# *FINAL (100%) REMEDIAL DESIGN REPORT – REVISION 2*
# *PHASE II-2 REMEDIATION AT OPERABLE UNIT 2*

## *FORMER SINCLAIR REFINERY SITE*
## *WELLSVILLE, NEW YORK*

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# PREFACE

Throughout the Remedial Design of the Phase II remediation at Operable Unit (OU2), , comprehensive design has been presented for review and comment. The 35%, 65% 95% and 100% (Phase II-1 portion) Design Reports submitted by other consultants prior to this report have included details for the Remedial Design. In the fall of 2007, ARC retained URS Corporation to assist with preparation of the Phase II -2 Final (100%) Remedial Design. This was originally submitted to USEPA in March 2008. USEPA commented on the original submittal on May 9, 2008. In order to facilitate resolution of comments, ARC, USEPA, NYSDEC and URS met on June 4, 2008 to discuss responses to comments, review alternatives for reuse of the CELA for permanent disposition of site spoils and review results from enhancing the previous groundwater model input parameters and domain. As a result of this meeting, USEPA and NYSDEC agreed that the CELA could be considered for reuse as long as grading plans and slope stability issues were addressed. Also, it was agreed that the Barrier Wall component of the 100% Design would be considered for either deferral and/or elimination pending result of the Performance Based Groundwater Monitoring Program (PBGM). The determination will be made based upon performance groundwater monitoring data and whether or not it verifies the updated groundwater modeling results, which have suggested that the groundwater collection trench provides capture of groundwater. ARC submitted a revised Final (100%) Remedial Design (Revision 1) on June 15, 2008. Subsequent comments from USEPA were dated on August 27, 2008. ARC responded to these comments in September 25, 2008 and USEPA approved responses in a letter dated January 29, 2009. In USEPA's August 27, 2008 Comments, USEPA approved implementation of portions of the Final Remedial Design. Due to delays in receiving the permit to work on flood control land from NYSDEC and USACE, ARC was not able to initiate construction in 2008 of these activities.

This Final (100%) Remedial Design Report (Revision 2) presents the planned strategy for completion of the Phase II remediation at OU2 of the former Sinclair Refinery in Wellsville, New York (Site). Revision 2 has been prepared to provide revised text that addresses issues discussed during a meeting with USEPA and NYSDEC on June 4, 2008 and all subsequent comments. Copies of all comments and responses prepared to date by Atlantic Richfield

Company (ARC) are provided in Appendices 1A through 1D of this report and summarized in Table 1.

In an effort to facilitate initiating the remedial construction activities, the Phase II Remedial Action has been divided into two separate components. Phase II-1 was initiated in 2007 and involved installation of the continuous groundwater collection trench and initiation of construction of the treatment wetland system. Phase II-1 work was substantially complete in October 2008. Phase II-2 is planned to be initiated in Spring 2009 and will continue into 2010. This report presents information on the components of remedial activities to be conducted during Phase II-2 of the remediation at OU2.

The Final (100%) Remedial Design Report, Phase II-2 Remediation at OU2 includes details on the following components: Barrier Wall, Performance-Based Groundwater Monitoring (PBGM) Program, River Sediment Excavation, Main Drainage Swale Excavation, Bank Soils Excavation, and CELA Reuse. A Site Restoration Plan is also included in the Phase II-2 design. Additionally, the design of the CELA Reuse has been enhanced since the September 2008 submittal. These elements of the remedial design are included for final approval and are scheduled to be constructed in 2009 and 2010.

# *1.0 INTRODUCTION*

## 1.1 Purpose

This Final (100%) Remedial Design Report (Revision 2, Phase II-2 Remediation) presents the planned strategy for Phase II remediation at Operable Unit 2 (OU2) of the former Sinclair Refinery in Wellsville, New York (Site). As described in the February 21, 2007 letter (Sontchi-Atlantic Richfield Company to Mike Negrelli-USEPA), Atlantic Richfield Company (ARC) requested a phased approach be implemented in order to facilitate the remedial activities in 2007. USEPA subsequently approved the approach in a letter dated March 19, 2007. As a result, this report includes only detailed presentations of the Barrier Wall, River Sediment, Main Drainage Swale and Bank Soils Excavations, a Site Restoration Plan, concepts for reuse of the Central Elevated Landfill Area (CELA) and Short-Term / Long-Term PBGM for the Phase II remedy for OU2.

Prior to the decision to divide the Phase II remedy into two segments, USEPA and NYSDEC issued comments on the combined Pre-Final (95%) submittal in a letter dated August 15, 2006. These comments were responded to in a letter dated September 21, 2006 from Joe Sontchi, ARC to Mike Negrelli, USEPA. Since the issuance of that response letter, discussions between ARC and USEPA continued on a number of important issues, such as: issues addressed in the Focused Feasibility Study for the Bank Soils Area Remediation (submitted on June 29, 2007 and revised on November 30, 2007 and January 16, 2008); and issues discussed at the June 4, 2008 meeting between ARC and USEPA (PBGM and CELA Reuse). As a result of these discussions and ARC's internal engineering reviews, a number of revisions have occurred to the design for the Phase II-2 project elements, since the original issuance of responses to the Pre-Final (95%) comments on September 21, 2006. The revisions that have been incorporated are to reflect the decisions since that time. Copies of all comments and responses prepared to date by Atlantic Richfield Company (ARC) are provided in Appendices 1A through 1D of this report and summarized in Table 1.

This report presents the design criteria, assumptions, calculations, supporting data, monitoring plans and schedule for implementation of the Phase II-2 remedy at OU2. This report has been prepared in accordance with the requirements set forth in the OU2 Record of Decision (ROD)

issued by the USEPA dated September 30, 1991 and the Unilateral Administrative Order (UAO) entered into by ARC, effective September 8, 1992, as they pertain to implementation of the Phase II Remedial Design program.

This document is organized into sections with attached appendices:

- Section 1 describes the Site location and description, history, remedial action objectives, performance goals and the proposed remedy.
- Section 2 summarizes the remedial design elements, their current status, notification requirements, and property access needs during remediation.
- Section 3 presents reuse plans of the CELA as a disposal area for onsite spoils generated during site activities such as swale and sediment remediation and other excavation work on site.
- Section 4 presents short-term and long-term PBGM of site conditions for developing decisions to either defer or eliminate installation of the Barrier Wall.
- Section 5 presents a project schedule for the Remedial Design and Remedial Action phases.
- Section 6 presents post construction community involvement.
- Section 7 provides references used within this report.

The attached appendices include responses to USEPA and NYSDEC comments regarding the Pre-Final (95%) Remedial Design (URS, 2008) and Final (100%) Remedial Design Report Revision 1, USEPA approval of the FFS, ARC correspondence to USEPA requesting a phased approach to Phase II Activities (ARC 2007), USEPA Approval of the phased approach, design drawings, design calculations, specifications, a Construction Quality Assurance Plan (CQAP), a draft Operations and Maintenance (O&M) Plan outline, literature describing AquaBlok®, CELA Reuse Design, an enhanced groundwater model to depict realistic site conditions, a Site Restoration Plan, and a Performance Based Groundwater Monitoring Plan.

## 1.2 Site Location and 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 Site is irregularly shaped and is bounded to the southwest by South Brooklyn Avenue and to the northeast by the northerly flowing Genesee River.

For purposes of investigation and remediation, two distinct operable units are referenced. Operable Unit 1 (OU1) consists of a 10-acre landfill area adjacent to the southern boundary of the former refinery, referred to as the CELA. OU2 consists of the 90-acre former refinery area located in the northern portion of the Site.

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.

## 1.3 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. Information regarding the various current owners of the former refinery Site is provided as Sheet C-01. It should be noted that ARC has acquired the area of OU1 (the CELA) and a portion of the Site owned by the Otis Eastern Company. Access to these properties provides area for the Treatment Wetland System, and staging areas for all of the Phase II remedial construction and future restoration activities. ARC is in negotiations to transfer ownership to the Educational Foundation of Alfred.

### 1.3.1 Operable Unit 1 (OU1)

The Site was first listed on the National Priority List (NPL) in 1983. The Remedial Investigation (RI), Feasibility Study (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 surficial soils from OU2 to this area (as stipulated by the ROD), and capping of the CELA. OU1 is currently in the operation and maintenance (O&M) phase. However, as described in Section 3 of this Design Report, reuse of the CELA for site spoils disposal and modifications to O&M and cover management will be considered for future work.

### 1.3.2 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 subsurface water and surface water for this area. 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 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** 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.

## 1.4 Phased Implementation of OU2 Remedial Action

### 1.4.1 Phase I Remedial Action for OU2

USEPA approved a phased approach to subsurface water remediation in a letter dated February 28, 1994. Following remediation of surface soils in 1993, Phase I remediation of subsurface water in OU2 involved the construction, operation, and monitoring of a subsurface water extraction and treatment system 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 subsurface water remedial systems implemented and operated under the Phase I program removed over 150,000 pounds of Constituents of Interest (COIs) (estimated). The AS/SVE systems reached asymptotic conditions following several years of operation and were deactivated (with concurrence from the regulatory agencies) in 2003.

The subsurface water 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.

### 1.4.2 Phase II Remedial Action for OU2

While the Phase I subsurface water treatment system(s) were effective in reducing residual constituents, USEPA and NYSDEC requested that a Phase II program be implemented, to enhance conditions in subsurface water at OU2. The Phase II remedial program will further advance subsurface water remedial efforts towards ARAR concentrations and to eliminate the migration of COIs in subsurface water to the Genesee River. The specific objectives of the Phase II Remedial Action are to:

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

The Design Report for Phase II activities is to provide detailed information describing the methods by which the components of the remedy will be implemented. The objective of the remedial activities in or at the Genesee River, River Bank Soil and Main Drainage Swale are to address specific issues at these locations.

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).

Additional investigation activities were completed during preparation of the Pre-Final (95%) design. The investigation activities included performing borings to further define subsurface conditions in the Genesee River. The additional subsurface investigations are described in Appendix 9 of the 95% Design Report. The laboratory testing of slurry and soil-bentonite mix design is provided in Appendix 5 of this report. A detailed assessment of the Genesee River floodplain has also been completed and is provided in Appendix 6.

Upon review of the Pre-Final (95%) Remedial Design, 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. ARC proposed a revision to the Pre-Final (95%) Remedial Design that would have effectively contained the soils (see Appendix 1A to review the comments by EPA and the responses by ARC). USEPA then asked that the proposed alternative (capping) be compared to an excavation and disposal alternative. ARC agreed to conduct a Focused Feasibility Study (FFS) for the bank soils; only the capping and excavation/disposal alternatives were developed. The FFS was conducted in 2007. In February 2008, USEPA and NYSDEC approved the FFS, which included a remedy for bank soils that involved placement of a sheet pile barrier at the mid slope of the western bank and excavation of approximately 3,000 cu yd of soil along the toe of slope. In addition, a Soil-Bentonite Barrier (S-B) wall was planned to be placed immediately upslope of the sheet pile wall. The S-B Wall in this area will be either deferred and/or eliminated based on performance monitoring. A copy of the USEPA approval letter for the FFS is provided in Appendix 1B.

In May 2008, ARC received comments on the 100% Remedial Design Report that was submitted in March 2008. Review of these comments indicated that there were no unresolved issues. However, as part of the 100% Design Report submitted in March 2008, ARC advised USEPA that the existing groundwater model was being reviewed to better understand groundwater management issues related to operation of the Treatment Wetland System and perform an evaluation of the groundwater collection trench remedial component, which replaced groundwater recovery wells. As a result of enhancing the domain of the groundwater model and completing a review of input parameters and site conceptual model aspects, ARC has determined that groundwater capture and mitigation of groundwater discharge to the Genesee River is feasible by implementation of groundwater extraction from the existing groundwater collection trench alone. Considering this enhanced model, USEPA and ARC have agreed that partial pumping at selected sumps and performance monitoring of groundwater capture is an appropriate remedial action. The installation of the Barrier Wall will be deferred and/or eliminated based on performance monitoring of groundwater capture. Section 4 of this Design Report provides a description of the approach for PBGM, Appendix 11 provides the enhanced groundwater model and Appendix 13 provides a Work Plan for PBGM.

## 1.5 Proposed Remedy

### 1.5.1 Phase II-1 Proposed Remedy

The Phase II-1 remedy was substantially completed in October 2008. The proposed Phase II-1 remedy for OU2 includes the following primary elements:

- **Subsurface Water Management**

  A downgradient groundwater collection trench has been installed to intersect subsurface water flow and includes a permeable backfill that collects subsurface water. The trench also includes eight manholes housing pumps to convey the subsurface water to a Treatment Wetland System for processing. The collection trench is approximately 3,000 ft long and is generally parallel to the Genesee River.

  It was anticipated that the conveyance piping and pumps would be operational by August 2008. Planting of the wetlands was planned for late July or August 2008. Although the operation of the conveyance pumps and wetland system was anticipated to become operational in August 2008, construction delays related to the liner replacement of the sedimentation pond and final plantings of the wetlands occurred in September 2008. The system became operational in December 2008.

- **Treatment Wetland System**

  Extracted subsurface water 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 via a new outfall (001). Water will be treated to meet the discharge limits established by the NYSDEC Division of Water. ARC anticipates that the discharge limits that are currently in place for the operating groundwater extraction and treatment system will be used for the Treatment Wetland System. As requested by USEPA and NYSDEC, the substantive requirements for a SPDES permit application were submitted to both agencies in July 2008. This application includes recent groundwater sampling data from the groundwater collection

trench and discharge limits for the existing operating system. NYSDEC granted temporary operations of the treatment system provided that influent and effluent samples are collected and analyzed for existing and proposed permit parameters. A six month testing program was authorized in Fall 2008. It was anticipated that the Treatment Wetland System would be planted and operational by September 2008. Due to construction delays, the Treatment Wetland System was planted in September 2008 and became operational in December 2008.

### 1.5.2 Phase II-2 Proposed Remedy

The Phase II-2 remedy includes the following primary elements:

- **Downgradient Barrier Wall**

  Based on the enhanced groundwater modeling work, the installation of the downgradient barrier wall will be either deferred and/or eliminated considering groundwater performance data collected in 2008-2009. Section 4 provides a discussion of the approach and a detailed Work Plan for monitoring is attached as Appendix 13. If required, a low-permeability soil-bentonite (S-B) Wall (Barrier Wall) will be installed along the downgradient edge of OU2 to contain shallow subsurface waters. 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 Subsurface Water Control Measures**

  Based on review of historical groundwater measurements, it has been determined that the depth of this control measure will intercept the groundwater table only 8% of the time and in general is too shallow to control upgradient groundwater flow. As a result of this analysis and review of site drainage features, which indicate that the pond upgradient from the site collects surface water from adjacent upland areas and does not discharge to groundwater, ARC has determined that the proposed upgradient surface water and subsurface water control measures provides no substantial effect on the flow of subsurface water. Therefore this element of the 100% Design has been eliminated

- **Genesee River Sediment/Soil**

  Approximately 5,000 cubic yards (cy) of sediment/soil from the Genesee River will be excavated. This will be material downstream of the lower drop structure. Excavated soil/sediment may be used on-site as structural soil fill where possible. If the material does not meet the requirements for structural soil fill, the material will be managed in the CELA, trucked off-site to an approved disposal facility, or a combination thereof as described in Section 2.11.

  A system of sheet piles will be driven in the river to partition off and divert river flow around the excavation areas during construction. After construction, the sheet piles will be removed. The area within the sheet pile following excavation will be protected with a bottom geotextile layer and a six-inch thick layer of AquaBlok® (i.e. bentonite coated aggregate material) and backfilled with adequate material to prevent erosion.

- **Main Drainage Swale Remediation**

  Approximately 2,800 cy of soil/sediment will be excavated from the Main Drainage Swale. Excavated soil/sediment may be used on-site as structural soil fill where possible. If the material does not meet the requirements for structural soil fill, the material will be managed in the CELA, trucked off-site to an approved disposal facility, or a combination thereof as described in Section 2.11. The Main Drainage Swale will be replanted with wetland species plants that are similar to existing non-invasive species – no *Phragmites.* or other invasive species will be planted. A Site Restoration Plan describing plantings is provided in Appendix 12.

- **River Bank Soils**

  A Focused Feasibility Study (FFS) for the river bank soils was conducted in 2007 and approved in February 2008. A revised excavation/disposal alternative was selected, in which approximately 3,800 cubic yards of the bank soils up to the midslope of the bank will be removed and replaced with clean fill. The excavated material will be managed in the CELA, trucked off-site to an approved disposal facility, or a combination there of as described in Section 2.11.3. A sheet pile wall will be installed mid slope (midslope sheet pile wall) and along the sides of the excavation area (sidewall sheet piles). These walls will provide structural support during excavation, and will then remain in place after completion. This revised approach is detailed as part of this 100% submittal. If required, the S-B Barrier Wall in this area will be constructed parallel and immediately behind upslope of the sheet piles. The side sections of the Barrier Wall will be stabilized with Portland cement to support side slopes – i.e., in these areas, a Soil-Cement-Bentonite (SCB) wall will be constructed. As discussed previously, the Barrier Wall may be deferred or eliminated (including the segment being discussed here), based on the results of the groundwater monitoring. The area beneath the excavation will be protected with a bottom geotextile layer and a six-inch layer of AquaBlok® and backfilled with adequate material to stabilize the slope.

- **Institutional and Engineering Controls**

  Institutional and Engineering Controls (ICs and ECs) will be implemented at the Site. The ROD requires controls to be recorded. Atlantic Richfield will advance discussions with the current property owners in an attempt to secure appropriate controls. In the event that an individual property owner declines to participate in this process, ARC will notify the USEPA and seek their assistance on this issue.

- **Reuse of CELA**

  During implementation of the Phase II-2 remedy, it is anticipated that approximately 20,000 to 35,000 cubic yards of spoils will be generated from multiple on site sources. During a review meeting with USEPA on June 4, 2008, it was agreed that the CELA will be used as a disposal location pending review of grading designs and slope stability issues. Section 3 provides a description of reuse concepts and Appendix 10 provides design information for

the proposed grading, water collection system, spoil placement, and cap system. Planned restoration of the CELA is included as part of the site restoration plan in Appendix 12.

- **Performance-Based Groundwater Monitoring**

  As a result of enhancing the existing groundwater model with a larger domain and updated input parameters, a scenario considering partial sump pumping and removal of the Barrier Wall has been proposed to USEPA. During implementation of this scenario, additional groundwater elevation data will be collected and analyzed. If results indicate groundwater capture, the Barrier Wall will be either deferred or eliminated. Section 4 describes a PBGM Program and Appendix 11 provides a description of the enhanced groundwater model and presentation slides from the June 4, 2008 USEPA meeting. A Work Plan for conducting performance-based monitoring is provided in Appendix 13.

- **Site Restoration Plan**

  Upon completion of remedial activities for Phase II-1 and Phase II-2, the disturbed area along the Genesee River, CELA and Treatment Wetland System area will be restored with vegetation plantings. The general concept will include restoration of the WAG Trail and plantings to provide natural regrowth. Restoration of the WAG Trail will be in accordance with the WAG specifications for the trail.

  Educational viewing platforms will be positioned adjacent to the Treatment Wetland System to provide interpretive information to the public. Also, the CELA will be regraded to promote site access and the cover will be enhanced using wildflowers and grasses that require minimal maintenance. Details of the Site Restoration Plan are provided in Appendix 12. The restoration of the CELA has been designed so as to complement the restoration of the overall site.

## 1.6 Components of the Remedial Design

This document submittal is intended to provide the Remedial Design package at final status. At this level of completion, all of the major design deliverables have been developed in sufficient detail for construction. Regulatory review comments on the Pre-Final (95%) Remedial Design

and comments on the 100% Remedial Design Report made to date have been considered during the preparation of this Final (100%) Remedial Design (Revision 2). As previously indicated, the installation of the Barrier Wall will be either deferred or eliminated pending performance monitoring. Also, the Upgradient Surface Water and Subsurface Water Control Measures, described in the Pre-Final (95%) Remedial Design Report has been removed from consideration based upon revised modeling data that demonstrated the proposed controls had no substantial impact on the flow of groundwater. .

A description of the components to be included in this Final (100%) Remedial Design follows:

- **Remedial Design Report**

  The Phase II-2 Remedial Design Report Revision 2 (Design Report) contains a narrative description of the major Remedial Design Elements. The Phase II-2 Design Report also contains specific elements of the design of the S-B Wall (if needed), River Sediment, Main Drainage Swale and Bank Soils Excavation, CELA reuse, and a Site Restoration Plan. The 100% Design Report describes the basis for each major component of the design and the relevant criteria considered during preparation of the design. The report also summarizes several additional supplemental investigations that have been completed as part of the Pre-final (95%) Remedial Design to address regulatory comments on the Preliminary (35%) and Intermediate (65%) Remedial Design submissions and address data gaps identified during the preparation of this document. An approach for using the CELA as a repository for site spoils, an updated groundwater model and a Work Plan for Short-Term / Long-Term Performance Monitoring are provided as appendices to the 100% Remedial Design Report.

- **Drawings**

  The Drawings provide a pictorial view of the proposed Remedial Activities for Phase II-2 and when reviewed in conjunction with the Design Report provide the reviewer with an understanding of how the project will be integrated with the physical conditions at the Site. The Drawing Sheets included in this Final (100%) Remedial Design Phase II-2 submissions are described below and are included in Appendix 2.

- **Design Drawings (Appendix 2)**

| | |
|---|---|
| G-01 | Title Sheet |
| G-02 | Project Notes, General Legend and Abbreviations |
| C-01 | Existing Site Plan |
| C-02 | Remedial Design Overview and Sequence Plan |
| C-02A | Soil Management Plan (North) |
| C-02B | Soil Management Plan (South) |
| C-02C | Soil and Erosion Control Details |
| C-03 | Known Existing Site Utilities Plan |
| C-04 | Downgradient Barrier Wall Alignment Plan (Deferred/Eliminated) |
| C-05 | Downgradient Barrier Wall Plan and Profile I (1 of 4) (Deferred/Eliminated) |
| C-06 | Downgradient Barrier Wall Plan and Profile II (2 of 4) (Deferred/Eliminated) |
| C-07 | Downgradient Barrier Wall Plan and Profile III (3 of 4) (Deferred/Eliminated) |
| C-08 | Downgradient Barrier Wall Plan and Profile IV (4 of 4) (Deferred/Eliminated) |
| C-09A | Downgradient Barrier Wall Details / Cross Sections I (Deferred/Eliminated) |
| C-09B | Downgradient Barrier Wall Details / Cross Sections II (Deferred/Eliminated) |
| C-10 | Genesee River Remediation Plan |
| C-11 | Genesee River Remediation Cross Sections and Details |
| C-12 | Genesee River Remediation Sheet Pile Plan and Details |
| C-13 | Main Drainage Swale Excavation Plan |
| C-14A | Landscaping Plan and Details (Main Drainage Swale) |
| C-14B | Main Drainage Swale Excavation Sections and Details |
| C-15 | General and Civil Details |

- **CELA Reuse Disposal Area Drawings (Appendix 10)**

| | |
|---|---|
| G-03 | Title Sheet |
| C-16 | Site Plan and Proposed Fill Area |
| C-17 | Option 1 Excavation Elevations and Water Collection System |
| C-18 | Option 1 Spoil Placement Elevations |
| C-19 | Option 1 Cap System Elevations |
| C-20 | Option 1 Final Grading and Cross-Section Plan |
| C-21 | Option 1 Cross-Sections |
| C-22 | Option 2 Excavation Elevations and Water Collection System |
| C-23 | Option 2 Spoil Placement Elevations |
| C-24 | Option 2 Cap System Elevations |
| C-25 | Option 2 Final Grading and Cross-Section Plan |
| C-26 | Option 2 Cross-Sections |
| C-27 | Details I |
| C-28 | Details II |

- **Site Restoration Plan Drawings (Appendix 12, Attachment A)**

| | |
|---|---|
| G-04 | Title Sheet |
| C-29 | Restoration Plan I |
| C-30 | Restoration Plan II |
| C-31 | Restoration Plan Details I |
| C-32 | Restoration Plan Details II |
| C-33 | Restoration Plan Details III |

- **CELA Restoration Plan Drawings (Appendix 12, Attachment B)**

| | |
|---|---|
| G-05 | Title Sheet |
| C-34 | Site Restoration Overview |
| C-35 | CELA Restoration Plan |
| C-36 | CELA Existing and Future Conditions |

It should be noted that substantial changes have been made to the drawing set since the Pre-Final (95%) submittal, to accommodate the division of the Phase II remedy into two

segments, and to incorporate new design elements based on USEPA comments and the decisions made as part of the Focused Feasibility Study for the bank soils, and CELA Reuse. An effort has been made to keep the organization of the drawing set as much like the previous submittals as possible. However, due to the removal of previous drawings some drawing numbers have changed.

- **Technical Specifications**

  The Technical Specifications provide detailed information related to work area preparation, materials of construction, installation procedures, fieldwork standards and discussions regarding the integration of related work elements. The Specifications also identify the submittals required at various phases of the project and quality control procedures to be implemented by the Remedial Action Contractor(s). Technical Specifications for all components of the project are provided in Appendix 4.

- **Construction Quality Assurance Plan**

  The Construction Quality Assurance Plan (CQAP) describes Quality Assurance measures to be implemented by a party independent of the Remedial Action Contractor(s) to ensure the completed remedial action meets the design specifications. The CQAP provides lines of communications, the frequency, and criteria for inspection activities, sampling protocol, description of procedures to address changed conditions and requirements for documentation. The CQAP is provided in Appendix 7.

- **Operation and Maintenance Plan**

  This Final (100%) Phase II-2 Remedial Design includes a draft Operation and Maintenance Plan (O&M Plan) outline for the remedial components included in this report. The outline charts the general approach and procedures to be followed during operation once the Remedial Action is implemented. The O&M Plan will be prepared and finalized prior to the completion of the Remedial Action. The O&M Plan will provide specific information about the equipment; systems installed as part of the Remedial Action and discuss a Contingency Plan for treating additional water quantity, if needed. The O&M Plan is a

draft document that will require significant development after the Remedial Action start-up and shakedown period is complete. The draft O&M Plan outline is provided in Appendix 8.

- **Remedial Action Schedule**

  The Remedial Action Schedule conveys to the reviewer the anticipated amount of time required to implement the Remedial Action. The schedule is developed based on the experience of the design team and, where appropriate, with input from Contractors experienced with specific components of the design. Efforts have been taken to minimize Site activities during holidays and community events. Note that this schedule may require revision to accommodate information received by the Contractor(s), Engineer, or regulatory agencies, or to reflect site conditions or requirements. The Remedial Action Schedule provided in Section 5.0 represents only Phase II-2 activities. The Site Management Plan (SMP) to be submitted 30 days prior to construction mobilization and will provide a detailed Remedial Action Schedule.

- **Final Design Modification and Clarification Request**

  A Final Design Modification and Clarification Request (FDMCR) will be submitted to USEPA within 45 days of the reward of the Remedial Construction contract for Phase II-2 for OU 2. The FDMCR will summarize submittals that the Contractor will be submitting as part of the scope required by the Technical Specifications. In addition, if there are any changes for critical work elements that are identified by the Contractor during construction, they will be summarized in an addendum to the FDMCR at significant events.

## 1.7 Additional Investigation Activities

During the preparation of this submittal and in response to regulatory review comments on the Preliminary (35%), Intermediate (65%), Pre-Final (95%) and 100% Final Remedial Design, additional investigation activities have been identified to facilitate design completion. These activities have been completed as preparatory activities prior to a phased construction sequence. The projected construction sequence and project schedule are presented in Section 3. Specific details of each activity for Phase II-2 actions are described in applicable sections of this

document. The additional investigation activities completed for the preparation of the Final 100% Remedial Design were performed prior to the Pre-Final (95%) submittal, and are identified as follows:

- **Barrier Wall Mix Design Testing**

  Additional permeability testing was performed to evaluate the suitability of on-site materials for use in the S-B backfill during development of the 95 % Design Report by SECOR. Material from an off-site borrow source was also tested. The testing was structured to address USEPA review comments on the Preliminary (35%) Remedial Design. The results of the testing are discussed in Section 2.2.1.4 and described in Appendix 5.

  The testing demonstrated that both on-site material (Stratum 1) and the selected off-site borrow material are suitable for use in the S-B backfill, if needed.

- **Slurry Mix Testing**

  Design calculations have determined that to maintain trench stability, a slurry mix will be required that has a higher density than the mix design described in the Preliminary (35%) Remedial Design. In addition, USEPA comments on the Preliminary (35%) Remedial Design questioned the influence of Site subsurface water on the slurry mix design. For those reasons, additional slurry mix testing was performed using Site subsurface water and potable water to determine what effect, if any, Site subsurface water has on slurry performance. In addition, the use of calcium carbonate to increase slurry density to 68 pcf was also evaluated. The testing results demonstrated no detrimental effects on the slurry mix with the use of Site subsurface water. In addition, it was concluded that the use of calcium carbonate will allow for a slurry mix of 68 pcf, providing increased trench stability during construction of the Barrier Wall. Testing results are described in Appendix 5. Trench stability calculations have been performed by the engineer and are given in Appendix 3 of this document. In addition, The S-B Barrier Wall Specifications (Section 02736) requires that the Contractor perform independent calculations to ensure trench stability during construction.

- **Subsurface Material Confirmation**

  A subsurface material confirmation investigation was performed along portions of the S-B Barrier Wall to confirm the presence and depths to the underlying glaciolacustrine silt and clay. A subsurface material confirmation investigation was also performed along the footprint of the Genesee River sediment excavation area to confirm the presence of glaciolacustrine silt and clay channel bed deposits (Strata 4). Results are described in Appendix 9 of the 95% Remedial Design Report.

  Strata 4 was chosen as the confining layer for the slurry wall key in because it was the only low permeability stratum encountered in the soil borings at the site. The soil boring logs in Appendix 3 show that Strata 4 consists of ML, CL, and CL-ML. The 2004 Parsons report includes permeability test results, which are in the $10^{-7}$ to $10^{-9}$ cm/sec range, of 13 permeability tests of Strata 4.

- **Floodplain Assessment**

  Remedial activities have been designed to minimize activities located in the floodplain of the Genesee River. In order to evaluate the effect of the proposed remedial activities in the floodplain, a floodplain assessment was completed. The results of the floodplain assessment indicate that the Remedial Action will have negligible effect on the existing flood levels and associated velocities. The floodplain assessment is included as Appendix 6.

## 1.8 Documents Utilized During Design Preparation

The investigation tasks completed as part of this design are summarized in the *Remedial Design Work Plan* (Parsons, June 2003) and the *Pre-Design Field Investigation Report*, *Phase II Remediation at OU2* (Parsons, August 2004). Other information includes previous Site investigations and the Preliminary (35%), Intermediate (65%) and Pre-Final (95%) and Final (100%) Remedial Design Reports.

The following additional information and data were also relied upon in development of this document:

- Topographic Information and Base Maps (Parsons, 2004);
- Final River NAPL Investigation Report (Parsons, March 2003);
- Draft Main Drainage Swale Investigation Report (Parsons, November 2003);
- Plan of a Survey of Lands for/OTIS Eastern Service, Inc. and MacTech Mineral Management, Inc. Properties (James Ball, Land Surveyor (March, 2005));
- Informational Drawing Showing Land-Ownership Data for the Former Sinclair Refinery Site (James Ball, Land Surveyor (December 2006)); and
- Updated Groundwater Modeling activities and development of short-term and long-term performance groundwater monitoring criteria (URS, June 2008).

# *2.0 REMEDIAL DESIGN ELEMENTS*

## 2.1 Introduction

This section describes the major design elements of the Phase II-2 Remedial Design for OU2. The primary goal of the Phase II Remedial Action for OU2 is to terminate the bulk of subsurface water flow from the site to the Genesee River and Main Drainage Swale and to treat the subsurface water to existing discharge limits. Components of the design to accomplish this goal are the installation of a Barrier Wall along the downgradient edge of the Site and a Subsurface Water Management System designed to extract subsurface water from the upgradient side of the Barrier Wall. Water removed by the Subsurface Water Management System will be conveyed to a Treatment Wetland System designed to reduce concentrations of COIs and allow discharge of the treated water to the Genesee River. The Subsurface Water Management System and the Treatment Wetland System are the major elements of the Phase II-1 Remedial Design. An overview of the Remedial Design and project sequencing is shown on Sheet C-02. As noted earlier, the Barrier Wall will either be deferred or eliminated from the 100% Design remedial construction based on performance monitoring.

In addition, Genesee River soil/sediment, the Main Drainage Swale and River Bank Soils are discussed herein as elements of this Phase II-2 Remedial Action. Additional design elements include Site Restoration and reuse of the CELA for spoils management. These elements are also included as part of this Phase II-2 Remedial Action. Site Preparation and Storm Water/Erosion and Sediment Control measures will be elements included in both Phase II-1 and Phase II-2 actions. Soil management and soil erosion control details are shown on Sheets C-02, C-02A, C-02B, and C-02C.

## 2.2 Barrier Wall (Deferred/Eliminated)

The Barrier Wall will be a vertical subsurface feature that is located along the entire downgradient portions of the Site. The Barrier Wall is proposed as the physical separation to minimize the migration of dissolved COIs and NAPL from the Site to the Genesee River and Main Drainage Swale. The Barrier Wall will be oriented generally parallel to the Genesee River.

The Barrier Wall consists primarily of a soil-bentonite (S-B) wall The S-B wall is a vertical zone of low permeability soil that will be keyed into a natural low-permeability soil layer. The S-B wall will be constructed using slurry trench excavation techniques to maintain an open excavation. The excavation will be backfilled using soil amended with sodium bentonite to create the low permeability barrier. In the area of the bank soils excavation, a sheet pile wall will be placed downgradient of the S-B wall to support the excavation and isolate bank soils. Also a small segment of sheet pile will be used near the CELA to provide a connection to existing remedy in OU1. See Section 2.2.2 for further details.

### 2.2.1 Soil-Bentonite Wall (Deferred/Eliminated)

#### 2.2.1.1 Soil-Bentonite Wall Alignment

The S-B wall alignment is generally along the Wellsville Addison and Galeton (WAG) trail situated at the crest of the river and swale embankment on the eastern edge of OU2, as shown on Sheet C-04. The S-B wall centerline alignment is defined for construction stakeout using coordinates on Sheet C-05 through C-08. In general, the S-B wall is represented by straight line segments with the coordinates representing the points of intersect. During construction, the straight-line segments will be connected by curved corners with a minimum radius of 100 feet. A temporary working surface will be created along the proposed S-B wall alignment to facilitate construction. Minor adjustments to the alignment may be made during construction of the S-B wall based on physical Site constraints such as existing fencing, buildings, and the river and swale embankment slopes. After construction, the disturbed areas will be restored as described in the restoration plan.

The S-B wall has been divided into three segments, to allow ease of construction sequencing – the south segment extends from station 1+00 to 21+12; the river remediation segment from station 21+12 to 26+96; and the north segment from station 26+96 to 34+12.

At the south end of the alignment, a permanent sheet pile wall will be constructed from Station 0+50 to 1+00 (see discussion below), to connect the proposed S-B wall with the existing

perimeter slurry wall of the CELA. The S-B wall will tie into the sheet pile wall at Station 1+00 and will continue for the remainder of the alignment.

At the river sediment remediation segment, the alignment of the S-B wall will shift. At Station 21+12, the wall will turn to the east (down the river bank), and then turn north at the midslope of the river bank. The wall will follow the bank at midslope and then turn west, back up the bank to the crest, and will meet the north segment of the wall at station 26+96. As shown on Sheets C-04 and C-12, sheet piling will be driven along the alignment of the S-B wall in the river remediation segment (Station 21+12 to 26+96) to facilitate construction of the S-B wall in this area. This sheet piling will be cut off 18-inches below grade after the S-B wall is constructed and will remain in place. ARC plans to remove other sheet piling that will be installed near this area after the river excavation work is completed.

The river remediation segment portion of the S-B wall will be stabilized with Portland cement to reduce potential for slope instabilities. This alignment is meant to create a continuous barrier in the bank soils remediation area. The system was described in detail in the "Revised Focused Feasibility Study- Genesee River Remediation at Operable Unit 2", approved by USEPA and NYSDEC in February 2008.

The two sections of SCB wall (station 21+02 to 21+47 and station 26+47 to 27+06) will be placed first and allowed to harden. The excavation for the S-B wall will then be cut into the hardened SCB wall to create a tight and continuous transition. The specifications require that the SCB wall have the same permeability as the S-B wall. Specification 02736 also includes requirements for the Contractor to perform testing that confirm that the SCB wall achieves the permeability requirement.

The north segment will continue approximately parallel with the river to Station 28+36. Then the wall will turn slightly westward to the north terminus at Station 34+12.

Four potential options were proposed in the Preliminary (35%) Remedial Design for the southern termination of the S-B wall. During the Intermediate (65%) Remedial Design process, a constructability review was performed for each of the options. The constructability review considered disturbance to the existing CELA cap and perimeter drainage system; feasibility of

wall construction techniques; and continuity of the proposed Barrier Wall with the existing Barrier Wall for the CELA. Based on those criteria, the use of a sheet pile to connect the new Barrier Wall to the existing S-B wall at CELA (Option 4) was selected. The primary advantages of the sheet pile wall were that it could be installed without re-grading the perimeter drainage for the CELA cap and resulted in the shortest duration for implementation. In addition, the sheet pile wall will permit more specific monitoring of the work activities, to help ensure that the CELA Barrier Wall is not compromised. The sheet pile joints will be sealed to ensure a low-permeability wall. The sheet pile used to connect the S-B Wall to the CELA slurry wall will be either deferred and/or eliminated based on performance monitoring.

#### 2.2.1.2 Soil-Bentonite Wall Depth and Thickness

As previously stated, the objective of the S-B Barrier Wall is to minimize migration of dissolved COIs from the Site to the Genesee River and Main Drainage Swale. Results from the updated groundwater model and site conceptual model indicate that the migration of dissolved COIs can be captured by the groundwater collection trench without the use of the S-B Barrier Wall. Performance monitoring will be used to verify this aspect of the design and to demonstrate when the Remedial Action is complete. Data generated from historic and pre-design investigation soil borings were used to characterize and develop subsurface profiles along the soil-bentonite wall alignment. Sheets C-05 through C-08 provides geotechnical profiles for the wall alignment from Station 0+50 to 34+12. The drawings indicate the limits of each segment of the proposed wall alignment – i.e., North, South, and River Remediation segments.

The S-B wall, if installed, will be keyed into the low-permeability Stratum 4 (either Stratum 4a or 4b) material (glaciolacustrine silt and clay), which was identified in all pre-design investigation borings conducted along the alignment (Parsons, August 2004). Each of these borings was advanced a minimum of 5 feet into Stratum 4 to confirm the presence of sufficient material thickness for a Barrier Wall key. The depth of the key will be a minimum of 3 feet into Stratum 4.

The S-B wall depth is anticipated to range from 20 feet to 47 feet below the existing ground surface. The deepest section of the wall is located in the area of Station 3+00. Based on S-B

wall design calculations (Appendix 3, Design Calculations), a minimum thickness of 3 feet is required for the S-B wall at a permeability of $1x10^{-7}$ cm/sec to match properties associated with the glaciolacustrine silt and clay present at the Site, and those properties of the Barrier Wall used in the predictive subsurface water modeling simulations.

#### 2.2.1.3 Soil-Bentonite Wall Stability Calculations

Excavation stability calculations performed as part of the Pre-Final (95%) Remedial Design were revised as part of this document submittal as follows:

- Limit equilibrium stability analysis of multiple soil strata were performed, as appropriate, at critical sections along the alignment of the proposed S-B wall. This analysis provided a check of previous multi-layer analyses submitted as part of the Pre-Final (95%) submittal.
- The effect of surcharge loads on trench stability were investigated. Surcharge loads used in the modeling included a fully loaded (50-ton) dump truck travelling close to the trench, and a building footing load surcharge, appropriate to locations where the slurry wall alignment runs in proximity to existing structures on the site.
- Limit equilibrium stability analysis of the proposed River Remediation Segment of the S-B wall. This segment represents a new design which had not been considered in previous submittals.

The results of the excavation stability analyses are presented in Appendix 3, Design Calculations. For design purposes a Factor of Safety (FS) of 1.1 or more was considered acceptable and is typical for slurry wall construction because the excavation will be open for a short period. The FS for excavation stability was less than 1.0 between Stations 1+00 and 12+00. In order to raise the factor of safety above 1.1 between Stations 1+00 and 12+00, an elevated working platform has been included in the design.

Additionally, for the River Sediment Remediation segment of the wall, the slurry trench will be constructed such that it will be supporting bank slope soils. In order to achieve a factor of safety greater than 1.1, it was found that a temporary buttress fill must be placed to level the bank grade

during trench construction. An analysis was used to size and configure this buttress fill. These calculations are provided in Appendix 3.

Trench stability is a field issue and will be handled appropriately by the Contractor and Resident Engineer. The routine QA/QC activities will indicate whether the trench walls are caving too much. If this condition occurs, there are several options for improving stability by balancing the lateral component of the weight of soil in the trench walls, plus forces associated with inflowing groundwater. The first and mostly easily implemented option is to increase the slurry density (and viscosity), which will apply larger fluid forces against the walls of the trench. If necessary the next step is to raise the work platform, which allows a higher slurry level to be used, which also increases fluid forces against the trench walls. Use of dewatering wells to depress the water table in the vicinity of the open trench is the third and least desirable option to deal with caving/instability. This third option increases trench wall stability by reducing groundwater forces that tend to push soil into the open trench from the sidewalls.

#### 2.2.1.4 Soil-Bentonite Wall Backfill Design and QA/QC

The S-B wall backfill design that will be used at the site does not include re-use of any on-site material. All soils for backfill will be imported NYSDOT Item 4. Although the previously completed S-B wall backfill design tests, which are described in the remainder of this section, indicated that some of the materials at the site were suitable for use, ARC has elected to use only imported material for the S-B wall backfill design. This approach will simplify construction by eliminating need to segregate strata during excavation of the trench for the S-B wall. Using only imported material will also streamline the QA/QC monitoring of the S-B wall backfill mix. The QA Official will be responsible for assuring that the appropriate backfill material is used. The Construction Quality Assurance Plan in Appendix 7 identifies four categories of individuals who may act as the QA Official, including the resident engineer, engineering technicians, the owner's representative, and the site safety supervisor. The person selected to inspect a given work activity may depend on who is available on site at a given time, the nature of work being performed, and any special expertise of the persons available.

S-B wall backfill design testing was initially performed as described in the Preliminary (35%) Remedial Design to evaluate backfill options to achieve the performance criteria of the Barrier Wall (i.e., permeability requirement of 1 x $10^{-7}$ cm/sec or less) and to demonstrate that the wall will be compatible with the Site subsurface water and soils.

As part of the Pre-Final (95%) document submittal, an additional study was conducted to evaluate the suitability of the on-site soils and an imported borrow soil (NYSDOT Item 4) for use as backfill material for the S-B wall. An off-site location for imported borrow soil for use in the S-B backfill was identified (June Bug Quarry, located near the Village of Wellsville). This study also included excavation of a test pit along the proposed barrier wall alignment to evaluate the consistency of the Stratum 1 and 3 soils and the collection of soil samples for physical property (moisture content, particle size analysis, and Atterberg limits) testing. In addition, JLT Laboratories, Inc. was engaged to conduct a bench-scale study of the slurry mix and S-B backfill. The results of the previously completed physical property testing and bench-scale study are included as Appendix 5.

Based on observations made during the test pit excavations and the results of the physical property testing, the Stratum 1 soil and the imported borrow soil were considered acceptable candidates for use as backfill for the S-B wall and were used in the bench-scale study conducted by JLT Laboratories, Inc. Due to the large percentage of gravel- and cobble-size particles, and low percentage of fine-grained soils, the Stratum 3 soil was considered unsuitable for use as backfill material for the proposed S-B wall. The mixing of the Stratum 3 and Stratum 4 soil, as proposed in the Preliminary (35%) Remedial Design has been determined to be unfeasible given the material characteristics, limited working area and level of effort that would be necessary to achieve a suitable homogeneous material.

The bench-scale study performed by JLT Laboratories, Inc. consisted of the following:

- Evaluating the effect of the Site subsurface water on Hydrogel 90® bentonite well index testing was performed using distilled water (baseline), the Site potable water, and the Site subsurface water.
- Testing of physical properties testing (density, pH, fluid loss, and viscosity) of a 40-sec slurry (a mixture of Hydrogel 90® bentonite and calcium carbonate (added to increase the

unit weight of the slurry to 68 lbs./ft$^3$)) made from both the Site potable water and the Site subsurface water.

- Mixing the Stratum 1 soil and the imported borrow soil with the 40-sec slurry and varying the Hydrogel 90® bentonite content (2%, 3%, and 4.5%) in the backfill soil to create a total of six mixes (three mixes for each soil source) for permeability testing to develop the relationship between percent dry Hydrogel 90® bentonite and permeability.
- Selecting of a design backfill mix for both the on-site Stratum 1 soil and imported borrow soil for long-term compatibility testing (permeability testing using the Site subsurface water). The Site subsurface water was also used to create the slurry mix for this testing.

Based on the results of the Swell index testing, the Site potable water and Site subsurface water are both considered suitable for use in making the bentonite slurry. The results of the physical property testing (density, pH, fluid loss, and viscosity) of a 40-sec slurry also indicate that both the Site potable water and the Site subsurface water are suitable for use in making the bentonite slurry.

The results of the permeability testing indicate that 2% dry Hydrogel 90® bentonite by moist weight of backfill soil will achieve the design permeability requirement of 1.0 x$10^{-7}$ cm/sec for both the Stratum 1 soil and the imported borrow soil. Compatibility testing (permeability testing using the Site subsurface water) was also performed for both the Stratum 1 soil and imported borrow soil. The results of this testing suggest that there is no incompatibility of either mix with the Site subsurface water.

#### 2.2.1.5 Imported Borrow Material for Backfill

Volume calculations were performed to estimate the volume of soils required as backfill in the S-B wall. Soils from Stratum 3 and Stratum 2 (soil exhibiting structural fill quality per Specification 02210) are considered acceptable for use as structural fill, but are not approved for use in the S-B wall.

The calculations were performed utilizing a 3-foot wide wall. The total volume removed from the trench excavation is 7,710 cy (with respect to existing surface grades). Approximately 610

cy will be replaced by the cap soil (Specification Section 02210); therefore, approximately 7,100 cy of imported soil will be required for S-B wall backfill.

#### 2.2.1.6 Trench Excavation and Backfill

If applicable, construction of the S-B wall will occur during the 2010 construction season, after completion, testing, and establishment of the groundwater collection system and Treatment Wetland System, and after completion of the river and swale remediation work. Although USEPA granted approval (August 27, 2008) for ARC to implement the Genesee River Sediment/Soil, Main Drainage Swale Remediation, and River Bank Soils in Fall 2008, all of these activities were to be fully or partially performed in the flood control easement. Due to permit review delays related to receiving approval from NYSDEC for work being completed in the flood control easement, the permanent sheet pile wall along the Genesee River and remediation of the swale was not completed in Fall 2008. As a result, it is not possible to construct the soil-bentonite wall concurrently with sheet pile installation and river sediment excavation in the Genesee River due to access limitations for equipment and site constraints for haul roads and staging areas. Much of the slurry wall work will need ot be performed in the same location that will be used for the other scheduled activities. This work sequence will provide a more logical construction plan involving installation of sheet piling in the Genesee River and excavation of the Bank Soils Area.

If installed, soils from the S-B wall alignment shall be excavated using a tracked backhoe capable of excavating to the required depths. However, the actual equipment used will be selected by the Contractor. Depth of excavation will extend 3-feet into Stratum 4 (either 4a or 4b) as shown on Sheets C-05 through C-08. Where required, the temporary working platform will be constructed prior to the start of trench excavation. Typical details of the slurry trench are shown on Sheet C-09A.

The work area is bounded by the Genesee River bank on the east, and generally by fence lines separating campus buildings to the west. Therefore, work space is limited to approximately 40 ft along most of the barrier wall alignment. Equipment and truck access must be maintained within this space, in addition to the trench and working platform. Therefore, preparation of slurry for

trenching and mixing of soil and bentonite for backfilling will need to occur at the south end of the site, away from the trench alignment (see Sheets C-02 and C-02B). During trench excavation, spoils will be continuously loaded onto trucks and transported to the south end of the site, where stockpile areas have been designated. Bentonite and water (subsurface water or potable water) will be mixed in temporary ponds (also on the south end of the site) to prepare bentonite slurry. The bentonite slurry will then be pumped into the active trench area, as the trench is being excavated, to maintain the stability of the trench. The pre-prepared S-B backfill mix will be trucked to the trench and then placed in the trench to displace the bentonite slurry with S-B backfill using a backhoe or a bulldozer as described in the Specifications. Details showing the soil-bentonite wall cap, cross-sections, road crossings and connection with sheet pile at the CELA are shown on Sheet C-09A.

#### 2.2.1.7 Preparation Activities for Soil-Bentonite Wall

Staging and work area(s) related to the S-B wall construction (e.g., for excavation spoils, slurry mixing ponds, soil stockpiles, backfill mixing areas, material storage, equipment storage, etc.) are illustrated on Sheet C-02, C-02A, and C-02B. Stockpiles and ponds have been determined by the designer, to accommodate the proposed construction. However, the Contractor will be required to provide final information for such features, such as size and materials used during construction as required by the Specifications. Documentation of submittals will be provided to USEPA in the FDMCR.

The existing utility plans, observations made during the pre-design investigation and historical photographs suggest that subsurface obstructions, including active and abandoned utilities, exist along the proposed Barrier Wall alignment. Based on experience during construction of the groundwater collection trench (part of Phase II-1), abandoned utilities are concentrated in the area of alignment between Stations 16+00 and 23+00, and within eight feet of existing grade. These obstructions may include, but are not limited to, former foundations, abandoned utilities, and construction debris. If these obstructions are encountered during construction of the S-B wall, they may result in loss of slurry and construction delays. Therefore, in this area pre-trenching with trench boxes or other shoring techniques will be required to a depth of 8 ft. Any

utilities encountered will be documented and plugged. Beneath the eight foot depth, trench excavations will be extended using slurry. Known existing site utilities are shown on Sheet C-03.

Known, active utilities crossing the S-B wall alignment, that cannot be relocated, will be maintained during the S-B wall construction using a temporary by-pass and re-constructed immediately after S-B wall construction. It is anticipated that four existing storm sewers, two proposed storm sewers, and an existing gas line will cross the S-B wall. Anti-seepage collars and special backfilling will occur at the locations of these utility crossings. Details are shown on Sheet C-09B.

#### 2.2.1.8 Surface Completion

Final grade will correspond to pre-existing grades at all locations along the S-B wall alignment – i.e, the top of S-B backfill will be 2 to 3 ft lower than existing grade. Surface completion features will be installed to occupy the upper 2 to 3 ft of depth below grade. Proper surface completion of the S-B wall will be required to protect the S-B wall from damage and to allow future use of the WAG trail. After the completion of construction of the S-B wall, or sections thereof, the temporary elevated working platform will be removed. A 2-foot thick soil cover will be installed between the top of S-B backfill and existing grade at the surface. Where a temporary or permanent road crossing occurs, a 3-foot thick dense graded aggregate cover will be installed. At areas where a soil cover is proposed, a 60-mil polypropylene geotextile will be used as a separation layer between the S-B wall backfill and soil cover. At road crossings, 2 layers of geogrid will be installed within the dense graded aggregate backfill, in addition to the geotextile. Details are shown on Sheet C-09A. The finished surface will be monitored twice each month for two months and monthly for months three through six for signs of settlement in the cover. The monitoring of settlement will be described in the O&M Plan. Settlement will be monitored by installing settlement plates every 500 feet along the S-B wall alignment. The settlement plate will consist of a two-foot by two-foot steel base plate with vertical riser pipe. Each settlement plate will be placed on the geomembrane prior to backfill. The elevation of each settlement plate will be documented at installation, and each monitoring period by a licensed surveyor. If

depressions are noticed in the cover, backfill will be placed with additional soil/aggregate to maintain surface integrity. After the period of six months, settlement plates will be removed.

The WAG trail will be re-established after all other work is completed along the alignment of the trail. The proposed plans for re-establishing the trail are depicted in the Site Restoration Plan. The conceptual design has been developed based on discussions with Allegany Trails, Inc. The Site Restoration Plan presented in Appendix 12 also describes the ecological enhancements that are planned for the trail. In addition, ecological enhancements to the CELA include segments of walking trails that will connect to the WAG Trail.

### 2.2.2 Sheet Pile Walls

Sheet pile walls are being planned at four locations;

- The southern connection to the existing CELA S-B wall ("southern connection sheet pile wall");
- The bank soils and river sediment remediation area;
- The river in the river remediation area, forming the river diversion system; and
- Immediately below the existing lower drop structure wall.

The sheet pile at the southern connection to the existing CELA S-B wall will either be deferred and/or eliminated based on performance monitoring. The sheet pile walls will consist of continuous, interlocking piles (steel) driven into the same low permeability soil layer that provides the key for the S-B wall. Sheet piles will be hot-rolled sections, which have tight interlocks to minimize leakage. Locations of sheet pile walls are shown on Sheet C-02.

Previous submittals had left design of the elements required to divert flow around the proposed excavation areas within the Genesee River to the Contractor. The Contractor was supposed to submit these designs as part of the Remedial Action Work Plan (RAWP). In this 100% submittal, the diversion system has been designed, and will no longer be a Contractor item. Also, the concept of a RAWP that was described in the 95% Design Report has been eliminated. ARC is proposing to use the FDMCR to replace the RAWP as described in Section 1.6. If changes to

the design presented herein are proposed by the Contractor, they will be submitted for approval as part of the FDMCR. Detailed design of the sheet piles has been performed using geotechnical stability and structural analyses. The design calculations are presented in Appendix 3.

#### 2.2.2.1 Southern Connection Sheet Pile Wall

If the southern connection sheet pile wall is installed it will be approximately 60 feet long, including embedment in the CELA Barrier Wall and overlap with the proposed S-B wall. Conceptually, it is expected that installation of the sheet pile wall will follow construction of the proposed S-B wall. The proposed S-B wall and sheet pile wall will overlap a minimum length of 10 feet (Station 0+50 to 0+60) and they will be in full contact over that distance with the sheet pile driven directly into the soil bentonite. At the CELA wall, the sheet pile will intersect the CELA S-B wall. The composite cap on the CELA (that extends beyond the CELA S-B wall) will be removed along the proposed alignment of the sheet pile wall and reconstructed following completion of the sheet pile installation. The S-B wall will be widened to approximately 4.0 ft in the area where sheet piling is used to connect to the CELA. Location and design of the sheet pile section at the CELA wall is shown on Sheet C-05.

The connection sheeting will have sealed joints. Adeka UltraSeal A-30 joint sealant, or equivalent, is specified. The use of Adeka sealant was added as an added precaution to minimize potential groundwater seepage though sheet pile joints. The only area where it will be used is at the connection between the existing slurry wall at the CELA and the proposed new slurry wall at the southern end of the slurry wall. Adeka sealant is applied to sheet pile joints prior to installation. The material is applied similar to caulk using a pointed tip applicator. The material swells when it comes in contact with groundwater. ARC has used Adeka sealant on several similar sheet pile installation projects where groundwater controls have been designed and constructed.

#### 2.2.2.2 Lower Drop Structure Sheet Pile Wall

As emphasized in a review comment from EPA on the Preliminary (35%) Remedial Design, the lower drop structure must be protected against damage and/or failure during sediment and soil excavation activities. The drop structure will be protected using hot-rolled PZC-13 sheet piles driven parallel with the drop structure and offset 2 ft downstream from it. The sheet pile will be driven to a bottom elevation of 1460.5 ft, and will extend up the west bank of the river, terminating just east of the proposed S-B wall alignment. The sheet pile is designed to maintain the passive resistance necessary to the support the drop structure during the excavation activities in the river. The sheet pile wall will also form the upstream limit of the proposed 4-foot deep river excavation and provide a subsurface barrier to water flowing into the excavation area from upstream. The sheet pile either will be cut off 12-inches below the surface of the streambed and closed-in-place after completion of sediment excavation or removed completely following backfilling. This decision will be left to the Remedial Contractor. Details of the Genesee River Remediation Plan are shown on Sheets C-10, C-11 and C-12.

#### 2.2.2.3 Midslope and Sidewall Sheet Piling

These sheet pile walls were described at length in the Revised FFS Report document, and represent new design elements for this 100% submittal. The midslope sheet pile is necessary to retain the south bank slope during the required excavation and replacement tasks that are to take place at the toe of the bank. The sheets will also provide part of the containment necessary to perform the river excavation (in conjunction with the river sheet piling described below). The midslope sheeting alignment will approximately follow the El. 1488 contour along the bank, from Stations 21+37 to 26+58 of the proposed S-B wall. The sheets will be hot-rolled PZC-13 sections, 32 ft long and will be driven flush with final grade at this elevation. The sheet pile is to be a cantilevered wall, and will likely be driven with equipment placed at the top of the bank. Details are shown on Sheet C-10, C-11, and C-12.

The sidewall sheeting adjacent to the midslope sheetpile will allow extension of the proposed S-B barrier wall located upslope into the river remediation area. As such, the sidewall sheeting will not retain earth, except when trenches are dug behind it to install the slurry wall.

The proposed S-B wall alignment (River Remediation Segment) will follow the alignment of the sidewall and midslope sheet piling, situated immediately behind (i.e., up slope) of them.

#### 2.2.2.4 River Sheet Piling

The proposed river sheet piling configuration is shown on Sheet C-10. The river sheeting, in conjunction with the midslope sheet pile, will form a "boxed-in" section around the perimeter of the proposed excavation area within the Genesee River. The river sheet piling will need to control the open portion of the river from flooding the excavation area and transporting sediments downstream. During normal flows, the river elevation will be low, and the only source of water into the excavation areas will be nominal seepage through the sheet pile joints. However, if a flood event occurs during construction, rising waters could overtop the sheet piles, allowing mixing and transport of contaminated excavation spoils into the river. To minimize this risk, the river sheeting will be extended to a top elevation of 1486.5 ft, which corresponds to approximately 6 feet above the normal river surface elevation. Details on how this elevation was selected are given in Section 2.6.2.1. River sheet pile will be cantilevered, hot-rolled PZC-12 (or equivalent) sections, with a total length of 20 ft. The river sheet pile will be removed completely following backfilling.

### 2.2.3 Removal and Reconstruction of CELA Cap at Connection Sheeting

Information contained in the Remedial Action Report for the Central Elevated Landfill Area (CELA) (GeoSyntec Consultants, December 1993) was utilized to determine the as-built configuration for the CELA at the connection to the proposed southern sheet pile wall. The most useful information in that document was Detail - 2 (G7) on Drawing AR-20 from Ebasco Services Incorporated (ESI), Revision 2 - 8/29/93 "As-Builts". Based on that detail, the existing slurry wall for the CELA is situated on the CELA side of the CELA drainage channel and the CELA cap geosynthetic components are terminated at the top of the opposite embankment for the drainage channel. The sheet pile wall proposed as part of the Phase II Remediation will be installed across an area currently covered by the CELA cap.

The cap components for the CELA outside the S-B wall consist of (from top to bottom), 6" of topsoil and 18" of common fill or 20" of rip rap on a 4" thick bedding; geotextile fabric; geomembrane; a geocomposite liner (GCL); and a second layer of geomembrane. The GCL stops at approximately the centerline of the perimeter channel around the CELA.

To facilitate construction of the sheet pile wall, the Contractor will field stake the proposed alignment of the wall. After representatives for ARC, USEPA and NYSDEC have reviewed the alignment, the Contractor will selectively remove each of the liner components within 15 feet on either side of the proposed alignment. The sheet pile wall will be installed along an alignment to be finalized in the field that will provide the 10 feet of intimate contact between the CELA slurry wall and the sheet pile wall. The top of the sheet pile wall will be cut flush with the subgrade for the CELA cap. After construction, the cap will be reconstructed. The total length of CELA cap to be disturbed is approximately 30 feet. A detail, including sequential notes, is provided on the design drawings and is shown on Sheets C-05 and C-09A.

## 2.3 Subsurface Water Management

Several of the components Subsurface Management System fall under OU2 Phase II-1, including the groundwater collection trench, treatment wetlands system, and associated conveyance piping. Detailed information for these components, is presented in the approved 100% submittal for OU2 Phase II-1. As part of the Intermediate (65%) Remedial Design, a hydrogeological evaluation was conducted using the existing Site subsurface water model (Parsons, 2004) to simulate subsurface water flow under proposed remedial strategies. Simulated design elements associated with the subsurface water flow modeling effort included:

- A Barrier Wall;
- A Barrier Wall combined with a Permeable Reactive Barrier;
- Subsurface water extraction wells; and
- An upgradient water diversion segment

The Phase II-1 remedy will include a subsurface water management system located along the bank of the Genesee River. The objectives of the Phase II Remedial Action include terminating subsurface water flow from the site to the Genesee River and Main Drainage Swale and to treat the water to existing discharge limits. The subsurface water management program will support Site remedial efforts by effectively controlling subsurface water upgradient of the river.

### 2.3.1 Groundwater Model Overview

During preparation of the Preliminary 35% Remedial Design, a subsurface water flow model was constructed to assess Site hydrogeological conditions. A discussion of the subsurface water flow model conceptualization, construction and calibration is provided in Appendix D of the Preliminary (35%) Design Report Phase II Remediation at OU2 (Parsons, October 2004).

During preparation of the 100% Design Report, ARC advised USEPA in March 2008 that the existing groundwater model would be updated to include enhancements regarding the domain size and input parameters to verify the existing model conditions and predictions. In particular, ARC was interested in evaluating discharge rates from the groundwater collection trench that was installed in 2007 as to sufficient treatment capacity of the Treatment Wetland System during long-term pumping. Also, it was necessary to update the model to depict the use of a continuous groundwater collection trench as a recovery option instead of the previously modeled recovery well scenario used in the 35% Design Report.

In June 2008, ARC presented the results of the enhanced groundwater model to USEPA. As a result of completing enhancements to the groundwater model, the following conclusions have been developed:

- The Genesee River valley is underlain with glacial drift and post glaciation alluvial deposits;
- The surrounding uplands are composed of sedimentary rocks (sandstone, shale, and limestone);
- Net glacial drift aquifer recharge from precipitation ranges from 3 to 7 inches per year (average 5 inches/year);
- Groundwater in flow from sedimentary rocks in upland areas is minimal and insignificant;
- Groundwater flows from the valley wall to the Genesee River with the following exceptions:

  - Drop structures in Genesee River create mounding from river and result in river recharge to the aquifer;
  - CELA slurry wall and cap in southern area of the site diverts groundwater flow;
- A groundwater deflection zone is produced near the southern end of the site as a result of drop structures, CELA slurry wall, modifications to former river channel and highly permeable sands and gravels;
- Three scenarios were modeled to evaluate pumping rates and flow conditions (Ambient conditions, Slurry Wall and pumping sumps A-H, No Slurry Wall and pumping sumps A-H, No Slurry Wall and pumping sumps A-F);
- All three remedial scenarios affect groundwater flow regime; and
- The most practical scenario to be considered viable that results in groundwater capture involves the No Slurry Wall and partial pumping of sumps A through F.

Results from modeling indicate that if the no slurry wall and partial sump pumping scenario is implemented, site groundwater is totally captured by hydraulic containment. Estimated groundwater withdrawal rates would range from 46 to 81 gpm in response to seasonal fluctuations.

As a result of these findings, ARC suggested to USEPA that the Barrier Wall portion of the remedial action be either deferred and/or eliminated pending performance monitoring. In addition, ARC has decided not to proceed with construction of the remaining surface flow wetlands (Cell No. 4) and vertical flow wetlands (Cell Nos., 1, 3, and 5). The remaining cells provide adequate flow capacity for treatment of groundwater from the groundwater collection trench. A detailed discussion of the modeling efforts is provided in Appendix 11.

### 2.3.2 Subsurface Water Management System

The subsurface water system consists of a subsurface groundwater collection water trench that has been installed to run parallel to the Genesee River along the same path as the originally proposed extraction wells. The groundwater collection trench and associated conveyance piping and controls were installed in 2007 and 2008. Eight (8) sumps have been installed along the trench alignment, and have been provided with pumps to extract groundwater collected by the trench. The location of the existing groundwater collection trench installed during Phase II-1 is shown on Sheet C-02. The primary objective of the Phase II-1 Remedial Design is to remove the bulk of subsurface water for treatment and maintain hydraulic control of subsurface water upgradient of the Genesee River. The use of groundwater extraction will achieve the overall remedial goal of eliminating migration of COIs to the Genesee River.

## 2.4 Surface and Upgradient Subsurface Water Control Measures (Eliminated)

The Phase II-2 remedy was intended to include surface and upgradient subsurface water control measures components. The surface and upgradient subsurface water control measures included the collection of surface and subsurface water originating from immediately adjacent to Brooklyn Avenue located near the southwestern portion of the Site. As a result of reviewing groundwater elevation data for a fourteen year period of time and reviewing historical topographic maps, which indicate the upgradient pond does not discharge to groundwater, it has been determined that the upgradient control measure is not required for successful implementation of the OU2 remedy. As a result, the surface and upgradient subsurface water control measures have been eliminated from the 100% Design (Revision 2).

## 2.5 Treatment Wetland System

The objectives of the Phase II Remedial Action include terminating subsurface water flow from the site to the Genesee River and Main Drainage Swale and treating the water to existing discharge limits. The Treatment Wetland System, designed as part of the Phase II-1 Remedial

Design, will support Site remedial efforts by effectively treating the water to existing discharge limits. Recovered subsurface water will be conveyed to the constructed wetland system and effluent will be discharged to the Main Drainage Swale. The construction and planting of the Treatment Wetland System was completed in August 2008. The Groundwater Extraction System and Wetland Treatment System became operational in December 2008. The location of the Treatment Wetland System area is shown on Sheet C-02.

## 2.6 Genesee River Soil/Sediment

### 2.6.1 Areas of Sediment Removal

Soil/sediment removal within the Genesee River is planned to address COIs at select locations in the river. Sediment removal will be performed in two distinct areas. These are referred to as the deep sediment removal area, and the surface sediment removal area. The Remedial Design anticipates that remedial activities within the Genesee River will proceed from upstream to downstream. Details of the Genesee River Remediation Plan are shown on Sheets C-10, C-11, and C-12. At this time, it is expected that soil/sediment removal in the Genesee River and bank soils area will occur in 2009.

#### 2.6.1.1 Deep Sediment Removal Area

Deep sediment removal is planned for the western half of the Genesee River bed from the lower drop structure to approximately 540 feet downstream, as illustrated on Sheets C-10 and C-11. Sediments within this area will be removed to a maximum depth of 4 feet, which translates to an elevation of approximately 1,476 feet above mean sea level. An estimated 4,300 cy of soil/sediment will be excavated from this area based on the horizontal excavation limits (Appendix 3).

#### 2.6.1.2 Surface Sediment Removal Area

Surface sediment will be removed from a portion of the river approximately 540 to 860 feet downstream of the lower drop structure – as shown on Sheets C-11 and C-12. The target removal depth for surface sediment is 6 inches. The removal is proposed where sheens were observed during previous characterization activities, although it is noted that sediment samples collected from this area were not above NYSDEC Sediment Screening Criteria (NYSDEC, 1999) for petroleum hydrocarbons and did not show evidence of NAPL based on field screening activities. Given the nature of the materials to be excavated (e.g. stones, cobbles, etc.), over-excavation of river sediments will likely occur. Assuming over-excavation, an estimated 700 cy of sediment will be excavated from this area based on a 1-foot excavation depth (Appendix 3).

### 2.6.2 Approach to Sediment Removal

The midslope, lower drop structure, and river sheet piling will be driven prior to beginning excavation activities in the river. The midslope sheeting will likely be driven by equipment placed at the top of the river bank. Access to drive the lower drop structure and river sheeting will require placement of temporary clean, granular fill in the river to create a working pad that is elevated over the normal water line. This material will likely need to be imported onto the site. Upon completion of pile driving, the working pad fill will be removed, and dewatering of the area within the sheet piles will be performed. Sediment excavation activities will then be performed under dry conditions, using traditional excavation equipment (excavators, dozers, etc). Permits for working within the Genesee River stream channel will be obtained prior to construction.

Excavated materials will be transported to the sediment dewatering area on the south end of the site via trucks or the Contractor may choose to use a solidification agent such as Portland cement to absorb free liquid and eliminate the dewatering step. The locations of the dewatering and stockpile areas are shown on Sheet-C-02B. The need for a solidification agent will be based on construction schedule and the sediment characteristics, such as particle size, water content, and sediment type. Dewatered or solidified sediments that are not determined to be suitable for use as structural fill, will be either disposed of in the CELA (nonhazardous) or characterized for off-

site disposal (hazardous) at a licensed disposal facility. The analytes for characterization will be as required by the disposal facility. Any materials to be removed from the site will be loaded into tarped and lined trucks for transport to the disposal facility. Shipping documents such as a bill of lading or manifest will be prepared for each load. Appropriate placards will be used.

Upon completion of sediment removal, a six-inch layer of AquaBlok® and geotextile will be placed on the surface of the excavated areas in the 4-foot river excavation and bank soils excavation areas (see Sheet C-11) prior to backfilling. AquaBlok® consists of bentonite coated granular material or stone that can be used as an impermeable barrier. Acceptance of AquaBlok® by USEPA on other project is provided in Appendix 9. All excavated areas will be restored with appropriate materials to approximate pre-excavation elevations in accordance with the Site Restoration Plan as detailed in Section 2.12. Details of the excavation and backfilling plan are shown on Sheet C-11.

#### 2.6.2.1 Flow Diversion

As stated previously, previous submittals included performance-based specifications for the flow diversion system in the river – leaving detailed design of the system to the Contractor. Comments on these submittals indicated that such performance-based specifications were considered unacceptable to USEPA and NYSDEC. Thus, as part of the 100% design, the design of sheet piling for flow diversion has been performed and is included in the plans (Sheets C-11 and C-12), as discussed in Section 2.2.2.

The river sheet piling must be driven with the top elevation several feet above the normal water line, in order to contain potential flooding that may occur during construction, prevent transport of contaminated sediments from the excavation downstream, protect workers, and to prevent construction delays. The design of the top elevation of the river sheeting was based on detailed hydraulic modeling and flooding characteristics of the Genesee River. Detailed review of historic flood data of the Genesee River was reviewed as part of the design evaluation, and it was determined that the period between June and September generally corresponds to low flow conditions in the river. Therefore, the Contractor is required to perform the river sediment remediation during these months. Statistical analysis of the historic data indicates that a flood

magnitude with a 3-year recurrence period within these months corresponds to a flow of roughly 3,800 cubic feet per second (cfs). Hydraulic modeling indicated that this flow corresponds to a water surface elevation of approximately 1486.5 ft (NGVD29). The majority of the top of the river sheet piling has thus been set one foot above at this elevation (El. 1487.5) to provide a minimum of 1-foot of freeboard. From 50-feet downstream of the lower drop structure to immediately downstream of the lower drop structure, the sheet piling is set one foot higher (El. 1488.5), to contain any hydraulic jump, froth or spillover that may occur due to uneven flows adjacent to and below the drop. Detailed calculations for the hydraulic design of the diversion system are provided in Appendix 3.

In addition, the NYSDEC requires that the temporary sheet pile wall comply with the "Criteria for Temporary Projects in 100-Year Floodplains". The hydraulic analysis for the basis of design of the temporary sheet pile wall cofferdam shows that the wall minimizes impacts to surrounding properties; to the extent that is economically and practicably possible. Because the work in the river is necessary for the remediation of contaminated soils, use of the temporary sheet pile wall is the most practical and economic alternative. Other options either increase the flooding in the area (dikes/berms) and are more expensive and take longer to construct; or do not protect the excavation area (shorter wall). The temporary sheet pile wall can be installed in segments to reduce the increased water surface elevations it causes. The potential increases due to the installation of the temporary sheet pile wall are summarized in Table 1 of the Addendum to the Investigation and Hydraulic Analysis of the Genesee River Remediation Sheet Pile Wall Design. There are a total of 26 potentially insurable structures (25 west bank/1 east bank) in the Genesee River 100-year floodplain that may experience increase flooding depths and velocities due to the temporary sheet pile wall. All affected property owners, community officials, the Chief Administrative Officer of the affected communities, and the Regional Permit Administrator will be informed of this condition prior to the temporary sheet pile wall being constructed.

In addition to the river diversion, the specifications require the Contractor to closely monitor weather conditions during the river remediation, and to evacuate personnel and equipment from the work areas if heavy storms or floods are predicted. Upon completion of sediment excavation and backfilling, the river sheetpile will be removed. Details of the Genesee River Remediation Plan are shown on Sheets C-10, C-11, and C-12.

### 2.6.3 Sediment Management

Staging areas, sediment dewatering areas and dewatered sediment storage areas have been identified and appropriate features have been designed, to manage dewatering operations. Due to site constraints these areas are generally located on the south side of the facility. (Sheets C-02 and C-02B). Surface water quality will be monitored as appropriate during excavation. Daily background turbidity readings will be taken approximately 200 feet downstream of the sheet pile enclosed work area, prior to start of construction activities each day. Timely readings will be taken during excavation each day to monitor stream conditions. If turbidity results exceed the background turbidity values, then silt curtains or sediment booms will be placed in the river channel downgradient of work areas. Procedures for managing turbidity are provided in Appendix 4.

## 2.7 Main Drainage Swale Restoration

Soil and sediment excavation within the Main Drainage Swale is planned and included in this design. Excavation work in the Main Drainage Swale will occur in 2009. The swale remedy is divided into two components:

- The first component is excavation of sediments; and
- The second component is excavation of soils within the swale embankment.

### 2.7.1 Sediment Removal

The removal of sediment is planned from an area within the Main Drainage Swale that corresponds to stations STA-4 through STA-12, (as suggested in USEPA's letter dated March 11, 2004 – Comments to Main Drainage Swale Investigation Report). The extent of excavation presented herein was established based on findings reported in the *Main Drainage Swale Investigation Report* (Parsons, November 2003), and subsequent *Pre-Design Field*

*Investigation Report* (Parsons, August 2004), *and Preliminary (35%) Remedial Design Report* (Parsons, August 2004).

The physical and chemical properties of the swale have been characterized. A 1-foot layer of organic sediments overlies a sand and gravel material (former riverbed). Numerous surface sediment (0 to 6-inch) and boring samples (1 to 2-foot interval and deeper) were collected and analyzed during previous investigations. Surface sediment and soil boring analytical data, including depth intervals, are illustrated on Sheet C-13. The sediment removal areas are illustrated Sheets C-13, C-14A, and C-14B.

Horizontal excavation limits were established based on the wetland delineation conducted by Parsons in October of 2001 and the surface sediment samples collected during the Main Drainage Swale Investigation. The excavation will extend to the limits of the delineated wetland boundary with an excavation depth of 1-foot. Based on a 1-foot excavation depth, the volume of sediment removal will be approximately 2,500 cy (Appendix 3).

Prior to sediment excavation, water in the Main Drainage Swale may be removed by draining or pumping to improve sediment properties for material handling. Surface water from upgradient sources will be diverted during excavation to minimize water entering the sediment removal area, if necessary. Temporary surface water control measures will also be installed near the mouth of the swale to prevent water from back flowing from the Genesee River into the excavation area. These control measures will be removed once the excavation and construction activities are completed. Excavation activities will proceed from upstream to downstream, with segments of the swale being divided into individual isolated active excavation areas.

Excavated sediment will be managed in the same manner as the Genesee River sediment. Sediment removal is expected to be performed using hydraulic excavator(s). Upon completion of excavation, disturbed areas will be restored with appropriate materials to approximate pre-excavation elevations in accordance with the Site Restoration Plan as detailed in Section 2.12.

### 2.7.2 Soil Removal in Swale Area

Soil removal will be conducted in the vicinity of test pit STP-11, 12, 13 and STP-5, as illustrated on Drawing C-14. Test pit STP-12 was excavated along the west bank of the Main Drainage Swale during the Pre-Design Investigation. Field observations during STP-12 excavation indicated that soils in this area contained residual COIs. In order to address this area, the excavations have been conservatively extended to include the entire area between STP-11 and STP-13. Soil removal will also occur in the vicinity of test pit STP-5.

Excavation limits are described as parallel to the embankment slope for soils in the area between STP-11 and STP-13 and extend horizontally from the toe of slope to an approximate elevation of 1,491 feet above mean sea level. This elevation was selected assuming the water table is at an approximate elevation of 1,487 feet and excavation will occur immediately above and/or below the water table. The excavation will extend vertically to elevation 1,486 feet, or approximately one foot below the swale bottom. Excavation limits are parallel to the embankment slope for soils adjacent to STP-5 and extend horizontally from the toe of slope to an approximate elevation of 1,493 feet above mean sea level. Excavation limits perpendicular to the embankment slope extend half the distance to test pits STP-7 and STP-2 (for the excavation at test pit STP-5 location), and the whole distance between test pits STP-11 and STP-13 (for the excavation at test pit STP-12 location). The STP-5 excavation will extend vertically to elevation 1,489 feet, or approximately one foot below the swale bottom. An estimated 260 cy and 250 cy of soil will be excavated from the swale embankment in the vicinity of STP-5 and STP-12, respectively. Details describing excavation procedures are shown on Sheets C-14A and C-14B.

Excavated soils will be managed with sediments removed from the swale. Soil removal is expected to be performed using excavator(s). Upon completion of excavation, the area will be backfilled with imported material and restored in accordance with the Site Restoration Plan, as detailed in Section 2.12.

## 2.8 Bank Soils

Bank soils located east of the proposed midslope sheet pile wall and within the river remediation area will be excavated and replaced with clean fill, as approved in the Revised Focused

Feasibility Study. Excavation work in the bank soils area will occur in 2009 following installation of the permanent midslope sheet pile. This excavation addresses potential contamination of existing bank soils in this area. The depth of removal will match that proposed for the deep sediment removal area - e.g. removal to approximate El. 1476. An estimated 3,300 CY of bank soils will be removed and replaced with clean fill. A 6-inch thick layer of AquaBlok® and geotextile will be placed on the surface of the final excavation depth prior to backfilling. The mid slope sheet pile will support the excavation activities in this area, and the excavation will be performed in conjunction with the river remediation. Soils will be handled in the same manner as river sediments. Details are shown on Sheets C-10 and C-11.

## 2.9 Site Preparation

Prior to beginning excavation activities and other intrusive work, the Underground Facilities Protective Organization (UFPO; New York State's utility one-call system), Site tenants, local municipalities will be contacted to identify and mark existing (known) Site utilities. The approximate locations of overhead and underground utilities, based on historical records and field reconnaissance, are illustrated on Sheets C-03. Coordination with local utility companies will be necessary to identify and protect existing utilities and Site workers, particularly if a utility requires shielding, de-energizing, and/or rerouting. Additionally, storm water/erosion and sediment control structures, as described in Section 2.9, will be erected prior to beginning work at the Site, as appropriate. Temporary facilities, such as construction/contractor trailers, utilities, decontamination pad(s), and staging areas will be installed as necessary to complete the work. A combination of permanent and temporary fencing will be utilized to provide security for activities at the Site.

A majority of the Site is sparsely vegetated except for areas adjacent to the recreational (WAG) trail along the Genesee River. Vegetated areas of the Site where actions are planned will be cleared of trees, shrubs, and other vegetation as needed to conduct the Remedial Action (both Phase II-1 and Phase II-2 actions). Respective property owners, as identified in Section 2.12.2, were contacted and access granted prior to the initiation of Phase II-1 activities. Salvageable woody material will be cut into manageable pieces and stockpiled on-site for general use or chipped along with the non-salvageable woody material. Non-salvageable woody material will

be chipped, if needed, and stockpiled on-site for reuse (e.g., mulch or organic substrate for wetlands). Below-grade portions of woody vegetation will be chipped / ground, if needed, and managed with chipped material from the aboveground portions.

A portion of the WAG Trail was temporarily closed by Allegany Trails to accommodate the remedial activities along the river. After restoration activities are completed, access to that portion of the WAG Trail will be re-established.

## 2.10 Storm Water/Erosion and Sediment Control

The remedial activities at the Site will require that erosion and sediment control measures be implemented. The Contractor will be required to meet the requirements set forth in Specification 02115 and the New York Guidelines for Urban Erosion and Sediment Control (NYSDEC, 1997). Proposed storm water and erosion control features are shown on Sheets C-02A, C-02B, and C-02C.

Storm water/erosion and sediment control measures will be of particular importance during remediation of the river and swale. Storm water/erosion and sediment control structures will be maintained as necessary throughout the project.

### 2.10.1 General Site Preparation

Temporary storm water/erosion and sediment control may consist of silt fencing and curtains, construction entrances, hay bales, diversion channels, etc. to prevent significant soil or sediment erosion from the Site. Temporary gravel construction entrances/exits will be installed as necessary, and decontamination pad(s) for decontamination of Remedial Action vehicles (excluding trucks for off-site transport) exiting the exclusion zone will be constructed at the Site. A soil stockpiling and materials handling area will be constructed as shown on Sheet C-02B. Sediment traps will be installed at the Site, to protect existing storm drainage features, including the swale and river. Storm water contact with exposed materials will be minimized to the extent practical. Adequate dust control measures will be taken, which will include sprinkling water

when excessive dust is generated. Idled utilities along the Barrier Wall alignment will be located, disconnected, and sealed prior to Barrier Wall construction. Active utilities will be temporarily relocated and then reinstalled after remedial construction activities are completed. Soil management plans are shown on Sheets C-02A, C-02B, and C-02C.

### 2.10.2 Barrier Wall Installation (Deferred/Eliminated)

Adequate erosion and sediment control measures will be implemented during construction of the Barrier Wall (S-B/sheet pile wall). Precipitation falling on the construction zone of the S-B wall alignment will be managed by silt fences on either side of the Barrier Wall work zone. Temporary diversions and, if necessary, pumping will be used to prevent surface water runoff from entering the construction zone. Soil utilized for remediation may be segregated from soils not designated for remediation uses, and will be stockpiled in an on-site soil staging area to facilitate dewatering. Water collected during this process will be allowed to infiltrate into the work area or will be conveyed to the Treatment Wetland System.

### 2.10.3 Genesee River and Main Drainage Swale Excavation

Protective barriers will be established for protection of the public and workers. The work area and/or the Site will be secured should flooding occur in the river. Check dams will be installed across the downstream end of the Main Drainage Swale for erosion control. Storm water and surface water from upgradient locations will also be controlled to prevent potential sediment migration. Location of check dams are shown on Sheet C-14. The river sheet piling will act as erosion control in the river remediation area, and turbidity monitoring of the river downstream will be implemented, as described in Section 2.6.

### 2.10.4 Stormwater Management

Temporary storm water management measures will be provided as part of the materials handling areas, as detailed on Sheet C-02C. Such measures have been designed to accommodate a 2-year 24-hour rainfall event.

## 2.11 Storage, Disposal and Reuse of Spoils

This remedial action addresses refinery impacted soils and sediment from the Bank Soils Area, Genesee River, Main Drainage Swale and Spoils from installing the Subsurface Water Management System and Barrier Wall. It is anticipated that these spoils are not hazardous. The sediment and soils that are encountered may be used on site as a fill for drainage areas and soil cover on the CELA, if geotechnically suitable and chemically acceptable per project specifications.

### 2.11.1 Stockpiling of Spoils

As shown on Sheet C-02B, the Contractor will be required to construct and maintain stockpiles to temporarily manage excavated materials and sediments, prior to disposal. These stockpiles will be located at the south end of the site. Separate stockpiles will be created to segregate materials that may be suitable for re-use in the various site features, and materials that are unsuitable for re-use. Appropriate soil and erosion control features have been detailed for the stockpiles, as discussed in the previous section. Stockpiles shown on the plans have been sized to accommodate the volume of spoils that is expected to be generated over a single construction season.

### 2.11.2 Transport of Spoils

Limited work space across the site will require the Contractor to continuously truck spoils from active excavation areas to the stockpiles at the south end of the site. A generalized layout of construction access/haul roads has been designed and is shown on Sheets C-02A and C-02B.

The system has been designed to allow two-way truck traffic to occur in most all areas of the site. The layout was created to verify that efficient trucking could occur on site within the space allotted. The Contractor may change the haul road layout and patterns, to suit his needs, but is required to stay within the work limits shown on the drawings.

### 2.11.3 Disposal of Spoils

Excavated materials that are determined to be either hazardous or nonhazardous and unsuitable for re-use on the site will be:

- Properly disposed at a licensed off-site facility (hazardous); or
- Placed in the CELA in a manner acceptable to USEPA and NYSDEC (nonhazardous).

Originally, excavation spoils unsuitable for re-use on the site were planned to be placed on-site as fill underneath the treatment wetland system. Due to the division of the OU2 project into two phases, the wetlands construction has been completed and soil use as fill beneath the wetlands was limited. The volume of excavation spoils that will need to be managed is estimated to be approximately 20,000 CY and includes spoil that remains on site from excavation of the subsurface groundwater collection trench in addition to the spoil that will be generated during sediment excavation, bank soil excavation and excess from access roads and general site work. An additional 15,000 CY of spoil may be generated if the soil-bentonite barrier wall is constructed, thus a total possible quantity of spoil to be disposed is 35,000 CY. Options for either off-site disposal or on-site management of these spoils have been incorporated into the design. Each of the two alternatives for the spoils are described in the following subsections.

#### 2.11.3.1 Off-Site Disposal

Excavated materials that are determined to be hazardous and unsuitable for re-use on the site and are not managed on-site as described in Section 2.11.3.2 will be characterized for off-site

disposal. The analytes for characterization will be as required by the disposal facility. The materials will be loaded into tarped and lined trucks for transport to the disposal facility. Shipping documents such as a bill of lading or manifest will be prepared for each load. Appropriate placards will be used.

#### 2.11.3.2 On-Site Disposal

Excavated materials (non-hazardous) that are determined to be unsuitable for re-use on the site and are not disposed off-site as described in Section 2.11.3.1 will be placed on the CELA. Reuse concepts are described in Section 3. Appendix 10 presents proposed design concepts and grading plans. The restoration of the CELA is presented in Appendix 12, including revegetation and trail enhancements for reuse.

### 2.11.4 Reuse of Spoils

Excavated materials that are determined to be suitable for reuse on the site may be used in the following ways:

- Constructing additional wetland cells;
- General fill and grading of surface drainage features; and
- Cover soils in the new CELA cap system.

All spoils that are used on site will be suitable from a geotechnical standpoint and acceptable for surface use based on analytical data. Procedures for determining suitability of spoils are described in the project specifications (Appendix 4, Specification 02210).

## 2.12 Site Restoration Plan

The objective of the restoration is to return the Site to existing (pre-remedial) conditions, as appropriate, after the implementation of the remedy. In particular, several areas such as the Swale and CELA will receive additional ecological enhancements during restoration. As appropriate, some ecological enhancements may be addressed as part of the restoration effort.

All contemplated activities will be finished below the existing Site grades (except for the Treatment Wetland System). The materials excavated during the Remedial Action will be replaced with materials exhibiting properties similar to natural/native materials at the Site, and the Site will be restored to existing (pre-remedial) elevations. Additionally, any disturbance to previously improved areas (e.g., SUNY, Allegany Trails, etc.) because of Remedial Action activities will be restored by replacing paved and/or vegetated areas to existing (pre-remedial) conditions.

The restoration plan is presented in detail in Appendix 12. The majority of restoration efforts will be performed during Phase II-2. Pertinent features of the restoration are presented herein.

The restoration activities address requirements under Section 404 of the Clean Water Act and New York State Environmental Conservation Law (ECL), Article 15 *Protection of Waters* and ECL Article 24 *Freshwater Wetlands*, and are intended to meet the substantive requirement of 6 New York Code of Rules and Regulations (NYCRR) Part 608 and 6 NYCRR Part 663. Water quality standards and criteria of 6 NYCRR Parts 700-704 will also apply during construction. Permits for remediation of a Superfund Site are not mandatory; however, substantive requirements of the regulations are intended to be met.

The overall goal of the Site Restoration Plan will be to revitalize the ecological habitat of the disturbed areas and riparian corridor of the Genesee River with native plant species. A listing of plant species intended for use is provided in Specification 02935 (trees and shrubs) and Specification 02939 (swale). ARC has solicited input from NYSDEC wildlife biologists regarding plant species selected for planting. In June 2008, Ms. Rebecca Quail from NYSDEC Bureau of Habitat approved the plant species lists that were provide for site restoration of disturbed areas and the riparian corridor. Additional details of the Site Restoration Plan and the planting list can be found in Appendix 12.

The Operation and Maintenance Plan will include provisions for maintaining the vegetation in the restored areas. The use of goose and duck control measures will be considered to protect the wetland plantings until they are established.

### 2.12.1 Soil-Bentonite Wall (Deferred/Eliminated)

The work zone along the alignment of the S-B wall will be restored to meet specifications of the existing WAG Trail. This will include restoration of the WAG trail per specifications provided by WAG. The area on either side of the WAG trail will be restored with vegetation.

In addition, staging and work area(s) related to the S-B wall (i.e., for excavation spoils, slurry mixing tanks/ponds, soil stockpiles, backfill mixing areas, material storage, and equipment storage) and the adjacent areas disturbed due to remedial activity will be restored with vegetation.

All the above-areas will be graded to approximate original (pre-remedial) surface elevations.

### 2.12.2 Genesee River and Bank Soils Area

Remedial activity in the Genesee River includes excavation of sediments and soils in deep sediment removal areas (4-foot excavation depth) and surface sediment removal area (6-inch to one foot excavation depth), as detailed on Sheet C-10 and C-11. Following remedial activity, restoration will be completed. In the deep sediment removal area, and bank soils areas, a six-inch thick layer of AquaBlok® and geotextile will be placed in the bottom of the excavation. The bottom of the excavation will be smooth graded. Upon installation of AquaBlok®, the excavation will be backfilled with non-plastic sand and gravel material. The material will be placed above the AquaBlok® in layers and compacted to 24 inches below the original river bed elevations. Eighteen inches of NYSDOT Medium Stone Filling ($d_{50}$=12 inch) stone (see Appendix 3 for Calculations) will then be placed above the granular fill to approximately 6-inches below pre-remedial elevations. Approximately 6-inches of NYSDOT Fine Stone Filling will then be placed above the NYSDOT Medium Stone Filling to meet the pre-remediation riverbed elevation. Voids in the NYSDOT Medium Stone Filling shall be infilled to the extent possible with granular backfill. In the surface sediment removal area, 6-inch stone, infilled with granular backfill, will replace the excavated sediments/soils. The surface of the Genesee River will be restored to existing (pre-remedial) elevations. Based on historical plans, existing rip-rap materials (2 to 3 ft thickness) exist below the lower drop structure. These materials will be

temporarily removed to allow for construction activities, and then replaced in the original configuration. In these areas, the thickness of the granular fill layer above the AquaBlok® will be smaller, to accommodate the larger thickness of rip-rap.

Construction of the river remediation segment of the S-B barrier wall (if required), the midslope and sidewall sheeting, and the bank excavations will require temporary removal of existing rip-rap that is installed along the bank in this area. As previously noted, the S-B barrier wall portion of the river remediation segment will either be deferred or eliminated pending performance monitoring. The rip-rap will be stockpiled and then replaced in the original configuration after construction is completed. Soils above the existing riverbed that are excavated from the bank of the Genesee River in the remediation area will be replaced with clean, compacted fill. Soils excavated from below the existing river bed will be restored in the same manner as described above for the deep sediment removal area.

Diversion sheet piling placed in the Genesee River before commencement of the remedial activity will be removed upon completion of backfilling. Removed portions of sheet pile or other structures will be properly disposed. Details of the Genesee River Remediation Plan are shown on Sheets C-10, C-11, and C-12.

### 2.12.3 Main Drainage Swale

The Main Drainage Swale will be restored using native grass species. The surface of the swale will be graded to existing (pre-remedial) surface elevations and vegetated with wetland plants. See Specification Section 02939 for proposed plant species .

At locations STP-12 and STP-5, excavations will be restored with granular fill, topsoil and seed mix. Granular fill of non-plastic sand and gravel material will be placed in layers and compacted to 6-inches below the original elevations. 6-inches of topsoil and mulch will be installed to vegetate the area. Details of the Main Drainage Swale Remediation Plan are shown on Sheets C-13, C-14A, and C-14B.

## 2.13 Institutional Controls

Institutional and engineering controls are contemplated at the Site. ARC will coordinate appropriate controls with the current property owners. However, implementation of controls is at the discretion of the property owners. In the event that an individual property owner declines to participate in this process, ARC will notify the USEPA and seek their assistance on this issue. Institutional controls include deed restrictions which prevent/manage future subsurface alterations, restrict residential use of the property and restrict withdrawal of subsurface water. Other controls may also be sought by ARC. Engineering controls include slab on grade building construction and maintenance of the components of the remedy.

## 2.14 Notification Requirements and Property Access

### 2.14.1 Notification Requirements

In accordance with 6 NYCRR §375-1.7 (Permitting Remedial Activities) and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), project-specific permit applications will not be required. ARC will facilitate substantive compliance with regulatory programs under the jurisdictional authority of federal and state agencies, which may include the following:

- Storm water Management & Erosion Control Plan – General Permit (USEPA, NYSDEC Division of Water);
- NYSDOT Right-of-Way Occupancy;
- NPDES Permit (or existing treatment standards established for the treatment of subsurface water) ;
- General Process Emission Sources (6 NYCRR Part 212.4) for air emissions;
- 6 NYCRR Part 608 Use and Protection of Waters;
- Village/Town of Wellsville Building Permit (including permits for plumbing, electrical, etc.);

- Construction Trade Permits (e.g., Dig Safely, plumbing);
- Nationwide Permit 38 (Section 404 Clean Water Act) Joint Application for Permit;
- 401 Water Quality Certification;
- United States Fish and Wildlife – request for Authorization Letter;
- NYSDEC Fish, Wildlife & Marine Resources – request for Authorization Letter;
- State Historic Preservation Office (SHPO) – request for Authorization Letter;
- United States Army Corps of Engineers; and
- Use of State Maintained Flood Control Land.

### 2.14.2 Property Access Needs

Implementation of the design activities will require coordination with some or all of the property owners listed below.

- Allegany County;
- Allegany Trails;
- Allegany County Industrial Development Agency;
- Village of Wellsville;
- Town of Wellsville;
- Educational Foundation of Alfred;
- National Fuel Gas District Company; and
- Current Controls, Inc.

Sheet C-01 illustrates the approximate property boundaries of the current property owners at the Site. ARC has coordinated with the property owners and obtained approvals or access agreements, as required, so that work may proceed in a timely manner.

# *3.0 CELA Reuse Spoil Disposal Area*

A portion of the existing CELA will be used for the on-site disposal of spoils that are generated during completion of the Phase II-1 and Phase II-2 remedy. Two disposal options have been presented as part of the design in order to accommodate expected spoil quantities.

Option 1 allows for the disposal of approximately 20,000 cubic yards of spoils material. This corresponds to the estimated spoil located in an existing onsite spoil stockpile (generated during Phase II-1 construction activities) as well as all spoil generated during river, bank and swale remediation activities during Phase II-2. Option 1 does not include spoils generated from the S-B Barrier Wall construction.

Option 2 allows for the disposal of all expected spoils material located in the existing onsite soil stockpile, all spoil generated during sediment removal in the river and swale, bank soils removal, and all spoil generated during the S-B Barrier Wall construction (if required). Option 2 allows for the disposal of approximately 35,000 cubic yards of spoils material.

While actual spoil volumes generated will vary during completion of the Phase II-1 and Phase II-2 remedy, the proposed options aim to provide the maximum required spoil volumes anticipated based on conservative estimates.

The decision as to whether the S-B Barrier Wall will be constructed or deferred will be made after completion of the PBGM program (See Section 4). Based on this decision, either Option 1 (20,000 CY) or Option 2 (35,000 CY) will be selected for construction. Since this decision is anticipated to be made during the 2009 construction season, construction of the CELA Reuse Disposal Area is currently anticipated to be performed in 2010.

A conceptual design for the CELA Reuse Disposal Area was included in the response to EPA Comments submitted on September 25, 2008. This concept was accepted by EPA in a letter to ARC dated January 29, 2009. Since the time of the original submittal, ARC has re-evaluated and enhanced the design of the Disposal Area, and is submitting these enhancements herein for approval.

The following design enhancements have been included in the current design of the CELA Reuse Disposal Area:

- The footprint of the proposed spoil area has been reduced to 3 acres for Option 1 and 4 acres for Option 2. The original concept for either option resulted in a footprint area of approximately 6 acres. The reduced footprint enables a more efficient design while ensuring that all spoil will be placed within the limits of the existing perimeter slurry wall and cap system.
- The current design utilizes the existing geosynthetic cap system as the base liner system for the placement of spoil material. An additional base liner system is not required since a perimeter geomembrane liner flap will be welded to the existing geomembrane cap to contain water within the spoils area. Any collected water will be conveyed via the perimeter water collection system into the existing CELA landfill material.
- The proposed geomembrane for the perimeter water collection system and capping system is textured low density polyethylene (LLDPE). LLDPE is the preferred geomembrane capping material due to its durability, flexibility and chemical resistance. The very low density polyethylene (VLDPE) geomembrane used in the existing CELA cap is not currently manufactured for capping applications. Rather, LLDPE geomembranes are the current industry standard.

This enhanced design provides several long-term benefits including reduced maintenance, improved surface water management, reduction of off-site disposal of materials thus reducing truck traffic and related environmental impacts, and a long-term recreational reuse of the CELA landfill.

The continuing sections describe the currently proposed design of the CELA Reuse Disposal Area and the implementation of spoils disposal at the CELA.

## 3.1 Disposal Area General Description

The northern area of the existing CELA will be used as the proposed spoil reuse disposal area. The proposed area covers approximately 3 acres if disposing up to 20,000 cubic yards (Option 1)

or 4 acres if disposing up to 35,000 cubic yards (Option 2). The northern area was selected for reuse in order to provide a location that is situated close to the spoil sources and has suitable space for additional fill placement. The surface elevation of the spoil reuse disposal area have been designed to generally blend into the existing CELA surface. The area proposed for fill is contained within the limits of the existing slurry wall and cap system. Drawings illustrating the proposed options, including site plans, general cross sections, and details are contained in Appendix 10.

Restoration of the CELA incorporates ecological enhancements and will facilitate recreational use, while providing an opportunity to reduce long-term operation and maintenance of existing perimeter drainage ditches and cover mowing. Drawings illustrating the proposed restoration of the CELA are located in Appendix 12.

## 3.2 Design of CELA Reuse Disposal Area

In order to avoid any impact to the existing CELA, this project does not propose to re-open the facility, but to construct a separate disposal unit for the spoil material above a portion of the existing CELA. The proposed disposal area on the CELA will be maintained within the limits of the existing slurry wall and cap. The following sections describe the key components of the CELA reuse disposal area, including the excavation and water collection system, spoil placement, and cap system. A sequence of construction for Options 1 and 2 is provided on the design drawings contained in Appendix 10.

### 3.2.1 Excavation and Water Collection System

The limits of the proposed disposal area will be delineated and surveyed based on the selected option. Erosion and sediment controls will be installed. Prior to placement of spoil, the top 12-inches of existing cover soil (consisting of 6-inches of topsoil and 6-inches of common fill) will be removed within the spoil placement area and will be segregated and stockpiled for future reuse. The top 12-inches of soil cover over the existing CELA geosynthetic cap will remain under the entire spoil placement area except in the perimeter water collection system area. The

geosynthetics of the existing CELA cap will remain intact and serve as the liner beneath the new spoils disposal area.

A water collection trench will be excavated along the entire perimeter of spoil placement, removing the 24-inch thick existing CELA cover soil and exposing the existing geosynthetic cap materials. Excavation will be conducted with caution to expose the existing geosynthetic cap materials without damaging them. Before installing the water collection system, a new geomembrane flap will be welded to the existing cap system geomembrane. The existing CELA cap system geomembrane and perimeter geomembrane flap will provide a continuous lined containment area for the placement of spoil material.

Perforated HDPE water collection pipe surrounded by free-draining aggregate material will be installed in the perimeter water collection trench along the inside of the geomembrane flap. Water drains will be constructed in low points around the perimeter of spoil placement. The water drains will consist of a perforated HDPE pipe section installed vertically through the existing CELA cap system. The water drains will be fitted with a typical HDPE pipe boot which will be extrusion welded to the geomembrane. The pipe section will be filled with aggregate to allow collected water to percolate into the existing CELA landfill material.

The aforementioned water collection system and vertical water drains are meant to collect any residual free water that exists within the spoil material after placement in the disposal area. Water will be collected by the existing CELA cap system geocomposite drainage layer, discharged into to the perimeter water collection piping, and directed to the nearest perimeter water drain, where the water will be discharged through the existing CELA cap system and into the existing landfill material below. It should be noted that the entire spoil unit will be covered with a geosynthetic cap system, as described in Section 3.2.3. Once constructed, the cap system will prevent additional water from infiltrating into the spoil material.

### 3.2.2 Spoil Placement

Once the perimeter water collection system is constructed, spoil materials will be placed. The remaining 12-inch thick common fill layer over the existing CELA cap will become the sub-base

for spoil placement and provide protection of the existing cap system geosynthetics. Spoil materials will be placed to elevations not exceeding those presented on the design drawings (Refer to Appendix 10). If Option 1 is constructed (20,000 CY) it is anticipated that the peak elevation of the CELA will be increased by approximately 8 feet when compared to existing grades. If the maximum 35,000 cubic yards of spoil material is placed (Option 2), it is anticipated that the peak elevation of the CELA will be increased by approximately 10 feet when compared to existing grades. Elevations will be adjusted based on actual spoil quantities generated during construction.

Spoils will be placed with a maximum slope of 8:1 (H:V) to provide a gentle slope that allows for future recreational activity in accordance with the Site Restoration Plan (See Appendix 12). Spoils will be placed at a minimum slope of 20:1 (H:V) grade in order to promote positive drainage off of the cap system. Spoils will be placed in controlled lifts and will be compacted prior to placement of the final cap system.

### 3.2.3 Cap System

Upon completion of spoil placement, a cap similar to the existing CELA cap will be constructed to provide complete containment of the CELA Reuse Disposal Area. The proposed cap system will consist of (from bottom to top) a geosynthetic clay liner (GCL), textured LLDPE geomembrane, geocomposite drainage layer, 18-inches of common fill and 6-inches of topsoil. The GCL, textured LLDPE geomembrane and geocomposite drainage layer will be terminated into an anchor trench at the perimeter of spoil placement. The perimeter anchor trench used to terminate the cap geosynthetics will be backfilled with aggregate material to allow subsurface drainage from the proposed cap system geocomposite drainage layer to connect directly to the existing CELA cap drainage system. The common fill and topsoil that was excavated from the cap system prior to spoil placement will be reused as part of the proposed cap system cover soil. Additional soils for completion of the cap cover soil will be obtained from offsite borrow sources.

All existing gas vents within the spoil placement area must be extended vertically through the spoil material and proposed cap system. The extension of gas vents through the proposed cap

system geosynthetics will be accomplished utilizing a typical geomembrane pipe boot penetration. Refer to the design details located in Appendix 10. Technical Specifications for components of the CELA Reuse Disposal Area are provided in Appendix 4.

### 3.3 Long-Term Reuse

It is proposed that the CELA will be developed as a recreational area. The new spoil area will be graded to facilitate access from the WAG Trail. The surface will be vegetated with low maintenance grasses, and wild flowers, and bird houses and hiking trails will be installed. The design for layout of access paths and recreational use is presented in the Restoration Plan (Appendix 12).

# *4.0 Performance-Based Groundwater Monitoring*

In order to assess the performance of the groundwater interceptor trench as an effective means to capture impacted groundwater from the refinery site, the groundwater elevations in the collection trench, surrounding geologic strata and surface water in the Genesee River will be monitored. Results obtained from the updated groundwater model indicate that capture of groundwater should occur as a result of partial pumping of sumps A through F that are located within the existing groundwater collection trench system.

As approved by USEPA in correspondence dated Janaury 29, 2009, ARC will implement Short-Term and Long-Term PBGM Programs. The intent of both programs will be to evaluate groundwater elevation data in the surrounding alluvial valley aquifer and compare the data to the groundwater elevation data in the groundwater collection trench, and surface water in the Genesee River and Main Drainage Swale to demonstrate groundwater capture onsite. A detailed Work Plan describing the approach for PBGM along with system optimization/start up procedures, number of piezometers in the Point of Demonstration (POD) network, monitoring locations, data collection activities and monitoring frequency is included as Appendix 13 to the 100% Design Report.

## 4.1 Baseline Sitewide Groundwater and Surface Water Elevation Determination

The baseline conditions for site-wide groundwater and river surface water elevation for the Genesee River will be established prior to system startup. This baseline database will be used to evaluate all future performance evaluation events to determine if hydraulic control is achieved.

In order to assess surface water elevations additional river gauging stations will be maintained at 13 locations. The surface water gauging locations will consist of the following areas :

- Upgradient of the CELA;
- Adjacent to the drop structure near south end of Main Drainage Swale;
- Adjacent to the drop structure near north end of Main Drainage Swale; and
- North of the Main Drainage Swale.

The groundwater POD locations will consist of pre-existing and recent monitoring wells/piezometers located located upgradient and downgradient of the groundwater collection trench. River water elevation data and site-wide groundwater elevation data will be collected from these new gauging stations twice prior to system start up and monthly during the first year of operation.

## 4.2 Performance Criteria

The overall remedial goal for the Former Sinclair Refinery OU-2 is to collect and treat groundwater to MCLs and to prevent contamination from migrating off-site into the Genesee River. The groundwater collection trench has been installed in such a fashion as to intercept groundwater flow and hydraulically control of groundwater prior to discharge to the Genesee River. The performance criteria for evaluating operation of the groundwater collection system will be the following:

- A groundwater divide between the groundwater collection trench and the Genesee River/Main Drainage Swale will be maintained and hydraulic control of groundwater will be maintained.

In order to evaluate the performance of the groundwater collection trench as an effective means to capture groundwater flow from the site before reaching the Genesee River/MainDrainage Swale, it will be necessary to collect water level measurements from five zones along this interface. These zones include the following:

- Genesee River;
- Main Drainage Swale;
- Between the trench and Genesee River/Main Drainage Swale in the alluvial aquifer;
- Within the trench and sumps; and
- Upgradient of the trench in the alluvial aquifer.

Details describing the data collection procedures, evaluation techniques and monitoring locations are provided in Appendix 13.

## 4.3 Short-Term / Performance Monitoring

In order to evaluate the performance of the trench as a means to capture groundwater prior to reaching the Genesee River/ Main Drainage Swale, short-term performance monitoring will be performed for a six month period beginning in December 2008 and extending until June 2009 or beyond, if warranted. The PBGM process will involve the following:

1. Water levels in the eight sumps in the trench will be measured and compared to baseline conditions to demonstrate drawdown in the trench.
2. Once drawdown is demonstrated in the trench, groundwater elevations in POD locations and river elevations at Genesee River/Main Drainage Swale staff gauges will be collected.
3. If measured groundwater elevations at the groundwater collection trench POD locations are below Genesee River/Main Drainage Swale water elevations or below the bottom of the channel, then the performance goal will have been achieved or
4. If measured groundwater elevations at POD locations between the trench and the Genesee River/Main Drainage Swale are higher than both the trench elevations and river/swale elevations then the performance goal will have been achieved.

In the September 2008 Response to Comments it was anticipated that startup would be November 2008. Due to construction delays the system was not started until December 2008. The following sections have been revised to reflect December startup. The groundwater collection sumps and treatment wetland system became operational in December 2008. PBGM data collection activities and sump optimization began in December 2008 and are ongoing. In order to evaluate short-term performance of the groundwater collection system and evaluate actual groundwater trends obtained during system optimization that can be compared to groundwater modeling results, ARC is proposing the following schedule:

- Installation of river gauges / additional wells – October/November 2008

- Initiate Genesee River baseline data collection – October/December 2008
- Initiate operation of treatment wetland system – December 2008
- Conduct Monthly Performance Surface Water / Groundwater Evaluation – December 2008 through June 2009
- Submit Monthly Status Reports
- Submit Evaluation Report – July 2009.

Upon completion of the Short-Term Performance evaluation, ARC will submit an evaluation report to USEPA in July 2009 that describes the results of the baseline river and groundwater level monitoring program, PBGM and provides a comparison to groundwater modeling predictions. This report will provide a recommendation as to the need for the Barrier Wall and will provide a description of site geologic aspects related to long-term operation of the groundwater collection trench and flow regime. If data indicates that the performance goal is not being attained, ARC may terminate the monitoring program earlier than July 2009 and consider to move forward with the barrier wall installation.

## 4.4 Project Update, Since June 2008

During construction of the Wetland Treatment System in July-August 2008, there were several construction delays for completing the Phase II-1 components. In particular, the sedimentation pond liner was compromised during placement of gabion baskets as a result of groundwater upwelling beneath the liner. Also, water balance testing of the Surface Flow Wetlands and Vertical Flow Wetlands indicated liner leakage. Several repairs were made to discharge line extrusion welds that were determined leaking. As a result, the sedimentation pond liner had to be replaced in September 2008 and the surface and vertical flow wetlands were not planted until late September 2008. The groundwater collection sumps and wetlands did not become operational until December 2008, as opposed to November 2008 as originally planned.

At this time, ARC does not anticipate any delays in remedial construction activities related to these changes in system startup plans. However, there may be schedule delays in construction

activities related to work performed in the NYSDEC easement area since a permit has not been issued as of March 2, 2009. Since the startup of the wetland treatment system was delayed until December 2008. Based on the reduced timeframe for short-term operations, there may be a need for extending the performance period. Extending the performance period will not result in the delayed implementation of remedial activities.

## 4.5 Long-Term / Performance Monitoring

ARC will collect groundwater and surface water elevation data from POD locations to help optimize groundwater recovery trench and wetland treatment system operation If the barrier wall is eliminated the long term performance will involve data collection monthly for the second year of operation and semi annually for the next three years. A detailed Work Plan describing number of sampling locations, sample collection methodology and frequency of long term monitoring is included as Appendix 13 to the 100% Design Report.

As part of the long term performance monitoring program, ARC will prepare an O&M Plan for the operation of the groundwater collection trench sumps and wetland treatment system. As part of this O&M Plan, ARC will describe plans for collecting groundwater samples upgradient of the collection trench in order to monitor the remedial progress against established cleanup criteria.

# *5.0 PROJECT SCHEDULE*

## 5.1 Project Schedule

The following tentative project task descriptions are being considered for the remainder of Phase II-2 remedial construction activities in 2009 and 2010. This schedule has been developed in consideration of the information provided to USEPA during the June 4, 2008 meeting, which indicated that the Barrier Wall will be either deferred or eliminated pending performance monitoring data collected in 2009. As of March 2, 2009, ARC has not received the flood control permit for working in the NYSDEC easement of the Genesee River. Therefore, the actual work schedule cannot be determined. ARC will submit a SMP to USEPA 30 days prior to construction mobilization. The SMP will provide a detailed project schedule upon receipt of the flood control permit.

## 5.2 2009 Remedial Action Activities

| Description |
|---|
| • USEPA approval of 100% Design |
| • Submit SMP to USEPA |
| • Initial Site Preparation / Mobilization |
| • Excavate Swale Soils and Restoration |
| • Construct Midslope Sheet Pile Wall |
| • Initiate River Soils/Sediment |

## 5.3 2010 Remedial Action Activities

| Description |
|---|
| • Remobilization |
| • Completion of River Soils/Sediment |
| • CELA Spoils Reuse Area Construction |
| • Restoration of CELA and Site |

| Description |
| --- |
| • Construct Slurry Wall (pending results of Performance Monitoring) |
| • Site Restoration |
| • Replanting, as necessary |

# *6.0 POST CONSTRUCTION COMMUNITY INVOLVEMENT*

Upon completion of Remedial Action construction, including start-up of the Treatment Wetland System, ARC will contact local community organizations to discuss the potential for educational opportunities that may be available for this project. The remainder of this section lists that potential educational opportunities that have been identified. ARC recognizes that community involvement will be a continuing and evolving process. As new opportunities are encountered, they will be evaluated and reported to USEPA.

Since the SUNY campus is immediately adjacent to the site, there will be an opportunity for the college to be involved in the educational opportunities. Potential educational opportunities may include study of the effectiveness of the Treatment Wetland System, observation and study of the development of the ecological community including species inventory, long-term monitoring of the remedial action, development of a wildlife management plan, or development of a wildflower demonstration area.

In addition, it may be feasible for local youth organizations or other community groups to assist with ecological improvement aspects of the project. Potential community projects include artificial nesting structure (bird house and bat house) construction and installation; creation of a butterfly garden, and monitoring of artificial nesting structures.

The close proximity of the WAG trail could also facilitate educational opportunities for the local community through the installation of interpretative signage in the vicinity of the remedial response that describes the history of the site, the goals of the remediation, and the basic principles of the technology. Public access to the site will be provided to the extent that it can be done in a manner that is protective of the well being of visitors. Within that constraint, interpretative signs could be provided that explain the transition of the site from a refinery to an ecologically revitalized state could be included in the interpretive signage.

Non-profit organizations that work with corporations and communities to enhance wildlife habitat, such as the Wildlife Habitat Council (WHC), could be contacted to provide support and resources to the educational opportunities that may be associated with this project. Other non-

profit organizations, such as the Audubon Society or the New York State Bluebird Society, may also be interested providing assistance with potential community involvement projects at the site.

***TABLES***

*FIGURES*

*Figure 1 - Site Location Map*

*Figure 2 – Draft Project Schedule for Phase II Remediation*

***APPENDICES***

*Appendix 1A – Revised 2008 Response to EPA Comments Dated August 15, 2006; Pre-Final (95%) Remedial Design*

***Appendix 1B – EPA Approval Letters For Remedial Phases (March 2007) And Focused Feasibility Study (February 2008)***

*Appendix 1C – Response to EPA Comments dated May 9, 2008 (100% Design)*

*Appendix 1D – Response to EPA Comments dated May 9, 2008 (100% Design)*

*Appendix 2 – Design Drawings*

*Appendix 3 – Design Calculations*

*Appendix 4 – Technical Specifications*

*Appendix 5 – Soil-Bentonite Wall Testing*

*Appendix 6 - Flood Plain Study*

*Appendix 7 - Construction Quality Assurance Plan*

*Appendix 8 – Draft Operation and Maintenance Plan Outline*

***Appendix 9 – AquaBlok® Literature***
*(Only Table of Contents included)*

*Appendix 10 – Alternative Grading Plans and Design for CELA*

*Appendix 11 – Groundwater Model Technical Memorandum*

*Appendix 12 – Site Restoration Plan*

*Appendix 13 – Performance-Based Groundwater Monitoring Work Plan*