

EXPLANATION OF SIGNIFICANT DIFFERENCE
to the
Final Record of Decision
Koppers Co., Inc. (Charleston Plant) NPL Site
Charleston, South Carolina
April 2003

I. INTRODUCTION AND STATEMENT OF PURPOSE

This Explanation of Significant Differences (ESD) has been prepared to document a significant change to the April 29, 1998 Final Record of Decision (ROD) for the Koppers Co., Inc. (Charleston Plant) Site located in Charleston, South Carolina. This ESD will change two remedy components selected in the Final ROD for the Barge Canal and Northwest Corner of the site. As the lead regulatory agency for this National Priorities List (NPL) Site, the Region 4 Office of the United States Environmental Protection Agency (EPA) is issuing this ESD pursuant to public participation requirements specified in Section 117(c) of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and Section 300.435(c)(2)(i) of the National Contingency Plan (NCP). The South Carolina Department of Health and Environmental Control (SCDHEC) is the support agency for this Site.

Regarding the Barge Canal, the Final ROD for the site specified installation of a two-foot protective cap over the bottom sediments of the approximate 3.2 acre Barge Canal to eliminate potential exposure to ecological receptors. However, several lines of evidence collected during the Remedial Design phase of the project determined that the Barge Canal is dominated by sediment depositional dynamics. Available data indicate that continued natural deposition of sediments in the Barge Canal will achieve the objectives established in the ROD for the sub-aqueous cap alternative. Data supporting a switch to natural capping from installation of an engineered cap are discussed further in Section III below.

The remedy selected in the Final ROD for the groundwater and non-aqueous phase liquid (NAPL) component involved extraction via recovery wells at three source areas on-site. The three source areas are known as the Former Treatment Area, the Old Impoundment Area, and the Northwest Corner (formerly the Braswell Shipyards parcel). Performance standards specified for the groundwater/NAPL remedy component involved recovery to the maximum extent practicable, containment of non-restorable source areas, and restoration of downgradient aqueous contaminant plumes. However, additional data collected from the Northwest Corner during the Remedial Design phase indicated that although NAPL was present, it did not appear to be of sufficient quantity and/or mobility to permit recovery via extraction wells. Subsequent treatability testing has demonstrated that NAPL in the Northwest Corner can be immobilized by in-situ stabilization and solidification (S/S) with Portland Cement. Information supporting this alternate approach to the groundwater/NAPL remedy component in the Northwest Corner of the site is discussed further in Section III below. The groundwater and NAPL remediation strategy for the Former Treatment Area and Old Impoundment Area remains extraction via recovery wells.

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This ESD document will become part of the Administrative Record for the Site pursuant to NCP Section 300.825(a)(2). The Administrative Record for this Site is available for public review at the EPA Region 4 Records Center, Atlanta Federal Center, 61 Forsyth Street, SW, Atlanta, GA 30303; and at the Charleston County Main Library, 68 Calhoun Street, Charleston, SC, 29401.

II. SITE HISTORY AND THE SELECTED REMEDY

The Site is approximately 102 acres in size and is located in the neck area of northern Charleston, SC on the west side of the peninsula formed by the Ashley and Cooper Rivers. The Site contains various commercial operations and is surrounded on the north, south and east by a mixture of industrial, commercial and residential properties. The Site is generally bounded on the north by Milford Street, on the south by Braswell Street, on the east by the King Street Extension, and on the west by the Ashley River. From 1940 to 1978, the Koppers Company operated a wood-treatment facility at the Site which primarily consisted of treating raw lumber, utility poles and cross-ties with creosote. Pentachlorophenol (penta) and copper chromium arsenate (CCA) were also used as wood preservatives for short periods of time. The majority of wood-treating operations were conducted in the eastern portion of the Site, now identified as the Former Treatment Area. This area contained various above ground structures including preservative storage tanks, pressure treating vessels and wastewater recovery equipment. Surface water run-off from the Site was directed through a series of ditches to the Ashley River and adjacent tidal marshes. Beazer East, Inc. of Pittsburgh, PA is the successor in interest to environmental liabilities of the former Koppers Company.

The Site was proposed to the NPL in February 1992 and became Final on the NPL in December 1994. In January 1993, a Site-wide Remedial Investigation/Feasibility Study (RI/FS) was initiated by Beazer East under an Administrative Order on Consent (AOC) with EPA. An Interim Action ROD was issued by EPA on March 29, 1995. The Interim Action ROD was a source control effort that involved several components designed to eliminate off-site migration of NAPL via surface water conveyances and shallow groundwater in close proximity to the Former Treatment Area. Physical reconstruction and rehabilitation of the Milford Street and Hagood Avenue drainage systems was completed in 1997. Six shallow NAPL extraction wells installed along Milford Street and two intermediate NAPL extraction wells installed near the former pressure vessels continue to operate to meet the objectives of the Interim Action ROD.

The Final Site-wide remedy was issued by EPA in the ROD dated April 29, 1998. The ROD specified a multi-media response action to address surface/subsurface soil, sediments of drainage ditches, groundwater and NAPL, surface water, contaminant transport pathways, and sediments of the Ashley River, Barge Canal, and North/South/Northwest Tidal Marshes. The major components of EPA's selected remedy for this Site include:

- Excavation of the most heavily impacted surface/subsurface soils and drainage ditch sediments with subsequent off-site transport and disposal in an approved hazardous waste landfill;
- Placement of a protective engineered soil cover over relatively less impacted surface soils;
- Permanent reconstruction of on-site surface water conveyances;
- Recovery of groundwater/NAPL at three source areas to remove/treat NAPL to the maximum extent practicable, contain non-restorable source areas, and contain/restore aqueous contaminant plumes;
- Enhanced sedimentation in the Ashley River;
- Placement of a protective cap over bottom sediments of the Barge Canal;
- Excavation of acutely toxic tidal marsh sediments in portions of the North and South Tidal Marshes followed by restoration/revegetation and off-site disposal in an approved hazardous waste landfill; and
- In-situ bioremediation for sediments in the Northwest Tidal Marsh and portions of the South Tidal Marsh which did not demonstrate significant acute toxicity.

Remedy construction and implementation began in 1999 with the upland soils/drainage ditch reconstruction work and excavation/restoration of the North Tidal Marsh. An ESD was issued in August 2001 that changed the Ashley River remedy from enhanced sedimentation to placement of an engineered, sub-aqueous cap. The Ashley River remedial work was completed by December 2001. All remedial construction work has been completed except the South Tidal Marsh and full-scale groundwater/NAPL collection system. Mobilization for these remaining work items is scheduled for April 2003. Construction completion for the Koppers Co., Inc. (Charleston Plant) NPL site is targeted for September 30, 2003.

III. BASIS FOR THE DOCUMENT

Barge Canal

Pursuant to requirements of the ROD, a two-dimensional hydrodynamic and sediment transport modeling study of the Ashley River and adjacent Barge Canal was conducted in 1999. The purpose of the modeling effort was to identify a design strategy that could achieve the established objectives for enhanced sedimentation in the Ashley River. Simulations of baseline sedimentation rates (i.e. without enhanced sedimentation structures) predicted 3 to 6 inches accumulation per year along the longitudinal cross section of the Barge Canal. The

sedimentation rates predicted by the modeling effort were verified using physical measurements of sediment depths obtained from bathymetric surveys conducted in 1995 and 1999.

Encouraged by the model-predicted sediment deposition rates in the Barge Canal, Beazer conducted a more thorough analysis to support natural deposition as an alternative to placement of an engineered cap. This effort involved the development of multiple lines of evidence to document that natural deposition over time can meet the performance standards specified in the ROD for sub-aqueous cap installation. These lines of evidence are summarized below:

- Permit History - The Barge Canal was created in 1984 under a permit with the U.S. Army Corps of Engineers and the South Carolina Coastal Council (now known as the Office of Ocean and Coastal Resource Management or OCRM). According to permit drawings, the canal was to extend approximately 1,000 feet inshore from the Ashley River bank and consist of a 100 foot wide channel dredged to a depth of -8 feet Mean Low Water (MLW). A total of 30,000 cubic yards were to be removed and disposed on-site in the Bermed Spoils Area. The 1995 bathymetric survey conducted during the Remedial Investigation/Feasibility Study effort indicated channel bottom elevations along the centerline of the canal ranged from about -1 foot MLW near the mouth to +1 foot MLW near the interior bulkhead. Therefore, between 7 and 9 feet of sediment accumulated in the Barge Canal over the 10-year period (i.e. approximately 8 to 11 inches per year).
- Analytical Sedimentation Estimates - Deposition rates in the Barge Canal were estimated using information obtained from technical literature and a geotechnical testing program done to support the Ashley River remedy. The predicted average deposition rates using this methodology was 1.2 feet per year, or approximately 14 inches per year.
- Bathymetric Surveys - Bathymetric and hydrographic surveys of the canal centerline depths have been conducted in 1995, 1998 and 2000. Survey data from 1995 to 2000 generally indicate the sediment interface along the channel bottom has gained an average of 2 feet in elevation. This corresponds to an average deposition rate of approximately 5 inches per year.
- Aerial Photographs - Aerial photography of the Barge Canal was obtained and examined to determine the cumulative vegetative area gained in six years between 1994 and 2000. Vegetative encroachment would indicate sediment levels in the Barge Canal are increasing as model predictions, analytical calculations, and physical survey data indicate. Analysis of aerial photography between 1994 and 2000 provides evidence that the width of the unvegetated portion of the Barge Canal has narrowed approximately 20 feet. Over the six year analysis period, the Barge Canal gained approximately 0.50 acres of vegetative growth. The area gained equates to approximately 15% of its original 3.2 acre size. The vegetated areas along the shoreline of the canal provide both a high degree of long-term stability to the naturally capped area, and a productive habitat by restoring the Barge Canal to its preexisting condition of vegetated salt marsh. These positive aspects of revegetation are referred to in the ROD, but are not required.

The multiple lines of evidence confirm that the Barge Canal is a depositional environment and that natural capping will provide the same level of protection (i.e. eliminate potential exposure to ecological receptors) as an engineered, sub-aqueous cap. A sediment monitoring plan has been developed to document the concentration trends of total polyaromatic hydrocarbons (PAHs) in sediments of the Barge Canal over time and with vertical depth. Ten sediment monitoring stations, arranged in pairs and evenly spaced along the longitudinal length of the Barge Canal, have been established for total PAH concentration trend monitoring. Stations have been co-located with historical RI sample locations where appropriate to compare total PAH concentrations in surface sediments (i.e. recently deposited sediments) to previously deposited sediments (i.e. sampled during the RI). At all ten stations, a composite sample from the upper 6 inches of sediment will be collected. In addition, at three locations sediments from the 6"-12", 12"-24", and 24"-36" depth intervals will be collected to confirm the RI finding that total PAH concentrations decrease with increasing depth of sediments. A baseline sample event is scheduled for April 2003, and a second round of sediment samples will be collected during the first quarter of 2004. Barge Canal bathymetry and vegetation encroachment is also scheduled for the first quarter of 2004. The scope and frequency of future sediment quality monitoring in the Barge Canal will be determined after the 2004 sampling event.

The following references in the Administrative Record contain a more detailed account of the subject matter summarized above:

- Ashley River Sedimentation Study; U.S. Army Corps of Engineers, Waterways Experiment Station, Engineering and Research Development Center (August 30, 2000).
- Technical Report to Support Barge Canal Revised Remedy; Former Koppers Company Wood Treating Site, Charleston, SC (URS, May 4, 2001).
- Barge Canal Sediment Monitoring Plan; Former Koppers Wood Treating Site, Charleston, SC (AMEC, December, 16, 2002).

Northwest Corner

The Northwest Corner of the site comprises approximately 17,500 square feet and is part of the former Braswell Shipyards parcel adjacent to the Ashley River. Depth of NAPL impacts are generally limited to approximately 12 -14 feet below land surface (BLS) due to the presence of a shallow clay confining unit. The ROD specifies the use of NAPL recovery wells in all 3 source areas of the site to recover NAPL to the maximum extent practicable. However, area specific conditions identified during the Pre-Design data collection effort indicated that while residual NAPL was observed in the subsurface of the Northwest Corner, it did not appear to be of sufficient quantity and/or mobility to permit NAPL recovery. Moreover, the data collected indicates that the Northwest Corner area comprises a de minimus amount of the total NAPL source mass on-site. Based on successful implementation at other sites, Beazer proposed the use of stabilization and solidification (S/S) technology to immobilize NAPL in the subsurface of the

Northwest Corner. Beazer indicated that the initial capital cost of the S/S remedy was slightly higher than the NAPL recovery remedy, but given the potential future reuse of the area, the problems of NAPL recovery via extraction wells, and the reduction in long-term operation, maintenance, and monitoring costs, in-situ S/S was a more appropriate application.

A treatability study was conducted in early 2002 to identify the appropriate ratio of Portland Cement needed to meet specified physical/analytical test criteria, and to identify key process parameters that could impact full-scale field operations. Key physical and analytical performance goals of the treatability study were unconfined compressive strength (minimum of 50 psi at 28 days), permeability (less than or equal to 1×10^{-5} cm/sec), and Synthetic Precipitation Leaching Procedure (reduction in benzo-a-pyrene equivalent from pre- to post-treatment). Key process parameters were in-place density of untreated soils, bulking, moisture content and cure time. In general, the treatability study effort involved the collection of representative samples via test pits, pre-treatment testing, treatment of soil with 3%, 6%, 9%, 12%, and 15% Type I/II Portland Cement (by wet weight of untreated soil), and post-treatment testing. The treatability study concluded that a 9% Portland Cement mix is adequate to meet the established performance standards. Significant reductions in post-treatment permeability provided a 99% reduction in contaminant mass transport to the Ashley River.

A pilot S/S field testing program was conducted in July 2002 to assist in the preparation of a Remedial Design strategy. The pilot program evaluated slurry testing as a means for completing S/S without side wall sloughing due to sandy soils and the proximity of the Ashley River. The pilot program also evaluated potential scale-up issues from the laboratory treatability program, and tested construction quality control and quality assurance protocols. Several constructability issues were identified during the pilot program that will be incorporated into the Remedial Design documents for full-scale implementation. The combination of bench and field scale evaluations of the S/S technology strongly suggests that S/S can achieve the performance standards specified by the ROD for the groundwater/NAPL remedy component at the Northwest Corner. The effectiveness of the S/S remedy in the Northwest Corner will be monitored by the site-wide monitoring plan that will be developed and submitted with the Final Construction Completion Report for the site.

The following references in the Administrative Record contain a more detailed account of the subject matter summarized above:

- NAPL/Groundwater Pre-Design Activities Report- Volumes I and II; Former Koppers Company Inc. Superfund Site, Charleston, SC (Key Environmental, April 17, 2000).
- Summary of Project Meeting and Submittal of Treatability Study Work Plan, Northwest Corner Area; Former Koppers Company Inc. Superfund Site, Charleston, SC (Key Environmental, November 1, 2001).
- In-Situ Stabilization/Solidification Treatability Study Report, Northwest Corner Area; Former Koppers Company Inc. Superfund Site, Charleston, SC (Key Environmental, March 4, 2002).

- **Stabilization/Solidification Pilot Study Report, Northwest Corner Area; Former Koppers Company Inc. Superfund Site, Charleston, SC (Key Environmental, September 12, 2002).**

IV. DESCRIPTION OF SIGNIFICANT DIFFERENCES

Barge Canal

Data generated after the ROD was finalized necessitated a change in remedial strategy for total PAH impacted sediments of the Ashley River and Barge Canal. Sediment fate and transport modeling suggested that natural deposition techniques were more applicable to the Barge Canal than the Ashley River. In other words, EPA has essentially switched the ROD selected remedies for the Ashley River and Barge Canal by applying engineered subaqueous capping to the Ashley River (i.e. instead of enhanced sedimentation), and natural deposition to the Barge Canal (i.e. instead of subaqueous capping).

Areas of potential ecological concern for the Ashley River and Barge Canal are approximately the same size. As discussed above, the current area of the Barge Canal is approximately 2.7 acres. An estimated 132,000 square feet (i.e. about 3 acres) of the Ashley River was capped at the end of 2001. The reduction in toxicity and mobility of total PAH impacted sediments of the Barge Canal will occur gradually over time as less impacted sediments are deposited in the low energy environment. However, the gradual reduction in contaminant concentrations in the Barge Canal sediments has been off-set by the relatively rapid reduction in total PAH concentrations afforded by placement of a subaqueous cap over impacted sediments in the Ashley River.

The ROD cost estimate for placement of an engineered, subaqueous cap over the Barge Canal sediments was \$447,000. This equates to roughly \$150,000 per acre. However, experiences gained at the Ashley River indicate the \$447,000 estimate was very low. Three acres of sediment in the Ashley River were covered with geotextile and a minimum of 12 inches of sand at a total approximate cost of \$2,200,000. The current cost estimate for natural deposition in the Barge Canal is estimated to be less than \$100,000. This estimate accounts for implementation of the monitoring program discussed in Section III above.

Northwest Corner

Data collected during the Pre-Design phase of the groundwater/NAPL remedy component indicated that NAPL recovery via extraction wells in the Northwest Corner would be inefficient at best. Beazer has elected to invest more capital upfront to immobilize NAPL via S/S in order to reduce future costs associated with long-term operation, maintenance, and monitoring of a NAPL recovery system. Application of S/S technology is well understood by the technical community, and results of the bench and field pilot studies indicate it will provide

a 99% reduction in contaminant mass transport to the Ashley River. Due to the small size (i.e. roughly 0.30 acres) and shallow depth of observed NAPL (i.e. generally < 12 feet BLS), EPA believes that immobilization of NAPL via S/S applications is more robust than recovery via extraction wells. The ROD did not separate costs of the groundwater/NAPL remedy component by source area, but total estimated present worth was \$3,074,000. The current cost estimate for S/S in the Northwest Corner is approximately \$750,000. This estimate accounts for solidification of the Northwest Corner area using a 9% Portland Cement mix and the disposal of debris expected to be encountered during the mixing process.

V. SUPPORT AGENCY COMMENTS

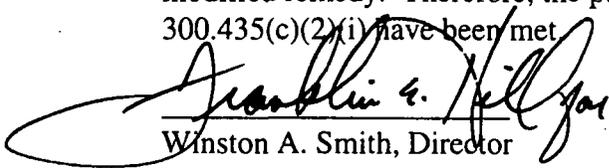
SCDHEC has reviewed this ESD and the documentation which provides the rationale and justification behind changing the remedy components for the Barge Canal and Northwest Corner. SCDHEC concurs with the basis for S/S in the Northwest Corner and believes this work should proceed. SCDHEC has chosen to wait on the sediment data from the April 2003 baseline monitoring event in the Barge Canal, before issuing a concurrence for the change in the Barge Canal remedy as described in this ESD.

VI. STATUTORY DETERMINATIONS

Pursuant to the requirements of CERCLA Section 121, the modified remedy for the Barge Canal and Northwest Corner is adequately protective of human health and the environment, complies with applicable or relevant and appropriate requirements, is cost-effective and utilizes permanent solutions and alternate treatment technologies or resource recovery technologies to the maximum extent practicable. Solidification and stabilization of subsurface NAPL underlying the Northwest Corner satisfies the preference for treatment as a principal element. Capping via natural deposition in the Barge Canal will reduce the toxicity and mobility of impacted sediments over time.

VII. PUBLIC PARTICIPATION COMPLIANCE

This ESD and other supporting documentation will be placed in the Administrative Record locations referred to in Section I above for public review. A notice will be published in a local newspaper of general circulation to summarize the ESD and reasons supporting the modified remedy. Therefore, the public participation requirements set forth in NCP Section 300.435(c)(2)(i) have been met.


Winston A. Smith, Director
Waste Management Division
U.S. EPA Region 4

4/24/03
Date