE OF THE WORK

### A. Compliance with the ROD and the Law

1. Based on the foregoing, and the Administrative Record supporting issuance of this Order, it is hereby ordered that Respondent implement the remedy selected in Section 11.0 of the ROD for the Site. This work shall be conducted in accordance with CERCLA, the NCP, and the requirements and schedules specified in this Order and any future written modifications to this Order including, but not limited to, achieving and maintaining the applicable Performance Standards as defined in Section V (Definitions) of this Order.

2. Nothing in this Order, the ROD, or EPA's approval of the Remedial Design Work Plan or the Remedial Action Work Plan constitutes a warranty or representation of any kind by EPA that compliance with this Order, the ROD, or the EPA-approved Remedial Design Work Plan or the EPA-approved Remedial Action Work Plan will achieve or maintain the Performance Standards, or that such compliance will foreclose EPA from seeking compliance with all terms and conditions of this Order including, but not limited to, the Performance Standards.

3. All actions and activities carried out by Respondent pursuant to this Order shall be performed in accordance with all applicable Federal, State, and local laws and regulations. Respondent shall also comply with all applicable or relevant and appropriate requirements of Federal and State environmental laws and regulations and relevant guidance documents.

4. Respondent shall obtain all permits and authorizations necessary for off-Site Work and shall submit timely and complete applications and requests for any such permits or authorizations.

5. This Order is not, and shall not be construed to be, a permit issued pursuant to any Federal, State, or local statute or regulation.

6. In the event EPA determines that Respondent has failed to implement any provision(s) of the Work in an adequate or timely manner, or has otherwise violated this Order, EPA may exercise any and all rights it may have including but not limited to, those expressly reserved in Section XXII (Enforcement and EPA's Reservation of Rights) of this Order.

**B. Selection of Contractor(s)**

1. Supervising Contractor

a. All aspects of the Work to be performed by Respondent pursuant to this Order shall be under the direction and supervision of the Supervising Contractor, the selection of which shall be subject to acceptance or disapproval by EPA. Within five (5) days after the effective date of this Order, Respondent shall notify EPA in writing of the name, title, and qualifications of any contractor proposed to be the Supervising Contractor. EPA will issue a notice of disapproval or acceptance of the selection of such Supervising Contractor. If at any time thereafter, Respondent proposes to change a Supervising Contractor, Respondent shall give such notice to EPA and must obtain a notice of acceptance of such change from EPA, before the new Supervising Contractor performs, directs, or supervises any Work under this Order.

b. If EPA disapproves the selection of a proposed Supervising Contractor, EPA will notify Respondent in writing. Respondent shall submit to EPA a list of at least three contractors, including the qualifications of each contractor, that would be acceptable to Respondent within fourteen (14) days of receipt of EPA's notice. EPA will provide written notice of the names of any contractor(s) whose selection it would accept. Respondent may select any contractor from that list and shall notify EPA of the name of the contractor selected within twenty-one (21) days of EPA's written notice. In the event EPA does not accept the selection of any of the contractors proposed in the Respondent's list, EPA may direct the Respondent to submit to EPA the names and qualifications of at least three (3) additional contractors whose selection would be acceptable to the Respondent within fourteen (14) days of receipt of EPA's disapproval.

2. Remedial Design Contractor

a. Within five (5) days after the effective date of this Order, the Respondent shall: (1) notify EPA and the State in writing of the name, title, and qualifications of all contractor(s) and subcontractor(s) to be used in carrying out all Remedial Design activities required by this Order; and (2) identify the personnel that will be used during construction to ensure that the Work is performed in accordance with the approved Remedial Design submittal(s). For purposes of this Paragraph, the term "contractors" shall be deemed to include contractors and subcontractors.

b. EPA will notify Respondent in writing of its acceptance or disapproval of the selection of the Remedial Design contractor(s), including subcontractor(s). If EPA disapproves of the selection of the Respondent's proposed Remedial Design contractor(s), the Respondent shall submit to EPA the names, titles, and qualification of at least three (3) contractors that would be acceptable to the Respondent within fourteen (14) days of receipt of EPA's disapproval. Except as provided below, EPA will provide written notice of the name of the contractor(s) whose selection EPA accepts. The Respondent may select any contractor(s) from that list and shall notify EPA and the State in writing of the name(s) of the contractor(s) selected within fourteen (14) days of EPA's designation. The Respondent shall notify EPA and the State of the date the Respondent enters into an agreement or contract with such contractor(s) to perform the Work for which the selection of such contractor(s) were accepted by EPA. In the event EPA does not accept the selection of any of the contractors proposed in the Respondent's list, EPA may direct the Respondent to submit to EPA the names and qualifications of at least three (3) additional contractors whose selection would be acceptable to the Respondent within fourteen (14) days of receipt of EPA's disapproval.

c. If at any time during the pendency of this Order a decision is made by the Respondent to retain an additional or substitute Remedial Design contractor or subcontractor, the Respondent shall give written notification to EPA and shall obtain acceptance from EPA in accordance with the procedures described in Paragraphs VI.B.2.a and VI.B.2.b, above, before the new contractor(s) or subcontractor(s) perform(s), direct(s), or supervise(s) any Work pursuant to this Order.

3. Remedial Action Contractor(s)

a. Within thirty (30) days after EPA approves the Remedial Action Work Plan submitted by the Respondent pursuant to Paragraph VI.C.3 of this Order, and prior to the commencement of any Work thereunder, the Respondent shall notify EPA in writing of the name(s), title(s) and qualifications of all contractor(s) and subcontractor(s) and the personnel of such contractor(s) and subcontractor(s) proposed to be used in carrying out Work required by such approved Remedial Action Work Plan. For purposes of this Paragraph, the term "contractors" shall be deemed to include contractors and subcontractors.

b. EPA will accept or disapprove the selection of the Remedial Action contractor(s) and subcontractor(s) proposed by the Respondent in accordance with the procedures described for the acceptance or disapproval of Remedial Design contractor(s) and subcontractor(s) in Paragraph VI.B.2.b, above.

c. If at any time during the pendency of this Order a decision is made by the Respondent to retain an additional or substitute Remedial Action contractor or subcontractor, the Respondent shall give written notification to EPA and shall obtain acceptance of the selection from EPA in accordance with the procedures described in Paragraphs VI.B.2.a and VI.B.2.b, above, before the new contractor(s) or subcontractor(s) perform(s), direct(s), or supervise(s) any Work pursuant to this Order.

4. EPA retains the right to disapprove at any time the selection of contractor(s), including subcontractor(s); supervisory personnel; or other persons retained to conduct any of the Work required by this Order. In such event, the Respondent shall propose replacements in accordance with the requirements of this Section VI.

**C. Respondent Shall Perform the Work as Follows**

1. The Remedial Design Work Plan

a. Within forty-five (45) days after receiving notice of EPA's acceptance of the selection of the Remedial Design Contractor(s) in accordance with Paragraph VI.B.2.b., Respondent shall submit to EPA for review and approval a work plan for the design of the Remedial Action at the Site ("Remedial Design Work Plan" or "RD Work Plan"). The RD Work Plan shall include a step-by-step plan for completing the Remedial Design for the remedy identified in the ROD and for achieving and maintaining all requirements, including the Performance Standards, identified in the ROD. The RD Work Plan shall describe in detail the tasks that the Respondent will complete and the deliverables the Respondent will submit during the Remedial Design phase, and contain an expeditious schedule for completing the tasks and submitting the deliverables described in the RD Work Plan. The major tasks and deliverables described in the RD Work Plan shall include, but not be limited to the following: (1) a Preliminary Design for the remedy; (2) a Pre-Final Design for the remedy; (3) a Final Design for the remedy; (4) a Report of the Findings of any pre-design sampling; (5) a Site Monitoring Plan; (6) a Design Sampling and Analysis Plan, which shall include a Field Sampling Plan and a Quality Assurance Project Plan; (7) a Site Health and Safety Plan for design activities; (8) a

Contingency Plan; (9) a Construction Quality Assurance Plan ("CQAP"); (10) a plan for gathering additional data or information, or performing additional studies; (11) other appropriate components including a Permitting Plan and an Institutional Controls Plan; a Site Management Plan; and (12) a Remedial Design Schedule. At a minimum, the Institutional Controls Plan shall include the requirements of this Order set forth in Sections VIII (Access to and Use of the Site) and XVI (Notice of Obligations and Transfer of Interests), below.

b. The RD Work Plan shall be consistent with, and shall provide for, achievement and maintenance of the Performance Standards for the remedy. The RD Work Plan shall comport with EPA's "Superfund Remedial Design and Remedial Action Guidance," OSWER Directive 9355.0-4A, and any amendments to such Guidance.

c. Upon approval by EPA, the RD Work Plan shall be deemed to be incorporated into this Order and made an enforceable part hereof.

d. Upon approval of the RD Work Plan by EPA, Respondent shall implement the RD Work Plan in accordance with the schedules and methodologies contained therein. The Respondent shall submit all plans, submittals, and other deliverables required in accordance with the approved schedule therein for review and approval pursuant to Section XIII (Plans and Reports Requiring EPA Approval) of this Order. Unless otherwise directed by EPA, the Respondent shall not commence Remedial Design activities at the Site prior to approval of the Remedial Design Work Plan.

2. Remedial Design

a. Within sixty (60) days after EPA approves the RD Work Plan, Respondent shall submit a Preliminary Design for the remedy to EPA for review and approval. The preliminary design submittal begins with the initial design of the remedy and ends with the completion of approximately thirty (30) percent of the design effort. The Preliminary Design shall include, at a minimum, the following; (1) a design criteria report; (2) results of additional field sampling; (3) project delivery strategy; (4) preliminary plans, drawings, and sketches; (5) required specifications in outline form; (6) a preliminary construction schedule; and (7) a basis of design report.

b. Within ninety (90) days after EPA approves the Preliminary Design, Respondent shall submit to EPA for review and approval a Pre-Final Design for the remedy. This submittal shall represent approximately ninety (90) percent of the design effort. The Pre-final Design shall address all of EPA's comments on the Preliminary Design and shall include, at a minimum, the following: (1) Pre-final Plans, Specifications and Schedules; (2) an Operation and Maintenance Plan; (3) the Construction Quality Assurance Plan ("CQAP"); (4) the Field Sampling Plan including a Quality Assurance Project Plan, directed at measuring progress towards meeting the remedy Performance Standards; (5) the Site RA Health and Safety Plan which conforms to applicable Occupational Safety and Health Administration and EPA requirements including, but not limited to, 29 C.F.R. § 1910.120 and guidance entitled "Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities," dated October 1985, as amended; (6) a RA Contingency Plan which includes an air monitoring plan to protect the public during any soil excavation activities and a Spill Control and Countermeasure Plan; (7) an Institutional Controls Plan, which, at a minimum, shall include the requirements of this Order set forth in Sections VIII (Access to and Use of the Site) and XVI (Notice of Obligations and Transfer of Interests), below, and which will ensure that the structures, devices, and other components of the Work along with the naturally occurring hydrogeologic conditions at the Site are not interfered with or disturbed by future use of the property; (8) a Permitting Requirements Plan for any Work that may require permits; (9) RA Schedule; and (10) Waste Management Plan. The CQAP shall detail the approach to quality assurance during construction activities at the Site, and shall specify an Independent Quality Assurance Team ("IQAT") to conduct the quality assurance program during the construction phase of the project. The IQAT shall be a separate contractor, submitted for EPA acceptance or disapproval pursuant to Paragraph VI.B, above, who is not involved in any other aspects of the Remedial Design and Remedial Action and shall be responsible for examining and testing various materials, procedures, and equipment during implementation of the construction activities. The IQAT shall perform on-Site inspections of the Work to assess compliance with project standards, verify that the CQAP is implemented, and report to the Respondent and EPA the results of all inspections.

c. Within thirty (30) days after EPA approves the Pre-final Design, Respondent shall submit a Final Design for the remedy to EPA for review and approval. The Final Design, which shall address all of EPA's comments on the Pre-final design, shall include, at a minimum; (1) final Plans, Specifications, and Schedules; (2) the final Operation and Maintenance Plan; (3) the final CQAP; (4) the final Field Sampling Plan (directed at measuring progress towards meeting Performance Standards); (5) the final Site RA Health and Safety Plan; (6) a final RA Contingency Plan; (7) a final Institutional Controls Plan; (8) a final Permitting Requirements Plan; (9) RA Schedule; (10) Waste Management Plan ; and (11) a Design Analysis Report that contains all of the Design calculations.

d. Upon EPA approval, the Final Design shall be deemed to be incorporated into this Order and made an enforceable part hereof.

3. Remedial Action Work Plan

a. Not later than thirty (30) days after EPA approves all deliverables required as part of the Final Design, Respondent shall submit a Remedial Action Work Plan for the remedy ("RA Work Plan") to EPA for review and approval. The RA Work Plan shall be developed in accordance with the ROD; any amendments to the ROD and any Explanations of Significant Differences issued by EPA pursuant to Section 117 of CERCLA, 42 U.S.C. § 9617; and shall be consistent with the Final Design for the remedy approved by EPA. The RA Work Plan shall include methodologies, plans and schedules for completion of, at a minimum, the following: (1) selection of the Remedial Action Contractor; (2) implementation of the Remedial Design; (3) implementation of the CQAP; (4) development and submission of the ground water monitoring plan; (5) identification of and satisfactory compliance with applicable permitting requirements; (6) implementation of the Operations and Maintenance ("O&M") Plan; (7) implementation of the Contingency Plan; (8) implementation of the Institutional Controls Plan; and (9) development and submission of the Performance Standards assessment plan. The RA Work Plan shall also include an expeditious schedule for implementing all Remedial Action tasks identified in the ROD for the remedy and shall tentatively identify the members of Respondent's Remedial Action Project Team.

b. Respondent shall submit for EPA acceptance the RA Work Plan and the Health and Safety Plans for Remedial Action activities. Upon acceptance by EPA, the Health and Safety Plan for Remedial Action shall be deemed to be incorporated into and made an enforceable part of the Remedial Action Work Plan. The Respondent shall ensure that the Health and Safety Plan for Remedial Action, as accepted by EPA, is met by Respondent's contractor(s).

c. Upon approval by EPA, the RA Work Plan shall be deemed to be incorporated into this Order and made an enforceable part hereof.

4. Remedial Action

a. Upon approval of the RA Work Plan by EPA, Respondent shall implement the RA Work Plan according to the schedules and methodologies in the RA Work Plan. Unless otherwise directed by EPA in writing, Respondent shall not commence Remedial Action at the Site prior to approval of the RA Work Plan.

b. If Respondent seeks to retain a construction contractor to assist in the performance of the Remedial Action, then Respondent shall submit a copy of the solicitation documents including, but not limited to, the Request For Proposals, to EPA not later than five (5) days after publishing the solicitation documents.

c. Within thirty (30) days after EPA approves the RA Work Plan, Respondent shall notify EPA in writing of the name, title, and qualifications of any construction contractor(s) proposed to be used in carrying out Work under this Order.

d. Not later than twenty-one (21) days after EPA's acceptance of the Remedial Action contractor(s) in accordance with Paragraph VI.B.3 of this Order, Respondent shall submit to EPA, for approval by EPA, a Construction Management Plan. The Construction Management Plan shall identify key personnel, their experience, their qualifications, and their responsibilities for construction activities, and shall include a detailed schedule for completing all construction activities. Upon approval by EPA, the Construction Management Plan shall be deemed to be incorporated into this Order and made an enforceable part hereof.

e. Within thirty (30) days after EPA approves the Construction Management Plan, Respondent shall begin on-Site implementation of the Remedial Action for the remedy. Upon approval by EPA of the Construction Management Plan, Respondent shall implement and comply with the schedules and terms of all deliverables relating to Remedial Action including the RA Work Plan and the Construction Management Plan.

f. The Work performed by the Respondent pursuant to this Order shall, at a minimum, achieve and maintain the Performance Standards and shall be consistent with CERCLA and the NCP.

g. Notwithstanding any action by EPA, Respondent remains fully responsible for achieving and maintaining the Performance Standards. Nothing in this Order, or in the Remedial Design or Remedial Action Work Plan, or approval of any other submission, shall be deemed to constitute a warranty or representation of any kind by EPA that full performance of the Remedial Design will achieve and maintain the applicable Performance Standards. Respondent's compliance with such approved documents shall not foreclose EPA from requiring additional response actions to achieve and maintain the applicable Performance Standards.

**D. Reporting Requirements/Progress Reports**

1. In addition to any other requirement of this Order, Respondent shall submit to EPA five (5) copies, and to the State two (2) copies, of written monthly progress reports that provide a summary of actions and activities undertaken pursuant to this Order. The progress reports shall be submitted on or before the fifth day of each calendar month following the effective date of this Order. Respondent's obligation to submit progress reports continues until EPA gives written notice that Respondent has demonstrated, to EPA's satisfaction, that all Work required pursuant to this Order has been fully performed and that all Performance Standards have been met. The monthly progress reports shall: (a) describe the actions which have been taken toward achieving compliance with this Order during the previous month; (b) include all results of sampling and tests and all other data pertaining to the Work received or generated by Respondent or its contractors or agents (and not previously submitted to EPA) in the previous month; (c) identify all Work plans, plans, and other deliverables required by this Order which were completed and submitted during the previous month; (d) describe all actions including, but not limited to, data collection and implementation of work plans, which are scheduled for the next month; 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 the percentage of completion of the Work, 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; (f) describe any modifications to the work plans or other schedules that Respondent has proposed to EPA or that have been approved by EPA; and (g) describe all activities, as approved by EPA under Section XIX (Community Relations) undertaken in support of the Community Relations Plan during the previous month and those to be undertaken in the next month. If requested by EPA, Respondent shall also provide briefings for EPA and the State to discuss the progress of the Work.

2. Except as otherwise provided in the next sentence, Respondent shall notify EPA of any anticipated change to the EPA-approved schedule for performance of any activity including, but not limited to, implementation of work plans, no later than seven (7) days prior to the scheduled performance of the activity. Notwithstanding the foregoing, Respondent shall notify EPA of any anticipated change to the EPA-approved schedule for the performance of data collection no later than thirty (30) days prior to the performance of such activity, unless otherwise directed by EPA. All modifications to the EPA-approved schedule must be approved by EPA in writing.

3. In addition to the reporting required by Section 103 of CERCLA, 42 U.S.C. § 9603, and Section 304 of the Emergency Planning and Community Right-to-Know Act ("EPCRA"), 42 U.S.C. § 11004, upon the occurrence of any event during performance of the Work that Respondent is required to report pursuant to Section 103 of CERCLA, 42 U.S.C. § 9603, or Section 304 of EPCRA, 42 U.S.C. § 11004, Respondent shall, within twenty-four (24) hours of the onset of such event, orally notify the EPA Remedial Project Manager or the Chief of the DE, VA, WV Remedial Branch within the Office of Superfund Site Remediation, Hazardous

Site Cleanup Division, EPA Region III ("Branch Chief") (in the event of the unavailability of the EPA Remedial Project Manager), or, in the event that neither the EPA Remedial Project Manager nor the Branch Chief is available, the EPA Region III Hotline at (215) 814-9016. Within ten (10) days of the onset of such an event, Respondent shall furnish to EPA and the State a written report, signed by the Respondent's Project Coordinator, setting forth the events which occurred and the measures taken, and to be taken, in response thereto. Within thirty (30) days of the conclusion of such an event, Respondent shall submit a report setting forth all actions taken in response thereto.

4. Respondent shall submit to EPA five (5) copies, and to the State two (2) copies, each year within thirty (30) days of the anniversary of the effective date of this Order, a report setting forth the status of the Work, which shall at a minimum include a statement of major milestones accomplished in the preceding year, a statement of tasks remaining to be accomplished, and a schedule for implementation of the remaining Work.

5. Failure to submit written reports in accordance with the requirements of this Order shall constitute a violation of this Order.

**E. <u>Off-Site Shipments</u>**

1. Respondent shall, at least twenty-one (21) days prior to any off-Site shipment of hazardous substances which are generated as part of the Remedial Design or Remedial Action activities from the Site to any waste management facility, provide written notification to the appropriate state environmental official in the receiving facility's state and to the EPA Remedial Project Manager of such shipment of hazardous substances. However, the requirement to notify

EPA shall not apply to any off-Site shipment when the total volume of all shipments from the Site to each receiving facility will not exceed ten (10) cubic yards.

2. Respondent shall include in the written notification the following information: (a) the name and location of the facility to which the hazardous substances are to be shipped; (b) the type and quantity of the hazardous substances to be shipped; (c) the expected schedule for the shipment of the hazardous substances; and (d) the method of transportation. Respondent shall notify the state in which the planned receiving facility is located of major changes in the shipment plan, such as a decision to ship the hazardous substances to another facility within the same state, or to a facility in another state.

3. The identity of the receiving facility and the State will be determined by the Respondent. Respondent shall provide written notification required by this Paragraph, including the information required by Paragraph VI.E.2, above, as soon as practicable, but in no case no less than fourteen (14) days before the hazardous substances are actually shipped.

4. All hazardous substances which Respondent removes from the Site shall be disposed of or treated at a facility in accordance with Section 121(d)(3) of CERCLA, 42 U.S.C. § 9621(d)(3), the EPA "Revised Procedures for Planning and Implementing Off-Site Response Actions" (September 22, 1993), Section 300.440 of the NCP (40 C.F.R. § 300.440), and all other applicable Federal, State and local laws and regulations.

**F. Operation and Maintenance ("O&M")**

Respondent shall perform the activities during O&M in accordance with the applicable Performance Standards, the EPA-approved RD and RA Work Plans, and the EPA-approved O&M Plan to be submitted pursuant to this Order. Notification requirements for off-Site shipments of hazardous substances described in Paragraph VI.E above shall also be met during the O&M.

G. **Additional Response Actions**

1. In the event that EPA determines that additional response actions are necessary to meet applicable Performance Standards or EPA determines, in accordance with Section XI (EPA Periodic Review), below, that the Remedial Action required by this Order is not protective of human health and the environment, EPA may notify Respondent that additional response actions are necessary.

2. Unless otherwise stated by EPA, within thirty (30) days of receipt of notice from EPA that additional response actions are necessary to meet applicable Performance Standards or, pursuant to Section XI, below, are necessary to protect human health and the environment, Respondent shall submit to EPA for approval a work plan for the additional response actions. The work plan shall conform to the applicable requirements to this Order.

3. Upon EPA's approval of the work plan for additional response actions, the work plan shall become an enforceable part hereof and Respondent shall implement that work plan in accordance with the provisions and schedule contained therein. Unless otherwise directed by EPA, Respondent shall not commence physical on-Site implementation of the work plan for additional response actions prior to the date for commencement set forth in the EPA-approved work plan.

4. Any additional response actions that Respondent proposes are necessary to carry out the requirements of the ROD, the requirements of this Order, or to achieve and maintain applicable Performance Standards shall be subject to approval by EPA and, if authorized by EPA, shall be completed by Respondent in accordance with plans, specifications, and schedules approved by EPA.

5. If required by Sections 113(k)(2) or 117 of CERCLA, 42 U.S.C. §§ 9613(k)(2) or 9617, or the NCP, Respondent and the public will be provided with an opportunity to comment on any additional response actions proposed pursuant to this Paragraph VI.G and to submit written comments for the record during the public comment period.

## VII. SAMPLING AND QUALITY ASSURANCE

A. Respondent shall consult with EPA in planning for, and prior to, all sampling and analysis required by this Order, and by any plan which EPA approves pursuant to this Order. Unless otherwise directed by the EPA Remedial Project Manager, Respondent shall not commence sampling until EPA approves the Remedial Design Work Plan and the Sampling and Analysis Plan ("SAP").

B. Respondent shall prepare a SAP, consisting of a Quality Assurance Project Plan ("QAPP") and a Field Sampling Plan ("FSP"), for sample collection, transportation, analysis, validation and reporting to be conducted pursuant to this Order. The SAP shall be submitted as part of the Remedial Design Work Plan to the EPA Remedial Project Manager for review and approval prior to commencing sampling and analysis or field investigation. Each plan shall specify, for the phase of activity addressed, the Data Quality Objectives ("DQOs"), sample collection and transportation procedures, data analysis methods, data reduction, data review, and reporting procedures. The FSP shall also include the types, locations, analytical parameters, and frequency of samples. Selection of analytical methods shall be justified in conjunction with the DQOs. The guidelines referenced in Paragraph VII.C, below, and any additional guidance provided to the Respondent by EPA shall be followed in the preparation of the SAP.

C. While conducting all sample collection and analysis activities required by this Order, the Respondent shall implement quality assurance, quality control, and chain of custody procedures in accordance with "EPA Requirements for Quality Assurance Project Plans," External Review Draft (EPA QA/R-5) (October 1998); "EPA NEIC Policies and Procedures Manual," (Revised 1991) (EPA 330/978-001-R); EPA Region III Modifications to the National Functional Guidelines for Inorganic Data Review (EPA Region III: April 1993); EPA Region III Modifications to the National Functional Guidelines for Organic Data Review (EPA Region III: September 1994); "EPA Region III Innovative Approaches to Data Validation," (EPA Region III: June 1995); "Data Quality Objectives Process for Superfund," (EPA 540/R-93/071: September 1994); and subsequent amendments to such guidelines upon notification by EPA to Respondent of such amendment. Prior to the commencement of any monitoring project under this Order, Respondent shall submit to EPA for approval a Quality Assurance Project Plan ("QAPP") for the Work that is consistent with the NCP and the guidance documents cited above. Respondent shall ensure that EPA and State personnel and their authorized representatives are allowed access at reasonable times to all laboratories utilized by Respondent in implementing this Order. In addition, Respondent shall ensure that such laboratories shall analyze all samples submitted by EPA pursuant to the QAPP for quality assurance monitoring. Respondent shall ensure that the laboratories they utilize for the analysis of samples taken pursuant to this Order perform all analyses according to accepted EPA methods. Respondent shall submit to EPA the selected laboratory's(ies') Quality Assurance Program Plan and their qualifications, which shall include, at a minimum, previous certifications, Performance Evaluation results, equipment lists and personnel resumes. Respondent shall ensure that all field methodologies utilized in collecting samples for subsequent analysis pursuant to this Order will be conducted in accordance with the procedures set forth in the QAPP approved by EPA. At the request of EPA, Respondent shall conduct one or more audits of the selected laboratory(ies) to verify analytical capability and compliance with the QAPP. Auditors shall conduct lab audits during the time the laboratory(ies) is(are) analyzing samples collected pursuant to this Order. The lab audit shall be conducted according to procedures available from the Analytical Services and Quality Assurance Branch, Environmental Assessment and Innovation Division, EPA Region 3. Audit reports shall be submitted to the EPA Remedial Project Manager within fifteen (15) days of completion of the audit. The Respondent shall report serious deficiencies, including all those which adversely impact data quality, reliability or accuracy, and take action to correct such deficiencies within twenty-four (24) hours of the time the Respondent knew or should have known of the deficiency.

D. Upon request, the Respondent shall allow split or duplicate samples to be taken by EPA and the State or their authorized representatives. Respondent shall notify EPA and the State not less than thirty (30) 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 the Respondent to take split or duplicate samples of any samples they take as part of EPA's oversight of the Respondent's implementation of the Work.

E. Respondent shall submit to EPA and the State two (2) copies each of the results of all sampling and/or tests or other data obtained or generated by or on behalf of Respondent with respect to the Site and/or the implementation of this Order unless EPA agrees otherwise.

F. Notwithstanding any provision of this Order, EPA hereby retains all of its information gathering and inspection authorities and rights, including enforcement actions related thereto, under CERCLA, RCRA, and any other applicable statutes or regulations.

## VIII. ACCESS TO AND USE OF THE SITE

A. If the Site, or any other property where access and/or land use restrictions are needed to implement any part of the ROD or this Order, is owned or controlled by the Respondent, Respondent shall:

1. Commencing on the effective date of this Order and thereafter, provide access to EPA and the State and their respective authorized representatives, employees, agents, consultants, or contractors for the purpose of conducting any activity related to this Order including, but not limited to, the following activities:

a. Performing and Monitoring the Work;

b. Verifying any data or information submitted by the Respondent to EPA or the State;

c. Conducting investigations relating to contamination at or near the Site;

d. Obtaining samples;

e. Assessing the need for, planning, or implementing additional response actions at or near the Site;

f. Inspecting and copying records, operating logs, contracts, or other documents maintained or generated by Respondent or its agents, consistent with Section XVIII (Access to Information);

g. Assessing Respondent's compliance with this Order; and

h. Determining whether the Site or other property is being used in a manner that is prohibited or restricted, or that may need to be prohibited or restricted.

2. Commencing on the effective date of this Order and thereafter, refrain from using the Site, or such other property, in any manner that would interfere with or adversely affect the integrity or protectiveness of the response actions to be implemented pursuant to this Order. In addition, Respondent shall refrain from using the Site, or such other property, for any purpose which might interfere with, obstruct, or disturb the performance, support, or supervision of the Work, including any Operation and Maintenance activities, taken pursuant to this Order. Unless otherwise required for implementation of the Work under this Order or otherwise determined to be necessary by EPA, such restrictions include, but are not limited to, the land and ground water use restrictions identified in Section 11.2.12 of the ROD.

B. If the Site, or any other property where access and/or land use restrictions are needed to implement this Order, is owned or controlled by persons other than the Respondent, Respondent shall use best efforts to secure from such persons:

1. An agreement to provide access thereto for EPA, the Respondent, and their respective authorized representatives, employees, agents, consultants, or contractors, for the purpose of conducting any activity related to this Order including, but not limited to, those activities listed in Paragraph VIII.A.1 of this Order;

2. An agreement to abide by the obligations and restrictions established by Paragraph VIII.A.2 of this Order, or that are otherwise necessary to implement, ensure non-interference with, or ensure the protectiveness of the response actions to be performed pursuant to this Order.

C. If, within forty-five (45) days of the effective date of this Order, Respondent has not submitted access and/or land use restriction agreements required by Paragraph VIII.B of this Order, Respondent shall promptly notify EPA in writing and shall include in that notification a summary of the steps that Respondent has taken to attempt to comply with Paragraph VIII.B of this Order. EPA may, as it deems appropriate, assist Respondent in obtaining access or land use restrictions. As used in this Section, "best efforts" shall include, at a minimum, but shall not be limited to, a certified letter from the Respondent to the owners of property not owned or controlled by the Respondent but to which access and/or land use restrictions are needed to implement this Order requesting:

1. the agreement required to be obtained pursuant to Paragraph VIII.B.1 of this Order; and

2. the agreement required to be obtained pursuant to Paragraph VIII.B.2 of this Order.

D. If EPA determines that land use restrictions in the form of State or local laws, regulations, ordinances or other governmental controls beyond those set forth in the ROD are needed to implement the remedy selected in the ROD, ensure the integrity and protectiveness thereof, or ensure non-interference therewith, Respondent shall cooperate with EPA's efforts to secure such governmental controls.

E. Notwithstanding any provision of this Order, EPA retains all of its access authorities and rights, as well as all of its rights to require land use restrictions, including enforcement authorities related thereto, under CERCLA, RCRA and any other applicable statutes or regulations.

## IX. FAILURE TO PERFORM

A. In the event of an inability or anticipated inability on the part of Respondent to perform any of the actions required by this Order in the time and/or manner required herein, the Respondent's Project Coordinator, as defined in Section XII (Designated Project Coordinators), below, shall notify EPA orally within forty-eight (48) hours of such event and in writing as soon as possible, but in no event more than ten (10) days after Respondent knew or should have known about such event. Such notice shall set forth the reason(s) for, and the expected duration of, the inability to perform; the actions taken and to be taken by Respondent to avoid and mitigate the impact of such inability to perform; and the proposed schedule for completing such actions. Such notification shall not relieve Respondent of any obligation under this Order.

B. Any delay in performance of this Order that, in EPA's judgment, is not properly justified by Respondent under the terms of this Section shall be considered a violation of this Order.

C. Any delay in performance of this Order or inability to perform any action required by this Order shall not affect Respondent's obligation to fully perform all activities required under the terms and conditions of this Order.

D. Failure of Respondent to carry out any requirement of this Order in accordance with the terms and conditions specified herein may result in the unilateral performance of the required actions by EPA pursuant to applicable authorities, an action to recover penalties and/or treble damages pursuant to CERCLA, and/or the initiation of an enforcement action against Respondent to require Respondent to perform such actions, in addition to any other relief that may be available to EPA pursuant to applicable law.

E. Nothing in this Section or any other provision of this Order shall be construed to limit any powers EPA may have under CERCLA, the NCP, or any other law or regulation.

F. Increased costs or expenses associated with implementation of the activities called for in this Order are not justification for any delay in performance or failure to perform.

## X. ENDANGERMENT AND EMERGENCY RESPONSE

A. In the event of any action, occurrence, or situation during the performance of the Work which causes or threatens to cause a release of a hazardous substance that constitutes an emergency situation or that may present an immediate threat to the public health or welfare or the environment, Respondent shall, subject to Paragraph B of this Section, immediately take all appropriate action to prevent, abate, or minimize such release or threat of release or endangerment, and shall immediately notify the EPA Remedial Project Manager, or, if the EPA Remedial Project Manager is unavailable, the Chief of the DE, VA, WV Remedial Branch within the Office of Superfund Site Remediation, Hazardous Site Cleanup Division, EPA Region III. If neither of these persons is available, Respondent shall notify the EPA Region III Hotline at (215) 814-9016. Respondent shall take such actions in consultation with the EPA Remedial Project Manager or other available authorized EPA officer and in accordance with all applicable provisions of the Health and Safety Plans, the Contingency Plans, any other applicable plans or documents developed and approved pursuant to this Order, and all other applicable Federal, State, and local laws and regulations.

B. Nothing in the preceding paragraph or in this Order shall be deemed to limit any authority of the EPA to take, direct, or order all appropriate action or to seek an order from the Court to protect public health or welfare or the environment or to prevent, abate, or minimize an actual or threatened release of hazardous substances on, at, or from the Site.

## XI. EPA PERIODIC REVIEW

A. Under Section 121(c) of CERCLA, 42 U.S.C. § 9621(c), and any applicable regulations, EPA must review the Remedial Action required by this Order at least every five (5) years after initiation of the Remedial Action if hazardous substances remain on the Site, to assure that the Work performed pursuant to this Order adequately protects human health and the environment. Until such time as EPA certifies completion of the Work, Respondent shall conduct the requisite studies, investigations, or other response actions as determined necessary by EPA in order to permit EPA to conduct the reviews under Section 121(c) of CERCLA, 42 U.S.C. § 9621(c). As a result of any reviews performed under this Section, Respondent may be required to perform additional Work in accordance with Paragraph C of this Section or to modify Work previously performed.

B. If required by Sections 113(k)(2) or 117 of CERCLA, 42 U.S.C. §§ 9613(k)(2) or 9617, or the NCP, Respondent and the public will be provided with an opportunity to comment on any additional response actions proposed by EPA as a result of the review conducted pursuant to Section 121(c) of CERCLA, 42 U.S.C. § 9621(c), and to submit written comments for the record during the public comment period.

C. If the Director of the Hazardous Site Cleanup Division, EPA Region III, or his/her delegate determines that information received, in whole or in part, during the review conducted pursuant to Section 121(c) of CERCLA, 42 U.S.C. § 9621(c), indicates that the Remedial Action required by this Order is not protective of human health and the environment, or that additional response actions are necessary to meet the applicable Performance Standards, Respondent shall undertake any additional response actions EPA has determined are appropriate in accordance with Paragraph VI.G of this Order.

## XII. DESIGNATED PROJECT COORDINATORS

A. EPA's Project Coordinator shall be the EPA Remedial Project Manager. EPA's Remedial Project Manager is:

**Matthew T. Mellon (3HS23)**
U.S. Environmental Protection Agency
Region III
1650 Arch Street
Philadelphia, PA 19103
Telephone: (215) 814-3168
Fax: (215) 814-3002

B. EPA has the discretionary, non-reviewable right to change its Remedial Project Manager. If EPA changes its Remedial Project Manager, EPA will inform Respondent in writing of the name, address and telephone number of the new Remedial Project Manager.

C. The EPA Remedial Project Manager shall have the authority lawfully vested in a Remedial Project Manager by the NCP. In addition, the EPA Remedial Project Manager shall have authority, consistent with the NCP, to halt or redirect any Work required by this Order and to take any necessary response action when s/he determines that conditions at the Site may present an imminent and substantial endangerment to public health or welfare or the environment.

D. Within five (5) days after the effective date of this Order, Respondent shall designate a Project Coordinator and shall submit the name and qualifications of the Project Coordinator, including any support entities and staff, to EPA for review and acceptance. Respondent's Project Coordinator shall have the technical expertise sufficient to adequately oversee all aspects of the Work and shall not be acting as an attorney for Respondent in this matter. If Respondent wishes to change its Project Coordinator, Respondent shall provide written notice to EPA of the name and qualifications of the new Project Coordinator at least five (5) days prior to changing the Project Coordinator.

E. Respondent's selection of a Project Coordinator or replacement Project Coordinator shall be subject to EPA acceptance. If EPA does not accept the selection of the Project Coordinator, Respondent shall submit to EPA a list of the names and qualifications of proposed Project Coordinators that would be acceptable to them, within fourteen (14) days after receipt of EPA's notice not to accept the Project Coordinator previously selected. EPA will then provide Respondent with written notice identifying each proposed Project Coordinator on the list whose designation would be acceptable to EPA. Within ten (10) days of receipt of EPA's notice identifying acceptable replacement Project Coordinators, Respondent shall select any acceptable Project Coordinator from the list and notify EPA of such selection.

F. Each Project Coordinator will be responsible for overseeing the implementation of this Order.

G. Unless otherwise directed by the EPA Remedial Project Manager, all communications, whether written or oral, from Respondent to EPA shall be directed to the EPA

Remedial Project Manager.

H. No informal advice or guidance from the EPA Remedial Project Manager shall relieve Respondent of any obligation under this Order.

## XIII. PLANS AND REPORTS REQUIRING EPA APPROVAL

A. Unless otherwise specified in this Order or by the EPA Remedial Project Manager, five (5) copies of all documents, including plans, reports, and other items required to be submitted to EPA for approval pursuant to this Order, shall be submitted to the EPA Remedial Project Manager in accordance with the requirements of this Section. Two (2) copies of each such document shall simultaneously be submitted to the State at the following address:

**Stephen Johnson**
State of Delaware
Division of Air & Waste Management
Dept. of Natural Resources and Environmental Control
391 Lukens Drive
New Castle, DE 19720-2774
Telephone: (302) 395-2604

To the maximum extent possible, communications from Respondent to EPA and all documents, including reports and other correspondence, concerning the activities performed pursuant to this Order, will be directed to the EPA and State Project Coordinators by overnight mail or equivalent delivery.

B. Plans, design documents, proposals, reports or other documents shall be signed by a Duly Authorized Representative (as defined in Section V (Definitions) of this Order) of

Respondent. The Remedial Design Work Plan, Remedial Action Work Plan, and any other work plan submitted to EPA for approval pursuant to this Order shall contain the following certification:

"Except as provided below, I certify that the information contained in or accompanying this [type of submission] is true, accurate, and complete."

"As to [the/those] portion(s) of this [type of submission] for which I cannot personally verify [its/their] accuracy, I certify under penalty of law that this [type of submission] 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."

Signature:

Name: ________________________
Title: _________________________

C. After review of any plan, report, or other item which is required to be submitted for approval by EPA pursuant to this Order, EPA shall, (1) approve, in whole or in part, the submission; (2) approve the submission upon specified conditions; (3) modify the submission to cure the deficiencies; (4) direct that the Respondent modify the submission; (5) disapprove, in whole or in part, the submission, notifying Respondent of deficiencies; or (6) any combination of the above.

D. If EPA disapproves a plan, report, or item because EPA determines that it is deficient, Respondent shall be deemed to be in violation of the provision of this Order requiring

Respondent to submit such plan, report, or item, and EPA may assume responsibility for performing all or any portion of the Work. Such EPA performance shall not release Respondent from its obligation to comply with the requirements of this Order.

E. In the event of approval, approval upon conditions, or modification by EPA, Respondent shall proceed to take any action required by the plan, report, or other item, as approved or modified by EPA with respect to the modifications or conditions made by EPA. In the event the preliminary, pre-final, or final design is approved upon specified conditions by EPA, Respondent shall incorporate all of the requirements contained in EPA's notice of approval upon conditions in the subsequent design submittal. Such subsequent design submittal shall be submitted in accordance with the schedule set forth in the Remedial Design Work Plan, unless otherwise directed by the EPA Remedial Project Manager.

F. Upon receipt of a notice of disapproval or a notice requiring modification of the submission, Respondent shall, within twenty-one (21) days or such other time as specified by EPA in such notice, correct the deficiencies and resubmit the plan, report, or other item for approval. Notwithstanding the notice of disapproval or a notice requiring modification of the submission, Respondent shall proceed, at the direction of EPA, to take any action required by any non-deficient portion of the submission.

G. In the event that a resubmitted plan, report or other item, or portion thereof, is again disapproved by EPA, EPA may require Respondent to correct the deficiencies, in accordance with Paragraph XIII.F, above. EPA also retains the right to amend or develop the plan, report or other item. Respondent shall implement any such plan, report, or item as amended or developed by EPA.

H. All plans, reports, and other items required to be submitted to EPA under this Order shall, upon modification and/or approval by EPA, be deemed to be incorporated into and enforceable as part of this Order. In the event that EPA approves a portion of a plan, report, or other item required to be submitted to EPA under this Order, the approved portion shall be deemed to be incorporated into and enforceable as part of this Order.

I. Notwithstanding any action by EPA, Respondent remain fully responsible for achieving and maintaining applicable Performance Standards. Nothing in this Order, or in EPA's approval of any submission shall be deemed to constitute a warranty or representation of any kind by EPA that performance of the Remedial Design or the Remedial Action will achieve and maintain the applicable Performance Standards. Respondent's compliance with EPA-approved documents does not foreclose EPA from seeking to require that Respondent perform additional actions to achieve and maintain the applicable Performance Standards.

J. No failure by EPA to approve, disapprove, or otherwise respond to a document submitted to EPA for approval shall be construed as an approval of such document.

## XIV. ASSURANCE OF ABILITY TO COMPLETE WORK

A. Within thirty (30) days of the effective date of this Order, Respondent shall demonstrate its ability to complete the Work required by this Order and to pay all claims which may arise from performance of the Work required by this Order by obtaining, and presenting to EPA for approval, financial assurance in the amount of $51,756,239 in one of the following forms:

1. A surety bond or performance bond guaranteeing performance of the Work;

2. One or more letters of credit;

3. A trust fund;

4. A guarantee to perform the Work by one or more parent corporations or subsidiaries, or by one or more unrelated corporations that have a substantial business relationship with the Respondent; or

5. A demonstration that the Respondent satisfies the requirements of 40 C.F.R. § 264.143(f).

B. If Respondent seeks to demonstrate its ability to complete the Work through a guarantee by a third party pursuant to Paragraph A.4 of this Section, Respondent shall demonstrate that the guarantor satisfies the requirements of 40 C.F.R. § 264.143(f). If Respondent seeks to demonstrate its ability to complete the Work by means of the financial test or the corporate guarantee, Respondent shall resubmit sworn statements conveying the information required by 40 C.F.R. § 264.143(f) annually, on the anniversary of the effective date of this Order. In the event that EPA determines at any time that the financial assurances provided pursuant to this Section are inadequate, Respondent shall, within thirty (30) days of receipt of notice of EPA's determination, obtain and present to EPA for approval one of the other forms of financial assurance identified in Paragraph A of this Section. Respondent's inability to demonstrate financial ability to complete the Work shall not excuse performance of any activities required under this Order.

C. Subject to this Paragraph, such financial assurance shall be maintained by the Respondent until EPA determines in accordance with Section XX of this Order (Certification of Completion of the Work) that all Work required pursuant to this Order has been fully performed and all applicable Performance Standards have been met. If Respondent can show that the estimated cost to complete the remaining Work has diminished below the amount set forth in Section XIV.A of this Order, Respondent may request, in writing, a reduction in the amount of the financial security provided under this Section to the estimated cost of the remaining work to be performed. Respondent may reduce the financial assurance only in accordance with EPA's written approval of such request.

## XV. INSURANCE

A. During the pendency of this Order, Respondent shall satisfy, and shall ensure that its contractor(s) and subcontractor(s) satisfy, all applicable laws and regulations regarding the provision of worker's compensation insurance for all persons retained to perform Work pursuant to this Order.

B. No later than fifteen (15) days before commencing any on-Site Work, Respondent shall secure and maintain, or shall ensure that its contractor(s) and subcontractor(s) secure and maintain, until the first anniversary of EPA's certification of completion of the Work pursuant to Section XX (Certification of Completion of the Work) of this Order, comprehensive general liability insurance with limits of at least five million dollars ($5,000,000), combined single limit, naming as additional insured the EPA.

C. No later than fifteen (15) days after the effective date of this Order, Respondent shall secure automobile liability insurance with limits of five hundred thousand dollars ($500,000) and shall maintain such insurance until the first anniversary of EPA's certification of completion of the Work pursuant to Section XX of this Order.

D. No less than fourteen (14) days prior to commencement of on-Site Work under this Order, Respondent shall provide to EPA certificates of comprehensive general liability and automobile insurance and a copy of each insurance policy. Respondent shall resubmit such certificates and copies of policies each year on the anniversary date of the policies.

E. If Respondent demonstrates by evidence satisfactory to EPA that any contractor or subcontractor retained to perform Work pursuant to this Order maintains insurance equivalent to that described above, or insurance covering the same risks but in a lesser amount, then, with respect to matters so insured by that contractor or subcontractor, Respondent need provide only that portion of the insurance described above which is not maintained by the contractor or subcontractor.

F. Respondent may satisfy the provisions of this Section XV (Insurance) if Respondent submits to EPA for approval one of the financial assurance mechanisms of Section XIV of this Order (Assurance of Ability to Complete Work) in at least the amounts stated in Paragraphs B and C of this Section (Insurance), thereby demonstrating that Respondent is able to pay any claims arising out of Respondent's performance of its obligations under this Order. Such financial assurance mechanism shall meet all of the requirements of Section XIV (Assurance of Ability to Complete Work) of this Order. If Respondent seeks to utilize one of the financial assurance mechanisms set forth in Section XIV (Assurance of Ability to Complete Work) to satisfy the provisions of this Section (Insurance), Respondent must demonstrate an ability to pay the amounts required under this Section (Insurance) above and beyond that required by the obligations of Section XIV (Assurance of Ability to Complete Work).

## XVI. NOTICE OF OBLIGATIONS AND TRANSFER OF INTERESTS

A. With respect to any property owned or controlled by the Respondent that is located within the Site, within fifteen (15) days after the effective date of this Order, the Respondent shall submit to EPA for review and approval a notice to be filed with the Recorder Of Deeds Office, New Castle County, Delaware ("Title Notice"), which shall provide notice to all successors-in-title that the property is part of the Site, that EPA selected a remedy for the Site on September 30, 2005, and that EPA has issued the Respondent this Order requiring the Respondent to implement the requirements of the ROD. Each such Title Notice shall identify the administrative docket number of this Order and the effective date of this Order. Each such Title Notice shall recite the Respondent's specific obligations to provide access to and restrict use of the Site pursuant to Section VIII of this Order. Respondent shall record the Title Notice within ten (10) days of EPA's approval of the Title Notice. The Respondent shall not modify or release such Title Notice without prior written approval of EPA. The Respondent shall provide EPA with a certified copy of the recorded Title Notice within ten (10) days of recording of such Title Notice.

B. Within fifteen (15) days after the effective date of this Order, the Respondent shall record a certified copy of this Order with the Recorder of Deeds Office for New Castle County, Delaware, in such manner as shall be effective to bring this Order to the attention of any person examining or researching the Site and/or quality of the title to any real property constituting the Site or searching for any encumbrances, covenants, easements, liens, restrictions, or other limitations relating to said property. At a minimum, such recording shall be made in the Grantor/Grantee and Lot/Block indices of the Land Records for the Site. Thereafter, each deed, title, or other instrument of conveyance for property included in the Site executed by Respondent shall contain a notice stating that the property is subject to this Order and any lien held by EPA pursuant to Section 107(1) of CERCLA, 42 U.S.C. § 9607(1), and shall reference the recorded locations of this Order, the Title Notice, and any restrictions applicable to the property under this Order.

C. At least thirty (30) days prior to the conveyance by Respondent of any interest in property located within the Site including, but not limited to, fee interests, leasehold interests, and mortgage interests, the Respondent shall give the grantee or transferee-in-interest written notice of (I) this Order and (ii) any Site access and use restriction requirements set forth in Section VIII (Access to and Use of the Site). At least thirty (30) days prior to such conveyance, Respondent shall also give written notice to EPA and the State of the proposed conveyance, including the name, address, and telephone number of the grantee or transferee-in-interest, and the date on which notice of this Order and Site access and use restriction requirements was given to the grantee.

D. In the event of any such conveyance, Respondent's obligations under this Order including, but not limited to, its obligation to provide access to and restrict use of the Site pursuant to Section VIII (Access to and Use of the Site), shall continue to be met by Respondent. In no event shall the conveyance release or otherwise affect Respondent's obligation to comply with all provisions of this Order, absent the prior written consent of EPA.

## XVII. RECORD RETENTION

A. Respondent shall preserve and retain all records and documents now in its possession or control or which come into its possession or control that relate in any manner to the performance of the Work, implementation of this Order, or liability of any person, including Respondent, for the response actions conducted and to be conducted at the Site, regardless of any document retention policy to the contrary, for a minimum of ten (10) years after the Respondent's receipt of EPA's notification pursuant to Section XX (Certification of Completion of the Work) of this Order.

B. Respondent shall use its best efforts to obtain copies of all documents relating in any way to the Site and which are in the possession of its employees, agents, accountants, contractors, subcontractors, consultants, or attorneys. Respondent shall ensure that any agreement between Respondent and any agent, contractor, subcontractor, consultant, or other person retained to perform or oversee Work pursuant to this Order shall explicitly require said agent, contractor, subcontractor, consultant, or other person to maintain and preserve, during the pendency of this Order and for a minimum of ten (10) years after Respondent's receipt of EPA's notification pursuant to Paragraph XX (Certification of Completion of the Work), all data, records, and documents within their respective possession or control which relate in any way to this Order or to hazardous substance management and/or disposal at the Site.

C. Upon conclusion of this document retention period, Respondent shall notify EPA at least ninety (90) days prior to the destruction of any such records, documents or information, and, upon request of EPA and subject to Paragraphs B, C and of Section XVIII (Access to Information) of this Order, Respondent shall deliver all such records, documents and information to EPA. In no event shall Respondent destroy such records, documents or information until EPA responds in writing approving such destruction.

## XVIII. ACCESS TO INFORMATION

A. Subject to the limitations contained in Paragraphs B, C and D of this Section, Respondent shall provide to EPA, within thirty (30) days of receipt of a request by EPA, copies of all documents and information within its possession or control or that of its contractors, subcontractors, or agents relating to activities at the Site or to the implementation of this Order including, but not limited to, sampling data, analyses of samples, field notes, contractual documents, chain of custody records, manifests, trucking logs, receipts, reports, sample traffic routing, correspondence, or other documents or information related to the Work. Respondent shall also make available to EPA for purposes of investigation, information gathering, or testimony, its employees, agents, or representatives with knowledge of relevant facts concerning the performance of the Work. Upon reasonable notice, Respondent and/or its contractors or subcontractors shall make themselves available for such meetings, conferences, and/or inspections with EPA, or its representatives, as may be necessary for EPA to oversee the performance of Work required by this Order.

B. Respondent may assert business confidentiality claims covering all or part of the documents or information submitted to EPA under this Order 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). Such assertion shall be made in the manner described in 40 C.F.R. § 2.203(b) and substantiated in accordance with 40 C.F.R. § 2.204(e)(4) at the time the assertion is made. Documents or information determined to be confidential by EPA (hereinafter referred to as "CBI") will be afforded the protection specified in 40 C.F.R. Part 2, Subpart B. If no claim of confidentiality accompanies documents or information when they are submitted to EPA, or if EPA has notified Respondent that the documents or information are not confidential under the standards of Section 104(e)(7) of CERCLA or 40 C.F.R. Part 2, the public may be given access to such documents or information without further notice to Respondent. 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.

C. Respondent shall maintain, for the period during which this Order is in effect, an index of documents, if any, that Respondent is claiming as CBI and has substantiated as such. The index shall contain, for each document, the date, author, addressee and subject of the document. Upon written request by EPA, Respondent shall submit a copy of the index to EPA.

D. Respondent's obligation to disclose information requested by EPA pursuant to this Order is subject to applicable privileges recognized by Federal Courts under Federal law, provided that no sample results or analytical data shall be claimed as privileged. If the Respondent asserts such a privilege, it shall provide EPA with the following: (1) the title of the document, record, or information; (2) the date of the document, record, or information; (3) the name and title of the author of the document, record, or information; (4) the name and title of each addressee and recipient; (5) a description of the contents of the document, record, or information; and (6) the nature and basis of the privilege asserted by Respondent.

E. Respondent shall cooperate with EPA to ensure that all data generated as part of the Work to be performed under this Order is maintained in a computerized system that is compatible with EPA's system. The means of storing and manipulating data generated as part of the Work shall be described in a Data Management Plan, as a component of the SAP. Upon request by EPA, Respondent's computerized data bases shall be provided to EPA within sixty (60) days of said request.

## XIX. COMMUNITY RELATIONS

Respondent shall cooperate with EPA and the State in providing information regarding the Work to the public. As requested by EPA, Respondent shall participate in the preparation of such information for dissemination to the public and in public meetings which may be held or sponsored by EPA to explain activities taking place at or concerning the Site.

## XX. CERTIFICATION OF COMPLETION OF THE WORK

### A. Completion of the Remedial Action

1. Within thirty (30) days after Respondent concludes that the Remedial Action has been fully performed in accordance with this Order and any modifications or amendments made hereto, and the applicable Performance Standards have been attained, Respondent shall so certify to EPA in writing and shall schedule and conduct a pre-certification inspection to be attended by the EPA Remedial Project Manager, a Registered Professional Engineer, and Respondent's Project Coordinator. Respondent shall also provide written notice to the State at least ten (10) days prior to the scheduled date of the inspection, and invite the State to such pre-certification inspection. If, after the pre-certification inspection, Respondent still believes that the Remedial Action has been fully performed in accordance with this Order and the applicable Performance Standards have been attained, Respondent shall submit a written report to EPA for approval pursuant to Section XIII (Plans and Reports Requiring EPA Approval) within thirty (30) days of the inspection. In the report, the Registered Professional Engineer ("RPE") and a Duly Authorized Representative of the Respondent shall certify pursuant to Paragraph XIII.B. that the Remedial Action has been completed in full satisfaction of the requirements of this Order. The written report shall include as-built drawings signed and stamped by the RPE and certified as required by Paragraph XIII.B. of this Order. If, after completion of the pre-certification inspection and receipt and review of the written report or any subsequent notification of completion by Respondent, EPA determines that the Remedial Action or any portion thereof has not been completed in accordance with this Order or that the applicable Performance Standards

have not been achieved, EPA will notify Respondent in writing of the activities that must be undertaken to complete the Remedial Action and/or achieve the applicable Performance Standards. EPA will set forth in the notice a schedule for performance of such activities consistent with the Order or require the Respondent to submit a schedule to EPA for approval pursuant to Section XIII (Plans and Reports Requiring EPA Approval). Respondent shall perform all activities described in the notice in accordance with the specifications and schedules established pursuant to this Paragraph.

2. If EPA concludes, based on the initial or any subsequent Certification of Completion by Respondent, that the Remedial Action has been fully performed in accordance with this Order and that the applicable Performance Standards have been achieved, EPA will so certify in writing to Respondent. This certification shall constitute the Certification of Completion of the Remedial Action for purposes of this Order. Certification of Completion of the Remedial Action shall not affect Respondent's obligations under this Order that continue beyond the Certification of Completion including, but not limited to, access, land use restrictions and institutional controls, O&M, record retention, indemnification, insurance, payment of fines, and any work to be conducted under Section VI.G. (Additional Response Activities), Section VI.D. (Reporting Requirements/ Progress Reports), Section XI (EPA Periodic Review), Section XVII (Record Retention), Section XVIII (Access to Information), and Section XIX (Community Relations). This certification shall not limit EPA's right to perform periodic reviews pursuant to Section 121(c) of CERCLA, 42 U.S.C. § 9621(c).

**B. <u>Completion of the Work</u>**

1. Within thirty (30) days after Respondent concludes that all phases of the Work required by this Order (including O&M) have been fully performed and that all Performance Standards required by this Order have been attained, Respondent shall so notify EPA's Remedial Project Manager by submitting a written report by an RPE certifying that the Work has been completed in full satisfaction of the requirements of this Order. The report shall also contain a sworn certification from a Duly Authorized Representative of Respondent in the form required by Paragraph XIII.B. of this Order. If, after review of the written report, EPA determines that any portion of the Work has not been completed in accordance with this Order and/or that the applicable Performance Standards have not been achieved, EPA will notify Respondent in writing of the activities that must be undertaken to complete the Work. EPA will set forth in the notice a schedule for performance of such activities consistent with the Order or require the Respondent to submit a schedule to EPA for approval pursuant to Section XIII (Plans and Reports Requiring EPA Approval). Respondent shall perform all activities described in the notice in accordance with the specifications and schedules established therein.

2. If EPA concludes, based on the initial or any subsequent Certification of Completion by Respondent, that the Work has been fully performed in accordance with this Order and that the applicable Performance Standards have been achieved, EPA will so notify the Respondent in writing.

## XXI. NON-LIABILITY OF EPA

By issuing this Order, EPA assumes no liability for any injuries or damages to persons or property resulting from acts or omissions of Respondent or its directors, officers, employees, agents, representatives, successors, assigns, contractors, subcontractors, or consultants in carrying out any action or activity pursuant to this Order. Neither EPA nor the United States may be deemed to be a party to any contract entered into by Respondent or its directors, officers, employees, agents, successors, assigns, contractors, subcontractors, or consultants in carrying out any action or activity pursuant to this Order.

## XXII. ENFORCEMENT AND EPA'S RESERVATION OF RIGHTS

A. EPA reserves all rights, claims, interests, and defenses it has under CERCLA or any other law or in equity.

B. Nothing herein shall be construed to prevent EPA from seeking legal or equitable relief to enforce the terms of this Order, to seek injunctive relief, and/or to seek the imposition of statutory penalties or punitive damages.

C. EPA reserves all rights, including the right to institute legal action against the Respondent in connection with the performance of any response actions not addressed by this Order.

D. EPA reserves the right to disapprove of Work performed by Respondent pursuant to this Order, to require that Respondent correct and/or re-perform any and all Work disapproved by EPA, and to require that Respondent perform response actions in addition to those required by this Order.

E. EPA reserves the right to take enforcement actions, including actions for monetary penalties, for any violation of law, regulation, or of this Order. Failure to comply with this Order subjects Respondent to the assessment of civil penalties of up to $32,500/day and/or punitive damages in an amount up to three times the amount of any costs incurred by the United States as a result of such failure pursuant to Sections 106(b) and 107(c) of CERCLA, 42 U.S.C. §§ 9606(b) and 9607(c). EPA may also undertake other actions as it may deem necessary or appropriate for any purpose including, but not limited to, actions pursuant to Sections 104 and/or 106 of CERCLA, 42 U.S.C. §§ 9604 and/or 9606.

F. EPA reserves the right to undertake removal and/or remedial actions, including all actions required by this Order, at any time such actions are appropriate under CERCLA and the NCP, and to seek reimbursement from Respondent for any costs incurred.

G. EPA reserves the right to bring an action against Respondent pursuant to Section 107 of CERCLA, 42 U.S.C. § 9607, for recovery of all response costs incurred by the United States in connection with this Order and not reimbursed by Respondent, as well as any other costs incurred by the United States in connection with response actions conducted pursuant to CERCLA at or in connection with the Site. The response costs included in this reservation include, but are not limited to, past costs, direct costs, indirect costs, the costs of oversight, the costs of analyzing the cost documentation to support oversight cost demand, as well as accrued interest as provided in Section 107(a) of CERCLA, 42 U.S.C. § 9607(a).

H. Without limitation of any other provision in this Order, EPA reserves the right to bring actions against, and/or issue orders to, Respondent pursuant to applicable authorities for any purpose including, but not limited to, performance of response actions other than those performed by Respondent pursuant to this Order. EPA also reserves the right to amend this Order and require any and all additional Work EPA deems necessary to implement the ROD.

## XXIII. EFFECT OF ORDER/INVALIDATION OF A PROVISION

A. Nothing herein shall constitute or be construed as a satisfaction or release from liability of Respondent or any other person.

B. Nothing in this Order shall constitute or be construed as a release from any claim, cause of action, or demand in law or equity against any person, firm, partnership, or corporation not bound by this Order for any liability it may have arising out of or relating in any way to the generation, storage, treatment, handling, transportation, release, or disposal of any hazardous substances found at, taken to, or taken from the Site.

C. This Order does not constitute any decision on pre-authorization of funds under Section 111(a)(2) of CERCLA, 42 U.S.C. § 9611(a)(2).

D. Invalidation of any provision or requirement of this Order shall not affect the validity of any other provision or requirement of this Order.

## XXIV. EFFECTIVE DATE AND OPPORTUNITY TO CONFER

A. This Order is deemed issued on the date it is signed by EPA. This Order shall become effective thirty (30) days following the date on which it is issued.

B. Not later than twenty (20) days from the date of issuance of this Order, Respondent may confer with EPA to discuss the scope and applicability of this Order, the findings upon which this Order is based, the appropriateness of any action or activity required to be undertaken hereby, or other issues directly relevant to issuance of this Order. Such a conference is not, and shall not be deemed to be, an adversarial hearing or part of a proceeding to challenge this Order, and no official stenographic record of such proceeding shall be kept. Any request for a conference within the prescribed time frame shall be made to:

Andrew S. Goldman (3RC42)
Sr Assistant Regional Counsel
U.S. Environmental Protection Agency
1650 Arch Street
Philadelphia, PA 19103
Telephone: (215) 814-2487
Fax:(215) 814-2602

## XXV. NOTICE OF INTENT TO COMPLY

A. No later than two (2) days after the effective date of this Order, Respondent shall provide notice in writing to EPA's Remedial Project Manager stating whether Respondent will comply with the terms of this Order. If Respondent does not unequivocally and unqualifiedly commit to perform all the Work required by this Order in such notice, EPA will assume that Respondent has decided not to comply with the terms of the Order and Respondent will be deemed to be in violation of this Order. Respondent shall describe, using facts that exist, on or prior to the effective date of this Order, any "sufficient cause" defenses asserted by Respondent within the meaning of Sections 106(b) and 107(c)(3) of CERCLA, 42 U.S.C. §§ 9606(b) and 9607(c)(3). The absence of a response by EPA to the notice required by this Section shall not be deemed to be acceptance of Respondent's assertions nor as a position taken by the Agency with regard to those assertions.

B. Failure of Respondent to provide such notice shall be a violation of this Order and deemed to be a decision by Respondent not to comply with the terms of this Order. Said failure to comply may trigger an Agency decision to file a judicial action or to initiate a Superfund response action at the Site.

## XXVI. ADMINISTRATIVE RECORD

The Administrative Record compiled in support of issuance of this Order may be reviewed at the EPA Region III offices by contacting the EPA Remedial Project Manager. A copy of the index to the Administrative Record is appended to this Order as Attachment 4.

## XXVII. MODIFICATIONS

A. Modification to any document submitted to and approved or accepted by EPA pursuant to this Order may be made in writing by EPA. The effective date of such modification shall be the date on which the Respondent receives notice of such modification.

B. Except as otherwise provided in Paragraph A of this Section XXVII, the provisions of this Order may be modified at any time, in writing, solely by the Director of the EPA Region III Hazardous Site Cleanup Division.

**IT IS SO ORDERED.**

Abraham Ferdas — 9/25/06

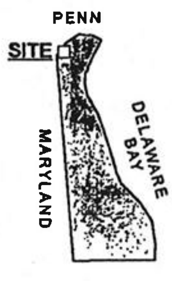
**ABRAHAM FERDAS** — Date
Director, Hazardous Site Cleanup Division
EPA Region III

EPA Docket No. CERC-03-2006-0266DC

# ATTACHMENT 1


*MAP SOURCE*
UNITED STATES GEOLOGICAL SURVEY
7.5 MINUTE TOPOGRAPHIC QUADRANGLE
SERIES "NEWARK EAST, DE" (1993) AND
"WILMINGTON SOUTH, DE-NJ" (1993)

2000 0 2000
APPROXIMATE SCALE IN FEET




FORMER KOPPERS COMPANY, INC. NEWPORT SITE
NEWPORT, DELAWARE
RECORD OF DECISION

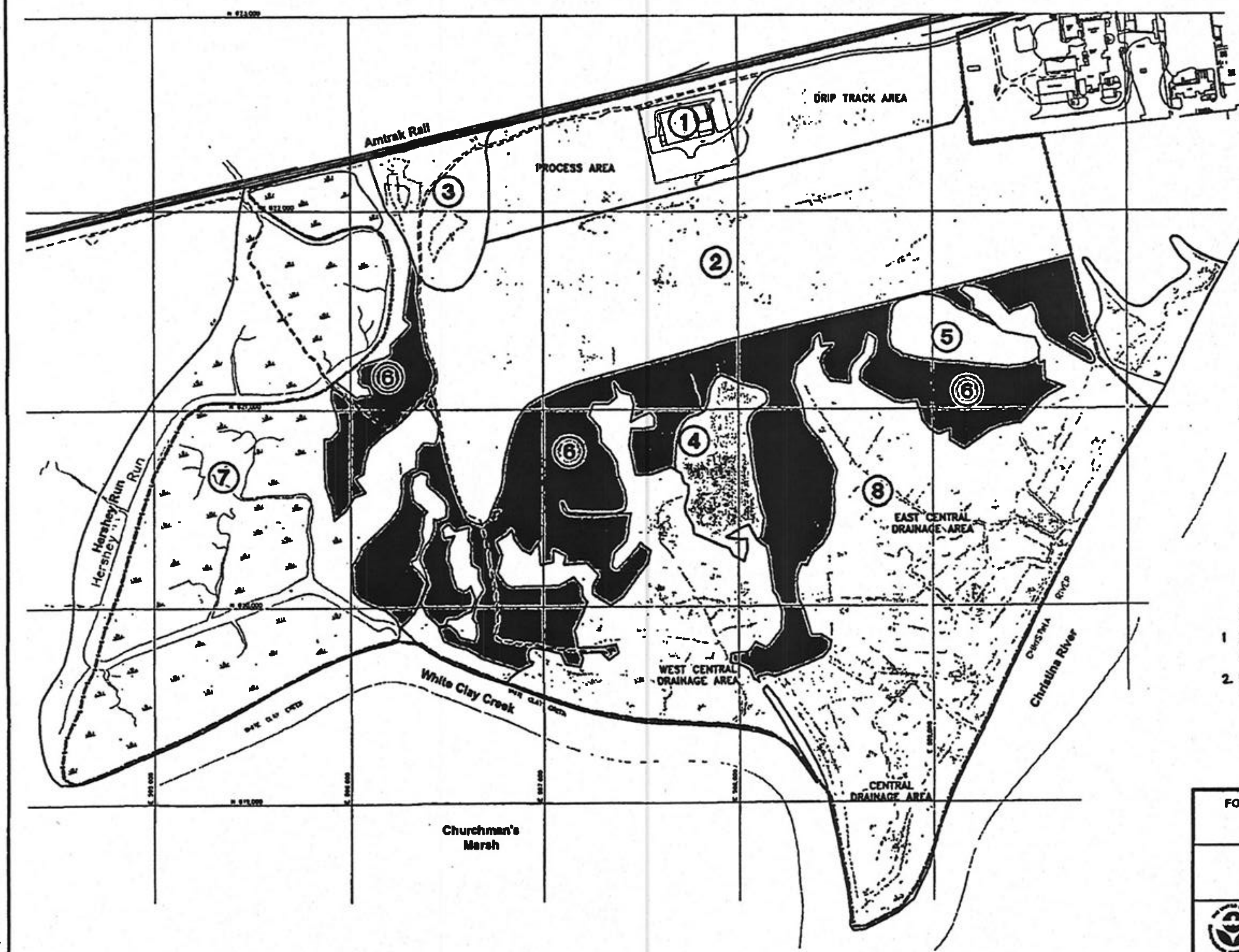
## SITE LOCATION MAP

U.S. EPA Region III
Philadelphia, PA

FIGURE
1

**EPA Docket No. CERC-03-2006-0266DC**

# ATTACHMENT 2




AREAS

1. PROCESS AREA DRIP TRACK AREA
2. WOOD STORAGE AREA
3. FIRE POND AREA
4. SOUTH PONDS AREA
5. K AREA
6. REMAINING UPLANDS
7. HERSHEY RUN DRAINAGE AREA
8. CENTRAL DRAINAGE AREA

SITE BOUNDARY
WETLANDS BOUNDARY

NOTES:

1. ALL "AREA" BOUNDARIES ARE APPROXIMATE.
2. MAPPING BASED ON DATA PROVIDED BY WOODWARD-CLYDE, APRIL, 1997

0 500' 1000'
GRAPHIC SCALE

FORMER KOPPERS COMPANY, INC NEWPORT SITE
NEWPORT, DELAWARE
RECORD OF DECISION

SITE PLAN

U.S. EPA Region III
Philadelphia, PA

FIGURE 2

**EPA Docket No. CERC-03-2006-0266DC**

# ATTACHMENT 3

## TABLE OF CONTENTS





AR315901

***IV. TABLES***



AR315902

## *V. FIGURES*



Note: Base Figures 1-6 and 8-12 were prepared by BBL, Inc , provided by Beazer East, and were modified by EPA

# *I. DECLARATION*

## *KOPPERS CO., INC. (NEWPORT PLANT)*
## *SUPERFUND SITE*

## *NEWPORT / NEW CASTLE COUNTY, DELAWARE*

AR315904

# RECORD OF DECISION
# KOPPERS CO , INC (NEWPORT PLANT)
# SUPERFUND SITE

## DECLARATION

### Site Name and Location

Koppers Co , Inc (Newport Plant) Superfund Site
Newport / New Castle County, Delaware
CERCLIS ID Number DED980552244

### Statement of Basis and Purpose

This decision document presents the selected remedial action for the Koppers Co , Inc Superfund Site ("Site" or "Koppers") located just outside of Newport, in New Castle County, Delaware, (see Figure 1) which was chosen in accordance with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 ("CERCLA"), as amended, and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan ("NCP"), 40 C F R Part 300 This decision document explains the factual and legal basis for selecting the remedial action for this Site The information supporting this decision is contained in the Administrative Record for this Site

The Delaware Department of Natural Resources and Environment Control ("DNREC") concurs with the selected remedy

### Assessment of the Site

Pursuant to duly delegated authority, I hereby determine, pursuant to Section 106 of CERCLA, 42 U S C. § 9606, that actual or threatened releases of hazardous substances from this Site, if not addressed by implementing the response action selected in this Record of Decision ("ROD"), may present an imminent and substantial endangerment to public health, welfare, or the environment

### Description of the Remedy

The remedial action described here comprises a comprehensive remedy for the Site Wood-treating operations conducted at the Site have resulted in residual contamination, mainly of creosote constituents (primarily quantified as total polycyclic aromatic hyrdocarbons, or "total PAHs"), in soils, sediments and ground water, with some areas having very high levels of contamination, including liquid creosote, a non-aqueous phase liquid ("NAPL") with a density only slightly greater than water This contamination is considered to be a principal threat waste since it is a continuous source for ground water contamination The remedial action addresses contaminated soils in upland areas of the Site (including the "Process Area", "Drip Track", and "Wood Storage Yard"), contaminated sediments in wetland areas of the Site (including the "Fire

Pond", "South Ponds", "K Area", "Hershey Run", "Hershey Run Marsh", and the "Western Central Marsh"), and contaminated ground water throughout the Site

The selected remedy includes

1. Excavating and consolidating all contaminated soils and sediments (soils with total PAHs greater than 600 mg/kg and sediments with total PAHs greater than 150 mg/kg) into one or two on-site landfills or containment areas, herein referred to collectively as "the Containment Area," to be located in the areas of the worst NAPL contamination,

1 Installing, operating and maintaining a ground water treatment system (e g , liquid carbon filtration) to prevent the migration of contaminated ground water, as well as to prevent the discharge of contaminated ground water from the recovery operation, and an oil-water separator (e g , belt skimmer or baffle tank) to facilitate the recovery of free-phase NAPL, as well as to prevent NAPL from reaching the ground water treatment system,

2 Treating ground water as necessary to meet discharge requirements,

3 Constructing ground water barrier walls and collection systems (e g , passive recovery trenches) in the Containment Area to prevent further migration of ground water contamination, including NAPL,

4 Managing the hydraulic head of ground water and collecting NAPL contamination in the ground water through the use of the passive recovery trenches,

5 Separating creosote from ground water and transporting creosote off-site for disposal or recycling in accordance with Section 121(d)(3) of CERCLA,

6 Moving debris to a location on-site where they can be placed under the RCRA (Resource Conservation and Recovery Act) modified cap,

7 Installing a RCRA modified cap across the Containment Area,

8 Relocating a portion of the existing channel of Hershey Run, if the Containment Area shall extend into the Hershey Run wetlands,

9. Creating wetlands to replace any that are filled in as part of the landfill construction,

10 Monitoring ground water, surface water, sediments and wetlands to ensure the effectiveness of the remedy,

11 Prevent exposure to contamination inside the Containment Area or in ground water beneath the Site, and prevent the drawdown of contamination into the deeper aquifer or elsewhere, through land and ground water use restrictions for the Site and surrounding area (as appropriate)

**Data Certification Checklist**

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

| ROD CERTIFICATION CHECKLIST | |
|---|---|
| Information | Location/Page Number |
| Chemicals of concern and respective concentrations | Section 7 1 1, Page 8<br>Tables 1, 2, 3, 4, 5 |
| Baseline risk | Section 7 1, Page 7<br>Tables 7, 8 |
| Clean-up levels and the basis for these levels | Section 8, Page 18<br>Section 11 2, Page 35 |
| How source materials constituting principal threat are addressed | Section 2, Page 1<br>Section 4, Page 3<br>Section 8, Page 18<br>Section 11 1, Page 34<br>Figures 4 – 7, 11 |
| Current and reasonably anticipated future land use assumptions and potential future beneficial uses of ground water | Section 6, Page 6<br>Section 11 4, Page 44 |
| Potential future land and ground water use that will be available at the Site as a result of the selected remedy | Section 6, Page 6<br>Section 11 4, Page 44 |
| Estimated capital, annual operation and maintenance, and total present worth costs, discount rate, and the number of years over which the remedy cost estimates are projected | Section 12 3, Page 46<br>Table 10 |
| Key factors that led to selecting the remedy | Section 10, Page 27<br>Section 11 1, Page 34 |

**Statutory Determinations**

The selected remedial action is protective of human health and the environment, complies with federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, 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 remaining on-site above levels that allow for unlimited use and unrestricted exposure, a review will be conducted within five years after commencement of the remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment  Such reviews will be conducted every five years thereafter, until EPA determines that hazardous substances remaining at the Site do not prevent unlimited use and unrestricted exposure at the Site.

Abraham Ferdas, Director
Hazardous Site Cleanup Division
EPA Region III

9/30/05
Date

# II. DECISION SUMMARY

## KOPPERS CO., INC. (NEWPORT PLANT) SUPERFUND SITE

## NEWPORT / NEW CASTLE COUNTY, DELAWARE

## 1.0 SITE NAME, LOCATION AND DESCRIPTION

The Koppers Co , Inc. (Newport Plant) Superfund Site ("Site" or "Koppers") is comprised of approximately 300 acres and is located in the northern part of New Castle County, in the State of Delaware, southwest of the town of Newport and northwest of the Route I-95 and Route 141 interchange (see Figures 1 and 2), and includes the areal extent of contamination from the property To the north, the Site is bordered by high-speed railroad lines Beyond the rail lines are a former municipal sewage treatment facility, an industrial property, and a residential area To the east, the Site is bordered by the former DuPont Holly Run Plant and the Christina River To the south and west, the Site is bordered by White Clay Creek and Hershey Run, respectively To the west of the Site, across Hershey Run, lies the Bread and Cheese Island property The Site previously contained a wood-treatment facility The Site consists of 163 acres of upland areas, 136 acres of wetlands, and three ponds Soil and ground water at the Site are contaminated as a result of past wood-treatment activities. Contamination at the Site is present in the following areas 1) upland soils, 2) Hershey Run, 3) the Fire Pond, 4) the South Pond area (the non-tidal South Pond itself and the tidal West Central Drainage area), 5) the K Pond area and 6) ground water (see Figure 2) Only the East Central and Central Drainage Areas (the marshes bordering the Christina River) and the wooded uplands to the south of the former facilities are generally free of site-related contaminants The Comprehensive Environmental Response, Compensation, and Liability Information System ("CERCLIS") identification number for this Site is DED980552244

The U S Environmental Protection Agency ("EPA") is the lead agency for Site activities and the Delaware Department of Natural Resources and Environment Control ("DNREC") is the support agency EPA has reached prior settlements with potentially responsible parties ("PRPs") under which the PRPs have performed a Remedial Investigation and Feasibility Study and maintained the Site

This action addresses contamination in the sediments, soils and ground water at the Site in the areas designated by Figures 4-6 This action comprises a comprehensive remedy for the Site, and no further actions are anticipated

## 2.0 SITE HISTORY AND ENFORCEMENT ACTIVITIES

In 1929, a group of parcels comprising the Site was conveyed by Lynam and Wright to the Delaware Wood Preserving Company, which began conducting wood-treatment operations on the property In 1931, the Site was sold to Century Wood Preserving Company (Century) Four years later in 1935, the Wood Preserving Company acquired the property and all associated stock from Century Through liquidation of the Wood Preserving Company, Koppers Company acquired the Site in 1940 and reorganized in 1944 into Koppers Company, Inc (Koppers) Koppers then continued wood-treatment operations at the Site until 1971, when the property was sold to DuPont The Site has remained largely inactive since wood-treating operations ceased in 1971

From 1974 to 1977, the New Castle County Department of Public Works leased the northern part of the Site, and then built and operated a wastewater treatment facility to temporarily maintain the County's wastewater treatment capabilities until permanent facilities were built In 1977, the County sold the building to DuPont and discontinued wastewater treatment operations at the Site

The primary material used in the wood-treatment processes was a creosote/coal tar solution, which was used to preserve railroad ties, telephone poles, and other wood products (this is typical of the type of wood-treatment used today for railroad ties and telephone poles) Pentachlorophenol (PCP) was also used to treat the wood, although to a much smaller degree Throughout a large area of the Site (approximately two-thirds of the operations area), an array of railroad tracks provided for the movement of wood and materials to and from the Site Based on available records, former Site areas where creosote handling occurred included the Process Area and Drip Track Area (Figure 2)

Located in the northwestern portion of the Site, the Process Area was utilized for the application of wood preservatives and contained various types of wood-treatment equipment and associated structures This area also provided storage for approximately 1,000,000 gallons of creosote and other process-related materials The treatment consisted of heating and pressurizing tanks filled with creosote and wood, forcing the creosote into the wood After treatment, the freshly-treated wood products were temporarily allowed to cure and drip dry in the Drip Track Area prior to transfer to the Wood Storage Area The Fire Pond was created as a source of water for fire-fighting purposes

Sloppy operations, including spills and leaks, allowed contaminants to seep into the soil It is likely that the contaminants escaped into Hershey Run by flowing as a separate phase with the shallow ground water, or by being washed toward Hershey Run during storm events.

The Site was identified as a potential hazardous waste site in 1979 Following multiple subsequent investigations, the Site was proposed to the NPL in 1989, and formally listed on August 30, 1990 In 1991, Beazer East ("Beazer," the successor corporation to Koppers) and DuPont (the land owner at that time, Beazer has since acquired the property from DuPont) signed an agreement with EPA to conduct the Remedial Investigation/Feasibility Study (RI/FS)

In 1991, an Administrative Order on Consent was signed by EPA and the PRPs, requiring the PRPs to conduct a Remedial Investigation and Feasibility Study ("RI/FS") at the Site These reports and other documentation provided in the Administrative Record provide the basis for the determinations found in this Record of Decision

## 3.0 COMMUNITY PARTICIPATION

The Koppers Remedial Investigation, Feasibility Study, and Baseline Risk Assessment, and other Administrative Record documents relating to the Site, were made available to the public They are located in the Administrative Record, which can be viewed at http //www epa gov/arweb, or at the Administrative Record link on the sidebar of the U.S EPA Region 3 Hazardous Site Cleanup Division Homepage at http //www epa gov/reg3hwmd In addition, the detailed Administrative Record can be examined at the following locations

| Kirkwood Public Library<br>6000 Kirkwood Highway<br>Wilmington, DE 19808<br>(302) 995-7663 | Delaware Department of Natural Resources & Environmental Control<br>Superfund Branch<br>391 Lukens Drive<br>New Castle, DE 19720<br>(302) 395-2600 | Admin Records Room<br>US EPA Region III<br>1650 Arch Street<br>Philadelphia, PA 19103<br>(215) 814-3157<br>(Please call ahead ) |
|---|---|---|

The notice of availability of these documents was published in the *Wilmington News Journal* on October 7, 2004 In addition, EPA sent a fact sheet summarizing the Agency's preferred remedial alternative for the Site to residences and businesses within an approximately one-mile radius of the Site in October 2004

From October 7, 2004 to December 7, 2004, EPA held a 60-day public comment period to accept public comments on the remedial alternatives presented in the *Feasibility Study* and the Proposed Plan and the other documents contained within the Administrative Record for the Site On October 21, 2004, EPA held a public meeting to discuss the Proposed Plan and accept comments. A transcript of this meeting is included in the Administrative Record The summary of significant comments received during the public comment period and EPA's responses are included in the Responsiveness Summary, which is a part of this Record of Decision

## 4.0 SCOPE AND ROLE

The actions proposed by EPA in this document constitute a comprehensive approach for addressing all of the environmental problems at the Site The actions proposed at this time are expected to be the final actions that will be necessary to completely address the risks from the contamination at the Site There have been no previous cleanup efforts at the Site by EPA or the State

## 5.0 SITE CHARACTERISTICS

### 5.1 Surface Features, Soil and Geology, and Hydrogeology

**Surface Features and Resources.** The Site is located in the Coastal Plain Physiographic Province in New Castle County, Delaware (see Figure 1), near the fall line with the Piedmont Physiographic Province.

Existing facilities/structures and other physical features at the Site include one warehouse building (constructed by the New Castle Department of Public Works), a paved access road, and secondary roads providing access to overhead power lines that traverse the Site Generally, the railroad lines once present throughout the Site no longer exist.

Access to the Site is restricted through the use of 24-hour security-guarded gates at the CibaSC facility, fencing, and posting Natural barriers, such as the Christina River, White Clay Creek, and Hershey Run, and the surrounding marshes and wetlands also limit access to the Site, as does the high-speed Amtrak rail line to the north (see Figure 2) However, signs of trespass, including spent shotgun shells, numerous hunting blinds and well-worn foot paths, have been found

The Site consists of 163 acres of upland areas, 136 acres of wetlands and three ponds Wetlands cover approximately 45 percent of the Site and dominate the southern and western portions The wetland cover types include freshwater tidal marsh (115 acres), non-tidal emergent wetlands (11 acres), non-tidal forested wetlands (9 acres), and non-tidal scrub/shrub wetlands (1 acre) Tidal wetlands at the Site individually drain into Hershey Run, White Clay Creek and the Christina River Non-tidal wetlands occur in the South Ponds Area, K Area, Fire Pond Area, and approximately 15 smaller disjunct non-tidal wetlands occupy low-lying areas in the uplands of the Process and Wood Storage Areas

White Clay Creek is Delaware's only "National Wild and Scenic River," a designation that is administered by the National Park Service (NPS) under the authority of the Wild and Scenic Rivers Act of 1968 The final reach of White Clay Creek, from the southern boundary of United Water Delaware Corporation's property (where the Amtrak lines cross the Creek) to the confluence with the Christina River, is the nearest and adjacent section of the Creek to hold this designation Work at the Site will be conducted in consultation with the NPS in order to ensure that cleanup work at the Site does not negatively affect this reach

Several plants that occur on Delaware's Rare Native Vascular Plant List exist at the Site These plants include the swamp white oak, sessile leaved tick-trefoil, swamp milkweed, and closed gentian While it is not expected that these plants will be impacted by the remedy, this will be evaluated in further detail during design work

The Site may contain suitable habitat for the bog turtle, a federally endangered species A survey to determine whether or not it is present will be conducted during the Remedial Design The State has recently reported that a bald eagle was observed nesting on Bread and Cheese Island, adjacent to the Site

**Soil and Geology.** Figure 3 shows a geological cross-section of the Site Fill is the uppermost unit encountered in the uplands area, and varies in thickness from 0 to approximately 9 ft with greater thicknesses observed in the Process Area and Fire Pond Area The fill is composed primarily of silts with lesser amounts of sands, gravels, and clays In addition, the fill contains various anthropogenic materials including stone fill, brick and concrete fragments, asphalt pavement, railroad tie pieces, coal and ash debris, and wood, steel, and iron debris In the former production areas of the Site, creosote is present within the fill, primarily in a dry, weathered form

Fluvial Quaternary (Recent) sediments overlie much, if not all, of the unconsolidated Columbia Formation (Pleistocene). The Quaternary (Recent) sediments are generally comprised of silts with lesser amounts of sand, gravel, and clay as well as organic matter in the form of roots, peat, reeds, and other organic debris These deposits range in thickness from 0 to upwards of approximately 10 to 15 ft and generally decrease in thickness near drainage areas Holocene deposits are present in drainageways and marsh areas and consist of silty clay with lesser amounts of fine sand and thicknesses ranging from 0 to 6 ft. In the marsh areas a gray clay is present which is described as a drier and firmer clay at depth. This clay unit ranges in depth from 1 to 4 ft below ground surface (bgs), and its thickness ranges from 1 to 5 ft This "marsh clay" is present in over 95 percent of the borings which were advanced below 2 ft or more in depth in the marsh areas For the probes that penetrated through the gray clay layer, the thickness ranged from approximately 1 to 3 ft with an average thickness of approximately 2 ft The marsh clay is apparently absent below sections of Hershey Run, or may be present at depths greater than that to which probes were advanced

The Columbia Formation is composed of primarily silty sands and gravels with seams and thin beds (up to 2 ft in thickness) of silts The Columbia Formation was encountered in thicknesses ranging from 0 ft to approximately 20 to 25 ft, and is generally thicker near the Process Area and Drip Track Area

The Potomac Formation is composed of silts and clays interlayered with medium to fine sands At the Site, a lower-permeability layer is typically observed at the top of this unit and can vary from clay to a clayey silt or clayey sand There are no known areas of direct recharge from the Columbia to the lower Potomac at the Site, although the two aquifers are referred to in the literature as "leaky" and "interconnected " The Potomac Formation is distinguished from the Columbia Formation by smaller grain sizes and the usual presence of the lower-permeability clayey layer at the contact with the Columbia Formation. The maximum thickness of the fine-grained layers at the top of the Potomac, where encountered at the Site, ranged from 1 3 to 5 ft (in seven borings). Where present, the fine-grained unit may act as a lower-permeability capillary barrier, potentially retarding the downward movement of NAPL between the Columbia and Potomac Formation

**Hydrogeology.** During high tides, ground water in the upper aquifer (which occurs in the Columbia and Fill geologic units) appears to be recharged by surface water in the West Central Drainageway and Hershey Run, during low tides the upper aquifer appears to discharge ground water to the West Central Drainageway and Hershey Run Horizontal hydraulic conductivities measured in the upper aquifer ranged from $2 \times 10^{-1}$ to $4 \times 10^{-4}$ cm/sec

Using the highest horizontal hydraulic gradient observed in the upper aquifer (0 013 ft/ft), the mean hydraulic conductivity ($3.2 \times 10^{-2}$ cm/sec), and an assumed effective porosity of 0 3, an average linear ground water flow velocity of approximately 4 ft/day was calculated

No drinking water wells are located within the Site boundaries. Local sources of drinking water include surface water from White Clay Creek (approximately one mile upstream) and municipal supply wells located within a few miles of the Site and screened in the Potomac aquifer

## 5.2 Nature and Extent of Contamination

The nature and extent of contamination in certain areas and environmental media at the Site were evaluated during the Remedial Investigation This information is documented in the Administrative Record and is only briefly summarized in this section of the ROD More than 100,000 data were obtained for surface soil, sediment, ground water, surface water, air, tissue and other media from the Site and surrounding area



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As a result of the former wood-treatment operations conducted at this Site, creosote NAPL has been released to the subsurface These highly concentrated contaminant liquids do not dissolve readily in water, are usually slightly heavier than water and, therefore, move downward with gravity to sink in and through the soil and ground water until they run into a less permeable clay layer NAPLs behave as continuing sources of contamination, as upgradient clean ground water flows through the Site and comes into contact with the NAPL Contamination slowly dissolves from the NAPL into the ground water, which eventually flows to surface water bodies, or migrates downward through the lower aquifer Creosote NAPL was observed in both subsurface soils and in wetland sediments at the Site In addition, creosote NAPL sheens have been observed in the surface waters of Hershey Run. Shallow soils, subsurface soils, ground water and sediments at the Site have been contaminated to varying degrees with PAHs, the primary chemical of concern (COC) identified at this Site (see Figures 4 – 6) For more information, refer to Section 4 of the Remedial Investigation Report for the Site (May 2003) and EPA's comments regarding the report, which are available in the Administrative Record

## 5.3 Conceptual Site Model

A Conceptual Site Model ("CSM") diagrams contaminant sources, contaminant release mechanisms and migration routes, exposure pathways, and potential human and ecological receptors It documents what is known about human and environmental exposure under current and potential future Site conditions The risk assessment and final response action for this Site are based on the CSM

The CSM for this Site (see Figure 7) illustrates residual NAPL in the shallow soil being released from past wood-treatment activities at the Site Contamination at the Site was released into the soil and migrated into the subsurface, adjacent wetlands and wetland sediments Once NAPLs enter the ground water, they act as a major source of ground water contamination (via dissolution), and surface water contamination (due to discharge of contaminated ground water and/or movement of NAPLs) Site receptors include individuals and ecological receptors that may be exposed to the contaminants in the soil, sediments, and ground water

## 6.0 CURRENT AND POTENTIAL FUTURE LAND USES

Land use within the surrounding area includes a mix of industrial, commercial and residential activities The Site (see Figure 2) is zoned for industrial use, according to the zoning board of New Castle County, Delaware, and the properties in use immediately adjacent to the Site are used for residential or industrial purposes. U.S Census Bureau data indicates that New Castle County has experienced significant growth in recent years. Because of the very limited access to the Site and because it is zoned for industrial use, EPA's assumed future use for the Site was for industrial purposes However, based on more recent discussions between EPA, DNREC and the property owner of the Site, EPA has also considered the possible future use of the Site as a wetlands bank

## 7.0 SUMMARY OF SITE RISKS

A baseline human health risk assessment was conducted in order to estimate the probability and magnitude of potential adverse human health effects from exposure to contaminants in on-site soil, sediments and ground water, assuming no further response actions are undertaken Both a human health and an ecological risk assessment were conducted for this Site The risk assessments provide the basis for taking action and identify the contaminants and exposure pathways that need to be addressed by the remedial action at the Site

This section of the ROD summarizes the results of the baseline human health and the ecological risk assessments

### 7.1 Summary of Human Health Risk Assessment

The Baseline Risk Assessment ("BLRA") for the Site is comprised of the *Human Health Risk Assessment for the Former Koppers Company, Inc Site, Newport, Delaware* submitted by DuPont and Beazer, and prepared by Environmental Standards, Inc The Human Health Risk Assessment was accepted by EPA on September 20, 2001 The BLRA was prepared in order to determine the current and potential future effects of contaminants in soil and ground water in the absence of further cleanup actions at the Site The BLRA considered the effects of exposure to soil and ground water The BLRA consisted of a four step process (1) the identification of chemicals of potential concern ("COPCs"), i e , those that have the potential to cause adverse health effects, (2) an exposure assessment, which identified actual and potential exposure pathways, potentially exposed populations, and the magnitude of possible exposure, (3) a toxicity assessment, which identified the adverse health effects associated with exposure to each COPC and the relationship between the extent of exposure and the likelihood or severity of adverse effects; and (4) a risk characterization, which integrated the three earlier steps to summarize the potential and actual risks posed by hazardous substances at the Site, including carcinogenic and non-carcinogenic risks A summary of those aspects of the human health risk assessment, which support the need for remedial action, is discussed below



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### 7.1.1 Contaminants of Potential Concern

During the Remedial Investigation, a number of organic and inorganic chemicals were detected in Site soils, sediments and ground water Chemicals with maximum concentrations and/or analytical method detection limits of less than Risk-Based Concentrations ("RBCs")[1] were eliminated from further consideration in the risk assessment Risk calculations were based on either the upper 95$^{th}$ percentile confidence limit on the mean ("UCL95") or the maximum detected concentration for each chemical The lower of these two values (designated the "medium-specific concentration" or "MSC") was used in the risk calculations as the exposure point concentration for that chemical in that medium Table 1 lists Summary Statistics and COPC Selection for Site soil, sediment and ground water PAHs are the primary COC at this Site, with the respective exposure point concentrations used in the risk assessment presented in each scenario's individual risk calculation (presented in Table 6) Please note that the tables and risk assessment, generated during the Remedial Investigation, included dioxin (specifically 2,3,7,8-TCDD) as a COC, it has since been determined that this was in error, and that dioxin was only detected due to a lab spike error As a result, dioxin is not a COC at the Koppers Site

### 7.1.2 Exposure Assessment

Potential human health effects associated with exposure to the COPCs were estimated quantitatively or qualitatively through the evaluation of several actual or potential exposure pathways These pathways were developed to reflect the potential for exposure to hazardous substances at the Site Demographics and land use were evaluated to assess present and potential future populations working or otherwise spending time at the Site The exposure scenarios evaluated in the *Baseline Risk Assessment* are presented below

The *Baseline Risk Assessment* considered the effects of ingestion of, and dermal contact with, soils, sediments, surface water and ground water at the Site The BLRA also considered the inhalation of chemical volatilization from ground water and dermal contact while showering

Five different current or future exposure scenarios were developed in order to estimate risks for the following populations: (1) on-site construction worker; (2) on-site industrial worker, (3) adolescent trespasser, (4) adolescent swimmer, and (5) angler

A number of assumptions were used in the risk assessment process to calculate the dose for each exposure pathway since it is seldom possible to measure a specific dose The following assumptions were used to estimate reasonable maximum exposure for each of the five populations identified above (see Table 3 for complete exposure parameters)

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[1] The identification of chemicals of potential concern was performed utilizing the EPA guidance, "Selecting Exposure Routes and Contaminants of Concern by Risk-Based Screening" (EPA Region III, 1992)

*On-site construction worker (Future)*

- The on-site construction worker was assumed to have a body weight of 70 kilograms ("kg")
- The exposure duration was 1 year
- The frequency of exposure to soil, NAPL and air emissions was assumed to be 120 days per year ("days/yr").
- The soil ingestion rate was assumed to be 50 milligrams per day ("mg/day")
- The skin surface area for dermal contact was assumed to be 1,820 square centimeters per day ("$cm^2$/day")
- A soil-to-skin adherence factor of 0 11 milligrams per square centimeter ("mg/$cm^2$") was used
- The inhalation rate was assumed to be 20 cubic meters per day ("$m^3$/day")

*On-site industrial worker (Future)*

- The on-site industrial worker was assumed to have a body weight of 70 kg
- The exposure duration was 25 years
- The frequency of exposure to soil and NAPL was assumed to be 134 days/yr
- The frequency of contact with ground water (via ingestion or while showering) was assumed to be 250 days/yr (1 shower/day at 15 minutes/shower)
- Ground water ingestion rate was 1L/day
- The soil ingestion rate was assumed to be 50 mg/day.
- The skin surface area for dermal contact was assumed to be 1,820 $cm^2$ (or 20,000 $cm^2$ while showering)
- A soil-to-skin adherence factor of 0 11 mg/$cm^2$ was used

*Adolescent trespasser (Current and Future)*

- The adolescent trespasser was assumed to have a body weight of 56 kg
- The exposure duration was 6 years (ages 12-18)
- The frequency of exposure to soil, NAPL and surface water was assumed to be 24 events/yr, and 10 events/yr for exposure to sediment
- The soil ingestion rate was assumed to be 100 mg/event
- The skin surface area for dermal contact was assumed to be 4,381 $cm^2$, based on area of face, upper extremities, and lower legs (and 207 $cm^2$ for legs wading in non-river surface water at 1 hour/event).
- A soil/sediment-to-skin adherence factor of 0 025 mg/$cm^2$ was used

*Adolescent swimmer (Current and Future)*

- The body weight of the adolescent swimmer was assumed to be 56 kg
- The exposure duration was 6 years
- The frequency of exposure to river surface water and sediment was assumed to be 24 events/yr at 1 hour/event
- The ingestion rate was assumed to be 50 mL/hr.
- The skin surface area for dermal contact with water was assumed to be 15,758 $cm^2$ (or 1,103 $cm^2$ for feet exposed to sediment)
- A sediment-to-skin adherence factor of 0 063 $mg/cm^2$ was used

*Angler (Current and Future)*

- The angler was assumed to have a body weight of 70 kg
- The exposure duration was 25 years
- The frequency of exposure was assumed to be 365 days/yr
- The ingestion rate was assumed to be 25 g/day

### 7.1.3 Toxicity Assessment

Excess lifetime cancer risks were determined for each exposure pathway by incorporating the chemical-specific cancer slope factor. Cancer slope factors have been developed by EPA from epidemiological or animal studies to reflect a conservative "upper bound" of the risk posed by potentially carcinogenic substances The resulting risk estimates are expressed in scientific notation as a probability (e g , 1 X $10^{-6}$ or 1/1,000,000) and indicate (using this example) that an average individual is not likely to have greater than a one in a million chance of developing cancer over 70 years as a result of site-related exposure to the compound at the stated concentrations. All risks estimated represent an "excess lifetime cancer risk," or the additional cancer risk on top of that which we all face from other causes such as cigarette smoke or exposure to ultraviolet radiation from the sun EPA's generally acceptable risk range for site-related exposure is $10^{-4}$ to $10^{-6}$. Current EPA practice considers carcinogenic risks to be additive when assessing exposure to multiple hazardous substances or exposure via multiple pathways

In assessing the potential for exposure to a chemical to cause adverse health effects other than cancer, a hazard quotient ("HQ") is calculated by dividing the daily intake level by the reference dose ("RfD") or other suitable benchmark EPA has developed reference doses for many chemicals which represent a level of exposure that is expected to result in no adverse health effects. RfDs are derived from epidemiological or animal studies and incorporate uncertainty factors to help ensure that the potential for adverse health effects will not be underestimated An HQ ≤ 1 indicates that a receptor's dose of a single contaminant is less than the RfD and that harmful non-cancer effects from that chemical are unlikely. The Hazard Index ("HI") is generated by adding the HQs for all COPCs that affect the same target organ (e g , liver) within or across those pathways by which the same individual may reasonably be exposed An HI ≤ 1 indicates that harmful non-cancer health effects are not expected as a result of exposure to all of the COPCs within a single or multiple exposure pathway(s)

A summary of the cancer and non-cancer toxicity data relevant to the COPCs in the *Baseline Risk Assessment* is presented in Table 4

### 7.1.4 Risk Characterization

The Baseline Risk Assessment was conducted in order to determine the current and potential future effects (if no cleanup actions were taken at the Site) of contaminants in sediments, soils and ground water on human health and the environment The current and potential future land use plays a key role when EPA determines the exposure scenarios to be evaluated in the Baseline Risk Assessment Although historically used for industrial purposes and currently zoned as industrial, the Site is currently not in use other than as wildlife habitat The adjacent properties (the former DuPont Holly Run plant and the existing CibaSC facility) have both been used for industrial purposes throughout the history of the Site Therefore, with regard to human health, EPA evaluated the potential risks associated with industrial use of the Site, construction workers, anglers, adolescent swimmers and adolescent trespassers EPA does not believe the Site could reasonably be used for residential purposes because of the difficulty of access (through an active chemical plant) and the isolation of the property (surrounded by railroad tracks [Amtrak's Northeast Corridor line], water, and the active facility)

The Baseline Risk Assessment considered the hazards from potential exposure to contamination if an industrial facility were to be built at the Site Potential effects were evaluated from the incidental ingestion of sediments and soils, ingestion of ground water contaminated with creosote constituents, dermal contact with Site sediments, soils and ground water, and the inhalation of vapors emitted from ground water were it to be used (i e , for showering) The future industrial worker scenario resulted in the greatest calculated risks, for details of the other scenarios evaluated, please refer to the Human Health Risk Assessment (HHRA) in the AR, and to the risk summary tables in this ROD.

For soils, the Human Health Risk Assessment found that the carcinogenic risk for an industrial worker from ingestion and dermal exposure $2\,4 \times 10^{-4}$. The majority of the risk was caused by the incidental ingestion of soil ($1.8 \times 10^{-4}$) The contaminant that contributed the most to the risk was benzo(a)pyrene, with other PAHs (including benzo(a)anthracene, benzo(b)fluoranthene, and dibenz(a,h)anthracene) also contributing

For groundwater, the carcinogenic risk from dermal exposure for a future industrial worker was $1.3 \times 10^{-3}$ and the carcinogenic risk from ingestion was $4\,6 \times 10^{-1}$ Scenarios evaluating exposure to ground water without NAPL present did not result in carcinogenic risk outside of the acceptable range.

The non-carcinogenic risks from groundwater to a future industrial worker resulted in a Hazard Index (HI) of 115 (or 115 times greater than EPA's threshold) from dermal exposure and an HI of 170 (170 times greater than EPA's threshold) from the ingestion scenario The risk to a future industrial worker where NAPL was not present in the ground water produced an HI of 1 3 when the dermal, ingestion, and inhalation pathways were combined The HI exceedance of 1 was

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largely caused by high background levels of metals that occur in Columbia Aquifer ground water, which contributed to the ingestion pathway

There were no site-related contaminants found in the Potomac Aquifer wells at the Site, but these wells were intentionally not located in the vicinity of the worst areas of contamination to avoid creating a pathway for contamination A summary of the risk calculations for all of the scenarios evaluated is presented in Table 5

EPA believes the risk from exposure to soil and sediment may be underestimated due to the presence of creosote NAPL, at the surface, in both soils and sediments at the Site The presence of surficial creosote NAPL has the potential to cause acute toxicity if a trespasser were to be exposed to that material, as PAHs are dermal irritants on direct contact

In summary, unacceptable risks exist to human health from groundwater at the Site In addition, there exists the potential risk of exposure to creosote material in soils and sediments for any person traversing the Site

### 7.1.5 Uncertainty in Risk Characterization

Risk assessment provides a systematic means of organizing, analyzing and presenting information on the nature and magnitude of risks posed by chemical exposures Uncertainties are present in all risk assessments because of the quality of available data and the need to make assumptions and develop inferences based on incomplete information about existing conditions and future circumstances Below is a brief discussion of the major uncertainties associated with the *Baseline Risk Assessment*.

- Dermal Contact Pathway - The use of adjusted toxicity values for the assessment of dermal risks is a source of uncertainty in the risk assessment Adjusted oral toxicity values were generated based on currently available oral absorption factors Adjustment factors ranging from less than 1 percent (inorganic) to 100 percent (VOCs) were applied to toxicity values to account for absorbed doses.

- Risk Characterization - Constituent-specific risks are generally assumed to be additive This oversimplifies the fact that some constituents are thought to act synergistically (1 + 1 > 2) while others act antagonistically (1 + 1 < 2) The overall effect of these mechanisms on multi-constituent, multi-media risk estimates is difficult to determine but the effects are usually assumed to balance

- There is inherent variability in environmental sampling results, given the spatial distribution of contamination and composition of the matrix sampled Small numbers of analytical samples for a given area may not completely characterize the numbers and concentrations of constituents actually present.

- Exposure parameters for the Site risk assessment were obtained from EPA guidance or peer review literature Most of these assumptions are considered average or reasonable maximum exposure estimates that would not likely underestimate exposure While there are situations where the parameters used may produce underestimates, it is unlikely that the cumulative effect of all exposure parameter estimates will lead to underestimates of risk

### 7.1.6 Principal Threat Waste

EPA characterizes waste on-site as either principal threat waste or low-level threat waste The concept of principal threat waste and low-level threat waste, as developed by EPA in the National Oil and Hazardous Substances Pollution Contingency Plan ("NCP"), is applied on a site-specific basis when characterizing source material "Source material" is defined as material that includes or contains hazardous substances, pollutants, or contaminants that act as a reservoir for migration of contamination to ground water, to surface water, to air, or that act as a source for direct exposure Principal threat wastes are those source materials considered to be highly toxic or highly mobile, which would present a significant risk to human health or the environment should exposure occur

The proposed cleanup addresses areas where contamination is just above the cleanup criteria to areas where contamination is so high and prevalent that it is visible and flows freely as a separate phase From the results of the RI/FS for the Koppers Site, EPA considers the NAPL in the shallow and subsurface soils and sediments to be principal threat waste because it is source material that contains hazardous substances, pollutants, or contaminants that act as a reservoir for the migration of contamination to surface water and/or ground water

Section 300 430(a)(1)(iii) of the NCP states that "EPA expects to use treatment to address the principal threats posed by a site, wherever practicable," that "EPA expects to use engineering controls, such as containment, for waste that poses a relatively low, long-term threat or where treatment is impracticable," and that "EPA expects to use a combination of methods, as appropriate, to achieve protection of human health and the environment " It also states that "EPA expects to use institutional controls .to supplement engineering controls as appropriate ," and that institutional controls may be used "where necessary, as a component of the completed remedy " However, the NCP also states that institutional controls "shall not substitute for active response measures . as the sole remedy unless such active measures are determined not to be practicable . " After giving careful consideration to the expectations in the NCP regarding principal threat waste and to the nine criteria in the NCP, which EPA is required to use to evaluate various possible remedial alternatives, EPA is proposing an alternative that uses containment rather than treatment to address principal threat waste The range of alternatives includes a treatment alternative EPA's rationale for proposing a containment remedy is discussed in detail in later sections of this Record of Decision

In regard to ground water, the NCP describes EPA's expectation to return contaminated ground water to its beneficial use, which in this case would be to a condition that would allow human consumption. While EPA's experience is that is difficult to clean up ground water that contains NAPL to such a degree as to allow drinking, EPA believes that at this Site, by isolating the worst NAPL in the containment areas, ground water outside the containment areas can be returned to its beneficial use In addition, because this contaminated ground water represents an ongoing source as described above, this will prevent the future recontamination of surface waters and sediments

### 7.2 Summary of Ecological Risk Assessment

Like a Human Health Risk Assessment, an Ecological Risk Assessment (ERA) serves to evaluate the potential for risks due to exposure to site contaminants specific to ecological receptors (such as wildlife, fish, and plants) Since the ERA evaluates many species that have drastically different exposure pathways, the ERA can appear complicated Numerous environmental processes and ecological receptor groups (part of what is referred to as "assessment endpoints") are evaluated, and there are differences in contaminant exposures and sensitivity to contaminants between groups For example, wildlife are mainly exposed through their diet, while soil organisms are exposed through direct contact with the soil in which they live The complexity of the ERA arises from the need to evaluate the important exposure pathways to the relevant receptors The toxicology varies between the different ecological groups In addition, some contaminants are effectively transferred up the food chain, concentrating and thereby posing risks, while other contaminants are not transferred because they are either metabolized, biologically regulated or simply not absorbed Some compounds may be metabolized into more or less toxic daughter compounds, which may be transferable

Superfund site-specific ERAs are conducted using an eight-step process which minimally consists of two tiers of evaluation a Screening Level ERA ("SLERA" - steps 1 and 2) and the full Baseline ERA ("BERA" - steps 3 through 7) Step 8 is a risk management step The function of the SLERA is to determine if a BERA is necessary, along with which contaminants should be evaluated further A SLERA uses published conservative toxicity benchmarks found in literature for water, sediment and soil, and compares site concentrations to these benchmarks

The BERA begins with the results of the SLERA and with problem formulation, which establishes the goals, breadth and focus of the investigation. It also establishes the assessment endpoints, which are the specific valued ecological communities to be protected The questions and issues to be addressed in the BERA are defined based on potentially complete exposure pathways and ecological effects A conceptual site model (CSM) is developed that includes questions about the assessment endpoints and the relationship between exposure and effects The CSM describes the approach, types of data and analytical tools to be used for the analysis phase of the BERA Information is generated through literature reviews and field studies, results are compiled and conclusions are reached Once it has been concluded that ecological risk exists, the information is used to meet other objectives, such as determining what exposure level may minimize any unacceptable risk.

A CSM relies on contaminant and habitat characteristics to identify critical exposure pathways to the selected measurement endpoints. A measurement endpoint is a measurable biological response to a stressor that can be related to the assessment endpoint. The CSM for the Koppers Site, for example, illustrates that contaminants were spilled onto the ground in the past and have migrated overland and/or through the subsurface into the adjacent wetlands (i e , Hershey Run and the Western Central Marsh adjacent to the South Ponds), where macroinvertebrates, insects, fish and other organisms may be exposed The potential for risk exists where organisms are exposed to contamination directly (e g , insect larvae living in contact with contaminated sediments, fish contacting contaminated sediments and/or earthworms and other burrowing organisms living in contact with soil), as well as when organisms higher in the food chain consume organisms lower in the food chain that have been in contact with contamination and have stored contamination in their bodies (e g , insects may store contaminants, then fish eat the insects, birds eat the fish, and so on) The SLERA identified PAHs and other contaminants exceeding benchmarks in sediment, soil and water

At the Koppers Site, a total of 12 assessment endpoints were evaluated, six related to direct exposure and six related to exposure to contamination through the food chain for non-aquatic receptors Only the six related to direct exposure (see Table 7) identified risks associated with the creosote contamination These conclusions are largely based upon the results of the site-specific toxicity tests conducted with Site sediment on the amphipod (a small shelled organism), *Hyalella azteca*, and the midge (a small fly), *Chironomus tentans*, and with Site soil on the earthworm, *Eisenia foetida*, as supplemented with plant community observations

For both the sediment and soil toxicity tests, the distribution of contaminants at the Site presented a dilemma in obtaining samples for testing and the determination of NOAEL (No Observed Adverse Effects Level) and LOAEL (Lowest Observed Adverse Effects Level) values The distribution of total PAH contamination can be characterized as having sharply defined highly contaminated areas and limited areas that have intermediate levels of contamination The result of these circumstances is that the toxicity results do not generate a gradient of toxicity responses; the results were either that the soil or sediment sample caused death or had no measured effect While this presented technical difficulties in the risk calculations, it clearly defines where severe ecological risks exist and do not exist In addition, the physical areas of uncertainty (the area and volume of intermediately contaminated soil and sediment) is a relatively small zone around areas of high contamination levels Therefore, the cleanup volumes are not very sensitive to changes in the cleanup goals.

The amphipod, *Hyallela azteca*, lives in close association with sediments, as does the larva of the midge, *Chironomus tentans* These two organisms were used under standardized solid-phase sediment testing procedures to determine if the contaminated sediments at the Site caused mortality (the test organisms died when exposed to sediment from the Site) or non-lethal adverse effects (such as reduced growth) Where adverse effects were determined, the concentrations of contaminants in test sediments were used to evaluate at what concentrations minimal or no adverse effects may occur (the NOAEL), and above what contaminant levels adverse effects would be expected (the LOAEL) In addition, the type of the adverse effect (e g , death or reduced growth) was taken into consideration in evaluating the certainty and the severity of risk The NOAEL was calculated to be 83 mg/kg, and the LOAEL was calculated to be 198 mg/kg for total PAHs [2]

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[2] Note that there appeared to be risk caused by zinc as well which is not a site-related contaminant

Fish that utilize the Site can be impacted by contaminants in two ways: (1) short-term toxicity and (2) long-term reproductive effects on organisms exposed as larvae or juveniles Short-term toxicity of Site contaminants to killifish (*Fundulus heteroclitus*) embryos was assessed in a 10-day solid-phase sediment toxicity test The bioaccumulation potential of each contaminant was assessed through a review of the fish tissue data collected at the Site Indirect effects on fish populations were inferred through the midge and amphipod toxicity tests, since benthic macroinvertebrates comprise a large percentage of predatory fish forage No significant correlations between fish survival and level of measured contaminants were found A NOAEL for total PAH concentration was calculated at 33 5 mg/kg based upon sublethal effects However, recent studies conducted by the USFWS and the State found an approximately 40% incidence of liver tumors, among other health effects, in fish in Hershey Run Follow-up studies have strongly suggested that this high incidence of liver tumors is unique to Hershey Run in the area (Copies of both studies are available in the Administrative Record )

To evaluate the potential effects of Site contaminants on the structure and function of the soil community, 7, 14, and 28-day solid-phase toxicity tests were conducted with the earthworm, *Eisenia foetida*. The toxicity tests provided information on the toxicity of soil contaminants to this species and potentially other soil invertebrate species found on-site In addition, the bioaccumulation potential of Site contaminants was assessed by analyzing all surviving earthworms for contaminants of concern potentially present in their tissues

Earthworm survival was reduced in PAH-contaminated samples from the upland area of the Site, with complete mortality occurring by day 7 of the 28 day test (none of the worms survived) Survival in all other soil samples was greater than 94 percent Growth was significantly lower in the PAH-contaminated samples from the upland wood storage yard From the toxicity data, PAHs were determined to be the compounds that were responsible for the observed toxicity The NOAEL for total PAH concentration for the tests conducted was determined to be 587 mg/kg and the LOAEL was 1,264 mg/kg.

Vegetation surveys conducted during the Remedial Investigation showed negative effects of contaminants on upland plants, particularly in areas of visible contamination

In summary, it is concluded that PAHs pose ecological risks to the upland, wetland and aquatic communities at the Site, specifically to organisms low in the food chain (i.e , earthworms, insects, shelled organisms, fish and frog embryos, and both upland and aquatic plants) [3] In

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[3] Zinc, which can be found at levels in the thousands of parts per million, poses an ecological risk at the Site as well Although EPA does not believe that the zinc is site-related, EPA's preferred alternative would address the vast majority of the elevated zinc in the areas where the elevated zinc is co-located with elevated levels of PAHs When the zinc is not co-located with PAHs, it exists at depth in sediments such that it does not pose a threat to ecological receptors EPA believes that the zinc most likely came from the adjacent DuPont-Newport Superfund site, where zinc was a major contaminant EPA notes that there are other zinc sources in the watershed, most notably the NVF Yorklyn site upstream on Red Clay Creek However, data evaluated during the DuPont-Newport remedy selection process showed that the zinc from

general the aquatic assessment endpoints were more sensitive than the terrestrial assessment endpoints with respect to the calculated NOAEL and LOAEL levels For the aquatic assessment endpoints the NOAEL was calculated to be 82 87 mg/kg total PAHs and the LOAEL was calculated to be 197 6 mg/kg For the terrestrial assessment endpoints the NOAEL was determined to be 587 mg/kg total PAHs, with a LOAEL of 1,264 mg/kg

Based on the results of the risk assessment, EPA has determined that for this Site, a sediment cleanup criteria of 150 mg/kg total PAHs (approximately the geometric mean between the sediment NOAEL of 83 and the LOAEL of 198) and a soil cleanup criteria of 600 mg/kg total PAHs (just above the NOAEL of 587)[4] are the appropriate levels to provide protection to the environment.

### 7.3 Conclusion of Risk Assessments

EPA has concluded that risks to a construction worker, industrial worker, adolescent trespasser, adolescent swimmer or angler exceed NCP target risk levels for carcinogenic and non-carcinogenic risks In addition, EPA has concluded that PAHs pose unacceptable ecological risks to the upland, wetland and aquatic communities at the Site By comparing maps of total PAH values to those of benzo(a)pyrene equivalences ("B(a)P equivalence"), EPA has determined that the cleanup criteria described above will be protective of both the environment and human health for potential future industrial workers and current and future trespassers

EPA has determined that the remedial action selected in this ROD is necessary to reduce the risks for these receptors to levels within or below EPA's risk range

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the NVF site was not causing sediment contamination in the vicinity of the Koppers and DuPont sites Since the time of the DuPont-Newport Record of Decision, work has been conducted to help control zinc discharges in the watershed, which will only further prevent recontamination In addition, the State has been developing a TMDL for zinc for both the Red Clay Creek and the Christina River, which should help minimize the potential for recontamination in the future

[4] EPA does not believe that using the geometric mean of the soil NOAEL and LOAEL to determine the soil cleanup criteria would be protective because the result would be much higher and could result in potential for contaminated soil to act as continuing source of contamination to the wetlands EPA believes that the 600 mg/kg soil cleanup criterion would provide adequate protection to the wetlands, since it is a "not-to-exceed" value that would result in average surface soil concentrations of total PAHs of a much lower value. Once vegetation has been reestablished after the cleanup, the possibility for recontamination is very remote. One hypothetical area where it could happen is if an area of soil was just below the 600 mg/kg soil cleanup criteria and located adjacent to a wetland that was just below the 150 mg/kg sediment cleanup criteria such that erosion could increase the wetland concentration to above 150 mg/kg, thus creating an unacceptable risk With the fact that the concentration gradients at the Site are steep (i e , the contamination goes from high to low in a short distance), any areas that would match this condition would be small and would not warrant a change in the soil cleanup criteria

## 8.0 REMEDIAL ACTION OBJECTIVES

Based on the information relating to the types of contaminants, environmental media of concern, and potential exposure pathways, Remedial Action Objectives ("RAOs") were developed to aid in the development and screening of alternatives EPA has established the following RAOs to mitigate and/or prevent existing and future potential threats to human health and the environment

1 Prevent current or future direct contact with contaminated soils and sediments that would result in unacceptable levels of risk to ecological receptors by reducing levels of total PAHs concentrations to below 150 mg/kg in sediment and 600 mg/kg in soil (150 mg/kg in soil that is to be converted to wetlands),

2 Prevent unacceptable human health risks due to exposure to contaminated ground water,

3 Minimize the on-going contamination of ground water from the presence of NAPL through removal and/or containment,

4 Prevent any direct contact threat to an adult or child trespasser and to an industrial worker,

5. Protect potential future residents from contact with contaminated soil and/or ground water, by preventing the construction of residential buildings on any part of the Site (which is currently prohibited by local zoning, a future zoning change and potential residential use of the Site would require a residential risk assessment scenario and an evaluation by EPA),

6 Restore ground water at the Site to its beneficial use.

## 9.0 SUMMARY OF REMEDIAL ALTERNATIVES

### 9.1 Remedial Alternatives Common Elements

During the **Feasibility Study,** various alternatives to cleanup contamination at the Site were developed EPA evaluated a number of alternatives, including the range of alternatives described in detail below, in order to determine which cleanup method would be best EPA's preferred alternative is Alternative 4 (see page 23) Further information may be obtained from the Administrative Record

The alternatives describe possible actions to address contamination in the following areas 1) upland soils, 2) Hershey Run, 3) the Fire Pond, 4) the South Pond area (the non-tidal South Pond itself and the tidal West Central Drainage area), 5) the K Pond area and 6) ground water (See Figure 2 )

Each alternative, except the "no action" alternative, contains some common elements that were considered in the evaluation process The common elements include.

1 Ground Water Each alternative includes monitoring of dissolved phase contamination in both the Columbia and Potomac aquifers until such a time as contaminant levels fall below levels EPA determines are safe to drink (approximately 20 wells - 10 in the Columbia and 10 in the Potomac aquifer). Although no creosote contamination was found in the Potomac aquifer during the RI, monitoring is necessary to ensure that contamination does not spread into the Potomac, since mobile NAPL was found in the Columbia aquifer. Several new Potomac aquifer wells would be installed closer to the processing areas to aid in this monitoring. DNREC would create a ground water management zone (GMZ) that would include the Site and enough adjacent areas such that pumping wells could not draw contamination from the Site, either laterally or downward into the Potomac (There currently exists a GMZ encompassing much of the adjacent DuPont-Newport Superfund Site ) The GMZ would have to remain in effect in perpetuity for Alternatives 2 and 3 because they do not fully address ground water contamination, and for Alternative 4 because of the waste remaining in the containment areas (although this could be smaller in size once EPA has determined that ground water outside the containment areas is safe to drink) Under Alternative 5, this GMZ could be lifted once MNA has succeeded in reducing contaminant concentrations to acceptable levels (presumably in 30 years, though possibly more). For those alternatives that include NAPL recovery, a characterization of any recovered NAPL would be conducted in order to determine an optimal method for disposal For the purposes of estimating costs, it was assumed that all recovered NAPL would be drummed, characterized and disposed of off-site at an appropriate permitted facility (in accordance with CERCLA 121(d)(3)), although it is possible that the creosote NAPL may be suitable for recycling (also in accordance with CERCLA 121(d)(3)) In addition to these measures, each alternative would include an evaluation to be conducted to verify the extent of NAPL at the Site, including along the ballast of the Amtrak railroad line along the northern boundary of the Site

2 Land-Use Restrictions Land-use restrictions or institutional controls would be used (1) to ensure that the land was not used for residential purposes or other purposes that would cause a risk to human health due to any contamination that would remain on-site after the cleanup was complete, and (2) to ensure that any activities that may take place on the Site after cleanup do not interfere with any components of the remedy and are conducted in a manner to protect the health of future construction workers For example, if any structures were to be constructed in the future on top of the containment area, they may be restricted to minimal intrusion into the subsurface in order to protect the cap (e g., foundations may be restricted to a minimum number of pilings with slab construction above, thereby potentially limiting the size of a structure). These institutional controls could include such things as restrictive covenants, and/or requirements that workers who might come into contact with any remaining contamination on-site be properly protected in accordance with the current Site Health and Safety Plan and/or Operations and Maintenance Manual The institutional controls may include restrictions that will operate as a covenant running with the land burdening the property such as. (a) activity restrictions (limitations on activities and use which may be conducted on the property, i e only those activities which do not interfere with the ongoing protectiveness and effectiveness of the Remedial Action), (b) restrictions on the disturbance of the soil (limitations on activities that could cause interference with or disturbance of the Remedial Action, disturbance of surface soils

or protective Site features, or a risk of soil erosion or exposure to remaining contamination, especially in the containment area), and (c) ground water restrictions (limitations on activities that would use ground water or cause a change in hydraulic conditions that could interfere with the ongoing protectiveness and effectiveness of the Remedial Action)

## 9.2 Remedial Alternatives

Note that the Total Present Worth Cost for each alternative was calculated using a 7% discount rate and an Operations and Maintenance ("O&M") period of 30 years (unless mentioned otherwise)

**Alternative 1** *No Action*

| | |
|---|---|
| *Capital Cost* | $ 0 |
| *Annual O&M Costs* | $ 0 |
| *Total O&M Costs* | $ 0 |
| *Total Present Worth Cost* | $ 0 |

Under this alternative, no remedial measures would be implemented at the Site to prevent exposure to the sediments, soil, NAPL and ground water contamination The "no action" alternative is included because the National Contingency Plan (NCP) requires that a "no action" alternative be developed as a baseline for evaluating other remedial alternatives

**Alternative 2** *Covering upland soils, Sediment cap in Fire Pond, South Pond and K Pond, Sheetpile and NAPL collection at Fire Pond and South Pond, Monitored Natural Recovery (MNR) in Hershey Run and tidal wetlands, Monitored Natural Attenuation of ground water contamination*

| | |
|---|---|
| *Capital Cost* | $ 15,934,988 |
| *Annual O&M Costs* | $ 125,500 *(for years 1-5)* |
| | $ 117,500 *(for years 6-30)* |
| *Total O&M Costs* | $ 1,490,864 |
| *Total Present Worth Cost* | $ 17,425,852 |

In addition to the common elements described above, Alternative 2 includes the remedial measures detailed below, according to media See Figure 8 for the further details

*Soils*

In order to protect trespassers and ecological receptors from contaminated soils, this alternative includes the installation of a soil cover on top of the existing grade This cover would consist of a geotextile layer followed by a 2-foot (ft) soil cover, including a burrow-inhibiting layer of stone, installed over upland surficial soils (0-24 inch layer) containing visual NAPL or total PAH concentrations greater than 600 mg/kg Approximately 125,000 cy of cover materials would be brought in and placed over a total of 39 acres

*Sediments*

In order to protect trespassers and ecological receptors from contaminated sediments, this alternative includes the installation of a 2-ft reactive (sorbent) cap over sediments in the Fire Pond, South Ponds, and K Area (totaling approximately 0.7 acres) This cap will be constructed (from bottom to top) of geotextile, approximately 1 ft of sorbent material (e g., a mixture of clay, anthracite, and soil that significantly retards potential movement of contaminants through the cap), and 1 ft of sand This alternative also includes monitored natural recovery of sediments in Hershey Run, Hershey Run Marsh, and the West Central Marsh Drainage

*Ground Water*

To prevent future releases of NAPL to surface water and sediments that could cause risks to trespassers and ecological receptors, Alternative 2 includes the installation of approximately 1,000 and 1,100 ft of sealed steel sheetpile walls at the South Ponds and Fire Pond, respectively This sheetpile would be installed within the Columbia aquifer, keyed into the lower permeability, finer-grained layer underlying the Site at depths ranging from approximately 15 to 30 ft bgs (at the top of the Potomac aquifer) Shallow hydraulic gates would be incorporated into the top of the walls of the sheetpiling to allow ground water to flow through the upper portions of the Columbia aquifer (thus preventing buildup of hydraulic head behind the wall) while NAPL is retained below In addition, this alternative includes monitoring and passively removing NAPL from interceptor trenches installed behind these sheetpile walls, with the collected NAPL to be disposed of or recycled off-site in accordance with CERCLA 121(d)(3) NAPL would remain in the ground water outside the containment area, preventing the restoration of ground water to its beneficial use

**Alternative 3** *Excavate, consolidate and cap shallow soils and shallow tidal sediments, Cap Fire, K and South Ponds, Sheetpile and NAPL collection at Fire Pond and South Ponds areas, Rechannelization of Hershey Run, Wetlands mitigation, Monitored Natural Attenuation of ground water contamination*

| | |
|---|---|
| *Capital Cost* | $ 40,094,305 |
| *Annual O&M Costs* | $ 261,937 *(for years 1-5)* |
| | $ 261,937 *(for years 6-30)* |
| *Total O&M Costs* | $ 3,250,383 |
| *Total Present Worth Cost* | $ 43,344,688 |

In addition to the common elements described above, Alternative 3 includes the remedial measures detailed below, according to media. See Figures 9 and 10 for the further details

*Soils*

In order to protect trespassers and ecological receptors from contaminated soils, this alternative includes the excavation of upland surficial soils containing visual NAPL or total PAH concentrations greater than 600 mg/kg to a depth of 2 ft bgs, followed by consolidation in an on-site containment area (approximately 115,000 cy of surficial soils would be removed over an approximately 35-acre area into a 4-acre containment area in either the former Process area or Drip Track area) which would then be capped with a geomembrane (see Figure 9) The excavated areas would be filled with clean soil to restore the grade. In areas that the soil at 2 ft bgs still remained above the soil cleanup criteria of 600 ppm total PAHs, a geotextile layer would be placed to separate the contaminated soil from the clean soil

*Sediments*

In order to protect trespassers and ecological receptors from contaminated sediments, this alternative includes the installation of a cap over sediments in the Fire Pond, South Pond, and K Area as described in Alternative 2

In addition, Alternative 3 would include the relocation of the channel of the upper portion of Hershey Run, as depicted in Figure 10, so that the new channel would bypass the NAPL-impacted area to the west of the Fire Pond which would be contained using sheetpile (described below) To create the new channel (approximately 800 ft long and 0 8 acre in size), this alternative would require the removal of approximately 6,500 cy of marsh sediment which would be deposited behind the sheetpile to fill the currently existing channel. The new channel would be constructed in such a way as to maximize habitat and control erosion Additional clean fill would be required within the sheetpile area to bring the grade to the top of the sheetpile (set at approximately 6-ft elevation or high high tide) EPA expects that this area would remain a wetland, although non-tidal

While the added containment area would enclose the majority of the NAPL underneath Hershey Run and adjacent wetlands, it would not contain all of the NAPL Therefore, to prevent any NAPL migration to the surface in this area where it could present a risk to trespassers and ecological receptors, the portions of existing Hershey Run that would be outside the containment area yet, due to the geometry, not be part of the new channel, would be capped with 1 ft of reactive cap material and 1 ft of sediments

In the remainder of the Hershey Run channel (the lower portion) and marsh and the West Central Drainage Areas, surficial sediments (within the upper 1 ft bgs) containing total PAHs greater than 150 mg/kg would be excavated, thus providing protection for trespassers and ecological receptors This excavation of surficial sediments is expected to generate 23,000 cy over an area of 9 acres

Where contamination exists below 1 ft bgs, an additional 1 ft of sediment would be excavated and a cap installed Installation of a cap would inhibit the migration or erosion of PAH-contaminated materials which could recontaminate the wetlands or migrate off-site The cap constructed in the channel portion of the drainage areas would consist of 0 5 ft of reactive material, on top of which would be placed 1.5 ft of sand, geotextile, and 0 5 ft of armor stone, respectively The marsh area cap would be of similar construction, however, 0 5 ft of soil would be placed on top of the sand, instead of the geotextile and armor stone, as erosional forces are expected to be less outside the channel in the marsh areas The additional excavation needed to accommodate the cap is expected to generate 25,000 cy over an area of 6 2 acres Sediment monitoring would be conducted in wetlands with caps to verify that the contaminated materials remain isolated Monitoring would also take place where any wetlands were disturbed to ensure that restoration activities were successful

If any wetland acreage is lost within the containment area, this alternative would, to comply with EPA's Wetlands Policy, include creating replacement wetlands commensurate with the acreage of wetlands filled at the Site (at a minimum ratio of 1 1)

Overall, approximately 55,000 cy of sediments (including about 15% added volume due to stabilization to improve soil properties to support a cap) would be added to the landfill area created with consolidated upland surface soils

*Ground Water*

To prevent future releases of NAPL to surface water and sediments where it could cause risks to trespassers and ecological receptors, this alternative includes sheetpile wall installations at the Fire and South Ponds as described in Alternative 2 However, due to the rechannelization of Hershey Run, in Alternative 3 an additional 600 ft of sealed steel sheetpile would be installed in the Fire Pond area to contain subsurface NAPL extending from the Fire Pond underneath wetlands across Hershey Run from the pond (See Figure 10) The sheetpile in the marsh would be set at or above the high high-tide elevation to preclude consistent surface water inundation NAPL would remain in the ground water outside the containment area, preventing the restoration of ground water to its beneficial use

**Alternative 4** *Excavate, consolidate and cap all contaminated soils and sediments, Subsurface ground water barrier wall around consolidation area(s) with passive NAPL recovery, Restoration of ground water through excavation of NAPL-contaminated aquifer material outside of consolidation areas, Rechannelization of Hershey Run, Wetlands mitigation, Monitoring of ground water contamination*

| | |
|---|---|
| *Capital Cost* | $ 49,837,587 |
| *Annual O&M Costs* | $ 227,267 *(for years 1-5)* |
| | $ 118,767 *(for years 6-30)* |
| *Total O&M Costs* | $ 1,918,652 |
| *Total Present Worth Cost* | $ 51,756,239 |

In addition to the common elements described above, Alternative 4 includes the remedial measures detailed below, according to media See Figure 11 for the further details

*Soils*

In order to protect trespassers and ecological receptors from contaminated soils, soil would be excavated as in Alternative 3 (soil with visible NAPL or total PAHs above 600 mg/kg) In addition, excavation would continue in those areas where wetlands are to be created until the total PAH concentration was 150 mg/kg or below Excavation depths will potentially reach as deep as 30 ft bgs in a few locations, although the average excavation depth is expected to be 5 to 15 ft Instead of backfilling the excavated areas, the areas would be graded appropriately, and

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wetlands would be created, minimizing the increase in cost over a shallower excavation since no outside fill would be needed An estimated 113,000 cy of soil would be excavated and consolidated into two on-site landfills. The location of the landfills would coincide with the areas of upland that have the greatest amount of NAPL in soil and the ground water, thus reducing the amount of excavation required and allowing the landfills and the NAPL recovery areas (described below) to be located together The two landfills would cover approximately 38 acres and would be used to contain all contaminated material excavated as part of this alternative This alternative would allow for the cover material (over the geomembrane) to come from areas of the Site with clean soil This fits with one possible reuse of the Site - wetland creation - since extra excavation would be required to create the wetlands The cost estimate for this alternative assumes that the cover material is coming from an on-site source (borrow area)

*Sediments*

In order to protect trespassers and ecological receptors from contaminated sediments, this alternative would involve the complete excavation (and consolidation into on-site landfills) of contaminated sediments (containing total PAHs above 150 mg/kg) in the Fire Pond, South Pond, K Area, West Central Drainage Area, lower Hershey Run and the marsh adjacent to the upper portion of Hershey Run The depth of excavation ranges from 0 to 13 ft with an average of 2-4 ft Restoration activities would take place as appropriate to provide suitable ecological habitat Backfilling shall be required to restore the original stream profile, unless it can be otherwise shown, as determined by EPA, that an alternate design may be hydrodynamically stable and ecologically advantageous If that is the case, there would likely be a cost savings associated with the reduction in need for backfill The use of minor backfilling may be able to effectively increase the diversity of the wetland types at the Site

As in Alternative 3, this alternative would involve the rechannelization of upper Hershey Run to allow the installation of sheetpile and passive NAPL recovery (see below) Any wetland acreage that was lost would be replaced at the Site It is estimated that a total of approximately 75,000 cy of stabilized sediments would be added to the consolidation area (including a 15% increase in volume for stabilization to improve soil/sediment properties to support a cap)

*Ground Water*

In order to achieve the restoration of ground water, NAPL-contaminated aquifer material located outside of the containment areas would be excavated to depth (generally 5 to 15 ft deep, and occasionally to 30 ft) and isolated in the on-site landfills (as described above) To prevent future releases of NAPL to surface water and sediments that could cause risks to trespassers and ecological receptors, as well as to control the source of ground water contamination, this alternative includes the sheetpile and passive NAPL collection in the area of the Fire Pond as in Alternative 3, with the extensive addition of sheetpile or other low permeability ground water barrier[5] (and associated passive NAPL recovery) around the two landfills. The landfills would be located over the areas of most extensive NAPL contamination where NAPL, based on

[5]The cost estimate assumed 1,375 ft (25%) of sheetpile and 4,125 ft (75%) of slurry wall



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observations during the RI, may still be mobile This alternative also includes the excavation of NAPL material from below the wetlands in the South Pond and adjacent West Central Drainage area, as well as from the K area By aggressively addressing these NAPL areas (i e , the sources of contamination), natural attenuation would restore the ground water outside of the containment area to its beneficial reuse, and no sediment caps would be required to prevent the recontamination of the wetlands The passive NAPL recovery trenches would also be used to manage the level of ground water inside of the barrier walls, draining ground water for surface discharge (following treatment via oil-water separation and carbon filtration, if necessary) Monitoring of ground water and sediments would be conducted to verify the effectiveness of containment and the continued attenuation of any dissolved phase contamination

Studies, including ground water modeling as appropriate, would be conducted during the Remedial Design to determine the optimal configuration for the passive NAPL recovery trenches and system, and would specifically seek to minimize the complexity of the system and, to the extent possible, minimize the need for ground water treatment prior to discharge Given the mobility of NAPL at the Site, as demonstrated by the extent to which NAPL has already migrated beneath and into the Hershey Run marsh, EPA believes that passive NAPL recovery would successfully and significantly reduce the volume of mobile NAPL at the Site At the same time, this NAPL recovery system would provide the opportunity for managing ground water (as described above) If monitoring shows that it is necessary to ensure compliance with the substantive requirements of the NPDES program and State Water Quality Standards, ground water drained through the recovery trenches would be treated using an oil-water separator and/or carbon filtration system in order to remove any contamination before it is discharged to surface water

**Alternative 5** ***In-situ steam-enhanced extraction of subsurface NAPL, excavation and off-site treatment of sediments and certain soils, Wetland restoration, Monitored Natural Attenuation of ground water contamination***

| | | |
|---|---|---|
| *Capital Cost* | $ 189,365,815 | |
| *Annual O&M Costs* | $ 169,000 | *(for years 1-5)* |
| | $ 87,500 | *(for years 6-30)* |
| *Total O&M Costs* | $ 1,419,957 | |
| *Total Present Worth Cost* | $ 190,785,772 | |

In addition to the common elements described above, Alternative 5 includes the remedial measures detailed below, according to media See Figure 12 for the further details

*Soils*

Upland soils containing visual, weathered NAPL would be excavated and transported off-site for treatment via low temperature thermal desorption (LTTD) and then landfilled in accordance with Section 121(d)(3) of CERCLA and 40 C F.R §300 440 In addition, upland soils with total PAH concentrations greater than 600 mg/kg that are outside of the area undergoing *in-situ* steam-enhanced extraction (see description below for ground water) would be excavated to a depth of 2 ft bgs and treated off-site The excavated areas would be backfilled with clean fill and revegetated Approximately 106,000 cy of surficial soils would be removed and backfilled over a 33-acre area A staging area would be constructed in the former Process or Drip Track areas

*Sediments*

The sediments in the Fire Pond, South Ponds, and K Area would be addressed as part of the *in-situ* steam-enhanced extraction at the subsurface NAPL areas (see below)

As described in Alternative 3, the upper portion of Hershey Run would be rechannelized so that the new channel would bypass the NAPL-impacted area adjacent to the Fire Pond (which would be addressed through *in-situ* steam-enhanced extraction, as described below under for ground water) Although the NAPL would eventually be addressed by the *in-situ* steam-enhanced extraction, the rechannelization and sheetpile would be necessary to prevent Hershey Run from becoming an infinite heat sink, substantially increasing fuel costs and likely preventing the appropriate temperature increase

All surface and subsurface sediments containing total PAHs greater than 150 mg/kg would be excavated from the lower portion of Hershey Run, Hershey Run Marsh to the west of the proposed sheeting, and the West Central Drainage Area waterway and marsh, with removal depths up to 13 ft The excavated sediments would be treated and disposed of along with the soils, as described above

*Ground Water*

To prevent future releases of NAPL to surface water and sediments where it could cause risks to trespassers and ecological receptors, as well as to restore ground water to its beneficial use through source control and natural attenuation, NAPL contamination would be addressed through thermally-enhanced *in-situ* extraction. The particular thermal enhancement proposed is known as "steam injection" or dynamic underground stripping This technique would be used to remove subsurface NAPL at all upland areas and subsurface NAPL beneath the Fire Pond and South Ponds areas

*In-situ* steam-enhanced extraction would require steam to be generated at the surface and injected into arrays of injection wells in an effort to heat the subsurface NAPL zones and recover NAPL through multi-phase extraction wells During steam injection, some of the NAPL constituents would distill or volatilize, become more mobile, and could then be removed via extraction wells Due to the high heat and oxygen introduced in the steam, some NAPL would be destroyed through physical and chemical degradation. The injection and extraction wells would be spaced according to the depth of the impacted zones, which may range from approximately 5 to 15 ft bgs, and in some cases up to 30 ft bgs Because of the shallow depth of the target zone, the soil surface would have to be covered, potentially with asphalt, to prevent steam from venting at the surface Steam, liquid, and noncondensible gases would be removed from the ground and captured in a recovery system, where fluid separation and treatment technologies would be required Recovered NAPL would be retained in storage tanks prior to transport and off-site incineration Three-phase resistive heating may be used as a complement to *in-situ* steam injection in an effort to heat low-permeability soil zones within the target areas As part of the pre-design investigation, an extensive pilot study would first be required to develop process control parameters

Infrastructure would be constructed at the Site including an electrical supply grid, steam boilers, boiler fuel supply such as propane or natural gas, injection and extraction wells, steam conveyance piping, recovered fluids conveyance piping, and a network of roads to access all of the treatment areas The fluid separation system would separate vapors, liquids, and NAPL A vapor treatment system would be designed and constructed to treat recovered vapors prior to discharge to the atmosphere A water treatment system would be designed and constructed to treat recovered liquid prior to discharge

Once the steam injection and extraction is completed (over a period of several years), monitored natural attenuation would allow for the eventual restoration of ground water at the Site to a beneficial use (potentially in 30 years)

## 10.0 EVALUATION OF ALTERNATIVES

The five remedial alternatives described above were evaluated in detail to determine which would best meet the requirements of the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended, ("CERCLA") and the NCP, and achieve the remedial action objectives identified in section 8 0 of this ROD EPA uses the nine criteria set forth in the NCP, 40 C F R. §300 430(e)(9)(iii); to evaluate remedial alternatives The first two criteria (overall protection of human health and the environment, and compliance with applicable or relevant and appropriate requirements ("ARARs")) are threshold criteria The selected remedy must meet both of these threshold criteria (except when an ARAR waiver is invoked) The next five criteria (long-term effectiveness and permanence, reduction of toxicity, mobility or volume through treatment; short-term effectiveness, implementability, and cost) are the primary balancing criteria. The remaining two criteria (state and community acceptance) are referred to as modifying criteria and are taken into account after public comment is received on the Proposed Remedial Action Plan

The following discussion summarizes the evaluation of the five remedial alternatives developed for the Site against the nine evaluation criteria.

**Overall Protection of Human Health and the Environment**

A primary requirement of CERCLA is that the selected remedial action be protective of human health and the environment A remedy is protective if it reduces, to acceptable levels, current and potential risks associated with each exposure pathway at a site

The "no action" alternative (Alternative 1) does not meet this threshold criterion for several reasons Without any active remediation at the Site, a number of risks (both current and potential) would remain, including (1) risks would remain for potential future industrial or construction workers from exposure to both soil and ground water, (2) current risks would remain to ecological receptors in aquatic areas such as the Fire and South Ponds, the K Area, Hershey Run and associated wetlands and in upland soil areas, (3) potential future risks to

ecological receptors could increase if the Site were developed to increase wetland acreage, and (4) while not readily quantifiable, risks to trespassers would remain from exposure to NAPL that can be released while wading in sediments in Hershey Run Since the "no action" alternative does not meet this threshold criterion, it will not be considered any further
Each of the other alternatives (Alternatives 2, 3, 4, and 5) would offer protection of human health from soil contamination through the use of institutional controls to prevent future use of the Site for residential purposes and to ensure that any industrial use was conducted in such a way as to ensure the protection of workers

For human health risks due to ground water, each alternative would initially address risks through the creation of a ground water management zone (GMZ) by the State of Delaware that would prevent any drinking water wells from being installed Each alternative would include monitoring until the ground water is restored to its beneficial use (which for Alternatives 2 and 3 could practically be forever) Alternatives 2, 3 and 4 would control NAPL to varying degrees with the use of ground water barrier walls, creating areas that would not be cleaned up and would rely solely on the GMZ Additionally, Alternative 4 would excavate NAPL found outside of the consolidation areas and provide for complete containment of NAPL through far more extensive barrier walls Alternative 4 is further augmented by extensive efforts to passively recover NAPL within the containment areas. Alternative 5 would aggressively address NAPL with *in-situ* steam-enhanced extraction followed by monitored natural attenuation to finish the cleanup Only Alternatives 4 and 5 provide overall protection to human health from ground water risks and restoration of ground water to its beneficial use (one of the RAOs), thus restoring the ground water to its beneficial use

In regard to protection of the environment, each of the alternatives would protect upland species Alternatives 2 and 3 would provide a clean "living layer" of soil by either covering soil contamination (soil with total PAH concentrations above 600 mg/kg) with clean soil (Alternative 2) or by removing and replacing the top layer of soil (Alternative 3) Alternative 4 would address risks from upland soil by removing all soil that is above the Site-specific soil cleanup criteria of 600 mg/kg with replacement (whole or partial) possibly occurring depending on the type of habitat desired Alternative 5 addresses these risks by removing contamination through a combination of excavation (when weathered NAPL is visible) and removal and/or destruction of contaminants through *in-situ* steam-enhanced extraction.

Alternative 2 would involve sediment caps in the Fire Pond, South Pond, and K Area to prevent receptors from coming into contact with contamination Sheetpile would be installed at the Fire Pond and the South Pond, along with passive NAPL collection, to prevent NAPL migration to water bodies However, Alternative 2 would not be protective in Hershey Run because, like the "no action" alternative, it would not address NAPL and PAHs in the sediments of lower Hershey Run except through natural recovery EPA does not believe that natural recovery could reduce the risks posed by the sediments in lower Hershey Run because of the amount of contamination present In addition, this material was used in the wood treating industry to prevent biodegradation of wood Any biodegradation that would take place would do so at a slow rate

Alternative 3 would also involve sediment caps in the Fire Pond, South Pond, and K Area to prevent receptors from coming into contact with contamination In addition, aquatic risk in

Hershey Run and the adjacent marsh and the West Central Drainage area would be addressed by excavating the top 2 ft with a reactive cap placed in areas where elevated levels of contamination remained below Sheetpile would also be installed at the Fire Pond (although over a greater area to enclose more NAPL, but resulting in the need to rechannelize Hershey Run) and the South Pond, along with passive NAPL collection, in order to prevent NAPL migration to water bodies and to mitigate an on-going source of contamination to the water bodies

Alternative 4 would address risks to aquatic receptors by aggressively excavating all sediment above the site-specific cleanup criteria of 150 mg/kg total PAHs in the South Pond, K Area, Hershey Run and adjacent marsh and the West Central drainage area Risks in the Fire Pond would be addressed by filling the Fire Pond as part of the consolidation of contaminated soils and sediments

Alternative 5 would address risks to aquatic receptors by removing and/or destroying subsurface contamination using *in-situ* steam-enhanced extraction, and by removing all contaminated sediments for treatment off-site

In terms of comparison, EPA believes Alternatives 4 and 5 provide the highest degree of overall protection of human health and the environment since they address all of the risks, provide the most aggressive cleanup and rely the least on institutional controls Alternative 3 provides a greater degree of protection compared to Alternative 2 since it provides for a greater degree of capture of NAPL at the Fire Pond/Hershey Run area and addresses contaminated sediments in lower Hershey Run and the West Central Drainage area

**Compliance with ARARs**

This criterion addresses whether a remedy will meet all of the applicable or relevant and appropriate requirements ("ARARs") of federal and state environmental and facility siting laws and/or will provide grounds for invoking a waiver

Any cleanup alternative selected by EPA must comply with all applicable or relevant and appropriate federal and state environmental requirements or, under certain conditions, waive one or more ARARs Applicable requirements are those substantive environmental standards, requirements, criteria, or limitations promulgated under federal or state law that are legally applicable to the Remedial Action to be implemented at a site. Relevant and appropriate requirements, while not being directly applicable, address problems or situations sufficiently similar to those encountered at a site such that their use is well-suited to the particular site EPA is not waiving any ARARs for this Site.

Alternatives 2, 3, 4 and 5 each meet this threshold criterion Some of the major ARARs for the Site include

1 State and Federal water and air discharge requirements – Air emissions for any excavation or on-site treatment; water discharge or re-injection for de-watering during construction activities and for ground water collected in the recovery of NAPL

2 State Water Quality Standards – State water quality standards will be attained during any Remedial Action taken Any surface water discharge will meet the substantive requirements of the NPDES program and will be monitored to ensure compliance with these standards

3 National Historic Preservation Act – Due to the long industrial and prior history of this Site, additional cultural resources surveys must be conducted prior to the beginning of any Remedial Action If cultural resources are found that are on, or eligible for, the National Register of Historic Places and would be impacted by the cleanup, including being covered by a cap or disturbed by excavation, mitigation activities may be required

4 RCRA Hazardous Waste Disposal Regulations – Since creosote is a listed waste, off-site disposal costs would be high All creosote ultimately left on-site would be consolidated within an "area of contamination" without triggering RCRA's "land-ban" regulations

5. Ground Water Regulations **(Maximum Contaminant Levels or MCLs and non-zero Maximum Contaminant Level Goals or MCLGs)** – The ground water at the Site is a Class IIB aquifer, meaning that it is a potential source of drinking water As such, MCLs and MCLGs are relevant and appropriate requirements. Only Alternatives 4 and 5 would meet these ARARs because only these alternatives aggressively address the NAPL (the source of the ground water contamination) outside of any area of consolidation or waste management area Note that Section 300 430(f)(5)(iii)(A) of the NCP states that performance (for example, attainment of ARARs) shall be measured at appropriate locations in the ground water, surface water, etc The preamble to the NCP explains that for ground water, remediation levels should generally be attained throughout the contaminated plume or at and beyond the edge of a waste management area when waste is left in place (55 FR 8753) Alternatives 2 and 3 would require an ARAR waiver in order to be selected as the cleanup for the Site

6 Wetlands Regulations – Any activity at the Site which will permanently fill wetlands must include the creation of compensatory wetlands resulting in no net loss of wetlands acreage at the Site

A complete list of ARARs for the selected remedy for the Site is presented in Table 8

**Long-term Effectiveness and Permanence**

This criterion considers the ability of an alternative to maintain protection of human health and the environment over time The evaluation takes into account the residual risk remaining from untreated waste at the conclusion of remedial activities, as well as the adequacy and reliability of containment systems and institutional controls

Since any containment system requires on-going Operations and Maintenance (O&M), Alternative 5, which includes *in-situ* treatment and excavation and off-site disposal, offers the highest degree of long-term protection because it would permanently remove contamination



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from the Site The other alternatives that include containment on-site do provide long-term effectiveness, although to significantly varying degrees

Of the on-site containment alternatives, Alternative 4 offers the highest degree of long-term effectiveness and permanence because all of the contamination is consolidated into two areas Alternatives 2 and 3 leave more contamination in the wetland areas (Alternative 2 does not address NAPL contamination in lower Hershey Run) and rely on sediment caps to prevent recontamination (note that generally only an additional 2 ft of excavation would be required to remove all of the contamination and eliminate the need for the sediment caps) The inclusion in Alternative 4 of NAPL recovery from within the containment area would provide an additional degree of long-term effectiveness and permanence by removing NAPL that otherwise that may have the potential to flow downward into the Potomac Alternatives 2 and 3 would be more susceptible to waste being exposed during severe storm or other erosional event as compared to Alternative 4

**Reduction of Toxicity, Mobility or Volume of Contaminants through Treatment**

This evaluation criterion addresses the statutory preference for selecting remedial actions that employ treatment technologies that permanently and significantly reduce the toxicity, mobility, or volume of the hazardous substances as their principal element This preference is satisfied when treatment is used to reduce the principal threats at a site

Alternative 5, by including *in-situ* extraction of subsurface NAPL, would provide the highest degree of reduction in the toxicity, mobility or volume of contaminants The steam injection would destroy some contamination and would remove a majority from the environment, to be disposed of off-site

The other alternatives would include sheetpiling and passive recovery (with off-site treatment and disposal) of NAPL (with Alternative 4 offering the most extensive recovery) that would provide for a reduction of the volume and mobility of NAPL

**Short-term Effectiveness**

This evaluation criterion addresses the effects of the alternative, during the construction and implementation phase until remedial action objectives are met It considers risk to the community and on-site workers and available mitigation measures, as well as the time frame for attainment of the response objectives

The construction of a soil cover or engineered cap in Alternatives 2, 3 and 4 would involve the delivery of a significant amount of clean soil, creating risks due to traffic through the small town of Newport and the Ciba Specialty Chemicals facility This would be minimized by avoiding or minimizing the need for imported fill (i e , through the use of clean soil from the Site for Alternative 4), and through the use of flag men and a zero-tolerance policy on speeding by the truck drivers

The use of erosion and surface water control measures in each of the alternatives would minimize the potential for any release of contaminated sediment or soil to Hershey Run and White Clay Creek during construction There is a chance for an air release of dust and contamination during excavation and when stockpiled material is stabilized or graded (a common element to several alternatives), but this can be monitored and controlled Dust will have to be controlled during construction for any of the alternatives

Alternative 5 offers the lowest degree of short-term effectiveness since it would take the longest to complete and would involve potential impacts due to the transportation of contaminated soil for off-site treatment and disposal In addition, Alternative 5 includes the risk that high-temperature steam or contamination could escape to the air during the *in-situ* treatment

From one aspect, Alternative 2 offers the highest degree of short-term effectiveness since it could be implemented in the shortest time period and would disturb the least acreage of the Site, minimizing the potential for a release of contamination during construction However, Alternative 2 would not involve any steps to reduce risk in lower Hershey Run Alternatives 3 and 4 provide nearly the same degree of short-term effectiveness, with Alternative 4 providing slightly less because it involves the disturbance of more contaminated material

**Implementability**

The evaluation of alternatives under this criterion considers the technical and administrative feasibility of implementing an alternative and the availability of services and materials required during implementation

Each of the alternatives is implementable, and the services and materials required for each alternative are readily available However, some would be more difficult to implement than others

Alternatives 2 and 5 would be significantly more difficult to implement since they would require far more truck trips to bring in or remove material This truck traffic would have to pass through an operating chemical plant, then through a small town. The added traffic burden to both the plant and the town is likely to meet some resistance, in addition to posing safety hazards for both

Alternatives 2, 3 and 4 use simple construction techniques that are well understood Alternatives 3 and 4 would require the minimum truck traffic of all of the alternatives Alternative 4 has the added benefit of localizing the construction of containment systems into just two areas, rather than the widespread construction of caps and covers included in Alternative 3 In addition, both Alternatives 3 and 4 would excavate sediments in Hershey Run However, Alternative 3 also proposes to construct caps where contamination extends to depth Alternative 4 does not require capping over widespread areas of the Site, but instead increases the depth of excavation, introducing some difficulties associated with any deeper excavation (e g , slope stabilization)

Alternative 5 utilizes complex technology that is not widely regarded as proven and is by no means simple In addition to a great deal of equipment that would have to be brought in, Alternative 5 would require the most infrastructure to be built at the Site

Each of the alternatives (besides "no action") requires construction within a floodplain, which presents several difficulties Steps must be taken to make sure that, for example, soil or sediment is not washed downstream if an extreme storm event occurs during construction

In addition, each of the alternatives requires actions to be taken in the wetlands on-site Numerous difficulties are presented when working in a wetland, specifically related to the prevalence of soft ground and the added difficulty of de-watering all excavated or dredged materials However, these difficulties are neither unique nor insurmountable

**Cost**

Alternative 4 is the most cost-effective alternative In evaluating the costs for the alternatives, it is worth noting that the O&M costs may appear high for Alternative 4 due to the inclusion in that alternative of extensive efforts to passively recovery NAPL and manage ground water For Alternative 5 the O&M costs may appear low due to the inclusion of the operating costs of the *in-situ* steam extraction with the capital cost as part of the alternative Under the preferred alternative, NAPL recovery would be expected to taper off, which would reduce O&M costs Alternatives 2 and 3 do not include aggressive efforts to recover NAPL, nor do they include provisions to manage ground water, which could build up behind the containment areas and potentially re-contaminate wetlands The high O&M costs associated with Alternative 3 are largely due to the need to maintain caps and wetlands across a large area for 30 years

Several points stand out when evaluating the costs First, there is a large increase in cost for Alternative 5, as compared to Alternatives 2, 3 and 4 Alternatives 2 through 4 are containment remedies Alternative 5 has been included as representative of a treatment remedy – other treatment remedies were considered in detail in the Feasibility Study Some treatment remedies were less costly (i e , solidification/stabilization at approximately $85 million), and others were more costly (i e., *in-situ* thermally-enhanced extraction of subsurface NAPL combined with excavation and off-site incineration of soils and sediments at approximately $280 million) Second, the preferred alternative, Alternative 4, is approximately $8 4 million more costly than Alternative 3 For this increase in cost, Alternative 4 restores ground water outside the containment area to its beneficial use and consolidates all of the contamination to two areas, thus avoiding long-term monitoring of vast areas of wetlands for recontamination

The Alternative Cost Summary Table (see Table 9) summarizes the capital, annual operation and maintenance ("O&M"), and total present worth costs for each alternative The total present worth is based on an O&M time period of 30 years for the engineered cover, containment, NAPL recovery and ground water treatment systems A discount rate of 7% was used on the present worth calculation For an additional cost estimate breakdown, see the Administrative Record

**State Acceptance**

DNREC has reviewed comments from the public and the Record of Decision, and concurs with the selected remedy

**Community Acceptance**

From October 7, 2004 to December 7, 2004, EPA held a 60-day public comment period to accept public comments on the remedial alternatives presented in the *Feasibility Study* and the Proposed Plan and the other documents contained within the Administrative Record for the Site On October 21, 2004, EPA held a public meeting to discuss the Proposed Plan and accept comments A transcript of this meeting is included in the Administrative Record The summary of significant comments received during the public comment period and EPA's responses are included in the Responsiveness Summary, which is a part of this Record of Decision

## 11.0 SELECTED REMEDY

Following review and consideration of the information in the Administrative Record, the requirements of CERCLA and the NCP, and public comment, EPA has selected Alternative 4 (see page 23), as the remedy for the Koppers Site

### 11.1 Summary of the Rationale for the Selected Remedy

EPA's preferred alternative meets the threshold criteria of overall protection to human health and the environment and compliance with ARARs [6] Based on the information currently available, EPA (the lead agency) believes Alternative 4 provides the best balance of tradeoffs among the alternatives with respect to the balancing criteria For example, EPA's preferred alterative

1) will be protective of both human health and the environment in the least amount of time,

2) will, compared to Alternatives 2 and 5, have significantly less impact to the community during construction, and

3) is the least costly of the alternatives that provide overall protection to human health and the environment

Alternative 4 also offers the highest degree of State acceptance since it provides for the maximum flexibility in the reuse of the Site In addition, EPA's preferred alternative is consistent with EPA's ground water policy and policies pertaining to the removal and/or containment of NAPL Overall, EPA's preferred alternative satisfies the statutory requirements

[6] Note that while each alternative, (other than the "no action" alternative) addresses some of the risks at the Site, the only other alternative to completely meet these threshold criteria was Alternative 5

of CERCLA §121(b) by being protective of human health and the environment; complying with ARARs; being cost-effective, utilizing permanent solutions and alternative treatment technologies to the maximum extent practicable, and satisfying the preference for treatment as a principal element.

### 11.2 Description of the Selected Remedy and Performance Standards

Based on the comparison of the nine criteria, EPA's preferred alternative is Alternative 4 The total present worth cost of EPA's preferred alternative is $51,760,000 In addition to the common elements described on page 17 (e g , ground water monitoring and institutional controls), the major components of Alternative 4 (as discussed in detail on page 23) are

The selected remedy includes

1 Excavating and consolidating all contaminated soils and sediments (soils with total PAHs greater than 600 mg/kg and sediments with total PAHs greater than 150 mg/kg) into one or two on-site landfills or containment areas, herein referred to collectively as "the Containment Area," to be located in the areas of the worst NAPL contamination,

2. Installing, operating and maintaining a ground water treatment system (e g., liquid carbon filtration) to prevent the migration of contaminated ground water, as well as to prevent the discharge of contaminated ground water from the recovery operation; and an oil-water separator (e g , belt skimmer or baffle tank) to facilitate the recovery of free-phase NAPL, as well as to prevent NAPL from reaching the ground water treatment system,

3. Treating ground water as necessary to meet discharge requirements,

4 Constructing ground water barrier walls and collection systems (e g , passive recovery trenches) in the Containment Area to prevent further migration of ground water contamination, including NAPL,

5 Managing the hydraulic head of ground water and collecting NAPL contamination in the ground water through the use of the passive recovery trenches;

6 Separating creosote from ground water and transporting creosote off-site for disposal or recycling in accordance with Section 121(d)(3) of CERCLA,

7 Moving debris to a location on-site where they can be placed under the RCRA (Resource Conservation and Recovery Act) modified cap,

8 Installing a RCRA modified cap across the Containment Area,

9 Relocating a portion of the existing channel of Hershey Run, if the Containment Area shall extend into the Hershey Run wetlands,

10 Creating wetlands to replace any that are filled in as part of the landfill construction,

11 Monitoring ground water, surface water, sediments and wetlands to ensure the effectiveness of the remedy,

12. Prevent exposure to contamination inside the Containment Area or in ground water beneath the Site, and prevent the drawdown of contamination into the deeper aquifer or elsewhere, through land and ground water use restrictions for the Site and surrounding area (as appropriate)

Institutional controls shall be implemented in order to ensure the effectiveness of the remedial action The selected remedy shall meet all applicable or relevant and appropriate requirements contained in the attached Table 8

### 11.2.1 Excavate and Consolidate Contaminated Soils and Sediments

Soils and sediments exceeding cleanup criteria shall be excavated and consolidated on-site into one or two containment areas (referred to as the "Containment Area") with amendments for geotechnical stabilization added as necessary to achieve adequate compaction and slope stability The exact location and configuration of the Containment Area will be determined during the remedial design, and subject to EPA approval Roads constructed for the purpose of excavating sediments shall be constructed in a manner to minimize disturbance to wetlands.

**Performance Standards for Excavating and Consolidating Contaminated Soils and Sediments**

1 Develop and follow plans for excavation near any historic structures in accordance with the National Historic Preservation Act of 1966, as amended

2 Translocate faunal populations present in intended excavation areas to alternate suitable locations in advance of excavation activities

3 In areas lying outside the boundary of the Containment Area (as described in 4, below), excavate all soils and sediments having PAHs present at concentrations greater than 600 mg/kg and 150 mg/kg respectively (the soil and sediment cleanup criteria), excavation depths on average will be 5-15 ft, with a few locations expected to reach depths of 30 ft

4 Consolidate all excavated material into a Containment Area(s) to be located approximately within the former Process Area (the portion of the upland nearest the active railroad tracks and the Fire Pond, see Figure 11).

5 Air emissions during Site grading activities shall comply with the substantive requirements of Delaware emission standards and Delaware regulations governing toxic air pollutants.

6 Any NAPL discovered during excavation or grading activities shall be collected and managed on-site in compliance with substantive requirements of regulations applicable to generators of hazardous waste, and treated and/or disposed of off-site at a RCRA

hazardous waste facility, in compliance with the permitting and other requirements of RCRA and applicable state hazardous waste regulations

7 All excavation activities that will affect wetlands, floodplains, or waters of the United States shall be conducted in accordance with the substantive requirements of Federal Regulation of Activities in or Affecting Wetlands/Floodplains, 40 C F R Sections 6 302(a) and (b), and Delaware Water Management Construction on Non-tidal Waters and Floodplains regulations

### 11.2.2 Install, Operate and Maintain a Ground Water Collection and Treatment System

Prevent the migration of contaminated ground water and facilitate the recovery of free-phase NAPL through the installation, operation and maintenance of a ground water collection and treatment system (to be supplied with ground water from the passive collection systems described in Sections 11 2 4 and 11 2 5)

Ground water from within the Containment Area shall be contained, collected and treated as necessary on-site, by using a constructed ground water and NAPL containment and recovery system to achieve the following performance standards The ground water collection and treatment system consists of four main components (1) ground water treatment system (e g , liquid carbon filtration; see 11.2 2 and 11 2 3), (2) sub-surface barrier walls to provide containment and isolate contaminated ground water from clean ground water and from tidal influences (see 11 2 4), (3) collection trenches, drainage ways, piping, and associated pumping and NAPL/water separation equipment (see 11 2 4), and (4) an impervious protective cover to prevent direct contact and excessive rainwater infiltration (see 11 2 8)

**Performance Standards for Ground Water Collection and Treatment System**

1. Prevent the migration of contaminated ground water from the Containment Area and facilitate the recovery of free phase NAPL from the Containment Area through the installation, operation and maintenance of a ground water collection (e g , holding tanks) and treatment system (e g., liquid carbon filtration or equivalent technology) on-site

2 Operate and maintain the ground water collection and treatment system until NAPL is no longer recovered and ground water contamination levels are such that contamination will not spread beyond the Containment Area for a period of three consecutive years. EPA approval shall be required in the determination that these conditions have been met

3 Separate collected NAPL from collected ground water and prevent NAPL from reaching the ground water treatment system through the installation, operation and maintenance of an oil-water separator (e g , belt skimmer or baffle tanks)

### 11.2.3 Treat Collected Ground Water as Necessary to Meet Discharge Requirements

Collected ground water shall be treated to achieve NPDES discharge requirements (for example, through the use of liquid carbon filtration or equivalent technology) The treated ground water shall be discharged to Hershey Run, the Christina River, or possibly the publicly owned treatment works ("POTW", the final discharge location and configuration shall be determined during the design, subject to EPA approval)

**Performance Standards for Treating Collected Ground Water as Necessary to Meet Discharge Requirements**

1 Collected ground water shall be treated prior to discharge to comply with the substantive requirements of the National Pollutant Discharge Elimination System ("NPDES") program and the Delaware Regulations Governing the Control of Water Pollution and monitoring requirements

2 Treated collected ground water shall be discharged to either Hershey Run, the Christina River or the local POTW

3. A capacity evaluation shall be completed during the remedial design to determine if additional treatment capacity is required The evaluation shall consider the volume of ground water currently being collected, and the volume, with a safety factor, that could reasonably be assumed to be collected during a wet weather year. The evaluation shall be documented and submitted to EPA in a report Based on the capacity evaluation report, which shall be updated every two years (unless otherwise specified by EPA), EPA will determine if expansion is necessary to prevent untreated ground water from bypassing the containment system If expansion or other modifications are deemed necessary by EPA, the system shall be modified accordingly

4 Treatment system components shall be maintained and replaced, as necessary, to minimize downtime and equipment leaks, and to maximize treatment performance

5 Monitoring reports shall be submitted to EPA at such frequency and in such detail to allow EPA to determine whether or not the NAPL recovery and ground water treatment systems are in compliance with this ROD and, in particular, whether performance standards 1 through 3 above have been achieved and are being maintained

6. On-site handling of hazardous waste and solid waste, resulting from the operation of the ground water treatment plant, shall be in accordance with ARARs Waste resulting from the operation of the plant shall be disposed of off-site. Off-site disposal and handling shall be in accordance with State and Federal waste laws and regulations, as set forth in Section 121(d)(3) of CERCLA and 40 CFR 300 440. Waste streams shall be characterized on a yearly basis, unless regulations require more frequent characterization

**11.2.4 Construct Ground Water Barrier Walls and Collection Systems**

Prevent the horizontal migration of contaminated ground water and/or creosote NAPL through the construction and installation of subsurface ground water barrier walls (e g , slurry walls or sheetpiling) Collect accumulating ground water and creosote NAPL for recovery and treatment through the construction and installation of a collection system such as a stone-filled passive recovery trench (with associated piping, drainage structures and collection sumps to direct collected ground water to the oil-water separator and ground water treatment system described in Section 11 2 2)

**Performance Standards for Ground Water Barrier Walls and Collection Systems**

1 Prevent the horizontal migration of contaminated ground water and creosote NAPL by means of ground water barrier walls installed to surround the Containment Area on all down-gradient sides The barrier walls shall be impermeable ($10^{-7}$) to ground water and shall extend to such depth as to key into the clayey layers in the subsurface, up to 30 feet deep The barrier walls shall also prevent the entry of clean ground water from down-gradient into the collection systems

2 Intercept, collect and drain accumulating ground water and creosote NAPL, directing collected materials to a collection area near the oil-water separator and ground water treatment systems through the use of collection systems such as passive recovery trenches (e g , a stone-filled passive recovery trench and piping) installed up-gradient of the ground water barrier walls The collection trenches shall be constructed in such a way as to present a preferential pathway of high permeability and conductivity such that ground water and NAPL freely drain into them.

**11.2.5 Manage the Hydraulic Head of Ground Water and Collect NAPL Contamination Through the Use of the Passive Recovery Trenches**

The ground water inside the Containment Area shall be managed in such a way to prevent mounding inside the Containment Area and to prevent up-gradient mounding or flooding, ground water gradient shall be maintained through the use of the passive recovery trenches described in Section 11 2 4; trenches shall also be used for the passive recovery of creosote NAPL from inside of the Containment Areas

**Performance Standards for Managing the Hydraulic Head of Ground Water and Collecting NAPL Contamination Through the Use of the Passive Recovery Trenches**

1 Manage the hydraulic head of ground water inside of the Containment Area to be kept lower than surrounding areas, thereby creating an inward-gradient, minimizing the risk of contaminated ground water or NAPL escaping into the deeper aquifer

2 Manage ground water so as to prevent flooding up-gradient of the barrier walls and Containment Area (i e., to the north of the active railroad line)

3 Collect NAPL from within the Containment Area through the use of the passive recovery trenches and the oil-water separator described in Section 11 2 2

**11.2.6 Separate Creosote NAPL from Ground Water for Off-Site Disposal or Recycling**

Creosote NAPL recovered pursuant to 11 2 2(3) and 11 2 5(3) above shall be separated, collected and disposed of or recycled off-site, in accordance with CERCLA 121(d)(3) and 40 CFR 300 440 Creosote that is stored on-site while awaiting off-site disposal or recycling shall be managed in accordance with RCRA

**Performance Standards for Separating Creosote NAPL from Ground Water for Off-Site Disposal or Recycling**

1 Creosote NAPL recovered pursuant to 11 2 2(3) and 11 2 5(3) above shall be separated, collected and disposed of or recycled off-site, in accordance with CERCLA 121(d)(3) and 40 CFR 300 440. Creosote that is stored on-site while awaiting off-site disposal or recycling shall be managed in accordance with RCRA

**11.2.7 Move Debris to a Location On-Site where they can be placed Under the RCRA Modified Cap**

Debris (such as old railroad ties and concrete from old foundations) encountered at the Site shall be consolidated and placed into the Containment Area Debris consolidation is required to (1) enable proper installation of the RCRA modified cap and to ensure its integrity, (2) remove the potential hazard posed to people by the debris, and (3) enable excavation and grading of contaminated areas of the Site without the need to send truck traffic off-site for debris disposal The use of on-site soil and debris that meet COMAR 26 04 07 04C(5) will minimize the need for clean-fill during preparation of the sub-base for the RCRA modified cap

**Performance Standards for Moving Debris to a Location On-Site where they can be placed under the RCRA Modified Cap**

1 Move and place debris (such as old railroad ties and concrete from old foundations) into the Containment Area.

2. Cover debris with consolidated soil and sediment so as to not extend into the sub-base for the cap (and risk puncturing the cap).

**11.2.8 Install a RCRA Modified Cap across the Containment Area**

Prevent direct contact with contaminated soils, sediments and ground water, which would result in unacceptable exposure risks, and divert rainwater infiltration, which would hinder the capacity of the ground water collection and treatment system, through the installation and maintenance of a RCRA modified cap across the Containment Area as identified in Figure 11 (the precise location of which shall be determined during the remedial design, subject to EPA approval) Final grading shall promote drainage off of the Site and provide a vegetative cover to prevent erosion

**Performance Standards for Installing a RCRA Modified Cap across the Containment Area**

1 Prepare the sub-base for the RCRA modified cap

a. Stockpiled soils and debris piles shall be graded as part of the sub-base

b. The sub-base (e g , clean soil fill) shall be placed over consolidated materials in the Containment Area, and shall provide a clean base for the RCRA modified cap

c Grading shall be performed to provide a sub-base to the cap that will serve to divert water off of the cap

d The graded sub-base soils shall not contain stones or debris that could cause a puncture in the cap

2 Install a low-permeability cover (cap), with a permeability of 1 x $10^{-7}$ cm/sec or less, over the consolidated materials (contaminated soils and sediments and debris and the sub-base) placed in the Containment Area The cap shall have at least two layers of low-permeability material (e g , 60 mil high density polyethylene, "HDPE"), one of which shall be a geosynthetic membrane

3. The cap shall be installed to completely cover the Containment Area (see Figure 11 for the approximate area of this cap)

4. The cap shall be designed and constructed to function with minimum maintenance, to promote drainage and minimize erosion or abrasion of the cover, to accommodate settling so that the cover's integrity is maintained, and to provide adequate freeze protection for the liner material.

5 The cap shall be designed and constructed to accommodate access to monitoring wells and NAPL recovery/ground water treatment trench maintenance points and associated piping and tanks

6 Vegetate and maintain the cap in such a way as to prevent erosion of soils above the liner material. The vegetation on the cap shall be controlled so as to prevent or limit the growth of any plants which would damage the cap with deep root systems (for example, by mowing to trim back woody plants). The types of vegetation shall be identified in the remedial design The remedial design shall be submitted to EPA and the State for review and approval by EPA

7 If needed, the cap shall be designed to permit gas venting. Presently, it is not known whether VOC emissions beneath the cap would exceed levels that require control under Federal and State regulations Field data shall be collected during the remedial design in order to assess air emissions, and controls shall be implemented as necessary to comply with the Federal and State ARARs identified in this ROD

### 11.2.9 Relocate a Portion of the Existing Channel of Hershey Run

If the Containment Area shall extend into the wetlands areas (which shall be determined during the remedial design), relocate the Hershey Run channel away from such Containment Area

Consideration of the hydrodynamics of Hershey Run shall be included in the remedial design to determine the optimal configuration of the new channel Ensure the stability of the filled former channel and the Containment Area in the former wetlands through the installation of appropriate armoring The new channel shall not alter in any negative way the existing capacity of Hershey Run for the conveyance of water. The new channel shall not alter drainage in the area in such a way as to promote flooding upstream

**Performance Standards for Relocating a Portion of the Existing Channel of Hershey Run**

1 Locate the new channel so that the stream is routed away from the portion of the Containment Area that extends into the wetlands

2 Configure the new channel so that it conveys both normal water levels (including the incoming and outgoing tides) and storm water runoff in a manner similar to the original channel, so as to prevent any increased negative effects to the area (e g , abnormal flooding).

3 Configure the new channel so that it creates environments similar in type and function to those of the original channel (to protect fish and wildlife resources)

4 The location and configuration of the new channel shall be determined in consideration of both the hydrodynamic and the ecological trade-offs associated with determining its final path, this consideration shall be made through a hydrodynamic study and wetland assessment to be conducted during the remedial design in consultation with USFWS, DNREC and EPA.

5 Ensure the stability of the filled former channel and the Containment Area in the former wetlands through the installation of appropriate armoring

**11.2.10 Create Wetlands to replace any that are filled in as part of the Landfill Construction**

Create replacement wetlands of similar type and ecological function according to what was filled or excavated during excavation of contaminated sediments (restoration), relocate the Hershey Run channel away from the Containment Area (if the Containment Area shall extend into the wetlands) and construct the Containment Area extending into the former wetlands (unless it is determined during design that the Containment Area shall not extend into the wetlands) Vegetation in the replacement or restored wetlands shall be similar to the filled or disturbed wetlands

**Performance Standards for Creating Wetlands to replace any that are filled in as part of the Landfill Construction**

1 Create at least as many acres of wetlands having a similar type, function and ecological diversity as any acres of wetlands that are filled as part of the remedial action (resulting, at a minimum, in no net loss of wetlands)

### 11.2.11 Monitor Ground Water, Surface Water, Sediments and Wetlands to Ensure the Effectiveness of the Remedy

Collect and analyze data from the ground water within and surrounding the Containment Area, surface water and sediments to determine if the containment, NAPL recovery and ground water treatment systems are operating effectively Develop and follow a plan to accomplish this during the remedial design

**Performance Standards for Monitoring Ground Water, Surface Water, Sediments and Wetlands to Ensure the Effectiveness of the Remedy**

1 Collect and analyze ground water, surface water, soil and sediment samples from multiple locations on-site, the specific locations and frequency shall be determined in the Operations and Maintenance Monitoring Plan, which will be drafted as a part of the remedial design, and finalized following implementation of the remedy

2. Update the monitoring plan every five years, coinciding with EPA's five year reviews, unless EPA accepts an alternate schedule

### 11.2.12 Land and Ground Water Use Restrictions for the Site and Surrounding Area (as appropriate) since Contamination will Remain at the Site

A Land Use Control Assurance Plan ("LUCAP") shall be developed to address institutional controls, including land and ground water use restrictions, for the Site The institutional controls contained in this ROD are based on current, reasonably anticipated uses of the Site and areas in the vicinity of the Site The purpose of the institutional controls shall be to prevent exposure to unacceptable risks associated with remaining Site-related contaminants and to protect the components of the selected remedy A status report on such institutional controls shall be prepared and submitted for EPA's review every five (5) years following the issuance of the ROD, unless EPA approves an alternate schedule

**Performance Standards for Land and Ground Water Use Restrictions for the Site and Surrounding Area**

1 Maintain and protect the integrity of the protective cap over the Containment Area and prohibit interference with the integrity of the cap

The integrity of the cap shall not be disturbed There shall be no activity or property use within the Containment Area that could compromise the integrity of the cap, including erosion resulting from activities that would disturb the vegetated soil layer or direct excavation, construction of below-grade foundations or footers, borings, well installation, or placement of heavy equipment, trailers, or other similar activities, without EPA's prior determination that such use could not compromise the integrity of the cap Institutional controls, such as land use restrictions (e g , restrictive covenants), shall be implemented to accomplish this

2 Prohibit exposure to contaminated ground water

Use and/or contact with contaminated ground water at the Site, via ingestion, vapor inhalation or dermal contact shall be prohibited to avoid unacceptable exposure to contaminants in ground water Institutional controls shall be implemented for the Site and the Containment Area on-site (see Figure 11) to accomplish this

3 Prohibit interference with the NAPL recovery and ground water treatment systems

Any activity or use that could interfere with the operation of the NAPL Recovery and Ground Water Treatment Systems, such as excavation and/or construction within the area of the trenches or treatment system, shall be prohibited Institutional controls shall be implemented to accomplish this

4. Prohibit interference with the structure and function of restored wetlands

Any activity that could interfere with the structure and function of restored wetlands at the Site shall be prohibited Institutional controls shall be implemented to accomplish this

## 11.3 Summary of the Estimated Remedy Costs

The estimated present worth cost of the selected remedy is $51,756,239 This figure includes the costs presented in the detailed cost summary in Table 10

The information in this cost estimate summary table is based on the best available information regarding the anticipated scope of the response action This is an order-of-magnitude engineering cost estimate that is expected to be within +50 to -30 percent of the actual project cost 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 Minor changes may be documented in the form of a memorandum in the Administrative Record Changes that are significant, but not fundamental, may be documented in an Explanation of Significant Differences Any fundamental changes would be documented in a ROD amendment

## 11.4 Expected Outcomes of the Selected Remedy

This section presents the expected outcomes of the selected remedy in terms of resulting land and ground water uses and risk reduction achieved as a result of the response action

The consolidation and containment of contaminated soils and sediments at the Site will end the ongoing hazard posed to human health and the environment by the high levels of PAHs present The containment and the NAPL recovery and ground water treatment system will allow Hershey Run to undergo an enormous reduction in risk posed to ecological receptors by the very high levels of PAHs in the sediments The ecological habitat that will be developed in the constructed wetlands or restored in other areas at the Site will continue to be maintained as a natural environmental setting, which benefits people and wildlife The ultimate future use of the Site will be determined by the landowner provided that such use is compatible with the restrictions outlined in this document

At this time, it is anticipated that the Site itself will be mostly re-vegetated open space, with constructed wetlands occupying any deeper excavation areas that remain wet However, if the property owner chooses, it may be further developed into a larger wetlands bank in a manner consistent with the land use restrictions identified above While the creation of a wetlands bank is one possible scenario, the future use of the remediated uplands of the Site has not been determined at this time Once Hershey Run has been restored, biological and toxicological monitoring will show that risks to ecological receptors (such as fish) will have been dramatically reduced Site visitors and workers could enter the Site knowing that there is a protective cap or barrier between them and the contamination below The plastic layer of the cap will provide a clear separation between clean cover soil above and contaminated soil and sediment below, and will be beneficial in the event of storm erosion or flood wash-outs

Institutional controls will restrict residential development and any use of ground water within the Site and activities that could interfere with the protective barrier cap, operation of the NAPL Recovery and Ground Water Treatment Systems

## 12.0 STATUTORY DETERMINATIONS

Under CERCLA, selected remedies must protect human health and the environment, comply with ARARs, be cost-effective and use permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable Additionally, CERCLA includes a preference for remedies that use treatment to significantly and permanently reduce the volume, toxicity or mobility of hazardous wastes, as their principal element The following sections discuss how the selected remedy for the Koppers Site meets these statutory requirements

### 12.1 Protection of Human Health and the Environment

The selected remedy will protect human health and the environment by eliminating exposure or the potential for exposure to Site-related contaminants through the consolidation and containment of contaminated soils and sediments. In addition, the NAPL recovery system and ground water treatment system will prevent the recontamination of Hershey Run surface waters and sediments A multi-layer cap over the consolidation area will provide protection against direct contact with consolidated contaminated soils and sediments for potential future industrial/construction workers or other visitors to the Site

The potential for contamination to migrate down from the Containment Area into the Potomac Aquifer ground water will be prevented by restricting ground water pumping in the area and by managing hydraulic head within the Containment Area via the recovery trenches The trenches will also provide a preferential pathway for the contamination to be recovered, thereby reducing the volume that could potentially migrate downward

Treated ground water, which may be discharged to Hershey Run, will meet all appropriate water quality standards and NPDES limitations in order to prevent any adverse human health and environmental effects

### 12.2 Compliance with Applicable or Relevant and Appropriate Requirements

The selected remedy will attain all applicable or relevant and appropriate requirements, which are identified as a performance standard in Section 11 2 and specified in Table 8 of this ROD

### 12.3 Cost Effectiveness

The selected remedy is cost effective in that it eliminates or mitigates the risks posed by the contaminants at the Site, meets all requirements of CERCLA and the NCP, and its overall effectiveness in meeting the remedial action objectives is proportional to its cost In fact, the selected remedy is nearly the lowest cost (see Table 9), yet ranks the highest or near highest in terms of long-term effectiveness and permanence, reduction in toxicity, mobility or volume, and short-term effectiveness, as compared to the other alternatives

### 12.4 Utilization of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Practicable

The selected remedy utilizes long-term solutions and treatment technologies to the maximum extent practicable through the use of containment, collection, and treatment of contaminants of concern from soil, sediments and ground water. 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 tradeoffs, in terms of long-term effectiveness and permanence, reduction in toxicity, mobility, or volume through treatment, short-term effectiveness, implementability, and cost, while also considering the statutory preference for treatment as a principal element, and State and community acceptance

### 12.5 Preference for Treatment as a Principal Element

The selected remedy will meet the statutory preference for treatment as a principal element, since it treats the principal threat waste present at the Site This is done through a combination consolidation of contaminated soil and sediment, which contains principal threat wastes, and passive NAPL recovery, including ground water treatment as needed While Alternative 5 may have best met this preference for treatment, it would have done so at a drastically higher cost with significant implementability issues and no assurance of complete success, as discussed in the evaluation of alternatives.

### 12.6 Five-Year Review Requirements

Because the remedy will result in hazardous substances remaining on-site above levels that will allow for unlimited use and unrestricted exposure, a review will be conducted at least every five years after initiation of the remedial action, pursuant to CERCLA Section 121(c) and the NCP, 40 C F R Section 300 430(f)(5)(iii)(C), in order to ensure that the remedy continues to provide adequate protection of human health and the environment

## 13.0 DOCUMENTATION OF SIGNIFICANT CHANGES

There have been no significant or fundamental changes to the proposed remedy as a result of public comments

# III. RESPONSIVENESS SUMMARY

## KOPPERS CO., INC. (NEWPORT PLANT) SUPERFUND SITE

## NEWPORT / NEW CASTLE COUNTY, DELAWARE

## RESPONSIVENESS SUMMARY

This Responsiveness Summary documents public participation in the remedy selection process for the Koppers Co , Inc Superfund Site It contains a summary of the major comments received by EPA during the public comment period on the Proposed Remedial Action Plan ("Proposed Plan" or "PRAP") for the Site and EPA's responses to those comments

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# I. Comments from October 21, 2004 Public Meeting and Written Comments with EPA Responses

EPA held a public meeting near the Site on October 21, 2004 to accept public comments on EPA's Proposed Plan The significant comments received regarding the plan are summarized here, along with EPA's responses thereto Because this Responsiveness Summary is a statutorily required document designed to meet the legal requirement that EPA summarize and respond to significant comments received regarding the Proposed Plan, EPA will provide a brief overview of the comments related to the remedy issues and the Agency's response The entire transcript of the meeting, including all comments received on any topic and EPA's response, is included in the publicly available portion of the Administrative Record for anyone who wants to view them

## *A. General Comments*

### Comments in Support of the Proposed Remedy

**[Resident/citizen]** - I would prefer to accept the recommendation of the EPA - Alternative 4 - how can I ensure that this is what is carried out?

**[Resident/citizen]** - Regarding the Koppers Superfund Site, I agree that this mess should be cleaned up.

**[Ciba]** - Ciba does not object to the preferred remedial alternative stated in the Proposed Plan.

**[DuPont]** - Overall, DuPont supports the EPA proposed alternative of on-site containment rather than treatment to address principal waste threat. We also believe it is important that future land use of the Site be considered in developing the Proposed Plan.

***EPA RESPONSE:*** *EPA notes for the Administrative Record the above-referenced general comments in support of the proposed remedy.*

## B. *Specific Comments*

### Miscellaneous Comments

**[Oral Comment]** - What is the cap and how will it look?

***EPA RESPONSE:*** *It is a cap that will be designed to RCRA landfill specifications. It will probably consist of a high-density polyethylene (HDPE) barrier and other layers of sands and soils. It is likely to look like a grassy hill when it is done.*

**[Oral Comment]** - What about RR ties on site? Will property values be affected?

***EPA RESPONSE:*** *Ties on the site will likely end up in the consolidation area under the RCRA modified cap. EPA's experience is that land values are not normally affected. The Site is being cleaned up, and is under control. This may be considered better than living next to an unknown.*

**[Resident/citizen]** - Is this why the community is voting?

***EPA RESPONSE:*** *The Koppers Superfund Site is unrelated to any vote currently occurring in the community.*

### Comments Concerning Funding for the Cleanup

**[Resident/citizen]** - who is paying for this clean up?

**[Oral Comment]** - A gentleman made a theatrical appearance, drinking some water in which he had placed a chip of dried creosote, presumably to demonstrate the lack of toxicity of creosote, and indicated that there was lots of creosote around in railroad ties and telephone poles that nobody seemed concerned about. After his statement, he asked, " who pays for cleanup of the site?"

***EPA RESPONSE:*** *During the Public Meeting, EPA explained the PRP aspects of CERCLA and indicated that not only did Beazer and DuPont (both of the PRPs) pay for what has been done so far, including the cost of EPA oversight, but will very likely pay for the cleanup as well. However, not only is the recommended alternative for remediation of the site out for comment by the public, but it is also open for comment by the PRPs at this time. EPA would like to add that there exists abundant information about the toxicity of creosote, and while it is likely that the water the gentleman drank contained only trace amounts of any of the PAH compounds found in creosote, EPA would caution against anyone knowingly consuming water contaminated by creosote or creosote constituents; to do so on a regular basis could constitute a significant risk to health.*

### Comments Concerning Drinking Water

**[Resident/citizen]** - I live [nearby] - is my water at risk for contamination?

**[Oral Comment]** - Where is the public water coming from? There is some sort of pump in the neighborhood.

***EPA RESPONSE:*** *State records show no wells using the aquifer in the vicinity of the Site. Public drinking water does not come from the Site. There appears to be a pumping station for either sewer or the public water supply in the area. Public water in the area is supplied from* *surface water or ground water from the Potomac aquifer, though not from the immediate vicinity of the Site.*

**[Oral Comment]** - Concerns regarding the flow of groundwater off-site were expressed.

***EPA RESPONSE:*** *EPA assured the questioner that the groundwater's normal flow is away from the residential areas. In addition, the creosote is not very mobile and groundwater monitoring has indicated that it is not leaving the Site.*

**[Oral Comment]** - Will the probability of contamination of the Potomac aquifer be increased?

***EPA RESPONSE:*** *No. The proposed alternative includes passive recovery trenches that will act as a "drain" within the containment area. This "drain" will relieve any pressure head of groundwater and inhibit groundwater migration through the clayey layers and into the Potomac aquifer.*

**[Oral Comment]** - What happens regarding past exposure to water in wells (before public water supplies)?

***EPA RESPONSE:*** *Any wells in the residential area are up-gradient of the site, so this is not likely a problem. Regarding past exposure, any wells that were up-gradient of the Site probably did not have any Site-related contamination, but it is impossible to know with any certainty. Current records show no wells in the vicinity of the Site.*

## Comments Concerning Short-term Impacts of the Remedy

**[Resident/citizen]** - I only ask you to consider those residents nearby. We have not been exposed to that much of the hazard since most of the problem is in the water, not airborne. That will change as dust rises. Also all the little, and not so little, rodents and snakes will go searching for new homes. You might consider starting near the railroad to chase the animals toward the river, and providing adequate or better dust control.

**[Oral Comment]** - During construction, will wildlife flee to the neighborhoods and will they be looked after? There are bald eagles in the neighborhood that may be disturbed as well as countless other critters that might be scared out of their normal habitat

***EPA RESPONSE:*** *Wildlife inhabiting the Site could be disturbed during construction. EPA is working closely with wildlife authorities to coordinate remedial activities to prevent negatively impacting existing wildlife and endangered species in particular. However, the translocation of species is contemplated in the ROD, if the natural habitats are affected by the remedial activities. Air emissions and dust control are concerns of the EPA and will be monitored and controlled during remediation of the Site.*

**[Oral Comment]** - How far will they dig down and what about air emissions during construction?

***EPA RESPONSE:*** *Depth will vary between 15 and 30 feet in soils and around 2 to 4 feet in most of the sediments. Air emissions and dust control are concerns of the EPA and will be monitored and controlled during remediation of the Site.*

**[Oral Comment]** - Will there be enough commotion during construction to damage house foundations?



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***EPA RESPONSE:*** *EPA expects that, as with any excavation and consolidation activities, there would be some vibrations, but any such vibrations would probably be less noticeable than when a fast train passes.*

## Comments Concerning Health Effects

**[Oral Comment]** - In reviewing the plan, it seems that EPA is moving the creosote-contaminated soil and sediment closer to the public by consolidating it along the RR tracks Should we be concerned about eating deer meat from animals taken in that area? Should we be concerned about breathing smoke from the brush fire that was at the site two years ago?

***EPA RESPONSE:*** *The material is being consolidated to the areas where it is already at its worst. The material will be contained by sheet piles, a RCRA hazardous waste landfill cap, and the clay layer of soil between the Columbia formation and the Potomac formation. It should be much safer than now. Creosote does not bioaccumulate, so it should not be a problem when consuming an animal that lives in the immediate area. The fire was not in an area where creosote is a problem. Creosote is on the surface at only few locations, it is mostly sub surface and in sediment. The fire was confined to brush in an area where there is no surface creosote.*

**[Oral Comment]** - Concern was expressed regarding the effect of creosote on fish

***EPA RESPONSE:*** *Studies indicated that 43% of fish sampled had liver tumors. Recent studies have indicated that this high incidence of tumors is unique in the area to Hershey Run in the vicinity of the Site. Even if not cancerous, such a high incidence of tumors is not normal and is one of the reasons remediation is planned. In addition, there is a fish consumption advisory in the area of the Site due to the presence of PCBs in fish tissue (although the PCBs are not Site-related contaminants).*

**[Oral Comment]** - Vincent Gruff of the Pleasant Hills community association asked if anybody's kids will get sick. There are quite a few homes (about 40 of the 80 homes in the association) in the area where somebody in the family has cancer. Could a study of the situation be performed?

***EPA RESPONSE:*** *EPA introduced ATSDR (from CDC) and the state public health official. The representative from CDC explained that cause and effect in cancer clusters is normally very hard to show. The purpose of EPA's risk assessment is to determine the risks posed to human health and the environment if the Site is not remediated. The EPA's risk assessment for the Site revealed that ecological-risk was posed by the hazardous substances at the Site. The selected remedy will address the identified risks. After the implementation of the ROD, during 5-year reviews, the protectiveness of the remedy will be evaluated on an on-going basis.*

## Comments Concerning Construction Traffic and Access

**[Ciba]** - Ciba's main concerns relate to the means of access to the Koppers site required to implement the proposed remedy. Ciba requests that this plan be amended to include construction of an access route to the Koppers site through a means other than Ciba's private right-of-way. As the Proposed Plan (p.1) and Figure 1 note, Ciba's Newport facility is adjacent to the Koppers site; and the current single means of access to the Koppers site is via a private road (the "Roadway") extending due west from James Street which runs through the middle of Ciba's Newport pigments production facility and which serves as the main artery for vehicular and pedestrian traffic at this facility. Ciba is deeply concerned that the use of this private road would pose significant disruption to the operations being conducted at its Newport facility, would

present significant safety and security concern and would impose significant expense upon Ciba, in addition to depriving it of its property rights.
Ciba's concerns--should its private Roadway be used to allow access of construction personnel, supervision, machinery and heavy equipment to the Koppers site--focus on a number of areas, including safety, security, disruption of business activities, imposition of additional expenses, and the deprivation of property rights.

Ciba, while not objecting to the preferred remedy contained in the Proposed Plan, requests that it be further amended to provide for the construction of a separate access road to the Koppers site-one that will not traverse Ciba's property and which will not result in increased safety and security risks, disruption of Ciba's Newport operations and the burden of additional expense to Ciba.

***EPA RESPONSE:*** *EPA will work with CIBA and the PRP, as well as other stakeholders, to address these potential issues and concerns regarding truck traffic and site-access during the critical remedial design phase of the work.*

## Comments Concerning Metals/PCBs in Sediments

**[DuPont]** - Specific comments on the Proposed Plan are limited to the second footnote on page 15 and 16. This footnote discusses elevated concentrations of zinc at the Site that are co-located with PAHs, as well as zinc that was detected at depth in the sediment (and does not pose a potential threat to ecological receptors) Within this footnote, EPA indicates that zinc "most likely" came from the adjacent DuPont-Newport Superfund site.

As indicated by EPA in the Proposed Plan, there are numerous sources of zinc within the Christina River watershed. We suggest that EPA review the Technical Background and Basis Documents for the Total Maximum Daily Loads (TMDLs) that have been established by the Delaware Department of Natural Resources and Environmental Control (DNREC) for zinc. In 1999, TMDLs were established for zinc in both the Red Clay and White Clay Creeks According to the DNREC TMDL website (http://www.dnrec.state.de.us/water2000/sections/watershed/tmdl/tmdlinfo.htm), a TMDL for zinc was not established, nor is one proposed for the Christina River According to the Technical Background and Basis Documents, NVF Yorklyn Site is the major source of zinc to the Red Clay Creek, and the NVF Newark Site is the major source of zinc to the White Clay Creek. Historic and current discharges (contaminated groundwater and permitted discharges) from both of these facilities entered into the Red Clay and White Clay Creeks. The Red Clay Creek enters into the White Clay Creek near Stanton upgradient of the Koppers Site The White Clay Creek flows past the Koppers property before flowing into the Christina River.

With these known major sources of zinc located upstream of the Site in the Red and White Clay Creeks, and the uncertainty associated with potential upstream sources in Hershey Run, there is a great deal of uncertainty in stating that zinc came from only one potential source. We believe that EPA needs to acknowledge this uncertainty and remove the reference to the DuPont Newport Site.

***EPA RESPONSE:*** *EPA acknowledges that there are numerous other potential sources of zinc in the area, though the adjacent DuPont-Newport Superfund Site remains the closest in proximity and was found to have zinc as a major site-contaminant.*

**[Oral Comment]** - What about metals and PCBs in sediments and surface waters in the area? Some areas have PCB warnings for fish. Has testing been done on the North side of the RR tracks?

***EPA RESPONSE:*** *This is an industrial area. PCBs and metals contaminations are from other sites and have accumulated in the sediments and wetlands of this site and surrounding areas.*

*The sediments that get removed will be consolidated into the containment area. Anything in the sediments will end up there. Overall, things should be cleaner even beyond the Site-related contamination. Testing of ground water from monitoring wells on the north side of the tracks has shown no contamination to date, though future delineation and monitoring will occur there. PCBs in fish near industrial areas are not uncommon.*

## Comments Concerning Flooding

**[Oral Comments]** - Concern was expressed regarding flooding if Hershey Run is rechanneled. Recent flooding has been a problem.

***EPA RESPONSE:*** *The redesign of the channel will have to take worst-case flood scenarios into account. These flood scenarios will be considered during the remedial design phase. Recent flooding was caused by flow restrictions north of the RR tracks. Modifications to the channel are all south of the RR tracks and should not impact the up gradient locations that recently experienced flooding.*

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# II. Comments Submitted by Beazer East, Inc. (PRP)

## A. Beazer's Comment Letter

This letter summarizes Beazer East, Inc.'s ("Beazer's") comments on the United States Environmental Protection Agency's ("EPA's") Proposed Remedial Action Plan ("PRAP") issued on October 7, 2004 for the Koppers Company Inc. ("Newport Plant") Superfund Site ("Site") located in Newport, Delaware The EPA previously granted Beazer an extension of time within which to file these comments until December 6, 2004. As you know, Section 121(a) of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 ("CERCLA"), as amended, 42 U.S.C. 9601 et seq. ("Superfund"), requires that when the EPA selects a remedial action in accordance with its Superfund authority, the EPA must "select *appropriate* remedial actions determined to be *necessary* to be carried out... which are in accordance with this section and, to the extent practicable, the national contingency plan, and which provide for a cost-effective response." In general, Beazer does not believe that EPA's action in proposing the remedy selected in the PRAP comports with its statutory obligations. Beazer believes that many components of the EPA's preferred cleanup alternative ("Alternative 4") are unnecessary, inappropriate and/or not cost-effective given the data that have been generated during the Site investigations and the feasibility analyses.

***EPA RESPONSE:*** *EPA has carefully considered Beazer's assertions regarding EPA's action, but does not believe that they are correct. The basis for EPA's actions are supported by the studies and investigations conducted over many years at the Site, which are available for review in the Administrative Record. Additionally, the selected remedy is analyzed in accordance with EPA's statutory obligations and is evaluated in light of the nine-criteria set forth in the NCP. EPA's analysis of the selected remedy is fully documented in the Administrative Record.*

In particular, Beazer has significant concerns with respect to the projected costs for implementation of Alternative 4 in the PRAP. Section 121(a) of Superfund directly addresses this key component of remedy selection as follows. "In evaluating the cost-effectiveness of proposed alternative remedial actions, [EPA] shall take into account the total short- and long-term costs of such actions, including the costs of operation and maintenance for the entire period during which such activities will be required " A close review of the PRAP indicates that the EPA has taken different elements of the alternatives presented by Beazer in the Feasibility Study ("FS") and the FS Addendum and added additional elements of significant cost to develop the PRAP. As a result, the PRAP now contains a number of redundant elements that have been incorporated at a significant cost but do not improve the performance of the remedy Furthermore, Beazer believes that the EPA has improperly considered or ignored a number of technical issues, and inappropriately integrated considerations of a possible future reuse, to create a PRAP which we believe is not supportable under CERCLA or the National Oil and Hazardous Substances Pollution Contingency Plan ("NCP"), 40 C.F.R. Part 300.

***EPA RESPONSE:*** *EPA has carefully considered Beazer's assertions, but does not believe that they are correct. EPA does not believe that any components of the remedy are redundant. EPA reviewed and considered Beazer's supplemental cost estimates for various components of the remedy. Issues related to potential future use are discussed in more detail within this document, however, the proposed remedy does not make any decision regarding future use, as is suggested in the comment. Rather, the proposed remedy is stated to be " compatible with one potential future use " referring to the proposal that Beazer brought before EPA to possibly use the Site as a wetlands bank for the Delaware Department of Transportation (DelDOT). For the purposes of*

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*comparison, EPA retained the discussion of future wetlands development as provided in Beazer's FS Addendum (Alternative 10) cost estimates, but these costs were not included in the cost of the proposed remedy itself, as they are related to additional excavation work associated with a potential future use and not directly related to the remedy.*

We request that the EPA address these comments to the PRAP and select a revised remedial action at the Newport Site that not only comports with the requirements of law but, in addition, provides a practical answer to the complex remediation issues that this Site presents Failure to do so represents agency action that is arbitrary, capricious, an abuse of discretion, and otherwise contrary to law. A summary of the most significant issues is provided in this letter and an expanded discussion of these points is contained in the attached document

***EPA RESPONSE:*** *EPA has carefully considered Beazer's comments and believes that the selected remedy addresses the risks posed by the Site. The basis of EPA's selected remedy includes a decade of data collection, which EPA has carefully reviewed and evaluated. EPA has proposed a cost-effective remedial action that is consistent with CERCLA, the NCP, and ARARs. The basis for the proposed remedy is well documented in the Administrative Record, including, but not limited to, EPA's numerous comments on the Remedial Investigation and Feasibility Study, EPA's presentation and response to the National Remedy Review Board, and the Proposed Remedial Action Plan. As stated previously, EPA has proposed a remedy that is consistent with CERCLA, the NCP, and ARARs. Furthermore, EPA's proposed remedy is largely based on an alternative developed by and proposed by Beazer as an addendum to the FS and based upon studies and investigations, which Beazer financed, conducted and submitted to EPA for review and consideration.*

**GENERAL ISSUES**

1. The Site-specific cleanup ecological risk-based criterion developed for polycyclic aromatic hydrocarbons (PAHs) in sediments (150 milligrams per kilogram [mg/kg]) has been inappropriately applied as a universal soil cleanup criterion, resulting in deeper and more extensive soil removal than is required to mitigate site risks. Beazer's best estimate of the cost, including contingency, for this deeper and more extensive soil removal, is approximately $6 7 million based upon the information provided by the EPA

***EPA RESPONSE:*** *EPA has considered Beazer's assertions, but does not believe that the cleanup criteria are inappropriate for the risks posed at this Site. As discussed in the PRAP and in the ROD, the sediment cleanup criterion is protective and is to apply to those soils where wetlands will be created. Regarding matters of cost, EPA has prepared an extensive analyses of costs, which is attached hereto. Beazer's submittal to EPA of supplemental cost estimates or various components of the remedy were carefully reviewed and considered in EPA's discussion of the cost criterion. Note that PRAP Alternative 3 details what a 2-foot excavation of soil with backfill and cover would cost. Soil excavation for Alternative 3 totaled approximately $7.2M, while soil excavation in Alternative 4 totaled approximately $8.4M - while this is a significant difference, it is not as large a difference as suggested in the comment. As discussed earlier in this document, note that the original cost estimates in the 2003 FS Addendum (FS Alternative 10) split the cost of deeper soil excavations (beyond that required by the remedy) between the remedy and the "wetlands developer". EPA adopted this approach in order to be consistent for the purposes of comparison, but is not requiring the further excavations of materials to create a wetlands bank, as that is not part of the selected remedy. Rather, as stated in the PRAP, EPA's selected remedy is compatible with that potential future use, should such a use materialize in the future.*

2. The EPA has inappropriately required an extensive sediment removal action in Lower Hershey Run and other aquatic Site areas (such as the Fire Pond, South Pond, K Area, and West

Central Drainage Area) through misapplication of both the risk-based site-specific cleanup criterion, and EPA's document titled Principles for Managing Contaminated Sediment Risks at Hazardous Waste Sites (EPA, 2002). Beazer's best estimate of the cost, including contingency, for the extensive sediment removal in Hershey Run alone is approximately $13.8 million, based upon the information provided by the EPA.

***EPA RESPONSE:*** *EPA has considered Beazer's assertions, but does not believe that they are correct. As stated in the PRAP, the sediment in Hershey Run contains very high levels of TPAHs, in some areas the levels are so high as to constitute a principal threat source area. Therefore, addressing this sediment is certainly appropriate. Regarding matters of cost, please see the attached discussion of cost estimates, and please also refer to Beazer's own supplemental cost estimates for various components of the remedy. In response to EPA's comments on the 2003 FS Addendum, Beazer provided its best-cost estimate for the sediment removal as $3.2 million. Beazer's FS Addendum states:*

> *"Removal of NAPL-contaminated sediments from the lower reaches of Hershey Run would include the removal of approximately 21,300 cubic yards of sediment from the upper 1 to 4 feet, disposal in the onsite containment area, and backfill with clean sand as is proposed for FS alternatives 6 through 9. The additional cost of this option is estimated to be $3.2 million based on the FS costs for Alternatives 6 through 9."*

*In contrast, the estimate that EPA presented to the National Remedy Review Board ("NRRB") regarding the additional cost of addressing the sediments in the lower reaches of Hershey Run was approximately $6.5M.*

3 The proposed EPA plan for passive and possibly active groundwater and dense non-aqueous phase liquids ("DNAPL") collection within the vertically contained consolidation areas is largely a redundant remedial element Both the vertical barrier wall and the groundwater and DNAPL system are intended to control the source of groundwater impacts and prevent future releases of DNAPL to surface water and sediments. Beazer's best estimate of the cost, including contingency, for the DNAPL collection element is approximately $7.4 million, based upon the information provided by the EPA.

***EPA RESPONSE:*** *EPA has considered Beazer's assertions, but does not believe that they are correct. Due to the actual mobility and the potential for mobilization of NAPL in the subsurface during construction, the vertical barrier wall will prevent any lateral migration of NAPL out of the containment area during the installation of the recovery trench system, as well as during the subsequent excavation of material outside of the containment area which will most certainly change the hydraulic conditions in the surrounding area of the Site. In addition, the vertical barrier wall will isolate ground water outside of the containment area, ensuring that only ground water from within is collected by the passive recovery trenches. Therefore, EPA does not believe that this remedial component is redundant, but is necessary to address the mobility of NAPL. EPA's cost estimate shows a cost of approximately $4.5 million for the DNAPL recovery trench system.*

4. The EPA-recommended remedy is supported largely by its unfounded intention to restore Site groundwater to its beneficial use as a potential source of drinking water. Beazer considers this intention to be both inappropriate and technically impracticable. The goal is inappropriate because the impacted aquifer is not a source of drinking water and technically impracticable because no proven technologies exist that could restore this impacted shallow groundwater to drinking water standards Moreover, any serious efforts at exploiting shallow groundwater for potable purposes could result in a greater damage to the environment due to the likelihood of saltwater intrusion. Thus, Beazer believes that the EPA has incorrectly

designated the aquifer for potable use thereby applying incorrect Applicable or Relevant and Appropriate Requirements ("ARARs") in the PRAP. In the alternative, if the groundwater ARARs are found to be appropriate, a position with which Beazer strongly disagrees, Beazer should qualify for an ARAR waiver for impacted shallow groundwater We note, for the record, that the EPA approved an ARAR waiver for shallow groundwater for similar reasons and incorporated it into a 1993 Record of Decision ("ROD") at the adjacent E I. DuPont de Nemours & Co., Inc. Pigment Plant Landfill Site (in Newport, Delaware). Estimated costs are included under point 1 above.

***EPA RESPONSE:*** *EPA has considered Beazer's assertions, but does not believe that they are correct. The PRAP neither refers to, nor suggests, that the Columbia aquifer is or should be restored to conditions consistent with potable use. Rather, the PRAP states that the Columbia Aquifer is a "potential drinking water aquifer," as designated by the State. EPA does not designate an aquifer for potable use, since such designations for ground water use is a State function. EPA does, however, pursuant to its statutory obligation, "expect to restore ground water to its beneficial use, to the maximum extent practicable " Contrary to the assertion in the comment, EPA believes and states in the PRAP that the excavation and consolidation of the NAPL- and PAH-contaminated material present in the aquifer will allow for physical and biological attenuation processes to ultimately eliminate any residual contamination, thus restoring the ground water outside of the containment area.*

5. The PRAP unfairly assumes that future reuse of the Site will occur and this assumption drives key components of the remedy. Aggressive cleanup of wetlands and groundwater to allow specific reuse of the Site as a wetlands bank is premature and represents an unacceptable basis for establishing the extent of soil and sediment cleanup required Aggressive wetlands cleanup may also permanently disturb wetland habitat and function Additionally, it is our understanding that alternative properties in the area may be more viable options for wetland construction and/or banking than the Site. Since the time Beazer evaluated reuse of the Site as a wetlands bank, other types of uses have been proposed by Site and area stakeholders, including the potential for the location of a drinking water storage reservoir at the Site, it is evident that an appropriate reuse scenario will not be determined for some time.

***EPA RESPONSE:*** *EPA has considered Beazer's assertions and recognizes their role as the property owner regarding the future use of the Site. The PRAP does not assume any future re-use scenario; rather, the remedial components are driven by the risk assessment data and the proposed remedy is stated to be "compatible" with future use, with no expected restriction on land use outside of the containment area. The soil and sediment cleanup is driven by the risks posed at the Site. EPA understands that the cleanup may disturb wetland habitat and function; however, any wetlands disturbance during the cleanup will be mitigated in accordance with the stated ARARs. The extent of excavation is not for the purposes of creating a wetlands bank which is not a remedial component of the selected remedy, but rather to address the Site risks posed by the hazardous substances in soils and sediments. EPA understands the future use of the Site has not been determined yet.*

6. The agency has arbitrarily mandated several prescriptive requirements to the remedy that are likely to change during the remedial design (e.g., the location and size of the on-site containment areas, the extent of areas that need to be excavated, etc.). Beazer believes that it is unnecessary and unreasonably restrictive to incorporate these requirements into the preferred remedy at this stage.

***EPA RESPONSE:*** *EPA has considered Beazer's assertions, but does not believe that they are correct. EPA is aware that estimates of areas and volumes to be excavated and contained are just that: estimates. For the purposes of estimating the cost and to evaluate completely* *the suitability of the remedy, detailed estimates were created, and the text of the PRAP stated that these exact figures and locations would likely change during the Remedial Design and further delineation efforts to determine the scope and extent of the hazardous substances on-Site.*

7. The agency has failed to clearly specify the cost components of the preferred remedy in sufficient detail for Beazer and the other stakeholders to understand the basis for EPA's decisions. Failure to adequately disclose the amounts and underlying rationale for these enormous costs deprives Beazer of an opportunity to comment meaningfully on the PRAP, in violation of Section 121(a) of CERCLA and due process of law.

***EPA RESPONSE:*** *EPA has considered Beazer's assertions, but does not believe that they are correct. There is significant identification and discussion of the remedial cost components in the Administrative Record. The cost estimates were (1) based on FS documents submitted to EPA by Beazer, (2) clearly documented in the Administrative Record, and (3.) presented to the NRRB for rigorous review. The original early estimates of volumes of soils and sediments potentially subject to remediation were developed by EPA due to Beazer's continued failure to provide that information upon EPA's request during the RI/FS process. Since that time, Beazer's additional studies, and EPA's subsequent evaluation of the new and existing data have provided EPA with sufficient information concerning the Site-contamination, and therefore, the estimated volumes of materials potentially subject to remediation. Further delineation will be performed during the RD, which is consistent with the Superfund process.*

8. Finally, Beazer believes that the EPA has improperly applied the required analysis of the nine criteria contained in 40 C.F.R. 300 430(e)(9) in selecting its preferred remedy in contravention of the agency's obligation in the NCP. In particular, and without limitation, Beazer believes that the threshold criteria have been misapplied inasmuch as cleanup beyond that necessary to protect human health and the environment has been proposed, and the ARARs for potable groundwater have been misinterpreted and applied to require extensive subsurface excavation activities. Secondly, and without limitation, the balancing criteria have been unfairly weighted particularly for short-term effectiveness, implementability, and cost, particularly with respect to the mandatory requirements for soils and sediments discussed above and for other reasons discussed in the attachment.

***EPA RESPONSE:*** *EPA has considered Beazer's assertions, but does not believe that they are correct. EPA has responded to the "potable use" issue above in #4. As stated in the PRAP, EPA expects to restore ground water outside of the containment area to beneficial use.*

*The comment underestimates the downward pathway of contamination to the underlying Potomac aquifer. Nonetheless, the Columbia **is** classified as a potential drinking water aquifer (a designation placed by the state, not by EPA), creosote NAPL at the Site **is** mobile and **has been** discharging to surface water for many years. Due to its mobility, EPA's remedial action components have been selected to mitigate this potential spread of contaminant.*

9. Conclusion -- Beazer requests that the EPA take all of these comments into account in its further decision-making at this Site to achieve an appropriate and practical resolution of Site cleanup.

***EPA RESPONSE:*** *EPA has carefully reviewed all the information and data presented to EPA by Beazer during the many years it has conducted the Site investigations and studies. EPA has thoughtfully considered the comments presented by Beazer during each phase of the Superfund process, including the comments submitted herein on the PRAP. EPA has selected* *a remedy in accordance with CERCLA, the NCP and ARARs. The information forming the basis of EPA's decision has been made available in the Administrative Record for the Site.*

## B. Beazer's Comments Attachment

**Beazer Comments on the PRAP for the Koppers Company, Inc. Superfund Site**

This attachment presents Beazer East, Inc.'s ("Beazer") comments in response to the United States Environmental Protection Agency's ("EPA") Proposed Remedial Action Plan ("PRAP") issued on October 7, 2004 for the Koppers Company Inc ("Newport Plant") Superfund Site ("Site") located in Newport, Delaware. Provided below is a brief description of what Beazer believes are the most significant issues related to EPA's recommended remedy, followed by a more detailed discussion of these issues, and finally, a specific page-by-page comments.

**1.0 GENERAL ISSUES**

1. The Site-specific cleanup ecological risk-based criterion developed for polycyclic aromatic hydrocarbons (PAHs) in sediments (150 milligrams per kilogram [mg/kg]) has been inappropriately applied as a universal soil cleanup criterion, resulting in deeper and more extensive soil removal than is required to mitigate Site risks. Beazer's best estimate of the cost, including contingency, for this deeper and more extensive soil removal, is approximately $6.7 million based upon the information provided by the EPA.

***EPA RESPONSE:*** *EPA has thoughtfully considered Beazer's assertions, but does not believe that they are correct. EPA has fully addressed this comment in EPA's response to Beazer's Comment 1, above.*

2. The EPA has inappropriately required an extensive sediment removal action in Lower Hershey Run and other aquatic Site areas (such as the Fire Pond, South Pond, K Area, and West Central Drainage Area) through misapplication of both the risk-based Site-specific cleanup criterion, and the EPA's document titled Principles for Managing Contaminated Sediment Risks at Hazardous Waste Sites (EPA, 2002). Beazer's best estimate of the cost, including contingency, for the extensive sediment removal in Hershey Run alone is approximately $13 8 million, based upon the information provided by the EPA

***EPA RESPONSE:*** *EPA has thoughtfully considered Beazer's assertions, but does not believe that they are correct. EPA has fully addressed this comment in EPA's response to Beazer's Comment 2, above.*

3. The proposed EPA plan for passive and possibly active groundwater and dense non-aqueous phase liquids ("DNAPL") collection within the vertically contained consolidation areas is largely a redundant remedial element. Both the vertical barrier wall and the groundwater and DNAPL system are intended to control the source of groundwater impacts and prevent future releases of DNAPL to surface water and sediments. Beazer's best estimate of the cost, including contingency, for the DNAPL collection element is approximately $7.4 million, based upon the information provided by the EPA.

***EPA RESPONSE:*** *EPA has thoughtfully considered Beazer's assertions, but does not believe that they are correct. EPA has fully addressed this comment in EPA's response to Beazer's Comment 3, above*

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4 The EPA-recommended remedy is supported largely by its unfounded intention to restore Site groundwater to its beneficial use as a potential source of drinking water. Beazer considers this intention to be both inappropriate and technically impracticable The goal is inappropriate because the impacted aquifer is not a source of drinking water and technically impracticable because no proven technologies exist that could restore this impacted shallow groundwater to drinking water standards. Moreover, any serious efforts at exploiting shallow groundwater for potable purposes could result in a greater damage to the environment due to the likelihood of saltwater intrusion. Thus, Beazer believes that the EPA has incorrectly designated the aquifer for potable use thereby applying incorrect Applicable or Relevant and Appropriate Requirements ("ARARs") in the PRAP. In the alternative, if the groundwater ARARs are found to be appropriate, a position with which Beazer strongly disagrees, Beazer should qualify for an ARAR waiver for impacted shallow groundwater. We note, for the record, that the EPA approved an ARAR waiver for shallow groundwater for similar reasons and incorporated it into a 1993 Record of Decision ("ROD") at the adjacent E.I. DuPont de Nemours & Co., Inc. Pigment Plant Landfill Site (in Newport, Delaware). Estimated costs are included under point 1 above.

***EPA RESPONSE:*** *EPA has thoughtfully considered Beazer's assertions, but does not believe that they are correct. EPA has fully addressed this comment in EPA's response to Beazer's Comment 4, above. Additionally, with respect to the ARAR waiver at the DuPont (Newport) Site, although similarities exist between Superfund sites, EPA's remedies are Site-specific with remedial components identified through the nine criteria set forth in the NCP. The ARAR waiver at DuPont (Newport) is not relevant to this Site.*

5. The PRAP unfairly assumes that future reuse of the Site will occur and this assumption drives key components of the remedy. Aggressive cleanup of wetlands and groundwater to allow specific reuse of the Site as a wetlands bank is premature and represents an unacceptable basis for establishing the extent of soil and sediment cleanup required. Aggressive wetlands cleanup may also permanently disturb wetland habitat and function. Additionally, it is our understanding that alternative properties in the area may be more viable options for wetland construction and/or banking than the Site. Since the time, Beazer evaluated reuse of the Site as a wetlands bank, other types of uses have been proposed by Site and area stakeholders including the potential for the location of a drinking water storage reservoir at the Site; it is evident that an appropriate reuse scenario will not be determined for some time

***EPA RESPONSE:*** *EPA has thoughtfully considered Beazer's assertions. EPA has fully addressed this comment in EPA's response to Beazer's Comment 5, above.*

6. The agency has arbitrarily mandated several prescriptive requirements to the remedy that are likely to change during the remedial design (e.g., the location and size of the onsite containment areas, the extent of areas that need to be excavated, etc.) Beazer believes that it is unnecessary and unreasonably restrictive to incorporate these requirements into the preferred remedy at this stage.

***EPA RESPONSE:*** *EPA has thoughtfully considered Beazer's assertions, but does not believe that they are correct. EPA has fully addressed this comment in EPA's response to Beazer's Comment 6, above.*

7 The agency has failed to clearly specify the cost components of the preferred remedy in sufficient detail for Beazer and the other stakeholders to understand the basis for EPA's decisions. Failure to adequately disclose the amounts and underlying rationale for these enormous costs deprives Beazer of an opportunity to comment meaningfully on the PRAP in violation of Section 121(a) of CERCLA and due process of law.

***EPA RESPONSE:*** *EPA has thoughtfully considered Beazer's assertions, but does not believe that they are correct. EPA has fully addressed this comment in EPA's response to Beazer's Comment 7, above.*

8. Finally, Beazer believes that the EPA has improperly applied the required analysis of the nine criteria contained in 40 C.F.R. 300.430(e)(9) in selecting its preferred remedy in contravention of the agency's obligation in the National Oil and Hazardous Substances Pollution Contingency Plan ("NCP"). In particular, and without limitation, Beazer believes that the threshold criteria have been misapplied inasmuch as cleanup beyond that necessary to protect HH and the environment has been proposed, and the ARARs for potable groundwater have been misinterpreted and applied to require extensive subsurface excavation activities. Secondly, and without limitation, the balancing criteria have been unfairly weighted particularly for short-term effectiveness, implementability, and cost, particularly with respect to the mandatory requirements for soils and sediments discussed above and for other reasons discussed in the attachment

***EPA RESPONSE:*** *EPA has thoughtfully considered Beazer's assertions, but does not believe that they are correct. EPA has fully addressed this comment in EPA's response to Beazer's Comment 7, above.*

The estimated total cost of the issues addressed above amounts to approximately $27.9 million, which represents over 50% of the total remedy cost. Beazer believes that a significant portion of these costs is unnecessary to protect human health and the environment and improperly imposed in the PRAP as result of improper balancing of the NCP balancing criteria in 40 C F.R. 300.430(e)(9).

***EPA RESPONSE:*** *EPA has considered Beazer's assertions, but does not believe that they are correct. Regarding matters of cost, please see the attached discussion of cost estimates, and please also refer to Beazer's own supplemental cost estimates for various components of the remedy. Note that PRAP Alternative 3 details what a 2-foot excavation of soil with backfill and cover would cost. Soil excavation for Alternative 3 totaled approximately $7.2M, while soil excavation in Alternative 4 totaled approximately $8.4M - while this is a significant difference, it is not as large a difference as suggested in the comment. As discussed earlier in this document, note that the original cost estimates in the 2003 FS Addendum (FS Alternative 10) split the cost of deeper soil excavations (beyond that required by the remedy) between the remedy and the "wetlands developer". EPA adopted this approach in order to be consistent for the purposes of comparison, but is not requiring the further excavations of materials to create a wetlands bank, as that is not part of the selected remedy. Rather, as stated in the PRAP, EPA's selected remedy is compatible with that potential future use, should such a use materialize in the future.*

## 2.0 DISCUSSION OF GENERAL ISSUES

This section expands upon the issues outlined above.

### 2.1 ISSUE 1: SOIL CLEANUP CRITERIA AND APPROACHES

Under the PRAP, the EPA proposes to excavate all surface and subsurface soil with PAH concentrations greater than 150 mg/kg PAH. Beazer believes that the EPA's proposal is arbitrary and without basis for several reasons. First, the 150 mg/kg PAH criterion is the *sediment cleanup criterion* and has no significance for surface and subsurface soils. The EPA prematurely states that the application of this criterion is necessary for soils and subsoils because of its determination regarding future use of the Site for wetlands banking However, even if conversion



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of terrestrial habitats to wetlands for wetland banking purposes is considered a viable end use, the requirement to remove all soil with PAH concentrations above 150 mg/kg is overly protective.

***EPA RESPONSE:*** *EPA has considered Beazer's assertions, and agrees that "the 150 mg/kg PAH criterion is the sediment cleanup criterion." However, the PRAP and the ROD clearly state that the sediment cleanup criterion shall be applied to soils in those areas where wetlands will be created. Furthermore, wetlands creation is listed as a possible future use, and not prescribed at all as part of the remedy. In response to this comment, EPA has further clarified this point in the description of Alternative 4.*

Second, the EPA has decided to use this criterion as a fixed cleanup target without consideration of the option of placing clean surface soils as a buffer to mitigate potential exposure risks. This approach results in excessive soil removal volumes and greatly increases the cost and technical complexity associated with huge soil excavation and movement projects. Third, this approach will result in excessive and unnecessary disturbance to unique ecologically sensitive habitats that are present at the Site. These negative impacts are greatly exacerbated by EPA's insistence in the PRAP to remove all soil where concentrations exceed the target criterion, including material at depth, not just in the biologically active zone. The result of this approach is that soil excavation depth will average 5 to 15 feet, up to a maximum of 30 feet below ground surface.

***EPA RESPONSE:*** *EPA has considered Beazer's assertions, and notes that in the PRAP EPA considered several options for cleanup. Specifically, in the PRAP Alternative 2, EPA clearly considered "the option of placing clean surface soils," even including a liner and burrow-inhibition layer. For the reasons clearly and carefully outlined and considered in the PRAP, including evaluation against the nine criteria, EPA believes this to be an inferior alternative to the selected remedy. Please refer to the previous comment regarding the actual application of the cleanup criteria, and please refer to the PRAP for a discussion of the comparison of the selected remedy and a cover-in-place alternative. EPA's selected remedy may temporarily disturb sensitive habitats, but will provide for the translocation of the species and provide permanent relief.*

With respect to the possible future exposure of aquatic organisms in created wetlands, Beazer's extensive review of the Site data indicate that it is not ecologically warranted. A review of the ecological literature indicates that sediment-dwelling organisms rarely occur at depths deeper than 10 to 30 centimeters. For example, 95% of chironomid larvae reside in the upper 10 centimeters of the sediment column in soft-bottom habitats (American Society for Testing and Materials [ASTM], 1995). Also, studies of the burrowing behavior of a broad range of freshwater insect taxa from four orders (i.e., Diptera, Ephemeroptera, Megaloptera, and Trichoptera) showed that burrows rarely exceeded 10 cm (Charbonneau et al , 1997; Charbonneau and Hare, 1998). These results indicate that removal of 1 to 2 feet of soil, and capping, if necessary, would be sufficient to prevent ecological organisms from re-exposure to PAHs remaining in soils underlying created wetlands. Furthermore, the EPA is not clear regarding its estimates of the associated impacted soil volumes. In the PRAP, excavation to the 600 mg/kg goal established based on earthworm toxicity tests is estimated at 115,000 cubic yards (cy) (see discussion of Alternative 3) and excavation to the more stringent goal of 150 mg/kg based on sediment toxicity tests is estimated at *a lesser* volume of 113,000 cy (see discussion of Alternative 4) Clearly, the EPA's calculations for soil removal volumes are incorrect.

***EPA RESPONSE:*** *EPA has considered Beazer's assertions, and does not believe that they are correct. Regarding capping sediments please refer to the extensive discussions of a cover-in-place alternative presented in the PRAP Alternative 2, as further explained in the previous response. Regarding volumes, the PRAP proposes a smaller containment area in Alternative 3, resulting in a larger acreage to be excavated (due to the smaller footprint of the containment/consolidation area which results in greater excavation outside of that footprint).*

*The previous response addresses EPA's selection of the cleanup criteria, and provides a further discussion of the ARARs as they apply to the media to be cleaned-up.*

This issue was also noted by the National Remedy Review Board ("NRRB") in its first recommendation, in which it indicated that such deep excavations were not justified to achieve a protective remedy and that "the preferred alternative should identify only those CERCLA remedial actions necessary for a protective remedy." In response to this, the EPA indicated that the extensive depth of excavation was to restore groundwater in the Columbia formation for use as a potential drinking water source. The EPA has not provided any justification to prove that the excavation of soils exceeding 150 mg/kg is necessary for the protection of groundwater. As explained below (see Issue 4), evidence indicates that the Columbia aquifer cannot be used as a drinking water source due to its poor water quality by non-Site related constituents.

***EPA RESPONSE:*** *EPA has considered Beazer's assertions, and notes that the comment does not accurately state the NRRB comment. Please note that what the NRRB actually commented was, "PRAP does not present the justification..." In response to the NRRB comment, EPA has included the thorough discussion of the justifications for deeper excavation and consolidation. In addition, EPA notes that while the Columbia aquifer is not presently used for drinking water, it is classified as a "potential drinking water source."*

To summarize then, Beazer believes that the EPA improperly has required the application of a more stringent standard for soil excavation than is required to protect human health and the environment, and has failed to consider the use of a suitable clean soil cover, or a combination of excavation and cover, as an equally protective approach.

***EPA RESPONSE:*** *EPA has carefully considered Beazer's assertions. EPA did consider the use of a clean soil cover, or a combination of excavation and cover in Alternative 2 of the PRAP.*

2.2 ISSUE 2: SEDIMENT REMEDIATION IN HERSHEY RUN

The EPA proposes to excavate all sediment from lower Hershey Run, and the marsh adjacent to the upper portion of Hershey Run where PAH concentrations exceed 150 mg/kg. Again, EPA's decision to use these criteria as cleanup targets improperly fails to consider: 1) the applicability of the cleanup target which applies to surficial sediments only; 2) the option of placing clean material covers to mitigate potential exposure risks; and 3) the unnecessarily excessive sediment removal volumes that will result in excessive disturbance to unique ecologically sensitive habitats to support the proposed excavation.

For aquatic plant and benthic invertebrate communities, the risk assessment for the Site (EPA, 2003a) concluded that impacts were only observed in localized areas within Hershey Run. Biodiversity increases with downstream distance from the Fire Pond, and the downstream area of Hershey Run is a diverse and functioning benthic community. However, the proposed alternative includes extensive sediment removal from all reaches of Hershey Run down to its confluence with White Clay Creek.

***EPA RESPONSE:*** *EPA has carefully considered Beazer's assertions, and does not believe they are correct. The toxicity data provided the most reliable indication of ecological risk. In addition, EPA believes that the benthic survey data has limited applicability, since the survey sampling was not conducted at the same time or in the same sampling locations as where toxicity samples were collected – an issue which was thoroughly discussed in the Ecological Risk Assessment ("ERA"). In addition, the resultant biodiversity data are not as conclusive as the toxicity data, as the ERA explains. The proposed alternative provides estimates of potential sediment excavation volumes, clearly stating that delineation efforts will be conducted during the RD.*

The EPA indicates that its proposed plan is consistent with the Eleven Risk Management Principles recommended in *Principles For Managing Contaminated Sediment Risks At Hazardous Waste Sites,* (OSWER Directive 9285.6-08) (EPA 2002) championed by the Contaminated Sediments Technical Advisory Group (CSTAG) The PRAP goes far beyond what is required to meet a sound risk management approach outlined in the above directive The first oversight is that principles 1, 5, and 11 of the OSWER Directive should be considered in conjunction with each other. These principles include: control sources early, use an iterative approach, and monitor during and after remediation. These principles point to a sediment solution that would cut off the upland DNAPL seeps near the Fire Pond, coupled with relocation of Upper Hershey Run as proposed by Beazer and by the EPA in the draft PRAP, followed by a period of monitoring to assess the benefits of this source control before implementing downstream remediation activities.

***EPA RESPONSE:*** *EPA has carefully considered Beazer's assertions, and does not believe that they are correct. EPA believes that Hershey Run is a principle threat source area. Creosote NAPL -- free product -- was observed throughout a significant distance of Hershey Run, well downstream of the proposed source control of the containment area. The "Eleven Principles" were indeed considered carefully, and a specific presentation was made to the CSTAG as part of the NRRB documents.*

The second oversight is that the EPA inappropriately contends that Monitored Natural Attenuation ("MNA") for sediments is not a viable option because Site operations ceased 30 years ago and there has been no reduction in risk. The EPA notes having seen DNAPL seeps to Hershey Run near the Fire Pond. Until source control measures are taken and monitoring data collected to assess the effectiveness of source control activities, the EPA is without basis to make statements regarding the viability of MNA. In fact, existing data provides indication of MNA, which might be greatly accelerated if upland sources (to the extent they exist) are mitigated.

***EPA RESPONSE:*** *EPA has carefully considered Beazer's assertions, but does not believe that they are correct. EPA's position is well documented in the Administrative Record. EPA disagrees with Beazer that "monitored natural recovery" (MNR) or "monitored natural attenuation" (MNA), which may be appropriate for low concentrations of PAHs (10s-100s of mg/kg in sediment), is appropriate for this Site where thousands of PPM of PAHs occur. Under such high concentrations, the very organisms which would degrade the contaminants are unable to survive. MNA / MNR is not regarded as effective where such high concentrations as to constitute a principal threat are found. EPA does not agree that existing data provide any clear indication of MNA / MNR in sediments. However, EPA is confident that the toxicity and other data do provide a clear indication of ecological risk in much of Hershey Run.*

The EPA also contends that the potential disturbance of impacted sediments is high and can be caused by activities such as wading or bioturbation. The majority of impacted sediments in Lower Hershey Run is found at depth and generally considered stable with ongoing deposition of new material (0.24 to 0.36 inch per year) covering and more thoroughly containing Site-related PAHs over time. Field activities performed in 2002 paint a different picture than that proposed by the EPA in the PRAP. These activities indicate that the sediments were only disturbed through intrusive coring and probing activities, not wading. Additionally most literature indicates that the bioturbation is generally limited to the upper 6 inches of sediment.

***EPA RESPONSE:*** *EPA has carefully considered Beazer's assertions, and does not believe that they are correct. The photographs and documents in the Administrative Record do not support Beazer's assertions. Free product creosote NAPL is easily liberated from shallow sediments through the simple action of wading. In addition, Beazer continues to argue that "natural encapsulation" will isolate these contaminants because a total of 2 sediment samples analyzed* *from the Site, both taken from isolated locations well outside of any major drainage channel, indicated a depositional setting. EPA, whose position regarding this argument is well-documented in the Administrative Record, does not agree (1.) that these 2 isolated samples can necessarily speak for the center of the Hershey Run channel, which drains many square miles of impervious surfaces, and (2.) that even if these samples were from Hershey Run itself, a particular environment can change from depositional to erosional quite literally overnight. Hershey Run is not immune to flooding problems, which occur in the area. EPA remains convinced that principle threat sediments and NAPL in Hershey Run must be remediated and not left susceptible to erosion or exposure.*

The EPA further contends that capping is not a cost effective action because generally only 1 to 2 feet of material will need to be removed and a cap would require the removal of 2 feet to maintain the existing grade. The EPA has failed to balance the advantages of suitable alternatives recommended by Beazer. Obviously, in these areas the removal of only the impacted material is appropriate; however, in areas where proposed sediment removal is greater than 2 feet, such as in Reach 8, capping is still a viable option that would adequately reduce risk, provide suitable benthic habitat, and would do so in a cost effective manner with reduced short-term impacts on the environment.

***EPA RESPONSE:** EPA has carefully considered Beazer's comments, and believes they are not correct. The PRAP includes an alternative, which carefully considered sediment capping, and was balanced against the nine criteria in the consideration of alternatives.*

Beazer believes that more appropriate alternatives to the above selected removal approach, could include selected hotspot removal followed by natural recovery, capping, or rechannelization of the complete length of Hershey Run coupled with backfilling and habitat restoration of the existing channel.

***EPA RESPONSE:** EPA has carefully considered Beazer's assertions and believes it has carefully considered multiple options, as have been clearly documented in the PRAP, NRRB documents and the AR, and has selected a remedy that best satisfies the nine criteria for remedy selection. EPA disagrees that hot spot removal, in the context of the comment, is a viable alternative because it would leave in place contaminated sediments with PAH levels exceeding the risk-based cleanup criterion, and therefore would not be protective; natural recovery would not reliably reduce risk in the remaining contaminated sediment, as is explained in the earlier response regarding "monitored natural recovery."*

2.3 ISSUE 3: PASSIVE DNAPL RECOVERY WITHIN THE CONTAINMENT AREAS

As discussed in the *Final Draft Remedial Investigation Report* (RI Report) (BBL, 2002), DNAPL in subsurface soils occurs in zones typically associated with historic Site operations. Within these zones, DNAPL was reported to occur either as discontinuous layers of potentially mobile liquid up to a few inches thick, as blebs that are not mobile, or as dry weathered seams that represent a residual and non-mobile phase. Contrary to the impression provided by the EPA in the PRAP, the data indicate that there is not a large mobile mass of DNAPL that poses any significant threat should it migrate, or that can be effectively removed. It is not physically or technically practicable under these conditions to remove even the mobile portion of the DNAPL because the product occurs in thin discontinuous layers, it migrates very slowly, if at all, and will not readily enter a collection well or trench.

***EPA RESPONSE:** The boring logs and monitoring well data for the Site show that fluid NAPL has indeed migrated throughout the subsurface, even entering sediments and surface waters in Hershey Run. While there are limited data at depth in the subsurface where NAPL has been* *encountered, the data obtained are consistent with the behavior of creosote NAPL at other wood treatment sites, and indicate that fluid mobile NAPL is present.*

Beazer's review of the data submitted in the RI Report and subsequent data gathering indicates that only two Site monitoring wells (i.e., MW-2 and MW-8) have ever had DNAPL accumulations that would indicate the potential presence of recoverable quantities of DNAPL. Apparent DNAPL thicknesses measured at these monitoring wells were approximately 1 to 2 feet during RI activities in 1996. On the other hand, subsequent testing at these monitoring wells in 2003 indicated DNAPL thicknesses less than 0.01 foot. With such significant reductions in DNAPL thickness over time, it is not likely to be practicable to remove significant quantities of DNAPL.

***EPA RESPONSE:*** *EPA has carefully considered Beazer's assertions, and believes they are not correct. Data from the boring logs and the monitoring wells indicate that the DNAPL has moved over the years. The NAPL that was detected in earlier sampling events remains present in the subsurface. The fact that it is no longer present in those wells indicates that EPA's contention that NAPL is mobile is in fact accurate. In addition, NAPL need not be encountered in a significant thickness in order to be recoverable; a one-inch NAPL-saturated sand seam can recover a great deal of NAPL (potentially thousands of gallons), behaving in a way similar to a large pipe over time, given the large surface area with which such a seam would intersect a collection trench.*

Furthermore, the PRAP already incorporates a barrier wall around the above-referenced DNAPL areas. The application of barrier walls to isolate DNAPL is a proven technology that has been instituted at a number of wood treating and other chemical sites as a source control measure These consolidation areas will also be covered with a low-permeability liner that prevents precipitation infiltration into the areas. This will further serve to contain the DNAPL soils, and the mobility of any associated free-phase DNAPL. Given the redundant source containment measures included in the PRAP, it is apparent that DNAPL removal to the extent outlined in the PRAP would not be needed

As previously recommended by Beazer, if DNAPL removal is required, a position with which Beazer does not agree at this time, before DNAPL removal is required, its feasibility and effectiveness should be evaluated. We therefore continue to recommend that passive DNAPL recovery not be a required remedial element, but rather DNAPL removal pilot testing be conducted to determine the need for and potential effectiveness of a DNAPL recovery system within the proposed consolidation areas. This pilot testing could be done in parallel with the remedial design process, and the soil containment area design could allow for the inclusion of DNAPL removal systems should the pilot testing establish its feasibility and effectiveness

Therefore, Beazer believes that the EPA has not demonstrated the need for a passive DNAPL removal system when there is no evidence to suggest there are significant removable quantities of DNAPL and the DNAPL will be contained, in any event, within a barrier wall. DNAPL removal pilot studies can be conducted, thus allowing implementation of a more cost-effective DNAPL removal approach, tailored to Site-specific conditions

***EPA RESPONSE:*** *EPA has carefully considered Beazer's assertions, and believes that they are not correct. Due to the actual mobility and the potential for mobilization of NAPL in the subsurface during construction, the vertical barrier wall will prevent and lateral migration of NAPL out of the containment area during the installation of the recovery trench system, as well as during the subsequent excavation of material outside of the containment area which will most certainly change the hydraulic conditions in the surrounding area of the Site. If EPA determines during the Remedial Design phase that the certainty of horizontal containment that this "belt and suspenders" approach could be achieved without the vertical barrier wall, both during* *construction and in perpetuity, EPA may revisit the necessity of the vertical barrier wall. Also, without a "drain" (the recovery trench system), the wall would cause mounding within the containment area, threatening the Potomac, and potentially causing up gradient flooding, threatening the rail lines and up gradient properties. Therefore, EPA does not believe that this remedial component is redundant, but is necessary to address the mobility of NAPL.*

2 4 ISSUE 4. GROUNDWATER REMEDIATION

The EPA recommended remedy is supported largely by its anticipated ability to restore Site groundwater to its beneficial use as a potential source of drinking water Beazer considers restoration of Site groundwater to beneficial use as a potential source of drinking water to be both inappropriate and technically impracticable for the reasons outlined below

Groundwater at the Site is found within two water-bearing zones. The upper, shallow groundwater-bearing zone resides in the Columbia Formation geologic unit and exists under unconfined, or water-table conditions. A limited portion of this shallow groundwater has been impacted with wood-treating residuals at the Site and is the focus of remedial alternatives being considered by the EPA.

The lower hydrostratigraphic unit, or deep groundwater-bearing zone, resides within the Potomac Formation geologic unit and exists under confining conditions. Groundwater in the lower hydrostratigraphic unit can be extracted at sufficient quantities, and is of sufficient quality, to render it an "aquifer" and has been given the name "Potomac Aquifer" in the state of Delaware. There are no users of this aquifer at or adjacent to the Site. The lower hydrostratigraphic unit has not been found to be impacted with Site-related constituents and, as a result, the PRAP proposes long-term monitoring of the lower unit as a protective measure.

***EPA RESPONSE:*** *In addition to preventing ground water mounding in the overlying containment area, the ground water recovery system will maintain a safe hydraulic gradient for the containment of contaminants by not increasing vertical head, which would potentially force contaminants down into the Potomac if they are not already present. This hydraulic head management will (1) prevent any further release into the Potomac, and (2) enhance the effectiveness of the recovery trench by dragging/pushing NAPL into it.*

These two hydrostratigraphic units are separated by a low-permeability; fine grained silt and clay layer of varying thickness that the data demonstrate to be continuous across the Site. Evidence for the continuity of the low-permeability, fine grained silt and clay layer across the Site includes the fact that it has been detected in over 100 soil borings completed at the Site and the fact that the lower hydrostratigraphic unit has not been found to be impacted with Site-related constituents.

***EPA RESPONSE:*** *EPA has carefully considered Beazer's assertions, and believes that they are not correct. As has been discussed in numerous documents over the past several years during the extensive study and investigation of this Site, neither the data presented, nor literature of local geology reviewed support the claim of a continuous clay layer. The Columbia and Potomac Formations are fluvial in origin, and as such are laterally quite variable. They have been described in the literature as an "interconnected system," and as having variegated clays with interbedded silts, sands and gravel. While some of the boring logs for the Site describe the "clay," the lab analytical data for some of those same samples identify particle size distributions more consistent with silt or sand, not clay. The ground water data for the Site also indicate a connection between the Columbia and Potomac aquifers (e.g., similar flow direction, similar response to tidal fluctuations, and varying differences in hydraulic head). EPA understands that there may exist a competent clay layer functioning as an aquitard between these aquifers at other Sites, but at this Site, which is* *especially large in size, it is not surprising to find the lateral variability of these deposits occurring within the Site boundaries.*

*The data indicate, and it is supported by the literature reviewed by EPA, that there is not likely a continuous clay beneath the Site. There are areas where lenses or stringers of clay with low permeability will inhibit downward flow of both ground water and NAPL, but due to the lateral variability and heterogeneity of the subsurface materials, the "clay layer" does not present the kind of vertical barrier to contaminant transport that Beazer describes.*

Irrespective of any impacts from wood treating constituents at the Site, groundwater in the Columbia Formation at and near the Site does not represent a suitable potential future supply of potable water due to its characteristically poor quality. Therefore, selection of a remedial action objective (RAO) to restore groundwater in the Columbia formation to drinking water standards is not only inappropriate, but it is also impracticable. Groundwater in the Columbia Formation at many locations in New Castle County has been found to contain naturally occurring elevated concentrations of iron to render it non-potable without significant pre-treatment (Bachman and Ferrari, 1995; Woodruff, 1970; Rima, et al., 1964) Iron concentrations in background groundwater samples collected at up gradient monitoring wells ranged between approximately 306 and 5,280 micrograms per liter (µg/L; BBL, 2002), exceeding the EPA secondary drinking water regulation level of 300 µg/L

Similarly, groundwater in the Columbia Formation at many locations in New Castle County has been found to contain elevated concentrations of nitrate and other septic wastes to render it nonpotable without significant pre-treatment (Miller, 1975; Goehring and Carr, 1980; Svatos and Goehring, 1981, Hamilton and Shedlock, 1989). Although nitrate concentrations have never exceeded the EPA maximum contaminant level (MCL) of 10 milligrams per liter (mg/L) in any groundwater sample collected at the Site, nitrate concentrations in background groundwater samples collected at up gradient monitoring wells screened in the Columbia Formation during remedial investigations were found to range from approximately 0 6 to 1.3 mg/L Since nitrate concentrations above 0 4 mg/L are indicative of septic wastes (Bachman and Ferrari, 1995) and therefore not Site-related.

Furthermore, adopting EPA's preferred approach to groundwater in the PRAP could have the negative effect of exacerbating the already poor quality of the existing aquifer. Any attempt at extracting groundwater from the Columbia Formation at the Site for water supply purposes would likely result in the intrusion of high-salinity-content surface water from the Christina River, White Clay Creek, and Hershey Run Creek. These surface water features are tidally influenced with an average tidal range of about 6 feet and a salinity range of approximately 500 to 5,000 mg/L (BBL, 2002). Since groundwater in the Columbia Formation is hydraulically connected to, and temporarily recharged by these surface water features during high tide, attempts at exploiting groundwater in the Columbia Formation at this Site for water supply purposes run the likely risk of degrading water quality due to salt water intrusion Instances of salt-water intrusion at pumping sites in New Castle County have been documented by Hayes et al. (1998). Furthermore, Groot (1983) concluded that no water supply wells should be constructed within several miles of the presence of brackish water if drinking water quality is required."

***EPA RESPONSE:*** *EPA has carefully considered Beazer's assertions, and believes that they are not correct. Beazer's barrier wall, as proposed, will isolate the containment area from tidal influence, and without a "drain" (the recovery trench system), the wall would cause mounding within the containment area, threatening the Potomac, and potentially causing up gradient flooding, threatening the rail lines and up gradient properties.*

The above Site-specific ground water quality information is consistent with the finding that ground water in the Columbia Formation is undesirable as a drinking water supply throughout much of the county. It is therefore evident that there would be no benefit achieved if wood treatment-related constituents could be removed from groundwater outside of the containment areas, particularly since the PRAP incorporates institutional controls that will prevent access to this water. Furthermore, as noted on page 10 of the PRAP, "exposure to groundwater without DNAPL present did not result in carcinogenic results outside the acceptable range"; and non-carcinogenic risk in groundwater without DNAPL present "was largely caused by high background levels of metals that occur in Columbia Aquifer ground water."

In summary, then, EPA's recommended remedy for groundwater is arbitrary and an abuse of the agency's discretion. EPA's goal of returning the impacted aquifer to potable status is inappropriate and technically impracticable. The EPA is applying ARARs that are not appropriate for this Site in violation of CERCLA and the NCP, which have a significant outcome on the remedy selection process. Section 300 430(a)(iii)(F) of the NCP directly addresses EPA's expectations for groundwater at a Site such as the Newport Plant. Although the NCP does establish an expectation on behalf of the EPA that it will return usable groundwater to its beneficial uses wherever practicable, the NCP states "[w]hen restoration of ground water to beneficial uses is not practicable, EPA expects to prevent further migration of the plume, prevent exposure to the contaminated ground water, and evaluate further risk reduction " 40 C F R 430(a)(iii)(F) Beazer believes that the Site data establish that the return of this aquifer to potable status is impracticable and that further migration of the plume and exposure to contaminated groundwater would both be prevented by Beazer's recommended approach.

***EPA RESPONSE:*** *EPA has carefully considered Beazer's assertions, but does not believe they are correct. The PRAP does not assert a position regarding the potable status of the Columbia aquifer; only to restore ground water to beneficial use to the maximum extent practicable outside of the containment area through consolidation only. Any remaining residual contamination would attenuate through physical and biological processes.*

Furthermore, even if the potable water ARARs were appropriate for this Site, a position with which Beazer does not agree, it is widely recognized that technical impracticality waivers are considered appropriate for these types of sites (EPA, 1993 and 1995) Because of these reasons, an ARAR waiver for the impacted portion of groundwater in the Columbia Formation at the former Koppers Co. Inc. Site would be appropriate given the following.

- Shallow groundwater has already been determined to be undesirable as a supply of potable water in New Castle County,
- No proven technologies exist that could restore impacted shallow groundwater to drinking water standards at the Site;
- Any serious efforts at exploiting shallow groundwater as a potable supply would likely result in greater risk to human health and the environment due to salt water intrusion; and
- The EPA has already approved an ARAR waiver for shallow groundwater in the Columbia Formation for similar reasons at the adjacent E I DuPont de Nemours & Co., Inc. Pigment Plant Landfill Site

***EPA RESPONSE:*** *EPA has considered Beazer's assertions, and does not believe they are correct. The PRAP does not assert a position regarding the potable status of the Columbia aquifer, which has been addressed in previous responses. EPA has not designated the aquifer as a potential drinking water aquifer, but EPA does expect to restore ground water to its beneficial use, to the maximum extent practicable. Again, the issue of ground water restoration to beneficial use has been addressed in previous responses.*

2.5 ISSUE 5: REMEDIATION FOR A SPECIFIC SITE REUSE

Beazer objects to EPA's PRAP in that it assumes that the future reuse of the Site will include wetlands banking, a fact that drives enormous increases in costs to implement such reuse. Although Beazer recognizes the benefits of combining remediation with future reuse, we are not willing to finance the incremental future reuse costs, particularly those associated with specific reuse as a wetlands bank or as the location of a drinking water supply reservoir. Two very significant cost components in EPA's recommended remedy include: 1) costs to consolidate/dispose of an estimated 423,000 CY of excavated soil (currently considered acceptable for offsite reuse) if offsite reuse is deemed unacceptable or an offsite use cannot be identified; and 2) a wetland developer willing and able to cover the estimated $8.5 million to construct the wetlands. The EPA would therefore either have to wait for a third party investor in wetlands to commit, or allow for a lesser, more reasonable, amount of soil excavation and surface restoration as part of the remedy.

***EPA RESPONSE:*** *EPA has considered Beazer's assertions, but does not believe that they are correct. As stated in the PRAP, the sediment cleanup criterion is to apply to those soils where wetlands will be created. Regarding matters of cost, please see the attached discussion of cost estimates, and please also refer to Beazer's own supplemental cost estimates for various components of the remedy. Note that PRAP Alternative 3 details what a 2-foot excavation of soil with backfill and cover would cost. Soil excavation for Alternative 3 totaled approximately $7.2M, while soil excavation in Alternative 4 totaled approximately $8.4M - while this is a significant difference, it is not as large a difference as suggested in the comment. As discussed earlier in this document, note that the original cost estimates in the 2003 FS Addendum (FS Alternative 10) split the cost of deeper soil excavations (beyond that required by the remedy) between the remedy and the "wetlands developer". EPA adopted this approach in order to be consistent for the purposes of comparison, but is not requiring the further excavations of materials to create a wetlands bank, as that is not part of the selected remedy. Rather, as stated in the PRAP, EPA's selected remedy is compatible with that potential future use, should such a use materialize in the future.*

*The PRAP does not assert a position regarding future use, and specifically mentions that EPA has generally little input regarding future use. Beazer, in its submittals to EPA has identified a possible future use scenario. The PRAP does identifies portions of the Site could be available for future use, with restrictions placed on use of the containment area.*

Beazer does not believe that either CERCLA or the NCP require that the EPA alter its remedy selection in order to accommodate a future use option that has been neither fully evaluated nor finalized. The appropriate reuse determination for the Site is within the Site owner's discretion and cannot be mandated by the EPA in a PRAP.

To summarize, Beazer believes that it is feasible to initiate some of the elements of the remedial action based on protection of human health and the environment, and upon establishing viable Site reuse, then complete remediation of the Site, consistent with the viable redevelopment plan

***EPA RESPONSE:*** *The PRAP does not assert a position regarding future use, and specifically mentions that EPA has generally little input regarding future use. Beazer, in its submittals to EPA has identified a possible future use scenario. The PRAP does identifies portions of the Site could be available for future use, with restrictions placed on use of the containment area.*

2.6 ISSUE 6: PRESCRIPTIVE REQUIREMENTS

The PRAP contains arbitrarily mandated prescriptive elements of the remedy that are likely to change during the remedial design process or during further implementation of remedial action at this Site. These include:

- Two onsite landfills covering 38 acres (consolidation areas). The objective in these areas is to contain mobile DNAPL. In the design, one or more areas may be selected The designs will be based on further investigative work and groundwater modeling to locate and size the containment areas.
- Soils from approximately 39 acres of uplands would be excavated The remedial design would select areas to be excavated and these are likely to be different. Specific areas to be excavated would be identified as part of the remedial design.
- Passive DNAPL recovery trenches and drainages. As discussed above, the specific DNAPL removal technology should be based on science established through pilot testing, and not an arbitrarily selected high cost technology.

***EPA RESPONSE:*** *EPA agrees that the PRAP identifies remedial components of the selected remedy. During Remedial Design, it is appropriate for the implementation of the remedial components to be planned for with specificity—for example the location and size of the containment system will be determined. Furthermore, the passive recovery trenches and drainages were selected as a remedial component. They are well understood to be more effective and less costly than recovery wells, and therefore, EPA believes they are less costly technology for DNAPL recovery. This "balancing" was discussed in the PRAP. Other effective options include in-situ or ex-situ thermal treatment and are fully discussed in the FS and PRAP.*

Beazer believes that it is unnecessary and unreasonably restrictive to incorporate these requirements into the preferred remedy at this stage. EPA's insistence on these premature requirements is particularly problematic to Beazer because we cannot determine from the PRAP whether these costs have been included within the total costs picture provided by the EPA To the extent that the costs do not include these prescriptive components, Beazer believes that the EPA has not complied with its duty under the NCP to fairly apprise the stakeholders of the costs of the preferred remedy.

***EPA RESPONSE:*** *EPA has carefully considered Beazer's assertions, and does not believe they are correct. It is appropriate for area and volume estimates, with exact delineations, are deferred to the RD. The PRAP clearly details assumptions for the cost estimates, which are well documented in the AR and were presented to the NRRB in detail. Please note that EPA's cost estimates are based on Beazer's estimates, with greater detail added and a number of refinements made by EPA to account for discrepancies.*

**3.0 SPECIFIC PAGE BY PAGE ISSUES**

1. Page 1 - EPA's stated goal of " restoring groundwater to its beneficial use as a potential drinking water aquifer." ignores the technical impracticability of achieving such a goal. Beazer incorporates by reference its discussion regarding this issue elsewhere in these comments and in the cover letter. This goal is used throughout the PRAP to justify the removal and management of thousands of yards of soil at increased cost without the application of previously calculated present or future predicted risks posed by the Site. The EPA is also acting contrary to the recommendations issued by the NRRB on June 14, 2004, which stated that the preferred alternative should identify only those CERCLA remedial actions necessary for a protective remedy. This overriding theme adds significant and unnecessary costs to the remedy.

***EPA RESPONSE:*** *EPA has carefully considered Beazer's assertions, and does not believe that they are correct. The NRRB requested that the PRAP be modified to include a more detailed* *justification of the remedial actions. EPA provided this justification. The NRRB did not suggest that there was a lack of justification or that such justification was not possible, as the comment suggests.*

Restoration of impacted groundwater at former creosote wood treating facilities has proven to be both complex and technically infeasible at a growing number of sites. Several relevant quotes from a report developed by an EPA - convened expert panel that examined the issue of DNAPL source depletion (EPA, 2003b) are provided below which support this:

- As far as the Panel is aware, there is no documented, peer-reviewed case study of DNAPL source zone depletion beneath the water table where U.S. drinking water standards, or MCLs have been achieved and sustained throughout the affected subsurface volume, regardless of the in-situ technology applied."
- " it is highly uncertain that MCLs can be achieved in source zones impacted with DNAPLs in most geologic settings."

***EPA RESPONSE:*** *The NRRB is a peer-review process, which subjects EPA's remedies to a high-level of scrutiny. The Koppers Site PRAP was reviewed, commented upon and accepted by the Panel. The Final Report of the NRRB accepted that excavation can be 100% effective; passive NAPL recovery will recover DNAPL and will provide for a safe preferential pathway, which is necessary since neither a safe pathway nor effective containment now exist.*

This goal is also inconsistent with the ROD issued for groundwater media at the neighboring DuPont Newport Superfund Site for the same aquifer. Beazer would recommend that the EPA provide flexibility in the PRAP to incorporate the application of ARAR waivers, common for many RODs issued for sites containing DNAPL.

***EPA RESPONSE:*** *EPA has carefully considered the assertions posed by Beazer. However, EPA believes that based upon the extensive study of creosote NAPL at the Site, the selected remedy will address the risks posed by the hazardous substances. Additionally, with respect to the ROD issued for the DuPont (Newport) Site, although similarities exist between Superfund sites, EPA's remedies are Site-specific with remedial components identified through the nine criteria set forth in the NCP. ARARs and performance standards are determined for each remedial component identified for the Site. Therefore, the ROD for the DuPont (Newport) Site may be distinguished on many bases and is not relevant to the Koppers Site.*

2. Page 2, paragraph 1 - The PRAP states that DNAPL material would be excavated "to the maximum extent practicable," correctly recognizing that removal of "all" DNAPL is not likely Given this statement, it is inconsistent for the EPA to assume and state in the following paragraph that " groundwater at the Site would be restored to its beneficial use (as a potential source of drinking water)." The requirement for removal of subsurface DNAPL outside of the containment area should be eliminated from the PRAP.

***EPA RESPONSE:*** *"Practicable" is generally defined as "capable of being accomplished." While EPA recognizes that recovery of all NAPL is difficult and may present implementability challenges during construction of the remedy, EPA believes that this does not make it impracticable.*

3. Page 2, paragraph 3 - It appears that future Site use has played a role in supporting the EPA's decision to recommend extensive deep upland Site excavation (see also page 35, State Acceptance). The NRRB seems to have made similar observations, and rightfully noted, "The

preferred Alternative should identify only those CERCLA remedial actions necessary for a protective remedy." While the EPA noted in its response to NRRB comments that extensive upland removal was necessary to restore the Columbia aquifer (due to EPA's "general" expectation" at Superfund sites to return groundwater to its beneficial use), restoration as EPA has suggested is neither technically supportable, nor appropriate given the Site setting/history. In the absence of risk or a defined reuse plan with financial backing, extensive deep upland excavation is not justified and should not be a part of any Proposed Plan for the Site. The PRAP should specifically state that no remedial measures proposed at the Site are driven by expectations of some "undefined possible future land use."

***EPA RESPONSE:*** *EPA has carefully considered Beazer's assertions and does not believe they are correct. EPA has not made a designation regarding future use of the Site. The PRAP states that EPA makes no decisions regarding future use of a property (except where Institutional Controls restricting certain uses are warranted for the protection of human health and the environment and to ensure the integrity of the remedy).*

4. Page 2 - The EPA's discussion of the use of institutional controls to restrict the installation of drinking water wells is incompatible and appears to be counter to its stated goal of restoring groundwater to its beneficial reuse as a drinking water supply.

***EPA RESPONSE:*** *EPA has carefully considered Beazer's assertions, and does not believe that they are correct. There is an hydraulic connection between the Columbia and Potomac aquifers. The Columbia is designated by the State as a potential drinking water source; the Potomac is a drinking water aquifer. Wells in the Potomac in the vicinity of the containment area would have the potential to draw contamination downward out of the containment area and into the Potomac. Therefore, consistent with CERCLA and the NCP, it is the goal of the Superfund program to restore ground water to beneficial use to the maximum extent possible. The Institutional Controls of restricting the installation of drinking water wells are warranted at this time in light of the high levels of creosote NAPL in the ground water. Also, the State may extend a Ground Water Management Zone in this area, both to protect public health and to minimize the potential for the downward migration of NAPL through well pumping that could affect the hydraulic regime at the Site.*

5. Page 2 - Beazer has not been provided with a copy of the comments and statement of position received from the Delaware Department of Natural Resources and Environmental Control (DNREC) by the EPA to understand how these were utilized in preparation of the PRAP. Beazer assumes that these documents will be included in the Administrative Record for review by the stakeholders. This statement is reiterated on Page 35

***EPA RESPONSE:*** *As stated in the PRAP, DNREC has expressed its support for the proposed remedy, but actual concurrence is not received on the PRAP; rather, it is evaluated for the ROD. DNREC's letter of concurrence or non-concurrence will be included in the Administrative Record with the ROD.*

6 Page 8 - The EPA has failed to provide the reference or source used to determine that the extent of DNAPL zones is approximately 82,000 CY.

***EPA RESPONSE:*** *The FS submitted by Beazer did not provide clear estimates of affected acreage or potential volumes of soil or sediment to be cleaned; therefore, EPA developed these estimates using data, maps, figures and tables provided by Beazer during the RI/FS to provide a certain degree of specificity based upon all the available Site information.*

7 Pages 8/9 - The EPA raises the concept of the "halo" effect stating that DNAPL related constituents " are not migrating in ground water" and that the " plume exists in ground water only very near the NAPL itself, like a halo, and is quickly attenuated in only a short distance". Beazer concurs with these conclusions and therefore does not understand why later on in the PRAP, the EPA uses DNAPL to justify the extensive removal and containment of thousands of cubic yards of soil without any corresponding risk justification.

***EPA RESPONSE:*** *Creosote DNAPL is often mobile or readily mobilized. The DNAPL at the Site is mobile. EPA, USFWS, DNREC and others have witnessed flowing liquid creosote at this Site. Beazer's own contractors have witnessed DNAPL accumulations in wells "disappear." The actual cleanup goals include consolidating all DNAPL, with excavation considered complete once TPAH levels are below the soil or sediment cleanup goals listed in the PRAP.*

8. Page 9 - states that DNAPL or highly contaminated sediment is present through " virtually the entire length of Hershey Run " Beazer disagrees with this statement and to the best of Beazer's knowledge; the EPA has not disclosed the data and supporting information that were used to reach this conclusion

***EPA RESPONSE:*** *EPA carefully reviewed the analytical data to which Beazer is referring, most of which was obtained from sediment samples taken from the 0-0.5 feet interval in Hershey Run, as well as the detailed boring logs and first-hand accounts that support EPA's position with regard to the channel and the overbank wetlands. This information may be found in the Administrative Record for the Site, in the RI/FS documents.*

9. Page 9 - The EPA makes a claim that DNAPL has been mobile and migrating for over 24 years. This appears to be counter intuitive to other statements made by the EPA that the material is quickly attenuated in the subsurface. Beazer expects that such hypothetical conclusions will be excluded from the PRAP unless factual evidence throughout the entire time interval, is presented to support this statement

***EPA RESPONSE:*** *EPA has carefully considered Beazer's assertions, and believes that they are not correct. It is important to distinguish between NAPL, which does not attenuate in the subsurface below the water table, and a limited aqueous phase plume of sparsely soluble constituents, which are somewhat readily attenuated because in general it is the low-molecular-weight constituents that are sparsely soluble. It is those same constituents that tend to be degradable in the aqueous phase. This information may be found in the Administrative Record for the Site, in the RI/FS documents.*

10. Page 9 - The fish tissue survey referred to is a Hershey Run mummichog histopathology report (Harshberger, 2003). That report was not used as a line of evidence in the final ecological risk assessment (ERA) for the Site (EPA, 2003a), but is presented as such in the PRAP, citing as evidence of effects a reported 40% prevalence of liver tumors in fish collected from Hershey Run. To be more accurate, the Harshberger report only found a 30% prevalence of liver tumors (hepatocellular carcinomas), with precursor alterations in another 6% of the 30 fish sampled. The Harshberger report concludes that Hershey Run is "confirmed to be a hazardous waterway," but provides no context as to what exactly is meant by that statement with regard to the results presented. A fundamental problem with the histopathology report is that no fish from any reference locations were evaluated. Consequently, there is no way to contrast prevalence of tumors in mummichog from Hershey Run with typical background levels and, therefore, no way to put these reported results into a proper risk perspective.

*EPA RESPONSE: The 2003 report has been supplemented by a subsequent report, published in late 2004, in which numerous other waterways (or "reference locations") in the area are compared to Hershey Run with striking results: Hershey Run is indeed far worse off than any other waterway, and is clearly a "hazardous waterway." A copy of this report is included in the Administrative Record.*

11. Page10 - Beazer agrees with the EPA that the Site could not be used for residential purposes and therefore questions the EPA's rationale for issuing a goal to clean groundwater to drinking water quality. While Beazer understands it is the EPA's general expectation at Superfund sites to return groundwater to its beneficial use, for reasons presented in General Comment 4, Beazer believes it is both unnecessary and unachievable (not driven by risk), and given the cost to implement, should be eliminated as a remedial goal for the Site.

*EPA RESPONSE: EPA has considered Beazer's comments and does not believe that they are correct. Neither EPA's rationale nor the stated goal in the PRAP mention cleaning "groundwater to drinking water quality." EPA is aware that the Columbia's natural condition does not necessarily make it suitable for drinking without treatment, and would refer Beazer to the actual text of the PRAP which clearly refers to the Columbia aquifer as a state-designated "potential drinking water aquifer."*

12. Page 10 - Beazer disagrees with EPA's statement that " the risk from exposure to soil and sediment may be underestimated" and requests that such speculative statements be retracted While Beazer does not deny that potential risks may exist, many of the components of the human and ecological risk assessments are based on generally conservative assumptions, suggesting that actual risks are less than those estimated. With specific regard to surface soils, the EPA correctly states on Page 8:

"Deposits of NAPL were observed in surficial soils of the Upland Area, primarily in the Process, Drip Tank, and Wood Storage Areas (Figure 4). Other smaller deposits were observed along the access road leading to the southwest corner of the uplands and in the South Ponds and K Areas. In surface soils of these areas, creosote was found in a dry weathered form, typical of creosote NAPL and tar-like material that has been significantly weathered and dried over time. As a result, the material appeared to be immobile and it possessed little detectable odor."

Given this, one would expect risks due to dermal exposure to PAHs by trespassers to be overestimated, not underestimated.

*EPA RESPONSE: EPA has carefully considered Beazer's assertions. EPA believes that Beazer is likely more familiar with creosote constituents, NAPL and PAHs in general than most citizens. As such, EPA expects that Beazer is familiar with the known contact hazards presented by a large number of the constituents in creosote. Since these constituents do not appear in the dermal exposure risk assessment scenarios (because they are known contact hazards and do not have associated risk parameters to estimate their potential for risk), any such scenario would therefore underestimate risk whenever actual creosote NAPL would be encountered (for example, NAPL pools in soils or NAPL releases from sediments).*

13. Page 13 - Beazer disagrees with the conclusion that plant community observations corroborate risks associated with creosote contamination in upland soil communities. The ERA for the Site (EPA 2003a) indicates that upland vegetation is adversely affected in areas of high PAH concentrations, but provides no quantitative data to support this assertion. Site surveys show high plant diversity in areas not directly affected by creosote, suggesting that

upland communities over much of the Site are unaffected, and effects that are observed may be due to hard matrix effects of creosote, not phytotoxicity.

***EPA RESPONSE:*** *EPA has carefully considered Beazer's assertions, and does not believe that they are correct. EPA's conclusions are based on a complete consideration of the Ecological Risk Assessment, which accorded the most significance to the evidence derived from the toxicity testing.*

14. Page 14 - The ERA synopsis notes that the distribution of PAH concentrations in soil and sediment did not generate a gradient of toxicity responses, which presented technical difficulties in the risk calculations. However, as Beazer has noted in previous submissions, there are statistical methods that can deal with dose-response data of the type observed in bioassays performed with Koppers sediment and soil For example, a point estimate approach can be applied to use regression statistics for all of the data in a concentration-response series to derive an effective concentration that corresponds to a selected response level and unlike a no-observed-adverse-effect level (NOAEL) or lowest-observed-adverse-effect level (LOAEL), is not constrained to be one of the tested concentrations. As noted, based on available data there is little difference in the areal extent of sediment or soil where PAH concentrations exceed effective concentration values versus the extent that exceeds EPA's RAOs based on NOAEL and LOAEL values Thus, while remedial decisions may be comparable, EPA should have considered alternative statistical approaches when determining effects thresholds.

***EPA RESPONSE:*** *EPA has carefully considered Beazer's assertions, and notes that the previous submittals mentioned in the comment were considered and responded to, with the result being that EPA remained confident with the conclusions of the Ecological Risk Assessment.*

15. Page 15- Table 1 lists southern leopard frogs (Rana pipiens) as the ecological receptor, and states that the weight of evidence concludes that "risk exists, effects levels consistent with other sediment contamination related risks." In fact, toxicity tests were performed using an exotic species, the African clawed frog, Xenopus laevis, as a test surrogate because of problems maintaining Rana pipiens in laboratory conditions. While not inappropriate to use surrogate species, the summary should note that the results are not derived directly from the selected ecological receptor. Furthermore, Beazer's review of the test data has shown consistently high mortality rates in control groups and in groups tested using reference location samples. This consistently high control and reference mortality indicates problems with the Xenopus bioassay and that this line of evidence should not be considered as sufficient to conclude that risk exists to amphibians at effect levels consistent with other sediment related risks.

***EPA RESPONSE:*** *The PRAP describes the complete list of lines of evidence listed in the comment, and specifically addresses the weight of each line of evidence. A more complete discussion is presented in the Ecological Risk Assessment. The data support EPA's conclusions.*

16. Page 15 - Evaluation of potential effects of Site contaminants to fish populations was assessed on four lines of evidence in the ERA (EPA, 2003a). Greatest weight was given to an indirect effect, benthic macroinvertebrate toxicity, and Beazer is still unclear how this represents the best measurement of direct toxicity to fish. The second line of evidence used was short-term toxicity testing with mummichog (*Fundulus heteroclitus*). The tests were subject to high control mortality (33%), which renders this dataset unsuitable for quantitative use in risk characterization. As noted above, the fish histopathology analysis was not included as a line of evidence in the ERA, and technical problems indicated previously limit the

relevance of conclusions presented in the ERA report Based on these issues, Beazer does not understand how the ecological risk synopsis can conclude that PAHs pose ecological risks to fish, as stated in the last paragraph on page 15.

***EPA RESPONSE:*** *The PRAP describes the complete list of lines of evidence listed in the comment, and specifically addresses the weight of each line of evidence. A more complete discussion is presented in the Ecological Risk Assessment. The data support EPA's conclusions.*

17. Page 15 - Beazer disagrees with the statement that "vegetation surveys conducted during the Remedial Investigation showed negative effects of contaminants on upland plants, particularly in areas of visible contamination." As noted above, the ERA (EPA 2003a) provides no quantitative data to support this assertion or evidence that effects are due to phytotoxicity, rather than a lack of pervious ground suitable for rooting due to hard matrix effects of creosote.

***EPA RESPONSE:*** *EPA has carefully considered Beazer's assertions, and does not believe that they are correct. The PRAP describes the complete list of lines of evidence listed in the comment, and specifically addresses the weight of each line of evidence. A more complete discussion is presented in the Ecological Risk Assessment. The data support EPA's conclusions.*

18. Page 15 - Beazer strongly believes that the statement, "In summary, it is concluded that PAHs pose ecological risks to upland, wetland, and aquatic communities at the Site, specifically to organisms low in the food chain (i.e., earthworms, insects, shelled organisms, fish and frog embryos, and both upland and aquatic plants)" grossly overstates the extent of risk to ecological communities by not sufficiently considering all available lines of evidence All conclusions regarding ecological risk are based on results of sediment and soil toxicity tests using Site media, as are the sediment and soil cleanup criteria Other lines of evidence, such as surveys of benthic invertebrate communities or wetland and upland plant communities do not support these conclusions. Furthermore, technical problems with fish and frog toxicity tests, as described above, limit the ability to use these lines of evidence in making conclusions of risk to fish and amphibian communities.

***EPA RESPONSE:*** *The PRAP describes the complete list of lines of evidence listed in the comment, and specifically addresses the weight of each line of evidence. As discussed in both the PRAP and the Administrative Record, the toxicity data provided the clearest indication of ecological risk, and therefore were accorded more weight in the risk assessment. A more complete discussion of the lines of evidence, their respective weights in reaching a conclusion, and the technical issues encountered is presented in the Ecological Risk Assessment.*

19. Page 15 - The EPA recognizes in footnotes 2/3 that zinc (a non-Site-related constituent) poses an ecological risk at the Site but has not addressed zinc from a source control standpoint. Beazer believes that even if the wood treating constituents were addressed to EPA's satisfaction at the Site, that the Site would be not be completely protective of human health and the environment due to the presence of zinc from offsite sources. The EPA has failed to address how zinc impacts at the Site are to be addressed as part of the PRAP

***EPA RESPONSE:*** *The PRAP notes that zinc in sediments generally coincides with high levels of total PAHs in sediments, and will be successfully addressed via containment along with the PAH-contaminated materials.*



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20. Page 17 - As previously mentioned, the EPA's treatment of DNAPL is linked with the concept of restoring groundwater to drinking water quality as a new RAO while generating no further incremental protection of human and health and the environment offered by the selected remedy discussed later in the document. In fact, there are several other alternatives that would provide an "equivalent standard of performance" as provided under CERCLA 121(d)(4)(D). This provision allows for one alternative if a potable water ARAR is ultimately determined to be appropriate, a position with which Beazer disagrees, that is, a waiver of an ARAR (i.e., restoring groundwater to drinking water standards) if "the remedial action selected will attain a standard of performance that is equivalent to that required under the otherwise applicable standard, requirement, criteria or limitation, through use of another method or approach". As previously discussed, there are other DNAPL source control technologies, in concert with soil management options previously reviewed in the FS, that can achieve the same level of protection, provide the same level of performance and offer the same future reliability and thus can be considered "equivalent". Therefore, the RAO of restoring groundwater to drinking water standards should be eliminated from the PRAP.

***EPA RESPONSE:*** *Please see previous responses regarding ground water cleanup and restoration of ground water to beneficial use to the maximum extent practicable.*

21. Page 18 - A number of the RAOs specified by EPA should be eliminated, or modified in a manner consistent with that specified in EPA's RI/FS guidance document (EPA, 1988). As noted in the guidance document:

"Remedial action objectives consist of medium-specific or operable unit-specific goals for protecting human health and the environment. The objectives should be as specific as possible but not so specific that the range of alternatives that can be developed is unduly limited."

"Remedial action objectives for protecting human receptors should express both a contaminant level and an exposure route, rather than contaminant levels alone, because protectiveness may be achieved by reducing exposure (such as capping an area, limiting access, or providing an alternate water supply) as well as by reducing contaminant levels."

Several of the RAO's provided by the EPA actually specify a remedial technology and/or "unduly limit" the range of alternatives considered or viable as remedial approaches Examples include:

- RAO-1, which excludes capping and institutional controls as viable remedy components by specifying " reducing levels of total PAH concentrations to below 150 mg/kg and 600 mg/kg in soil " to prevent current or future direct contact;
- RAO-3, which specifically requires RAO achievement "through removal and/or containment"; and
- RAO-6, which specifies groundwater restoration to its beneficial use, without recognition of the potential impracticability of achievement[1], nor recognition that the RAO is not risk driven.

FOOTNOTE*1 There are countless examples of similar sites where this has been demonstrated to be infeasible. Not only is it difficult to thoroughly characterize the presence and extent of subsurface DNAPL at a site as complex and large as the Koppers Site, but EPA recognizes that some residual may remain behind during the proposed deep upland excavation activities (page 2, paragraph 1) in areas where DNAPL is known to be present Beazer believes that the burden rests upon EPA to provide the technical basis for concluding that at the Kopper's Inc. Site, achievement of drinking water status in the Columbia Formation is feasible.

***EPA RESPONSE:*** *EPA believes that the RAOs are appropriate and were developed in accordance with EPA guidance. Please see previous responses regarding ground water cleanup and restoration of ground water to beneficial use to the maximum extent practicable.*

22. Page 18 - The RAO-1 states that the cleanup number for soils is 600, but for soils where wetlands are to be created (as in EPA's preferred alternative), the clean up number shifts to 150 mg/kg. Beazer objects to this because it exceeds the actions "necessary for a protective remedy."

***EPA RESPONSE:*** *Please see previous response regarding volumes and cleanup criteria. As explained previously, in areas where wetlands are to be created, the sediment cleanup criterion applies.*

23. Page 18 - The EPA states that the Feasibility Study was used to develop remedial alternatives, and directs the reader to the Administrative Record if additional information regarding alternative development is required. Noting that the EPA has created a new list of remedial alternatives in the PRAP, Beazer requests that the EPA provide a more specific reference(s) to Administrative Record materials, which may support EPA's development/selection of alternatives.

***EPA RESPONSE:*** *The FS and numerous comments and meetings regarding the FS and FS Addendum are all well represented in the Administrative Record, and EPA believes that the PRAP clearly explains each included alternative.*

24. Page 19 - While Beazer understands that it is EPA's general expectation at Superfund sites to return groundwater to its beneficial use, there is sufficient Site-specific data to conclude that this is both unachievable (see general comment 4) and unnecessary (EPA does not believe the Site would be reasonably used for residential purposes and proposes institutional controls to "prevent residential use and the installation of drinking water wells on the property"). Returning the Columbia aquifer to drinking water status should be eliminated from the PRAP as a RAO and a Ground Management Zone (similar to the adjacent DuPont - Newport Superfund Site) should be assumed in perpetuity (similar to Alternatives 2 and 3).

***EPA RESPONSE:*** *Please see previous response regarding ground water cleanup and restoration to beneficial use.*

25. Page 19 - Beazer agrees that land-use restrictions should be a component of each active remedial alternative considered. As noted previously, implementation of groundwater and future land use restrictions at the Site should preclude the need to implement extensive (and expensive) active remedial measures which attempt to cleanup the shallow Site groundwater to drinking water quality.

***EPA RESPONSE:*** *Please see previous responses regarding potential future use and ground water cleanup and restoration to beneficial use to the maximum extent practicable.*

26. Page 20 - Beazer believes that the EPA has failed to provide the technical justification to support selection of the soil cover thickness (i.e., 2-foot soil cover with a burrow-inhibiting/layer)

***EPA RESPONSE:*** *EPA has considered Beazer's assertions, and does not believe they are correct. EPA notes the following as necessary: a one-foot clean soil layer would be underlain by a small buffer of soil and a stone layer to inhibit organisms known to inhabit the Site and which burrow well below one foot. (If only one foot of cover were used, organisms could burrow right into the contaminated material below.)*

27. Page 23 - Beazer believes that the EPA's soil removal volumes may be underestimated, given: 1) EPA's proposal to remove 2 feet of surficial soil to protect trespassers and ecological receptors (compared to 1 foot removal assumed by Beazer in the FS Report) (BBL, 2003); and 2) EPA's proposal to continue in these areas to remove all soils containing total PAHs in excess of 150 mg/kg, to depths up to 30 feet (Beazer did not assume such extensive removal in the FS Addendum).

***EPA RESPONSE:*** *Please see previous response regarding volumes and cleanup criteria.*

28. Page 23 - The cost description makes no reference to the estimated $8.5 million to be bourne by Wetlands developers (see Alternative 4 cost estimate), which is part of the total cost to implement the remedy (i.e. the cost to implement Alternative 4 would actually be $60.3 million). The EPA has failed to include these costs, which are critical for Beazer and the public to be able to evaluate its response to the PRAP.

***EPA RESPONSE:*** *Please see previous response regarding these costs, which are not part of the remedy, but rather of a potential future use. As discussed earlier in this document, note that the original cost estimates in the 2003 FS Addendum (FS Alternative 10) split the cost of deeper soil excavations (beyond that required by the remedy) between the remedy and the "wetlands developer". EPA adopted this approach in order to be consistent for the purposes of comparison, but is not requiring the further excavations of materials to create a wetlands bank, as that is not part of the selected remedy. Rather, as stated in the PRAP, EPA's selected remedy is compatible with that potential future use, should such a use materialize in the future.*

29. Page 23/24 - The description of soil removal under Alternative 4 indicates that 115,000 cy of soil will be excavated "in order to protect trespassers and ecological receptors" (i.e., same as Alternative 3), and that excavation would continue in these areas until "the total PAH concentration was 150 mg/kg or below, with excavation depths potentially reaching as deep as 30 ft bgs in a few locations, though the average excavation depths is expected to be 5 to 15 ft." While the excavation volume is never specified, it is likely significant, and appears to be proposed to support "one possible reuse of the Site - wetland excavation". Beazer requests that the EPA clarify both assumptions.

***EPA RESPONSE:*** *Please see previous responses regarding volumes and cleanup criteria, as well as the potential reuse of the site.*

30. Page 24 - Assumptions made by the EPA regarding the volume and ultimate disposition of excavated soil are not clearly described. While the text states 113,000 CY of soil would be excavated and consolidated into two onsite landfill, it also notes that 115,000 CY of surface soils will be excavated to protect trespassers and ecological receptors, with continued excavation as deep as 30 feet to achieve 150 mg/kg. The EPA has failed to clarify its assumptions of costs or volumes. In addition, Beazer does not believe that the onsite landfills have been costed to handle such a capacity.

***EPA RESPONSE:*** *Please see previous response regarding volumes. In addition, in Beazer's response to EPA comments, Beazer stated that the volume capacity of the landfills as drawn*

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*was approximately 1,000,000 cubic yards. EPA does not anticipate approaching this capacity.*

31. Page 24 - The EPA has failed to provide an adequate description of the sediment removal volumes estimated from various portions of the Site, which apparently total 75,000 CY, once stabilized. The EPA must specify these volumes particularly as referenced in Alternative 4.

***EPA RESPONSE:*** *EPA has considered Beazer's assertions, and does not believe they are correct. In both the text and the figures of the PRAP, the volumes were clearly stated and drawn, with assumptions regarding the potential need to add amendments for geotechnical purposes also clarified. Please refer again to this text and to Figure 6, "Hershey Run Marsh and West Central Marsh Volume."*

32. Page 24 - The PRAP text again notes that excavating of DNAPL at depths up to 30 feet is proposed, "In order to achieve the restoration of ground water " As noted previously, there is sufficient Site-specific data to conclude that restoring the Columbia aquifer to drinking water standards is unachievable, unnecessary (the EPA has noted in the PRAP that it does not believe the Site would be reasonably used for residential purposes, and proposes institutional controls to "prevent residential use and the installation of drinking water wells on the property"), and inconsistent with the decision documented in the ROD for the adjacent E I DuPont de Nemours & Co. Inc Pigment Plant Landfill Site (see general Comment 4).

***EPA RESPONSE:*** *EPA has considered Beazer's comments and does not believe that they are correct. Neither EPA's rationale nor the stated goal in the PRAP mentions cleaning "groundwater to drinking water quality." EPA is aware that the Columbia's natural condition does not necessarily make it suitable for drinking without treatment, and would refer Beazer to the actual text of the PRAP which clearly refers to the Columbia aquifer as a state-designated "potential drinking water aquifer."*

33. Page 25 - The EPA has unnecessarily specified a passive DNAPL recovery system within the onsite consolidation areas, as "EPA believes that DNAPL recovery would successfully and significantly reduce the volume of mobile DNAPL at the Site" (see General Comment 3). Beazer believes that the EPA has failed to provide technical justification for its inclusion, given the following:

    a The proposed remedy currently includes construction of a barrier wall around the consolidation areas, keyed into an underlying confining unit and covered with a low permeability cover which should adequately contain any mobile DNAPL, and
    b Only two Site monitoring wells (i e MW-2 and MW-8, both with recorded DNAPL thickness of less than 0.01 foot in 2003) have ever historically had DNAPL accumulations, and data collected from these wells was not encouraging regarding the practicability of removing significant quantities of DNAPL.

***EPA RESPONSE:*** *EPA has carefully considered Beazer's assertions, and does not believe that they are correct. As has been discussed in numerous documents over the past several years, neither the data presented, nor literature of local geology reviewed support the claim of a continuous clay layer. The Columbia and Potomac Formations are fluvial in origin, and as such are laterally quite variable. They have been described in the literature as an "interconnected system," and as having variegated clays with interbedded silts, sands and gravel. While some of the boring logs for the Site describe the "clay," the lab analytical data for some of those same samples identify particle size distributions more consistent with silt or sand, not clay. The ground water data for the Site also indicate a connection between the Columbia and Potomac aquifers (e.g., similar flow direction, similar response to tidal* *fluctuations, and varying differences in hydraulic head). EPA understands that there may exist a competent clay layer functioning as an aquitard between these aquifers at other Sites, but at this Site, which is especially large in size, it is not surprising to find the lateral variability of these deposits occurring within the Site boundaries.*

*The data indicate, and it is supported by the literature reviewed by EPA, that there is not likely a continuous clay layer beneath the Site. There are areas where lenses or stringers of clay with low permeability will inhibit downward flow of both ground water and NAPL, but due to the lateral variability and heterogeneity of the subsurface materials, the "clay layer" does not present the kind of vertical barrier to contaminant transport that the Beazer describes.*

*A passive NAPL recovery trench can work to recover product despite the heterogeneous subsurface lithology, whereas pumping NAPL from a well would be severely hampered by this heterogeneity. A well can only intersect a one-inch creosote-saturated sand seam for the diameter of the well screen, but a recovery trench will intersect the same sand seam for the entire length of the trench. Note that a one-inch sand seam 1/8th of a mile long would be roughly equivalent to a 7-foot diameter sand-filled pipe; a recovery trench built to intersect such a seam could recover copious amounts of NAPL. EPA did not propose NAPL recovery using wells because such attempts would not work at this Site. Please also note that the NAPL that had accumulated in the two wells cited did not simply disappear, but rather moved away from the wells.*

34 Page 27 - In the "Evaluation of Alternatives", the EPA has rightfully recognized the importance of RAO achievement when comparing and selecting remedial Alternatives As noted in Specific Comment 21, a number of the RAOs specified by EPA are inappropriate, and if developed consistent with EPA guidance on RAO development (EPA, 1988), could very likely have resulted in selection of Alternative 3. Beazer requests that the EPA revise the RAOs in a manner consistent with EPA guidance and revise the comparative analysis accordingly to confirm that an appropriate remedy is selected for the Site

***EPA RESPONSE:** EPA has considered Beazer's assertions and does not believe they are correct. The RAOs were developed in accordance with EPA guidance, and the selected remedy was proposed after careful consideration of all the Site-related data balanced against the nine criteria for remedy selection.*

35. Page 29 - Regarding EPA's failure to provide technical justification to support the conclusion that Alternative 4 will restore groundwater to its beneficial use, see previous comments.

***EPA RESPONSE:** EPA has considered Beazer's assertions and does not believe they are correct. The RAOs were developed in accordance with EPA guidance, and the selected remedy was proposed after careful consideration of all the Site-related data balanced against the nine criteria for remedy selection.*

36. Page 29 - The EPA has concluded that for Alternative 2, natural recovery would not reduce the risks posed by sediments in lower Hershey River "because of the amount of contamination present." This statement is not supported by any data that Beazer is aware of, and ignores the potential benefits of source control activities (proposed as part of Alternative 2) at accelerating the natural recovery process (a concept supported by EPA's OSWER Directive titled Principles for Managing Contaminated Sediment Risks at Hazardous Waste Sites [EPA, 2002]).

As discussed in the FS Report (BBL, 2003) the presence of DNAPL noted during the investigation was generally limited to the centerline of the channel in the lower portion of Hershey Run and the majority of DNAPL observations were deeper than the 0- to 6-inch depth interval (i e bioavailable zone). Geochronologic-dating information collected from the Hershey Run Drainage Area indicates that deposition of new material is occurring at a rate between 0 24 and 0 36 inch per year. As such, the drainage basin is considered to be a net sediment deposition area, with clean sediment (assuming upland source control is completed as in Alternative 2) gradually providing a cover for impacted sediments (Section 3.4 of the RI Report [BBL, 2002]) In addition to the deposition of new material, the weathering of existing PAHs in sediments (BBL, 2002) would also continue to reduce concentrations over time. Again, Beazer believes that the EPA has failed to provide the technical justification for the statement regarding natural recovery, and requests that it be revised to more accurately reflect data collected during the RI/FS, giving due consideration to the potential benefits of upland source control as a remedy component

***EPA RESPONSE:*** *EPA has carefully considered Beazer's assertions, and does not believe that they are correct. Source control does not "accelerate natural recovery." It stops ongoing releases, and where appropriate, may allow for natural recovery to then occur. As stated previously, Beazer has failed to recognize that NAPL throughout the sediments of Hershey Run is source material and thus qualifies as needing source control, and at such high concentrations as to be considered a source, will not naturally degrade in any reasonable timeframe. Please see previous response regarding "natural encapsulation" (the deposition of new material) and erosion.*

37. Page 31. As noted by the EPA, "The preamble to the NCP explains that for groundwater, remediation levels should generally be attained throughout the contaminated plume or at and beyond the edge of a waste management area when waste is left in place (55FR 8753)." (emphasis added) Consistent with the latter part of this statement, EPA recognized earlier in the PRAP that Site-related impacts to groundwater have only been noted in close proximity to source material As correctly stated on pages 8 and 9 of the PRAP·

"Groundwater analytical data have shown that creosote NAPL constituents are not migrating in ground water This is consistent with the low solubilities of creosote and PAHs Where constituents have been detected, borings have shown that NAPL is present in very close proximity. The plume exists in ground water only very near the DNAPL itself, like a halo, and is quickly attenuated in only a short distance."

Given this, Beazer disagrees with EPA's rationale for including a very extensive and costly subsurface soil excavation program in the proposed remedy.

***EPA RESPONSE:*** *EPA has carefully considered Beazer's assertions, and does not believe that they are correct. As stated throughout the PRAP and in previous responses to comments submitted, the excavation of source material is expected to result in the eventual elimination of any ground water contamination. The source material itself is a principal threat waste and warrants remediation.*

38. Page 33 - Beazer believes that the EPA has understated some of the implementation challenges which will be posed by Alternative 4, including digging up to 30 feet deep (and below the water table) in soils, up to 13 feet deep in the marsh/Hershey Run sediments, and removing "all subsurface NAPL" to achieve drinking water standards in the Columbia aquifer Please either provide text down playing what we perceive as the potential complexities of performing these activities, or give them due consideration when selecting the final remedy

***EPA RESPONSE:*** *EPA has considered Beazer's comments and does not believe that they are correct. Neither EPA's rationale nor the stated goal in the PRAP mentions cleaning "groundwater to drinking water quality." EPA is aware that the Columbia's natural condition does not necessarily make it suitable for drinking without treatment, and would refer Beazer to the actual text of the PRAP which clearly refers to the Columbia aquifer as a state-designated "potential drinking water aquifer." The PRAP does not specify "drinking water standards" as Beazer incorrectly asserts. EPA is aware of the technical challenges posed by excavation, and has considered these carefully in the PRAP and the ROD.*

39 Page 34 - As noted previously, Alternative 4 has failed to consider and include the additional $8.5 million that would be required by a wetlands developer to perform deep excavation and wetlands construction.

***EPA RESPONSE:*** *EPA has considered Beazer's assertions, but does not believe that they are correct. Regarding matters of cost, EPA has prepared an extensive analyses of costs, which is attached hereto. Beazer's submittal to EPA of supplemental cost estimates or various components of the remedy were carefully reviewed and considered in EPA's discussion of the cost criterion. Note that PRAP Alternative 3 details what a 2-foot excavation of soil with backfill and cover would cost. Soil excavation for Alternative 3 totaled approximately $7.2M, while soil excavation in Alternative 4 totaled approximately $8.4M - while this is a significant difference, it is not as large a difference as suggested in the comment. As discussed earlier in this document, note that the original cost estimates in the 2003 FS Addendum (FS Alternative 10) split the cost of deeper soil excavations (beyond that required by the remedy) between the remedy and the "wetlands developer". EPA adopted this approach in order to be consistent for the purposes of comparison, but is not requiring the further excavations of materials to create a wetlands bank, as that is not part of the selected remedy. Rather, as stated in the PRAP, EPA's selected remedy is compatible with that potential future use, should such a use materialize in the future. The text of Alternative 4 clearly states that the additional $8.5 million is excluded because it is tied to a potential future use, and not part of the remedy.*

# IV. TABLES

## KOPPERS CO., INC. (NEWPORT PLANT)
## SUPERFUND SITE

## NEWPORT / NEW CASTLE COUNTY, DELAWARE

**Table 1. Statistical Summary and COPC Selection for Risk Scenarios Evaluated [HHRA Tables 1 – 16]**

***Table 1***
***Statistical Summary and COPC Selection for Construction Worker Exposed to Soils (0-18' bgs)***
***Former Koppers Company, Inc., Newport, DE***

| Analyte | Total # of Samples | Hits | Hit Frequency % | Minimum Detected mg/kg | Mean mg/kg | Lognormal Mean mg/kg | Maximum Detected mg/kg | Standard Deviation mg/kg |
|---|---|---|---|---|---|---|---|---|
| **Dioxins** | | | | | | | | |
| 2,3,7,8-TCDD Equiv | 27 | 27 | 100 | 1.14E-04 | 8.55E-04 | 3.79E-04 | 7.34E-03 | 1.49E-03 |
| **Inorganics** | | | | | | | | |
| Aluminum | 137 | 136 | 99.27 | 1.98E+03 | 1.44E+04 | 1.26E+04 | 3.65E+04 | 6.76E+03 |
| Antimony | 73 | 15 | 20.55 | 4.90E-01 | 1.99E+01 | 8.84E+00 | 1.21E+01 | 1.37E+01 |
| Arsenic | 123 | 112 | 91.06 | 8.60E-01 | 4.76E+00 | 3.88E+00 | 2.19E+01 | 3.19E+00 |
| Barium | 137 | 137 | 100 | 1.51E+01 | 2.37E+02 | 1.33E+02 | 1.65E+03 | 3.12E+02 |
| Beryllium | 131 | 129 | 98.47 | 2.60E-01 | 1.20E+00 | 1.03E+00 | 3.90E+00 | 7.48E-01 |
| Cadmium | 135 | 28 | 20.74 | 2.40E-01 | 2.07E+00 | 1.57E+00 | 1.23E+01 | 1.26E+00 |
| Chromium | 137 | 137 | 100 | 3.70E+00 | 2.46E+01 | 2.22E+01 | 1.19E+02 | 1.29E+01 |
| Cobalt | 130 | 119 | 91.54 | 6.10E-01 | 8.13E+00 | 6.11E+00 | 3.25E+01 | 5.53E+00 |
| Copper | 134 | 134 | 100 | 1.40E+00 | 2.31E+01 | 1.37E+01 | 5.28E+02 | 5.23E+01 |
| Iron | 137 | 137 | 100 | 4.43E+03 | 1.78E+04 | 1.66E+04 | 4.89E+04 | 6.44E+03 |
| Lead[1] | 137 | 137 | 100 | 1.80E+00 | 3.12E+01 | 1.47E+01 | 5.66E+02 | 7.35E+01 |
| Manganese | 137 | 137 | 100 | 4.06E+01 | 1.12E+03 | 3.62E+02 | 1.51E+04 | 2.27E+03 |
| Mercury | 122 | 35 | 28.69 | 5.00E-02 | 3.21E-01 | 1.26E-01 | 8.30E+00 | 9.61E-01 |
| Nickel | 131 | 130 | 99.24 | 3.40E+00 | 1.27E+01 | 1.14E+01 | 5.18E+01 | 6.85E+00 |
| Selenium | 117 | 15 | 12.82 | 8.60E-01 | 2.15E+00 | 1.89E+00 | 2.30E+00 | 7.20E-01 |
| Silver | 137 | 2 | 1.46 | 1.10E+00 | 4.35E+00 | 3.16E+00 | 1.50E+00 | 1.63E+00 |
| Thallium | 130 | 29 | 22.31 | 1.60E+00 | 5.01E+00 | 3.89E+00 | 4.44E+01 | 4.38E+00 |
| Vanadium | 137 | 136 | 99.27 | 7.60E+00 | 5.81E+01 | 4.49E+01 | 3.06E+02 | 5.72E+01 |
| Zinc | 133 | 133 | 100 | 5.20E+00 | 7.57E+01 | 4.31E+01 | 2.50E+03 | 2.28E+02 |
| **PCBs/Pesticides** | | | | | | | | |
| 4,4'-DDD | 24 | 1 | 4.17 | 3.80E-03 | 2.81E-02 | 4.73E-03 | 3.80E-03 | 6.66E-02 |
| 4,4'-DDE | 24 | 3 | 12.5 | 1.40E-02 | 1.65E-02 | 4.23E-03 | 2.40E-01 | 4.91E-02 |
| 4,4'-DDT | 24 | 5 | 20.83 | 2.90E-04 | 1.62E-02 | 4.37E-03 | 1.20E-01 | 3.44E-02 |
| alpha-Chlordane[2] | 24 | 1 | 4.17 | 1.80E-04 | 1.46E-02 | 2.33E-03 | 1.80E-04 | 3.44E-02 |
| Dieldrin | 24 | 5 | 20.83 | 2.20E-04 | 2.01E-02 | 3.61E-03 | 1.30E-02 | 5.65E-02 |
| Endosulfan II[3] | 24 | 2 | 8.33 | 4.50E-04 | 2.79E-02 | 4.15E-03 | 7.30E-04 | 6.67E-02 |
| Endrin | 24 | 1 | 4.17 | 1.10E-01 | 2.49E-02 | 4.81E-03 | 1.10E-01 | 5.91E-02 |
| Endrin ketone[4] | 24 | 1 | 4.17 | 2.90E-02 | 2.19E-02 | 4.56E-03 | 2.90E-02 | 5.76E-02 |
| Heptachlor | 24 | 1 | 4.17 | 5.30E-03 | 1.07E-02 | 2.22E-03 | 5.30E-03 | 2.93E-02 |
| Heptachlor epoxide | 24 | 2 | 8.33 | 1.00E-02 | 6.92E-03 | 2.12E-03 | 2.00E-02 | 1.92E-02 |
| Methoxychlor | 22 | 3 | 13.64 | 2.90E-01 | 9.87E-02 | 2.49E-02 | 9.20E-01 | 2.24E-01 |
| PCB-1254 | 24 | 1 | 4.17 | 4.60E-01 | 2.99E-01 | 5.25E-02 | 4.60E-01 | 6.65E-01 |
| PCB-1260 | 25 | 1 | 4 | 3.40E-01 | 2.86E-01 | 5.32E-02 | 3.40E-01 | 6.52E-01 |
| **Semivolatiles** | | | | | | | | |
| 2-Methylnaphthalene | 136 | 24 | 17.65 | 1.40E-01 | 2.03E+01 | 8.01E-01 | 6.10E+02 | 8.64E+01 |
| Acenaphthene | 136 | 28 | 20.59 | 1.80E-01 | 2.70E+01 | 8.73E-01 | 7.90E+02 | 1.16E+02 |
| Acenaphthylene | 136 | 17 | 12.5 | 5.90E-02 | 7.22E+00 | 7.43E-01 | 4.40E+01 | 2.65E+01 |
| Anthracene | 137 | 55 | 40.15 | 8.30E-02 | 3.84E+01 | 9.25E-01 | 2.60E+03 | 2.37E+02 |
| Benzo(a)anthracene | 137 | 87 | 63.5 | 1.10E-01 | 2.04E+01 | 1.56E+00 | 3.10E+02 | 4.63E+01 |
| Benzo(a)pyrene | 137 | 75 | 54.74 | 8.40E-02 | 1.65E+01 | 1.36E+00 | 2.40E+02 | 3.84E+01 |
| Benzo(b)fluoranthene | 137 | 86 | 62.77 | 8.50E-02 | 2.81E+01 | 2.01E+00 | 3.70E+02 | 5.94E+01 |
| Benzo(g,h,i)perylene | 137 | 67 | 48.91 | 8.40E-02 | 1.14E+01 | 1.18E+00 | 1.70E+02 | 2.75E+01 |
| Benzo(k)fluoranthene | 137 | 66 | 48.18 | 9.10E-02 | 1.17E+01 | 1.11E+00 | 1.10E+02 | 2.97E+01 |
| bis(2-Ethylhexyl)phthalate | 130 | 5 | 3.85 | 4.20E-02 | 7.43E+00 | 7.72E-01 | 7.90E-01 | 2.70E+01 |
| Carbazole | 135 | 38 | 28.15 | 9.60E-02 | 1.66E+01 | 7.76E-01 | 1.20E+03 | 1.07E+02 |
| Chrysene | 137 | 90 | 65.69 | 7.20E-02 | 2.17E+01 | 1.62E+00 | 2.60E+02 | 4.77E+01 |
| Di-n-butylphthalate[5] | 136 | 50 | 36.76 | 2.90E-02 | 7.36E+00 | 6.90E-01 | 5.30E-01 | 2.66E+01 |



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ENVIRONMENTAL STANDARDS

*Table 1*

***Statistical Summary and COPC Selection for Construction Worker Exposed to Soils (0-18' bgs)***

***Former Koppers Company, Inc., Newport, DE***

| Analyte | 95% UCL mg/kg | Lognormal 95% UCL mg/kg | Distribution 99% Confidence | Exposure Point Concentration mg/kg | Industrial Soil RBC mg/kg | Is Maximum >RBC? | Is Detection Frequency >5%? |
|---|---|---|---|---|---|---|---|
| **Dioxins** | | | | | | | |
| 2,3,7,8-TCDD Equiv | 1.35E-03 | 1.37E-03 | Unknown | 1.37E-03 | 3.80E-05 | yes | yes |
| **Inorganics** | | | | | | | |
| Aluminum | 1.54E+04 | 1.71E+04 | Unknown | 1.71E+04 | 2.00E+05 | no | |
| Antimony | 2.26E+01 | 7.70E+01 | Unknown | 1.21E+01 | 8.20E+01 | no | |
| Arsenic | 5.24E+00 | 5.61E+00 | Unknown | 5.61E+00 | 3.80E+00 | yes | yes |
| Barium | 2.81E+02 | 2.68E+02 | Lognormal | 2.68E+02 | 1.40E+04 | no | |
| Beryllium | 1.31E+00 | 1.30E+00 | Unknown | 1.30E+00 | 4.10E+02 | no | |
| Cadmium | 2.25E+00 | 2.81E+00 | Unknown | 2.81E+00 | 2.00E+02 | no | |
| Chromium | 2.65E+01 | 2.65E+01 | Unknown | 2.65E+01 | 3.10E+05 | no | |
| Cobalt | 8.93E+00 | 1.21E+01 | Unknown | 1.21E+01 | 1.20E+04 | no | |
| Copper | 3.06E+01 | 2.16E+01 | Unknown | 2.16E+01 | 8.20E+03 | no | |
| Iron | 1.87E+04 | 1.90E+04 | Unknown | 1.90E+04 | 6.10E+04 | no | |
| Lead[1] | 4.16E+01 | 2.87E+01 | Unknown | 2.87E+01 | 7.50E+02 | no | |
| Manganese | 1.44E+03 | 1.23E+03 | Unknown | 1.23E+03 | 2.90E+04 | no | |
| Mercury | 4.66E-01 | 2.31E-01 | Unknown | 2.31E-01 | 6.10E+01 | no | |
| Nickel | 1.37E+01 | 1.35E+01 | Unknown | 1.35E+01 | 4.10E+03 | no | |
| Selenium | 2.26E+00 | 2.59E+00 | Unknown | 2.30E+00 | 1.00E+03 | no | |
| Silver | 4.58E+00 | 8.31E+00 | Unknown | 1.50E+00 | 1.00E+03 | no | |
| Thallium | 5.65E+00 | 6.33E+00 | Unknown | 6.33E+00 | 1.40E+01 | yes | yes |
| Vanadium | 6.62E+01 | 6.18E+01 | Unknown | 6.18E+01 | 1.40E+03 | no | |
| Zinc | 1.08E+02 | 6.52E+01 | Unknown | 6.52E+01 | 6.10E+04 | no | |
| **PCBs/Pesticides** | | | | | | | |
| 4,4'-DDD | 5.15E-02 | 4.80E-02 | Unknown | 3.80E-03 | 2.40E+01 | no | |
| 4,4'-DDE | 3.37E-02 | 2.08E-02 | Unknown | 2.08E-02 | 1.70E+01 | no | |
| 4,4'-DDT | 2.82E-02 | 3.33E-02 | Unknown | 3.33E-02 | 1.70E+01 | no | |
| alpha-Chlordane[2] | 2.66E-02 | 3.05E-02 | Unknown | 1.80E-04 | 1.60E+01 | no | |
| Dieldrin | 3.99E-02 | 2.92E-02 | Unknown | 1.30E-02 | 3.60E-01 | no | |
| Endosulfan II[3] | 5.13E-02 | 5.68E-02 | Unknown | 7.30E-04 | 1.20E+03 | no | |
| Endrin | 4.56E-02 | 4.28E-02 | Unknown | 4.28E-02 | 6.10E+01 | no | |
| Endrin ketone[4] | 4.21E-02 | 3.19E-02 | Unknown | 2.90E-02 | 6.10E+01 | no | |
| Heptachlor | 2.09E-02 | 1.38E-02 | Unknown | 5.30E-03 | 1.30E+00 | no | |
| Heptachlor epoxide | 1.37E-02 | 9.19E-03 | Unknown | 9.19E-03 | 6.30E-01 | no | |
| Methoxychlor | 1.81E-01 | 1.85E-01 | Unknown | 1.85E-01 | 1.00E+03 | no | |
| PCB-1254 | 5.32E-01 | 6.41E-01 | Unknown | 4.60E-01 | 2.90E+00 | no | |
| PCB-1260 | 5.09E-01 | 5.54E-01 | Unknown | 3.40E-01 | 2.90E+00 | no | |
| **Semivolatiles** | | | | | | | |
| 2-Methylnaphthalene | 3.26E+01 | 1.01E+01 | Unknown | 1.01E+01 | 4.10E+03 | no | |
| Acenaphthene | 4.36E+01 | 1.35E+01 | Unknown | 1.35E+01 | 1.20E+04 | no | |
| Acenaphthylene | 1.10E+01 | 6.34E+00 | Unknown | 6.34E+00 | NA | NA | yes |
| Anthracene | 7.19E+01 | 1.95E+01 | Unknown | 1.95E+01 | 6.10E+04 | no | |
| Benzo(a)anthracene | 2.70E+01 | 5.62E+01 | Unknown | 5.62E+01 | 7.80E+00 | yes | yes |
| Benzo(a)pyrene | 2.20E+01 | 4.24E+01 | Unknown | 4.24E+01 | 7.80E-01 | yes | yes |
| Benzo(b)fluoranthene | 3.65E+01 | 1.02E+02 | Unknown | 1.02E+02 | 7.80E+00 | yes | yes |
| Benzo(g,h,i)perylene | 1.53E+01 | 2.43E+01 | Unknown | 2.43E+01 | NA | NA | yes |
| Benzo(k)fluoranthene | 1.60E+01 | 2.27E+01 | Unknown | 2.27E+01 | 7.80E+01 | yes | yes |
| bis(2-Ethylhexyl)phthalate | 1.14E+01 | 6.58E+00 | Unknown | 7.90E-01 | 4.10E+02 | no | |
| Carbazole | 3.19E+01 | 7.59E+00 | Unknown | 7.59E+00 | 2.90E+02 | yes | yes |
| Chrysene | 2.85E+01 | 6.54E+01 | Unknown | 6.54E+01 | 7.80E+02 | no | |
| Di-n-butylphthalate | 1.11E+01 | 7.14E+00 | Unknown | 5.30E-01 | 2.00E+04 | no | |



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ENVIRONMENTAL STANDARDS

***Table 1***
***Statistical Summary and COPC Selection for Construction Worker Exposed to Soils (0-18' bgs)***
***Former Koppers Company, Inc., Newport, DE***

| Analyte | Total # of Samples | Hits | Hit Frequency % | Minimum Detected mg/kg | Mean mg/kg | Lognormal Mean mg/kg | Maximum Detected mg/kg | Standard Deviation mg/kg |
|---|---|---|---|---|---|---|---|---|
| Dibenz(a,h)anthracene | 136 | 45 | 33 09 | 7 40E-02 | 6 85E+00 | 8 02E-01 | 1 30E+02 | 2.30E+01 |
| Dibenzofuran | 137 | 30 | 21 9 | 2 70E-01 | 2 03E+01 | 8 53E-01 | 5 80E+02 | 8 37E+01 |
| Diethylphthalate | 135 | 1 | 0 74 | 1.00E-01 | 7.43E+00 | 7 80E-01 | 1 00E-01 | 2 66E+01 |
| Fluoranthene | 137 | 95 | 69 34 | 8 20E-02 | 5 36E+01 | 2 29E+00 | 1 20E+03 | 1 62E+02 |
| Fluorene | 137 | 31 | 22 63 | 6 60E-02 | 2 80E+01 | 8 54E-01 | 7 70E+02 | 1 17E+02 |
| Indeno(1,2,3-c,d)pyrene | 138 | 68 | 49 28 | 5 60E-02 | 1 22E+01 | 1 26E+00 | 1 10E+02 | 2 66E+01 |
| Naphthalene | 136 | 30 | 22 06 | 3 50E-02 | 5.92E+01 | 8 87E-01 | 3 00E+03 | 3 18E+02 |
| Pentachlorophenol | 136 | 6 | 4 41 | 1 30E-01 | 1 76E+01 | 1 80E+00 | 5 50E+00 | 6 58E+01 |
| Phenanthrene | 134 | 77 | 57.46 | 4 10E-02 | 7.08E+01 | 1.23E+00 | 2 10E+03 | 2.97E+02 |
| Pyrene | 137 | 95 | 69 34 | 4.10E-02 | 4.64E+01 | 2 19E+00 | 8 50E+02 | 1 28E+02 |
| **Volatiles** | | | | | | | | |
| 1,1,2,2-Tetrachloroethane | 143 | 13 | 9.09 | 1 00E-01 | 5 26E-02 | 1 02E-02 | 4 00E-01 | 1 51E-01 |
| 2-Butanone | 130 | 21 | 16 15 | 2 00E-03 | 3 61E-02 | 7.76E-03 | 3 80E-02 | 1.45E-01 |
| 2-Hexanone | 130 | 1 | 0 77 | 6 00E-03 | 3 56E-02 | 7 54E-03 | 6 00E-03 | 1 46E-01 |
| Acetone | 100 | 34 | 34 | 3 00E-03 | 9 03E-02 | 1 65E-02 | 2 10E+00 | 2 57E-01 |
| Benzene | 130 | 7 | 5 38 | 1 10E-02 | 3 36E-02 | 7 96E-03 | 5.30E-01 | 1 30E-01 |
| Carbon Disulfide | 130 | 5 | 3 85 | 4 00E-03 | 3.55E-02 | 7 51E-03 | 7 00E-03 | 1 46E-01 |
| Ethylbenzene | 130 | 19 | 14.62 | 1.00E-03 | 1 14E-01 | 8 71E-03 | 4 30E+00 | 5 51E-01 |
| Styrene | 130 | 9 | 6 92 | 5 00E-03 | 7.82E-02 | 8 24E-03 | 3 10E+00 | 3 94E-01 |
| Tetrachloroethene | 127 | 50 | 39 37 | 1 00E-03 | 3.82E-02 | 8 28E-03 | 7 40E-02 | 1 47E-01 |
| Toluene | 130 | 40 | 30 77 | 1 00E-03 | 1 10E-01 | 8 46E-03 | 5 70E+00 | 5 88E-01 |
| Xylenes (total) | 130 | 29 | 22 31 | 2 00E-03 | 4.86E-01 | 1 02E-02 | 2 40E+01 | 2 68E+00 |

*Table 1*
***Statistical Summary and COPC Selection for Construction Worker Exposed to Soils (0-18' bgs)***
***Former Koppers Company, Inc., Newport, DE***

| Analyte | 95% UCL mg/kg | Lognormal 95% UCL mg/kg | Distribution 99% Confidence | Exposure Point Concentration mg/kg | Industrial Soil RBC mg/kg | Is Maximum >RBC? | Is Detection Frequency >5%? |
|---|---|---|---|---|---|---|---|
| Dibenz(a,h)anthracene | 1 01E+01 | 7 15E+00 | Unknown | 7 15E+00 | 7 80E-01 | yes | yes |
| Dibenzofuran | 3 22E+01 | 1 11E+01 | Unknown | 1 11E+01 | 8 20E+02 | no | |
| Diethylphthalate | 1.12E+01 | 6 35E+00 | Unknown | 1 00E-01 | 1.60E+05 | no | |
| Fluoranthene | 7 66E+01 | 1 99E+02 | Unknown | 1 99E+02 | 8 20E+03 | no | |
| Fluorene | 4.45E+01 | 1 46E+01 | Unknown | 1 46E+01 | 8 20E+03 | no | |
| Indeno(1,2,3-c,d)pyrene | 1 60E+01 | 2 89E+01 | Unknown | 2.89E+01 | 7 80E+00 | yes | yes |
| Naphthalene | 1 04E+02 | 1 96E+01 | Unknown | 1 96E+01 | 4 10E+03 | no | |
| Pentachlorophenol | 2 70E+01 | 1 37E+01 | Unknown | 5 50E+00 | 4.80E+01 | no | |
| Phenanthrene | 1 13E+02 | 5 65E+01 | Unknown | 5 65E+01 | NA | NA | yes |
| Pyrene | 6 45E+01 | 1 83E+02 | Unknown | 1 83E+02 | 6 10E+03 | no | |
| **Volatiles** | | | | | | | |
| 1,1,2,2-Tetrachloroethane | 7 35E-02 | 3 24E-02 | Unknown | 3 24E-02 | 2 90E+01 | no | |
| 2-Butanone | 5 73E-02 | 1 54E-02 | Unknown | 1 54E-02 | 1 20E+05 | no | |
| 2-Hexanone | 5 67E-02 | 1 43E-02 | Unknown | 6 00E-03 | NA | NA | no |
| Acetone | 1 33E-01 | 9 55E-02 | Unknown | 9 55E-02 | 2.00E+04 | no | |
| Benzene | 5 25E-02 | 1 55E-02 | Unknown | 1 55E-02 | 2 00E+02 | no | |
| Carbon Disulfide | 5 67E-02 | 1 42E-02 | Unknown | 7 00E-03 | 2 00E+04 | no | |
| Ethylbenzene | 1 94E-01 | 2 87E-02 | Unknown | 2.87E-02 | 2.00E+04 | no | |
| Styrene | 1 35E-01 | 2 04E-02 | Lognormal | 2 04E-02 | 4 10E+04 | no | |
| Tetrachloroethene | 5 98E-02 | 1 87E-02 | Unknown | 1 87E-02 | 1.10E+02 | no | |
| Toluene | 1 96E-01 | 2 92E-02 | Unknown | 2.92E-02 | 4.10E+04 | no | |
| Xylenes (total) | 8 76E-01 | 6 47E-02 | Unknown | 6 47E-02 | 4 10E+05 | no | |

This data set includes samples from the Process/Wood Storage and Drip Track areas
NA - Not available
[1] The screening level of 750 mg/kg is based on US EPA's adult blood lead uptake model under default exposure assumptions
[2] These compounds have no published RBC or RfD values They are sufficiently close in toxicity to Chlordane so that the Chlordane RBC is applicable to its congeners as a provisional benchmark.
[3] These compounds have no published RBC or RfD values They are sufficiently close in toxicity to Endosulfan so that the Endosulfan RBC is applicable to its congeners as a provisional benchmark.
[4] These compounds have no published RBC or RfD values They are sufficiently close in toxicity to Endrin so that the Endrin RBC is applicable to its congeners as a provisional benchmark





ENVIRONMENTAL STANDARDS

***Table 2***
***Statistical Summary and COPC Selection for Construction Worker Exposed to Soils and NAPL (0-18' bgs)***
***Former Koppers Company, Inc., Newport, DE***

| Analyte | Total # of Samples | Hits | Hit Frequency % | Minimum Detected mg/kg | Mean mg/kg | Lognormal Mean mg/kg | Maximum Detected mg/kg | Standard Deviation mg/kg |
|---|---|---|---|---|---|---|---|---|
| **Dioxins** | | | | | | | | |
| 2,3,7,8-TCDD Equiv | 27 | 27 | 100 | 1.14E-04 | 8.55E-04 | 3.79E-04 | 7.34E-03 | 1.49E-03 |
| **Inorganics** | | | | | | | | |
| Aluminum | 164 | 163 | 99.39 | 1.98E+03 | 1.43E+04 | 1.26E+04 | 3.65E+04 | 6.61E+03 |
| Antimony | 98 | 19 | 19.39 | 4.90E-01 | 1.52E+01 | 4.63E+00 | 1.21E+01 | 1.44E+01 |
| Arsenic | 150 | 139 | 92.67 | 8.60E-01 | 5.00E+00 | 4.00E+00 | 3.10E+01 | 3.90E+00 |
| Barium | 164 | 164 | 100 | 1.51E+01 | 2.43E+02 | 1.40E+02 | 1.65E+03 | 3.04E+02 |
| Beryllium | 152 | 150 | 98.68 | 2.60E-01 | 1.20E+00 | 1.02E+00 | 3.90E+00 | 7.53E-01 |
| Cadmium | 160 | 34 | 21.25 | 2.40E-01 | 1.81E+00 | 1.09E+00 | 1.23E+01 | 1.33E+00 |
| Chromium | 164 | 164 | 100 | 3.70E+00 | 2.67E+01 | 2.28E+01 | 2.44E+02 | 2.29E+01 |
| Cobalt | 157 | 145 | 92.36 | 6.10E-01 | 7.80E+00 | 5.92E+00 | 3.25E+01 | 5.42E+00 |
| Copper | 161 | 161 | 100 | 9.10E-01 | 2.42E+01 | 1.43E+01 | 5.28E+02 | 5.07E+01 |
| Iron | 164 | 164 | 100 | 4.43E+03 | 1.83E+04 | 1.69E+04 | 7.73E+04 | 8.34E+03 |
| Lead[1] | 164 | 164 | 100 | 1.80E+00 | 3.80E+01 | 1.60E+01 | 8.92E+02 | 9.77E+01 |
| Manganese | 164 | 164 | 100 | 3.52E+01 | 1.11E+03 | 3.88E+02 | 1.51E+04 | 2.14E+03 |
| Mercury | 140 | 51 | 36.43 | 1.90E-02 | 2.95E-01 | 1.16E-01 | 8.30E+00 | 9.00E-01 |
| Nickel | 157 | 156 | 99.36 | 3.40E+00 | 1.26E+01 | 1.13E+01 | 5.18E+01 | 6.59E+00 |
| Selenium | 144 | 22 | 15.28 | 8.50E-01 | 1.85E+00 | 1.47E+00 | 2.30E+00 | 9.13E-01 |
| Silver | 162 | 3 | 1.85 | 2.10E-01 | 3.70E+00 | 1.83E+00 | 1.50E+00 | 2.15E+00 |
| Thallium | 157 | 38 | 24.2 | 8.90E-01 | 4.30E+00 | 2.90E+00 | 4.44E+01 | 4.29E+00 |
| Vanadium | 164 | 163 | 99.39 | 7.60E+00 | 5.58E+01 | 4.39E+01 | 3.06E+02 | 5.33E+01 |
| Zinc | 156 | 156 | 100 | 5.20E+00 | 7.85E+01 | 4.66E+01 | 2.50E+03 | 2.14E+02 |
| **PCBs/Pesticides** | | | | | | | | |
| 4,4'-DDD | 24 | 1 | 4.17 | 3.80E-03 | 2.81E-02 | 4.73E-03 | 3.80E-03 | 6.66E-02 |
| 4,4'-DDE | 24 | 3 | 12.5 | 1.40E-02 | 1.65E-02 | 4.23E-03 | 2.40E-01 | 4.91E-02 |
| 4,4'-DDT | 24 | 5 | 20.83 | 2.90E-04 | 1.62E-02 | 4.37E-03 | 1.20E-01 | 3.44E-02 |
| alpha-Chlordane[2] | 24 | 1 | 4.17 | 1.80E-04 | 1.46E-02 | 2.33E-03 | 1.80E-04 | 3.44E-02 |
| Dieldrin | 24 | 5 | 20.83 | 2.20E-04 | 2.01E-02 | 3.61E-03 | 1.30E-02 | 5.65E-02 |
| Endosulfan II[3] | 24 | 2 | 8.33 | 4.50E-04 | 2.79E-02 | 4.15E-03 | 7.30E-04 | 6.67E-02 |
| Endrin | 24 | 1 | 4.17 | 1.10E-01 | 2.49E-02 | 4.81E-03 | 1.10E-01 | 5.91E-02 |
| Endrin ketone[4] | 24 | 1 | 4.17 | 2.90E-02 | 2.19E-02 | 4.56E-03 | 2.90E-02 | 5.76E-02 |
| Heptachlor | 24 | 1 | 4.17 | 5.30E-03 | 1.07E-02 | 2.22E-03 | 5.30E-03 | 2.93E-02 |
| Heptachlor epoxide | 24 | 2 | 8.33 | 1.00E-02 | 6.92E-03 | 2.12E-03 | 2.00E-02 | 1.92E-02 |
| Methoxychlor | 22 | 3 | 13.64 | 2.90E-01 | 9.87E-02 | 2.49E-02 | 9.20E-01 | 2.24E-01 |
| PCB-1254 | 24 | 1 | 4.17 | 4.60E-01 | 2.99E-01 | 5.25E-02 | 4.60E-01 | 6.65E-01 |
| PCB-1260 | 25 | 1 | 4 | 3.40E-01 | 2.86E-01 | 5.32E-02 | 3.40E-01 | 6.52E-01 |
| **Semivolatiles** | | | | | | | | |
| 2,4-Dimethylphenol | 163 | 1 | 0.61 | 1.20E+01 | 6.08E+00 | 6.57E-01 | 1.20E+01 | 2.43E+01 |
| 2-Methylnaphthalene | 163 | 36 | 22.09 | 4.10E-02 | 1.84E+01 | 6.95E-01 | 6.10E+02 | 8.08E+01 |
| 4-Methylphenol | 163 | 1 | 0.61 | 3.10E+01 | 6.20E+00 | 6.61E-01 | 3.10E+01 | 2.43E+01 |
| Acenaphthene | 163 | 45 | 27.61 | 4.60E-02 | 3.12E+01 | 7.30E-01 | 1.40E+03 | 1.52E+02 |
| Acenaphthylene | 163 | 37 | 22.7 | 5.90E-02 | 6.82E+00 | 7.15E-01 | 9.90E+01 | 2.53E+01 |



AR316002
RONMENTAL STANDARDS

***Table 2***
***Statistical Summary and COPC Selection for Construction Worker Exposed to Soils and NAPL (0-18' bgs)***
***Former Koppers Company, Inc., Newport, DE***

| Analyte | 95% UCL mg/kg | Lognormal 95% UCL mg/kg | Distribution 99% Confidence | Exposure Point Concentration mg/kg | Industrial Soil RBC mg/kg | Is Maximum >RBC? | Is Detection Frequency >5%? |
|---|---|---|---|---|---|---|---|
| **Dioxins** | | | | | | | |
| 2,3,7,8-TCDD Equiv | 1 35E-03 | 1 37E-03 | Unknown | 1 37E-03 | 3 80E-05 | yes | yes |
| **Inorganics** | | | | | | | |
| Aluminum | 1 51E+04 | 1 65E+04 | Unknown | 1 65E+04 | 2.00E+05 | no | |
| Antimony | 1 76E+01 | 5 80E+01 | Unknown | 1 21E+01 | 8 20E+01 | no | |
| Arsenic | 5 53E+00 | 5 71E+00 | Unknown | 5 71E+00 | 3 80E+00 | yes | yes |
| Barium | 2 83E+02 | 2 74E+02 | Lognormal | 2 74E+02 | 1.40E+04 | no | |
| Beryllium | 1 30E+00 | 1.29E+00 | Unknown | 1.29E+00 | 4 10E+02 | no | |
| Cadmium | 1 98E+00 | 3 42E+00 | Unknown | 3.42E+00 | 2.00E+02 | no | |
| Chromium | 2 96E+01 | 2 80E+01 | Unknown | 2 80E+01 | 3 10E+05 | no | |
| Cobalt | 8 51E+00 | 1 09E+01 | Unknown | 1 09E+01 | 1 20E+04 | no | |
| Copper | 3 08E+01 | 2 31E+01 | Unknown | 2 31E+01 | 8 20E+03 | no | |
| Iron | 1 94E+04 | 1 94E+04 | Unknown | 1.94E+04 | 6 10E+04 | yes | yes |
| Lead[1] | 5 07E+01 | 3 34E+01 | Unknown | 3 34E+01 | 7 50E+02 | yes | yes |
| Manganese | 1 39E+03 | 1 24E+03 | Unknown | 1 24E+03 | 2 90E+04 | no | |
| Mercury | 4 21E-01 | 2 28E-01 | Unknown | 2.28E-01 | 6 10E+01 | no | |
| Nickel | 1 34E+01 | 1 33E+01 | Unknown | 1.33E+01 | 4 10E+03 | no | |
| Selenium | 1 98E+00 | 2 33E+00 | Unknown | 2 30E+00 | 1 00E+03 | no | |
| Silver | 3 98E+00 | 1.17E+01 | Unknown | 1 50E+00 | 1.00E+03 | no | |
| Thallium | 4.87E+00 | 5 85E+00 | Unknown | 5.85E+00 | 1 40E+01 | yes | yes |
| Vanadium | 6 27E+01 | 5 85E+01 | Unknown | 5.85E+01 | 1 40E+03 | no | |
| Zinc | 1 07E+02 | 7 03E+01 | Unknown | 7.03E+01 | 6 10E+04 | no | |
| **PCBs/Pesticides** | | | | | | | |
| 4,4'-DDD | 5 15E-02 | 4 80E-02 | Unknown | 3 80E-03 | 2.40E+01 | no | |
| 4,4'-DDE | 3 37E-02 | 2.08E-02 | Unknown | 2.08E-02 | 1 70E+01 | no | |
| 4,4'-DDT | 2 82E-02 | 3 33E-02 | Unknown | 3 33E-02 | 1 70E+01 | no | |
| alpha-Chlordane[2] | 2 66E-02 | 3 05E-02 | Unknown | 1 80E-04 | 1 60E+01 | no | |
| Dieldrin | 3 99E-02 | 2 92E-02 | Unknown | 1 30E-02 | 3 60E-01 | no | |
| Endosulfan II[3] | 5 13E-02 | 5 68E-02 | Unknown | 7.30E-04 | 1 20E+03 | no | |
| Endrin | 4 56E-02 | 4 28E-02 | Unknown | 4 28E-02 | 6 10E+01 | no | |
| Endrin ketone[4] | 4 21E-02 | 3 19E-02 | Unknown | 2 90E-02 | 6 10E+01 | no | |
| Heptachlor | 2 09E-02 | 1 38E-02 | Unknown | 5 30E-03 | 1 30E+00 | no | |
| Heptachlor epoxide | 1.37E-02 | 9 19E-03 | Unknown | 9.19E-03 | 6 30E-01 | no | |
| Methoxychlor | 1 81E-01 | 1 85E-01 | Unknown | 1 85E-01 | 1 00E+03 | no | |
| PCB-1254 | 5 32E-01 | 6 41E-01 | Unknown | 4 60E-01 | 2 90E+00 | no | |
| PCB-1260 | 5 09E-01 | 5 54E-01 | Unknown | 3 40E-01 | 2 90E+00 | no | |
| **Semivolatiles** | | | | | | | |
| 2,4-Dimethylphenol | 9 23E+00 | 4 05E+00 | Unknown | 4.05E+00 | 4 10E+03 | no | |
| 2-Methylnaphthalene | 2 88E+01 | 7 46E+00 | Unknown | 7 46E+00 | 4 10E+03 | no | |
| 4-Methylphenol | 9 36E+00 | 4 17E+00 | Unknown | 4 17E+00 | 1 00E+03 | no | |
| Acenaphthene | 5 09E+01 | 1 07E+01 | Unknown | 1 07E+01 | 1 20E+04 | no | |
| Acenaphthylene | 1 01E+01 | 5 41E+00 | Unknown | 5 41E+00 | NA | NA | yes |




ENVIRONMENTAL STANDARDS

*Table 2*
***Statistical Summary and COPC Selection for Construction Worker Exposed to Soils and NAPL (0-18' bgs)***
***Former Koppers Company, Inc., Newport, DE***

| Analyte | Total # of Samples | Hits | Hit Frequency % | Minimum Detected mg/kg | Mean mg/kg | Lognormal Mean mg/kg | Maximum Detected mg/kg | Standard Deviation mg/kg |
|---|---|---|---|---|---|---|---|---|
| Anthracene | 164 | 76 | 46 34 | 8 30E-02 | 3 96E+01 | 9 15E-01 | 2 60E+03 | 2.35E+02 |
| Benzo(a)anthracene | 164 | 112 | 68.29 | 6.70E-02 | 2 84E+01 | 1 68E+00 | 1.60E+03 | 1 31E+02 |
| Benzo(a)pyrene | 164 | 100 | 60 98 | 6.30E-02 | 2 00E+01 | 1 49E+00 | 7 40E+02 | 6 70E+01 |
| Benzo(b)fluoranthene | 164 | 111 | 67 68 | 8 50E-02 | 3 42E+01 | 2.34E+00 | 1 20E+03 | 1 07E+02 |
| Benzo(g,h,i)perylene | 164 | 90 | 54 88 | 4 70E-02 | 1 22E+01 | 1.28E+00 | 2 70E+02 | 3 26E+01 |
| Benzo(k)fluoranthene | 164 | 88 | 53 66 | 5 20E-02 | 1 23E+01 | 1 14E+00 | 3 20E+02 | 3 65E+01 |
| bis(2-Ethylhexyl)phthalate | 133 | 5 | 3 76 | 4.20E-02 | 7 28E+00 | 7.64E-01 | 7 90E-01 | 2.67E+01 |
| Butylbenzylphthalate | 164 | 2 | 1.22 | 6.50E-02 | 6 41E+00 | 6 71E-01 | 9 30E-02 | 2.44E+01 |
| Carbazole | 162 | 59 | 36 42 | 6.10E-02 | 1 85E+01 | 7.12E-01 | 1.20E+03 | 1 13E+02 |
| Chrysene | 164 | 116 | 70.73 | 4.60E-02 | 3 00E+01 | 1 82E+00 | 1 60E+03 | 1.31E+02 |
| Di-n-butylphthalate | 163 | 53 | 32.52 | 2.90E-02 | 6 43E+00 | 6 02E-01 | 5 30E-01 | 2.45E+01 |
| Di-n-octylphthalate | 164 | 1 | 0 61 | 4.30E-02 | 6.41E+00 | 6 72E-01 | 4 30E-02 | 2 44E+01 |
| Dibenz(a,h)anthracene | 163 | 64 | 39 26 | 7.40E-02 | 6 67E+00 | 8 23E-01 | 1 30E+02 | 2 22E+01 |
| Dibenzofuran | 164 | 45 | 27 44 | 8.50E-02 | 2 50E+01 | 7 45E-01 | 1 30E+03 | 1.26E+02 |
| Diethylphthalate | 162 | 2 | 1 23 | 6.40E-02 | 6 49E+00 | 6 81E-01 | 1 00E-01 | 2 46E+01 |
| Fluoranthene | 164 | 122 | 74 39 | 5.70E-02 | 9 98E+01 | 2 49E+00 | 8 60E+03 | 6 84E+02 |
| Fluorene | 164 | 44 | 26.83 | 5.40E-02 | 3 87E+01 | 7 40E-01 | 2 50E+03 | 2 21E+02 |
| Indeno(1,2,3-c,d)pyrene | 165 | 91 | 55.15 | 5.50E-02 | 1 35E+01 | 1.37E+00 | 3 40E+02 | 3 57E+01 |
| Naphthalene | 163 | 47 | 28 83 | 3.50E-02 | 5.09E+01 | 7 75E-01 | 3 00E+03 | 2 92E+02 |
| Pentachlorophenol | 163 | 15 | 9 2 | 4 20E-02 | 1 54E+01 | 1 47E+00 | 5 50E+00 | 6 07E+01 |
| Phenanthrene | 161 | 99 | 61.49 | 4.10E-02 | 1 28E+02 | 1 22E+00 | 1 10E+04 | 9 04E+02 |
| Phenol | 163 | 1 | 0 61 | 5.70E+01 | 6.36E+00 | 6.64E-01 | 5 70E+01 | 2 46E+01 |
| Pyrene | 164 | 121 | 73 78 | 4.10E-02 | 7.61E+01 | 2 45E+00 | 5 70E+03 | 4 57E+02 |
| **Volatiles** | | | | | | | | |
| 1,1,2,2-Tetrachloroethane | 152 | 13 | 8.55 | 1.00E-01 | 4.99E-02 | 9.90E-03 | 4.00E-01 | 1.47E-01 |
| 2-Butanone | 139 | 21 | 15 11 | 2.00E-03 | 3.42E-02 | 7 65E-03 | 3 80E-02 | 1 41E-01 |
| 2-Hexanone | 139 | 1 | 0 72 | 6.00E-03 | 3.37E-02 | 7 45E-03 | 6 00E-03 | 1 41E-01 |
| Acetone | 102 | 35 | 34 31 | 3.00E-03 | 9 08E-02 | 1 67E-02 | 2 10E+00 | 2 55E-01 |
| Benzene | 139 | 7 | 5.04 | 1.10E-02 | 3.18E-02 | 7 83E-03 | 5 30E-01 | 1 26E-01 |
| Carbon Disulfide | 139 | 5 | 3 6 | 4.00E-03 | 3.36E-02 | 7.42E-03 | 7 00E-03 | 1 41E-01 |
| Ethylbenzene | 139 | 19 | 13.67 | 1.00E-03 | 1.07E-01 | 8 52E-03 | 4 30E+00 | 5 33E-01 |
| Styrene | 139 | 9 | 6 47 | 5.00E-03 | 7.35E-02 | 8 09E-03 | 3 10E+00 | 3 81E-01 |
| Tetrachloroethene | 136 | 50 | 36.76 | 1.00E-03 | 3 60E-02 | 8.13E-03 | 7 40E-02 | 1.42E-01 |
| Toluene | 139 | 40 | 28.78 | 1.00E-03 | 1.03E-01 | 8 29E-03 | 5 70E+00 | 5 69E-01 |
| Trichloroethene | 139 | 1 | 0.72 | 2.00E-03 | 3 36E-02 | 7 39E-03 | 2.00E-03 | 1 41E-01 |
| Xylenes (total) | 139 | 29 | 20 86 | 2.00E-03 | 4.55E-01 | 9 83E-03 | 2 40E+01 | 2 59E+00 |



AR316004
ENVIRONMENTAL STANDARDS

*Table 2*
***Statistical Summary and COPC Selection for Construction Worker Exposed to Soils and NAPL (0-18' bgs)***
***Former Koppers Company, Inc., Newport, DE***

| Analyte | 95% UCL mg/kg | Lognormal 95% UCL mg/kg | Distribution 99% Confidence | Exposure Point Concentration mg/kg | Industrial Soil RBC mg/kg | Is Maximum >RBC? | Is Detection Frequency >5%? |
|---|---|---|---|---|---|---|---|
| Anthracene | 7.00E+01 | 1.58E+01 | Unknown | 1 58E+01 | 6 10E+04 | no | |
| Benzo(a)anthracene | 4.53E+01 | 5.92E+01 | Unknown | 5.92E+01 | 7 80E+00 | yes | yes |
| Benzo(a)pyrene | 2.87E+01 | 4.66E+01 | Unknown | 4 66E+01 | 7.80E-01 | yes | yes |
| Benzo(b)fluoranthene | 4.81E+01 | 1.12E+02 | Unknown | 1 12E+02 | 7 80E+00 | yes | yes |
| Benzo(g,h,ı)perylene | 1.64E+01 | 2.45E+01 | Unknown | 2 45E+01 | NA | NA | yes |
| Benzo(k)fluoranthene | 1.71E+01 | 2.08E+01 | Unknown | 2 08E+01 | 7 80E+01 | yes | yes |
| bis(2-Ethylhexyl)phthalate | 1.11E+01 | 6.32E+00 | Unknown | 7.90E-01 | 4 10E+02 | no | |
| Butylbenzylphthalate | 9.57E+00 | 4.56E+00 | Unknown | 9.30E-02 | 4 10E+04 | no | |
| Carbazole | 3.33E+01 | 6.63E+00 | Unknown | 6.63E+00 | 2.90E+02 | yes | yes |
| Chrysene | 4.70E+01 | 7.33E+01 | Unknown | 7.33E+01 | 7 80E+02 | yes | yes |
| Dı-n-butylphthalate | 9.61E+00 | 5.23E+00 | Unknown | 5.30E-01 | 2.00E+04 | no | |
| Di-n-octylphthalate | 9.57E+00 | 4.57E+00 | Unknown | 4 30E-02 | 4 10E+03 | no | |
| Dıbenz(a,h)anthracene | 9.55E+00 | 6.58E+00 | Unknown | 6.58E+00 | 7.80E-01 | yes | yes |
| Dibenzofuran | 4.13E+01 | 8.65E+00 | Unknown | 8.65E+00 | 8.20E+02 | yes | |
| Dıethylphthalate | 9.68E+00 | 4.70E+00 | Unknown | 1 00E-01 | 1 60E+05 | no | |
| Fluoranthene | 1.88E+02 | 2.09E+02 | Unknown | 2.09E+02 | 8 20E+03 | yes | yes |
| Fluorene | 6.73E+01 | 1.16E+01 | Unknown | 1.16E+01 | 8 20E+03 | no | |
| Indeno(1,2,3-c,d)pyrene | 1.81E+01 | 2.95E+01 | Unknown | 2.95E+01 | 7 80E+00 | yes | yes |
| Naphthalene | 8.88E+01 | 1.35E+01 | Unknown | 1 35E+01 | 4 10E+03 | no | |
| Pentachlorophenol | 2.33E+01 | 1.12E+01 | Unknown | 5.50E+00 | 4 80E+01 | no | |
| Phenanthrene | 2.46E+02 | 4.98E+01 | Unknown | 4.98E+01 | NA | NA | yes |
| Phenol | 9.55E+00 | 4.27E+00 | Unknown | 4 27E+00 | 1 20E+05 | no | |
| Pyrene | 1.35E+02 | 1.88E+02 | Unknown | 1.88E+02 | 6.10E+03 | no | |
| **Volatiles** | | | | | | | |
| 1,1,2,2-Tetrachloroethane | 6.96E-02 | 2.95E-02 | Unknown | 2.95E-02 | 2 90E+01 | no | |
| 2-Butanone | 5.40E-02 | 1.45E-02 | Unknown | 1 45E-02 | 1 00E+05 | no | |
| 2-Hexanone | 5.35E-02 | 1.35E-02 | Unknown | 6.00E-03 | NA | NA | no |
| Acetone | 1.33E-01 | 9.83E-02 | Unknown | 9 83E-02 | 2.00E+04 | no | |
| Benzene | 4.95E-02 | 1.46E-02 | Unknown | 1 46E-02 | 2 00E+02 | no | |
| Carbon Dısulfide | 5.34E-02 | 1.35E-02 | Unknown | 7 00E-03 | 2 00E+04 | no | |
| Ethylbenzene | 1.82E-01 | 2.60E-02 | Unknown | 2 60E-02 | 2 00E+04 | no | |
| Styrene | 1.27E-01 | 1.89E-02 | Unknown | 1.89E-02 | 4 10E+04 | no | |
| Tetrachloroethene | 5.63E-02 | 1.74E-02 | Unknown | 1 74E-02 | 1 10E+02 | no | |
| Toluene | 1.83E-01 | 2.64E-02 | Unknown | 2 64E-02 | 4 10E+04 | no | |
| Trichloroethene | 5.34E-02 | 1.35E-02 | Unknown | 2 00E-03 | 5 20E+02 | no | |
| *Xylenes (total)* | *8.20E-01* | *5.55E-02* | *Unknown* | 5 55E-02 | 4 10E+05 | no | |

This data set includes samples from the Process/Wood Storage and Drip Track areas
NA - Not available
[1] The screening level of 750 mg/kg is based on US EPA's adult blood lead uptake model under default exposure assumptions
[2] These compounds have no published RBC or RfD values. They are sufficiently close in toxicity to Chlordane so that the Chlordane RBC is applicable to its congeners as a provisional benchmark
[3] These compounds have no published RBC or RfD values. They are sufficiently close in toxicity to Endosulfan so that the Endosulfan RBC is applicable to its congeners as a provisional benchmark
[4] These compounds have no published RBC or RfD values. They are sufficiently close in toxicity to Endrin so that the Endrin RBC is applicable to its congeners as a provisional benchmark




ENVIRONMENTAL STANDARDS

*Table 3*
***Statistical Summary and COPC Selection for Industrial Worker Exposed to Surface Soils (0-12" bgs)***
***Former Koppers Company, Inc., Newport, DE***

| Analyte | Total # of Samples | Hits | Hit Frequency % | Minimum Detected mg/kg | Mean mg/kg | Lognormal Mean mg/kg | Maximum Detected mg/kg | Standard Deviation mg/kg |
|---|---|---|---|---|---|---|---|---|
| **Dioxins** | | | | | | | | |
| 2,3,7,8-TCDD Equiv | 12 | 12 | 100 | 1 48E-04 | 1 69E-03 | 9 77E-04 | 7 34E-03 | 1 98E-03 |
| **Inorganics** | | | | | | | | |
| Aluminum | 43 | 43 | 100 | 2 07E+03 | 1 73E+04 | 1 45E+04 | 3 65E+04 | 9 54E+03 |
| Antimony | 24 | 10 | 41 67 | 6.50E-01 | 1.25E+01 | 3.24E+00 | 1 21E+01 | 1 41E+01 |
| Arsenic | 38 | 36 | 94 74 | 1 20E+00 | 6 31E+00 | 4 88E+00 | 2 19E+01 | 4 60E+00 |
| Barium | 43 | 43 | 100 | 2 11E+01 | 5.29E+02 | 3 62E+02 | 1 65E+03 | 4 15E+02 |
| Beryllium | 42 | 42 | 100 | 2 60E-01 | 1 72E+00 | 1 42E+00 | 3 90E+00 | 9 82E-01 |
| Cadmium | 42 | 23 | 54.76 | 2.40E-01 | 1 43E+00 | 9.56E-01 | 2 10E+00 | 1 04E+00 |
| Chromium | 43 | 43 | 100 | 3 70E+00 | 2 42E+01 | 1 99E+01 | 1.19E+02 | 1 93E+01 |
| Cobalt | 41 | 33 | 80 49 | 6 10E-01 | 6 45E+00 | 3 54E+00 | 1 20E+01 | 5 99E+00 |
| Copper | 42 | 42 | 100 | 5 30E+00 | 4 76E+01 | 2 52E+01 | 5 28E+02 | 8 82E+01 |
| Iron | 43 | 43 | 100 | 4 43E+03 | 1 59E+04 | 1 49E+04 | 2 82E+04 | 5 18E+03 |
| Lead[1] | 43 | 43 | 100 | 3 80E+00 | 6 20E+01 | 3 53E+01 | 4 77E+02 | 9 29E+01 |
| Manganese | 43 | 43 | 100 | 4 06E+01 | 2.55E+03 | 1 24E+03 | 9 81E+03 | 2 81E+03 |
| Mercury | 35 | 17 | 48 57 | 5 00E-02 | 6.45E-01 | 1.64E-01 | 8 30E+00 | 1 56E+00 |
| Nickel | 39 | 39 | 100 | 4 00E+00 | 1 23E+01 | 1 01E+01 | 5 18E+01 | 1 02E+01 |
| Selenium | 37 | 7 | 18 92 | 8 60E-01 | 1.73E+00 | 1 27E+00 | 2 30E+00 | 9 79E-01 |
| Silver | 43 | 2 | 4.65 | 1.10E+00 | 3 57E+00 | 1 65E+00 | 1 50E+00 | 2 21E+00 |
| Thallium | 42 | 19 | 45.24 | 1 60E+00 | 5.56E+00 | 3 23E+00 | 4 44E+01 | 7 44E+00 |
| Vanadium | 43 | 42 | 97 67 | 7 60E+00 | 8 94E+01 | 5.70E+01 | 3 06E+02 | 9 01E+01 |
| Zinc | 43 | 43 | 100 | 6.40E+00 | 9 92E+01 | 6 28E+01 | 8 74E+02 | 1 39E+02 |
| **PCBs/Pesticides** | | | | | | | | |
| 4,4'-DDD | 7 | 1 | 14.29 | 3 80E-03 | 8.71E-02 | 1.58E-02 | 3 80E-03 | 1 06E-01 |
| 4,4'-DDE | 7 | 3 | 42 86 | 1 40E-02 | 4.72E-02 | 1 07E-02 | 2 40E-01 | 8 75E-02 |
| 4,4'-DDT | 7 | 4 | 57 14 | 6 90E-03 | 4 64E-02 | 1 59E-02 | 1 20E-01 | 5 47E-02 |
| alpha-Chlordane[2] | 7 | 1 | 14 29 | 1 80E-04 | 4.53E-02 | 7 28E-03 | 1 80E-04 | 5 46E-02 |
| Dieldrin | 7 | 3 | 42.86 | 2 40E-03 | 6 11E-02 | 1 07E-02 | 1.30E-02 | 9 72E-02 |
| Endosulfan I[3] | 7 | 1 | 14 29 | 4 50E-04 | 8.78E-02 | 1.46E-02 | 4 50E-04 | 1 06E-01 |
| Endrin | 7 | 1 | 14 29 | 1 10E-01 | 7.59E-02 | 1 67E-02 | 1 10E-01 | 9 53E-02 |
| Endrin ketone[4] | 7 | 1 | 14.29 | 2 90E-02 | 6.57E-02 | 1 39E-02 | 2 90E-02 | 9 76E-02 |
| Heptachlor | 7 | 1 | 14 29 | 5 30E-03 | 3.19E-02 | 6.11E-03 | 5 30E-03 | 5 03E-02 |
| Heptachlor epoxide | 7 | 2 | 28.57 | 1 00E-02 | 1 90E-02 | 5 21E-03 | 2 00E-02 | 3 42E-02 |
| Methoxychlor | 7 | 3 | 42.86 | 2.90E-01 | 2 66E-01 | 7 02E-02 | 9 20E-01 | 3 57E-01 |
| PCB-1260 | 8 | 1 | 12.5 | 3 40E-01 | 8.13E-01 | 1.96E-01 | 3.40E-01 | 9 94E-01 |



AR316006
ENVIRONMENTAL STANDARDS

***Table 3***
***Statistical Summary and COPC Selection for Industrial Worker Exposed to Surface Soils (0-12" bgs)***
***Former Koppers Company, Inc., Newport, DE***

| Analyte | 95% UCL mg/kg | Lognormal 95% UCL mg/kg | Distribution 99% Confidence | Exposure Point Concentration mg/kg | Industrial Soil RBC mg/kg | Is Maximum >RBC? | Is Detection Frequency >5%? |
|---|---|---|---|---|---|---|---|
| **Dioxins** | | | | | | | |
| 2,3,7,8-TCDD Equiv | 2.71E-03 | 5.44E-03 | Lognormal | 5.44E-03 | 3.80E-05 | yes | yes |
| **Inorganics** | | | | | | | |
| Aluminum | 1.98E+04 | 2.21E+04 | Normal/Lognormal | 2.21E+04 | 2.00E+05 | no | |
| Antimony | 1.74E+01 | 1.20E+02 | Unknown | 1.21E+01 | 8.20E+01 | no | |
| Arsenic | 7.57E+00 | 8.56E+00 | Lognormal | 8.56E+00 | 3.80E+00 | yes | yes |
| Barium | 6.36E+02 | 8.53E+02 | Lognormal | 8.53E+02 | 1.40E+04 | no | |
| Beryllium | 1.98E+00 | 2.21E+00 | Normal/Lognormal | 2.21E+00 | 4.10E+02 | no | |
| Cadmium | 1.70E+00 | 2.30E+00 | Unknown | 2.10E+00 | 2.00E+02 | no | |
| Chromium | 2.92E+01 | 2.94E+01 | Lognormal | 2.94E+01 | 3.10E+05 | no | |
| Cobalt | 8.02E+00 | 2.17E+01 | Unknown | 1.20E+01 | 1.20E+04 | no | |
| Copper | 7.06E+01 | 5.89E+01 | Lognormal | 5.89E+01 | 8.20E+03 | no | |
| Iron | 1.73E+04 | 1.81E+04 | Normal | 1.73E+04 | 6.10E+04 | no | |
| Lead[1] | 8.58E+01 | 8.22E+01 | Lognormal | 8.22E+01 | 7.50E+02 | no | |
| Manganese | 3.27E+03 | 5.50E+03 | Lognormal | 5.50E+03 | 2.90E+04 | no | |
| Mercury | 1.09E+00 | 8.57E-01 | Unknown | 8.57E-01 | 6.10E+01 | no | |
| Nickel | 1.51E+01 | 1.44E+01 | Unknown | 1.44E+01 | 4.10E+03 | no | |
| Selenium | 2.00E+00 | 2.84E+00 | Unknown | 2.30E+00 | 1.00E+03 | no | |
| Silver | 4.14E+00 | 2.05E+01 | Unknown | 1.50E+00 | 1.00E+03 | no | |
| Thallium | 7.49E+00 | 8.56E+00 | Unknown | 8.56E+00 | 1.40E+01 | yes | yes |
| Vanadium | 1.13E+02 | 1.28E+02 | Lognormal | 1.28E+02 | 1.40E+03 | no | |
| Zinc | 1.35E+02 | 1.28E+02 | Lognormal | 1.28E+02 | 6.10E+04 | no | |
| **PCBs/Pesticides** | | | | | | | |
| 4,4'-DDD | 1.65E-01 | 6.23E+02 | Unknown | 3.80E-03 | 2.40E+01 | no | |
| 4,4'-DDE | 1.11E-01 | 8.03E+00 | Lognormal | 2.40E-01 | 1.70E+01 | no | |
| 4,4'-DDT | 8.66E-02 | 7.59E+00 | Normal/Lognormal | 1.20E-01 | 1.70E+01 | no | |
| alpha-Chlordane[2] | 8.54E-02 | 3.69E+03 | Normal/Lognormal | 1.80E-04 | 1.60E+01 | no | |
| Dieldrin | 1.32E-01 | 4.36E+01 | Lognormal | 1.30E-02 | 3.60E-01 | no | |
| Endosulfan II[3] | 1.65E-01 | 4.37E+03 | Normal/Lognormal | 4.50E-04 | 1.20E+03 | no | |
| Endrin | 1.46E-01 | 1.72E+02 | Normal/Lognormal | 1.10E-01 | 6.10E+01 | no | |
| Endrin ketone[4] | 1.37E-01 | 5.35E+01 | Lognormal | 2.90E-02 | 6.10E+01 | no | |
| Heptachlor | 6.88E-02 | 1.87E+01 | Lognormal | 5.30E-03 | 1.30E+00 | no | |
| Heptachlor epoxide | 4.41E-02 | 1.78E+00 | Lognormal | 2.00E-02 | 6.30E-01 | no | |
| Methoxychlor | 5.28E-01 | 1.34E+02 | Normal/Lognormal | 9.20E-01 | 1.00E+03 | no | |
| PCB-1260 | 1.48E+00 | 4.17E+02 | Lognormal | 3.40E-01 | 2.90E+00 | no | |



AR316007
ENVIRONMENTAL STANDARDS

***Table 3***
***Statistical Summary and COPC Selection for Industrial Worker Exposed to Surface Soils (0-12" bgs)***
***Former Koppers Company, Inc., Newport, DE***

| Analyte | Total # of Samples | Hits | Hit Frequency % | Minimum Detected mg/kg | Mean mg/kg | Lognormal Mean mg/kg | Maximum Detected mg/kg | Standard Deviation mg/kg |
|---|---|---|---|---|---|---|---|---|
| **Semivolatiles** | | | | | | | | |
| Acenaphthene | 43 | 7 | 16 28 | 5 00E-01 | 9.52E+00 | 2 37E+00 | 1 50E+02 | 2 40E+01 |
| Acenaphthylene | 43 | 12 | 27 91 | 6 20E-01 | 6 92E+00 | 2 68E+00 | 1 30E+01 | 9 71E+00 |
| Anthracene | 43 | 27 | 62 79 | 1 40E-01 | 7 33E+01 | 3 10E+00 | 2 60E+03 | 3 97E+02 |
| Benzo(a)anthracene | 43 | 40 | 93 02 | 3 80E-01 | 4.10E+01 | 1 50E+01 | 1 70E+02 | 4 52E+01 |
| Benzo(a)pyrene | 43 | 40 | 93 02 | 3 40E-01 | 3 48E+01 | 1 26E+01 | 2 40E+02 | 4 48E+01 |
| Benzo(b)fluoranthene | 43 | 40 | 93 02 | 9 30E-01 | 6 98E+01 | 2 51E+01 | 3 70E+02 | 8 00E+01 |
| Benzo(g,h,i)perylene | 43 | 39 | 90 7 | 3 40E-01 | 2.06E+01 | 8 98E+00 | 9 40E+01 | 2 07E+01 |
| Benzo(k)fluoranthene | 43 | 39 | 90 7 | 1 70E-01 | 2 28E+01 | 8 59E+00 | 1.10E+02 | 2.60E+01 |
| Carbazole | 43 | 20 | 46 51 | 9 80E-02 | 3 42E+01 | 2 29E+00 | 1 20E+03 | 1.82E+02 |
| Chrysene | 43 | 40 | 93 02 | 5 60E-01 | 4.73E+01 | 1.67E+01 | 2 60E+02 | 5 83E+01 |
| Di-n-butylphthalate[5] | 44 | 2 | 4 55 | 1 90E-01 | 7 33E+00 | 2 61E+00 | 2 10E-01 | 1 08E+01 |
| Dibenz(a,h)anthracene | 43 | 32 | 74 42 | 3 90E-01 | 7.52E+00 | 3 25E+00 | 2.20E+01 | 8 74E+00 |
| Dibenzofuran | 43 | 9 | 20 93 | 1 00E+00 | 1.11E+01 | 2 44E+00 | 2 30E+02 | 3 54E+01 |
| Fluoranthene | 43 | 41 | 95.35 | 9 40E-02 | 6 63E+01 | 2 12E+01 | 3 90E+02 | 9 33E+01 |
| Fluorene | 43 | 6 | 13 95 | 7 10E-01 | 1 81E+01 | 2 44E+00 | 5 20E+02 | 7 90E+01 |
| Indeno(1,2,3-c,d)pyrene | 44 | 41 | 93 18 | 3 00E-01 | 2 47E+01 | 1 03E+01 | 1 10E+02 | 2 48E+01 |
| Naphthalene | 43 | 10 | 23.26 | 4 70E-01 | 9 75E+00 | 2 55E+00 | 1.50E+02 | 2 40E+01 |
| Pentachlorophenol | 43 | 3 | 6 98 | 6 50E-01 | 1.65E+01 | 5 80E+00 | 2.30E+00 | 2 47E+01 |
| Phenanthrene | 43 | 37 | 86 05 | 1 30E-01 | 3 07E+01 | 4 02E+00 | 8 50E+02 | 1 30E+02 |
| Pyrene | 43 | 40 | 93 02 | 5 10E-01 | 6 74E+01 | 2 20E+01 | 4 10E+02 | 9 06E+01 |
| **Volatiles** | | | | | | | | |
| 1,1,2,2-Tetrachloroethane | 38 | 2 | 5 26 | 1 00E-01 | 1 63E-02 | 7 23E-03 | 3 00E-01 | 4 97E-02 |
| 2-Butanone | 36 | 2 | 5 56 | 6 00E-03 | 6 90E-03 | 6 31E-03 | 3 80E-02 | 5 36E-03 |
| Acetone | 35 | 5 | 14.29 | 4 00E-03 | 1 27E-02 | 7.19E-03 | 1 50E-01 | 2 70E-02 |
| Benzene | 36 | 1 | 2.78 | 1 10E-02 | 6.24E-03 | 6 17E-03 | 1 10E-02 | 1 07E-03 |
| Ethylbenzene | 36 | 4 | 11 11 | 1 00E-03 | 1 13E-02 | 6.27E-03 | 2 00E-01 | 3 24E-02 |
| Tetrachloroethene | 36 | 25 | 69 44 | 4 00E-03 | 1 17E-02 | 8 88E-03 | 7 40E-02 | 1 27E-02 |
| Toluene | 36 | 16 | 44 44 | 1 00E-03 | 1.15E-02 | 7 09E-03 | 1 50E-01 | 2 43E-02 |
| Xylenes (total) | 36 | 6 | 16 67 | 3 30E-03 | 2 68E-02 | 6 99E-03 | 7 40E-01 | 1 22E-01 |



ENVIRONMENTAL STANDARDS
AR316008

***Table 3***
***Statistical Summary and COPC Selection for Industrial Worker Exposed to Surface Soils (0-12" bgs)***
***Former Koppers Company, Inc., Newport, DE***

| Analyte | 95% UCL mg/kg | Lognormal 95% UCL mg/kg | Distribution 99% Confidence | Exposure Point Concentration mg/kg | Industrial Soil RBC mg/kg | Is Maximum >RBC? | Is Detection Frequency >5%? |
|---|---|---|---|---|---|---|---|
| **Semivolatiles** | | | | | | | |
| Acenaphthene | 1.57E+01 | 1 76E+01 | Lognormal | 1 76E+01 | 1.20E+04 | no | |
| Acenaphthylene | 9 41E+00 | 1 58E+01 | Lognormal | 1 30E+01 | NA | NA | yes |
| Anthracene | 1 75E+02 | 6 96E+01 | Lognormal | 6 96E+01 | 6 10E+04 | no | |
| Benzo(a)anthracene | 5 26E+01 | 2 13E+02 | Unknown | 1 70E+02 | 7 80E+00 | yes | yes |
| Benzo(a)pyrene | 4 63E+01 | 1.61E+02 | Lognormal | 1.61E+02 | 7 80E-01 | yes | yes |
| Benzo(b)fluoranthene | 9 04E+01 | 4 22E+02 | Unknown | 3 70E+02 | 7 80E+00 | yes | yes |
| Benzo(g,h,i)perylene | 2 59E+01 | 8 16E+01 | Unknown | 8 16E+01 | NA | NA | yes |
| Benzo(k)fluoranthene | 2 95E+01 | 1 11E+02 | Unknown | 1 10E+02 | 7 80E+01 | yes | yes |
| Carbazole | 8 11E+01 | 2 96E+01 | Lognormal | 2 96E+01 | 2 90E+02 | yes | yes |
| Chrysene | 6 23E+01 | 2.42E+02 | Lognormal | 2 42E+02 | 7 80E+02 | no | |
| Di-n-butylphthalate | 1.01E+01 | 1 60E+01 | Lognormal | 2 10E-01 | 2.00E+04 | no | |
| Dibenz(a,h)anthracene | 9 77E+00 | 1 99E+01 | Lognormal | 1 99E+01 | 7 80E-01 | yes | yes |
| Dibenzofuran | 2 02E+01 | 1 76E+01 | Lognormal | 1 76E+01 | 8 20E+02 | no | |
| Fluoranthene | 9 03E+01 | 4 11E+02 | Lognormal | 3 90E+02 | 8 20E+03 | no | |
| Fluorene | 3 84E+01 | 2 25E+01 | Lognormal | 2.25E+01 | 8 20E+03 | no | |
| Indeno(1,2,3-c,d)pyrene | 3 10E+01 | 1 11E+02 | Unknown | 1 10E+02 | 7 80E+00 | yes | yes |
| Naphthalene | 1 59E+01 | 1 96E+01 | Lognormal | 1 96E+01 | 4 10E+03 | no | |
| Pentachlorophenol | 2 28E+01 | 3 61E+01 | Lognormal | 2 30E+00 | 4 80E+01 | no | |
| Phenanthrene | 6.42E+01 | 5 16E+01 | Lognormal | 5 16E+01 | NA | NA | yes |
| Pyrene | 9 07E+01 | 3 90E+02 | Lognormal | 3 90E+02 | 6 10E+03 | no | |
| **Volatiles** | | | | | | | |
| 1,1,2,2-Tetrachloroethane | 3 00E-02 | 1 28E-02 | Unknown | 1 28E-02 | 2 90E+01 | no | |
| 2-Butanone | 8 42E-03 | 7 31E-03 | Unknown | 7 31E-03 | 1 00E+05 | no | |
| Acetone | 2 04E-02 | 1 25E-02 | Unknown | 1 25E-02 | 2.00E+04 | no | |
| Benzene | 6 54E-03 | 6 50E-03 | Unknown | 6 50E-03 | 2.00E+02 | no | |
| Ethylbenzene | 2 04E-02 | 9 97E-03 | Unknown | 9.97E-03 | 2 00E+04 | no | |
| Tetrachloroethene | 1 53E-02 | 1 39E-02 | Unknown | 1 39E-02 | 1.10E+02 | no | |
| Toluene | 1.84E-02 | 1 22E-02 | Unknown | 1 22E-02 | 4.10E+04 | no | |
| Xylenes (total) | 6.14E-02 | 1 37E-02 | Unknown | 1 37E-02 | 1.00E+05 | no | |

This data set includes samples from the Process/Wood Storage and Drip Track areas
NA - Not available
[1] The screening level of 750 mg/kg is based on US EPA's adult blood lead uptake model under default exposure assumptions
[2] These compounds have no published RBC or RfD values. They are sufficiently close in toxicity to Chlordane so that the Chlordane RBC is applicable to its congeners as a provisional benchmark
[3] These compounds have no published RBC or RfD values They are sufficiently close in toxicity to Endosulfan so that the Endosulfan RBC is applicable to its congeners as a provisional benchmark
[4] These compounds have no published RBC or RfD values They are sufficiently close in toxicity to Endrin so that the Endrin RBC is applicable to its congeners as a provisional benchmark





ENVIRONMENTAL STANDARDS

*Table 4*
***Statistical Summary and COPC Selection for Industrial Worker Exposed to Surface Soils and NAPL (0-12" bgs)***
***Former Koppers Company, Inc., Newport, DE***

| Analyte | Total # of Samples | Hits | Hit Frequency % | Minimum Detected mg/kg | Mean mg/kg | Lognormal Mean mg/kg | Maximum Detected mg/kg | Standard Deviation mg/kg |
|---|---|---|---|---|---|---|---|---|
| **Dioxins** | | | | | | | | |
| 2,3,7,8-TCDD Equiv | 12 | 12 | 100 | 1 48E-04 | 1.69E-03 | 9 77E-04 | 7 34E-03 | 1 98E-03 |
| **Inorganics** | | | | | | | | |
| Aluminum | 67 | 67 | 100 | 2 07E+03 | 1.59E+04 | 1 36E+04 | 3 65E+04 | 8 63E+03 |
| Antimony | 46 | 14 | 30 43 | 6 50E-01 | 7.23E+00 | 1 60E+00 | 1 21E+01 | 1 16E+01 |
| Arsenic | 62 | 60 | 96 77 | 1 20E+00 | 6.34E+00 | 4 86E+00 | 3 10E+01 | 5 34E+00 |
| Barium | 67 | 67 | 100 | 2 11E+01 | 4.47E+02 | 2 91E+02 | 1 65E+03 | 3 85E+02 |
| Beryllium | 60 | 60 | 100 | 2 60E-01 | 1 58E+00 | 1 28E+00 | 3 90E+00 | 9 61E-01 |
| Cadmium | 64 | 29 | 45 31 | 2 40E-01 | 1.09E+00 | 5 30E-01 | 2 10E+00 | 1 02E+00 |
| Chromium | 67 | 67 | 100 | 3 70E+00 | 2.93E+01 | 2 19E+01 | 2 44E+02 | 3 43E+01 |
| Cobalt | 65 | 56 | 86.15 | 6 10E-01 | 6.49E+00 | 4 14E+00 | 2 50E+01 | 5 52E+00 |
| Copper | 66 | 66 | 100 | 9 10E-01 | 4.19E+01 | 2 23E+01 | 5 28E+02 | 7 54E+01 |
| Iron | 67 | 67 | 100 | 4 43E+03 | 1.77E+04 | 1 59E+04 | 7 73E+04 | 1 00E+04 |
| Lead[1] | 67 | 67 | 100 | 2 30E+00 | 6.85E+01 | 3 25E+01 | 8 92E+02 | 1 31E+02 |
| Manganese | 67 | 67 | 100 | 4 06E+01 | 2.07E+03 | 9.90E+02 | 9 81E+03 | 2 48E+03 |
| Mercury | 50 | 31 | 62 | 2 10E-02 | 4.93E-01 | 1 33E-01 | 8 30E+00 | 1 32E+00 |
| Nickel | 62 | 62 | 100 | 4 00E+00 | 1.25E+01 | 1 06E+01 | 5 18E+01 | 8.68E+00 |
| Selenium | 61 | 13 | 21 31 | 8 50E-01 | 1.26E+00 | 8 66E-01 | 2 30E+00 | 9 80E-01 |
| Silver | 65 | 3 | 4 62 | 2 10E-01 | 2.40E+00 | 6 24E-01 | 1 50E+00 | 2 43E+00 |
| Thallium | 66 | 26 | 39.39 | 8 90E-01 | 3.85E+00 | 1.83E+00 | 4 44E+01 | 6 35E+00 |
| Vanadium | 67 | 66 | 98 51 | 7 60E+00 | 7.32E+01 | 5.00E+01 | 3 06E+02 | 7 64E+01 |
| Zinc | 66 | 66 | 100 | 6 40E+00 | 9.78E+01 | 6.61E+01 | 8 74E+02 | 1 25E+02 |
| **PCBs/Pesticides** | | | | | | | | |
| 4,4'-DDD | 7 | 1 | 14.29 | 3 80E-03 | 8.71E-02 | 1 58E-02 | 3.80E-03 | 1 06E-01 |
| 4,4'-DDE | 7 | 3 | 42 86 | 1 40E-02 | 4.72E-02 | 1.07E-02 | 2.40E-01 | 8 75E-02 |
| 4,4'-DDT | 7 | 4 | 57 14 | 6 90E-03 | 4.64E-02 | 1 59E-02 | 1 20E-01 | 5 47E-02 |
| alpha-Chlordane[2] | 7 | 1 | 14 29 | 1 80E-04 | 4.53E-02 | 7 28E-03 | 1 80E-04 | 5 46E-02 |
| Dieldrin | 7 | 3 | 42.86 | 2 40E-03 | 6.11E-02 | 1 07E-02 | 1 30E-02 | 9 72E-02 |
| Endosulfan II[3] | 7 | 1 | 14 29 | 4 50E-04 | 8.78E-02 | 1 46E-02 | 4 50E-04 | 1 06E-01 |
| Endrin | 7 | 1 | 14 29 | 1 10E-01 | 7.59E-02 | 1.67E-02 | 1 10E-01 | 9 53E-02 |
| Endrin ketone[4] | 7 | 1 | 14 29 | 2.90E-02 | 6.57E-02 | 1 39E-02 | 2 90E-02 | 9 76E-02 |
| Heptachlor | 7 | 1 | 14 29 | 5 30E-03 | 3.19E-02 | 6 11E-03 | 5 30E-03 | 5 03E-02 |
| Heptachlor epoxide | 7 | 2 | 28.57 | 1 00E-02 | 1.90E-02 | 5 21E-03 | 2.00E-02 | 3 42E-02 |
| Methoxychlor | 7 | 3 | 42 86 | 2 90E-01 | 2.66E-01 | 7 02E-02 | 9 20E-01 | 3 57E-01 |
| PCB-1260 | 8 | 1 | 12.5 | 3 40E-01 | 8.13E-01 | 1 96E-01 | 3 40E-01 | 9 94E-01 |
| **Semivolatiles** | | | | | | | | |
| 2,4-Dimethylphenol | 67 | 1 | 1 49 | 1 20E+01 | 4.63E+00 | 1 24E+00 | 1 20E+01 | 8 51E+00 |
| 2-Methylnaphthalene | 67 | 18 | 26 87 | 4 10E-02 | 1.00E+01 | 1.22E+00 | 2 20E+02 | 3 48E+01 |
| 4-Methylphenol | 67 | 1 | 1.49 | 3.10E+01 | 4.91E+00 | 1.26E+00 | 3 10E+01 | 9 06E+00 |
| Acenaphthene | 67 | 22 | 32.84 | 4 60E-02 | 2.71E+01 | 1 14E+00 | 1 40E+03 | 1 71E+02 |
| Acenaphthylene | 67 | 31 | 46.27 | 1 10E-01 | 6.36E+00 | 1 66E+00 | 9 90E+01 | 1 42E+01 |



AR316010
ENVIRONMENTAL STANDARDS

*Table 4*
***Statistical Summary and COPC Selection for Industrial Worker Exposed to Surface Soils and NAPL (0-12" bgs)***
***Former Koppers Company, Inc., Newport, DE***

| Analyte | 95% UCL mg/kg | Lognormal 95% UCL mg/kg | Distribution 99% Confidence | Exposure Point Concentration mg/kg | Industrial Soil RBC mg/kg | Is Maximum >RBC? | Is Detection Frequency >5%? |
|---|---|---|---|---|---|---|---|
| **Dioxins** | | | | | | | |
| 2,3,7,8-TCDD Equiv | 2 71E-03 | 5 44E-03 | Lognormal | 5 44E-03 | 3 80E-05 | yes | yes |
| **Inorganics** | | | | | | | |
| Aluminum | 1 76E+04 | 1 86E+04 | Unknown | 1 86E+04 | 2.00E+05 | no | |
| Antimony | 1 01E+01 | 1 83E+01 | Unknown | 1 21E+01 | 8.20E+01 | no | |
| Arsenic | 7.48E+00 | 7 70E+00 | Unknown | 7 70E+00 | 3.80E+00 | yes | yes |
| Barium | 5 25E+02 | 6 51E+02 | Unknown | 6 51E+02 | 1.40E+04 | no | |
| Beryllium | 1 79E+00 | 1 95E+00 | Unknown | 1 95E+00 | 4 10E+02 | no | |
| Cadmium | 1 31E+00 | 2 50E+00 | Normal | 1 31E+00 | 2.00E+02 | no | |
| Chromium | 3 63E+01 | 3 28E+01 | Unknown | 3 28E+01 | 3.10E+05 | no | |
| Cobalt | 7 63E+00 | 1 37E+01 | Unknown | 1 37E+01 | 1 20E+04 | no | |
| Copper | 5.74E+01 | 5 02E+01 | Lognormal | 5 02E+01 | 8.20E+03 | no | |
| Iron | 1 97E+04 | 1 94E+04 | Unknown | 1 94E+04 | 6.10E+04 | yes | yes |
| Lead[1] | 9 54E+01 | 8 31E+01 | Unknown | 8.31E+01 | 7 50E+02 | yes | yes |
| Manganese | 2 57E+03 | 3 46E+03 | Unknown | 3 46E+03 | 2.90E+04 | no | |
| Mercury | 8 08E-01 | 5 65E-01 | Unknown | 5 65E-01 | 6.10E+01 | no | |
| Nickel | 1 43E+01 | 1 39E+01 | Unknown | 1 39E+01 | 4 10E+03 | no | |
| Selenium | 1 47E+00 | 1.72E+00 | Unknown | 1 72E+00 | 1.00E+03 | no | |
| Silver | 2 91E+00 | 1 19E+01 | Unknown | 1 50E+00 | 1.00E+03 | no | |
| Thallium | 5 16E+00 | 5 40E+00 | Unknown | 5 40E+00 | 1.40E+01 | yes | yes |
| Vanadium | 8 88E+01 | 8 78E+01 | Unknown | 8.78E+01 | 1.40E+03 | no | |
| Zinc | 1 23E+02 | 1 15E+02 | Unknown | 1 15E+02 | 6.10E+04 | no | |
| **PCBs/Pesticides** | | | | | | | |
| 4,4'-DDD | 1 65E-01 | 6 23E+02 | Unknown | 3.80E-03 | 2 40E+01 | no | |
| 4,4'-DDE | 1 11E-01 | 8.03E+00 | Lognormal | 2 40E-01 | 1.70E+01 | no | |
| 4,4'-DDT | 8 66E-02 | 7 59E+00 | Normal/Lognormal | 1 20E-01 | 1.70E+01 | no | |
| alpha-Chlordane[2] | 8 54E-02 | 3 69E+03 | Normal/Lognormal | 1 80E-04 | 1 60E+01 | no | |
| Dieldrin | 1 32E-01 | 4 36E+01 | Lognormal | 1.30E-02 | 3 60E-01 | no | |
| Endosulfan II[3] | 1 65E-01 | 4 37E+03 | Normal/Lognormal | 4 50E-04 | 1 20E+03 | no | |
| Endrin | 1 46E-01 | 1 72E+02 | Normal/Lognormal | 1 10E-01 | 6.10E+01 | no | |
| Endrin ketone[4] | 1 37E-01 | 5 35E+01 | Lognormal | 2 90E-02 | 6.10E+01 | no | |
| Heptachlor | 6 88E-02 | 1 87E+01 | Lognormal | 5.30E-03 | 1.30E+00 | no | |
| Heptachlor epoxide | 4 41E-02 | 1 78E+00 | Lognormal | 2.00E-02 | 6 30E-01 | no | |
| Methoxychlor | 5 28E-01 | 1 34E+02 | Normal/Lognormal | 9 20E-01 | 1 00E+03 | no | |
| PCB-1260 | 1 48E+00 | 4 17E+02 | Lognormal | 3 40E-01 | 2 90E+00 | no | |
| **Semivolatiles** | | | | | | | |
| 2,4-Dimethylphenol | 6 36E+00 | 8 47E+00 | Unknown | 8.47E+00 | 4 10E+03 | no | |
| 2-Methylnaphthalene | 1 71E+01 | 1 40E+01 | Unknown | 1 40E+01 | 4 10E+03 | no | |
| 4-Methylphenol | 6 76E+00 | 9 06E+00 | Unknown | 9 06E+00 | 1.00E+03 | no | |
| Acenaphthene | 6 21E+01 | 1 86E+01 | Unknown | 1 86E+01 | 1 20E+04 | no | |
| Acenaphthylene | 9 25E+00 | 1 21E+01 | Unknown | 1 21E+01 | NA | NA | yes |



AR316011
ENVIRONMENTAL STANDARDS

***Table 4***
***Statistical Summary and COPC Selection for Industrial Worker Exposed to Surface Soils and NAPL (0-12" bgs)***
***Former Koppers Company, Inc., Newport, DE***

| Analyte | Total # of Samples | Hits | Hit Frequency % | Minimum Detected mg/kg | Mean mg/kg | Lognormal Mean mg/kg | Maximum Detected mg/kg | Standard Deviation mg/kg |
|---|---|---|---|---|---|---|---|---|
| Anthracene | 67 | 46 | 68 66 | 1 20E-01 | 6.55E+01 | 2.05E+00 | 2 60E+03 | 3 48E+02 |
| Benzo(a)anthracene | 67 | 63 | 94 03 | 6 70E-02 | 5 39E+01 | 8 46E+00 | 1 60E+03 | 1 96E+02 |
| Benzo(a)pyrene | 67 | 63 | 94 03 | 6 30E-02 | 3.74E+01 | 7.68E+00 | 7 40E+02 | 9 54E+01 |
| Benzo(b)fluoranthene | 67 | 63 | 94.03 | 1 60E-01 | 7 11E+01 | 1 57E+01 | 1 20E+03 | 1 57E+02 |
| Benzo(g,h,i)perylene | 67 | 60 | 89 55 | 4 70E-02 | 1 98E+01 | 5 73E+00 | 2 70E+02 | 3 63E+01 |
| Benzo(k)fluoranthene | 67 | 59 | 88.06 | 5 20E-02 | 2 09E+01 | 4 68E+00 | 3 20E+02 | 4 36E+01 |
| Butylbenzylphthalate | 68 | 2 | 2 94 | 6 50E-02 | 5 44E+00 | 1 29E+00 | 9 30E-02 | 9 97E+00 |
| Carbazole | 67 | 39 | 58 21 | 6 10E-02 | 3 33E+01 | 1 36E+00 | 1 20E+03 | 1 71E+02 |
| Chrysene | 67 | 64 | 95 52 | 4 60E-02 | 5.95E+01 | 1.02E+01 | 1 60E+03 | 1 98E+02 |
| Di-n-butylphthalate | 68 | 5 | 7.35 | 3 90E-02 | 5.43E+00 | 1 24E+00 | 2 10E-01 | 9 97E+00 |
| Di-n-octylphthalate | 68 | 1 | 1 47 | 4.30E-02 | 5.44E+00 | 1.30E+00 | 4 30E-02 | 9 97E+00 |
| Dibenz(a,h)anthracene | 67 | 50 | 74 63 | 2.90E-01 | 7.12E+00 | 2.25E+00 | 9 50E+01 | 1 33E+01 |
| Dibenzofuran | 67 | 22 | 32 84 | 8 50E-02 | 2.66E+01 | 1.27E+00 | 1 30E+03 | 1 61E+02 |
| Diethylphthalate | 68 | 1 | 1 47 | 6.40E-02 | 5.44E+00 | 1 31E+00 | 6.40E-02 | 9 97E+00 |
| Fluoranthene | 67 | 65 | 97 01 | 6 80E-02 | 1 77E+02 | 1 24E+01 | 8 60E+03 | 1 05E+03 |
| Fluorene | 67 | 17 | 25 37 | 5 40E-02 | 4.91E+01 | 1 25E+00 | 2 50E+03 | 3 11E+02 |
| Indeno(1,2,3-c,d)pyrene | 68 | 62 | 91 18 | 8.40E-02 | 2.39E+01 | 6.57E+00 | 3 40E+02 | 4 50E+01 |
| Naphthalene | 67 | 26 | 38 81 | 5 20E-02 | 1.00E+01 | 1.30E+00 | 2 40E+02 | 3 46E+01 |
| Pentachlorophenol | 67 | 11 | 16 42 | 6 50E-02 | 1.22E+01 | 2.58E+00 | 2 30E+00 | 2 32E+01 |
| Phenanthrene | 67 | 56 | 83 58 | 1 00E-01 | 1.85E+02 | 2 66E+00 | 1 10E+04 | 1 35E+03 |
| Phenol | 57 | 1 | 1 49 | 5 70E+01 | 5.30E+00 | 1 27E+00 | 5.70E+01 | 1 06E+01 |
| Pyrene | 67 | 64 | 95 52 | 6 10E-02 | 1.35E+02 | 1 33E+01 | 5 70E+03 | 6 95E+02 |
| Volatiles | | | | | | | | |
| 1,1,2,2-Tetrachloroethane | 47 | 2 | 4.26 | 1.00E-01 | 1.44E-02 | 7.02E-03 | 3 00E-01 | 4 47E-02 |
| 2-Butanone | 45 | 2 | 4 44 | 6 00E-03 | 6.77E-03 | 6 28E-03 | 3.80E-02 | 4 79E-03 |
| Acetone | 37 | 6 | 16.22 | 4 00E-03 | 1.84E-02 | 7 86E-03 | 2.30E-01 | 4 44E-02 |
| Benzene | 45 | 1 | 2 22 | 1 10E-02 | 6.23E-03 | 6.17E-03 | 1 10E-02 | 9.86E-04 |
| Ethylbenzene | 45 | 4 | 8 89 | 1.00E-03 | 1.03E-02 | 6 26E-03 | 2.00E-01 | 2 89E-02 |
| Tetrachloroethene | 45 | 25 | 55 56 | 4 00E-03 | 1.06E-02 | 8 27E-03 | 7 40E-02 | 1 15E-02 |
| Toluene | 45 | 16 | 35.56 | 1 00E-03 | 1.05E-02 | 6.91E-03 | 1 50E-01 | 2 18E-02 |
| Trichloroethene | 45 | 1 | 2 22 | 2 00E-03 | 6.04E-03 | 5 95E-03 | 2 00E-03 | 9 03E-04 |
| Xylenes (total) | 45 | 6 | 13 33 | 3 30E-03 | 2.27E-02 | 6 83E-03 | 7 40E-01 | 1 09E-01 |

***Table 4***
***Statistical Summary and COPC Selection for Industrial Worker Exposed to Surface Soils and NAPL (0-12" bgs)***
***Former Koppers Company, Inc., Newport, DE***

| Analyte | 95% UCL mg/kg | Lognormal 95% UCL mg/kg | Distribution 99% Confidence | Exposure Point Concentration mg/kg | Industrial Soil RBC mg/kg | Is Maximum >RBC? | Is Detection Frequency >5%? |
|---|---|---|---|---|---|---|---|
| Anthracene | 1 37E+02 | 4 08E+01 | Unknown | 4.08E+01 | 6 10E+04 | no | |
| Benzo(a)anthracene | 9 39E+01 | 2 92E+02 | Unknown | 2.92E+02 | 7 80E+00 | yes | yes |
| Benzo(a)pyrene | 5 69E+01 | 2 02E+02 | Unknown | 2.02E+02 | 7 80E-01 | yes | yes |
| Benzo(b)fluoranthene | 1 03E+02 | 4 29E+02 | Unknown | 4.29E+02 | 7 80E+00 | yes | yes |
| Benzo(g,h,i)perylene | 2 72E+01 | 7 85E+01 | Unknown | 7.85E+01 | NA | NA | yes |
| Benzo(k)fluoranthene | 2 97E+01 | 9 95E+01 | Unknown | 9.95E+01 | 7 80E+01 | yes | yes |
| Butylbenzylphthalate | 7 46E+00 | 1 11E+01 | Unknown | 9.30E-02 | 4 10E+04 | no | |
| Carbazole | 6 81E+01 | 2 11E+01 | Unknown | 2.11E+01 | 2 90E+02 | yes | yes |
| Chrysene | 9 98E+01 | 3 27E+02 | Unknown | 3.27E+02 | 7 80E+02 | yes | yes |
| Di-n-butylphthalate | 7.45E+00 | 1 24E+01 | Unknown | 2.10E-01 | 2 00E+04 | no | |
| Di-n-octylphthalate | 7 46E+00 | 1 11E+01 | Unknown | 4.30E-02 | 4 10E+03 | no | |
| Dibenz(a,h)anthracene | 9 84E+00 | 1 55E+01 | Unknown | 1.55E+01 | 7.80E-01 | yes | yes |
| Dibenzofuran | 5 94E+01 | 1 55E+01 | Unknown | 1.55E+01 | 8 20E+02 | yes | yes |
| Diethylphthalate | 7 46E+00 | 1 09E+01 | Unknown | 6.40E-02 | 1 60E+05 | no | |
| Fluoranthene | 3 91E+02 | 6 59E+02 | Unknown | 6.59E+02 | 8 20E+03 | yes | yes |
| Fluorene | 1 12E+02 | 2 15E+01 | Unknown | 2.15E+01 | 8 20E+03 | no | |
| Indeno(1,2,3-c,d)pyrene | 3 31E+01 | 1 01E+02 | Unknown | 1.01E+02 | 7.80E+00 | yes | yes |
| Naphthalene | 1 71E+01 | 1 54E+01 | Unknown | 1.54E+01 | 4 10E+03 | no | |
| Pentachlorophenol | 1 70E+01 | 3 19E+01 | Unknown | 2.30E+00 | 4 80E+01 | no | |
| Phenanthrene | 4 59E+02 | 6 75E+01 | Unknown | 6.75E+01 | NA | NA | yes |
| Phenol | 7 47E+00 | 9 56E+00 | Unknown | 9.56E+00 | 1 20E+05 | no | |
| Pyrene | 2 76E+02 | 5 67E+02 | Unknown | 5.67E+02 | 6 10E+03 | no | |
| **Volatiles** | | | | | | | |
| 1,1,2,2-Tetrachloroethane | 2.54E-02 | 1 11E-02 | Unknown | 1.11E-02 | 2 90E+01 | no | |
| 2-Butanone | 7 97E-03 | 7 07E-03 | Unknown | 7.07E-03 | 1.00E+05 | no | |
| Acetone | 3 08E-02 | 1 71E-02 | Unknown | 1.71E-02 | 2.00E+04 | no | |
| Benzene | 6 48E-03 | 6 45E-03 | Unknown | 6.45E-03 | 2 00E+02 | no | |
| Ethylbenzene | 1 75E-02 | 8 98E-03 | Unknown | 8.98E-03 | 2 00E+04 | no | |
| Tetrachloroethene | 1 35E-02 | 1 20E-02 | Unknown | 1.20E-02 | 1 10E+02 | no | |
| Toluene | 1 59E-02 | 1 06E-02 | Unknown | 1.06E-02 | 4 10E+04 | no | |
| Trichloroethene | 6 27E-03 | 6 38E-03 | Unknown | 2.00E-03 | 5 20E+02 | no | |
| Xylenes (total) | 5 01E-02 | 1 15E-02 | Unknown | 1.15E-02 | 4 10E+05 | no | |

This data set includes samples from the Process/Wood Storage and Drip Track areas
NA - Not available
[1] The screening level of 750 mg/kg is based on US EPA's adult blood lead uptake model under default exposure assumptions
[2] These compounds have no published RBC or RfD values They are sufficiently close in toxicity to Chlordane so that the Chlordane RBC is applicable to its congeners as a provisional benchmark.
[3] These compounds have no published RBC or RfD values They are sufficiently close in toxicity to Endosulfan so that the Endosulfan RBC is applicable to its congeners as a provisional benchmark.
[4] These compounds have no published RBC or RfD values They are sufficiently close in toxicity to Endrin so that the Endrin RBC is applicable to its congeners as a provisional benchmark



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ENVIRONMENTAL STANDARDS

***Table 5***
***Statistical Summary and COPC Selection of Constituents in Columbia Aquifer Groundwater****
***Former Koppers Company, Inc., Newport, DE***

| Analyte | Total # of Samples | Hits | Hit Frequency % | Minimum Detected mg/L | Mean mg/L | Lognormal Mean mg/L | Maximum Detected mg/L | Standard Deviation mg/L |
|---|---|---|---|---|---|---|---|---|
| **Inorganics** | | | | | | | | |
| Aluminum | 2 | 2 | 100 | 2 52E-01 | 2 73E-01 | 2 72E-01 | 2 94E-01 | 2 97E-02 |
| Antimony | 10 | 2 | 20 | 5 70E-03 | 2 07E-03 | 1 12E-03 | 9 00E-03 | 2 90E-03 |
| Arsenic | 11 | 1 | 9 09 | 3 30E-03 | 1 14E-03 | 9 81E-04 | 3 30E-03 | 7 75E-04 |
| Barium | 11 | 11 | 100 | 2 90E-02 | 6 75E-02 | 5 32E-02 | 2 13E-01 | 5 65E-02 |
| Cadmium | 12 | 1 | 8 33 | 2 10E-03 | 5 70E-04 | 3 83E-04 | 2 10E-03 | 5 95E-04 |
| Cobalt | 12 | 8 | 66.67 | 8 70E-04 | 4.96E-03 | 1.94E-03 | 2 82E-02 | 8 13E-03 |
| Copper | 11 | 1 | 9.09 | 1 50E-03 | 8 20E-04 | 6 21E-04 | 1 50E-03 | 6.09E-04 |
| Iron | 9 | 6 | 66 67 | 6 07E-01 | 1 21E+00 | 2 83E-01 | 3 20E+00 | 1 32E+00 |
| Lead | 10 | 2 | 20 | 5.10E-03 | 1 48E-03 | 8 45E-04 | 5 40E-03 | 1 99E-03 |
| Manganese | 16 | 15 | 93.75 | 2.44E-02 | 5 17E-01 | 1 39E-01 | 1 86E+00 | 6 80E-01 |
| Nickel | 11 | 3 | 27.27 | 7 10E-03 | 3 19E-03 | 1 26E-03 | 1 22E-02 | 4 50E-03 |
| Selenium | 11 | 3 | 27.27 | 3 20E-03 | 2 64E-03 | 1.60E-03 | 1 17E-02 | 3 35E-03 |
| Vanadium | 13 | 2 | 15 38 | 2 90E-03 | 8 67E-04 | 5 45E-04 | 3 40E-03 | 1 05E-03 |
| Zinc | 3 | 2 | 66.67 | 8 80E-03 | 9 22E-03 | 5 92E-03 | 1 75E-02 | 8 08E-03 |
| **Pesticides** | | | | | | | | |
| 4,4' DDD | 3 | 1 | 33 33 | 1 40E-04 | 8 00E-05 | 7.05E-05 | 1 40E-04 | 5 20E-05 |
| 4,4-DDE | 3 | 2 | 66.67 | 1 00E-05 | 2 47E-05 | 1 91E-05 | 1 40E-05 | 2 20E-05 |
| 4,4' DDT | 3 | 1 | 33 33 | 5.00E-05 | 5 00E-05 | 5 00E-05 | 5 00E-05 | 0 00E+00 |
| alpha-BHC | 3 | 1 | 33 33 | 1 50E-06 | 1 72E-05 | 9 79E-06 | 1 50E-06 | 1 36E-05 |
| Dieldrin | 3 | 1 | 33.33 | 3.50E-05 | 4 50E-05 | 4 44E-05 | 3 50E-05 | 8.66E-06 |
| Endosulfan II | 3 | 1 | 33.33 | 2 90E-05 | 4.30E-05 | 4 17E-05 | 2 90E-05 | 1 21E-05 |
| Endosulfan Sulfate | 3 | 1 | 33.33 | 1 40E-05 | 3 80E-05 | 3 27E-05 | 1 40E-05 | 2 08E-05 |
| Endrin | 3 | 1 | 33 33 | 3 80E-05 | 4 60E-05 | 4 56E-05 | 3 80E-05 | 6 93E-06 |
| gamma-Chlordane | 3 | 1 | 33 33 | 1.60E-05 | 2.20E-05 | 2 15E-05 | 1.60E-05 | 5 20E-06 |
| Heptachlor | 3 | 1 | 33.33 | 1 80E-05 | 2 27E-05 | 2 24E-05 | 1 80E-05 | 4.04E-06 |
| Heptachlor epoxide | 3 | 1 | 33 33 | 6 60E-05 | 3 87E-05 | 3 46E-05 | 6 60E-05 | 2.37E-05 |
| **Semivolatiles** | | | | | | | | |
| Acenaphthene | 17 | 1 | 5.88 | 3 00E-03 | 3 29E-03 | 2 15E-03 | 3 00E-03 | 2 18E-03 |
| Benzo(a)anthracene | 17 | 1 | 5 88 | 2 00E-03 | 3 47E-03 | 2 25E-03 | 2 00E-03 | 2 17E-03 |
| Benzo(b)fluoranthene | 17 | 1 | 5.88 | 1 00E-03 | 3 44E-03 | 2 31E-03 | 1 00E-03 | 2 18E-03 |
| Benzo(k)fluoranthene | 17 | 1 | 5 88 | 1 00E-03 | 3 59E-03 | 2.83E-03 | 1 00E-03 | 1 97E-03 |
| bis(2-Ethylhexyl)phthalate | 16 | 1 | 6.25 | 1 50E-02 | 4 22E-03 | 2 61E-03 | 1 50E-02 | 3.57E-03 |
| Butylbenzylphthalate | 17 | 1 | 5 88 | 1.00E-03 | 3 44E-03 | 2 31E-03 | 1 00E-03 | 2 18E-03 |
| Chrysene | 17 | 1 | 5 88 | 1.00E-03 | 3 59E-03 | 2 83E-03 | 1 00E-03 | 1 97E-03 |
| Dibenzofuran | 17 | 1 | 5.88 | 3 00E-03 | 3.47E-03 | 2.75E-03 | 3 00E-03 | 1.94E-03 |
| Di-n-butylphthalate | 17 | 1 | 5 88 | 1.00E-03 | 3 18E-03 | 2 02E-03 | 1 00E-03 | 2 25E-03 |
| Fluoranthene | 17 | 1 | 5.88 | 4 00E-03 | 3 53E-03 | 2.80E-03 | 4 00E-03 | 1 94E-03 |
| Fluorene | 17 | 1 | 5.88 | 4 00E-03 | 3.35E-03 | 2 19E-03 | 4 00E-03 | 2 18E-03 |
| Naphthalene | 17 | 1 | 5.88 | 2.00E-03 | 3.41E-03 | 2 68E-03 | 2 00E-03 | 1 97E-03 |
| Phenanthrene | 17 | 2 | 11.76 | 2.00E-03 | 3 85E-03 | 2 52E-03 | 1 10E-02 | 2 78E-03 |
| Pyrene | 17 | 1 | 5.88 | 1.00E-03 | 3 44E-03 | 2 31E-03 | 1 00E-03 | 2 18E-03 |
| **Volatiles** | | | | | | | | |
| Acetone | 17 | 1 | 5.88 | 6 00E-03 | 4.62E-03 | 4 56E-03 | 6 00E-03 | 7 19E-04 |



AR316014

ENVIRONMENTAL STANDARDS

*Table 5*
*Statistical Summary and COPC Selection of Constituents in Columbia Aquifer Groundwater**
*Former Koppers Company, Inc., Newport, DE*

| Analyte | 95% UCL mg/L | Lognormal 95% UCL mg/L | Distribution 99% Confidence | Exposure Point Concentration mg/L | Tap Water RBC mg/L | Is Maximum Greater than RBC? | Is Detection Frequency >5%? |
|---|---|---|---|---|---|---|---|
| **Inorganics** | | | | | | | |
| Aluminum | 4 06E-01 | 4 21E-01 | Unknown | 2.94E-01 | 3 70E+00 | no | |
| Antimony | 3 75E-03 | 5 74E-03 | Unknown | 5 74E-03 | 1 50E-03 | yes | yes |
| Arsenic | 1 56E-03 | 1 68E-03 | Lognormal | 1 68E-03 | 4 50E-05 | yes | yes |
| Barium | 9 84E-02 | 1 12E-01 | Lognormal | 1.12E-01 | 2 60E-01 | no | |
| Cadmium | 8 79E-04 | 1 14E-03 | Unknown | 1 14E-03 | 1 80E-03 | yes | yes |
| Cobalt | 9 18E-03 | 2 22E-02 | Lognormal | 2 22E-02 | 2 20E-01 | no | |
| Copper | 1 15E-03 | 1 66E-03 | Lognormal | 1 50E-03 | 1 50E-01 | no | |
| Iron | 2.03E+00 | 3 42E+03 | Normal/Lognormal | 3 20E+00 | 1 10E+00 | yes | yes |
| Lead† | 2 63E-03 | 3 58E-03 | Unknown | 3 58E-03 | NA | NA | no |
| Manganese | 8 15E-01 | 4 43E+01 | Lognormal | 1 86E+00 | 7 30E-02 | yes | yes |
| Nickel | 5 65E-03 | 1 63E-02 | Unknown | 1 22E-02 | 7 30E-02 | no | |
| Selenium | 4 47E-03 | 6.30E-03 | Lognormal | 6.30E-03 | 1 80E-02 | no | |
| Vanadium | 1 38E-03 | 1 67E-03 | Unknown | 1 67E-03 | 2 60E-02 | no | |
| Zinc | 2 28E-02 | 1 62E+05 | Normal/Lognormal | 1 75E-02 | 1 10E+00 | no | |
| **Pesticides** | | | | | | | |
| 4,4'-DDD | 1.68E-04 | 2 17E-03 | Unknown | 1 40E-04 | 2 80E-04 | no | |
| 4,4'-DDE | 6 18E-05 | 2 11E-02 | Normal/Lognormal | 1 40E-05 | 2 00E-04 | no | |
| 4,4'-DDT | 5 00E-05 | 5.00E-05 | Unknown | 5 00E-05 | 2 00E-04 | no | |
| alpha-BHC | 4 00E-05 | 1 42E+06 | Unknown | 1 50E-06 | 1 10E-05 | no | |
| Dieldrin | 5 96E-05 | 7 37E-05 | Unknown | 3 50E-05 | 4 20E-06 | yes | yes |
| Endosulfan II[1] | 6 34E-05 | 1 13E-04 | Unknown | 2 90E-05 | 2.20E-02 | no | |
| Endosulfan Sulfate[1] | 7 30E-05 | 6 22E-03 | Unknown | 1.40E-05 | 2 20E-02 | no | |
| Endrin | 5 77E-05 | 6 49E-05 | Unknown | 3 80E-05 | 1 10E-03 | no | |
| gamma-Chlordane[2] | 3 08E-05 | 4 39E-05 | Unknown | 1 60E-05 | 1.90E-04 | no | |
| Heptachlor | 2 95E-05 | 3.52E-05 | Unknown | 1.80E-05 | 2 30E-06 | yes | yes |
| Heptachlor epoxide | 7 86E-05 | 7 26E-04 | Unknown | 6 60E-05 | 1 20E-06 | yes | yes |
| **Semivolatiles** | | | | | | | |
| Acenaphthene | 4 22E-03 | 8 92E-03 | Unknown | 3.00E-03 | 2 20E-01 | no | |
| Benzo(a)anthracene | 4 39E-03 | 1 06E-02 | Unknown | 2 00E-03 | 9 20E-05 | yes | yes |
| Benzo(b)fluoranthene | 4 36E-03 | 8 97E-03 | Unknown | 1.00E-03 | 9 20E-05 | yes | yes |
| Benzo(k)fluoranthene | 4 42E-03 | 6 21E-03 | Unknown | 1 00E-03 | 9 20E-04 | yes | yes |
| bis(2-Ethylhexyl)phthalate | 5 78E-03 | 1 31E-02 | Unknown | 1 31E-02 | 4 80E-03 | yes | yes |
| Butylbenzylphthalate | 4 36E-03 | 8 97E-03 | Unknown | 1 00E-03 | 7 30E-01 | no | |
| Chrysene | 4 42E-03 | 6 21E-03 | Unknown | 1 00E-03 | 9 20E-03 | no | |
| Dibenzofuran | 4 29E-03 | 5 90E-03 | Unknown | 3 00E-03 | 2 40E-03 | yes | yes |
| Di-n-butylphthalate | 4.13E-03 | 8 58E-03 | Unknown | 1 00E-03 | 3 70E-01 | no | |
| Fluoranthene | 4 35E-03 | 6 05E-03 | Unknown | 4 00E-03 | 1 50E-01 | no | |
| Fluorene | 4 28E-03 | 9 23E-03 | Unknown | 4 00E-03 | 1 50E-01 | no | |
| Naphthalene | 4 25E-03 | 5 79E-03 | Unknown | 2 00E-03 | 7 30E-02 | no | |
| Phenanthrene† | 5 03E-03 | 1 04E-02 | Unknown | 1 04E-02 | NA | NA | no |
| Pyrene | 4 36E-03 | 8 97E-03 | Unknown | 1 00E-03 | 1 10E-01 | no | |
| **Volatiles** | | | | | | | |
| Acetone | 4 92E-03 | 4 97E-03 | Unknown | 4 97E-03 | 3 70E-01 | no | |

* Data set includes MW-1, MW-3, MW-9, and MW-15 Metals statistics are based on filtered samples

†Lead and phenanthrene were considered COPCs and not eliminated based on detection frequency because of their presence in other media

[1] These compounds have no published RBC or RfD values They are sufficiently close in toxicity to Endosulfan so that the Endosulfan RBC is applicable to its congeners as a provisional benchmark

[2] These compounds have no published RBC or RfD values. They are sufficiently close in toxicity to Chlordane so that the Chlordane RBC is applicable to its congeners as a provisional benchmark



AR316015

ENVIRONMENTAL STANDARDS

***Table 6***
***Statistical Summary and COPC Selection of Constituents in Columbia Aquifer Groundwater and NAPL****
***Former Koppers Company, Inc., Newport, DE***

| Analyte | Total # of Samples | Hits | Hit Frequency % | Minimum Detected mg/L | Mean mg/L | Lognormal Mean mg/L | Maximum Detected mg/L | Standard Deviation mg/L |
|---|---|---|---|---|---|---|---|---|
| **Dioxins** | | | | | | | | |
| 2,3,7,8-TCDD Equiv | 5 | 2 | 40 | 6.72E-06 | 2.37E-04 | 7.26E-06 | 1.17E-03 | 5.24E-04 |
| **Inorganics** | | | | | | | | |
| Aluminum | 9 | 8 | 88.89 | 2.51E-02 | 6.07E-01 | 1.67E-01 | 9.24E-02 | 1.92E-01 |
| Antimony | 21 | 3 | 14.29 | 5.70E-03 | 1.51E-02 | 2.98E-03 | 1.51E-03 | 3.79E-03 |
| Arsenic | 25 | 7 | 28 | 2.20E-03 | 4.80E-03 | 1.62E-03 | 1.28E-03 | 1.21E-03 |
| Barium | 29 | 29 | 100 | 2.27E-02 | 2.34E-01 | 7.44E-02 | 5.86E-02 | 5.74E-02 |
| Beryllium | 17 | 1 | 5.88 | 2.30E-04 | 2.30E-04 | 3.55E-04 | 3.35E-04 | 1.25E-04 |
| Cadmium | 22 | 1 | 4.55 | 2.10E-03 | 2.10E-03 | 5.52E-04 | 3.90E-04 | 5.06E-04 |
| Cobalt | 27 | 23 | 85.19 | 8.70E-04 | 2.82E-02 | 9.03E-03 | 4.78E-03 | 8.30E-03 |
| Copper | 20 | 1 | 5 | 1.50E-03 | 1.50E-03 | 8.02E-04 | 6.01E-04 | 6.00E-04 |
| Iron | 27 | 24 | 88.89 | 6.07E-01 | 3.83E+01 | 1.50E+01 | 4.13E+00 | 1.41E+01 |
| Lead | 19 | 5 | 26.32 | 1.60E-03 | 5.40E-03 | 1.47E-03 | 9.48E-04 | 1.62E-03 |
| Manganese | 34 | 33 | 97.06 | 2.44E-02 | 9.74E+00 | 2.02E+00 | 5.61E-01 | 2.78E+00 |
| Nickel | 21 | 9 | 42.86 | 1.80E-03 | 1.76E-02 | 5.05E-03 | 2.12E-03 | 6.19E-03 |
| Selenium | 28 | 10 | 35.71 | 3.10E-03 | 3.30E-02 | 4.89E-03 | 2.28E-03 | 7.08E-03 |
| Thallium | 24 | 7 | 29.17 | 7.00E-03 | 1.94E-02 | 5.11E-03 | 3.66E-03 | 4.90E-03 |
| Vanadium | 25 | 8 | 32 | 9.30E-04 | 3.60E-03 | 9.98E-04 | 6.95E-04 | 9.68E-04 |
| Zinc | 7 | 6 | 85.71 | 7.50E-03 | 1.15E-01 | 3.05E-02 | 1.50E-02 | 3.92E-02 |
| **Pesticides** | | | | | | | | |
| 4,4'-DDD | 5 | 2 | 40 | 2.10E-05 | 6.22E-05 | 5.16E-05 | 1.40E-04 | 4.53E-05 |
| 4,4'-DDE | 5 | 2 | 40 | 1.00E-05 | 4.48E-05 | 3.23E-05 | 1.40E-05 | 3.63E-05 |
| 4,4'-DDT | 4 | 2 | 50 | 5.00E-05 | 5.75E-05 | 5.62E-05 | 8.00E-05 | 1.50E-05 |
| alpha-BHC | 5 | 1 | 20 | 1.50E-06 | 2.53E-05 | 1.64E-05 | 1.50E-06 | 1.72E-05 |
| alpha-Chlordane[1] | 5 | 1 | 20 | 1.10E-04 | 4.20E-05 | 3.36E-05 | 1.10E-04 | 3.80E-05 |
| Dieldrin | 5 | 1 | 20 | 3.50E-05 | 5.70E-05 | 5.35E-05 | 3.50E-05 | 2.49E-05 |
| Endosulfan II[2] | 5 | 1 | 20 | 2.90E-05 | 5.58E-05 | 5.15E-05 | 2.90E-05 | 2.63E-05 |
| Endosulfan Sulfate[2] | 5 | 1 | 20 | 1.40E-05 | 5.28E-05 | 4.45E-05 | 1.40E-05 | 3.06E-05 |
| Endrin | 5 | 1 | 20 | 3.80E-05 | 5.76E-05 | 5.44E-05 | 3.80E-05 | 2.43E-05 |
| gamma-Chlordane[1] | 5 | 1 | 20 | 1.60E-05 | 2.82E-05 | 2.63E-05 | 1.60E-05 | 1.28E-05 |
| Heptachlor | 5 | 1 | 20 | 1.80E-05 | 2.86E-05 | 2.69E-05 | 1.80E-05 | 1.23E-05 |
| Heptachlor epoxide | 5 | 1 | 20 | 6.60E-05 | 3.82E-05 | 3.49E-05 | 6.60E-05 | 1.89E-05 |
| **Semivolatiles** | | | | | | | | |
| 2,4-Dimethylphenol | 34 | 7 | 20.59 | 1.00E+00 | 1.30E+00 | 1.31E-02 | 1.50E+01 | 3.54E+00 |
| 2-Methylnaphthalene | 34 | 12 | 35.29 | 5.60E-01 | 7.15E-01 | 2.00E-02 | 1.30E+01 | 2.24E+00 |
| 2-Methylphenol | 34 | 7 | 20.59 | 4.70E-01 | 1.36E+00 | 1.19E-02 | 2.20E+01 | 4.46E+00 |
| 4-Methylphenol | 34 | 9 | 26.47 | 1.80E-02 | 3.60E+00 | 1.89E-02 | 5.20E+01 | 1.14E+01 |
| Acenaphthene | 34 | 13 | 38.24 | 3.00E-03 | 5.12E-01 | 1.73E-02 | 1.00E+01 | 1.71E+00 |
| Acenaphthylene | 34 | 9 | 26.47 | 2.50E-02 | 4.21E-02 | 7.26E-03 | 5.80E-01 | 1.04E-01 |
| Anthracene | 34 | 9 | 26.47 | 2.20E-02 | 9.43E-02 | 7.83E-03 | 2.30E+00 | 3.92E-01 |
| Benzo(a)anthracene | 34 | 7 | 20.59 | 2.00E-03 | 8.00E-02 | 6.41E-03 | 2.10E+00 | 3.58E-01 |
| Benzo(a)pyrene | 34 | 3 | 8.82 | 1.30E-02 | 4.07E-02 | 6.34E-03 | 6.50E-01 | 1.15E-01 |
| Benzo(b)fluoranthene | 34 | 7 | 20.59 | 1.00E-03 | 5.05E-02 | 6.31E-03 | 1.00E+00 | 1.73E-01 |
| Benzo(g,h,i)perylene | 34 | 1 | 2.94 | 6.00E-03 | 3.44E-02 | 6.27E-03 | 6.00E-03 | 7.41E-02 |
| Benzo(k)fluoranthene | 34 | 3 | 8.82 | 1.00E-03 | 4.28E-02 | 7.87E-03 | 5.50E-01 | 1.04E-01 |
| bis(2-Ethylhexyl)phthalate | 33 | 1 | 3.03 | 1.50E-02 | 3.35E-02 | 6.96E-03 | 1.50E-02 | 6.86E-02 |

***Table 6***
***Statistical Summary and COPC Selection of Constituents in Columbia Aquifer Groundwater and NAPL****
***Former Koppers Company, Inc., Newport, DE***

| Analyte | 95% UCL mg/L | Lognormal 95% UCL mg/L | Distribution 99% Confidence | Exposure Point Concentration mg/L | Tap Water RBC mg/L | Is Maximum Greater than RBC? | Is Detection Frequency >5%? |
|---|---|---|---|---|---|---|---|
| **Dioxins** | | | | | | | |
| 2,3,7,8-TCDD Equiv | 7 36E-04 | 4.22E+05 | Lognormal | 1 17E-03 | NA | NA | NA |
| **Inorganics** | | | | | | | |
| Aluminum | 2 86E-01 | 8 66E-01 | Normal/Lognormal | 9.24E-02 | 3 70E+00 | no | |
| Antimony | 4 40E-03 | 6 06E-03 | Unknown | 1 51E-03 | 1 50E-03 | yes | yes |
| Arsenic | 2 03E-03 | 2 18E-03 | Lognormal | 1 28E-03 | 4 50E-05 | yes | yes |
| Barium | 9 25E-02 | 9.63E-02 | Lognormal | 5 86E-02 | 2.60E-01 | no | |
| Beryllium | 4 08E-04 | 4.20E-04 | Unknown | 3 35E-04 | 1 60E-05 | yes | yes |
| Cadmium | 7 38E-04 | 8 28E-04 | Unknown | 3 90E-04 | 1 80E-03 | no | |
| Cobalt | 1 18E-02 | 2 52E-02 | Lognormal | 4 78E-03 | 2 20E-01 | no | |
| Copper | 1 03E-03 | 1 25E-03 | Unknown | 6 01E-04 | 1 50E-01 | no | |
| Iron | 1 96E+01 | 1 09E+03 | Unknown | 4 13E+00 | 1 10E+00 | yes | yes |
| Lead | 2 11E-03 | 2.33E-03 | Unknown | 9 48E-04 | NA | NA | yes |
| Manganese | 2 83E+00 | 3 07E+01 | Unknown | 5 61E-01 | 7 30E-02 | yes | yes |
| Nickel | 7 38E-03 | 1.53E-02 | Unknown | 2.12E-03 | 7 30E-02 | no | |
| Selenium | 7 16E-03 | 9 20E-03 | Lognormal | 2 28E-03 | 1 80E-02 | no | |
| Thallium | 6 82E-03 | 7 23E-03 | Unknown | 3 66E-03 | 2 60E-04 | yes | yes |
| Vanadium | 1 33E-03 | 1 47E-03 | Lognormal | 6.95E-04 | 2 60E-02 | no | |
| Zinc | 5 93E-02 | 6 72E-01 | Normal/Lognormal | 1 50E-02 | 1 10E+00 | no | |
| **Pesticides** | | | | | | | |
| 4,4'-DDD | 1 05E-04 | 2 14E-04 | Normal/Lognormal | 1.40E-04 | 2 80E-04 | no | |
| 4,4'-DDE | 7 94E-05 | 5 12E-04 | Normal/Lognormal | 1 40E-05 | 2 00E-04 | no | |
| 4,4'-DDT | 7 51E-05 | 8 19E-05 | Unknown | 8.00E-05 | 2 00E-04 | no | |
| alpha-BHC | 4 17E-05 | 3 65E-03 | Normal/Lognormal | 1.50E-06 | 1 10E-05 | no | |
| alpha-Chlordane[1] | 7 82E-05 | 1.34E-04 | Unknown | 1 10E-04 | 1 90E-04 | no | yes |
| Dieldrin | 8 07E-05 | 9 47E-05 | Normal/Lognormal | 3.50E-05 | 4 20E-06 | yes | yes |
| Endosulfan II[2] | 8 09E-05 | 1 04E-04 | Normal/Lognormal | 2 90E-05 | 2 20E-02 | no | |
| Endosulfan Sulfate[2] | 8 20E-05 | 2 16E-04 | Normal/Lognormal | 1 40E-05 | 2 20E-02 | no | |
| Endrin | 8 07E-05 | 9.19E-05 | Normal/Lognormal | 3 80E-05 | 1 10E-03 | no | |
| gamma-Chlordane[1] | 4 04E-05 | 4.93E-05 | Normal/Lognormal | 1 60E-05 | 1 90E-04 | no | |
| Heptachlor | 4 04E-05 | 4 68E-05 | Normal/Lognormal | 1 80E-05 | 2 30E-06 | yes | yes |
| Heptachlor epoxide | 5 63E-05 | 7 54E-05 | Normal/Lognormal | 6 60E-05 | 1.20E-06 | yes | yes |
| **Semivolatiles** | | | | | | | |
| 2,4-Dimethylphenol | 2 33E+00 | 4 88E+01 | Unknown | 1 50E+01 | 7 30E-02 | yes | yes |
| 2-Methylnaphthalene | 1 37E+00 | 8 72E+01 | Unknown | 1 30E+01 | 1 20E-02 | yes | yes |
| 2-Methylphenol | 2 66E+00 | 2 39E+01 | Unknown | 2 20E+01 | 1 80E-01 | yes | yes |
| 4-Methylphenol | 6 91E+00 | 1 13E+02 | Unknown | 5 20E+01 | 1 80E-02 | yes | yes |
| Acenaphthene | 1 01E+00 | 3 31E+01 | Unknown | 1 00E+01 | 2 20E-01 | yes | yes |
| Acenaphthylene | 7 25E-02 | 1 84E-01 | Unknown | 1 84E-01 | NA | NA | yes |
| Anthracene | 2 08E-01 | 3 06E-01 | Unknown | 3 06E-01 | 1 10E+00 | yes | yes |
| Benzo(a)anthracene | 1 84E-01 | 1 70E-01 | Unknown | 1 70E-01 | 9 20E-05 | yes | yes |
| Benzo(a)pyrene | 7 43E-02 | 1 33E-01 | Unknown | 1 33E-01 | 9 20E-06 | yes | yes |
| Benzo(b)fluoranthene | 1 01E-01 | 1 30E-01 | Unknown | 1 30E-01 | 9 20E-05 | yes | yes |
| Benzo(g,h,i)perylene† | 5 59E-02 | 1 29E-01 | Unknown | 6 00E-03 | NA | NA | no |
| Benzo(k)fluoranthene | 7 29E-02 | 1 05E-01 | Unknown | 1 05E-01 | 9 20E-04 | yes | yes |
| bis(2-Ethylhexyl)phthalate† | 5 37E-02 | 1 30E-01 | Unknown | 1 50E-02 | 4 80E-03 | yes | no |

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ENVIRONMENTAL STANDARDS

***Table 6***
***Statistical Summary and COPC Selection of Constituents in Columbia Aquifer Groundwater and NAPL****
***Former Koppers Company, Inc., Newport, DE***

| Analyte | Total # of Samples | Hits | Hit Frequency % | Minimum Detected mg/L | Mean mg/L | Lognormal Mean mg/L | Maximum Detected mg/L | Standard Deviation mg/L |
|---|---|---|---|---|---|---|---|---|
| Butylbenzylphthalate | 34 | 1 | 2 94 | 1 00E-03 | 3 21E-02 | 6 36E-03 | 1 00E-03 | 6 72E-02 |
| Carbazole | 34 | 12 | 35 29 | 9.00E-02 | 1 56E-01 | 1 22E-02 | 1 80E+00 | 3 43E-01 |
| Chrysene | 34 | 7 | 20 59 | 1 00E-03 | 7.33E-02 | 8 00E-03 | 1 60E+00 | 2 75E-01 |
| Di-n-butylphthalate | 34 | 1 | 2 94 | 1 00E-03 | 3 10E-02 | 5 91E-03 | 1 00E-03 | 6.45E-02 |
| Di-n-octylphthalate | 34 | 1 | 2 94 | 1.00E-03 | 2 89E-02 | 6 21E-03 | 1 00E-03 | 5 83E-02 |
| Dibenzofuran | 34 | 13 | 38 24 | 3 00E-03 | 3.50E-01 | 1 74E-02 | 7 20E+00 | 1 23E+00 |
| Fluoranthene | 34 | 10 | 29 41 | 4 00E-03 | 3.46E-01 | 1 19E-02 | 9 90E+00 | 1 69E+00 |
| Fluorene | 34 | 13 | 38.24 | 4 00E-03 | 3 70E-01 | 1.42E-02 | 8.60E+00 | 1 46E+00 |
| Indeno(1,2,3-c,d)pyrene | 34 | 1 | 2 94 | 5 00E-03 | 2.80E-02 | 5 89E-03 | 5 00E-03 | 5 64E-02 |
| Naphthalene | 34 | 16 | 47 06 | 2 00E-03 | 4 91E+00 | 4 41E-02 | 6 00E+01 | 1 14E+01 |
| Pentachlorophenol | 34 | 11 | 32 35 | 1 40E-03 | 1 41E-02 | 1 02E-03 | 6 00E-02 | 4 34E-02 |
| Phenanthrene | 34 | 14 | 41 18 | 2 00E-03 | 7.92E-01 | 1 72E-02 | 2 10E+01 | 3 58E+00 |
| Phenol | 34 | 11 | 32 35 | 9 00E-03 | 4 85E+00 | 2 12E-02 | 5 80E+01 | 1 34E+01 |
| Pyrene | 34 | 10 | 29 41 | 1 00E-03 | 2 29E-01 | 9 04E-03 | 6.50E+00 | 1 11E+00 |
| **Volatiles** | | | | | | | | |
| 1,1,2-Trichloroethane | 40 | 1 | 2 5 | 5 30E-02 | 2.80E-03 | 5 76E-03 | 5 30E-02 | 1 08E-02 |
| 2-Hexanone | 40 | 1 | 2 5 | 1 00E-02 | 3.90E-03 | 5 49E-03 | 1.00E-02 | 7 79E-03 |
| 4-Methyl-2-Pentanone | 40 | 1 | 2 5 | 3 00E-03 | 3 99E-03 | 5 64E-03 | 3 00E-03 | 8 16E-03 |
| Acetone | 33 | 6 | 18 18 | 6 00E-03 | 8 35E-03 | 6 08E-03 | 2 00E-02 | 9 78E-03 |
| Benzene | 31 | 7 | 22 58 | 1 50E-02 | 8 63E-02 | 6.64E-03 | 9 20E-01 | 2 30E-01 |
| Chlorobenzene | 35 | 1 | 2 86 | 3 00E-03 | 4 69E-03 | 2 39E-03 | 3.00E-03 | 8.17E-03 |
| Ethylbenzene | 35 | 13 | 37 14 | 4 00E-03 | 4 90E-02 | 8 38E-03 | 4 10E-01 | 9 32E-02 |
| Methylene Chloride | 31 | 1 | 3 23 | 2 00E-03 | 4 68E-03 | 2 40E-03 | 2 00E-03 | 8 66E-03 |
| Styrene | 35 | 10 | 28 57 | 2 00E-03 | 3 29E-02 | 4 63E-03 | 5 20E-01 | 9 83E-02 |
| Toluene | 35 | 13 | 37 14 | 2 00E-03 | 1 17E-01 | 7 25E-03 | 1.50E+00 | 3 32E-01 |
| Xylenes (total) | 34 | 13 | 38 24 | 1 20E-02 | 1 77E-01 | 1 34E-02 | 1 90E+00 | 3 87E-01 |




ENVIRONMENTAL STANDARDS

***Table 6***
***Statistical Summary and COPC Selection of Constituents in Columbia Aquifer Groundwater and NAPL****
***Former Koppers Company, Inc., Newport, DE***

| Analyte | 95% UCL mg/L | Lognormal 95% UCL mg/L | Distribution 99% Confidence | Exposure Point Concentration mg/L | Tap Water RBC mg/L | Is Maximum Greater than RBC? | Is Detection Frequency >5%? |
|---|---|---|---|---|---|---|---|
| Butylbenzylphthalate | 5 16E-02 | 1.14E-01 | Unknown | 1 00E-03 | 7 30E-01 | no | |
| Carbazole | 2 56E-01 | 2 96E+00 | Unknown | 1 80E+00 | 3.30E-03 | yes | yes |
| Chrysene | 1 53E-01 | 1 32E-01 | Unknown | 1 32E-01 | 9 20E-03 | yes | yes |
| Di-n-butylphthalate | 4 98E-02 | 1 20E-01 | Unknown | 1 00E-03 | 3 70E-01 | no | |
| Di-n-octylphthalate | 4 59E-02 | 1 01E-01 | Unknown | 1 00E-03 | 7 30E-02 | no | |
| Dibenzofuran | 7 08E-01 | 5.69E+00 | Unknown | 5 69E+00 | 2 40E-03 | yes | yes |
| Fluoranthene | 8 39E-01 | 8.18E-01 | Unknown | 8 18E-01 | 1 50E-01 | yes | yes |
| Fluorene | 7 96E-01 | 8.19E+00 | Unknown | 8 19E+00 | 1 50E-01 | yes | yes |
| Indeno(1,2,3-c,d)pyrene† | 4 44E-02 | 1.01E-01 | Unknown | 5 00E-03 | 9 20E-05 | yes | no |
| Naphthalene | 8 23E+00 | 2 33E+04 | Unknown | 6 00E+01 | 7 30E-02 | yes | yes |
| Pentachlorophenol | 2 67E-02 | 1.88E-01 | Unknown | 6 00E-02 | 5 60E-04 | yes | yes |
| Phenanthrene | 1 83E+00 | 1.85E+01 | Unknown | 1 85E+01 | NA | NA | yes |
| Phenol | 8 76E+00 | 4.65E+02 | Unknown | 5 80E+01 | 2.20E+00 | yes | yes |
| Pyrene | 5 52E-01 | 6.37E-01 | Unknown | 6 37E-01 | 1 10E-01 | yes | yes |
| **Volatiles** | | | | | | | |
| 1,1,2-Trichloroethane | 8 67E-03 | 8.60E-03 | Unknown | 8 60E-03 | 1 90E-04 | yes | no |
| 2-Hexanone | 7 58E-03 | 6 43E-03 | Unknown | 6.43E-03 | NA | NA | no |
| 4-Methyl-2-Pentanone | 7 83E-03 | 6.45E-03 | Unknown | 3 00E-03 | 2 90E-01 | no | |
| Acetone | 1 12E-02 | 9 78E-03 | Unknown | 9 78E-03 | 3 70E-01 | no | |
| Benzene | 1 56E-01 | 2.64E-01 | Unknown | 2 64E-01 | 3 60E-04 | yes | yes |
| Chlorobenzene | 7 03E-03 | 8.66E-03 | Unknown | 3 00E-03 | 3 50E-03 | no | |
| Ethylbenzene | 7 58E-02 | 1 79E-01 | Unknown | 1.79E-01 | 1 30E-01 | yes | yes |
| Methylene Chloride | 7 32E-03 | 8.02E-03 | Unknown | 2 00E-03 | 4 10E-03 | no | |
| Styrene | 6.11E-02 | 6.49E-02 | Unknown | 6.49E-02 | 1 60E-01 | yes | yes |
| Toluene | 2.12E-01 | 5.48E-01 | Unknown | 5 48E-01 | 7 50E-02 | yes | yes |
| Xylenes (total) | 2 90E-01 | 2.39E+00 | Unknown | 1.90E+00 | 1 20E+00 | yes | yes |

* Data set includes MW-1, MW-2, MW-3, MW-8, MW-9, and MW-15 Metals statistics are based on filtered samples
NA - Not available
† Benzo(ghi)perylene, bis(2-ethylhexyl)phthalate, and indeno(1,2,3-cd)pyrene were considered COPCs and not eliminated based on detection frequency because of their presence in other media.
[1] These compounds have no published RBC or RfD values They are sufficiently close in toxicity to Chlordane so that the Chlordane RBC is applicable to its congeners as a provisional benchmark.
[2] These compounds have no published RBC or RfD values They are sufficiently close in toxicity to Endosulfan so that the Endosulfan RBC is applicable to its congeners as a provisional benchmark.




ENVIRONMENTAL STANDARDS

*Table 7*
***Statistical Summary and COPC Selection of Constituents in Potomac Aquifer Groundwater****
***Former Koppers Company, Inc., Newport, DE***

| Analyte | Total # of Samples | Hits | Hit Frequency % | Minimum Detected mg/L | Mean mg/L | Lognormal Mean mg/L | Maximum Detected mg/L | Standard Deviation mg/L | 95% UCL mg/L | Lognormal 95% UCL mg/L | Distribution 99% Confidence | Exposure Point Concentration mg/L | Tap Water RBC mg/L | Is Maximum Greater than RBC? | Is Detection Frequency >5%? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Inorganics** | | | | | | | | | | | | | | | |
| Antimony | 3 | 2 | 66 67 | 2.10E-03 | 1.80E-03 | 1 69E-03 | 2 30E-03 | 7 00E-04 | 2 98E-03 | 1 28E-02 | Normal/Lognormal | 2 30E-03 | 1 50E-03 | yes | yes |
| Barium | 2 | 2 | 100 | 9.40E-03 | 9.80E-03 | 9 79E-03 | 1.02E-02 | 5 66E-04 | 1 23E-02 | 1 20E-02 | Unknown | 1 02E-02 | 2 60E-01 | no | |
| Cobalt | 3 | 1 | 33 33 | 1 20E-03 | 6.90E-04 | 6 10E-04 | 1 20E-03 | 4 42E-04 | 1 43E-03 | 1 70E-02 | Unknown | 1 20E-03 | 2 20E-01 | no | |
| Iron | 2 | 2 | 100 | [illegible] | 1 11E-01 | [illegible] | [illegible] | [illegible] | [illegible] | 1 27E-01 | Unknown | 1 14E-01 | 1 10E+00 | no | |
| Lead | 3 | 1 | 33 33 | 3.50E-03 | 1.50E-03 | 9 56E-04 | 3 50E-03 | 1 73E-03 | 4.42E-03 | 2 07E+02 | Unknown | 3 50E-03 | NA | NA | yes |
| Manganese | 3 | 3 | 100 | 2.90E-02 | 3 77E-02 | 3 65E-02 | 5 15E-02 | 1 21E-02 | 5 81E-02 | 9.30E-02 | Normal/Lognormal | 5 15E-02 | 7.30E-02 | no | |
| Selenium | 3 | 1 | 33.33 | 3 60E-03 | 1.70E-03 | 1 22E-03 | 3 60E-03 | 1.66E-03 | 4 51E-03 | 2 10E+01 | Normal/Lognormal | 3.60E-03 | 1.80E-02 | no | |
| **Pesticides** | | | | | | | | | | | | | | | |
| 4,4-DDD | 2 | 1 | 50 | 2 90E 06 | 2 65E-05 | [illegible] | [illegible] | [illegible] | [illegible] | 1 08E+45 | Unknown | 2 90E 06 | 2 80E 04 | no | |
| 4,4'-DDT | 2 | 1 | 50 | 1 70E-05 | 3.35E-05 | 2 92E-05 | 1 70E-05 | 2.33E-05 | 1 38E-04 | 3 40E+02 | Unknown | 1 70E-05 | 2 00E-04 | no | |
| Endosulfan I[1] | 2 | 1 | 50 | 3 10E-06 | 1 41E-05 | 8 80E-06 | 3.10E-06 | 1 55E-05 | 8 32E-05 | 5.70E+21 | Unknown | 3 10E-06 | 2 20E-02 | no | |
| Endosulfan II[1] | 2 | 1 | 50 | 5 70E-06 | 2.79E-05 | 1.69E-05 | 5.70E-06 | 3.13E-05 | 1.68E-04 | 1.77E+24 | Unknown | 5.70E-06 | 2.20E-02 | no | |
| Heptachlor epoxide | 2 | 2 | 100 | 5 90E-06 | 6.00E-06 | 6 00E-06 | 6 10E-06 | 1 41E-07 | 6 63E-06 | 6 50E-06 | Unknown | 6 10E-06 | 1 20E-06 | yes | yes |

* Data set includes MW-15 Metals statistics are based on filtered samples.
[1] These compounds have no published RBC or RfD values They are sufficiently close in toxicity to Endosulfan so that the Endosulfan RBC is applicable to its congeners as a provisional benchmark.

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ENVIRONMENTAL STANDAR

***Table 8***
***Statistical Summary and COPC Selection for Trespasser Exposed to Surface Soils (0-12" bgs)***
***Former Koppers Company, Inc., Newport, DE***

| Analyte | Total # of Samples | Hits | Hit Frequency % | Minimum Detected mg/kg | Mean mg/kg | Lognormal Mean mg/kg | Maximum Detected mg/kg | Standard Deviation mg/kg |
|---|---|---|---|---|---|---|---|---|
| **Dioxins** | | | | | | | | |
| 2,3,7,8-TCDD Equiv | 18 | 18 | 100 | 9.31E-05 | 1.75E-03 | 7.21E-04 | 7.34E-03 | 2.35E-03 |
| **Inorganics** | | | | | | | | |
| Aluminum | 72 | 72 | 100 | 2.07E+03 | 1.48E+04 | 1.27E+04 | 3.65E+04 | 8.29E+03 |
| Antimony | 43 | 19 | 44.19 | 6.50E-01 | 9.35E+00 | 2.10E+00 | 1.21E+01 | 1.32E+01 |
| Arsenic | 66 | 64 | 96.97 | 1.20E+00 | 6.99E+00 | 5.54E+00 | 3.19E+01 | 5.39E+00 |
| Barium | 72 | 72 | 100 | 2.11E+01 | 3.85E+02 | 2.52E+02 | 1.65E+03 | 3.71E+02 |
| Beryllium | 68 | 68 | 100 | 2.60E-01 | 1.36E+00 | 1.11E+00 | 3.90E+00 | 9.07E-01 |
| Cadmium | 71 | 41 | 57.75 | 8.00E-02 | 1.40E+00 | 8.87E-01 | 3.40E+00 | 1.05E+00 |
| Chromium | 72 | 72 | 100 | 3.70E+00 | 2.33E+01 | 2.03E+01 | 1.19E+02 | 1.53E+01 |
| Cobalt | 69 | 61 | 88.41 | 6.10E-01 | 7.12E+00 | 4.50E+00 | 4.64E+01 | 7.11E+00 |
| Copper | 70 | 70 | 100 | 5.30E+00 | 3.93E+01 | 2.34E+01 | 5.28E+02 | 7.11E+01 |
| Iron | 72 | 72 | 100 | 4.43E+03 | 1.75E+04 | 1.65E+04 | 3.12E+04 | 5.40E+03 |
| Lead[1] | 72 | 72 | 100 | 3.80E+00 | 5.81E+01 | 3.86E+01 | 4.77E+02 | 7.45E+01 |
| Manganese | 72 | 72 | 100 | 4.06E+01 | 1.70E+03 | 6.78E+02 | 9.81E+03 | 2.45E+03 |
| Mercury | 59 | 31 | 52.54 | 5.00E-02 | 1.17E+00 | 2.10E-01 | 1.96E+01 | 3.09E+00 |
| Nickel | 67 | 67 | 100 | 4.00E+00 | 1.22E+01 | 1.08E+01 | 5.18E+01 | 7.96E+00 |
| Selenium | 65 | 14 | 21.54 | 8.60E-01 | 1.69E+00 | 1.23E+00 | 3.30E+00 | 9.92E-01 |
| Silver[5] | 72 | 2 | 2.78 | 1.10E+00 | 3.47E+00 | 1.50E+00 | 1.50E+00 | 2.26E+00 |
| Thallium | 68 | 22 | 32.35 | 1.60E+00 | 5.18E+00 | 3.30E+00 | 4.44E+01 | 6.19E+00 |
| Vanadium | 72 | 71 | 98.61 | 7.60E+00 | 7.05E+01 | 4.93E+01 | 3.06E+02 | 7.38E+01 |
| Zinc | 72 | 72 | 100 | 6.40E+00 | 9.35E+01 | 6.77E+01 | 8.74E+02 | 1.11E+02 |
| ***PCBs/Pesticides*** | | | | | | | | |
| 4,4'-DDD | 16 | 4 | 25 | 3.80E-03 | 7.88E-02 | 1.76E-02 | 1.00E-01 | 9.23E-02 |
| 4,4'-DDE | 17 | 8 | 47.06 | 2.20E-04 | 2.55E-02 | 7.47E-03 | 2.40E-01 | 5.71E-02 |
| 4,4'-DDT | 15 | 7 | 46.67 | 6.90E-03 | 2.79E-02 | 1.17E-02 | 1.20E-01 | 4.04E-02 |
| alpha-Chlordane[2] | 17 | 3 | 17.65 | 1.80E-04 | 3.45E-02 | 6.57E-03 | 2.80E-02 | 4.75E-02 |
| Dieldrin | 15 | 5 | 33.33 | 3.10E-04 | 6.10E-02 | 1.18E-02 | 2.70E-02 | 9.05E-02 |
| Endosulfan II[3] | 17 | 2 | 11.76 | 4.50E-04 | 6.45E-02 | 1.24E-02 | 4.70E-03 | 9.26E-02 |
| Endrin | 17 | 1 | 5.88 | 1.10E-01 | 5.99E-02 | 1.38E-02 | 1.10E-01 | 8.70E-02 |
| Endrin ketone[4] | 17 | 2 | 11.76 | 2.90E-02 | 5.73E-02 | 1.34E-02 | 4.70E-02 | 8.68E-02 |
| gamma-Chlordane[2] | 17 | 1 | 5.88 | 1.10E-04 | 3.35E-02 | 6.31E-03 | 1.10E-04 | 4.79E-02 |
| Heptachlor | 17 | 1 | 5.88 | 5.30E-03 | 2.80E-02 | 6.16E-03 | 5.30E-03 | 4.50E-02 |
| Heptachlor epoxide | 17 | 2 | 11.76 | 1.00E-02 | 2.27E-02 | 5.77E-03 | 2.00E-02 | 3.89E-02 |
| Methoxychlor | 16 | 5 | 31.25 | 4.20E-02 | 2.11E-01 | 6.59E-02 | 9.20E-01 | 3.35E-01 |
| PCB-1254 | 17 | 1 | 5.88 | 4.02E-02 | 6.50E-01 | 1.47E-01 | 4.02E-02 | 9.23E-01 |
| PCB-1260 | 18 | 4 | 22.22 | 8.30E-03 | 6.36E-01 | 1.50E-01 | 3.40E-01 | 8.96E-01 |
| **Semivolatiles** | | | | | | | | |
| 2,4-Dimethylphenol | 72 | 1 | 1.39 | 3.60E-02 | 1.75E+01 | 2.08E+00 | 3.60E-02 | 5.80E+01 |
| 2-Methylnaphthalene | 72 | 16 | 22.22 | 9.80E-02 | 8.71E+01 | 2.39E+00 | 2.90E+03 | 3.90E+02 |
| 4-Methylphenol | 72 | 2 | 2.78 | 7.20E-02 | 1.41E+01 | 2.06E+00 | 1.10E+02 | 4.33E+01 |
| Acenaphthene | 72 | 19 | 26.39 | 4.30E-02 | 1.14E+02 | 2.23E+00 | 3.10E+03 | 4.85E+02 |
| Acenaphthylene | 72 | 22 | 30.56 | 1.50E-01 | 1.37E+01 | 2.32E+00 | 8.20E+01 | 4.21E+01 |
| Anthracene | 72 | 47 | 65.28 | 5.30E-02 | 5.50E+02 | 4.12E+00 | 1.50E+04 | 2.24E+03 |
| Benzo(a)anthracene | 72 | 65 | 90.28 | 9.30E-02 | 8.87E+01 | 1.25E+01 | 1.20E+03 | 2.10E+02 |
| Benzo(a)pyrene | 72 | 64 | 88.89 | 8.10E-02 | 5.64E+01 | 9.87E+00 | 5.50E+02 | 1.10E+02 |
| Benzo(b)fluoranthene | 72 | 66 | 91.67 | 1.60E-01 | 9.74E+01 | 1.89E+01 | 7.50E+02 | 1.62E+02 |
| Benzo(g,h,i)perylene | 72 | 62 | 86.11 | 1.20E-01 | 2.87E+01 | 6.95E+00 | 2.40E+02 | 4.82E+01 |
| Benzo(k)fluoranthene | 72 | 62 | 86.11 | 4.60E-02 | 3.82E+01 | 6.64E+00 | 4.70E+02 | 7.66E+01 |
| bis(2-Ethylhexyl)phthalate | 70 | 4 | 5.71 | 6.70E-02 | 1.80E+01 | 2.17E+00 | 5.30E-01 | 5.88E+01 |



ENVIRONMENTAL STANDARDS

*Table 8*
***Statistical Summary and COPC Selection for Trespasser Exposed to Surface Soils (0-12" bgs)***
***Former Koppers Company, Inc., Newport, DE***

| Analyte | 95% UCL mg/kg | Lognormal 95% UCL mg/kg | Distribution 99% Confidence | Exposure Point Concentration mg/kg | Industrial Soil RBC mg/kg | Is Maximum >RBC? | Is Detection Frequency >5%? |
|---|---|---|---|---|---|---|---|
| **Dioxins** | | | | | | | |
| 2,3,7,8-TCDD Equiv | 2.72E-03 | 6.56E-03 | Lognormal | 6.56E-03 | 3.80E-05 | yes | yes |
| **Inorganics** | | | | | | | |
| Aluminum | 1.64E+04 | 1.70E+04 | Unknown | 1.70E+04 | 2.00E+05 | no | |
| Antimony | 1.27E+01 | 3.07E+01 | Unknown | 1.21E+01 | 8.20E+01 | no | |
| Arsenic | 8.10E+00 | 8.40E+00 | Unknown | 8.40E+00 | 3.80E+00 | yes | yes |
| Barium | 4.59E+02 | 5.08E+02 | Unknown | 5.08E+02 | 1.40E+04 | no | |
| Beryllium | 1.55E+00 | 1.59E+00 | Unknown | 1.59E+00 | 4.10E+02 | no | |
| Cadmium | 1.61E+00 | 2.20E+00 | Unknown | 2.20E+00 | 2.00E+02 | no | |
| Chromium | 2.63E+01 | 2.61E+01 | Unknown | 2.61E+01 | 3.10E+05 | no | |
| Cobalt | 8.55E+00 | 1.42E+01 | Unknown | 1.42E+01 | 1.20E+04 | no | |
| Copper | 5.35E+01 | 4.21E+01 | Unknown | 4.21E+01 | 8.20E+03 | no | |
| Iron | 1.85E+04 | 1.90E+04 | Unknown | 1.90E+04 | 6.10E+04 | no | |
| Lead[1] | 7.28E+01 | 6.91E+01 | Unknown | 6.91E+01 | 7.50E+02 | no | |
| Manganese | 2.18E+03 | 2.61E+03 | Unknown | 2.61E+03 | 2.90E+04 | no | |
| Mercury | 1.85E+00 | 1.37E+00 | Unknown | 1.37E+00 | 6.10E+01 | no | |
| Nickel | 1.38E+01 | 1.34E+01 | Unknown | 1.34E+01 | 4.10E+03 | no | |
| Selenium | 1.90E+00 | 2.50E+00 | Unknown | 2.50E+00 | 1.00E+03 | no | |
| Silver | 3.91E+00 | 1.59E+01 | Unknown | 1.50E+00 | 1.00E+03 | no | |
| Thallium | 6.43E+00 | 7.12E+00 | Unknown | 7.12E+00 | 1.40E+01 | yes | yes |
| Vanadium | 8.51E+01 | 8.23E+01 | Unknown | 8.23E+01 | 1.40E+03 | no | |
| Zinc | 1.15E+02 | 1.08E+02 | Unknown | 1.08E+02 | 6.10E+04 | no | |
| **PCBs/Pesticides** | | | | | | | |
| 4,4'-DDD | 1.19E-01 | 2.43E+00 | Unknown | 1.00E-01 | 2.40E+01 | no | |
| 4,4'-DDE | 4.97E-02 | 1.24E-01 | Lognormal | 1.24E-01 | 1.70E+01 | no | |
| 4,4'-DDT | 4.62E-02 | 1.04E-01 | Lognormal | 1.04E-01 | 1.70E+01 | no | |
| alpha-Chlordane[2] | 5.46E-02 | 9.82E-01 | Lognormal | 2.80E-02 | 1.60E+01 | no | |
| Dieldrin | 1.02E-01 | 1.75E+00 | Lognormal | 2.70E-02 | 3.60E-01 | no | |
| Endosulfan II[3] | 1.04E-01 | 1.16E+00 | Lognormal | 4.70E-03 | 1.20E+03 | no | |
| Endrin | 9.67E-02 | 6.18E-01 | Unknown | 1.10E-01 | 6.10E+01 | no | |
| Endrin ketone[4] | 9.41E-02 | 5.26E-01 | Unknown | 4.70E-02 | 6.10E+01 | no | |
| gamma-Chlordane[2] | 5.37E-02 | 8.44E-01 | Lognormal | 1.10E-04 | 4.40E+00 | no | |
| Heptachlor | 4.70E-02 | 2.11E-01 | Unknown | 5.30E-03 | 1.30E+00 | no | |
| Heptachlor epoxide | 3.91E-02 | 1.27E-01 | Lognormal | 2.00E-02 | 6.30E-01 | no | |
| Methoxychlor | 3.58E-01 | 1.14E+00 | Lognormal | 9.20E-01 | 1.00E+03 | no | |
| PCB-1254 | 1.04E+00 | 6.99E+00 | Unknown | 4.02E-02 | 2.90E+00 | no | |
| PCB-1260 | 1.00E+00 | 7.51E+00 | Lognormal | 3.40E-01 | 2.90E+00 | no | |
| **Semivolatiles** | | | | | | | |
| 2,4-Dimethylphenol | 2.90E+01 | 3.10E+01 | Unknown | 3.60E-02 | 4.10E+03 | no | |
| 2-Methylnaphthalene | 1.64E+02 | 8.69E+01 | Unknown | 8.69E+01 | 4.10E+03 | no | |
| 4-Methylphenol | 2.27E+01 | 2.65E+01 | Unknown | 2.65E+01 | 1.00E+03 | no | |
| Acenaphthene | 2.10E+02 | 1.20E+02 | Unknown | 1.20E+02 | 1.20E+04 | no | |
| Acenaphthylene | 2.20E+01 | 2.52E+01 | Unknown | 2.52E+01 | NA | NA | yes |
| Anthracene | [illegible]91E+02 | 8.14E+02 | Unknown | 8.14E+02 | 6.10E+04 | no | |
| Benzo(a)anthracene | [illegible]30E+02 | 5.64E+02 | Unknown | 5.64E+02 | 7.80E+00 | yes | yes |
| Benzo(a)pyrene | 7.81E+01 | 3.59E+02 | Unknown | 3.59E+02 | 7.80E-01 | yes | yes |
| Benzo(b)fluoranthene | [illegible]29E+02 | 8.56E+02 | Unknown | 7.50E+02 | 7.80E+00 | yes | yes |
| Benzo(g,h,i)perylene | 3.82E+01 | 1.32E+02 | Unknown | 1.32E+02 | NA | NA | yes |
| Benzo(k)fluoranthene | 5.33E+01 | 2.36E+02 | Unknown | 2.36E+02 | 7.80E+01 | yes | yes |
| bis(2-Ethylhexyl)phthalate | 2.98E+01 | 3.21E+01 | Unknown | 5.30E-01 | 4.10E+02 | no | |



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ENVIRONMENTAL STANDARDS

***Table 8***
***Statistical Summary and COPC Selection for Trespasser Exposed to Surface Soils (0-12" bgs)***
***Former Koppers Company, Inc., Newport, DE***

| Analyte | Total # of Samples | Hits | Hit Frequency % | Minimum Detected mg/kg | Mean mg/kg | Lognormal Mean mg/kg | Maximum Detected mg/kg | Standard Deviation mg/kg |
|---|---|---|---|---|---|---|---|---|
| Butylbenzylphthalate | 73 | 4 | 5 48 | 4 70E-02 | 1 78E+01 | 2 13E+00 | 1 70E-01 | 5 77E+01 |
| Carbazole | 72 | 38 | 52 78 | 4 00E-02 | 2 65E+02 | 2 68E+00 | 8 70E+03 | 1 19E+03 |
| Chrysene | 72 | 65 | 90 28 | 1 60E-01 | 8 70E+01 | 1.32E+01 | 1 10E+03 | 1 92E+02 |
| Dibenz(a,h)anthracene | 72 | 49 | 68 06 | 6 30E-02 | 1 87E+01 | 3 03E+00 | 8 10E+01 | 5 76E+01 |
| Dibenzofuran | 72 | 22 | 30 56 | 5 40E-02 | 1 11E+02 | 2 35E+00 | 3.20E+03 | 4 71E+02 |
| Di-n-butylphthalate | 72 | 6 | 8 33 | 1 20E-01 | 1 81E+01 | 2 29E+00 | 5 80E-01 | 5 80E+01 |
| Fluoranthene | 72 | 68 | 94 44 | 9 40E-02 | 2 26E+02 | 1 75E+01 | 4 70E+03 | 7 30E+02 |
| Fluorene | 72 | 21 | 29 17 | 4.70E-02 | 1 95E+02 | 2 40E+00 | 5 60E+03 | 8 35E+02 |
| Indeno(1,2,3-c,d)pyrene | 73 | 65 | 89 04 | 5 80E-02 | 3 33E+01 | 7 86E+00 | 2.70E+02 | 5 42E+01 |
| Naphthalene | 72 | 25 | 34 72 | 6.20E-02 | 1 04E+02 | 2 41E+00 | 3 50E+03 | 4 74E+02 |
| Pentachlorophenol | 72 | 12 | 16 67 | 2 10E-01 | 4.04E+01 | 4 83E+00 | 1 20E+02 | 1 42E+02 |
| Phenanthrene | 69 | 56 | 81 16 | 1 30E-01 | 3 68E+02 | 4 74E+00 | 8 80E+03 | 1 52E+03 |
| Phenol | 72 | 1 | 1 39 | 7.70E+01 | 1 37E+01 | 2.08E+00 | 7 70E+01 | 4 24E+01 |
| Pyrene | 72 | 67 | 93 06 | 2.10E-01 | 2 12E+02 | 1 89E+01 | 3 60E+03 | 6 29E+02 |
| **Volatiles** | | | | | | | | |
| 1,1,2,2-Tetrachloroethane | 43 | 2 | 4 65 | 1 00E-01 | 1 52E-02 | 7 14E-03 | 3 00E-01 | 4 67E-02 |
| 2-Butanone | 41 | 2 | 4 88 | 6 00E-03 | 6 85E-03 | 6.33E-03 | 3 80E-02 | 5 02E-03 |
| Acetone | 40 | 9 | 22 5 | 3.00E-03 | 1 28E-02 | 7 20E-03 | 1 50E-01 | 2.60E-02 |
| Benzene | 41 | 1 | 2 44 | 1.10E-02 | 6 27E-03 | 6 20E-03 | 1 10E-02 | 1 02E-03 |
| Ethylbenzene | 41 | 4 | 9 76 | 1.00E-03 | 1 07E-02 | 6 30E-03 | 2.00E-01 | 3 03E-02 |
| Tetrachloroethene | 41 | 28 | 68 29 | 4.00E-03 | 1 17E-02 | 8 73E-03 | 7 40E-02 | 1.27E-02 |
| Toluene | 41 | 17 | 41 46 | 1.00E-03 | 1.10E-02 | 7 08E-03 | 1 50E-01 | 2 28E-02 |
| Xylenes (total) | 41 | 7 | 17 07 | 3.30E-03 | 2 43E-02 | 6.90E-03 | 7 40E-01 | 1 15E-01 |



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ENVIRONMENTAL STANDARDS

*Table 8*
***Statistical Summary and COPC Selection for Trespasser Exposed to Surface Soils (0-12" bgs)***
***Former Koppers Company, Inc., Newport, DE***

| Analyte | 95% UCL mg/kg | Lognormal 95% UCL mg/kg | Distribution 99% Confidence | Exposure Point Concentration mg/kg | Industrial Soil RBC mg/kg | Is Maximum >RBC? | Is Detection Frequency >5%? |
|---|---|---|---|---|---|---|---|
| Butylbenzylphthalate | 2.91E+01 | 3.44E+01 | Unknown | 1.70E-01 | 4.10E+04 | no | |
| Carbazole | 4.99E+02 | 2.99E+02 | Unknown | 2.99E+02 | 2.90E+02 | yes | yes |
| Chrysene | 1.25E+02 | 5.85E+02 | Unknown | 5.85E+02 | 7.80E+02 | yes | yes |
| Dibenz(a,h)anthracene | 3.00E+01 | 3.95E+01 | Unknown | 3.95E+01 | 7.80E-01 | yes | yes |
| Dibenzofuran | 2.04E+02 | 1.24E+02 | Unknown | 1.24E+02 | 8.20E+02 | yes | yes |
| Di-n-butylphthalate | 2.95E+01 | 3.15E+01 | Unknown | 5.80E-01 | 2.00E+04 | no | |
| Fluoranthene | 3.70E+02 | 1.52E+03 | Unknown | 1.52E+03 | 8.20E+03 | no | |
| Fluorene | 3.60E+02 | 2.29E+02 | Unknown | 2.29E+02 | 8.20E+03 | no | |
| Indeno(1,2,3-c,d)pyrene | 4.39E+01 | 1.90E+02 | Unknown | 1.90E+02 | 7.80E+00 | yes | yes |
| Naphthalene | 1.97E+02 | 1.22E+02 | Unknown | 1.22E+02 | 4.10E+03 | no | |
| Pentachlorophenol | 6.83E+01 | 6.62E+01 | Unknown | 6.62E+01 | 4.80E+01 | yes | yes |
| Phenanthrene | 6.74E+02 | 4.93E+02 | Unknown | 4.93E+02 | NA | NA | yes |
| Phenol | 2.20E+01 | 2.47E+01 | Unknown | 2.47E+01 | 1.20E+05 | no | |
| Pyrene | 3.36E+02 | 1.44E+03 | Unknown | 1.44E+03 | 6.10E+03 | no | |
| **Volatiles** | | | | | | | |
| 1,1,2,2-Tetrachloroethane | 2.72E-02 | 1.18E-02 | Unknown | 1.18E-02 | 2.90E+01 | no | |
| 2-Butanone | 8.17E-03 | 7.20E-03 | Unknown | 7.20E-03 | 1.00E+05 | no | |
| Acetone | 1.98E-02 | 1.28E-02 | Unknown | 1.28E-02 | 2.00E+04 | no | |
| Benzene | 6.54E-03 | 6.50E-03 | Unknown | 6.50E-03 | 2.00E+02 | no | |
| Ethylbenzene | 1.87E-02 | 9.40E-03 | Unknown | 9.40E-03 | 2.00E+04 | no | |
| Tetrachloroethene | 1.50E-02 | 1.38E-02 | Unknown | 1.38E-02 | 1.10E+02 | no | |
| Toluene | 1.70E-02 | 1.13E-02 | Unknown | 1.13E-02 | 4.10E+04 | no | |
| Xylenes (total) | 5.44E-02 | 1.23E-02 | Unknown | 1.23E-02 | 4.10E+05 | no | |

This data set includes samples from all on-site areas and Hershey Run sediment.
NA Not available
[1] The screening level of 750 mg/kg is based on US EPA's adult blood lead uptake model under default exposure assumptions
[2] These compounds have no published RBC or RfD values. They are sufficiently close in toxicity to Chlordane so that the Chlordane RBC is applicable to its congeners as a provisional benchmark.
[3] These compounds have no published RBC or RfD values They are sufficiently close in toxicity to Endosulfan so that the Endosulfan RBC is applicable to its congeners as a provisional benchmark
[4] These compounds have no published RBC or RfD values. They are sufficiently close in toxicity to Endrin so that the Endrin RBC is applicable to its congeners as a provisional benchmark.

*Table 9*
***Statistical Summary and COPC Selection for Trespasser Exposed to Surface Soils and NAPL (0-12" bgs)***
***Former Koppers Company, Inc., Newport, DE***

| Analyte | Total # of Samples | Hits | Hit Frequency % | Minimum Detected mg/kg | Mean mg/kg | Lognormal Mean mg/kg | Maximum Detected mg/kg | Standard Deviation mg/kg |
|---|---|---|---|---|---|---|---|---|
| **Dioxins** | | | | | | | | |
| 2,3,7,8-TCDD Equiv | 18 | 18 | 100 | 9 31E-05 | 1 75E-03 | 7 21E-04 | 7 34E-03 | 2 35E-03 |
| **Inorganics** | | | | | | | | |
| Aluminum | 114 | 114 | 100 | 2 07E+03 | 1 39E+04 | 1.22E+04 | 3 65E+04 | 7 35E+03 |
| Antimony | 82 | 25 | 30 49 | 6.50E-01 | 5 59E+00 | 1 37E+00 | 1 21E+01 | 1 04E+01 |
| Arsenic | 108 | 106 | 98 15 | 1.20E+00 | 6 63E+00 | 5 27E+00 | 3 19E+01 | 5 30E+00 |
| Barium | 114 | 114 | 100 | 2 04E+01 | 3 42E+02 | 2 25E+02 | 1 65E+03 | 3 29E+02 |
| Beryllium | 100 | 98 | 98 | 2 00E-01 | 1 23E+00 | 9 53E-01 | 3 90E+00 | 8 81E-01 |
| Cadmium | 110 | 50 | 45 45 | 8 00E-02 | 1 06E+00 | 5 35E-01 | 3 40E+00 | 1 00E+00 |
| Chromium | 114 | 114 | 100 | 3 70E+00 | 2 60E+01 | 2 13E+01 | 2 44E+02 | 2.67E+01 |
| Cobalt | 111 | 102 | 91 89 | 6 10E-01 | 6 84E+00 | 4.89E+00 | 4 64E+01 | 6 05E+00 |
| Copper | 112 | 112 | 100 | 9.10E-01 | 3 57E+01 | 2.10E+01 | 5 28E+02 | 6 16E+01 |
| Iron | 114 | 114 | 100 | 4 43E+03 | 1.83E+04 | 1.69E+04 | 7 73E+04 | 8 25E+03 |
| Lead[1] | 114 | 114 | 100 | 2 30E+00 | 6 23E+01 | 3 51E+01 | 8 92E+02 | 1 06E+02 |
| Manganese | 114 | 114 | 100 | 4 06E+01 | 1 40E+03 | 6 21E+02 | 9 81E+03 | 2 10E+03 |
| Mercury | 82 | 53 | 64 63 | 1 50E-02 | 8 88E-01 | 1 68E-01 | 1 96E+01 | 2 66E+00 |
| Nickel | 103 | 103 | 100 | 4.00E+00 | 1 24E+01 | 1 11E+01 | 5.18E+01 | 6 96E+00 |
| Selenium | 107 | 26 | 24 3 | 8.50E-01 | 1 25E+00 | 8 65E-01 | 3 30E+00 | 9 70E-01 |
| Silver | 112 | 3 | 2 68 | 2 10E-01 | 2 28E+00 | 5 98E-01 | 1 50E+00 | 2 41E+00 |
| Thallium | 110 | 32 | 29.09 | 8.40E-01 | 3 49E+00 | 1 75E+00 | 4 44E+01 | 5 33E+00 |
| Vanadium | 114 | 113 | 99 12 | 7 60E+00 | 6 00E+01 | 4 45E+01 | 3 06E+02 | 6 19E+01 |
| Zinc | 111 | 111 | 100 | 6 40E+00 | 9 38E+01 | 6 83E+01 | 8 74E+02 | 1 05E+02 |
| **PCBs/Pesticides** | | | | | | | | |
| 4,4'-DDD | 16 | 4 | 25 | 3 80E-03 | 7 88E-02 | 1 76E-02 | 1 00E-01 | 9.23E-02 |
| 4,4'-DDE | 17 | 8 | 47 06 | 2.20E-04 | 2 55E-02 | 7 47E-03 | 2 40E-01 | 5 71E-02 |
| 4,4'-DDT | 15 | 7 | 46.67 | 6.90E-03 | 2 79E-02 | 1 17E-02 | 1 20E-01 | 4.04E-02 |
| alpha-Chlordane[2] | 17 | 3 | 17 65 | 1 80E-04 | 3 45E-02 | 6 57E-03 | 2 80E-02 | 4.75E-02 |
| Dieldrin | 15 | 5 | 33 33 | 3 10E-04 | 6 10E-02 | 1 18E-02 | 2 70E-02 | 9 05E-02 |
| Endosulfan II[3] | 17 | 2 | 11 76 | 4 50E-04 | 6 45E-02 | 1 24E-02 | 4 70E-03 | 9.26E-02 |
| Endrin | 17 | 1 | 5 88 | 1 10E-01 | 5 99E-02 | 1 38E-02 | 1 10E-01 | 8.70E-02 |
| Endrin ketone[4] | 17 | 2 | 11 76 | 2 90E-02 | 5 73E-02 | 1 34E-02 | 4 70E-02 | 8 68E-02 |
| gamma-Chlordane[2] | 17 | 1 | 5.88 | 1 10E-04 | 3 35E-02 | 6 31E-03 | 1 10E-04 | 4 79E-02 |
| Heptachlor | 17 | 1 | 5 88 | 5.30E-03 | 2.80E-02 | 6 16E-03 | 5 30E-03 | 4.50E-02 |
| Heptachlor epoxide | 17 | 2 | 11 76 | 1.00E-02 | 2 27E-02 | 5 77E-03 | 2 00E-02 | 3 89E-02 |
| Methoxychlor | 16 | 5 | 31 25 | 4 20E-02 | 2 11E-01 | 6 59E-02 | 9 20E-01 | 3 35E-01 |
| PCB-1254 | 17 | 1 | 5 88 | 4 02E-02 | 6.50E-01 | 1 47E-01 | 4 02E-02 | 9 23E-01 |
| PCB-1260 | 18 | 4 | 22 22 | 8 30E-03 | 6 36E-01 | 1 50E-01 | 3 40E-01 | 8 96E-01 |
| **Semivolatiles** | | | | | | | | |
| 2,4-Dimethylphenol | 114 | 4 | 3.51 | 3 60E-02 | 1 18E+01 | 1 10E+00 | 1 20E+01 | 4 68E+01 |
| 2-Methylnaphthalene | 114 | 33 | 28 95 | 4.10E-02 | 7 03E+01 | 1 29E+00 | 2 90E+03 | 3 40E+02 |
| 4-Methylphenol | 114 | 6 | 5.26 | 4 20E-02 | 9 81E+00 | 1 09E+00 | 1 10E+02 | 3 52E+01 |
| Acenaphthene | 114 | 41 | 35 96 | 4 30E-02 | 1 09E+02 | 1 18E+00 | 3 10E+03 | 4 80E+02 |
| Acenaphthylene | 114 | 53 | 46 49 | 5 50E-02 | 1 11E+01 | 1 44E+00 | 1 30E+02 | 3 67E+01 |
| Anthracene | 114 | 80 | 70.18 | 4 60E-02 | 4 37E+02 | 2 28E+00 | 1 50E+04 | 1 97E+03 |
| Benzo(a)anthracene | 114 | 105 | 92 11 | 3 50E-02 | 8 82E+01 | 7 05E+00 | 1 60E+03 | 2 65E+02 |
| Benzo(a)pyrene | 114 | 103 | 90 35 | 4.00E-02 | 5.25E+01 | 6.19E+00 | 7 40E+02 | 1 28E+02 |
| Benzo(b)fluoranthene | 114 | 106 | 92 98 | 1.00E-01 | 9.14E+01 | 1 22E+01 | 1 20E+03 | 2 01E+02 |
| Benzo(g,h,i)perylene | 114 | 100 | 87 72 | 4 70E-02 | 2 54E+01 | 4 41E+00 | 2 70E+02 | 5 18E+01 |
| Benzo(k)fluoranthene | 114 | 95 | 83 33 | 4 60E-02 | 3 24E+01 | 3 70E+00 | 4 70E+02 | 8.02E+01 |
| bis(2-Ethylhexyl)phthalate | 78 | 4 | 5 13 | 6 70E-02 | 1 63E+01 | 1.93E+00 | 5 30E-01 | 5 59E+01 |
| Butylbenzylphthalate | 115 | 10 | 8 7 | 4 70E-02 | 1 22E+01 | 1 10E+00 | 1 70E-01 | 4 67E+01 |




ENVIRONMENTAL STANDARDS

*Table 9*

***Statistical Summary and COPC Selection for Trespasser Exposed to Surface Soils and NAPL (0-12" bgs)***

***Former Koppers Company, Inc., Newport, DE***

| Analyte | 95% UCL mg/kg | Lognormal 95% UCL mg/kg | Distribution 99% Confidence | Exposure Point Concentration mg/kg | Industrial Soil RBC mg/kg | Is Maximum >RBC? | Is Detection Frequency >5%? |
|---|---|---|---|---|---|---|---|
| **Dioxins** | | | | | | | |
| 2,3,7,8-TCDD Equiv | 2.72E-03 | 6.56E-03 | Lognormal | 6.56E-03 | 3.80E-05 | yes | yes |
| **Inorganics** | | | | | | | |
| Aluminum | 1.50E+04 | 1.52E+04 | Unknown | 1.52E+04 | 2.00E+05 | no | |
| Antimony | 7.50E+00 | 7.65E+00 | Unknown | 7.65E+00 | 8.20E+01 | no | |
| Arsenic | 7.48E+00 | 7.48E+00 | Unknown | 7.48E+00 | 3.80E+00 | yes | yes |
| Barium | 3.93E+02 | 4.24E+02 | Unknown | 4.24E+02 | 1.40E+04 | no | |
| Beryllium | 1.38E+00 | 1.47E+00 | Unknown | 1.47E+00 | 4.10E+02 | no | |
| Cadmium | 1.22E+00 | 1.96E+00 | Unknown | 1.96E+00 | 2.00E+02 | no | |
| Chromium | 3.02E+01 | 2.75E+01 | Unknown | 2.75E+01 | 3.10E+05 | no | |
| Cobalt | 7.80E+00 | 1.04E+01 | Unknown | 1.04E+01 | 1.20E+04 | no | |
| Copper | 4.55E+01 | 3.83E+01 | Unknown | 3.83E+01 | 8.20E+03 | no | |
| Iron | 1.95E+04 | 1.94E+04 | Unknown | 1.94E+04 | 6.10E+04 | yes | yes |
| Lead[1] | 7.89E+01 | 7.05E+01 | Unknown | 7.05E+01 | 7.50E+02 | yes | yes |
| Manganese | 1.73E+03 | 1.75E+03 | Unknown | 1.75E+03 | 2.90E+04 | no | |
| Mercury | 1.38E+00 | 8.50E-01 | Unknown | 8.50E-01 | 6.10E+01 | no | |
| Nickel | 1.35E+01 | 1.32E+01 | Unknown | 1.32E+01 | 4.10E+03 | no | |
| Selenium | 1.41E+00 | 1.58E+00 | Unknown | 1.58E+00 | 1.00E+03 | no | |
| Silver | 2.66E+00 | 7.54E+00 | Unknown | 1.50E+00 | 1.00E+03 | no | |
| Thallium | 4.34E+00 | 4.50E+00 | Unknown | 4.50E+00 | 1.40E+01 | yes | yes |
| Vanadium | 6.97E+01 | 6.48E+01 | Unknown | 6.48E+01 | 1.40E+03 | no | |
| Zinc | 1.10E+02 | 1.04E+02 | Unknown | 1.04E+02 | 6.10E+04 | no | |
| **PCBs/Pesticides** | | | | | | | |
| 4,4'-DDD | 1.19E-01 | 2.43E+00 | Unknown | 1.00E-01 | 2.40E+01 | no | |
| 4,4'-DDE | 4.97E-02 | 1.24E-01 | Lognormal | 1.24E-01 | 1.70E+01 | no | |
| 4,4'-DDT | 4.62E-02 | 1.04E-01 | Lognormal | 1.04E-01 | 1.70E+01 | no | |
| alpha-Chlordane[2] | 5.46E-02 | 9.82E-01 | Lognormal | 2.80E-02 | 1.60E+01 | no | |
| Dieldrin | 1.02E-01 | 1.75E+00 | Lognormal | 2.70E-02 | 3.60E-01 | no | |
| Endosulfan II[3] | 1.04E-01 | 1.16E+00 | Lognormal | 4.70E-03 | 1.20E+03 | no | |
| Endrin | 9.67E-02 | 6.18E-01 | Unknown | 1.10E-01 | 6.10E+01 | no | |
| Endrin ketone[4] | 9.41E-02 | 5.26E-01 | Unknown | 4.70E-02 | 6.10E+01 | no | |
| gamma-Chlordane[2] | 5.37E-02 | 8.44E-01 | Lognormal | 1.10E-04 | 1.60E+01 | no | |
| Heptachlor | 4.70E-02 | 2.11E-01 | Unknown | 5.30E-03 | 1.30E+00 | no | |
| Heptachlor epoxide | 3.91E-02 | 1.27E-01 | Lognormal | 2.00E-02 | 6.30E-01 | no | |
| Methoxychlor | 3.58E-01 | 1.14E+00 | Lognormal | 9.20E-01 | 1.00E+03 | no | |
| PCB-1254 | 1.04E+00 | 6.99E+00 | Unknown | 4.02E-02 | 2.90E+00 | no | |
| PCB-1260 | 1.00E+00 | 7.51E+00 | Lognormal | 3.40E-01 | 2.90E+00 | no | |
| **Semivolatiles** | | | | | | | |
| 2,4-Dimethylphenol | 1.91E+01 | 1.28E+01 | Unknown | 1.20E+01 | 4.10E+03 | no | |
| 2-Methylnaphthalene | 1.24E+02 | 3.78E+01 | Unknown | 3.78E+01 | 4.10E+03 | no | |
| 4-Methylphenol | 1.53E+01 | 1.24E+01 | Unknown | 1.24E+01 | 1.00E+03 | no | |
| Acenaphthene | 1.85E+02 | 5.73E+01 | Unknown | 5.73E+01 | 1.20E+04 | no | |
| Acenaphthylene | 1.68E+01 | 1.52E+01 | Unknown | 1.52E+01 | NA | NA | yes |
| Anthracene | 7.46E+02 | 2.82E+02 | Unknown | 2.82E+02 | 6.10E+04 | no | |
| Benzo(a)anthracene | 1.30E+02 | 5.00E+02 | Unknown | 5.00E+02 | 7.80E+00 | yes | yes |
| Benzo(a)pyrene | 7.24E+01 | 2.90E+02 | Unknown | 2.90E+02 | 7.80E-01 | yes | yes |
| Benzo(b)fluoranthene | 1.23E+02 | 6.26E+02 | Unknown | 6.26E+02 | 7.80E+00 | yes | yes |
| Benzo(g,h,i)perylene | 3.35E+01 | 1.05E+02 | Unknown | 1.05E+02 | NA | NA | yes |
| Benzo(k)fluoranthene | 4.50E+01 | 1.37E+02 | Unknown | 1.37E+02 | 7.80E+01 | yes | yes |
| bis(2-Ethylhexyl)phthalate | 2.69E+01 | 2.53E+01 | Unknown | 5.30E-01 | 4.10E+02 | no | |
| Butylbenzylphthalate | 1.95E+01 | 1.54E+01 | Unknown | 1.70E-01 | 4.10E+04 | no | |



ENVIRONMENTAL STANDARDS

AR301636

*Table 9*
***Statistical Summary and COPC Selection for Trespasser Exposed to Surface Soils and NAPL (0-12" bgs)***
***Former Koppers Company, Inc., Newport, DE***

| Analyte | Total # of Samples | Hits | Hit Frequency % | Minimum Detected mg/kg | Mean mg/kg | Lognormal Mean mg/kg | Maximum Detected mg/kg | Standard Deviation mg/kg |
|---|---|---|---|---|---|---|---|---|
| Carbazole | 114 | 68 | 59 65 | 4 00E-02 | 2 16E+02 | 1 50E+00 | 8.70E+03 | 1 05E+03 |
| Chrysene | 114 | 107 | 93 86 | 4 60E-02 | 9 38E+01 | 8 15E+00 | 2.20E+03 | 2.91E+02 |
| Di-n-butylphthalate | 114 | 9 | 7 89 | 3 90E-02 | 1 23E+01 | 1 16E+00 | 5 80E-01 | 4 69E+01 |
| Di-n-octylphthalate | 115 | 1 | 0 87 | 4 30E-02 | 1.22E+01 | 1 17E+00 | 4 30E-02 | 4.67E+01 |
| Dibenz(a,h)anthracene | 114 | 80 | 70 18 | 6.30E-02 | 1.47E+01 | 2 03E+00 | 1 30E+02 | 4.82E+01 |
| Dibenzofuran | 114 | 41 | 35 96 | 5.40E-02 | 1.06E+02 | 1 33E+00 | 3 20E+03 | 4.69E+02 |
| Diethylphthalate | 115 | 2 | 1 74 | 6.40E-02 | 1 22E+01 | 1 16E+00 | 7 80E-02 | 4 67E+01 |
| Fluoranthene | 114 | 110 | 96 49 | 4 70E-02 | 3 05E+02 | 1 01E+01 | 9.20E+03 | 1.30E+03 |
| Fluorene | 114 | 38 | 33 33 | 4 70E-02 | 1 89E+02 | 1 30E+00 | 5.60E+03 | 8 38E+02 |
| Indeno(1,2,3-c,d)pyrene | 115 | 104 | 90 43 | 5 10E-02 | 3 01E+01 | 4 95E+00 | 3 50E+02 | 6 19E+01 |
| Naphthalene | 114 | 48 | 42 11 | 5 20E-02 | 8 40E+01 | 1 36E+00 | 3 50E+03 | 4 12E+02 |
| Pentachlorophenol | 114 | 22 | 19 3 | 6 50E-02 | 2.78E+01 | 2 45E+00 | 1 20E+02 | 1 15E+02 |
| Phenanthrene | 111 | 89 | 80 18 | 5 50E-02 | 4.74E+02 | 2 79E+00 | 1 60E+04 | 2 17E+03 |
| Phenol | 114 | 4 | 3 51 | 9 00E-02 | 9 53E+00 | 1 12E+00 | 7 70E+01 | 3 45E+01 |
| Pyrene | 114 | 109 | 95.61 | 6 10E-02 | 2 47E+02 | 1 12E+01 | 6 40E+03 | 9 31E+02 |
| **Volatiles** | | | | | | | | |
| 1,1,2,2-Tetrachloroethane | 56 | 2 | 3.57 | 1 00E-01 | 1 31E-02 | 6 93E-03 | 3 00E-01 | 4.10E-02 |
| 2-Butanone | 54 | 2 | 3.7 | 6.00E-03 | 6 72E-03 | 6.32E-03 | 3 80E-02 | 4 37E-03 |
| Acetone | 42 | 10 | 23 81 | 3 00E-03 | 1.78E-02 | 7 78E-03 | 2 30E-01 | 4 21E-02 |
| Benzene | 54 | 1 | 1 85 | 1 10E-02 | 6.28E-03 | 6.22E-03 | 1 10E-02 | 9 30E-04 |
| Chloroform | 50 | 1 | 2 | 2.00E-03 | 6 02E-03 | 5.95E-03 | 2 00E-03 | 7 89E-04 |
| Ethylbenzene | 54 | 4 | 7 41 | 1 00E-03 | 9 64E-03 | 6 29E-03 | 2 00E-01 | 2.64E-02 |
| Tetrachloroethene | 54 | 28 | 51 85 | 4 00E-03 | 1 04E-02 | 8 06E-03 | 7 40E-02 | 1.13E-02 |
| Toluene | 54 | 17 | 31 48 | 1.00E-03 | 9 85E-03 | 6 88E-03 | 1 50E-01 | 1.99E-02 |
| Trichloroethene | 54 | 1 | 1 85 | 2 00E-03 | 6 12E-03 | 6 04E-03 | 2 00E-03 | 8 68E-04 |
| Xylenes (total) | 54 | 7 | 12 96 | 3 30E-03 | 2 00E-02 | 6 75E-03 | 7 40E-01 | 9.99E-02 |



AR316027
ENVIRONMENTAL STANDARDS

*Table 9*
***Statistical Summary and COPC Selection for Trespasser Exposed to Surface Soils and NAPL (0-12" bgs)***
***Former Koppers Company, Inc., Newport, DE***

| Analyte | 95% UCL mg/kg | Lognormal 95% UCL mg/kg | Distribution 99% Confidence | Exposure Point Concentration mg/kg | Industrial Soil RBC mg/kg | Is Maximum >RBC? | Is Detection Frequency >5%? |
|---|---|---|---|---|---|---|---|
| Carbazole | 3 80E+02 | 1 09E+02 | Unknown | 1 09E+02 | 2 90E+02 | yes | yes |
| Chrysene | 1 39E+02 | 5 42E+02 | Unknown | 5 42E+02 | 7 80E+02 | yes | yes |
| Di-n-butylphthalate | 1 97E+01 | 1 51E+01 | Unknown | 5 80E-01 | 2 00E+04 | no | |
| Di-n-octylphthalate | 1 95E+01 | 1 39E+01 | Unknown | 4 30E-02 | 4.10E+03 | no | |
| Dibenz(a,h)anthracene | 2 22E+01 | 2 46E+01 | Unknown | 2 46E+01 | 7 80E-01 | yes | yes |
| Dibenzofuran | 1 80E+02 | 5 25E+01 | Unknown | 5 25E+01 | 8 20E+02 | yes | yes |
| Diethylphthalate | 1 95E+01 | 1 40E+01 | Unknown | 7 80E-02 | 1 60E+05 | no | |
| Fluoranthene | 5 08E+02 | 1 48E+03 | Unknown | 1 48E+03 | 8 20E+03 | yes | yes |
| Fluorene | 3 21E+02 | 8 91E+01 | Unknown | 8.91E+01 | 8 20E+03 | no | |
| Indeno(1,2,3-c,d)pyrene | 3 98E+01 | 1 51E+02 | Unknown | 1 51E+02 | 7 80E+00 | yes | yes |
| Naphthalene | 1 48E+02 | 5 01E+01 | Unknown | 5 01E+01 | 4 10E+03 | no | |
| Pentachlorophenol | 4 57E+01 | 3 44E+01 | Unknown | 3 44E+01 | 4 80E+01 | yes | yes |
| Phenanthrene | 8 18E+02 | 3.45E+02 | Unknown | 3 45E+02 | NA | NA | yes |
| Phenol | 1 49E+01 | 1 14E+01 | Unknown | 1 14E+01 | 1 20E+05 | no | |
| Pyrene | 3 92E+02 | 1 26E+03 | Unknown | 1 26E+03 | 6 10E+03 | yes | yes |
| **Volatiles** | | | | | | | |
| 1,1,2,2-Tetrachloroethane | 2 23E-02 | 1 01E-02 | Unknown | 1 01E-02 | 2.90E+01 | no | |
| 2-Butanone | 7 72E-03 | 6 97E-03 | Unknown | 6 97E-03 | 1 00E+05 | no | |
| Acetone | 2 88E-02 | 1 68E-02 | Unknown | 1.68E-02 | 2 00E+04 | no | |
| Benzene | 6 49E-03 | 6 46E-03 | Unknown | 6 46E-03 | 2 00E+02 | no | |
| Chloroform | 6 21E-03 | 6 31E-03 | Unknown | 2 00E-03 | 9 40E+02 | no | |
| Ethylbenzene | 1 57E-02 | 8 47E-03 | Unknown | 8.47E-03 | 2 00E+04 | no | |
| Tetrachloroethene | 1 30E-02 | 1 15E-02 | Unknown | 1 15E-02 | 1 10E+02 | no | |
| Toluene | 1 44E-02 | 9 76E-03 | Unknown | 9 76E-03 | 4 10E+04 | no | |
| Trichloroethene | 6 32E-03 | 6 41E-03 | Unknown | 2 00E-03 | 5 20E+02 | no | |
| Xylenes (total) | 4 28E-02 | 1 04E-02 | Unknown | 1 04E-02 | 4 10E+05 | no | |

This data set includes samples from all on-site areas and Hersh ... in sediment.
NA - Not available
[1] The screening level of 750 mg/kg is based on US EPA's adult ... d lead uptake model under default exposure assumptions.
[2] These compounds have no published RBC or RfD values Th... re sufficiently close in toxicity to Chlordane so that the Chlordane RBC is applicable to its congeners as a provisional benchmark
[3] These compounds have no published RBC or RfD values Th... re sufficiently close in toxicity to Endosulfan so that the Endosulfan RBC is applicable to its congeners as a provisional benchmark
[4] These compounds have no published RBC or RfD values The... re sufficiently close in toxicity to Endrin so that the Endrin RBC is applicable to its congeners as a provisional benchmark





ENVIRONMENTAL STANDARDS

***Table 10***
***Statistical Summary and COPC Selection for Trespasser Exposed to Non-River Surface Water***
***Former Koppers Company, Inc., Newport, DE***

| Analyte | Total # of Samples | Hits | Hit Frequency % | Minimum Detected mg/L | Mean mg/L | Lognormal Mean mg/L | Maximum Detected mg/L | Standard Deviation mg/L |
|---|---|---|---|---|---|---|---|---|
| **Dioxins** | | | | | | | | |
| 2,3,7,8-TCDD Equiv | 14 | 1 | 7.14 | 1.99E-06 | 2.43E-06 | 2.35E-06 | 1.99E-06 | 6.37E-07 |
| **Inorganics** | | | | | | | | |
| Aluminum | 40 | 38 | 95 | 3.38E-02 | 7.07E-01 | 3.72E-01 | 3.90E+00 | 8.92E-01 |
| Antimony | 52 | 3 | 5.77 | 2.20E-03 | 2.25E-02 | 1.43E-02 | 5.80E-03 | 1.25E-02 |
| Arsenic | 45 | 11 | 24.44 | 1.40E-03 | 4.25E-03 | 3.84E-03 | 1.01E-02 | 1.85E-03 |
| Barium | 59 | 59 | 100 | 2.32E-02 | 9.13E-02 | 8.00E-02 | 3.47E-01 | 5.32E-02 |
| Cadmium | 54 | 1 | 1.85 | 1.40E-03 | 2.23E-03 | 1.88E-03 | 1.40E-03 | 7.29E-04 |
| Chromium | 55 | 26 | 47.27 | 7.00E-04 | 4.14E-03 | 3.14E-03 | 1.11E-02 | 2.49E-03 |
| Cobalt | 49 | 5 | 10.2 | 1.50E-03 | 2.02E-02 | 1.32E-02 | 1.31E-02 | 9.29E-03 |
| Copper | 53 | 29 | 54.72 | 1.30E-03 | 8.72E-03 | 7.33E-03 | 1.57E-02 | 4.11E-03 |
| Iron | 56 | 55 | 98.21 | 1.49E-01 | 3.65E+00 | 1.62E+00 | 3.42E+01 | 5.85E+00 |
| Lead | 58 | 22 | 37.93 | 2.00E-03 | 4.01E-03 | 2.54E-03 | 2.92E-02 | 5.41E-03 |
| Manganese | 59 | 59 | 100 | 8.90E-03 | 6.92E-01 | 2.76E-01 | 6.52E+00 | 1.08E+00 |
| Mercury | 58 | 1 | 1.72 | 1.30E-04 | 8.66E-05 | 7.08E-05 | 1.30E-04 | 3.31E-05 |
| Nickel | 51 | 1 | 1.96 | 8.00E-03 | 1.86E-02 | 1.59E-02 | 8.00E-03 | 4.86E-03 |
| Thallium | 55 | 4 | 7.27 | 7.60E-03 | 5.24E-03 | 4.78E-03 | 2.46E-02 | 3.03E-03 |
| Vanadium | 49 | 23 | 46.94 | 1.40E-03 | 1.64E-02 | 1.16E-02 | 2.88E-02 | 1.02E-02 |
| Zinc | 44 | 43 | 97.73 | 2.15E-02 | 7.17E-02 | 5.35E-02 | 4.70E-01 | 7.69E-02 |
| **PCBs/Pesticides** | | | | | | | | |
| alpha-Chlordane | 14 | 5 | 35.71 | 5.00E-06 | 1.89E-05 | 1.63E-05 | 1.00E-05 | 8.59E-06 |
| Endosulfan II | 13 | 1 | 7.69 | 8.00E-06 | 4.68E-05 | 4.34E-05 | 8.00E-06 | 1.16E-05 |
| gamma-Chlordane | 14 | 1 | 7.14 | 1.00E-05 | 2.39E-05 | 2.34E-05 | 1.00E-05 | 4.01E-06 |
| Methoxychlor | 14 | 2 | 14.29 | 2.00E-05 | 2.17E-04 | 1.77E-04 | 2.40E-05 | 8.28E-05 |
| PCB-1260 | 14 | 1 | 7.14 | 5.90E-04 | 5.06E-04 | 5.06E-04 | 5.90E-04 | 2.41E-05 |
| **Semivolatiles** | | | | | | | | |
| Acenaphthene | 47 | 2 | 4.26 | 7.00E-03 | 6.87E-03 | 5.62E-03 | 7.70E-02 | 1.05E-02 |
| Anthracene | 47 | 2 | 4.26 | 3.00E-03 | 5.70E-03 | 5.39E-03 | 2.60E-02 | 3.13E-03 |
| Benzo(a)anthracene | 47 | 2 | 4.26 | 5.00E-03 | 6.45E-03 | 5.55E-03 | 5.90E-02 | 7.87E-03 |
| Benzo(a)pyrene | 47 | 2 | 4.26 | 3.00E-03 | 5.77E-03 | 5.40E-03 | 2.90E-02 | 3.56E-03 |
| Benzo(b)fluoranthene | 47 | 4 | 8.51 | 2.00E-03 | 6.35E-03 | 5.47E-03 | 5.40E-02 | 7.19E-03 |
| Benzo(g,h,i)perylene | 47 | 1 | 2.13 | 2.60E-02 | 5.74E-03 | 5.45E-03 | 2.60E-02 | 3.11E-03 |
| Benzo(k)fluoranthene | 47 | 2 | 4.26 | 3.00E-03 | 6.15E-03 | 5.46E-03 | 4.70E-02 | 6.14E-03 |
| bis(2-Ethylhexyl)phthalate | 46 | 1 | 2.17 | 3.00E-03 | 5.77E-03 | 5.41E-03 | 3.00E-03 | 3.52E-03 |
| Chrysene | 47 | 4 | 8.51 | 2.00E-03 | 7.01E-03 | 5.44E-03 | 9.00E-02 | 1.24E-02 |
| Di-n-butylphthalate[1] | 47 | 1 | 2.13 | 3.00E-03 | 5.76E-03 | 5.40E-03 | 3.00E-03 | 3.49E-03 |
| Dibenzofuran | 47 | 1 | 2.13 | 1.40E-02 | 5.49E-03 | 5.38E-03 | 1.40E-02 | 1.47E-03 |
| Fluoranthene | 47 | 4 | 8.51 | 3.00E-03 | 1.06E-02 | 5.78E-03 | 2.50E-01 | 3.57E-02 |
| Fluorene | 47 | 2 | 4.26 | 4.00E-03 | 5.55E-03 | 5.38E-03 | 1.80E-02 | 2.01E-03 |
| Indeno(1,2,3-c,d)pyrene | 47 | 1 | 2.13 | 2.80E-02 | 5.79E-03 | 5.46E-03 | 2.80E-02 | 3.39E-03 |
| Naphthalene | 47 | 1 | 2.13 | 1.70E-02 | 5.55E-03 | 5.40E-03 | 1.70E-02 | 1.86E-03 |
| Phenanthrene | 47 | 2 | 4.26 | 2.00E-03 | 6.02E-03 | 5.40E-03 | 4.20E-02 | 5.44E-03 |
| Pyrene | 47 | 4 | 8.51 | 2.00E-03 | 9.69E-03 | 5.67E-03 | 2.10E-01 | 2.99E-02 |
| **Volatiles** | | | | | | | | |
| Acetone | 39 | 3 | 7.69 | 4.00E-03 | 4.97E-03 | 4.97E-03 | 5.00E-03 | 1.60E-04 |
| Bromomethane | 49 | 2 | 4.08 | 3.00E-03 | 4.98E-03 | 4.97E-03 | 6.00E-03 | 3.22E-04 |
| Carbon Disulfide | 49 | 1 | 2.04 | 2.10E-02 | 5.33E-03 | 5.15E-03 | 2.10E-02 | 2.29E-03 |
| Chloromethane | 48 | 2 | 4.17 | 1.70E-02 | 5.63E-03 | 5.29E-03 | 2.30E-02 | 3.09E-03 |
| Toluene | 49 | 1 | 2.04 | 2.00E-03 | 4.94E-03 | 4.91E-03 | 2.00E-03 | 4.29E-04 |

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ENVIRONMENTAL STANDARDS

***Table 10***
***Statistical Summary and COPC Selection for Trespasser Exposed to Non-River Surface Water***
***Former Koppers Company, Inc., Newport, DE***

| Analyte | 95% UCL mg/L | Lognormal 95% UCL mg/L | Distribution 99% Confidence | Exposure Point Concentration mg/L | Adjusted Tap Water RBC* mg/L | Is Maximum Greater than RBC? | Is Detection Frequency >5%? |
|---|---|---|---|---|---|---|---|
| **Dioxins** | | | | | | | |
| 2,3,7,8-TCDD Equiv | [illegible] | 2 79E-06 | Normal/Lognormal | 1 99E-06 | 9 00E-09 | yes | yes |
| **Inorganics** | | | | | | | |
| Aluminum | 9 46E-01 | 1 23E+00 | Lognormal | 1 23E+00 | 7 40E+01 | no | |
| Antimony | [illegible] | 5 00E-02 | Unknown | 5 80E-03 | 3.00E-02 | no | |
| Arsenic | 4 71E-03 | 4.95E-03 | Unknown | 4.95E-03 | 9 00E-04 | yes | yes |
| Barium | 1 03E-01 | 1.03E-01 | Unknown | 1 03E-01 | 5 20E+00 | no | |
| Cadmium | [illegible] | 3.24E-03 | Unknown | 1 40E-03 | 3 60E-02 | no | |
| Chromium | 4 70E-03 | 6 16E-03 | Unknown | 6 16E-03 | 1 10E+02 | no | |
| Cobalt | 2 24E-02 | 5.77E-02 | Unknown | 1 31E-02 | 4 40E+00 | no | |
| Copper | 9 67E-03 | 1 14E-02 | Unknown | 1 14E-02 | 3 00E+00 | no | |
| Iron | 4 07E+00 | 6 21E+00 | Unknown | 6.21E+00 | 2 20E+01 | yes | yes |
| Lead | [illegible] | 4.49E-03 | Unknown | 4 49E-03 | NA | NA | yes |
| Manganese | [illegible] | 1 36E+00 | Unknown | 1 36E+00 | 1 46E+00 | yes | yes |
| Mercury | [illegible] | 1 26E-04 | Unknown | 1 26E-04 | 2.20E-02 | no | |
| Nickel | [illegible] | 2.99E-02 | Unknown | 8.00E-03 | 1 46E+00 | no | |
| Thallium | 5 93E-03 | 5 77E-03 | Unknown | 5 77E-03 | 5 20E-03 | yes | yes |
| Vanadium | 1 89E-02 | 2.61E-02 | Unknown | 2 61E-02 | 5 20E-01 | no | |
| Zinc | 9 12E-02 | 8.52E-02 | Lognormal | 8 52E-02 | 2 20E+01 | no | |
| **PCBs/Pesticides** | | | | | | | |
| alpha-Chlordane | [illegible] | 2.95E-05 | Unknown | 1 00E-05 | 1 04E-03 | no | |
| Endosulfan II | [illegible] | 6 75E-05 | Unknown | 8 00E-06 | 4 40E-01 | no | |
| gamma-Chlordane | [illegible] | 2.74E-05 | Unknown | 1 00E-05 | 1 04E-03 | no | |
| Methoxychlor | [illegible] | 4.95E-04 | Unknown | 2 40E-05 | 3.60E-01 | no | |
| PCB-1260 | [illegible] | 5.17E-04 | Unknown | 5 17E-04 | 1 46E-03 | no | |
| **Semivolatiles** | | | | | | | |
| Acenaphthene | [illegible] | 6.81E-03 | Unknown | 6 81E-03 | 4 40E+00 | no | |
| Anthracene | [illegible] | 6 00E-03 | Unknown | 6 00E-03 | 2 20E+01 | no | |
| Benzo(a)anthracene | [illegible] | 6 55E-03 | Unknown | 6 55E-03 | 1.84E-03 | yes | no |
| Benzo(a)pyrene | [illegible] | 6 06E-03 | Unknown | 6.06E-03 | 1 84E-04 | yes | no |
| Benzo(b)fluoranthene | [illegible] | 6.59E-03 | Unknown | 6 59E-03 | 1.84E-03 | yes | yes |
| Benzo(g,h,i)perylene | [illegible] | 6 02E-03 | Unknown | 6 02E-03 | NA | NA | no |
| Benzo(k)fluoranthene | [illegible] | 6.36E-03 | Unknown | 6 36E-03 | 1 84E-02 | yes | no |
| bis(2-Ethylhexyl)phthalate | [illegible] | 6 07E-03 | Unknown | 3 00E-03 | 9 60E-02 | no | |
| Chrysene | [illegible] | 6.87E-03 | Unknown | 6.87E-03 | 1 84E-01 | no | |
| Di-n-butylphthalate | [illegible] | 6.05E-03 | Unknown | 3 00E-03 | 7 40E+00 | no | |
| Dibenzofuran | [illegible] | 5 72E-03 | Unknown | 5 72E-03 | 3 00E-01 | no | |
| Fluoranthene | [illegible] | 8.18E-03 | Unknown | 8 18E-03 | 3.00E+00 | no | |
| Fluorene | [illegible] | 5.81E-03 | Unknown | 5 81E-03 | 3.00E+00 | no | |
| Indeno(1,2,3-c,d)pyrene | [illegible] | 6 06E-03 | Unknown | 6 06E-03 | 1 84E-03 | yes | no |
| Naphthalene | [illegible] | 5.80E-03 | Unknown | 5.80E-03 | 3.00E+01 | no | |
| Phenanthrene | [illegible] | 6 31E-03 | Unknown | 6 31E-03 | NA | NA | no |
| Pyrene | [illegible] | 7 86E-03 | Unknown | 7.86E-03 | 2 20E+01 | no | |
| **Volatiles** | | | | | | | |
| Acetone | [illegible] | 5 02E-03 | Unknown | 5.00E-03 | 7 40E+01 | no | |
| Bromomethane | [illegible] | 5 08E-03 | Unknown | 5 08E-03 | 1 74E-02 | no | |
| Carbon Disulfide | [illegible] | 5 53E-03 | Unknown | 5.53E-03 | 2 00E+00 | no | |
| Chloromethane | [illegible] | 5 91E-03 | Unknown | 5 91E-03 | 2.80E-02 | no | |
| Toluene | [illegible] | 5 11E-03 | Unknown | 2 00E-03 | 1 50E+00 | no | |

* See text for explanation of RBC adjustments.



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ENVIRONMENTAL STANDARDS

***Table 11***
***Statistical Summary and COPC Selection for Trespasser Exposed to Non-River Sediment (0-12" bgs)***
***Former Koppers Company, Inc., Newport, DE***

| Analyte | Total # of Samples | Hits | Hit Frequency % | Minimum Detected mg/kg | Mean mg/kg | Lognormal Mean mg/kg | Maximum Detected mg/kg | Standard Deviation mg/kg |
|---|---|---|---|---|---|---|---|---|
| **Dioxins** | | | | | | | | |
| 2,3,7,8-TCDD Equiv | 31 | 31 | 100 | 9 20E-05 | 6 77E-04 | 2.86E-04 | 6 22E-03 | 1 42E-03 |
| **Inorganics** | | | | | | | | |
| Aluminum | 163 | 163 | 100 | 8 92E+02 | 1 93E+04 | 1 78E+04 | 3 39E+04 | 6 67E+03 |
| Antimony | 92 | 44 | 47 83 | 8 60E-01 | 9 58E+00 | 3.17E+00 | 9 20E+00 | 1 26E+01 |
| Arsenic | 141 | 135 | 95 74 | 1 70E+00 | 1 06E+01 | 8.83E+00 | 3 19E+01 | 6 40E+00 |
| Barium | 163 | 163 | 100 | 2 63E+01 | 4 21E+02 | 3 25E+02 | 3 06E+03 | 4.03E+02 |
| Beryllium | 145 | 138 | 95 17 | 3 80E-01 | 1 53E+00 | 1 44E+00 | 3 80E+00 | 4 89E-01 |
| Cadmium | 155 | 114 | 73 55 | 3 90E-01 | 2 72E+00 | 1 41E+00 | 2 59E+01 | 3 58E+00 |
| Chromium | 163 | 162 | 99 39 | 8 40E+00 | 5 42E+01 | 4 93E+01 | 1 36E+02 | 2 23E+01 |
| Cobalt | 148 | 145 | 97 97 | 3.60E+00 | 1 62E+01 | 1 50E+01 | 5 00E+01 | 5 95E+00 |
| Copper | 163 | 163 | 100 | 4 20E+00 | 6 64E+01 | 5 33E+01 | 1 88E+02 | 4 19E+01 |
| Iron | 163 | 163 | 100 | 2 20E+03 | 3.07E+04 | 2.92E+04 | 5 48E+04 | 8.30E+03 |
| Lead[1] | 163 | 163 | 100 | 4 50E+00 | 1 19E+02 | 7 82E+01 | 3 15E+03 | 2 52E+02 |
| Manganese | 163 | 163 | 100 | 5 76E+01 | 7 74E+02 | 5 54E+02 | 5 27E+03 | 7 72E+02 |
| Mercury | 149 | 128 | 85.91 | 4.60E-02 | 4 75E-01 | 2 68E-01 | 8 80E+00 | 1 13E+00 |
| Nickel | 162 | 161 | 99 38 | 8.00E+00 | 2.73E+01 | 2 49E+01 | 1 11E+02 | 1 22E+01 |
| Selenium | 151 | 40 | 26 49 | 1 40E+00 | 1 91E+00 | 1 48E+00 | 6 60E+00 | 1 18E+00 |
| Silver | 151 | 16 | 10 6 | 2.00E-01 | 3 23E+00 | 1 45E+00 | 5 80E+00 | 2 30E+00 |
| Thallium | 138 | 31 | 22 46 | 1 40E+00 | 3 74E+00 | 2 67E+00 | 3 26E+01 | 3.96E+00 |
| Vanadium | 163 | 163 | 100 | 4 50E+00 | 7 80E+01 | 6 77E+01 | 6 52E+02 | 7 07E+01 |
| Zinc | 163 | 163 | 100 | 3 54E+01 | 1 07E+03 | 5.78E+02 | 8 54E+03 | 1 35E+03 |
| **PCBs/Pesticides** | | | | | | | | |
| 4,4'-DDD | 43 | 30 | 69 77 | 3 70E-04 | 1.05E-01 | 1 18E-02 | 4 00E-01 | 3 21E-01 |
| 4,4'-DDE | 43 | 32 | 74 42 | 1.50E-03 | 7.23E-02 | 1 05E-02 | 3 20E-01 | 3 06E-01 |
| 4,4'-DDT | 43 | 16 | 37 21 | 1 80E-03 | 8 63E-02 | 1 47E-02 | 1 20E+00 | 2 16E-01 |
| Aldrin | 42 | 3 | 7 14 | 1 80E-03 | 5 86E-02 | 7.66E-03 | 1.20E-02 | 1 64E-01 |
| alpha-Chlordane[2] | 42 | 6 | 14.29 | 6 20E-04 | 5 93E-02 | 7 25E-03 | 4 30E-02 | 1.64E-01 |
| Dieldrin | 43 | 6 | 13 95 | 1 80E-03 | 9 81E-02 | 1.27E-02 | 2 90E-02 | 3 20E-01 |
| Endosulfan II[3] | 43 | 5 | 11 63 | 3 90E-03 | 1 06E-01 | 1 43E-02 | 5.80E-02 | 3.21E-01 |
| Endosulfan Sulfate[3] | 43 | 5 | 11 63 | 2.10E-04 | 1.13E-01 | 1 37E-02 | 3.80E-02 | 3 23E-01 |
| Endrin | 43 | 2 | 4 65 | 1 10E-02 | 1.15E-01 | 1 52E-02 | 2 20E-02 | 3 26E-01 |
| Endrin aldehyde[4] | 42 | 6 | 14 29 | 1 40E-03 | 1.12E-01 | 1 41E-02 | 2 00E-02 | 3 29E-01 |
| Endrin ketone[4] | 43 | 1 | 2 33 | 2 70E-02 | 1 30E-01 | 1 84E-02 | 2 70E-02 | 3 28E-01 |
| gamma-Chlordane[2] | 43 | 17 | 39 53 | 4 20E-04 | 6 61E-02 | 7 48E-03 | 5 30E-03 | 1.66E-01 |
| Heptachlor | 43 | 1 | 2 33 | 3 20E-03 | 6 61E-02 | 8 68E-03 | 3 20E-03 | 1 66E-01 |
| Heptachlor epoxide | 43 | 1 | 2 33 | 8 30E-04 | 6 64E-02 | 8.79E-03 | 8 30E-04 | 1 66E-01 |
| Methoxychlor | 38 | 3 | 7 89 | 1 60E-03 | 6 24E-01 | 6 74E-02 | 2.10E-02 | 1 74E+00 |
| PCB-1254 | 43 | 13 | 30 23 | 1 80E-02 | 1 33E+00 | 2 22E-01 | 5 80E-01 | 3 27E+00 |
| PCB-1260 | 43 | 10 | 23 26 | 1 20E-02 | 1 31E+00 | 1 87E-01 | 5 40E-01 | 3 27E+00 |
| **Semivolatiles** | | | | | | | | |
| 1,2,4-Trichlorobenzene | 162 | 2 | 1 23 | 1 60E-01 | 3 72E+01 | 1 05E+00 | 1 00E+00 | 2 36E+02 |
| 1 2-Dichlorobenzene | 162 | 1 | 0 62 | 7 80E-02 | 3 72E+01 | 1 04E+00 | 7 80E-02 | 2.36E+02 |
| 2,4-Dichlorophenol | 161 | 1 | 0 62 | 2 70E-01 | 3 75E+01 | 1 05E+00 | 2 70E-01 | 2.37E+02 |
| 2,4-Dimethylphenol | 161 | 2 | 1 24 | 1 90E-01 | 3 75E+01 | 1 04E+00 | 3 80E+00 | 2 37E+02 |
| 2-Chlorophenol | 161 | 2 | 1 24 | 1 70E-01 | 3 75E+01 | 1 05E+00 | 7 80E-01 | 2 37E+02 |
| 2-Methylnaphthalene | 162 | 49 | 30 25 | 4 90E-02 | 1 03E+02 | 1 66E+00 | 3 20E+03 | 4.14E+02 |
| 2-Nitrophenol | 161 | 1 | 0 62 | 3 20E-01 | 3 75E+01 | 1 05E+00 | 3 20E-01 | 2 37E+02 |
| 3,3'-Dichlorobenzidine | 162 | 1 | 0 62 | 7 40E+00 | 3 73E+01 | 1.05E+00 | 7 40E+00 | 2 36E+02 |
| Acenaphthene | 162 | 66 | 40 74 | 6 90E-02 | 2 45E+02 | 2 12E+00 | 8 60E+03 | 1 01E+03 |
| Acenaphthylene | 162 | 41 | 25 31 | 7 70E-02 | 3 95E+01 | 1.15E+00 | 2.80E+02 | 2 37E+02 |
| Anthracene | 162 | 88 | 54 32 | 6 90E-02 | 2 98E+02 | 2.94E+00 | 1 20E+04 | 1 23E+03 |
| Benzo(a)anthracene | 162 | 123 | 75 93 | 7 20E-02 | 1 20E+02 | 2 92E+00 | 3.40E+03 | 4 27E+02 |
| Benzo(a)pyrene | 162 | 110 | 67 9 | 9 20E-02 | 5 90E+01 | 2.33E+00 | 7 50E+02 | 2 45E+02 |
| Benzo(b)fluoranthene | 162 | 124 | 76 54 | 6 70E-02 | 6 63E+01 | 3 39E+00 | 1 70E+03 | 2 09E+02 |
| Benzo(g,h,i)perylene | 162 | 96 | 59 26 | 7 50E-02 | 4 41E+01 | 1 71E+00 | 1 90E+02 | 2 36E+02 |
| Benzo(k)fluoranthene | 162 | 110 | 67 9 | 6 70E-02 | 3 93E+01 | 1 86E+00 | 8 20E+02 | 1 70E+02 |





ENVIRONMENTAL STANDARDS

***Table 11***
***Statistical Summary and COPC Selection for Trespasser Exposed to Non-River Sediment (0-12" bgs)***
***Former Koppers Company, Inc., Newport, DE***

| Analyte | 95% UCL mg/kg | Lognormal 95% UCL mg/kg | Distribution 99% Confidence | Exposure Point Concentration mg/kg | Industrial Soil RBC mg/kg | Is Maximum >RBC? | Is Detection Frequency >5%? |
|---|---|---|---|---|---|---|---|
| **Dioxins** | | | | | | | |
| 2,3,7,8-TCDD Equiv | 1 11E-03 | 7 96E-04 | Unknown | 7 96E-04 | 3 80E-05 | yes | yes |
| **Inorganics** | | | | | | | |
| Aluminum | 2 01E+04 | 2 10E+04 | Unknown | 2 10E+04 | 2 00E+05 | no | |
| Antimony | 1 18E+01 | 1 70E+01 | Unknown | 9 20E+00 | 8 20E+01 | no | |
| Arsenic | 1 15E+01 | 1 19E+01 | Unknown | 1.19E+01 | 3 80E+00 | yes | yes |
| Barium | 4 73E+02 | 4 65E+02 | Unknown | 4 65E+02 | 1 40E+04 | no | |
| Beryllium | 1 60E+00 | 1 63E+00 | Unknown | 1 60E+00 | 4 10E+02 | no | |
| Cadmium | 3 19E+00 | 4 73E+00 | Unknown | 4 73E+00 | 2 00E+02 | no | |
| Chromium | 5 71E+01 | 5 88E+01 | Unknown | 5 71E+01 | 3.10E+05 | no | |
| Cobalt | 1 70E+01 | 1 74E+01 | Unknown | 1 74E+01 | 1.20E+04 | no | |
| Copper | 7 18E+01 | 7.67E+01 | Unknown | 7 67E+01 | 8 20E+03 | no | |
| Iron | 3 18E+04 | 3 29E+04 | Unknown | 3 29E+04 | 6.10E+04 | no | |
| Lead[1] | 1 51E+02 | 1 27E+02 | Unknown | 1 27E+02 | 7 50E+02 | yes | yes |
| Manganese | 8 75E+02 | 8 85E+02 | Unknown | 8 85E+02 | 2.90E+04 | no | yes |
| Mercury | 6 29E-01 | 4 27E-01 | Unknown | 4 27E-01 | 6 10E+01 | no | |
| Nickel | 2 89E+01 | 2 92E+01 | Unknown | 2.92E+01 | 4 10E+03 | no | |
| Selenium | 2 07E+00 | 2 30E+00 | Unknown | 2 07E+00 | 1 00E+03 | no | |
| Silver | 3 54E+00 | 8 57E+00 | Unknown | 5 80E+00 | 1.00E+03 | no | |
| Thallium | 4 30E+00 | 4 32E+00 | Unknown | 4 32E+00 | 1.40E+01 | yes | yes |
| Vanadium | 8 72E+01 | 8 10E+01 | Unknown | 8 72E+01 | 1 40E+03 | no | |
| Zinc | 1 24E+03 | 1 51E+03 | Unknown | 1 51E+03 | 6 10E+04 | no | |
| **PCBs/Pesticides** | | | | | | | |
| 4,4'-DDD | 1 87E-01 | 2 17E-01 | Unknown | 2.17E-01 | 2 40E+01 | no | |
| 4,4'-DDE | 1.51E-01 | 6 82E-02 | Unknown | 6.82E-02 | 1 70E+01 | no | |
| 4,4'-DDT | 1.42E-01 | 1 44E-01 | Unknown | 1 44E-01 | 1 70E+01 | no | |
| Aldrin | 1 01E-01 | 1 08E-01 | Unknown | 1.20E-02 | 3 40E-01 | no | |
| alpha-Chlordane[2] | 1 02E-01 | 1.41E-01 | Unknown | 4 30E-02 | 1 60E+01 | no | |
| Dieldrin | 1 80E-01 | 1 27E-01 | Unknown | 2.90E-02 | 3.60E-01 | no | |
| Endosulfan I[3] | 1 88E-01 | 1 64E-01 | Unknown | 5 80E-02 | 1 20E+03 | no | |
| Endosulfan sulfate[3] | 1.96E-01 | 3.05E-01 | Unknown | 3 80E-02 | 1 20E+03 | no | |
| Endrin | 1 99E-01 | 2 04E-01 | Unknown | 2 20E-02 | 6 10E+01 | no | |
| Endrin aldehyde[4] | 1 97E-01 | 1.96E-01 | Unknown | 2 00E-02 | 6 10E+01 | no | |
| Endrin ketone | 2 14E-01 | 3 22E-01 | Unknown | 2 70E-02 | 6 10E+01 | no | |
| gamma-Chlordane[2] | 1 09E-01 | 2 42E-01 | Unknown | 5 30E-03 | 1 60E+01 | no | |
| Heptachlor | 1 09E-01 | 1.64E-01 | Unknown | 3 20E-03 | 1 30E+00 | no | |
| Heptachlor epoxide | 1 09E-01 | 1 73E-01 | Unknown | 8 30E-04 | 6 30E-01 | no | |
| Methoxychlor | 1 10E+00 | 1 66E+00 | Unknown | 2.10E-02 | 1 00E+03 | no | |
| PCB-1254 | 2 17E+00 | 3 60E+00 | Unknown | 5.80E-01 | 2 90E+00 | no | |
| PCB-1260 | 2.15E+00 | 3 94E+00 | Unknown | 5.40E-01 | 2 90E+00 | no | |
| **Semivolatiles** | | | | | | | |
| 1,2,4-Trichlorobenzene | 6 81E+01 | 6 88E+00 | Unknown | 1 00E+00 | 2 00E+03 | no | |
| 1,2-Dichlorobenzene | 6 80E+01 | 6.92E+00 | Unknown | 7 80E-02 | 1 80E+04 | no | |
| 2,4-Dichlorophenol | 6 85E+01 | 6 93E+00 | Unknown | 2 70E-01 | 6 10E+02 | no | |
| 2,4-Dimethylphenol | 6 85E+01 | 6 92E+00 | Unknown | 3 80E+00 | 4.10E+03 | no | |
| 2-Chlorophenol | 6 85E+01 | 6 95E+00 | Unknown | 7 80E-01 | 1 00E+03 | no | |
| 2-Methylnaphthalene | 1.57E+02 | 8 86E+01 | Unknown | 8 86E+01 | 4 10E+03 | no | |
| 2-Nitrophenol | 6 85E+01 | 6 93E+00 | Unknown | 3 20E-01 | NA | NA | no |
| 3,3'-Dichlorobenzidine | 6 81E+01 | 6 90E+00 | Unknown | 6.90E+00 | 1 30E+00 | yes | no |
| Acenaphthene | 3 76E+02 | 3 62E+02 | Unknown | 3 62E+02 | 1 20E+04 | no | |
| Acenaphthylene | 7 04E+01 | 9 47E+00 | Unknown | 9 47E+00 | NA | no | |
| Anthracene | 4 58E+02 | 7 40E+02 | Unknown | 7 40E+02 | 6 10E+04 | no | |
| Benzo(a)anthracene | 1 76E+02 | 3 20E+02 | Unknown | 3 20E+02 | 7.80E+00 | yes | yes |
| Benzo(a)pyrene | 9 09E+01 | 9 10E+01 | Unknown | 9 10E+01 | 7 80E-01 | yes | yes |
| Benzo(b)fluoranthene | 9 35E+01 | 1 65E+02 | Unknown | 1 65E+02 | 7.80E+00 | yes | yes |
| Benzo(g,h,i)perylene | 7 49E+01 | 3 42E+01 | Unknown | 3 42E+01 | NA | no | |
| Benzo(k)fluoranthene | 6 15E+01 | 5 51E+01 | Unknown | 5 51E+01 | 7 80E+01 | yes | yes |



AR316032

ENVIRONMENTAL STANDARDS

***Table 11***
***Statistical Summary and COPC Selection for Trespasser Exposed to Non-River Sediment (0-12" bgs)***
***Former Koppers Company, Inc., Newport, DE***

| Analyte | Total # of Samples | Hits | Hit Frequency % | Minimum Detected mg/kg | Mean mg/kg | Lognormal Mean mg/kg | Maximum Detected mg/kg | Standard Deviation mg/kg |
|---|---|---|---|---|---|---|---|---|
| bis(2-Ethylhexyl)phthalate | 131 | 29 | 22.14 | 6.00E-02 | 4.59E+01 | 1.17E+00 | 1.50E+00 | 2.62E+02 |
| Butylbenzylphthalate | 163 | 35 | 21.47 | 7.90E-02 | 3.70E+01 | 8.41E-01 | 1.20E+00 | 2.36E+02 |
| Carbazole | 162 | 58 | 35.8 | 4.60E-02 | 1.11E+02 | 1.85E+00 | 4.20E+03 | 4.63E+02 |
| Chrysene | 162 | 123 | 75.93 | 7.20E-02 | 9.34E+01 | 3.19E+00 | 2.10E+03 | 2.95E+02 |
| Dibenz(a,h)anthracene | 162 | 65 | 40.12 | 7.60E-02 | 3.87E+01 | 1.30E+00 | 4.20E+01 | 2.36E+02 |
| Dibenzofuran | 162 | 69 | 42.59 | 5.80E-02 | 1.77E+02 | 1.94E+00 | 5.80E+03 | 6.99E+02 |
| Diethylphthalate | 164 | 5 | 3.05 | 7.40E-02 | 3.68E+01 | 1.01E+00 | 2.30E-01 | 2.35E+02 |
| Di-n-butylphthalate | 164 | 38 | 23.17 | 8.20E-02 | 3.68E+01 | 9.16E-01 | 7.50E-01 | 2.35E+02 |
| Fluoranthene | 162 | 132 | 81.48 | 4.80E-02 | 4.97E+02 | 4.57E+00 | 1.70E+04 | 1.97E+03 |
| Fluorene | 162 | 74 | 45.68 | 6.20E-02 | 2.69E+02 | 2.45E+00 | 9.50E+03 | 1.07E+03 |
| Indeno(1,2,3-c,d)pyrene | 164 | 103 | 62.8 | 7.20E-02 | 4.62E+01 | 1.84E+00 | 2.40E+02 | 2.35E+02 |
| Isophorone | 162 | 1 | 0.62 | 9.00E-02 | 3.72E+01 | 1.04E+00 | 9.00E-02 | 2.36E+02 |
| Naphthalene | 162 | 58 | 35.8 | 7.40E-02 | 1.95E+02 | 1.76E+00 | 7.70E+03 | 9.54E+02 |
| Nitrobenzene | 162 | 1 | 0.62 | 2.90E-01 | 3.72E+01 | 1.05E+00 | 2.90E-01 | 2.36E+02 |
| Pentachlorophenol | 161 | 8 | 4.97 | 6.00E-02 | 9.38E+01 | 2.49E+00 | 2.20E+01 | 5.94E+02 |
| Phenanthrene | 162 | 104 | 64.2 | 8.40E-02 | 7.85E+02 | 3.41E+00 | 2.90E+04 | 3.34E+03 |
| Phenol | 159 | 1 | 0.63 | 1.50E+00 | 3.79E+01 | 1.07E+00 | 1.50E+00 | 2.39E+02 |
| Pyrene | 162 | 130 | 80.25 | 4.60E-02 | 3.31E+02 | 4.05E+00 | 1.20E+04 | 1.29E+03 |
| **Volatiles** | | | | | | | | |
| 1,1,2,2-Tetrachloroethane | 104 | 3 | 2.88 | 3.00E-01 | 6.89E-02 | 1.42E-02 | 1.00E+00 | 2.28E-01 |
| 2-Butanone | 100 | 70 | 70 | 8.00E-03 | 8.40E-02 | 3.04E-02 | 1.10E+00 | 2.10E-01 |
| Acetone | 92 | 69 | 75 | 5.00E-03 | 2.86E-01 | 8.62E-02 | 1.00E+01 | 1.05E+00 |
| Benzene | 101 | 4 | 3.96 | 2.00E-03 | 5.36E-02 | 1.23E-02 | 1.10E-02 | 2.08E-01 |
| Carbon Disulfide | 101 | 4 | 3.96 | 4.00E-03 | 5.38E-02 | 1.25E-02 | 8.00E-03 | 2.08E-01 |
| Ethylbenzene | 101 | 17 | 16.83 | 2.00E-03 | 1.44E-01 | 1.52E-02 | 3.70E+00 | 5.56E-01 |
| Methylene Chloride | 59 | 1 | 1.69 | 6.40E-02 | 8.36E-02 | 1.45E-02 | 6.40E-02 | 2.69E-01 |
| Styrene | 101 | 5 | 4.95 | 5.00E-03 | 7.75E-02 | 1.27E-02 | 3.10E+00 | 3.63E-01 |
| Tetrachloroethene | 101 | 46 | 45.54 | 2.00E-03 | 5.36E-02 | 1.17E-02 | 3.30E-02 | 2.08E-01 |
| Toluene | 101 | 18 | 17.82 | 4.00E-03 | 8.97E-02 | 1.36E-02 | 2.70E+00 | 3.84E-01 |
| Xylenes (total) | 101 | 21 | 20.79 | 1.00E-03 | 6.57E-01 | 1.77E-02 | 3.50E+01 | 3.73E+00 |



AR316033
ENVIRONMENTAL STANDARDS

*Table 11*
*Statistical Summary and COPC Selection for Trespasser Exposed to Non-River Sediment (0-12" bgs)*
*Former Koppers Company, Inc., Newport, DE*

| Analyte | 95% UCL mg/kg | Lognormal 95% UCL mg/kg | Distribution 99% Confidence | Exposure Point Concentration mg/kg | Industrial Soil RBC mg/kg | Is Maximum >RBC? | Is Detection Frequency >5%? |
|---|---|---|---|---|---|---|---|
| bis(2-Ethylhexyl)phthalate | 8 39E+01 | 1 34E+01 | Unknown | 1.50E+00 | 4 10E+02 | no | |
| Butylbenzylphthalate | 6 76E+01 | 8 19E+00 | Unknown | 1.20E+00 | 4 10E+04 | no | |
| Carbazole | 1 71E+02 | 1 02E+02 | Unknown | 1.02E+02 | 2 90E+02 | yes | yes |
| Chrysene | 1 32E+02 | 2 64E+02 | Unknown | 2.64E+02 | 7 80E+02 | yes | yes |
| Dibenz(a,h)anthracene | 6 95E+01 | 1 25E+01 | Unknown | 1.25E+01 | 7 80E-01 | yes | yes |
| Dibenzofuran | 2 68E+02 | 2 55E+02 | Unknown | 2.55E+02 | 8 20E+02 | yes | yes |
| Diethylphthalate | 6 72E+01 | 6 89E+00 | Unknown | 2.30E-01 | 1 60E+05 | no | |
| Di-n-butylphthalate | 6 72E+01 | 7 18E+00 | Unknown | 7.50E-01 | 2 00E+04 | no | |
| Fluoranthene | 7 54E+02 | 2 27E+03 | Unknown | 2.27E+03 | 8 20E+03 | yes | yes |
| Fluorene | 4 08E+02 | 5 67E+02 | Unknown | 5.67E+02 | 8 20E+03 | yes | yes |
| Indeno(1,2,3-c,d)pyrene | 7 67E+01 | 4 56E+01 | Unknown | 4 56E+01 | 7 80E+00 | yes | yes |
| Isophorone | 6 80E+01 | 6 91E+00 | Unknown | 9.00E-02 | 6 00E+03 | no | |
| Naphthalene | 3 19E+02 | 1 13E+02 | Unknown | 1.13E+02 | 4 10E+03 | yes | |
| Nitrobenzene | 6 80E+01 | 6 84E+00 | Unknown | 2.90E-01 | 1 00E+02 | no | |
| Pentachlorophenol | 1 71E+02 | 1 86E+01 | Unknown | 1.86E+01 | 4 80E+01 | no | |
| Phenanthrene | 1 22E+03 | 3 16E+03 | Unknown | 3.16E+03 | NA | no | |
| Phenol | 6 93E+01 | 7 17E+00 | Unknown | 1 50E+00 | 1 20E+05 | no | |
| Pyrene | 5 00E+02 | 1 17E+03 | Unknown | 1 17E+03 | 6 10E+03 | yes | yes |
| **Volatiles** | | | | | | | |
| 1,1,2,2-Tetrachloroethane | 1 06E-01 | 4 10E-02 | Unknown | 4.10E-02 | 2 90E+01 | no | |
| 2-Butanone | 1 19E-01 | 8 84E-02 | Unknown | 8.84E-02 | 1 00E+05 | no | |
| Acetone | 4 69E-01 | 4 72E-01 | Unknown | 4.72E-01 | 2 00E+04 | no | |
| Benzene | 8 82E-02 | 2.87E-02 | Unknown | 1.10E-02 | 2.00E+02 | no | |
| Carbon Disulfide | 8 84E-02 | 2 91E-02 | Unknown | 8.00E-03 | 2.00E+04 | no | |
| Ethylbenzene | 2 37E-01 | 6 78E-02 | Unknown | 6.78E-02 | 2 00E+04 | no | |
| Methylene Chloride | 1 43E-01 | 5 46E-02 | Unknown | 5.46E-02 | 7 60E+02 | no | |
| Styrene | 1.38E-01 | 3 22E-02 | Unknown | 3.22E-02 | 4 10E+04 | no | |
| Tetrachloroethene | 8 82E-02 | 2 94E-02 | Unknown | 2.94E-02 | 1 10E+02 | no | |
| Toluene | 1 54E-01 | 4 10E-02 | Unknown | 4.10E-02 | 4 10E+04 | no | |
| Xylenes (total) | 1 28E+00 | 1 59E-01 | Unknown | 1.59E-01 | 4.10E+05 | no | |

This data set includes samples from all on-site non-river sediment areas.
NA - Not available
[1] The screening level of 750 mg/kg is based on US EPA's adult blood lead uptake model under default exposure assumptions.
[2] These compounds have no published RBC or RfD values They are sufficiently close in toxicity to Chlordane so that the Chlordane RBC is applicable to its congeners as a provisional benchmark.
[3] These compounds have no published RBC or RfD values They are sufficiently close in toxicity to Endosulfan so that the Endosulfan RBC is applicable to its congeners as a provisional benchmark.
[4] These compounds have no published RBC or RfD values They are sufficiently close in toxicity to Endrin so that the Endrin RBC is applicable to its congeners as a provisional benchmark.

*Table 1:*
***Statistical Summary and COPC Selection for Swimmer Exposed to Surface Water From Christina River***
***Former Koppers Company, Inc., Newport, DE***

| Analyte | Total # of Samples | Hits | Hit Frequency % | Minimum Detected mg/L | Mean mg/L | Lognormal Mean mg/L | Maximum Detected mg/L | Standard Deviation mg/L | 95% UCL mg/L | Lognormal 95% UCL mg/L | Distribution 99% Confidence | Exposure Point Concentration mg/L | Adjusted Tap Water RBC* mg/L | Is Maximum Greater than RBC? | Is Detection Frequency >5%? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Inorganics** | | | | | | | | | | | | | | | |
| Aluminum | 18 | 18 | 100 | 2.17E-01 | 7.81E-01 | 6.77E-01 | 1.60E+00 | 3.91E-01 | 9.42E-01 | 1.08E+00 | Normal/Lognormal | 1.08E+00 | 7.40E+01 | no | |
| Barium | 19 | 19 | 100 | 4.41E-02 | 6.45E-02 | 6.35E-02 | 8.18E-02 | 1.17E-02 | 6.92E-02 | 6.99E-02 | Normal/Lognormal | 6.99E-02 | 5.20E+00 | no | |
| Chromium | 17 | 14 | 82 | 5.50E-04 | 2.95E-03 | 2.65E-03 | 4.20E-03 | 1.26E-03 | 3.48E-03 | 4.01E-03 | Normal/Lognormal | 4.01E-03 | 1.10E+02 | no | |
| Cobalt | 19 | 7 | 37 | 8.80E-04 | 8.46E-03 | 2.17E-03 | 1.90E-03 | 1.15E-02 | 1.31E-02 | 5.32E-02 | Unknown | 1.90E-03 | 4.40E+00 | no | |
| Copper | 14 | 14 | 100 | 2.80E-03 | 3.89E-03 | 3.78E-03 | 6.30E-03 | 9.87E-04 | 4.35E-03 | 4.38E-03 | Normal/Lognormal | 4.38E-03 | 3.00E+00 | no | |
| Iron | 19 | 19 | 100 | 3.75E-01 | 1.49E+00 | 1.36E+00 | 2.68E+00 | 5.86E-01 | 1.72E+00 | 1.90E+00 | Normal/Lognormal | 1.90E+00 | 2.20E+01 | no | |
| Lead | 19 | 15 | 79 | 3.10E-03 | 3.85E-03 | 3.31E-03 | 1.18E-02 | 2.30E-03 | 4.76E-03 | 5.22E-03 | Lognormal | 5.22E-03 | NA | NA | yes |
| Manganese | 19 | 19 | 100 | 9.47E-02 | 1.75E-01 | 1.67E-01 | 2.91E-01 | 5.60E-02 | 1.97E-01 | 2.02E-01 | Normal/Lognormal | 2.02E-01 | 1.46E+00 | no | |
| Mercury | 19 | 1 | 5 | 3.60E-04 | 7.14E-05 | 2.68E-05 | 3.60E-04 | 1.19E-04 | 1.19E-04 | 1.75E-04 | Unknown | 1.75E-04 | 2.20E-02 | no | |
| Nickel | 7 | 1 | 14 | 2.70E-03 | 1.75E-02 | 1.50E-02 | 2.70E-03 | 6.54E-03 | 2.23E-02 | 5.13E-02 | Unknown | 2.70E-03 | 1.46E+00 | no | |
| Vanadium | 17 | 14 | 82 | 2.70E-03 | 5.72E-03 | 3.59E-03 | 4.70E-03 | 7.31E-03 | 8.82E-03 | 1.13E-02 | Unknown | 4.70E-03 | 5.20E-01 | no | |
| Zinc | 12 | 12 | 100 | 4.06E-02 | 6.59E-02 | 6.49E-02 | 7.90E-02 | 1.09E-02 | 7.15E-02 | 7.32E-02 | Normal/Lognormal | 7.32E-02 | 2.20E+01 | no | |
| **Semivolatiles** | | | | | | | | | | | | | | | |
| bis(2-Ethylhexyl)phthalate | 6 | 1 | 17 | 1.00E-03 | 4.33E-03 | 3.82E-03 | 1.00E-03 | 1.63E-03 | 5.68E-03 | 1.16E-02 | Unknown | 1.00E-03 | 9.60E-02 | no | |

* See text for explanation of RBC adjustments
NA - Not available

AR316035

UAO Bates 00517



ENVIRONMENTAL STANDARDS

*Table 13*

***Statistical Summary and COPC Selection for Swimmer Exposed to Surface Water From White Clay Creek***

***Former Koppers Company, Inc., Newport, DE***

| Analyte | Total # of Samples | Hits | Hit Frequency % | Minimum Detected mg/L | Mean mg/L | Lognormal Mean mg/L | Maximum Detected mg/L | Standard Deviation mg/L | 95% UCL mg/L | Lognormal 95% UCL mg/L | Distribution 99% Confidence | Exposure Point Concentration mg/L | Adjusted Tap Water RBC* mg/L | Is Maximum Greater than RBC? | Is Detection Frequency >5%? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Inorganics** | | | | | | | | | | | | | | | |
| Aluminum | 4 | 4 | 100 | 2.31E-01 | 6.24E-01 | 5 49E-01 | 8 99E-01 | 3 15E-01 | 9.94E-01 | 3 32E+00 | Normal/Lognormal | 8 99E-01 | 7 40E+01 | no | |
| Barium | 9 | 9 | 100 | 3.45E-02 | 5 30E-02 | 5 11E-02 | 7 47E-02 | 1 53E-02 | 6.25E-02 | 6 57E-02 | Normal/Lognormal | 6 57E-02 | 5 20E+00 | no | |
| Chromium | 7 | 1 | 14 | 2 40E-03 | 3 95E-03 | 2 91E-03 | 2 40E-03 | 1 90E-03 | 5 34E-03 | 3 80E-02 | Unknown | 2 40E-03 | 1 10E+02 | no | |
| Copper | 9 | 9 | 100 | 3.10E-03 | 4.80E-03 | 4.58E-03 | 9.20E-03 | 1.78E-03 | 5.90E-03 | 5 97E-03 | Lognormal | 5 97E-03 | 3 00E+00 | no | |
| Iron | 9 | 9 | 100 | 1.95E-01 | 8.09E-01 | 6 24E-01 | 2 10E+00 | 6 18E-01 | 1 19E+00 | 1.85E+00 | Normal/Lognormal | 1 85E+00 | 2 20E+01 | no | |
| Lead | 9 | 2 | 22 | 4 80E-03 | 2.17E-03 | 1 84E-03 | 4 80E-03 | 1 51E-03 | 3 10E-03 | 3 49E-03 | Unknown | 3 49E-03 | NA | NA | yes |
| Manganese | 9 | 9 | 100 | 5.51E-02 | 1.40E-01 | 1 21E-01 | 2.83E-01 | 7 68E-02 | 1.88E-01 | 2 43E-01 | Normal/Lognormal | 2 43E-01 | 1 46E+00 | no | |
| Vanadium | 9 | 3 | 33 | 2 00E-03 | 1 76E-02 | 1 18E-02 | 5 70E-02 | [illegible] | 2 45E-02 | 9 31E-02 | Unknown | 3 20E-03 | 5 20E-01 | no | |
| Zinc | [illegible] | [illegible] | [illegible] | 5 45E-02 | 8 55E-02 | [illegible] | [illegible] | [illegible] | 1 35E-01 | 1 55E-01 | Lognormal | 1 55E-01 | [illegible] | no | |
| **Semivolatiles** | | | | | | | | | | | | | | | |
| bis(2-Ethylhexyl)phthalate | 7 | 1 | 14 | 8.00E-03 | 5.71E-03 | 5 64E-03 | 8 00E-03 | 1 07E-03 | 6 50E-03 | 6 55E-03 | Lognormal | 6 55E-03 | 9 60E-02 | no | |

* See text for explanation of RBC adjustments

NA - Not available

AR316036





ENVIRONMENTAL STANDA

*Table 14*
***Statistical Summary and COPC Selection for Swimmer Exposed to River Sediments From Christina River***
***Former Koppers Company, Inc., Newport, DE***

| Analyte | Total # of Samples | Hits | Hit Frequency % | Minimum Detected mg/kg | Mean mg/kg | Lognormal Mean mg/kg | Maximum Detected mg/kg | Standard Deviation mg/kg |
|---|---|---|---|---|---|---|---|---|
| **Dioxins** | | | | | | | | |
| 2,3,7,8-TCDD Equiv | 3 | 3 | 100 | 9.18E-05 | 1 01E-04 | 1 01E-04 | 1 16E-04 | 1 27E-05 |
| **Inorganics** | | | | | | | | |
| Aluminum | 37 | 37 | 100 | 1.19E+03 | 1 46E+04 | 1 25E+04 | 2 47E+04 | 5 70E+03 |
| Antimony | 23 | 4 | 17 | 2 40E-01 | 4 26E+00 | 5 87E-01 | 1.40E+00 | 1 02E+01 |
| Arsenic | 33 | 33 | 100 | 2.20E+00 | 7 72E+00 | 7 01E+00 | 1 74E+01 | 3 53E+00 |
| Barium | 37 | 37 | 100 | 1.29E+01 | 2 08E+02 | 1 46E+02 | 1 24E+03 | 2 26E+02 |
| Beryllium | 29 | 28 | 97 | 2.90E-01 | 1.13E+00 | 1 01E+00 | 2 10E+00 | 5 28E-01 |
| Cadmium | 34 | 16 | 47 | 4.60E-01 | 2 07E+00 | 6 07E-01 | 2 23E+01 | 4 13E+00 |
| Chromium | 37 | 37 | 100 | 6.90E+00 | 4.24E+01 | 3 64E+01 | 1 50E+02 | 2 38E+01 |
| Cobalt | 29 | 29 | 100 | 3.40E+00 | 1.12E+01 | 1 05E+01 | 1.66E+01 | 3 33E+00 |
| Copper | 35 | 35 | 100 | 7.20E+00 | 2 84E+01 | 2 29E+01 | 6.64E+01 | 1 85E+01 |
| Iron | 37 | 37 | 100 | 4.46E+03 | 2.38E+04 | 2.18E+04 | 3 39E+04 | 7 67E+03 |
| Lead[1] | 37 | 37 | 100 | 6.60E+00 | 4.86E+01 | 3 18E+01 | 2 20E+02 | 4.66E+01 |
| Manganese | 37 | 37 | 100 | 7.57E+01 | 6 39E+02 | 5 23E+02 | 1 30E+03 | 3 48E+02 |
| Mercury | 34 | 28 | 82 | 1.40E-02 | 1 69E-01 | 9 54E-02 | 6.30E-01 | 1 67E-01 |
| Nickel | 37 | 37 | 100 | 3.00E+00 | 1 93E+01 | 1 77E+01 | 2 77E+01 | 6 18E+00 |
| Selenium | 35 | 12 | 34 | 3.40E-01 | 1 11E+00 | 7 56E-01 | 1 90E+00 | 8 83E-01 |
| Thallium | 28 | 3 | 11 | 1.26E+00 | 2 08E+00 | 1 23E+00 | 3.50E+00 | 1 97E+00 |
| Vanadium | 37 | 37 | 100 | 7.30E+00 | 4 08E+01 | 3 74E+01 | 5 78E+01 | 1 29E+01 |
| Zinc | 37 | 37 | 100 | 4.02E+01 | 4 46E+02 | 2.28E+02 | 3 09E+03 | 6 25E+02 |
| **PCBs/Pesticides** | | | | | | | | |
| 4,4'-DDD | 25 | 14 | 56 | 9.50E-05 | 1 90E-01 | 3.33E-03 | 3 80E+00 | 7.63E-01 |
| 4,4'-DDE | 15 | 12 | 80 | 2.70E-04 | 7 58E-02 | 2.33E-03 | 1 10E+00 | 2 83E-01 |
| 4,4'-DDT | 20 | 8 | 40 | 4.10E-05 | 1.25E+00 | 3 33E-03 | 2.40E+01 | 5 36E+00 |
| alpha-BHC | 28 | 2 | 7 | 6.30E-05 | 2 83E-02 | 1.91E-03 | 1 30E-03 | 1 16E-01 |
| alpha-Chlordane[2] | 28 | 11 | 39 | 1.80E-04 | 7.61E-03 | 1.74E-03 | 1 70E-02 | 2.90E-02 |
| delta-BHC[3] | 25 | 3 | 12 | 2.10E-04 | 7 45E-03 | 1.44E-03 | 4 10E-04 | 3 07E-02 |
| Dieldrin | 14 | 4 | 29 | 3.50E-04 | 2 36E-02 | 2 69E-03 | 4 40E-03 | 7 96E-02 |
| Endrin aldehyde[4] | 25 | 6 | 24 | 9.30E-05 | 3 82E-02 | 2.67E-03 | 3 70E-03 | 1 31E-01 |
| Endrin ketone[4] | 28 | 3 | 11 | 2.20E-04 | 6 67E-02 | 3.49E-03 | 1 40E-03 | 2 86E-01 |
| gamma-Chlordane[2] | 28 | 21 | 75 | 8.30E-05 | 7 35E-03 | 8.74E-04 | 1 90E-02 | 2 92E-02 |
| Heptachlor epoxide | 23 | 2 | 9 | 3.70E-05 | 3.41E-02 | 1 98E-03 | 1 50E-03 | 1 27E-01 |
| Methoxychlor | 28 | 9 | 32 | 1.20E-04 | 6 48E-02 | 5.68E-03 | 2 20E-03 | 2 91E-01 |
| PCB-1254 | 28 | 6 | 21 | 3.80E-02 | 2 13E-01 | 5 19E-02 | 1 30E+00 | 6 04E-01 |
| PCB-1260 | 28 | 8 | 29 | 3.60E-03 | 1 70E-01 | 3 85E-02 | 3 30E-01 | 5.68E-01 |



AR316037
ENVIRONMENTAL STANDARDS

***Table 14***
***Statistical Summary and COPC Selection for Swimmer Exposed to River Sediments From Christina River***
***Former Koppers Company, Inc., Newport, DE***

| Analyte | 95% UCL mg/kg | Lognormal 95% UCL mg/kg | Distribution 99% Confidence | Exposure Point Concentration mg/kg | Industrial Soil RBC[a] mg/kg | Is Maximum >RBC? | Is Detection Frequency >5%? |
|---|---|---|---|---|---|---|---|
| **Dioxins** | | | | | | | |
| 2,3,7,8-TCDD Equiv | 1 22E-04 | 1 30E-04 | Normal/Lognormal | 1 16E-04 | 3 80E-05 | yes | yes |
| **Inorganics** | | | | | | | |
| Aluminum | 1 62E+04 | 2 06E+04 | Unknown | 2 06E+04 | 2 00E+06 | no | |
| Antimony | 7 91E+00 | 8 82E+00 | Unknown | 1 40E+00 | 8 20E+01 | no | |
| Arsenic | 8 77E+00 | 9 03E+00 | Normal/Lognormal | 9 03E+00 | 3 80E+00 | yes | yes |
| Barium | 2 71E+02 | 2 96E+02 | Lognormal | 2 96E+02 | 1 40E+04 | no | |
| Beryllium | 1 30E+00 | 1 38E+00 | Normal/Lognormal | 1 38E+00 | 4 10E+02 | no | |
| Cadmium | 3 27E+00 | 5 98E+00 | Lognormal | 5 98E+00 | 2 00E+02 | no | |
| Chromium | 4 90E+01 | 5 37E+01 | Unknown | 5.37E+01 | 3 10E+05 | no | |
| Cobalt | 1 23E+01 | 1 31E+01 | Normal | 1 31E+01 | 1 20E+04 | no | |
| Copper | 3 38E+01 | 3 69E+01 | Lognormal | 3.69E+01 | 8 20E+03 | no | |
| Iron | 2 60E+04 | 2 88E+04 | Unknown | 2 88E+04 | 6 10E+04 | no | |
| Lead[1] | 6 16E+01 | 7 31E+01 | Lognormal | 7 31E+01 | 7 50E+02 | no | |
| Manganese | 7 36E+02 | 8 77E+02 | Normal | 8 77E+02 | 2 90E+04 | no | |
| Mercury | 2 18E-01 | 3.35E-01 | Lognormal | 3 35E-01 | 6 10E+01 | no | |
| Nickel | 2 10E+01 | 2 36E+01 | Unknown | 2 36E+01 | 4 10E+03 | no | |
| Selenium | 1 37E+00 | 1 85E+00 | Unknown | 1 85E+00 | 1 00E+03 | no | |
| Thallium | 2 72E+00 | 4 09E+00 | Unknown | 3.50E+00 | 1 40E+01 | no | |
| Vanadium | 4 44E+01 | 4 94E+01 | Unknown | 4 94E+01 | 1 40E+03 | no | |
| Zinc | 6 20E+02 | 7 08E+02 | Lognormal | 7 08E+02 | 6 10E+04 | no | |
| **PCBs/Pesticides** | | | | | | | |
| 4,4'-DDD | 4 52E-01 | 6 66E-01 | Unknown | 6 66E-01 | 2.40E+01 | no | |
| 4,4'-DDE | 2 05E-01 | 2.65E-01 | Unknown | 2.65E-01 | 1 70E+01 | no | |
| 4,4'-DDT | 3 32E+00 | 2 27E+01 | Unknown | 2.27E+01 | 1 70E+01 | yes | yes |
| alpha-BHC | 6 55E-02 | 1 73E-02 | Unknown | 1 30E-03 | 9 10E-01 | no | |
| alpha-Chlordane[2] | 1 70E-02 | 6 49E-03 | Unknown | 6.49E-03 | 1.60E+01 | no | |
| delta-BHC[3] | 1 80E-02 | 4 86E-03 | Unknown | 4 10E-04 | 9 10E-01 | no | |
| Dieldrin | 6 13E-02 | 5.00E-02 | Unknown | 4 40E-03 | 3 60E-01 | no | |
| Endrin aldehyde[4] | 8 31E-02 | 6 71E-02 | Unknown | 3 70E-03 | 6 10E+01 | no | |
| Endrin ketone[4] | 1 59E-01 | 3 60E-02 | Unknown | 1 40E-03 | 6 10E+01 | no | |
| gamma-Chlordane[2] | 1 67E-02 | 1 15E-02 | Lognormal | 1 15E-02 | 1 60E+01 | no | |
| Heptachlor epoxide | 7 97E-02 | 3 93E-02 | Unknown | 1 50E-03 | 6 30E-01 | no | |
| Methoxychlor | 1 59E-01 | 1 91E-01 | Unknown | 2.20E-03 | 1 00E+03 | no | |
| PCB-1254 | 4 08E-01 | 2.33E-01 | Unknown | 2 33E-01 | 2 90E+00 | no | |
| PCB-1260 | 3 52E-01 | 1 89E-01 | Unknown | 1 89E-01 | 2 90E+00 | no | |



ENVIRONMENTAL STANDARDS
AR316038

*Table 14*
***Statistical Summary and COPC Selection for Swimmer Exposed to River Sediments From Christina River***
***Former Koppers Company, Inc., Newport, DE***

| Analyte | Total # of Samples | Hits | Hit Frequency % | Minimum Detected mg/kg | Mean mg/kg | Lognormal Mean mg/kg | Maximum Detected mg/kg | Standard Deviation mg/kg |
|---|---|---|---|---|---|---|---|---|
| **Semivolatiles** | | | | | | | | |
| 1,2,4-Trichlorobenzene | 38 | 1 | 3 | 4 00E-01 | 4 78E-01 | 3 68E-01 | 4 00E-01 | 5 74E-01 |
| 2-Methylnaphthalene | 38 | 1 | 3 | 5 00E-02 | 4 71E-01 | 3 50E-01 | 5 00E-02 | 5 78E-01 |
| 4-Methylphenol | 38 | 1 | 3 | 7 10E-02 | 4 72E-01 | 3 54E-01 | 7 10E-02 | 5 77E-01 |
| Acenaphthene | 38 | 5 | 13 | 6 00E-02 | 4 61E-01 | 3 35E-01 | 8 80E-01 | 5.84E-01 |
| Anthracene | 38 | 4 | 11 | 8 20E-02 | 4 55E-01 | 3 25E-01 | 1 30E-01 | 5 85E-01 |
| Benzo(a)anthracene | 38 | 23 | 61 | 6 80E-02 | 4 33E-01 | 2 61E-01 | 1 60E+00 | 6 30E-01 |
| Benzo(a)pyrene | 38 | 19 | 50 | 3 30E-02 | 3.93E-01 | 2 45E-01 | 3 30E-01 | 5 98E-01 |
| Benzo(b)fluoranthene | 38 | 23 | 61 | 4 90E-02 | 4 35E-01 | 2.88E-01 | 9 50E-01 | 5 95E-01 |
| Benzo(g,h,i)perylene | 38 | 12 | 32 | 6 70E-02 | 4.21E-01 | 2 71E-01 | 2 50E-01 | 5 98E-01 |
| Benzo(k)fluoranthene | 38 | 12 | 32 | 4 70E-02 | 4 09E-01 | 2 51E-01 | 3 10E-01 | 5.99E-01 |
| bis(2-Ethylhexyl)phthalate | 28 | 17 | 61 | 5 90E-02 | 8 03E-01 | 4 34E-01 | 3 50E+00 | 9 62E-01 |
| Butylbenzylphthalate | 38 | 8 | 21 | 6.50E-02 | 4 39E-01 | 2 85E-01 | 1.20E-01 | 5 95E-01 |
| Chrysene | 34 | 19 | 56 | 5 40E-02 | 4 58E-01 | 3 00E-01 | 1 30E+00 | 6 33E-01 |
| Di-n-butylphthalate | 37 | 12 | 32 | 3 70E-02 | 4 10E-01 | 2 42E-01 | 1 60E-01 | 6.10E-01 |
| Dibenz(a,h)anthracene | 38 | 1 | 3 | 7 00E-02 | 4 71E-01 | 3 53E-01 | 7 00E-02 | 5 78E-01 |
| Dibenzofuran | 38 | 1 | 3 | 6 50E-02 | 4.71E-01 | 3 52E-01 | 6 50E-02 | 5 78E-01 |
| Diethylphthalate | 38 | 1 | 3 | 9 40E-01 | 5.03E-01 | 3 86E-01 | 9.40E-01 | 5 78E-01 |
| Fluoranthene | 38 | 25 | 66 | 6.10E-02 | 6 08E-01 | 3 43E-01 | 5.70E+00 | 1 03E+00 |
| Fluorene | 38 | 6 | 16 | 4.80E-02 | 4 60E-01 | 3 10E-01 | 1 30E+00 | 6 02E-01 |
| Indeno(1,2,3-c,d)pyrene | 37 | 12 | 32 | 5 70E-02 | 4 16E-01 | 2.67E-01 | 3 60E-01 | 6 04E-01 |
| Naphthalene | 38 | 5 | 13 | 6 20E-02 | 4 66E-01 | 3 26E-01 | 7 50E-01 | 5 87E-01 |
| Pentachlorophenol | 38 | 2 | 5 | 6 50E-02 | 1 16E+00 | 8.23E-01 | 1.30E-01 | 1 45E+00 |
| Phenanthrene | 38 | 22 | 58 | 6 00E-02 | 5 58E-01 | 2 78E-01 | 6 00E+00 | 1.09E+00 |
| Pyrene | 38 | 24 | 63 | 8 50E-02 | 5 80E-01 | 3 52E-01 | 4.80E+00 | 9 13E-01 |
| **Volatiles** | | | | | | | | |
| 1,1,2,2-Tetrachloroethane | 17 | 5 | 29 | 2 00E-01 | 8 93E-02 | 2 46E-02 | 4 00E-01 | 1 38E-01 |
| 2-Butanone | 12 | 5 | 42 | 1 60E-02 | 1 86E-02 | 1 35E-02 | 6 30E-02 | 1.75E-02 |
| Acetone | 11 | 6 | 55 | 1 50E-01 | 2 40E-01 | 6 64E-02 | 9 10E-01 | 3 37E-01 |

AR316039

ENVIRONMENTAL STANDARDS

***Table 14***
***Statistical Summary and COPC Selection for Swimmer Exposed to River Sediments From Christina River***
***Former Koppers Company, Inc., Newport, DE***

| Analyte | 95% UCL mg/kg | Lognormal 95% UCL mg/kg | Distribution 99% Confidence | Exposure Point Concentration mg/kg | Industrial Soil RBC* mg/kg | Is Maximum >RBC? | Is Detection Frequency >5%? |
|---|---|---|---|---|---|---|---|
| **Semivolatiles** | | | | | | | |
| 1,2,4-Trichlorobenzene | 6.36E-01 | 5.24E-01 | Unknown | 4.00E-01 | 2.00E+03 | no | |
| 2-Methylnaphthalene | 6.30E-01 | 5.44E-01 | Unknown | 5.00E-02 | 4.10E+03 | no | |
| 4-Methylphenol | 6.31E-01 | 5.34E-01 | Unknown | 7.10E-02 | 1.00E+03 | no | |
| Acenaphthene | 6.22E-01 | 5.34E-01 | Unknown | 5.34E-01 | 1.20E+04 | no | |
| Anthracene | 6.16E-01 | 5.32E-01 | Unknown | 1.30E-01 | 6.10E+04 | no | |
| Benzo(a)anthracene | 6.06E-01 | 5.51E-01 | Lognormal | 5.51E-01 | 7.80E+00 | no | |
| Benzo(a)pyrene | 5.58E-01 | 4.88E-01 | Unknown | 3.30E-01 | 7.80E-01 | no | |
| Benzo(b)fluoranthene | 5.99E-01 | 5.43E-01 | Lognormal | 5.43E-01 | 7.80E+00 | no | |
| Benzo(g,h,i)perylene | 5.85E-01 | 5.20E-01 | Unknown | 2.50E-01 | NA | NA | yes |
| Benzo(k)fluoranthene | 5.74E-01 | 5.41E-01 | Unknown | 3.10E-01 | 7.80E+01 | no | |
| bis(2-Ethylhexyl)phthalate | 1.11E+00 | 1.44E+00 | Lognormal | 1.44E+00 | 4.10E+02 | no | |
| Butylbenzylphthalate | 6.03E-01 | 5.68E-01 | Unknown | 1.20E-01 | 4.10E+04 | no | |
| Chrysene | 6.42E-01 | 5.72E-01 | Unknown | 5.72E-01 | 7.80E+02 | no | |
| Di-n-butylphthalate | 5.80E-01 | 5.65E-01 | Lognormal | 1.60E-01 | 2.00E+04 | no | |
| Dibenz(a,h)anthracene | 6.30E-01 | 5.34E-01 | Unknown | 7.00E-02 | 7.80E-01 | no | |
| Dibenzofuran | 6.30E-01 | 5.36E-01 | Unknown | 6.50E-02 | 8.20E+02 | no | |
| Diethylphthalate | 6.61E-01 | 5.60E-01 | Unknown | 5.60E-01 | 1.60E+05 | no | |
| Fluoranthene | 8.92E-01 | 7.56E-01 | Unknown | 7.56E-01 | 8.20E+03 | no | |
| Fluorene | 6.25E-01 | 5.81E-01 | Unknown | 5.81E-01 | 8.20E+03 | no | |
| Indeno(1,2,3-c,d)pyrene | 5.85E-01 | 5.15E-01 | Unknown | 3.60E-01 | 7.80E+00 | no | |
| Naphthalene | 6.28E-01 | 5.76E-01 | Unknown | 5.76E-01 | 4.10E+03 | no | |
| Pentachlorophenol | 1.56E+00 | 1.47E+00 | Unknown | 1.30E-01 | 4.80E+01 | no | |
| Phenanthrene | 8.58E-01 | 6.65E-01 | Unknown | 6.65E-01 | NA | NA | yes |
| Pyrene | 8.32E-01 | 6.92E-01 | Unknown | 6.92E-01 | 6.10E+03 | no | |
| **Volatiles** | | | | | | | |
| 1,1,2,2-Tetrachloroethane | 1.48E-01 | 4.06E-01 | Unknown | 4.00E-01 | 2.90E+01 | no | |
| 2-Butanone | 2.76E-02 | 3.35E-02 | Lognormal | 3.35E-02 | 1.20E+05 | no | |
| Acetone | 4.24E-01 | 1.01E+01 | Lognormal | 9.10E-01 | 2.00E+04 | no | |

* Since the only sediment exposure route evaluated for the swimmer scenario was dermal contact, comparison of maximum concentrations to the industrial soil RBC were most appropriate

NA - Not available

[1] The screening level of 750 mg/kg is based on US EPA's adult blood lead uptake model under default exposure assumptions

[2] These compounds have no published RBC or RfD values. They are sufficiently close in toxicity to Chlordane so that the Chlordane RBC is applicable to its congeners as a provisional benchmark

[3] This compound has no published RBC or RfD value. It is sufficiently close in toxicity to alpha-BHC so that the alpha-BHC RBC is applicable to its congener as a provisional benchmark.

[4] These compounds have no published RBC or RfD values. They are sufficiently close in toxicity to Endrin so that the Endrin RBC is applicable to its congeners as a provisional benchmark.





ENVIRONMENTAL STANDARDS

***Table 15***
***Statistical Summary and COPC Selection for Swimmer Exposed to River Sediments From White Clay Creek***
***Former Koppers Company, Inc., Newport, DE***

| Analyte | Total # of Samples | Hits | Hit Frequency % | Minimum Detected mg/kg | Mean mg/kg | Lognormal Mean mg/kg | Maximum Detected mg/kg | Standard Deviation mg/kg |
|---|---|---|---|---|---|---|---|---|
| **Dioxins** | | | | | | | | |
| 2,3,7,8-TCDD Equiv | 2 | 2 | 100 | 1 35E-04 | 1.65E-04 | 1 63E-04 | 1 95E-04 | 4 22E-05 |
| **Inorganics** | | | | | | | | |
| Aluminum | 17 | 17 | 100 | 3 35E+03 | 1 47E+04 | 1 23E+04 | 2 67E+04 | 7 44E+03 |
| Arsenic | 14 | 11 | 79 | 1 20E+00 | 4.50E+00 | 3 83E+00 | 8 30E+00 | 2 25E+00 |
| Barium | 17 | 17 | 100 | 3 63E+01 | 1.81E+02 | 1.37E+02 | 6 67E+02 | 1 52E+02 |
| Beryllium | 15 | 15 | 100 | 2 80E-01 | 1.02E+00 | 9 19E-01 | 1 60E+00 | 4 24E-01 |
| Cadmium | 17 | 6 | 35 | 4 20E-01 | 1 67E+00 | 8.05E-01 | 3 70E+00 | 1 23E+00 |
| Chromium | 17 | 17 | 100 | 1 04E+01 | 3 24E+01 | 2 88E+01 | 5 21E+01 | 1.44E+01 |
| Cobalt | 17 | 17 | 100 | 3 00E+00 | 1.25E+01 | 1 08E+01 | 2 26E+01 | 5 93E+00 |
| Copper | 17 | 17 | 100 | 4 50E+00 | 2.08E+01 | 1.68E+01 | 5 00E+01 | 1 30E+01 |
| Iron | 17 | 17 | 100 | 7 65E+03 | 2.09E+04 | 1 91E+04 | 3 11E+04 | 7.88E+03 |
| Lead[1] | 17 | 17 | 100 | 6.80E+00 | 2.99E+01 | 2 32E+01 | 7 92E+01 | 2.19E+01 |
| Manganese | 17 | 17 | 100 | 1 34E+02 | 4.33E+02 | 3 74E+02 | 1 01E+03 | 2 37E+02 |
| Mercury | 17 | 9 | 53 | 2 90E-02 | 1.05E-01 | 9 08E-02 | 2 40E-01 | 5 83E-02 |
| Nickel | 16 | 16 | 100 | 4 20E+00 | 1.85E+01 | 1 63E+01 | 2 77E+01 | 7 61E+00 |
| Thallium | 13 | 2 | 15 | 4 00E+00 | 4.86E+00 | 4 85E+00 | 4 20E+00 | 3 40E-01 |
| Vanadium | 17 | 17 | 100 | 1.31E+01 | 4 35E+01 | 3 83E+01 | 6 71E+01 | 1.89E+01 |
| Zinc | 17 | 17 | 100 | 7.34E+01 | 4 11E+02 | 2 95E+02 | 1 21E+03 | 3 54E+02 |
| **PCBs/Pesticides** | | | | | | | | |
| 4,4'-DDD | 6 | 6 | 100 | 3 20E-05 | 4.59E-03 | 9 84E-04 | 2 30E-02 | 9 04E-03 |
| 4,4'-DDE | 6 | 5 | 83 | 5 40E-04 | 2.21E-03 | 1 34E-03 | 6 60E-03 | 2 48E-03 |
| 4,4'-DDT | 6 | 3 | 50 | 6 40E-04 | 3.03E-02 | 4.22E-03 | 1 70E-01 | 6.84E-02 |
| alpha-Chlordane[2] | 6 | 4 | 67 | 1 80E-04 | 8.83E-04 | 6 33E-04 | 9.10E-04 | 7 13E-04 |
| delta-BHC[3] | 6 | 1 | 17 | 1 90E-04 | 1.27E-03 | 1 04E-03 | 1 90E-04 | 6 03E-04 |
| Dieldrin | 6 | 2 | 33 | 8 30E-05 | 1.94E-03 | 9 26E-04 | 1 30E-04 | 1 54E-03 |
| Endrin aldehyde[4] | 6 | 2 | 33 | 2 00E-04 | 1.66E-03 | 1 06E-03 | 2.30E-04 | 1 20E-03 |
| gamma-Chlordane[2] | 6 | 4 | 67 | 2.00E-04 | 8.05E-04 | 5 49E-04 | 6 30E-04 | 7 42E-04 |
| Heptachlor epoxide | 6 | 1 | 17 | 4.60E-04 | 1.24E-03 | 1 12E-03 | 4 60E-04 | 5 23E-04 |
| Methoxychlor | 6 | 3 | 50 | 3 20E-04 | 8.48E-03 | 3 04E-03 | 1 00E-03 | 8 78E-03 |
| **Semivolatiles** | | | | | | | | |
| Benzo(a)anthracene | 17 | 5 | 29 | 2 30E-01 | 5.25E-01 | 4 28E-01 | 4 30E-01 | 4 03E-01 |
| Benzo(a)pyrene | 17 | 1 | 6 | 7 30E-01 | 5.49E-01 | 4.71E-01 | 7 30E-01 | 3 59E-01 |
| Benzo(b)fluoranthene | 17 | 8 | 47 | 4 60E-02 | 4.89E-01 | 3 77E-01 | 8 30E-01 | 3 90E-01 |
| Benzo(g,h,i)perylene | 17 | 1 | 6 | 2 60E-01 | 5 54E-01 | 4 60E-01 | 2 60E-01 | 3 93E-01 |
| Benzo(k)fluoranthene | 17 | 1 | 6 | 1 10E-01 | 5.65E-01 | 4.61E-01 | 1 10E-01 | 3.94E-01 |
| bis(2-Ethylhexyl)phthalate | 14 | 3 | 21 | 2.20E-01 | 5 91E-01 | 4 85E-01 | 3 90E-01 | 4 23E-01 |
| Chrysene | 17 | 4 | 24 | 1 50E-01 | 5 26E-01 | 4 20E-01 | 4 30E-01 | 4 07E-01 |
| Di-n-butylphthalate | 17 | 3 | 18 | 1 60E-01 | 5.45E-01 | 4 41E-01 | 3 70E-01 | 4 02E-01 |
| Fluoranthene | 17 | 8 | 47 | 4 80E-02 | 5 42E-01 | 4 49E-01 | 1.10E+00 | 2 89E-01 |
| Indeno(1,2,3-c,d)pyrene | 17 | 1 | 6 | 2 40E-01 | 5 52E-01 | 4.58E-01 | 2 40E-01 | 3 94E-01 |
| Naphthalene | 17 | 1 | 6 | 4 00E-01 | 5 85E-01 | 5 04E-01 | 4 00E-01 | 3 76E-01 |
| Phenanthrene | 17 | 7 | 41 | 1 80E-01 | 4 84E-01 | 3 92E-01 | 6 40E-01 | 3 81E-01 |
| Pyrene | 17 | 8 | 47 | 4 10E-02 | 5 43E-01 | 4 01E-01 | 8 00E-01 | 3 89E-01 |

***Table 15***
***Statistical Summary and COPC Selection for Swimmer Exposed to River Sediments From White Clay Creek***
***Former Koppers Company, Inc., Newport, DE***

| Analyte | 95% UCL mg/kg | Lognormal 95% UCL mg/kg | Distribution 99% Confidence | Exposure Point Concentration mg/kg | Industrial Soil RBC mg/kg | Is Maximum >RBC? | Is Detection Frequency >5%? |
|---|---|---|---|---|---|---|---|
| **Dioxins** | | | | | | | |
| 2,3,7,8-TCDD Equiv | 3 54E-04 | 8 36E-04 | Unknown | 1 95E-04 | 3 80E-05 | yes | yes |
| **Inorganics** | | | | | | | |
| Alumınum | 1 79E+04 | 2 28E+04 | Normal/Lognormal | 2 28E+04 | 2 00E+06 | no | |
| Arsenic | 5 57E+00 | 7 10E+00 | Normal/Lognormal | 7 10E+00 | 3 80E+00 | yes | yes |
| Barium | 2 45E+02 | 2 91E+02 | Lognormal | 2 91E+02 | 1 40E+04 | no | |
| Beryllium | 1 21E+00 | 1 40E+00 | Normal/Lognormal | 1 40E+00 | 4 10E+02 | no | |
| Cadmium | 2 19E+00 | 1 59E+01 | Unknown | 3 70E+00 | 2 00E+02 | no | |
| Chromium | 3 85E+01 | 4 38E+01 | Normal/Lognormal | 4 38E+01 | 3 10E+05 | no | |
| Cobalt | 1 50E+01 | 1 81E+01 | Normal/Lognormal | 1 81E+01 | 1 20E+04 | no | |
| Copper | 2 63E+01 | 3 22E+01 | Normal/Lognormal | 3 22E+01 | 8 20E+03 | no | |
| Iron | 2 42E+04 | 2 71E+04 | Normal | 2 71E+04 | 6 10E+04 | no | |
| Lead[1] | 3 91E+01 | 4 74E+01 | Normal/Lognormal | 4 74E+01 | 7 50E+02 | no | |
| Manganese | 5 34E+02 | 5 98E+02 | Normal/Lognormal | 5 98E+02 | 2 90E+04 | no | |
| Mercury | 1 30E-01 | 1 47E-01 | Lognormal | 1 47E-01 | 6 10E+01 | no | |
| Nickel | 2 18E+01 | 2 64E+01 | Normal | 2 64E+01 | 4 10E+03 | no | |
| Thallium | 5.03E+00 | 5 05E+00 | Unknown | 4 20E+00 | 1.40E+01 | no | |
| Vanadium | 5 15E+01 | 6 09E+01 | Normal | 6 09E+01 | 1 40E+03 | no | |
| Zinc | 5 61E+02 | 6 93E+02 | Lognormal | 6 93E+02 | 6 10E+04 | no | |
| **PCBs/Pesticides** | | | | | | | |
| 4,4'-DDD | 1.20E-02 | 1 89E+01 | Lognormal | 2.30E-02 | 2 40E+01 | no | |
| 4,4'-DDE | 4 25E-03 | 1 82E-02 | Normal/Lognormal | 6.60E-03 | 1 70E+01 | no | |
| 4,4'-DDT | 8.66E-02 | 1.50E+01 | Lognormal | 1 70E-01 | 1 70E+01 | no | |
| alpha-Chlordane[2] | 1 47E-03 | 5 24E-03 | Normal/Lognormal | 9.10E-04 | 1 60E+01 | no | |
| delta-BHC[3] | 1 77E-03 | 6 08E-03 | Normal | 1.90E-04 | 9 10E-01 | no | |
| Dieldrin | 3.20E-03 | 6 68E-01 | Normal/Lognormal | 1 30E-04 | 3 60E-01 | no | |
| Endrin aldehyde[4] | 2 65E-03 | 3.71E-02 | Normal/Lognormal | 2.30E-04 | 6.10E+01 | no | |
| gamma-Chlordane[2] | 1.42E-03 | 4 96E-03 | Normal/Lognormal | 6.30E-04 | 1 60E+01 | no | |
| Heptachlor epoxide | 1 67E-03 | 2.35E-03 | Normal/Lognormal | 4 60E-04 | 6 30E-01 | no | |
| Methoxychlor | 1 57E-02 | 7 37E+00 | Normal/Lognormal | 1 00E-03 | 1 00E+03 | no | |
| **Semivolatiles** | | | | | | | |
| Benzo(a)anthracene | 6 96E-01 | 7 27E-01 | Lognormal | 4 30E-01 | 7 80E+00 | no | |
| Benzo(a)pyrene | 7.01E-01 | 7 33E-01 | Lognormal | 7 30E-01 | 7 80E-01 | no | |
| Benzo(b)fluoranthene | 6 54E-01 | 8 16E-01 | Lognormal | 8 16E-01 | 7 80E+00 | no | |
| Benzo(g,h,i)perylene | 7 20E-01 | 7 62E-01 | Lognormal | 2 60E-01 | NA | NA | yes |
| Benzo(k)fluoranthene | 7 32E-01 | 8.39E-01 | Lognormal | 1 10E-01 | 7 80E+01 | no | |
| bis(2-Ethylhexyl)phthalate | 7 92E-01 | 8.85E-01 | Lognormal | 3.90E-01 | 4 10E+02 | no | |
| Chrysene | 6 98E-01 | 7 62E-01 | Lognormal | 4 30E-01 | 7 80E+02 | no | |
| Di-n-butylphthalate | 7 15E-01 | 7 85E-01 | Lognormal | 3 70E-01 | 2 00E+04 | no | |
| Fluoranthene | 6 65E-01 | 9 05E-01 | Normal/Lognormal | 9.05E-01 | 8 20E+03 | no | |
| Indeno(1,2,3-c,d)pyrene | 7 19E-01 | 7 63E-01 | Lognormal | 2 40E-01 | 7 80E+00 | no | |
| Naphthalene | 7 45E-01 | 7 75E-01 | Lognormal | 4 00E-01 | 4 10E+03 | no | |
| Phenanthrene | 6 46E-01 | 6 79E-01 | Lognormal | 6 40E-01 | NA | NA | yes |
| Pyrene | 7.08E-01 | 1.17E+00 | Normal | 8 00E-01 | 6.10E+03 | no | |



AR316042
ENVIRONMENTAL STANDARDS

***Table 15***
***Statistical Summary and COPC Selection for Swimmer Exposed to River Sediments From White Clay Creek***
***Former Koppers Company, Inc., Newport, DE***

| Analyte | Total # of Samples | Hits | Hit Frequency % | Minimum Detected mg/kg | Mean mg/kg | Lognormal Mean mg/kg | Maximum Detected mg/kg | Standard Deviation mg/kg |
|---|---|---|---|---|---|---|---|---|
| **Volatiles** | | | | | | | | |
| 2-Butanone | 13 | 3 | 23 | 1 00E-02 | 1 07E-02 | 9 56E-03 | 2 60E-02 | 6 31E-03 |
| Acetone | 11 | 5 | 45 | 1 00E-02 | 3 59E-02 | 1 85E-02 | 1 50E-01 | 4 52E-02 |
| Carbon Disulfide | 13 | 1 | 8 | 5 00E-03 | 7 77E-03 | 7 63E-03 | 5 00E-03 | 1 52E-03 |
| Tetrachloroethene | 13 | 4 | 31 | 1 00E-03 | 7 88E-03 | 6 93E-03 | 1 30E-02 | 3 04E-03 |
| Toluene | 13 | 1 | 8 | 1 00E-02 | 8.15E-03 | 8 05E-03 | 1 00E-02 | 1 39E-03 |




ENVIRONMENTAL STANDARDS

*Table 15*
***Statistical Summary and COPC Selection for Swimmer Exposed to River Sediments From White Clay Creek***
***Former Koppers Company, Inc., Newport, DE***

| Analyte | 95% UCL mg/kg | Lognormal 95% UCL mg/kg | Distribution 99% Confidence | Exposure Point Concentration mg/kg | Industrial Soil RBC mg/kg | Is Maximum >RBC? | Is Detection Frequency >5%? |
|---|---|---|---|---|---|---|---|
| **Volatiles** | | | | | | | |
| 2-Butanone | 1 38E-02 | 1 38E-02 | Unknown | 1.38E-02 | 1 20E+05 | no | |
| Acetone | 6 06E-02 | 1 27E-01 | Lognormal | 1 27E-01 | 2 00E+04 | no | |
| Carbon Disulfide | 8 52E-03 | 8.66E-03 | Normal/Lognormal | 5.00E-03 | 2 00E+04 | no | |
| Tetrachloroethene | 9 38E-03 | 1 32E-02 | Normal | 1 30E-02 | 1 10E+02 | no | |
| Toluene | 8 84E-03 | 8 91E-03 | Normal/Lognormal | 8 91E-03 | 4 10E+04 | no | |

* Since the only sediment exposure route evaluated for the swimmer scenario was dermal contact, comparison of maximum concentrations to the industrial soil RBC were most appropriate

NA - Not available

[1] The screening level of 750 mg/kg is based on US EPA's adult blood lead uptake model under default exposure assumptions

[2] These compounds have no published RBC or RfD values They are sufficiently close in toxicity to Chlordane so that the Chlordane RBC is applicable to its congeners as a provisional benchmark.

[3] These compounds have no published RBC or RfD values They are sufficiently close in toxicity to alpha-BHC so that the alpha-BHC RBC is applicable to its congeners as a provisional benchmark.

[4] These compounds have no published RBC or RfD values They are sufficiently close in toxicity to Endrin so that the Endrin RBC is applicable to its congeners as a provisional benchmark.

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ENVIRONMENTAL STANDARDS

*Table 1*
*Statistic[illegible] [illegible]mmary* and COPC Selection for Angler Ingesting Locally Caught Fish*
*Former Koppers Company, Inc., Newport, DE*

| Analyte | Total # of Samples | Hits | Hit Frequency % | Minimum Detected mg/kg | Mean mg/kg | Lognormal Mean mg/kg | Maximum Detected mg/kg | Standard Deviation mg/kg | 95% UCL mg/kg | Lognormal 95% UCL mg/kg | Distribution 99% Confidence | Exposure Point Concentration mg/kg | Fish RBC mg/kg | Is Maximum >RBC? | Is Detection Frequency >5%? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dioxins** | | | | | | | | | | | | | | | |
| 2,3,7,8-TCDD Equiv | 3 | 3 | 100 | 8 02E-07 | 8 89E-07 | 8 86E-07 | 9 90E-07 | 9 46E-08 | 1 05E-06 | 1 10E-06 | Normal/Lognormal | 9 90E-07 | 2 10E-08 | yes | yes |
| **Inorganics** | | | | | | | | | | | | | | | |
| Aluminum | [illegible] | [illegible] | 100 | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | 2 59E+00 | 4 51E+00 | Normal/Lognormal | 2 23E+00 | 1 40E+02 | no | |
| Arsenic | 3 | 3 | 100 | 3 33E-01 | 5 40E-01 | 5 17E-01 | 6 59E-01 | 1 80E-01 | 8.43E-01 | 2 13E+00 | Normal/Lognormal | 6 59E-01 | 2 10E-03 | yes | yes |
| Barium | 3 | 3 | 100 | 9.41E-02 | 1.05E-01 | 1.04E-01 | 1.27E-01 | 1.86E-02 | 1.37E-01 | 1.53E-01 | Normal/Lognormal | 1.27E-01 | 9.50E+00 | no | |
| Chromium | 3 | 3 | 100 | 9 52E-02 | 1 13E-01 | 1 13E-01 | 1 26E-01 | 1 60E-02 | 1 40E-01 | 1 55E-01 | Normal/Lognormal | 1.26E-01 | 2 00E+02 | no | |
| Copper | 3 | 3 | 100 | 4 60E-01 | 4 98E-01 | 4 97E-01 | 5 18E-01 | 3 30E-02 | 5 54E-01 | 5.65E-01 | Normal/Lognormal | 5 18E-01 | 5 40E+00 | no | |
| Iron | 3 | 3 | 100 | 4 20E+00 | 4 93E+00 | 4 89E+00 | 5 80E+00 | 8 09E-01 | 6 30E+00 | 7 03E+00 | Normal/Lognormal | 5 80E+00 | 4 10E+01 | no | |
| Lead | 3 | 3 | 100 | 1 10E-01 | 1 19E-01 | 1 18E-01 | 1 27E-01 | 8.55E-03 | 1 33E-01 | 1 36E-01 | Normal/Lognormal | 1 27E-01 | NA | NA | yes |
| Mercury | 3 | 3 | 100 | 1 11E-01 | 1 69E-01 | 1 59E-01 | 2 54E-01 | 7 51E-02 | 2 95E-01 | 9 09E-01 | Normal/Lognormal | 2 54E-01 | 4 10E-02 | yes | yes |
| Nickel | 3 | 1 | 33 33 | 1 74E-01 | 9 95E-02 | 8 75E-02 | 1 74E-01 | 6 49E-02 | 2 09E-01 | 2 79E+00 | Normal/Lognormal | 1 74E-01 | 2 70E+00 | no | |
| Selenium | 3 | 3 | 100 | 3 69E-01 | 3 95E-01 | 3 95E-01 | 4 28E-01 | 3.02E-02 | 4 46E-01 | 4 56E-01 | Normal/Lognormal | 4 28E-01 | 6 80E-01 | no | |
| Zinc | 3 | 3 | 100 | 4.47E+00 | 4.64E+00 | 4.64E+00 | 4.85E+00 | 1.92E-01 | 4.96E+00 | 5.00E+00 | Normal/Lognormal | 4.85E+00 | 4.10E+01 | no | |
| **PCBs/Pesticides** | | | | | | | | | | | | | | | |
| Aroclor 1254 | 3 | 3 | 100 | 3 40E-01 | 3 77E-01 | 3 75E-01 | 4 20E-01 | 4 04E-02 | 4 45E-01 | 4 65E-01 | Normal/Lognormal | 4 20E-01 | 1 60E-03 | yes | yes |
| Aroclor 1260 | 3 | 3 | 100 | 1 40E-01 | 1 93E-01 | 1 89E-01 | 2 40E-01 | 5 03E-02 | 2.78E-01 | 4 15E-01 | Normal/Lognormal | 2 40E-01 | 1 60E-03 | yes | yes |
| 4,4'-DDD | 3 | 3 | 100 | 2.40E-02 | 3 23E-02 | 3 13E-02 | 4 40E-02 | 1 04E-02 | 4 99E-02 | 8 26E-02 | Normal/Lognormal | 4 40E-02 | 1 30E-02 | yes | yes |
| 4,4'-DDE | 3 | 3 | 100 | 6 90E-02 | 9 37E-02 | 9 03E-02 | 1 30E-01 | 3 21E-02 | 1 48E-01 | 2 63E-01 | Normal/Lognormal | 1 30E-01 | 9 30E-03 | yes | yes |
| **Volatiles** | | | | | | | | | | | | | | | |
| Tetrachloroethene | 3 | 2 | 66 67 | 9 00E-04 | 2 30E-03 | 1 65E-03 | 1 00E-03 | 2 34E-03 | 6.24E-03 | 1 32E+01 | Normal/Lognormal | 1 00E-03 | 6 10E-02 | no | |

*Statistics were calculated on a wet-weight basis from data derived from edible fish tissue samples collected in White Clay Creek

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ENVIRONMENTAL STANDARDS

**Table 2.** Exposure Pathway Analysis for Risk Scenarios Evaluated
[HHRA Table 17]

**Table 17**
***Exposure Pathway Analysis***
***Former Koppers Company, Inc., Newport, DE***

| Media | Potential Exposure Point | Potential Exposure Route | Potentially Exposed Population | Selected for Analysis | Data Set to be Used | Exposure Assumptions |
|---|---|---|---|---|---|---|
| Soil, Non-river Sediment | On-site | Dermal contact<br>Ingestion<br>Inhalation | Construction Worker | Yes | Soil and NAPL Data combined | Occupational |
| | On-site | Dermal contact w/ Ingestion | Industrial Worker | Yes | Soil and NAPL Data combined | Occupational |
| | On-site | Dermal contact w/ Ingestion | Adolescent Trespasser | Yes | Soil and Non-River Sediment separately | Recreational |
| | On-site | Dermal contact<br>Ingestion<br>Inhalation | Future On-site Residence | No - Not conducive to residential development | N/A | N/A |
| River Sediment | On-site | Dermal contact | Adolescent Swimmer | Yes | Christina River, White Clay Creek sediment | Recreational |
| Non-river Surface Water | On-site | Dermal contact | Adolescent Trespasser | Yes | Non-river, Hershey Run surface water | Recreational |
| River Surface Water | On-site | Dermal contact<br>Ingestion | Adolescent Swimmer | Yes | Christina River, White Clay Creek surface water | Recreational |
| Ground Water | On-site | Dermal contact<br>Ingestion<br>Inhalation | Industrial Worker | Yes | Columbia, Potomac aquifer ground water | Occupational |
| | Future Residential Drinking Water | Ingestion<br>Dermal contact<br>Inhalation | Future On-site Residence | No - Not conducive to residential development | N/A | N/A |





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*Table 17*
*Exposure Pathway Analysis*
*Former Koppers Company, Inc., Newport, DE*

| Media | Potential Exposure Point | Potential Exposure Route | Potentially Exposed Population | Selected for Analysis | Data Set to be Used | Exposure Assumptions |
|---|---|---|---|---|---|---|
| Air | | | | | | |
| | On-site | Inhalation | Construction Worker | Yes | Soil/NAPL Data | Occupational |
| | On-site | Inhalation | Industrial Worker | No - wet conditions preclude volatilization | N/A | N/A |
| | On-site | Inhalation | Trespasser | No - wet conditions preclude volatilization | N/A | N/A |
| | On-site | Inhalation | Resident | No - Not conducive to residential development | N/A | N/A |
| Fish Tissue | | | | | | |
| | On-site | Ingestion | Local Fisherperson | Yes | Edible fish filet data | Recreational |

N/A Not Applicable



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**Table 3.** RME Exposure Parameters Used in the Assessment of Potential Intakes
[HHRA Table 19]

*Table 19*

***Reasonable Maximum Exposure Parameters Used in the Assessment of Potential Intakes***

***Former Koppers Company, Inc., Newport, DE***

| Receptor/Pathway/Route | Contact Rate | Exposure Frequency and Duration | Absorption | Body Weight | Averaging Time |
|---|---|---|---|---|---|
| **Future Construction Worker** | | | | | |
| Soil/NAPL | | | | | |
| Dermal | Total surface area.<br>20,000 $cm^2$ (5)<br>Fraction surface area available<br>9 1% (2)<br>Exposed surface area:<br>(face, hands)<br>1820 $cm^2$ | 120 days/year (1)<br>1 year (1)<br>Adherence 0 11 $mg/cm^2$ (4) | 0 01 for inorganics (7)<br>0.10 for semivolatiles (7)<br>0 10 for pesticides/PCBs (7) | 70 kg (3) | For noncarcinogenic effects<br>Exposure is averaged over 1-year period,<br>exposure is of subchronic duration<br>For carcinogenic effects<br>Exposure is averaged over a 70-year lifetime |
| Oral | Ingestion Rate<br>50 mg/day (6) | 120 days/year (1)<br>1 year (1) | | 70 kg (3) | For noncarcinogenic effects<br>Exposure is averaged over 1-year period,<br>exposure is of subchronic duration<br>For carcinogenic effects<br>Exposure is averaged over a 70-year lifetime |
| Inhalation | Inhalation Rate:<br>20 $m^3$/day (6) | 120 days/year (1)<br>1 year (1) | Retention Factors<br>Volatiles - 1 0 or 0 5 (11)<br>Dusts - 0.75 (9)<br>Fraction of $PM_{15}$<br>respirable - 0 84 | 70 kg (3) | For noncarcinogenic effects<br>Exposure is averaged over 1-year period,<br>exposure is of subchronic duration<br>For carcinogenic effects<br>Exposure is averaged over a 70-year lifetime |
| **Future Industrial Worker** | | | | | |
| Soil/NAPL | | | | | |
| Dermal | Total surface area<br>20,000 $cm^2$ (5)<br>Fraction surface area available<br>9.1% (2)<br>Exposed surface area<br>(face, hands)<br>1820 $cm^2$ | 134 days/year (8)<br>25 years (6)<br>Adherence 0 11 $mg/cm^2$ (4) | 0 01 for inorganics (7)<br>0 10 for semivolatiles (7)<br>0 10 for pesticides/PCBs (7) | 70 kg (3) | For noncarcinogenic effects<br>Exposure is averaged over 25-year period,<br>exposure is of chronic duration<br>For carcinogenic effects<br>Exposure is averaged over a 70-year lifetime |





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*R...onable Maximum Exposure Parameters Used in the Assessment of Pote...al Intakes*
*Former Koppers Company, Inc., Newport, DE*

| Receptor/Pathway/Route | Contact Rate | Exposure Frequency and Duration | Absorption | Body Weight | Averaging Time |
|---|---|---|---|---|---|
| Oral | Ingestion Rate<br>50 mg/day (6) | 134 days/year (8)<br>25 years (6) | | 70 kg (3) | For noncarcinogenic effects<br>Exposure is averaged over 25-year period, exposure is of chronic duration<br>For carcinogenic effects<br>Exposure is averaged over a 70-year lifetime |
| Ground water | | | | | |
| Dermal (while showering) | Total surface area<br>20,000 $cm^2$ (5)<br>Fraction surface area available<br>100% (1)<br>Exposed surface area<br>20,000 $cm^2$ | 15 min/shower (5)<br>250 showers/year (10)<br>25 years (6) | chemical specific (5) | 70 kg (3) | For noncarcinogenic effects:<br>Exposure is averaged over 25-year period, exposure is of chronic duration<br>For carcinogenic effects.<br>Exposure is averaged over a 70-year lifetime |
| Oral | Ingestion Rate<br>1 L/day (6) | 250 days/year (10)<br>25 years (6) | | 70 kg (3) | For noncarcinogenic effects.<br>Exposure is averaged over 25-year period, exposure is of chronic duration<br>For carcinogenic effects<br>Exposure is averaged over a 70-year lifetime |
| Inhalation (while showering) | Air Exchange Rate:<br>0.5 /hr (10)<br>Ventilation Rate.<br>15 L/min (10)<br>Shower Room Air Volume:<br>6 $m^3$ (10) | Duration in Shower Room<br>5 min (2)<br>15 min/shower (4)<br>250 showers/year (10)<br>25 years (6) | chemical specific (5) | 70 kg (3) | For noncarcinogenic effects<br>Exposure is averaged over 25-year period, exposure is of chronic duration<br>For carcinogenic effects:<br>Exposure is averaged over a 70-year lifetime |
| Adolescent Trespasser (Ages 12-18) | | | | | |
| Soil/SNAPL | | | | | |
| Dermal | Total Skin Surface Area<br>15758 $cm^2$ (4)<br>Fraction surface area available<br>27.8% (2)<br>Exposed surface area<br>(Face, arms, hands, legs)<br>4381 $cm^2$ | 24 events/year (1)<br>6 years (1)<br>Adherence. 0.025mg/$cm^2$ (4) | 0.01 for inorganics (7)<br>0.10 for semivolatiles (7)<br>0.10 for pesticides/PCBs (7) | 56 kg (4) | For noncarcinogenic effects<br>Exposure is averaged over 6-year period; exposure is of subchronic duration<br>For carcinogenic effects<br>Exposure is averaged over a 70-year lifetime |

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*Table 19*

***Reasonable Maximum Exposure Parameters Used in the Assessment of Potential Intakes***

***Former Koppers Company, Inc., Newport, DE***

| Receptor/Pathway/Route | Contact Rate | Exposure Frequency and Duration | Absorption | Body Weight | Averaging Time |
|---|---|---|---|---|---|
| Oral | Ingestion Rate: 100 mg/event (6) | 1 24 events/year (1)<br>6 years (1) | | 56 kg (4) | For noncarcinogenic effects<br>Exposure is averaged over 6-year period, exposure is of subchronic duration<br>For carcinogenic effects<br>Exposure is averaged over a 70-year lifetime |
| Sediment | | | | | |
| Dermal | Total Skin Surface Area 15758 $cm^2$ (4)<br>Fraction surface area available 7% (2)<br>Exposed surface area. (Face, arms, hands, legs) 1103 $cm^2$ | 2 10 events/year (1)<br>6 years (1)<br>Adherence: 0.025mg/$cm^2$ (4) | 0.01 for inorganics (7)<br>0.10 for semivolatiles (7)<br>0.10 for pesticides/PCBs (7) | 56 kg (4) | For noncarcinogenic effects<br>Exposure is averaged over 6-year period, exposure is of subchronic duration<br>For carcinogenic effects<br>Exposure is averaged over a 70-year lifetime |
| Oral | Ingestion Rate: 100 mg/event (6) | 3 10 events/year (1)<br>6 years (1) | | 56 kg (4) | For noncarcinogenic effects<br>Exposure is averaged over 6-year period; exposure is of subchronic duration<br>For carcinogenic effects<br>Exposure is averaged over a 70-year lifetime |
| Non-river surface water | | | | | |
| Dermal<br>what about ingestion?) | Exposed surface area (Lower legs) 207 $cm^2$ (5) | 6 1.0 hr/event (5)<br>24 events/year (1)<br>6 years (1) | chemical specific (5) | 56 kg (4) | For noncarcinogenic effects.<br>Exposure is averaged over 6-year period, exposure is of subchronic duration<br>For carcinogenic effects<br>Exposure is averaged over a 70-year lifetime |
| Adolescent Swimmer (Ages 12-18) | | | | | |
| River surface water* | | | | | |
| Dermal | Total Skin Surface Area 15758 $cm^2$ (4)<br>Fraction surface area available 100% (1) | 5 1.0 hr/event (5)<br>24 events/year (1)<br>6 years (1) | 0.01 for inorganics (7)<br>0.10 for semivolatiles (7)<br>0.10 for pesticides/PCBs (7) | 56 kg (4) | For noncarcinogenic effects<br>Exposure is averaged over 6-year period, exposure is of subchronic duration<br>For carcinogenic effects<br>Exposure is averaged over a 70-year lifetime |

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ENVIRONMENTAL STANDARDS

19

**Reasonable Maximum Exposure Parameters Used in the Assessment of Potential Intakes**
**Former Koppers Company, Inc., Newport, DE**

| Receptor/Pathway/Route | Contact Rate | Exposure Frequency and Duration | Absorption | Body Weight | Averaging Time |
|---|---|---|---|---|---|
| Oral | Ingestion Rate<br>50 ml/hr (3) | 1 0 hr/event (5)<br>24 events/year (1)<br>6 years (1) | | 56 kg (4) | For noncarcinogenic effects<br>Exposure is averaged over 6-year period; exposure is of subchronic duration<br>For carcinogenic effects<br>Exposure is averaged over a 70-year lifetime |
| River sediment<br>Dermal | Total Skin Surface Area<br>15758 $cm^2$ (4)<br>Fraction surface area available<br>7% (2)<br>Exposed surface area (feet)<br>1103 $cm^2$ | 24 events/year (1)<br>6 years (1)<br>Adherence 0 63 $mg/cm^2$ (4) | 0 01 for inorganics (7)<br>0.10 for semivolatiles (7)<br>0 10 for pesticides/PCBs (7) | 56 kg (4) | For noncarcinogenic effects<br>Exposure is averaged over 6-year period, exposure is of subchronic duration<br>For carcinogenic effects<br>Exposure is averaged over a 70-year lifetime |
| Adult Fisherperson<br>Locally caught fish<br>Oral | Ingestion Rate:<br>25 g/day (2) | 365 events/year (3)<br>25 years (1) | | 70 kg (3) | For noncarcinogenic effects<br>Exposure is averaged over 25-year period, exposure is of chronic duration<br>For carcinogenic effects.<br>Exposure is averaged over a 70-year lifetime |

* These exposure routes could not be evaluated as lead was the only COPC selected and lead does not have published toxicity values.

(1) Best Professional Judgement
(2) US EPA 1996, Exposures Factors Handbook
(3) US EPA, 1989, RAGS Part A
(4) Calculated based on data in US EPA 1996, Exposure Factors Handbook
(5) US EPA, 1992, Dermal Exposure Assessment
(6 )US EPA 1991, Human Health Evaluation Manual, Supplemental Guidance, Standard Default Exposure Factors
(7) US EPA 1995, Region III
(8) Calculated based on Michigan Dept. of Natural Resources 1995, Operational Memorandum #14, Rev 2
(9) International Commission on Radiological Protection
(10) Foster and Chrostowski, "Inhalation Exposures to Volatile Organic Contaminants in the Shower"
(11) Depending on whether toxicity benchmark (RfD or CSF) is based on administered or absorbed dose

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**Table 4. Summary of Toxicity Indices**
**[HHRA Table 21]**

*Tabl*
*Summ..y of Toxicity Indices*
*Former Koppers Company, Inc, Newport, DE*

| Chemical | Oral Chronic RfD mg/kg-day | Soure | Inhalation Chronic RfD mg/kg-day | Soure | GI Tract Absorption Factor | Dermal Chronic RfD[1] mg/kg-day | Oral Subchronic RfD mg/kg-day | Soure | Inhalation Subchronic RfD mg/kg-day | Source | Dermal Subchronic RfD[1] mg/kg-day | Oral CSF 1/(mg/kg-day) | Source | Inhalation CSF 1/(mg/kg-day) | Source | Dermal CSF[1] 1/(mg/kg-day) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dioxins** | | | | | | | | | | | | | | | | |
| 2,3,7,8-TCDD | NA | | NA | | 0 5 | NA | NA | | NA | | NA | 1 50E+05 | H | 1 50E+05 | H | 3 00E+05 |
| **Inorganics** | | | | | | | | | | | | | | | | |
| Antimony | 4 00E-04 | IRIS | NA | | 0.01 | 4 00E-06 | 4.00E-04 | H | NA | | 4 00E-06 | NA | | NA | | NA |
| Arsenic | 3 00E-04 | IRIS | NA | | 0 95 | 2.85E-04 | 3.00E-04 | H | NA | | 2 85E-04 | 1 50E+00 | IRIS | 1 51E+01 | IRIS | 1 58E+00 |
| Beryllium | 2 00E-03 | IRIS | 5.70E-06 | IRIS | 0 1 | 2 00E-04 | 5 00E-03 | H | NA | | 5 00E-04 | 4 30E+00 | IRIS | 8 40E+00 | IRIS | 4 30E+01 |
| Cadmium-Water | 5.00E-04 | IRIS | 5 71E-05 | W | 0 6 | 3.00E-04 | NA | | NA | | NA | NA | | 6.30E+00 | IRIS | NA |
| Copper | 4 00E-02 | H | -NA | | 0 6 | 2 40E-02 | 3 71E-02 | H | NA | | 2 23E-02 | NA | | NA | | NA |
| Iron | 3 00E-01 | E | NA | | 0 5 | 1 50E-01 | NA | | NA | | NA | NA | | NA | | NA |
| Lead | NA | | NA | | NA | NA | NA | | NA | | NA | NA | | NA | | NA |
| Manganese-water | 1 40E-01 | IRIS | 1.43E-05 | IRIS | NA | NA | NA | | NA | | NA | NA | | NA | | NA |
| Manganese-soils | 2 00E-02 | IRIS | 1 43E-05 | IRIS | 0 05 | 1.00E-03 | 1 40E-01 | H | NA | | 7 00E-03 | NA | | NA | | NA |
| Mercury | NA | | 8 60E-05 | IRIS | 0 07 | NA | 3.00E-04 | H | 8 57E-05 | HE | 2 10E-05 | NA | | NA | | NA |
| Thallium | 7.00E-05 | O | NA | | 0 8 | 5 60E-05 | NA | | NA | | NA | NA | | NA | | NA |
| **PCBs/Pesticides** | | | | | | | | | | | | | | | | |
| alpha-Chlordane | 5.00E-04 | IRIS | 2 00E-04 | IRIS | 0 3 | 1 50E-04 | 6 00E-05 | H | NA | | 1 80E-05 | 3 50E-01 | IRIS | 3 50E-01 | IRIS | 1 17E+00 |
| Aroclor 1254 | 2 00E-05 | IRIS | NA | | 0 9 | 1 80E-05 | 5 00E-05 | H | NA | | 4.50E-05 | 2 00E+00 | IRIS | 2 00E+00 | IRIS | 2 22E+00 |
| Aroclor 1260 | 2 00E-05 | IRIS | NA | | 0 9 | 1 80E-05 | NA | H | NA | | NA | 2.00E+00 | IRIS | 2 00E+00 | IRIS | 2 22E+00 |
| 4,4'-DDD | NA | | NA | | 0.7 | NA | NA | | NA | | NA | 2.40E-01 | IRIS | NA | | 3.43E-01 |
| 4,4'-DDE | NA | | NA | | 0 7 | NA | NA | | NA | | NA | 3 40E-01 | IRIS | NA | | 4 86E-01 |
| 4,4'-DDT | 5 00E-04 | IRIS | NA | | 0 7 | 3 50E-04 | 5 00E-04 | H | NA | | 3.50E-04 | 3 40E-01 | IRIS | 3 40E-01 | IRIS | 4 86E-01 |
| Dieldrin | 5.00E-05 | IRIS | NA | | 0 3 | 1 50E-05 | 5 00E-05 | H | NA | | 1.50E-05 | 1 60E+01 | IRIS | 1 60E+01 | IRIS | 5 33E+01 |
| Heptachlor | 5.00E-04 | IRIS | NA | | 0 3 | 1 50E-04 | 5 00E-04 | H | NA | | 1 50E-04 | 4 50E+00 | IRIS | 4 50E+00 | IRIS | 1 50E+01 |
| Heptachlor epoxide | 1 30E-05 | IRIS | NA | | 0 3 | 3 90E-06 | 1 30E-05 | H | NA | | 3 90E-06 | 9 10E+00 | IRIS | 9 10E+00 | IRIS | 3 03E+01 |
| **Semivolatiles** | | | | | | | | | | | | | | | | |
| 2,4-Dimethylphenol | 2.00E-02 | IRIS | NA | | 0 7 | 1 40E-02 | 2 00E-01 | H | NA | | 1 40E-01 | NA | | NA | | NA |
| 2-Methylnaphthalene | 2.00E-02 | O | NA | | 0 7 | 1 40E-02 | NA | | NA | | NA | NA | | NA | | NA |
| 2-Methylphenol | 5 00E-02 | IRIS | NA | | 0 7 | 3.50E-02 | 5 00E-01 | H | NA | | 3.50E-01 | NA | | NA | | NA |
| 4-Methylphenol | 5 00E-03 | H | NA | | 0 7 | 3 50E-03 | 5 00E-03 | H | NA | | 3 50E-03 | NA | | NA | | NA |
| Acenaphthene | 6.00E-02 | IRIS | NA | | 0 7 | 4 20E-02 | 6 00E-01 | H | NA | | 4 20E-01 | NA | | NA | | NA |

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*Table 21*
***Summary of Toxicity Indices***
***Former Koppers Company, Inc, Newport, DE***

| Chemical | Oral Chronic RfD mg/kg-day | Soure | Inhalation Chronic RfD mg/kg-day | Soure | GI Tract Absorption Factor | Dermal Chronic RfD[1] mg/kg-day | Oral Subchronic RfD mg/kg-day | Soure | Inhalation Subchronic RfD mg/kg-day | Source | Dermal Subchronic RfD[1] mg/kg-day | Oral CSF 1/(mg/kg-day) | Source | Inhalation CSF 1/(mg/kg-day) | Source | Dermal CSF[1] 1/(mg/kg-day) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acenaphthylene | NA | | NA | | NA | NA | NA | | NA | | NA | NA | | NA | | NA |
| Anthracene | 3 00E-01 | IRIS | NA | | 0 7 | 2 10E-01 | 3 00E+00 | H | NA | | 2 10E+00 | NA | | NA | | NA |
| Benzo(a)anthracene | NA | | NA | | NA | NA | NA | | NA | | NA | 7 30E-01 | E | NA | | NA |
| Benzo(a)pyrene | NA | | NA | | NA | NA | NA | | NA | | NA | 7 30E+00 | IRIS | 3 10E+00 | E | NA |
| Benzo(b)fluoranthene | NA | | NA | | NA | NA | NA | | NA | | NA | 7 30E-01 | E | NA | | NA |
| Benzo(g,h,i)perylene | NA | | NA | | NA | NA | NA | | NA | | NA | NA | | NA | | NA |
| Benzo(k)fluoranthene | NA | | NA | | NA | NA | NA | | NA | | NA | 7 30E-02 | E | NA | | NA |
| Bis(2-ethylhexyl) phthalate | 2.00E-02 | IRIS | NA | | 0 7 | 1 40E-02 | NA | | NA | | NA | 1 40E-02 | IRIS | 1 40E-02 | E | 2 00E-02 |
| Carbazole | NA | | NA | | NA | NA | NA | | NA | | NA | 2 00E-02 | H | NA | | NA |
| Chrysene | NA | | NA | | NA | NA | NA | | NA | | NA | 7 30E-03 | E | NA | | NA |
| Dibenz(a,h)anthracene | NA | | NA | | NA | NA | NA | | NA | | NA | 7.30E+00 | E | NA | | NA |
| Dibenzofuran | 4.00E-03 | E | NA | | 0.7 | 2 80E-03 | NA | | NA | | NA | NA | | NA | | NA |
| Fluoranthene | 4 00E-02 | IRIS | NA | | 0 7 | 2.80E-02 | 4.00E-01 | H | NA | | 2 80E-01 | NA | | NA | | NA |
| Fluorene | 4.00E-02 | IRIS | NA | | 0 7 | 2.80E-02 | 4 00E-01 | H | NA | | 2 80E-01 | NA | | NA | | NA |
| Indeno(1,2,3-cd)pyrene | NA | | NA | | NA | NA | NA | | NA | | NA | 7 30E-01 | E | NA | | NA |
| Naphthalene | 2 00E-02 | IRIS | 9 00E-04 | IRIS | 0 7 | 1.40E-02 | NA | | NA | | NA | NA | | NA | | NA |
| Pentachlorophenol | 3 00E-02 | IRIS | NA | | 0 7 | 2.10E-02 | 3 00E-02 | H | NA | | 2.10E-02 | 1 20E-01 | IRIS | NA | | 1 71E-01 |
| Phenanthrene | NA | | NA | | NA | NA | NA | | NA | | NA | NA | | NA | | NA |
| Phenol | 6 00E-01 | IRIS | NA | | 0 7 | 4 20E-01 | 6.00E-01 | H | NA | | 4 20E-01 | NA | | NA | | NA |
| Pyrene | 3.00E-02 | IRIS | NA | | 0 7 | 2 10E-02 | 3 00E-01 | H | NA | | 2 10E-01 | NA | | NA | | NA |
| Volatiles | | | | | | | | | | | | | | | | |
| Benzene | 3 00E-03 | E | 1 70E-03 | E | 0.95 | 2.85E-03 | NA | | NA | | NA | 2 90E-02 | IRIS | 2.90E-02 | IRIS | 3 05E-02 |
| Ethylbenzene | 1 00E-01 | IRIS | 2 90E-01 | IRIS | 0.95 | 9.50E-02 | NA | | NA | | NA | NA | | NA | | NA |
| Styrene | 2 00E-01 | IRIS | 2.86E-01 | IRIS | 0.95 | 1 90E-01 | 8.57E-01 | HE | 8 57E-01 | HE | NA | NA | | NA | | NA |
| Toluene | 2 00E-01 | IRIS | 1 14E-01 | IRIS | 0 95 | 1.90E-01 | 2.00E+00 | H | NA | | 1.90E+00 | NA | | NA | | NA |
| Xylenes (total) | 2 00E+00 | IRIS | NA | | 0 87 | 1 74E+00 | NA | | NA | | NA | NA | | NA | | NA |

(1) - Published oral toxictiy values were adjusted for gastrointestinal absorption to convert to dermal toxicity values
H - values are published in HEAST, 1997
HE - values are published in HEAST, 1997 as RfC values and are converted by ESI to RfD values
H2 - values are published in Table 2 - *Alternate Methods in HEAST*, 1997
IRIS - values are available in IRIS, 1999
NA - published value not available/not applicable
Reg III - Region III Risk Based Concentration Tables - 10/98

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**Table 5. Summary of Hazard and Estimated Potential Risk Calculations for the Risk Scenarios Evaluated**
**[HHRA Tables 23 - 26]**

***Table 23***
***Summary of Hazard and Estimated Potential Risk Calculations for the Construction Worker***
***Former Koppers Company, Inc., Newport, DE***

| Source/Pathway | Potentially Exposed Population | Total Hazard Index | Total Estimated Potential Cancer Risk | Table Referenced | with Dioxin Risk Removed |
|---|---|---|---|---|---|
| **Central Tendency** | | | | | |
| Dermal Exposure to Soil | Construction Workers | 0.00003 | 9E-08 | 27 | |
| Ingestion of Soil | Construction Workers | 0 0003 | 8E-08 | 28 | |
| Inhalation of Ambient Air and Dust | Construction Workers | NA | 3E-08 | 29 | |
| | Total | 0 0003 | 2E-07 | | |
| **Reasonable Maximum** | | | | | |
| *Dermal Exposure to Soil* | Construction Workers | *0 0001* | 4E-07 | 30 | 8E-10 |
| Ingestion of Soil | Construction Workers | 0 003 | 8E-07 | 31 | 3E-07 |
| Inhalation of Ambient Air and Dust | Construction Workers | NA | 8E-08 | 32 | 4E-08 |
| | Total | 0.003 | 1E-06 | | 3.41E-07 |
| **Central Tendency w/NAPL** | | | | | |
| Dermal Exposure to Soil | Construction Workers | 0 00003 | 9E-08 | 33 | |
| Ingestion of Soil | Construction Workers | 0.0003 | 8E-08 | 34 | |
| Inhalation of Ambient Air and Dust | Construction Workers | NA | 3E-08 | 35 | |
| | Total | 0.0003 | 2E-07 | | |
| **Reasonable Maximum w/NAPL** | | | | | |
| Dermal Exposure to Soil | Construction Workers | 0.0001 | 4E-07 | 36 | 8E-10 |
| Ingestion of Soil | Construction Workers | 0.003 | 2E-06 | 37 | 1E-06 |
| Inhalation of Ambient Air and Dust | Construction Workers | NA | 1E-07 | 38 | 7E-08 |
| | Total: | 0 003 | 2E-06 | | 1.07E-06 |



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***Table 24***
***Summary of Hazard and Estimated Potential Risk Calculations for the Industrial Worker***
***Former Koppers Company, Inc., Newport, DE***

| Source/Pathway | Potentially Exposed Population | Total Hazard Index | Total Estimated Potential Cancer Risk | Table Referenced | With Dioxin Risk Removed |
|---|---|---|---|---|---|
| **Central Tendency** | | | | | |
| Dermal Exposure to Soil | Industrial Workers | 0 00009 | 4E-06 | 39 | |
| Ingestion of Soil | Industrial Workers | 0 0002 | 1E-06 | 40 | |
| | Total: | 0 0003 | 5E-06 | | |
| * **Reasonable Maximum** | | | | | |
| Dermal Exposure to Soil | Industrial Workers | 0.0019 | 6E-05 | 41 | 5E-08 |
| Ingestion of Soil | Industrial Workers | 0.040 | 2E-04 | 42 | 2E-04 |
| | Total: | 0 04 | 3E-04 | | 2E-04 |
| **Central Tendency w/NAPL** | | | | | |
| Dermal Exposure to Soil | Industrial Workers | 0 00008 | 4E-06 | 43 | |
| Ingestion of Soil | Industrial Workers | 0 0002 | 1E-06 | 44 | |
| | Total: | 0 0003 | 5E-06 | | |
| * **Reasonable Maximum w/NAPL** | | | | | |
| Dermal Exposure to Soil | Industrial Workers | 0.003 | 6E-05 | 45 | 5E-05 |
| Ingestion of Soil | Industrial Workers | 0 05 | 3E-04 | 46 | 2E-04 |
| | Total: | 0 05 | 3E-04 | | 2.5E-04 |
| **Columbia Aquifer - Central Tendency** | | | | | |
| Dermal Exposure to Ground Water | Industrial Workers | 0.61 | 8E-06 | 47 | |
| Ingestion of Ground Water | Industrial Workers | 0 25 | 5E-06 | 48 | |
| Inhalation of VOC Vapors | Industrial Workers | NA | 2E-10 | 49 | |
| | Total: | 0 86 | 1E-05 | | |
| * **Columbia Aquifer - Reasonable Maximum** | | | | | |
| Dermal Exposure to Ground Water | Industrial Workers | 0 73 | 4E-05 | 50 | SAME |
| Ingestion of Ground Water | Industrial Workers | 0 52 | 2E-05 | 51 | " |
| Inhalation of VOC Vapors | Industrial Workers | NA | 1E-09 | 52 | " |
| | Total: | 1 2 | 6E-05 | | " |

(no dioxin already)

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*Table 24*
***Summary of Hazard and Estimated Potential Risk Calculations for the Industrial Worker***
***Former Koppers Company, Inc., Newport, DE***

| Source/Pathway | Potentially Exposed Population | Total Hazard Index | Total Estimated Potential Cancer Risk | Table Referenced | with Dioxin Risk Removed |
|---|---|---|---|---|---|
| **Columbia Aquifer - Central Tendency with MW-2 and MW-8** | | | | | |
| Dermal Exposure to Ground Water | Industrial Workers | 44 9 | 1E+00 | 53 | |
| Ingestion of Ground Water | Industrial Workers | 104.5 | 1E-01 | 54 | |
| Inhalation of VOC Vapors | Industrial Workers | 0 0000009 | 1E-06 | 55 | |
| | Total | 149 35 | 1E+00 | | |
| **Columbia Aquifer - Reasonable Maximum with MW-2 and MW-8** (NAPL) | | | | | |
| Dermal Exposure to Ground Water | Industrial Workers | 115 | 1E+00 | 56 | 1E-03 |
| Ingestion of Ground Water | Industrial Workers | 170 | 5E-01 | 57 | 4E-03 |
| Inhalation of VOC Vapors | Industrial Workers | 0 0033 | 7E-06 | 58 | 3E-08 |
| | Total | 284.86 | 1E+00 | | 5E-03 |
| **Potomac Aquifer - Central Tendency** | | | | | |
| Dermal Exposure to Ground Water | Industrial Workers | 0 07 | 4E-07 | 59 | |
| Ingestion of Ground Water | Industrial Workers | 0.06 | 4E-08 | 60 | |
| Inhalation of VOC Vapors | Industrial Workers | NA | 4E-12 | 61 | |
| | Total | 0 13 | 5E-07 | | |
| **Potomac Aquifer - Reasonable Maximum** | | | | | |
| Dermal Exposure to Ground Water | Industrial Workers | 0 08 | 2E-06 | 62 | SAME |
| Ingestion of Ground Water | Industrial Workers | 0 06 | 2E-07 | 63 | " |
| Inhalation of VOC Vapors | Industrial Workers | NA | 3E-11 | 64 | " |
| | Total | 0 14 | 2E-06 | | " |

(no dioxin already)

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***Table 25***
***Summary of Hazard and Estimated Potential Risk Calculations for the Adolescent Trespasser***
***Former Koppers Company, Inc., Newport, DE***

| Source/Pathway | Potentially Exposed Population | Total Hazard Index | Total Estimated Potential Cancer Risk | Table Referenced | With Dioxin Risk Removed |
|---|---|---|---|---|---|
| **Central Tendency** | | | | | |
| Dermal Exposure to Soil | Adolescent Trespassers | 0.00002 | 6E-07 | 65 | |
| Ingestion of Soil | Adolescent Trespassers | 0 00005 | 5E-07 | 66 | |
| | Total: | 0 0001 | 1E-06 | | |
| **Reasonable Maximum** | | | | | |
| Dermal Exposure to Soil | Adolescent Trespassers | 0 00008 | 2E-06 | 67 | 1E-08 |
| Ingestion of Soil | Adolescent Trespassers | 0.004 | 5E-05 | 68 | 4E-05 |
| | Total: | 0.004 | 5E-05 | | 4E-05 |
| **Central Tendency w/NAPL** | | | | | |
| Dermal Exposure to Soil | Adolescent Trespassers | 0.00002 | 6E-07 | 69 | |
| Ingestion of Soil | Adolescent Trespassers | 0 00005 | 4E-07 | 70 | |
| | Total: | 0 00007 | 1E-06 | | |
| **Reasonable Maximum w/NAPL** | | | | | |
| Dermal Exposure to Soil | Adolescent Trespassers | 0.00005 | 2E-06 | 71 | 8E-09 |
| Ingestion of Soil | Adolescent Trespassers | 0 004 | 4E-05 | 72 | 3E-05 |
| | Total: | 0 004 | 4E-05 | | 3E-05 |
| **Central Tendency** | | | | | |
| Dermal Exposure to Non-River Surface Water | Adolescent Trespassers | 0.0000002 | 2E-05 | 73 | |
| | Total: | 0.0000002 | 2E-05 | | |
| **Reasonable Maximum** | | | | | |
| Dermal Exposure to Non-River Surface Water | Adolescent Trespassers | 0 0000008 | 6E-05 | 74 mislabeled as "CTE" | |
| | Total: | 0 0000008 | 6E-05 | | 3.26E-11 |
| **Central Tendency** | | | | | |
| Dermal Exposure to Non-River Sediment | Adolescent Trespassers | 0.000007 | 8E-09 | 75 | |
| Ingestion of Non-River Sediment | Adolescent Trespassers | 0.00004 | 5E-08 | 76 | |
| | Total: | 0.00005 | 6E-08 | | |
| **Reasonable Maximum** | | | | | |
| Dermal Exposure to Non-River Sediment | Adolescent Trespassers | 0 00002 | 3E-08 | 77 | 2E-10 |
| Ingestion of Non-River Sediment | Adolescent Trespassers | 0 003 | 5E-06 | 78 | 5E-06 |
| | Total: | 0 003 | 5E-06 | | 5E-06 (insignificant change) |

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*Table 26*

***Summary of Hazard and Estimated Potential Risk Calculations for the Adolescent Swimmer and Angler***

***Former Koppers Company, Inc., Newport, DE***

| Source/Pathway | Potentially Exposed Population | Total Hazard Index | Total Estimated Potential Cancer Risk | Table Referenced |
|---|---|---|---|---|

With Dioxin Risk Removed

**Central Tendency**

| | | | | |
|---|---|---|---|---|
| Dermal Exposure to Christina River Sediment | Adolescent Swimmers | 0.001 | 2E-08 | 79 |
| | Total | 0.001 | 2E-08 | |

**Reasonable Maximum**

| | | | | |
|---|---|---|---|---|
| Dermal Exposure to Christina River Sediment | Adolescent Swimmers | 0.006 | 9E-08 | 80 |
| | Total. | 0.006 | 9E-08 | |

SAME (No Dioxin already)

**Central Tendency**

| | | | | |
|---|---|---|---|---|
| Dermal Exposure to White Clay Creek Sediment | Adolescent Swimmers | 0.00004 | 2E-09 | 81 |
| | Total | 0.00004 | 2E-09 | |

**Reasonable Maximum**

| | | | | |
|---|---|---|---|---|
| Dermal Exposure to White Clay Creek Sediment | Adolescent Swimmers | 0.0002 | 8E-09 | 82 |
| | Total. | 0.0002 | 8E-09 | |

SAME (No Dioxin already)

**Central Tendency**

| | | | | |
|---|---|---|---|---|
| Ingestion of Locally Caught Fish | Anglers | 4 | 3E-05 | 83 |
| | Total | 4 | 3E-05 | |

**Reasonable Maximum**

| | | | | |
|---|---|---|---|---|
| Ingestion of Locally Caught Fish | Anglers | 13 | 3E-04 | 84 |
| | Total | 13 | 3E-04 | |

3E-04 (insignificant change)

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ENVIRONMENTAL STANDARDS

**Table 6. RME Risk Calculations for the Exposure Pathways and Risk Scenarios Evaluated [HHRA Tables 30 – 84, non-inclusive]**

***Table 30***
***Reasonable Maximum Dermal Exposure to Soil by a Construction Worker***
***Former Koppers Company, Inc, Newport, DE***

$$\text{Intake (mg/kg-day)} = \frac{Cs*SA*FX*AF*ABS*EF*ED*CF}{BW*AT}$$

| | | | |
|---|---|---|---|
| Cs - Concentration in soil = | mg/kg | chemical specific | |
| SA - Adult skin surface area available for exposure = | $cm^2$/day | 1820 | calculated |
| $SA_t$ - Total Adult Surface area = | $cm^2$ | 20000 | USEPA 1989, EFH |
| $F_s$ - Fraction of skin surface area available for exposure = | | 9 1% | reasonable maximum |
| FX - Fraction of exposed skin covered with soil = | | 100% | reasonable maximum |
| AF -Soil Adherence Factor = | mg/$cm^2$ | 0 11 | USEPA 1995, EFH |
| $ABS_d$ - Absorption for dioxins = | | 0.1 | US EPA 1995, Region III |
| $ABS_i$ - Absorption for inorganics = | | 0 01 | USEPA 1995, Region III |
| EF - Exposure frequency = | days/year | 80 | Reasonable maximum |
| ED - Exposure duration = | years | 1 | Reasonable maximum |
| CF - Conversion factor (1 kg/1,000,000 mg) = | kg/mg | 1.00E-06 | |
| BW - Body weight = | kg | 70 | USEPA 1991, HHEM |
| $AT_n$ - Averaging Time noncarcinogenic = | days | 365 | Reasonable maximum |
| $AT_c$ - Averaging Time carcinogenic = | days | 25550 | USEPA 1991, HHEM |

| Analyte | Concentration in Soil mg/kg | Average Daily Intake mg/kg-day | Dermal Subchronic RfD mg/kg-day | Hazard Index | Average Lifetime Daily Intake mg/kg-day | Cancer Slope Factor 1/(mg/kg-day) | Cancer Risk |
|---|---|---|---|---|---|---|---|
| **Dioxins** | | | | | | | |
| 2,3,7,8-TCDD Equiv. | 1.37E-03 | 8 59E-11 | NA | NA | 1 23E-12 | 3.00E+05 | 3 68E-07 |
| **Inorganics** | | | | | | | |
| Arsenic | 5.61E+00 | 3 52E-08 | 2 85E-04 | 1 23E-04 | 5 02E-10 | 1 58E+00 | 7 93E-10 |
| Thallium | 6.33E+00 | 3.97E-08 | NA | NA | 5 67E-10 | NA | NA |

NA - Not available | Total Hazard Index 0 0001 | Total Cancer Risk 3 69E-07

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*Table 31*
***Reasonable Maximum Exposure by Ingestion of Soil by a Construction Worker***
***Former Koppers Company, Inc, Newport, DE***

$$\text{Intake (mg/kg-day)} = \frac{Cs*IngR*EF*ED*CF*FI}{BW*AT}$$

| | | | |
|---|---|---|---|
| Cs - Concentration in soil = | mg/kg | chemical specific | |
| IngR - Ingestion rate = | mg/day | 50 | USEPA 1991, HHEM |
| EF - Exposure frequency = | days/year | 80 | Reasonable maximum |
| ED - Exposure duration = | years | 1 | Reasonable maximum |
| CF - Conversion factor (1 kg/1,000,000 mg) = | kg/mg | 1.00E-06 | |
| FI - Fraction of total daily soil ingested at site = | | 1 | reasonable maximum |
| BW - Body weight = | kg | 70 | USEPA 1991, HHEM |
| $AT_n$ - Averaging Time noncarcinogenic = | days | 365 | Reasonable maximum |
| $AT_c$ - Averaging Time carcinogenic = | days | 25550 | USEPA 1991, HHEM |

| Chemical | Concentration in Soil mg/kg | Average Daily Intake mg/kg-day | Oral Subchronic RfD mg/kg-day | Hazard Index | Average Lifetime Daily Intake mg/kg-day | Oral Slope Factor 1/(mg/kg-day) | Cancer Risk |
|---|---|---|---|---|---|---|---|
| **Dioxins** | | | | | | | |
| 2,3,7,8-TCDD Equiv | 1.37E-03 | 2 15E-10 | NA | NA | 3.07E-12 | 1 50E+05 | 4 60E-07 |
| **Inorganics** | | | | | | | |
| Arsenic | 5.61E+00 | 8 78E-07 | 3.00E-04 | 2.93E-03 | 1 25E-08 | 1 50E+00 | 1 88E-08 |
| Thallium | 6 33E+00 | 9 92E-07 | NA | NA | 1.42E-08 | NA | NA |
| **Semivolatiles** | | | | | | | |
| Acenaphthylene | 6.34E+00 | 9 93E-07 | NA | NA | 1.42E-08 | NA | NA |
| Benzo(a)anthracene | 5.61E+01 | 8 80E-06 | NA | NA | 3 65E-08 | 7 30E-01 | 2 66E-08 |
| Benzo(a)pyrene | 4.24E+01 | 6 64E-06 | NA | NA | 2 75E-08 | 7 30E+00 | 2 01E-07 |
| Benzo(b)fluoranthene | 1 02E+02 | 1 60E-05 | NA | NA | 6 63E-08 | 7 30E-01 | 4 84E-08 |
| Benzo(g,h,i)perylene | 2.43E+01 | 3 80E-06 | NA | NA | 5.43E-08 | NA | NA |
| Benzo(k)fluoranthene | 2 27E+01 | 3 55E-06 | NA | NA | 1 47E-08 | 7.30E-02 | 1 07E-09 |
| Carbazole | 7 59E+00 | 1.19E-06 | NA | NA | 4 92E-09 | 2 00E-02 | 9 85E-11 |
| Dibenz(a,h)anthracene | 7.15E+00 | 1 12E-06 | NA | NA | 4.64E-09 | 7.30E+00 | 3 39E-08 |
| Indeno(1,2,3-c,d)pyrene | 2 89E+01 | 4 53E-06 | NA | NA | 1.87E-08 | 7 30E-01 | 1 37E-08 |
| Phenanthrene | 5 65E+01 | 8 85E-06 | NA | NA | 1 26E-07 | NA | NA |

NA - Not available

Total Hazard Index 0 003

Total Cancer Risk: 8 03E-07





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*Table 32*

***Reasonable Maximum Exposure to Construction Worker via Inhalation of Vapors and Dust***

***Former Koppers Company, Inc, Newport, DE***

Intake (mg/kg-day) = $\frac{Ca*InhR*EF*ED*RA*RF}{BW*AT}$

| | | | |
|---|---|---|---|
| Ca - Concentration in air = | mg/m$^3$ | chem spec. | |
| InhR - Inhalation Rate = | m$^3$/day | 20 | USEPA 1991, HHEM |
| EF - Exposure Frequency = | days/year | 80 | Reasonable maximum |
| ED - Exposure Duration = | years | 1 | Reasonable maximum |
| RA - Fraction of $PM_{15}$ respirable (≤ 10 um) = | | 0 84 | Cowherd, 1985 |
| RF - Retention Factor for dusts (non-VOAs) = | | 0 75 | Reasonable maximum |
| BW - Body Weight = | kg | 70 | USEPA 1991, HHEM |
| $AT_n$ - Averaging Time noncarcinogenic = | days | 365 | Reasonable maximum |
| $AT_c$ - Averaging Time carcinogenic = | days | 25550 | USEPA 1991, HHEM |

Ca = Concentration in Air (mg/m$^3$) = $E_i/(H_b*W_b*V)$

$E_i$ - Emission Rate of Component (mg/sec) = chemical specific

$H_b$ - Downwind Ht (m) = 5 11

$W_b$ - Width (m) = 55

V - Wind speed (m/sec) = 4 99

Length (downwind distance) (m) = 55

r - Roughness Ht (m) = 0 20

z - downwind distance (m) = 55

$z = 6\,25r[H_b/r * Ln(H_b/r) - 1\,58*H_b/r + 1\,58]$

$E_i$ - Emission Rate (mg/sec) = $C_s*(PER_v+PER_e)$

| | | |
|---|---|---|
| $C_s$ - Concentration in soil = | mg/kg | chem spec |
| $PER_v$ - Fugitive Dust Emission Rate (Vehicular movement) = | kg/sec | 2.93E-05 |
| $PER_e$ - Fugitive Dust Emission Rate (Excavation) = | kg/sec | 4 21E-04 |

| Chemicals | Concentration in Soil mg/kg | Emission Rate mg/sec | Concentration in Air mg/m$^3$ | Average Daily Intake mg/kg-day | Inhalation Subchronic RfD mg/kg-day | Hazard Index | Average Lifetime Daily Intake mg/kg-day | Inhalation Cancer Slope Factor 1/(mg/kg-day) | Cancer Risk |
|---|---|---|---|---|---|---|---|---|---|
| **Dioxins** | | | | | | | | | |
| 2,3,7,8-TCDD Equiv. | 1 37E-03 | 6.17E-07 | 4 40E-10 | 1 74E-11 | NA | NA | 2 48E-13 | 1 50E+05 | 3 72E-08 |
| **Inorganics** | | | | | | | | | |
| Arsenic | 5 61E+00 | 2 52E-03 | 1 80E-06 | 7.10E-08 | NA | NA | 1 01E-09 | 1 51E+01 | 1 53E-08 |
| Thallium | 6 33E+00 | 2 85E-03 | 2 03E-06 | 8 02E-08 | NA | NA | 1.15E-09 | NA | NA |
| **Semivolatiles** | | | | | | | | | |
| Acenaphthylene | 6 34E+00 | 2 85E-03 | 2 04E-06 | 8 03E-08 | NA | NA | 1 15E-09 | NA | NA |
| Benzo(a)anthracene | 5 62E+01 | 2 53E-02 | 1 80E-05 | 7.12E-07 | NA | NA | 1 02E-08 | NA | NA |
| Benzo(a)pyrene | 4 24E+01 | 1 91E-02 | 1 36E-05 | 5 37E-07 | NA | NA | 7 67E-09 | 3 10E+00 | 2 38E-08 |
| Benzo(b)fluoranthene | 1 02E+02 | 4 60E-02 | 3 28E-05 | 1 29E-06 | NA | NA | 1 85E-08 | NA | NA |
| Benzo(g,h,i)perylene | 2 43E+01 | 1 09E-02 | 7 79E-06 | 3 07E-07 | NA | NA | 4 39E-09 | NA | NA |
| Benzo(k)fluoranthene | 2 27E+01 | 1.02E-02 | 7 28E-06 | 2 87E-07 | NA | NA | 4 10E-09 | NA | NA |
| Carbazole | 7 59E+00 | 3 42E-03 | 2 44E-06 | 9 61E-08 | NA | NA | 1 37E-09 | NA | NA |
| Dibenz(a,h)anthracene | 7 15E+00 | 3 22E-03 | 2 30E-06 | 9 06E-08 | NA | NA | 1 29E-09 | NA | NA |
| Indeno(1,2,3-c,d)pyrene | 2 89E+01 | 1 30E-02 | 9.27E-06 | 3 66E-07 | NA | NA | 5 23E-09 | NA | NA |
| Phenanthrene | 5 65E+01 | 2 54E-02 | 1.81E-05 | 7 16E-07 | NA | NA | 1 02E-08 | NA | NA |

NA - Not available

Total Hazard Index NA

Total Cancer Risk 7 63E-08

AR316066



ENVIRONMENTAL STANDAR

***Table 36***
***Reasonable Maximum Dermal Exposure to Soil and NAPL by a Construction Worker***
***Former Koppers Company, Inc, Newport, DE***

$$\text{Intake (mg/kg-day)} = \frac{Cs*SA*FX*AF*ABS*EF*ED*CF}{BW*AT}$$

| | | | |
|---|---|---|---|
| Cs - Concentration in soil and NAPL = | mg/kg | chemical specific | |
| SA - Adult skin surface area available for exposure = | $cm^2$/day | 1820 | calculated |
| $SA_t$ - Total Adult Surface area = | $cm^2$ | 20000 | USEPA 1989, EFH |
| $F_a$ - Fraction of skin surface area available for exposure = | | 9 1% | reasonable maximum |
| FX - Fraction of exposed skin covered with soil = | | 100% | reasonable maximum |
| AF -Soil Adherence Factor = | mg/$cm^2$ | 0 11 | USEPA 1995, EFH |
| $ABS_d$ - Absorption for dioxins = | | 0 1 | US EPA 1995, Region III |
| $ABS_i$ - Absorption for inorganics = | | 0 01 | USEPA 1995, Region III |
| EF - Exposure frequency = | days/year | 80 | Reasonable maximum |
| ED - Exposure duration = | years | 1 | Reasonable maximum |
| CF - Conversion factor (1 kg/1,000,000 mg) = | kg/mg | 1 00E-06 | |
| BW - Body weight = | kg | 70 | USEPA 1991, HHEM |
| $AT_n$ - Averaging Time noncarcinogenic = | days | 365 | Reasonable maximum |
| $AT_c$ - Averaging Time carcinogenic = | days | 25550 | USEPA 1991, HHEM |

| Analyte | Concentration in Soil and NAPL mg/kg | Average Daily Intake mg/kg-day | Dermal Subchronic RfD mg/kg-day | Hazard Index | Average Lifetime Daily Intake mg/kg-day | Cancer Slope Factor 1/(mg/kg-day) | Cancer Risk |
|---|---|---|---|---|---|---|---|
| **Dioxins** | | | | | | | |
| 2,3,7,8-TCDD Equiv. | 1 37E-03 | 8.59E-11 | NA | NA | 1 23E-12 | 3.00E+05 | 3 68E-07 |
| **Inorganics** | | | | | | | |
| Arsenic | 5 71E+00 | 3 58E-08 | 2 85E-04 | 1 26E-04 | 5 11E-10 | 1 58E+00 | 8.07E-10 |
| Iron | 1.94E+04 | 1.21E-04 | NA | NA | 1 74E-06 | NA | NA |
| Lead | 3 34E+01 | 2.10E-07 | NA | NA | 2 99E-09 | NA | NA |
| Thallium | 5 85E+00 | 3.67E-08 | NA | NA | 5 24E-10 | NA | NA |

NA - Not available — Total Hazard Index 0.0001 — Total Cancer Risk: 3 69E-07




ENVIRONMENTAL STANDARDS

***Table 37***
***Reasonable Maximum Exposure by Ingestion of Soil and NAPL by a Construction Worker***
***Former Koppers Company, Inc, Newport, DE***

$$\text{Intake (mg/kg-day)} = \frac{Cs*IngR*EF*ED*CF*FI}{BW*AT}$$

| | | | |
|---|---|---|---|
| Cs - Concentration in soil and NAPL = | mg/kg | chemical specific | |
| IngR - Ingestion rate = | mg/day | 50 | USEPA 1991, HHEM |
| EF - Exposure frequency = | days/year | 80 | Reasonable maximum |
| ED - Exposure duration = | years | 1 | Reasonable maximum |
| CF - Conversion factor (1 kg/1,000,000 mg) = | kg/mg | 1.00E-06 | |
| FI - Fraction of total daily soil ingested at site = | | 1 | reasonable maximum |
| BW - Body weight = | kg | 70 | USEPA 1991, HHEM |
| $AT_n$ - Averaging Time noncarcinogenic = | days | 365 | Reasonable maximum |
| $AT_c$ - Averaging Time carcinogenic = | days | 25550 | USEPA 1991, HHEM |

| Chemical | Concentration in Soil and NAPL mg/kg | Average Daily Intake mg/kg-day | Oral Subchronic RfD mg/kg-day | Hazard Index | Average Lifetime Daily Intake mg/kg-day | Oral Slope Factor 1/(mg/kg-day) | Cancer Risk |
|---|---|---|---|---|---|---|---|
| **Dioxins** | | | | | | | |
| 2,3,7,8-TCDD Equiv. | 1 37E-03 | 2 15E-10 | NA | NA | 3 07E-12 | 1 50E+05 | 4 60E-07 |
| **Inorganics** | | | | | | | |
| Arsenic | 5.71E+00 | 8 93E-07 | 3.00E-04 | 2 98E-03 | 1 28E-08 | 1 50E+00 | 1 91E-08 |
| Iron | 1 94E+04 | 3.03E-03 | NA | NA | 4.33E-05 | NA | NA |
| Lead | 3 34E+01 | 5 23E-06 | NA | NA | 7 48E-08 | NA | NA |
| Thallium | 5.85E+00 | 9.16E-07 | NA | NA | 1 31E-08 | NA | NA |
| **Semivolatiles** | | | | | | | |
| Acenaphthylene | 5 41E+00 | 8 48E-07 | NA | NA | 1.21E-08 | NA | NA |
| Benzo(a)anthracene | 5 92E+01 | 9 27E-06 | NA | NA | 1.32E-07 | 7.30E-01 | 9 67E-08 |
| Benzo(a)pyrene | 4.66E+01 | 7.30E-06 | NA | NA | 1 04E-07 | 7 30E+00 | 7 61E-07 |
| Benzo(b)fluoranthene | 1 12E+02 | 1 75E-05 | NA | NA | 2.50E-07 | 7.30E-01 | 1.82E-07 |
| Benzo(k)fluoranthene | 2.45E+01 | 3 84E-06 | NA | NA | 5.49E-08 | 7 30E-02 | NA |
| Benzo(g,h,i)perylene | 2 08E+01 | 3 26E-06 | NA | NA | 4.65E-08 | NA | NA |
| Carbazole | 6 63E+00 | 1 04E-06 | NA | NA | 1 48E-08 | 2.00E-02 | 2.96E-10 |
| Chrysene | 7 33E+01 | 1 15E-05 | NA | NA | 1 64E-07 | 7 30E-03 | 1.20E-09 |
| Dibenz(a,h)anthracene | 6 58E+00 | 1 03E-06 | NA | NA | 1.47E-08 | 7 30E+00 | 1 07E-07 |
| Fluoranthene | 2 09E+02 | 3 27E-05 | 4 00E-01 | 8 17E-05 | 4.67E-07 | NA | NA |
| Indeno(1,2,3-c,d)pyrene | 2.95E+01 | 4.62E-06 | NA | NA | 6 59E-08 | 7 30E-01 | 4 81E-08 |
| Phenanthrene | 4 98E+01 | 7 80E-06 | NA | NA | 1 11E-07 | NA | NA |

NA - Not available | Total Hazard Index 0 003 | Total Cancer Risk 1.68E-06

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ENVIRONMENTAL STANDARDS

UAO Bates 00551

Tal

*Reas...ble Maximum Exposure to Construction Worker via Inhalation of Vapors and Dust**

*Former Koppers Company, Inc, Newport, DE*

| | | | |
|---|---|---|---|
| Intake (mg/kg-day) = | | $\frac{Ca*InhR*EF*ED*RA*RF}{BW*AT}$ | |
| Ca - Concentration in air = | $mg/m^3$ | chem spec | |
| InhR - Inhalation Rate = | $m^3/day$ | 20 | USEPA 1991, HHEM |
| EF - Exposure Frequency = | days/year | 80 | Reasonable maximum |
| ED - Exposure Duration = | years | 1 | Reasonable maximum |
| RA - Fraction of $PM_{15}$ respirable (≤ 10 um) = | | 0 84 | Cowherd, 1985 |
| RF - Retention Factor for dusts (non-VOAs) = | | 0 75 | Reasonable maximum |
| BW - Body Weight = | kg | 70 | USEPA 1991, HHEM |
| $AT_n$ - Averaging Time noncarcinogenic = | days | 365 | Reasonable maximum |
| $AT_c$ - Averaging Time carcinogenic = | days | 25550 | USEPA 1991, HHEM |

Ca = Concentration in Air ($mg/m^3$) = $E_i/(H_b*W_b*V)$

$E_i$ - Emission Rate of Component (mg/sec) = chemical specific

$H_b$ - Downwind Ht (m) = 5 11

$W_b$ - Width (m) = 55

V - Wind speed (m/sec) = 4.99

Length (downwind distance) (m) = 55

r - Roughness Ht (m) = 0 20

z - downwind distance (m) = 55

$z = 6\ 25r[H_b/r * Ln(H_b/r) - 1\ 58*H_b/r + 1\ 58]$

$E_i$ - Emission Rate (mg/sec) = $C_i*(PER_v+PER_e)$

| | | | |
|---|---|---|---|
| $C_i$ - Concentration in soil and NAPL = | mg/kg | chem spec | |
| $PER_v$ - Fugitive Dust Emission Rate (Vehicular movement) = | kg/sec | 2.93E-04 | Calculated |
| $PER_e$ - Fugitive Dust Emission Rate (Excavation) = | kg/sec | 4.21E-04 | Calculated |

| Chemicals | Concentration in Soil and NAPL mg/kg | Emission Rate mg/sec | Concentration in Air $mg/m^3$ | Average Daily Intake mg/kg-day | Inhalation Subchronic RfD mg/kg-day | Hazard Index | Average Lifetime Daily Intake mg/kg-day | Inhalation Cancer Slope Factor 1/(mg/kg-day) | Cancer Risk |
|---|---|---|---|---|---|---|---|---|---|
| **Dioxins** | | | | | | | | | |
| 2,3,7,8-TCDD Equiv | 1 37E-03 | 9 79E-07 | 6 98E-10 | 2 75E-11 | NA | NA | 3 93E-13 | 1 50E+05 | 5 90E-08 |
| **Inorganics** | | | | | | | | | |
| Arsenic | 5 71E+00 | 4 08E-03 | 2.91E-06 | 1 15E-07 | NA | NA | 1.64E-09 | 1 51E+01 | 2 47E-08 |
| Iron | 1 94E+04 | 1.38E+01 | 9 86E-03 | 3 89E-04 | NA | NA | 5 56E-06 | NA | NA |
| Lead | 3 34E+01 | 2.39E-02 | 1 70E-05 | 6 71E-07 | NA | NA | 9.59E-09 | NA | NA |
| Thallium | 5 85E+00 | 4 18E-03 | 2 98E-06 | 1.18E-07 | NA | NA | 1.68E-09 | NA | NA |
| **Semivolatiles** | | | | | | | | | |
| Acenaphthylene | 5 41E+00 | 3.87E-03 | 2 76E-06 | 1 09E-07 | NA | NA | 1 55E-09 | NA | NA |
| Benzo(a)anthracene | 5 92E+01 | 4 23E-02 | 3 02E-05 | 1 19E-06 | NA | NA | 1 70E-08 | NA | NA |
| Benzo(a)pyrene | 4 66E+01 | 3 33E-02 | 2 37E-05 | 9 36E-07 | NA | NA | 1 34E-08 | 3 10E+00 | 4 15E-08 |
| Benzo(b)fluoranthene | 1 12E+02 | 7 97E-02 | 5.68E-05 | 2 24E-06 | NA | NA | 3 20E-08 | NA | NA |
| Benzo(k)fluoranthene | 2 45E+01 | 1 75E-02 | 1 25E-05 | 4 93E-07 | NA | NA | 7 04E-09 | NA | NA |
| Benzo(g,h,i)perylene | 2 08E+01 | 1 49E-02 | 1 06E-05 | 4 18E-07 | NA | NA | 5 97E-09 | NA | NA |
| Carbazole | 6 63E+00 | 4 73E-03 | 3 37E-06 | 1 33E-07 | NA | NA | 1 90E-09 | NA | NA |

AR316069



ENVIRONMENTAL STANDARDS

UAO Bates 00552

*Table 38*

***Reasonable Maximum Exposure to Construction Worker via Inhalation of Vapors and Dust****

***Former Koppers Company, Inc, Newport, DE***

Intake (mg/kg-day) = $\frac{Ca*InhR*EF*ED*RA*RF}{BW*AT}$

| | | | |
|---|---|---|---|
| Ca - Concentration in air = | $mg/m^3$ | chem spec | |
| InhR - Inhalation Rate = | $m^3/day$ | 20 | USEPA 1991, HHEM |
| EF - Exposure Frequency = | days/year | 80 | Reasonable maximum |
| ED - Exposure Duration = | years | 1 | Reasonable maximum |
| RA - Fraction of $PM_{15}$ respirable (≤ 10 um) = | | 0 84 | Cowherd, 1985 |
| RF - Retention Factor for dusts (non-VOAs) = | | 0 75 | Reasonable maximum |
| BW - Body Weight = | kg | 70 | USEPA 1991, HHEM |
| $AT_n$ - Averaging Time noncarcinogenic = | days | 365 | Reasonable maximum |
| $AT_c$ - Averaging Time carcinogenic = | days | 25550 | USEPA 1991, HHEM |

Ca - Concentration in Air ($mg/m^3$) = $E_i/(H_b*W_b*V)$

$E_i$ - Emission Rate of Component (mg/sec) = chemical specific

$H_b$ - Downwind Ht (m) = 5 11

$W_b$ - Width (m) = 55

V - Wind speed (m/sec) = 4 99

Length (downwind distance) (m) = 55

r - Roughness Ht. (m) = 0 20

z - downwind distance (m) = 55

$z = 6\ 25r[H_b/r * Ln(H_b/r) - 1\ 58*H_b/r + 1\ 58]$

$E_i$ - Emission Rate (mg/sec) = $C_s*(PER_v+PER_e)$

| | | | |
|---|---|---|---|
| $C_s$ - Concentration in soil and NAPL = | mg/kg | chem spec | |
| $PER_v$ - Fugitive Dust Emission Rate (Vehicular movement) = | kg/sec | 2 93E-04 | Calculated |
| $PER_e$ - Fugitive Dust Emission Rate (Excavation) = | kg/sec | 4.21E-04 | Calculated |

| Chemicals | Concentration in Soil and NAPL mg/kg | Emission Rate mg/sec | Concentration in Air $mg/m^3$ | Average Daily Intake mg/kg-day | Inhalation Subchronic RfD mg/kg-day | Hazard Index | Average Lifetime Daily Intake mg/kg-day | Inhalation Cancer Slope Factor 1/(mg/kg-day) | Cancer Risk |
|---|---|---|---|---|---|---|---|---|---|
| Chrysene | 7 33E+01 | 5.24E-02 | 3 73E-05 | 1 47E-06 | NA | NA | 2.10E-08 | NA | NA |
| Dibenz(a,h)anthracene | 6 58E+00 | 4 70E-03 | 3 35E-06 | 1 32E-07 | NA | NA | 1.89E-09 | NA | NA |
| Fluoranthene | 2 09E+02 | 1 49E-01 | 1 06E-04 | 4 19E-06 | NA | NA | 5 99E-08 | NA | NA |
| Indeno(1,2,3-c,d)pyrene | 2 95E+01 | 2 11E-02 | 1.50E-05 | 5.92E-07 | NA | NA | 8 46E-09 | NA | NA |
| Phenanthrene | 4 98E+01 | 3.56E-02 | 2.54E-05 | 1.00E-06 | NA | NA | 1.43E-08 | NA | NA |
| | | | | | Total Hazard Index | NA | | Total Cancer Risk | 1.25E-07 |

* Includes NAPL data

NA - Not available

AR316070



ENVIRONMENTAL STANDAF

41

**_R... onable Maximum Dermal Exposure to Soil by an Industrial Worker_**
**_Former Koppers Company, Inc, Newport, DE_**

$$\text{Intake (mg/kg-day)} = \frac{Cs * SA * FX * AF * ABS * EF * ED * CF}{BW * AT}$$

| | | | |
|---|---|---|---|
| Cs - Concentration in soil = | mg/kg | chemical specific | |
| SA - Adult skin surface area available for exposure = | $cm^2$/day | 1820 | calculated |
| $SA_t$ - Total Adult Surface area = | $cm^2$ | 20000 | USEPA 1989, EFH |
| $F_s$ - Fraction of skin surface area available for exposure = | | 9 1% | reasonable maximum |
| FX - Fraction of exposed skin covered with soil = | | 100% | reasonable maximum |
| AF -Soil Adherence Factor = | mg/$cm^2$ | 0 11 | USEPA 1995, EFH |
| $ABS_d$ – Absorption for dioxins = | | 0 1 | US EPA 1995, Region III |
| $ABS_n$ - Absorption for inorganics = | | 0.01 | USEPA 1995, Region III |
| EF - Exposure frequency = | days/year | 134 | reasonable maximum |
| ED - Exposure duration = | years | 25 | USEPA 1991, HHEM |
| CF - Conversion factor (1 kg/1,000,000 mg)= | kg/mg | 1 00E-06 | |
| BW - Body weight = | kg | 70 | USEPA 1991, HHEM |
| $AT_n$ - Averaging Time noncarcinogenic = | days | 9125 | USEPA 1991, HHEM |
| $AT_c$ - Averaging Time carcinogenic = | days | 25550 | USEPA 1991, HHEM |

| A... e | Concentration in Soil mg/kg | Average Daily Intake mg/kg-day | Dermal Chronic RfD mg/kg-day | Hazard Index | Average Lifetime Daily Intake mg/kg-day | Cancer Slope Factor 1/(mg/kg-day) | Cancer Risk |
|---|---|---|---|---|---|---|---|
| 2,...-TCDD Equiv | 5 44E-03 | 5 71E-10 | NA | NA | 2 04E-10 | 3 00E+05 | 6 12E-05 |
| **Inorganics** | | | | | | | |
| Arsenic | 8 56E+00 | 8 99E-08 | 2 85E-04 | 3 15E-04 | 3.21E-08 | 1 58E+00 | 5.07E-08 |
| Thallium | 8 56E+00 | 8 99E-08 | 5.60E-05 | 1 61E-03 | 3 21E-08 | NA | NA |

NA - Not available

Total Hazard Index: 0.0019 | 6.13E-05



AR316071

ENVIRONMENTAL STANDARDS

*Table 42*
***Reasonable Maximum Exposure by Ingestion of Soil by an Industrial Worker***
***Former Koppers Company, Inc, Newport, DE***

$$\text{Intake (mg/kg-day)} = \frac{Cs * IngR * EF * ED * CF * FI}{BW * AT}$$

| | | | |
|---|---|---|---|
| $C_s$ - Concentration in soil = | mg/kg | chemical specific | |
| $I_{ng}R$ - Ingestion rate = | mg/day | 50 | USEPA 1991, HHEM |
| EF - Exposure frequency = | days/year | 134 | reasonable maximum |
| ED - Exposure duration = | years | 25 | USEPA 1991, HHEM |
| CF - Conversion factor (1 kg/1,000,000 mg)= | kg/mg | 1 00E-06 | |
| FI - Fraction of total daily soil ingested at site = | | 1 | reasonable maximum |
| BW - Body weight = | kg | 70 | USEPA 1991, HHEM |
| $AT_n$ - Averaging Time noncarcinogenic = | days | 9125 | USEPA 1991, HHEM |
| $AT_c$ - Averaging Time carcinogenic = | days | 25550 | USEPA 1991, HHEM |

| Analyte | Concentration in Soil mg/kg | Average Daily Intake mg/kg-day | Oral Chronic RfD mg/kg-day | Hazard Index | Average Lifetime Daily Intake mg/kg-day | Oral Cancer Slope Factor 1/(mg/kg-day) | Cancer Risk |
|---|---|---|---|---|---|---|---|
| **Dioxins** | | | | | | | |
| 2,3,7,8-TCDD Equiv. | 5 44E-03 | 1 43E-09 | NA | NA | 5.10E-10 | 1 50E+05 | 7 64E-05 |
| **Inorganics** | | | | | | | |
| Arsenic | 8 56E+00 | 2 24E-06 | 3 00E-04 | 7 48E-03 | 8 02E-07 | 1.50E+00 | 1 20E-06 |
| Thallium | 8 56E+00 | 2 25E-06 | 7.00E-05 | 3 21E-02 | 8 02E-07 | NA | NA |
| **Semivolatiles** | | | | | | | |
| Acenaphthylene | 1 30E+01 | 3.41E-06 | NA | NA | 1.22E-06 | NA | NA |
| Benzo(a)anthracene | 1 70E+02 | 4.46E-05 | NA | NA | 1.59E-05 | 7 30E-01 | 1 16E-05 |
| Benzo(a)pyrene | 1 61E+02 | 4.21E-05 | NA | NA | 1 50E-05 | 7.30E+00 | 1 10E-04 |
| Benzo(b)fluoranthene | 3 70E+02 | 9 70E-05 | NA | NA | 3 47E-05 | 7.30E-01 | 2.53E-05 |
| Benzo(g,h,i)perylene | 8 16E+01 | 2.14E-05 | NA | NA | 7.64E-06 | NA | NA |
| Benzo(k)fluoranthene | 1 10E+02 | 2.88E-05 | NA | NA | 1.03E-05 | 7 30E-02 | 7 52E-07 |
| Carbazole | 2.96E+01 | 7.76E-06 | NA | NA | 2 77E-06 | 2 00E-02 | 5.55E-08 |
| Dibenz(a,h)anthracene | 1 99E+01 | 5 21E-06 | NA | NA | 1.86E-06 | 7.30E+00 | 1 36E-05 |
| Indeno(1,2,3-c,d)pyrene | 1 10E+02 | 2 88E-05 | NA | NA | 1.03E-05 | 7.30E-01 | 7 52E-06 |
| Phenanthrene | 5 16E+01 | 1 35E-05 | NA | NA | 4 83E-06 | NA | NA |

NA - Not available

Total Hazard Index: 0 040 — 2 46E-04



ENVIRONMENTAL STANDARDS

**[illegible] 45**

***[illegible]onable Maximum Dermal Exposure to Soil and NAPL by an Industrial Worker***

***Former Koppers Company, Inc, Newport, DE***

$$\text{Intake (mg/kg-day)} = \frac{Cs * SA * FX * AF * ABS * EF * ED * CF}{BW * AT}$$

| | | | |
|---|---|---|---|
| Cs - Concentration in soil and NAPL = | mg/kg | chemical specific | |
| SA - Adult skin surface area available for exposure = | $cm^2$/day | 1820 | calculated |
| $SA_t$ - Total Adult Surface area = | $cm^2$ | 20000 | USEPA 1989, EFH |
| $F_s$ - Fraction of skin surface area available for exposure = | | 9 1% | reasonable maximum |
| FX - Fraction of exposed skin covered with soil = | | 100% | reasonable maximum |
| AF - Soil Adherence Factor = | mg/$cm^2$ | 0 11 | USEPA 1995, EFH |
| $ABS_d$ - Absorption for dioxins = | | 0 1 | US EPA 1995, Region III |
| $ABS_n$ - Absorption for inorganics = | | 0 01 | USEPA 1995, Region III |
| EF - Exposure frequency = | days/year | 134 | reasonable maximum |
| ED - Exposure duration = | years | 25 | USEPA 1991, HHEM |
| CF - Conversion factor (1 kg/1,000,000 mg)= | kg/mg | 1 00E-06 | |
| BW - Body weight = | kg | 70 | USEPA 1991, HHEM |
| $AT_n$ - Averaging Time noncarcinogenic = | days | 9125 | USEPA 1991, HHEM |
| $AT_c$ - Averaging Time carcinogenic = | days | 25550 | USEPA 1991, HHEM |

| A[illegible]te | Concentration in Soil and NAPL mg/kg | Average Daily Intake mg/kg-day | Dermal Chronic RfD mg/kg-day | Hazard Index | Average Lifetime Daily Intake mg/kg-day | Cancer Slope Factor 1/(mg/kg-day) | Cancer Risk |
|---|---|---|---|---|---|---|---|
| 2,[illegible]8-TCDD Equiv | 5 44E-03 | 5 71E-10 | NA | NA | 2 04E-10 | 3 00E+05 | 6 12E-05 |
| **Inorganics** | | | | | | | |
| Arsenic | 7 70E+00 | 8 08E-08 | 2 85E-04 | 2.84E-04 | 2 89E-08 | 1 58E+00 | 4.56E-08 |
| Iron | 1 94E+04 | 2 04E-04 | 1 50E-01 | 1.36E-03 | 7 27E-05 | NA | NA |
| Lead | 8 31E+01 | 8.73E-07 | NA | NA | 3 12E-07 | NA | NA |
| Thallium | 5 40E+00 | 5 67E-08 | 5 60E-05 | 1.01E-03 | 2.02E-08 | NA | NA |
| NA – Not available | | | Total Hazard Index | 0 003 | | | 6 13E-05 |



AR316073
ENVIRONMENTAL STANDARDS

*Table 46*

***Reasonable Maximum Exposure by Ingestion of Soil and NAPL by an Industrial Worker***

***Former Koppers Company, Inc, Newport, DE***

$$\text{Intake (mg/kg-day)} = \frac{Cs \cdot IngR \cdot EF \cdot ED \cdot CF \cdot FI}{BW \cdot AT}$$

| | | | |
|---|---|---|---|
| Cs - Concentration in soil and NAPL = | mg/kg | chemical specific | |
| IngR - Ingestion rate = | mg/day | 50 | USEPA 1991, HHEM |
| EF - Exposure frequency = | days/year | 134 | reasonable maximum |
| ED - Exposure duration = | years | 25 | USEPA 1991, HHEM |
| CF - Conversion factor (1 kg/1,000,000 mg)= | kg/mg | 1 00E-06 | |
| FI - Fraction of total daily soil ingested at site = | | 1 | reasonable maximum |
| BW - Body weight = | kg | 70 | USEPA 1991, HHEM |
| $AT_n$ - Averaging Time noncarcinogenic = | days | 9125 | USEPA 1991, HHEM |
| $AT_c$ - Averaging Time carcinogenic = | days | 25550 | USEPA 1991, HHEM |

| Analyte | Concentration in Soil and NAPL mg/kg | Average Daily Intake mg/kg-day | Oral Chronic RfD mg/kg-day | Hazard Index | Average Lifetime Daily Intake mg/kg-day | Oral Cancer Slope Factor 1/(mg/kg-day) | Cancer Risk |
|---|---|---|---|---|---|---|---|
| **Dioxins** | | | | | | | |
| 2,3,7,8-TCDD Equiv | 5 44E-03 | 1 43E-09 | NA | NA | 5 10E-10 | 1 50E+05 | 7 64E-05 |
| **Inorganics** | | | | | | | |
| Arsenic | 7 70E+00 | 2 02E-06 | 3 00E-04 | 6 73E-03 | 7 21E-07 | 1 50E+00 | 1 08E-06 |
| Iron | 1 94E+04 | 5.09E-03 | 3 00E-01 | 1 70E-02 | 1 82E-03 | NA | NA |
| Lead | 8.31E+01 | 2 18E-05 | NA | NA | 7 79E-06 | NA | NA |
| Thallium | 5 40E+00 | 1 42E-06 | 7 00E-05 | 2 02E-02 | 5 06E-07 | NA | NA |
| **Semivolatiles** | | | | | | | |
| Acenaphthylene | 1 21E+01 | 3 18E-06 | NA | NA | 1 14E-06 | NA | NA |
| Benzo(a)anthracene | 2 92E+02 | 7 65E-05 | NA | NA | 2.73E-05 | 7 30E-01 | 2 00E-05 |
| Benzo(a)pyrene | 2 02E+02 | 5 30E-05 | NA | NA | 1 89E-05 | 7.30E+00 | 1 38E-04 |
| Benzo(b)fluoranthene | 4 29E+02 | 1.13E-04 | NA | NA | 4 02E-05 | 7 30E-01 | 2 93E-05 |
| Benzo(g,h,i)perylene | 7 85E+01 | 2.06E-05 | NA | NA | 7 35E-06 | NA | NA |
| Benzo(k)fluoranthene | 9 95E+01 | 2.61E-05 | NA | NA | 9 32E-06 | 7 30E-02 | 6.80E-07 |
| Carbazole | 2.11E+01 | 5 52E-06 | NA | NA | 1.97E-06 | 2.00E-02 | 3 94E-08 |
| Chrysene | 3 27E+02 | 8 57E-05 | NA | NA | 3.06E-05 | 7.30E-03 | 2 23E-07 |
| Dibenz(a,h)anthracene | 1.55E+01 | 4 06E-06 | NA | NA | 1 45E-06 | 7 30E+00 | 1 06E-05 |
| Dibenzofuran | 1 55E+01 | 4 06E-06 | 4 00E-03 | 1 01E-03 | 1 45E-06 | NA | NA |
| Fluoranthene | 6 59E+02 | 1 73E-04 | 4 00E-02 | 4 32E-03 | 6 18E-05 | NA | NA |
| Indeno(1,2,3-c,d)pyrene | 1.01E+02 | 2 66E-05 | NA | NA | 9 50E-06 | 7 30E-01 | 6 93E-06 |
| Phenanthrene | 6.75E+01 | 1 77E-05 | NA | NA | 6.32E-06 | NA | NA |

| NA - Not available | | Total Hazard Index | 0 05 | | | | 2 83E-04 |
|---|---|---|---|---|---|---|---|



AR316071
ENVIRONMENTAL STANDARDS

**...onable Maximum Dermal Exposure to Columbia Aquifer Groundwater ... an Industrial Worker Showering**

**Former Koppers Company, Inc., Newport, DE**

Average Daily Intake (mg/kg-day) = $\frac{DA * EF * ED * FS * SAt}{BW * AT}$

| | | | |
|---|---|---|---|
| DA - Absorbed dose = | chem. specific | mg/day-cm$^2$ | |
| EF- Exposure frequency = | 250 | day/year | US EPA 1991, HHEM Supp Guidance |
| ED - Exposure duration = | 25 | year | Carey, 1988 |
| SA - Skin surface area available for contact = | 20000 | cm$^2$ | calculated |
| SAt - Total skin surface area = | 20000 | cm$^2$ | US EPA 1989, RAGS Part A |
| FS - Fraction of skin surface area available for contact = | 100% | | reasonable maximum |
| BW - Body weight = | 70 | kg | US EPA 1989, RAGS Part A |
| $AT_n$ - Averaging Time noncarcinogenic = | 9125 | days | US EPA 1989, RAGS Part A |
| $AT_c$ - Averaging Time carcinogenic = | 25550 | days | US EPA 1989, RAGS Part A |

**For Inorganics:**

DA (mg/day-cm$^2$) = Kp * Cgw * t * CF

| | | | |
|---|---|---|---|
| Kp - Dermal permeability constant = | chem specific | cm/hr | |
| Cgw - Chemical concentration in groundwater = | chem specific | mg/L | |
| t - Event duration = | 0 25 | hr | US EPA 1992, Dermal Exp Assess |
| CF - Conversion factor = | 1 00E-03 | L/cm$^3$ | |

**For Organics:**

If t < t*, then DA = 2 * CF * Cgw * Kp * $(6 * \tau * t / \pi)^{0.5}$

If t>t*, then DA = Kp * Cgw * CF * (t/(1+B) + (2 * τ * ((1+3B) / ( 1+B)))

| | | |
|---|---|---|
| t* - Percutaneous absorption time = | chem specific | hr |
| B - Partitioning coefficient = | chem. specific | dimensionless |
| τ - Lag time = | chem. specific | hr |

| Analyte | Concentration in Groundwater mg/L | Kp cm/hr | t* hr | B | τ hr | Absorbed Dose mg/day-cm$^2$ | Average Daily Intake mg/kg-day | Dermal Chronic RfD mg/kg-day | Hazard Index | Average Lifetime Daily Intake mg/kg-day | Cancer Slope Factor 1/(mg/kg-day) | Cancer Risk |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Inorganics** | | | | | | | | | | | | |
| Antimony | 5 74E-03 | 1 00E-03 | NA | NA | NA | 1 44E-09 | 2 81E-07 | 4.00E-06 | 7.02E-02 | 1 00E-07 | NA | NA |
| Arsenic | 1 68E-03 | 1 00E-03 | NA | NA | NA | 4.20E-10 | 8 23E-08 | 2 85E-04 | 2 89E-04 | 2.94E-08 | 1 58E+00 | 4 64E-08 |
| Cadmium | 1 14E-03 | 1 00E-03 | NA | NA | NA | 2.86E-10 | 5 59E-08 | 3 00E-04 | 1 86E-04 | 2 00E-08 | NA | NA |
| Iron | 3 20E+00 | 1.00E-03 | NA | NA | NA | 8 00E-07 | 1 57E-04 | 1 50E-01 | 1 04E-03 | 5.59E-05 | NA | NA |
| Lead | 3 58E-03 | 4 00E-06 | NA | NA | NA | 3 58E-12 | 7 01E-10 | NA | NA | 2.50E-10 | NA | NA |
| Manganese | 1 86E+00 | 1 00E-03 | NA | NA | NA | 4 65E-07 | 9.10E-05 | NA | NA | 3 25E-05 | NA | NA |
| **PCBs/Pesticides** | | | | | | | | | | | | |
| Dieldrin | 3 50E-05 | 1 60E-02 | 9 40E+01 | 3.60E+00 | 1 80E+01 | 3 28E-09 | 6 43E-07 | 1 50E-05 | 4.28E-02 | 2 29E-07 | 5 33E+01 | 1 22E-05 |
| Heptachlor | 1 80E-05 | 1 10E-02 | 9 40E+01 | 1 90E+00 | 1 70E+01 | 1 13E-09 | 2 21E-07 | 1 50E-04 | 1 47E-03 | 7 89E-08 | 1 50E+01 | 1 18E-06 |
| Heptachlor epoxide | 6 60E-05 | 2 76E-02 | 1 30E+02 | 9 55E+00 | 2 07E+01 | 1 15E-08 | 2 24E-06 | 3 90E-06 | 5 75E-01 | 8 01E-07 | 3 03E+01 | 2 43E-05 |
| **Semivolatiles** | | | | | | | | | | | | |
| bis(2-Ethylhexyl)phthalate | 1 31E-02 | 3 30E-02 | 1 00E+02 | 1 30E+01 | 2.10E+01 | 2 73E-06 | 5 34E-04 | 1 40E-02 | 3 82E-02 | 1.91E-04 | 2 00E-02 | 3 82E-06 |
| Dibenzofuran | 3 00E-03 | 1 51E-01 | 9 07E+00 | 1 32E+00 | 9 29E-01 | 6 04E-07 | 1 18E-04 | 2.80E-03 | 4 22E-02 | 4 22E-05 | NA | NA |

NA - Not Applicable

Total Hazard Index. 0 73

4 16E-05

Gwcol xls \ dermal - RME



ENVIRONMENTAL STANDARDS

AR316075

UAO Bates 00557

***Table 51***
***Reasonable Maximum Oral Exposure to Columbia Aquifer Groundwater While Drinking at the Job Site***
***Former Koppers Company, Inc., Newport, DE***

$$\text{Average Daily Intake (mg/kg-day)} = \frac{Cgw * IR * ED * EF}{BW * AT}$$

| | | | |
|---|---|---|---|
| Cgw - Concentration in groundwater = | chem specific | mg/L | |
| IR - Ingestion Rate = | 1 | L/day | US EPA 1991, HHEM Supp. Guidance |
| ED - Exposure duration = | 25 | year | US EPA 1991, HHEM Supp. Guidance |
| EF- Exposure frequency = | 250 | days/year | US EPA 1991, HHEM Supp Guidance |
| BW - Body weight = | 70 | kg | US EPA 1989, RAGS Part A |
| $AT_n$ - Averaging Time noncarcinogenic = | 9125 | days | US EPA 1989, RAGS Part A |
| $AT_c$ - Averaging Time carcinogenic = | 25550 | days | US EPA 1989, RAGS Part A |

| Analyte | Concentration in Groundwater mg/L | Average Daily Intake mg/kg-day | Oral Chronic RfD mg/kg-day | Hazard Index | Lifetime Average Daily Intake mg/kg-day | Oral Cancer Slope Factor 1/(mg/kg-day) | Cancer Risk |
|---|---|---|---|---|---|---|---|
| **Inorganics** | | | | | | | |
| Antimony | 5.74E-03 | 5 62E-05 | 4.00E-04 | 1 40E-01 | 2.01E-05 | NA | NA |
| Arsenic | 1.68E-03 | 1 65E-05 | 3.00E-04 | 5 49E-02 | 5.88E-06 | 1.50E+00 | 8.82E-06 |
| Cadmium | 1.14E-03 | 1.12E-05 | 5.00E-04 | 2 24E-02 | 3.99E-06 | NA | NA |
| Iron | 3.20E+00 | 3 13E-02 | 3.00E-01 | 1.04E-01 | 1.12E-02 | NA | NA |
| Lead | 3.58E-03 | 3 50E-05 | NA | NA | 1.25E-05 | NA | NA |
| Manganese | 1.86E+00 | 1.82E-02 | 1.40E-01 | 1 30E-01 | 6 50E-03 | NA | NA |
| **PCBs/Pesticides** | | | | | | | |
| Dieldrin | 3.50E-05 | 3.42E-07 | 5.00E-05 | 6 85E-03 | 1.22E-07 | 1.60E+01 | 1 96E-06 |
| Heptachlor | 1.80E-05 | 1 76E-07 | 5.00E-04 | 3 52E-04 | 6 29E-08 | 4 50E+00 | 2.83E-07 |
| Heptachlor epoxide | 6.60E-05 | 6.46E-07 | 1.30E-05 | 4.97E-02 | 2 31E-07 | 9 10E+00 | 2.10E-06 |
| **Semivolatiles** | | | | | | | |
| Benzo(a)anthracene | 2.00E-03 | 1 96E-05 | NA | NA | 6.99E-06 | 7 30E-01 | 5.10E-06 |
| Benzo(b)fluoranthene | 1.00E-03 | 9 78E-06 | NA | NA | 3 49E-06 | 7.30E-01 | 2.55E-06 |
| Benzo(k)fluoranthene | 1.00E-03 | 9 78E-06 | NA | NA | 3.49E-06 | 7 30E-02 | 2 55E-07 |
| bis(2-Ethylhexyl)phthalate | 1.31E-02 | 1 28E-04 | 2.00E-02 | 6 39E-03 | 4 57E-05 | 1 40E-02 | 6 39E-07 |
| Dibenzofuran | 3.00E-03 | 2.94E-05 | 4.00E-03 | 7 34E-03 | 1 05E-05 | NA | NA |
| Phenanthrene | 1.04E-02 | 1 02E-04 | NA | NA | 3 65E-05 | NA | NA |
| | | | Total Hazard Index. | 0.52 | | | 2 17E-05 |




ENVIRONMENTAL STANDARDS

***Table 5?***
***Reasona... aximum Inhalation Exposure to VOC Vapors by an Industrial Work... wering with Columbia Aquifer Groundwater***
***Former Koppers Company, Inc., Newport, DE***

Average Daily Intake (mg/kg-day) = $\frac{\text{Dose} * \text{EF} * \text{ED}}{\text{AT}}$

| | | | |
|---|---|---|---|
| Dose - Inhalation dose = | chem specific | | |
| EF - Exposure frequency = | 250 | showers/year | US EPA 1991, HHEM Supp. Guid |
| Ed - Exposure duration = | 25 | years | Carey, 1988 |
| $AT_n$ - Averaging Time noncarcinogenic = | 9125 | days | US EPA 1989, RAGS Part A |
| $AT_c$ - Averaging Time carcinogenic = | 25550 | days | US EPA 1989, RAGS Part A |

Inhalation Dose (mg/kg-shower) =
((VR * S) / (BW * Rex * $10^6$)) * (Ds + (exp(-Rex * Dt) / Rex) - (exp(Rex * (Ds - Dt)) / Rex))

| | | | |
|---|---|---|---|
| VR - Ventilation Rate = | 15 | L/min | Foster, Chrostowski, 1987 |
| S - Indoor VOC generation rate = | chem. specific | ug/m$^3$-min | |
| BW - Body Weight = | 70 | kg | US EPA 1989, RAGS Part A |
| Rex - Air Exchange Rate = | 0.0083 | exchange/min | Foster, Chrostowski, 1987 |
| Ds - Duration in Shower = | 15 | min | US EPA 1995, Exp. Factors Handbook |
| Dt - Total Duration in Shower Room = | 20 | min | reasonable maximum |

S (ug/m$^3$-min) = (Cwd * FR) / SV

| | | | |
|---|---|---|---|
| Cwd - Concentration leaving shower droplet after time ts = | chem. specific | ug/L | |
| FR - Shower Water Flow Rate = | 10 | L/min | Foster, Chrostowski, 1987 |
| SV - Shower Room Air Volume = | 6 | m$^3$ | Foster, Chrostowski, 1987 |

Cwd (ug/L) = Cwo * $CF_1$ * (1-exp((-Kal * tsd) / (60 * d)))

| | | | |
|---|---|---|---|
| Cwo - Shower water concentration = | chem specific | mg/L | |
| $CF_1$ - Conversion factor = | 1 00E+03 | ug/mg | |
| Kal - overall mass transfer coefficient = | chem. specific | cm/hr | |
| tsd - shower droplet drop time = | 2 | sec | Foster, Chrostowski, 1987 |
| d - shower droplet diameter = | 1 | mm | Foster, Chrostowski, 1987 |

Kal (cm/hour) = KL / ((T$_1$ * u$_s$) / (T$_s$ * u$_l$))$^{0.5}$

| | | |
|---|---|---|
| KL - mass transfer coefficient = | chem specific | cm/hr |
| $T_l$ - calibration water temperature = | 293 | K |
| $u_s$ - water viscosity at Ts = | 0 596 | cp |
| $T_s$ - shower water temperature = | 318 | K |
| $u_l$ - water viscosity at Tl = | 1 002 | cp |

KL (cm/hr) = ((1 / kl(voc))+((R * T) / (H * kg(voc))))$^{-1}$

| | | |
|---|---|---|
| kl(voc) - liquid-film mass transfer coefficient = | chem. specific | cm/hr |
| R - universal gas constant = | 8 20E-05 | atm-m$^3$/mol K |
| T - absolute temperature = | 293 | K |
| H - Henry's Law Constant = | chem specific | atm-m$^3$/mol |
| kg(voc) - gas-film mass transfer coefficient = | chem. specific | cm/hr |

kg(voc) (cm/hr) = kg($H_2O$) * (18 / MWvoc)$^{0.5}$

| | | |
|---|---|---|
| kg($H_2O$) = | 3000 | cm/hr |
| MW - molecular weight = | chem. specific | g/mol |

kl(voc) (cm/hr) = kl($CO_2$) * (44 / MWvoc)$^{0.5}$

| | | |
|---|---|---|
| kl($CO_2$) = | 20 | cm/hr |

| Constituent | Cwo mg/L | kl(voc) cm/hr | kg(voc) cm/hr | KL cm/hr | Kal cm/hr | Cwd ug/L | S ug/m$^3$-min | Inhalation Dose mg/kg-shower | Average Daily Intake mg/kg-day | Inhalation Chronic RfD mg/kg-day | Hazard Index | Lifetime Average Daily Intake mg/kg-day | Inhalation Cancer Slope Factor 1/(mg/kg-day) | Cancer Risk |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **PCBs/Pesticides** | | | | | | | | | | | | | | |
| Dieldrin | 3.50E-05 | 6 80E+00 | 6 52E+02 | 1 28E+00 | 1 73E+00 | 1 96E-06 | 3 26E-06 | 1 24E-10 | 8 48E-11 | NA | NA | 3 03E-11 | 1 60E+01 | 4 84E-10 |
| Heptachlor | 1 80E-05 | 6 87E+00 | 6 59E+02 | 5 87E+00 | 7 93E+00 | 4 18E-06 | 6 97E-06 | 2 64E-10 | 1 81E-10 | NA | NA | 6 47E-11 | 4 50E+00 | 2 91E-10 |
| Heptachlor epoxide | 6 60E-05 | 6 72E+00 | 6 45E+02 | 7 62E-01 | 1 03E+00 | 2 23E-06 | 3 71E-06 | 1 41E-10 | 9 64E-11 | NA | NA | 3 44E-11 | 9 10E+00 | 3 13E-10 |
| **Semivolatiles** | | | | | | | | | | | | | | |
| Benzo(a)anthracene | 2 00E-03 | 8 78E+00 | 8 42E+02 | 2 72E-01 | 3 68E-01 | 2 44E-05 | 4 06E-05 | 1 54E-09 | 1.06E-09 | NA | NA | 3 77E-10 | NA | NA |
| Benzo(b)fluoranthene | 1.00E-03 | 8 35E+00 | 8 01E+02 | 2 56E+00 | 3 46E+00 | 1 09E-04 | 1.82E-04 | 6 90E-09 | 4 72E-09 | NA | NA | 1 69E-09 | NA | NA |
| Benzo(k)fluoranthene | 1 00E-03 | 8 35E+00 | 8 01E+02 | 1 33E-02 | 1 80E-02 | 6 00E-07 | 9 99E-07 | 3 79E-11 | 2 60E-11 | NA | NA | 9 27E-12 | NA | NA |
| bis(2-Ethylhexyl)phthalate | 1.31E-02 | 6 71E+00 | 6 44E+02 | 3 72E-01 | 5 03E-01 | 2 17E-04 | 3 62E-04 | 1 37E-08 | 9 40E-09 | NA | NA | 3 36E-09 | 1.40E-02 | 4 70E-11 |
| Dibenzofuran | 3 00E-03 | 1 02E+01 | 9 81E+02 | 4 70E+00 | 6 35E+00 | 5 72E-04 | 9 54E-04 | 3 62E-08 | 2 48E-08 | NA | NA | 8 85E-09 | NA | NA |
| Phenanthrene | 1 04E-02 | 9 94E+00 | 9 53E+02 | 1.25E+00 | 1 69E+00 | 5 71E-04 | 9 52E-04 | 3 61E-08 | 2 47E-08 | NA | NA | 8 84E-09 | NA | NA |
| | | | | | | | | | Total Hazard Index | | NA | | | |



**ENVIRONMENTAL STANDARDS**

*Table 36*

***Reasonable Maximum Dermal Exposure to Columbia Aquifer Groundwater (Including MW-2 and MW-8) for an Industrial Worker Showering***

***Former Koppers Company, Inc., Newport, DE***

Average Daily Intake (mg/kg-day) = $\frac{DA * EF * ED * FS * SAt}{BW * AT}$

| | | | |
|---|---|---|---|
| DA - Absorbed dose = | chem specific | mg/day-cm$^2$ | |
| EF - Exposure frequency = | 250 | day/year | US EPA 1991, HHEM Supp Guidance |
| ED - Exposure duration = | 25 | year | Carey, 1988 |
| SA - Skin surface area available for contact = | 20000 | cm$^2$ | calculated |
| SAt - Total skin surface area = | 20000 | cm$^2$ | US EPA 1989, RAGS Part A |
| FS - Fraction of skin surface area available for contact = | 100% | | reasonable maximum |
| BW - Body weight = | 70 | kg | US EPA 1989, RAGS Part A |
| $AT_n$ - Averaging Time noncarcinogenic = | 9125 | days | US EPA 1989, RAGS Part A |
| $AT_c$ - Averaging Time carcinogenic = | 25550 | days | US EPA 1989, RAGS Part A |

**For Inorganics:**

DA (mg/day-cm$^2$) = Kp * Cgw * t * CF

| | | | |
|---|---|---|---|
| Kp - Dermal permeability constant = | chem. specific | cm/hr | |
| Cgw - Chemical concentration in groundwater = | chem. specific | mg/L | |
| t - Event duration = | 0.25 | hr | US EPA 1992, Dermal Exp. Assess |
| CF - Conversion factor | 1.00E-03 | L/cm$^3$ | |

**For Organics:**

If t < t*, then $DA = 2 * CF * Cgw * Kp * (6 * \tau * t / \pi)^{0.5}$

If t>t*, then $DA = Kp * Cgw * CF * (t/(1+B) + (2 * \tau * ((1+3B) / (1+B)))$

| | | |
|---|---|---|
| t* - Percutaneous absorption time = | chem specific | hr |
| B - Partitioning coefficient = | chem. specific | dimensionless |
| τ - Lag time = | chem specific | hr |

| Analyte | Concentration in Groundwater mg/L | Kp cm/hr | t* hr | B | τ hr | Absorbed Dose mg/day-cm$^2$ | Average Daily Intake mg/kg-day | Dermal Chronic RfD mg/kg-day | Hazard Index | Average Lifetime Daily Intake mg/kg-day | Cancer Slope Factor 1/(mg/kg-day) | Cancer Risk |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dioxins** | | | | | | | | | | | | |
| 2,3,7,8-TCDD Equiv * | 1.17E-03 | 1.40E+00 | 3.80E+01 | 6.30E+02 | 8.10E+00 | 6.46E-06 | 1.26E-03 | NA | NA | 4.52E-04 | 3.00E+05 | 1.00E+00 |
| **Inorganics** | | | | | | | | | | | | |
| Antimony | 1.51E-03 | 1.00E-03 | NA | NA | NA | 3.78E-10 | 7.39E-08 | 4.00E-06 | 1.85E-02 | 2.64E-08 | NA | NA |
| Arsenic | 1.28E-03 | 1.00E-03 | NA | NA | NA | 3.21E-10 | 6.28E-08 | 2.85E-04 | 2.20E-04 | 2.24E-08 | 1.58E+00 | 3.54E-08 |
| Beryllium | 3.35E-04 | 1.00E-03 | NA | NA | NA | 8.38E-11 | 1.64E-08 | 2.00E-04 | 8.20E-05 | 5.86E-09 | 4.30E+01 | 2.52E-07 |
| Iron | 4.13E+00 | 1.00E-03 | NA | NA | NA | 1.03E-06 | 2.02E-04 | 1.50E-01 | 1.35E-03 | 7.22E-05 | NA | NA |
| Lead | 9.48E-04 | 4.00E-06 | NA | NA | NA | 9.48E-13 | 1.86E-10 | NA | NA | 6.63E-11 | NA | NA |
| Manganese | 5.61E-01 | 1.00E-03 | NA | NA | NA | 1.40E-07 | 2.75E-05 | NA | NA | 9.80E-06 | NA | NA |
| Thallium | 3.66E-03 | 1.00E-03 | NA | NA | NA | 9.14E-10 | 1.79E-07 | 5.60E-05 | 3.20E-03 | 6.39E-08 | NA | NA |
| **PCBs/Pesticides** | | | | | | | | | | | | |
| alpha-Chlordane | 7.82E-05 | 4.60E-02 | 1.30E+02 | 3.00E+01 | 2.80E+01 | 2.63E-08 | 5.15E-06 | 1.50E-04 | 3.43E-02 | 1.84E-06 | 1.17E+00 | 2.15E-06 |
| Dieldrin | 3.50E-05 | 1.60E-02 | 9.40E+01 | 3.60E+00 | 1.80E+01 | 3.28E-09 | 6.43E-07 | 1.50E-05 | 4.28E-02 | 2.29E-07 | 5.33E+01 | 1.22E-05 |
| Heptachlor | 1.80E-05 | 1.10E-02 | 9.40E+01 | 1.90E+00 | 1.70E+01 | 1.13E-09 | 2.21E-07 | 1.50E-04 | 1.47E-03 | 7.89E-08 | 1.50E+01 | 1.18E-06 |
| Heptachlor epoxide | 5.63E-05 | 2.76E-02 | 1.30E+02 | 9.55E+00 | 2.07E+01 | 9.77E-09 | 1.91E-06 | 3.90E-06 | 4.90E-01 | 6.83E-07 | 3.03E+01 | 2.07E- |




ENVIRONMENTAL STANDAR

AR316078

UAO Bates 00560

Table ...
*Rea... e Maximum Dermal Exposure to Columbia Aquifer Groundwater (l... ıg MW-2 and MW-8) for an Industrial Worker Showering*
*Form... Koppers Company, Inc., Newport, DE*

Average Daily Intake (mg/kg-day) = $\frac{DA * EF * ED * FS * SAt}{BW * AT}$

| | | | |
|---|---|---|---|
| DA - Absorbed dose = | chem. specific | mg/day-cm$^2$ | |
| EF - Exposure frequency = | 250 | day/year | US EPA 1991, HHEM Supp Guidance |
| ED - Exposure duration = | 25 | year | Carey, 1988 |
| SA - Skin surface area available for contact = | 20000 | cm$^2$ | calculated |
| SAt - Total skin surface area = | 20000 | cm$^2$ | US EPA 1989, RAGS Part A |
| FS - Fraction of skin surface area available for contact = | 100% | | reasonable maximum |
| BW - Body weight = | 70 | kg | US EPA 1989, RAGS Part A |
| $AT_n$ - Averaging Time noncarcinogenic = | 9125 | days | US EPA 1989, RAGS Part A |
| $AT_c$ - Averaging Time carcinogenic = | 25550 | days | US EPA 1989, RAGS Part A |

**For Inorganics:**

DA (mg/day-cm$^2$) = Kp * Cgw * t * CF

| | | | |
|---|---|---|---|
| Kp - Dermal permeability constant = | chem. specific | cm/hr | |
| Cgw - Chemical concentration in groundwater = | chem specific | mg/L | |
| t - Event duration = | 0.25 | hr | US EPA 1992, Dermal Exp. Assess |
| CF - Conversion factor | 1.00E-03 | L/cm$^3$ | |

**For Organics:**

If t < t*, then DA = 2 * CF * Cgw * Kp * $(6 * \tau * t / \pi)^{0.5}$
If t>t*, then DA = Kp * Cgw * CF * (t/(1+B) + (2 * τ * ((1+3B) / (1+B)))

| | | |
|---|---|---|
| t* - Percutaneous absorption time = | chem. specific | hr |
| B - Partitioning coefficient = | chem. specific | dimensionless |
| τ - Lag time = | chem. specific | hr |

| Analyte | Concentration in Groundwater mg/L | Kp cm/hr | t* hr | B | τ hr | Absorbed Dose mg/day-cm$^2$ | Average Daily Intake mg/kg-day | Dermal Chronic RfD mg/kg-day | Hazard Index | Average Lifetime Daily Intake mg/kg-day | Cancer Slope Factor 1/(mg/kg-day) | Cancer Risk |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Semivolatiles** | | | | | | | | | | | | |
| 2,4-Dimethylphenol | 1 50E+01 | 1 10E-01 | 1.20E+00 | 2.00E-02 | 4.90E-01 | 1.60E-03 | 3.12E-01 | 1.40E-02 | 2 23E+01 | 1.12E-01 | NA | NA |
| 2-Methylphenol | 2.20E+01 | 1.60E-02 | 1.57E-02 | 9.60E-01 | 8.90E-03 | 5.73E-05 | 1 12E-02 | 3.50E-02 | 3.20E-01 | 4 00E-03 | NA | NA |
| 4-Methylphenol | 5 20E+01 | 1.80E-02 | 1.75E-02 | 9 60E-01 | 8.70E-03 | 1 52E-04 | 2 97E-02 | 3 50E-03 | 8 48E+00 | 1.06E-02 | NA | NA |
| bis(2-Ethylhexyl)phthalate | 1 50E-02 | 3 30E-02 | 1 00E+02 | 1 30E+01 | 2 10E+01 | 3 13E-06 | 6.13E-04 | 1 40E-02 | 4.38E-02 | 2 19E-04 | 2 00E-02 | 4.38E-06 |
| Dibenzofuran | 5 69E+00 | 1.51E-01 | 9.07E+00 | 1.32E+00 | 9 29E-01 | 1 14E-03 | 2 24E-01 | 2.80E-03 | 8 00E+01 | 8.00E-02 | NA | NA |
| Pentachlorophenol | 6 00E-02 | 6.50E-01 | 1.70E+01 | 7.20E+01 | 3.70E+00 | 1.04E-04 | 2 03E-02 | 2 10E-02 | 9.66E-01 | 7 25E-03 | 1 71E-01 | 1 24E-03 |
| Phenol | 5.80E+01 | 8.10E-03 | 7.90E-01 | 2.90E-03 | 3.30E-01 | 3.73E-04 | 7.30E-02 | 4.20E-01 | 1 74E-01 | 2.61E-02 | NA | NA |
| **Volatiles** | | | | | | | | | | | | |
| Benzene | 2 64E-01 | 1 10E-01 | 6 30E-01 | 1.30E-02 | 2 60E-01 | 2 04E-05 | 4 00E-03 | 2.85E-03 | 1 40E+00 | 1 43E-03 | 3.05E-02 | 4 36E-05 |
| Ethylbenzene | 1 79E-01 | 1.00E+00 | 1.30E+00 | 1 40E-01 | 3 90E-01 | 1 55E-04 | 3 03E-02 | 9 50E-02 | 3 19E-01 | 1 08E-02 | NA | NA |
| Styrene | 6 49E-02 | 6.70E-01 | 9.10E-01 | 8 90E-02 | 3.80E-01 | 3.70E-05 | 7.25E-03 | 1 90E-01 | 3.81E-02 | 2 59E-03 | NA | NA |
| Toluene | 5 48E-01 | 1 00E+00 | 7 70E-01 | 5.40E-02 | 3.20E-01 | 4 29E-04 | 8 39E-02 | 1.90E-01 | 4.41E-01 | 2 99E-02 | NA | NA |
| Xylenes (total) | 1 90E+00 | 8 00E-02 | 6 53E+00 | 1 58E-01 | 3 89E-01 | 1.31E-04 | 2.56E-02 | 1 74E+00 | 1 47E-02 | 9 15E-03 | NA | NA |
| | | | | | | | | Total Hazard Index | 115.08 | | | 1 00E+ |

NA - Not applicable/available

Gwcol28 xls \ dermal - RME


ENVIRONMENTAL STANDARDS

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*Table 57*
***Reasonable Maximum Oral Exposure to Columbia Aquifer Groundwater (Including MW-2 and MW-8) While Drinking at the Job Site***
***Former Koppers Company, Inc., Newport, DE***

Average Daily Intake (mg/kg-day) = $\frac{Cgw * IR * ED * EF}{BW * AT}$

| | | | |
|---|---|---|---|
| Cgw - Concentration in groundwater = | chem specific | mg/L | |
| IR - Ingestion Rate = | 1 | L/day | US EPA 1991, HHEM Supp Guidance |
| ED - Exposure duration = | 25 | year | US EPA 1991, HHEM Supp Guidance |
| EF- Exposure frequency = | 250 | days/year | US EPA 1991, HHEM Supp Guidance |
| BW - Body weight = | 70 | kg | US EPA 1989, RAGS Part A |
| $AT_n$ - Averaging Time noncarcinogenic = | 9125 | days | US EPA 1989, RAGS Part A |
| $AT_c$ - Averaging Time carcinogenic = | 25550 | days | US EPA 1989, RAGS Part A |

| Analyte | Concentration in Groundwater mg/L | Average Daily Intake mg/kg-day | Oral Chronic RfD mg/kg-day | Hazard Index | Lifetime Average Daily Intake mg/kg-day | Oral Cancer Slope Factor 1/(mg/kg-day) | Cancer Risk |
|---|---|---|---|---|---|---|---|
| **Dioxins** | | | | | | | |
| 2,3,7,8-TCDD Equiv * | 1.17E-03 | 1 15E-05 | NA | NA | 4 10E-06 | 1 50E+05 | 4 59E-01 |
| **Inorganics** | | | | | | | |
| Antimony | 1.51E-03 | 1 48E-05 | 4.00E-04 | 3 69E-02 | 5.28E-06 | NA | NA |
| Arsenic | 1.28E-03 | 1 26E-05 | 3 00E-04 | 4.19E-02 | 4.49E-06 | 1 50E+00 | 6 73E-06 |
| Beryllium | 3 35E-04 | 3 28E-06 | 2 00E-03 | 1 64E-03 | 1.17E-06 | 4 30E+00 | 5.04E-06 |
| Iron | 4.13E+00 | 4 05E-02 | 3.00E-01 | 1 35E-01 | 1 44E-02 | NA | NA |
| Lead | 9.48E-04 | 9 28E-06 | NA | NA | 3 31E-06 | NA | NA |
| Manganese | 5.61E-01 | 5 49E-03 | 1.40E-01 | 3 92E-02 | 1.96E-03 | NA | NA |
| Thallium | 3 66E-03 | 3 58E-05 | 7 00E-05 | 5 11E-01 | 1 28E-05 | NA | NA |
| **PCBs/Pesticides** | | | | | | | |
| alpha-Chlordane | 7.82E-05 | 7.66E-07 | 5 00E-04 | 1 53E-03 | 2 73E-07 | 3 50E-01 | 9 57E-08 |
| Dieldrin | 3 50E-05 | 3 42E-07 | 5 00E-05 | 6 85E-03 | 1.22E-07 | 1 60E+01 | 1 96E-06 |
| Heptachlor | 1.80E-05 | 1 76E-07 | 5 00E-04 | 3 52E-04 | 6 29E-08 | 4.50E+00 | 2.83E-07 |
| Heptachlor epoxide | 5 63E-05 | 5.50E-07 | 1 30E-05 | 4 23E-02 | 1 97E-07 | 9 10E+00 | 1 79E-06 |
| **Semivolatiles** | | | | | | | |
| 2,4-Dimethylphenol | 1 50E+01 | 1.47E-01 | 2.00E-02 | 7 34E+00 | 5 24E-02 | NA | NA |
| 2-Methylnaphthalene | 1 30E+01 | 1 27E-01 | 2.00E-02 | 6.36E+00 | 4.54E-02 | NA | NA |
| 2-Methylphenol | 2 20E+01 | 2.15E-01 | 5 00E-02 | 4.31E+00 | 7 69E-02 | NA | NA |
| 4-Methylphenol | 5 20E+01 | 5 09E-01 | 5 00E-03 | 1 02E+02 | 1 82E-01 | NA | NA |
| Acenaphthene | 1.00E+01 | 9 78E-02 | 6.00E-02 | 1.63E+00 | 3 49E-02 | NA | NA |
| Acenaphthylene | 1 84E-01 | 1.80E-03 | NA | NA | 6 42E-04 | NA | NA |
| Anthracene | 3.06E-01 | 3 00E-03 | 3 00E-01 | 9.99E-03 | 1 07E-03 | NA | NA |
| Benzo(a)anthracene | 1.70E-01 | 1.66E-03 | NA | NA | 5 93E-04 | 7 30E-01 | 4 33E-04 |
| Benzo(a)pyrene | 1 33E-01 | 1 30E-03 | NA | NA | 4 65E-04 | 7 30E+00 | 3 40E-03 |
| Benzo(b)fluoranthene | 1.30E-01 | 1.27E-03 | NA | NA | 4 53E-04 | 7 30E-01 | 3 31E-04 |
| Benzo(g,h,i)perylene | 6.00E-03 | 5 87E-05 | NA | NA | 2.10E-05 | NA | NA |
| Benzo(k)fluoranthene | 1 05E-01 | 1 02E-03 | NA | NA | 3 65E-04 | 7 30E-02 | 2 67E-05 |
| bis(2-Ethylhexyl)phthalate | 1.50E-02 | 1 47E-04 | NA | NA | 5.24E-05 | 1 40E-02 | 7 34E-07 |
| Carbazole | 1.80E+00 | 1 76E-02 | NA | NA | 6 29E-03 | 2 00E-02 | 1 26E-04 |
| Chrysene | 1 32E-01 | 1.29E-03 | NA | NA | 4.61E-04 | 7 30E-03 | 3.37E-06 |
| Dibenzofuran | 5 69E+00 | 5.56E-02 | 4 00E-03 | 1 39E+01 | 1.99E-02 | NA | NA |
| Fluoranthene | 8.18E-01 | 8 01E-03 | 4 00E-02 | 2 00E-01 | 2 86E-03 | NA | NA |
| Fluorene | 8 19E+00 | 8.01E-02 | 4.00E-02 | 2.00E+00 | 2.86E-02 | NA | NA |
| Indeno(1,2,3-c,d)pyrene | 5.00E-03 | 4.89E-05 | NA | NA | 1.75E-05 | 7 30E-01 | 1 28E-05 |
| Naphthalene | 6.00E+01 | 5.87E-01 | 2 00E-02 | 2.94E+01 | 2 10E-01 | NA | NA |
| Pentachlorophenol | 6.00E-02 | 5 87E-04 | 3 00E-02 | 1.96E-02 | 2.10E-04 | 1 20E-01 | 2 52E-05 |
| Phenanthrene | 1 85E+01 | 1 81E-01 | NA | NA | 6.48E-02 | NA | NA |
| Phenol | 5 80E+01 | 5.68E-01 | 6.00E-01 | 9 46E-01 | 2.03E-01 | NA | NA |
| Pyrene | 6 37E-01 | 6 23E-03 | 3 00E-02 | 2 08E-01 | 2.23E-03 | NA | NA |
| **Volatiles** | | | | | | | |
| Benzene | 2 64E-01 | 2 58E-03 | 3 00E-03 | 8.60E-01 | 9 22E-04 | 2 90E-02 | 2 67E-05 |
| Ethylbenzene | 1 79E-01 | 1 75E-03 | 1 00E-01 | 1 75E-02 | 6 27E-04 | NA | NA |
| Styrene | 6 49E-02 | 6.35E-04 | 2.00E-01 | 3.17E-03 | 2 27E-04 | NA | NA |
| Toluene | 5 48E-01 | 5.36E-03 | 2.00E-01 | 2 68E-02 | 1 92E-03 | NA | NA |
| Xylenes (total) | 1 90E+00 | 1 86E-02 | 2 00E+00 | 9 30E-03 | 6 64E-03 | NA | NA |
| NA - Not available | | | Total Hazard Index | 169 78 | | | 4 64E-01 |

* Cancer risks calculated using one-hit equation, US EPA RAGS Part A, 1989.





ENVIRONMENTAL STANDARDS

Table 5x

**Reaso  Maximum Exposure - Inhalation of VOC Vapors from Columbia Aq  roundwater (Including MW-2 and MW-8) by an Industrial Worker S  ing**
**Forme.  pers Company, Inc., Newport, DE**

Average Daily Intake (mg/kg-day)= $\frac{Dose * EF * ED}{AT}$

| | | | |
|---|---|---|---|
| Dose - Inhalation dose = | chem. specific | | |
| EF - Exposure frequency = | 250 | showers/year | US EPA 1991, HHEM Supp. Guid. |
| Ed - Exposure duration = | 25 | years | Carey, 1988 |
| $AT_n$ - Averaging Time noncarcinogenic = | 9125 | days | US EPA 1989, RAGS Part A |
| $AT_c$ - Averaging Time carcinogenic = | 25550 | days | US EPA 1989, RAGS Part A |

Inhalation Dose (mg/kg-shower) =
((VR * S) / (BW * Rex * $10^6$)) * (Ds + (exp(-Rex * Dt) / Rex) - (exp(Rex * (Ds - Dt)) / Rex))

| | | | |
|---|---|---|---|
| VR - Ventilation Rate = | 15 | L/min | Foster, Chrostowski, 1987 |
| S - Indoor VOC generation rate = | chem. specific | ug/m$^3$-min | |
| BW - Body Weight = | 70 | kg | US EPA 1989, RAGS Part A |
| Rex - Air Exchange Rate = | 0.0083 | exchange/mi | Foster, Chrostowski, 1987 |
| Ds - Duration in Shower = | 15 | min | US EPA 1995, Exp. Factors Handbook |
| Dt - Total Duration in Shower Room = | 20 | min | reasonable maximum |

S (ug/m$^3$-min) = (Cwd * FR) / SV

| | | | |
|---|---|---|---|
| Cwd - Concentration leaving shower droplet after time ts = | chem specific | ug/L | |
| FR - Shower Water Flow Rate = | 10 | L/min | Foster, Chrostowski, 1987 |
| SV - Shower Room Air Volume = | 6 | m$^3$ | Foster, Chrostowski, 1987 |

Cwd (ug/L) = Cwo * CF1 * (1-exp((-Kal * tsd) / (60 * d)))

| | | | |
|---|---|---|---|
| Cwo - Shower water concentration = | chem specific | mg/L | |
| CF1 - Conversion factor = | 1 00E+03 | ug/mg | |
| Kal - overall mass transfer coefficient = | chem. specific | cm/hr | |
| tsd - shower droplet drop time = | 2 | sec | Foster, Chrostowski, 1987 |
| d - shower droplet diameter = | 1 | mm | Foster, Chrostowski, 1987 |

Kal (cm/hour) = KL / (($T_1$ * $u_s$) / ($T_s$ * $u_l$))$^{0.5}$

| | | |
|---|---|---|
| KL - mass transfer coefficient = | chem specific | cm/hr |
| $T_1$ - calibration water temperature = | 293 | K |
| $u_s$ - water viscosity at Ts = | 0 596 | cp |
| $T_s$ - shower water temperature = | 318 | K |
| $u_l$ - water viscosity at Tl = | 1.002 | cp |

KL (cm/hr) = ((1 / kl(voc))+((R * T) / (H * kg(voc))))$^{-1}$

| | | |
|---|---|---|
| kl(voc) - liquid-film mass transfer coefficient = | chem specific | cm/hr |
| R - universal gas constant = | 8 20E-05 | atm-m$^3$/mol K |
| T - absolute temperature = | 293 | K |
| H - Henry's Law Constant = | chem specific | atm-m$^3$/mol |
| kg(voc) - gas-film mass transfer coefficient = | chem specific | cm/hr |

kg(voc) (cm/hr) = kg($H_2O$) * (18 / MWvoc)$^{0.5}$

| | | |
|---|---|---|
| kg($H_2O$) = | 3000 | cm/hr |
| MW - molecular weight = | chem specific | g/mol |

kl(voc) (cm/hr) = kl($CO_2$) * (44 / MW)$^{0.5}$

| | | |
|---|---|---|
| kl($CO_2$) = | 20 | cm/hr |

| Constituent | Cwo mg/L | kl(voc) cm/hr | kg(voc) cm/hr | KL cm/hr | Kal cm/hr | Cwd ug/L | S ug/m$^3$-min | Inhalation Dose mg/kg-shower | Average Daily Intake mg/kg-day | Inhalation Chronic RfD mg/kg-day | Hazard Index | Lifetime Average Daily Intake mg/kg-day | Inhalation Cancer Slope Factor 1/(mg/kg-day) | Cancer Risk |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dioxins** | | | | | | | | | | | | | | |
| 2,3,7,8-TCDD Equiv | 1 17E-03 | 7 39E+00 | 7 09E+02 | 5 86E-02 | 7.91E-02 | 3.09E-06 | 5.15E-06 | 1 95E-10 | 1.34E-10 | NA | NA | 4 78E-11 | 1 50E+05 | 7 17E-06 |
| **PCBs/Pesticides** | | | | | | | | | | | | | | |
| alpha-Chlordane | 7.82E-05 | 6 55E+00 | 6 29E+02 | 3 81E+00 | 5 14E+00 | 1 23E-05 | 2.05E-05 | 7 79E-10 | 5.34E-10 | 2 00E-04 | 2 67E-06 | 1 91E-10 | 3.50E-01 | 6 67E-11 |
| Dieldrin | 3 50E-05 | 6 80E+00 | 6.52E+02 | 1.28E+00 | 1 73E+00 | 1 96E-06 | 3.26E-06 | 1 24E-10 | 8 48E-11 | NA | NA | 3.03E-11 | 1 60E+01 | 4 84E-10 |
| Heptachlor | 1.80E-05 | 6 87E+00 | 6.59E+02 | 5.87E+00 | 7.93E+00 | 4.18E-06 | 6.97E-06 | 2.64E-10 | 1.81E-10 | NA | NA | 6.47E-11 | 4 50E+00 | 2.91E-10 |
| Heptachlor epoxide | 5 63E-05 | 6 72E+00 | 6 45E+02 | 7 62E-01 | 1 03E+00 | 1 90E-06 | 3.16E-06 | 1 20E-10 | 8 22E-11 | NA | NA | 2 93E-11 | 9.10E+00 | 2 67E-10 |
| **Semivolatiles** | | | | | | | | | | | | | | |
| 2,4-Dimethylphenol | 1 50E+01 | 1.20E+01 | 1 15E+03 | 9 51E-02 | 1 28E-01 | 6.41E-02 | 1 07E-01 | 4 05E-06 | 2 78E-06 | NA | NA | 9 91E-07 | NA | NA |
| 2-Methylnaphthalene | 1.30E+01 | 1 11E+01 | 1 07E+03 | 7.50E+00 | 1 01E+01 | 3.73E+00 | 6 21E+00 | 2 36E-04 | 1 61E-04 | NA | NA | 5 76E-05 | NA | NA |
| 2-Methylphenol | 2 20E+01 | 1 28E+01 | 1 22E+03 | 6 08E-02 | 8.22E-02 | 6 02E-02 | 1.00E-01 | 3 81E-06 | 2 61E-06 | NA | NA | 9 31E-07 | NA | NA |
| 4-Methylphenol | 5.20E+01 | 1 28E+01 | 1 22E+03 | 5 07E-02 | 6 85E-02 | 1.19E-01 | 1.98E-01 | 7 50E-06 | 5.14E-06 | NA | NA | 1 84E-06 | NA | NA |
| Acenaphthene | 1.00E+01 | 1 07E+01 | 1 02E+03 | 4 08E+00 | 5.52E+00 | 1.68E+00 | 2 80E+00 | 1 06E-04 | 7 28E-05 | NA | NA | 2 60E-05 | NA | NA |
| Acenaphthylene | 1.84E-01 | 1 08E+01 | 1 03E+03 | 3 36E+00 | 4 54E+00 | 2.58E-02 | 4 30E-02 | 1 63E-06 | 1.12E-06 | NA | NA | 3.99E-07 | NA | NA |

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ENVIRONMENTAL STANDARDS

**Table 58**

***Reasonable Maximum Exposure - Inhalation of VOC Vapors from Columbia Aquifer Groundwater (Including MW-2 and MW-8) by an Industrial Worker Showering***

***Former Koppers Company, Inc., Newport, DE***

Average Daily Intake (mg/kg-day) = $\frac{Dose * EF * ED}{AT}$

| | | | |
|---|---|---|---|
| Dose - Inhalation dose = | chem specific | | |
| EF - Exposure frequency = | 250 | showers/year | US EPA 1991, HHEM Supp Guid. |
| Ed - Exposure duration = | 25 | years | Carey, 1988 |
| $AT_n$ - Averaging Time noncarcinogenic = | 9125 | days | US EPA 1989, RAGS Part A |
| $AT_c$ - Averaging Time carcinogenic = | 25550 | days | US EPA 1989, RAGS Part A |

Inhalation Dose (mg/kg-shower) =

((VR * S) / (BW * Rex * $10^6$)) * (Ds + (exp(-Rex * Dt) / Rex) - (exp(Rex * (Ds - Dt)) / Rex))

| | | | |
|---|---|---|---|
| VR - Ventilation Rate = | 15 | L/min | Foster, Chrostowski, 1987 |
| S - Indoor VOC generation rate = | chem specific | $ug/m^3$-min | |
| BW - Body Weight = | 70 | kg | US EPA 1989, RAGS Part A |
| Rex - Air Exchange Rate = | 0 0083 | exchange/mi | Foster, Chrostowski, 1987 |
| Ds - Duration in Shower = | 15 | min | US EPA 1995, Exp Factors Handbook |
| Dt - Total Duration in Shower Room = | 20 | min | reasonable maximum |

S ($ug/m^3$-min) = (Cwd * FR) / SV

| | | | |
|---|---|---|---|
| Cwd - Concentration leaving shower droplet after time ts = | chem. specific | ug/L | |
| FR - Shower Water Flow Rate = | 10 | L/min | Foster, Chrostowski, 1987 |
| SV - Shower Room Air Volume = | 6 | $m^3$ | Foster, Chrostowski, 1987 |

Cwd (ug/L) = Cwo * CFi * (1-exp((-Kal * tsd) / (60 * d)))

| | | | |
|---|---|---|---|
| Cwo - Shower water concentration = | chem. specific | mg/L | |
| CFi - Conversion factor = | 1 00E+03 | ug/mg | |
| Kal - overall mass transfer coefficient = | chem specific | cm/hr | |
| tsd - shower droplet drop time = | 2 | sec | Foster, Chrostowski, 1987 |
| d - shower droplet diameter = | 1 | mm | Foster, Chrostowski, 1987 |

Kal (cm/hour) = KL / (($T_l$ * $u_s$) / ($T_s$ * $u_l$))$^{0.5}$

| | | |
|---|---|---|
| KL - mass transfer coefficient = | chem specific | cm/hr |
| $T_l$ - calibration water temperature = | 293 | K |
| $u_s$ - water viscosity at Ts = | 0.596 | cp |
| $T_s$ - shower water temperature = | 318 | K |
| $u_l$ - water viscosity at Tl = | 1 002 | cp |

KL (cm/hr) = ((1 / kl(voc))+((R * T) / (H * kg(voc))))$^{-1}$

| | | |
|---|---|---|
| kl(voc) - liquid-film mass transfer coefficient = | chem specific | cm/hr |
| R - universal gas constant = | 8 20E-05 | atm-$m^3$/mol K |
| T - absolute temperature = | 293 | K |
| H - Henry's Law Constant = | chem. specific | atm-$m^3$/mol |
| kg(voc) - gas-film mass transfer coefficient = | chem specific | cm/hr |

kg(voc) (cm/hr) = kg($H_2O$) * (18 / MWvoc)$^{0.5}$

| | | |
|---|---|---|
| kg($H_2O$) = | 3000 | cm/hr |
| MW - molecular weight = | chem specific | g/mol |

kl(voc) (cm/hr) = kl($CO_2$) * (44 / MW)$^{0.5}$

| | | |
|---|---|---|
| kl($CO_2$) = | 20 | cm/hr |

| Constituent | Cwo mg/L | kl(voc) cm/hr | kg(voc) cm/hr | KL cm/hr | Kal cm/hr | Cwd ug/L | S ug/m³-min | Inhalation Dose mg/kg-shower | Average Daily Intake mg/kg-day | Inhalation Chronic RfD mg/kg-day | Hazard Index | Lifetime Average Daily Intake mg/kg-day | Inhalation Cancer Slope Factor 1/(mg/kg-day) | Cancer Risk |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Anthracene | 3 06E-01 | 9 94E+00 | 9.53E+02 | 7.37E+00 | 9 96E+00 | 8 65E-02 | 1.44E-01 | 5 47E-06 | 3 75E-06 | NA | NA | 1 34E-06 | NA | NA |
| Benzo(a)anthracene | 1 70E-01 | 8 78E+00 | 8.42E+02 | 2 72E-01 | 3 68E-01 | 2 07E-03 | 3 45E-03 | 1 31E-07 | 8 97E-08 | NA | NA | 3 20E-08 | NA | NA |
| Benzo(a)pyrene | 1.33E-01 | 8.35E+00 | 8 01E+02 | 8 09E-02 | 1 09E-01 | 4 84E-04 | 8 07E-04 | 3 06E-08 | 2 10E-08 | NA | NA | 7 49E-09 | 3 10E+00 | 2.32E-08 |
| Benzo(b)fluoranthene | 1 30E-01 | 8.35E+00 | 8.01E+02 | 2 56E+00 | 3 46E+00 | 1 42E-02 | 2.36E-02 | 8 95E-07 | 6 13E-07 | NA | NA | 2 19E-07 | NA | NA |
| Benzo(g,h,i)perylene | 6 00E-03 | 7 98E+00 | 7 66E+02 | 5 07E-02 | 6 84E-02 | 1.37E-05 | 2.28E-05 | 8 65E-10 | 5 92E-10 | NA | NA | 2 11E-10 | NA | NA |
| Benzo(k)fluoranthene | 1 05E-01 | 8 35E+00 | 8 01E+02 | 1 33E-02 | 1 80E-02 | 6 27E-05 | 1 04E-04 | 3 96E-09 | 2 72E-09 | NA | NA | 9 70E-10 | NA | NA |
| bis(2-Ethylhexyl)phthalate | 1 50E-02 | 6 71E+00 | 6 44E+02 | 3.72E-01 | 5 03E-01 | 2 49E-04 | 4 15E-04 | 1 58E-08 | 1 08E-08 | NA | NA | 3 86E-09 | 1 40E-02 | 5 40E-11 |
| Carbazole | 1 80E+00 | 1 03E+01 | 9 84E+02 | 3 54E-03 | 4 79E-03 | 2 87E-04 | 4 78E-04 | 1 82E-08 | 1.24E-08 | NA | NA | 4 44E-09 | NA | NA |
| Chrysene | 1 32E-01 | 8 78E+00 | 8 42E+02 | 2 41E+00 | 3 25E+00 | 1 36E-02 | 2 26E-02 | 8 57E-07 | 5 87E-07 | NA | NA | 2 10E-07 | NA | NA |
| Dibenzofuran | 5 69E+00 | 1 02E+01 | 9 81E+02 | 4 70E+00 | 6 35E+00 | 1 08E+00 | 1 81E+00 | 6 86E-05 | 4.70E-05 | NA | NA | 1 68E-05 | NA | NA |
| Fluoranthene | 8 18E-01 | 9 33E+00 | 8 95E+02 | 3 28E+00 | 4 43E+00 | 1 12E-01 | 1 87E-01 | 7 11E-06 | 4 87E-06 | NA | NA | 1 74E-06 | NA | NA |
| Fluorene | 8.19E+00 | 1.03E+01 | 9 87E+02 | 2.94E+00 | 3.97E+00 | 1.01E+00 | 1.69E+00 | 6.41E-05 | 4.39E-05 | NA | NA | 1 57E-05 | NA | NA |

AR316082



ENVIRONMENTAL STANDAF

**Table** ...
**Reas... Maximum Exposure - Inhalation of VOC Vapors from Columbia A... Groundwater (Including MW-2 and MW-8) by an Industrial Worker ... ring**
**Forme... ...oppers Company, Inc., Newport, DE**

Average Daily Intake (mg/kg-day) = $\frac{Dose \cdot EF \cdot ED}{AT}$

| | | | |
|---|---|---|---|
| Dose - Inhalation dose = | chem specific | | |
| EF - Exposure frequency = | 250 | showers/year | US EPA 1991, HHEM Supp Guid |
| Ed - Exposure duration = | 25 | years | Carey, 1988 |
| $AT_n$ - Averaging Time noncarcinogenic = | 9125 | days | US EPA 1989, RAGS Part A |
| $AT_c$ - Averaging Time carcinogenic = | 25550 | days | US EPA 1989, RAGS Part A |

Inhalation Dose (mg/kg-shower) =
$((VR \cdot S) / (BW \cdot Rex \cdot 10^6)) \cdot (Ds + (\exp(-Rex \cdot Dt) / Rex) - (\exp(Rex \cdot (Ds - Dt)) / Rex))$

| | | | |
|---|---|---|---|
| VR - Ventilation Rate = | 15 | L/min | Foster, Chrostowski, 1987 |
| S - Indoor VOC generation rate = | chem. specific | ug/m³-min | |
| BW - Body Weight = | 70 | kg | US EPA 1989, RAGS Part A |
| Rex - Air Exchange Rate = | 0 0083 | exchange/mi | Foster, Chrostowski, 1987 |
| Ds - Duration in Shower = | 15 | min | US EPA 1995, Exp. Factors Handbook |
| Dt - Total Duration in Shower Room = | 20 | min | reasonable maximum |

S (ug/m³-min) = (Cwd * FR) / SV

| | | | |
|---|---|---|---|
| Cwd - Concentration leaving shower droplet after time ts = | chem. specific | ug/L | |
| FR - Shower Water Flow Rate = | 10 | L/min | Foster, Chrostowski, 1987 |
| SV - Shower Room Air Volume = | 6 | m³ | Foster, Chrostowski, 1987 |

Cwd (ug/L) = $Cwo \cdot CFi \cdot (1 - \exp((-Kal \cdot tsd) / (60 \cdot d)))$

| | | | |
|---|---|---|---|
| Cwo - Shower water concentration = | chem. specific | mg/L | |
| CFi - Conversion factor = | 1 00E+03 | ug/mg | |
| Kal - overall mass transfer coefficient = | chem. specific | cm/hr | |
| tsd - shower droplet drop time = | 2 | sec | Foster, Chrostowski, 1987 |
| d - shower droplet diameter = | 1 | mm | Foster, Chrostowski, 1987 |

Kal (cm/hour) = $KL / ((T_l \cdot u_s) / (T_s \cdot u_l))^{0.5}$

| | | |
|---|---|---|
| KL - mass transfer coefficient = | chem. specific | cm/hr |
| $T_l$ - calibration water temperature = | 293 | K |
| $u_s$ - water viscosity at Ts = | 0 596 | cp |
| $T_s$ - shower water temperature = | 318 | K |
| $u_l$ - water viscosity at Tl = | 1.002 | cp |

KL (cm/hr) = $((1 / kl(voc)) + ((R \cdot T) / (H \cdot kg(voc))))^{-1}$

| | | |
|---|---|---|
| kl(voc) - liquid-film mass transfer coefficient = | chem. specific | cm/hr |
| R - universal gas constant = | 8 20E-05 | atm-m³/mol K |
| T - absolute temperature = | 293 | K |
| H - Henry's Law Constant = | chem specific | atm-m³/mol |
| kg(voc) - gas-film mass transfer coefficient = | chem. specific | cm/hr |

kg(voc) (cm/hr) = $kg(H_2O) \cdot (18 / MWvoc)^{0.5}$

| | | |
|---|---|---|
| $kg(H_2O)$ = | 3000 | cm/hr |
| MW - molecular weight = | chem. specific | g/mol |

kl(voc) (cm/hr) = $kl(CO_2) \cdot (44 / MW)^{0.5}$

$kl(CO_2)$ = 20 cm/hr

| Constituent | Cwo mg/L | kl(voc) cm/hr | kg(voc) cm/hr | KL cm/hr | Kal cm/hr | Cwd ug/L | S ug/m³-min | Inhalation Dose mg/kg-shower | Average Daily Intake mg/kg-day | Inhalation Chronic RfD mg/kg-day | Hazard Index | Lifetime Average Daily Intake mg/kg-day | Inhalation Cancer Slope Factor 1/(mg/kg-day) | Cancer Risk |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Indeno(1,2,3-c,d)pyrene | 5.00E-03 | 7 98E+00 | 7.66E+02 | 5.07E-02 | 6 84E-02 | 1.14E-05 | 1.90E-05 | 7.20E-10 | 4.93E-10 | NA | NA | 1.76E-10 | NA | NA |
| Naphthalene | 6.00E+01 | 1 17E+01 | 1 12E+03 | 7 72E+00 | 1 04E+01 | 1 76E+01 | 2 94E+01 | 1 11E-03 | 7 63E-04 | 9.00E-04 | NA | 2 72E-04 | NA | NA |
| Pentachlorophenol | 6 00E-02 | 8.13E+00 | 7.80E+02 | 7.95E-04 | 1.07E-03 | 2.15E-06 | 3 58E-06 | 1 36E-10 | 9.30E-11 | NA | NA | 3 32E-11 | NA | NA |
| Phenanthrene | 1 85E+01 | 9 94E+00 | 9 53E+02 | 1 25E+00 | 1 69E+00 | 1.01E+00 | 1.69E+00 | 6 41E-05 | 4.39E-05 | NA | NA | 1 57E-05 | NA | NA |
| Phenol | 5 80E+01 | 1.37E+01 | 1 31E+03 | 1.82E-02 | 2 45E-02 | 4.74E-02 | 7 90E-02 | 3.00E-06 | 2 05E-06 | NA | NA | 7.33E-07 | NA | NA |
| Pyrene | 6 37E-01 | 9.33E+00 | 8 95E+02 | 3.93E-01 | 5.30E-01 | 1.12E-02 | 1.86E-02 | 7 06E-07 | 4 83E-07 | NA | NA | 1.73E-07 | NA | NA |
| Volatiles | | | | | | | | | | | | | | |
| Benzene | 2.64E-01 | 1.50E+01 | 1.44E+03 | 1.44E+01 | 1.94E+01 | 1.26E-01 | 2 09E-01 | 7 95E-06 | 5 44E-06 | 1.70E-03 | 3.20E-03 | 1 94E-06 | 2 90E-02 | 5 64E-08 |
| Ethylbenzene | 1 79E-01 | 1.29E+01 | 1.24E+03 | 1 25E+01 | 1.69E+01 | 7 71E-02 | 1 28E-01 | 4.87E-06 | 3 34E-06 | 2.90E-01 | 1.15E-05 | 1.19E-06 | NA | NA |
| Styrene | 6 49E-02 | 1 30E+01 | 1.25E+03 | 1.19E+01 | 1 61E+01 | 2 69E-02 | 4.49E-02 | 1 70E-06 | 1.17E-06 | 2 86E-01 | 4 08E-06 | 4 17E-07 | NA | NA |
| Toluene | 5.48E-01 | 1 38E+01 | 1 33E+03 | 1 33E+01 | 1 80E+01 | 2 47E-01 | 4.12E-01 | 1 56E-05 | 1 07E-05 | 1 14E-01 | 9 39E-05 | 3 82E-06 | NA | NA |
| Xylenes (total) | 1 90E+00 | 1.29E+01 | 1 24E+03 | 1.24E+01 | 1.68E+01 | 8.13E-01 | 1.36E+00 | 5 14E-05 | 3.52E-05 | NA | NA | 1.26E-05 | NA | NA |

NA - Not available

Total Hazard Index: 3 31E-03

7 25E-06

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Gwcol28 xls \ inhalation - RME


ENVIRONMENTAL STANDARDS

*Table 62*
***Reasonable Maximum Dermal Exposure to Potomac Aquifer Groundwater to an Industrial Worker Showering***
***Former Koppers Company, Inc., Newport, DE***

Average Daily Intake (mg/kg-day) = $\frac{DA * EF * ED * FS * SAt}{BW * AT}$

| | | | |
|---|---|---|---|
| DA - Absorbed dose = | chem specific | mg/day-cm$^2$ | |
| EF - Exposure frequency = | 250 | day/year | US EPA 1991, HHEM Supp Guidance |
| ED - Exposure duration = | 25 | year | Carey, 1988 |
| SA - Skin surface area available for contact = | 20000 | cm$^2$ | calculated |
| SAt - Total skin surface area = | 20000 | cm$^2$ | US EPA 1989, RAGS Part A |
| FS - Fraction of skin surface area available for contact = | 100% | | reasonable maximum |
| BW - Body weight = | 70 | kg | US EPA 1989, RAGS Part A |
| $AT_n$ - Averaging Time noncarcinogenic = | 9125 | days | US EPA 1989, RAGS Part A |
| $AT_c$ - Averaging Time carcinogenic = | 25550 | days | US EPA 1989, RAGS Part A |

**For Inorganics:**

DA (mg/day-cm$^2$) = Kp * Cgw * t * CF

| | | | |
|---|---|---|---|
| Kp - Dermal permeability constant = | chem specific | cm/hr | |
| Cgw - Chemical concentration in groundwater = | chem. specific | mg/L | |
| t - Event duration = | 0 25 | hr | US EPA 1992, Dermal Exp. Assess |
| CF - Conversion factor | 1.00E-03 | L/cm$^3$ | |

**For Organics:**

If t < t*, then DA = 2 * CF * Cgw * Kp * $(6 * \tau * t / \pi)^{0.5}$
If t>t*, then DA = Kp * Cgw * CF * (t/(1+B) + (2 * τ * ((1+3B) / ( 1+B)))

| | | |
|---|---|---|
| t* - Percutaneous absorption time = | chem specific | hr |
| B - Partitioning coefficient = | chem specific | dimensionless |
| τ - Lag time = | chem specific | hr |

| Analyte | Concentration in Groundwater mg/L | Kp cm/hr | t* hr | B | τ hr | Absorbed Dose mg/day-cm$^2$ | Average Daily Intake mg/kg-day | Dermal Chronic RfD mg/kg-day | Hazard Index | Average Lifetime Daily Intake mg/kg-day | Cancer Slope Factor 1/(mg/kg-day) | Cancer Risk |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Inorganics** | | | | | | | | | | | | |
| Antimony | 2 30E-03 | 1 00E-03 | NA | NA | NA | 5 75E-10 | 1.13E-07 | 4 00E-06 | 2 81E-02 | 4 02E-08 | NA | NA |
| Lead | 3 50E-03 | 4 00E-06 | NA | NA | NA | 3 50E-12 | 6 85E-10 | NA | NA | 2 45E-10 | NA | NA |
| **PCBs/Pesticides** | | | | | | | | | | | | |
| Heptachlor epoxide | 6 10E-06 | 2.76E-02 | 1 30E+02 | 9 55E+00 | 2 07E+01 | 1 06E-09 | 2.07E-07 | 3 90E-06 | 5 32E-02 | 7 40E-08 | 3 03E+01 | 2 24E-06 |
| | | | | | | | | Total Hazard Index | 0 08 | | Total Cancer Risk: | 2 24E-06 |

NA - Not applicable

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ENVIRONMENTAL STANDA

ENVIRONMENTAL STANDARDS

***Table 63***
***Reasonable Maximum Oral Exposure to Potomac Aquifer Groundwater While Drinking at the Job Site***
***Former Koppers Company, Inc., Newport, DE***

$$\text{Average Daily Intake (mg/kg-day)} = \frac{Cgw * IR * ED * EF}{BW * AT}$$

| | | | |
|---|---|---|---|
| Cgw - Concentration in groundwater = | chem specific | mg/L | |
| IR - Ingestion Rate = | 1.0 | L/day | US EPA 1991, HHEM Supp Guidance |
| ED - Exposure duration = | 25 | year | US EPA 1991, HHEM Supp Guidance |
| EF- Exposure frequency = | 250 | days/year | US EPA 1991, HHEM Supp Guidance |
| BW - Body weight = | 70 | kg | US EPA 1989, RAGS Part A |
| $AT_n$ - Averaging Time noncarcinogenic = | 9125 | days | US EPA 1989, RAGS Part A |
| $AT_c$ - Averaging Time carcinogenic = | 25550 | days | US EPA 1989, RAGS Part A |

| Analyte | Concentration in Groundwater mg/L | Average Daily Intake mg/kg-day | Oral Chronic RfD mg/kg-day | Hazard Index | Lifetime Average Daily Intake mg/kg-day | Oral Cancer Slope Factor 1/(mg/kg-day) | Cancer Risk |
|---|---|---|---|---|---|---|---|
| **Inorganics** | | | | | | | |
| Antimony | 2.30E-03 | 2 25E-05 | 4 00E-04 | 5.63E-02 | 8.04E-06 | NA | NA |
| Lead | 3.50E-03 | 3 42E-05 | NA | NA | 1.22E-05 | NA | NA |
| **PCBs/Pesticides** | | | | | | | |
| Heptachlor epoxide | 6.10E-06 | 5 97E-08 | 1 30E-05 | 4.59E-03 | 2.13E-08 | 9 10E+00 | 1 94E-07 |
| | | | Total Hazard Index | 0 06 | | Total Cancer Risk. | 1.94E-07 |

*Table 64*
***Reasonable Maximum Inhalation Exposure to VOC Vapors by an Industrial Worker Showering with Potomac Aquifer Groundwater***
***Former Koppers Company, Inc., Newport, DE***

Average Daily Intake (mg/kg-day) = $\frac{Dose * EF * ED}{AT}$

| | | | |
|---|---|---|---|
| Dose - Inhalation dose = | chem. specific | | |
| EF - Exposure frequency = | 250 | showers/year | US EPA 1991, HHEM Supp Guid |
| Ed - Exposure duration = | 25 | years | Carey, 1988 |
| $AT_n$ - Averaging Time noncarcinogenic = | 9125 | days | US EPA 1989, RAGS Part A |
| $AT_c$ - Averaging Time carcinogenic = | 25550 | days | US EPA 1989, RAGS Part A |

Inhalation Dose (mg/kg-shower) =
$((VR * S) / (BW * Rex * 10^6)) * (Ds + (exp(-Rex * Dt) / Rex) - (exp(Rex * (Ds - Dt)) / Rex))$

| | | | |
|---|---|---|---|
| VR - Ventilation Rate = | 15 | L/min | Foster, Chrostowski, 1987 |
| S - Indoor VOC generation rate = | chem. specific | ug/m$^3$-min | |
| BW - Body Weight = | 70 | kg | US EPA 1989, RAGS Part A |
| Rex - Air Exchange Rate = | 0.0083 | exchange/mi | Foster, Chrostowski, 1987 |
| Ds - Duration in Shower = | 15 | min | US EPA 1995, Exp Factors Handbook |
| Dt - Total Duration in Shower Room = | 20 | min | reasonable maximum |

S (ug/m$^3$-min) = (Cwd * FR) / SV

| | | | |
|---|---|---|---|
| Cwd - Concentration leaving shower droplet after time ts = | chem specific | ug/L | |
| FR - Shower Water Flow Rate = | 10 | L/min | Foster, Chrostowski, 1987 |
| SV - Shower Room Air Volume = | 6 | m$^3$ | Foster, Chrostowski, 1987 |

Cwd (ug/L) = Cwo * CFi * (1-exp((-Kal * tsd) / (60 * d)))

| | | | |
|---|---|---|---|
| Cwo - Shower water concentration = | chem. specific | mg/L | |
| CFi - Conversion factor = | 1 00E+03 | ug/mg | |
| Kal - overall mass transfer coefficient = | chem. specific | cm/hr | |
| tsd - shower droplet drop time = | 2 | sec | Foster, Chrostowski, 1987 |
| d - shower droplet diameter = | 1 | mm | Foster, Chrostowski, 1987 |

Kal (cm/hour) = $KL / ((T_l * u_s) / (T_s * u_l))^{0.5}$

| | | |
|---|---|---|
| KL - mass transfer coefficient = | chem. specific | cm/hr |
| $T_l$ - calibration water temperature = | 293 | K |
| $u_s$ - water viscosity at Ts = | 0 596 | cp |
| $T_s$ - shower water temperature = | 318 | K |
| $u_l$ - water viscosity at Tl = | 1.002 | cp |

KL (cm/hr) = $((1 / kl(voc))+((R * T) / (H * kg(voc))))^{-1}$

| | | |
|---|---|---|
| kl(voc) - liquid-film mass transfer coefficient = | chem specific | cm/hr |
| R - universal gas constant = | 8 20E-05 | atm-m$^3$/mol K |
| T - absolute temperature = | 293 | K |
| H - Henry's Law Constant = | chem. specific | atm-m$^3$/mol |
| kg(voc) - gas-film mass transfer coefficient = | chem. specific | cm/hr |

kg(voc) (cm/hr) = $kg(H_2O) * (18 / MWvoc)^{0.5}$

| | | |
|---|---|---|
| $kg(H_2O)$ = | 3000 | cm/hr |
| MW - molecular weight = | chem specific | g/mol |

kl(voc) (cm/hr) = $kl(CO_2) * (44 / MW)^{0.5}$

| | | |
|---|---|---|
| $kl(CO_2)$ = | 20 | cm/hr |

| Constituent | Cwo mg/L | kl(voc) cm/hr | kg(voc) cm/hr | KL cm/hr | Kal cm/hr | Cwd ug/L | S ug/m$^3$-min | Inhalation Dose mg/kg-shower | Average Daily Intake mg/kg-day | Inhalation Chronic RfD mg/kg-day | Hazard Index | Lifetime Average Daily Intake mg/kg-day | Inhalation Cancer Slope Factor 1/(mg/kg-day) | Cancer Risk |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PCBs/Pesticides | | | | | | | | | | | | | | |
| Heptachlor epoxide | 6 10E-06 | 6 72E+00 | 6 45E+02 | 7 62E-01 | 1 03E+00 | 2 06E-07 | 3.43E-07 | 1 30E-11 | 8.91E-12 | NA | NA | 3 18E-12 | 9 10E+00 | 2 90E-11 |
| | | | | | | | | | Total Hazard Index | | NA | | Total Cancer Risk. | 2.90E-11 |

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UAO Bates 00568



ENVIRONMENTAL STANDAP

*Table 67*
***Reasonable Maximum Dermal Exposure to Soils by a Trespasser (12 - 18 years old)***
***Former Koppers Company, Inc., Newport, DE***

Intake (mg/kg-day) = (Cs * SA * AF * ABS * EF * ED * CF) / (BW * AT)

| | | | |
|---|---|---|---|
| Cs - Concentration in soil and sediments = | mg/kg | chemical specific | |
| SA - Skin surface area available for exposure = | $cm^2$/day | 4381 | calculated |
| Total Surface area = | $cm^2$ | 15758 | US EPA 1995, EFH |
| Fraction of skin surface area available for exposure = | | 27 8% | US EPA 1995, EFH |
| AF -Soil Adherence Factor = | mg/$cm^2$ | 0.025 | US EPA 1995, EFH |
| $ABS_d$ - Absorption for dioxins = | | 0.1 | US EPA 1995, Region III |
| $ABS_s$ - Absorption for semivolatiles = | | 0 1 | US EPA 1995, Region III |
| $ABS_n$ - Absorption for inorganics = | | 0 01 | US EPA 1995, Region III |
| EF - Exposure frequency = | days/year | 24 | reasonable maximum |
| ED - Exposure duration = | years | 6 | reasonable mamimum |
| CF - Conversion factor (1 kg/1,000,000 mg) = | kg/mg | 1.00E-06 | |
| BW - Body weight = | kg | 56 | US EPA 1995, EFH |
| $AT_n$ - Averaging time for noncarcinogenic effects = | days | 2190 | US EPA 1989, RAGS Part A |
| $AT_c$ - Averaging time for carcinogenic effects = | days | 25550 | US EPA 1989, RAGS Part A |

| Chemical | Conc. in Soils mg/kg | Average Daily Intake mg/kg-day | Dermal Subchronic RfD mg/kg-day | Hazard Index | Average Lifetime Daily Intake mg/kg-day | Cancer Slope Factor 1/(mg/kg-day) | Cancer Risk |
|---|---|---|---|---|---|---|---|
| **Dioxins** | | | | | | | |
| 2,3,7,8-TCDD Equiv. | 6 56E-03 | 8 44E-11 | NA | NA | 7 23E-12 | 3.00E+05 | 2 17E-06 |
| **Inorganics** | | | | | | | |
| Arsenic | 8.40E+00 | 1 08E-08 | 2 85E-04 | 3 79E-05 | 9 26E-10 | 1 58E+00 | 1 46E-09 |
| Thallium | 7 12E+00 | 9.15E-09 | NA | NA | 7 85E-10 | NA | NA |
| **Semivolatiles** | | | | | | | |
| Dibenzofuran | 1 24E+02 | 1 59E-06 | NA | NA | 1.36E-07 | NA | NA |
| Pentachlorophenol | 6 62E+01 | 8 51E-07 | 2 10E-02 | 4.05E-05 | 7 30E-08 | 1 71E-01 | 1 25E-08 |
| Phenanthrene | 4 93E+02 | 6 34E-06 | NA | NA | 5 43E-07 | NA | NA |

NA - Not available — Total Hazard Index. 0.00008 — 2 18E-06

*Table 68*
***Reasonable Maximum Exposure by Ingestion of Soils by a Trespasser (12 - 18 years old)***
***Former Koppers Company, Inc., Newport, DE***

$$\text{Intake (mg/kg-day)} = \frac{Cs * IngR * EF * ED * CF * FI}{BW * AT}$$

| | | | |
|---|---|---|---|
| Cs - Concentration in soil and sediments = | mg/kg | chemical specific | |
| IngR - Ingestion rate = | mg/day | 100 | Calabrese et al, 1987 |
| EF - Exposure frequency = | days/year | 24 | reasonable maximum |
| ED - Exposure duration = | years | 6 | reasonable mamimum |
| CF - Conversion factor (1 kg/1,000,000 mg) = | kg/mg | 1.00E-06 | |
| FI - Fraction of daily soil ingested at site = | | 1 | reasonable maximum |
| BW - Body weight = | kg | 56 | US EPA 1995, EFH |
| AT - Averaging time for noncarcinogenic effects = | days | 2190 | US EPA 1989, RAGS Part A |
| and for carcinogenic effects = | days | 25550 | US EPA 1989, RAGS Part A |

| Chemical | Conc. in Soils mg/kg | Average Daily Intake mg/kg-day | Oral Subchronic RfD mg/kg-day | Hazard Index | Average Lifetime Daily Intake mg/kg-day | Oral Slope Factor 1/(mg/kg-day) | Cancer Risk |
|---|---|---|---|---|---|---|---|
| **Dioxins** | | | | | | | |
| 2,3,7,8-TCDD Equiv | 6 56E-03 | 7.70E-10 | NA | NA | 6 60E-11 | 1 50E+05 | 9 90E-06 |
| **Inorganics** | | | | | | | |
| Arsenic | 8 40E+00 | 9 87E-07 | 3 00E-04 | 3 29E-03 | 8 46E-08 | 1.50E+00 | 1.27E-07 |
| Thallium | 7.12E+00 | 8.36E-07 | NA | NA | 7.16E-08 | NA | NA |
| **Semivolatiles** | | | | | | | |
| 2-Methylnaphthalene | 8.69E+01 | 1 02E-05 | NA | NA | 8 74E-07 | NA | NA |
| Acenaphthylene | 2.52E+01 | 2.96E-06 | NA | NA | 2.54E-07 | NA | NA |
| Benzo(a)anthracene | 5.64E+02 | 6 62E-05 | NA | NA | 5.67E-06 | 7.30E-01 | 4.14E-06 |
| Benzo(a)pyrene | 3.59E+02 | 4.21E-05 | NA | NA | 3 61E-06 | 7 30E+00 | 2.64E-05 |
| Benzo(b)fluoranthene | 7.50E+02 | 8.81E-05 | NA | NA | 7 55E-06 | 7.30E-01 | 5.51E-06 |
| Benzo(g,h,i)perylene | 1.32E+02 | 1.55E-05 | NA | NA | 1 33E-06 | NA | NA |
| Benzo(k)fluoranthene | 2.36E+02 | 2.77E-05 | NA | NA | 2 38E-06 | 7.30E-02 | 1 73E-07 |
| Carbazole | 2.99E+02 | 3.51E-05 | NA | NA | 3 01E-06 | 2.00E-02 | 6.02E-08 |
| Chrysene | 5.85E+02 | 6.87E-05 | NA | NA | 5.89E-06 | 7 30E-03 | 4 30E-08 |
| Dibenz(a,h)anthracene | 3.95E+01 | 4.63E-06 | NA | NA | 3 97E-07 | 7 30E+00 | 2.90E-06 |
| Dibenzofuran | 1 24E+02 | 1 45E-05 | NA | NA | 1 24E-06 | NA | NA |
| Indeno(1,2,3-c,d)pyrene | 1.90E+02 | 2 24E-05 | NA | NA | 1.92E-06 | 7.30E-01 | 1.40E-06 |
| Pentachlorophenol | 6 62E+01 | 7 77E-06 | 3.00E-02 | 2 59E-04 | 6 66E-07 | 1.20E-01 | 8.00E-08 |
| Phenanthrene | 4 93E+02 | 5 79E-05 | NA | NA | 4.96E-06 | NA | NA |

NA - Not available — Total Hazard Index. 0 0035 — 5 07E-05

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tres_so XLS \ ingestion - RME
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ENVIRONMENTAL STANDARDS

***Table 71***
***Reasonable Maximum Dermal Exposure to Soils and NAPL by a Trespasser (12 - 18 years old)***
***Former Koppers Company, Inc., Newport, DE***

$$\text{Intake (mg/kg-day)} = \frac{Cs * SA * AF * ABS * EF * ED * CF}{BW * AT}$$

| | | | |
|---|---|---|---|
| Cs - Concentration in soil and sediments = | mg/kg | chemical specific | |
| SA - Skin surface area available for exposure = | $cm^2$/day | 4381 | calculated |
| Total Surface area = | $cm^2$ | 15758 | US EPA 1995, EFH |
| Fraction of skin surface area available for exposure = | | 27 8% | US EPA 1995, EFH |
| AF -Soil Adherence Factor = | mg/$cm^2$ | 0 025 | US EPA 1995, EFH |
| $ABS_d$ - Absorption for dioxins = | | 0 1 | US EPA 1995, Region III |
| $ABS_s$ - Absorption for semivolatiles = | | 0 1 | US EPA 1995, Region III |
| $ABS_n$ - Absorption for inorganics = | | 0 01 | US EPA 1995, Region III |
| EF - Exposure frequency = | days/year | 24 | reasonable maximum |
| ED - Exposure duration = | years | 6 | reasonable maximum |
| CF - Conversion factor (1 kg/1,000,000 mg) = | kg/mg | 1.00E-06 | |
| BW - Body weight = | kg | 56 | US EPA 1995, EFH |
| $AT_n$ - Averaging time for noncarcinogenic effects = | days | 2190 | US EPA 1989, RAGS Part A |
| $AT_c$ - Averaging time for carcinogenic effects = | days | 25550 | US EPA 1989, RAGS Part A |

| Chemical | Conc. in Soils and NAPL mg/kg | Average Daily Intake mg/kg-day | Dermal Subchronic RfD mg/kg-day | Hazard Index | Average Lifetime Daily Intake mg/kg-day | Cancer Slope Factor 1/(mg/kg-day) | Cancer Risk |
|---|---|---|---|---|---|---|---|
| **Dioxins** | | | | | | | |
| 2,3,7,8-TCDD Equiv | 6 56E-03 | 8 44E-11 | NA | NA | 7.23E-12 | 3.00E+05 | 2 17E-06 |
| **Inorganics** | | | | | | | |
| Arsenic | 7 48E+00 | 9 61E-09 | 2.85E-04 | 3.37E-05 | 8.24E-10 | 1 58E+00 | 1 30E-09 |
| Iron | 1.94E+04 | 2.50E-05 | NA | NA | 2.14E-06 | NA | NA |
| Lead | 7.05E+01 | 9 07E-08 | NA | NA | 7 77E-09 | NA | NA |
| Thallium | 4.50E+00 | 5 79E-09 | NA | NA | 4 96E-10 | NA | NA |
| **Semivolatiles** | | | | | | | |
| Dibenzofuran | 5 25E+01 | 6 75E-07 | NA | NA | 5 79E-08 | NA | NA |
| Pentachlorophenol | 3.44E+01 | 4 42E-07 | 2 10E-02 | 2.11E-05 | 3 79E-08 | 1 71E-01 | 6 48E-09 |

NA - Not available | Total Hazard Index. 0 0001 | 2 18E-06



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ENVIRONMENTAL STANDARDS

*Table 72*
***Reasonable Maximum Exposure by Ingestion of Soils and NAPL by a Trespasser (12 - 18 years old)***
***Former Koppers Company, Inc., Newport, DE***

$$\text{Intake (mg/kg-day)} = \frac{Cs * IngR * EF * ED * CF * FI}{BW * AT}$$

| | | | |
|---|---|---|---|
| Cs - Concentration in soil and sediments = | mg/kg | chemical specific | |
| IngR – Ingestion rate = | mg/day | 100 | Calabrese et al, 1987 |
| EF - Exposure frequency = | days/year | 24 | reasonable maximum |
| ED - Exposure duration = | years | 6 | reasonable mamimum |
| CF - Conversion factor (1 kg/1,000,000 mg) = | kg/mg | 1.00E-06 | |
| FI - Fraction of daily soil ingested at site = | | 1 | reasonable maximum |
| BW – Body weight = | kg | 56 | US EPA 1995, EFH |
| AT - Averaging time for noncarcinogenic effects = | days | 2190 | US EPA 1989, RAGS Part A |
| and for carcinogenic effects = | days | 25550 | US EPA 1989, RAGS Part A |

| Chemical | Conc. in Soils and NAPL mg/kg | Average Daily Intake mg/kg-day | Oral Subchronic RfD mg/kg-day | Hazard Index | Average Lifetime Daily Intake mg/kg-day | Oral Slope Factor 1/(mg/kg-day) | Cancer Risk |
|---|---|---|---|---|---|---|---|
| **Dioxins** | | | | | | | |
| 2,3,7,8-TCDD Equiv | 6 56E-03 | 7.70E-10 | NA | NA | 6.60E-11 | 1 50E+05 | 9 90E-06 |
| **Inorganics** | | | | | | | |
| Arsenic | 7 48E+00 | 8 78E-07 | 3 00E-04 | 2.93E-03 | 7.52E-08 | 1.50E+00 | 1.13E-07 |
| Iron | 1.94E+04 | 2.28E-03 | NA | NA | 1.95E-04 | NA | NA |
| Lead | 7.05E+01 | 8.28E-06 | NA | NA | 7 10E-07 | NA | NA |
| Thallium | 4 50E+00 | 5 28E-07 | NA | NA | 4.53E-08 | NA | NA |
| **Semivolatiles** | | | | | | | |
| Acenaphthylene | 1 52E+01 | 1.78E-06 | NA | NA | 1.53E-07 | NA | NA |
| Benzo(a)anthracene | 5 00E+02 | 5.87E-05 | NA | NA | 5 03E-06 | 7 30E-01 | 3 67E-06 |
| Benzo(a)pyrene | 2 90E+02 | 3.40E-05 | NA | NA | 2 92E-06 | 7 30E+00 | 2 13E-05 |
| Benzo(b)fluoranthene | 6 26E+02 | 7.35E-05 | NA | NA | 6 30E-06 | 7 30E-01 | 4 60E-06 |
| Benzo(g,h,i)perylene | 1.05E+02 | 1.23E-05 | NA | NA | 1 06E-06 | NA | NA |
| Benzo(k)fluoranthene | 1 37E+02 | 1 61E-05 | NA | NA | 1.38E-06 | 7 30E-02 | 1.01E-07 |
| Carbazole | 1.09E+02 | 1 28E-05 | NA | NA | 1 10E-06 | 2.00E-02 | 2.19E-08 |
| Chrysene | 5.42E+02 | 6 37E-05 | NA | NA | 5 46E-06 | 7.30E-03 | 3.98E-08 |
| Dibenz(a,h)anthracene | 2.46E+01 | 2.89E-06 | NA | NA | 2.47E-07 | 7 30E+00 | 1 81E-06 |
| Dibenzofuran | 5.25E+01 | 6 16E-06 | NA | NA | 5.28E-07 | NA | NA |
| Fluoranthene | 1 48E+03 | 1.74E-04 | 4 00E-01 | 4 35E-04 | 1 49E-05 | NA | NA |
| Indeno(1,2,3-c,d)pyrene | 1.51E+02 | 1 78E-05 | NA | NA | 1 52E-06 | 7 30E-01 | 1 11E-06 |
| Pentachlorophenol | 3.44E+01 | 4 04E-06 | 3 00E-02 | 1.35E-04 | 3 46E-07 | 1.20E-01 | 4 15E-08 |
| Phenanthrene | 3.45E+02 | 4 06E-05 | NA | NA | 3 48E-06 | NA | NA |
| Pyrene | 1.26E+03 | 1 48E-04 | 3 00E-01 | 4 93E-04 | 1 27E-05 | NA | NA |

NA - Not available    Total Hazard Index: 0.004    4 27E-05

tres_son XLS \ ingestion - RME
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ENVIRONMENTAL STANDARDS

Table 7 RME (Typo)

*~~Central Tendency~~ Dermal Exposure to Non-River Surface Water - Adolescent Trespasser*

*Former Koppers Company, Inc., Newport, DE*

Average Daily Intake (mg/kg-day) = $\frac{DA * EF * ED * SA}{BW * AT}$

| | | | |
|---|---|---|---|
| DA - Absorbed dose = | chem specific | mg/day-cm$^2$ | |
| EF - Exposure frequency = | 24 | day/year | US EPA 1991, HHEM Supp Guidance |
| ED - Exposure duration = | 6 | year | Carey, 1988 |
| SA - Skin surface area available for contact = | 207 | cm$^2$ | calculated |
| BW - Body weight = | 56 | kg | US EPA 1989, RAGS Part A |
| $AT_n$ - Averaging Time noncarcinogenic = | 2190 | days | US EPA 1989, RAGS Part A |
| $AT_c$ - Averaging Time carcinogenic = | 25550 | days | US EPA 1989, RAGS Part A |

**For Inorganics:**

DA (mg/day-cm$^2$) = Kp * Cgw * t * CF

| | | | |
|---|---|---|---|
| Kp - Dermal permeability constant = | chem. specific | cm/hr | US EPA 1992, Dermal Exp Assess. |
| Cgw - Chemical concentration in groundwater = | chem specific | mg/L | |
| t - Event duration = | 0.2 | hr | US EPA 1992, Dermal Exp Assess |
| CF - Conversion factor | 1 00E-03 | L/cm$^3$ | |

**For Organics:**

If t < t*, then DA = 2 * CF * Cgw * Kp * (6 * t * t / p)$^{0.5}$

If t > t*, then DA = Kp * Cgw * CF * (t/(1+B) + (2 * t * ((1+3B) / ( 1+B)))

| | | |
|---|---|---|
| t* - Percutaneous absorption time = | chem specific | hr |
| B - Partitioning coefficient = | chem specific | dimensionless |
| t - Lag time = | chem specific | hr |

| Analyte | Concentration in Groundwater mg/L | Kp cm/hr | t* hr | B | t hr | Absorbed Dose mg/day-cm$^2$ | Average Daily Intake mg/kg-day | Dermal Subchronic RfD mg/kg-day | Hazard Index | Average Lifetime Daily Intake mg/kg-day | Cancer Slope Factor 1/(mg/kg-day) | Cancer Risk |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dioxins** | | | | | | | | | | | | |
| 2,3,7,8-TCDD Equiv | 1 99E-06 | 1 40E+00 | 3.80E+01 | 6 30E+02 | 8 10E+00 | 9 81E-09 | 2 38E-09 | NA | NA | 2 04E-10 | 3 00E+05 | 6 13E-05 |
| **Inorganics** | | | | | | | | | | | | |
| Arsenic | 4 95E-03 | 1 00E-03 | NA | NA | NA | 9.90E-10 | 2 41E-10 | 2 85E-04 | 8 44E-07 | 2 06E-11 | 1 58E+00 | 3 26E-11 |
| Iron | 6 21E+00 | 1 00E-03 | NA | NA | NA | 1 24E-06 | 3 02E-07 | NA | NA | 2 59E-08 | NA | NA |
| Lead | 4 49E-03 | 4 00E-06 | NA | NA | NA | 3 59E-12 | 8 74E-13 | NA | NA | 7 49E-14 | NA | NA |
| Manganese | 1 36E+00 | 1 00E-03 | NA | NA | NA | 2 71E-07 | 6 59E-08 | NA | NA | 5 65E-09 | NA | NA |
| Thallium | 5.77E-03 | 1 00E-03 | NA | NA | NA | 1 15E-09 | 2 80E-10 | NA | NA | 2 40E-11 | NA | NA |
| | | | | | | | | Total Hazard Index | 0 0000008 | | | 6 13E-05 |

NA - Not Applicable

AR316091

Tressw xls \ dermal - RME



ENVIRONMENTAL STANDARDS

UAO Bates 00573

*Table 77*

***Reasonable Maximum Dermal Exposure to Sediment* by a Trespasser (12 - 18 years old)***

***Former Koppers Company, Inc., Newport, DE***

$$\text{Intake (mg/kg-day)} = \frac{Cs * SA * AF * ABS * EF * ED * CF}{BW * AT}$$

| | | | |
|---|---|---|---|
| Cs - Concentration in soil and sediments = | mg/kg | chemical specific | |
| SA - Skin surface area available for exposure = | $cm^2$/day | 1103 | calculated |
| Total Surface area = | $cm^2$ | 15758 | US EPA 1995, EFH |
| Fraction of skin surface area available for exposure = | | 7.0% | US EPA 1995, EFH |
| AF -Soil Adherence Factor = | mg/$cm^2$ | 0 025 | US EPA 1995, EFH |
| $ABS_d$ - Absorption for dioxins = | | 0 1 | US EPA 1995, Region III |
| $ABS_s$ - Absorption for semivolatiles = | | 0 1 | US EPA 1995, Region III |
| $ABS_n$ - Absorption for inorganics = | | 0 01 | US EPA 1995, Region III |
| EF - Exposure frequency = | days/year | 10 | reasonable maximum |
| ED - Exposure duration = | years | 6 | reasonable mammum |
| CF - Conversion factor (1 kg/1,000,000 mg) = | kg/mg | 1 00E-06 | |
| BW - Body weight = | kg | 56 | US EPA 1995, EFH |
| $AT_n$ - Averaging time for noncarcinogenic effects = | days | 2190 | US EPA 1989, RAGS Part A |
| $AT_c$ - Averaging time for carcinogenic effects = | days | 25550 | US EPA 1989, RAGS Part A |

| Chemical | Conc. in Soils and Sediments mg/kg | Average Daily Intake mg/kg-day | Dermal Subchronic RfD mg/kg-day | Hazard Index | Average Lifetime Daily Intake mg/kg-day | Cancer Slope Factor 1/(mg/kg-day) | Cancer Risk |
|---|---|---|---|---|---|---|---|
| **Dioxins** | | | | | | | |
| 2,3,7,8-TCDD Equiv | 7 96E-04 | 1 07E-12 | NA | NA | 9 21E-14 | 3 00E+05 | 2 76E-08 |
| **Inorganics** | | | | | | | |
| Arsenic | 1 19E+01 | 1 60E-09 | 2 85E-04 | 5 63E-06 | 1 37E-10 | 1 58E+00 | 2 17E-10 |
| Lead | 1 27E+02 | 1 72E-08 | NA | NA | 1.47E-09 | NA | NA |
| Manganese | 8 85E+02 | 1 19E-07 | 7 00E-03 | 1.71E-05 | 1.02E-08 | NA | NA |
| Thallium | 4 32E+00 | 5 82E-10 | NA | NA | 4 99E-11 | NA | NA |
| **Semivolatiles** | | | | | | | |
| Carbazole | 1 02E+02 | 1 38E-07 | NA | NA | 1 18E-08 | NA | NA |
| Dibenzofuran | 2.55E+02 | 3 44E-07 | NA | NA | 2 95E-08 | NA | NA |

* Includes Hershey Run sediments — Total Hazard Index: 0 00002 — Total Cancer Risk 2 78E-08

NA - Not available

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ENVIRONMENTAL STANDARDS

***Table 78***
***Reasonable Maximum Exposure by Ingestion of Sediment* by a Trespasser (12 - 18 years old)***
***Former Koppers Company, Inc., Newport, DE***

$$\text{Intake (mg/kg-day)} = \frac{Cs * IngR * EF * ED * CF * FI}{BW * AT}$$

| | | | |
|---|---|---|---|
| Cs - Concentration in soil and sediments = | mg/kg | chemical specific | |
| IngR - Ingestion rate = | mg/day | 100 | Calabrese et al, 1987 |
| EF - Exposure frequency = | days/year | 10 | reasonable maximum |
| ED - Exposure duration = | years | 6 | reasonable mamimum |
| CF - Conversion factor (1 kg/1,000,000 mg) = | kg/mg | 1 00E-06 | |
| FI - Fraction of daily soil ingested at site = | | 1 | reasonable maximum |
| BW - Body weight = | kg | 56 | US EPA 1995, EFH |
| AT - Averaging time for noncarcinogenic effects = | days | 2190 | US EPA 1989, RAGS Part A |
| and for carcinogenic effects = | days | 25550 | US EPA 1989, RAGS Part A |

| Chemical | Conc. in Soils and Sediments mg/kg | Average Daily Intake mg/kg-day | Oral Subchronic RfD mg/kg-day | Hazard Index | Average Lifetime Daily Intake mg/kg-day | Oral Slope Factor 1/(mg/kg-day) | Cancer Risk |
|---|---|---|---|---|---|---|---|
| **Dioxins** | | | | | | | |
| 2,3,7,8-TCDD Equiv | 7.96E-04 | 3 89E-11 | NA | NA | 3 34E-12 | 1 50E+05 | 5 01E-07 |
| **Inorganics** | | | | | | | |
| Arsenic | 1 19E+01 | 5 81E-07 | 3.00E-04 | 1.94E-03 | 4 98E-08 | 1.50E+00 | 7 47E-08 |
| Lead | 1 27E+02 | 6.23E-06 | NA | NA | 5.34E-07 | NA | NA |
| Manganese | 8.85E+02 | 4.33E-05 | 1.40E-01 | 3.09E-04 | 3 71E-06 | NA | NA |
| Thallium | 4.32E+00 | 2 11E-07 | NA | NA | 1.81E-08 | NA | NA |
| **Semivolatiles** | | | | | | | |
| Benzo(a)anthracene | 3 20E+02 | 1.57E-05 | NA | NA | 1 34E-06 | 7 30E-01 | 9 80E-07 |
| Benzo(a)pyrene | 9 10E+01 | 4 45E-06 | NA | NA | 3 82E-07 | 7 30E+00 | 2 79E-06 |
| Benzo(b)fluoranthene | 1 65E+02 | 8.07E-06 | NA | NA | 6 92E-07 | 7 30E-01 | 5 05E-07 |
| Benzo(k)fluoranthene | 5 51E+01 | 2 70E-06 | NA | NA | 2.31E-07 | 7 30E-02 | 1 69E-08 |
| Carbazole | 1 02E+02 | 5.00E-06 | NA | NA | 4.29E-07 | 2 00E-02 | 8.58E-09 |
| Chrysene | 2 64E+02 | 1 29E-05 | NA | NA | 1 11E-06 | 7 30E-03 | 8 09E-09 |
| Dibenz(a,h)anthracene | 1 25E+01 | 6.09E-07 | NA | NA | 5.22E-08 | 7 30E+00 | 3.81E-07 |
| Dibenzofuran | 2.55E+02 | 1 25E-05 | NA | NA | 1 07E-06 | NA | NA |
| Fluoranthene | 2 27E+03 | 1 11E-04 | 4.00E-01 | 2 78E-04 | 9 53E-06 | NA | NA |
| Fluorene | 5.67E+02 | 2.77E-05 | 4.00E-01 | 6 93E-05 | 2.38E-06 | NA | NA |
| Indeno(1,2,3-c,d)pyrene | 4.56E+01 | 2.23E-06 | NA | NA | 1.91E-07 | 7 30E-01 | 1.39E-07 |
| Pyrene | 1.17E+03 | 5 70E-05 | 3 00E-01 | 1 90E-04 | 4.89E-06 | NA | NA |
| * Includes Hershey Run sediments | | Total Hazard Index | | 0.003 | Total Cancer Risk | | 5 40E-06 |

NA - Not available

tres_sed xls \ ingestion - RME
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ENVIRONMENTAL STANDARDS

*Table 84*
***Reasonable Maximum Exposure by Ingestion of Locally Caught Fish***
***Former Koppers Company, Inc., Newport, DE***

Daily Intake (mg/kg-day) = $\frac{Cf \cdot IRf \cdot FI \cdot EF \cdot ED}{BW \cdot AT}$

| | | | |
|---|---|---|---|
| Cf - Concentration in fish = | chem. specific | mg/kg | |
| IRf - Ingestion rate of fish = | 0.025 | kg/day | From Ebert, 1992, Connelly et al., 1996, West, 1993 |
| FI - Fraction of fish ingested from affected source = | 100% | | reasonable maximum |
| BW - Body weight = | 70 | kg | US EPA 1989, RAGS Part A |
| EF - Exposure frequency = | 365 | days/year | US EPA 1989, RAGS Part A |
| ED - Exposure duration = | 25 | year | US EPA 1991, Supp Guid to RAGS |
| $AT_n$ - Averaging Time noncarcinogenic = | 9125 | days | US EPA 1989, RAGS Part A |
| $AT_c$ - Averaging Time carcinogenic = | 25550 | days | US EPA 1989, RAGS Part A |

| Analyte | Concentration in Fish mg/kg | Average Daily Intake mg/kg-day | Oral Chronic RfD mg/kg-day | Hazard Index | Lifetime Average Daily Intake mg/kg-day | Oral Cancer Slope Factor 1/(mg/kg-day) | Cancer Risk |
|---|---|---|---|---|---|---|---|
| **Dioxins** | | | | | | | |
| 2,3,7,8-TCDD Equiv | 3 01E-07 | 1 08E-10 | NA | NA | 3.84E-11 | 1 50E+05 | 5.77E-06 |
| **Inorganics** | | | | | | | |
| Arsenic | 6 59E-01 | 2 35E-04 | 3.00E-04 | 7 85E-01 | 8 41E-05 | 1 50E+00 | 1 26E-04 |
| Lead | 1 27E-01 | 4 54E-05 | NA | NA | 1 62E-05 | NA | NA |
| Mercury | 2.54E-01 | 9.06E-05 | NA | NA | 3.24E-05 | NA | NA |
| **PCBs/Pesticides** | | | | | | | |
| Aroclor 1254 | 4 20E-01 | 1 50E-04 | 2.00E-05 | 7 50E+00 | 5 36E-05 | 2 00E+00 | 1 07E-04 |
| Aroclor 1260 | 2 40E-01 | 8 57E-05 | 2.00E-05 | 4 29E+00 | 3.06E-05 | 2 00E+00 | 6 12E-05 |
| 4,4'-DDD | 4 40E-02 | 1 57E-05 | NA | NA | 5.61E-06 | 2.40E-01 | 1 35E-06 |
| 4,4'-DDE | 1 30E-01 | 4 64E-05 | NA | NA | 1 66E-05 | 3.40E-01 | 5 64E-06 |

NA - Not available

Total Hazard Index. 12 57

Total Cancer Risk 3 07E-04



AR316094
ENVIRONMENTAL STANDARDS

**Table 7.** Ecological Risk Assessment Endpoints

**Table 7. Ecological Risk Assessment Endpoints**

| Assessment Endpoint | Lines of Evidence | Ecological Receptor | Weight of Evidence |
|---|---|---|---|
| 1) Protection of the structure and function of wetland communities and | Vegetation surveys | | |
| | Toxicity test results | Amphipod and Midge | NOAEL 82.87 mg/kg total PAHs, LOAEL 197.6 mg/kg total PAHs |
| 2) Protection of the aquatic benthic invertebrate communities structure and function | Evaluation of the benthic macroinvertebrate population/ community structure | | In areas of high total PAH sediment concentration, reduction in population of benthic organisms present |
| 3) Protection of the upland soil community functioning | Toxicity test results | Earthworm | NOAEL 587 mg/kg total PAHs and LOAEL 1264 mg/kg total PAHs |
| | Plant community surveys | | Areas of stressed vegetation associated with elevated levels of contamination |
| 4) Protection of the structure and function of the terrestrial plant community | Plant community surveys | | Negative effects of contamination on upland plants particularly in areas where visible contamination found |
| 5) Protection of fish populations and communities from direct toxicity and reproductive impairment | Embryo toxicity tests | Killifish | NOAEL 33.5 mg/kg total PAHs |
| | Potential indirect effects based on benthic macroinvertebrate toxicity tests | | |
| 6) Protection of amphibian population, specifically in terms of recruitment | Toxicity test results | Southern Leopard Frog | Risk exists, effects levels consistent with other sediment contamination related risks |

**Table 8.** Applicable or Relevant and Appropriate Requirements ("ARARs")

# TABLE 8

## APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs) AND TO BE CONSIDERED MATERIAL (TBCs) KOPPERS (NEWPORT) SITE

| ARAR or TBC | Legal Citation | ARAR Class | Requirement Synopsis | Applicability to Selected Remedy | Area of Concern |
|---|---|---|---|---|---|
| **I. CHEMICAL SPECIFIC** | | | | | |
| **A. Water** | | | | | |
| 1. Safe Drinking Water Act | 42 U S.C. §§ 300f <u>et seq</u> | | | | |
| a. Maximum Contaminant Level Goals (MCLGs) | 40 C.F.R § 141.50-51 | Relevant and Appropriate | Non-enforceable health goals for public water supplies. The NCP requires that non-zero MCLGs shall be attained by remedial actions for ground water that is a current or potential source of drinking water, where the MCLGs are relevant and appropriate under the circumstances of the release. | The containment of NAPL and NAPL-contaminated soils and sediments will allow for natural attenuation processes to work in the Columbia aquifer. It is expected that attenuation processes will be able to restore impacted ground water outside of the containment area once containment is complete. There is no known contamination in the Potomac Aquifer<br><br>A State Ground Water Management Zone (GMZ) will be extended to encompass the Site in order to prevent the use of and exposure to Columbia ground water | GW |
| b. Maximum Contaminant Levels (MCLs) | 40 C F.R § 141.11-12 | Relevant and Appropriate | Enforceable standards for public drinking water supply systems (with at least fifteen service connections or used by at least 25 people) The NCP requires that MCLs, for those contaminants whose MCLG is zero, shall be attained by remedial actions for ground water that is a current or potential source of drinking water, where the MCLs are relevant and appropriate under the circumstances of the release. | The containment of NAPL and NAPL-contaminated soils and sediments will allow for natural attenuation processes to work in the Columbia aquifer. It is expected that attenuation processes will be able to restore impacted ground water outside of the containment area once containment is complete. There is no known contamination in the Potomac Aquifer.<br><br>A State Ground Water Management Zone (GMZ) will be extended to encompass the Site in order to prevent the use of and exposure to Columbia ground water. | GW |
| 2. Health Effects Assessment | | To be Considered | Non-enforceable toxicity data for specific chemicals for use in public health assessments. Also "to be considered" are Carcinogenic Potency Factors and Reference Doses provided in the Superfund Public Health Evaluation Manual | To be considered where remedial action addresses risk-based criteria or when setting clean-up standards for the protection of human health | Site-wide |

AR316098

| ARAR or TBC | Legal Citation | ARAR Class | Requirement Synopsis | Applicability to Selected Remedy | Area of Concern |
|---|---|---|---|---|---|
| 3. Delaware Comprehensive Water Resources Management Committee Reports, December 13, 1983 | | To Be Considered | The reports were adopted as policy by the DNREC Secretary. Among these reports is the Groundwater Quality Management Report, July 1983, which provided Delaware with a number of tools for dealing with ground-water contamination. | To be considered for ground water monitoring. | GW |
| 4 Clean Water Act | Clean Water Act, Section 303 | Relevant and Appropriate | Water quality criteria set at levels to protect human health for water and fish ingestion and protection of aquatic life in streams, lakes, and rivers | To be considered for ground water management if a surface water discharge will be required<br>To be considered for storm water management if a surface water discharge will be required. | Hershey Run, GW |
| 5 Delaware Surface Water Quality Standards as amended, Feb. 26, 1993 | Sections 3, 4, 5, 6, 8, 9, 10, 11.1, 11.2, 11.3, 11.4, 11.6, 12 | Applicable | Criteria are provided to maintain surface water for streams, lakes, rivers, and standing water in wetlands of satisfactory quality consistent with public health and recreational purposes, the propagation and protection of fish and aquatic life, and other beneficial uses of water. | Any surface water discharge must meet these levels if more stringent than federal regulations. | Hershey Run |
| **B. Air** | | | | | |
| 1 Clean Air Act | 42 U.S.C. § 7401 | | | | |
| a National Emissions Standards for Hazardous Air Pollutants | 40 C.F.R. Part 61 | Relevant and Appropriate | Standards promulgated for air emissions from specific source categories. Not applicable but may be relevant and appropriate for emissions from excavations at Superfund sites. | Relevant and appropriate for potential odors and emissions resulting from excavation. | Uplands |
| 2. Delaware Ambient Air Quality Standards | Title 7, Delaware Code, Ch 60, Regulation 3, Section 6003 | Applicable | Establishes ambient air quality standards. | Applicable for potential releases from excavation work or other remedial actions. | Uplands |
| **II. LOCATION SPECIFIC** | | | | | |
| 1. Coastal Zone Management Act of 1972, Coastal Zone Act Reauthorization Amendments of 1990 | 16 U.S.C. §§ 1451 et seq. 15 C.F.R. Part 930 | Applicable | Requires that Federal agencies conducting or supporting activities directly affecting the coastal zone, conduct or support those activities in a manner that is consistent with the approved appropriate State coastal zone management program. (See Delaware's Comprehensive Update and Routine Program Implementation, March 1993) | On-site remedial actions are required to be consistent, to the maximum extent practicable, with Delaware's coastal zone management program EPA must notify Delaware of its determination that the actions are consistent to the maximum extent practicable. | Site-wide |
| 2. The Archaeological and Historical Preservation Act of 1974 | 16 U.S.C. § 469 | Applicable | Requirements relating to potential loss or destruction of significant scientific, historical, or archaeological data | The preferred alternative has the potential for disturbing archeological resources. Further action will be taken to identify the potentially affected resources and action will be taken to mitigate any adverse effects on those resources that would result from Remedial activities | Site-wide |



AR316099

| ARAR or TBC | Legal Citation | ARAR Class | Requirement Synopsis | Applicability to Selected Remedy | Area of Concern |
|---|---|---|---|---|---|
| 3. Protection of Floodplains | 40 C F.R. Part 6, Appendix A; 40 C.F.R. § 6.302 | Applicable | Sets forth EPA policy for carrying out provisions of Executive Order 11988 (Floodplain Management) which requires actions to avoid adverse effects, minimize potential harm, and restore and preserve natural and beneficial values. | Applicable since much of the remedial action will take place within both the 100-year and 500-year floodplains. Due to the encroachment of the containment area into tidal wetlands, wetlands will be constructed on site to mitigate the loss of volume inside the floodplain. | Site-wide |
| 4. Protection of Wetlands | 40 C.F.R. Part 6, Appendix A; 40 C.F.R. § 6.302 | Applicable | Sets forth EPA policy for carrying out provisions of Executive Order 11990 (Protection of Wetlands) which requires actions to avoid adverse effects, minimize potential harm, and restore and preserve natural and beneficial values. | Applicable since the construction of the containment area will affect wetlands. | Wetlands |
| 5. Delaware Coastal Zone Act, 7 Delaware Code Chapter 70, Coastal Zone Act Regulations, 6/9/93 | 7 Delaware Code, Sections 7003, 7004 | To Be Considered | Controls the location, extent, and type of industrial development in Delaware's coastal areas. | Will be considered for consistency since the remedial action involves substantial aquatic habitat and is located in Delaware's coastal area although not in the defined coastal zone of this statute | ALL |
| 6. Delaware Wetlands Regulations Revised June 29, 1984 | Sections 1, 2, 7 | Applicable | Requires activities that may adversely affect wetlands in Delaware to be permitted. Permits must be approved by the county or municipality having jurisdiction | Any substative requirements shall be met since wetlands will be destroyed and replaced in the Hershey Run marsh, and dredged (or excavated) and restored in the wetlands near the South Ponds. Since all of the wetland or remediation is considered "on-site", no permit will be required. | Wetlands |
| 7. Delaware Regulations Governing the Use of Subaqueous Lands, amended September 2, 1992 | Sections 1, 3, 4 | Applicable | Requires activities that affect public or private subaqueous lands in the State be permitted. | Any substantive requirements shall be met since the remediation involves dredging and the potential rechannelization of Hershey Run. However, no permit shall be required. | Wetlands |
| 8. Delaware Executive Order 56 on Freshwater Wetlands (1988) | | To Be Considered | General policy to minimize the adverse effects to freshwater wetlands. | To be considered for wetland remediation and restoration | Wetlands |
| 9. Governor's Roundtable Report on Freshwater Wetlands (1989) | | To Be Considered | General policy to minimize the adverse effects to freshwater wetlands | To be considered for wetland remediation and restoration. | Wetlands |
| 10. Ground Water Protection Strategy of 1984 | EPA 440/6-84-002 | To be Considered | Identifies ground water quality to be achieved during remedial actions based on aquifer characteristics and use. | The EPA aquifer classification will be taken into consideration during design and implementation of the remedy. | GW |
| 11. Requirements pertaining to White Clay Creek, a Wild and Scenic River | Wild and Scenic River Act 36 C F R. Part 297 | Applicable | Requirements to maintain the WSR in a free-flowing condition to protect the water quality and to fulfill other vital national conservation purposes | Applies to White Clay Creek, the stream into which Hershey Run drains | Site-wide |



AR316100

| ARAR or TBC | Legal Citation | ARAR Class | Requirement Synopsis | Applicability to Selected Remedy | Area of Concern |
|---|---|---|---|---|---|
| **III. ACTION SPECIFIC** | | | | | |
| **A. Miscellaneous** | | | | | |
| 1. Council on Environmental Quality | 40 C.F R. § 1500.2(f) | Relevant and Appropriate | Requires use of all practicable means, consistent with the requirements of NEPA to restore and enhance the quality of the human environment and avoid or minimize any possibe adverse effects upon the quality of the human environment | Institutional controls shall be added to the Site to make sure the restored wetlands remain wildlife habitat. | Wetlands |
| 2. Delaware Regulations Governing Hazardous Substance Cleanup, 1/93 | Section 9 | Relevant and Appropriate | Establishes clean-up criteria for hazardous waste sites. Only criteria considered relevant and appropriate are for ground water and soil ($1x10^{-5}$; Hazard Index of 1; or natural background if higher). | The cleanup criteria for the Site, though derived from the results of the Ecological Risk Assessment, are protective of Human Health as well. | Uplands, GW |
| 3. Requirements for dredging,excavation and rechannelization | The Rivers and Harbors Act, Section 10 | Applicable | Substantive requirements of a Section 10 permit for disposal of dredged and/or excavated materials at an approved facility or in a containment cell | Applies to all materials dredged or excavated during rechannelization of a navigable water of the U.S. | Site-wide |
| 4. Requirements for dewatering from dredging operation | Clean Water Act, Section 404 | Applicable | Substantive requirements for the discharge resulting from the dewatering of dredged or fill material into the waters of the U.S. | Applies to all discharges from materials dredged or excavated requiring dewatering during rechannelization of a navigable water | Site-wide |
| 5. Delaware Land Use Restrictive Covenants | Title 7, Delaware Code Chapter 79 | Applicable | To provide the required restrictions on land use to protect the integrity of the remedy as well as human health and the environment. | Applies to institutional controls to be implemented at the Site. | Site-wide |
| **B. Water** | | | | | |
| 1. Clean Water Act (CWA), National Pollutant Discharge Elimination System Requirements | 40 C.F.R. Part 122-125 | Applicable | Enforceable standards for all discharges to waters of the United States | Discharge limits shall be met for any on-site discharges to surface water including treated ground water (if necessary) and wastewater from dewatering dredge material. Only substantive requirements shall be met and no permit shall be required. | Wetlands GW |
| 2. General Pretreatment Regulations | 40 C.F R Part 403 | Applicable | Standards for discharge to POTW. | Applicable should the extracted ground water, treated ground water, or wastewater from dredge material be discharged to a POTW. | Wetlands GW |
| 3. Section 10 of the River and Harbors Act | 33 U.S.C Section 403<br>33 C F.R. Part 320-330 | Applicable | Permitting requirements for dredging | The stream and wetland dredging will comply to any substantive requirements, but no permit will be required | Wetlands |
| 4. State of Delaware Regulations Governing the Construction of Water Wells, January 20, 1987 | Sections 3, 4, 5, 6, 7, 8, 9, 10 | Applicable | Contain requirements governing the location, design, installation, use, disinfection, modification, repair, and abandonment of all wells and associated pumping equipment | Installation of any monitoring and recovery wells and the abandonment of wells shall meet all substantive requirements. | Site-wide |

AR316101

| ARAR or TBC | Legal Citation | ARAR Class | Requirement Synopsis | Applicability to Selected Remedy | Area of Concern |
|---|---|---|---|---|---|
| 5. Delaware Water Quality Standards, as amended, February 26, 1993 | Sections 3-6, 8-10, 11.1, 11.2, 11.3, 11.4, 11.6, 12 | Applicable | Standards are established in order to regulate the discharge into state waters in order to maintain the integrity of the water. | Applicable because the ground water management system will most likely discharge to surface water (the final discharge point will be determined in design). | Hershey Run, GW |
| 6. Delaware River Basin Commission (DRBC) Water Quality | DRBC Ground Water Protected Area Regulation, No. 4, 6(f), 9, 10; Water Code of the Basin, Sections 2.20.4, 2.50.2 | To Be Considered | Regulate restoration, enhancement, and preservation of waters in the Delaware River basin. | To be considered if remedial action involves discharge of >50,000 gallons/day average over any month or a withdrawal of ground water of 100,000 gallons/day or more average over any month. | Hershey Run, GW |
| 7 Delaware Regulations Governing the Allocation of Water March 1, 1987 | Sections 1, 3, 5.05 | Applicable | Contain information pertaining to water allocation permits and criteria for their approval. | May be applicable for the ground water management system.<br>No permit required. | Hershey Run, GW |
| 8. State of Delaware Groundwater Management Plan November 1, 1987 | | To Be Considered | Policy for ground-water management. | To be considered in setting the ground water management zone. | GW |
| 9 Delaware Regulations Governing Control of Water Pollution, amended 6/23/83 | Section 7, 8, 9, 10, 11, 12, 13 | Applicable | Contain water quality regulations for the discharging into surface and ground water. | Applicable for potential discharge of treated ground water into surface water Also applicable for potential storm water runoff into Hershey Run, White Clay Creek or the Christina River | Surface Waters, GW |
| **C. Sediments/Solids** | | | | | |
| 1. Delaware Sediment and Stormwater Regulations January 23, 1991 | Section 3, 6, 9; 10, 11, 15 | Applicable | Establishes a statewide sediment and stormwater management program | A stormwater and sediment management plan consistent with Delaware requirements must be approved by EPA before construction disturbing over 5,000 square feet of land can begin | Site-wide |
| **D. Waste Handling and Disposal** | | | | | |
| 1. RCRA Subtitle D Landfill Regulations | 40 C.F.R. § 258.60(a) | Relevant and Appropriate | Closure requirements for RCRA subtitle D landfills | Provides some technical requirements for the cap for the containment area | Uplands |
| 2 Delaware Regulations Governing Hazardous Waste | SEE BELOW F 5, F.7, F.9, F.11, F.13, F.15, F.17 | SEE BELOW | Delaware Regulations Governing Hazardous Waste Part 261 define "hazardous waste" The regulations listed below apply to the handling of such hazardous waste. | SEE BELOW | SEE BELOW |



AR316102

| ARAR or TBC | Legal Citation | ARAR Class | Requirement Synopsis | Applicability to Selected Remedy | Area of Concern |
|---|---|---|---|---|---|
| 3. Resource Conservation and Recovery Act of 1976, Hazardous and Solid Waste Amendments of 1984 | SEE BELOW F.6, F.8, F.10, F.12, F.14, F.16, F.18<br><br>Federal regulations would not apply for those regulations which Delaware has the authority from EPA to administer. | SEE BELOW | Regulates the management of hazardous waste, to ensure the safe disposal of wastes, and to provide for resource recovery from the environment by controlling hazardous wastes "from cradle to grave " | SEE BELOW | SEE BELOW |
| 4 Standards Applicable to Generators of Hazardous Waste | Delaware Regulations Governing Hazardous Waste, §§ 262.10-58 | Applicable | Establishes standards for generators of hazardous wastes including waste determination manifests and pre-transport requirements.<br><br>(Applies to recovered creosote NAPL drummed for off-site treatment or recycling.) | Applicable to operator(s) of the NAPL recovery and ground water management systems because the wastes to be recovered are a RCRA-hazardous waste. | Site-wide |
| 5. Standards Applicable to Generators of Hazardous Waste | EPA Regulations, 40 C.F.R Part 262.10-58 | Applicable | Establishes standards for generators of hazardous wastes including waste determination manifests and pre-transport requirements | Applicable to operator(s) of the NAPL recovery and ground water management systems because the wastes to be recovered are a RCRA-hazardous waste. | Site-wide |
| 6. Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities (TSDF) | Delaware Regulations Governing Hazardous Waste, Part 264 (40 C.F.R. §§ 264) | Applicable | Regulations for owners and operators of TSDFs which define acceptable management of hazardous wastes | Applies to onsite recovery and treatment systems which handle hazardous waste | Site-wide |
| 7. Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities (TSDF) | EPA Regulations, 40 C F.R. Part 264 | Applicable | Regulations for owners and operators of TSDFs which define acceptable management of hazardous wastes | Applies to onsite recovery and treatment systems which handle hazardous waste | Site-wide |
| 8 RCRA Requirements for Use and Management of Containers | Delaware Regulations Governing Hazardous Waste, §§ 264.170-178 | Applicable | Requirements for storage of hazardous waste in storage containers. | Applicable for temporary storage containers and on-site treatment systems. | Site-wide |
| 9 RCRA Requirements for Use and Management of Containers | EPA Regulations, 40 C F.R §§ 264.170-178 | Applicable | Requirements for storage of hazardous waste in storage containers | Applicable for temporary storage containers and on-site treatment systems | Site-wide |
| 10. RCRA Requirements for Tanks Systems | Delaware Regulations Governing Hazardous Waste, §§ 264.190-199 | Applicable | Requirements for storage or treatment of hazardous waste in tank systems. | Only applicable for onsite treatment systems and temporary storage tanks containing hazardous wastes. | Site-wide |

AR316103

| ARAR or TBC | Legal Citation | ARAR Class | Requirement Synopsis | Applicability to Selected Remedy | Area of Concern |
|---|---|---|---|---|---|
| 11. RCRA Requirements for Tanks Systems | EPA Regulations, 40 C.F.R. §§ 264.190-199 | Applicable | Requirements for storage or treatment of hazardous waste in tank systems. | Only applicable for onsite treatment systems and temporary storage tanks containing hazardous wastes. | Site-wide |
| 12. The Hazardous Waste Permit Program | Delaware Regulations Governing Hazardous Waste, Part 122 | Applicable | Requires a permit for the treatment, storage, or disposal of any hazardous waste as identified or listed in Part 261. | Any substative requirements will be met. But no permit will be required | Site-wide |
| 13 The Hazardous Waste Permit Program | EPA Regulations, 40 C.F.R. Part 122 | Applicable | Requires a permit for the treatment, storage, or disposal of any hazardous waste as identified or listed in Part 261. | Any substative requirements will be met. But no permit will be required | Site-wide |
| 14 Identification and Listing of Hazardous Wastes | Delaware Regulations Governing Hazardous Wastes, Part 261 | Applicable | Identifies solid wastes which are regulated as hazardous wastes. | Use to determine which materials to be disposed of are hazardous wastes. | Site-wide |
| 15. Identification and Listing of Hazardous Wastes | EPA Regulations, 40 C F R. Part 261 | Applicable | Identifies solid wastes which are regulated as hazardous wastes | Use to determine which materials to be disposed of are hazardous wastes | Site-wide |
| 16. RCRA Land Disposal Restrictions | Delaware Regulation Governing Hazardous Waste, Part 268 | Applicable | Restrictions on land disposal of hazardous wastes. | Applies to consolidation of waste which is hazardous from across the Site. (EPA has herein designated the containment areas as Areas of Contamination ) | Site-wide |
| 17. RCRA Land Disposal Restrictions | EPA Regulations, 40 C.F.R. Part 268 | Applicable | Restrictions on land disposal of hazardous wastes. | Applies to consolidation of waste which is hazardous from across the Site. (EPA has herein designated the containment areas as Areas of Contamination.) | Site-wide |

**Table 9.** Cost Summaries - Alternatives 1, 2, 3, 4, and 5

**Table 9. Cost Summaries for Alternatives 1, 2, 3, 4, and 5**

| Remedial Alternative | Description | Capital Cost | Present Worth Operations & Maintenance Cost (7%, 30 Yrs) | Total Present Worth Cost |
|---|---|---|---|---|
| 1 | No Action | $0 | $0 | $0 |
| 2 | Cover upland soils; Sediment cap in Fire Pond, South Pond and K Pond; Sheetpile & NAPL collection at Fire Pond and South Pond; MNR in Hershey Run and tidal wetlands; MNA of ground water contamination | $15,934,988 | $1,490,864 | $17,425,852 |
| 3 | Excavate, consolidate and cap shallow soils and shallow tidal sediments; Cap Fire, K and South Ponds; Sheetpile and NAPL collection at Fire Pond and South Ponds areas; Rechannelization of Hershey Run; Wetlands mitigation; MNA of ground water contamination | $40,094,305 | $40,094,305 | $43,344,688 |
| 4 | Excavate, consolidate and cap all contaminated soils and sediments; Subsurface ground water barrier wall around consolidation areas with passive NAPL recovery; Restoration of ground water through excavation of NAPL-contaminated aquifer material outside of consolidation areas; Rechannelization of Hershey Run; Wetlands mitigation; Monitoring of ground water contamination | $49,837,587 | $1,918,652 | $51,756,239 |
| 5 | In-situ steam-enhanced extraction of subsurface NAPL; excavation and off-site treatment of sediments and certain soils; Wetland restoration; MNA of ground water contamination | $189,365,815 | $1,419,957 | $190,785,772 |

**Table 10.** Cost Estimate Details for Selected Remedy

## Table 10. Cost Estimate Details for Selected Remedy

| Item | Item Description | Estimated Quantity | Unit | Unit Price | Cost | Costs to be Bourne by Wetlands Developer* |
|---|---|---|---|---|---|---|
| | **Capital Costs** | | | | | |
| 1 | Pre-Design Investigation | 1 | LS | $500,000 | $500,000 | |
| 2 | Mobilization/Demobilization | 1 | LS | $100,000 | $100,000 | |
| 3 | Site Preparation | | | | | |
| 3a | Clearing | 102 7 | Acres | $5,670 | $582,309 | |
| 3b | Erosion/Sedimentation Control | 1 | LS | $35,000 | $35,000 | |
| 4 | Remove/Replace Surface Soils | | | | | |
| 4a | Excavate/Trans/Stockpile Sediment From Upper Hershey | 12,000 | CY | $100 | $1,200,000 | |
| 4b | Excavate/Trans/Stockpile NAPL Impacted Soil Below GW | 48,400 | CY | $100 | $4,840,000 | |
| 4c | Soil Removal Excavate/Transport/Consolidation or Stockpile | 715,619 | CY | $6 | $2,146,857 | $2,146,857 |
| 4d | Compaction of Clean Soil Used To Fill in NAPL Excavations | 48,400 | CY | $6 | $290,400 | |
| 4e | Water Treatment | 1 | LS | $500,000 | $500,000 | |
| 5 | NAPL Area Capping | | | | | |
| 5a | Place 60 mil HDPE Liner In Former NAPL Areas | 7 5 | Acres | $25,700 | $192,750 | |
| 6 | Barrier Wall | | | | | |
| 6a | Platform Construction/Backfill | 1 | LS | $20,000 | $20,000 | |
| 6b1 | Slurry Wall Installation | 125,100 | SF | $8 | $1,000,800 | |
| 6b2 | Sheetpile Wall Installation | 41,700 | SF | $22 | $917,400 | |
| 6c | Cap on Slurry Wall | 2,471 | CY | $18 | $44,480 | |
| 6d | NALP Interceptor Trench w / 2 - 75 Yard Finger Trenches | | | | | |
| 6d1 | Excavation of Trench - In line with sheet piles & slurry wall | 18,533 | CY | $145 | $2,687,285 | |
| 6d2 | Excavation of Trench Fingers 210' X 21' X 3' | 1,050 | CY | $145 | $152,250 | |
| 6d4 | Filter Fabric for all trenches | 60,707 | SY | $0 | $3,642 | |
| 6d5 | Stone Backfill for Trenches | 19,583 | CY | $74 | $1,449,142 | |
| 6d6 | Perforated 36" Stand pipe - ( 1-31' & 22' = 53') | 53 | LF | $75 | $3,975 | |
| 6d7 | Two locking manhole covers | 2 | EA | $250 | $500 | |
| 7 | Excavation and Upper Hershey Run Rechannelization | | | | | |
| 7a | Excavation of Channel [(PRP= 3300 CY was 6500 cy in text, $478,500), 45,600 conservatively includes all of HR] | 45,600 | CY | $145 | $6,612,000 | |
| 7b | Backfill in Entire Channel (6"=5,542cy) (3'=32,000cy) | 32,000 | CY | $65 | $2,080,000 | |
| 7c | Geotextile | 6 9 | Acres | $2,550 | $17,646 | |
| 7d | 6-Inch Stone Backfill in New Channel | 444 | CY | $74 | $32,874 | |
| 7e | Backfill Existing Channel (not expected to be required) | 0 | CY | $170 | $0 | |
| 8 | Wetlands Construction | | | | | |
| 8a | Install Sediment Control Systems | 1 | LS | $50,000 | | $50,000 |
| 8b | Forested Riparian Wetlands -Organic Soil Placement | 18,553 | CY | $30 | | $556,600 |
| 8c | Forested Riparian Wetlands -Vegetation | 23 | Acres | $20,000 | | $460,000 |
| 8d | Tidal Marsh Wetlands -Organic Soil Placement | 13713 | CY | $30 | | $411,390 |
| 8e | Tidal Marsh Wetlands -Vegetation | 17 | Acres | $18,000 | | $306,000 |
| 8f | Wet Meadow/Emergent Wetlands -Organic Soil Placement | 24,200 | CY | $30 | | $726,000 |
| 8g | Meadow/Shrub Wetland and Emergent Wetlands -Vegetation | 30 5 | Acres | $19,000 | | $579,120 |
| 8h | Existing Meadow/Shrub Wetland Restoration -Remove | 10 | Acres | $43,000 | | $430,000 |
| 8i | Existing Meadow/Shrub Wetland Restoration -Seeding | 10 | Acres | $19,000 | | $190,000 |
| 9 | On-site Consolidation (38 acre consolidation area) | 38 | Acres | | | |
| 9a | Grading/Compaction of Surface | 39,398 | CY | $6 | $236,388 | |
| 9b | Grading and Compaction of Impacted Soils | 327,305 | CY | $7 | $2,291,135 | |
| 10 | Low-Permeability Vegetative Cover | | | | | |
| 10a1 | Grade Traffic Areas (PRP= 351,408 SF, $42,178) | 416,040 | SF | $0 | $49,925 | |
| 10a2 | Geotextile on Traffic Areas (PRP= 8 1 Acres, $17,913) | 11 | Acres | $2,220 | $24,489 | |
| 10a3 | Install Gravel Pad and Haul Road (PRP= 4,353 CY, $97,083) | 6,744 | CY | $22 | $150,402 | |
| 10b | HDPE Geomembrane Liner (acreage * 1 05 for overlap) | 39 9 | Acres | $25,700 | $1,025,430 | |
| 10c | Geocomposite Drainage Layer- | 38 0 | Acres | $41,385 | $1,572,630 | |
| 10d | 18-inch Backfill from Stockpiled Soil | 91,960 | CY | $3 | $262,086 | |
| 10e | 6-inch Topsoil/Seeding | 30,653 | CY | $61 | $1,869,853 | |
| 10f | Drainage System V-Ditch Reinforced Concrete | 80 | LF | $10 | $800 | |
| 11 | Miscelaneous - | | | | | |
| 11a | Reseed All Areas other than Cap | 7 8 | Acres | $5,670 | $44,226 | |
| 11b | Miscellaneous Site Restoration | 1 | LS | $20,000 | $20,000 | |
| 11c | Miscellaneous Waste Disposal | 1 | LS | $600,000 | $600,000 | |
| 12 | NAPL Monitoring Wells | 0 | Well | $3,000 | $0 | |
| 13 | Groundwater MNA (Initial Evaluation & Well Installation) | | | | | |
| 13a | Natural Attenuation Modeling | 1 | Model | $150,000 | $150,000 | |
| 13b | Groundwater Monitoring Wells | 20 | Well | $3,000 | $60,000 | |
| 13c | Groundwater Sampling | 8 | Events | $25,000 | $200,000 | |
| 13d | Report | 1 | Report | $50,000 | $50,000 | |

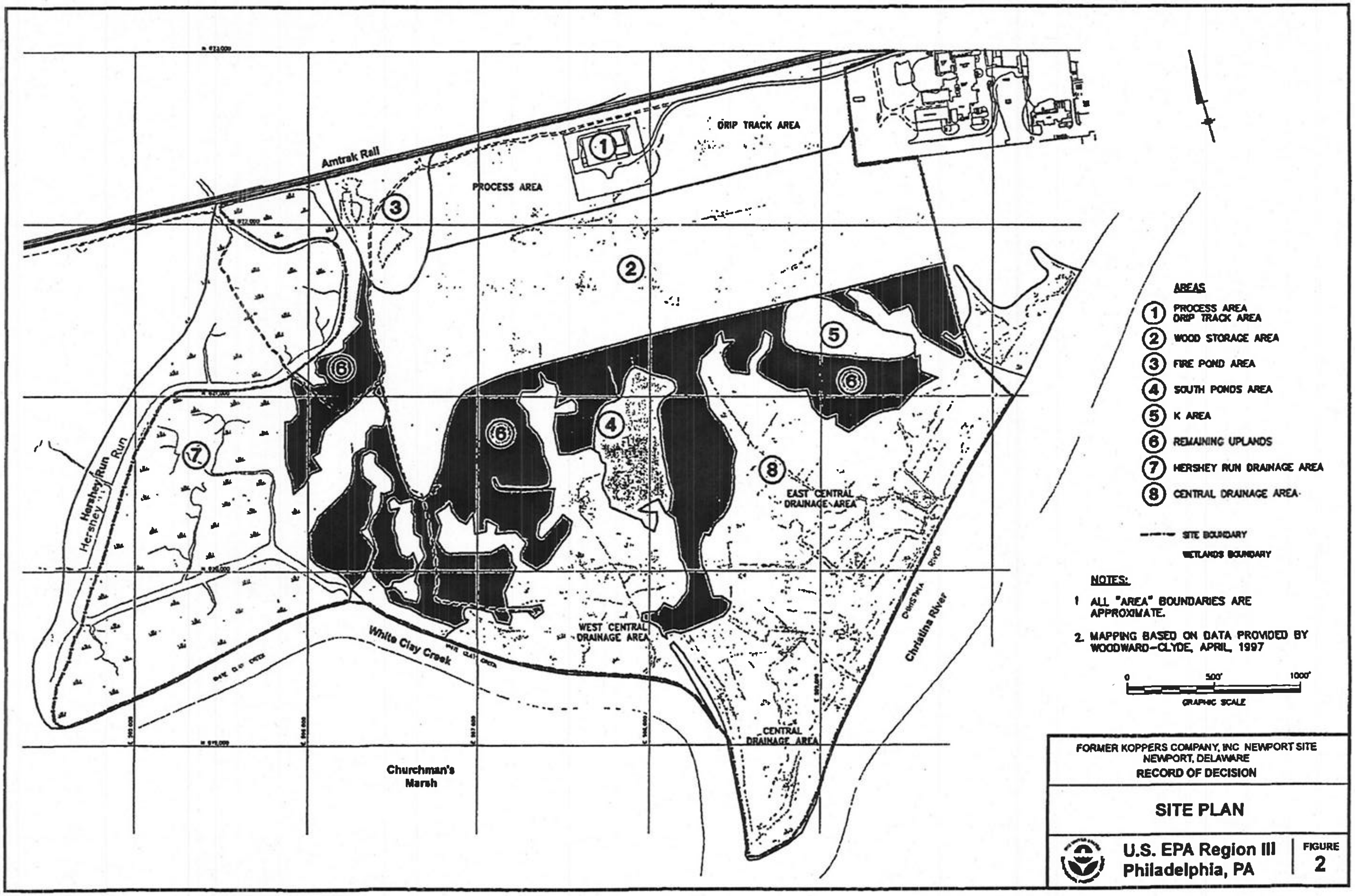
## Table 10. Cost Estimate Details for Selected Remedy

| | | | | | | |
|---|---|---|---|---|---|---|
| 14 | Passive NAPL Recovery | | | | | |
| 14a | Pilot Studies | 12 | Area | $5,000 | $60,000 | |
| 14d | Oil Separator Units | 6 | Unit | $20,000 | $120,000 | |
| 14e | Protective Housings (sheds) | 6 | Shed | $10,000 | $60,000 | |
| 14f | NAPL Storage Tanks | 7 | Tank | $5,000 | $35,000 | |
| 14g | Water Treatment (carbon filtration) | 1 | LS | $178,500 | $178,500 | |
| 15 | Indirects | 63 | Weeks | $20,540 | $1,294,020 | |
| 16 | Archaeological Evaluations | 1 | LS | $350,000 | $350,000 | |
| | | | | Subtotal: | $36,114,193 | $5,855,967 |
| | | Administration and Enigneering (15%) | | | $5,417,129 | $878,395 |
| | | | | Contingency (20%) | $8,306,264 | $1,346,872 |
| | | | | Total Capital Costs: | $49,837,587 | $8,081,234 |
| | **Operations and Maintenance (O&M) Costs** | | | | | |
| | ***30 year costs*** | | | | | |
| 17 | Site inspections (30 yrs) | 1 | Annual | $20,000 | $20,000 | |
| 18 | Landfill maintenance (i e , mowing) (1/3 area from Item 9 per year) | 12 67 | Acres/YR | $100 | $1,267 | |
| 19 | Misc Erosion Control and Repairs (i e , cleaning access roads of vegetation, etc ) | 1 | Annual | $1,500 | $1,500 | |
| 20 | NAPL Monitoring (30 yrs) | 1 | Annual | $15,000 | $15,000 | |
| 21 | NAPL Transport and Disposal (30 yrs) | 25 | GAL/YR | $100 | $2,500 | |
| 22 | Passive NAPL Recovery and Disposal (30 yrs) | | | | | |
| 22a | Oil Separator Unit Maintenance (30 yrs) | 1 | Annual | $30,000 | $30,000 | |
| 22b | Manual Bailing (30 yrs) | 0 | Annual | $60,000 | $0 | |
| 22c | NAPL Disposal (30 yrs) (off-site disposal or recycling) | 35 | GAL / YR | $100 | $3,500 | |
| 22d | Water Treatment (carbon filtration) | 1 | Annual | $30,000 | $30,000 | |
| 23 | Groundwater Monitoring (30 years) | 2 | Annual | $7,500 | $15,000 | |
| | | | | Subtotal: | $118,767 | $0 |
| | P-Present Worth = A{[((1+i)^n)-1)]/[i(1+i)^n]} | | | A - Annual Payment | $118,767 | $0 |
| | | | | I - interest Rate | 7% | 7% |
| | | | | n - # years | 30 | 30 |
| | | | | P-Present Worth (30) = | $1,473,780 | $0 |
| | ***5 year costs*** | | | | | |
| | Wetland Monitoring (5 yrs) | 21 7 | Acres/YR | $5,000 | $108,500 | $108,500 |
| | | | | Subtotal: | $108,500 | $108,500 |
| | P-Present Worth = A{[((1+i)^n)-1)]/[i(1+i)^n]} | | | A - Annual Payment | $108,500 | $108,500 |
| | | | | I - interest Rate | 7% | 7% |
| | | | | n - # years | 5 | 5 |
| | | | | P-Present Worth (5) = | $444,871 | $444,871 |
| | * Note Wetlands development costs are not part of the remedy, but rather are presented for purposes of comparison with the FS Addendum "Alternative 10" cost estimates | Total Present Worth O&M Cost: | | | $1,918,652 | $444,871 |
| | | Total Estimated Cost for Alternative 4: | | | $51,756,239 | $8,526,106 |
| | | Total Rounded Cost for Alternative 4: | | | $51,760,000 | $8,530,000 |

# *V. FIGURES*

## *KOPPERS CO., INC. (NEWPORT PLANT) SUPERFUND SITE*

## *NEWPORT / NEW CASTLE COUNTY, DELAWARE*

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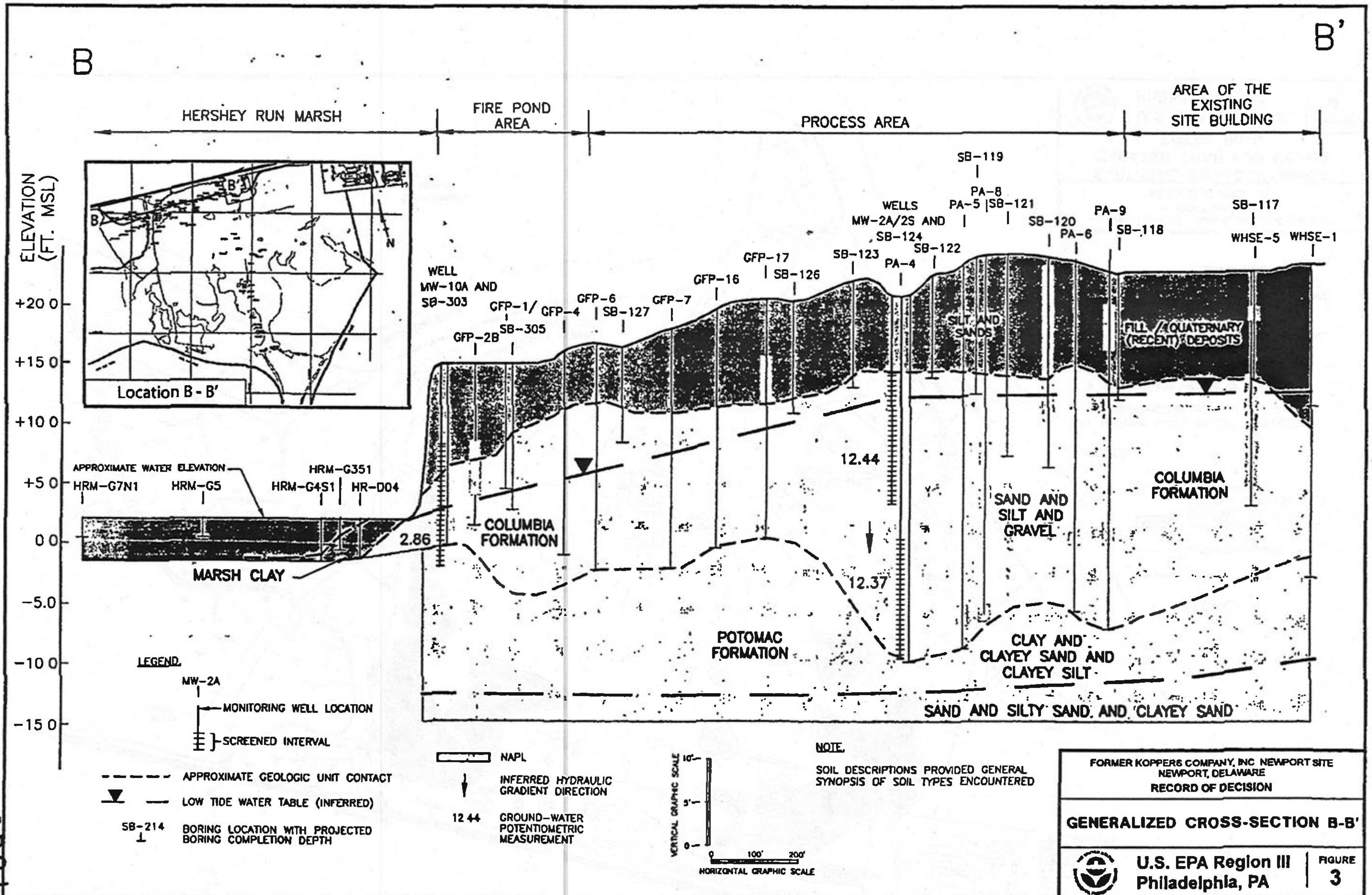
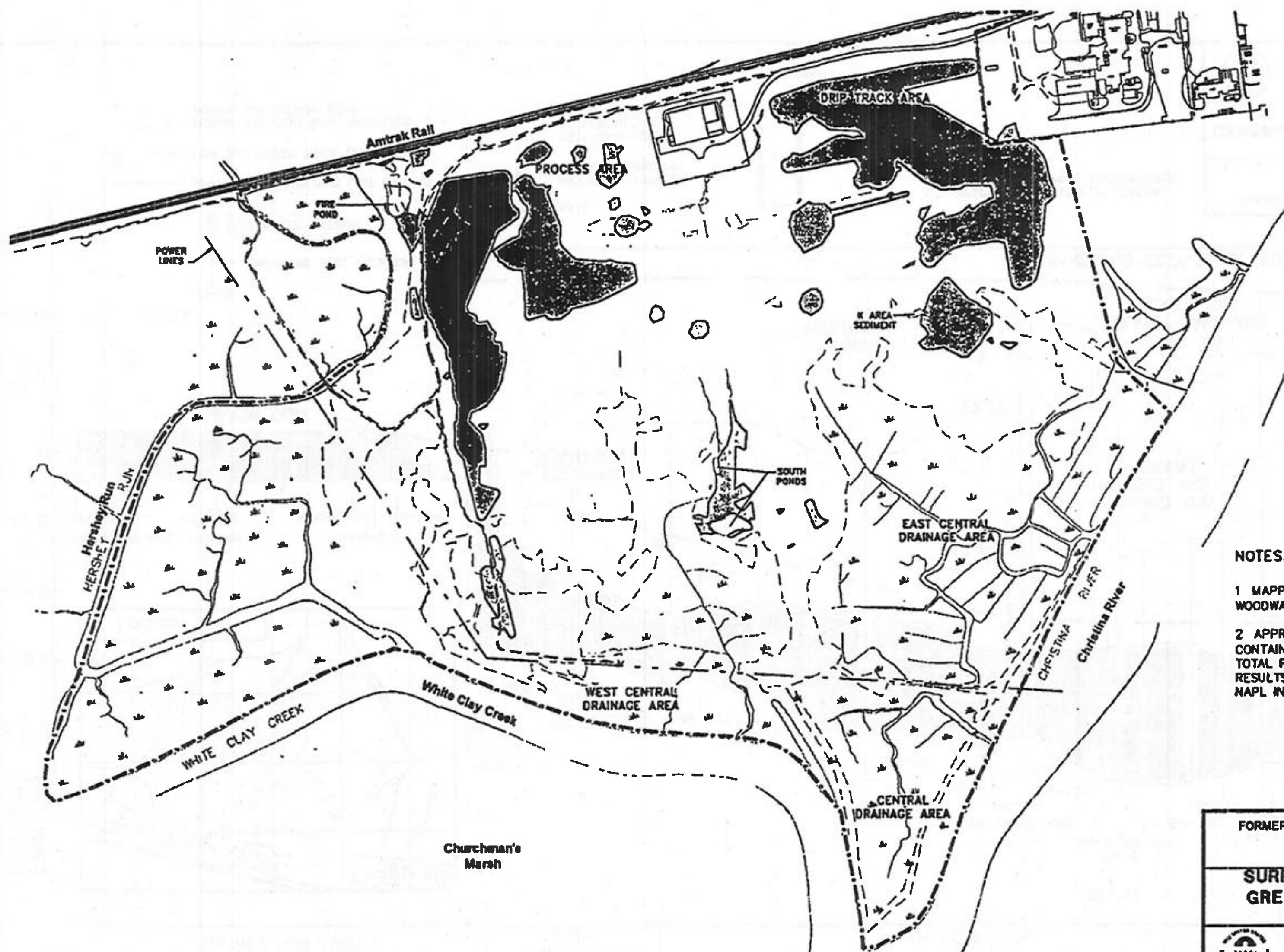

B
B'
HERSHEY RUN MARSH
FIRE POND AREA
PROCESS AREA
AREA OF THE EXISTING SITE BUILDING
ELEVATION (FT. MSL)
+20 0
+15 0
+10 0
+5 0
0 0
-5.0
-10 0
-15 0
Location B - B'
APPROXIMATE WATER ELEVATION
HRM-G7N1
HRM-G5
HRM-G4S1
HRM-G351
HR-D04
MARSH CLAY
2.86
WELL MW-10A AND SB-303
GFP-2B
GFP-1/ SB-305
GFP-4
GFP-6
SB-127
GFP-7
GFP-16
GFP-17
SB-126
SB-123
WELLS MW-2A/2S AND SB-124
PA-4
SB-122
PA-5
PA-8
SB-121
SB-119
SB-120
PA-6
PA-9
SB-118
SB-117
WHSE-5
WHSE-1
SILT AND SANDS
FILL / QUATERNARY (RECENT) DEPOSITS
12.44
12.37
COLUMBIA FORMATION
SAND AND SILT AND GRAVEL
COLUMBIA FORMATION
POTOMAC FORMATION
CLAY AND CLAYEY SAND AND CLAYEY SILT
SAND AND SILTY SAND, AND CLAYEY SAND
LEGEND
MW-2A
MONITORING WELL LOCATION
SCREENED INTERVAL
APPROXIMATE GEOLOGIC UNIT CONTACT
LOW TIDE WATER TABLE (INFERRED)
SB-214
BORING LOCATION WITH PROJECTED BORING COMPLETION DEPTH
NAPL
INFERRED HYDRAULIC GRADIENT DIRECTION
12 44
GROUND-WATER POTENTIOMETRIC MEASUREMENT
VERTICAL GRAPHIC SCALE
10'
5'
0
100'
200'
HORIZONTAL GRAPHIC SCALE
NOTE
SOIL DESCRIPTIONS PROVIDED GENERAL SYNOPSIS OF SOIL TYPES ENCOUNTERED
FORMER KOPPERS COMPANY, INC NEWPORT SITE NEWPORT, DELAWARE
RECORD OF DECISION
GENERALIZED CROSS-SECTION B-B'
U.S. EPA Region III Philadelphia, PA
FIGURE 3




**LEGEND:**

- SITE BOUNDARY
- WETLANDS BOUNDARY
- APPROXIMATE EXTENT OF SURFICIAL SOIL CONTAINING GREATER THAN 600 mg/kg TOTAL PAHs

**NOTES:**

1. MAPPING BASED ON DATA PROVIDED BY WOODWARD-CLYDE, APRIL, 1997
2. APPROXIMATE EXTENT OF SOIL CONTAINING GREATER THAN 600 MG/KG TOTAL PAHs DEFINED BY ANALYTICAL RESULTS AND VISUAL OBSERVATIONS OF NAPL IN THE TOP 1-FOOT DEPTH INTERVAL

0 500' 1000'

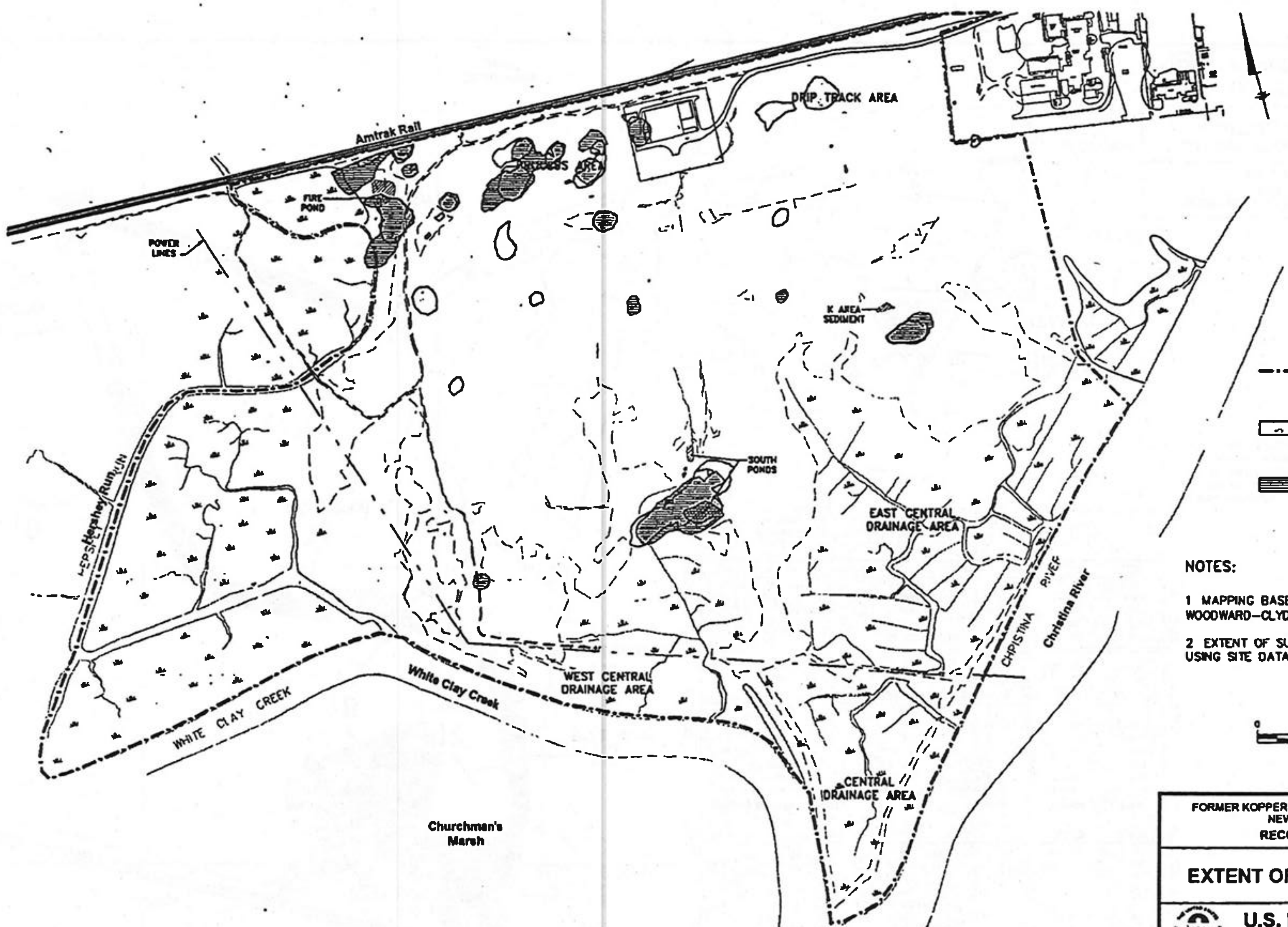
GRAPHIC SCALE

FORMER KOPPERS COMPANY, INC NEWPORT SITE
NEWPORT, DELAWARE
RECORD OF DECISION

**SURFICIAL SOIL CONTAINING GREATER THAN 600 MG/KG TOTAL PAHs**

**U.S. EPA Region III**
**Philadelphia, PA**

FIGURE 4




LEGEND:

- SITE BOUNDARY
- WETLANDS BOUNDARY
- EXTENT OF SUBSURFACE NAPL IN VADOSE ZONE (1- TO 10-FEET BGS)
- EXTENT OF SUBSURFACE NAPL IN SATURATED ZONE (10 FEET BGS TO TOP OF FINE-GRAINED LAYER)

NOTES:

1. MAPPING BASED ON DATA PROVIDED BY WOODWARD-CLYDE, APRIL 1997
2. EXTENT OF SUBSURFACE NAPL DETERMINED USING SITE DATA AND MVS SOFTWARE

0 500' 1000'

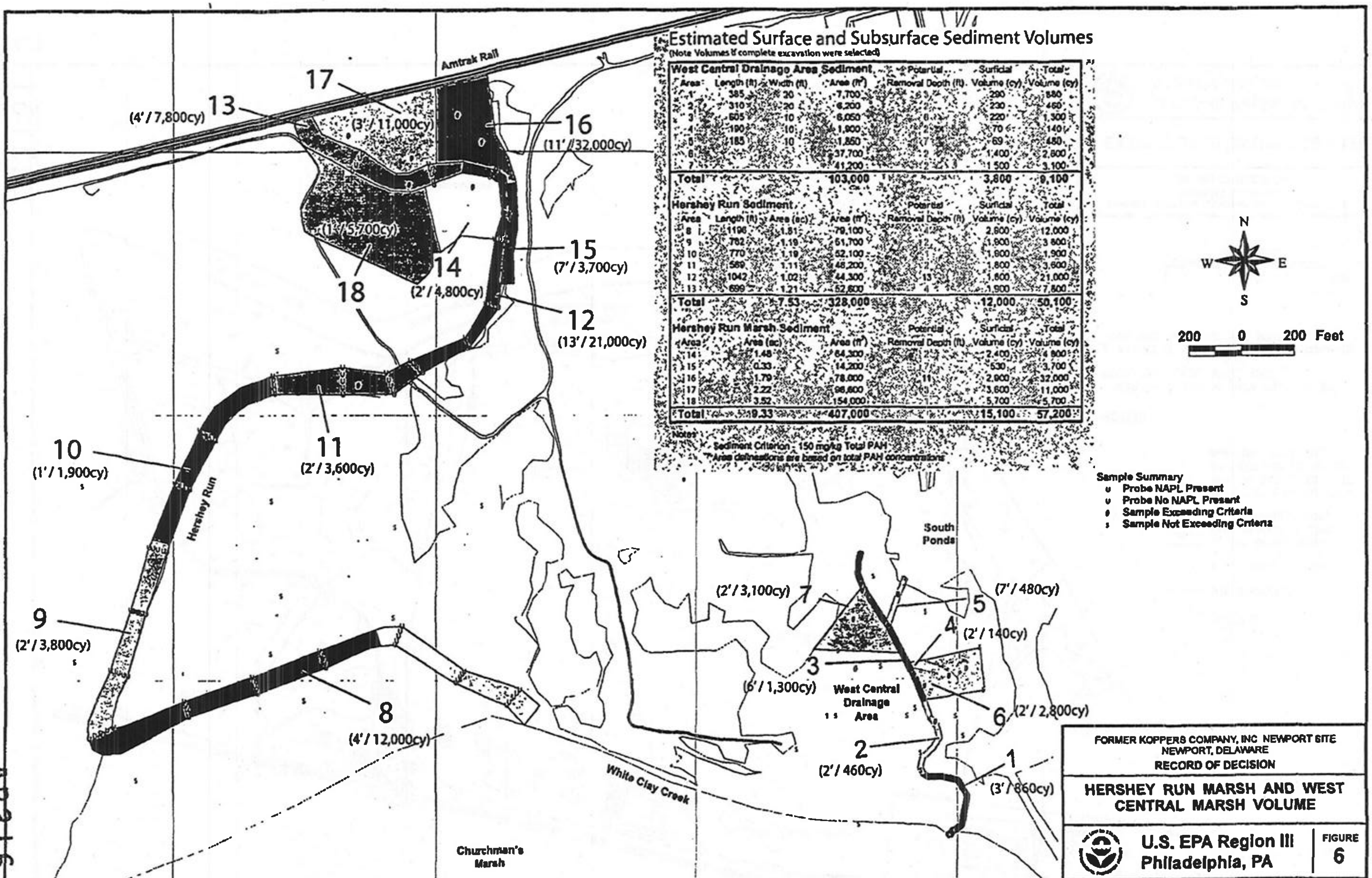
GRAPHIC SCALE

FORMER KOPPERS COMPANY, INC NEWPORT SITE
NEWPORT, DELAWARE
RECORD OF DECISION

**EXTENT OF SUBSURFACE NAPL**

**U.S. EPA Region III**
**Philadelphia, PA**

FIGURE
5




## Estimated Surface and Subsurface Sediment Volumes

(Note Volumes if complete excavation were selected)

| West Central Drainage Area Sediment | | | | Potential | Surficial | Total |
|---|---|---|---|---|---|---|
| Area | Length (ft) | Width (ft) | Area (ft²) | Removal Depth (ft) | Volume (cy) | Volume (cy) |
| 1 | 385 | 20 | 7,700 | 3 | 290 | 860 |
| 2 | 310 | 20 | 6,200 | 2 | 230 | 460 |
| 3 | 605 | 10 | 6,050 | 6 | 220 | 1,300 |
| 4 | 190 | 10 | 1,900 | 2 | 70 | 140 |
| 5 | 185 | 10 | 1,850 | 7 | 69 | 480 |
| 6 | | | 37,700 | 2 | 1,400 | 2,800 |
| 7 | | | 41,200 | 2 | 1,500 | 3,100 |
| Total | | | 103,000 | | 3,800 | 9,100 |

| Hershey Run Sediment | | | | Potential | Surficial | Total |
|---|---|---|---|---|---|---|
| Area | Length (ft) | Area (ac) | Area (ft²) | Removal Depth (ft) | Volume (cy) | Volume (cy) |
| 8 | 1196 | 1.81 | 79,100 | 4 | 2,800 | 12,000 |
| 9 | 762 | 1.19 | 51,700 | 2 | 1,900 | 3,800 |
| 10 | 770 | 1.19 | 52,100 | 1 | 1,900 | 1,900 |
| 11 | 569 | 1.11 | 48,200 | 2 | 1,800 | 3,600 |
| 12 | 1042 | 1.02 | 44,300 | 13 | 1,600 | 21,000 |
| 13 | 699 | 1.21 | 52,600 | 4 | 1,900 | 7,800 |
| Total | | 7.53 | 328,000 | | 12,000 | 50,100 |

| Hershey Run Marsh Sediment | | | Potential | Surficial | Total |
|---|---|---|---|---|---|
| Area | Area (ac) | Area (ft²) | Removal Depth (ft) | Volume (cy) | Volume (cy) |
| 14 | 1.48 | 64,300 | 2 | 2,400 | 4,800 |
| 15 | 0.33 | 14,200 | 7 | 530 | 3,700 |
| 16 | 1.79 | 78,000 | 11 | 2,900 | 32,000 |
| 17 | 2.22 | 96,600 | 3 | 3,600 | 11,000 |
| 18 | 3.52 | 154,000 | 1 | 5,700 | 5,700 |
| Total | 9.33 | 407,000 | | 15,100 | 57,200 |

Notes:
Sediment Criterion - 150 mg/kg Total PAH
Area delineations are based on total PAH concentrations

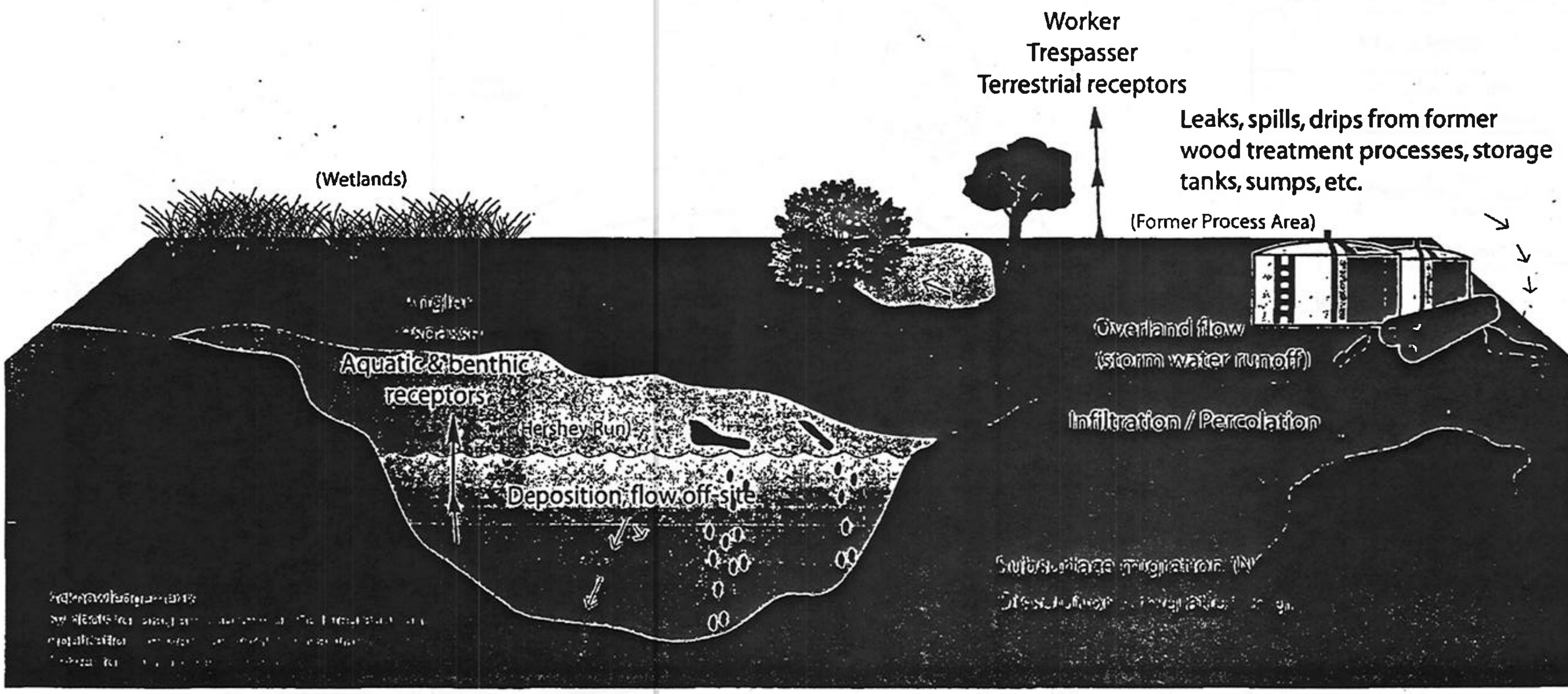
FORMER KOPPERS COMPANY, INC NEWPORT SITE
NEWPORT, DELAWARE
RECORD OF DECISION

**HERSHEY RUN MARSH AND WEST CENTRAL MARSH VOLUME**

**U.S. EPA Region III**
**Philadelphia, PA**

FIGURE 6

AR316116




LEGEND:

→ → Contaminant migration pathway

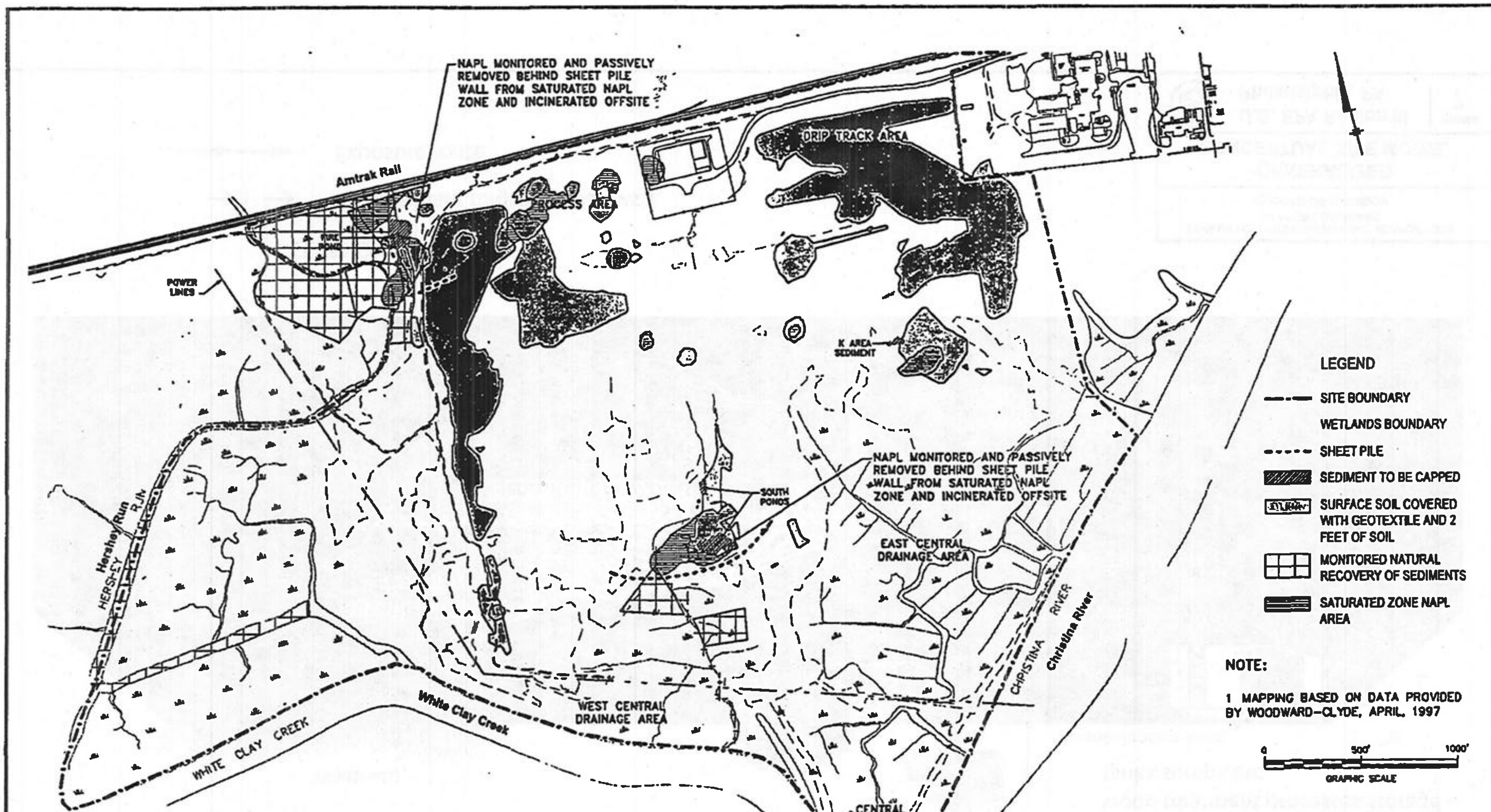
⟶ Exposure route

FORMER KOPPERS COMPANY, INC NEWPORT SITE
NEWPORT, DELAWARE
RECORD OF DECISION

GENERALIZED CONCEPTUAL SITE MODEL

U.S. EPA Region III
Philadelphia, PA

FIGURE 7



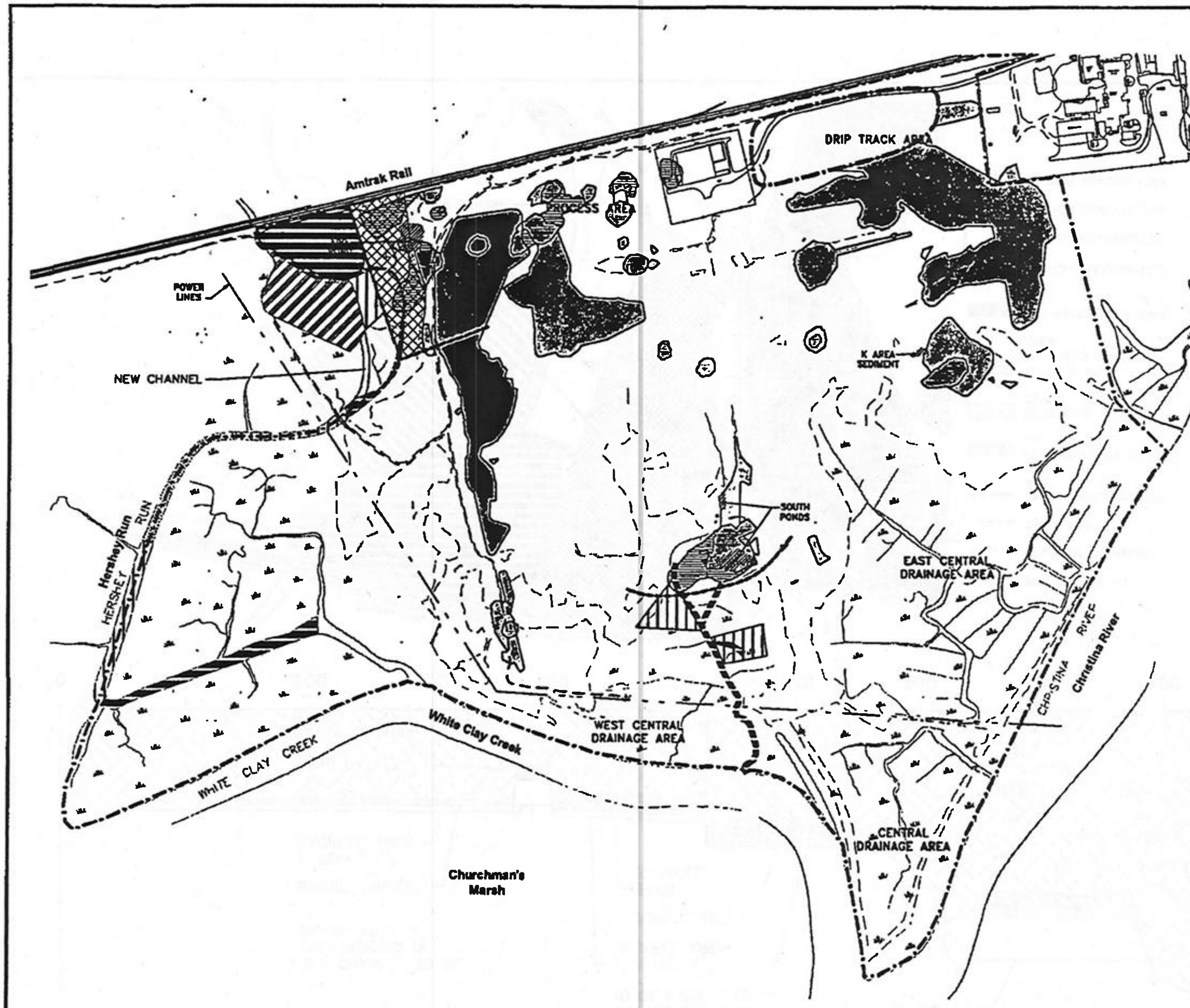

FORMER KOPPERS COMPANY, INC NEWPORT SITE
NEWPORT, DELAWARE
RECORD OF DECISION

**ALTERNATIVE 2**

**U.S. EPA Region III**
**Philadelphia, PA**

FIGURE
8

AR316118

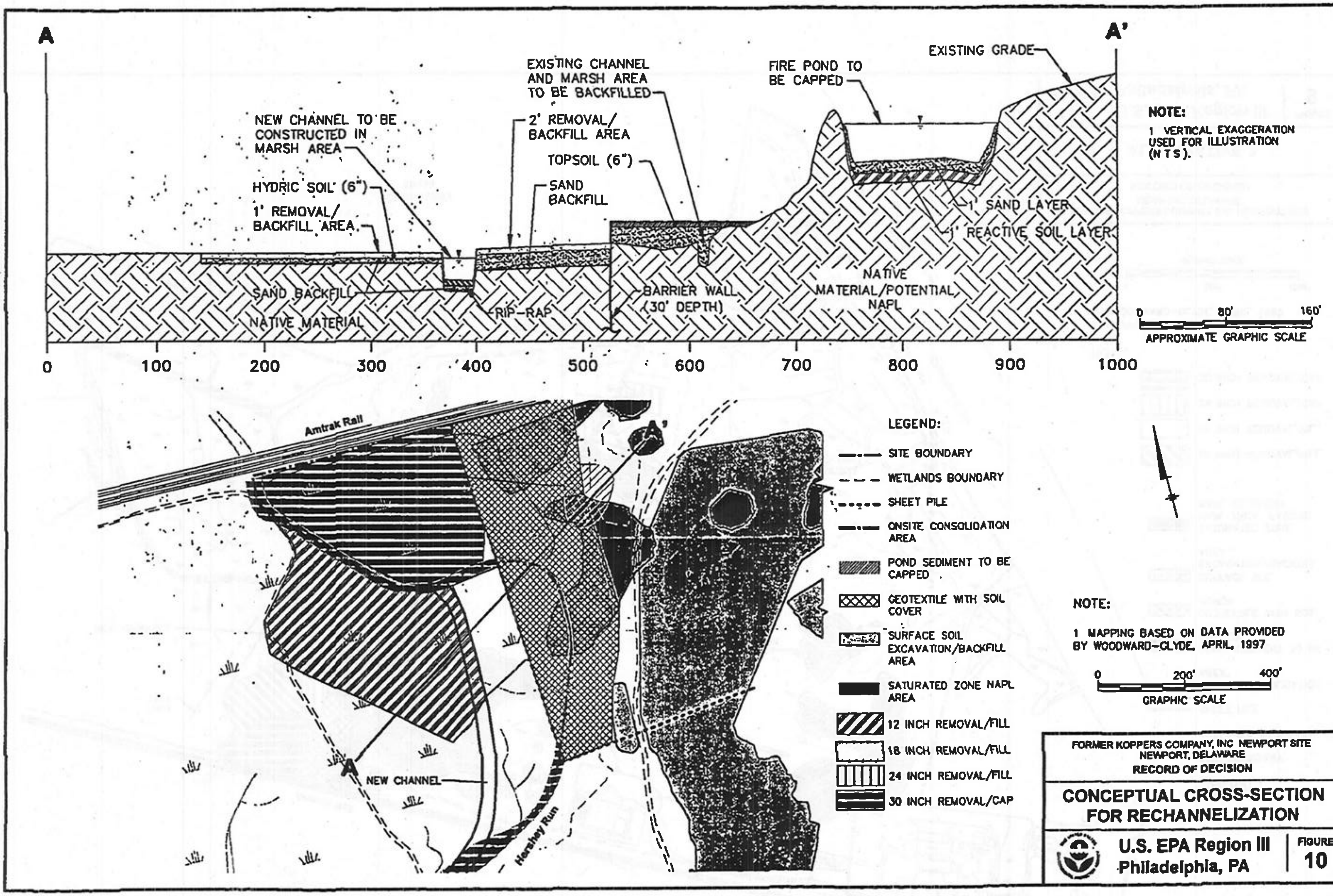



FORMER KOPPERS COMPANY, INC NEWPORT SITE
NEWPORT, DELAWARE
RECORD OF DECISION

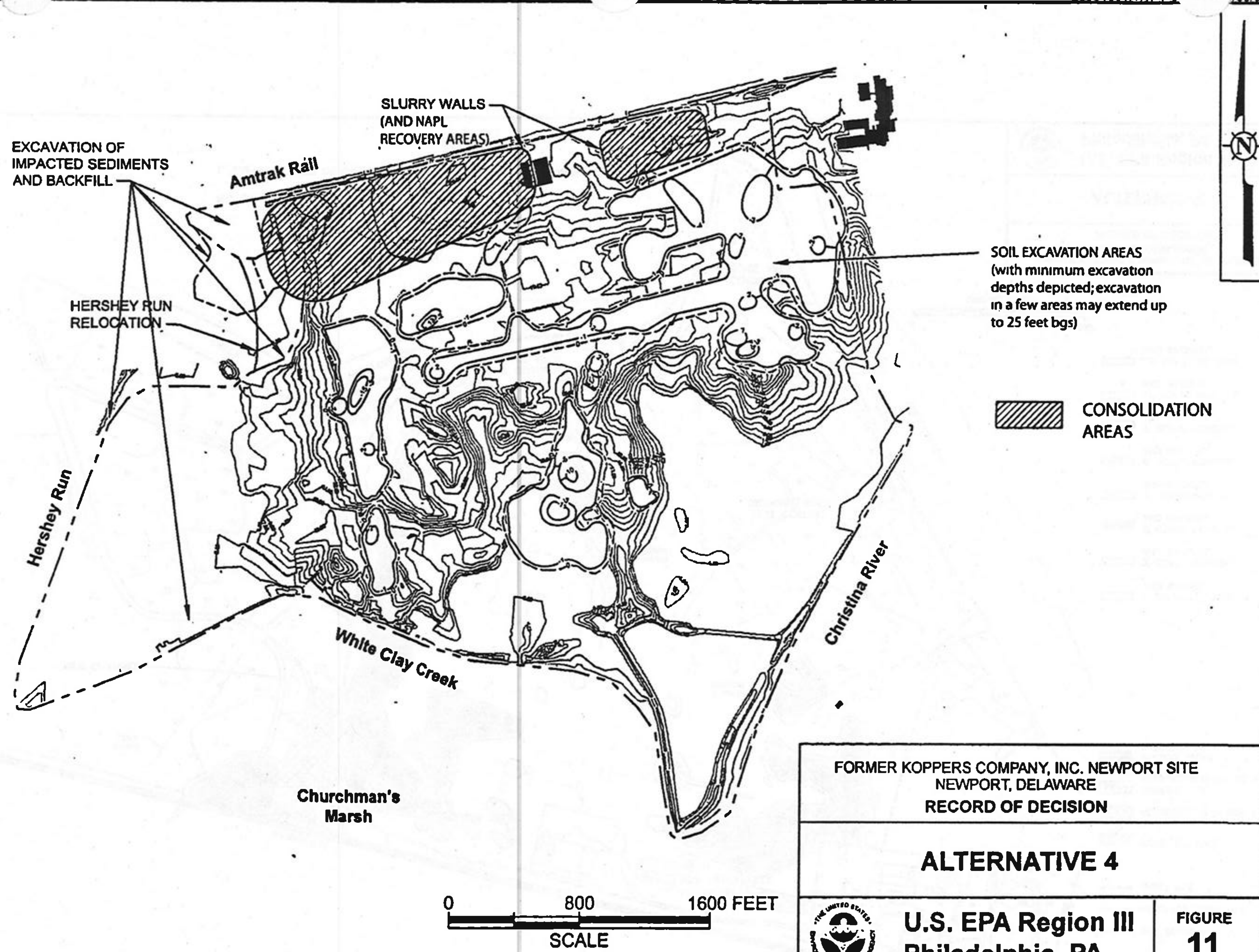
ALTERNATIVE 3

U.S. EPA Region III
Philadelphia, PA

FIGURE 9


A
A'
NEW CHANNEL TO BE CONSTRUCTED IN MARSH AREA
HYDRIC SOIL (6")
1' REMOVAL/ BACKFILL AREA
SAND BACKFILL
NATIVE MATERIAL
2' REMOVAL/ BACKFILL AREA
RIP-RAP
EXISTING CHANNEL AND MARSH AREA TO BE BACKFILLED
TOPSOIL (6")
SAND BACKFILL
BARRIER WALL (30' DEPTH)
FIRE POND TO BE CAPPED
EXISTING GRADE
1' SAND LAYER
1' REACTIVE SOIL LAYER
NATIVE MATERIAL/POTENTIAL NAPL
0
100
200
300
400
500
600
700
800
900
1000
NOTE:
1 VERTICAL EXAGGERATION USED FOR ILLUSTRATION (N T S).
0
80'
160'
APPROXIMATE GRAPHIC SCALE
Amtrak Rail
NEW CHANNEL
Hershey Run
LEGEND:
SITE BOUNDARY
WETLANDS BOUNDARY
SHEET PILE
ONSITE CONSOLIDATION AREA
POND SEDIMENT TO BE CAPPED
GEOTEXTILE WITH SOIL COVER
SURFACE SOIL EXCAVATION/BACKFILL AREA
SATURATED ZONE NAPL AREA
12 INCH REMOVAL/FILL
18 INCH REMOVAL/FILL
24 INCH REMOVAL/FILL
30 INCH REMOVAL/CAP
NOTE:
1 MAPPING BASED ON DATA PROVIDED BY WOODWARD-CLYDE, APRIL, 1997
0
200'
400'
GRAPHIC SCALE
FORMER KOPPERS COMPANY, INC NEWPORT SITE
NEWPORT, DELAWARE
RECORD OF DECISION
CONCEPTUAL CROSS-SECTION FOR RECHANNELIZATION
U.S. EPA Region III
Philadelphia, PA
FIGURE
10

29024801NWPT-0 /30/04




FORMER KOPPERS COMPANY, INC. NEWPORT SITE
NEWPORT, DELAWARE
RECORD OF DECISION

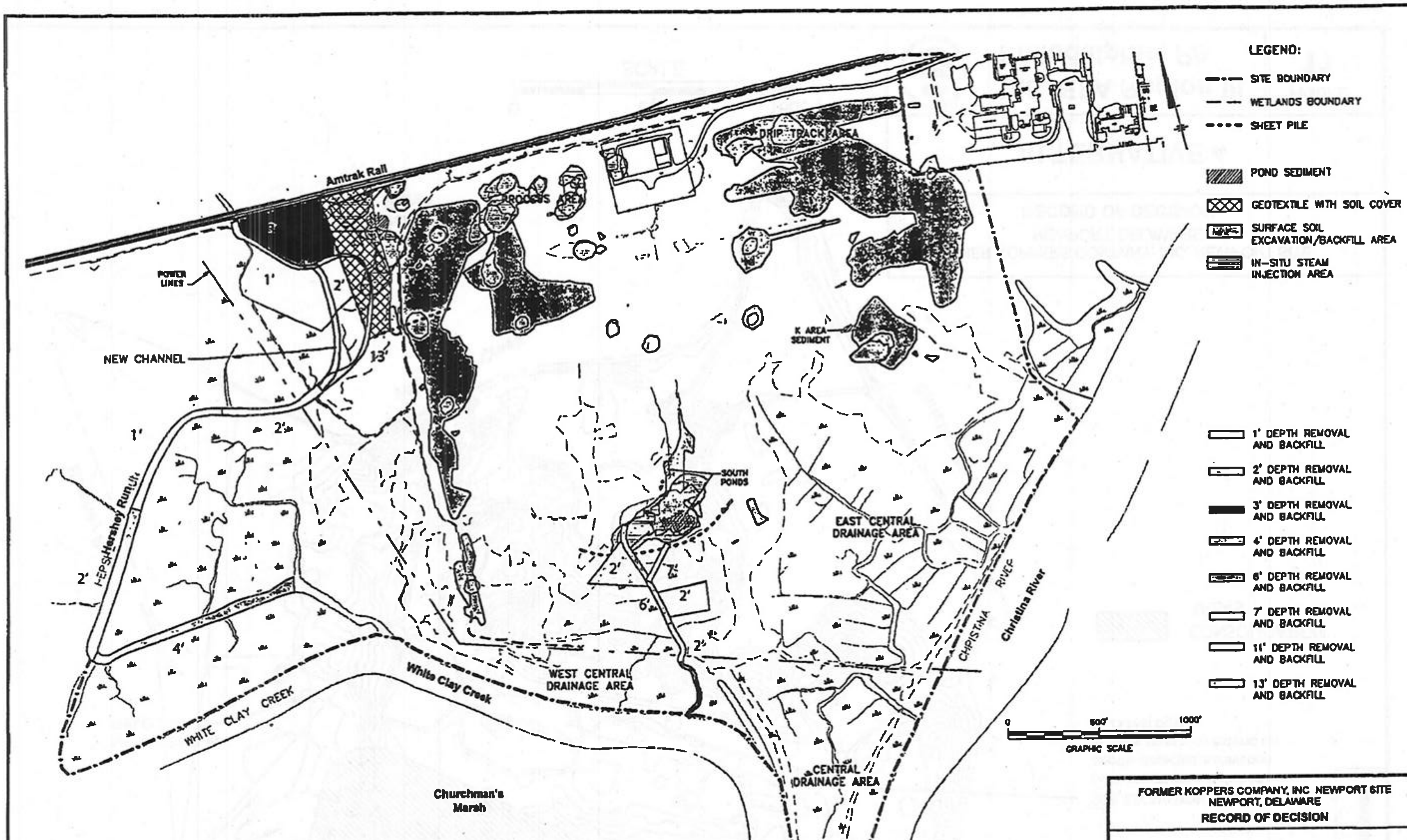
**ALTERNATIVE 4**

**U.S. EPA Region III**
**Philadelphia, PA**

FIGURE
**11**

AR316121

UAO Bates 00603




NOTES:

1. MAPPING BASED ON DATA PROVIDED BY WOODWARD-CLYDE, APRIL, 1997

FORMER KOPPERS COMPANY, INC NEWPORT SITE
NEWPORT, DELAWARE
RECORD OF DECISION

**ALTERNATIVE 5**

**U.S. EPA Region III**
**Philadelphia, PA**

FIGURE 12

**EPA Docket No. CERC-03-2006-0266DC**

# ATTACHMENT 4

UAO Bates 00606

# KOPPERS CO.
# UNILATERAL ADMINISTRATIVE ORDER
# FOR REMEDIAL DESIGN/REMEDIAL ACTION
# ADMINISTRATIVE RECORD FILE * **
# INDEX OF DOCUMENTS

1. Letter to Mr. William Giarla, Beazer East, Inc., from Mr. Peter Schaul, U.S. EPA, re: Special Notice Demand Letter, 11/4/05. P. The following are attached:

   a) an undated Consent Decree;

   b) an undated Administrative Order on Consent for Remedial Design;

   c) a June 25, 2005 Narrative Cost Summary Report.

2. Letter to Ms. Patricia Miller, U.S. EPA, from Ms. Lindsay Howard, Babst, Calland, Clements, and Zomnir, re: Request for extension for response to Special Notice Letter, 12/14/05. P.

3. Letter to Mr. Matthew Mellon, U.S. EPA, from Mr. Robert Markwell, Beazer East, Inc., re: Response to Special Notice Letter and Good Faith Offer, 1/30/06. P. A January 31, 2006 cover letter to Ms. Donna Duer, US Department of Justice, from Ms. Lindsay Howard, Babst, Calland, Clements, and Zomnir, and a January 30, 2006 Proposed Administrative Settlement Agreement and Order on Consent, are attached.

4. Letter to Mr. William Giarla, Beazer East, Inc., from Mr. Peter Schaul, U.S. EPA, re: Response to Special Notice Letter, (undated). P.

5. Letter to Ms. Patricia Miller, U.S. EPA, from Ms. Lindsay Howard, Babst, Calland, Clements, and Zomnir, re: Response to Good Faith Offer, 3/17/06. P.

* Administrative Record File available //.

** This Index of Documents for the Koppers Co., Unilateral Administrative Order Administrative Record File hereby incorporates by reference all documents contained in the Koppers Co., Remedial Administrative Record File Index of Documents.

SDMS DocID 156381

KOPPERS COMPANY
ADMINISTRATIVE RECORD FILE *
INDEX OF DOCUMENTS

I. SITE IDENTIFICATION

1. Potential Hazardous Waste Site Log for the Koppers Company Site, 11/1/79. P. 100001-100001.

2. Potential Hazardous Waste Site Identification and Preliminary Assessment, 5/20/80. P. 100002-100005.

3. Letter to Mr. Anthony S. Bartholomeo, U.S. EPA, from Mr. William L. Osburn, Delaware Department of Natural Resources & Environmental Control (DNREC), re· Transmittal of information from "Public Water Systems in Delaware," 5/20/80. P. 100006-100011. The information is attached

4. U.S. EPA sampling report, 5/28/80. P. 100012-100014. Photographs of the site are attached.

5. Letter to Mr. William M. Thomas, U.S. EPA, from Ms. Lisa A Hamilton, DNREC, re. Transmittal of U S. Geological Survey quadrangles showing the Koppers Company Site, 5/29/80. P. 100015-100016. The quadrangles are attached.

6. Memorandum to the file from Mr. Garth Glenn and C.K. Lee, re: Summary of a May 28, 1980, inspection and sampling conducted at the site, 5/30/80. P. 100017-100019. A hand-drawn site map is attached.

7. U.S. EPA Potential Hazardous Waste Site Inspection Report, 6/9/80 P. 100020-100031.

8. Memorandum to Mr. Jeffrey Haas, U.S EPA, from Mr. Gerard Crutchley, U.S. EPA, re: Summary of a May 28, 1980, inspection and sampling conducted at the site, 6/11/80. P. 100032-100046. A list of samples, a map of the area, and a copy of the Potential Hazardous Waste Site Inspection Report are attached.

9. Telephone conversation record of Mr. Peter Brown with B. Hofman re: Receipt of sampling results from the May 28, 1980, inspection and sampling, 8/18/80. P. 100047-100047. An August 20, 1980, Potential Hazardous Waste Site Tentative Disposition, Mr. Gerard Crutchley's June 11, 1980, memorandum to Mr. Jeffrey Haas, and a June 9, 1980, Potential Hazardous Waste Site Inspection Report are attached.

* Administrative Record File available 9/26/96, updated 9/2/04, 10/7/04 and 9/30/05 .

10. Memorandum to the file from C.K. Lee, re: Recommendation that all area wells be investigated, then selected wells be sampled, 9/22/80 P. 100048-100049. A map showing the proposed area for the investigation is attached.

11. Geohydrology of the Wilmington Area, Hydrologic Map Series, No. 3, prepared by Delaware Geological Survey, 1981. P. 100050-100053.

12. Memorandum to Ms. Rita Lavelle, U.S. EPA, from Mr. Robert Perry, U.S. EPA, re. The applicability of Section 102(2)(C) of the National Environmental Policy Act (NEPA) to response actions under Section 104 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 9/1/82. P. 100054-100064.

13. DNREC Wetlands Regulations, adopted 12/23/76, revised 6/29/84. P. 100065-100089.

14. Memorandum to U.S. EPA Regional Administrators from Ms. Josephine Cooper and Mr. Lee Thomas, U.S. EPA, re: CERCLA remedial actions and NEPA/Environmental Impact Statement (EIS) functional equivalency, 8/22/84. P. 100090-10093.

13. Report: Preliminary Assessment of Koppers Company Emergency and Remedial Response Information System, prepared by DNREC, 1984. 100094-1000124.

15. Report: Preliminary Field Trip Report for the Koppers Company Site, prepared by NUS Corporation, 1/14/85. P. 100125-100155. A January 14, 1985, transmittal to Mr. Harold Byer, U.S. EPA, from Mr. Garth Glenn, NUS Corporation, letter is attached.

16. Data Management Summary Reports, prepared by Environmental Testing and Certification on behalf of DuPont, 4/19/85. P. 100156-100160. An August 19, 1985, transmittal letter to Ms. Laura Boornazian, U S. EPA, from A.B. Palmer, E.I. DuPont de Nemours, Inc. (DuPont), stating that A.B. Palmer believes there has been no recent testing for contaminants at the Newport Landfill is attached.

17. Sample Data Summary for the Koppers Company Site, prepared by NUS Corporation, 7/8/85. P. 100161-100170. A July 8, 1985, transmittal letter to Mr. Harold Byer, U.S. EPA, from Mr. Garth Glenn, NUS Corporation, and a hand-drawn sample location map are attached.

18. Letter to Ms. Laura Boornazian, U.S. EPA, from Ms. Eileen M. Hack, DNREC, re: Comments regarding the site inspections of Koppers Company and Sussex County Landfills and recommendation that Hazardous Ranking System packages be completed on both sites, 1/13/86 P. 100171-100173 An excerpt from a report is attached.

19. Report: Site Inspection of the Koppers Company Site, prepared by NUS Corporation, 2/27/86. P. 100174-100390. A March 3, 1986, transmittal letter to Mr. Harold Byer, U.S. EPA, from Mr. Garth Glenn, NUS Corporation, is attached.

20. Letter to Ms. Eileen Hack, DNREC, from Ms. Laura Boornazian, U.S. EPA, re: Transmittal of the final site inspection report for the Koppers Company Site, 3/10/86. P. 100391-100391.

21. Letter to Koppers Company from Mr. Bruce Smith, U.S. EPA, re: Request for release of all documents concerning hazardous substances to U.S. EPA, 2/3/88. P. 100392-100395. A certified mail receipt is attached.

22. 104(e) letter to DuPont from Mr. Bruce Smith, U.S. EPA, re: Request for release of all documents concerning hazardous substances to U.S. EPA, 2/3/88. P. 100396-100398.

23. 104(e) letter to Mr. Gerardo Amador, U.S. EPA, from Ms. Suzanne Burtt, Koppers Company, re: Confirmation of a February 11, 1988, telephone conversation in which Mr. Amador granted Koppers Company an extension in releasing documents to U.S. EPA, 2/12/88. P. 100399-100399.

24. Letter to Mr. Gerardo Amador, U.S. EPA, from Ms Julie Whited, DuPont, re: Response to U.S. EPA's February 3, 1988, request for information, 2/22/88. P. 100400-100645. The following are attached:

    a) a deposition of Koppers Company, Inc., by its designee Mary Holland, In The Matter Of United States of America vs. New Castle County, William Ward, Stauffer Chemical, and ICI Americas, Inc., vs. Avon Products, Inc., et al., Civil Action No. 80-489;

    b) a copy of the deed for the Koppers Company Site;

c) a copy of the Agreement Option with a March 30, 1970 transmittal letter to Mr. Thomas Bourne, Koppers Company, from C.M Thayer, DuPont;

d) a copy of the Lawyers Title Insurance Policy for the site,

e) a February 27, 1988, report entitled Site Inspection of Koppers Company.

25. Letter to Mr. Gerardo Amador, U.S. EPA, from Mr. William Giarla, Koppers Company, re: Response to U.S. EPA's February 3, 1988, request for information, 2/25/88. P. 100646-100666. The following are attached:

a) a list of the primary constituents of creosote;

b) a description of the Boulton wood treating process;

c) a document entitled Liquid Effluent Discharges and Proposed Treatment, Forest Products Plant, Newport, Delaware;

d) an April 29, 1971, letter to Mr. Carl Shields, Delaware Water and Air Resources Commission, from Mr. R.P. Williams, Koppers Company, with a response to Mr. Williams from Mr. John Bryson, DNREC, attached

26. Letter to Mr Gary A. Molchan, DNREC, from Mr. Ben Mykijewycz, U.S. EPA, re. Notice that the Koppers Company Site is a candidate for proposal to the NPL on Update #10, 10/16/89. P. 100667-100667.

27. U.S. EPA Pollution Report #1, Koppers Company, 12/14/89. P. 100668-100673. A November 20, 1989, memorandum to Mr. Gregg Crystall, U.S. EPA, from Mr. John C. Kilcher, Roy F. Weston, Inc., is attached.

28. Memorandum to the Regional Administrators for U.S. EPA Regions I through X, from Mr. Donald R. Clay, U.S. EPA, re: Guidelines for the development of risk assessments for sites remediated under CERCLA, 8/28/90. P. 100674-100677.

29. Summary of the joint site inspection of the Koppers Company Site conducted by DNREC and NUS Corporation on December 20, 1984, (undated). P. 100678-100679. A site map is attached.

30. Letter to Ms Eileen Hack, DNREC, from Ms. Laura Boornazian, U.S. EPA, re: Transmittal of the draft site inspection report and request for comments, (undated). P. 100680-100680.

31. U S. EPA Organics Analysis Data Sheet, Lab Sample ID # 80-083, (undated). P. 100681-100683.

32. U.S. EPA Organics Analysis Data Sheet, Lab Sample ID # 80-084, (undated). P. 100684-100688.

34. U.S. EPA Organics Analysis Data Sheet, Lab Sample ID # 80-085, (undated). P. 100689-100692

35. U.S. EPA Organics Analysis Data Sheet, Lab Sample ID # 80-086, (undated). P. 100693-100695.

36. U S. EPA Organics Analysis Data Sheet, Lab Sample ID # 25-036, (undated). P. 100696-100709. An October 13, 1980, U.S EPA Inorganics Traffic Report shipping slip for sample number C8055, Case Number 268 is attached.

37. U.S EPA Organics Analysis Data Sheet, Lab Sample ID # 25-037, (undated). P. 100710-100720. An October 13, 1980, U.S EPA Inorganics Traffic Report shipping slip for sample number C8056, Case Number 268 is attached.

38. Report: Field Investigations of Uncontrolled Hazardous Waste Sites, prepared by Ecology & Environment, Inc., (undated). P. 100721-100740.

39. Report: Evaluation of Tumor Prevalence in Mummichogs from the Delaware Estuary Watershed, prepared by U S. Fish & Wildlife Service, 12/04. P. 100722-100766.

## III. REMEDIAL RESPONSE PLANNING

1. Report: Remedial Investigation/Feasibility Study (RI/FS) Work Plan for the Koppers Company Site, prepared by Dames & Moore, 5/9/91. P. 300001-300106 A May 9, 1991, transmittal letter to Mr. S. Andrew Sochanski, U.S. EPA, from Mr. Eric Tartler, Dames & Moore, is attached.

2. Letter to Mr. S Andrew Sochanski, U.S. EPA, from Mr. Robert Allen, DNREC, re: Comments regarding the RI/FS work plan, 8/30/91. P. 300107-300109.

3. Letter to Mr. S. Andrew Sochanski, U.S. EPA, from Ms. M. Margie Zhang, DNREC, re: Notification of Ms. Zhang's appointment as project officer for the Koppers Company Site, 9/20/91. P. 300110-300110.

4. Memorandum to Mr. Robert Allen, DNREC, from Ms. Faye Stocum, Delaware Division of Historical and Cultural Affairs, re: Comments regarding the RI/FS work plan, 9/23/91. P. 300111-300111.

5. Administrative Order on Consent In The Matter Of: Koppers Company Site, Docket No. III-91-16-DC, 9/26/91. P. 300112-300160. A September 25, 1991, transmittal memorandum to Mr. Edwin Erickson, U.S. EPA, from Mr. Thomas Voltaggio and Ms. Marcia Mulkey, U.S. EPA, is attached.

6. Letter to Ms. M. Margie Zhang, DNREC, from Mr. S. Andrew Sochanski, U.S EPA, re: Transmittal of the Administrative Order on Consent for the site, 10/11/91. P. 300161-300161.

7. Report: Site Analysis, Koppers Chemical, Newport, Delaware, Volume I, 10/91. P. 300162-300180.

8. Report: Koppers Company NPL Site, Preliminary Health Assessment, prepared by Oak Ridge National Laboratory, 12/31/91. P. 300181-300218. A December 31, 1991, transmittal letter to Mr. Lee Tate, ATSDR, from Robin Brothers, Oak Ridge National Laboratory, is attached.

9. Report: Draft Remedial Investigation/Feasibility Study Work Plan for the Koppers Company Site, 1/20/92. P. 300219-300334. January 20, 1992, transmittal letters to Mr. S. Andrew Sochanski, U.S. EPA, and Ms Jane Patarcity, Beazer East, Inc. (Beazer), and Mr. Brandt Butler, DuPont, from Mr. James Buczala, Ms Ceil Mancini, and Mr. Robert Gresh, Woodward-Clyde Consultants, are attached.

10. Letter to Ms. Felicia Dailey, ATSDR, from Ms. M. Margie Zhang, DNREC, re: Transmittal of Dr. Gerald Llewellyn's comments regarding the Preliminary Health Assessment for the site, 2/11/92. P. 300335-300336. Dr. Llewellyn's comments

11. Letter to Mr. S. Andrew Sochanski, U.S. EPA, from Ms. Faye Stocum, Delaware Division of Historical and Cultural Affairs, re. Comments regarding the RI/FS work plan, 2/19/92. P 300337-300339.

12. Letter to Mr. S. Andrew Sochanski, U.S. EPA, from Ms. M. Marie Zhang, DNREC, re: Transmittal of comments regarding the RI/FS work plan, 2/19/92 P. 300340-300345. A February 19, 1992, facsimile transmittal page is attached.

13. Comments of Mr. Robert Allen, DNREC, regarding the RI/FS work plan, 2/21/92. P. 300346-300347. A February 24, 1992, facsimile transmittal page to Mr. S. Andrew Sochanski, U.S. EPA, from Ms. M. Margie Zhang, DNREC, is attached.

14. Letter to Ms. Jane Patarcity, Beazer, and Mr. Joel Karmazyn, DuPont, from Mr. S. Andrew Sochanski, U.S EPA, re: Notification that U.S. EPA has found the February 2, 1992, RI/FS work plan to be deficient and transmittal of comments regarding the document's deficiencies, 4/15/92 P. 300348-300380.

15. Letter to Mr. S. Andrew Sochanski, U.S. EPA, from Ms. Faye Stocum, Delaware Division of Historical and Cultural Affairs, re: Description of the historical significance of the Koppers Company Site area and recommendation that a Stage IA and IB level survey of the site area be conducted, 4/24/92. P. 300381-300382.

16. Report: <u>Revised Remedial Investigation/Feasibility Study Work Plan (RWP) for the Koppers Company Site</u>, 6/18/92. P. 300383-300553. A June 18, 1992, transmittal letter to Mr. S. Andrew Sochanski, U.S. EPA, from Mr. James Buczala, Ms. Ceil Mancini, and Mr. Robert Gresh, Woodward-Clyde Consultants, is attached

17. Letter to Mr. S. Andrew Sochanski, U.S. EPA, from Ms. M. Margie Zhang, DNREC, re: Comments regarding the June 18, 1992, RWP, 7/28/92. P. 300554-300555.

18. Letter to Mr. S. Andrew Sochanski, U.S. EPA, from Ms Faye Stocum, Delaware Division of Historical and Cultural Affairs, re: Comments regarding the June 18, 1992, RWP, 8/4/92. P. 300556-300558.

19. DNREC Regulations Governing the Use of Subaqueous Lands, adopted 5/8/91, amended 9/2/92. P. 300559-300585.

20. Memorandum to Ms. M. Margie Zhang, DNREC, from Mr. Robert Allen, DNREC, re: Comments regarding the June 18, 1992, RWP, 9/7/92. P. 300586-300586.

21. Letter to Ms. Jane Patarcity, Beazer, and Mr. Joel Karmazyn, DuPont, from Mr. S. Andrew Sochanski, U.S. EPA, re: Notification that U.S. EPA has found the June 18, 1992, RWP to be deficient and transmittal of comments regarding the document's deficiencies, 11/6/92. P. 300587-300605.

22. Letter to Mr. S. Andrew Sochanski, U.S. EPA, from Ms Jane Patarcity, Beazer, re· Notification that Beazer and DuPont object to U S. EPA's disapproval of the June 18, 1992, RWP and are invoking dispute resolution, 11/20/92. P. 300606-300646. Woodward-Clyde Consultants' response to U.S. EPA's comments regarding the RWP are attached.

23. Letter to Mr. S. Andrew Sochanski, U.S. EPA, from Mr Robert Ehlenberger, Woodward-Clyde Consultants, re: Transmittal of Woodward-Clyde Consultants' proposed resolutions for finalizing the June 18, 1992, RWP, 12/7/92. P. 300647-300686. The resolutions are attached.

24. Letter to Mr. S. Andrew Sochanski, U.S. EPA, from Mr. James Buczala and Mr. Robert Ehlenberger, Woodward-Clyde Consultants, re: Transmittal of a map showing proposed background soil sampling location submitted for U.S. EPA's review, 12/11/92. P. 300687-300678. The map is attached.

25. Report: <u>Revised Remedial Investigation/ Feasibility Study Work Plan for the Koppers Company Site,</u> prepared by Woodward-Clyde Consultants, 12/21/92. P. 300689-300887. A December 21, 1992, transmittal letter to Mr. S. Andrew Sochanski, U.S. EPA, from Mr. James Buczala, Ms. Ceil Mancini, and Mr. Robert Ehlenberger, Woodward-Clyde Consultants, is attached.

26. Letter to Ms. Jane Patarcity, Beazer, and Mr. Joel Karmazyn, DuPont, from Mr. S. Andrew Sochanski, U.S. EPA, re: Transmittal of a meeting summary for a December 15, 1993, Dispute Resolution Meeting, transmittal of specifications for hazardous warning signs to be posted around the site, and approval of an deadline extension, 1/3/93. P. 300888-300900. The meeting summary and the sign specifications are attached.

27. Memorandum to Ms. Lydia Ogden Askew, U.S. EPA, from Mr. S. Andrew Sochanski, U.S. EPA, re: Recommendation of changes to be made in the December 31, 1991, Preliminary Public Health Assessment for the Koppers Company Site, 1/19/93. P. 300901-300939. The following are attached:

    a) a December 7, 1992, transmittal letter to Ms. Laura Janson, U.S. EPA, from Mr. Max M. Howie, Agency for Toxic Substances and Disease Registry (ATSDR);

    b) an ATSDR Public Notice,

    c) an ATSDR Fact Sheet;

    d) the Preliminary Public Health Assessment.

28. Letter to Mr. S. Andrew Sochanski, U.S. EPA, from Ms. M. Margie Zhang, DNREC, re Comments regarding the December 21, 1992, RWP, 1/20/93. P. 300940-300941.

29. Memorandum to Ms. M. Margie Zhang, DNREC, from Mr. Gerald Llewellyn, DNREC, re: Comments regarding the Revised Preliminary Public Health Assessment, 1/21/93. P. 300942-300942.

30. Letter to Mr. S. Andrew Sochanski, U.S. EPA, from Mr. Robert Ehlenberger, Woodward-Clyde Consultants, re: Notification on behalf of Beazer and DuPont of the selection of Maar Associates, Inc., to assist in the performance of the Cultural and Historical Survey (CHS) for the site, 1/29/93. P. 300943-300978. Personnel qualifications and three certificates of insurance are attached.

31. Letter to Mr. S. Andrew Sochanski, U.S. EPA, from Mr Robert Ehlenberger, Woodward-Clyde Consultants, re. Notification on behalf of Beazer and DuPont of the selection of Georarchaeology Research Associates and Dr. Joseph Sculdenrein to assist in the performance of the CHS for the site, 3/3/93. P. 300979-301008. The following are attached:

a) a chart entitled Cultural Resources Personnel Organization;

b) a table entitled Hours by Personnel and Task;

c) personnel qualifications for Maar Associates, Inc., and Geoarchaeology Research Associates;

d) certificates of insurance for Maar Associates, Inc , and Geoarchaeology Research Associates.

32. Letter to Mr. S. Andrew Sochanski, U.S. EPA, from Mr. Derron LaBrake and Mr. Robert Ehlenberger, Woodward-Clyde Consultants, re: Notification of a revision to the December 21, 1992, RWP, 3/17/93. P. 301009-301010.

33. Letter to Mr. S. Andrew Sochanski, U.S. EPA, from Mr. Robert Ehlenberger, Woodward-Clyde Consultants, re: Transmittal of selected attachments to the <u>Cultural and Historical Resources Work Plan</u> (CHRSWP), 4/2/93 P. 301011-301018. A revision to Table 5-1, Hours by Personnel and Task, Figure 4-1, Section 106 Compliance Process, and three technical drawings are attached.

34 Letter to Ms. Jane Patarcity, Beazer, and Mr. Joel Karmazyn, DuPont, from Mr. S. Andrew Sochanski, U.S. EPA, re: Notification of conditional approval of the December 21, 1992, RWP, 4/7/93. P. 301009-301027. U.S. EPA's comments regarding the RWP are attached.

35 Letter to Mr. S. Andrew Sochanski, U.S. EPA, from Mr. James Buczala and Mr. Robert Ehlenberger, Woodward-Clyde Consultants, re: Outline of major issues to be addressed at the April 19, 1993, meeting to discuss the December 21, 1992, RWP, 4/16/93. P. 301028-301034. A facsimile transmittal page is attached

36. Letter to Mr. S. Andrew Sochanski, U.S. EPA, from Ms. Faye Stocum, Delaware Division of Historical and Cultural Affairs, re: Transmittal of comments regarding the CHRSWP, 4/19/93. P. 301035-301038. Ms. Stocum's comments are attached.

37. Letter to Mr. S. Andrew Sochanski, U.S. EPA, from Ms. Jane Patarcity, Beazer, re: Notification that Beazer and DuPont object to U.S. EPA's comments regarding the December 21, 1992, RWP and are invoking dispute resolution, 4/22/93. P. 301039-301062. Woodward-Clyde Consultants' response to comments regarding the RWP are attached.

38. Letter to Ms. Jane Patarcity, Beazer, and Mr. Joel Karmazyn, DuPont, from Mr S. Andrew Sochanski, U.S. EPA, re: Transmittal of comments to be incorporated into the final RWP, 6/8/93. P. 301063-301067.

39. Report: Quality Assurance Project Plan for the Koppers Company Site, prepared by Woodward-Clyde Consultants, 6/23/93. P. 301068-301787.

40. Report: Revised Remedial Investigation/ Feasibility Study Work Plan for the Koppers Company Site, prepared by Woodward-Clyde Consultants, 6/23/93. P. 301788-302006. A June 23, 1993, transmittal letter to Mr. S. Andrew Sochanski, U S. EPA, from Mr. Robert Ehlenberger, Woodward-Clyde Consultants, is attached.

41. Letter to Mr. S. Andrew Sochanski, U.S. EPA, from Mr Robert Ehlenberger, Woodward-Clyde Consultants, re: Notification on behalf of Beazer and DuPont of the selection of Bowser-Morner to conduct selected geotechnical analyses, 7/1/93. P. 302007-302008.

42. Letter to Mr. S. Andrew Sochanski, U.S. EPA, from Ms. Faye Stocum, Delaware Division of Historical and Cultural Affairs, re. Approval of the revised CHRSWP, 7/27/93. P. 302009-302009.

43. Letter to Mr. S. Andrew Sochanski, U.S. EPA, from Ms. M. Margie Zhang, DNREC, re: Approval of and comments regarding the June 23, 1993, RWP, 8/4/93. P. 302010-302011.

44. Letter to Ms. Jane Patarcity, Beazer, and Mr. Joel Karmazyn, DuPont, from Mr. S. Andrew Sochanski, U.S. EPA, re: Transmittal of comments to be incorporated into the final RWP, the Field Sampling Plan (FSP), the Quality Assurance Project Plan (QAPjP), and the Health and Safety Plan (HASP), 8/24/93. P. 302012-302051.

45. Memorandum to the U.S. EPA Regional Administrators for Regions I through X from Mr. Richard Guimond, U.S. EPA, re: Description of U.S. EPA's new policy on conducting risk assessments at Superfund sites where potentially responsible parties (PRPs) are conducting the RI/FS, 9/1/93. P. 302052-302057.

46. Memorandum to Ms. M. Margie Zhang, DNREC, from Mr. Robert Allen, DNREC, re: Comments on U.S. EPA's comments regarding the June 23, 1993, RWP, 9/20/93. P. 302058-302059. A September 21, 1993, facsimile transmittal page addressed to Mr. S. Andrew Sochanski, U.S. EPA, from Ms. Zhang is attached.

47. Report: Preliminary Public Health Assessment for the Koppers Company Site, prepared by ATSDR, 10/21/93 P. 302059-302093. An October 21, 1993, transmittal letter to Ms. Laura Janson, U.S. EPA, from Mr Max Howie, ATSDR, is attached.

48. Letter to Ms. Jane Patarcity, Beazer, and Mr. Joel Karmacyzn, DuPont, from Mr. Walter Graham, U.S. EPA, re: Clarification of U.S. EPA's comments regarding the June 23, 1993, RWP and approval of an extension to the submittal date for the work plan, the FSP, the QAPjP, and the HASP, 11/29/93. P. 302094-3020115. A copy of Mr. Sochanski's August 24, 1993, letter with comments is attached.

49. Letter to Mr Walter Graham, U.S. EPA, from Ms. Jane Patarcity, Beazer, re: Proposal of an agenda for the planned December 15, 1993, meeting, request for an extension to the submittal date for the RWP, the FSP, the QAPjP, and the HASP, and transmittal of responses to comments regarding these documents, 12/14/93. P. 302116-302172. A chart entitled Chronology of Events, RI/FS Work Plan, Koppers Company Site, and the responses to U.S. EPA's comments are attached.

50. Letter to Mr. Terry Stilman, U.S. EPA, from Ms. M. Margie Zhang, DNREC, re: Transmittal of Applicable or Relevant and Appropriate Requirements (ARARs) for Removal Action at the Koppers Company Site, 12/20/93. P. 302173-302179 The list of ARARs and an envelope addressed to Mr. S. Andrew Sochanski, U.S. EPA, are attached.

51. Letter to Mr. S Andrew Sochanski, U.S. EPA, from Mr. Christopher Burns, Tetra Tech, Inc., re: Transmittal of a summary of the December 15, 1993, Dispute Resolution Meeting, prepared by Tetra Tech, Inc., 12/20/93. P. 302180-302190. The summary is attached

52. Letter to Ms. Jane Patarcity, Beazer, and Mr. Joel Karmazyn, DuPont, from Mr. S. Andrew Sochanski, U.S EPA, re: Clarification and transmittal of a summary of the December 15, 1993, Dispute Resolution Meeting summary prepared by Tetra Tech, Inc., 12/23/93. P. 302191-302192.

53. Letter to Ms. Jane Patarcity, Beazer, and Mr. Joel Karmazyn, DuPont, from Mr. S. Andrew Sochanski, U.S EPA, re: Clarification and transmittal of a summary of the December 15, 1993, Dispute Resolution Meeting, prepared by Tetra Tech, Inc., transmittal of specifications for hazardous warning signs to be posted around the Koppers Company Site, and notification of

approval of an extension of the submittal date for the RWP, the FSP, the QAPjP, and the HASP, 1/3/94 P. 302193-302205. The meeting summary and the sign specifications are attached.

54. Report: Revised Work Plan, RI/FS for the Koppers Company Site, prepared by Woodward-Clyde Consultants, 1/31/94 P. 302206-302420. A January 31, 1994, transmittal letter to Mr. S. Andrew Sochanski, U.S. EPA, from Mr. James Buczala and Mr. Robert Ehlenberger, Woodward-Clyde Consultants, and a January 31, 1994, transmittal letter to Ms. Jane Patarcity, Beazer, and Mr. Brandt Butler, DuPont, from Mr. H. Scott Laird, Woodward-Clyde Consultants, are attached.

55. Report: Field Sampling Plan, RI/FS for the Koppers Company Site, prepared by Woodward-Clyde Consultants, 1/31/94. P. 302421-302631. A January 31, 1994, transmittal letter to Mr. S. Andrew Sochanski, U S. EPA, from Mr. James Buczala and Mr. Robert Ehlenberger, Woodward-Clyde Consultants, is attached

56. Report: Quality Assurance Project Plan, RI/FS for the Koppers Company Site, prepared by Woodward-Clyde Consultants, 1/31/94. P. 302632-303427. A January 31, 1994, transmittal letter to Mr. S. Andrew Sochanski, U.S. EPA, from Mr. James Buczala and Mr. Robert Ehlenberger, Woodward-Clyde Consultants, is attached.

57. Report: Health and Safety Plan RI/FS for the Koppers Company Site, prepared by Woodward-Clyde Consultants, 1/31/94. P. 303428-303568. A January 31, 1994, transmittal letter to Mr. S. Andrew Sochanski, U.S. EPA, from Mr. James Buczala and Mr. Robert Ehlenberger, Woodward-Clyde Consultants, is attached.

58. Letter to Mr. S. Andrew Sochanski, U.S. EPA, from Ms. M. Margie Zhang, DNREC, re: Comments regarding the January 31, 1994, RWP and the January 31, 1994, FSP, 3/4/94. P. 303569-303570.

59. Letter to Mr. S. Andrew Sochanski, U.S. EPA, from Mr. James Buczala and Mr. H. Scott Laird, Woodward-Clyde Consultants, re: Transmittal of the approval sheet for the January 31, 1994, QAPjP, Table 1a, and Table 2, which were originally omitted from the QAPjP, 3/14/94 P. 303571-303578. The approval sheet and tables are attached.

60. Letter to Ms. Jane Patarcity, Beazer, and Mr. Joel Karmazyn, DuPont, from Mr. S. Andrew Sochanski, U S. EPA, re: Approval of the January 31, 1994, RWP, the January 31, 1994, the January 31, 1994, FSP, and the January 31, 1994, QAPjP, and the January 31, 1994, HASP with the insertion of U.S. EPA's review, 5/4/94. P. 303579-303618. The review is attached.

61. Letter to Mr. S. Andrew Sochanski, U.S. EPA, from Ms. M. Margie Zhang, DNREC, re: Comments on the January 31, 1994, RWP, the January 31, 1994, FSP, the January 31, 1994, QAPjP, and the January 31, 1994, HASP, 5/9/94. P. 303619-303620.

62. Letter to Mr. S. Andrew Sochanski, U.S. EPA, from Mr. H. Scott Laird, Woodward-Clyde Consultants, re Notification on behalf of Beazer and DuPont that James C. Anderson Associates, Inc., has been selected to perform drilling services and Enesco Wadsworth-Alert has been selected to perform pesticide and PCB analyses, 5/19/94. P. 303621-303670. James C. Anderson Associates, Inc.'s qualifications and a performance evaluation for Enesco Wadsworth-Alert are attached.

63 Letter to Ms. Jane Patarcity, Beazer, from Mr. Peter Ludzia, U.S. EPA, re: Approval of the January 31, 1994, RWP, the January 31, 1994, FSP, the January 31, 1994, QAPjP, and the January 31, 1994, HASP, subject to previously agreed-upon modifications and notification that Ms. Lisa Marino has replaced Mr. S Andrew Sochanski as the Remedial Project Manager for the site, 5/26/94. P. 303671-303674. A summary of the understandings reached by Beazer and U.S. EPA and a map of off-site aquatic sampling locations are attached.

64. Letter to Ms. Lisa Marino, U.S. EPA, from Ms. Jane Patarcity, Beazer, re: Notification of Beazer and DuPont's withdrawal of their May 26, 1994, request for Dispute Resolution and correction of dates in U.S EPA's letter of May 26, 1994, 6/16/94. P. 303675-303675.

65. Letter to Ms. Lisa Marino, U.S. EPA, from Mr. H. Scott Laird, Woodward-Clyde Consultants, re: Results of a survey of public supply and residential wells surrounding the site, 6/16/94. P. 303676-303685. . The following are attached:

   a) Table 1, Residential/Commercial Well Inventory;

b) Table 2, Residential Wells Proposed for Sampling;

c) a map of public and private water supply wells;

d) a map of residential/commercial well locations.

66 Letter to Ms. Lisa Marino, U.S. EPA, from Mr. H. Scott Laird, Woodward-Clyde Consultants, re: Notification on behalf of Beazer and DuPont of the selection of Victor Colbert Construction to provide earthwork services at the site, 6/17/94. P 303686-303687.

67. Letter to Ms. Lisa Marino, U S. EPA, from Ms. M. Margie Zhang, DNREC, re: Comments regarding the Residential Well Survey, 6/22/94. P. 303688-303689.

68. Letter to Mr. H. Scott Laird, Woodward-Clyde Consultants, from Ms. Lisa Marino, U.S. EPA, re: Notification of approval of the proposed background sampling locations, 6/22/94. P. 303690-303690.

69. Letter to Mr. H. Scott Laird, Woodward-Clyde Consultants, from Ms. Lisa Marino, U.S. EPA, re: Comments regarding the results of the residential well survey, 7/7/94. P. 303691-303693.

70. Letter to Ms. Lisa Marino, U.S. EPA, from Mr. James Buczala and Mr. H. Scott Laird, Woodward-Clyde Consultants, re: Response to U.S. EPA's July 7, 1994, comments regarding the results of the residential well survey and confirmation of an extension to the submittal date for the revised report, 7/21/94. P. 303694-303696.

71. Letter to Ms. Lisa Marino, U.S. EPA, from Mr. James Buczala and Mr. H. Scott Laird, Woodward-Clyde Consultants, re: Transmittal of a description of the proposed ultraviolet soil sediment field screening method, 7/21/94. P. 303697-303699. The description of the method is attached.

72. Memorandum to Ms. Lisa Marino, U.S. EPA, from Mr. James Buczala, Woodward-Clyde Consultants, re: Transmittal of an article entitled Using Ultraviolet Light to Investigate Petroleum-Contaminated Soil, 7/26/94. P. 303700-303709. The article is attached.

73 Letter to Mr. H. Scott Laird, Woodward-Clyde Consultants, from Ms. Lisa Marino, U.S. EPA, re: Recommendations for the clearing of potential wetland areas and request for information regarding compliance with DNREC and U.S. Army Corp of Engineers (USACE) regulations, 7/27/94 P 303710-303711.

74. Letter to Mr. James Buczala and Mr. H. Scott Laird, Woodward-Clyde Consultants, from Ms. Lisa Marino, U.S. EPA, re: Approval of the ultraviolet soil sediment field screening method with suggestions, 8/3/94. P. 303712-303712.

75 Letter to Mr. James Buczala and Mr. H. Scott Laird, Woodward-Clyde Consultants, from Ms. Lisa Marino, U.S. EPA, re. Response to Woodward-Clyde Consultants' July 27, 1994, letter responding to U S EPA's comments regarding the results of the residential well survey, 8/9/94. P. 303713-303714.

76. Letter to Ms. Lisa Marino, U.S. EPA, from Mr. James Buczala and Mr. H. Scott Laird, Woodward-Clyde Consultants, re: Transmittal of information regarding compliance with DNREC and USACE regulations requested in U.S. EPA's letter of July 27, 1994, 8/10/94 P. 303715-303718. A technical drawing of preliminary wetlands boundaries is attached.

77. Letter to Ms. Lisa Marino, U.S. EPA, from Ms. Deborah Conte Toth, BCM Engineers, re: Transmittal of BCM Laboratory's Quality Assurance Program plan and copies of the methods BCM Engineers will use for analysis of sediment samples, 8/10/94. P. 303719-303813. The program plan and methods are attached.

78. Letter to Ms. Lisa Marino, U.S. EPA, from Mr. H. Scott Laird, Woodward-Clyde Consultants, re: Notification on behalf of Beazer and DuPont of the selection of RMC Environmental Services, Inc., and BCM Engineers to perform benthic taxonomy consulting services and selected analytical services for soil and sediment samples, 8/10/94. P. 303814-303856. Statements of qualifications for RMC Environmental Services, Inc., and BMC Engineers are attached.

79. Letter to Ms. Lisa Marino, U.S. EPA, from Mr. H. Scott Laird, Woodward-Clyde Consultants, re: Results of a survey of public supply and residential wells surrounding the site, 8/16/94. P. 303857-303905. The following are attached:

a) Table 1, Residential/Commercial Well Inventory;

b) Table 2, Residential Wells Proposed for Sampling;

c) a map of public and private water supply wells,

d) a map of residential/commercial well locations;

e) Appendix A.

80. Letter to Ms. Lisa Marino, U.S. EPA, from Mr. James Buczala and Mr. H. Scott Laird, Woodward-Clyde Consultants, re: Description of modifications to the January 31, 1994, FSP and the January 31, 1994, QAPjP, 8/16/94. P. 303906-303908.

81. Letter to Ms. Lisa Marino, U.S. EPA, from Ms. Faye Stocum, Delaware Division of Historical and Cultural Affairs, re: Comments regarding the Phase IA Cultural Resources Survey for the site, 8/23/94. P 303909-303913. Ms. Stocum's comments and an August 25, 1994, letter to Ms. Lisa Marino from Ms. Stocum transmitting a revised second page to her comments is attached.

82. Letter to Ms. Lisa Marino, U.S. EPA, from Mr. Derron LaBrake and Mr. H. Scott Laird, Woodward-Clyde Consultants, re: Transmittal of the Preliminary Covertype Map showing proposed vegetation sampling locations, 8/29/94. P. 303914-303917. The map and a facsimile transmittal page addressed to Ms. Elizabeth Rogers from Ms. Lisa Marino, U.S. EPA, are attached.

83. Letter to Ms. Lisa Marino, U.S. EPA, from Ms. M. Margie Zhang, DNREC, re: Comments regarding the proposed locations for background soil sampling for the site, 9/2/94. P. 303918-303920. A map showing the area proposed for collection is attached.

84. Letter to Ms. Faye Stocum, Delaware Division of Historical and Cultural Affairs, from Ms. Lisa Marino, U.S. EPA, re: Transmittal of Ms. Marino's September 7, 1994, letter to Woodward-Clyde Consultants regarding the Phase IA Cultural Resources Survey Report and schedule and a copy of the RI/FS project schedule, 9/7/94. P. 303921-303925. Ms. Marino's letter and the schedules are attached.

85. Letter to Mr. William Moyer, DNREC, from Ms. Lisa Marino, U.S. EPA, re: Transmittal of Woodward-Clyde Consultants's August 10, 1994, letter regarding compliance with DNREC and USACE regulations, 9/8/94. P. 303926-303926.

86. Letter to Mr. Chuck Barscz, National Park Service, from Ms. Lisa Marino, U.S. EPA, re: Transmittal of Woodward-Clyde Consultants's August 10, 1994, letter regarding compliance with DNREC and USACE regulations, 9/8/94. P. 303927-303927.

87. Memorandum to U.S. Fish and Wildlife Service, from Ms. Lisa Marino, U.S. EPA, re: Transmittal of Woodward-Clyde Consultants' August 10, 1994, letter regarding compliance with DNREC and USACE regulations, 9/8/94. P. 303928-303928.

88. Memorandum to Mr. Peter Stokely, U.S. EPA, from Ms. Lisa Marino, U.S. EPA, re: Transmittal of Woodward-Clyde Consultants's August 10, 1994, letter regarding compliance with DNREC and USACE regulations, 9/8/94. P. 303929-303929.

89. Report: Laboratory Audit Report, prepared by Quanterra Environmental Services, 9/8/94. P. 303930-304092. A September 8, 1994, transmittal letter to Ms. Lisa Marino, U.S. EPA, from Ms. Ann Racine and Mr. H. Scott Laird, Woodward-Clyde Consultants, is attached.

90. Report: Laboratory Audit Report, prepared by Quanterra Environmental Services, 9/8/94. P. 304093-304187. A September 8, 1994, transmittal letter to Ms. Lisa Marino, U.S. EPA, from Mr. Willian Lyon and Mr. H. Scott Laird, Woodward-Clyde Consultants, is attached.

91. Letter to Ms. Lisa Marino, U S. EPA, from Ms. Susan Colman, Geomatrix Consultants, Inc. (Geomatrix), re: Notification that Geomatrix has selected AWD Technologies, Inc (AWD), to perform chemical data validation for the site, 9/8/94. P. 304188-304205. Resumes for AWD personnel are attached.

92. Letter to Mr. Robert Davis, U.S. EPA, from Mr. Robert Pennington, U.S. Fish and Wildlife Service, re: Notification that the U.S. Fish and Wildlife Service has no concerns regarding the terrestrial covertype sampling map and the Substantive Requirements for Wetlands Permit Program, 9/12/94. P. 304206-304207.

93. Letter to Mr. Ronald Thomas, Maar Research Associates, Inc., from Ms. Faye Stocum, Delaware Division of Historical and Cultural Affairs, re: Approval of Mr. Thomas's decision to name Dr. Douglas Kellogg as the geoarchaeologist responsible for monitoring the RI Phase I wetlands investigation at the Koppers Company Site, 9/12/94. P. 304208-304208.

94. Memorandum to Ms. M. Margie Zhang, DNREC, from Mr. Robert Allen, DNREC, re: Suggestion that terrestrial covertype sampling plots be located by a grid system or by a random procedure in order to eliminate unintentional bias, 9/14/94. P. 304209-304209.

95 Letter to Mr. H. Scott Laird and Mr. James Buczala, Woodward-Clyde Consultants, from Ms. Lisa Marino, U.S. EPA, re: Outline of sample integrity issues associated with the September 1, 1994, sampling activities conducted at the Koppers Company Site and request for response to the issues, 9/15/94. P. 304210-304212. A facsimile transmittal page is attached.

96. Letter to Ms. Lisa Marino, U.S. EPA, from Mr H. Scott Laird, Woodward-Clyde Consultants, re: Transmittal of the Revised Phase IA Cultural Resources Survey for the Koppers Company Site on behalf of Beazer and DuPont, 9/16/94. P. 304213-304213.

97. Letter to Ms Lisa Marino, U.S. EPA, from Mr. Timothy Glazer and Mr. H. Scott Laird, Woodward-Clyde Consultants, re: Results of a September 2, 1994, field audit for the site, 9/16/94. P. 304214-304227. A field audit checklist is attached.

98. Memorandum to Mr. John Bartholomeo, USACE, from Ms. Lisa Marino, U.S. EPA, re: Transmittal of information regarding soil boring at the site and request for feedback, 9/21/94. P. 304228-304229. A facsimile transmittal page is attached.

99. Letter to Mr H. Scott Laird and Mr. Derron LaBrake, Woodward-Clyde Consultants, from Ms. Lisa Marino, U.S. EPA, re: Comments regarding the Preliminary Terrestrial Covertype Map for the site, 9/21/94. P. 304230-304231.

100. Letter to Ms. Lisa Marino, U.S. EPA, from Mr. James Buczala and Mr. H. Scott Laird, Woodward-Clyde Consultants, re: Description of soil sampling conditions and recommendations for modifications to the first flush sampling, 9/22/94. P. 304232-304235. A sample location plan is attached.

101. Letter to Ms. Lisa Marino, U.S. EPA, from Mr. James Buczala and Mr. H. Scott Laird, Woodward-Clyde Consultants, re: Responses to U.S. EPA's September 15, 1994, comments regarding Woodward-Clyde's surface water and sediment sampling program for the site, 9/22/94. P. 304236-304239.

102. Memorandum to Ms. Lisa Marino, U.S. EPA, from Mr John Bartholomeo, USACE, re: Notification that the soil boring plan meets the requirements of the U.S. ACE permit program, 9/23/94. P. 304240-304241. A facsimile transmittal page is attached.

103. Report: Phase IA Cultural Resources Survey for the Koppers Company Site, prepared by Maar Associates, Inc., 9/23/94. P. 304242-304340. A September 16, 1994, transmittal letter to Ms. Lisa Marino, U.S. EPA, from Mr. H. Scott Laird, Woodward-Clyde Consultants, is attached.

104 Letter to Ms. Lisa Marino, U.S. EPA, from Ms. Jessica Billy, Maar Associates, Inc., re: Transmittal of errata sheet 3-12 of the cultural resources survey, 9/23/94. P. 304341-304342 The errata sheet is attached.

105. Letter to Ms. Faye Stocum, Delaware Division of Historical and Cultural Affairs, from Ms. Lisa Marino, U.S. EPA, re: Request that Ms. Stocum notify Ms. Marino if she feels that her comments regarding the draft Phase IA Cultural Resources Survey for the Koppers Company Site were not adequately addressed in the final version, 9/28/94. P. 304343-304343.

106 Letter to Ms. Lisa Marino, U.S. EPA, from Mr. Derron LaBrake and Mr. H. Scott Laird, Woodward-Clyde Consultants, re: Responses to U.S. EPA's September 21, 1994, comments regarding the proposed terrestrial covertype sampling locations, 9/28/94. P. 304344-303447. A copy of the Preliminary Terrestrial Covertype Map for the site is attached.

107. Letter to Ms. Lisa Marino, U.S. EPA, from Mr. James Buczala and Mr. H. Scott Laird, Woodward-Clyde Consultants, re: Request that the requirement for sediment collection during the first flush sampling program be removed, 9/28/94. P. 304348-304349.

108. Area B, E, and F maps relating to the terrain conductivity survey at the site, 9/29/94. P. 304350-304362. An October 3, 1994, transmittal page addressed to Ms. Lisa Marino, U.S. EPA, and Ms. Elizabeth Rogers, Tetra Tech, Inc., from Mr. Douglas Kier, Woodward-Clyde Consultants, is attached.

109. Inorganic Data Validation Report for the Koppers Company Site, prepared by Lockheed Environmental Systems & Technologies (Lockheed), 9/29/94. P 304363-304417. An October 6, 1994, transmittal memorandum to Ms. Lisa Marino, U.S. EPA, from Ms. Susanne Stevens, U.S. EPA, is attached.

110. Letter to Mr. Derron LaBrake and Mr. Scott Laird, Woodward-Clyde Consultants, from Ms. Lisa Marino, U.S. EPA, re: Notification that U.S. EPA accepts Woodward-Clyde Consultants' modifications to the sampling plan and approval to begin the terrestrial covertypes survey, 9/30/94. P. 304418-304418.

111. Letter to Ms. Lisa Marino, U.S. EPA, from Mr. James Buczala and Mr. H. Scott Laird, Woodward-Clyde Consultants, re: Proposal of a revised schedule for the RI/FS at the site, 9/30/94. P. 304419-304428. Two proposed schedules are attached.

112. Memorandum to Ms. Lisa Marino, U.S. EPA, and Ms. Elizabeth Rogers, Tetra Tech, Inc., from Mr. Keith Kowalski, Woodward-Clyde Consultants, re: Transmittal of Figure 2-5 showing boring locations within Area J of the site, 9/30/94. P. 304429-304430. Figure 2-5 is attached.

113. Report: Terrain Conductivity Survey for the Koppers Company Site, prepared by Woodward-Clyde Consultants, 9/94. P. 304431-304491. A September 14, 1994, transmittal letter to Ms. Lisa Marino, U.S. EPA, from Mr. James Buczala and Mr H. Scott Laird, Woodward-Clyde Consultants, is attached.

114. Letter to Mr. James Buczala and Mr. H. Scott Laird, Woodward-Clyde Consultants, from Ms. Lisa Marino, U S. EPA, re: Comments regarding the terrain conductivity survey, 10/5/94. P. 304492-304495.

115. Letter to Mr. H. Scott Laird, Woodward-Clyde Consultants, from Ms. Lisa Marino, U.S. EPA, re: Notification that U.S. EPA approves the revised residential well survey with comment, 10/6/94. P. 304496-304496.

116. Letter to Mr. James Buczala and Mr. H. Scott Laird, Woodward-Clyde Consultants, from Ms. Lisa Marino, U.S. EPA, re: Approval of modifications to the first flush sampling program proposed in Woodward-Clyde Consultants' letters of September 22, 1994, and September 28, 1994, 10/6/94. P. 304497-304499. A U.S. EPA list of recommended field and analytical parameters for surface water is attached.

117. Area D, J, K, N, UST, and GAS UST maps relating to the terrain conductivity survey at the site, 10/6/94. P. 304500-304524 An October 7, 1994, transmittal page addressed to Ms. Lisa Marino, U.S. EPA, and Ms. Elizabeth Rogers, Tetra Tech, Inc., from Mr. Douglas Kier, Woodward-Clyde Consultants, is attached.

118. Inorganic Data Validation Report for the Koppers Company Site, prepared by Lockheed, 10/11/94. P. 304525-304602. An October 13, 1994, transmittal memorandum to Ms. Lisa Marino, U.S. EPA, from Ms. Susanne Stevens, U S. EPA, is attached.

119. Organic Data Validation Report for the Koppers Company Site, prepared by Lockheed, 10/18/94. P. 304603-304916. An October 13, 1994, transmittal memorandum to Ms. Lisa Marino, U.S. EPA, from Ms. Susanne Stevens, U.S. EPA, is attached.

120. Letter to Ms. Lisa Marino, U.S. EPA, from Mr. James Buczala and Mr. H. Scott Laird, Woodward-Clyde Consultants, re: Description of plans for the first flush sampling event at the site and response to issues raised in U.S. EPA's letter of October 6, 1994, regarding sampling, 10/24/94. P. 304917-304920.

121. Letter to Ms. Lisa Marino, U.S. EPA, from Mr. H. Scott Laird, Woodward-Clyde Consultants, re: Proposal of five additional off-site soil sampling locations for the RI, 10/28/94. P. 304921-304924. Table 1, Background Soil Sampling Locations and a map showing the proposed sampling locations are attached.

122. Inorganic Data Validation Report for the Koppers Company Site, prepared by Lockheed, 10/31/94. P. 304925-304976. A November 10, 1994, transmittal memorandum to Ms. Lisa Marino, U.S. EPA, from Ms. Susanne Stevens, U.S. EPA, is attached.

123. Letter to Ms. Lisa Marino, U.S. EPA, from Mr. James Buczala and Mr. H. Scott Laird, Woodward-Clyde Consultants, re: Documentation of telephone conversations regarding the installation of additional shallow monitoring wells at the site, 11/1/94. P. 304977-304978.

124. Letter to Ms. Lisa Marino, U.S. EPA, from Ms. Jane Patarcity, Beazer, re: Notification on behalf of Beazer and DuPont of the selection of Entrix, Inc., to provide ecological consulting services, 11/3/94 P. 304979-304979.

125. Letter to Ms. Lisa Marino, U.S. EPA, from Mr. James Buczala and Mr. H. Scott Laird, Woodward-Clyde Consultants, re: Description of shallow well development at the site, 11/7/94. P. 304980-304981.

126. Organic Data Validation Report for the Koppers Company Site, prepared by Lockheed, 11/9/94. P. 304982-305104.

127. Dioxin Data Validation Report for the Koppers Company Site, prepared by Lockheed, 11/9/94. P. 305105-305145. A November 15, 1994, transmittal memorandum to Ms. Lisa Marino, U.S. EPA, from Ms. Susanne Stevens, U.S. EPA, is attached.

128. Letter to Mr. H. Scott Laird, Woodward-Clyde Consultants, from Ms Lisa Marino, U.S. EPA, re: Comments regarding the background soil sampling locations proposed in Woodward-Clyde Consultants' letter of October 28, 1994, 11/17/94. P. 305146-304147.

129. Inorganic Data Validation Report for the Koppers Company Site, prepared by Lockheed, 11/25/94. P. 305148-305169. A November 28, 1994, transmittal memorandum to Ms. Lisa Marino, U.S. EPA, from Ms Susanne Stevens, U.S. EPA, is attached.

130. Report: Analytical Report for the Koppers Company Site, prepared by U.S. EPA, 11/29/94. P. 305170-305262. A November 29, 1994, transmittal letter to Ms. Lisa Marino, U.S. EPA, from Mr. Frederick Dreisch and Ms. Peggy Zawodny, U.S. EPA, is attached

131. Report: Analytical Report for the Koppers Company Site, prepared by U.S. EPA, 12/5/94. P. 305263-305300. A December 5, 1994, transmittal letter to Ms. Lisa Marino, U.S. EPA, from Mr. Frederick Dreisch and Ms. Peggy Zawodny, U.S. EPA, is attached.

132. Organic Data Validation Report for the Koppers Company Site, prepared by Dow Environmental, Inc., 12/7/94. P. 305301-305384. A December 7, 1994, transmittal letter to Ms. Jane Patarcity, Beazer, from Mr. Andy Mehalko, Dow Environmental, Inc., is attached.

133. Inorganic Data Validation Report for the Koppers Company Site, prepared by Lockheed, 12/8/94. P. 305385-305432. A December 12, 1994, transmittal memorandum to Ms. Lisa Marino, U.S. EPA, from Ms Susanne Stevens, U.S. EPA, is attached.

134. Report: Summary of Analytical Results Received Through November 30, 1994, for the Koppers Company Site, 12/15/94. P. 305433-305897. A December 15, 1994, transmittal letter to Ms. Lisa Marino, U.S. EPA, from Mr. James Buczala and Mr. H. Scott Laird, Woodward-Clyde Consultants, is attached.

135. Organic Data Validation Report for the Koppers Company Site, prepared by Lockheed, 12/21/94. P. 305898-306045. A December 22, 1994, transmittal memorandum to Ms. Lisa Marino, U.S. EPA, from Ms. Susanne Stevens, U.S. EPA, is attached.

136. Dioxin/Furan Data Validation Report for the Koppers Company Site, prepared by Lockheed, 1/12/95. P. 306046-306144. A January 17, 1995, transmittal memorandum to Ms. Lisa Marino, U.S. EPA, from Ms. Susanne Stevens, U.S. EPA, is attached.

137. Dioxin Data Validation Report for the Koppers Company Site, prepared by Lockheed, 1/23/95. P. 306145-306189. A January 25, 1995, transmittal memorandum to Ms. Lisa Marino, U.S. EPA, from Ms. Cynthia Caporale, U.S. EPA, is attached.

138. Organic Data Validation Report for the Koppers Company Site, prepared by Lockheed, 1/30/95. P. 306190-306237. A January 31, 1995, transmittal memorandum to Ms. Lisa Marino, U.S. EPA, from Ms. Cynthia Caporale, U.S. EPA, is attached.

139. Letter to Mr. Randy Sturgeon, U.S. EPA, from Ms. Faye Stocum, Delaware Division of Historical and Cultural Affairs, re: Comments regarding the Management Summary for the Phase I Archaeological Survey of Old Airport Road, 2/6/95. P. 306238-306238.

140. Letter to Ms. Lisa Marino, U.S. EPA, from Mr. H. Scott Laird, Woodward-Clyde Consultants, re: Notification on behalf of Beazer and DuPont of the selection of Mr. Charles LeeDecker as the Cultural Resources Task Leader for the site, 2/21/95. P. 306239-306247. Mr. Leedecker's qualifications are attached.

141. Letter to Ms. Jane Patarcity, Beazer, from Ms. Lisa Marino, U.S. EPA, re: Request for the credentials of Dr. Ralph Markarian, Entrix, Inc., 2/21/95. P. 306248-306248.

142. Inorganic Data Validation Report for the Koppers Company Site, prepared by Lockheed, 2/23/95. P. 306249-306252. A March 2, 1995, transmittal memorandum to Ms Lisa Marino, U.S. EPA, from Ms. Cynthia Caporale, U.S. EPA, is attached.

143. Letter to Ms. Lisa Marino, U.S. EPA, from Ms. Jane Patarcity, Beazer, re: Transmittal of resumes for Entrix, Inc., personnel, 2/24/95. P. 306253-306313. The resumes are attached.

144. Report: Geoarchaeological Evaluation, Phase I Cultural Resources Survey for the Koppers Company Site, prepared by Maar Associates, Inc., 2/95. P. 306314-306359. A February 28, 1995, transmittal letter to Ms Lisa Marino, U.S. EPA, from Mr. H. Scott Laird and Mr. Charles LeeDecker, Woodward-Clyde Consultants, is attached.

145. Report: Phase IA Cultural Resources Survey for the Koppers Company Site, prepared by Maar Associates, Inc., 2/95 P. 306360-306456. An April 24, 1995, transmittal letter to Ms. Lisa Marino, U.S. EPA, from Ms. Jessica Billy, Maar Associates, Inc., is attached.

146. Memorandum to Ms. Susan Colman, Geomatrix, T. Faye, Beazer, Mr. Peter Ludzia, U.S. EPA, and Ms. M. Margie Zhang, DNREC, from Mr. Charles LeeDecker, Woodward-Clyde Consultants, re: Transmittal of the February 1995 Geoarchaeological Evaluation, Phase I Cultural Resources Survey for the Koppers Company Site, 3/2/95. P. 306457-306457.

147. Letter to James Buczala and H. Scott Laird, Woodward-Clyde Consultants, from Ms. Lisa Marino, U.S. EPA, re: Permission to backfill the excavations produced during the Phase IB Cultural Resources Survey work, 3/8/95. P. 306458-306459.

148. Memorandum to Ms. Faye Stocum, Delaware Division of Historical and Cultural Affairs, from Ms. Lisa Marino, U.S. EPA, re: Request for a confirmation of a date by which Ms. Stocum will comment on the Geoarchaeological Evaluation for the site, 3/15/95. P. 306460-306460.

149. Memorandum to Ms. Lisa Marino, U.S. EPA, from Ms. Faye Stocum, Delaware Division of Historical and Cultural Affairs, re: Notification that Ms. Stocum plans to comment on the February 1995 Geoarchaeological Evaluation for the site around mid-April, 3/20/95. P. 306461-306462. A facsimile transmittal page is attached.

150. Report: Analytical Report for the Koppers Company Site, prepared by U.S EPA, 3/21/95. P. 306463-306503 A March 21, 1995, transmittal letter to Ms. Lisa Marino, U.S. EPA, from Mr. Frederick Dreisch and Ms. Peggy Zawodny, U.S. EPA, is attached.

151. Report: Work Plan for Phase IB Cultural Resources Studies at the Koppers Company Site, prepared by Maar Associates, Inc., 3/27/95. P. 306504-306518. A March 27, 1995, transmittal letter to Ms. Lisa Marino, U.S. EPA, from Mr. James Buczala and Mr. H. Scott Laird, Woodward-Clyde Consultants, is attached.

152 Letter to Ms. Lisa Marino, U.S. EPA, from Ms. Jessica Billy, Maar Associates, Inc., re: Transmittal of Figures 2, 3, and 4 for the March 27, 1995, Phase IB Cultural Resources Studies work plan, 3/28/95. P. 306519-306522. The figures are attached.

153. Letter to Ms. Lisa Marino, U.S. EPA, from Mr. H. Scott Laird, Woodward-Clyde Consultants, re: Description of Round 1 ground water sampling events and plans for Round 2 sampling, 4/4/95. P. 306523-306633. A tabulated summary of Phase I ground water results is attached.

154. Report: Phase II Remedial Investigation Scope of Work for the Koppers Company Site, prepared by Woodward-Clyde Consultants, 4/27/95. P. 306634-307090. An April 27, 1995, transmittal letter to Ms. Lisa Marino, U.S. EPA, from Mr. James Buczala and Mr. H. Scott Laird, Woodward-Clyde Consultants, is attached.

155. Letter to Ms. Lisa Marino, U.S EPA, from Ms. Faye Stocum, Delaware Division of Historical and Cultural Affairs, re: Notification that the Phase IA Cultural Resources Survey is acceptable and request for additional copies, 5/1/95. P. 307091-307091.

156. Letter to Ms. Lisa Marino, U.S. EPA, from Ms. Faye Stocum, Delaware Division of Historical and Cultural Affairs, re: Notification that the February, 1995 Phase I Cultural Resources Survey and the March 27, 1995, Phase IB Cultural Resources Studies work plan need revision, 5/1/95. P. 307092-307097. Ms. Stocum's comments regarding the documents are attached.

157. Report: Phase I Remedial Investigation Data Package for the Koppers Company Site, Attachment 1, Volume 1 of 4, prepared by Woodward-Clyde Consultants, 5/8/95. P. 307098-307425. A May 8, 1995, transmittal letter to Ms. Lisa Marino, U.S. EPA, from Mr. James Buczala, Woodward-Clyde Consultants, is attached.

158. Report: Phase I Remedial Investigation Data Package for the Koppers Company Site, Attachment 1, Volume 2 of 4, prepared by Woodward-Clyde Consultants, 5/8/95. P. 307426-307685.

159. Report: Phase I Remedial Investigation Data Package for the Koppers Company Site, Attachment 1, Volume 3 of 4, prepared by Woodward-Clyde Consultants, 5/8/95 P. 307686-307736.

160. Report. Phase I Remedial Investigation Data Package for the Koppers Company Site, Attachment 1, Volume 4 of 4, prepared by Woodward-Clyde Consultants, 5/8/95. P. 307737-307826.

161. Report: Phase I Remedial Investigation Data Package for the Koppers Company Site, Attachments 2 Through 7, prepared by Woodward-Clyde Consultants, 5/8/95. P. 307827-308075

162. Letter to Mr. James Buczala and Mr. H. Scott Laird, Woodward-Clyde Consultants, from Ms. Lisa Marino, U.S. EPA, re: Transmittal of the May 1, 1995, letters written by Ms. Faye Stocum, Delaware Division of Historical and Cultural Affairs, commenting on the Phase IA Cultural Resources Survey, the February 1995 Phase I Cultural Resources Survey and the March 27, 1995, Phase IB Cultural Resources Studies work plan, 5/9/95. P. 308076-308084. The letters are attached.

163. Memorandum to the file from Ms. Lisa Marino, U S. EPA, re. Notification that Woodward-Clyde Consultants missed the holding time for a portion of the ground water sample and will use the split sample data for this location collected by Tetra Tech, Inc., 5/9/95. P. 308085-308085.

164. Letter to Ms. Lisa Marino, U.S. EPA, from Ms. Susan Colman, Geomatrix, re: Notification on behalf of Beazer and DuPont of the selection of Dames & Moore to perform the FS for the site and Environmental Standards, Inc., to perform the Public Health Assessment, 5/18/95. P. 308086-308100. The resumes of Dames & Moore and Environmental Standards, Inc., personnel are attached.

165. Letter to Ms. Susan Colman, Geomatrix, from Ms. Lisa Marino, U.S. EPA, re: Notification that U.S. EPA approves of the selection of Dames & Moore to perform the FS for the site but will not comment on the proposed selection of Environmental Standards, Inc., until Beazer and DuPont submit a formal request to perform risk assessments, 5/30/95. P. 308101-308101.

166. Letter to Ms. Lisa Marino, U.S. EPA, from Ms. M. Margie Zhang, DNREC, re: Comments regarding the Phase II Remedial Investigation Scope of Work (RI SOW), 6/6/95. P. 308102-308104. A facsimile transmittal page is attached.

167. Report: Analytical Report, prepared by U S. EPA, 6/7/95. P. 308105-308132. A June 7, 1995, transmittal letter to Ms. Lisa Marino, U.S. EPA, is attached.

168 Inorganic Data Validation Report for the Koppers Company Site, prepared by Lockheed, 6/15/95. P. 308133-308134. A June 22, 1995, transmittal memorandum to Ms. Lisa Marino, U.S. EPA, from Ms. Cynthia Caporale, U.S. EPA, is attached.

169. Organic Data Validation Report for the Koppers Company Site, prepared by Lockheed, 6/16/95. P. 308135-308257 A June 22, 1995, transmittal memorandum to Ms. Lisa Marino, U.S. EPA, from Ms. Cynthia Caporale, U.S. EPA, is attached.

170 Letter to Mr. James Buczala, Woodward-Clyde Consultants, from Ms. Lisa Marino, U.S. EPA, re: Transmittal of comments regarding the April 27, 1995, Phase II RI SOW, 6/27/95. P. 308258-308305. The comments are attached.

171. Letter to Ms. Lisa Marino, U.S. EPA, from Ms. Jane Patarcity, Beazer, re: Request for an extension of the submittal date for the response to U.S. EPA's June 27, 1995, comments regarding the April 27, 1995, Phase II RI SOW and notification that Beazer and DuPont are invoking dispute resolution, 7/12/95. P. 308306-308308.

172. Letter to Ms. Lisa Marino, U.S. EPA, from Mr. James Buczala, Woodward-Clyde Consultants, re· Transmittal of a summary of resolutions of the Delaware Division of Historical and Cultural Affairs' comments regarding the February 1995 Geoarchaeological Evaluation and the March 27, 1995, Phase IB Cultural Resources Studies work plan for the site achieved at a June 13, 1995, meeting, as well as the map depicting the potential location of prehistoric sites and excerpts from the Geoarchaeological Evaluation, both revised in accordance with the Delaware Division of Historical and Cultural Affairs' comments, 7/20/95. P. 308309-308328. The summary, the map, and the excerpt are attached.

173. Letter to Jane Patarcity, Beazer, from Ms. Lisa Marino, U.S. EPA, re: Offer of an extension to the submittal date for the response to U.S. EPA's comments regarding the April 27, 1995, Phase II RI SOW, 7/25/95. P. 308329-308330.

174. Letter to Ms. Lisa Marino, U.S. EPA, from Mr. James Buczala, Woodward-Clyde Consultants, re: Transmittal of Woodward-Clyde Consultants' response to U.S. EPA's June 27, 1995, comments regarding the April 27, 1995, Phase II RI SOW, 8/2/95. P 308331-308406. The response is attached.

175. Report: Revised Phase II Remedial Investigation Scope of Work for the Koppers Company Site, prepared by Woodward-Clyde Consultants, 8/18/95. P. 308407-308991. An August 18, 1995, transmittal letter to Ms. Lisa Marino, U.S. EPA, from Ms. Ceil Mancini and Mr. James Buczala, Woodward-Clyde Consultants, is attached.

176. Letter to Ms. Lisa Marino, U.S. EPA, from Ms. Faye Stocum, Delaware Division of Historical and Cultural Affairs, re: Transmittal of comments regarding Woodward-Clyde Consultants' July 20, 1995, summary of resolutions and revised excerpts from the Geoarchaeological Evaluation, 8/21/95. P. 308992-308996. The comments and an August 29, 1995, transmittal letter from Ms. Marino to Mr. James Buczala, Woodward-Clyde Consultants, are attached.

177. Letter to Ms. Lisa Marino, U.S. EPA, from Ms. Jane Patarcity, Beazer, re: Request for permission for Environmental Standards, Inc., to perform the Public Health Assessment portion of the Risk Assessment and for Woodward-Clyde Consultants to perform the Ecological Assessment portion of the Risk Assessment for the site on behalf of Beazer and DuPont, 8/30/95. P. 308997-309055. Statements of qualifications for Environmental Standards, Inc., and Woodward-Clyde Consultants, are attached.

178. Letter to Mr. James Buczala, Woodward-Clyde Consultants, from Ms. Lisa Marino, U.S. EPA, re: Transmittal of comments in response to Woodward-Clyde Consultants' August 2, 1995, response to U.S. EPA's June 27, 1995, comments regarding the April 27, 1995, Phase II RI SOW and the August 18, 1995, Phase II RI SOW, 9/13/95. P. 309056-309068. The comments are attached.

179. Report: Field Oversight Summary Report for the RI/FS Oversight at the Koppers Company Site, prepared by Tetra Tech, Inc., 9/14/95. P. 309069-309353. A September 14, 1995, transmittal letter to Ms. Lisa Marino, U.S. EPA, from Ms. Elizabeth Rogers, Tetra Tech, Inc. summarizing Tetra Tech, Inc.'s conclusions and recommendations and a September 28, 1995, transmittal letter from Ms. Marino to Mr. James Buczala, Woodward-Clyde Consultants, are attached.

180. Letter to Mr. James Buczala, Woodward-Clyde Consultants, from Ms. Lisa Marino, U.S. EPA, re: Comments regarding the August 18, 1995, Phase II RI SOW, 9/19/95. P. 309354-309355

181. Letter to Ms. Lisa Marino, U.S. EPA, from Mr. James Buczala, Woodward-Clyde Consultants, re: Confirmation of the one-week extension granted by U.S. EPA for Beazer and DuPont's response to U.S. EPA's September 13, 1995, comments, 9/22/95. P. 309356-309356.

182. Letter to Ms. Lisa Marino, U.S. EPA, from Ms Jane Patarcity, Beazer, re: Notification that Beazer and DuPont invoke dispute resolution with respect to U.S. EPA's September 13, 1995, comments, 9/28/95. P. 309357-309358. An envelope is attached.

183. Report: Geoarchaeological Evaluation, Phase I Cultural Resources Survey for the Koppers Company Site, prepared by Maar Associates, Inc., 10/2/95. P. 309360-309408. An October 3, 1995, transmittal letter to Ms Lisa Marino, U.S. EPA, from Ms. Jessica Billy, Maar Associates, is attached.

184. Report: Phase IB Cultural Resources Studies Work Plan for the Koppers Company Site, prepared by Maar Associates, 10/2/95. P. 309409-309422.

185. Letter to Ms. Lisa Marino, U.S. EPA, from Mr. James Buczala, Woodward-Clyde Consultants, re: Transmittal of response to U.S. EPA's September 13, 1995, comments, 10/4/95. P. 309423-309450.

186. Report: Phase II Remedial Investigation Scope of Work-Response to U.S. EPA Comments Dated September 13, 1995, Volume 2 of 3, prepared by Woodward-Clyde Consultants, 10/4/95. P. 309451-309786.

187. Report: Phase II Remedial Investigation Scope of Work-Response to U.S. EPA Comments Dated September 13, 1995, Volume 3 of 3, prepared by Woodward-Clyde Consultants, 10/4/95. P. 309787-310087.

188. Letter to Mr. James Buczala, Woodward-Clyde Consultants, from Ms. Lisa Marino, U.S. EPA, re: Recommendations for the use of split sample data collected by Tetra Tech, Inc., 11/1/95. P. 310088-310089.

189. Letter to Ms. Lisa Marino, U.S. EPA, from Mr. James Buczala, Woodward-Clyde Consultants, re: Transmittal of a set of data inadvertently excluded from the data screening package attached to Woodward-Clyde Consultants' October 4, 1995, letter to U.S. EPA, 11/1/95. P. 310090-310114. The set of data is attached

190. Memorandum to Ms. Lisa Marino, U.S. EPA, from Mr. Keith Kowalski, Woodward-Clyde Consultants, re: Transmittal of ground water elevation data, 11/22/95. P. 310115-310116. The data are attached.

191. Letter to Mr. James Buczala, Woodward-Clyde Consultants, from Ms. Lisa Marino, U.S. EPA, re: Transmittal of comments regarding Woodward-Clyde Consultants' letter of October 4, 1995, 11/28/95. P. 310117-310124. The comments and a map indicating additional Phase II sampling locations are attached.

192. Letter to Ms. Jane Patarcity, Beazer, from Ms. Lisa Marino, U.S. EPA, re: Approval of Beazer and DuPont's August 30, 1995, request to have Environmental Standards, Inc., perform the Public Health Assessment for the site and rejection of the request to have Woodward-Clyde Consultants perform the Ecological Assessment, 11/29/95. P. 310125-310126.

193 Organic and Inorganic Data Validation Reports for the Koppers Company Site, prepared by Lockheed, 11/29/95. P. 310127-310301. A November 30, 1995, transmittal memorandum to Mr. S. Andrew Sochanski, U.S. EPA, from Ms. Cynthia Caporale, U.S. EPA, is attached.

194. Organic, Inorganic, and Dioxin/Furon Data Validation Reports for the Koppers Company Site, prepared by Lockheed, 12/1/95. P. 310302-310404. A December 5, 1995, transmittal memorandum to Ms. Lisa Marino, U.S EPA, from Ms. Cynthia Caporale, U.S. EPA, is attached.

195. Letter to Ms. Lisa Marino, U.S. EPA, from Mr. James Buczala, Woodward-Clyde Consultants, re: Request for extension of the submittal date for the changes to the August 18, 1995, Phase II RI SOW, 12/4/95. P. 310405-310406.

196. Letter to Ms. Lisa Marino, U.S. EPA, from Ms. Jane Patarcity, Beazer, re: Notification that Beazer and DuPont invoke dispute resolution with respect to U.S. EPA's November 28, 1995, inclusion of surface water samples and pesticide/PCB and PCDD/PCDF analyses as part of the Phase II RI SOW, 12/11/95. P. 310407-310408.

197. Letter to Ms. Jane Patarcity, Beazer, and Mr. James Buczala, Woodward-Clyde Consultants, from Ms. Lisa Marino, U.S. EPA, re: Approval of an extension of the submittal date for the changes to the Phase II RI SOW, agreement to drop PCDD/PCDF, PAH, and pesticide analysis from the surface water and PCDD/PCDF analysis from sediment samples, and explanation of U.S EPA's reasons for requiring analysis of metals in surface water samples and pesticides/PCBs, metals, and PAHs in sediment samples, 12/14/95. P. 310409-310411.

198 Letter to Ms. Lisa Marino, U.S. EPA, from Mr. James Buczala, Woodward-Clyde Consultants, re: Transmittal of responses to issues raised in U.S. EPA's letter of November 28, 1995, and revised text, tables, and figures for the December 21, 1995, Revised Phase II Remedial Investigation Scope of Work, 12/20/95 P. 310412-310423. The responses are attached.

199. Report: Revised Phase II Remedial Investigation Scope of Work, prepared by Woodward-Clyde Consultants, 12/21/95. P. 310424-311009. An August 18, 1995, transmittal letter is attached.

200. Memorandum to Ms. Lisa Marino, U.S. EPA, from Mr. Keith Kowalski, Woodward-Clyde Consultants, re: Transmittal of Figure 4-1A, an addition to the December 21, 1995, Revised Phase II RI SOW, showing off-site Phase II sediment/surface water sampling locations at the site, 12/21/95. P. 311010-311011. Figure 4-1A is attached.

201. Memorandum to U.S. EPA Personnel, from Mr. Stephen Luftig, U.S. EPA, re: Description of U.S. EPA's revised policy on allowing PRPs to conduct risk assessments, 1/26/96. P. 311012-311014.

202. Letter to Ms. Lisa Marino, U.S. EPA, from Mr. James Buczala, Woodward-Clyde Consultants, re: Notification on behalf of Beazer and DuPont of the selection of John Milner Associates to perform the Phase IB Cultural Resources Survey and of Dr. John Sprinkle to replace Mr. Charles LeeDecker as the Cultural Resources Task Manager for Woodward-Clyde Consultants, 2/16/96. P. 311015-311037. Dr. Sprinkle's resume and the resumes of John Milner Associates personnel are attached.

203 Letter to Ms. Lisa Marino, U.S. EPA, from Ms. Faye Stocum, Delaware Division of Historical and Cultural Affairs, re: Transmittal of comments regarding the July 20, 1995, Revised Geoarchaeological Evaluation Phase I Cultural Resources Survey and the October 2, 1995, Revised Phase IB Cultural Resources Studies work plan, 2/29/96. P. 311038-311043. The comments are attached.

204. Letter to Ms. Lisa Marino, U.S. EPA, from Mr. James Buczala, Woodward-Clyde Consultants, re: Description of damage to wells at the site, 2/29/96. P. 311044-311045.

205. Letter to Ms. Lisa Marino, U.S. EPA, from Mr. James Buczala, Woodward-Clyde Consultants, re: Notification that Woodward-Clyde Consultants will be forwarding validation letters for data they collected during the Phase I RI and transmittal of a summary list of the data to be included in that package, 3/4/96. P. 311046-311047. The summary list is attached.

206. Letter to Ms. Lisa Marino, U.S. EPA, from Mr. James Buczala, Woodward-Clyde Consultants, re: Proposal to revise the immunoassay screening methodology presented in the December 21, 1996, Revised Phase II RI SOW to include both Ensys RISc and Ohmicron PAH RaPID Assay, 3/4/96. P. 311048-311090. Information regarding the proposed methods is attached.

207. Letter to Ms. Lisa Marino, U S. EPA, from Mr James Buczala, Woodward-Clyde Consultants, re: Proposal and description of an alternative approach to handling soil cutting drilling operations at the site, 3/5/96. P. 311091-311092.

208. Letter to Mr. James Buczala, Woodward-Clyde Consultants, from Ms. Lisa Marino, U.S. EPA, re: Approval of Woodward-Clyde Consultants' March 4, 1996, proposal to revise the immunoassay screening methodology, 3/7/96 P. 311093-311093.

209. Letter to Ms. Lisa Marino, U.S. EPA, from Mr. James Buczala, Woodward-Clyde Consultants, re: Transmittal of the addendum to the January 31, 1996, HASP, 3/8/96. P. 311094-311105. The addendum is attached.

210. Letter to Mr. James Buczala, Woodward-Clyde Consultants, from Ms. Lisa Marino, U.S. EPA, re: Approval, with provisions, of Woodward-Clyde Consultants' March 5, 1996, proposal to use an alternative approach to handling soil cutting drilling operations at the site, 3/12/96. P. 311106-311106.

211. Letter to Mr. James Buczala, Woodward-Clyde Consultants, from Ms. Lisa Marino, U.S. EPA, re: Directions for confirmation of well integrity and request for a summary of collected field data to evaluate the integrity of the damaged monitoring wells, as well as recommendations for corrective measures, 3/19/96. P. 311107-311108.

212. Letter to Mr. James Buczala, Woodward-Clyde Consultants, from Ms. Lisa Marino, U.S. EPA, re: U.S. EPA's conditional approval of the October 2, 1995, Revised Phase IB Cultural Resources Studies work plan and the July 20, 1995, Geoarchaeological Evaluation Phase I Cultural Resources Survey provided that John Milner Associates revises them in accordance with the February 29, 1996, comments of Ms. Faye Stocum, Delaware Division of Cultural and Historical Affairs, 3/21/96. P. 311109-311110.

213. Letter to Ms. Lisa Marino, U.S. EPA, from Mr. James Buczala, Woodward-Clyde Consultants, re: Proposal of modifications to item No. 2 in Section VIII (I) of the September 30, 1991, Administrative Order on Consent dealing with monthly progress reporting, 3/21/96. P. 311111-311113.

214. Letter to Ms. Lisa Marino, U.S. EPA, from Mr. James Buczala, Woodward-Clyde Consultants, re: Evaluation of the extent of damage to wells at the site, as requested in U.S. EPA's letter of March 19, 1996, 4/1/96. P. 311114-311115.

215. Letter to Ms. Lisa Marino, U.S. EPA, from Mr. James Buczala, Woodward-Clyde Consultants, re: Results of the March 15, 1996, PAH immunoassay screening evaluation conducted at the site, as requested in U.S. EPA's letter of March 7, 1996, and notification of the selected methodology, 4/8/96. P. 311116-311118.

216. Letter to Mr. James Buczala, Woodward-Clyde Consultants, from Ms. Lisa Marino, U.S. EPA, re: Agreement with Woodward-Clyde Consultants' April 1, 1996, proposal to evaluate the Phase I and Phase II RI ground water sample results prior to making a determination regarding the need for corrective action, 4/9/96. P. 311119-311119.

217. Letter to Mr. James Buczala, Woodward-Clyde Consultants, from Ms. Lisa Marino, U.S. EPA, re: Comments regarding the March 8, 1996, addendum to the January 31, 1996, HASP, 4/9/96. P. 311120-311121.

218. Letter to Ms. Lisa Marino, U.S. EPA, from Mr. John Sprinkle and Mr. James Buczala, Woodward-Clyde Consultants, re: Transmittal of the April 11, 1996, Revised Phase IB Cultural Resources Studies work plan, prepared by MAAR Associates, Inc., and revised by Woodward-Clyde Consultants and the April 11, 1996, Revised Geoarchaeological Evaluation, Phase I Cultural Resources Survey, prepared by MAAR Associates, Inc., and revised by Woodward-Clyde Consultants, 4/11/96. P. 311122-311192. The reports are attached.

219. Letter to Mr. James Buczala, Woodward-Clyde Consultants, from Ms. Lisa Marino, U.S. EPA, re: Request that Woodward-Clyde Consultants continue to submit data summary tables, but not raw data sheets, with its monthly progress reports, in response to Woodward-Clyde Consultants' March 21, 1996, proposal of modifications to the September 30, 1991, Administrative Order on Consent dealing with monthly progress reporting, 4/24/96. P. 311193-311194.

220. Letter to Mr. James Buczala, Woodward-Clyde Consultants, from Ms. Lisa Marino, U.S. EPA, re: Concerns posed by USACE and Tetra Tech, Inc., regarding health and safety practices at the site, 4/24/96. P. 311195-311196.

221. Letter to Ms. Lisa Marino, U.S. EPA, from Mr. James Buczala, Woodward-Clyde Consultants, re: Description of modifications made to field tasks based on field observations made during Phase II RI data collection at the site, 4/24/96. P. 311197-311198.

222. Letter to Ms. Lisa Marino, U.S. EPA, from Mr. James Buczala, Woodward-Clyde Consultants, re: Transmittal of a map showing the preliminary findings of the dense nonaqueous phase liquid (DNAPL) delineation program and the proposed Phase II RI monitoring well locations, 4/24/96. P. 311200-311201. The map is attached.

223. Memorandum to Ms. Lisa Marino, U.S. EPA, from Mr. Ron Gantreau, Woodward-Clyde Consultants, re: Transmittal of two maps showing the approximate locations of hand borings in Hershey Run Marsh, West Central Marsh, and East Central Marsh at the site, as well as preliminary boring logs, 4/30/96. P. 311202-311205. The maps and boring logs are attached.

224. Letter to Mr. James Buczala, Woodward-Clyde Consultants, from Ms. Lisa Marino, U.S. EPA, re: Concerns regarding Woodward-Clyde Consultants' April 24, 1996, proposed modifications to the Phase II RI work plan, 5/6/96. P. 311206-311208.

225. Letter to Ms. Lisa Marino, U.S. EPA, from Mr. James Buczala, Woodward-Clyde Consultants, re: Response to U.S. EPA's May 6, 1996, concerns regarding proposed modifications to the Phase II RI work plan, 5/30/96 P. 311209-311215.

226. Letter to Mr. James Buczala, Woodward-Clyde Consultants, from Ms. Lisa Marino, U.S. EPA, re: Response to Woodward-Clyde Consultants' May 30, 1996, letter in response to U.S. EPA's May 6, 1996, concerns regarding proposed modifications to the Phase II RI work plan, 6/20/96. P. 311216-311217.

227. Report: <u>Phase IA Cultural Resources Survey for the Koppers Company Site</u>, prepared by Maar Associates, Inc., (undated). P. 311218-311306.

228. Report: <u>Quality Assurance Project Plan, Remedial Investigation/Feasibility Study, Former Koppers Company, Inc, Newport Site</u>, prepared by Woodward-Clyde Consultants, 1/31/94. P. 311307-311480. A December 5,2002 transmittal letter to Mr. Matthew Mellon, U.S. EPA, from Mr. Stuart Messur, Blasland, Bouck & Lee, Inc., is attached.

229. Presentation entitled, "Agenda - Overview of the Remedial Investigation," prepared by Woodward-Clyde Consultants, 3/24/97. P. 311481-311545.

230. Report: <u>Remedial Investigation Report, Former Koppers Company, Inc , Newport Site, Newport, Delaware, Volume 1 of 3</u>, prepared by Blasland, Bouck & Lee, Inc., 5/97. P. 311546-311703. A May 10, 1997, transmittal letter to Ms. Stephanie Dehnhard, U.S. EPA, from Mr. David Hale, Blasland, Bouck & Lee, Inc., is attached.

231. Report: <u>Remedial Investigation Report, Former Koppers Company, Inc., Newport Site, Newport, Delaware, Volume 2 of 3, Tables/Appendices</u>, prepared by Blasland, Bouck & Lee, Inc., 5/97. P. 311704-312359.

232. Report: <u>Remedial Investigation Report, Former Koppers Company, Inc., Newport Site, Newport, Delaware, Volume 3 of 3, Appendices</u>, prepared by Blasland, Bouck & Lee, Inc., 5/97. P. 312360-312838.

233. Report: <u>Phase IB Archeological Survey of Selected Areas of the Former Koppers Company, Inc. Property</u>, prepared by John Milner Associates, Inc., 1997. P. 312839-312968. A June 26, 1997, transmittal letter to Mr. John Sprinkle, Woodward-Clyde Consultants, from Mr. Douglas Kellogg, John Milner Associates, Inc., and a June 26, 1997, transmittal memorandum to Ms. Stephanie Dehnhard, U.S. EPA, from Mr. Douglas Kellogg, John Milner Associates, Inc., are attached.

234 Report: <u>Final Ecological Risk Assessment, Former Koppers Company, Inc. Site, Newport, Delaware</u>, prepared by U.S. EPA, U.S. Fish & Wildlife Service, and Roy F. Weston, 8/97. P. 312969-313308. The following are attached.

a) an August 26, 1997, transmittal letter to Ms Maryann Nicholson, Dupont, from Ms. Stephanie Dehnhard, U.S. EPA;

b) a June, 1997, review of EPA's Draft Final Ecological Risk Assessment, prepared by PTI Environmental Services;

c) a June 11, 1997, transmittal memorandum to Ms Stephanie Dehnhard, U.S. EPA, from Ms. Lucinda Jacobs, PTI Environmental Services;

d) undated EPA responses to comments submitted by PTI Environmental Services.

235. Letter to Ms. Maryann Nicholson, DuPont, from Ms. Stephanie Dehnhard, U.S. EPA, re: How Ecological Risk Assessment results translate into remedial goals, 9/5/97. P. 313309-313312.

236. Report: <u>Analysis of Sediment and Soil Toxicity Data for the Former Koppers Company, Inc., Newport Site</u>, prepared by PTI Environmental Services, 10/97. P. 313313-313358. The following are attached:

a) an October, 1997, report entitled "Discussion of Statistical Methods Used to Establish Ecotoxicity Thresholds from Toxicity Test Data for the Koppers Company, Inc., Newport Site," prepared by PTI Environmental Services;

b) an October 10, 1997, transmittal letter to Ms. Stephanie Dehnhard, U.S. EPA, from Ms. Lucinda Jacobs, PTI Environmental Services;

c) a September 16, 1997, facsimile transmittal memorandum to Ms. Stephanie Dehnhard, U.S. EPA, from Ms. Lucinda Jacobs, PTI Environmental Services;

d) a September 16, 1997, letter to Ms. Stephanie Dehnhard, U.S. EPA, from Ms. Lucinda Jacobs, PTI Environmental Services, regarding action items from a meeting on September 10, 1997;

e) an October 8, 1997, packet of maps depicting TPAH concentrations.

237. Letter to Ms. Jane Patarcity, Beazer, from Ms. Stephanie Dehnhard, U.S. EPA, re: Transmittal of comments on the Draft Human Health Risk Assessment, 12/21/98. P. 313359-313375. The comments are attached.

238. Letter to Ms. Jane Patarcity, Beazer, from Mr. Matthew Mellon, U.S. EPA, re: Comments on the Draft Remedial Investigation Report of May 1997, 1/11/99. P. 313376-313424.

239. Letter to Mr. Matthew Mellon, U.S. EPA, from Ms. Jane Patarcity, Beazer, re: Comments on the Draft Remedial Investigation Report of May 1997, 1/27/99. P. 313425-313426.

240 Report: Remedial Investigation Report, Former Koppers Company, Inc., Newport Site, Newport, Delaware, Volume 1 of 3, prepared by Blasland, Bouck & Lee, Inc., 4/99. P. 313427-313775.

241. Report: Human Health Risk Assessment for the Former Koppers Company, Inc Site, prepared by Environmental Standards, Inc., 4/30/99. P. 313776-314106.

242. Report: Feasibility Study Report, Former Koppers Company, Inc., Newport Site, Newport, Delaware, prepared by Blasland, Bouck & Lee, Inc., 9/99. P. 314107-314279 A June 18, 1999, proposed Feasibility Study outline, a September 30, 1999, transmittal letter to Mr. Matthew Mellon, U.S. EPA, from Mr. David Hale, Blasland, Bouck & Lee, Inc., and a November 5, 1999, transmittal memorandum to Mr. Matthew Mellon, U.S. EPA, from Mr. David Hale, Blasland, Bouck & Lee, Inc., are attached.

243. Letter to Ms. Jane Patarcity, Beazer, from Mr. Matthew Mellon, U.S. EPA, re: Notice that EPA will provide comments on and an addendum to the Revised Draft Remedial Investigation Report, 9/27/00. P. 314280-314285. An October 4, 2000, letter to Mr. Matthew Mellon, U.S. EPA, from Ms Jane Patarcity, Beazer, and Ms. Maryann Nicholson, DuPont, regarding the response to comments on the Revised Draft Remedial Investigation Report is attached.

244. Letter to Mr. Matthew Mellon, U.S. EPA, from Ms. Jane Patarcity, Beazer, and Ms. Maryann Nicholson, DuPont, re: Response to comments on the Revised Draft Remedial Investigation Report, 10/4/00. P. 314286-314289.

245. Packet of maps entitled, "Benzo(a)pyrene equivalence - B(a)P," prepared by Mr. Matthew Mellon, U.S. EPA, 2001. P. 314290-314294.

246 Map entitled, "All TPAH RAO (ERA) Exceedences," prepared by Mr. Matthew Mellon, U.S. EPA, 2001. P. 314295-314295.

247. Letter to Mr. Peter Schaul, U.S. EPA, from Ms. Jane Patarcity, Beazer, re: Confirmation of August 29, 2001, meeting, 8/20/01. P. 314296-314297. An August 29, 2001, meeting agenda is attached.

248. Meeting agenda, 8/29/01. P 314298-314301. A PowerPoint presentation is attached.

249. Meeting sign-in sheet, 8/29/01. P. 314302-314302.

250. Letter to Ms. Jane Patarcity, Beazer, from Mr. Matthew Mellon, U.S. EPA, re. Schedule by which EPA proposes to complete the Remedial Investigation and Feasibility Study, 9/7/01. P. 314303-314303.

251. Letter to Ms. Jane Patarcity, Beazer, from Mr. Matthew Mellon, U.S. EPA, re: Preliminary remedial action objectives in the Ecological Risk Assessment, 9/17/01. P. 314304-314309.

252. Letter to Ms. Jane Patarcity, Beazer, from Mr. Matthew Mellon, U.S. EPA, re: Acceptance of Human Health Risk Assessment, 9/20/01. P. 314310-314310.

253. Letter to Mr. Matthew Mellon, U.S. EPA, from Ms. Jane Patarcity, Beazer, and Ms. Maryann Nicholson, DuPont, re: Comments on Ecological Risk Assessment, Human Health Risk Assessment, and U.S. EPA figures, 9/26/01. P. 314311-314314. An envelope is attached.

254. Letter to Ms. Jane Patarcity, Beazer, from Mr. Matthew Mellon, U.S. EPA, re: Comments on the Revised Draft Remedial Investigation Report, 10/25/01. P. 314315-314338. The comments are attached.

255. Letter to Ms. Jane Patarcity, Beazer, from Mr. Matthew Mellon, U.S. EPA, re: Comments on Draft Feasibility Study Report, 11/21/01. P. 314339-314340.

256. Letter to Mr. Matthew Mellon, U.S. EPA, from Mr. David Hale, Blasland, Bouck & Lee, Inc., re: Comments on Revised Draft Remedial Investigation Report, 11/28/01. P. 314341-314342.

257. Meeting agenda entitled "Forging a Consensus," 12/01. P. 314343-314350. A December, 2001, matrix for identifying COCs, December, 2001, EPA comments, and an undated topic schedule table are attached.

258. Meeting sign-in sheet, 12/19/01. P. 314351-314351.

259. Letter to Mr. Matthew Mellon, U.S. EPA, from Mr. David Hale, Blasland, Bouck & Lee, Inc., re: Transmittal of draft responses to comments on the April 1999 Draft Remedial Investigation Report, 2/4/02. P. 314352-314407. The responses are attached.

260. Meeting agenda entitled, "Reaching Agreement on Comment Responses," 2/02 - 3/02. P. 314408-314408.

261 Letter to Ms. Lynn Broaddus, Delaware Natural Heritage Program, from Mr. Paul Kocak, Blasland, Bouck & Lee, Inc., re: Threatened or endangered species information, 3/28/02. P. 314409-314414. A May 7, 1997, site location map, and a March 28, 2002, letter to Ms. Mary Ratnaswamy, U.S. Fish & Wildlife Service, from Mr. Paul Kocak, Blasland, Bouck & Lee, Inc., regarding threatened or endangered species information, and an envelope are attached.

262. Electronic memorandum to Ms. Lois Ryfun, Blasland, Bouck & Lee, Inc., from Mr. Matthew Mellon, U.S. EPA, re: Transmittal of Remedial Investigation figures and anticipated changes, 3/28/02. P. 314415-314417. The figures are attached.

263. Memorandum to Mr. Matthew Mellon, U.S. EPA, Ms. Jane Patarcity and Ms. Maryann Nicholson, DuPont, from Mr. David Hale, Blasland, Bouck & Lee, Inc., re: February 28, 2002, meeting minutes, 4/12/02. P. 314418-314421.

264. Meeting agenda, 5/10/02. P. 314422-314422.

265. Letter to Mr. Paul Kocak, Blasland, Bouck & Lee, Inc., from Ms. Mary Ratnaswamy, U.S. Fish & Wildlife Service, re: Threatened or endangered species information, 6/14/02. P. 314423-314424.

266. Meeting agenda entitled, "Feasibility Study Discussions," 6/20/02. P. 314425-314427 A meeting sign-in sheet and handwritten meeting notes are attached.

267. Handwritten meeting notes, 6/25/02 P. 314428-314431. A meeting sign-in sheet is attached.

268. Letter to Mr. Matthew Mellon, U.S. EPA, from Mr. David Hale, Blasland, Bouck & Lee, Inc., re: Transmittal of the Supplemental Drainage Area Investigation Work Plan, 7/19/02. P. 314432-314438. The Work Plan is attached.

269. Letter to Mr. Matthew Mellon, U.S. EPA, from Mr. Stuart Messur, Blasland, Bouck & Lee, Inc., re: Addendum to the scope of work for delineation of the lower fine-grained unit and vertical extent of non-aqueous phase liquid (NAPL), 8/7/02. P. 314439-314444. The addendum and a July 24, 2002, boring area location map, are attached.

270. Letter to Mr. Matthew Mellon, U.S. EPA, from Mr. Stuart Messur, Blasland, Bouck & Lee, Inc., re: Addendum to the scope of work for delineation of the lower fine-grained unit and vertical extent of NAPL, 8/8/02. P. 314445-314450. The addendum is attached

271. Report: Health and Safety Plan, prepared by Beazer, 10/02. P. 314451-314565. An October 25, 2002, electronic transmittal memorandum to Mr. Matthew Mellon and Mr. Eric Newman, U.S. EPA, from Mr. Kendrick Jaglal, Blasland, Bouck & Lee, Inc., is attached.

272. Report: Sampling and Analysis Plan Addendum, Former Koppers Company, Inc., Newport Site, Newport, Delaware, prepared by Blasland, Bouck & Lee, Inc., 10/02. P. 314566-314623. A November 20, 2002, memorandum to Mr. Matthew Mellon, U.S. EPA, from Ms. Cynthia Caporale, U.S. EPA, regarding a review of the addendum is attached.

273. Letter to Ms. Jane Patarcity, Beazer, from Mr. Matthew Mellon, U.S. EPA, re: Conditional acceptance of Supplemental Drainage Area Investigation Work Plan, 10/17/02. P. 314624-314625.

274. Letter to Ms. Jane Patarcity, Beazer, from Mr. Matthew Mellon, U.S. EPA, re: Request for submittal of revised final draft Remedial Investigation Report, 10/21/02. P. 314626-314626.

275. Letter to Ms. Jane Patarcity, Beazer, from Mr. Matthew Mellon, U.S. EPA, re: Acceptance of scope of work for delineation of the lower fine-grained unit and vertical extent of NAPL and addendum, 10/21/02 P. 314627-314627.

276. Proposed meeting agenda, 11/19/02. P. 314628-314629. A meeting sign-in sheet is attached.

277. Letter to Ms. Jane Patarcity, Beazer, from Mr. Matthew Mellon, U.S. EPA, re: Acceptance of Sampling and Analysis Plan Addendum and HASP update, 11/21/02. P. 314630-314630.

278. Letter to Mr. Matthew Mellon, U.S. EPA, from Mr. Stuart Messur, Blasland, Bouck & Lee, Inc., re: Cutting and removal of vegetation and minimizing disturbance to the wetlands and forested areas, 12/2/02. P. 314631-314633. A facsimile transmittal memorandum is attached.

279. Letter to Mr. Matthew Mellon, U.S. EPA, from Mr. Stuart Messur, Blasland, Bouck & Lee, Inc., re: Management of investigation derived waste in the form of residual sediment and drill cuttings, 12/9/02. P. 314634-314636. A March 12, 1996, letter to Mr. James Buczala, Woodward-Clyde Consultants, from Ms. Lisa Marino, U.S. EPA, regarding handling of soil cuttings is attached.

280. Internet photograph printout entitled, "Ellicott MC-2000 Mud Cat," Baltimore Dredges, LLC, 2003. P. 314637-314637.

281. Letter to Mr. Matthew Mellon, U.S. EPA, from Ms. Jane Patarcity, Beazer, re: Notification that the contractor chosen to support the Feasibility Study is Haley & Aldrich, 1/29/03. P. 314638-314649. Resumes for Mr. Michael Basel and Mr. Denis Conley, Haley & Aldrich, are attached.

282. Electronic memorandum to Mr. Peter Knight, National Oceanic and Atmospheric Administration, Mr. Bruce Plata, U.S. EPA, and Mr. Matthew Mellon, U.S. EPA, from Mr. Christopher Guy, U.S. Fish & Wildlife Service, re: Mummichog liver cancer, 1/30/03. P. 314650-314651.

283. Letter to Mr. Matthew Mellon, U.S. EPA, from Mr. Robert Fisher, Beazer, re: Investigation derived waste materials, 2/3/03. P. 314652-314653. An envelope is attached.

284. Meeting sign-in sheet, 2/4/03. P. 314654-314655.

285. Meeting agenda, 2/4/03. P. 314656-314657.

286. Report: Supplemental Investigation Sampling Data Report, prepared by Blasland, Bouck & Lee, 2/21/03. P. 314658-314685. A transmittal letter to Mr. Matthew Mellon, U.S. EPA, from Mr. Stuart Messur, Blasland, Bouck & Lee, Inc., is attached.

287. Letter to Mr. Matthew Mellon, U.S. EPA, from Mr. Stuart Messur, Blasland, Bouck & Lee, Inc., re: Subsurface field activities, 2/21/03. P. 314686-314767. A summary of soil borings, a summary of geotechnical data, and boring logs, are attached.

288. Meeting agenda, 2/26/03. P. 314768-314768.

289. Meeting sign-in sheet, 2/26/03. P. 314769-314769.

290. Electronic memorandum to Mr. Stuart Messur and Mr. Kendrick Jaglal, Blasland, Bouck & Lee, Inc., Ms. Jane Patarcity, Beazer, and Ms. Maryann Nicholson, DuPont, re: Presentation of site data meeting and scheduling of a meeting for March 3, 2003, 2/27/03. P. 314770-314771.

291. Letter to Ms. Jane Patarcity, Beazer, from Mr. Matthew Mellon, U.S. EPA, re: Comments on February 26, 2003, meeting regarding Feasibility Study Report, 2/28/03. P. 314772-314773.

292. Report: Feasibility Study Report, Former Koppers Company, Inc., Newport Site, Newport, Delaware, prepared by Blasland, Bouck & Lee, Inc., 4/03. P. 314774-315084.

293. Meeting sign-in sheet, 4/9/03. P. 315085-315086. Handwritten meeting notes are attached.

294. Letter to Mr. Matthew Mellon, U.S. EPA, from Mr. Stuart Messur, Blasland, Bouck & Lee, Inc., re: Transmittal of the Draft Final Feasibility Study Report, 4/30/03. P. 315087-315087.

295. Report: Evaluation of Liver and Skin Tumor Prevalence in Fish from the Delaware Estuary Watershed, prepared by Mr. Fred Pinkney, U.S. Fish & Wildlife Service, 5/03. P. 315088-315099. A July 24, 2003, electronic transmittal memorandum to Mr. Matthew Mellon, U.S. EPA, from Mr. Christopher Guy, U.S. Fish & Wildlife Service, is attached.

296. Report: Remedial Investigation Report, Former Koppers Company, Inc., Newport Site, Newport, Delaware, Volume 1 of 3, prepared by Blasland, Bouck & Lee, Inc., 5/03 P. 315100-315346.

297. Letter to Mr Matthew Mellon, U.S. EPA, from Mr. Kendrick Jaglal, Blasland, Bouck & Lee, Inc., re: Revised Draft Feasibility Study Report, 6/13/03 P. 315347-315401. An April 17, 1989, memorandum to Regional Administrators, U.S EPA, from Mr. Jonathan Cannon, U.S. EPA, regarding policy for Superfund compliance with the RCRA land disposal, and a packet of Area of Contamination Policy documents, are attached.

298. Letter to Mr. Matthew Mellon, U.S. EPA, from Mr. Kendrick Jaglal, Blasland, Bouck & Lee, Inc., re: Response to comments on the revised Draft Feasibility Study, 6/16/03. P. 315402-315409. An electronic transmittal memorandum is attached.

299. U.S. EPA Fact Sheet: Federal Remediation Technologies Roundtable, entitled, "Technology Cost and Performance Case Studies: Fact Sheet and Order Form," 7/03. P. 315410-315411.

300. U.S. EPA Fact Sheet: Garland Creosoting, Gregg County, Texas, entitled, "Garland Creosoting, Texas," 9/29/03. P. 315412-315416.

301. Report: <u>Addendum to the Feasibility Study Report, Former Koppers Company, Inc., Newport Site, Newport, Delaware</u>, prepared by TRC Companies, Inc., 10/03. P. 315417-315449

302. Letter to Ms. Jane Patarcity, Beazer, from Mr. Matthew Mellon, U.S. EPA, re: Request for additional information regarding the preferred alternative presented in the Addendum to the Feasibility Study, 11/19/03. P. 315450-315451.

303. Letter to Mr. Matthew Mellon, U.S. EPA, from Ms. Jane Patarcity and Ms. Maryann Nicholson, DuPont, re: Response to comments on Addendum to Feasibility Study, 12/19/03. P. 315452-315455.

304. Letter to Mr. Steve Johnson, DNREC, from Mr. Matthew Mellon, U.S. EPA, re: Request for identification of the applicable or relevant and appropriate regulations and requirements, 2/24/04. P. 315456-315457.

305. Letter to Ms. Jane Patarcity, Beazer, from Mr. Matthew Mellon, U.S. EPA, re: Opportunity for submitting comments for inclusion in National Remedy Review Board package, 3/10/04. P. 315458-315458.

306. Memorandum to Mr. Matthew Mellon, U.S. EPA, from Mr. Christopher Guy and Mr. Fred Pinkney, U.S. Fish & Wildlife Service, re: Observation of visible rainbow sheen and brown NAPL in the surface water and sediment, 3/12/04. P. 315459-315460. An envelope is attached.

307. Letter to Mr. Matthew Mellon, U.S. EPA, from Ms. Jane Patarcity and Ms. Maryann Nicholson, DuPont, re: Comments for inclusion in National Remedy Review Board package, 3/31/04. P 315461-315469.

308. Presentation entitled, "Evaluation of the Applicability of In-Situ Thermal Remediation Technologies," undated. P. 315470-315545.

309. Letter to Mr. Matthew Mellon, U.S. EPA, from Mr. Kenneth Symms, Environmental Standards, re: Submission of the revised Human Health Risk Assessment, 4/30/99 P 315546-315546.

310. Report: Hershey Run Mummichog Histopathology Report, prepared by John Harshbarger, George Washington University Medical Center, 4/25/03. P. 315547-315553.

311. National Remedy Review Board Presentation, prepared by Matthew Mellon, U.S. EPA, 5/12/04. P 315554-315735. An April 19, 2004, electronic memorandum from Mr. Randy Sturgeon, U.S. EPA, regarding additional alternatives information, and an April, 2004, National Remedy Review Board report are attached.

312. Electronic memorandum to Mr. Matthew Mellon, U.S. EPA, from Ms. Christina Wirtz, DNREC, re: State concurrence on the Proposed Plan for Remedial Action, 9/28/04. P. 315736-315736.

313. Memorandum to Ms. JoAnn Griffith, National Remedy Review Board, from Mr. Abraham Ferdas, U.S. EPA, re: Responses to the National Remedy Review Board recommendations for the Proposed Plan, (undated). P. 315737-315742

314. Proposed Plan, Koppers Co., Inc. (Newport Plant) Superfund Site, Newport, Delaware, 10/7/04. P. 315743-315801.

315. Memorandum to Mr. Matthew Mellon, U.S. EPA, from Mr. Chris Guy and Mr. Fred Pinkney, USFWS, re: Observation of visible sheen and non-aqueous phase liquid (NAPL) in Hershey Run and the White Clay Creek in the fall of 2002 and 2003, 3/12/04. P. 315802-315802.

316. Letter to the U.S. EPA, from Mr. Colin Mackay, Ciba Specialty Chemical Corporation, re: Comments on the Proposed Remedial Action Plan, 12/2/04 P. 315803-315806.

317. Letter to Mr. Larry Johnson, U.S. EPA, from Ms. Jane Patarcity, Beazer East, Inc., re: Comments on the Proposed Remedial Action Plan, 12/6/04. P. 315807-315825.

318. Letter to Mr. Larry Johnson, U.S. EPA, from Ms. Maryann Nicholson, E.I. du Pont de Nemours and Company, re: Comments on the Proposed Remedial Action Plan, 12/6/04. P. 315826-315827.

319. Revised groundwater risk tables with correct dioxin TEC's, 2/05. P. 315828-315841. A February 9, 2005 electronic cover memorandum to Mr. Matthew Mellon, U.S. EPA, from Ms. Jane Patarcity, is attached.

320. Memorandum to Technical Memorandum - Project File, from Mr. Keith Stang, Blasland, Bouck & Lee, Inc., re: Summary of Dioxin TEC Calculation and Risk Updates, Former Koppers Company Newport, Delaware Site, 2/16/05. P. 315842-315897. A February 2, 2005 electronic cover memorandum to Mr. Matthew Mellon, U.S. EPA, from Ms. Jane Patarcity, and Attachment A: Soil/Sediment Dioxin TEC Calculations and Attachment B: Revised Soil/Sediment HHRA Tables, are attached.

321. Former Koppers Company, Inc , Newport Site, Soil and Sediment Volume Estimates, 10/05. P. 315898-315898.

322. Letter to Mr. Matthew Mellon, U.S. EPA, from Ms. Kathleen Banning, State of Delaware Department of Natural Resources and Environmental Control, re: State concurrence on the Record of Decision (ROD), 9/23/05. P. 315899-315899.

323. Record of Decision, Koppers Co., Inc., 9/30/05. P 315900-316123.

V. COMMUNITY CORRESPONDENCE/CONGRESSIONAL CORRESPONDENCE/IMAGERY

1. News Release from ATSDR entitled "ATSDR Announces Public Comment Period on Health Assessment," 12/4/92. P. 500001-500004. An ATSDR Public Notice and a distribution list are attached.

2 U.S. EPA Fact Sheet, re: Environmental work along Old Airport Road, Newark, Delaware, (undated). P. 500005-500006.

3. Letter to Mr. Matthew Mellon, U.S. EPA, from Ms Jane Patarcity, re: Request for the extention of the public comments period for the Proposed Remedial Action Plan, 10/11/04. P. 500007-500007.

4. Transcript of Public Meeting Minutes, Koppers Superfund Site, 10/21/04. P 500008-500094.

5. Newspaper article entitled,"Residents grill EPA on toxic cleanup - neighbors worry about cancer risk," The News Journal, 10/22/04. P. 500095-500096.

6. U.S. EPA Public Notice, Koppers Co., Inc. Site, re: EPA extends public comment period now October 7 - December 7, 2004, (undated) P. 500097-500097.

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

*Office of Regional Counsel*

*Andrew S. Goldman*
*Direct Dial (215) 814-2487*

*Telefax (215) 814-2603*

AUG 1 7 2010

**VIA EMAIL AND**
**FIRST CLASS MAIL**

Dean A. Calland, Esquire
Babst, Calland, Clements & Zomnir
Two Gateway Center
Pittsburgh, PA 15222

**Re: Koppers (Newport) Site: Administrative Order No. CERC-03-2006-0266-DC: Modification No. 1**

Dear Dean:

Enclosed please find a true and correct copy of Modification No. 1 (Modification) to the above-described administrative order (Order). The document (1) modifies the definition of "ROD" in the Order to include EPA's May 28, 2010 Explanation of Significant Differences relating to the National Historic Preservation Act (NHPA); and (2) allows EPA's Remedial Project Manager to approve changes to the remedial design schedule to accommodate the NHPA consultation process. Pursuant to Section IV (Effective Date) of the Modification, the effective date of the Modification is the date of this letter. Please distribute this Modification as appropriate to your client and its contractors.

Do not hesitate to contact me if you have any questions regarding this matter.

Respectfully,

ANDREW S. GOLDMAN
Sr. Assistant Regional Counsel

Enclosure

cc: Hilary Thornton (3HS23)

**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY**
**REGION III**

| | |
|---|---|
| **IN THE MATTER OF:**<br>**KOPPERS CO., INC. (NEWPORT PLANT)**<br>**SUPERFUND SITE**<br><br>**Beazer East, Inc.,**<br><br>**Respondent**<br><br>**Proceeding Under Section 106(a) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended, 42 U.S.C. § 9606(a)** | **Docket No.**<br>**CERC-03-2006-0266DC** |

## MODIFICATION NO. 1 TO ADMINISTRATIVE ORDER FOR REMEDIAL DESIGN/REMEDIAL ACTION

WHEREAS, on September 25, 2006, the United States Environmental Protection Agency ("EPA") issued the above-captioned Order ("Order") directing the Respondent to take certain action with respect to the Koppers Co. Inc. Newport Plant in Newport, New Castle County, Delaware ("Koppers Site" or "Site");

WHEREAS, Section VI.A of the Order directs the Respondent to "implement the remedy selected in Section 11.0 of the ROD for the Site;"

WHEREAS, Section V.J of the Order defines "ROD" to mean "the EPA Record of Decision for the Site signed on September 30, 2005, by the Director of the EPA Region 3 Hazardous Site Cleanup Division, and all attachments thereto."

WHEREAS, on May 28, 2010, EPA issued a document entitled *Explanation of Significant Differences* ("ESD"), a copy of which is attached hereto as "Exhibit 1," making changes to the ROD;

WHEREAS, under the circumstances of this case EPA finds it appropriate to adjust the timing of the remedial design submittals that are required by Section VI.C.2 of the Order;

WHEREAS, Section XXVII.B of the Order specifies that the Order may be modified at any time, in writing, solely by the Director of the EPA Region III Hazardous Site Cleanup Division;

WHEREAS, EPA has notified the State of Delaware of the issuance of this *Modification No. 1 Administrative Order for Remedial Design/Remedial Action* ("Modification No. 1");

THEREFORE, EPA hereby issues this Modification No. 1 and modifies the Order as follows:

## I. MODIFICATIONS

1. Section V.J of the Order is replaced with the following:

"ROD" shall mean, unless otherwise stated, the EPA Record of Decision for the Site signed on September 30, 2005, by the Director of the EPA Region 3 Hazardous Site Cleanup Division, and all attachments thereto, as modified by the *Explanation of Significant Differences* issued by EPA for the Site on May 28, 2010 and incorporated herein. The ROD issued on September 30, 2005 is appended hereto as Attachment 3 and is incorporated herein."

2. The first sentence in Section VI.C.2.a of the Order is replaced with the following:

"Within sixty (60) days after EPA approves the RD Workplan, or such longer time frame as approved in writing by EPA's Project Coordinator, Respondent shall submit a Preliminary Design for the remedy to EPA for review and approval."

3. The first sentence in Section VI.C.2.b of the Order is replaced with the following:

"Within ninety (90) days after EPA approves the Preliminary Design, or such longer time frame as approved in writing by EPA's Project Coordinator, Respondent shall submit to EPA for review and approval a Pre-Final Design for

UAO Bates 00658



the remedy."

4. The first sentence in Section VI.C.2.c of the Order is replaced with the following:

"Within thirty (30) days after EPA approves the Pre-Final Design, or such longer time frame as approved in writing by EPA's Project Coordinator, Respondent shall submit a Final Design for the remedy to EPA for review and approval."

## II. LIMITATION OF MODIFICATION

Except as provided in Section I of this Modification No. 1, nothing in this Modification No. 1 shall alter or otherwise affect any term, condition, or requirement of the Order.

## IV. EFFECTIVE DATE

Except as provided in Section I, the effective date of this Modification No. 1 shall be the date on which a signed copy of this Modification No. 1 is forwarded to Respondent's counsel.

**SO ORDERED.**

Ronald Borsellino, Director
Hazardous Site Cleanup Division
EPA Region 3

8/16/10
Date

**EXPLANATION OF SIGNIFICANT DIFFERENCES**
**Koppers Co. Inc, (Newport Plant) Superfund Site**
**Newport, New Castle County, Delaware**

## I. INTRODUCTION AND STATEMENT OF PURPOSE

This Explanation of Significant Differences (ESD) for the Koppers Co., Inc. (Newport) Superfund Site in Newport, New Castle County, Delaware (Site), is issued in accordance with Section 117(c) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended (CERCLA), 42 U.S.C. § 9617(c), and Section 300.435(c)(2)(i) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 C.F.R. § 300.435(c)(2)(i), which require the United States Environmental Protection Agency (EPA) to issue such a document where a remedial action will differ in any significant, but not fundamental, respect from that selected by EPA and described in the Record of Decision. EPA is the lead agency at the Site; the Delaware Department of Natural Resources and Environmental Control (DNREC) is the support agency at the Site.

This ESD clarifies the remedial action selected by EPA for the Koppers Site in a Record of Decision dated September 30, 2005 (ROD) by confirming that certain provisions of the National Historic Preservation Act of 1966, 16 U.S.C. § 470, *et seq*., and its implementing regulations are applicable requirements with respect to the remedial action within the meaning of Section 121(d) of CERCLA, 42 U.S.C. § 9621(d).

A copy of this ESD, together with information supporting the changes described herein, will be included in the administrative record supporting selection of the remedy in accordance with Section 300.825(a)(2) of the NCP. Public access to these documents is discussed in Section IV of this ESD.

## II. SUMMARY OF THE SITE HISTORY, SITE CONDITIONS AND SELECTED REMEDY

The Koppers (Newport) Site is approximately 300 acres in size, and is located in the northern part of New Castle County, Delaware. It lies south of the Amtrak Northeast Corridor railroad tracks, southwest of the town of Newport, and northwest of the Route I-95 and Route 141 interchange, and includes all locations to which contaminants have migrated or otherwise come to be located. The Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) identification number for this Site is DED980552244.

To the north, the Site is bordered by high-speed railroad lines. Beyond the rail lines are a former municipal sewage treatment facility, an industrial property, and a residential area. To the east, the Site is bordered by the former DuPont Holly Run Plant and the Christina River. To the south and west, the Site is bordered by White Clay Creek and Hershey Run, respectively. To the west of the Site, across Hershey Run, lies the Bread and Cheese Island property. The Site consists of 163 acres of upland areas, 136 acres of wetlands, and three ponds.

The Site previously contained a wood-treatment facility. Soil and ground water at the Site are contaminated as a result of past wood-treatment operations. Contamination at the Site is present in the following areas: (1) upland soils, (2) Hershey Run, (3) the Fire Pond, (4) the South Pond area (the non-tidal South Pond itself and the tidal West Central Drainage area), (5) the K Pond area, and (6) ground water (*see* Figure 2 of the ROD). Only the East Central and Central Drainage Areas (the marshes bordering the Christina River) and the wooded uplands to the south of the former facilities are generally free of site-related contaminants.

EPA selected a remedial action for implementation at the Site in the 2005 ROD. The main components of the selected remedy include:

1. Excavation and consolidation of all contaminated soils and sediments (soils contaminated with total polycyclic aromatic hydrocarbons (PAHs) greater than 600 mg/kg and sediments with total PAHs greater than 150 mg/kg) into one or two on-site landfills or containment areas;

2. Installation, operation, and maintenance of a ground water treatment system to prevent the migration of contaminated ground water, as well as to prevent the discharge of contaminated ground water from the recovery operation, and an oil/water separator to facilitate the recovery of free-phase non-aqueous phase liquid (NAPL), as well as to prevent NAPL from reaching the ground water treatment system;

3. Treatment of ground water as necessary to meet discharge requirements;

4. Construction of ground water barrier walls and collection systems in the Containment Area to prevent further migration of ground water contamination;

5. Management of the hydraulic head of ground water and collection of NAPL contamination in the ground water through the use of the passive recovery trenches;

6. Separation of creosote from ground water and transportation of creosote off-site for disposal or recycling;

7. Relocation of debris to a location on-site where it can be placed under a RCRA modified cap;

8. Installation of a RCRA modified cap across the Containment Area;

9. Relocation of a portion of the existing channel of Hershey Run, if the Containment Area extends into the Hershey Run wetlands;

10. Creation of wetlands to replace any that are filled in as part of the landfill construction;

11. Monitoring of ground water, surface water, sediments and wetlands to ensure the effectiveness of the remedy; and

12. Implementation of institutional controls to prevent exposure to contamination inside the Containment Area or in ground water beneath the Site, and to prevent the drawdown of contamination into the deeper aquifer or elsewhere.

Additional details on the selected remedial action can be found in the 2005 ROD and the administrative record.

## III. DESCRIPTION OF SIGNIFICANT DIFFERENCE AND THE BASIS FOR THAT DIFFERENCE

EPA clearly regarded the National Historic Preservation Act of 1966 as an applicable or relevant and appropriate requirement (ARAR) for the Site during its evaluation of remedial alternatives. In the portion of Section 10 (Evaluation of Alternatives) of the ROD discussing ARARs, EPA wrote:

> "This criterion addresses whether a remedy will meet all of the applicable or relevant and appropriate requirements (ARARs) of federal and state environmental and facility siting laws and/or will provide grounds for invoking a waiver. Any cleanup alternative selected by EPA must comply with all applicable or relevant and appropriate federal and state environmental requirements or, under certain conditions, waive one or more ARARs. Applicable requirements are those substantive environmental standards, requirements, criteria, or limitations promulgated under federal or state law that are legally applicable to the Remedial Action to be implemented at a site. Relevant and appropriate requirements, while not being directly applicable, address problems or situations sufficiently similar to those encountered at a site such that their use is well-suited to the particular site EPA is not waiving any ARARs for this Site.
>
> "Alternatives 2, 3, 4 and 5 each meet this threshold criterion. Some of the major ARARs for the Site include:

> "3. National Historic Preservation Act - Due to the long industrial and prior history of this Site, additional cultural resources surveys must be conducted prior to the beginning of any Remedial Action. If cultural resources are found that are on, or eligible for, the National Register of Historic Places and would be impacted by the cleanup, including being covered by a cap or disturbed by excavation, mitigation activities may be required."[1]

In the 2005 ROD, EPA announced the selection of Alternative 4 and identified ARARs for the remedial action in Section 11.2 and in Table 8 of the ROD (*see* Section 12.2 of the ROD). In describing the performance standards for the excavation and consolidation of contaminated soils and sediments at the Site in Section 11.2.1 of the ROD, EPA referred to the National Historic Preservation Act of 1966 as follows:

> "Develop and follow plans for excavation near any historic structures in accordance with the National Historic Preservation Act of 1966, as amended."

No reference to the NHPA or its implementing regulations was made in Table 8 of the ROD. While Section 10 of the ROD evidences a clear intent by EPA to identify the NHPA as an ARAR for the Site, the Agency inadvertently limited application of the NHPA to "excavation" activities occurring "near any historic structures" in Section 11.2.1 of the ROD and failed to include a reference to the NHPA or its implementing regulations in Table 8.

Through this ESD, EPA makes clear that the provisions of the NHPA and its implementing regulations identified in the revision to Table 8 of the ROD below are applicable to all activities performed to implement the selected remedial action. Accordingly, the following changes are made to the ROD:

1. The performance standard in Section 11.2.1 of the ROD is modified as follows:

> "Develop and follow plans for excavating and consolidating contaminated soils and sediments in accordance with the applicable or relevant and appropriate requirements of the National Historic Preservation Act of 1966, as amended, including its implementing regulations, identified in Table 8 of this ROD."

This change makes clear that the requirements of the NHPA and its implementing regulations identified in Table 8 (as revised by this ESD) apply to all soil and sediment excavation and consolidation activities contemplated under Section 11.2.1 of the ROD.

---

[1] Notably, EPA identified the NHPA as a major ARAR for the alternative later selected in the ROD in the October 7, 2004 Proposed Plan for the Site.

2. The following information is added to Table 8 of the ROD:

| ARAR or TBC | Legal Citation | ARAR Class | Requirement Synopsis | Applicability to Selected Remedy | Area of Concern |
|---|---|---|---|---|---|
| National Historic Preservation Act (NHPA) of 1966, as amended;<br><br>36 C.F.R. Part 800 (Protection of Historic Properties) | 16 U.S.C. §§<br><br>470-1 Declaration of Policy of the Federal Government<br><br>470f Effect of Federal undertakings upon property listed in National Register; comment by Advisory Council on Historic Preservation<br><br>470w Definitions<br><br>36 C.F.R. §§ 800.1(a), 800.2, 800.3, 800.4, 800.5, 800.6, 800.7, 800.9, 800.11, 800.13, 800.14, 800.16, and Appendix A to Part 800. | Applicable | Requires that federal projects take into account effects on properties included on or eligible for inclusion on the National Register of Historic Places (NRHP). | Cultural resources that may be eligible for inclusion in the NRHP have been identified onsite. Implementation of the selected remedy has the potential for adversely impacting cultural resources. Further action shall be taken to identify resources and, if identified, action shall be taken to mitigate any adverse effects on those resources that would result from the cleanup. | Site-wide |

This change makes clear that the identified NHPA requirements apply to all activities undertaken to implement the selected remedial action—not just to the soil and sediment excavation and consolidation activities contemplated by Section 11.2.1 of the ROD.

## IV. PUBLIC PARTICIPATION

This ESD and the information upon which it is based will be included in the Administrative Record file for this Site. The Administrative Record also includes the ROD and all documents that formed the basis for EPA's selection of the remedial action for the Site. The complete administrative record can be examined online at www.epa.gov/arweb. Publicly available computers that can be used to access the administrative record online can be found at most public libraries and at:

U.S. EPA Region 3
1650 Arch Street, 6th Floor
Philadelphia, PA 19103
(215) 814-3157

EPA will publish a notice of this ESD in the Wilmington News Journal in accordance with 40 C.F.R. § 300.435(c)(2)(i)(B). Questions or comments regarding this ESD can be directed to:

Larry Johnson
Community Involvement Coordinator
U.S. EPA, Region 3
1650 Arch Street (3HS52)
Philadelphia, PA 19103
(215) 814-3239
(800) 553-2509

Hilary Thornton
Remedial Project Manager
U.S. EPA, Region 3
1650 Arch Street (3HS23)
Philadelphia, PA 19103
(215) 814-3323

## V. SUPPORT AGENCY REVIEW

EPA has consulted with the Delaware Department of Natural Resources and Environmental Control (DNREC) regarding this ESD. DNREC concurs with the issuance of this ESD (see attachment).

## VI. AFFIRMATION OF STATUTORY DETERMINATION

EPA determines that the selected remedy described in the 2005 ROD, as clarified in this ESD, remains protective of human health and the environment, complies with Federal and State requirements that are applicable or relevant and appropriate to this remedial action, and is cost-effective. In addition, the selected remedy, as clarified in this ESD, utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable at this Site.

for Dennis P. Carney
Kathryn A. Hodgkiss, Acting Director
Hazardous Site Cleanup Division
U.S. EPA Region 3

5/28/10
Date

STATE OF DELAWARE
DEPARTMENT OF NATURAL RESOURCES
AND ENVIRONMENTAL CONTROL
DIVISION OF AIR AND WASTE MANAGEMENT
391 LUKENS DRIVE
NEW CASTLE, DELAWARE 19720-2774

WASTE MANAGEMENT SECTION
SITE INVESTIGATION &
RESTORATION BRANCH

TELEPHONE: (302) 395-2600
FAX: (302) 395-2601

March 30, 2010

Mr. Hilary M. Thornton
DE/VA/WV Remedial Branch
U.S. EPA Region III (3HS23)
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

**RE: State Concurrence for the Explanation of Significant Differences to the Record of Decision for the Koppers Site (DE-0019)**

Dear Mr. Thornton:

Thank you for your consultation with the State of Delaware, Department of Natural Resources and Environmental Control regarding the Explanation of Significant Differences to the Record of Decision for the Koppers Site.

The State concurs with your proposal to add the National Historic Preservation Act of 1966, as amended, and 36 C.F.R. Part 800 (Protection of Historic Properties) to the Record of Decision as stated in your draft Explanation of Significant Differences.

Sincerely,

Stephen F. Johnson

Stephen F. Johnson, PE
Project Officer

SFJ:tlw
SFJ10012.doc
DE-0019 II B 7

pc: Kathy Stiller, Program Manager II
Tim Ratsep, Program Manager I

*Delaware's good nature depends on you!*

**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY**
**REGION III**
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***Office of Regional Counsel***

***Andrew S. Goldman***
***Direct Dial (215) 814-2487***

***Telefax (215) 814-2603***

AUG 1 9 2014

**VIA EMAIL & OVERMIGHT MAIL**

Jean M. Mosites, Esquire
Babst Calland
Two Gateway Center
Pittsburgh, PA 15222

**Re: Koppers Newport Site: Administrative Order**
**No. CERC-03-2006-0266-DC: Modification No. 2**

Dear Jean:

Enclosed please find a true and correct copy of Modification No. 2 to the above-referenced administrative order ("Order"). The modification (1) suspends certain requirements of the Order, and (2) requires Beazer to complete a focused feasibility study to provide EPA with information from which it may modify the selected remedial action.

The effective date of Sections I, III, IV, and V of this modification is the date of this letter. The effective date of Section II Modification is thirty (30) calendar days from the date it is signed by EPA. Note that, in accordance with Section III, Beazer may confer with EPA regarding Section II of the modification during a period not to exceed twenty (20) calendar days from the effective date of Section III.

Please do not hesitate to contact me at (215) 814-2487 if you have any questions regarding this matter.

Respectfully,

ANDREW S. GOLDMAN
Sr. Assistant Regional Counsel

cc: Terry Gallagher (3EC00)
Will Geiger (3HS21)

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**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY**
**REGION III**

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|---|---|
| **IN THE MATTER OF:**<br>**KOPPERS CO., INC. (NEWPORT PLANT) SUPERFUND SITE**<br><br>**Beazer East, Inc.,**<br><br>**Respondent**<br><br>**Proceeding Under Section 106(a) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended, 42 U.S.C. § 9606(a)** | **Docket No.**<br>**CERC-03-2006-0266-DC** |

**MODIFICATION NO. 2 TO ADMINISTRATIVE ORDER FOR REMEDIAL DESIGN/REMEDIAL ACTION**

WHEREAS, in September 2005 the United States Environmental Protection Agency (EPA) issued a Record of Decision (ROD) selecting remedial action for implementation at the Koppers Co., Inc. Superfund Site in Newport, New Castle County, Delaware ("Koppers Site" or "Site") under Section 104 of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended (CERCLA), 42 U.S.C. § 9604;

WHEREAS, in September 2006 EPA issued EPA issued Administrative Order No. CERC-03-2006-0266-DC (2006 Order) directing Beazer East, Inc. (Respondent) to implement the remedy selected in the 2005 ROD;

WHEREAS, in 2007 Respondent conducted an extensive investigation of Site conditions which produced new information previously unavailable to EPA (2007 Investigation);

WHEREAS, in August 2010 EPA issued Modification No. 1 to the 2006 Order incorporating an Explanation of Significant Differences making clear that certain provisions of the National Historic Preservation Act of 1966, 16 U.S.C. § 470 *et. seq*. and its implementing regulations (NHPA) are applicable requirements with respect to the remedial action within the meaning of Section 121(d) of CERCLA, 42 U.S.C. § 9621(d);

WHEREAS, EPA agrees that the information supplied by Respondent in the 2007 Investigation calls into question appropriateness of the remedial action selected in the 2006 ROD;

WHEREAS, EPA finds that additional information is necessary in order to evaluate an alternative remedial action and select such action in a manner not inconsistent with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 C.F. Part 300;

NOW THEREFORE, EPA hereby issues this Modification No. 2 and modifies the 2006 Order as follows:

## I. SUSPENSION OF CERTAIN REQUIREMENTS UNDER THE 2006 ORDER

1.1 Pursuant to section 106(a) of CERCLA, 42 U.S.C. § 9606(a), EPA hereby suspends all requirements under the 2006 Order which obligate Respondent to design and implement remedial action at the Site until further notice. Such suspension of requirements may be lifted at any time upon notice from the Associate Director of the Office of Superfund Site Remediation, Hazardous Site Cleanup Division, EPA Region 3. Such notice shall be effective upon receipt by the Respondent's Project Coordinator.

1.2 The suspension of requirements referenced in Paragraph 1.1 of this Modification No. 2 shall not affect any provision of the 2006 Order describing the manner in which work is to be performed including, but not limited to, provisions governing the selection of contractors (for purposes of this Modification No 2, each contractor performing the work required hereunder shall be regarded as a Supervising Contractor as described in Section VI.B.1 of the 2006 Order), reporting requirements and progress reports, off-site shipment of hazardous substances, additional response actions, sampling and quality assurance, access to and use of the Site, failure to per perform, endangerment and emergency response, EPA periodic review, designated project coordinators, plans and reports requiring EPA approval, insurance, notice of obligations and transfers of interest, record retention, access to information, and community relations.

## II. PERFORMANCE OF A FOCUSED FEASIBILITY STUDY

2.1 Respondent shall, as provided herein, conduct a Focused Feasibility Study (FFS) in accordance with the provisions of this Modification No. 2, the EPA-approved FFS Work Plan, CERCLA, the NCP and all applicable EPA guidance, policies and procedures including, but not limited to the "Interim Final Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA" (OSWER Directive No. 9355.3-01, October 1988 or subsequently issued guidance) (hereinafter "RI/FS Guidance"); "Guidance for Data Useability in Risk Assessment" (OSWER Directive No. 9285.7-05, October 1990 or subsequently issued guidance); and guidance referenced therein, as may be amended or modified by EPA. The FFS shall determine and evaluate (based on treatability testing, where appropriate) alternatives for remedial action to prevent, mitigate, or otherwise respond to or remedy the release or threatened release of hazardous substances, pollutants, or contaminants at the Site. The alternatives evaluated must include, but shall not be limited to, the range of alternatives described in the NCP, and shall include remedial actions that utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In evaluating the alternatives, Respondents shall address the factors required to be taken into account by Section 121 of CERCLA, 42 U.S.C. § 9621, and Section 300.430(e) of the NCP, 40 C.F.R. § 300.430(e). Upon request by EPA, Respondents shall submit in electronic form all portions of any plan, report, or other deliverable Respondent is required to submit pursuant to provisions of this Modification No. 2.

a. FFS Work Plan. Within sixty (60) days after the Effective Date of this Modification No. 2, Respondent shall submit to EPA for review and approval an FFS Work Plan. Upon its approval by EPA pursuant to Section XIII of the 2006 Order, the FFS Work Plan shall be incorporated into and become enforceable under the 2006 Order. Respondents shall implement the EPA-approved FFS Work Plan in accordance with the terms, conditions, and schedules contained therein and shall prepare and submit the FFS for EPA's review and approval as specified in the EPA-approved FFS Work Plan and its accompanying schedule. The FFS Work

Plan shall include, but not be limited to, the following:

1. A comprehensive summary of known conditions at the Site;
2. A discussion of data gaps;
3. The methodology and logistics for obtaining information (including, but not limited to, data from existing or newly installed monitoring wells, if necessary) in order to meet the objectives of the FFS;
4. A strategy for identifying the need for and carrying out treatability studies;
5. A preliminary listing and discussion of applicable and relevant and appropriate requirements ("ARARs"); other advisories, criteria, and guidance to be considered pursuant to section 300.400(g)(3) of the NCP, 40 C.F.R. § 300.400(g)(3) ("TBCs"); and a plan for refinement of ARARs and TBCs throughout the FFS process, including proposed clean-up levels;
6. A discussion of historic properties that may be adversely affected by the alternatives reviewed and proposed steps to mitigate such adverse effects within the meaning of the NHPA; and
7. A schedule for expeditious completion of the FFS, including projected start-up and delivery dates for milestone field work,

treatability studies, written reports (including draft and final FFS Reports), and for meetings with EPA to present progress information about the Site.

Existing data quality and health and safety plans previously approved by EPA for field sampling and data evaluation activities at this Site may be referenced and utilized with EPA approval to maintain continuity and quality control. Any necessary modifications to these plans based on new Site conditions or activities may be addressed as addendums to such plans.

b. Sampling and Analysis Work Plan. If the FFS Work Plan requires the collection and analysis of samples, Respondents shall submit, as a component of the FFS Work Plan, such plans as may be required under Section VII of the 2006 Order and shall collect and analyze such samples in accordance with the requirements of that Section and the EPA-approved FFS Workplan.

c. Respondent shall implement the FFS Work Plan and Sampling and Analysis Workplan according to their approved terms, conditions, and schedules, and shall prepare and submit the FFS Reports for EPA's review as specified therein. Respondents shall prepare, and submit for approval pursuant to Section XIII of the 2006 Order, the following:

1. A Remedial Alternatives Matrix which identifies the alternatives which are to be considered in the FFS, including a justification for eliminating or retaining each alternative.

2. An FFS Report which proposes an appropriate range of waste management options that are evaluated through the development and screening of alternatives. The report shall contain a comparative analysis of the remedial alternatives against the nine evaluation criteria as described in the NCP and EPA's RI/FS guidance.

3. Treatability Studies: Respondents shall conduct treatability studies if the FFS Work Plan approved by EPA so requires. In such event, Respondents shall provide EPA with the following deliverables:

   a. Identification of Candidate Technologies Memorandum. Respondents shall identify candidate remedial technologies.

   b. Treatability Testing Statement of Work. If EPA determines that treatability testing is required, Respondents shall submit a treatability testing statement of work.

   c.. Treatability Testing Work Plan. If EPA determines that treatability testing is required, Respondents shall include a treatability testing work plan, including an expeditious schedule, sampling and analysis plan, and a health and safety plan, in the FFS Work Plan.

d. Treatability Study Evaluation Report. Respondents shall submit a treatability study evaluation report as part of the FFS Report.

e. Community Relations Plan. EPA will prepare a community relations plan in accordance with EPA guidance and the NCP. As requested by EPA, Respondents shall provide information supporting EPA's community relations plan and shall participate in the preparation of such information for dissemination to the public and in public meetings which may be held or sponsored by EPA to explain activities at or concerning the Site.

2.2 When EPA determines that all Work required by Section II of this Modification No. 2 has been fully performed in accordance with this Modification No. 2 and the 2006 Order, EPA will provide written notice to Respondents. If EPA determines that any such Work has not been completed in accordance with Section II of this Modification No. 2, EPA will notify Respondent, provide a list of the deficiencies, and require that Respondent modify the FFS Work Plan or such other submission as appropriate in order to correct such deficiencies. Failure by Respondents to implement the approved modified FFS

Work Plan or other submission shall be a violation of the 2006 Order.

## III. OPPORTUNITY TO CONFER AND NOTICE OF INTENT TO COMPLY WITH SECTION II OF THIS MODIFICATION

3.1 Not later than twenty (20) days from the effective date this Modification No. 2 (as described in Section V below), Respondent may confer with EPA to discuss the scope and applicability of Section II of this Modification No. 2, the appropriateness of any action or activity required to be undertaken by Section II of this Modification No. 2, or other issues directly relevant to issuance of this Modification No. 2. Such a conference is not, and shall not be deemed to be, an adversarial hearing or part of a proceeding to challenge this Modification No. 2 or the 2006 Order, and no official stenographic record of such proceeding shall be kept. Any request for a conference within the prescribed time frame shall be made to:

Andrew S. Goldman (3RC42)
Sr Assistant Regional Counsel
U.S. Environmental Protection Agency
1650 Arch Street
Philadelphia, PA 19103
Telephone: (215) 814-2487

3.2 No later than five (5) days after the effective date of Section II of this Modification No. 2 (as described in Section V below), Respondent shall provide notice in writing to EPA's Remedial Project Manager stating whether Respondent will comply with the terms of Section II of this Modification No. 2. If Respondent does not unequivocally and unqualifiedly commit to perform all the work required by Section II of this Modification No. 2 in such notice, EPA will assume that Respondent has decided not to comply with the terms of Section II of this Modification No. 2. If Respondent asserts that it does not intend to comply with Section II of this Modification No. 2, Respondent shall describe, using facts that exist, on or prior to the effective date of this Modification No. 2, any "sufficient cause" defenses asserted by Respondent within the meaning of Sections 106(b) and 107(c)(3) of CERCLA, 42 U.S.C. §§ 9606(b) and 9607(c)(3). The absence of a response by EPA to the notice required by this Section shall not be deemed to be acceptance of Respondent's assertions nor as a position taken by the Agency with regard to those assertions.

3.2 Failure of Respondent to provide the notice required by Paragraph 3.2 herein shall constitute a violation of the 2006 Order and deemed to be a decision by Respondent not to comply with the terms of Section II of this Modification No. 2. Said failure to comply may trigger an Agency decision to file a judicial action or to initiate a Superfund response action at the Site.

## IV. LIMITATIONS OF MODIFICATION

4.1 Except as provided in Section I of this Modification No. 2, nothing in this Modification No. 2 shall alter or otherwise affect any term, condition, or requirement of the 2006 Order.

## V. EFFECTIVE DATES

5.1 This Modification No. 2 is deemed issued on the date it is signed by EPA.

5.2 The effective date of Sections I, III, IV, and V of this Modification No. 2 shall be the date on which a signed copy of this Modification No. 2 is transmitted to Respondent's counsel.

5.3 The effective date of Section II of this Modification No. 2 shall be thirty (30) days following the date it is issued.

**SO ORDERED.**

Cecil Rodrigues
Cecil Rodrigues, Director
Hazardous Site Cleanup Division
EPA Region 3

8/19/2014
Date

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

***Office of Regional Counsel***

***Andrew S. Goldman***
***Direct Dial (215) 814-2487***

***Telefax (215) 814-2603***

May 2, 2019

**VIA EMAIL & OVERNIGHT MAIL**

Jean M. Mosites, Esquire
Babst Calland
Two Gateway Center
603 Stanwix Street
6th Floor
Pittsburgh, PA 15222

**Re: Koppers Newport Site: Administrative Order No. CERC-03-2006-0266-DC: Modification No. 3**

Dear Jean:

Enclosed please find a true and correct copy of Modification No. 3 (Mod 3) to the above-referenced administrative order (Order). Mod 3 replaces the requirement to perform a Focused Feasibility Study at the Site, established in Mod 2, with the requirement to submit a "Request for ROD Amendment" as detailed in Mod 3.

The effective date of Sections I, III, IV, and V of this modification is the date of this letter. The effective date of Section II Modification is thirty (30) calendar days from the date it is signed by EPA. Note that, in accordance with Section III, Beazer may confer with EPA regarding Section II of the modification during a period not to exceed twenty (20) calendar days from the effective date of Section III.

Please do not hesitate to contact me at (215) 814-2487 if you have any questions regarding this matter.

Respectfully,

ANDREW S. GOLDMAN
Sr. Assistant Regional Counsel

cc: Christopher Corbett (3SD23)
Daniel Taylor (3SD23)

# UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
# REGION III

| | |
|---|---|
| **IN THE MATTER OF:**<br>**KOPPERS CO., INC. (NEWPORT PLANT) SUPERFUND SITE**<br><br>**Beazer East, Inc.,**<br><br>**Respondent**<br><br>**Proceeding Under Section 106(a) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended, 42 U.S.C. § 9606(a)** | **Docket No.**<br>**CERC-03-2006-0266-DC** |

## MODIFICATION NO. 3 TO ADMINISTRATIVE ORDER FOR REMEDIAL DESIGN/REMEDIAL ACTION

WHEREAS, in September 2005 the United States Environmental Protection Agency (EPA) issued a Record of Decision (ROD) selecting remedial action for implementation at the Koppers Co., Inc. Superfund Site in Newport, New Castle County, Delaware ("Koppers Site" or "Site") under Section 104 of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended (CERCLA), 42 U.S.C. § 9604;

WHEREAS, in September 2006 EPA issued Administrative Order No. CERC-03-2006-0266-DC (2006 Order) directing Beazer East, Inc. (Respondent) to implement the remedy selected in the 2005 ROD (Selected Remedy);

WHEREAS, from 2007-2010 Respondent conducted an extensive investigation of Site conditions which produced new information previously unavailable to EPA (2007-2010 Investigation);

WHEREAS, in August 2010 EPA issued Modification No. 1 to the 2006 Order incorporating modifications to the Selected Remedy as described in a May 28, 2010 Explanation of Significant Differences (ESD) making clear that certain provisions of the National Historic Preservation Act of 1966, 16 U.S.C. § 470 *et. seq*. and its implementing regulations (NHPA) are applicable requirements with respect to the Selected Remedy within the meaning of Section 121(d) of CERCLA, 42 U.S.C. § 9621(d);

WHEREAS, EPA agreed that the information supplied by Respondent in the 2007-2010 Investigation called into question the appropriateness of the Selected Remedy;

WHEREAS, EPA found that additional information was necessary in order to evaluate an alternative remedial action and select such action in a manner not inconsistent with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 C.F. Part 300;

WHEREAS, on August 19, 2014 EPA issued Modification No. 2 to the 2006 Order which (1) suspended certain requirements under the 2006 Order, and (2) required Respondent to perform a Focused Feasibility Study (FFS) to identify and evaluate alternatives for remedial action to prevent, mitigate, or otherwise respond to or remedy the release or threatened release of hazardous substances, pollutants, or contaminants at the Site; and

WHEREAS, EPA hereby determines that completion of an FFS as described in and required by Modification No. 2 to the 2006 Order is unnecessary in order for EPA to select an alternative remedial action for the Site;

NOW THEREFORE, EPA hereby issues this Modification No. 3 and modifies the 2006 Order, as previously modified by Modification Nos. 1 and 2 (hereinafter collectively referred to as the 2006 Modified Order) as follows:

## I. REVOCATION OF SECTION II OF MODIFICATION NO. 2 OF THE 2006 ORDER

1.1 Section II of Modification No. 2 of the 2006 Modified Order is hereby revoked and Respondent shall not be required to perform a Focused Feasibility Study as described therein.

## II. SUBMISSION OF A REQUEST FOR ROD AMENDMENT

2.1 Within seventy-five (75) days after the Effective Date of this Modification No. 3, Respondent shall submit for EPA review a Request for ROD Amendment in accordance with the provisions of this Modification No. 3.

a. The Request for ROD Amendment shall identify and propose an alternative (hereinafter "Proposed Action") to the Selected Remedy, as modified by the ESD (hereinafter collectively referred to as the Modified Selected Remedy) required to be implemented by the 2006 Modified Order. In accordance with Section 121 of CERCLA, 42 U.S.C. § 9621, the Proposed Action must:

1. Be protective of human health and the environment;

2. Comply with applicable or relevant and appropriate requirements (ARARs);

3. Be cost-effective;

4. Utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and

5. Satisfy the preference for treatment as a principal element or justify not meeting this preference.

b. The Request for ROD Amendment shall include supporting information and documentation sufficient to enable EPA to develop and issue a new Proposed Plan for the Site in a manner that is consistent with CERCLA; the NCP; and all applicable EPA guidance, policies and procedures. Such information and documentation shall include, but shall not be limited to, the following:

1. A comprehensive summary of known conditions at the Site;

2. A summary of the Modified Selected Remedy which includes, without limitation:

a. A description of the Modified Selected Remedy and performance standards;

b. A summary of the estimated costs to implement the Modified Selected Remedy; and

c. Expected issues and outcomes should Respondent be required to continue implementation of the Modified Selected Remedy;

3. A summary of all information and data obtained from the Site subsequent to issuance of the 2005 ROD including, without limitation:

a. A summary of all data from soil, sediment, groundwater, and dense non-aqueous phase liquid investigations; and

b. A summary of geotechnical investigations for the barrier wall and containment area cap.

4. A description of Proposed Action which includes, without limitation:

a. A description of each component of the Proposed Action, including performance standards;

b. A list of all applicable and relevant and appropriate requirements for the Proposed Action as described in Section 121(d) of CERCLA, 42 U.S.C. § 9621(d) and any waivers that may apply;

c. A proposed strategy for completing a consultation under Section 106 of the National Historic Preservation Act of 1966, as amended, 54 U.S.C. § 306108 ("NHPA"), and its implementing regulations at 36 C.F.R. Part 800 with respect to the Proposed Action; and

d. A description of how the Proposed Action meets the requirements identified in Paragraph 2.1.a.1-5, above.

5. A comparison of the Proposed Action with the Modified Selected Remedy including, without limitation, an evaluation and comparison of the Proposed Action against the Modified Selected Remedy using the nine criteria set forth in Section 300.430(e)(9) of the NCP, 40 C.F.R. § 300.430(e)(9).

2.2 EPA will review the Request for ROD Amendment submitted by Respondent and may request additional information and/or documents in support thereof. Respondent shall provide such requested information and documents within the timeframe specified by EPA at the time EPA makes any such request.

2.3 EPA will prepare a community relations plan in accordance with EPA guidance and the NCP. As requested by EPA, Respondent shall provide information supporting EPA's community relations plan and shall participate in the preparation of such information for dissemination to the public and in public meetings which may be held or sponsored by EPA to explain activities at or concerning the Site.

## III. OPPORTUNITY TO CONFER AND NOTICE OF INTENT TO COMPLY WITH SECTION II OF THIS MODIFICATION

3.1 Not later than twenty (20) days from the Effective Date this Modification No. 3 (as described in Section V below), Respondent may confer with EPA to discuss the scope and applicability of Section II of this Modification No. 3, the appropriateness of any action or activity required to be undertaken by Section II of this Modification No. 3, or other issues directly relevant to issuance of this Modification No. 3. Such a conference is not, and shall not be deemed to be, an adversarial hearing or part of a proceeding to challenge this Modification No. 3 or the 2006 Modified Order, and no official stenographic record of such proceeding shall be kept. Any request for a conference within the prescribed time frame shall be made to:

Andrew S. Goldman (3RC10)
Sr Assistant Regional Counsel
U.S. Environmental Protection Agency
1650 Arch Street
Philadelphia, PA 19103
Telephone: (215) 814-2487

3.2 No later than five (5) days after the effective date of Section II of this Modification No. 3 (as described in Section V below), Respondent shall provide notice in writing to EPA's Remedial Project Manager stating whether Respondent will comply with the terms of Section II of this Modification No. 3. If Respondent does not unequivocally and unqualifiedly commit to perform all the work required by Section II of this Modification No. 3 in such notice, EPA will assume that Respondent has decided not to comply with the terms of Section II of this Modification No. 3. If Respondent asserts that it does not intend to comply with Section II of this Modification No. 3, Respondent shall describe, using facts that exist, on or prior to the effective date of this Modification No. 3, any "sufficient cause" defenses asserted by Respondent within the meaning of Sections 106(b) and 107(c)(3) of CERCLA, 42 U.S.C. §§ 9606(b) and 9607(c)(3). The absence of a response by EPA to the notice required by this Section shall not be deemed to be acceptance of Respondent's assertions nor as a position taken by the Agency with regard to those assertions.

3.3 Failure of Respondent to provide the notice required by Paragraph 3.2 herein shall constitute a violation of the 2006 Modified Order and deemed to be a decision by Respondent not to comply with the terms of Section II of this Modification No. 3. Said failure to comply may trigger an Agency decision to file a judicial action or to initiate a Superfund response action at the Site.

## IV. LIMITATIONS OF MODIFICATION

4.1 Except as provided in Section I of this Modification No. 3, nothing in this Modification No. 3 shall alter or otherwise affect any term, condition, or requirement of the 2006 Modified Order.

## V. EFFECTIVE DATES

5.1 This Modification No. 3 is deemed issued on the date it is signed by EPA.

5.2 The Effective Date of Sections I, III, IV, and V of this Modification No. 3 shall be the date on which a signed copy of this Modification No. 3 is transmitted to Respondent's counsel.

5.3 The Effective Date of Section II of this Modification No. 3 shall be thirty (30) days following the date it is issued.

**SO ORDERED.**

Paul Leonard, Acting Director
Superfund & Emergency Management Division
EPA Region III

April 30, 2019
Date

# APPENDIX D

## [INCORPORATED FINDINGS OF FACT]

# Appendix C
# Findings of Fact From Docket No. CERC-03-2006-0266DC Incorporated into This Order

## III. FINDINGS OF FACT

The following facts are a synopsis of information contained in the Administrative Record supporting issuance of this Order. That Administrative Record is incorporated by reference as if fully set forth herein:

### A. Site Location and Historical Use

1. The Koppers Site consists of over 300 acres of land located in the northern part of New Castle County, Delaware, southwest of the town of Newport and northwest of the Route

I-95 and Route 141 interchange; is generally depicted as the "Former Koppers Company, Inc. Site" in Attachment 1 to this Order; and includes all places and property to which hazardous substances, pollutants or contaminants have migrated from the "Former Koppers Company, Inc. Site" in Attachment 1. The Site was the location of wood treatment operations from approximately the 1930s through 1971.

2. To the north, the Site is bordered by high-speed railroad lines. Beyond the rail lines are a former municipal sewage treatment facility, an industrial property, and a residential area. To the east, the Site is bordered by the former DuPont Holly Run Plant and the Christina River. To the south and west, the Site is bordered by White Clay Creek and Hershey Run, respectively. To the west of the Site, across Hershey Run, lies the Bread and Cheese Island property. The Site contains approximately 163 acres of upland areas 136 acres of wetlands, and three ponds.

3. In or around April 1929, Delaware Wood Preserving Company ("DelWood") acquired two parcels which comprise much of the Site and conducted wood treatment operations there until 1932. In 1932, DelWood sold the property to Century Wood Preserving Company, which continued to conduct wood treatment operations until it sold the property to the Wood Preserving Company ("WPC") in 1935. WPC continued wood treatment operations until 1941, when Koppers Company acquired the property. Koppers Company merged into Koppers Company, Inc. ("Koppers") in 1944 and continued to use the Site for wood treatment activities until 1971. In 1971, Koppers sold the property to E.I. duPont de Nemours & Company

("DuPont").

4. In 1974, the New Castle County Department of Public Works ("DPW") leased land in the northern portion of the Site where it built and operated a sewage/sludge treatment facility from 1974 until 1977. In 1977, DPW sold the building which currently exists on-Site to DuPont and discontinued wastewater treatment operations at the Site. In December 2004, DuPont transferred ownership of the Site to Respondent.

5. Wood treatment operations, conducted at various areas of the Site generally depicted in Attachment 2 to this Order, took place in the northern half of the Site. The Process Area contained various types of treatment equipment and storage for approximately 1,000,000 gallons of creosote and other process-related materials. Wood was treated in the Process Area using a creosote coal/tar solution, though pentachlorophenol ("PCP") with number 2 fuel oil was also used. The creosote treatment consisted of heating and pressurizing tanks filled with creosote and wood, forcing the creosote into the wood. After treatment, the freshly-treated wood products were temporarily allowed to cure and drip dry in the Drip Track Area prior to transfer to the large Wood Storage Area. Spills and leaks, including drips from drying wood, allowed treatment chemicals to seep into the soil.

6. The Potomac Formation, a major aquifer in the region of the Site and a source of potable water, lies beneath the Site. Several municipal water supply wells are located within approximately one mile of the Site.

7. Present on-Site is a building and sewer line constructed by DPW in or around 1974, a partial fence enclosure, and a blacktopped area. After purchasing the Site in 1971, Du Pont expanded its adjacent Holly Run Facility onto approximately 5 acres of the eastern portion of the Site, but subsequently dismantled the facility. Additional current Site features include two culverts, several drainage ditches, piles of old railroad ties, an "old foundation," a "fill or mounded area," an "old fire pond" and a former sump where effluent was treated or stored and is now covered with sediment/soil.

**B. Environmental Investigations**

1. The Site was first identified as a potential hazardous waste site in or around November 1979 following a review of responses to the Waste Disposal Site Survey of 1979 developed by the Subcommittee on Oversight and Investigation of the House Interstate and Foreign Commerce Committee (commonly known as the “Eckhardt Report”).

2. EPA and the State conducted a Site Inspection on May 28, 1980, at which time several surface water samples were collected. Results showed that surface water on the Site appeared to be contaminated with phenolic compounds and PAHs. Additional samples were collected from the Site, as well as from nearby municipal drinking water supply wells, in October 1980 by an EPA contractor. On-site samples showed PAHs present in soil and leachate, but no contamination was detected in the supply wells.

3. EPA and the State conducted a Site Inspection in December 1984. Analytical results revealed the presence of, among other things, anthracene, benzo(a)anthracene,

benzo(b)fluoranthene, benzo(b)pyrene, 2-butanone, chrysene, fluoranthene, phenanthrene, pyrene, aluminum, barium, lead and magnesium in the on-site soil/sediment samples and stream sediment samples.

4. EPA proposed the Site for inclusion on the National Priorities List ("NPL") in 1989, and formally listed the Site on the NPL on August 30, 1990.

5. In 1991, Respondent agreed to perform a Remedial Investigation/Feasibility Study ("RI/FS") under the terms of an Administrative Consent Order signed by Respondent and EPA. Initial Remedial Investigation ("RI") field work was completed in 1996, with supplemental investigations conducted in 2002 and 2003. The RI, which EPA accepted as final in April 2003, revealed the presence of creosote non-aqueous phase liquid in both subsurface soils and wetland sediments at the Site. Shallow soils, subsurface soils, groundwater, and sediments were also found to be contaminated to varying degrees with polynuclear aromatic hydrocarbons. Contamination at the Site was found to be present in the Process and Drip Track, Wood Storage, Remaining Upland, Hershey Run Drainage, Fire Pond, South Ponds, and K Areas depicted in Attachment 2 to this Order.

6. A Human Health Risk Assessment ("HHRA"), conducted during the RI by Respondent to evaluate the human health risks that could result if no remedial action were taken at the Site, found that risks to a construction worker, industrial worker, adolescent trespasser, adolescent swimmer or angler exceed target risk levels for carcinogenic and non-carcinogenic risks.

7. In an Ecological Risk Assessment for the Site conducted in 1996-1997, EPA concluded that PAHs pose ecological risks to the upland, wetland and aquatic communities at the Site.

8. In September 1999, a draft Feasibility Study ("FS") report was submitted to EPA by Respondent. After receiving comments, extensive revisions were made and the draft FS was resubmitted in April 2003. Respondent submitted an addendum to the FS in September 2004. EPA accepted the FS, as modified by the FS Addendum, in 2005.

C. **EPA's Record of Decision**

1. EPA published a notice of its Proposed Remedial Action Plan for the Site on October 7, 2004. A period of public review and comment was held from October 7, 2004 through December 7, 2004.

2. On September 30, 2005, EPA issued a Record of Decision ("ROD") in which the Agency selected remedial action for implementation at the Koppers Site. The remedial action selected in the ROD generally consists of the following components:

a. Excavation and consolidation of all contaminated soils and sediments (soils with total PAHs greater than 600 mg/kg and sediments with total PAHs greater than 150 mg/kg) into one or two on-site landfills or containment areas ("Containment Area") to be located in the areas of the worst NAPL contamination;

b. Installation, operation, and maintenance of a ground water treatment system to prevent the migration of contaminated ground water, as well as to prevent the discharge of contaminated ground water from the recovery operation, and an oil-water separator to facilitate the recovery of free-phase NAPL as well as to prevent NAPL from reaching the ground water treatment system;

c. Treatment of ground water as necessary to meet discharge requirements;

d. Construction of ground water barrier walls and collection systems in the Containment Area to prevent further migration of ground water contamination, including NAPL;

e. Management of the hydraulic head of ground water and collection of NAPL contamination in the ground water through the use of the passive recovery trenches;

f. Separation of creosote from ground water and off-site disposal or recycling;

g. Movement of debris to a location on-Site where it can be placed under a cap;

h. Installation of a cap across the Containment Area;

i. Relocation of a portion of the existing channel of Hershey Run if the Containment Area extends into the Hershey Run wetlands;

j. Creation of wetlands to replace any wetlands that are filled in as part of the landfill construction;

k. Monitoring of ground water, surface water, sediments and wetlands to ensure the effectiveness of the remedy; and

l. Prevention of exposure to contamination inside the Containment Area or in ground water beneath the Site, and prevention of the drawdown of contamination into the deeper aquifer or elsewhere through land and ground water use restrictions for the Site and surrounding area.

**D. Respondent**

1. Respondent Beazer East, Inc. is a Delaware corporation.

2. In or around 1988, approximately 17 years after it ceased wood treatment operations at the Site, Koppers was acquired by BNS Acquisition, Inc.

3. In or around 1989, BNS Acquisition, Inc. merged into Koppers, and Beazer East, Inc. was established as the new holding company. Also in 1989, Koppers changed its name to Beazer Materials and Services, Inc.

4. In or around 1990, Beazer Materials and Services, Inc. changed its name to Beazer East, Inc.