

PRIVILEGED AND CONFIDENTIAL
PREPARED AT THE REQUEST OF ENCORE COUNSEL

CHEMICAL OXIDATION DESIGN AND TECHNICAL SPECIFICATIONS

**Former Willow Run Assembly Plant
Ypsilanti, Michigan**

**NOVEMBER 2001
REF. NO. 17303 (1)**

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1.0 INTRODUCTION

Conestoga-Rovers & Associates (CRA) was retained by ENCORE to conduct a pilot test using potassium permanganate at the Company Vehicle Operations (CVO) area at the former Willow Run Assembly Plant located in Ypsilanti, Michigan (Site). Figure 1 presents the Site location. The pilot test was completed in May 2001 and indicated significant reductions in trichloroethylene (TCE), 1,2-dichloroethene (DCE) and vinyl chloride (VC). Based on the success of the pilot study, full scale implementation of the chemical oxidation treatment was recommended for two areas of high volatile organic compound (VOC) concentrations in the CVO area. This document provides a design of the full scale implementation for these two affected areas.

2.0 RECOMMENDATIONS FROM PILOT TEST

The pilot test results showed that the application of KMnO_4 is effective in reducing TCE, DCE, and VC concentrations in groundwater at the Site. The following is a summary of the recommendations based on the pilot test:

Well spacing : 30 feet maximum (radius of influence =15 feet)

Potassium permanganate solution concentration: 2% by weight

Injection solution quantity: 250 gallons/injection

Water flush after injection: 250 gallons/injection

Injection frequency: Every eight weeks

Total number of injections: four to six estimated depending on actual monitoring results

Monitoring frequency: Monitoring should be conducted prior to treatment and then three weeks after each injection for the parameters identified in Section 6.0.

3.0 INJECTION WELLS

Injection wells should be installed in two areas with the highest TCE and VC concentrations. This approach will treat the source areas for these compounds to minimize any further migration of contaminants from these sources. The wells should be installed in the areas containing VC concentrations greater than 100,000 µg/L (Area 1) and TCE concentrations greater than 10,000 µg/L (Area 2). The concentration contours for these compounds and the injection well locations are shown on Figure 2.

Wells should be installed on a grid pattern with rows and columns spaced at 21 feet. This spacing provides complete coverage of the injection areas using a 15 feet radius of influence for each injection well. The 15 foot radius of influence is based on the results of the pilot test.

Site geology consists of 15 to 20 feet of sandy fill material over an underlying clay layer. Static water level is located approximately 12 feet below ground surface (bgs). Injection wells should be installed to the top of the underlying clay layer using a 10 foot screen. The underlying clay layer varies from 15 to 20 feet bgs. This design is consistent with the pilot test wells and will provide injection of the potassium permanganate solution to both the saturated and unsaturated zones. Figure 3 shows the typical injection well construction.

Each injection well should be equipped with a cam adaptor. The injection hose will be equipped with a cam fitting coupler. The cam fitting will facilitate connecting the injection hose to the well. When the well is not being used the cam adaptor will be covered with a locking dust cap. Figure 4 shows a detail of the injection wellhead.

Maximum injection pressure at the wellhead should be monitored and should not exceed 50 psi. Figure 5 shows a conceptual schematic of the injection system and pressure monitoring set up.

The designated injection well locations are shown on Figure 2. The wells are located on a grid pattern over the areas of concern with a maximum distance (the diagonal distance between wells) of 30 feet between two adjacent wells. A total of 40 wells are required for Area 1 and 15 wells are required for Area 2. Note, one of the Area 1 injection wells will be a monitoring well (MW-2) which will be converted to an injection well.

4.0 INJECTION SOLUTION

A two percent by weight solution of potassium permanganate in water will be the injection fluid. The potassium permanganate salt crystals will be completely dissolved in water prior to injection. Table 1 shows the recipe for preparing the solution in large quantities.

5.0 INJECTION SCHEDULE

Permanganate solution injections will be conducted at eight week intervals. It is estimated that four to six injection treatments will be required. The injection schedule is shown in Figure 6.

Each well will be injected with 250 gallons of the permanganate solution for each treatment. Each well will then be flushed with 250 gallons of water within one week after injecting the permanganate solution. The flush water is intended to minimize the potential for clogging at the injection well.

6.0 MONITORING SCHEDULE

Monitoring will be conducted prior to the first injection and then three weeks after each injection for the following parameters:

- VOCs;
- Chloride;
- Potassium;
- Manganese;
- pH (field);
- Redox potential (field);
- Dissolved oxygen (DO) (field);
- Conductivity; and
- Residual KMnO_4 .

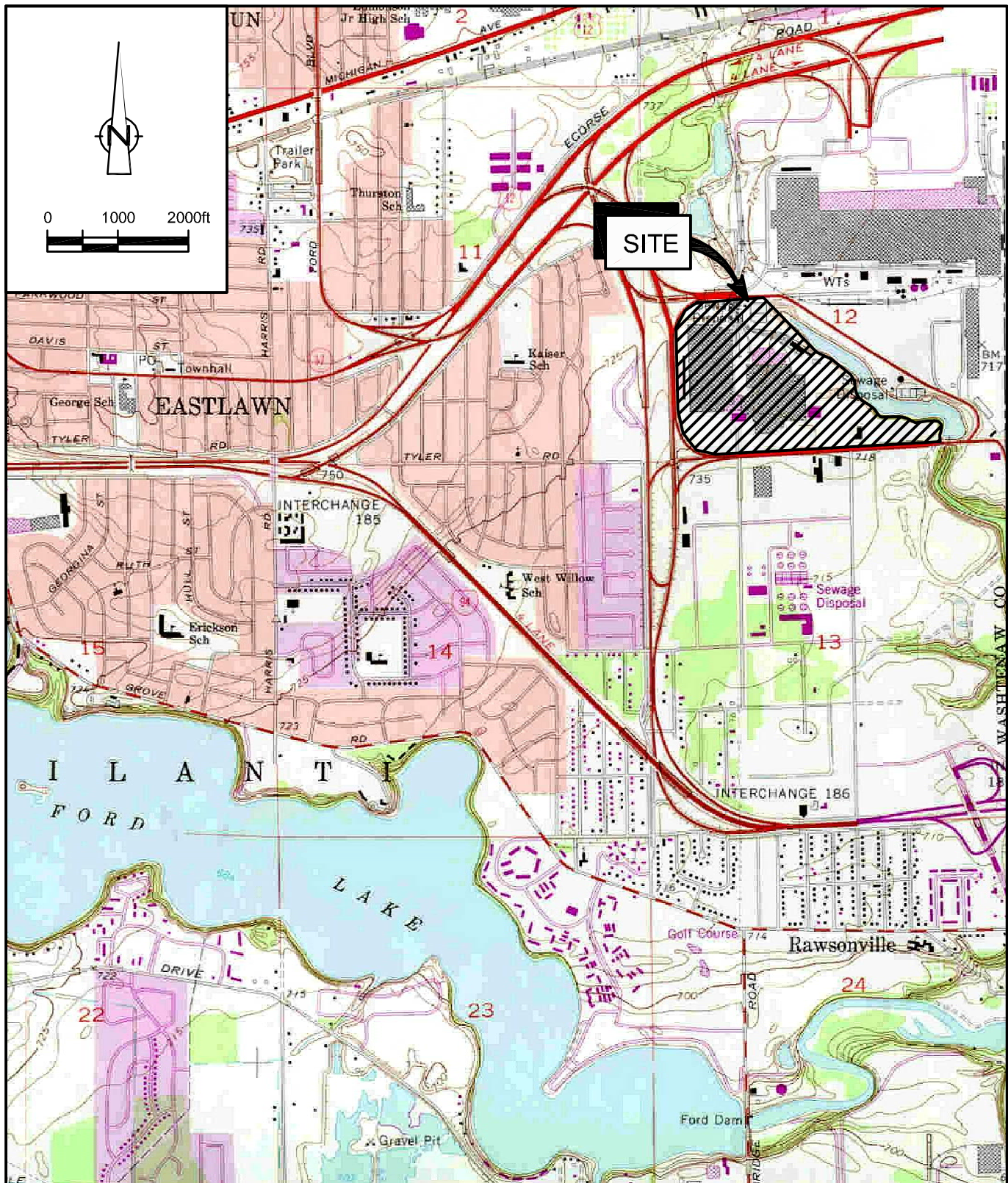
The results of the monitoring will be used to determine the need for further injections. Assuming a normal turn-around time of three weeks for the analytical results, adjustments to the KMnO_4 recipe can be made prior to the next injection. The treatment will be considered complete once the VOC levels decrease by 90 percent.

7.0 LOGISTICS

The Site is active and any work at the Site must be coordinated with Chad Clayton (734/481-7961), the CVO contact at the Site. The Site has numerous automobiles that will have to be moved to provide access to the injection well areas.

8.0 TECHNICAL SPECIFICATIONS

The specifications for the project are found in Appendix A. The specifications were prepared for the contractor under the assumption that the contractor will install the wells and conduct the well injections. An engineer will provide oversight to the contractor, conduct groundwater sampling, and assist ENCORE with the characterization and disposal of any wastes.

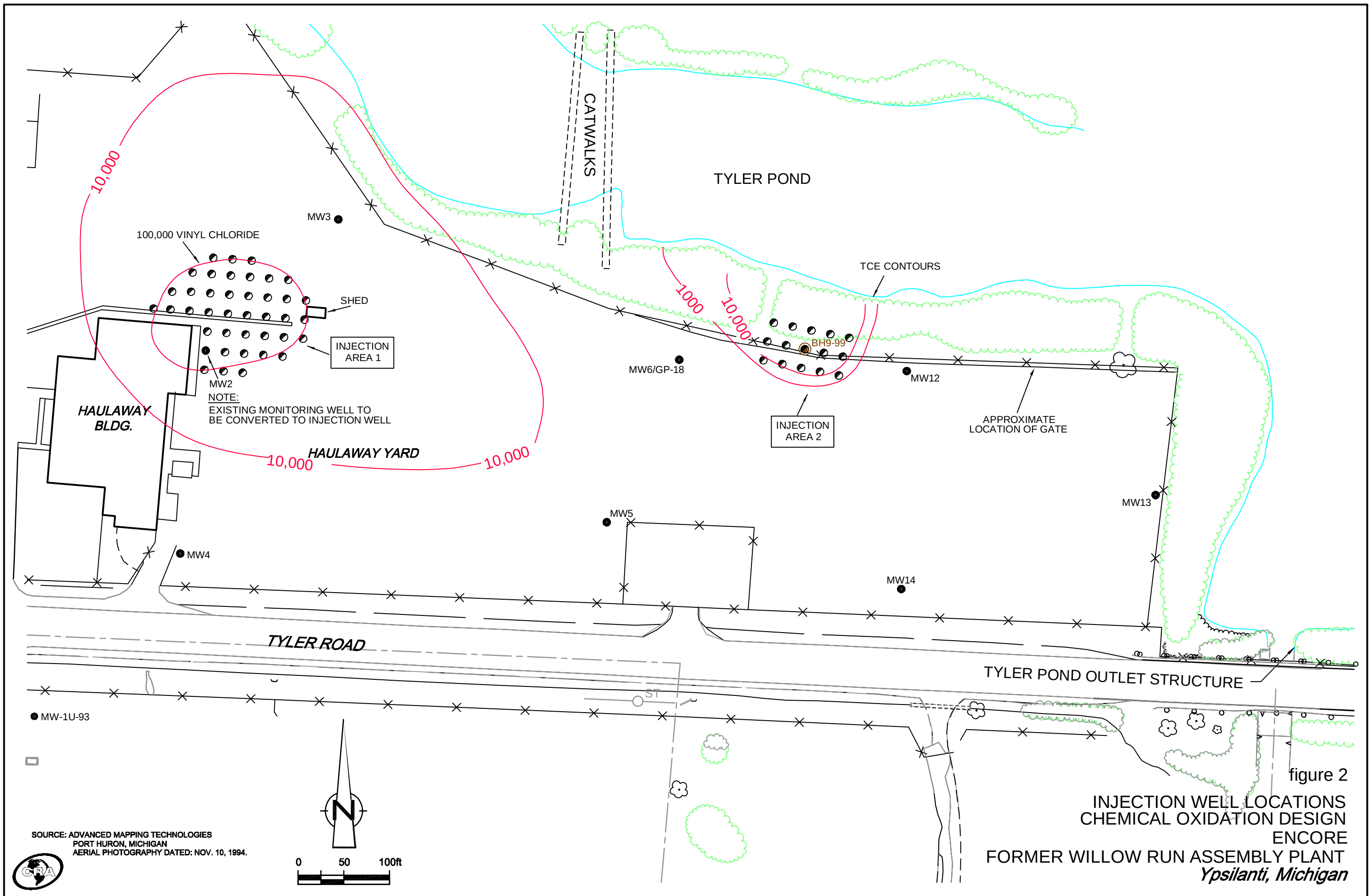


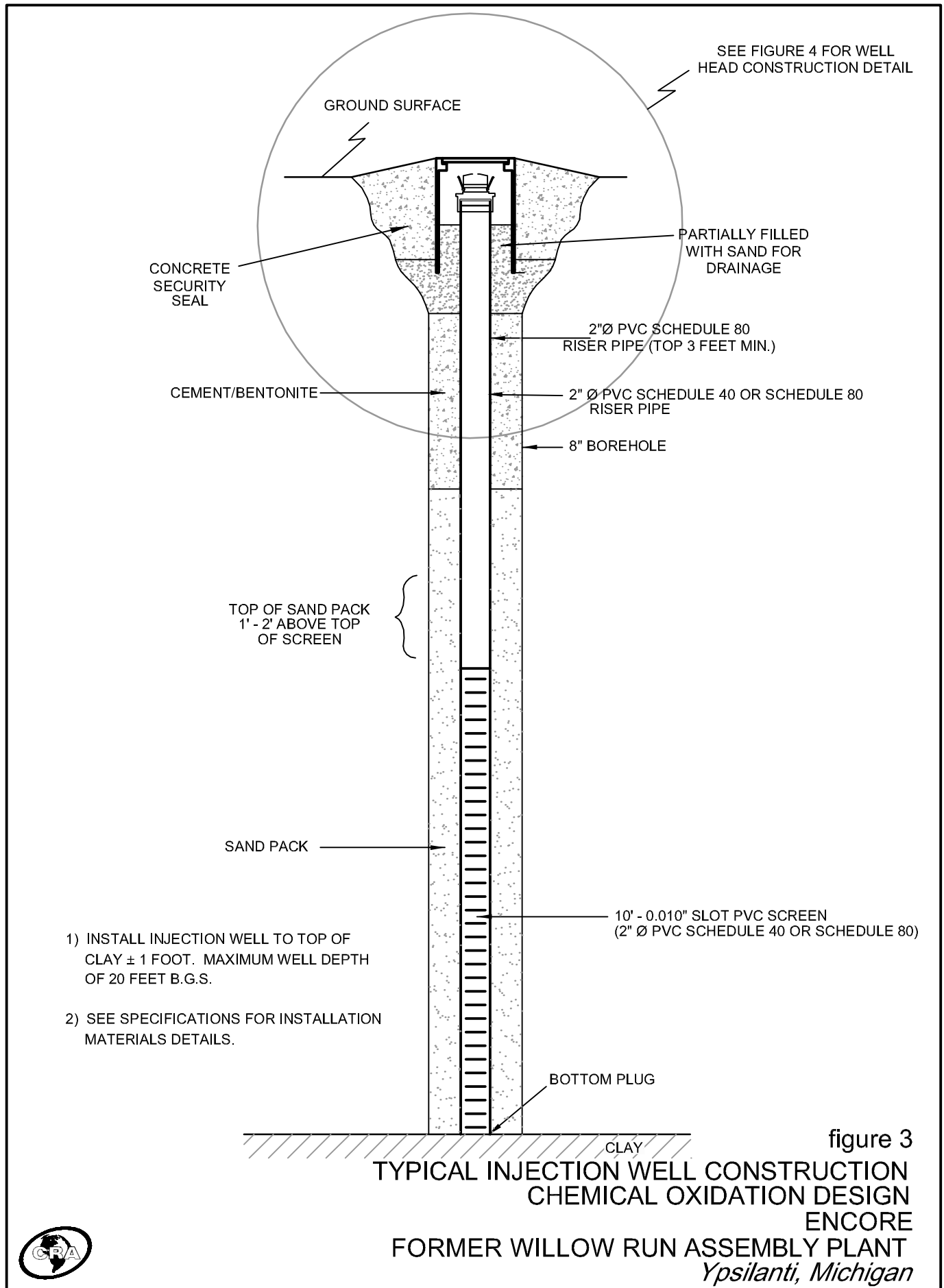
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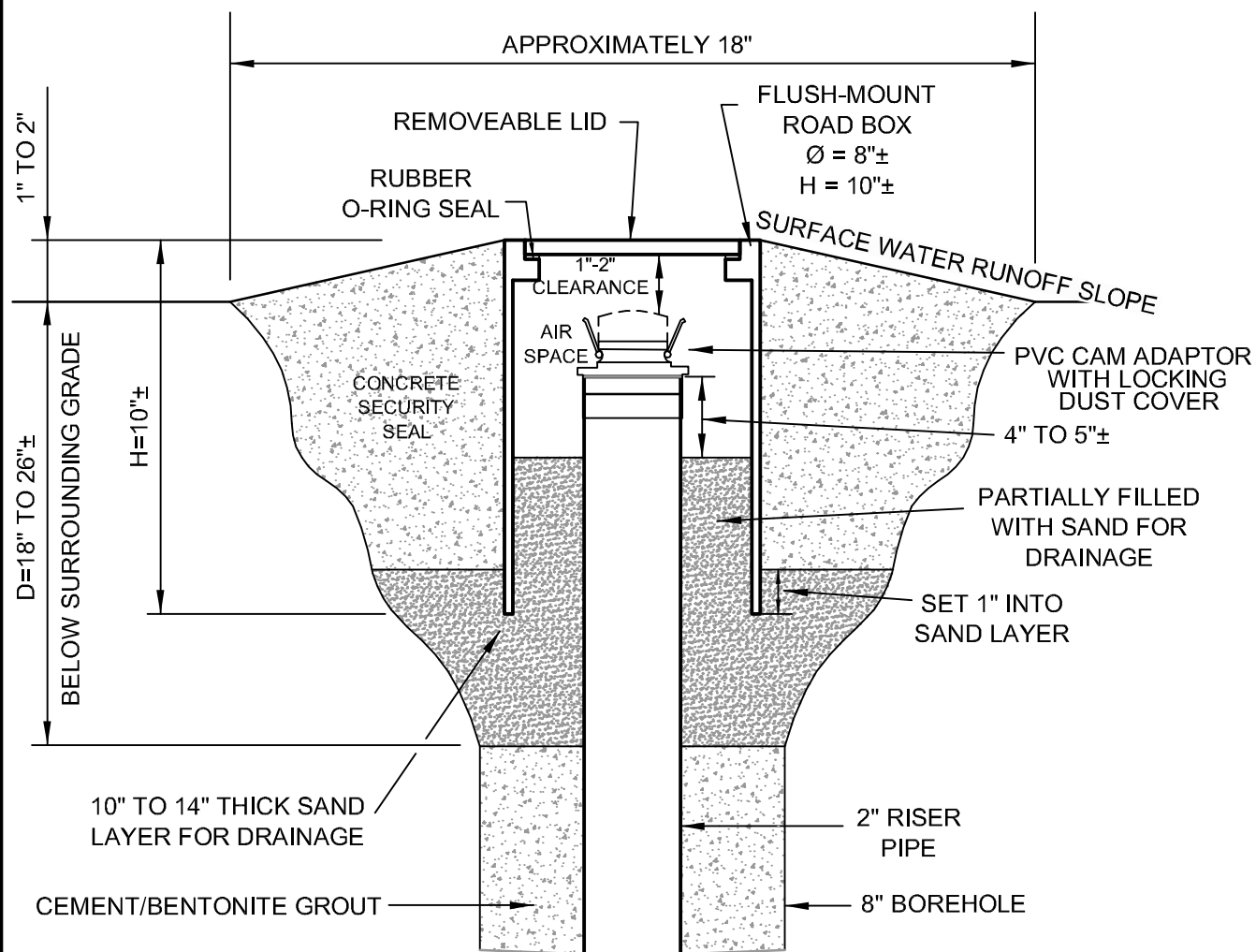
figure 1



SITE LOCATION
ENCORE
FORMER WILLOW RUN ASSEMBLY PLANT
Ypsilanti, Michigan







FLUSH-TO-GROUND INJECTION WELL

figure 4

TYPICAL INJECTION WELL HEAD CONSTRUCTION
 CHEMICAL OXIDATION DESIGN
 ENCORE
 FORMER WILLOW RUN ASSEMBLY PLANT
Ypsilanti, Michigan



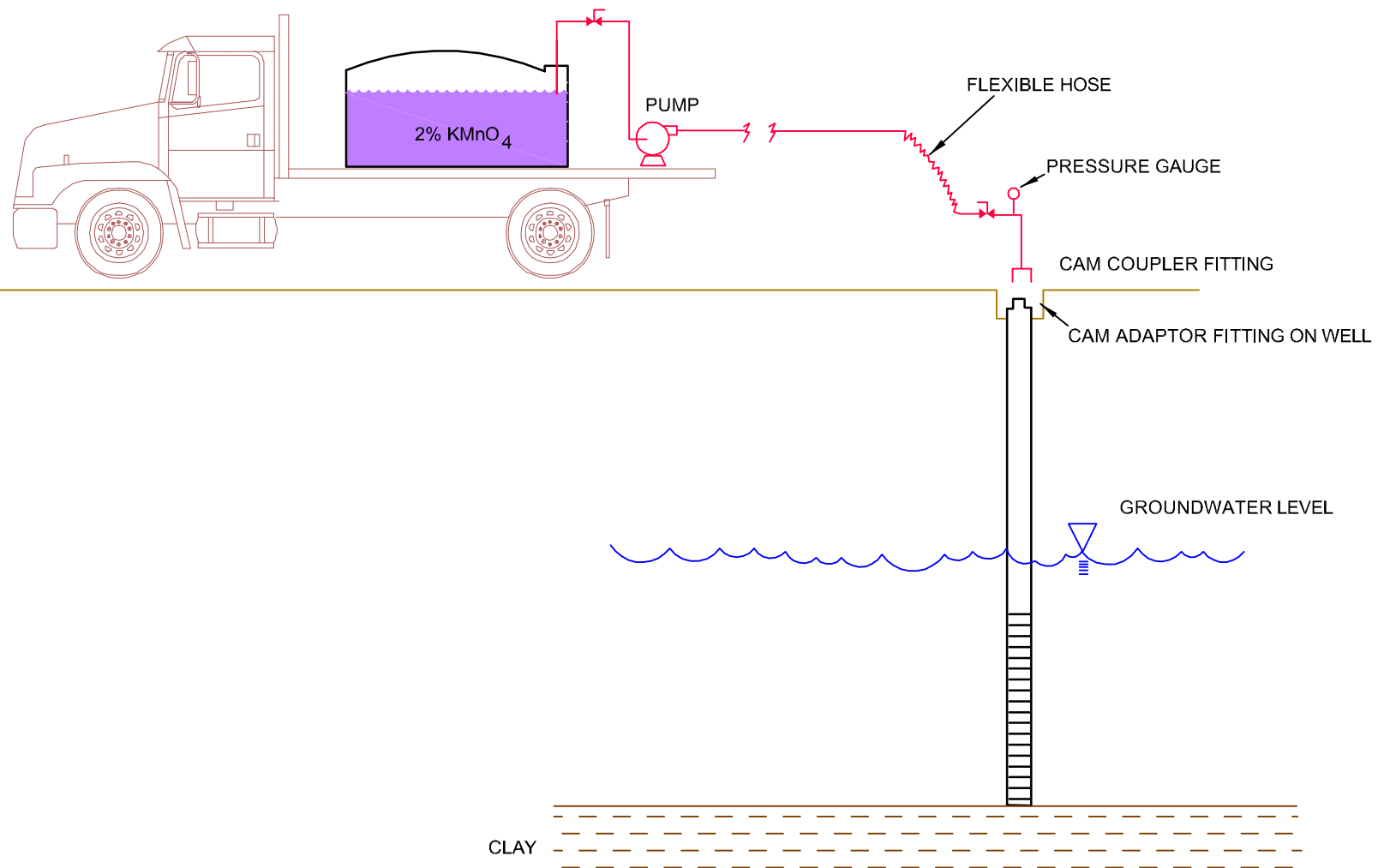
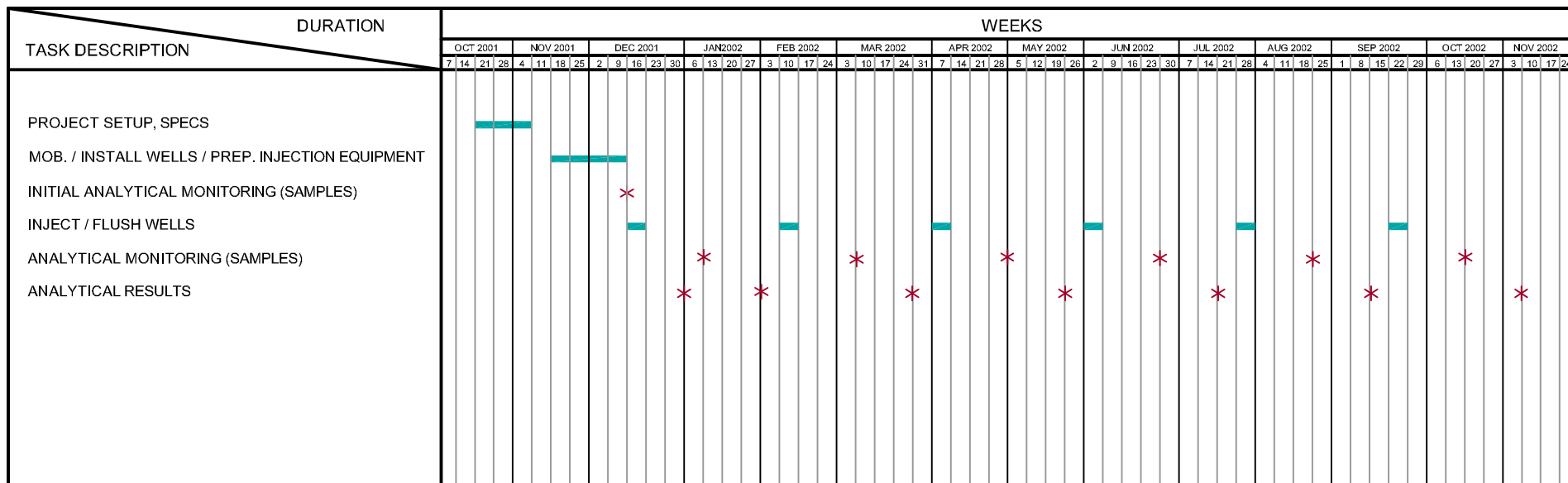


figure 5

SCHEMATIC OF INJECTION SYSTEM
 CHEMICAL OXIDATION DESIGN
 ENCORE
 FORMER WILLOW RUN ASSEMBLY PLANT
Ypsilanti, Michigan





LEGEND

- CONTINUOUS ACTIVITY
- * ONE DAY DURATION

figure 6
 PROJECT SCHEDULE
 CHEMICAL OXIDATION DESIGN
 ENCORE
 FORMER WILLOW RUN ASSEMBLY PLANT
Ypsilanti, Michigan



TABLE 1

POTASSIUM PERMANGANATE TWO WT% SOLUTION RECIPE
CHEMICAL OXIDATION DESIGN
FORMER WILLOW RUN ASSEMBLY PLANT

<i>KMnO₄</i> <i>(lbs)</i>	<i>Water</i> <i>(gallons)</i>
17	100
85	500
170	1,000
255	1,500
340	2,000
511	3,000
681	4,000
851	5,000
1,021	6,000

APPENDIX A

TECHNICAL SPECIFICATIONS

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EXHIBIT A FORM OF BID

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SECTION 01110

SUMMARY OF WORK

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Project Location.
- B. Purpose.
- C. Background Information and Existing Site Conditions.
- D. Work to be Done.
- E. Work Under One Single Contract.
- F. Items Provided By CRA.
- G. CONTRACTOR Use of Site and Premises.
- H. Pre-Bid Site Investigation.
- I. Work Hours.
- J. Weekend Work.

1.2 PROJECT LOCATION

- A. Former Willow Run Assembly Plant – Company Vehicle Operations (CVO) 2901 Tyler Road, Ypsilanti, MI (Figure 1).

1.3 PURPOSE

- A. Conduct in-situ remediation of groundwater impacted by 1,2-dichloroethene, trichloroethylene, and vinyl chloride. Activities include: Installing injection wells, injecting a potassium permanganate solution, and injecting water into the wells.

1.4 BACKGROUND INFORMATION AND EXISTING SITE CONDITIONS

- A. Existing groundwater contains volatile organic compounds (VOCs). Site geology consists of 15 to 20 feet of sandy fill material over an underlying clay layer.

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1.5 WORK TO BE DONE

- A. The VENDOR shall furnish all material, labor, equipment, and incidentals required for activities, including the following:
1. Pre-work submittals, including a Site-specific Health and Safety Plan.
 2. Mobilize to Former Willow Run Assembly Plant.
 3. Construct, operate, and maintain a temporary equipment decontamination facility at the Site for use by VENDOR.
 4. VENDOR will complete specified activities at the Former Willow Run Assembly Plant:
 - a. Verify location of all underground utilities in Area 1 and Area 2 (see Figure 2).
 - b. Install 54 injection wells (39 wells in Area 1, 15 in Area 2) to a depth of approximately 20 feet below ground surface (Engineer will determine injection well locations) (see Figures 3 and 4).
 - c. Convert monitoring well MW-2 (in Area 1) to an injection well.
 - d. Prepare a potassium permanganate solution and inject 250 gallons into each well every eight weeks for a total of four injections (Minimum temperature of injection solution is 50° F) (see Figure 5).
 - e. Flush each well with 250 gallons of water within one week after injecting the potassium permanganate solution (Minimum temperature of flush water is 50° F).
 5. Disassemble and containerize the decontamination facility after installation of injection wells for disposal by others.
- B. All work shall be in accordance with the requirements of this section, the requirements of other specifications and the design report.

1.6 CONTRACT TIMES

- A. Remediation activities shall start on or about the date specified in the RFP.

1.7 WORK UNDER ONE SINGLE CONTRACT

- A. The Work To Be Done shall be done under one single contract.
- B. The VENDOR shall be responsible for coordinating his work with CVO personnel and other subcontractors.

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1.8 ITEMS PROVIDED BY CRA

- A. Information under CRA's control will be furnished by CRA with reasonable promptness to avoid delay in the orderly progress of the work.
- B. CRA will issue all instructions to the VENDOR.
- C. Items noted as being handled by CRA will be completed by CRA or other VENDORS.

1.9 VENDOR USE OF SITE AND PREMISES

- A. Neither the CONTRACTOR nor any of his employees shall park any vehicle anywhere on the site, except at such locations as shown or as specifically approved by CRA for the purpose.

1.10 PRE-BID SITE INVESTIGATION

- A. A mandatory Pre-Bid meeting will be held at the site. Any bidder not attending the pre-Bid meeting will have their bid disqualified, unless otherwise approved by CRA.

1.11 WORK HOURS

- 1. Work is allowed 7am to 7pm Monday through Friday.

1.12 WEEKEND WORK

- 1. VENDOR shall seek approval from ENGINEER at least 48 hours prior to scheduling work for Saturday or Sunday.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

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SECTION 01271

MEASUREMENT AND PAYMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Procedures for measurement and payment for the work to be done.

1.2 RELATED SECTIONS

- A. Section 01110 – Summary of Work.
- B. Section 01330 – Submittal Procedures.
- C. Section 01770 – Closeout Procedures.

1.3 GENERAL

- A. The following paragraphs describe measurement of and payment for the work to be done under the respective items listed in the itemized bid for this contract.
- B. Payment for the Work will be made in lump sums and unit prices in accordance with the Compensation Schedules. Payment in the case of unit price work will be based on actual quantities of completed Work, verified by ENGINEER. Payment in the case of lump sum Work will be based on the percentage of Work completed, verified by ENGINEER.
- C. Each lump sum and unit price stated in the itemized bid shall constitute full compensation for not only all labor, equipment and materials necessary and required to complete all work specified under that particular item including cleaning up, but also all costs for doing related work as set forth in these Specifications or implied in carrying out their intent.
- D. Requests for payment shall be in accordance with CRA General Conditions.

1.4 COMPUTATION OF QUANTITIES

- A. Measurement of Lump Sum Work: ENGINEER will measure or quantify the amount of work eligible for progress payment purposes. Items will be measured in units such as time, weight, volume, area, or linear means, or combination as appropriate as a completed item or unit of the

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Work. Such measurements will serve as a basis for estimating percentage of completion.

- B. No partial payments shall be made for items which have not been approved by ENGINEER.
- C. Lump sum payment will be made to the quantities as shown in the Contract Documents. If quantities are exceeded by 10% it is considered out of the scope and unit rates would apply. Payments for quantities that exceed the shown quantities will only be made with the written approval of CRA. The payment for quantities that exceed the shown quantities can only be obtained through an approved change order (or written agreement) before contract quantities are exceeded.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

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SECTION 01291

APPLICATIONS FOR PAYMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Procedures for preparation and submittal of Applications for Payment.

1.2 RELATED SECTIONS

- A. Section 01271 - Measurement and Payment.
- B. Section 01330 - Submittal Procedures.
- C. Section 01770 - Closeout Procedures.

1.3 FORMAT

- A. Form 01291.1 and 01291.2 - Application for Payment (attached), including continuation sheets when required.
- B. The CONTRACTOR may submit to the GM PM for approval an alternate request for payment format. All such submittals must be prior to the first payment request.
- C. For each item, provide a column for listing: Item Number; Description of Work; Scheduled Value, Previous Applications: Work in Place and Stored Materials under this Application; Authorized Change Orders; Total Completed and Stored to Date of Application; Percentage of Completion; Balance to Finish; and Retainage.

1.4 PREPARATION OF APPLICATIONS

- A. Present required information on Form 01291.1 and 0.1291.2.
- B. Execute certification by signature of authorized officer.
- C. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed.
- D. List each authorized Change Order as an extension on continuation sheet, listing Change Order number and dollar amount as for an original item of Work.

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- E. All Applications for Payment must be accompanied by the appropriate Notarized Sworn Statement(s), Waivers of Lien, and substantiating documentation described in Article 8 and Appendices D and J of GM 1638 (4/00).
- F. Prepare Application for Final Payment as specified in Section 01770 – Closeout Procedures.

1.5 SUBMITTAL PROCEDURES

- A. Section 01330 – Submittal Procedures
- B. Submit one original and one copy of the Application for Payment, Notarized Sworn Statements, Waivers of Lien, and supporting documentation with each invoice. The individual documents shall be so marked so as to distinguish the original and the copy.
- C. Submit an updated Decommissioning Work Schedule specified in Sections 01330 – Submittal Procedures with each Application for Payment.
- D. Payment Period – Submit at intervals stipulated in the Agreement, but not less than 15 day cycles in accordance with 1638 (4/00). Final invoice shall be submitted within 15 days of Substantial Completion Inspection.
- E. Progress payments will not be processed until project Record Documents are up-to-date and complete.
- F. Application for Payment will not be processed unless it is complete and contains all of the above specified items for the work covered by the payment request.

1.6 SUBSTANTIATING DATA

- A. When ENGINEER requires substantiating information, submit data justifying dollar amounts in question.
- B. Provide one (1) copy of invoice for each copy of submittal. Show Application number and date, and line item by number and description.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

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END OF SECTION

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SECTION 01300

ADMINISTRATIVE REQUIREMENTS

1.1 SECTION INCLUDES

- A. Specification language.
- B. Mobilization and startup.
- C. Coordination.
- D. Pre-construction meeting.
- E. Submittal procedures.
- F. Proposed products list.
- G. Shop Drawings.
- H. Project organization.
- I. Health and safety.
- J. Measurement and payment.

1.2 SPECIFICATION LANGUAGE

- A. These Project Specifications are written in imperative mood and are in abbreviated or streamlined form and include incomplete sentences. This imperative language is directed to **VENDOR**, unless specifically noted otherwise. Omission of words or phrases, such as "VENDOR shall", "shall be", "a", "the", and "all" are intentional. Omitted words or phrases shall be supplied by inference in the same manner as they are when a "note" occurs on the Drawings.

1.3 MOBILIZATION AND STARTUP

- A. Do not mobilize to the Site without **ENGINEER's** prior written authorization. Ensure insurance as required are in full force. Provide copies of well construction permits and insurance certificates to **ENGINEER** a minimum of three days prior to mobilization.
- B. Perform planning and scheduling activities as necessary for the performance of the Works.
- C. Purchase materials and mobilize equipment, supplies, and incidentals to the Site.

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- D. Use the existing Site access roads to the designated work areas during mobilization. Complete improvements to roads as necessary for the performance of the Works.
- E. Site temporary utilities and facilities in areas designated by ENGINEER. Obtain ENGINEER's approval prior to changing locations of temporary construction facilities. Do not use other areas without ENGINEER's prior approval. Relocate construction equipment or other materials or equipment as required for the performance of the Works.
- F. Do not commence work involving contact with potentially contaminated materials until decontamination facilities are operational and approved by ENGINEER.

1.4 COORDINATION

- A. Coordinate scheduling, submittals, and work of the various Sections of the Project Specifications and other requirements of the Contract Documents to assure efficient and orderly sequence of installation of interdependent construction elements.

1.5 PRE-CONSTRUCTION MEETING

- A. ENGINEER will schedule and administer a pre-construction meeting at the Site after the date of the Notice to Proceed and prior to start of construction at the Site.
- B. Agenda will include, but will not necessarily be limited to, the following:
 - 1. Designation of responsible personnel.
 - 2. Lines of authority and communication.
 - 3. Health and safety.
 - 4. Use of the Site for storage, vehicle parking, access routes, and other Site requirements.
 - 5. OWNER's requirements.
 - 6. Temporary facilities and controls provided by VENDOR.
 - 7. Temporary utilities and services provided by OWNER.
 - 8. Field offices.
 - 9. Security and housekeeping procedures.
 - 10. Procedures for processing field decisions, submittals, substitutions, applications for payments, proposal requests, Field Orders, Work Change Directives, Change Orders, and closeout procedures.

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11. Progress schedules.
12. Procedures for testing and inspection.
13. Procedures for maintaining record documents.

1.6 SUBMITTAL PROCEDURES

- A. Unless directed otherwise, transmit submittals to ENGINEER at 14496 Sheldon Road, Suite 200, Plymouth, Michigan 48170, Attention Pete Romzick.
- B. Identify the Project, VENDOR, Subcontractor, or Supplier; pertinent Drawing and detail number and Section number, as appropriate.
- C. Except as specified otherwise, for each submittal for review by ENGINEER allow 5 days excluding delivery time to and from VENDOR. Schedule submittals to expedite the Contract and in accordance with specified scheduling. Coordinate submission of related items.
- D. Identify product or system limitations which may be detrimental to successful performance of the completed Works.
- E. Provide space for ENGINEER review stamp and comments on submittals.
- F. Make corrections to each submittal required by ENGINEER. Promptly revise and resubmit the required number of corrected copies of each submittal and submit new submittals required by such correction; identify changes made since previous submission and changes other than those requested by ENGINEER.
- G. Promptly distribute copies of reviewed submittals to Subcontractors, Suppliers, and other concerned parties as appropriate. Instruct parties to promptly report any inability to comply with provisions.
- H. Submittals not requested will not be recognized or processed. Submittals received directly from Subcontractors, Suppliers, vendors, or other Representatives or without VENDOR stamp will be returned by ENGINEER without action.
- I. Adjustments made on VENDOR's drawings by ENGINEER are not intended to change the Contract Price. If adjustments affect the Contract Price, state such in writing, as specified elsewhere in the Contract, to ENGINEER for approval prior to proceeding with the Works.
- J. It is the responsibility of VENDOR to review submittals made by Suppliers and Subcontractors before transmitting them to ENGINEER to assure proper coordination of the Works and to determine that each submittal is in accordance with VENDOR's desires and that there is sufficient information about materials and equipment for ENGINEER to determine compliance

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with the Drawings and Specifications. Incomplete or inadequate submittals will be returned for revision without review.

- K. Unless specified otherwise submit 2 copies of submittals.
- L. Requirements of this Article shall apply to all required submittals.

1.7 PROPOSED PRODUCTS LIST

- A. Within 5 days after the date of the Notice to Proceed and prior to products arrival on the Site, submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
- B. For products specified only by reference standards or description, give name of manufacturer, trade name, model or catalog designation, and reference standards.
- C. For products requiring special handling procedures, submit a Material Safety Data Sheet prior to product's arrival on the Site.

1.8 SHOP DRAWINGS

- A. When specified in individual Sections, prepare detailed drawings of material and structures to be supplied by VENDOR from typical details shown on "Approved for Construction" Drawings and/or from specified requirements.
- B. Indicate special utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- C. Indicate materials, methods of construction, attachment or anchorage, erection diagrams, connections, explanatory notes, and other information necessary for completion of the Works.
- D. Where articles or equipment attach or connect to other articles or equipment, indicate that such work has been coordinated, regardless of the Section under which the adjacent items will be supplied and installed.
- E. Confirm dimensions shown on VENDOR's drawings with actual measurements of existing and/or completed associated structures and affected adjacent work at the Site.
- F. After ENGINEER completes his review, the Shop Drawings will be stamped with one of the following notations:
 - 1. Approved.
 - 2. Approved as Noted.

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3. Not Subject to Review.
 4. Revise and Resubmit.
- G. If a Shop Drawing is acceptable, it will be marked "Approved" or "Approved as Noted". One copy of the Shop Drawing will be returned to VENDOR for all Shop Drawings on 8 1/2-inch by 11-inch size sheets.
- H. Upon return of a Shop Drawing marked "Approved" or "Approved as Noted", VENDOR may order, ship, or fabricate the materials included on the Shop Drawing, provided it is in accordance with the corrections indicated. Upon receipt of Shop Drawings stamped "Approved" or "Approved as Noted", produce copies and distribute in accordance with Article 1.8 and for record document purposes as described in Section 01700.
- I. If a Shop Drawing marked "Approved as Noted" has extensive corrections or corrections affecting other drawings or Works, ENGINEER may require that VENDOR make the corrections indicated thereon and resubmit the Shop Drawings for record purposes.
- J. Shop Drawings that are for information only will be marked "Not Subject to Review" and 1 copy plus 1 reproducible will be returned to VENDOR.
- K. If a Shop Drawing is unacceptable, 2 copies will be returned to VENDOR marked "Revise and Resubmit".
- L. Upon return of a Shop Drawing marked "Revise and Resubmit", VENDOR shall make the corrections indicated and repeat the initial approval procedure.
- M. Shop Drawings lacking adequate details or information to allow ENGINEER to determine whether or not the Shop Drawing meets the Contract will also be marked "Revise and Resubmit" and returned without further comment.
- N. Shop Drawings not bearing ENGINEER's "Approved" or "Approved as Noted" notation shall not be issued to Subcontractors nor utilized for construction purposes. No Works requiring submission and approval of Shop Drawings shall be performed or equipment requiring submission and approval of Shop Drawings installed without Shop Drawings bearing one of these notations.
- O. Submit Shop Drawings well in advance of the need for the material or equipment for construction and with ample allowance for time required to make delivery of material or equipment after data covering such is approved. VENDOR shall assume the risk for all materials or equipment which are fabricated or delivered prior to the approval of Shop Drawings. No materials or equipment shall be incorporated into the Works nor shall such be included in periodic progress payments until approval thereof has been obtained in the specified manner.
- P. ENGINEER will review and process all Shop Drawings promptly, but a reasonable time should be allowed for this, for the Shop Drawings being revised and resubmitted, and for time required to return the approved Shop Drawings to VENDOR.

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- Q. Approval of Shop Drawings shall not relieve VENDOR from the responsibility of furnishing materials and equipment of proper dimension, size, quality, quantity, and all performance characteristics to efficiently perform the requirements and intent of the Contract Documents. Approval shall not relieve VENDOR from responsibility for errors of any sort on the Shop Drawings. Approval is intended only to assure conformance with the design concept of the Project and compliance with the information given in the Contract Documents. VENDOR is responsible for information that pertains solely to the fabrication processes, to the technique of construction, and for the coordination of the work of all trades.
- R. VENDOR shall not be relieved of any part of its responsibilities for correctness of its drawings or adequacy of its design bearing ENGINEER's "Approved" or "Approved as Noted" notation. ENGINEER's approval is for the sole purpose of ascertaining conformance with general design concepts, and in no way constitutes approval of the detail design inherent in VENDOR's drawings, responsibility for which remains solely with VENDOR. Drawings prepared by VENDOR's representatives including Subcontractors, Suppliers, vendors, or other Representatives shall be considered VENDOR's drawings.

1.9 PROJECT ORGANIZATION

- A. Within 5 days after the date of the Notice to Proceed and prior to mobilization to the Site submit to ENGINEER a Project organization chart identifying major positions and names of persons assigned to these positions, including off-Site Project manager, superintendent, certified industrial hygienist, health and safety officer, testing labs, and Subcontractors, as applicable.

1.10 HEALTH AND SAFETY

- A. Develop a written Site-specific Health and Safety Plan which complies with 29 CFR 1910.120 and 29 CFR 1926.65 prior to commencing any on-Site work and continue to implement, maintain, and enforce the plan until final demobilization from the Site. The development, implementation, and maintenance of the Site-specific Health and Safety Plan is VENDOR's sole responsibility.

VENDOR's Site-specific Health and Safety Plan, as a minimum, shall address the specifications contained herein.

- B. The health and safety guidelines contained herein are intended to provide for a safe and minimal risk working environment for on-Site personnel and to minimize the impact of activities involving contact with any hazardous materials or hazardous wastes on the general public and the surrounding environment.
- C. VENDOR's Site-Specific Health and Safety Plan:
1. Within 5 days after the date of the Notice to Proceed and prior to mobilization to the Site, submit a Site-specific Health and Safety Plan which complies with 20 CFR 1910.120 and 29 CFR 1926.65. As a minimum, the Health and Safety Plan shall include the following:

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1. Personnel training assignments in accordance with 29 CFR 1910.120 (e) and 29 CFR 1926.65 (e).
 2. Personal protective equipment to be used by personnel for each of the Site tasks and operations being conducted in accordance with 29 CFR 1910.120 (g)(5) and 20 CFR 1926.65 (g)(5).
 3. Medical surveillance requirements in accordance with 29 CFR 1910.120 (f) and 29 CFR 1926.65 (f).
 4. Frequency and types of air monitoring, personnel monitoring, and environmental sampling techniques and instrumentation to be used, including methods of maintenance and calibration of monitoring and sampling equipment to be used.
 5. Site control measures in accordance with 29 CFR 1910.120 (d) and 29 CFR 1926.65 (d).
 6. Decontamination procedures in accordance with 29 CFR 1910.120 (k) and 29 CFR 1926.65 (k).
 7. An Emergency Response Plan meeting the requirements of 29 CFR 1910.120 (i) and 29 CFR 1926.65 (l) for safe and effective responses to emergencies, including the necessary personal protective equipment and other equipment.
 8. A written Respiratory Protection Program for Project activities.
 9. Procedures dealing with Heat and/or Cold Stress.
 10. A spill containment program meeting the requirements of 29 CFR 1910.120 (j) and 29 CFR 1926.65 (j) if drummed waste material is generated, excavated, stored, or managed at the Site.
2. ENGINEER will review VENDOR's Site-specific Health and Safety Plan and provide comments to VENDOR" within five days after receipt of the plan. Revise the plan as appropriate and resubmit the plan to ENGINEER within three days after receipt of comments from ENGINEER.
- D. Proof of OSHA Training: Within 5 days after the date of the Notice to Proceed and prior to mobilization to the Site, submit a list of all personnel that will be employed at the Site. For each of the listed personnel, provide proof of training as required under OSHA 29 CFR 1910.120 and 29 CFR 1926.65. Submit proof of training for any additional personnel, as they are sent to the Site.
- E. Medical Surveillance:

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1. Within 5 days after the date of the Notice to Proceed and prior to mobilization to the Site, submit certification of medical surveillance for all Site personnel.
2. Submit additional certifications as personnel are sent to the Site.

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F. Contingency and Emergency Response:

1. In the event of injury to on-Site personnel requiring immediate medical attention, implement the following protocol:
 1. Phone 911 and describe injury.
 2. Administer appropriate first aid.
 3. Notify the Health and Safety Officer and ENGINEER.
 4. Transport personnel to the specified hospital along the most direct route which shall be predefined prior to commencing the Site work.
2. Develop techniques and recommended procedures for immediate first-aid emergency response with local medical facilities.

G. Should any unforeseen or Site-peculiar safety related factor, hazard, or condition become evident during the performance of the Works at the Site, it shall be VENDOR's responsibility to bring such to the attention of ENGINEER, verbally and in writing, as quickly as possible for resolution. In the interim, take prudent action to establish and maintain safe working conditions and to safeguard persons, property, and the environment.

H. Health and Safety Officer: Employ and assign to the Works a competent and authorized representative herein referred to as the Health and Safety Officer. The Health and Safety Officer shall be on the Site during the execution of the Works.

I. Personal Protective Equipment (PPE): Furnish on-Site VENDOR personnel with appropriate PPE. Ensure that safety equipment and protective clothing is kept clean and well maintained. As a minimum, supply each worker with:

1. Steel-toed, steel-shank, chemical-resistant safety boots.
2. Work clothing (full-length pants, long-sleeve shirt).
3. Hard hat.
4. Safety glasses with sideshields.

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- J. Proof of Fit Testing: Within 5 days of the Notice to Proceed and prior to mobilization to the Site, VENDOR shall provide proof of respirator fit testing for each listed personnel.
- K. Levels of Protection: Establish actual levels of protection for each work area based on planned activity and location of activity. The anticipated levels of personal protection based on work activity are as follows:

<i>Work Activity</i>	<i>Anticipated Level of Personal Protection</i>
1. Install injection wells	Level D or C (based on air monitoring)
2. Prepare KMnO ₄	Level C
3. Inject KMnO ₄ solution	Level D

L. Respiratory Protection:

1. Furnish on-Site personnel with extensive training in the usage and limitations of, and qualitative fit testing for, air purifying and supplied-air respirators in accordance with 29 CFR 1910.134.
2. Develop, implement, and maintain a written respiratory program in accordance with 29 CFR 1910.134.
3. Monitor, evaluate, and provide respiratory protection for on-Site personnel.
4. Levels of protection as listed in Paragraph 1.10 J have been chosen to be consistent with the Site-specific potential airborne hazards associated with the major contaminants identified at the Site. The selection of appropriate protection is based upon the potential presence of compounds with the lowest recommended threshold limit value.
5. In the absence of additional air monitoring information or substance identification, the following minimum levels of respiratory protection shall be required:

<i>Sustained Total Organic Vapor Concentration Above Background (ppm)</i>	<i>Level of Respiratory Protection Required</i>
≤ Background	Level D
< 5 meter units above background or > 1 meter unit above background in the presence of vinyl chloride	Full-facepiece air-purifying respirator, Level C
≥ 5 meter units above background	Shut down activities, evaluate the need for Level B or higher respiratory

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protection

6. Immediately notify ENGINEER when level of respiratory protection required increases from Level D to Level C or from Level C to Level B.

1.11 MEASUREMENT AND PAYMENT

A. Schedule of Prices: Exhibit A: Form of Bid.

B. Insurance:

1. No separate payment will be made.

C. Mobilization and Startup:

1. Exhibit A, Schedule of Prices, Item No. 1.
2. Payment Basis: Lump sum price. Includes resource and material procurement activities; procure permits; meetings to coordinate key interface points and to establish communication channels between OWNER, ENGINEER, and VENDOR.

END OF SECTION

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SECTION 01311

COORDINATION AND MEETINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Coordination.
- B. Pre-Decommissioning Conference.
- C. Progress Meetings.

1.2 PRE-BID MEETING

- A. A mandatory Pre-Bid meeting will be held at the site on the date and time specified in the invitation to bid. Any bidder not attending the Pre-Bid meeting will have their bid disqualified, unless otherwise approved by CRA.

1.3 COORDINATIONS

- A. The CONTRACTOR shall have primary responsibility to coordinate schedule and the work. Each CONTRACTOR shall be responsible for adhering to the schedule and coordinating submittals and installation of the work of the various Sections of specifications to assure efficient and orderly sequence of installation of interdependent construction elements. Accordingly, each CONTRACTOR shall, as applicable, perform the following tasks.
 - 1. Verify that all utility requirement characteristics of operating equipment are compatible with building utilities. Coordinate work of various Sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
 - 2. Coordinate completion and clean-up of work of separate Sections in preparation for Substantial Completion.
 - 3. Coordinate work activities of various sections having interdependent responsibilities for building decommissioning.

1.4 PRE-MOBILIZATION CONFERENCE

- A. CRA will schedule a conference after Notice of Award.
- B. Attendance Required – CRA and CONTRACTOR.
- C. Agenda.

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1. Execution of CRA-CONTRACTOR Agreement.
2. Submission of executed bonds and insurance certificates.
3. Submission of list of subcontractors, list of products, Schedule of Values, and Construction Work Schedule in accordance with Section 01330 – Submittal Procedures.
4. Designation of personnel representing the parties in Contract and the ENGINEER.
5. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders and Contract closeout procedures.
6. Scheduling.
7. Use of premises by CONTRACTOR.
8. Construction facilities and controls provided by CRA.
9. Temporary utilities provided by CRA, if any.
10. CONTRACTOR work area.
11. Security and housekeeping procedures.
12. Procedures for maintaining record documents.

1.5 PROGRESS MEETINGS

- A. The ENGINEER will schedule and administer meetings throughout progress of the work at weekly intervals.
- B. The ENGINEER will make arrangements for meetings, preside at meetings, record minutes, and distribute copies to ENCORE, CONTRACTOR, participants, and those affected by decisions made.
- C. Attendance Required – Job superintendent, major subcontractors and suppliers, CRA and ENGINEER, as appropriate to agenda topics for each meeting.
- D. Agenda.
 1. Review minutes of previous meetings.
 2. Review of work progress.
 3. Field observations, problems, decisions, injury reports, and safety issues.
 4. Identification of problems which impede planned progress.
 5. Review of submittals schedule and status of submittals.

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6. Review of off-site fabrication and delivery schedules.
7. Maintenance of progress schedule.
8. Corrective measures to regain lost progress.
9. Planned progress during succeeding work period.
10. Coordination of projected progress.
11. Maintenance of quality and work standards.
12. Effect of proposed changes on progress schedule and coordination.
13. Other business relating to work.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

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SECTION 01330

SUBMITTAL PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Submittal Procedures.
- B. Pre-Work Submittals.
- C. Decommissioning Work Schedules.

1.2 RELATED SECTIONS

- A. Section 01291 – Applications for Payment.
- B. Section 01450 – Quality Control.
- C. Section 01770 – Closeout Procedures.

1.3 SUBMITTAL PROCEDURES

- A. Prepare a complete listing of all submittals required for the project noting the number of each submittal and the date each submittal is to be submitted. The CONTRACTOR shall identify submittals that are time critical to completion of the project. The listing shall be submitted within 7 days of Award of the Contract and shall be a prerequisite to the first partial payment.
- B. Engineer will provide a list of work plan submittals at the pre-bid meeting.
- C. Transmit each submittal with ENGINEER-accepted form. Submit the number of copies which the CONTRACTOR requires plus two (2) copies for CRA.
- D. Sequentially number the submittals using the section and sequential number (e.g., 03300-1, 03300-2). Resubmittals shall have the same submittal number with a sequential letter designation for each succeeding resubmittal (e.g., 0330-1-A, 03300-1-B).
- E. Identify Project, CONTRACTOR, subcontractor or supplier; pertinent Drawing sheet and detail number(s), and specification Section number, as appropriate.
- F. Apply CONTRACTOR's stamp, signed or initialed certifying that review, verification of products required, field dimensions, adjacent construction work, and coordination of information, is in accordance with the requirements of the work and Contract Documents.
- G. Schedule submittals to expedite the project, and deliver to ENGINEER's business address. Coordinate submission of related items such that a complete review of the submittal can be

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performed. Incomplete submittals or submittals not fully coordinated will not be reviewed. The CONTRACTOR will be advised in writing of the reasons for the ENGINEER's action.

- H. Identify variations from Contract Documents and product or system limitations which may be detrimental to successful performance of the completed work.
- I. Provide space for CONTRACTOR and ENGINEER review stamps.
- J. Revise and resubmit submittals as required, identify all changes made since previous submittal.
- K. Distribute copies of reviewed submittals to concerned parties. Instruct parties to promptly report any inability to comply with provisions.
- L. The CONTRACTOR shall allow a minimum of 5 working days for the ENGINEER to review each submittal. The ENGINEER will endeavor to complete the review of all submittals as soon as possible in accordance with the CONTRACTOR's assigned priority to each submittal. Failure by the CONTRACTOR to make submittals on time or failure to allow sufficient time for review of any and all submittals will not relieve him of the responsibility to complete the project in the specified time.

1.4 PRE-WORK SUBMITTALS

- A. Pre-work submittals include, but are not necessarily limited to, the following items:
 - 1. List of subcontractors.
 - 2. List of all personnel who will be working on the Site including social security number. All personnel shall carry a photo ID at all times while on the Site.
 - 3. Insurance Certificates
 - 4. Schedule of Values.
 - 5. CONTRACTOR Project organization chart.
 - 6. Equipment List.
 - 7. Listing of all submittals required for the project.
 - 8. Construction Work Schedule, including bar chart (Gantt) schedule showing the beginning and end of each major task involved in the construction from the Notice of Award.
 - 9. Health and Safety Plan (HASP) (Submit at preconstruction conference). Include documentation of OSHA training, medical surveillance, and respirator fit testing specified in Section 01351.

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PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

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SECTION 01351

HEALTH AND SAFETY

1.1 SECTION INCLUDES

- A. References.
- B. General requirements.
- C. Basis of program.
- D. Site characterization.
- E. Submittals.
- F. Health and Safety Officer.
- G. Personnel health, safety, and hygiene.
- H. Air monitoring.
- I. Contingency and Emergency Response Plans.
- J. Site control.
- K. Measurement and payment.

1.2 REFERENCES

- A. Section 01450 - Quality Control.
- B. United States Federal Government - Code of Federal Regulations (CFR):
 - 1. 29 CFR 1910.120 - Hazardous Waste Operations and Emergency Response.
 - 2. 29 CFR 1910.134 - Respiratory Protection.
 - 3. 29 CFR 1910.1200 - Hazard Communication.
 - 4. 29 CFR 1926.65 - Hazardous Waste Operations and Emergency Response.
- C. CRA Construction General Conditions (1638, 4/00), Article 9.

1.3 GENERAL REQUIREMENTS

- A. Develop a written Site-specific Health and Safety Plan which complies with 29 CFR 1910.120 and 29 CFR 1926.65 prior to commencing any on-Site work and continue to implement, maintain, and

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enforce the plan until final demobilization from the Site. The development, implementation, and maintenance of the Site-specific Health and Safety Plan is CONTRACTOR's sole responsibility. CONTRACTOR's Site-specific Health and Safety Plan, as a minimum, shall address the specifications contained herein.

- B. The health and safety guidelines contained herein are intended to provide for a safe and minimal risk working environment for on-Site personnel and to minimize the impact of activities involving contact with hazardous materials or hazardous wastes on the general public and the surrounding environment.
- C. Should CONTRACTOR seek relief from or substitution for any portion or provision of the minimum health and safety guidelines specified herein or CONTRACTOR's Site-specific Health and Safety Plan, such relief or substitution shall be requested of ENGINEER in writing, and if accepted by ENGINEER, will be authorized in writing.
- D. Responsibility: Be responsible for the safety of persons and property on the Site and for the protection of persons off the Site and the environment to the extent that they may be affected by the conduct of the Works. Comply with and enforce compliance by employees of CONTRACTOR and Representatives with safety requirements of the Contract Documents, Laws and Regulations, and CONTRACTOR's Site-specific Health and Safety Plan. CONTRACTOR acknowledges that safety and environment protection obligations are of paramount importance regarding all of the work to be performed under the Contract Documents.
- E. Hazard Communication Requirements:
 - 1. Comply with the requirements of OSHA's "Hazard Communication" rule, 29 CFR 1910.1200. Obtaining information on any hazardous chemical or harmful physical agent to which personnel of CONTRACTOR and Representatives, and visitors have potential exposure while on the Site.
 - 2. CONTRACTOR shall provide ENGINEER with Material Safety Data Sheet (MSDS) documentation on any "hazardous" chemicals that CONTRACTOR or Representatives plan to bring onto the Site. In addition, CONTRACTOR shall be responsible for meeting container warning label requirements of OSHA rule.
- F. Work Stoppage: Give precedence to the safety and health of the public and on-Site personnel and the protection of the environment over cost and schedule considerations for all Project work. The Health and Safety Officer shall be responsible for decisions regarding when work will be stopped or started for health or safety considerations and shall have the authority, in the Health and Safety Officer's discretion, to stop or start the work for health or safety considerations. ENGINEER will have the right to stop work for health and safety considerations.
- G. Unforeseen Hazards: Should any unforeseen or Site-peculiar safety-related factor, hazard, or condition become evident during performance of the Works at the Site, bring such to the attention of ENGINEER verbally and in writing as quickly as possible, for resolution. In the interim, take prudent action to establish and maintain safe working conditions and to safeguard employees of CONTRACTOR and Representatives, the public, GM, ENGINEER, and the environment.
- H. Comply with all safety precautions and programs contained in CRA Construction General Conditions.

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1.4 BASIS OF PROGRAM

- A. OSHA standards and regulations contained in 29 CFR 1910 and 1926 provide the basis for the health and safety program. The program also reflects the position of USEPA and NIOSH regarding procedures recommended or required to ensure safe operations at sites containing hazardous or toxic materials.

1.5 SITE CHARACTERIZATION

- A. Work at the Site will involve contact with free product, volatile organic compounds, and semi-volatile organic compounds in groundwater, potassium permanganate (crystals and 2% solution in water), gasoline, oil, coolants, and diesel. The project will also involve working around construction equipment (drill rigs).

1.6 SUBMITTALS

- A. Section 01330 – Submittal Procedures.
- B. CONTRACTOR's Site-Specific Health and Safety Plan:
 - 1. Within 7 days after the date of the Notice to Proceed and prior to mobilization to the Site, submit a Site-specific Health and Safety Plan which complies with 29 CFR 1910.120 and 29 CFR 1926.65. As a minimum, the Site-specific Health and Safety Plan shall include the following:
 - 1. A safety and health risk or hazard analysis for each Site task and operation.
 - 2. Personnel training assignments in accordance with 29 CFR 1910.120 (e) and 29 CFR 1926.65 (e).
 - 3. Personal protective equipment to be used by personnel for each Site task and operation being conducted in accordance with 29 CFR 1910.120 (g)(5) and 29 CFR 1926.65 (g)(5).
 - 4. Medical surveillance requirements in accordance with 29 CFR 1910.120 (f) and 29 CFR 1926.65 (f).
 - 5. Frequency and types of air monitoring, personnel monitoring, and environmental sampling techniques and instrumentation to be used, including methods of maintenance and calibration of monitoring and sampling equipment to be used.
 - 6. Site control measures in accordance with 29 CFR 1910.120 (d) and 29 CFR 1926.65 (d).
 - 7. Decontamination procedures in accordance with 29 CFR 1910.120 (k) and 29 CFR 1926.65 (k).

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8. An emergency response plan meeting the requirements of 29 CFR 1910.120 (l) and 29 CFR 1926.65 (l) for safe and effective responses to emergencies, including necessary personal protective equipment and other equipment.
 9. A written respiratory protection program for Project activities.
 10. Procedures dealing with heat and/or cold stress.
 11. A spill containment program meeting the requirements of 29 CFR 1910.120 (j) and 29 CFR 1926.65 (j) if drummed waste material is generated, excavated, stored, or managed at the Site.
2. ENGINEER will review CONTRACTOR's Site-specific Health and Safety Plan and provide comments to CONTRACTOR within 3 days after receipt of the plan. Revise the plan as appropriate and resubmit the plan to ENGINEER within 3 days after receipt of comments from ENGINEER.
- C. Proof of OSHA Training: Within 7 days after the date of the Notice to Proceed and prior to mobilization to the Site, submit a list of all personnel that will be employed at the Site. For each of the listed personnel, provide proof of training as required under OSHA 29 CFR 1910.120 and 29 CFR 1926.65. Submit proof of training for any additional personnel, as they are sent to the Site.
- D. Medical Surveillance:
1. Within 7 days after the date of the Notice to Proceed and prior to mobilization to the Site, submit certification of medical surveillance for all Site personnel.
 2. Submit additional certification of medical surveillance as personnel are sent to the Site.
- E. Respirator Fit Test: Within 7 days after the date of the Notice to Proceed and prior to mobilization to the Site, submit proof of respirator fit testing for on-Site personnel.
- F. Air Monitoring Reporting: Submit air monitoring results daily on a separate CONTRACTOR designated form.
- 1.7 HEALTH AND SAFETY OFFICER
- A. ENGINEER will provide a "Health and Safety Officer". Health and Safety Officer Qualifications:
1. Have a minimum of 2 years Site-related working experience specific to the activities associated with groundwater well installation and general site safety and health.
 2. Have a basic working knowledge of state and federal occupational safety and health regulations.
 3. Have formal education and/or training in occupational safety and health.

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B. Health and Safety Officer Responsibilities:

1. Obligated to stop or start the work when it is necessary or advisable for reasons of health or safety.
2. Establish Exclusion Zone and Contaminant Reduction Zone.
3. Completing Health and Safety Training Sessions and ensuring that personnel not successfully completing the required training are not permitted to enter the Site to perform work in the Exclusion Zone or the Contaminant Reduction Zone.
4. Implementing and daily enforcing and monitoring the Site-specific Health and Safety Plan.
5. Be on the Site during the execution of work at the Site.

1.8 PERSONNEL HEALTH, SAFETY, AND HYGIENE

A. Medical Surveillance:

1. Conduct medical surveillance of personnel as required by 29 CFR 1910.120, 29 CFR 1926.65, and 29 CFR 1910.134.

B. Training: Furnish personnel assigned to or entering the Site who have successfully completed training required by the applicable OSHA Standards in 29 CFR 1910 and 29 CFR 1926 and specifically with 29 CFR 1910.120 and 1926.65.

C. Levels of Protection: Establish actual levels of protection for each work area based on planned activity and location of activity. The anticipated levels of personal protection based on work activity are as follows:

<i>Work Activity</i>	<i>Anticipated Level of Personal Protection</i>
1. Install injection wells	Level D or C (based on air monitoring)
2. Prepare KMnO ₄	Level C
3. Inject KMnO ₄ solution	Level D

D. Personal Protective Equipment:

1. Furnish on-Site CONTRACTOR personnel with appropriate PPE. Clean and maintain safety equipment and protective clothing. As a minimum, each worker on Site shall wear a hard hat, safety glasses with side shields, safety boots with steel toes and shank, full-length pants, and long sleeve shirt.
2. Develop protective equipment usage procedures and enforce strict compliance with such procedures by on-Site personnel; include the following procedures as a minimum:

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1. Do not permit prescription eyeglasses to be worn that are not safety glasses. Do not permit contact lenses on the Site within the Exclusion Zone or the Contaminant Reduction Zone.
2. Change respirator cartridges/filters daily during periods of respirator usage or upon breakthrough, whichever occurs first.
3. Do not permit footwear to be worn that is not steel-toed safety shoes or boots. Cover footwear by rubber overshoes when entering or working in the Exclusion Zone or the Contaminant Reduction Zone.
4. Dispose of or decontaminate PPE worn on the Site at the end of the work day.
 1. Place visually uncontaminated personal protection equipment or personal protective equipment soiled with non-hazardous, non-toxic material in general GM Site trash containers. Otherwise, handle personal protection equipment in accordance with guidelines for the associated waste.
5. Decontaminate reusable PPE before reissuing.
6. Do not permit on-Site personnel who have not passed a respirator fit test to enter the Exclusion Zone or the Contaminant Reduction Zone. Do not permit personnel to have facial hair that interferes with a proper fit of the respirator.

E. Respiratory Protection:

1. Furnish on-Site personnel with extensive training in the usage and limitations of, and qualitative fit testing for, air purifying and supplied-air respirators in accordance with 29 CFR 1910.134.
2. Develop, implement, and maintain a written respiratory program in accordance with 29 CFR 1910.134.
3. Monitor, evaluate, and provide respiratory protection for on-Site personnel.
4. Levels of protection as listed in Paragraph 1.8 C have been chosen to be consistent with the Site-specific potential airborne hazards associated with the major contaminants identified at the Site. The selection of appropriate protection is based upon the potential presence of compounds with the lowest recommended threshold limit value.
5. In the absence of additional air monitoring information or substance identification, the following minimum levels of respiratory protection shall be required:

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<i>Sustained Total Organic Vapor Concentration Above Background (ppm)</i>	<i>Level of Respiratory Protection Required</i>
$\leq$ Background	Level D
< 5 meter units above background or > 1 meter unit above background in the presence of vinyl chloride	Full-facepiece air-purifying respirator, Level C
$\geq$ 5 meter units above background	Shut down activities, evaluate the need for Level B or higher respiratory protection

6. Immediately notify ENGINEER when level of respiratory protection required increases from Level D to Level C or from Level C to Level B.
 7. Be responsible for appropriate respiratory protection during work activities. Do not allow persons to enter the Exclusion Zone or the Contaminant Reduction Zone without appropriate respiratory protection.
 8. Be responsible for assessing the ability for on-Site personnel to wear respiratory protection. Cardiopulmonary system examination and pulmonary function testing are minimum requirements for personnel wearing respiratory protection.
 9. Do not permit on-Site personnel unable to pass a respirator fit test to wear respiratory protection and to enter the Exclusion Zone or the Contaminant Reduction Zone.
- F. Heat Stress/Cold Stress: Implement a heat stress and/or cold stress monitoring program as applicable and include in the Site-specific Health and Safety Plan.
- G. Personnel Hygiene and Personnel Decontamination Procedures:
1. Provide, as a minimum, the following:
 1. Suitable containers for storage and disposal of used disposable PPE.
 2. Potable water and a suitable sanitation facility.
- H. Emergency and First-Aid Equipment:
1. Locate and maintain emergency and first-aid equipment in appropriate location on the Site, including:
 1. First-aid kit to accommodate the numbers of on-Site personnel.
 2. Portable emergency eye wash.
 3. Two 20-pound ABC type dry chemical fire extinguishers.
 4. Blankets and towels.

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5. Stretcher.
 6. One hand-held emergency siren.
 2. As a minimum, provide 1 certified first-aid technician on the Site at all times that on-Site work activities are in progress. This technician may perform other duties but shall be immediately available to render first aid when needed.
 - I. Site Communications:
 1. Ensure that personnel work under the use of a "buddy" system and develop a hand signal system appropriate for the Site activities.
 2. Provide an employee alarm system to notify employees of on-Site emergency situations or to stop work activities if necessary.
 3. Furnish selected personnel with 2-way radios.
 - J. Safety Meetings: Conduct and document mandatory daily safety meetings for on-Site personnel, and additionally as required by special or work-related conditions; include refresher training for existing equipment and protocols, review ongoing safety issues and protocols, and examine new Site conditions as they are encountered. Hold additional safety meetings on an as-needed basis.
- 1.9 CONTINGENCY AND EMERGENCY RESPONSE PLANS
- A. General: Comply with 29 CFR 1910.120 (l) and 20 CFR 1926.65 (l).
 - B. On-Site Contingency and Emergency Response Plan: Address the standard operating procedures to be implemented during emergency situations. Coordinate response procedures with Willow Run Assembly Plant Contingency and Emergency Response Plan.
- 1.10 SITE CONTROL
- A. Comply with 29 CFR 1910.120 (d) and 20 CFR 1926.65 (d).
 - B. Provide in the Site-specific Health and Safety Plan a figure or map which presents the delineation of the work zones for Project activities.
 - C. Provide in the Site-specific Health and Safety Plan a discussion on Site security issues.
 - D. Provide in the Site-specific Health and Safety Plan a detailed discussion on decontamination procedures for both equipment and personnel, including collection and disposal of wash waters and spent PPE.
- 1.11 MEASUREMENT AND PAYMENT
- A. Section 01271 - Measurement and Payment.

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- B. Development, Implementation, and Maintenance of the Site-specific Health and Safety Plan:
1. Payment Basis: Included in Lump Sum price. Includes, but is not limited to, development, implementation, and maintenance of the Site-specific Health and Safety Plan; provision of all required training; designation and maintenance of work areas; wages, taxes, and benefits; and all PPE for CONTRACTOR personnel.

END OF SECTION

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SECTION 01355

ENVIRONMENTAL PROTECTION PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Protection of Land Resources.
- B. Protection of Water Resources.
- C. Protection of Fish and Wildlife.
- D. Maintenance.
- E. Dust Control.
- F. Noise Control.
- G. Pesticides and Herbicides.
- H. Prohibited Construction Procedures.
- I. Equipment Decontamination.

1.2 RELATED SECTIONS

- A. Section 01110 – Summary of Work.
- B. CRA Construction General Conditions.

1.3 REGULATORY REQUIREMENTS

- A. CONTRACTOR and his subcontractors shall comply with all applicable Federal, State, and local laws and regulations concerning environmental protection procedures, as well as the specific requirements stated in this Section and elsewhere in the Specifications.

PART 2 PRODUCTS

Not Used.

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PART 3 EXECUTION

3.1 GENERAL

- A. The CONTRACTOR shall furnish all labor, equipment, and materials required for environmental protection procedures during and as the result of construction operations under this Contract except for those measures set forth in other provisions of these Specifications.
- B. CONTRACTOR shall comply with the provisions of CRA's Construction General Conditions.

3.2 PROTECTION OF LAND RESOURCES

- A. General.
 - 1. It is intended that the land resources within the project boundaries and outside the limits of permanent work performed under this contract be preserved in their present condition, or be restored to a condition after completion of construction, that will appear to be natural and not detract from the appearance of the project.
 - 2. The CONTRACTOR shall confine his construction activities to areas defined on the Specifications except with written approval of the property owners and the ENGINEER.
- B. Prevention of Landscape Defacement.
 - 1. Limits of working areas include areas for storage of construction material, and shall be cleared in a manner which will enable satisfactory restoration and which will not affect the environment during or after the construction period.
 - 2. The CONTRACTOR shall not enter beyond the working limits of the working area except with written approval of the ENGINEER and GM.
- C. Location of Storage.
 - 1. The location of areas for storage of the CONTRACTOR's materials required temporarily in the performance of the work, shall be within the limits of the working area and shall require written approval of the ENGINEER prior to use. The preservation of the landscape shall be an imperative consideration in the selection of all such sites.
- D. Post-Construction Cleanup or Obliteration.
 - 1. The CONTRACTOR shall obliterate all signs of temporary construction facilities such as haul roads, work areas, structures, foundations of temporary structures, stockpiles of excess or waste materials, or any other vestiges of construction.

3.3 PROTECTION OF WATER RESOURCES

- A. General.

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1. The CONTRACTOR shall not pollute streams, lakes or reservoirs with fuels, oils, bitumens, calcium chloride, acids, or harmful materials.
2. It is the responsibility of the CONTRACTOR to investigate and comply with all applicable Federal, State, County, and Municipal laws concerning pollution of rivers, streams and impounded water.
3. All work under this Contract shall be performed in such a manner that objectionable conditions will not be created in streams through, or bodies of water adjacent to, the project area.

B. Spillages.

1. Special measures shall be taken to prevent chemicals, fuels, oils, greases, bituminous materials, waste washings, herbicides and insecticides, and cement and surface drainage from entering public waters.
2. Should a spillage into the public waters occur, the CONTRACTOR shall immediately notify the proper authorities.
3. The CONTRACTOR will be responsible for any and all costs associated with the cleanup of spillages.

C. Washwater.

1. Water used for cleaning and crushing operations, and other wastewaters, shall not be allowed to enter the sewers.

D. Disposal.

1. Disposal of any materials, wastes, effluents, trash, garbage, oil, grease, chemicals, etc., in areas adjacent to streams or other waterways shall be strictly prohibited.
2. If any waste material is dumped in unauthorized area, the CONTRACTOR shall remove the material and restore the area to the condition of the adjacent undisturbed area.
3. If necessary, contaminated ground shall be excavated, disposed of as specified before herein and replaced with suitable fill material, compacted and finished with topsoil, all at the expense of the CONTRACTOR.

3.4 PROTECTION OF FISH AND WILDLIFE

- A. The CONTRACTOR shall at all times perform all work and take such steps required to prevent any interference or disturbance to fish and wildlife.
- B. Fouling or polluting of water will not be permitted.
- C. All wash waters and wastes shall be collected for off-site treatment/disposal.

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- D. Should polluting or fouling the water occur, the CONTRACTOR shall immediately notify the proper authorities.
- E. The CONTRACTOR will be responsible for any and all costs associated with the cleanup of polluted or fouled waters.

3.5 MAINTENANCE

- A. The CONTRACTOR shall dispose of all discarded debris, and waste from any source whatsoever, in a manner approved by the ENGINEER. Toilet facilities shall be kept clean and sanitary at all times. Services shall be performed at such a time and in such a manner to least interfere with the operations. Services shall be accomplished to the satisfaction of the ENGINEER.
- B. The CONTRACTOR shall frequently remove material no longer required on the site, such as forms, temporary structures and similar materials and equipment so that, at all times, the site, access routes to the site and any other areas disturbed by his operations shall present a neat, orderly, workmanlike appearance.
- C. Before substantial completion inspection, the CONTRACTOR shall remove all surplus material, falsework, temporary structures, including foundations thereof, plant of any description, and debris of every nature resulting from his operations, and put the site in a neat, orderly condition; and restore all areas which have been used for storage of materials and equipment, and all areas which have been disturbed by his operations, to their original condition or to a condition satisfactory to and approved by the ENGINEER.

3.6 DUST CONTROL

- A. The CONTRACTOR shall maintain all excavations, stockpiles, haul roads, permanent access roads, waste areas, borrow areas, foundry sand stabilization processing, and all other work areas within or without the project boundaries free from dust which would cause a hazard or nuisance to others or contaminate surface water.
- B. The CONTRACTOR shall, at his own expense, keep dust under control at all times on all roadways and other areas adjacent to the work or on the site of the work.
- C. Approved temporary methods of stabilization consisting of motor sweepers, vacuums, spraying water, or a combination of these methods, will be permitted to control dust. Spraying water shall be repeated at such intervals as to keep all parts of the disturbed area at least damp at all times, and the CONTRACTOR shall have sufficient suitable equipment on the job to accomplish this, if sprinkling is used. Dust control shall be performed daily as the work proceeds and whenever a dust nuisance or hazard occurs.

3.7 NOISE CONTROL

- A. The CONTRACTOR shall use every effort and means possible to minimize or eliminate noise caused by his operation which the ENGINEER may consider objectionable.

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- B. The CONTRACTOR shall provide working machinery, designed to operate with the least possible noise.
- C. The CONTRACTOR is responsible for maintaining compliance with all applicable noise regulations and all State and local noise ordinances.

3.8 PROHIBITED CONSTRUCTION PROCEDURES

- A. The CONTRACTOR is advised that the disposal of excess excavated material in wetlands, stream corridors, and floodplains is strictly prohibited. Any violation of this restriction by the CONTRACTOR or any person employed by him, will be brought to the immediate attention of the responsible regulatory agencies, with a request that appropriate action be taken against the offending parties. Therefore, the CONTRACTOR will be required to remove the fill at his own expense and restore the area impacted.
- B. The CONTRACTOR shall, at a minimum, be strictly prohibited from performing the following construction procedures:
 - 1. Dumping of spoil material into any stream corridor, any wetlands, any surface waters, or at unspecified locations.
 - 2. Indiscriminate, arbitrary or capricious operation of equipment in any stream corridors, any wetlands or surface waters.
 - 3. Open burning of project debris.
 - 4. Location of storage stockpile areas in environmentally sensitive areas.
 - 5. Discharging silty or muddy water from dewatering operations into natural water courses.
 - 6. Airborne discharges of dust or particulate matter in excess of 3 mg/m³.
 - 7. Airborne discharges of mist in excess of OSHA limits.

3.9 EQUIPMENT DECONTAMINATION

- A. Decontaminate decommissioning equipment upon mobilization to, and prior to demobilization from the Site.
- B. Decontaminate equipment which may come in contact with potentially impacted materials, prior to commencing activities at each location, according to the following procedure:
 - 1. Flush and wipe components to remove soils and other gross contamination.
 - 2. Clean with potable water and non-phosphate detergent (e.g., Liqui-Nox) using a brush if necessary to remove particulate matter and surface films.
 - 3. Rinse thoroughly with potable water.

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4. Allow to air dry as long as possible.
- C. Collect washwaters and place in temporary on-Site storage until off-Site disposal.

END OF SECTION

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SECTION 01400

QUALITY REQUIREMENTS

1.1 SECTION INCLUDES

- A. Quality control.
- B. Tolerances.
- C. References.
- D. Measurement and payment.

1.2 QUALITY CONTROL

- A. Monitor quality control over products, services, the Site conditions, and workmanship, to produce Works of specified quality.
- B. Comply with specified standards as minimum quality for the Works except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- C. Perform work by persons qualified to produce workmanship of specified quality. Use persons licensed to perform the Works where required by these Specifications or Laws and Regulations.

1.3 TOLERANCES

- A. Monitor tolerance control of installed products to produce acceptable Works.

1.4 REFERENCES

- A. For products or workmanship specified by association, trade, or other consensus standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable Laws and Regulations.
- B. Conform to reference standard by date of issue current as of bid closing date, except where a specific date is established by Laws or Regulations or by an individual Section.
- C. Specific provisions of Laws or Regulations may be referenced in the Project Specifications to assist VENDOR and identify options selected by CRA ENGINEER. Such references do not relieve VENDOR from compliance with other applicable provisions of Laws or Regulations not specifically referenced.

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- D. No inference or provision of any reference document including but not limited to any standard specification, manual, or code shall be effective to change the relationships, duties, and responsibilities of CRA, VENDOR, or CRA ENGINEER from those set forth in the purchase order, nor shall it be effective to assign to CRA or CRA ENGINEER any duty or authority to supervise or direct the furnishing or performance of the Works or any duty or authority to undertake responsibility inconsistent with the provisions of the purchase order.
- E. Publications referred to in these Specifications form part of the Specifications to the extent specified in individual Sections.
- F. In case of conflict or discrepancy between a reference standard and the Project Specifications or with another reference standard, the more stringent requirements shall apply.
- G. Should specified reference standards conflict with the purchase order, request clarification from CRA ENGINEER before proceeding.

1.5 MEASUREMENT AND PAYMENT

- A. No separate payment will be made for work under this Section.

END OF SECTION

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SECTION 01450

QUALITY CONTROL

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Control of Work.
- B. References.
- C. Field samples.

1.2 QUALITY ASSURANCE/CONTROL OF WORK

- A. Monitor quality control over services, site conditions, and workmanship, to produce work of specified quality.
- B. Comply with specified standards as a minimum quality for the work except when more stringent tolerances, codes, or manufacturer's specified requirements indicate higher standards or more precise workmanship.
- C. Work is to be performed by persons qualified to produce workmanship of specified quality.
- D. ENGINEER to conduct visual inspections for quality assurance and completeness.

1.3 REFERENCES

- A. The contractual relationship of the parties to the Contract shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.4 FIELD SAMPLES

- A. Where field sample is specified in individual Sections to be removed when directed by the ENGINEER, remove the sample and restore the area as specified.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

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END OF SECTION

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SECTION 01500

TEMPORARY FACILITIES AND CONTROLS

1.1 SECTION INCLUDES

- A. Construction Facilities: equipment decontamination, drums.
- B. Vehicular Access and Parking: access roads, parking
- C. Temporary Barriers and Enclosures: barriers
- D. Temporary Controls: equipment decontamination.
- E. Removal of temporary facilities and controls.
- F. Measurement and payment.

1.2 CONSTRUCTION FACILITIES

- A. Equipment Decontamination:
 - 1. Prior to commencing work involving drilling equipment contact with potentially contaminated materials, construct an equipment decontamination pad. The decontamination pad should consist of a plywood base underlying a visqueen sheet or other materials approved by CRA ENGINEER and prevent runoff. The decontamination pad should be located in an area deemed acceptable to VENDOR and CRA ENGINEER.
 - 2. Provide, operate, and maintain suitable portable, high-pressure, low-volume decontamination wash unit(s) equipped with self-contained water storage tank and pressurizing system and capable of heating and maintaining wash waters to 180 degrees F and providing a nozzle pressure of 150 psi.
- B. Drums:
 - 1. Storage of Liquid Waste: Michigan Department of Transportation (MDOT) - approved 55-gallon steel drums, closable lids, complete with labels for marking contents and date filled.
 - 2. Storage of Solid Waste: MDOT-approved 55-gallon steel drums, closable lids, complete with labels for marking contents and date filled.

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1.3 VEHICULAR ACCESS AND PARKING

A. Access Roads:

1. Existing Roads:

1. Comply with weight and load size restrictions where applicable.

B. Traffic Regulation:

1. Control construction vehicular parking to prevent interference with public traffic, site operations, parking, and access by emergency vehicles.
2. Monitor parking of construction personnel's vehicles. Maintain vehicular access to and through parking areas. Park in area specified by CRA ENGINEER.
3. Prevent construction parking on or adjacent to access roads or in non-designated areas.

1.4 TEMPORARY BARRIERS AND ENCLOSURES

A. Barriers:

1. Provide barriers to prevent unauthorized entry to construction and to protect existing facilities and adjacent properties from damage from VENDOR's operations.

B. Fencing:

1. Enforce and require that workers and visitors observe and respect the limits marked with temporary fencing.

C. Security:

1. Access to the Site is limited by existing VENDOR Security operations. Entry and exit from the Site will require compliance with VENDOR Security operations.

1.5 TEMPORARY CONTROLS

A. Water Control:

1. Do not discharge decontamination water, or surface water runoff, or groundwater which may have come in contact with potentially contaminated material, off the Site or to municipal sewers.
2. Dispose of water in a manner not injurious to public health or safety, to property, or to any part of the Works completed or under construction.

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3. Contain and collect wastewaters and transfer such collected wastewaters to VENDOR-supplied 55-gallon drums.

B. Erosion and Sediment Control:

1. Provide and maintain temporary measures which may include, but are not limited to, silt fences, hay or straw bales, and any other construction required to prevent erosion and migration of silt, mud, sediment, and other debris off the Site or to other areas of the Site where damage might result, or that might otherwise be required by Laws and Regulations. Make sediment control measures available during construction.
2. Plan construction procedures to avoid damage to, or work or equipment encroachment onto water bodies or drainage ditch banks. In the event of damage, promptly take action to mitigate the effects of such damage. Restore the affected bank or water body to its existing condition.
3. Installation:
 1. Check erosion and sediment control measures weekly and after each rainfall. During prolonged rainfall, check daily.
 2. Unless otherwise specified on the Drawings or directed by CRA ENGINEER, remove temporary erosion and sediment control devices upon completion of the Works.
4. Do not disturb existing embankments or embankment protection.
5. Unless specified otherwise, provide erosion and sediment control in accordance with the State of Michigan regulations.

C. Pollution Control:

1. Be prepared to intercept, clean up, and dispose of spills or releases that may occur whether on land or water. Maintain materials and equipment required for cleanup of spills or releases readily accessible on the Site.
2. Promptly report spills and releases potentially causing damage to the environment to:
 1. Authority having jurisdiction or an interest in the spill or release including any conservation authority, water supply authorities, drainage authority, road authority, fire department, etc.
 2. The owner of the pollutant, if known.
 3. The person having control over the pollutant, if known.
 4. CRA ENGINEER.

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3. Contact the manufacturer of the pollutant if known and ascertain the hazards involved, precautions required, and best measures to be used in any cleanup or mitigating action.
4. Take immediate action using available resources to contain and mitigate the effects on the environment and persons from any spill or release.

D. Equipment Decontamination:

1. At a minimum, perform the following steps during equipment decontamination:
 1. Use high-pressure, low-volume, hot water or steam supplemented by detergents as appropriate and as approved by CRA ENGINEER.
 2. Pay particular attention to tire treads, equipment tracks, springs, joints, sprockets, and undercarriages.
2. Each piece of equipment will be inspected by CRA ENGINEER after decontamination and prior to removal from the Site and/or travel on clean areas. CRA ENGINEER will have right to require additional decontamination to be completed if deemed necessary.
3. Furnish and equip personnel engaged in equipment decontamination with protective equipment including suitable disposable clothing, and face shields.

1.6 REMOVAL OF TEMPORARY FACILITIES AND CONTROLS

- A. Remove temporary equipment, facilities, materials, prior to Substantial Completion inspection.
- B. Clean and repair damage caused by installation or use of temporary work.
- C. Restore existing facilities used during construction to specified condition.

1.7 MEASUREMENT AND PAYMENT

- A. Equipment Decontamination :
 1. No separate payment will be made.

END OF SECTION

ENVIRONMENTAL AUDIT REPORT;
PRIVILEGED DOCUMENT

SECTION 01521
FIELD OFFICES AND SHEDS

PREPARED FOR GENERAL MOTORS CORPORATION

ENVIRONMENTAL AUDIT REPORT;
PRIVILEGED DOCUMENT

SECTION 01521

FIELD OFFICES AND SHEDS

1.1 SECTION INCLUDES

- A. Use of existing facilities.
- B. Use of permanent facilities.
- C. Materials, equipment, furnishings.
- D. Construction.
- E. Environmental control.
- F. CONTRACTOR office and facilities.
- G. Maintenance and cleaning.
- H. Removal.

1.2 USE OF EXISTING FACILITIES

- A. Designated existing spaces may be used for field offices:
 - 1. Southeast corner of lot, south of Area 2.

1.3 USE OF PERMANENT FACILITIES

- A. Permanent facilities shall not be used for field offices by CONTRACTOR.

1.4 MATERIALS, EQUIPMENT, FURNISHINGS

- A. Serviceable, new or used, adequate for required purpose.

1.5 CONSTRUCTION

- A. Portable or mobile buildings, or buildings constructed with floors raised above ground, securely fixed to foundations, with steps and landings at entrance doors.
- B. Construction: Structurally sound, secure, weathertight enclosures for office and storage spaces. Maintain during progress of the Works; remove at completion of the Works.
- C. Temperature Transmission Resistance of Floors, Walls, and Ceilings: Compatible with occupancy and storage requirements.

ENVIRONMENTAL AUDIT REPORT;
PRIVILEGED DOCUMENT

- D. Exterior Materials: Weather resistant.
- E. Interior Materials in Offices: Sheet type materials for walls and ceilings, prefinished or painted; resilient floors and bases.
- F. Fire Extinguishers: Appropriate type fire extinguisher at each office and each storage area.
- G. Interior Materials in Storage Sheds: As required to provide specified conditions for storage of products.

1.6 ENVIRONMENTAL CONTROL

- A. Heating, Cooling, and Ventilating for Offices: Automatic equipment to maintain comfort conditions.
- B. Storage Spaces: Heating and ventilation as needed to maintain products in accordance with the Contract Documents; adequate lighting for maintenance and inspection of products.
- C. Furnish and pay for all fuel.

1.7 CONTRACTOR OFFICE AND FACILITIES

- A. Size: For CONTRACTOR's needs and to provide space for project meetings.
- B. Furnishings in Meeting Area: Conference table and chairs to seat at least 8 persons; racks and files for Contract Documents, submittals, and Project record documents.
- C. Other Furnishings: CONTRACTOR's option.
- D. Equipment: 6 adjustable band protective helmets for visitors, one 10-inch outdoor weather thermometer.

1.8 MAINTENANCE AND CLEANING

- A. Provide continuous maintenance of offices and services.
- B. Provide weekly janitorial services for offices; periodic cleaning and maintenance for office and storage areas.
- C. Maintain approach walks free of mud, water, and snow.
- D. Provide soap, paper towels, cleansers and janitorial implements.
- E. Repair immediately any damage, leaks, or defective service.

1.9 REMOVAL

- A. At completion of the Works or when directed by ENGINEER remove buildings, foundations, utility services, and debris. Restore areas.

ENVIRONMENTAL AUDIT REPORT;
PRIVILEGED DOCUMENT

END OF SECTION

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SECTION 01700

EXECUTION REQUIREMENTS

1.1 SECTION INCLUDES

- A. Examination.
- B. Restoration.
- C. Progress cleaning
- D. Final cleaning
- E. Final decontamination.
- F. Removal and disposal.
- G. Protection of installed work.
- H. Closeout procedures.
- I. Project record documents.
- J. Spare parts, maintenance materials, and extra materials.
- K. Measurement and payment.

1.2 EXAMINATION

- A. Prior to commencement of work at the Site, inspect the Site with CRA ENGINEER to review and establish the condition of surface features including existing roads, parking areas, buildings, wells, trees and other plants, grassed areas, fencing, service poles, wires, paving, and survey bench marks or monuments on or adjacent to the Site which may be affected by the Works. This inventory shall be mutually agreed between CRA ENGINEER and VENDOR and shall not thereafter be subject to dispute. Such inventory as may be amended, from time to time, will be used by CRA ENGINEER to check compliance by VENDOR with the requirements of the Contract Documents.
- B. Provide ongoing review, inspection, and attendance during performance of the Works to properly document conditions. Promptly inform CRA ENGINEER of any existing condition at the Site affected by the Works which may require restoration, repair, or replacement. Do not cover up any of the Works without prior approval from CRA ENGINEER.

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- C. Maintain and protect existing Site structures and facilities from damage which may be affected by the Works while work is in progress. Repair or replace damage resulting from the Works to CRA ENGINEER's approval.
- D. Verify that existing Site conditions and substrate surfaces are acceptable for subsequent work. Beginning new work means acceptance by VENDOR of existing conditions.
- E. Examine and verify specific conditions described in individual Sections.

1.3 RESTORATION

- A. As a minimum, restoration shall mean replacement, repairs, or reconstruction to a condition at least as good as or better than the condition prior to commencement of the Works.
- B. Except where specifically required otherwise by other Sections, restore areas of the Works and areas affected by the performance of the Works to conditions that existed prior to commencement of the Works and to match condition of similar adjacent, undisturbed areas.
- C. Ensure that restored areas match existing grade and surface drainage characteristics, except as otherwise specified, and ensure a smooth transition from restored surfaces to existing surfaces.
- D. Without limiting the generality of the foregoing or other requirements of the Contract Documents, preserve and protect existing features encountered at the Site during the performance of the Works including, but not limited to buildings, wells, structures, curbs and gutters, fences, pavement, manholes and catch basins, utilities, roads, streets, grassed areas, and other graded or improved areas.
- E. Utilize construction methods and procedures during the performance of the Works which keeps disturbance and damage of whatever nature to existing conditions to the practical minimum. Where work necessitates root or branch cutting, do not proceed without CRA ENGINEER's prior approval.
- F. Restoration Material: New, except as otherwise specified, not damaged or defective, and of the best quality for the purpose intended. Furnish evidence as to type, source, and quality of materials or products furnished when requested by CRA ENGINEER or specified in other Sections.
- G. Should any dispute arise as to the quality or fitness of materials, whether obtained on the Site or off the Site, whether previously inspected by CRA ENGINEER prior to use or not, the decision to use any material or product in the finished Works will rest solely with CRA ENGINEER.
- H. Remove from the Site clean material not approved for reuse.
- I. Handle and store products and materials in a manner to prevent damage, adulteration, or deterioration, in accordance with manufacturer's instructions when applicable.

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- J. Prior to commencement of restoration work, inform CRA ENGINEER of proposed material, methods, and procedures to repair, replace, or reconstruct disturbed, damaged, or suspected damage to the Works.
- K. Perform coordination work to make the several parts of the Works fit together.
- L. Except as specified otherwise, dismantle and salvage materials for reuse where practicable. Exercise due care when removing material for salvage. Repair or replace materials damaged through improper handling or through loss after removal.
- M. Store and protect removed material approved for reuse in approved locations. Beginning of restoration work means acceptance of existing conditions.

1.4 PROGRESS CLEANING

- A. Execute cleaning during progress of the Works and as required by the General Conditions.
- B. Requirements of Regulatory Agencies:
 - 1. In addition to the requirements herein, maintain the cleanliness of the Works and surrounding premises within the Works limits so as to comply with federal, state, and local fire and safety laws, ordinances, codes, and regulations.
 - 2. Comply with all federal, state, and local anti-pollution laws, ordinances, codes, and regulations when disposing of waste materials, debris, and rubbish.
- C. Coordinate cleaning operations with disposal operations to prevent accumulation of dust, dirt, debris, rubbish, and waste materials on or within the Works or on the premises surrounding the Works.

1.5 FINAL CLEANING

- A. Execute final cleaning prior to Substantial Completion of the Works.
- B. Repair pavement, roads, sod, and all other areas affected by construction operations and restore them to original condition or to minimum condition specified.
- C. Maintain cleaning until acceptance and occupation by VENDOR.

1.6 FINAL DECONTAMINATION

- A. Perform final decontamination of construction facilities, equipment, and materials which may have come in contact with potentially contaminated materials prior to removal from the Site.

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- B. Perform decontamination as specified in Section 01500 to the satisfaction of CRA ENGINEER. CRA ENGINEER will have right to direct VENDOR to perform additional decontamination if required.

1.7 REMOVAL AND DISPOSAL

- A. Remove surplus materials and temporary facilities and controls from the Site.
- B. Dispose of all non-contaminated waste materials, litter, debris, and rubbish off Site.
- C. Do not burn or bury rubbish and waste materials on the Site.
- D. Do not dispose of volatile or hazardous wastes such as mineral spirits, oil, or paint thinner in storm or sanitary drains.
- E. Do not discharge wastes into streams or waterways.
- F. Dispose of the following materials at an appropriate off-Site facility identified by VENDOR and approved by CRA:
 - 1. Debris including excess construction material, non-contaminated litter and rubbish.
 - 2. Spent Tyvek and other disposable PPE worn during final cleaning.
 - 3. Lumber from the decontamination pads.
 - 4. Visqueen from the decontamination pads.
- G. Wastewater: CRA ENGINEER will perform sampling and analysis of drum stored wastewater for disposal purposes prior to removal from the Site. The results of the analyses will determine the appropriate methods of disposal. Off-site disposal of waste materials will be conducted by others.

1.8 PROTECTION OF INSTALLED WORK

- A. Protect installed work and provide special protection where specified in individual Sections.
- B. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

1.9 CLOSEOUT PROCEDURES

- A. Submit written certification that the Technical Specifications have been reviewed, the Works has been inspected, and that the Works is complete in accordance with the Technical Specifications

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and in compliance with Laws and Regulations including, but not limited to, the provision of all applicable federal, state, and local health, safety, and environmental laws and regulations, including OSHA, and ready for CRA ENGINEER's review.

- B. Submit final Application for Payment identifying previous payments and amounts remaining due.
- C. Complete and furnish submittals to CRA ENGINEER that are required by governing or other authorities and by the Contract Documents. Payment shall not become due and payable until all submittals have been made acceptable to CRA ENGINEER.

1.10 PROJECT RECORD DOCUMENTS

- A. Maintain 1 set of the following record documents on the Site; record actual revisions to the Works:
 - 1. Drawings/Figures.
 - 2. Specifications.
 - 3. Change Orders and other modifications to the Contract.
 - 4. Manufacturer's instruction for assembly, installation, and adjusting.
- B. Ensure entries are complete and accurate, enabling future reference by CRA.
- C. Store record documents separate from documents used for construction.
- D. Record information concurrent with construction progress.
- E. Record Documents and Shop Drawings: Legibly mark each item to record actual construction including:
 - 1. Field changes of dimension and detail.
 - 2. Details not on original Drawings.
- F. Remove CRA ENGINEER title block from all documents generated by VENDOR.
- G. Submit documents to CRA ENGINEER.

1.11 SPARE PARTS, MAINTENANCE MATERIALS, AND EXTRA MATERIALS

- A. Deliver to the Site and place in location as directed; obtain receipt from CRA.

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- B. Provide list of spare parts and maintenance and extra materials furnished prior to final payment.

1.12 MEASUREMENT AND PAYMENT

- A. Price and Payment Procedures: Exhibit A: Form of Bid. Item 1 and/or 2, as applicable.
- B. Mobilization, Demobilization and Closeout:
 - 1. Schedule of Prices: Exhibit A: Form of Bid
 - 2. Payment Basis: Lump sum price. Includes preparation of Site HASP, insurance obtaining necessary permits, mobilization, final decontamination of equipment, construction facilities, and materials to be removed from the Site; containerization and labeling of contaminated material; final removal of temporary construction and support facilities provided by VENDOR; final Site cleanup; final non-contaminated waste removal and disposal; final grading; adjusting; field surveying; cutting and patching; restoration; protection of installed work; record documents; operation and maintenance data; warranties; and furnishing spare parts, maintenance materials, and extra materials.

END OF SECTION

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SECTION 01770
CLOSEOUT PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Closeout Procedures.
- B. Final Cleaning.
- C. Project Record Documents.

1.2 RELATED SECTIONS

- A. Section 01291 - Application for Payment.
- B. CRA Construction General Conditions.

1.3 CLOSEOUT PROCEDURES

- A. Submit written certification that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for ENGINEER's inspection.
- B. Provide submittals to CRA that are required by Contract Documents.
- C. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due, and appropriate Sworn Statements and Waivers of Lien in accordance with Section 01291 and CRA's Construction General Conditions.

1.4 FINAL CLEANING

- A. Execute final cleaning prior to final inspection.
- B. Clean site and sweep paved areas, rake clean landscaped surfaces.
- C. Remove waste and surplus materials, rubbish, and construction facilities from the site.

1.5 PROJECT RECORD DOCUMENTS

- A. The following Project Record Documents will be submitted to the ENGINEER:
 - 1. Specifications.

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2. Addenda.
 3. Change Orders and other Modifications to the Contract.
- B. Specifications – Legibly mark and record at each relevant specification section a description of actual products installed, including the following:
1. Substitutions or alternatives utilized.
 2. Changes made by Addenda and Modifications.
- C. Submit documents to ENGINEER within 15 days of the Substantial Completion Inspection.

PART TWO PRODUCTS

Not Used.

PART THREE EXECUTION

Not Used.

END OF SECTION

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SECTION 02120

WASTE IDENTIFICATION, OFF-SITE TRANSPORTATION AND DISPOSAL

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Arranging for supply of containers not supplied by CRA.
- B. Preparing containers for off-Site transportation.
- C. Load and secure materials in proper containers.

1.2 REFERENCES

- A. United States Federal Government - Code of Federal Regulations (CFR):
 - 1. 40 CFR 261 - Identification and Listing of Hazardous Waste.
 - 2. 40 CFR 262 - Standards Applicable to Generators of Hazardous Waste.
 - 3. 40 CFR 263 - Standards Applicable to Transporters of Hazardous Waste.
 - 4. 40 CFR 264 - Standards for GM and Operators of Hazardous Waste Treatment, Storage, and Disposal.
 - 5. 40 CFR 265 - Interim Status Standards for GM and Operators of Hazardous Waste Treatment, Storage, and Disposal.
 - 6. 40 CFR 273 - Standards for Universal Waste Management.
 - 7. 49 CFR 171 - General Information, Regulations, and Definitions.
 - 8. 49 CFR 172 - Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements.
 - 9. 49 CFR 173 - Shippers - General Requirements for Shipments and Packaging.
 - 10. 49 CFR 177 - Carriage by Highway.

1.3 DEFINITIONS

- A. CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act.
- B. Excluded By Products - Include general plant trash (e.g., paper, cardboard, packing material, scrap metal); non-contaminated earthen materials, non-contaminated equipment, machinery,

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structural components and building materials; fossil fuel ash and foundry sand; any by product which is recycled, reclaimed, or reused or managed in a manner other than disposal in a landfill.

1.4 QUALITY ASSURANCE

- A. Section 01450 – Quality Control

1.5 ENVIRONMENTAL REQUIREMENTS

- A. Section 01355 – Environmental Protection Procedures.
- B. Do not spill, leak, or otherwise release materials during loading and unloading operations.
- C. Do not generate dusting conditions when loading bulk solids.
- D. Do not generate fume or misting conditions when loading bulk liquids.

PART 2 PRODUCTS

2.1 POLYETHYLENE SHEETING

- A. Continuous sheeting, minimum 0.006 inch (6 mil) thick, fabricated from a single ply of construction grade polyethylene plastic.

2.2 TUB LINER

- A. Tub Liners for Bulk Solid Shipments: Pre-manufactured fitted polyethylene tub liner or continuous single sheet of polyethylene sheeting.

2.3 CONTAINERS, PACKING MATERIAL, AND LABELS

- A. Comply with DOT, federal, state, and local regulations. See Article 1.2 of this Section for references.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Notify ENGINEER sufficiently in advance of intention to commence activities at Site that require attendance by ENGINEER as provided hereinafter.
- B. Do not cover up loaded material prior to ENGINEER's inspection.

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3.2 WASTE PROFILING

- A. All waste profiling will be by ENGINEER.

3.3 SEGREGATION OF MATERIALS

- A. Segregate and prepare materials per ENGINEER.

3.4 PREPARATION AND SECUREMENT OF TRANSPORT VEHICLES/CONTAINERS

- A. CONTRACTOR to supply all waste containers.
- B. Comply with applicable federal, state, and local regulations concerning shipping containers and materials.
- C. Visibly display number for each loaded container.
- D. Secure materials in containers in accordance with regulations governing transportation of materials.
- E. Bulk Solid Shipments:
 - 1. Load bulk materials into transport vehicles or containers in a manner which will not damage the placed tub liner. Limit the freefall of bulk materials being loaded.
 - 2. Replace damaged tub liner which is incapable of providing containment.
 - 3. Following loading, fold the tub liner over the loaded materials and place an overliner of polyethylene sheeting over the materials prior to securing with an approved tarpaulin in a manner to prevent loss of materials or fugitive dust emissions.
- F. Bulk Liquid Shipments:
 - 1. Inspect bulk liquid tankers prior to use.
 - 2. Verify that all attached piping and valving is sound and in good working order.
 - 3. Verify that all necessary valves are closed prior to loading.
 - 4. Observe for leaks during loading. Correct all leaks that are observed. Cleanup of materials impacted by leaks during loading is the responsibility of CONTRACTOR. Replace bulk liquid containers that leak and are unsuitable for transport.
- G. Drummed/Containerized Shipments:
 - 1. Verify that each drum/container is tightly closed and labeled in accordance with DOT and RCRA regulations.

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PART 4 MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. Section 01271 – Measurement and Payment.
- B. Section 01291 – Applications for Payment.
- C. Basis of Payment: Included in Lump Sum price.

END OF SECTION

SECTION 02521

GROUNDWATER INJECTION WELLS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Drilling and casing groundwater injection well.
- B. Well development.

1.2 REFERENCES

- A. Section 01450 - Quality Control.
- B. American Society for Testing and Materials (ASTM):
 - 1. A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
 - 2. A312/A312M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Pipes.
 - 3. D1586 - Standard Test Method for Penetration Test and Split-Barrel Sampling of Soils.
- C. American Water Works Association (AWWA):
 - 1. A100 - Water Wells.
 - 2. C900 - Polyvinyl Chloride (PVC) Pressure Pipe, 4 Inch Through 12 Inch, for Water Distribution.

1.3 SYSTEM DESCRIPTION

- A. Groundwater injection well with the following characteristics:
 - 1. Drill Hole: 8 inch diameter.
 - 2. Casing Size: 2 inch diameter.
 - 3. Sand Pack: 1 - 2 feet above top of screen.
 - 4. Cement/Bentonite Grout: Top of sand pack to 18" - 24" below ground surface.
 - 5. Total Well Depth: top of clay layer $\pm$ 1 foot (approximately 15-20 feet deep).
 - 6. Road box set in sand and concrete.

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1.4 PROGRESS SUBMITTALS

- A. Section 01330 – Submittal Procedures.

1.5 CLOSEOUT SUBMITTALS

- A. Section 01770 - Closeout Procedures.
- B. Record Documents: Accurately record actual well depth and drilling difficulties encountered. Submit a signed copy of driller's log book statements.

1.6 QUALITY ASSURANCE

- A. The groundwater injection well will be used to treat contaminated groundwater.
- B. Because of the nature of activities which have taken place at Site, the groundwater injection well may penetrate potentially contaminated soil. Take necessary precautionary measures to prevent contamination near the ground surface from being carried downhole.
- C. Procure permits, certificates, and licenses required by law for the execution of Works. Request and obtain waivers from authorities having jurisdiction and submit to ENGINEER prior to commencement of work at Site. Comply with federal, state, and local Laws and Regulations relating to the performance of Works.

1.7 QUALIFICATIONS

- A. Drilling Firm: Company specializing in performing the work of this Section with a driller licensed in the state of Michigan with minimum 5 years experience.

1.8 REGULATORY REQUIREMENTS

- A. Conform to all applicable regulations.

1.9 ENVIRONMENTAL REQUIREMENTS

- A. Section 01355 – Environmental Protection Procedures.
- B. Section 01571 - Temporary Soil Erosion and Sediment Control.
- C. Shut off and seal a hole should flowing artesian water or gas be encountered.
- D. Take necessary precautions to ensure subsurface soils and water which could impact the integrity of Site are not released.

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- E. Remediate any release of potentially contaminated material and restore the area to preconstruction conditions using clean imported materials.

1.10 SEQUENCING AND SCHEDULING

- A. Section 01311 – Coordination Meetings.
- B. Sequence and schedule the work subject to the following conditions:
 - 1. ENGINEER will determine location and sequence of drilling events.
 - 2. Strictly enforce equipment cleaning.
 - 3. Complete drilling and installation activities at each well in its entirety, except for installation of the flush mount road box in concrete. All flush mount road boxes must be completed by the end of each day for the wells installed that day.

PART 2 PRODUCTS

2.1 DESIGN REQUIREMENTS

- A. Groundwater injection well installed to top of clay layer $\pm$ 1 foot.

2.2 WELL CASING

- A. Well Casing (PVC): AWWA C900 PVC Schedule 40 pipe and/or Schedule 80 2 inch ID, with PVC CAM adapter and locking dust cover. The top 3 feet (minimum) of riser shall be Schedule 80.

2.3 WELL SCREEN

- A. AWWA C900 PVC 0.010" slot, Schedule 40 or Schedule 80.

2.4 SILICA SAND

- A. Inert uniformly graded, silica sand 20-40 mesh (6/20 mesh) and shall be well rounded and free of fines.
- B. Gradation: Containing no more than 10 percent of sand grains finer than screen slot size.

2.5 CEMENT

- A. ASTM C150 Type I, Portland cement.

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B. Do not use quick setting cement containing additives.

C. Acceptable product shall be Sakrete.

2.6 BENTONITE GROUT - (NOT USED)

2.7 CEMENT-BENTONITE GROUT

A. Mixture of 6.5 U.S. gallons of water per 94-pound bag of normal Portland cement.

B. Add approximately 4 pounds of bentonite powder per bag of cement to the slurry.

C. Quantity of Bentonite: Not exceeding 5 percent by weight of the mixed slurry, to avoid excessive shrinkage of grout.

2.8 CONCRETE

A. Pre-mix concrete mixed to manufacturer's specifications with potable water.

B. Compressive Strength: Minimum 3,000 psi at 28 days.

2.9 WATER

A. Clean, potable water obtained from available source at Site.

2.10 BENTONITE CHIPS - (NOT USED)

2.11 DRILLING FLUID

A. Not Used.

2.12 POLYETHYLENE SHEETING

A. Continuous sheeting of minimum 3-mil thickness fabricated from a single ply of construction grade high-density polyethylene (HDPE) plastic.

2.13 FLUSH MOUNT ROAD BOX

A. 8 inch flush mount road box shall be 5 Pro Covers or equivalent.

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2.14 ABSORBENT MATERIAL

- A. Kitty Litter or equivalent.

2.15 DRUMS

- A. DOT-approved, 55-gallon steel drums complete with lids and required labels for describing contents.

2.16 OTHER MATERIALS

- A. Selected by VENDOR for the purpose intended and subject to ENGINEER's approval prior to use.
- B. PVC Cam Adaptor and locking dust cover for top of riser.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that Site conditions will support equipment for performing drilling operations.
- B. Locate each proposed well placement.
- C. Obtain ENGINEER's approval for any material introduced into borehole.
- D. Obtain clearance of existing utilities and provide documentation to ENGINEER.

3.2 PREPARATION

- A. Protect structures near well from damage.
- B. Prior to commencing drilling at each drilling location, protect surface pavement/soil in the immediate area of drill rig with 2 layers of minimum 3-mil HDPE sheeting covered by 5/8-inch plywood (plywood is optional); minimum area to be covered: approximately 12 feet by 16 feet; contain drill cuttings on top of the plastic/plywood prior to transfer to disposal container (roll off or drums). Do not cut plastic sheeting.
- C. In addition to HDPE sheeting, surround the work area around the drill rig with dikes or absorbent materials to prevent the release of surface water during drilling operations. If absorbent materials are contacted by drilling liquids or surface water contacting material potentially containing Site-specific constituents, place the absorbent materials in drums pending final disposal.

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D. Equipment Cleaning:

1. Construct, operate, and maintain a temporary equipment decontamination facility at the Project site for use by the VENDOR. The location of the decontamination facility will be identified to the VENDOR prior to initiation of the Services. Decontamination waste water shall not be discharged to the ground surface. Decontamination water shall prior to disposal be containerized for characterization.
2. Upon mobilization to Site and prior to commencing drilling, take drill rig and associated equipment to the designated on-Site Equipment Decontamination Facility and thoroughly clean with a high-pressure, low-volume, hot water wash to remove mud and other foreign matter; ensure drill rig and associated equipment are free of mud and hydraulic fluid, seals and gaskets are intact, and no fluids are leaking. Remove loose paint or encrustation from downhole equipment prior to use; remove by sandblasting prior to mobilization to Site.
3. Take downhole equipment used in the completion of soil borings and installation of wells to Equipment Decontamination Facility and clean as specified herein prior to commencing each borehole to prevent cross-contamination from the previous drilling location.
4. Clean drill rig prior to mobilizing to each Area. Cleaning is not required between installation of multiple wells within Area 1 or Area 2.
5. Clean well screens and casings prior to installation as specified herein.

E. Methods of Cleaning:

1. Clean downhole drilling equipment such as augers, cutting bits, drill steel, and associated equipment and tools that will contact potentially contaminated soil or groundwater with clean, hot water under high pressure using the following wash sequence:
 1. Clean, hot water, high-pressure wash and wipe.
 2. Clean, hot water, high-pressure rinse.
2. Clean well screens and well casings thoroughly using the following wash sequence:
 1. Sand off printing inks, if present, on the surface of casing or screen.
 2. Wash equipment thoroughly with a detergent (Liqui-Nox) high-pressure wash to remove particulate matter or surface film (if any).
 3. Rinse with deionized water.
3. Transfer washwater generated from cleaning of drilling equipment and well screens and casings to wastewater storage tank.
4. Clean sampling equipment and tools thoroughly, including split spoons or other equipment used for collecting soil samples during construction of wells, using the following wash sequence:

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1. Clean with tap water and detergent (Liqui-Nox) using a brush if necessary to remove particulate matter and surface films.
2. Rinse thoroughly with tap water.
5. Transfer wash water, rinse water, and fluids to wastewater storage tank.
6. Obtain ENGINEER's approval of cleaned drilling equipment and sampling equipment and tools prior to their use.
7. Disposal of Decontamination Wash Waters and Sediments: Collect and transfer decontamination wash waters to wastewater storage tank; collect and transfer sediments to drums; disposal of decontamination wash waters and sediments will be the responsibility of others.

F. Clear brush from Area 2 to allow access by drill rig.

3.3 PILOT BORINGS

A. Not Used.

3.4 DRILLING AND INSTALLATION

- A. Advance borehole using 8 inch OD hollow-stem augers (HSA) to ensure a minimum 8 inch diameter borehole. Advance borehole to top of clay layer and a maximum of 1 foot into clay layer. Collect split spoon samples at 2' - 4' bgs, 6' - 8' bgs, 10' - 12' bgs, 14' - 16' bgs, and 18' - 20' bgs at four of the borings selected by ENGINEER.
- B. If auger refusal is encountered, ENGINEER will mark the relocation of the injection well.
- C. If the confining layer is encountered, place a bentonite pellet plug up to the top of the confining layer before installing well.
- D. Attach screen, complete with bottom plug, to riser pipe by threaded flush joint couplers and lower through hollow-stem auger so bottom of screen is located at top of clay layer $\pm$ 1 foot. Take precautions to prevent damage to threaded joints during installation.
- E. Install well screen and riser pipe assembly straight.
- F. Extend riser pipe above grade and cap temporarily to deter entrance of foreign materials during injection well completion.
- G. Place suitably graded silica sand in the annulus between augers and riser pipe by using a decontaminated, flush-threaded, tremie pipe as auger is withdrawn from borehole to a height of 1 - 2 vertical feet above the top of screen. If bridging of the silica sand occurs, mechanically break the bridged material prior to proceeding with the addition of more silica sand.

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- H. Install a cement/bentonite grout seal by the tremie method or other approved method to within 1.5 to 2 feet of ground surface. Once the grout has set, fill the remaining portion of unfilled boring with sand and concrete to hold the flush mount road box and stabilize the riser.
- I. Install PVC CAM adapter with locking dust cap.
- J. Install the flush mount road box in the concrete such that the road box is down and raised 1" - 2" above existing terrain and concrete slopes away from road box. Concrete collar shall extend a minimum of 4" out from edge of road box on all sides. Concrete collar shall not rest on top of existing asphalt. Provide 1" - 2" clearance between road box cover and locking dust cover on cam adaptor.

3.5 BOREHOLE LOGGING

- A. Conducted by ENGINEER.

3.6 WASTE HANDLING

- A. Collect cuttings and solid waste generated during well construction; place in drums or rollofs.
- B. Collect liquid wastes generated during well construction and transfer to drums or wastewater storage tank.
- C. Label all drums and containers in accordance with RCRA regulations.
- D. Waste characterization and analysis by others.

3.7 WELL ABANDONMENT

- A. In the event of well abandonment because of loss of tools or equipment, or due to VENDOR negligence, if requested and as directed by ENGINEER, fill the abandoned hole with cement-bentonite grout as directed by ENGINEER, salvage and remove such casing as can be salvaged. The cost of abandonment of an incomplete borehole, including the filling, drilling, casing or other work performed on the abandoned borehole shall be at no additional cost to CRA.
- B. Abandonment of a borehole due to refusal and not due to VENDOR equipment loss, equipment failure, or negligence, which is beyond VENDOR's control, will be reimbursed at the appropriate Contract rates.

3.8 TOLERANCES

- A. Maximum Variation from Plumb: To satisfaction of the ENGINEER.
- B. Maximum Offset from True Position: To satisfaction of the ENGINEER.

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3.9 WELL DEVELOPMENT

- A. Develop injection wells after completion.
- B. Provide ENGINEER with proposed well development method and receive approval prior to commencing well development.
- C. Continue well development until sand-free conditions are obtained, five well volumes are removed, or well is dry, whichever occurs first.
- D. Contain solids and liquids generated during well development in VENDOR supplied containers.

3.10 PUMPING TEST

- A. Not Used.

3.11 WELL DISINFECTION

- A. Not Used.

3.12 PROTECTION OF FINISHED WORK

- A. Protect completed wells and wells under construction from contamination.
- B. Install lockable 2-inch diameter PVC CAM adapter and locking dust cap with ENGINEER-supplied lock.

3.13 POTASSIUM PERMANGANATE (KmnO₄) SOLUTION

- A. Prepare KMnO₄ solution. Use minimum water temperature of 50° F. Completely dissolve KMnO₄ salt in the water prior to use.
- B. Inject 250 gallons of KMnO₄ solution into each injection well. Maximum injection pressure of 50 psi.
- C. Inject 250 gallons of clean water (minimum temperature of 50° F) into each well within one week after injecting KMnO₄ solution.

3.14 SAMPLING AND ANALYSIS OF GROUNDWATER

- A. Conducted by others.

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PART 4 MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. Payment Basis: Included in lump sum price.

4.2 DRUMS

- A. Schedule of Prices.
- B. Measurement Basis: By the number (each) counted in place.
- C. Payment Basis: Unit price. Includes supplying DOT-approved 55-gallon drums.

4.3 LOSS OF TOOLS OR EQUIPMENT

- A. No additional payment will be made for time spent or expense incurred in an attempt to fish out or recover the tools or equipment prior to possible abandonment of a well will be made.

4.4 WASTE PROFILING

- A. Waste characterization by others.

4.5 WASTE DISPOSAL

- A. Waste characterization analysis and disposal costs by others.

END OF SECTION