Statement of Work for
Remedial Investigation and Feasibility Study Portion of
Lower Passaic River Restoration Project

Introduction

This Statement of Work ("SOW") provides an overview of the Work that will be carried out by the Settling Parties as they complete the Remedial Investigation and Feasibility Study (RI/FS) begun by EPA for the Lower Passaic River Study Area (LPRSA) portion of the Diamond Alkali Superfund Site. This RI/FS SOW is attached to the Settlement Agreement for the LPRSA, and is a supporting document for the Settlement Agreement. Technical work described in the SOW is intended to provide more information to Settling Parties for purposes of implementing the Settlement Agreement and is not intended to change the meaning of any Settlement Agreement language. Terms used in this SOW shall have the same meaning assigned to them in the Settlement Agreement. The SOW is also consistent with both CERCLA and the NCP. Any discrepancies between the Settlement Agreement and this SOW are unintended and whenever necessary, the Settlement Agreement will control in any interpretive disputes.

The RI/FS is expected to be an iterative process. Moreover, Settling Parties are assuming responsibility for completing the RI/FS at a time when certain of the Project Plans referred to in the Settlement Agreement, are not in final form. Accordingly, EPA and the Settling Parties expect and the Settlement Agreement recognizes that this SOW and the Project Plans may be modified as provided in the Settlement Agreement, subject to EPA approval. This SOW outlines a process that will be used to focus programs to gather information that is needed for the RI/FS. As specified in Section 104(a)(1) of CERCLA, EPA will provide oversight of Settling Parties' performance under the Settlement Agreement. Although EPA is currently evaluating interim actions, this Settlement Agreement does not require the Settling Parties to implement early actions or interim remedial measures (IRMs), or to perform any remedial action selected for the LPRSA. Any early actions, IRMs, or remedial action(s) selected for the LPRSA will be the subject of separate settlement agreements.

EPA will document remedial action decisions in one or more records of decision. The remedial action(s) selected by EPA will not be inconsistent with the requirements of Section 121 of CERCLA and the NCP and will be coordinated with WRDA to the extent practicable. The final RI/FS report, as approved by EPA will, along with the Administrative Record developed by EPA, form the basis for remedy selection for the LPRSA and will provide the information necessary to support development of one or more records of decision.

Scope of the Project

The Lower Passaic River Restoration Project is a joint CERCLA and WRDA project that is being conducted by a partnership of agencies, including EPA, U.S. Army Corps of Engineers (USACE), New Jersey Department of Transportation, (NJDOT), National Oceanic and Atmospheric Administration (NOAA), U.S. Fish and Wildlife Service (USFWS) and New Jersey Department of Environmental Protection (NJDEP) [“the Partner Agencies”]. The Work required under the Settlement Agreement and this SOW represents the CERCLA portion of the RI/FS,

which is EPA's responsibility to implement, in coordination with the Partner Agencies. The goal of the project is to integrate the results of the CERCLA RI/FS with the results of the WRDA Study to produce a comprehensive plan for remediating and restoring the Lower Passaic River. To the extent practicable, EPA will integrate the results of the CERCLA RI/FS with the results of the WRDA Study to produce a comprehensive plan for remediating and restoring the LPRSA

Purpose of the RI/FS

The purpose of this RI/FS is to determine the nature and extent of contamination within the Lower Passaic River Study Area of the Diamond Alkali Superfund Site, and to develop and evaluate remedial alternatives. For the purposes of this effort, the Lower Passaic River Study Area is defined as the 17-mile tidal stretch of the Passaic River and its tributaries from Dundee Dam to the River's mouth at Newark Bay. Contaminants of Potential Concern (COPCs) referred to in this SOW include, but are not limited to, dioxins/furans, polychlorinated biphenyls (PCBs), polyaromatic hydrocarbons (PAHs), pesticides and metals. The RI and FS are interconnected and are conducted concurrently so that the data collected in the RI are used in the development of remedial alternatives in the FS, which in turn affect the data needs and scope of treatability studies, if necessary.

An RI/FS for the Newark Bay Study Area of the Diamond Alkali Superfund Site is being conducted under the Newark Bay AOC. Under the Newark Bay AOC, the Newark Bay Study Area is defined as Newark Bay and portions of the Hackensack River, Arthur Kill and Kill van Kull. Since the LPRSA and the Newark Bay Study Area are hydrodynamically linked waterbodies, the RI/FS for the Lower Passaic River Restoration Project must be conducted consistently and in coordination with the RI/FS for Newark Bay.

EPA will select a remedy for the LPRSA that will be documented in one or more CERCLA Records of Decision (ROD). The remedy selected by EPA will meet the cleanup standards specified in CERCLA Section 121 and the NCP. That is, the selected remedial action will be protective of human health and the environment, will be in compliance with or include a waiver of applicable or relevant and appropriate requirements (ARARs) of other laws, will be cost-effective, will use permanent solutions and alternative treatment technologies or resource recovery technologies, to the maximum extent practicable, and will address the statutory preference for treatment as a principal element. The final RI/FS Report, as adopted by EPA, along with the Administrative Record and comments from the public will form the basis for the selection of the LPRSA's remedial actions.

As specified in CERCLA Section 104(a)(1), EPA will provide oversight of Settling Parties' activities throughout the RI/FS. Settling Parties shall support EPA's initiation and conduct of activities related to the implementation of oversight activities.

Remedial Investigation

A. Goals and Objectives of the RI

1. Identify and quantify the hazardous contaminants present in sediment, water and biota;

2. Understand the vertical and horizontal distribution of hazardous contaminants in the LPRSA;

3. To the extent practicable, identify sources of historical hazardous contamination;

4. Quantify any significant continuing sources of hazardous contaminants;

5. Understand the geomorphological setting and processes (e.g., resuspension, transport, deposition, weathering) affecting the stability of sediment;

6. Understand the key chemical and biological processes affecting the fate, transport and bioavailability of hazardous contaminants;

7. Identify the complete or potentially complete human and ecological exposure pathways for the hazardous contaminants;

8. Identify current and potential future human and ecological risks posed by the hazardous contaminants;

9. Collect data necessary to evaluate the potential effectiveness of natural recovery, in-situ capping, sediment removal, and promising innovative technologies; and

10. Provide a baseline of data that can be used to monitor remedy effectiveness in all appropriate media (generally sediment, water, and biota).

B. Remedial Investigation Activities

1. The LPRSA CERCLA RI activities shall be conducted in accordance with the Settlement Agreement, this SOW, guidance referenced therein and the CERCLA portions of the following Project Plans as approved by EPA, as the same may be modified in accordance with the procedures set forth in the Settlement Agreement:

a. Lower Passaic River Restoration Project Work Plan, August 2005;

b. Quality Assurance Project Plan, Lower Passaic River Restoration Project, August 2005;

c. Lower Passaic River Restoration Project Field Sampling Plan Volume 1, January 2006 (to be refined based upon the results of Step 3 of the Baseline Ecological Risk Assessment as defined in Section A.7.b. of the SOW);

d. Lower Passaic River Restoration Project Health and Safety Plan, January 2005, as amended through July 2005;

e. Lower Passaic River Restoration Project Pathways Analysis Report, July 2005;

f. Lower Passaic River Restoration Project Modeling Work Plan, August 2006;

g. Newark Bay Study Modeling Work Plan Addendum, August 2006 (in close coordination with the Newark Bay AOC Settling Party, to ensure that one model is developed that includes the Lower Passaic River and Newark Bay watershed);

h. Lower Passaic River Restoration Project Field Sampling Plan Volume 2 (draft dated August 2005 to be approved by EPA in coordination with the Partner Agencies) (to be refined based upon the results of Step 3 of the Baseline Ecological Risk Assessment as defined in Section A.7.b. of the SOW);

I. Lower Passaic River Restoration Project Field Sampling Plan Volume 3 (draft dated July 2005 to be approved by EPA in coordination with the Partner Agencies) (to be refined based upon the results of Step 3 of the Baseline Ecological Risk Assessment as defined in Section A.7.b. of the SOW); and

j. The CSO Study Work Plan, currently under development, which is to be the subject of a separate administrative consent order between EPA and the respondents named therein.

Settling Parties shall be responsible only for the performance and financing of those tasks described in the Project Plans which are necessary to complete the CERCLA RI/FS and not for the performance and financing of those tasks which are exclusively WRDA or NRDA activities. The Settling Parties with the exception of Occidental Chemical Corporation and its assigns including Tierra Solutions, Inc., and any other parties that have received notices of potential liability with regard to Newark Bay, shall not be responsible for the performance of the sampling or gathering of data required by the Newark Bay AOC, nor for the tasks described in the CSO Study Work Plan.

2. Settling Parties shall perform the Work (i.e. the CERCLA RI/FS activities) as approved by EPA, detailed in the Project Plans listed above, except to the extent that the Work has been or will be completed by EPA and/or the Partner Agencies. Settling Parties shall perform the Work in accordance with the Quality Assurance Project Plan (August 2005) and the Lower Passaic River Restoration Project Health and Safety Plan, January 2005, as amended through July 2005.

3. Given unknown site conditions, field investigation activities are often iterative. In order to satisfy the objectives of the RI/FS, it may be necessary for Settling Parties or EPA to modify the Work specified in the Project Plans described in Section B.1 of the SOW. If the Settling Parties propose any modifications, they shall submit them to EPA for review and approval in accordance with Paragraph 39 and Section X (EPA Approval of Plans and Other Submissions) of the Settlement Agreement.

4. Within 30 days of the Effective Date of the Settlement Agreement, Settling Parties shall submit a detailed schedule ("Project Schedule") for EPA review and approval pursuant to Section X (EPA Approval of Plans and Other Submissions) of the Settlement Agreement. The Project Schedule shall include dates by which action or submission by entities other than the Settling Parties or their contractors or subcontractors must be accomplished in order to achieve the completion date.

5. For all field investigation tasks, Settling Parties shall address the following logistical, documentation and reporting activities:

a. Settling Parties shall give EPA at least 7 business days notice prior to the start of any field activities (with the exception of conducting sampling related to significant storm events, which are addressed in Paragraph 5.b. below), so that EPA may adequately schedule oversight tasks.

b. For sampling related to significant storm events, Settling Parties shall give EPA at least 1 business day notice prior to the proposed start of any field activities, with the understanding that such proposed start may need to be modified in accordance to the storm event, which may be unpredictable. In the event of such modification, verbal notice shall be given in as timely a manner as possible.

c. Information gathered during field investigations shall be consistently documented and adequately recorded by Settling Parties in well-maintained field logs and laboratory reports. Settling Parties shall use the Passaic River Estuary Management Information System (PREmis) developed by EPA and its contractor to report field information electronically, and upload and validate laboratory data. The PREmis field application documents observations, measurements and significant events that have occurred during field activities. PREmis laboratory reports document sample custody, analytical responsibility, analytical results, adherence to prescribed protocols, nonconformity events, corrective measures, and/or data deficiencies. Use of PREmis will ensure compatibility with the data

already collected by the Partner Agencies under the Lower Passaic River Restoration Project. EPA, or its contractor, shall be responsible for managing and maintaining PREmis.

d. After completing each field investigation task, Settling Parties shall prepare a concise characterization summary. This summary shall review the investigative activities that have taken place, and describe and display the data collected.

6. Modeling. Settling Parties shall perform the Modeling in accordance with the Lower Passaic River Restoration Project Modeling Work Plan and the Newark Bay Study Modeling Work Plan Addendum (collectively, "the Modeling Work Plan"), as may be modified pursuant to Paragraph 6.c. below. In performing the Modeling, Settling Parties shall closely coordinate with the Settling Party responsible under the Newark Bay AOC for obtaining the data in the Newark Bay Study Area necessary to conduct the Modeling. Settling Parties shall ensure that one model is developed that includes the Lower Passaic River and Newark Bay Study Areas. Settling Parties shall use the LPRSA Hydrodynamic Model and the LPRSA Hydrodynamic Model Calibration Report (draft dated April 2006 to be approved by EPA in coordination with the Partner Agencies), as the same may be modified in accordance with the procedures set forth in the Settlement Agreement and shall also provide the following:

a. Source code with entered input data, in a format that will allow EPA to have the models peer reviewed and recreate the results of the model and in sufficient detail to allow an in-depth analysis of the model results, for model calibrations for each of the following:

(1) Sediment Transport: Calibrated and validated sediment transport and organic carbon cycling model (ST-SWEM model code) which includes the SEDZLJ erosion formulations with the following inputs for each variable modeled:

- Boundary Conditions
- Initial Conditions
- Sediment Loads
- Sediment Composition
- Organic Carbon Loads
- Nutrient Loads
- Data Used for Calibration and Validation
- Geometry of Model Grid
- Results of Hydrodynamic Model

(2) Chemical Fate and Transport: Calibrated and validated chemical fate and transport model (RCATOX model code) with the following inputs for each variable modeled:

- Boundary Conditions
- Initial Conditions

- Chemical Loads
- Data Used for Calibration and Validation
- Results of Hydrodynamic and Sediment Transport Model

(3) Bioaccumulation and Toxicity: Calibrated and validated bioaccumulation and toxicity model with the following inputs for each variable modeled:

- Exposure Concentrations from Fate and Transport model
- Data Used for Calibration and Validation

b. Modeling Deliverables. The calibration reports will include sections on model validation, sensitivity analyses for all models, and formal uncertainty analyses for the bioaccumulation and toxicity models. Settling Parties shall submit to EPA for review and approval pursuant to Section X (EPA Approval of Plans and Other Submissions) of the Settlement Agreement each of the following in accordance with the Project Schedule:

(1) (A) Sediment Transport Model
(B) Draft Sediment Transport Model Calibration Report

(C) Final Sediment Transport Model Calibration/Validation Report

(2) (A) Chemical Fate and Transport Model
(B) Draft Chemical Fate and Transport Model Calibration Report
(C) Final Chemical Fate and Transport Model Calibration/Validation Report

(3) (A) Bioaccumulation and Toxicity Model including exposure concentration data in a format to include in the Baseline Human Health Risk Assessment and the Baseline Ecological Risk Assessment
(B) Draft Bioaccumulation and Toxicity Model Calibration Report
(C) Final Bioaccumulation and Toxicity Model Calibration/Validation Report

(4) (A) Draft Model Calibration Report for the entire Modeling effort
(B) Final Model Calibration/Validation Report for the entire Modeling effort

c. Settling Parties shall obtain EPA approval for all changes to the Modeling framework and Modeling Work Plan input data, model codes and refinements pursuant to Section X (EPA Approval of Plans and Other Submissions) of the Settlement Agreement.

d. The Settling Parties shall conduct sensitivity analyses for each component of the Modeling and a formal uncertainty analysis for the bioaccumulation and toxicity models in the Model Calibration/Validation Report, which will be peer reviewed. If necessary, modifications to the Project Schedule may be recommended by the Settling Parties for approval by EPA as provided in Section X (EPA Approval of Plans and Other Submissions) of the Settlement Agreement.

7. Risk Assessments. Settling Parties shall conduct the baseline human health risk assessment and ecological risk assessment ("Risk Assessments"), in accordance with the Lower Passaic River Restoration Project Pathways Analysis Report (July 2005), as the same may be modified in accordance with Paragraph 39 of the Settlement Agreement, the Lower Passaic River Restoration Project Work Plan (August 2005) and any other relevant Project Plans, applicable EPA guidance (including, without limitation, EPA Risk Assessment guidance referenced in the Settlement Agreement), guidelines, policies, and directives which may be found at (http://www.epa.gov.oswer/riskassessment/risk/superfund.htm), including but not limited to: "Interim Final Risk Assessment Guidance for Superfund, Volume I - Human Health Evaluation Manual (Parts A to E and Volume II)," (RAGS, EPA-540-1-89-002, OSWER Directive 9285.7-01A, December 1989); "Interim Final Risk Assessment Guidance for Superfund, Volume I - Human Health Evaluation Manual (Part D, Standardized Planning, Reporting, and Review of Superfund Risk Assessments)," (RAGS, EPA 540-R-97-033, OSWER Directive 9285.7-01D, January 1998); "Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments" (ERAGS, EPA-540-R-97-006, OSWER Directive 9285.7-25, June 1997) or subsequently issued guidance. The plans, reports and other deliverables described herein and in the Settlement Agreement shall be provided to EPA for approval pursuant to Section X (EPA Approval of Plans and Other Submissions) of the Settlement Agreement. The Risk Assessments shall include the following:

a. Baseline Human Health Risk Assessment. Settling Parties shall review and revise the Lower Passaic River Restoration Project Pathways Analysis Report (July 2005) following discussions with EPA to reflect changes in toxicity values, new sampling data, and revisions to guidance. Settling Parties shall update the Pathways Analysis Report upon receipt of new data or new information on toxicity values and exposure variables, as necessary throughout the RI/FS process. After receipt of the last set of validated data from the final sampling event and completion of the Modeling, Settling Parties shall submit the final Pathways Analysis Report to EPA for approval pursuant to Section X (EPA Approval of Plans and Other Submissions) of the Settlement Agreement in accordance with the Project Schedule.

Settling Parties shall submit a draft Human Health Risk Assessment to EPA for approval pursuant to Section X (EPA Approval of Plans and Other Submissions) of the Settlement Agreement. Based on the results of the Human Health Risk Assessment (point estimate or deterministic risk),

EPA will determine whether a probabilistic risk assessment is appropriate and if so, Settling Parties shall conduct a probabilistic risk assessment consistent with the Risk Assessment Guidance for Superfund Volume III Part A: Process for Conducting Probabilistic Risk Assessment (RAGS Part 3A, December 2001, OSWER 9285.7-45, and subsequent updates), and the Guiding Principles of Risk Assessment (available at: http://www.epa.gov/oswer/riskassessment/superfund_hh_characterization.htm) and other related guidance. EPA will determine the level and extent of the probabilistic risk assessment in accordance with Risk Assessment Guidance for Superfund Volume III (Part A) and other appropriate EPA guidance and policy.

b. Baseline Ecological Risk Assessment. Settling Parties shall perform a full Baseline Ecological Risk Assessment in accordance with the Settlement Agreement, this SOW and EPA guidance. Settling Parties shall submit a draft Baseline Ecological Risk Assessment, which shall include both the Screening Level Ecological Risk Assessment and the Baseline Ecological Risk Assessment (i.e., containing steps 1 through 8 identified in "Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments" (ERAGS, EPA-540-R-97-006, OSWER Directive 9285.7-25, June 1997) to EPA for approval pursuant to Section X (EPA Approval of Plans and Other Submissions) of the Settlement Agreement in accordance with the Project Schedule.

8. Peer Review. Consistent with the Peer Review Handbook (EPA/100/B-06/002), EPA will determine on a case-by-case basis which Lower Passaic River Restoration Project work products should be peer reviewed, in accordance with the principle that all influential scientific and technical work products used in decision making will be peer reviewed. At a minimum, the Model Calibration/Validation, Baseline Human Health Risk Assessment and Baseline Ecological Risk Assessment reports shall be peer reviewed. Peer involvement shall consist of the LPRSA Technical Advisory Committee ("Peer Input") and/or an external Peer Review Group ("External Peer Review"). The members of the External Peer Review Group will be selected by EPA based on the guidance provided in the Peer Review Handbook, Section 3.4. While the Settling Parties may propose charge questions, EPA will make the final determination on what elements to include in the charge to ensure that it meets EPA's needs for the peer review. EPA will be responsible for developing a peer review record that includes a response to peer review comments. Settling Parties shall incorporate comments from both the Peer Input and External Peer Review and revise reports as directed by EPA. All peer review shall be conducted in accordance with the Peer Review Handbook.

a. Settling Parties shall provide information for dissemination to the Peer Input and/or Peer Review and participate in meetings to provide supporting materials, background on the approach, assumptions, results of analysis and conclusions. The extent of Settling Parties' involvement in

the Peer Input and/or Peer Review will be at the discretion of EPA. All Settling Party-conducted activities regarding the Peer Input and/or Peer Review activities will be subject to oversight by EPA.

C. Community Involvement

EPA will conduct community involvement in accordance with the Lower Passaic River Restoration Project and Newark Bay Study Final Community Involvement Plan (June 2006). Although implementation of the Community Involvement Plan (CIP) is the responsibility of EPA, Settling Parties shall assist by providing information for dissemination to the public and participating in public meetings. The extent of Settling Parties' involvement in community involvement activities is left to the discretion of EPA. All Settling Party-conducted community involvement activities pursuant to the CIP will be subject to oversight by EPA.

D. RI Report

1. In accordance with the Project Schedule approved by EPA, Settling Parties shall submit to EPA and the Partner Agencies, the draft RI Report presenting the results of the RI activities implemented, including the Modeling results and the human health and ecological Risk Assessments. Settling Parties shall submit the draft RI Report to EPA for review and comment in accordance with Section X (EPA Approval of Plans and Other Submissions) of the Settlement Agreement. Settling Parties shall revise the draft RI Report per EPA's comments. The RI Report may require further revision depending upon public comment. EPA will approve the final RI Report.

2. The RI Report shall consist of the following sections, consistent with the suggested format described in Table 3-13 of EPA's "Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA", October 1988, EPA/540/G-89/004:

a. Introduction, including Purpose and Site Background
b. Study Area Investigation including a presentation of historical data, data collected by the Partner Agencies, as well as data collected pursuant to the Settlement Agreement and this SOW
c. Study Area Physical Characteristics
d. Nature and Extent of Contamination in water column, sediment and biota
e. Modeling Results
f. Baseline Human Health Risk Assessment
g. Baseline Ecological Risk Assessment
h. Data Validation and Interpretation Report
I. Summary and Conclusions
j. Appendices, including technical memoranda on field activities, analytical data and quality assurance and quality control (QA/QC) evaluation results.

Feasibility Study

The LPRSA CERCLA Feasibility Study (FS) activities will be developed to evaluate remedial alternatives for the LPRSA and shall be conducted in accordance with the Settlement Agreement, this SOW, and the guidance referenced therein.

E. Feasibility Study Work Plan

1. Settling Parties shall prepare a draft Feasibility Study (FS) Work Plan that includes a detailed description of the work to be performed and the schedule for implementation of the work. The FS Work Plan shall be submitted to EPA in conjunction with the Project Schedule for review and approval pursuant to Section X (EPA Approval of Plans and Other Submissions) of the Settlement Agreement. Settling Parties shall revise the draft FS Work Plan per EPA's comments. The FS Report may require further revision depending upon public comment. EPA will approve the final FS Report.

2. The FS Work Plan shall consist of the following tasks, as described in Section F of the SOW:

a. Description of Remedial Action Objectives and Preliminary Risk-Based Remediation Goals
b. Description of Current Situation and Proposed Response
c. Development of Alternatives
d. Screening of Alternatives
e. Treatability Studies
f. Analysis of Alternatives
g. Reports

F. Description of Feasibility Study Tasks

1. Development of Remedial Action Objectives and Preliminary Risk-Based Remediation Goals. Settling Parties shall conduct an analysis of ARARs and identify risk-based concentrations for each media for the Contaminants of Potential Concern in the baseline Human Health Risk Assessment and the baseline Ecological Risk Assessment consistent with appropriate EPA guidance, including but not limited to, "Risk Assessment Guidance for Superfund, Volume 1 - Human Health Evaluation Manual (Part B, Development of Risk- Based Preliminary Remediation Goals)," (RAGS, EPA-540/R-92/003, OSWER Directive 9285.7-01B, December 1991) or subsequently issued guidance or updates, and consistent with exposure assumptions used in the Human Health Risk Assessment. The calculations for the individual chemicals in the various media shall be submitted to EPA for review and approval pursuant to Section X (EPA Approval of Plans and Other Submissions) of the Settlement Agreement before the FS proceeds in accordance with the Project Schedule. The Remedial Action Objectives and Preliminary Risk-Based Remedial Goals shall be submitted to EPA for review and approval pursuant to Section X (EPA Approval of Plans and Other Submissions) of the Settlement Agreement before the start of the selection of alternatives in the FS.

2. Description of Current Situation and Proposed Response. Information on the Site background, nature and extent of the problem, and previous response activities presented in the RI should be summarized briefly, then incorporated by reference. Following this summary of the current situation, a site-specific statement of the purpose for the response, based on the results of the RI should be presented. The statement of purpose should identify the actual or potential exposure pathways that should be addressed by remedial alternatives.

3. Development of Alternatives. Based on the results of the RI, Settling Parties shall develop a limited number of alternatives for source control of contaminated sediments and surface water, and/or off-site remedial actions based on objectives established for the response and applicable EPA policy. Implementation activities associated with this task are described below.

a. Establishment of Remedial Action Objectives. LPRSA-specific objectives for the response action shall be proposed by Settling Parties and approved by EPA and incorporated by Settling Parties into this task. These objectives will be based on protecting public health and the environment through the development of Preliminary Remediation Goals, information gathered during the RI, Section 300.430 of the NCP and the requirements of any other applicable Federal and/or State environmental standards, guidance and advisories as defined under Section 121 of CERCLA. The remedial action objectives will specify the COPCs, water and sediment quality exposure pathways, and remediation goals that permit a range of alternatives to be developed including each of the three major approaches (MNR, capping and removal) and promising innovative technologies, such as in-situ treatment. The objectives shall consider state and local objectives for the LPRSA.

b. Identification of Areas or Volumes of Media. Settling Parties shall identify areas or volumes of media to which general response actions may apply, taking into account requirements for protectiveness as identified in the remedial action objectives and the biological, chemical and physical characteristics of each specific area in the LPRSA.

c. Alternative Remedial Actions. Combinations of identified technologies that will meet remedial response objectives will be assembled into alternative remedial actions. To the extent that it is feasible and appropriate, alternatives and other considerations should be developed into a comprehensive site- specific approach. Additional detail concerning the equipment, methods and locations to be evaluated for each alternative, including the three major approaches (e.g., potential natural recovery processes, potential cap materials and placement methods, number and types of dredges or excavators, transport methods, treatment methods, types of disposal units, general disposal location, need for monitoring and/or institutional controls) shall be developed. To the extent

possible with information available at this stage of the FS, the time frame(s) in which the alternatives are expected to achieve cleanup levels and RAOs should be identified. Alternatives should be assembled representing a range of options, including MNR, in-situ capping, and removal options or combinations of options, as appropriate, and shall include, but not be limited to, the following:

(I) Treatment alternatives for source control of contaminated LPRSA sediments and waters that would eliminate or reduce the need for long-term management (including monitoring);
(ii) Alternatives involving treatment as a principal element to reduce the toxicity, mobility or volume of waste;
(iii) An alternative that involves containment of waste with little or no treatment, but provides protection of human health and the environment primarily by preventing potential exposure or reducing the mobility of the waste; and
(iv) A no action alternative.

4. Screening of Alternatives.

a. Alternatives. The alternatives developed in Task F.3. shall be screened to eliminate alternatives that are clearly ineffective or unimplementable, or that are clearly inferior to other alternatives being considered in terms of protecting human health and the environment, effectiveness, implementability or cost prior to undertaking detailed evaluations of the remaining alternatives. The list of alternatives shall be screened based on the NCP, CERCLA and the rules promulgated under CERCLA.

b. Remedial Alternatives Screening Document. Settling Parties shall prepare a Remedial Alternatives Screening (RAS) Technical Memorandum summarizing the work performed and the results of each task above, including an alternatives array summary. Settling Parties shall describe the alternatives screening in accordance with EPA rules and guidance. The RAS Technical Memorandum should also summarize the reasoning employed in screening, arraying alternatives that remain after screening, and identifying ARARs for the alternatives that remain after screening. These will be modified by Settling Parties if required by EPA's comments to assure identification of a complete and appropriate range of viable alternatives to be considered in the detailed analysis. This deliverable will document the methods, rationale, and results of the alternatives screening process and demonstrate that the proposed alternatives meet the goals of protection of human health and the environment and meet ARARs. Settling Parties shall submit the RAS Technical Memorandum to EPA for review and approval pursuant to Section X (EPA Approval of Plans and

Other Submissions) of the Settlement Agreement. As appropriate, EPA will update the ARARs throughout the FS process.

5. Treatability Studies. The Partner Agencies, led by NJDOT, are implementing an Environmental Dredging and Sediment Decontamination Technologies Pilot. EPA and Settling Parties will evaluate the need for additional treatability studies, if any, as follows.

a. Identification of Candidate Technologies. Settling Parties shall identify, in a technical memorandum, candidate technologies for a treatability studies program. The listing of candidate technologies will cover the range of technologies required for alternatives analysis. Settling Parties will conduct a literature survey to gather information on performance, relative costs, applicability, removal efficiencies, operation and maintenance requirements and implementability of candidate technologies. Settling Parties shall submit the Identification of Candidate Technologies Memorandum to EPA for review and approval pursuant to Section X (EPA Approval of Plans and Other Submissions) of the Settlement Agreement.

b. Implementation and Evaluation of Treatability Studies. Settling Parties shall conduct any necessary laboratory and bench scale treatability studies required to evaluate the effectiveness of remedial technologies and establish engineering criteria, except where Settling Parties demonstrate to EPA's satisfaction that they are not needed. The major components of the treatability studies shall include a determination of the need for and scope of studies, the design of the studies and the completion of the studies. Where treatability studies are needed, initial treatability testing activities (such as research and study design) will be planned to occur concurrently with site characterization activities. Submittals shall be made in the time frame required to maintain steady progress of the overall FS. Additional studies may also be conducted during the design phase if needed, to refine treatability results or develop detailed design criteria. Settling Parties may perform pilot scale treatability studies consistent with the Settlement Agreement. Because of the time required to design, fabricate, and install pilot scale equipment, as well as perform testing for various operating conditions, the decision to perform pilot testing should be made as early in the process as possible to minimize potential delays of the FS.

c. Treatability Study Deliverables. Settling Parties shall provide EPA with the following deliverables for any necessary treatability studies:

(I) Treatability Testing Work Plan. Settling Parties shall prepare a treatability testing work plan or amendment to the Project Work Plan for EPA review and approval pursuant to Section X (EPA Approval of Plans and Other Submissions) of the Settlement Agreement, describing the site

background, remedial technology(ies) to be tested, test objectives, experimental procedures, treatability conditions to be tested, measurements of performance, analytical methods, data management and analysis, health and safety procedures, and residual waste management. The data quality objectives for treatability testing should be documented as well. If pilot scale treatability testing is to be performed, the pilot-scale work plan shall describe pilot plant installation and start-up, pilot plant operation and maintenance procedures, operating conditions to be tested, a sampling plan to determine pilot plant performance, and a detailed health and safety plan. If testing is to be performed off-site, permitting requirements will be addressed.

(ii) Treatability Study Sampling and Analysis Plan and/or Health and Safety Plan. If the FSP, the Project QAPP and/or the Project HASP is/are not adequate for defining the activities to be performed during the treatability tests, separate treatability study plans or amendments to the original plans shall be prepared by Settling Parties for EPA review and approval pursuant to Section X (EPA Approval of Plans and Other Submissions) of the Settlement Agreement. The study plans should also address protection of the community members during the treatability study through specific considerations of potential hazards to the community and means of preventing or limiting these exposures.

(iii) Treatability Study Evaluation Report. Following completion of treatability testing, Settling Parties shall analyze and interpret the testing results in a technical report to EPA. Depending on the sequence of activities, this report may be a part of the FS Report or a separate deliverable. The report shall evaluate each technology's effectiveness, implementability, cost and actual results as compared with predicted results. The report shall also evaluate full scale application of the technology, including a sensitivity analysis identifying the key parameters affecting full-scale operation. Settling Parties shall submit the treatability study evaluation report to EPA for review and approval pursuant to Section X (EPA Approval of Plans and Other Submissions) of the Settlement Agreement.

6. Analysis of Alternatives.

a. Analysis of Alternatives. In accordance with CERCLA and the NCP, Settling Parties shall conduct a detailed analysis of alternatives that will consist of an analysis of each option against a set of nine evaluation criteria and a comparative analysis of all options using the same evaluation criteria as a basis for comparison. Alternatives shall be analyzed in sufficient detail so that the remedies can be selected from a set of defined and discrete hazardous waste management approaches

b. Application of Nine Criteria. Settling Parties shall apply the nine evaluation criteria set forth in the NCP to the assembled remedial alternatives, including institutional controls, to ensure that the selected remedial alternative will be protective of human health and the environment; will be in compliance with, or include a waiver of, ARARs; will be cost-effective; will utilize permanent solutions and alternative treatment technologies, or resource recovery technologies, to the maximum extent practicable; and will address the statutory preference for treatment as a principal element. The evaluation criteria include: (1) overall protection of human health and the environment through evaluation of risk based concentrations developed at appropriate risk levels for both human health and the environment and discussion where changes are made in the risk based concentrations from the point of departure; (2) compliance with ARARs; (3) long-term effectiveness and permanence; (4) reduction of toxicity, mobility, or volume; (5) short-term effectiveness; (6) implementability; (7) cost; (8) state (or support agency) acceptance; and (9) community acceptance. Criteria 8 and 9 are considered after the RI/FS report has been released to the general public. For each alternative, Settling Parties shall provide: (1) a description of the alternative that outlines the waste management strategy involved and identifies the key ARARs associated which each alternative, and (2) a discussion of the individual criterion assessment. If Settling Parties do not have direct input on criteria (8) state (or support agency) acceptance and (9) community acceptance, these will be addressed by EPA.

c. Comparison of Alternatives. Settling Parties shall compare the alternatives to each other using the full array of evaluation factors. Component measures, as described below, should be tailored appropriately for the LPRSA. Where the measures are likely to be important in evaluating among alternatives, more emphasis and detail may be appropriate to assist in the selection of a remedy. Settling Parties shall prepare a Remedial Alternatives Evaluation Technical Memorandum summarizing the results of the comparative analysis, to be submitted to and approved by EPA pursuant to Section X (EPA Approval of Plans and Other Submissions) of the Settlement Agreement.

(i) Component measures of effectiveness include the degree to which the alternative is protective of human health and the environment. Where health-based levels are established as ARARs, they can be used to establish the minimum level of protection needed. Where these levels do not exist, Risk Assessments performed by Settling Parties can be used to help establish levels appropriate for the LPRSA. The reliability of the remedy, including the potential need for a cost of replacement, is another important element of effectiveness. Specific measures may also include other health risks borne by the affected population, population

sensitivities, and impacts on environmental receptors. Another important measure of effectiveness is the degree that the mobility, toxicity, or volume of hazardous substances, pollutants, or contaminants are reduced.

(ii) Component measures of implementability include the technical feasibility of the alternative, and the availability of any needed equipment, specialists or off-site capacity.

(iii) Component measures of cost include short-term capital and operation costs and any long-term operation or maintenance costs. Present worth analysis will be used to compare all alternatives.

G. Feasibility Study Report

1. In accordance with the FS Work Plan and Project Schedule approved by EPA, Settling Parties shall submit to EPA and the Partner Agencies a draft Feasibility Study (FS) Report presenting the results of the FS Tasks. Settling Parties shall submit the draft FS Report to EPA for review and approval pursuant to Section X (EPA Approval of Plans and Other Submissions) of the Settlement Agreement. Settling Parties shall revise the draft FS Report per EPA's comments. The FS Report may require further revision depending upon State and public comment. EPA will approve the final FS Report.

2. The FS Report shall consist of the following sections, in accordance with the suggested format described in Table 6-5 of EPA's "Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA", October 1988, EPA/540/G-89/004:

a. Introduction, including Purpose and Background Information (summarized from the RI Report)
b. Identification and Screening of Technologies
c. Development and Screening of Alternatives
d. Detailed Analysis of Alternatives
e. Summary and Conclusions

3. The FS Report shall include consideration of the results of the Environmental Dredging and Sediment Decontamination Technologies Pilot implemented by the Partner Agencies.