

In-Situ Chemical Oxidation Construction Package

Former Dover Electronics Site
Kirkwood, Broome County, New York
Site Number (7-04-026)

February 2011

ARCADIS



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Construction Package**

Former Dover Electronics Site
Kirkwood, Broome County, New
York

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1. Introduction

On behalf of Dover Corporation (Dover), ARCADIS of New York, Inc. (ARCADIS) has prepared this *In-Situ Chemical Oxidation (ISCO) Construction Package* (Construction Package) for groundwater remediation at the former Dover Electronics site in Kirkwood, Broome County, New York (Site Number 7-04-026). This document provides the remedial construction design information that was specified in the *Full Scale In-Situ Chemical Oxidation Design Report* (Design Report) submitted to the New York State Department of Environmental Conservation (NYSDEC) in March 2010 in accordance with the executed Order on Consent between Universal and the NYSDEC, dated January 19, 2001.

1.1 Purpose

This document summarizes the objectives for site groundwater remediation and provides detailed descriptions for implementation of the remedial action (i.e. remedial system construction) as described in the Design Report (ARCADIS 2010). ISCO injection with sodium permanganate will be implemented to reduce the dissolved groundwater impacts of tetrachloroethene (PCE) in the source area as well as the downgradient area (i.e. Pilot Truck Stop) to conditions acceptable to NYSDEC for monitored natural attenuation (MNA).

The following documents are also included in the Construction Package: Site Management Plan (SMP) including Operation & Maintenance (O&M) program and Monitoring program, Quality Assurance Project Plan (QAPP), Field Sampling Plan (FSP), site-specific Health and Safety Plan (HSP), and Community Air Monitoring Plan (CAMP).

The remainder of this report is organized into the following sections:

- Section 2 Remedial System Construction - This section provides technical specifications for the construction of ISCO injection system, as well as specifications for monitoring points to be installed during the construction.
- Section 3 Remedial System Operation – This section discusses the steps for system operation including startup of the ISCO system, full-scale operation, and implementation of contingency plan.

- Section 4 Groundwater Monitoring Program – This section describes the groundwater sampling procedures and frequency for assessing the effectiveness of the ISCO using sodium permanganate and the dispersion of the sodium permanganate into the target area.
- Section 5 Site Management Plan – This section addresses site management requirements for soil and groundwater operable units.
- Section 6 Health and Safety Plan – This section includes the revised HSP and CAMP for the new remediation tasks so that persons at and in the vicinity of the site during remedial action construction work and during the O&M phase of the remedial action will be protected.
- Section 7 Quality Assurance/Quality Control Program – This section provides the details of the activities to be undertaken to ensure the quality of all data and data collection activities associated with the implementation and monitoring of the remedial action.
- Section 8 Field Sampling Plan – This section presents the proposed technical approach for conducting field sampling activities at the site.
- Section 9 Reporting – This section summarizes the reporting requirements for the full-scale ISCO remediation program.
- Section 10 Schedule - This section presents the schedule for implementation of the ISCO system construction, operation and monitoring activities.

1.2 Project Background

Several subsurface environmental investigations were conducted at the site spanning the time period between 1990 and 1996 to assess soil and groundwater beneath the facility. The original consent order regarding this site (between NYSDEC and the DII Group) was entered into on May 12, 1998. A Remedial Investigation/Feasibility Report was submitted to NYSDEC in February 2000 (Shield Environmental, 2000). Additional studies have been conducted at the site since the March 2000 Record of Decision (ROD) was published to refine understanding of the subsurface PCE contamination in groundwater and physical/geochemical properties that influence remediation of the site's groundwater plume.

1.2.1 Site Location

The former Dover Electronics facility is located at 29 Industrial Park Drive, Kirkwood, Broome County, New York. The facility is located on a site of approximately 9.58 acres in size. A site location map is shown on Construction Drawing 1 in **Appendix A**.

The property is situated in an industrial setting. Major plants in the area include: Truckstops of America Landfill (0.5 mile southeast), Frito Lay Plant (0.5 mile south), Universal Instruments (147 Industrial Park Drive, 0.5 mile east), Kason Industries (eastern property boundary), Consolidated Freightways (northern property boundary), and the Pilot Truck Stop to the south. Industrial properties surround the property to the north, east, and west.

The property consists of an industrial building with parking areas. The site had served as one of Universal Instruments' service facilities for product training, research and development, and Odd Form Assembly (OFA), which involves the engineering and assembly of non-standard/specialty circuit boards until 2007. In 2007 the facility was sold to Modern Marketing Concepts, Inc. (MMC). MMC handles outsourced customer service and product ordering for other companies.

1.2.2 Site History

The facility was first constructed in 1973, with subsequent additions built in 1978, 1982, and 1984. It has been occupied by Universal Instruments, Dover Electronics, and, most recently, MMC. In 1993, Dover Electronics was renamed Dovatron, Inc. (Dovatron). In 1995, Dovatron transferred its title to the facility to Universal Instruments. In 1996, Dovatron changed its name to the DII Group. Later, the DII Group sold to Flextronics International, Inc. and Universal Instruments became a wholly-owned subsidiary to Dover Corporation. In 2007, Dover Technologies, Inc. (the parent company of Universal Instruments) sold the facility to MMC, who now owns and occupies the property.

Circuit board manufacturing processes used PCE as a cleaning solvent. Originally, the virgin PCE was stored in 55-gallon drums at an outside drum storage area. During the initial facility expansion, a ramp to the east-side overhead door served as the entry point for PCE drums. As production increased and the facility was again expanded, virgin PCE was stored in a 3,000-gallon aboveground storage tank that has since been removed. An aboveground 5,000-gallon waste PCE flux storage tank was also located on the site. In March 1993, the aboveground PCE system was dismantled. Two 480-

gallon PCE tanks were reportedly dismantled and removed from the building interior at that time.

1.2.3 ISCO Field Tests

Three phases of ISCO field tests were conducted between 2005 and 2008 at the site to evaluate the effectiveness of ISCO using sodium permanganate as a full-scale groundwater remedy. The ISCO field testing using sodium permanganate was proposed for the remaining residual chlorinated ethenes within the central part of the groundwater plume. Sodium permanganate is a proven oxidizer of chlorinated ethenes and has very high water solubility allowing high dissolved concentrations of the oxidant to be introduced into the aquifer. The field test objective was to reduce concentrations of PCE within the area defined by the 1,000 micrograms per liter (\bullet g/L) isoconcentration contour line (September 2004 groundwater data). The results of ISCO field tests indicate that the permanganate is effective in reducing chlorinated ethenes concentrations.

1.2.4 Present Groundwater Plume Conditions

Groundwater monitoring data collected between September 2004 and September 2008 sampling events were compared to evaluate PCE concentration rebound at certain monitoring wells and monitoring points in shallow and intermediate groundwater zones. The findings are summarized below.

In the shallow groundwater zone:

- PCE was not detected in MW-7A in March 2008, but rebounded to 1,600 μ g/L in September 2008. The PCE concentration trend at MW-7A indicates flow path connectivity to upgradient injection wells and the presence of residual PCE mass in the vicinity.
- PCE concentration trends at MW-28, MP-4 and MP-6S indicate initial oxidation of PCE followed by rebound. PCE concentration initially decreased at MW-28 from 240 μ g/L in September 2004 to 48 μ g/L (September 2006) following injection and rebounded up to 160 μ g/L in September 2008. The concentration of PCE in MP-4 exhibited the following concentration profile:
 - 9,900 μ g/L in September 2004

- 6,200 µg/L in September 2005
- 17,000 µg/L in October 2007
- 3,600 µg/L in March 2008
- 9,100 µg/L in September 2008

MP-6S shows an initial PCE decline from 2,400 µg/L in September 2004 to 1,200 µg/L (March 2006), rebounded up to 2,300 µg/L (October 2007), and slightly decreased to 2,200 µg/L in September 2008.

In the intermediate groundwater zone:

- The overall PCE concentration trend in the area of MW-25 is indicative of a decrease of approximately 63% that coincides with the permanganate injection upgradient at location IJ-6.
- The concentration of PCE in MW-38 initially decreased from 300 µg/L in September 2004 to 6.3 µg/L in March 2006 followed by a rebound. In September 2008, PCE concentration was detected at 270 µg/L.

PCE concentration at MW-37 has decreased from 18 µg/L in September 2004 to 0.99 µg/L in September 2008.

1.3 Remedial Action Goals

As stated in the Design Report, the goals of the groundwater remedial program at the former Dover Electronics Site are to meet relevant NYSDEC's Standards, Criteria, and Guidance (SCGs) and to be protective of human health and the environment.

Specifically, the goals selected for this site are:

- to reduce, control, or eliminate, to the extent practicable, the continued migration of impacted groundwater from the site;
- to eliminate, to the extent practicable, exceedances of applicable environmental quality standards related to groundwater;

- to protect human health and the environment through implementation, operation, and monitoring of the remedial program.

To meet these goals through the proper application of scientific and engineering principles, the following objectives have been established for the remedial action:

- Install and operate an ISCO injection system to distribute sodium permanganate in the source area to oxidize the constituents of concerns (COCs) within the target radius of influence (ROI) (8 to 15 ft) and to reduce the COC levels downgradient/outside of the target ROI;
- Install additional monitoring points and conduct groundwater monitoring to assess the dispersion of the sodium permanganate into the target area and check assumptions and assigned parameter values incorporated into the basis for design; and
- Protect human health and the environment through implementation, operation, and monitoring of the remedial program.

2. Remedial System Construction

The scope of work to be performed entails the implementation of the full-scale ISCO system construction for PCE-affected groundwater at the source area of the site. The major construction components will include the following:

- Site preparation including mobilization, installation of a temporary equipment decontamination area, site security and access, and site and utility survey.
- Injection well and monitoring point installations;
- Trenching and piping between the proposed ISCO tank area and the injection wells;
- Construction of a below grade distribution box;
- Installation of an aboveground chemical storage tank on a concrete pad;
- Removal excess soils from trenching and distribution box areas and off-site transportation and disposal of non-hazardous soil excavated; and,
- Restoration including installation of chain link fence around the aboveground mixing tank area.

The full-scale ISCO system has been designed based on previous groundwater investigation and pilot test results. The remedial system will be constructed in accordance with the remedial construction drawings and technical specifications prepared for the site. The construction drawings including general site plan, ISCO system layout plan, piping plans and details, feed tank foundation plan, general arrangement and details, piping and instrumentation diagram and well construction plans are provided in **Appendix A**. The technical specifications for each of the Construction Divisions used, such as General Requirements, Site Work, Equipment etc. are provided as **Appendix B**.

However, adjustments will be made in the field to accommodate field conditions, including existing utility lines and location of trees and other structures. Modifications to the proposed scope of work, schedule, and construction activities will be discussed with NYSDEC and agreed to on an on-going basis before and during construction.

2.1 Applicable Remedial Standards

The remedial criteria (i.e. groundwater quality standard) applicable to this groundwater remedial action are found in the NYSDEC's Division of Water Technical and Operational Guidance Series (TOGS 1.1.1), dated June 1998. Other relevant criteria for managing wastes generated during remedial action activity include the Resource Conservation and Recovery Act (RCRA) hazardous characteristics. The RCRA characteristics analyses (ignitability, corrosivity, reactivity, and Toxicity Characteristic Leaching Procedure [TCLP]) will be used for waste profiling, waste characterization, and waste disposal activities.

2.2 Site Preparation

Prior to the remedial system construction, various site preparation activities will be performed at the site. The site preparation activities are identified and discussed in the sections below.

2.2.1 Mobilization

Prior to the initiation of any site activity, ARCADIS and the selected contractors will mobilize to the site and prepare for ISCO system construction activities.

2.2.2 Temporary Equipment Decontamination Area

A temporary decontamination area will be constructed for use throughout the duration of the construction and restoration phases of the project. The area will be used to contain contaminated material, if any, to the designated work area. The decontamination area will be located at the parking lot area near IJ-2 and IJ-3 as shown on Construction Drawing 3 (**Appendix A**). The decontamination area will consist of a bermed area lined with at least a 100-mil thick synthetic liner. Water collected from the decontamination activities will be drummed for off-site disposal.

2.2.3 Site Security and Access

During remedial construction, site security will be implemented to prevent unauthorized entries throughout the duration of the project. A temporary security barriers or fencing will be installed around the proposed construction area and signs posted around construction areas to restrict access to active work areas and when work has been

stopped or during nighttime hours. Personnel and equipment entering and leaving the work zone will be controlled and recorded in a daily visitor's log.

Site access for construction equipment and trucks will be through Industrial Park Drive to the construction area. Site access has been obtained from the current property owner, MMC.

2.2.4 Site and Utility Survey

A licensed New York State Land Surveyor will locate the location of proposed injection wells and monitoring points, trenches, distribution box, and tank area prior to the initiation of construction activities. Also the existing site topography within the proposed construction areas, property lines, electric lines, manholes, catch basins and any outstanding pertinent site features will be surveyed. Prior to the commencement of work, the areas of work will be photographed to document pre-existing surface conditions at the site.

After the construction is complete, a final as-built survey indicating the finished grades and all restoration features within the construction areas will be conducted to document the changes from the proposed plan. In addition, riser top/measurement point elevations and locations of newly installed injection wells and monitoring points will be surveyed.

Underground and overhead utility lines will be identified within the construction area (i.e. along the trace of proposed trenching as well as the proposed locations of injection and monitoring wells) before mobilization through Dig Safety New York (UFPO). In addition, a geophysical survey using ground penetrating radar (GPR) will be conducted to identify potentially unknown subsurface obstructions. All identified utilities/subsurface obstructions will be painted/marked out onsite. Identified underground and overhead utility lines will be avoided to practical extent. Underground utilities and structures are known to run through the proposed trenching area. The backfill and bedding for these utility lines are the targets of the trenching activities at these locations. The utilities and structures are not intended to be removed or replaced, if practical, so care will be exercised during construction work so that the utilities are not damaged.

2.3 Injection Well and Monitoring Point Installation

All injection wells and monitoring points required for the implementation of full scale ISCO will be installed in accordance with the previously established procedures for injection and monitoring wells installed during the three phases of pilot testing. Development water will be containerized for proper disposal. Drill cuttings will also be containerized for offsite disposal.

The location of proposed injection wells and monitoring points is presented on Construction Drawing 3. The well construction details are presented on Construction Drawing 5B and discussed in the following sections.

2.3.1 Injection Well Construction

Three injection wells (IJ-7 through IJ-9) will be installed in the source area for the full scale ISCO injection. These wells will supplement the two existing injection wells (IJ-2 and IJ-3). Each well will be blind drilled to a depth of 46 feet. The top of screen elevations for these wells will be set 16 feet above the base of the soil boring. The injection well screens will not exceed 15 feet in length. The proposed injection wells will be constructed from 6-inch Schedule 40 PVC riser with a 0.010-inch slotted screen (stainless steel wire wrapped screen). The sand pack placed around the screen will consist of a commercial No. 3 sand or equivalent. The remaining annular space above the sand pack will be filled with a pure sodium bentonite seal followed by bentonite/neat cement grout.

The borings will be drilled with hollow-stem augers to create a pilot boring in the initial 10 to 17 feet, depending on the total depth of the boring, and mud rotary into the final 25 or 28 feet of boring to minimize borehole wall damage and clay smearing. A polymer mud will be used during the rotary drilling process. The injection wells will be completed within a vault to provide access for injection pressure gauges and fittings, and for future monitoring and maintenance activities. In addition, existing injection wells IJ-2 and IJ-3 will be modified/retro-fitted to allow for continuous gravity feed of the oxidant.

The well head details are identical for each injection well with the exception of the depth of the injection line. The injection lines will be located at a minimum depth of 36-inches below grade. The 1-inch diameter HDPE injection line will be connected into the 6-inch diameter injection well riser with the following components; 1-inch diameter HDPE threaded transition fitting, 1-inch diameter PVC union, and a 1x6-inch diameter

PVC tee. The details of the injection well constructions are shown on Construction Drawing 5B.

One injection well (IJ-10) will be installed downgradient of the source area for the full scale ISCO injection. This well will be constructed similar to IJ-7 through IJ-9 except the well head. The well construction details are shown on Construction Drawing 5B.

A minimum of 24 hours after the injection wells are installed, they will be developed by hydraulic jetting followed by moderate pumping until a minimum of 3 well volumes has been removed. Existing injection wells IJ-2 and IJ-3 will be re-developed by hydraulic jetting.

Hydraulic jetting will be accomplished by simultaneous high velocity, horizontal water jetting and well pumping. The jetting tool will be rotated at a speed of 1 revolution per minute (rpm) or less and will be moved from the bottom to the top of the screened interval. No more than 6 inches of vertical screen will be jetted at one time. The wells will be pumped at a rate of 10% to 15% more than the rate at which water will be introduced. The purpose of the hydraulic jetting is to agitate the sand filter pack so that bridging does not occur and, more importantly for the site, to break up any clay skin formed on the borehole wall during drilling.

2.3.2 Additional Groundwater Monitoring Point Construction

Four additional groundwater monitoring points (MP-11, MP-12, MP-13, and MP-14) will be installed to assess the dispersion of the oxidant into the target area. The locations of these additional monitoring points are presented on Construction Drawing 3.

The depth of monitoring points will range from approximately 25 to 50 feet bgs. The monitoring points will consist of 2-inch diameter, 10-foot PVC, 10-slot screens used in conjunction with a 2-inch diameter, PVC riser. The annulus around each well screen will be filled with a sand (filter) pack, tremied into place, topped with a 2-foot thick bentonite seal and completed with neat cement grout. Each well will be an at-grade installation, finished under protective at-grade covers.

2.4 Mixing Tank Area

A 6,500-gallon heavy-duty polyethylene (HDPE) double wall vertical tank will be utilized to mix and store the oxidant solution for injection. This mixing tank will be placed on a

concrete pad with curb at the proposed location northwest of the main building as shown on Construction Drawing 3.

A 16-foot by 16-foot concrete pad with 1.5-foot height curb will be installed first at the proposed mixing tank area. This concrete pad and curb will be utilized as spill containment. The double wall mixing tank providing a minimum of 110 percent secondary containment will be installed on the top of concrete pad and be equipped with the following: 1) leak detection sensor; 2) heat tracing elements and insulation; 3) one dual impeller mixer; 4) level switches; and 5) required piping and appurtenances. The details of mixing tank and concrete pad are shown on Construction Drawing 5A. In order to connect the tank to the permanganate tanker truck or the fire hydrant, the pipe at the inlet of the tank will be ended with a stainless steel male camlock. At the outlet of the tank, a gate valve will be installed to control the injection flow. The mixing tank will be connected to the distribution box through a piping layout plan. The trenching and piping details are discussed in Section 2.5.

After the tank and concrete pad are installed, a 12-foot tall chain-link fence and gate with privacy windscreen will be installed around the tank/concrete pad area to restrict access to the public and provide security. The details of the chain-link fence and gate are shown on Construction Drawing 5B.

The mixing tank, concrete pad, and electrical components will be installed in compliance with local, New York State, and Federal requirements.

2.5 Trenching and Piping

The mixing tank and five injection wells (IJ-2, IJ-3, IJ-7 through IJ-9) will be connected to the distribution box through a piping layout plan, as shown on Construction Drawing 3 (**Appendix A**). The mixing tank will be connected to the distribution box through a 2-inch diameter stainless steel pipe (aboveground with insulation and heat tracing) and then a 2-inch diameter HDPE pipe (underground). Each injection well will be connected to the distribution box by a 1-inch diameter HDPE pipe. Because the permanganate solution will be injected by gravity, a minimum of 1 percent pipe slope will be maintained from the tank to the distribution box and from the distribution box to the injection wells.

A common manifold located inside the distribution box will service each of the injection wells. The distribution box will be constructed of 4000-psi pre-cast 4-feet by 4-feet or 5-feet by 5-feet concrete vault. The distribution box will be accommodated with an

aluminum ladder and locking, heavy duty, double leaf door. Each of the individual injection lines will have the following components located within the distribution box; one ball valve, one totalizing flow meter (0.3-3 gallons per minute [gpm]), schedule 80 PVC unions, one pressure gauge (0-30 psi), one pressure relief ball valve, and one tee to tie the injection line into a common manifold. Each injection line will be secured to a unistrut pipe rack in the distribution box. All materials will be compatible with sodium permanganate. The detailed design with specifications of distribution box is presented on Construction Drawing 6 (**Appendix A**).

The depth of trenches will be below the frost line (i.e. approximately 4 feet below ground [bgs]). All soil will be removed by means and methods proposed by the contractor. Hand digging may be required to avoid damaging underground utilities. All excavated material will be staged temporarily onto a 40-mil thick liner and be covered by two layers of 6-mil thick plastic. The plastic cover will be maintained to prevent rainfall infiltration of the stockpiled soil. After the piping being installed, the trench will be backfilled with a flowable fill or clean gravel to 3 ft bgs.

Given that no contamination was observed within the proposed trenching and distribution box areas during previous investigation activities, the soil cuttings from these areas will be used to backfill the trench to the pre-construction grade. However, a photoionization detectors (PID) equipped with a 10.6 eV lamps will be used to screen the excavated soil prior to backfilling. Brush, roots, sod, organic matter, and other unsuitable materials will not be placed within the fill. All unsuitable items within the fill will be removed and disposed. Soil fill will be spread in horizontal uniform lifts with each lift uniformly compacted.

Any excess soil cuttings will be disposed of offsite. Prior to disposal, waste classification samples will be collected and analyzed for NYSDEC Analytical Services Protocol (ASP) VOCs and RCRA metals using the TCLP analysis method. The sampling results will be used to satisfy selected TSD facility requirements. Additional parameters may be analyzed if required by the TSD facility. Soil that fails toxic characteristic analyses, such as the TCLP, will be classified as hazardous. Soils that pass toxic characteristic analyses but exceed NYSDEC soil cleanup objectives and levels (TAGM # 4046, *Determination of Soil Cleanup Objectives and Cleanup Levels*, Tables 1 and 2) will be classified as non-hazardous. Soils that do not exceed the contaminant concentrations listed in TAGM #4046 will be classified as clean.

The construction specifications are presented in **Appendix B**.

2.6 Utility Service

Electric service will be obtained from an existing power pole located immediately along the southern property boundary. The power will be transferred via underground conduit from the power pole to the proposed tank area. A 120/208 volt, 150 amp electric service will be provided in order to satisfy the power requirements of the equipment and controls.

2.7 Dust Control

The construction area will be maintained so as to minimize the creation and dispersion of fugitive dust. The program for suppressing fugitive dust and monitoring particulate matter will follow NYSDEC's *Technical And Administrative Guidance Memorandum #4031: Fugitive Dust Suppression and Particulate Monitoring Program At Inactive Hazardous Waste Sites*. (TAGM #4031). Dust control measures will be used throughout the course of the site work, as warranted. These measures will include:

- *Applying water to roadways and work area, as needed* – The water used for dust suppression will be free of oil and other deleterious materials. Standing water and collected rainwater may be used for dust control on areas within the active excavation areas, provided runoff is contained within the areas; and
- *Covering stockpiles with plastic sheeting* – The stockpile coverings will be properly overlapped and secured to prevent the plastic sheeting from being dislodged by high winds and rain.

Dust emissions will be visually monitored throughout the period of work. Particulate monitoring for fugitive dust will be performed using real-time particulate monitors that will have automatic alarms and will detect particulate matter less than 10 microns in diameter. Fugitive dust controls will immediately be implemented if conditions warrant. The details of monitoring plan are provided in CAMP (**Appendix G**).

2.8 Site Restoration and Demobilization

Any collected sediment from erosion control devices and structures will be removed and disposed. Any temporary utilities, facilities, and structures will be disconnected and removed. All on-site surfaces and facilities will be restored to pre-construction conditions, including:

- Landscaping;
- Paving and curbing;
- Utilities; and
- Structures.

A final cleaning will be performed, including removal of incidental construction debris, surplus materials, rubbish, and construction facilities from the work area. A certificate of decontamination will be prepared for each piece of equipment once the equipment has been decontaminated prior to leaving the site.

2.9 Permitting Requirements

Implementation of the ISCO system construction will require permits or permit equivalencies in accordance with applicable regulations. The need for these permits or permit equivalencies is also dependant on the activity being pursued. A brief discussion of the permits is provided herein.

To construct the remedial system, the following permits may be required.

- Building Permits (local authority)
- Electrical Permit (local authority)

The above listed permits or permit equivalencies will be coordinated and obtained prior to system installation by the remedial contractor.

Prior to well installation, a notification will be provided to the United States Environmental Protection Agency (USEPA) for the construction of Class V Underground Injection Control (UIC) wells. This procedure is necessary to meet the administrative requirements of 40CFR, subparts B, C and G, Sections 144.25 through 84. At least 30 days prior to injection well construction USEPA will be notified using the specified inventory form (USEPA Form 7520-16). The notification will state that the former Dover Electronics site is overseen by the NYSDEC and that the ISCO program has been approved by NYSDEC.

3. Remedial System Operation

The remedial system operation will include startup of the ISCO system, full-scale system operation, and implementation of contingency plan. The details of these steps are described below.

3.1 System Startup

The concentration of permanganate solution for each injection point will be approximately 5% and the volume will vary per injection point. Based on fluid accommodation rates observed during field test injection activities, the source area injection wells will have received an approximate minimum total volume of 5% solution of 6,500 gallons and an approximate maximum of 13,000 gallons. The actual volume for each injection well will be verified based on field conditions (i.e., well volume and soil porosity) identified during startup tests. Each injection well will be tested independently to estimate its hydraulic capacity by injecting a 5% permanganate solution. It is estimated that the duration of the startup test for five injection wells will be about two weeks.

3.2 System Operation

The primary operational activity will consist of sodium permanganate delivery to the site by tanker truck, transfer of 40% sodium permanganate solution to the aboveground feed tank, and dilution to 5% via mixing with hydrant water. The 5% solution of sodium permanganate will then be delivered by a gravity-feed system in the source area and manually injected at the downgradient of the source area. Once the aboveground feed tank is filled, it will take approximately 12 to 24 days to drain to the injection wells in the source area. The aboveground feed tank will be re-filled w/ oxidant followed by a post-injection period (total of approximately 70 days) and the sequence repeated. The volume of oxidant liquid delivered into the subsurface is estimated approximately 33,500 gallons in total per year in the source area. Delivery will be by pulsed distribution, 5 events per year for gravity feed and 4 events per year for manual injection, through two arrays of injection wells/points.

Although the ISCO system will be essentially self-operating because it is a gravity feed system the feed tank will need periodic refilling, high and low fill probes will need checking; injection well and piping manifold vaults will need checking; heat trace, pressure gauges, and tank condition will need monitoring, and security fencing will require monitoring.

It is proposed that oxidant injections will be continued actively treat the groundwater until the following criterion is met:

- Low-level asymptotic concentrations are observed in monitoring wells in the source area and downgradient of the source area.

When this criterion is met an evaluation of system performance with respect to temporarily or permanently inactivate the groundwater remediation system will be made following DER-10 guidance found in Section 6.4 “Remedial Process Closure Requirements”, Subsection (b) 1 “Shutdown of Groundwater Treatment Systems”. By design of the periodic injection of oxidant, the groundwater remediation system operationally incorporates a type of pulsing treatment (on/off cycles); therefore the length of off cycles will be part of the system evaluation.

In order to assess the overall effectiveness of the ISCO program and estimate the mass of any remaining residual PCE, groundwater will be allowed to equilibrate for 6 months after the oxidant injection is suspended. Groundwater samples will be collected from the monitoring points and monitoring wells presently in the groundwater sampling program. The sampling results will be used to determine the extent and magnitude of any PCE concentration rebound (evaluated as total SSPL VOCs).

If, after a minimum of 8 groundwater sampling events to determine asymptotic conditions, the average total SSPL VOC concentrations do not rebound (remain below low-level asymptotic concentrations within the source-area for two consecutive sampling events [one year timeframe post- oxidant injection]) and SCGs are attained at the property line, an active oxidation termination request letter will be submitted to the NYSDEC for approval.

Should low-level asymptotic groundwater concentrations result in a condition where SCGs are not attained and MNA or enhanced reductive dechlorination (ERD) program will be proposed and, with NYSDEC’s approval, implemented after the ISCO treatment to complete the remediation of remaining total SSPL VOCs in the source area to attain SCGs. If a rebound of total SSPL VOC concentrations are observed in the source area or elevated COC concentrations are observed in the groundwater at the property line, additional oxidant injections or other remedial measures, such as ERD, will be proposed and implemented upon NYSDEC approval.

3.3 Contingency Plan

The effectiveness will be gauged through regular performance monitoring as detailed in Section 4.0. Based on results of field monitoring activities, injections may be further enhanced for optimizing site remediation including, but not limited to: adjusting permanganate concentrations and frequency and/or installation of additional injection wells. Prior notice, as necessary, to NYSDEC and approval will be obtained prior to implementation of contingency plan.

4. Groundwater Monitoring Program

A groundwater monitoring program to evaluate the effectiveness of the ISCO treatment was developed and is summarized in this section. Groundwater monitoring program will include baseline and performance monitoring. The details of the sampling methodology and analytical protocols are discussed in the QAPP in **Appendix D** and FSP in **Appendix E**.

4.1 Baseline Monitoring

Baseline groundwater conditions for benchmarking full-scale ISCO remediation progress is established by the March 2010 groundwater sampling event. During the March 2010 groundwater sampling event, samples were collected from all monitoring wells and monitoring points that are west of the facility building. All groundwater samples were analyzed for site-specific parameter list (SSPL) VOCs, which include: PCE; trichloroethene (TCE); 1,1,1-trichloroethane (1,1,1-TCA); 1,1-dichloroethene (1,1-DCE); cis-1,2-dichloroethene (1,2-DCE); trans 1,2-DCE; 1,1-dichloroethane (1,1-DCA); and vinyl chloride (VC). The analytical method used to test the groundwater samples for VOCs was United States Environmental Agency (USEPA) Method 8260B following Contract Laboratory Protocol (CLP) Statement of Work (SOW), document OLM04.2, as modified by the NYSDEC Analytical Services Protocol (ASP) dated June 2000. Prior to sampling, water levels within all monitoring wells will be measured with a Solinst water level meter equipped with a stainless steel probe and measuring tape graduated in engineering units to 0.01 foot.

In addition to the groundwater data collected during the baseline groundwater sampling event (i.e. March 2010 groundwater monitoring), baseline field parameter data will be collected from wells that are anticipated to show the arrival of injection solution (based on primary or secondary indicators) within the first 90 days. Monitoring wells and points MP-4, MP-5, MP-6S and MP-6D, MW-7A, and injection wells IJ-1, IJ-4, and IJ-9 will be used to establish the site baseline for field parameters pre-full scale remedy implementation. The field parameter data will be collected just prior to full-scale ISCO implementation. These points will also be used for visual observation and field measurements after the oxidant injection starts.

The field measurements will consist of oxidation reduction potential (ORP), specific conductivity, pH and manganese and permanganate using field colorimetric methods. This pre-injection field parameter monitoring will occur approximately 24 hours prior to the start of oxidant injection. Field data can provide real-time indications of oxidant

influence at monitoring locations during and following injection activities. Details of this pre-injection field parameter monitoring event are provided in **Table 1**.

4.2 Performance Monitoring

Part of the overall system performance monitoring will consist of checking selected monitoring wells and monitoring points for visual indications of permanganate and for field parameter indications. Pressure gauges at source area injection wells will be periodically checked while the reagent feed tank is filled to confirm pressures are at an acceptable level (i.e., low enough to be protective of the formation and measurable so that gravity drainage flow from the feed tank will occur).

Source area monitoring wells and points MP-4, MP-5, MP-6S, MP-6D, and MW-7A, proposed monitoring points MP-11, MP-12, MP-13 and MP-14, and injection points IJ-1, IJ-4, and IJ-10 will be used to monitor the progress of injected solution for the first 90 days after which injection points IJ-1, IJ-4, and IJ-10 will revert to use as points for manual injection of permanganate on a quarterly basis.

Initially, as outlined in **Table 2**, field parameter monitoring will be conducted at the specified points daily for the first week, weekly for the two months, monthly for the following four month. Thereafter, the monitoring points will be checked on a bi-monthly basis for field parameters.

PCE (site specific parameter list for SSPL) concentrations in groundwater will be checked at the monitoring points on a bi-monthly basis for the first 6 months of ISCO operations via the collection of groundwater samples. Groundwater samples will be collected in accordance with the requirements for the site. Prior to sample collection, groundwater color as an indicator in the field will be checked at each monitoring point to evaluate the presence and the concentrations of un-reacted permanganate in groundwater. Monitoring points will be sampled quarterly between 6 and 12 months and semi-annually after 1 year.

At the Pilot Truck Stop area, field parameter monitoring will be conducted monthly for the first 6 months using MW-25, MW-28, MP-8S, MP-8D, MP-10D and MW-30 and quarterly for the next 6 months (**Table 2**). Field parameter monitoring will be discontinued thereafter. VOC (SSPL) monitoring will be conducted on a quarterly basis for the first year using MW-25, MW-28, MP-8S, MP-8D, MP-10D and MW-30 and semi-annually, thereafter.

5. Site Management Plan

A draft SMP has been prepared for the soil and groundwater operable units and is provided in **Appendix C** of this Construction Package. The SMP addresses site management requirements for groundwater. The SMP provides guidance for checking and maintaining the ISCO system. Additionally, the SMP includes procedures for documenting system operations, inspections and maintenance activities. The purpose and objective of the SMP is to provide for proper procedures that will ensure that the groundwater remediation system is operating, functioning properly, and is maintained in good condition. Moreover, system performance will be monitored to assess whether modifications are warranted for system equipment, the number and location of injection points, frequency of injections, and/or other system operations and infrastructure.

Per the NYSDEC technical documents, each site should have one SMP for all media. Therefore, management of soil material that has been addressed in the NYSDEC approved Operations, Maintenance and Monitoring Plan (OM&M) including Soils Management Plan (October 2005) is also summarized in this SMP. Means for implementing the Institutional Controls (ICs) and Engineering Controls (ECs) that are required by the Environmental Easement for the site are also included.

6. Health and Safety Plan

The existing HSP is revised to include the new on-site work tasks associated with the remedial action. The revised HSP describes the policies and procedures to be followed by employees of ARCADIS during implementation of the remedial action at the site.

The additional activities to be performed by ARCADIS will include:

- Observation and supervision of injection and monitoring well installation;
- Observation and supervision of ISCO system construction;
- Implementation of ISCO system startup and operation;
- Collection of groundwater samples and waste characterization samples;
- Observation and supervision of site restoration; and
- Other site activities as Universal's representative.

The objective of the HSP is to provide a mechanism for establishing safe working conditions for ARCADIS personnel. Employees of subcontracted companies must work in accordance with their own independent HSP, which must comply with ARCADIS's health and safety standards and requirements.

The HSP provides for a safety organization, procedures, and protective equipment that have been established based on an analysis of potential physical, chemical, and biological hazards. Specific hazard control methodologies have been evaluated and selected to minimize potential accidents or injuries.

A copy of the revised HSP is included as **Appendix F**. A CAMP is included as **Appendix G**.

7. Quality Assurance/Quality Control Program

A QAPP details the activities to be undertaken to ensure the quality of all data and data collection activities associated with the implementation and monitoring of the remedial action. The QAPP is provided in **Appendix D**.

8. Field Sampling Plan

A FSP has been prepared to present the proposed technical approach for conducting field sampling activities at the site. The FSP details the standard operating procedures (SOPs) that will be followed for collecting the samples, the sample handling and shipment, sample documentation, and the quality control (QC) criteria that will be adhered to during sampling activities. The FSP is provided in **Appendix E**.

9. Reporting

9.1 Periodic Review Reports

Periodic Review Reports (PRRs) will be submitted annually to NYSDEC to describe the site operation and monitoring activities performed during the reporting period with respect to the groundwater operable unit and the results of the coincident groundwater sampling event. The PRRs will be certified by a New York State licensed professional engineer. The report will state the operation and monitoring activities conducted, observations made, and report operational data recorded. The report will also describe proposed system modifications or modifications made and summarize the ISCO performance monitoring results. A recommendation for site closure may be proposed in the PRRs based on the performance monitoring results. The inspection check lists, system operational logs and a summary of technician field notes will also be included in the report.

In addition to PRRs, data tables summarizing groundwater sampling results will be prepared and submitted to the NYSDEC after each sampling event.

9.2 Final Engineering Report

Following conclusion of the ISCO remedial system construction, a Final Engineering Report (FER) will be prepared and submitted to NYSDEC for review and approval. The FER will summarize the construction activities and start-up test results.

Supporting documentation will include summary data tables, figures, well construction logs, hazardous waste manifests and bills of lading, and photographic logs.

10. Schedule

Following NYSDEC approval of the Construction Package, ARCADIS is prepared to initiate the implementation of remedial system construction. The tentative schedule for the implementation of the remedial action activities is provided in **Appendix H**.



Table 1 Pre-Injection Field Parameter Monitoring, Former Dover Electronics Site, Kirkwood, New York

Monitoring Points	Field Monitoring Parameters
MP-4 MP-5 MP-6S MP-6D MW-7A IJ-1 IJ-4 IJ-9	- pH, specific conductivity, and redox will be collected using a down-hole water quality instrument - Manganese and permanganate using field colorimetric methods

Note:

1. Pre-injection field parameters monitoring will occur approximately 24 hours prior to the start of oxidant injection.

Table 2 Groundwater Monitoring Matrix - Full-Scale ISCO Remediation, Former Dover Electronics Site, Kirkwood, New York

Injection Well ID No.	Monitoring Points		Monitoring Schedule
	Shallow Zone	Intermediate Zone	
IJ-1	MP-5, MP-6S, IJ-5	MP-6D	Bi-monthly for the first 6 months, quarterly for the next 6 months, and semi-annual thereafter at all monitoring points Daily for the first week, weekly for the next two months, monthly for the following 4 months, and bi-monthly thereafter at all monitoring points Monthly for the first 6 months and quarterly for the next 6 months
IJ-2	MP-4, MP-12, IJ-4	--	
IJ-3	MP-4, MW-7A, IJ-1, IJ-4	MP-6D	
IJ-4	MP-5, MP-12	--	
IJ-5	Offline for the first year	--	
IJ-7	MP-4, MP-11, IJ-1, IJ-4	--	
IJ-8	MP-4, MP-5, IJ-1, IJ-4	--	
IJ-9	MP-4, MP-13, MW-7A, IJ-1	MP-6D	
IJ-10	MP-5, MP-6S, MP-14, IJ-5	--	
MW-24	MP-11, MW-16	--	
IJ-6	MW-28, MW-30, MP-8S	MP-8D, MP-10D, MW-25	Quarterly for the first year and semi-annual thereafter Monthly for the first 6 months and quarterly for the next 6 months

Notes:

- All monitoring points listed in the table will be sampled for VOCs (Site-Specific Parameter List [SSPL]) and/or field parameters based on the proposed monitoring schedule.
- Field parameters including pH, specific conductivity, and redox will be collected using a down-hole water quality instrument and manganese and permanganate using a colorimeter.
- IJ-1, IJ-4, and IJ-10 will be used as monitoring points for the 1st Quarter of operations.