

ENGINEER'S CERTIFICATION

Pursuant to Section 6.3 of the "Remedial Design Work Plan – Operable Unit 3, May 2007" for the Vanadium Corporation of America Site (Site), Town of Niagara, New York, the undersigned submit the attached "100% Design Report" for the Site. The "100% Design Report" was prepared by CRA Infrastructure & Engineering, Inc. in accordance with the requirements of the "Remedial Design Work Plan."

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100% DESIGN REPORT

**VANADIUM CORPORATION OF AMERICA SITE
TOWN OF NIAGARA, NEW YORK**

NOVEMBER 2008

REF. NO. 19867 (25)

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1.0 INTRODUCTION

This 100% Remedial Design (RD) Report has been prepared by Conestoga-Rovers & Associates (CRA) and presents the technical requirements of the remedial action (RA) that will be conducted at the Vanadium Corporation of America site (Site) in Niagara Falls New York. Revisions are included where appropriate to address the New York State Department of Environmental Conservation (NYSDEC) comments of December 6, 2007 and March 21, 2008 on the 95% RD Report submitted May 3, 2007.

The Vanadium site location is presented on Figure 1.1 and the Site plan is presented on Figure 1.2.

1.1 GENERAL

The Vanadium Corporation of America (Vanadium) site is located in the Town of Niagara, Niagara County, New York. The Vanadium site includes property parcels owned by Airco Properties, Inc. (Airco), CC Metals and Alloys, Inc. (CCMA), and the New York Power Authority (NYPA) and Niagara Mohawk Power Corporation (NiMo). The New York State Department of Environmental Conservation (NYSDEC) has designated the Vanadium site as a Class 2 inactive hazardous waste disposal site. NYSDEC has designated the CCMA parcel as Operable Unit 1 (OU #1); the Airco parcel as Operable Unit 2 (OU #2); and the NYPA and NiMo parcel as Operable Unit 3 (OU #3). NYSDEC published the selected remedy for the three operable units comprising the Site in a Record of Decision (ROD) (NYSDEC, March 2006).

This document, entitled "100% Design Report" (Report) was prepared to meet the requirements and schedule for the final design for OU #3, hereafter referred to as the "Site".

This Report presents the design for the various remedy components for the Site. At this design stage, all technical requirements are addressed in sufficient detail to define the functional aspects of the remedy. This Report is based on the results of the pre-design investigations and evaluations and the verification of existing conditions.

The Final 100% Design includes detailed specifications and drawings suitable for use in subsequent Contractor procurement activities.

1.2 PURPOSE AND ORGANIZATION OF REPORT

The purpose of the design is to develop clear and comprehensive plans and specifications. The 100% Design Report is organized as follows:

- Section 1.0 presents the introduction;
- Section 2.0 presents Site background information;
- Section 3.0 presents the remedial action objectives;
- Section 4.0 presents information regarding pre-design data collection;
- Section 5.0 presents the pre-design additional investigation results;
- Section 6.0 presents the remedial design components;
- Section 7.0 presents the sediment and erosion control plan details;
- Section 8.0 presents the stormwater management plan;
- Section 9.0 presents the health and safety plan;
- Section 10.0 presents the construction quality assurance project plan;
- Section 11.0 presents a description of the permitting requirements;
- Section 12.0 presents a description of the progress reports;
- Section 13.0 presents the implementation schedule; and
- Section 14.0 presents the references.

2.0 SITE BACKGROUND

2.1 HISTORICAL SITE OPERATIONS

The Vanadium site (consisting of OU #1, OU #2, and OU #3) is estimated to consist of approximately 150 acres. From 1920 to 1964, Vanadium owned the Vanadium site and constructed and operated a ferroalloy production plant. Portions of the Vanadium site were used to dispose of wood, brick, ash, lime slag (calcium hydroxide), ferrochromium silicon slag, and ferrochromium silicon dust (ABB, 1993). Vanadium ceased operations in 1964.

NYPA purchased the eastern 88 acres of the Vanadium Site now known as OU #3 from Vanadium in 1959 to construct a portion of the Niagara Power Project, which included two underground power conduits. A portion of OU #3 was subsequently sold to NiMo. Both NYPA and NiMo installed several high voltage transmission lines on OU #3.

Airco purchased the western 62 acres of the Vanadium site now known as OU #1 and OU #2 in 1964. Airco or its affiliates continued ferrochromium manufacturing operations and disposed of wastes similar to those disposed by Vanadium (ABB, 1993). Additionally, between 1971 and 1979, Airco disposed of bag house dust containing ferrochromium silicon dust on OU #2. Between 1981 and 1988, Airco operated a permitted landfill on OU #2 for disposal of industrial wastes resulting from off-site manufacturing operations. An Interim Remedial Measure (IRM) for the OU #2 landfill was completed in 2001.

In 1979, SKW Metals and Alloys, Inc (SKW), purchased the western 37 acres of the Airco property, now known as OU #1 (NYSDEC, 1997). SKW operated a solid waste disposal facility consisting of two landfill cells. The facility was designed for the disposal of ferrochromium silicon bag house dust and ferrosilicon bag house dust wastes. An IRM for the OU #1 landfill was completed in 1999.

2.2 SITE DESCRIPTION

The 150-acre Vanadium site is bounded on the north by an automobile depot and vacant property, to the west by Witmer Road (Route 31), on the east by Interstate 190, and on the south by vacant land and industrial facilities. The nearest water bodies are the Lower Niagara River located approximately 1.4 miles west of the property, the NYPA reservoir, located approximately 0.8 miles north of the property, and Gill Creek located approximately 1,000 feet east of OU #3. Water transfer units (conduits) are located

beneath the NYPA property. These conduits transfer water from the Upper Niagara River, located to the south, to the NYPA reservoir. Numerous high voltage electrical transmission towers are located on OU #3 and overhead electrical transmission lines cross OU #3.

OU #3 consists of a relatively large central area containing the main slag mound area and two long narrow legs that extend west of the central area. The north leg is located immediately north of OU #1 and OU #2 and the south leg is located immediately south of OU #1 and OU #2.

A drainage ditch traverses the central area of OU #3 from north to south and then drains in a westerly direction along the south leg where it ultimately discharges into a wetland located south of OU #1. Several areas of OU #3 are poorly drained and an intermittent pond exists west of the main slag mound.

2.3 SITE INVESTIGATIONS

This section presents a brief summary of the investigation activities that have been performed at OU #3.

NYSDEC Investigations - 1996

In 1996, NYSDEC performed an investigation under the Immediate Investigative Work Assignment (IIWA) program to evaluate OU #3. The investigation by NYSDEC included installing eight monitoring wells for groundwater sampling, 12 soil borings for soil sampling, two test pit samples to investigate the waste piles, and the collection of surface water and sediment samples from an intermittent pond located near soil boring SB-2. The results are presented in the IIWA Report (NYSDEC, 1997).

NYSDEC Investigations - 1999/2000

In 1999 and 2000, NYSDEC performed an IIWA Investigation for the NiMo Right-of-Way (ROW) to determine the presence and location of any waste/fill areas and to determine if the NiMo ROW is the source of the volatile organic contamination found in the Union Carbide (UCAR) well BW-4 located south of the south leg of OU #3. The first phase of the investigation consisted of the installation of two overburden and bedrock groundwater monitoring well pairs, and subsequent groundwater sampling. The second phase included an on-site soil/waste investigation, site survey/mapping,

soil/waste sampling, and laboratory analysis. The results of these investigations are presented in the IIWA Report, Niagara Mohawk Right-of-Way Site (NYSDEC, 2001).

Golder Associates Inc. - 2001

In 2001, Golder Associates performed supplemental investigations at the Site that included a Fish and Wildlife Impact Analysis (FWIA), wetland delineation, and groundwater well sampling and analyses for OU #3. Golder collected groundwater samples and water level measurements from the existing Site monitoring wells. Seven water samples were collected and analyzed for Target Analytical List (TAL) metals and hexavalent chromium. The results of the Golder Site investigations are presented in their report entitled "Delineation of Surface Water Bodies, Wetlands, and Ecological Receptors at the Former Vanadium Corporation of America Site" (Golder, 2001).

Conestoga-Rovers & Associates - 2003/2004

On September 27, 2002, Conestoga-Rovers & Associates (CRA) prepared and submitted a Phase I Work Plan to NYSDEC. The Work Plan was approved by NYSDEC on December 4, 2002. In 2003/2004, CRA implemented the Phase I Investigation. The investigation included the following tasks:

- Task 1 Shallow Monitoring Well Inventory, Survey, and Water Levels;
- Task 2 Test Pit Excavations;
- Task 3 Boreholes and Subsurface Soil Sampling and Analysis;
- Task 4 Monitoring Well Installation;
- Task 5 Hydraulic Water Level Measurements;
- Task 6 Shallow Groundwater Sampling and Analysis;
- Task 7 Surface Soil Sampling and Analysis;
- Task 8 Surface Water and Sediment Sampling and Analysis;
- Task 9 Community Air Monitoring; and
- Task 10 Topographic/Property Survey.

During 2003/2004, 15 soil borings were completed, 14 shallow groundwater monitoring wells were installed, hydraulic water level measurements were obtained, 21 test pits were excavated to delineate the extent of slag, 31 surface soil and 30 subsurface soil samples were collected and submitted for analyses, 2 rounds of groundwater samples were collected and submitted for analyses, and 4 rounds of surface water and 1 round of sediment samples were collected from 17 locations and submitted for analyses. All

samples were analyzed for TAL metals, hexavalent chromium, and pH. A total of 7 groundwater samples were analyzed for dissolved TAL metals and dissolved hexavalent chromium. In addition, 3 samples were collected from the soil cover material on Site, and analyzed for physical parameters including particle size distribution, liquid limit, plastic limit, plasticity index, and hydraulic conductivity.

The results are presented in the Phase I Letter Report (CRA, 2004b).

Conestoga-Rovers & Associates - 2005

In 2005, CRA completed a remedial investigation and feasibility study and the results were presented in the report entitled "Remedial Investigation and Remedial Analysis/Feasibility Study" (RI/FS) dated November 2005 (CRA, 2005). The RI/FS recommended Remedial Alternative 3 that included the following components:

- institutional controls to restrict on-Site groundwater use and future Site development;
- on-Site consolidation of soils/slag and sediment;
- containment of consolidated materials using an engineered cap; and
- groundwater and surface water monitoring program.

Additional investigation activities were also performed by CRA during 2005 in accordance with the Addendum I Phase I Work Plan dated November 14, 2005. The additional investigation included the following tasks:

- topographic survey;
- additional delineation sampling;
- additional cap evaluation;
- borrow area investigation;
- investigation east of the slag mound;
- off-Site sampling; and
- electrical transmission line survey.

During the Addendum I additional investigation, a total of 68 soil and sediment samples were collected and submitted for analyses for TAL metals, hexavalent chromium, and pH and 17 soil samples were submitted for geotechnical analyses.

The results of the Addendum I additional investigations are presented in Appendix A.

Conestoga-Rovers & Associates - 2006

On May 19, 2006, CRA prepared and submitted a Phase I Addendum II Work Plan for additional data collection at the Site. The Addendum II work included the following tasks:

- sediment sampling for acid volatile sulphide/simultaneous extracted metals (AVS/SEM) and pore water analyses;
- surface water sampling from the wetland area;
- sediment treatability testing;
- wetland delineation and wetland function and values assessment; and
- additional piezometer installation and water level monitoring.

The Addendum II field work was performed between July and September 2006. The results of the Addendum II investigation are presented in Appendix A.

2.4 SELECTED REMEDIAL ALTERNATIVE

The NYSDEC ROD identified Alternative 3 as the selected remedial alternative for OU3. The remedial alternative components, as specified in the ROD, are as follows:

- *A remedial design program to provide the details necessary to implement the remedial program;*
- *Partial excavation of soil/slag and sediment, and on-Site consolidation and capping of these materials;*
- *Collection of confirmatory soil samples from excavations;*
- *Development of a site management plan to address residual contamination, any use restrictions;*
- *Imposition of an environmental easement to restrict groundwater use and ensure compliance with an approved site management plan;*
- *Certification of, and the use of institutional and engineering controls; and*
- *Long term monitoring program would be instituted. A periodic report would be prepared that would include results of groundwater and surface water monitoring, inspections and maintenance activities.*

3.0 REMEDIAL ACTION OBJECTIVES

As specified in the ROD, the remedial goals for OU #3 are to eliminate or reduce, to the extent practicable:

- *exposure of persons at or around the site to the potential for the dermal contact with, ingestion of, or inhalation of contaminated soil/slag from or at the Site that could result in unacceptable risk to human health;*
- *the potential for migration of contaminants from soil/slag to surface water or sediments by runoff that could result in exceeding surface water Standards, Criteria and Guidance Values (SCGs);*
- *the potential for dermal contact with, or inadvertent ingestion of contaminated sediment and surface water from or at the Site that could result in unacceptable risk to human health;*
- *exposure to contaminants in the sediments that exceed applicable SCGs;*
- *exposure to groundwater that would result in unacceptable risk to human health;*
- *to restore surface water quality in the drainage ditches to a level suitable for intermittent birds and mammal use;*
- *environmental exposures of flora or fauna to high pH leachate and inorganic compounds in the exposed waste and sediments;*
- *the release of contaminants from soil into groundwater that may create exceedances of groundwater quality standards; and*
- *the release of contaminants from surface soil, exposed waste, leachate and sediments into the ambient air and surface water through storm water erosion and wind borne dust.*

Specific RA objectives for each medium of interest are presented in the FS as follows:

Soil/Slag

- prevent the potential for dermal contact with, ingestion of, or inhalation of contaminated soil/slag from or at the Site that could result in unacceptable risk to human health; and
- prevent the potential for migration of contaminants from soil/slag to surface water or sediments by runoff that could result in exceeding surface water SCGs.

Sediment

- prevent the potential for dermal contact with, or inadvertent ingestion of contaminated sediment from or at the Site that could result in unacceptable risk to human health; and
- prevent exposure to Chemicals of Potential Concern (COPCs) in the sediment that exceeds applicable SCGs.

Groundwater

- prevent exposure to groundwater that would result in unacceptable risk to human health; and
- prevent further degradation of the bedrock groundwater beneath the Site.

Surface Water

- prevent the potential for dermal contact with, or ingestion of contaminated surface water from or at the Site that could result in unacceptable risk to human health; and
- restore surface water quality in the drainage ditches to a level suitable for intermittent bird or mammal use.

12.0 PROGRESS REPORTS

Monthly progress reports will be provided to NYSDEC and will include the following major items:

- submission of sampling and testing data received during the course of the work which has passed quality assurance and quality control procedures;
- description of any problems encountered and schedule variances during the previous month and plans for resolution/corrective action, if necessary;
- description of all actions, data, and plans which are scheduled for the next month and provide other information relating to the progress of associated work; and
- summarize percentage of completion, including unresolved delays encountered or anticipated that may affect the future schedule for implementation of the design, and a description of efforts made to mitigate those delays or anticipated delays.

4.0 PRE-DESIGN - DATA COLLECTION

Pre-design data collection activities were undertaken to obtain sufficient detailed information, as necessary, to complete the engineering design work. Several of the pre-design data collection tasks have been undertaken in accordance with Addendum I and Addendum II to the Phase I Work Plan. The pre-design data collection tasks are as follows:

- topographic survey (Addendum I Work Plan);
- additional delineation sampling (Addendum I Work Plan);
- borrow area investigation (Addendum I Work Plan);
- electrical transmission line survey (Addendum I Work Plan);
- Acid Volatile Sulphide/Simultaneously Extracted Metals (AVS/SEM) and porewater sampling in wetland area (Addendum II Work Plan);
- wetland surface water sampling (Addendum II Work Plan);
- sediment treatability testing (Addendum II Work Plan); and
- wetlands delineation and function and values assessment (Addendum II Work Plan).

Addendum 1 to the Phase I Work Plan was presented in a letter to the NYSDEC, dated November 14, 2005. The Addendum I Work Plan identified seven (7) additional investigation tasks to be undertaken at OU #3. The purpose of the additional investigation was to obtain further information regarding the distribution of contaminants at the Site and to obtain additional Site information that would be used for the Remedial Design. The tasks included a topographic survey, additional delineation sampling, and additional cap evaluation; borrow area investigation, investigation east of the slag mound, off-Site sampling, and electrical transmission line survey.

Addendum II to the Phase II Work Plan was presented in a letter dated May 19, 2006 to the NYSDEC. The Addendum II Work Plan identified six tasks including collecting sediment samples for AVS/SEM and pore water analysis, collecting and analyzing surface water samples from the wetland area, conducting a sediment treatability test, performing a wetland delineation and wetland function and values assessment, and installing an additional piezometer and performing water level monitor over a one month period.

Addendum I field activities were conducted between the period from December 5 through December 29, 2005, except for the borrow area investigation test pits that were

excavated on January 30, 2006, and the electrical transmission line survey, which was completed by NiMo and NYPA. Addendum II field activities were performed between June 27, and October 3, 2006.

The results of the predesign data collection activities are presented in Appendix A.

5.0 PRE-DESIGN DATA COLLECTION RESULTS

Pre-design data collection was performed in accordance with the Addendum I and Addendum II Work Plans. The results are discussed in detail in the Technical Memorandums 1 and 2 as presented in Appendix A. In a letter dated March 21, 2008, NYSDEC provided comments related to Technical Memorandum 1 and requested remedial action be taken for the sediments in the wetland south of OU1. A further technical evaluation of all the lines of evidence related to the sediments in this area was presented in a Memorandum dated June 11, 2008 and submitted to NYSDEC for consideration (copy included in Appendix A). This section presents a brief summary of the results of the pre-design data collection as they pertain to the final remedial design.

5.1 SEDIMENT SAMPLING

Sediment samples were collect from the wetland located south of OU1. The sediment sample results indicated elevated bulk metals concentrations in some of the sediment samples, however, the AVS/SEM, pore water and surface water results indicated little to no risk to benthic organisms. Two areas of the wetland were identified as having a greater potential risk to benthic organisms and remediation of these specific areas is proposed.

5.2 ADDITIONAL WASTE/SLAG DELINEATION

Three test pits were excavated and samples were collected to further delineate the areas with waste materials and slag requiring remediation. Waste materials were identified at one test pit (TP-43) located in a wooded area southwest of the slag mound. This area has been included in the area to be remediation.

Hand auger samples were collected from a total of 15 locations. Some of these samples were collected within the wetland area and the results are presented with the sediment results (see Section 5.1). At other samples locations, the data were compared to the soil cleanup levels and the results for the off-Site sampling (see Section 5.6), as appropriate.

Based upon these results, one area was identified as requiring remediation. This area is immediately north of the slag mound at sample location HA-5.

5.3 ADDITIONAL CAP EVALUATION

Sixteen shallow test pits and six soil samples were collect for chemical analysis to determine if the existing cap material could be used as a component of the cap to be constructed. Although the existing cap material is deemed suitable for use as common fill for a future cap, it was only present in relatively thin layers (0.5 to 1.5 feet). Therefore, it would be difficult to strip this soil from the existing slag mound for reuse, without cross contaminating it with the underlying slag material. The final design does not account for reusing this material for the final cap construction.

5.4 INVESTIGATION EAST OF SLAG MOUND

Three test pits were excavated along the eastern side of the slag mound to determine the nature of the soils and to evaluate the potential for a hydraulic connection between the slag mound and the NYPA conduits. It was determined that buried shot rock fill extends essentially to the eastern edge of the slag mound and that this material provides effective subsurface drainage for the soils in this area.

5.5 OFF-SITE SAMPLING

Soil samples were collected from eight locations along the Witmer Road ditches to obtain background data to assist in evaluation of some of the on-Site samples results. Metals concentrations in these samples were below the soil cleanup levels. There is no evidence that Site operations or Site runoff have impacted the ditches, and the metals concentrations appear representative of the overall industrial area along Witmer Road. Therefore, remediation of the Witmer Road ditches is not warranted.

5.6 BORROW AREA INVESTIGATION

A total of eight test pits were excavated in the area north of the existing slag mound to investigate this area as a potential source area for soils required to complete the remediation at the Site. Soil samples were collected and analyzed for geotechnical characterization and chemical parameters. It was determined that the soil at seven of the eight test pit locations was suitable for use as clean fill for the on-Site remediation. Using the test pit and soils data, proposed ground surface contours were developed to maximize the quantity of soil that could be extracted from this area for reuse. It is estimated that approximately 51,000 cubic yards of clayey silt soil could be obtained

from this area. The remedial design includes utilization of this area as a source for soil for the final cap.

5.7 SURFACE WATER SAMPLING

Three surface water samples were collected from the wetland south of OU #1 to assist in evaluation of options for managing water during remediation. It is anticipated that water can be effectively managed on Site during the remediation such that off-Site water disposal will be minimal, if any.

5.8 SEDIMENT TREATABILITY STUDY

Sediment samples were collected from three locations within the wetland located south of OU #1 and submitted for treatability testing to determine appropriate methods for stabilizing excavated sediments, if required prior to consolidation at the Site. The results indicated that additives such as sawdust, flyash, cement kiln dust and/or portland cement may need to be mixed with the sediment in order to solidify the sediments for consolidation in the slag mound prior to capping.

5.9 WETLAND DELINEATION AND WETLAND FUNCTION AND VALUES ASSESSMENT

A wetland delineation and wetland function and values assessment was performed in the wetland areas that may potentially be impacted by the Site remediation. It was concluded that none of the functions provided by the wetlands are regionally critical and no species of special concern were found to exist in the wetlands. The wetland areas to be impacted by the proposed remediation are identified in the remedial design. The Wetlands Delineations and Functions and Values Assessment is presented in Appendix A.

5.10 ADDITIONAL PIEZOMETER INSTALLATION AND WATER LEVEL MEASUREMENTS

One new piezometer was installed and water level measurements were obtained at 15 monitoring wells and four surface water monitoring locations to further evaluate the relationship between the shallow groundwater and the surface water drainage features

at the Site. The results indicate that the water levels measured in the ditches, ponds and wet areas around the slag mound were consistently above the water levels measured in the nearby wells, indicating that the groundwater was not discharging to the surface water during the monitoring period.

6.0 REMEDIAL DESIGN COMPONENTS

The major components of the selected remedial alternative are as follows:

- Site preparation;
- relocation of existing local electrical distribution line;
- sediment and erosion control;
- soil/slag excavation and consolidation;
- sediment excavation and consolidation;
- grading of existing slag mound;
- confirmatory sampling;
- cap construction;
- stormwater management
- wetland restoration;
- Site backfill;
- fencing;
- institutional controls to restrict groundwater use and future development; and
- long-term OM&M.

Project Specifications are provided in Appendix B.

6.1 SITE PREPARATION

Site preparation will include establishing the work zones to complete the remedial action and completing the initial work tasks to prepare the Site.

6.1.1 RESTRICTED WORK ZONES

CRA has reviewed input from both NiMo and NYPA about work around their power line facilities. NiMo and NYPA provided guidelines for the transmission lines indicating the maximum grade elevation and the minimum clearance for equipment. All of the clearance requirements as specified by the "High Voltage Proximity Act" of the New York Department of Labor will be strictly observed. This information is presented on Drawing C-01. Work conditions are presented in Appendix C.

Restricted work zones will be marked out to control traffic and construction equipment usage around the transmission towers and under the transmission lines. Work within the restricted work zones will be completed only with the concurrence of the power company representatives. Excavation of slag or sediments in restricted zones will be performed using approved equipment and/or hand work where necessary. All buried ground wires will be located in areas to be excavated and protected against damage. If a buried ground wire is broken, it will not be touched and NGRID (NiMo) and/or NYPA will be notified immediately. Designated locations that are not restricted will be used for laydown and for stockpiling backfill material.

6.1.2 CLEARING AND GRUBBING

Trees and shrubs in the slag areas will be cleared, segregated and chipped into mulch and disposed on Site or utilized for re-vegetation. Tree removal is limited to the southwest corner of the slag area and near NiMo tower 13 as indicated on the Site Preparation Drawing. Miscellaneous debris located within the work area will be collected and consolidated on Site and covered by the cap. Metal debris may be sent off Site for recycling.

6.1.3 TEMPORARY ACCESS ROADS

Temporary access roads will be constructed as necessary to support the RA. A controlled construction access will be established at Witmer Road. This will allow construction equipment ingress and egress across non-contaminated areas. An access road will be extended to the proposed borrow area and continue to the east side of the existing slag mound to allow soil material to be delivered to non-restrictive work zones on or near the existing slag mound for use in construction of the final cap system.

The existing access road from Witmer Road to OU #2 will be maintained at all times during the remedial construction on OU #3.

6.1.4 MONITORING WELL ABANDONMENT

Existing monitoring wells on the slag mound that are located within the foot print of the proposed cap will be abandoned in place prior to commencement of construction. The

wells to abandoned are identified on Drawing C-03. Procedures to abandon wells will conform to NYSDEC criteria.

At the completion of the construction, new monitoring wells will be installed as proposed in the Operation, Maintenance, and Monitoring Plan (see Appendix F).

6.2 RELOCATION OF EXISTING ELECTRICAL DISTRIBUTION LINE

A pole-mounted electrical distribution line located on OU #3 between the existing slag mound and OU #2 will be relocated to the west by NiMo to allow for consolidation of excavated soil, slag, and sediment in this area and for placement of the final cap system. Details of the distribution line relocation will be developed by NiMo in accordance with their standard Construction Specifications.

6.3 SOIL/SLAG EXCAVATION AND CONSOLIDATION

Testing conducted during the RI and the Addendum I and II work activities identified the extent of soil and slag material requiring remediation. It is estimated that approximately 120,000 cubic yards of soil/slag within the proposed cap limits will need up to be excavated/graded to achieve the proposed subgrade contours prior to capping. It is estimated that an additional 5,600 cubic yards of soil/slag that are beyond the limits of the proposed cap will need to be excavated and consolidated on Site. The initial excavations outside the limits of the cap will be based on the results of the RI and visual observations of slag material in the field. Confirmatory sampling will be conducted as described in Section 6.7 to verify that the remediation goals have been met in the excavation areas. The slag areas are presented on Figure 6.1. The limit of cap has been extended to include most of slag areas 2 and 4 in order to limit the depth of excavation required around the transmission towers. Some of the areas are directly under NiMo and NYPA power lines or near the towers. Excavation will be performed in all of the six slag areas to remove slag down to appropriate subgrade elevations within the limit of the proposed cap or to the soil/slag interface in the case of slag that is outside the limit of the proposed cap. Once completed, confirmatory samples will be collected to determine residual concentrations in excavation areas located beyond the limit of the proposed cap. The excavations beyond the cap limits will be backfilled with soil obtained from the on-Site borrow area or imported fill once the soil cleanup levels have been achieved. If the soil cleanup levels have not been achieved, either additional soil will be excavated and the area re-sampled, or the soil cap system, as discussed in Section 6.6.2, will be expanded to cover the area with elevated concentrations. The

remedial work to be performed in all the slag areas is presented in the following sections.

6.3.1 AREA 1 - WEST OF EXISTING SLAG MOUND

Approximately 23,000 cubic yards of slag will be cut in Area 1 to conform the shape to the power companies grading elevations. Of the total cut, 16,000 cubic yards of the slag in Area 1 will be removed and consolidated onto the existing slag mound. This will be done by either pushing using a dozer or by excavating and transporting the slag onto the mound. The remaining slag in Area 1 will be capped in place. It is not feasible to consolidate this remaining slag onto the existing slag mound due to the power company(s) ground elevation restrictions over much of the existing slag mound. To the extent possible, slag will be regraded in Area 1 to accommodate drainage requirements and power company elevation restrictions prior to placement of the cap system. Following re-grading, the entire Area 1 will be capped. Where the cap has to be placed around transmission tower foundations, the top of the cap will be within 1.5 to 0.5 feet below the top of the foundations or if it is necessary to cover the foundations, mastic will be applied to the steel legs of the NiMo towers to a height of 1.5 feet above the final grade elevations.

6.3.2 AREA 2 - NORTH OF EXISTING SLAG MOUND

A limited amount of slag and sediment in Area 2 will be removed and consolidated onto the existing slag mound. This will be done by either pushing slag using a dozer or by excavating and transporting the slag onto the mound. It is estimated that approximately 5,200 cubic yards of slag will be excavated from Area 2 can be consolidated on the slag mound. There are five NiMo transmission towers in Area 2 (ID Tower 10). Slag removal work within 5 feet of the towers will be performed using hand operated equipment. The maximum depth of the slag removal in Area 2 will be approximately 2 feet which is sufficient to accommodate the placement of a 2-foot soil cap. Slag will be removed from around tower structures as uniformly as possible one leg at a time. Where the cap has to be placed around transmission tower foundations, the top of the cap will be within 1.5 to 0.5 feet below the top of the foundations or if it is necessary to cover the foundations, mastic will be applied to the steel legs of the NiMo towers to a height of 1.5 feet above the final grade elevations. Procedures for working around the transmission towers are presented in Appendix C.

The proposed final elevations in the vicinity of the transmission towers are presented on Drawing C-15.

6.3.3 AREA 3 - EXISTING SLAG MOUND

The existing slag mound will be graded to allow for consolidation of slag/sediment from the designated slag areas and placement of the cap material. Approximately 76,000 cubic yards of slag will be cut and graded to shape the slag mound and make space for slag from Areas 1, 2, 3, 5, and 6 that will be consolidated on Area 3 prior to placement of the cap.

The final subgrade beneath transmission lines will be at least 2 feet below the restricted final grade elevation to allow for placement of a 2-foot cap. Cap and grading requirements are presented in Section 6.5. The cap design details are presented in Section 6.6.

6.3.4 AREA 4 - EAST OF EXISTING SLAG MOUND

A limited amount of slag in Area 4 will be removed and consolidated onto the existing slag mound. It is estimated that approximately 1,200 cubic yards of slag from Area 4 will be removed and consolidated on the slag mound. There is one NYPA transmission tower (1-8) in Area 4. Slag removal work within 5 feet of the tower will be performed using hand operated equipment. The maximum depth of the slag removal in Area 4 will be approximately 2 feet, which is sufficient to accommodate the placement of a 2-foot soil cap. The cap will extend past the transmission towers and the final cap elevation will be essentially the same as the existing grade. Slag will be removed from around the tower structure as uniformly as possible, with work being performed around one leg of the tower structure at a time. Where the cap has to be placed around transmission tower foundation, the top of the cap will be within 1.5 to 0.5 feet below the top of the foundation. Procedures for working around the transmission towers are presented in Appendix C. The proposed final elevations in the vicinity of the transmission towers are presented on Drawing C-15.

6.3.5 AREA 5 - SOUTH OF EXISTING SLAG MOUND AND AROUND NIMO TOWERS

A limited amount of slag in Area 5 that is adjacent to NiMo transmission towers (collectively known as towers ID 13 and 214) will be removed and consolidated onto the existing slag mound. The slag mound surrounds the towers on three sides. Slag removal work within 5 feet of each tower will be performed using hand-operated equipment. The maximum depth of the slag in Area 5 is estimated to be approximately 6 feet. Slag will be removed from around each tower structures as uniformly as possible to a maximum depth of 2.5 feet below the final proposed grade. Approximately 1,200 cubic yards of slag will be removed in Area 5 from around the outside perimeter of the transmission towers. Additional slag will be removed from under the towers. Work being performed around the tower will be performed on one leg of the tower structure at a time. It will not be possible to remove all the slag next to the tower foundations. The residual slag in Area 5 will be capped with a GCL cap, consisting of geosynthetic clay liner (GCL), 18 inches of soil, and 6 inches of gravel that will extend to the limits of the slag mound. The areas proposed for GCL cap are shown on Drawing C-07. As shown on Drawing C-07, a GCL cap will be placed around the NiMo towers to mitigate infiltration of surface water. The surface will be sloped away from the towers towards perimeter drainage ditches. The slag mound will be pulled back from the edge of the towers and sloped back to 4:1. The proposed final elevations in the vicinity of the transmission towers are presented on Drawing C-15.

6.3.6 AREA 6 - WEST OF EXISTING SLAG MOUND ALONG OU1/OU2 FENCE LINE

Most of the slag in Area 6 will be capped in place. A limited amount of slag will be removed and consolidated on the existing slag mound. The slag that is adjacent to NiMo transmission towers (collectively known as towers ID 12, 7D, and 215) in Area 6 will be removed to the extent possible. The slag mound surrounds the towers on three sides. Slag removal work within 5 feet of each tower will be performed using hand operated equipment. The maximum depth of the slag in Area 6 is estimated to be approximately 6 feet. Approximately 11,300 cubic yards of slag will be removed in Area 6 which includes the cut necessary to install two 18-inch culvert and to create the drainage ditch along the north/south OU #2 fence line. Slag will be removed from around each tower structure as uniformly as possible, with work being performed around one leg of the tower structure at a time. The maximum cut within 75 feet of each tower structure will be made at a slope of 5:1 to a maximum depth of 2.5 feet below the top of the tower foundation. It will not be possible to remove all the slag next to the

tower foundations. The residual slag in Area 6 will be capped with clean fill, a GCL cap and a layer of crushed stone that will extend to the limits of the slag mound. The areas proposed for GCL cap are shown on Drawing C-07. As shown on Drawing C-07, the GCL cap will be placed around the NiMo towers to mitigate infiltration of surface water. The surface will be sloped away from the towers towards perimeter drainage ditches. The slag mound will be pulled back from the edge of the towers and sloped back to 4:1. The proposed final elevations in the vicinity of the transmission towers are presented on Drawing C-15.

Around selected towers in Area 6, the final grade elevation will exceed the foundation elevation. NiMo has provided procedures to protect the steel tower structures, which are presented on Detail 1 and 5 of Drawing C-15. This only applies where a final elevation "C" is specified in the detail.

As presented in Section 6.6.3, the proposed cap will extend across Area 6 towards the OU #2 fence line and terminate at the edge of the OU #2 cap. Tie-in details to the existing OU #2 cap system are illustrated in the ditch cross-sections presented on Drawing C-19. GCL used in the proposed cap at the locations will be anchored in the OU #2 clay cap.

6.4 SEDIMENT EXCAVATION AND CONSOLIDATION

Sediment in the identified on-Site ditches and pond (see Drawing C-02) will be removed and consolidated on Site. Sampling conducted during the RI, and subsequent sampling conducted in December 2005 for the Addendum I Work being performed around the NYSDEC Sediment Quality Benchmarks (SQBs). Additional sampling was conducted in accordance with the Addendum II Work Plan to assess the bioavailability and toxicity of the metals in the sediments. These data indicate that the sediments present little to no risk to benthic organisms (see Technical Memorandum 1 presented in Appendix A). In accordance with NYSDEC review of the data presented in Technical Memorandum 1 (see NYSDEC comment letter dated March 21, 2008) and subsequent response from CRA on behalf of Vanadium Corporation of America (see Memorandum dated June 11, 2008 included in Appendix A), approximately 2,110 cubic yards of sediment will be removed from the wetland south of OU1. In the proposed sediment remediation areas, sediment will be removed down to the native silt/clay soil. At the edges of the excavation, the remaining sediment/soil will be graded to provide a maximum 5:1 slope transition between the excavation and the adjacent undisturbed area. In addition, three wetland islands will be created in the remediation areas and planted with indigenous plants

(Button Brush [*Cephalanthus Occidentalis*]). Details of the wetland islands are presented on Drawing C-22. Creation and planting of the wetlands islands will help to inhibit the advance of the invasive *phragmites* onto these areas and thus create additional habitat.

Sediments/gravel sediments from the drainage immediately ditch south of OU #2 will be removed.. Excavated sediments will be consolidated under the proposed cover system on OU #3 after dewatering/stabilizing as discussed below.

Measures will be taken as necessary to allow sediments to be excavated under dry conditions, to the extent possible. Possible measures include rerouting surface water drainage around the remediation area, isolating the remediation areas using temporary berms or sheet piling and pumping the water from the remediation area prior to excavation. The pumped water will be discharged to the adjacent wetland area. Depending on the Site conditions at the time of the remediation, several of the on-Site ditches, pond, and wetland areas may be dry.

The excavated sediment may need to be dewatered and stabilized prior to placement in the consolidation area. Treatability testing conducted in accordance with the Addendum II Work Plan was performed to evaluate various means of dewatering and solidifying the sediment from the wetland prior to consolidation. The results of the treatability tests are presented in Appendix A and indicate that additives such as sawdust, fly ash, cement kiln dust and/or Portland cement may need to be mixed with the sediment in order to solidify the sediments for consolidation on the slag mound prior to capping.

6.5 GRADING OF EXISTING SLAG MOUND AND SLAG AREA 1

The existing slag mound has a relatively flat top surface with steep slopes along the edges. The final design will include grading the existing slag mound to achieve a minimum 3 percent slope for the soil cap to promote surface water runoff and minimize infiltration. The final cap design will have a maximum 4:1 horizontal to vertical slope to minimize erosion and allow access for maintenance vehicles. The final contours for the existing slag mound and the consolidation areas are constrained by the maximum allowable grades beneath the existing high-voltage electrical transmission lines and the presence of the existing electrical transmission towers. The transmission lines were surveyed and maximum elevations for the final cap were provided by NiMo/NYPA. These maximum elevations as well as restrictions for working around the base of the transmission towers have been incorporated into the design for the slag mound and consolidation areas. The grade restrictions are shown on Drawing C-01. An excavation

and grading plan is presented on Drawing C-05. Work zone restrictions are presented on Drawing C-09.

After the existing slag mound has been re-graded to establish the pre-subgrade elevations, , slag and sediments removed from Areas 1, 2, 4, 5, and 6, and the drainage swales will be consolidated/backfilled to achieve the final subgrade elevations. The footprint for the final cap will extend beyond the limits of the existing slag mound to provide adequate volume capacity to consolidate slag/sediments from the designated locations and to minimize the depth of excavation around transmission tower foundations that are in slag areas. The subgrade cap contours and footprint that conform to the power company restrictions are shown on Drawings C-06. Slag Area 1 will require re-grading so that the cap can be extended over this area. An estimated 120,000 cubic yards of slag will be cut from the proposed cap footprint and the proposed cap subgrade. An additional 7,700 cubic yards of soils/sediments from outside the cap footprint will be cut and consolidated within the cap footprint. The proposed subgrade cap contours can accommodate a fill volume beneath the cap of approximately 195,000 cubic yards. Based on the expected volume of slag/sediment material that will be consolidated and graded (127,700 cubic yards), a surplus fill volume of approximately 67,000 cubic yards is available. If the amount of slag and sediments requiring consolidation within the cap limits is less than the amount needed to achieve the subgrade contours is anticipated, the final elevations of the cap will be reduced during construction and recorded on the final post construction drawings.

6.6 CAP CONSTRUCTION

6.6.1 BASIS OF DESIGN

The final cap will be placed over the slag in Areas 1, 2, 4, 5, and 6 and the existing slag mound (Area 3) to:

- eliminate direct contact with contaminated slag, soil, and sediment;
- eliminate the potential transport of contaminants in surface water runoff by eliminating surface water runoff contact with soil, slag, and sediment;
- reduce infiltration to the extent necessary to achieve the groundwater and surface water remedial action objectives; and
- prevent erosion of the capped slag areas.

Design of the final cap has considered grade height restrictions imposed by the power company and power company access requirements. Erosion control measures will be installed as required to minimize erosion of the cap.

6.6.2 CAP DESIGN OPTIONS

The RI/FS presented three alternative cap designs for potential use at the Site.

Clay Cap consisting of the following components listed in order from top to bottom:

- vegetative cover;
- 6-inch topsoil layer;
- 36-inch barrier protection layer (common fill);
- geosynthetic drainage net (geonet); and
- low permeability layer (12 inches of clay).

Soil-GCL Cap consisting of the following components listed in order from top to bottom:

- vegetative cover;
- 6-inch soil layer capable of supporting vegetation;
- 18-inch barrier protection layer (common fill);
- geosynthetic drainage net (geonet); and
- low permeability layer (GCL).

Site-specific Cap consisting of the following components listed in order from top to bottom:

- vegetative cover;
- 6-inch soil layer capable of supporting vegetation; and
- 18-inch barrier protection layer (common fill).

To determine the most appropriate final cap design for the Site, the following evaluations were performed:

- the effectiveness of the various capping systems in achieving the remediation goals; and

- grade restriction imposed by power companies and constraints when working next to and beneath the electrical transmission towers and wires.

The proposed cap consists of a combination of the Site-specific soil cap and a GCL cap (two variations depending on the location). The majority of the area will be capped with the Site-specific soil cap consisting of 18 inches of soil and 6 inches of topsoil. In the main drainage pathways, the cap will consist of a soil-GCL cap consisting of a GCL, a synthetic drainage net, 18 inches of soil and 6 inches of topsoil to further reduce infiltration in these areas. In the areas around the existing transmission towers, the soil-GCL cap will consist of a GCL, 18 inches of soil, and 6 inches of gravel. A drainage net will not be installed in the locations where a gravel surface is proposed in place of topsoil. The gravel is meant to facilitate power company access to transmission towers and allow surface water to drain to stormwater ditches.

The proposed cap will prevent direct contact with contaminated materials by providing at least 2 feet of clean soil over the contaminated soil/slag/sediment.

Capping the exposed slag will eliminate the source of contamination to the surface water. In addition, improving the surface water drainage in the area of slag mound and promoting runoff from the capped area will reduce infiltration of surface water into the slag and leaching of contaminants into the shallow overburden groundwater. Surface water drainage off the cap will be controlled by slopes promoting surface water flow toward existing water courses and drainage ditches along the slag mound perimeter.

The proposed Site-specific cap will minimize the potential for migration of contaminants to groundwater and prevent direct contact with, or ingestion of, contaminants under the cap. Under current conditions, the RI/FS determined that no specific remedial measures are required to address the groundwater. The proposed cap design and drainage improvements associated with the Site regrading will significantly reduce infiltration of precipitation and hence reduce the potential for contaminant migration to the groundwater.

6.6.3 LIMITS OF THE CAP

Drawing C-02 presents the existing conditions of the Site including the limits of the proposed cap. The approximate cap area extent is 51 acres. This includes the existing slag mound and adjacent areas where slag is present but cannot be removed and consolidated due to excavation and grading constraints. The cap will extend west to the

OU #2/OU #3 fence line and will terminate at the interface with the OU #2 capping system. Based on available as built information, the OU #2 cap extends 2 feet past the fence line onto OU #3 and consists of a 3.5-foot layer of clay. The GCL in the cap will tie into the OU #2 clay cap.

6.6.4 CONTOUR DESIGN

Drawing C-06 presents the Subgrade Contour Plan. Drawing C-07 presents the grade contours for the final cap and indicates areas where the GCL cap is proposed. The contours will maintain a minimum slope of 3 percent, where possible. In some drainage collection areas below transmission lines the GCL cap could have drainage slopes less than 0.5 percent. The GCL cap will limit infiltration in areas where surface water drainage is concentrated. The maximum slope at the toe of the slag mound cap will be 4:1.

The final contours for the cap reflect power line maximum grade elevations, clearance restrictions for construction equipment beneath the lowest transmission wire elevation under worst-case conditions and for grading around the transmission tower foundations.

6.6.5 CAP CONSTRUCTION

The majority of the Site-specific cap will consist of the following components listed in order from top to bottom:

- vegetative cover;
- 6-inch soil layer capable of supporting vegetation; and
- 18-inch barrier protection layer (compacted fill).

The GCL with drainage net cap will consist of:

- vegetative cover;
- 6-inch soil layer capable of supporting vegetation;
- 18-inch barrier protection layer (compacted fill);
- a synthetic drainage net; and
- GCL.

The GCL without drainage net cap will consist of:

- 6-inch gravel cover;
- 18-inch barrier protection layer (compacted fill); and
- GCL.

On-Site soil from a borrow area will be used during the capping operations. The suitability of these soils for use in the cap construction has been evaluated by geotechnical testing and chemical testing for TAL metals parameters. The results of the tests are presented in Technical Memorandum 2 presented in Appendix A. Additional fill will be imported for capping operations including common fill for the cap barrier protection layer, structural fill for use in backfilling excavations within 5 feet of the transmission tower foundations, and aggregate for capping and access road applications.

Imported common fill will be free of rocks larger than 2 inches, loam, organic matter, very soft clays, swelling clays, or fine uniform sands that may be difficult to compact. Grain size analysis must yield a minimum of 70 percent passing the No. 200 sieve, with a minimum of 20 percent clay content (<0.002 mm), and a minimum plasticity index of 5. Maximum permeability of 1×10^{-6} cm/s determined in accordance with ASTM International D5084.

All imported soil and soil from the on-Site borrow sources will be tested for chemical constituents as detailed in the specifications. Imported soil will be tested at a frequency of one per source or every 10,000 cubic yards, whichever is greater, for TCL VOCs, TCL SVOCs, TCL pesticides/herbicides, TAL metals, and PCBs, and must be below the Part 375 industrial standards.

The following subsections present the preliminary design of each cap component.

GCL

GCL is proposed to be used in the main surface water drainage pathways. Drainage pathways are a primary source of infiltration and even though the soil cap material is low permeability, the GCL was added to further prevent infiltration in the primary surface water drainage pathways.

Intimate contact between the sub-base and GCL is required to achieve the minimum hydraulic conductivity of the GCL. Subgrade preparation requires surfaces to be smooth and free of unsuitable materials including organic materials, debris, roots, sticks, and angular rocks larger than 1 inch in diameter. All major voids and cracks should be filled. A bedding layer comprised of 6 inches of soil (either soil removed from slag mound or imported soil) will be placed to separate the GCL and underlying slag. Field tests/inspections consistent with the Construction Quality Assurance Program Plan (CQAPP) Plan (see Section 10.0) will be conducted to ensure appropriate sub-base conditions exist prior to placement of the GCL.

The GCL will be installed by unrolling individual GCL panels. GCL panels will be overlapped in strict accordance with the manufacturer's specifications. Any soil or debris will be removed from the seams to ensure sufficient sealing. The GCL panels and seams will be tested in accordance with the QAPP.

Placement of the GCL will begin at the highest elevation and end at the lowest elevation to allow for drainage in the event of precipitation.

GCL panels will be covered the same day they are installed to prevent ultraviolet light degradation, shrinking of the panels, and damage due to rain.

Construction and material specifications for the GCL are provided in the Project Specifications.

Synthetic Drainage Layer (Geonet)

In specified areas, a synthetic drainage net composite with geofabric (drainage geocomposite) will be placed over the GCL to ensure adequate drainage of the overlying soil layers and to prevent an excessive head of water from developing on top of the GCL. The drainage net will include non-woven geofabric on the top and bottom. The geofabric will be heat laminated to the drainage net such that the net and fabric can be installed as one layer. Shear strength testing of the drainage geocomposite by the Contractor will also be performed in accordance with the CQAPP. Interface shear calculations for the drainage net and GCL and the drainage net and barrier soil cover are included in Appendix D.

Water exiting the drainage net will outlet at the toe of the cap perimeter drain system and drain away from the cap in combination with surface water runoff.

Construction and material specifications for the drainage net geocomposite are provided in the Project Specifications.

Drainage calculations for the synthetic geocomposite drainage net drainage system are included in Appendix D. Test data indicating the hydraulic conductivity and/or transmissivity of the selected drainage net geocomposite also is included in Appendix D.

The drainage layer hydraulics, at a 0.3 percent slope to represent flat zones in drainage collection areas beneath transmission lines, was modeled using a landfill drainage system program. The cap soil was assumed to be a silty-clay with a permeability of 1×10^{-6} cm/s. This type of soil is readily available from the proposed on-Site borrow area, which investigations indicated the borrow area soil is typically in the range of 1×10^{-7} cm/s. The selected drainage net has a transmissivity of 4.5×10^{-3} m²/sec (fabric on both sides) at 0.3 percent slope.

The drainage net performance was evaluated for a worst-case scenario of 0.3 percent side slope. Calculations were performed for the slope length of 150 feet, which represents the typical Site configuration. The results were evaluated using a factor of safety to account for higher than predicted infiltration rates and drainage system performance inefficiencies. The calculated capacity for drainage net exceeds the expected drainage requirements.

The irregular shape of the final cap system, due to the constraints of the transmission towers and lines, results in varying drainage patterns and lengths. A drainage net geocomposite with a minimum transmissivity of 4.5×10^{-3} m²/s has been selected to satisfy drainage requirements during periods of intense rainfall, to reduce the time excess water accumulates above the GCL in the primary drainage locations.

Geotextile

A non-woven geotextile fabric will be heat laminated to the specified drainage net prior to its delivery. Construction and material specifications for the geofabric are included as part of the final drainage net geocomposite specification.

The Apparent Opening Size (AOS) of the geotextile will be sized based on the grain size of the soil to eliminate the risk of soil clogging the drainage net. The AOS divided by the D_{85} of the soil will be less than 3. The D_{85} of the soil is that particle size which 85 percent of the soil particles, by weight, are finer than.

Barrier Protection/Compacted Fill Layer

An 18-inch barrier protection layer of compacted fill will be placed over the graded slag. The quantity of fill required for the cap soil protection layer is approximately 121,000 cubic yards, of which approximately 51,000 cubic yards will come from the on-Site borrow area and 70,000 cubic yards will come from off-Site sources. Based on pre-design testing, the permeability of the on-Site borrow fill ranges from the 10^{-6} cm/s to 10^{-7} cm/s. Imported soil that will be used for the cap protection fill layer will have a maximum permeability of 10^{-6} cm/s.

The predesign investigation determined that a borrow area north of the existing slag mound could be developed as a source for fill. The location of the borrow area is presented on Drawing C-02. Approximately 51,000 cubic yards of soil can be obtained from the borrow area and used for fill in conjunction with the proposed remedial work.

The borrow area will be developed and restored as follows:

- existing topsoil will be removed and stockpiled for reuse;
- soil will be excavated and graded to the contours shown on Drawing C-08;
- the stockpiled topsoil will be placed over the graded surface; and
- the topsoil will be seeded to establish a vegetated cover.

Topsoil

A 6-inch layer of soil capable of supporting vegetative growth will be placed over the common fill layer to support a vegetative cover over the cap. This will require approximately 42,000 cubic yards of topsoil. The topsoil will consist of 6 inches of tilled, uncompacted soil containing organic material. The soil will be free of unsuitable materials or debris. The soil shall have a maximum aggregate size of 1.5 inches and contain organic matter at 3 to 20 percent with a pH of 6.1 to 7.8. The soil shall be suitable as a turf growing medium.

Vegetative Layer

The vegetative layer serves to:

- stabilize the soil against erosion due to runoff and wind;
- minimize percolation of precipitation;

- maximize evapotranspiration of soil moisture; and
- increase the aesthetic value of the cap.

The final vegetative cover will include a mixture of the following grasses:

- | | |
|-----------------------------|-----|
| • Creeping Red Fescue Grass | 25% |
| • Kentucky Blue Grass | 20% |
| • Perennial Ryegrass | 40% |
| • Annual Ryegrass | 10% |
| • Red Clover | 5% |

These grasses are suitable for late-summer planting. Prior to seeding, the topsoil will be fertilized, if necessary. Fertilization rates will be determined based on analysis of the topsoil.

Specifications for the topsoil and vegetative cover are provided in the Project Specifications.

6.7 CONFIRMATORY SAMPLING

In areas where sediment/slag removal is performed beyond the limits of the proposed cap, confirmatory samples will be collected at a frequency of approximately one sample per 100- by 100-foot area. Samples will be analyzed for the following metals:

- | | |
|-------------------------|------------|
| • arsenic | • copper |
| • cadmium | • nickel |
| • chromium (total) | • vanadium |
| • chromium (hexavalent) | • zinc |

The soil cleanup levels for the metals identified above are as follows:

Restricted Industrial Use Soil Cleanup Objectives⁽¹⁾

Arsenic	16
Cadmium	60
Chromium (total)	680
Chromium (hexavalent)	800
Copper	10,000
Nickel	10,000
Vanadium	NA
Zinc	10,000

Notes:

NA - Not available

(1) - Remedial Program Soil Cleanup Objectives, 6 NYCRR Subpart 375.6, December 14, 2006.

A Field Sampling Plan (FSP) is presented in Appendix E and a Laboratory Quality Assurance Project Plan is presented in Appendix K.

6.8 SURFACE WATER DRAINAGE

Currently there are several drainage ditches and several areas of ponded water on Site. The remedial design includes drainage modifications to promote runoff from the site and minimize ponding of water within and adjacent to the capped area. A 15-inch HDPE culvert will be installed to convey stormwater from the north side of the OU #3 cap to the west side of the OU #3 cap passing under the access road.

A new drainage ditch culvert will be constructed along the OU #2/OU #3 boundary. The ditch will collect water from the west side of the cap and drain to the south. The ditch linings consist of either riprap or grass, designed to convey the surface water flow without erosion of the channel. Two new 18-inch culvert pipes also will be installed along the OU #2/OU #3 boundary, beneath the new ditch. The culvert pipes will be used to convey surface water drainage from the area north of the slag mound and Area 1 and will ultimately discharge into the new drainage ditch approximately 100 feet north of the OU #2/OU #3 southeast corner. A plan and profile of proposed ditch and culvert is presented on Drawings C-17 and C-18. Manhole details are presented on Drawing C-21. To mitigate groundwater movement in the culvert pipe bedding, clay seepage collars will be installed at regular intervals.

6.9 WETLAND RESTORATION

Remedial activities will involve some disturbance of the wetlands north and south of the slag mound and improvements to the drainage at the Site will eliminate some of these areas as wetlands. Restoration of these areas will not be performed beyond grading, placing topsoil and seeding. As discussed in Section 6.8, the final contours and drainage plan for the Site are designed to promote surface water runoff and minimize ponding of water within and adjacent to the capped area.

Disturbances will occur during removal of sediments from the wetland south of OU #1. Following removal of the sediments, the edges of the remediation areas will be graded to a maximum slope of 5:1 to provide for a transition from the remediated areas to the adjacent unremediated areas. In addition, three wetland islands will be created within the remediated areas to provide additional habitat. The top of each island will be planted with indigenous plants in an effort to minimize the spread of phragmites into these areas.

6.10 LONG-TERM OPERATION, MAINTENANCE, AND MONITORING

A preliminary long-term OM&M Plan has been developed and is presented in Appendix F. A final OM&M Plan will be submitted to the NYSDEC upon completion of remedial construction.

6.11 FENCING

Chain-link fencing, (8 feet with three strands of barbed wire) will be installed around the engineered cap to prevent unauthorized access. The fencing and gates will be grounded in accordance with Section 92.E of the National Electrical Safety Code, latest edition. The limits of fencing are shown on Drawing C-02.

7.0 SEDIMENT AND EROSION CONTROL PLAN

7.1 TEMPORARY CONTROLS

A sediment and erosion control plan is presented in Appendix H that specifies the measures to be taken to prevent erosion and sediment transport from the work area. The sediment and erosion control plan, at a minimum, will meet the substantive requirements of the NYSDEC SPDES General Permit for Stormwater Discharges from Construction Activity. The sediment and erosion control plan will be implemented by the selected Remedial Contractor prior to commencement of construction.

The soil erosion and sediment controls to be implemented at the Site are as follows:

- installation of hay bales and/or silt fences around remedial activities;
- installation of stone check dams in drainage swales or locations of concentrated surface water flow, as required;
- daily smooth rolling of open cap soil backfill areas; and
- maintenance of the implemented soil erosion and sediment controls.

The overall sediment and erosion control plan to be implemented during remedial construction (RC) activities is presented on Drawing C-04 (Sediment and Erosion Control Plan). Details of the sediment and erosion control features are presented on Drawing C-14 (Sediment and Erosion Control Plan Details).

7.2 PERMANENT CONTROLS

Cap system topsoil soil erosion calculations using the Universal Soil Loss Equation are presented in Appendix D. Analysis was performed for the cap 1 year after seeding and with a mature grass cover. The results for the cap system during the first year after seeding are satisfactory except where the slope gradient exceeds 6 percent. Overall, it is not expected that soil loss will exceed the USEPA guidance value of 2 tons per acre per year, as the analysis for the cap with an established grass cover shows soil loss per year to be less than 0.5 tons per acre per year.

To reduce the potential for soil loss, prior to establishing a mature grass cover, a tackifier will be applied during hydroseeding.

8.0 STORMWATER MANAGEMENT PLAN

The Stormwater Management Plan (SWMP) is presented in Appendix G. The SWMP was prepared in accordance with the "New York State Stormwater Management Design Manual". The SWMP describes how surface water runoff will be conveyed from the capped area of the Site.

9.0 CONSTRUCTION HEALTH AND SAFETY PLAN

A Construction Health and Safety Plan (CHASP) is presented in Appendix I. The CHASP contains performance levels and necessary criteria to address the following areas:

- i) general requirements;
- ii) personnel;
- iii) levels of protection;
- iv) safety work practices;
- v) medical surveillance;
- vi) personal and community air monitoring;
- vii) personal protective equipment;
- viii) personal hygiene;
- ix) decontamination – personnel and equipment;
- x) Site work zones;
- xi) Contaminant control;
- xii) Contingency and emergency planning; and
- xiii) Logs, reports, and recordkeeping.

During the implementation of the RA activities, Site health and safety programs will be implemented to ensure that a safe work environment is provided for the on-Site workers, and to minimize the potential impact of activities on the general public. The selected contractor will be required to prepare a Site-specific Health and Safety Plan (SSHASP) to govern all on-Site contractor personnel and activities. The SSHASP will meet, as a minimum, the requirements of 29 CFR 1910 and will include working around power lines in accordance with power companies' safety standards as set forth in the CHASP. The SSHASP will promote a safe work environment for Site personnel, and will provide measures to mitigate contaminant migration from the Site during the RA.

A Community Air Monitoring Plan (CAMP) is presented as Appendix C to the CHASP. Community air monitoring will be performed in accordance with the NYSDEC Technical and Administrative Guidance Memorandum #4031 Fugitive Dust Suppression and Particulate Monitoring Program.

10.0 CONSTRUCTION QUALITY ASSURANCE PROJECT PLAN

A Site-specific Construction Quality Assurance Project Plan (CQAPP) is presented in Appendix J. It has been developed to ensure that the minimum objectives of the remedial design are met during implementation. The CQAPP includes the following:

- i) introduction;
- ii) project description;
- iii) project organization and responsibilities;
- iv) personnel qualifications;
- v) project meetings;
- vi) inspection and testing activities, and
- vii) documentation.

The inspection, testing, and control activities of the CQAPP include surveying, geotechnical analysis, permeability analysis, compaction testing, GCL inspection and testing, drainage net inspection, and chemical analysis of imported soil.

11.0 PERMITTING REQUIREMENTS

Pursuant to § 121(e)(1) of CERCLA, 42 U.S.C. § 9621(e)(1), all permits or approvals necessary under federal, state, and local laws for off-Site work will be obtained by submitting timely applications and requests for any such permits and approvals (if required).

At this time, anticipated permit requirements that may be applicable are identified as follows:

- NYPA Right-of-Way Permit;
- Town of Niagara sewer discharge permit;
- NYSDEC General Permit for Stormwater Discharges from Construction Activity; and
- U.S Army Corps of Engineers NWP 38.

The above permits, if necessary, will be obtained in advance of construction. Permitting requirements imposed by the applicable permit programs will be incorporated in the final construction requirements.

13.0 IMPLEMENTATION SCHEDULE

The slag consolidation and construction of the final cap system will take approximately 11 months. The time to complete Site work is impacted by work restrictions and health and safety considerations when working under the transmission lines. A detailed schedule will be prepared and submitted to NYSDEC upon completion and approval of the Final Design submittals.

14.0 REFERENCES

- ABB Environmental Services (ABB), 1993. *Engineering Investigations at Inactive Hazardous Waste Sites. Preliminary Site Assessment Evaluation Report of Initial Data. Volume 1. Vanadium Corporation, Town of Niagara.* Prepared for NYSDEC. Prepared September 1993.
- Conestoga-Rovers & Associates (CRA), 2004a. *Phase III and IV Work Plan.* Vanadium Corporation of America, Niagara Falls, New York. Prepared December 13, 2004.
- Conestoga-Rovers & Associates (CRA), 2004b. *Phase I Letter Report.* Vanadium Corporation of America, Niagara Falls, New York. Dated August 6, 2004.
- Golder Associates, Inc. (Golder), 2001. *Delineation of Surface Water Bodies, Wetlands, and Ecological Receptors at the Former Vanadium Corporation of America Site.* Town of Niagara, New York. New York Hazardous Waste Disposal Site No. 932001. Operable Unit #3. Prepared December 2001.
- New York State Department of Environmental Conservation (NYSDEC), 2001. *IIWA Report.* Niagara Mohawk Right of Way Site. Town of Niagara, Niagara County. Prepared February 2001.
- New York State Department of Environmental Conservation (NYSDEC), 1997. *Immediate Investigative Work Assignment (IIWA).* Vanadium Corporation of America Site #932001. Operable Unit No. 3. Prepared August 1997.
- Conestoga-Rovers & Associates (CRA), 2005. *Remedial Analysis/Feasibility Study (RI/FS).* Vanadium Corporation of America, Niagara Falls, New York, dated November 2005.
- Conestoga-Rovers & Associates (CRA), 2007. *95% Design Report.* Vanadium Corporation of America, Niagara Falls, New York, dated May 2007.

FIGURES



SOURCE:
DELOME MAPPING ATLAS,
UPSTATE NEW YORK, CITY STREET MAPS

figure 1.1
SITE LOCATION
REMEDIAL DESIGN
VANADIUM CORPORATION OF AMERICA SITE
Town of Niagara, NY

