Atlantic Richfield Company

28100 Torch Parkway
Warrenville, IL 60555

June 28, 2007

Mr. Michael J. Negrelli
Remedial Project Manager
U.S. Environmental Protection Agency
Region 2
290 Broadway Avenue
NYC SB2 – 20th Floor
New York, New York 10007-1866

RE: Modified Focused Feasibility Study
Genesee River Bank Remediation at Operable Unit 2
Former Sinclair Refinery Site
Wellsville, New York

Dear Mr. Negrelli:

Transmitted herewith are two (2) copies of the *Modified Focused Feasibility Study* for the Former Sinclair Refinery Site in Wellsville, New York. As we discussed, the feasibility study was prepared to evaluate the containment and excavation alternatives for a select area of bank soils along the Genesee River. The alternatives were evaluated with respect to the nine criteria used by EPA to evaluate proposed alternatives for remediation.

If you have any questions regarding this letter, please do not hesitate to contact me at (630) 836-6955.

Sincerely,

Joseph P. Sontchi, CPG
Environmental Business Manager
Atlantic Richfield Company, a BP affiliated company

cc: (w/ attachment)
Maurice Moore – NYSDEC, Region 9 (2 copies)
John Laager –Ballard Spahr, Andrews and Ingersoll, LLP
Sheila D'Cruz – BP
Jerry Palmer – On-Site Technical Services
Ken Hannon – Secor
David A. Howe Public Library
File

MODIFIED FOCUSED FEASIBILITY STUDY
GENESEE RIVER BANK SOILS
REMEDIATION AT OPERABLE UNIT 2

FORMER SINCLAIR REFINERY SITE
WELLSVILLE, NEW YORK

Prepared For:

ATLANTIC RICHFIELD COMPANY

Prepared By:

SECOR Engineering P.C.
102 Pickering Way, Suite 200
Exton, PA 19341

June 30, 2007

EXECUTIVE SUMMARY

This modified Focused Feasibility Study (FFS) has been prepared by SECOR Engineering, P.C. (SECOR) on behalf of Atlantic Richfield Company (ARC). This study is conducted as a voluntary effort by Atlantic Richfield Company conducted as part of the remedial efforts at the portion of the site known as Operable Unit 2 (OU2). This FFS is written to address a specific area of soils along the banks of the Genesee River to develop the most appropriate remedy for this area in conjunction with an existing remedial design for OU2. The remedial alternatives addressed in this FFS were suggested by the United States Environmental Protection Agency and the New York State Department of Environmental Conservation. The remedial alternatives evaluated were developed primarily to prevent groundwater migration through the soils study area from impacting the quality of the river.

This report is organized into 3 chapters. Chapter One presents an introduction to the site and surrounding area. This chapter provides pertinent information describing the physical settings, history, the nature and extent of contamination, and the remedial action objectives as they relate to the soils that are the focus of this FFS. In addition, applicable regulations related to the site and limited remedial actions are discussed.

Chapter Two provides an introduction to the alternatives to be evaluated. The alternatives are described briefly in this chapter. As this is a "focused" study, only limited alternatives are described in this chapter. The limited alternatives are not subject to the traditional screening stage conducted in a traditional feasibility study.

Remedial alternatives described in Chapter Two are developed in detail in Chapter Three of this report. The alternatives are evaluated against the selection criteria identified in the National Oil and Hazardous Substances Contingency Plan (NCP), and then the alternatives are compared to each other. Finally, the preferred alternative is identified.

Based on the information in this study, the soil containment alternative is selected as the preferred alternative. This alternative satisfies all of the selection criteria identified in the NCP. Although the no action alternative satisfies the NCP criteria, the containment alternative is more protective than the no action alternative and is the preferred remedy by Atlantic Richfield Company to provide increased protection over the no action alternative and to mitigate the potential for problems arising in upset conditions.

Table of Contents

Figures:

1.0 INTRODUCTION

This modified Focused Feasibility Study (FFS) was prepared by SECOR Engineering P.C. (SECOR) on behalf of Atlantic Richfield Company (ARC). This study is conducted as a voluntary effort by ARC to develop a complete remedy for the area known as Operable Unit 2 (OU2) at the former Sinclair Refinery in Wellsville, New York (the Site). A Site Map is included in this FFS as Figure 1. The alternatives identified in this FFS are developed in conjunction with the remedial design for OU2 as identified in the *Pre-Final (95%) Remedial Design Report Phase II Remediation at Operable Unit 2* (SECOR, 2006) and the *Final (100%) Remedial Design Report Phase II-1 Remediation at Operable Unit 2* (SECOR, 2007). This study will be used to select an appropriate alternative to address limited soils located along the Genesee River at the Site.

This modified FFS generally follows the format and methodology identified in the *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA* (EPA, 1998). This FFS has been modified from the EPA suggested format for traditional FS and does not include a section for the development and screening of alternatives. This FFS is written to address specific soils along the banks of the Genesee River to develop the most appropriate remedy for these soils in conjunction with an existing remedial design for OU2. The remedial alternative approaches addressed in this FFS were suggested by the United States Environmental Protection Agency (USEPA) and the New York State Department of Environmental Conservation (NYSDEC) in a letter dated August 15, 2006; no other remedial alternatives have been developed. The FFS format and content have been modified to provide a detailed review of a limited number of remedial alternatives that can sufficiently address the concerns of USEPA and NYSDEC in a rapid timeframe.

In addition, this FFS is modified from the suggested EPA approach in that a standard risk assessment has not been completed. USEPA and NYSDEC have provided comments related to elements the remedial design for OU2. The FFS addresses comments related to one element (river bank soils) without the standard risk assessment; the FFS is written under the assumption that the risk posed by the area of concern to USEPA and NYSDEC does pose an undo risk to human health or the environment. Finally, the site history and background identified in this FFS and the applicable or relevant and appropriate requirements developed as part of this study are specific to the area being addressed in this report and the alternatives selected for review. This FFS is not intended to be a stand alone document. This FFS is written in conjunction with the Remedial Design Reports for the Site and as a supplement to the *Feasibility Study Report for the Sinclair Refinery Site* (Ebasco, 1991); these documents provide additional information needed to fully understand the remedial actions addressed in this study being considered for the Site.

1.1 Purpose and Organization of Report

In November 2005, ARC submitted the *Pre-Final (95%) Remedial Design Report Phase II Remediation at Operable Unit 2* (hereafter referred to as *Pre-Final (95%) Remedial Design Report*) to USEPA. This design report presented a detailed remedial design for

the Site. The remedial design presented in the report primarily addresses Site groundwater but also addresses specific Site soils. USEPA with the NYSDEC reviewed the document and provided comments to the design in a letter dated August 15, 2006. Several comments to the design were related to soils along the bank of the Genesee River. The area of soils that is the focus of the comments and of this report is shown on Figure 2.

USEPA and NYSDEC commented that the design presented in the *Pre-Final (95%) Remedial Design Report* will not adequately control groundwater during high water events. USEPA and NYSDEC also commented that the sheet pile wall and soil-bentonite barrier wall configurations would create a "funnel and gate configuration for groundwater flow over the sheet pile wall into the river" and that this could become a pathway for future light non-aqueous phase liquids (LNAPL) releases into the river. In discussing the comments related to the design presented in the *Pre-Final (95%) Remedial Design Report*, USEPA and NYSDEC suggested that the slurry (soil-bentonite) wall be continued along the top of "the riverbank without interruption in the area in question and the contaminated material in the riverbank outside the containment zone established by the slurry wall be removed and replaced with clean fill." In addition, USEPA and NYSDEC offered a second approach for these soils which required the continuation of "the slurry wall along the top of the riverbank in addition to the sheet pile placement as currently configured in the design would isolate this area from the groundwater, eliminating the need for soil removal" so long as "a pumping well would need to be included in the design to control the water level in this isolation cell or an impermeable barrier placed over the entire cell to prevent water from entering from above."

This FFS is written to evaluate remedial alternatives that may be needed to prevent or mitigate the risk related to the soils identified in Figure 2. The remedial alternatives that are evaluated are limited to those initially identified by USEPA and NYSDEC and further developed for this report. In addition, a no action alternative was also developed and is included in the FFS.

The report is organized to meet the recommended format suggested by *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA* (USEPA, 1988). The alternatives are more fully developed in this reported and then evaluated against the criteria developed by USEPA for evaluating remedial alternatives.

1.2 Background Information

Background information on the Site presented in this FFS has been condensed to focus primarily on information relevant to the soils study area. The former Sinclair Refinery was listed on the National Priorities List (NPL) in 1983 and has been the subject of various studies and reports. The former Sinclair Refinery remediation has been separated into two distinct operable units (OU1 and OU2) and several phases.

This FFS is limited to a relatively small localized area of soils along the bank of the Genesee River. The soils study area is located within OU2, and will be addressed as part of a Phase II-2 remedial action. The Site descriptions and histories presented herein are not intended to fully describe the Site or the actions leading to this study. The

1985 Record of Decision (ROD) for OU1, 1991 ROD for OU2, 1991 FS, the 2006 *Pre-Final (95%) Remedial Design Report*, 2007 *Final (100%) Remedial Design Report*, and various Administrative Orders should be reviewed to provide a detail description and history of the activities at the Site prior to the development of this FFS. This FFS is developed to identify a remedial action for a limited soils area and to provide supplemental information from the *Pre-Final (95%) Remedial Design Report* to the yet to be developed *Final (100%) Remedial Design Report Phase II-2 Remediation at Operable Unit 2.*

1.2.1 Site Description

The former Sinclair Refinery is located in the Town and Village of Wellsville, Allegany County, New York, approximately 10 miles north of the New York and Pennsylvania border (Figure 1). The former Sinclair Refinery site is irregularly shaped and is bounded to the southwest by South Brooklyn Avenue and to the northeast by the northerly flowing Genesee River. The soils study area, the area of study for this FFS, is located long the bank of the Genesee River in the northern section of OU2. Figure 2 highlights the study area.

For purposes of investigation and remediation, two distinct operable units have been referenced throughout the remedial design and construction. Operable Unit 1 (OU1) consists of an approximately 10-acre landfill area adjacent to the southern boundary of the former refinery, referred to as the Central Elevated Landfill Area (CELA). OU1 has been the focus of previous remedial actions and is now in the operations and maintenance stage of the remedial process. Operable Unit 2 (OU2) consists of the 90-acre former refinery area located in the northern portion of the Site. OU2 remedial design and construction have been separated into several phases. These remedial actions conducted at the former Sinclair Refinery are discussed in more detail in the Site History section of this report.

OU2 is currently occupied by a number of commercial/manufacturing businesses and the State University of New York (SUNY) at Alfred campus. SUNY operates a vocational–technical school at the Site consisting of programs including; auto mechanics, heating, ventilation, cooling and air conditioning (HVAC), construction, electrical and other vocational programs. Most of the former refinery structures were removed before 1964, however; some buildings from the original refinery operations remain on Site. Most of these buildings have been renovated and are now in use supporting the SUNY campus. The remainder of the original buildings still standing are vacant.

1.2.2 Site History

The refinery was initially built in 1901 for processing primarily New York and Pennsylvania crude oils. Manufactured products from the refinery included heavy oils and grease for lubrication, light oils for fuel, gasoline, lighter fluid, naphtha, and paraffin. During the early 1900's, the Wellsville Refining Company conducted operations at the Site.

In 1919, Sinclair Refining Company (Sinclair) purchased the facility. Sinclair owned and operated the facility until 1958. In 1939 and 1958, fires occurred at the refinery, causing substantial damage. The refinery was rebuilt after the 1939 fire, however, operations were terminated following the 1958 event. When the refinery was closed, Sinclair transferred a majority of the property to the Village of Wellsville. Since that time, various entities have held title to portions of the former refinery property.

Remedial activities at the former Sinclair Refinery have been separated into two operable units and into various phases. OU1 remedial activities focused on soils in the southern portion of the former refinery property. OU2 remedial activities focused on soils, groundwater and surface water.

Operable Unit 1 (OU1)

The former refinery was first listed on the National Priority List (NPL) in 1983. The Remedial Investigation (RI), FS, and Remedial Action at OU1 were completed in accordance with the OU1 ROD (USEPA, 1985). Requirements of the OU1 ROD included channel construction and controls within the Genesee River, consolidation of the South Landfill Area (SLA) into the CELA, relocation of certain surface soils from OU2 to this area (as stipulated by the ROD), and capping of the CELA. OU1 is currently in the operation and maintenance phase.

Operable Unit 2 (OU2)

The RI/FS and Remedial Design Investigation (RDI) activities at OU2 were conducted between 1985 and 1994. The USEPA issued the OU2 ROD on September 30, 1991 and Unilateral Administrative Order (UAO) on September 8, 1992. The ROD and UAO specified remedial criteria for groundwater and surface water for this area. The major components of the selected remedy for OU2, as set forth in the ROD, are as follows:

Excavation of **Surface Soils** (completed in 1993);
No remedial action for **Subsurface Soils**;
Extraction and treatment of **Subsurface Water** (groundwater) from the shallow water bearing zone;
Long-Term Monitoring of surface water, subsurface water, soil gas; and
Implementation of certain **Institutional Controls** to address future Site uses.

The remedial activities conducted at OU2 have been separated into several phases. Phase I remedial activities focused on groundwater at the former refinery. Phase II remedial actions also focus primarily groundwater issues but also include some soils/sediment and surface water remediation/protection measures. Phase II activities have been further separated into Phase II-1 and Phase II-2 activities. Phase II-1 activities at OU2 are defined in the Phase II-1 *Final (100%) Remedial Design Report* submitted in 2007. Implementation of this remedial design is currently planned to be started in 2007. The elements of Phase II-2 remedial actions include the construction of a soil-bentonite slurry wall, surface and upgradient groundwater control measures, and measures to address river sediment, the main drainage swale and river bank soils. The river bank soils that are the focus of this FFS are included in the Phase II-2 remedial action for OU2.

Phase I Remedial Action for OU2

USEPA approved a phased approach to groundwater remediation in a letter dated February 28, 1994. Following remediation of surface soils in 1993, Phase I remediation of groundwater in OU2 involved the construction, operation, and monitoring of a groundwater extraction and treatment system for three wells and three air sparging/soil vapor extraction (AS/SVE) systems. Operation of these OU2 remedial systems was initiated in 1995 and enhanced with an expanded AS/SVE system in December 1997.

The groundwater remedial systems implemented and operated under the Phase I program removed over an estimated 150,000 pounds of contaminants of interest (COIs). The AS/SVE systems reached asymptotic conditions following several years of operation and were deactivated (with concurrence from the regulatory agencies) in 2003. In a letter dated September 19, 2002, USEPA requested that Atlantic Richfield Company continue investigation and design efforts to implement the Phase II Remedial Action, and to continue to operate the three recovery well groundwater extraction and treatment system.

The groundwater extraction system was severely damaged by a fire on April 11, 2004. The extraction system and building were decommissioned and demolished during the spring and summer of 2004 as a result of the incident. The extraction system was rebuilt and became operational in December 2004.

Phase II Remedial Action for OU2

While the Phase I groundwater treatment systems have been effective in reducing residual constituents, USEPA and NYSDEC requested that a Phase II program be implemented, to enhance conditions in groundwater at OU2. The goal of the Phase II remedial program is to further advance groundwater remedial efforts towards ARAR concentrations and to eliminate the migration of COIs in groundwater to the Genesee River. The specific objectives of the Phase II Remedial Action are to:

- Terminate groundwater flow from the Site to the riverbank/riverbed and the Main Drainage Swale; and
- Treat groundwater to existing discharge limitations.

To support the design of the Phase II remedy, a pre-design investigation was conducted to collect pertinent data. A detailed discussion of Site characteristics, including findings from past investigations and remedial activities, is provided in the *Pre-Design Field Investigation Report, Phase II Remediation at OU2* (Parsons, August 2004).

Upon review of the *Pre-Final (95%) Remedial Design Report,* USEPA and NYSDEC submitted comments regarding the design, including comments related specifically to soils along the western bank of the Genesee River north of the lower drop structure. USEPA and NYSDEC requested that additional measures be taken to prevent the soils from impacting the quality of the Genesee River. Atlantic Richfield Company proposed a revision to the *Pre-Final (95%) Remedial Design Report* that would have effectively contained the soils. EPA asked that the proposed alternative (capping) be compared to an excavation and disposal alternative.

Phase II-1 Remedy for OU2

To facilitate the implementation of portions of the Phase II remedy in 2007, Atlantic Richfield Company requested (letter to USEPA dated February 21, 2007) that the Phase II remedy be separated into additional phases. In addition, Atlantic Richfield Company requested that the remedy for the soils along the bank of the Genesee River be developed in this FFS. USEPA approved this approach in a letter dated March 19, 2007.

The proposed Phase II-1 remedy for OU2 includes the following primary elements:

Groundwater Management
Extraction wells have been proposed as the primary method to manage the migration of groundwater upgradient of the Barrier Wall. Extracted water will be conveyed via subsurface piping to a Treatment Wetland System for processing.

An infiltration trench is proposed as an alternative method of managing the migration of groundwater in place of extraction wells. The infiltration trench will be constructed to intersect groundwater flow and would include a permeable backfill that would collect groundwater. The trench would also include a manhole that would house pumps to convey the groundwater to a Treatment Wetland System for processing.

Prior to constructing the trench along the entire approximately 3,200 feet of the extraction well pathway, an approximately 400-foot long pilot infiltration trench will be constructed at the southern portion of the site, near the Treatment Wetland System. The pilot trench will be constructed prior to the installation of the extraction wells and the construction of the Treatment Wetland System; this construction is scheduled to begin in the summer of 2007. Construction of the pilot trench would be conducted to identify constructability issues or subsurface conditions that might negatively impact the construction of the entire trench. If the pilot trench construction is successful, the infiltration trench may be constructed to replace all of the proposed extraction wells. EPA will be notified of the success of the infiltration trench and the alternative proposed for implementation.

Treatment Wetland System
Extracted groundwater will be treated by an on-site Treatment Wetland System, located near the southern end of the Site. After treatment, water will discharge to the Main Drainage Swale. Water will be treated to meet the discharge limits applied to an existing treatment system in operation at the site.

ARC submitted the design report entitled *Final (100%) Remedial Design Report Phase II-1 Remediation at Operable 2* on March 23, 2007. In a letter dated May 14, 2007, USEPA approved the submittal upon ARCs adequately addressing comments provided as part of the letter. ARC provided responses to USEPA comments in a letter dated June 5, 2007.

Phase II-2 Proposed Remedy

The proposed Phase II-2 portion of the remedy for OU2 has not yet received the approval of USEPA. While the majority of the remedial concepts are acceptable to USEPA and the NYSDEC, the remedy for the bank soils study area along the Genesee

River has not yet been approved. The remedy for the bank soils in the soils study area is the focus of this FFS. The Phase II-2 remedy concepts that are acceptable and have been detailed in the *Pre-Final (95%) Remedial Design Report* and that will be implemented in conjunction with the alternative selected by this FFS include the following primary elements:

Downgradient Barrier Wall
A low-permeability Barrier Wall (Barrier Wall) will be installed along the downgradient edge of OU2 to contain shallow groundwaters. The Barrier Wall will be installed to depths ranging from approximately 20 to 45-feet below ground surface (bgs) and keyed into the underlying low-permeability lithologic layer.

Upgradient Surface Water and Groundwater Control Measures
Surface and upgradient groundwater control measures will include the installation of an upgradient trench drain and improvements to the surface water conveyance system. The upgradient diversion will reduce the flux of groundwater entering the upgradient portion of the Site. The improvement to surface water drainage at the Site will benefit water management issues associated with the Site remedy.

Genesee River Sediment/Soil
Approximately 5,000 cubic yards (cy) of soil/sediment from the Genesee River will be excavated. This will be material downstream of the lower drop structure. Excavated soil/sediment will be used on-site as structural soil fill during construction of the Treatment Wetland System. If the material does not meet the requirements for structural soil fill, the material will be managed elsewhere on-site, off-site at an approved disposal facility, or a combination thereof.

Main Drainage Swale Remediation
Approximately 2,800 cy of soil/sediment will be excavated from the Main Drainage Swale. Excavated soil/sediment will be used on-site as structural soil fill during construction of the Treatment Wetland System. If the material does not meet the requirements for structural soil fill, the material will be managed elsewhere on-site, off-site at an approved disposal facility, or a combination thereof. The Main Drainage Swale will be restored as a wetland area.

Institutional and Engineering Controls
Institutional and Engineering Controls (ICs and ECs) will be implemented at the former refinery area. The ROD requires controls to be recorded. Atlantic Richfield Company will advance discussions with the current property owners in an attempt to secure appropriate controls.

1.2.3 Nature and Extent of Contamination

The area of focus of this FFS includes soils located along the bank of the Genesee River. The approximately 19,973 cubic yards of soils are located between stations 20+40 and 26+70 from the top of the bank [approximate elevation 1,496 feet above mean sea level (ft msl)] to the toe of the bank at the river edge. The soils extend to a depth of 4 feet at the river's edge to about 20 feet at the top of the bank (1,476 ft msl). The soils study area is shown in Figure 2.

The 1991 FS details the nature and extent of contamination for the former refinery, including the area that is the focus of this FFS. These reports should be referenced to review all of the contaminants of interest for the refinery area. In addition, previous studies including the *Pre-Design Investigation Report Phase II Remediation at Operable Unit (OU) 2*, and the *River NAPL Investigation Report Genesee River Adjacent to OU-2* (Parsons, 2003) have shown some evidence of LNAPL in the soils study area. As a result, USEPA and NYSDEC have expressed concern that groundwater (if not properly controlled) could cause contaminants in this area to migrate into the Genesee River.

1.2.4 Baseline Risk Assessment

A human health risk assessment and an ecological risk assessment have not been conducted for the soils study area. Previous studies have been conducted to identify the human health and ecological risks for the various media and COIs at the former refinery. This FFS is developed to evaluate select remedial options designed to address the potential for contaminant migration from the soils study area into the Genesee River.

1.2.5 Applicable Regulatory Requirements

The purpose of this section of the report is to summarize the regulations that are applicable to the remedial alternatives presented in this study. The applicable regulatory requirements are used as a guide for development of remedial action objectives, to evaluate remedial alternatives and to govern the implementation and operation of the selected remedy.

There are essentially three types of applicable regulations considered in the FFS. These three types of regulations include chemical specific, action specific and location specific regulations. Chemical specific requirements are generally related to risk or health based and limit the amount or concentration of a chemical in a particular media. Action based requirements are usually technology based requirements on actions taken with respect to hazardous wastes. Location specific requirements are restrictions placed on the concentrations of hazardous substances because they occur in a special location or are requirements that restrict actions because of the characteristics or a site or its immediate environs.

This FFS does not attempt to identify all of the ARARs associated with the remedies identified for this Site. The Feasibility Study Report written in 1991 addresses ARARs for Site groundwater, surface water and soils. This FFS only discusses ARARs as they pertain to the limited alternatives detailed in this report and identifies ARARs not previously discussed in the 1991 study.

The 1991 FS discussed several ARARs related to the former refinery area which encompasses the soils study area evaluated in this report. The shallow water bearing zone at the Site is designated by New York State as a class GA aquifer, and the Genesee River adjacent to the Site is designated a Class A surface water. These classifications characterize the water bearing zone and river as potential sources of potable water. Chemical-specific applicable or relevant and appropriate requirements

(ARARs) for subsurface water and surface water at the Site were defined as federal maximum contaminant levels (MCLs) (USEPA, 2002) and state ambient water quality standards (AWQSs) (New York Department of Environmental Conservation (NYSDEC), 1998). Location-specific ARARs for this project include E.O. 11988 "Floodplain Management"; E.O. 11990 "Protection of Wetlands"; 40 CFR Part 6, Appendix A, "Statement of Procedures on Floodplains Management and Wetlands Protection"; EPA's 1985 "Statement of Policy on Floodplain/Wetland Assessment for CERCLA Actions" and the "National Historic Preservation Act".

The Solid Waste Disposal Act as amended by the Resource Conservation and Control Act (as further amended, herein referred to as RCRA) established the federal program regulating solid and hazardous waste management. RCRA gave USEPA the authority to control hazardous waste, including the generation, transportation, treatment, storage, and disposal of hazardous waste. RCRA also set forth a framework for the management of non-hazardous wastes.

Regulations developed as a result of RCRA include 40 CFR 261, Identification and Listing of Hazardous Waste, require the proper identification, manifesting, transportation and disposal of wastes. Any soils removed from the site for disposal must be properly characterized and disposed according to these regulations.

NYSDEC has regulations related to the general remediation of a site (Title 6, Part 375, Subpart 1, Section 8 – Remedial Program, and Title 6, Part 375, Subpart 2, Section 8 – Remedial Program) and regulations related to remediation of soils (Title 6, Part 375, Subpart 6 – Remedial Program Soil Cleanup Objectives) that related specifically to the Site and the alternatives developed in this FFS.

NYSDEC regulations for the remedial program require that a feasibility study be conducted to develop and evaluate alternatives for the site. Where soil contamination at the site is at concentrations above unrestricted use cleanup objectives (Section 375-6.3), the remedial regulations require that the study evaluate one or more alternatives that achieve unrestricted use cleanup objectives and allow for the evaluation of alternatives that do not achieve an unrestricted use of the site. Alternatives that result are developed that do not met the unrestricted use cleanup objectives must be defined in an "environmental easement and the institutional and engineering controls must be effectively implemented, maintained, monitored and enforced through the site management plan".

The remedial program regulations also specify a preference for source removal or control efforts. The preference included in the regulations includes, from most preferable to least preferable, removal and/or treatment, containment, elimination of exposure, and finally treatment of source at the point of exposure. The remedial program regulations also require that a remedy be selected "conform to standards and criteria that are generally applicable, consistently applied, and officially promulgated." Finally, these regulation set forth the criteria used to evaluate alternatives which are similar to the criteria defined in the NCP and used in this FFS.

The regulations defining soil cleanup objectives (Section 375 -6) defines concentrations of contaminants at the site which when achieved require no use restrictions at the site for protection of human health and the environment. In addition, this section defines

concentrations of contaminants that require restricted use of site soils. There has been no remedial investigation of soils for the soils study area only, therefore no comparisons to these standards will be made. The excavation/disposal alternative should meet the requirement for an alternative to be developed that meets unrestricted use of the site.

This FFS is centered upon the potential for contamination in soils to impact surface water through groundwater flow. As such, ARARs specific to this cross-contamination must be considered. The soil cleanup objectives regulations specifically state that they "do not account for the impact of contaminants in soil relative to surface water and surface sediments" (Section 375-6.7b). However, the regulations require that a remedy be selected that will eliminate or mitigate the threat to public health and the environment from contaminated surface water and surface water sediments and shall, to the extent feasible: remove, contain or treat the source of a discharge of contaminants from the site to the surface water and sediments; address through appropriate removal or engineering controls the migration of contaminants in soil and groundwater, and remove, contain or treat impacted surface water and sediments

1.3 Remedial Action Objectives

Remedial action objectives are medium-specific or unit specific goals developed to protect human health and the environment. Remedial action objectives are developed considering the contaminants of concern and the exposure routes and receptor. The objectives consider the current and future uses of the site, the use and level of contamination of surrounding properties, facility specific risk assessments, and applicable laws and regulations.

The remedial action objectives for the site are to limit the risk posed by specific site soils and to prevent groundwater and potential contaminants conveyed by groundwater at the site from moving from the study area into the Genesee River. The risks may be limited through pathway elimination or by removal of contaminated material to acceptable levels. The remedial action objectives can be achieved by removal, containment or treatment and be consistent with USEPA and NYSDEC regulations and requirements.

2.0 IDENTIFICATION OF ALTERNATIVES

2.1 Introduction

The remedial alternatives to be evaluated were suggested by USEPA and NYSDEC in correspondence to Atlantic Richfield Company providing comments on the *Pre-Final (95%) Remedial Design Report.* In the correspondence USEPA and NYSDEC suggested that the slurry (soil-bentonite) wall be continued along the top of "the riverbank without interruption in the area in question and the contaminated material in the riverbank outside the containment zone established by the slurry wall be removed and replaced with clean fill." This alternative has been developed for this FFS and is referred to as the excavation/disposal alternative.

In addition, USEPA and NYSDEC offered a second approach for these soils which required the continuation of "the slurry wall along the top of the riverbank in addition to the sheet pile placement as currently configured in the design would isolate this area from the groundwater, eliminating the need for soil removal" so long as "a pumping well would need to be included in the design to control the water level in this isolation cell or an impermeable barrier placed over the entire cell to prevent water from entering from above." This alternative has been developed for this FFS and is referred to as the containment alternative.

These two alternatives were developed in this FFS along with a no action alternative. The excavation/disposal alternative and the containment alternatives have been revised from the original suggestions by USEPA and NYSDEC to allow for the alternative to be implemented in the most effective manner. The no action alternative is developed and evaluated to assess the effectiveness of the original remedy as defined in the *Pre-Final (95%) Remedial Design Report.*

2.2 No Action Alternative

The no action alternative is reviewed and evaluated as a baseline to compare all other remedial options. The *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (USEPA, 1998)* suggests that a no action alternative be developed for all feasibility studies. The no action alternative may be considered a no "additional" action alternative in that no actions beyond those presented in the *Pre-Final (95%) Remedial Design Report* will be conducted. This alternative assumes that a groundwater extraction system and a barrier wall system will be installed. The details of these systems including modeling results, equipment and operational descriptions are included in the *Pre-Final (95%) Remedial Design Report.* The groundwater extraction system and the barrier wall will be used to capture and control groundwater flow from the former refinery, including through the soils study area, to the Genesee River.

In summary, the no action alternative will include either a groundwater extraction well system or an infiltration trench system to capture groundwater flow through the area. The groundwater extraction well system is the most conservative system; the infiltration trench system has the capability to effectively capture all shallow groundwater flow and

has an increased pumping rate when compared to the groundwater well system. As the groundwater well system is the most conservative system, this system will be evaluated in this FFS. Should the infiltration trench system be implemented throughout the former refinery area, the effectiveness of the system to capture and control groundwater will be greater.

The groundwater extraction well system detailed in the *Pre-Final (95%) Remedial Design Report* has the capability to pump water at a rate of approximately 220 gallons per minute (gpm). Based on previous investigations, the high water table recharge rate, or highest anticipated groundwater flux rate through the refinery area is approximately 108 gpm. The groundwater extraction well network is anticipated to have the capability to capture and control more than twice the groundwater flow expected through the former refinery area.

The extraction wells proposed immediately upgradient of the soils study area, extraction wells EW-6 though EW-12, also have more than a 200% pumping capacity relative to the modeled groundwater flux in that area. The anticipated groundwater flux under high flow conditions in the area of these wells is about 29 gpm. Wells EW-6 through EW-12 have the capability of pumping approximately 62 gpm.

In addition to the groundwater extraction system, a barrier wall system will also be included in the no action alternative. The barrier wall system would include a soil-bentonite barrier wall extending north from the CELA to station 20+40. The soil-bentonite barrier wall would then be extended from station 26+70 north for almost seven hundred feet. A sheet pile wall will be connected to the soil-bentonite barrier wall at station 20+40. The sheet pile wall will run continuously from this station down the bank to the edge of the river, along the rivers edge and then up the bank to station 26+70 where it will be tied into the soil-bentonite barrier wall. Although the design has not been completed in detail, the sheet pile wall along the edge of the river is expected to be extended to a depth of at least 12 feet (approximately 1466 feet above mean sea level).

2.3 Excavation/Disposal Alternative

The excavation/disposal alternative is developed to remove the contaminated soils between stations 20+40 and 26+70. The soils (approximately 19,973 cubic yards) will be excavated from this area to a uniform bottom at elevation 1476 ft msl, which is consistent with the proposed bottom of excavation for the excavation within the river The soils are anticipated to be disposed as petroleum impacted soils at a facility permitted to receive and dispose of the soils. Prior to disposal, the soils will be characterized to ensure that they are properly disposed.

The depth of the proposed excavation will range from 4 feet along edge of the river to 20 feet deep along the alignment of the barrier wall. In order to excavate the soils safely, the area of excavation will need to be stabilized. The sheet pile wall detailed in the *Pre-Final (95%) Remedial Design Report* will be used to stabilize the area of excavation along the Genesee River and up the bank to stations 20+40 and 26+70. Although the design has not been completed in detail, the sheet pile wall along the edge of the river is expected to be extended to a depth of at least 12 feet (approximately 1466 feet above mean sea level). An additional sheet pile wall (not included in the 95% Design Report)

will be extended between stations 20+40 and 26+70 along the alignment of the barrier wall to a preliminarily estimated depth of approximately 36 feet (approximately 1460 ft msl). The extension of the additional sheet pile wall along the alignment of the barrier wall at top of the embankment will effectively isolate the excavation area on all sides.

Originally, the excavation/disposal alternative was developed assuming that the soil bentonite barrier wall would be constructed between stations 20+40 and 26+70, similar to the containment option. However, during the course of the FFS it was determined that the soil bentonite barrier wall could not provide for the proper stabilization needed to excavate to 20 feet. Without the sheet pile wall, the soils at the top of the bank would need to be benched to stabilize the bank. The additional excavation (cropping) would likely interfere with the proposed groundwater extraction system, impede on the existing buildings, and would require that the soil excavation be completed before construction of the soil bentonite wall. Because of the amount of excess excavation to perform the benching, impact to adjacent site areas and inability to cutoff upgradient ground water before excavation, the soil bentonite wall was replaced by the sheet pile wall. The sheet pile wall will allow 20 feet deep vertical excavations, minimize impact to surrounding site features, minimize the volume of soil to be excavated and provide a means of cutting off upgradient groundwater from the excavation area.

Prior to replacing the excavated soils with clean fill, a geosynthetic clay liner (GCL) would be placed over the bottom of the excavation. The liner (approximately 3,100 square yards) would provide a barrier between existing soils and the new fill. The CGL would then be covered with a 24-inch thick layer of coarse aggregate fill (approximately 2,067 cubic yards) to provide a stable subgrade for subsequent filling with clean structural soil fill. The structural soil fill will be placed in 12 inch thick horizontal lifts and compacted. Approximately 14,800 CY of structural soil fill will be required to fill the excavation back to the subgrade for the 3 feet thick layer of sand, crushed stone and rip-rap described for the containment option. The excavated area would be restored to the original ground surface. Figure 3 provides a detailed view of this remedial alternative.

2.4 Containment

The containment alternative is developed to isolate soils along the Genesee River bank between stations 20+40 and 26+70, eliminating the potential for a funnel and gate condition in the event of extremely high groundwater levels where groundwater could flow over the sheet pile wall (as detailed in the *Pre-Final (95%) Remedial Design Report*) into the river. The containment alternative will use the existing proposed sheet pile wall along the river, and include a soil bentonite barrier wall extended across stations 20+40 to 25+70, and a impermeable geomembrane cap on the soils between the soil bentonite wall and sheet pile wall.

The sheet pile wall as detailed in the *Pre-Final (95%) Remedial Design Report* will extend between stations 20+40 and 26+70 at the soil bentonite barrier wall towards the Genesee River and then run along the edge of the river. Although the design has not been completed in detail, the sheet pile wall is expected to be extended to a depth of 12 feet (approximately 1466 feet above mean sea level). The sheet pile wall will allow completion of the proposed river excavations without destabilizing the river embankment. In addition, the sheet pile wall will provide a secure feature to anchor the

geomembrane proposed in this alternative to cap the soils. The soil bentonite barrier wall will be extended between stations 20+40 and 26+70 to a depth between 20 to 28 feet (approximately 1468 to 1476 ft msl). The extension of the soil bentonite barrier wall along with the sheet pile wall will effectively isolate the soils on all sides.

The soils will be further isolated along the top of the containment area (outlined by the soil bentonite barrier wall and the sheet pile wall) by an impermeable geomembrane barrier. The top 3 feet of soil and rip-rap (used by the Army Corps to stabilize the embankment) will be excavated from the top of the isolated area (about 3,100 cubic yards of soil). The area will then be graded smooth and then covered with a geotextile fabric (3,100 square yards) and a 45 mil scrim reinforced polypropylene (PPE) liner (3,100 square yards). The liner will be integrated with the soil-bentonite wall cap at the top of the embankment and anchored to a concrete curb that will be cast along the sheet pile wall at the toe of slope.

Once the PPE liner is anchored, the area will be restored to its original ground surface with materials consistent with the gradation and configuration utilized by the Army Corps when the embankment was originally stabilized. The PPE liner will be covered with a layer of geotextile, approximately 6-inches of sand bedding (approximately 517cubic yards). The sand bedding will be covered with an additional 9-inches of crushed stone bedding (approximately 775 cubic yards). Finally, the sand and stone bedding material will be covered with approximately 21-inches of 18-inch diameter rip-rap (approximately 1,800 cubic yards). The finished slope will be at the same elevation as the existing slope. Figure 4 provides a detailed view of this remedial alternative.

3.0 DETAILED ANALYSIS OF ALTERNATIVES

3.1 Introduction

The objective of the detailed analysis of remedial alternatives is to evaluate the alternatives against a set of criteria that USEPA uses to make the selection of the preferred alternative. Each alternative is discussed briefly in relation to the criteria, and then the alternatives are compared to each other against each of the criteria. The relative advantages and disadvantages of the various remedial alternatives are therefore identified. The criteria by which the alternatives are evaluated are identified and discussed below:

Overall Protection of Public Health and the Environment
This evaluation criterion assures that the remedial alternative provides adequate protection of human health and the environment. The overall assessment of protection considers the evaluation of other criteria, including chiefly the long-term effectiveness, permanence, short-term effectiveness, and compliance with applicable regulations. The evaluation of an alternative should describe how the site risks are eliminated, reduced, or otherwise controlled. This criterion is a threshold criterion that must be met by the remedy selected.

Compliance with Applicable or Relevant and Appropriate Regulations (ARARs)
Chemical specific, location specific, and action specific laws and regulations identified in previous stages of the RI/FS process are reviewed and evaluated against the remedial alternatives. In addition, compliance with other criteria including advisories and guidance document are contemplated. This threshold criterion is used to determine how an alternative will meet all of its applicable laws and regulations. When an ARAR is not met, consideration of the six waivers identified in the NCP should b discussed.

Long-term Effectiveness and Permanence
This criterion evaluates the results of a remedial action in terms of the risk associated with contaminants remaining onsite after implementation of an alternative. In addition, the type and effort related to the long-term management of a site after a remedial action is implemented is reviewed.

Reduction of Toxicity, Mobility or Volume Through Treatment
This criterion evaluates the extent to which the toxicity, mobility, or the volume of contaminants is reduced through the implementation of an alternative. This evaluation criterion addresses the statutory preference for selecting remedial actions that employ treatment technologies that permanently and significantly reduce toxicity, mobility, or volume of the hazardous substances as their principal element.

Short-term Effectiveness
This criterion evaluates the effectiveness of an alternative at protecting human health and the environment during the construction and implementation phase until the remedial objectives are met. Factors such as environmental impacts, the need to transport material through populated areas, the protection of workers during implementation and the time until the remedial action objectives are met are evaluated.

Implementability
This criterion is an evaluation of the alternative with respect to performance, reliability administrative and technical feasibility. The likelihood that technologies will meet performance specifications (the specific remediation goals) is evaluated. The ability to construct and implement the alternative and the ease of undertaking additional remedial actions if needed is also discussed.

Cost
The capital and operations and maintenance costs of each alternative are generally compared for the alternatives that equally satisfy these criteria. The costs of each alternative will then be used to establish a preference for the proposed remedial action for the site provided that each alternative satisfies the threshold criteria (overall protection of human health and the environment and compliance with ARARs). As the operations and maintenance cost for each option will be similar, and will be included as a relatively small part to the OU2 remedial action operations and maintenance budget, individual operations and maintenance costs for each alternative were not considered in this FFS.

State Acceptance
This criterion reflects the state's apparent preferences among or concerns about the alternatives. This criterion is generally evaluated following comments to an RI/FS and in this case following this FFS.

Community Acceptance
The potential concerns of the community are evaluated under this criterion. As with the State Acceptance criterion, this criterion is generally evaluated following comments to the FFS.

3.2 No Action Alternative

The no action alternative is reviewed and evaluated as a baseline to compare all other remedial options. As previously noted, this alternative is in effect a no additional action alternative. This alternative will employ a groundwater extraction system and barrier wall already present in the design to prevent groundwater and contaminants from migrating through Site soils to the Genesee River.

The no action alternative meets the remedial action objective of limiting the risk posed by Site soils and preventing groundwater and contaminants from moving from the study area into the Genesee River. The proposed groundwater extraction system in conjunction with the barrier wall will allow for the capture and control of groundwater and contaminants from the study area. The extraction system has more than twice the pumping capacity required to remove all groundwater flux in the area at high groundwater flow periods. In addition, contaminants in subsurface soils are isolated and will not pose a significant risk to human health and the environment. This alternative reduces the risk posed by subsurface soils contact and groundwater migration from the area through engineering controls and therefore meets the requirement to be protective of human health and the environment.

The no action alternative meets the compliance with ARARs criterion by effectively isolating contaminants and eliminating potential routes of exposure. While this alternative does not satisfy the NYSDEC preference for soils removal, this alternative meets other regulatory acceptable goals of containment and elimination of exposure. This alternative will effectively contain contaminants with the barrier wall system and eliminate the exposure pathway with the groundwater extraction system in conjunction with the barrier wall system. This alternative satisfies the NYSDEC requirement that a remedy be selected that will eliminate or mitigate the threat to public health and the environment from contaminated surface water and surface water sediments by removing, containing or treating the source of a discharge of contaminants from the site to the surface water and sediments. Administrative controls, limiting the use of soils in the study area (and other areas within the former refinery) may be required to satisfy all ARARs.

The no action alternative will provide a level of long-term effectiveness and permanence by effectively containing contaminants within the soils study area and by eliminating the migration of groundwater to the Genesee River. Some risk will remain once this alternative is implemented however, since the potential contamination source will remain on the Site. In order to remain effective, the barrier wall and groundwater extraction systems must be maintained. In the event that these systems fail, limited migration of groundwater from the Site is could occur. Based on the extended period of time that contaminants have been at the Site, limited migration of contaminants from the area is possible even in the absence of any remedial alternative.

This alternative meets the regulatory requirement for the reduction of toxicity, mobility or volume of hazardous substances. While contaminants may remain at the Site once the alternative is implemented, the mobility of the contaminants will be significantly reduced. Long-term management of the alternative will be required to ensure that the groundwater extraction and barrier wall systems remain effective in preventing the migration of groundwater and contaminants from the soils study area. This long-term monitoring for the soils study area would become part of the monitoring requirement for the OU2 remedial action.

Implementation of the no action alternative would provide for no additional risks. This alternative is extremely effective in the short-term in that no additional risks are realized through the construction and implementation phase of this alternative.

This alternative is technical and administratively feasible. As no additional actions are required for this alternative, no construction or reliability issued can be realized.

There are no additional costs realized for the no action alternative. As the groundwater and extraction and barrier wall systems will be implemented as part of the OU2 remedial action regardless of which alternative is selected for soils within this study area, no specific operations and maintenance costs are associated with this alternative. This approach assumes that the incremental operations and maintenance costs related to any of the alternatives selected for the limited study area are included in the overall OU2 remedial action and will not vary significantly regardless of the alternative selected.

While community-acceptance issues and concerns are not expected to be insurmountable for this alternative, these issues cannot be fully evaluated until such time as a remedy is selected. While the community may request a remedial alternative which

effectively removes all contaminants from the study area, this alternative provides for containment of contaminants and elimination of migration of contaminants. This alternative is consistent with the overall remedy selected for OU2 and is not inconsistent with remediation technologies identified in the NCP and within NYSDEC regulations. USEPA and NYSDEC commented on the *Pre-Final (95%) Remedial Design* Report that this approach created a "funnel and gate" scenario.

3.3 Excavation/Disposal Alternative

The excavation/disposal alternative will include a barrier wall around soils within the study area and the removal of contaminated soils from within this area. The excavation/disposal alternative will prevent migration through Site soils to the Genesee River by the barrier wall. In addition, this alternative will effectively remove the contaminants from within the study area.

The excavation/disposal alternative meets the remedial action objective of limiting the risk posed by Site soils and preventing groundwater and LNAPL from moving from the study area into the Genesee River. The removal of contaminants from the area and hydraulic isolation of the area will eliminate the risk posed by contaminants in the area and by groundwater migration through the area. This alternative eliminates the risk posed by subsurface soils contact and groundwater migration through source removal and engineering controls and therefore meets the requirement to be protective of human health and the environment.

The excavation/disposal alternative meets the compliance with ARARs criterion by effectively removing contaminants and eliminating potential routes of exposure. This alternative satisfies the NYSDEC preference for soils removal as a soils remedial alternative. This alternative satisfies the NYSDEC requirement that a remedy be selected that will eliminate or mitigate the threat to public health and the environment from contaminated surface water and surface water sediments by removing, containing or treating the source of a discharge of contaminants from the site to the surface water and sediments. In order to satisfy regulatory requirements related to disposal, proper characterization and disposal of the soils must be completed.

The excavation/disposal alternative will provide an effective long-term and permanent solution by effectively removing contaminants within the soils study area and by eliminating the migration of groundwater to the Genesee River.

This alternative meets the regulatory requirement for the reduction of toxicity, mobility or volume of hazardous substances. As contaminants from the study area will be removed, the volume of hazardous substances within the area is significantly reduced or eliminated. Long-term management of the alternative will be required to ensure that the groundwater extraction and barrier wall systems implemented as part of the OU2 remedy remain effective in preventing the migration of groundwater and contaminants from the soils study area.

Implementation of the excavation/disposal alternative would provide for some short-term increase in risk to site workers. Site workers can mitigate risks by effective use of personal protective equipment and the implementation of an effective health and safety

program. While the excavation of soils from this area will provide for limited exposure concerns for the general public, these concerns can be reduced by limiting site access and the implementation of a monitoring plan (to detect and mitigate offsite impacts). The disposal of the soils also presents a limited risk to the public during the transportation of materials at the Site to a proper disposal facility. Finally, risks of environmental impact while excavating relatively large quantities of soils at the river's edge is high. Due care must be taken during the excavation of the soils to prevent contaminants from entering the Genesee River during the implementation of this alternative. The occurrence of unforeseen weather events (i.e. heavy rains or flash floods) represent a significant challenge in preventing contaminants from entering the river during implementation.

This alternative is technical and administratively feasible. Sheet pile walls will be used to provide shoring during excavation. Excavation of the soils from the isolated area can be achieved.

The excavation/disposal alternative can be implemented for approximately $2,692,000. The cost estimate for this alternative includes only construction and implementation costs and is detailed in Appendix A. Note that no specific operations and maintenance costs are associated with this or any alternative developed as part of this FFS. The excavation/disposal cost estimate includes costs for the additional sheet pile wall installation (in addition to the sheet pile wall already identified as part of the OU2 remedy), soils excavation and disposal, soil replacement (fill) operation, and for stabilizing the bank.

While State- and community-acceptance issues and concerns are not expected to be insurmountable for this alternative, these issues cannot be fully evaluated until such time as a remedy is selected. This alternative is not inconsistent with remediation technologies identified in the NCP and within NYSDEC regulations.

3.4 Containment Alternative

The containment alternative will include a barrier wall around soils within the study area and the installation of a cap over the surface of the study area. The containment alternative will prevent groundwater migration through Site soils to the Genesee River. In addition, this alternative will effectively isolate the contaminants from within the study area.

The containment alternative meets the remedial action objective of limiting the risk posed by Site soils and preventing groundwater and potential contaminants conveyed by groundwater at the site from moving from the study area into the Genesee River. The isolation of contaminants from the area will significantly reduce the risk posed by contaminants in the area and by groundwater migration through the area. This alternative eliminates the risk posed by subsurface soils contact and significantly reduces the risk associated with groundwater migration through engineering controls and therefore meets the requirement to be protective of human health and the environment.

The containment alternative meets the compliance with ARARs criterion by effectively isolating contaminants and eliminating potential routes of exposure. While this

alternative does not satisfy the NYSDEC preference for soils removal, this alternative meets other regulatory acceptable remedial goals of containment and elimination of exposure. This alternative will effectively contain contaminants with the barrier wall system and eliminate the exposure pathway. This alternative satisfies the NYSDEC requirement that a remedy be selected that will eliminate or mitigate the threat to public health and the environment from contaminated surface water and surface water sediments by removing, containing or treating the source of a discharge of contaminants from the site to the surface water and sediments. In order to satisfy regulatory requirements related to disposal, proper characterization and disposal of the soils must be completed. Administrative controls, limiting the use of soils in the study area (and other areas within the former refinery) may be required to satisfy all ARARs.

The containment alternative will provide an effective long-term and permanent solution by effectively isolating contaminants within the soils study area and by eliminating the migration of groundwater to the Genesee River. Some risk will remain once this alternative is implemented however, since the potential contaminant source will remain on the Site. In order to remain effective, the barrier wall, surface cap and groundwater extraction systems must be maintained. In the event that these systems fail, limited migration of groundwater from the Site is expected. Based on the extended period of time that contaminants have been at the Site, limited migration of contaminants from the area is expected even in the absence of any remedial alternative.

This alternative meets the regulatory requirement for the reduction of toxicity, mobility or volume of hazardous substances. While contaminants may remain at the Site once the alternative is implemented, the mobility of the contaminants will be significantly reduced. Long-term management of the alternative will be required to ensure that the groundwater extraction, surface cap and barrier wall systems remain effective in preventing the migration of groundwater and contaminants from the soils study area. This long-term monitoring for the soils study area would become part of the monitoring requirement for the OU2 remedial action.

Implementation of the containment alternative would provide for some short-term risks. Site workers can mitigate risks by effective use of personal protective equipment and the implementation of an effective health and safety program. While the excavation and transportation for disposal of soils from this area may provide some increased risk to the public, the risk is expected to be minimal as gross contamination is not anticipated within the limited excavation area posed with this alternative. Exposure concerns for the general public can be reduced by limiting site access and the implementation of a monitoring plan (to detect and mitigate offsite impacts). Finally, risks of environmental impact while excavating the limited quantities of soils at the river's edge is relatively low. The volume of soils to be removed is limited and the concentrations of contaminants in these materials is expected to be low. Due care must be taken during the excavation of the soils to prevent contaminants from entering the Genesee River during the implementation of this alternative. Given the very short duration of the excavation preventing contaminants from entering the Genesee River is manageable.

This alternative is technical and administratively feasible. Sheet pile walls will be used to provide shoring during the limited excavation. Excavation of the soils from the isolated area can be easily achieved.

The containment alternative can be implemented for approximately $533,000. The cost estimate for this alternative includes only construction and implementation costs and is detailed in Appendix A. Note that no specific operations and maintenance costs are associated with this or any alternative developed as part of this FFS. The containment cost estimate includes costs for the additional soil-bentonite wall installation, limited soils excavation and disposal, soil replacement (fill) operation, and for stabilizing the bank.

While State- and community-acceptance issues and concerns are not expected to be insurmountable for this alternative, these issues cannot be fully evaluated until such time as a remedy is selected. While the State and/or community may request a remedial alternative which effectively removes all contaminants from the study area, this alternative provides for containment of contaminants and elimination of migration of contaminants. This alternative is consistent with the overall remedy selected for OU2 and is not inconsistent with remediation technologies identified in the NCP and within NYSDEC regulations.

3.5 Comparative Analysis of Alternatives

This section presents a comparative analysis of the site remedial alternatives described in previous sections. Note that the No-Action alternative satisfies the regulatory requirement to be protective of human health and the environment and implemented in compliance with ARARs and is included in the comparisons. The comparative analysis of site remediation alternatives evaluates the relative performance of each option with respect to the selection criteria described in Section 3.1. The first two applicability criteria, protection of human health and the environment and compliance with applicable regulations, generally serve as the threshold criteria in that they must be met by any option for it to be eligible for selection. The remaining criteria serve as balancing criteria that are compared such that major trade-offs among the options are identified and weighed during the decision-making process. The cost of implementing each option that reasonably compare to each other is used to select a preference for the alternative selected.

The purpose of this comparative analysis is to identify the relative advantages and disadvantages of each alternative and thereby provide a sound basis for site remedial action selection. The primary goal of this study and the alternative to be implemented is to be protective of human health and the environment by limiting the risk posed by specific site soils and preventing groundwater and potential contaminants conveyed by groundwater at the site from moving from the study area into the Genesee River. The analysis provides the information needed to decide which alternative or alternatives best satisfy the goals of this study. Discussions of the comparative analysis are presented in the following sections.

3.5.1 Overall Protection of Human Health and the Environment

Overall protection of human health and the environment is a considered a threshold criteria. While some options may present better scenarios for overall protection, this criteria is not usually measured by degree. Each option is considered to be either protective or not protective.

Each of the three alternatives evaluated, no action, excavation/disposal and containment, meet the requirement to be protective of human health and the environment. The no action and containment alternatives effectively isolate soils and LNAPL and prevent the migration of contaminants into the Genesee River. The excavation/disposal option removes contaminated soils and LNAPL from the area.

3.5.2 Compliance with ARARs

Each of the three alternatives, No Action, Excavation/Disposal and Containment can be implemented to meet the applicable regulations. Proper characterization and disposal of wastes can be accomplished through sample analyses identified previously in this report. Each alternative satisfies the regulatory requirements to implement a remedy that is protective of human health and the environment. Some administrative controls may be required to satisfy all regulatory requirements associated with the actions.

3.5.3 Long-term Effectiveness and Permanence

This criterion examines the results of the remedial action in terms of risk associated with the contaminants remaining onsite, and the type and effort of long-term management of a site after the implementation of the alternative. Each of the three scenarios reduces the risk associated with site contaminants. Through pathway elimination, the no action and containment alternatives reduce the risk of exposure to site soils and the migration of contaminants from the soils. The removal of materials outlined in the excavation/disposal alternative eliminates the risk by removing the concentrations from the study area.

Each of the alternatives requires some long-term monitoring. The monitoring and maintenance programs for each alternative are expected to be similar. With each alternative, monitoring of the effectiveness of the groundwater extraction system (as proposed in the OU2 Phase II-1 remedy) and the barrier wall systems will be required. Maintenance activities associated with the barrier systems and groundwater extraction systems is also expected to be similar for all of the alternatives.

The excavation/disposal alternative will result in the greater reduction in contaminants at the Site. This alternative will effectively limit long-term risk better than the containment and no action alternatives.

3.5.4 Reduction of Toxicity, Mobility or Volume Through Treatment

Each of the three alternatives satisfies the regulatory preference for technologies that permanently and significantly reducing toxicity, mobility or volume of hazardous substances as their principal element. The excavation/disposal alternative satisfies the requirement by reducing the volume of hazardous substances. The containment and no action alternatives satisfy the requirement by effectively reducing the mobility of hazardous substances. As the containment option provides for additional isolation of the soils over the no action alternative, the containment alternative should more effectively reduce the mobility of contaminants in comparison to the no action alternative. The containment alternative also eliminates the potential for the "funnel and gate" scenario raised by USEPA and NYSDEC.

3.5.5 Short-term Effectiveness

During the implementation of the excavation/disposal alternative, the greatest quantity of soils will be excavated and transported from the site, as compared to the other options. The risk associated with transporting the material through the community and with exposures to workers during removal activities is greater with this alternative than with the other alternatives. In addition, the risk to potentially impact the quality of the Genesee River is greater for this alternative as compared to others. The risk associated with the removal activities and erosion and sediment control during excavation/disposal alternative however, along with the risks associated with the containment alternative, is expected to be manageable.

During excavation activities, workers will wear the appropriate personnel protective equipment to minimize the risks associated with exposure to the contaminants. The risks associated with transporting materials can also be minimized by proper identification and handling of the materials.

3.5.6 Implementability

Each of the three alternatives can be implemented using proven technologies and construction methods. Materials and equipment required for each alternative are relatively available. Monitoring of the remedy will be similar for each of the alternatives. No significant implementability issues have been identified for any of the three alternatives evaluated.

3.5.7 Cost

Cost estimates prepared for the excavation/disposal and containment alternatives are included in Appendix A. As this remedy will be implemented in conjunction with the overall remedy selected for OU2, no significant operations and maintenance or monitoring costs are anticipated due to the selection of any of the alternatives.

As no operations and maintenance costs are considered for the alternatives, the cost to implement the no action alternative is effectively $0. The excavation/disposal alternative is estimated to be approximately $2,692,000 and is the highest cost for any alternative evaluated. The containment alternative implementation costs are estimate to be approximately $533,000.

3.5.8 State Acceptance

While State -acceptance issues and concerns are not expected to be insurmountable for these alternatives, these issues cannot be fully evaluated until such time as a remedy is selected. Each of the alternatives is consistent with the overall remedy selected for OU2

and is not inconsistent with remediation technologies identified in the NCP and within NYSDEC regulations.

3.5.9 Community Acceptance

As with State-acceptance, community-acceptance issues and concerns are not expected to be insurmountable for these alternatives, and also cannot be fully evaluated until such time as a remedy is selected. While the community could request a remedial alternative which effectively removes all contaminants from the study area, each of the alternatives provides for elimination of migration of contaminants from the study area. Each of the alternatives is consistent with the overall remedy selected for OU2 and is not inconsistent with remediation technologies identified in the NCP and within NYSDEC regulations.

3.6 Preferred Alternative and Justification

All the alternatives, no action, excavation/disposal and containment, are protective of human health and the environment. The alternatives are proven technologies that are easily and effectively implemented to address contaminated soils and prevent the migration of groundwater from the study area. Each of the alternatives would reduce the mobility and/or volume of contaminants at the site. The three alternatives will meet the remedial action objectives for the site.

The alternatives could all be implemented in compliance with applicable laws. Some administrative restrictions may be required to be implemented for the alternatives, particularly the no action and containment alternatives.

Each of the alternatives satisfies the threshold criteria; the alternatives are protective of human health and the environment and can be implemented in compliance with applicable laws. None of the alternatives are significantly different from the others when compared to other criteria including long-term effectiveness and permanence, reduction of contamination, short-term effectiveness and implementability. As each of the alternatives is relatively similar as compared by the evaluation criteria, the cost of the alternatives becomes a weighted factor in the selection of the proposed alternative. The cost to implement the excavation/disposal alternative is significantly more (approximately five times greater cost) than the containment alternative.

Note that some differences were noted in the evaluation criteria. The excavation/disposal alternative provides the most effective long-term solution, through source removal, when compared to the other alternatives. The excavation/disposal alternative also presents the greatest risk to human health and the environment during the construction and implementation (short-term) stages.

Based on the information in this study, the soil containment alternative is selected as the preferred alternative. This alternative satisfies all of the selection criteria identified in the NCP. While the containment and no action alternatives provide for limited long-term effectiveness in comparison to the excavation/disposal alternative, the risks associated with the remaining contamination are relatively low for these alternatives also. The no

action and containment alternatives will effectively isolate soils and prevent the migration of groundwater and contaminants from the study area to the Genesee River. Although the no action alternative satisfies the NCP criteria, the containment alternative is more protective than the no action alternative and is the preferred remedy by Atlantic Richfield Company to provide increased protection and to mitigate the potential for problems arising in upset conditions.

4.0 REFERENCES

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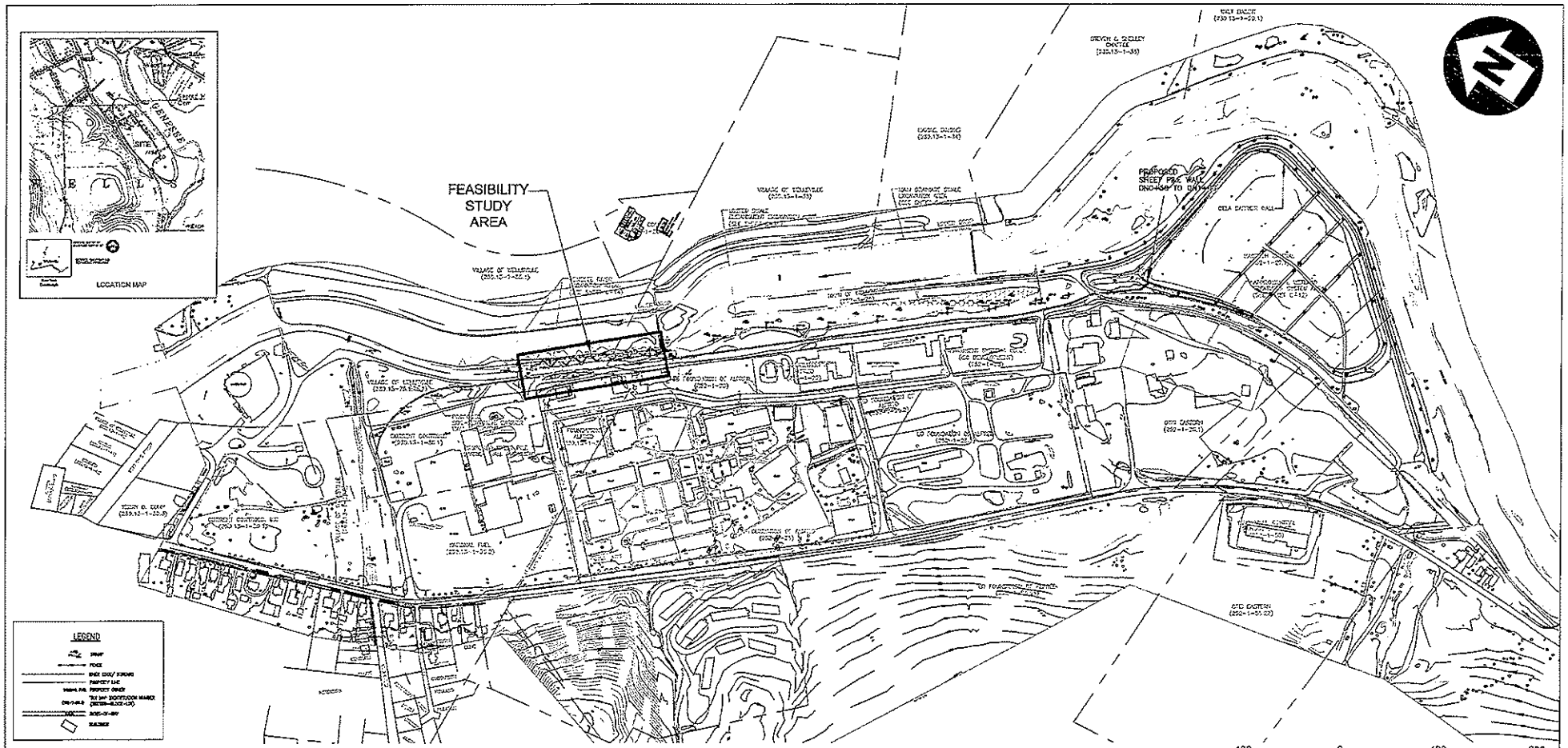

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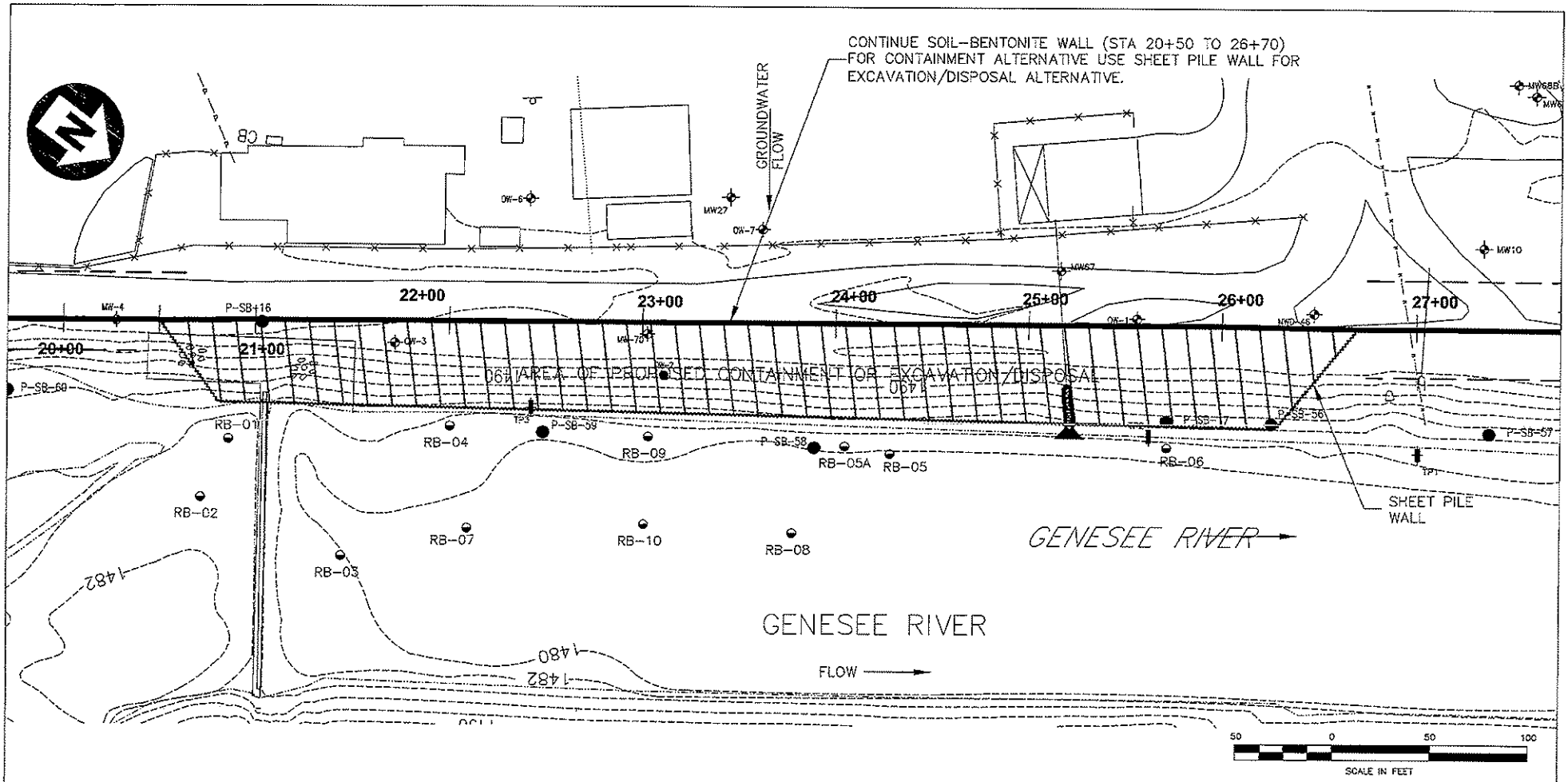
SITE MAP

FORMER SINCLAIR REFINERY SITE
WELLSVILLE, NEW YORK

PROJECT ENGINEER:	P.G.S.
CHECKED BY:	P.G.S.
DRAWN BY:	P.S.G.
SCALE:	1"=400'
PROJECT NUMBER:	NY-1863
DATE:	5/30/07
FIGURE:	1



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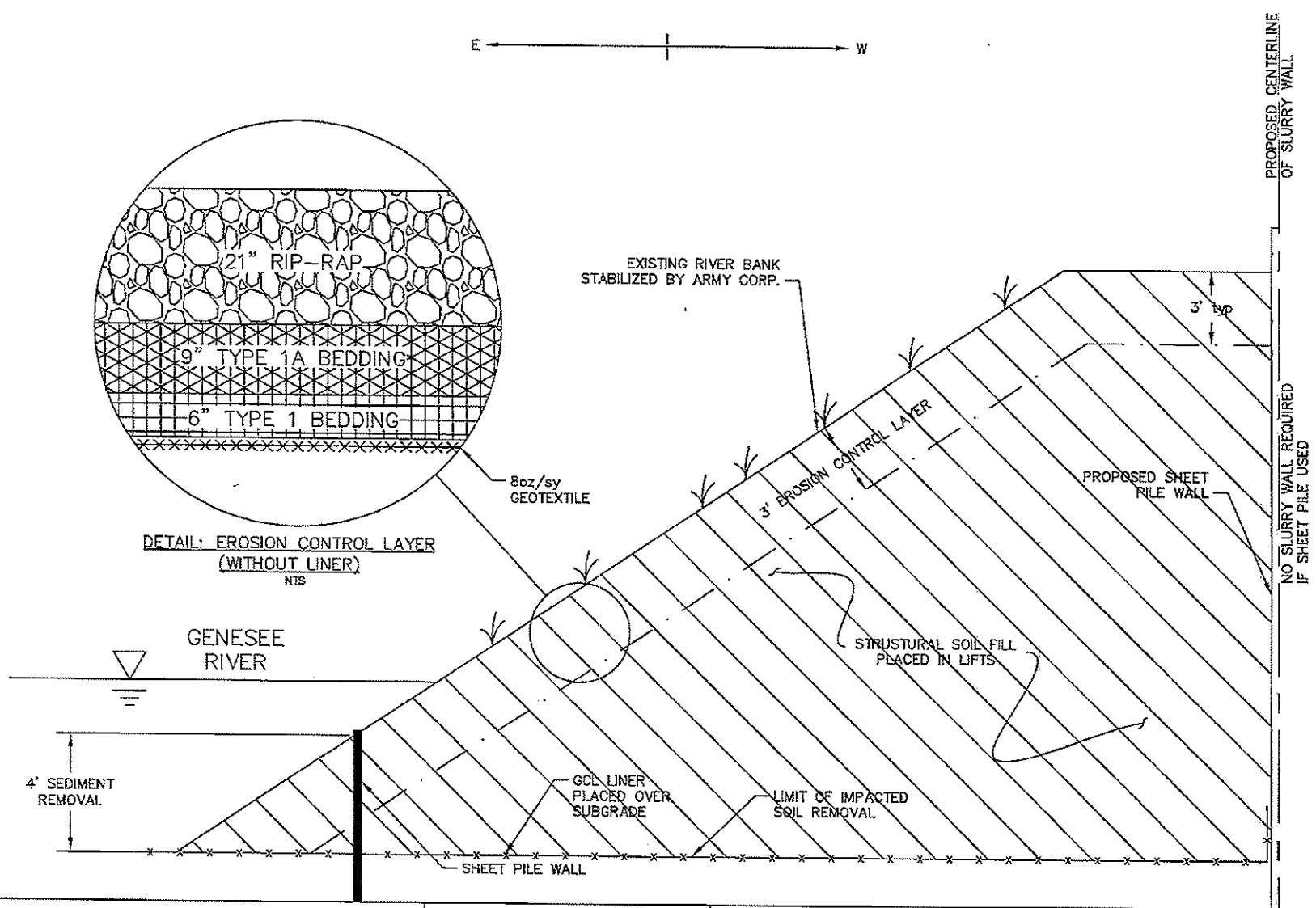
SOILS STUDY AREA

FORMER SINCLAIR
REFINERY SITE
WELLSVILLE, NEW YORK

PROJECT ENGINEER:	P.G.S.
CHECKED BY:	P.G.S.
DRAWN BY:	P.S.G.
SCALE:	1"=50'
PROJECT NUMBER:	NY-1883
DATE:	5/30/07
FIGURE:	2



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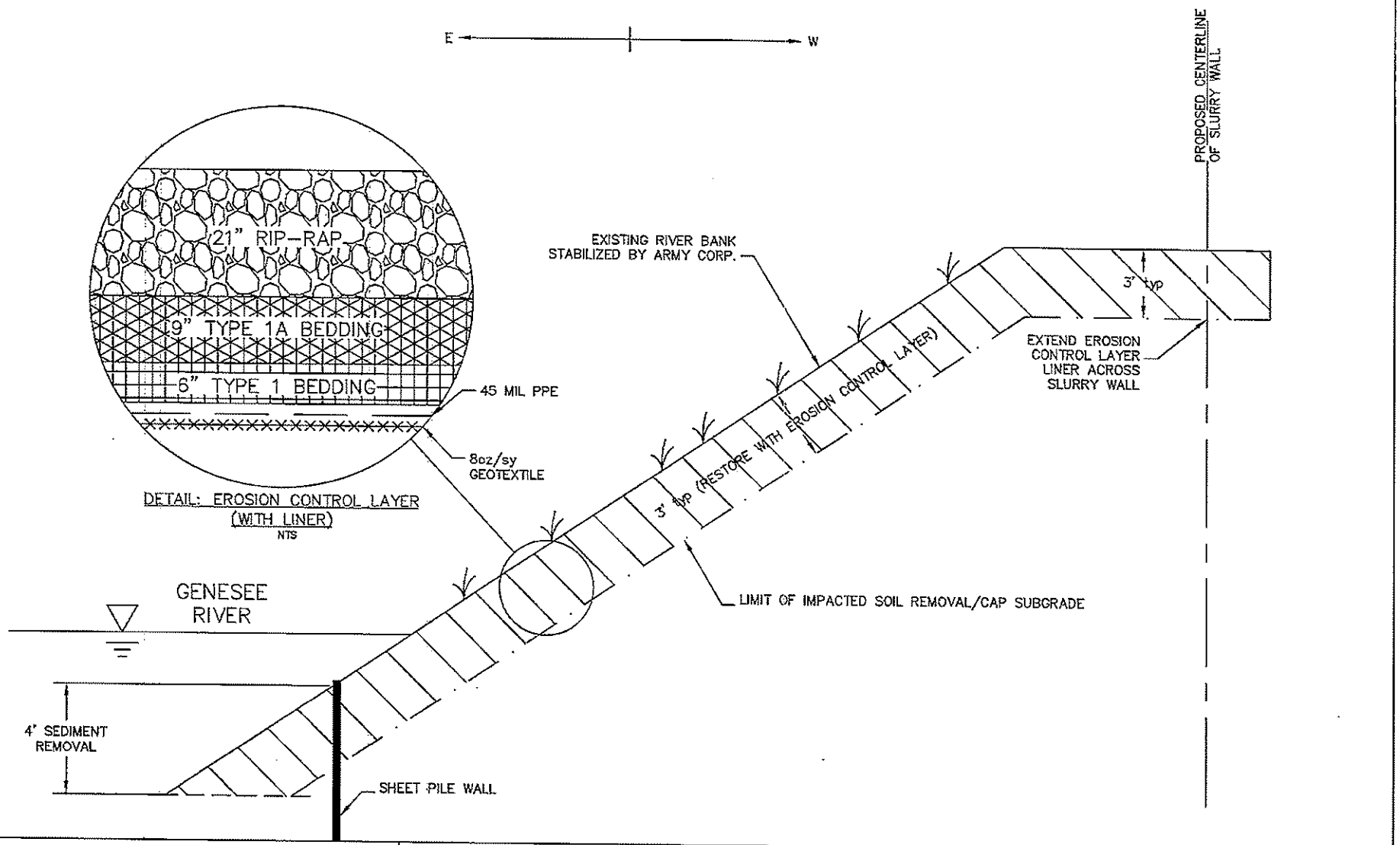
TYPICAL CROSS – SECTION (EXCAVATION/DISPOSAL OPTION) FORMER SINCLAIR REFINERY SITE WELLSVILLE, NEW YORK

PROJECT ENGINEER:	P.G.S.
CHECKED BY:	P.G.S.
DRAWN BY:	P.S.G.
SCALE:	NTS
PROJECT NUMBER:	NY-1863
DATE:	5/30/07
FIGURE:	3



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TYPICAL CROSS – SECTION (CONTAINMENT OPTION) FORMER SINCLAIR REFINERY SITE WELLSVILLE, NEW YORK

PROJECT ENGINEER:	P.G.S.
CHECKED BY:	P.G.S.
DRAWN BY:	P.S.G.
SCALE:	NTS
PROJECT NUMBER:	NY-1863
DATE:	5/30/07
FIGURE:	4

Former Sinclair Refinery
Focused Feasibility Study
Alternative Cost Estimate

Containment Alternative	Unit Price	Extended Price	RS Means Reference Nos.
E&S Control along River (10 days)	$500/day	$5,000.00	
Soil/Rip Rap Excavation (3' deep, 3100cy)	$7.07/cy	$21,917.00	G1030-110-2200
Offsite Soil Disposal (Non-Haz) (3,100cy)	$70/cy	$217,000.00	
Geotextile Fabric (8oz/sy- 3100sy)-2 layers	$1.95/sy	$12,090.00	02620-300-0110
Scrim Reinforced PPE Liner (27,900sf)	$2.14/sf	$59,706.00	33-08-0552
Concrete Anchor at Toe of Slope (75cy)	$49.50/cy	$3,713.00	03310-700-5200
Slurry Wall (630lf, 26'average depth)	$10.00/sf	$163,800.00	
Engineering Support	$ 25,000.00	$25,000.00	
Contingency (Oversight, H&S, etc.)	5% subtotal	$25,411.30	
	Total:	**$533,637.30**	

Excavation/Disposal Alternative	Unit Price	Extended Price	RS Means Reference Nos.
Sheet Pile Wall Top of Bank (630' x 36') *50=567 tons	$1350/ton	$765,450.00	02250-400-0900
E&S along River (40 days)	$500/day	$20,000.00	
Soil Excavation (856cf/lf x 630lf = 19,973cy	$7.13/cy	$142,407.00	G1030-110-2800
Offsite Soil Disposal (Non-Haz) (19,973cy)	$70/cy	$1,398,110.00	
GCL Barrier Layer (3100sy) (27,900sf)	$.90/sf	$25,110.00	33-080508
Coarse Aggregate Fill 24" Thick (2070cy)	$10.77/cy	$22,294.00	02315-210-5010 + 02315-310-5100
Structural Soil Fill (14798cy	$10.77/cy	$159,375.00	02315-210-5010 + 02315-310-5100
Geotextile Fabric (3100sy)	$1.95/sy	$6,045.00	02620-300-0110
Engineering Support	$ 25,000.00	$25,000.00	
Contingency (Oversight, H&S, etc.)	5% subtotal	$128,189.55	
	Total:	**$2,691,980.55**	