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HEALTH AND SAFETY PLAN FOR FIELD DEMONSTRATION AND VALIDATION OF
PEROXYGEN-BASED IN-SITU CHEMICAL OXIDATION FOR REMEDIATION OF
CONTAMINATED GROUNDWATER AT SITE 45 MCRD PARRIS ISLAND SC
4/4/2008
U S EPA REGION IV

HEALTH AND SAFETY PLAN

FOR

**Solid Waste Management Unit 45, Marine Corps Recruit Depot,
Parris Island, South Carolina**

Prepared for:

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
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RSKERC PROJECT (Task# 23234)

Field Demonstration and Validation of Peroxygen-Based ISCO for the Remediation
of Contaminated Groundwater Using Rational and Mechanism-Based Design

April 4, 2008

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Name

TABLE OF CONTENTS

Section 1 **PURPOSE AND POLICY**3

Section 2 **SITE DESCRIPTION AND SCOPE OF WORK**4

Section 3 **PROGRAM TEAM ORGANIZATION**.....5

Section 4 **SITE-SPECIFIC EMPLOYEE TRAINING
AND MEDICAL MONITORING**6

Section 5 **SAFETY AND HEALTH RISK ANALYSIS**7

Section 6 **EMERGENCY RESPONSE PLAN**.....9

APPENDIX A - **EMERGENCY CONTACTS** 16

APPENDIX B - **SITE SPECIFIC TRAINING RECORD** 17

APPENDIX C - **PLAN ACCEPTANCE FORM** 18

SECTION 1

PURPOSE AND POLICY

The purpose of this health and safety plan is to establish personnel protection standards and mandatory safety practices for all personnel employed on the Marine Corps Recruit Depot, Parris Island, South Carolina, field project being conducted under Task# 23234. This program health and safety plan has been prepared to permit EPA personnel to conduct site characterization of an aquifer contaminated with chlorinated solvents. The plan also provides for contingencies that may arise during field operations. The provisions of this plan are mandatory for all onsite investigations. All EPA personnel shall abide and adhere to the plan and all its provisions. This plan provides specific health and safety guidance for site operations at the Marine Corps Recruit Depot, in particular the Solid Waste Management Unit 45 site.

SECTION 2

SITE DESCRIPTION AND SCOPE OF WORK

2.1 PROJECT DESCRIPTION

Parris Island Marine Corps Recruit Depot (MCRD) is located on a barrier island off the South Carolina coast, approximately 30 miles northeast of Savannah, Georgia. Parris Island MCRD lies within a system of islands, marshes and interconnecting man-made causeways that form a peninsula and consist of dry land, salt marshes, tidal ponds, and streams. Site 45 is a reportable spill of tetrachloroethylene (PCE), which occurred at the dry cleaners in March, 1994, when a storage tank was inadvertently overfilled, spilling PCE into a concrete containment basin. PCE was released to the ground when the containment basin was drained following heavy rains. Recent data indicated that the plume had migrated beyond the original bounds. The US Navy decided to conduct a non-time critical removal action. The goal of this action is to control ground water contamination by preventing further migration of the groundwater contaminant plume and treating excessively contaminated groundwater at the center of the plume. The site is now being evaluated under an extensive Remedial Investigation, to fully delineate the current location of the plume, and to prepare for a feasibility study to evaluate other remedial alternatives. Currently, a treatability study is being planned to look at the effectiveness of in-situ chemical oxidation (ISCO) at the source zones of the plume. The Parris Island site offers an ideal opportunity to conduct research and collect site data that will be of great benefit to EPA's Office of Research and Development, the State of South Carolina, EPA Region 4, and site owners, managers, and consultants.

2.2 SCOPE OF WORK

The scope of work of the field component of the project include: 1) evaluating the effectiveness of oxidants injected into the subsurface to oxidize chlorinated VOCs; 2) assessing the transport distance of the oxidants in the subsurface, and; 3) evaluating long-term performance of ISCO for treating source zone chlorinated solvents.

SECTION 3

PROGRAM TEAM ORGANIZATION

The general RSKERC project team that may work on the Parris Island Field project, and their projected responsibilities and lines of authority are outlined below.

| <u>Name</u> | <u>Task Assigned</u> |
|---------------------------------------|--|
| Dr. Scott Huling (EPA) | Project Manager |
| Dr. Ann Keeley (EPA) | Microbiologist |
| Dr. Bruce Pivetz (Shaw Environmental) | Hydrologist |
| Mr. Ken Jewell (EPA) | Direct Push Supervisor and Operator |
| Mr. Pat Clark (EPA) | Direct Push Supervisor and Operator |
| Tim Lankford (EPA) | Direct Push Operator |
| Mr. Garmon Smith (EPA) | Health and Safety Manager |
| Kyle Jones (EPA) | Technician, Site Health and Safety Officer |

The project manager, Dr. Huling, will report to Dr. Mary Gonsoulin, and will be responsible for the overall conduct of the project, including developing the project health and safety plan. Mr. Smith is the RSKERC health and safety manager and will be responsible for updating and revising the project health and safety plan, as necessary. He will arrange for periodic field audits to ensure that the provisions of the health and safety plan are being enforced. These audits will be conducted to verify compliance with the corporate health and safety program and applicable regulations. Mr. Smith will also be responsible for assuring that field team members have the necessary hazardous waste site training and will coordinate the staff medical monitoring program.

For each field trip, either Dr. Huling or Dr. Pivetz will be assigned to be Site Health and Safety Officer. He will also supervise site drilling activities and installation of ground water monitoring wells. He is responsible for assuring that day-to-day activities are performed in conformance with the project health and safety plan. The site health and safety officer has the authority to stop work on the site if actions or conditions are deemed unsafe or not in conformance with the health and safety plan. Other EPA or contract staff will provide technical support for the tasks, as needed.

All field team members and contractors are responsible for reading and conforming to the project health and safety plan. All RSKERC team members will sign the statement found in Appendix B stating they have read the plan, are familiar with its contents and have received training in accordance with OSHA regulation 29 CFR 1910.120(e). No employee will perform a project activity that he or she believes may endanger his or her health and safety or the health and safety of others.

SECTION 4

SITE-SPECIFIC EMPLOYEE TRAINING AND MEDICAL MONITORING

All field team members will have the 40-hour Occupational Safety and Health Administration (OSHA) training as specified in 29 CFR 1910.120, a current 8-hour annual refresher course and site-specific training. All field team members will be on appropriate and current medical monitoring programs. Listed below are additional health and safety training and medical monitoring requirements for this project.

4.1 ADDITIONAL SAFETY TRAINING REQUIREMENTS

None

4.2 ADDITIONAL MEDICAL MONITORING REQUIREMENTS

None.

SECTION 5

SAFETY AND HEALTH RISK ANALYSIS

5.1 CHEMICAL HAZARDS

A number of products containing hazardous chemicals may be encountered while work is being conducted at the field site. Hazardous chemicals suspected to be present at the site include PCE, TCE, cis 1,2-DCE, trans 1,2-DCE, 1,1-DCE, and vinyl chloride. Hazardous substances that are of primary concern occurring at this site are those potentially occurring in contaminated groundwater, soils, sediment.

If other compounds are discovered at these sites, the health and safety plan will be amended, and the pertinent information about these compounds will be provided. The appropriate risk analysis of the compounds will then be communicated to onsite employees.

5.2 PHYSICAL HAZARDS

In addition to the hazardous substances potentially present during the Parris Island project, some physical hazards or hazardous conditions may be expected at the site due to the use of heavy equipment during groundwater and soils investigation. These include possible risks from injury while working around drilling equipment, or heat stress and cold-related exposures. The following subsections describe physical hazard concerns associated with cold-related illness and heat stress.

5.2.1 Effects and Prevention of Heat Stress

One or more of the following recommendations will help reduce heat stress:

- § Provide plenty of liquids.
- § Provide cooling devices to aid natural body ventilation.
- § Wear long cotton underwear.
- § Ensure that adequate shelter is available to protect personnel against sun, heat, or other adverse weather conditions.
- § In hot weather, rotate workers wearing protective clothing.

5.2.2 Cold Exposure

Persons working outdoors in temperatures at or below freezing may suffer from cold exposure. During prolonged outdoor periods with inadequate clothing, effects of cold exposure may even occur at temperatures well above freezing. Cold exposure may cause severe injury by freezing

exposed body surfaces (frostbite) or result in profound generalized cooling (hypothermia), possibly causing death. Areas of the body which have high surface area-to-volume ratios such as fingers, toes, and ears are the most susceptible to frostbite.

Local injury resulting from cold is included in the generic term frostbite. There are several degrees of damage. Frostbite of the extremities can be categorized into:

- § Frost nip or incipient frostbite characterized by suddenly blanching or whitening of skin.
- § Superficial frostbite: skin has a waxy or white appearance and is firm to the touch, but tissue beneath is resilient.
- § Deep frostbite: tissues are cold, pale, and solid; extremely serious injury.

Systemic hypothermia, or lowering of the core body temperature, is caused by exposure to freezing or rapidly dropping temperatures. Symptoms are usually exhibited in five stages: (1) shivering and incoordination; (2) apathy, listlessness, sleepiness, and (sometimes) rapid cooling of the body to less than 95°F (35°C); (3) unconsciousness, glassy stare, slow pulse, and slow respiratory rate; (4) freezing of the extremities; and (5) death.

5.3 HAZARD EVALUATION

Personnel conducting field activities may be potentially exposed to certain groups of chemical toxicants by both the respiratory and skin absorption routes. The risk of exposure and the severity of the resultant physiologic reaction to any of the contaminants previously identified is determined chiefly by their inherent toxicity, concentration, physical characteristics, duration of exposure, and individual work susceptibility or hypersensitivity.

The chemical groups listed below are in order of decreasing potential for encounter by RSKERC site investigative personnel, rather than by relative toxicity concentration, or industrial hygiene importance of the groups.

- § Volatile aromatic hydrocarbons;
- § Semivolatile organic compounds; and
- § All other contaminants.

In the event that additional compounds are detected, health hazard information including levels of respiratory and personnel protection will be evaluated to adequately address onsite programs.

Exposure to H₂O₂ (30 – 50%), persulfate, acid (sulfuric), or base (KOH) represents a significant health hazard. Access to these chemicals will be restricted and controlled by site staff required to use these chemicals as part of the treatment process.

SECTION 6

EMERGENCY RESPONSE PLAN

All hazardous waste site activities present a degree of risk to onsite personnel. During routine operations, risk is minimized by establishing good work practices, staying alert and using proper personal protective equipment (PPE). Unpredictable events such as physical injury, chemical exposure, or fire may occur and must be anticipated. Employees are encouraged to participate in American Red Cross first-aid and cardiopulmonary resuscitation (CPR) courses in order to more effectively handle physical and medical emergencies that may arise in the field. The sections below establish procedures and guidelines for emergencies.

6.1 GUIDELINES FOR PRE-EMERGENCY PLANNING AND TRAINING

Employees must read this site health and safety plan, and must familiarize themselves with the information in this chapter. Prior to project initiation, the site health and safety officer will conduct a meeting with the field team members to review the provisions of this health and safety plan and to review the emergency response plan. Employees will be required to have a copy of the emergency contacts and telephone numbers immediately accessible onsite and know the route to the nearest emergency medical services. Appendix A contains specific emergency data for Extraction Technologies.

6.2 EMERGENCY RECOGNITION AND PREVENTION

Emergency conditions are considered to exist if:

- § Any member of the field crew is involved in an accident or experiences any adverse effects or symptoms of exposure while onsite.
- § A condition is discovered that suggests the existence of a situation more hazardous than anticipated.
- § Concentrations of combustible vapors exceed 10 percent of the lower explosive limit (LEL).
- § Concentrations of organic vapors exceed 5 parts per million, volume per volume (ppmv) above background air concentrations [based on perishable exposure limits (PEL) for benzene].

Some measures to help prevent emergency situations are listed below.

- § Visual contact must be maintained between onsite personnel and safety personnel.

- § During continual operations, onsite workers act as safety backup to each other.
- § All field crew members should make use of all of their senses to alert themselves to potentially dangerous situations which they should avoid (e.g., presence of strong and irritating or nauseating odors).
- § Personnel should practice unfamiliar operations prior to performing the procedure in the field.
- § Field crew members will be familiar with the physical characteristics of investigations, including:
 - Wind direction in relation to contamination zones;
 - Accessibility to associates, equipment, and vehicles;
 - Communications;
 - Hot zone (areas of known or suspected contamination);
 - Site access; and
 - Nearest water sources.
- § Personnel and equipment in a work area enclosure should be minimized, consistent with effective site operations.
- § Work areas for various operational activities must be established.

In the event that any member of the field crew experiences any adverse effects or symptoms of exposure while on the scene, or that organic vapors and combustible vapors exceed the action limits, the entire field crew will immediately halt work and act according to the instructions provided by the site health and safety officer.

The discovery of any condition that would suggest the existence of a situation more hazardous than anticipated will result in the evacuation of the field team and re-evaluation of the hazard and the level of protection required.

In the event an accident occurs, the field supervisor is to complete an Accident Report Form. Follow-up action should be taken to correct the situation that caused the accident.

Electrical safety, fire safety, physical hazards, general emergency procedures, and specific procedures for handling personal injury and chemical exposure, are described in the following sections.

6.3 ELECTRICAL SAFETY

Of special concern to drilling operations is the possibility for conducting electricity through the drilling tower, through either inadvertent contact with overhead power lines or lightning strikes. In addition, some of the equipment used during site characterization is operated by electricity. Maintenance and day-to-day activities require personnel to handle and control this equipment. Unless safe work practices are strictly observed, serious injury or death can result.

6.3.1 General Electrical Safety Rules

- § While working on electrical circuits, do not touch the switch box cabinet or any other object, such as a pipe, that will give electric current a path through your body. Do not stand in water and, if possible, place a rubber mat under your feet.
- § Allow only authorized people to work on electrical panels.
- § Keep rubber mats in front of electrical panels.
- § Treat all electrical wires and circuits as "live," unless certain they are not.
- § Use approved rubber gloves.
- § Electrical control panels should never be opened unless the job requires it.
- § No part of the body should be used to test a circuit
- § Always work from a firm base as loss of balance may cause a fall onto energized busses or parts, which should be covered with a good electrical insulator such as a rubber blanket.
- § No safety device should be made inoperative by removing guards, using oversized fuses, or blocking or bypassing protective devices, unless it is absolutely essential to the repair or maintenance activity, and then only after alerting operating personnel and the maintenance supervisor.
- § All tools should have insulated handles, be electrically grounded, or double insulated.
- § Jewelry should never be worn when working on electric circuits.
- § Use fuse pullers to change fuses.
- § Proper storage of flammables;
- § Adequate numbers and types of fire extinguishers;

- § Use of intrinsically safe or explosion proof equipment where appropriate;
- § Monitoring for development of an explosive atmosphere; and
- § Prevention of explosive atmospheres by placing blower equipment in well ventilated enclosures.

6.3.2 Electrical Safety Rules Specific to Drill Rig Operation

Extra precautions will be exercised when drilling or using direct push technologies (GeoProbe) near overhead electrical lines. The site health and safety officer will provide onsite surveillance of drilling operations to ensure that personnel meet these requirements. If deficiencies are noted, work will be stopped and corrective actions implemented.

- § Do not drill within 50 ft of an overhead power line. In case of high winds, this radius should be extended to 75 ft.
- § In the event that drilling is required within this radius, power to the line must first be turned off. This must be done only by a qualified site representative. In addition, a person must remain at the switchbox location for the duration of the drilling to ensure that power is not re-established.
- § Prior to drilling, have site representatives delineate location of underground power lines. If locations are not known, arrange to have locations delineated through a conductance survey. Do not drill within 25 ft of any known underground power line.
- § Maintain a watch for electric storms. If electrical activity appears to be imminent, cease drilling operations and evacuate area around drill rig. If time permits, do not leave auger or drill string in the borehole.

6.4 PHYSICAL HAZARDS

The scope of work for this study involves working outdoors around vehicles and heavy equipment. Any project involving heavy equipment, unimproved work sites, and outside work can present numerous physical hazards to the work force. Training, adherence to work rules, and careful housekeeping can prevent many problems or accidents arising from physical hazards. The general rules and preventative measures for this work follows.

6.4.1 Drill Rigs

Working with drill rigs could be a major hazard at these sites. Injuries can result from equipment dislodging, striking unsuspected personnel, and impacts from flying objects or overturning of vehicles. In particular, the following precautions will be used to help prevent injuries and accidents:

- § Drill rig brakes, hydraulic lines, light signals, fire extinguishers, fluid levels, steering, tires, horn, and other safety devices will be inspected prior to the trip and checked routinely throughout the project.
- § Drill rig cabs will be kept free of all nonessential items and all loose items will be secured.
- § Drill rigs will be provided with necessary safety equipment, including seat belts.
- § Parking brakes will be set before shutting off any heavy equipment or vehicle.

6.4.2 Slip, Trip and Fall Hazards

The sites could contain a number of slip, trip and fall hazards for site workers, such as:

- § Holes, pits, or ditches;
- § Slippery surfaces;
- § Steep grades;
- § Uneven grades; and
- § Sharp objects.

Site personnel will be instructed to look for potential safety hazards and immediately inform the site health and safety officer or the site manager about any new hazards. If the hazard cannot be immediately removed, actions must be taken to warn site workers about the hazard.

6.4.3 Drilling/Cone Penetrometer Accidents

Associated hazards are having suspended loads dropped on employees, being caught behind a load and a stationary object, or being struck by counterweights. Accidents of this type are most likely to occur during drilling/direct push operations and can be prevented by the safe operation of drilling equipment, the wearing of protective equipment including a hard hat and safety boots, and the routine inspection of drilling/direct push equipment to identify unsafe conditions (e.g., frayed ropes).

6.4.4 Subsurface Hazards

Before drilling activities are initiated, efforts must be made to determine whether underground installations, (e.g., sewers, telephone, water, fuel, and electric lines) will be encountered and, if so, where such underground installations are located. Utility companies or the facility engineer will be contacted by the field team leader prior to commencing drilling or soil gas operations.

6.4.5 Noise-Induced Hearing Loss

Work onsite may involve the use of heavy equipment such as a drill rig, geoprobe, compressor, and generator. The unprotected exposure of site workers to this noise during drilling activities can result in noise induced hearing loss. The site health and safety officer will monitor the noise exposure for the initial trip and determine whether noise protection is warranted for each of the team members. The site health and safety officer will ensure that either ear muffs or disposable foam earplugs are made available to all personnel and are used by the personnel in the immediate vicinity of the drill rig as required.

6.5 PERSONNEL ROLES, LINES OF AUTHORITY, AND COMMUNICATION PROCEDURES DURING AND EMERGENCY

When an emergency occurs, decisive action is required. Rapidly made choices may have far reaching, long-term consequences. Delays of minutes can create life threatening situations. Personnel must be ready to respond to emergency situations immediately. All personnel should know their own responsibilities during an emergency, know who is in charge during an emergency, and know the extent of that person's authority. This section outlines personnel roles, lines of authority, and communication procedures during emergencies.

In the event of an emergency situation at a site, the site health and safety officer will assume total control and will be responsible for onsite decision making. The designated alternate for the site health and safety officer will be the team leader. These individuals have the authority to resolve all disputes about health and safety requirements and precautions. They will also be responsible for coordinating all activities until emergency response teams (ambulance, fire department, etc.) arrive onsite.

All onsite personnel must know the location of the nearest telephone and the location of the emergency telephone number list.

6.6 PROCEDURES FOR EMERGENCY MEDICAL TREATMENT AND FIRST AID

6.6.1 Chemical Exposure

In the event of chemical exposure (skin contact, inhalation, ingestion) the following procedures should be implemented:

- § Another team member should assist or remove the individual from the immediate area of contamination to an upwind location if it is safe to do so.
- § Precautions should be taken to avoid exposure of other individuals to the chemical.
- § If the chemical is on the individual's clothing, the clothing should be removed if it is safe to do so.
- § If the chemical has contacted the skin, the skin should be washed with copious amounts of water, preferably under a shower.
- § In case of eye contact, an emergency eye wash should be used. Eyes should be washed for at least 15 minutes.
- § If necessary, the victim should be transported to the nearest hospital or medical center. If necessary, an ambulance should be called to transport the victim.

6.6.2 Personal Injury

In the event of personal injury:

- § Field team members trained in first aid can administer treatment to an injured worker.
- § The victim should be transported to the nearest hospital or medical center. If necessary, an ambulance should be called to transport the victim.
- § The site health and safety officer is responsible for the completion of an Accident Report Form.

6.6.3 Fire or Explosion

In the event of fire or explosion, personnel will evacuate the area immediately and administer necessary first aid to injured employees. Personnel will proceed to a safe area and telephone the emergency support services. Upon contacting the emergency support services, the caller should state his/her name, nature of the hazard (fire, high combustible vapor levels), the location of the incident, and whether there were any physical injuries requiring an ambulance. Do not hang up until emergency support services has all of the additional information they may require.

6.6.4 Emergency Contacts

In the event of any situation or unplanned occurrence requiring assistance, the appropriate contact(s) should be made from the list as provided in Appendix A. For emergency situations, telephone or radio contact should be made with the site point of contact or site emergency personnel who will then contact the appropriate response teams.

APPENDIX A - EMERGENCY CONTACTS

In the event of any situation or unplanned occurrence requiring assistance, the appropriate contact(s) should be made from the list below. For emergency situations, telephone contact should be made with the site point of contact or site emergency personnel who will then contact the appropriate response teams.

Contingency Contacts

Phone Number

| | |
|--------------------------------|---|
| Nearest phone at the work site | 580-235-7954 (S. Huling cell phone) Others will be added later |
| Fire Department | 911, 843-524-5123 (Port Royal) |
| Site Contact | (Darrel) Heber Pittman, Marine Corps Recruit Depot, Natural Resources & Env. Affairs, PO Box 5028, Parris Island, SC 29905-9001, phone: (843) 228-3615, fax: (843) 228-2616, e-mail: darrel.pittman@usmc.mil, |

RSKERL Contacts

| | |
|-----------------------------------|----------------|
| Dr. Schmelling, Division Director | (580) 436-8540 |
| Mr. Garmon Smith, H & S Manager | (580) 436-8565 |

Medical Emergency

| | |
|-------------------------|--|
| Hospital Name | Beaufort Primary Care Clinic |
| Hospital Address | 1 Pinckney Blvd, Beaufort, SC 29902 |
| Hospital Phone Number | 843-770-0444 |
| Ambulance Service | 843-524-5123 |

Directions from site to (Beaufort Primary Care Clinic): Get this

APPENDIX B - SITE SPECIFIC TRAINING RECORD

On this date _____ the following individuals were provided site specific training in accordance with OSHA regulations contained in 29 CFR 1910.120 (e). These individuals have also read and are familiar with the contents of the site specific health and safety plan.

| | Name (print) | Company | Signature |
|----|--------------|---------|-----------|
| 1. | _____ | _____ | _____ |
| 2. | _____ | _____ | _____ |
| 3. | _____ | _____ | _____ |
| 4. | _____ | _____ | _____ |
| 5. | _____ | _____ | _____ |
| 6. | _____ | _____ | _____ |
| 7. | _____ | _____ | _____ |
| 8. | _____ | _____ | _____ |

APPENDIX C - PLAN ACCEPTANCE FORM

**PROJECT HEALTH AND SAFETY PLAN
FOR PARK CITY SITE, KANSAS**

Instructions: This form is to be completed by each person to work on the subject project work site and returned to the Health and Safety and Environmental Compliance Officer.

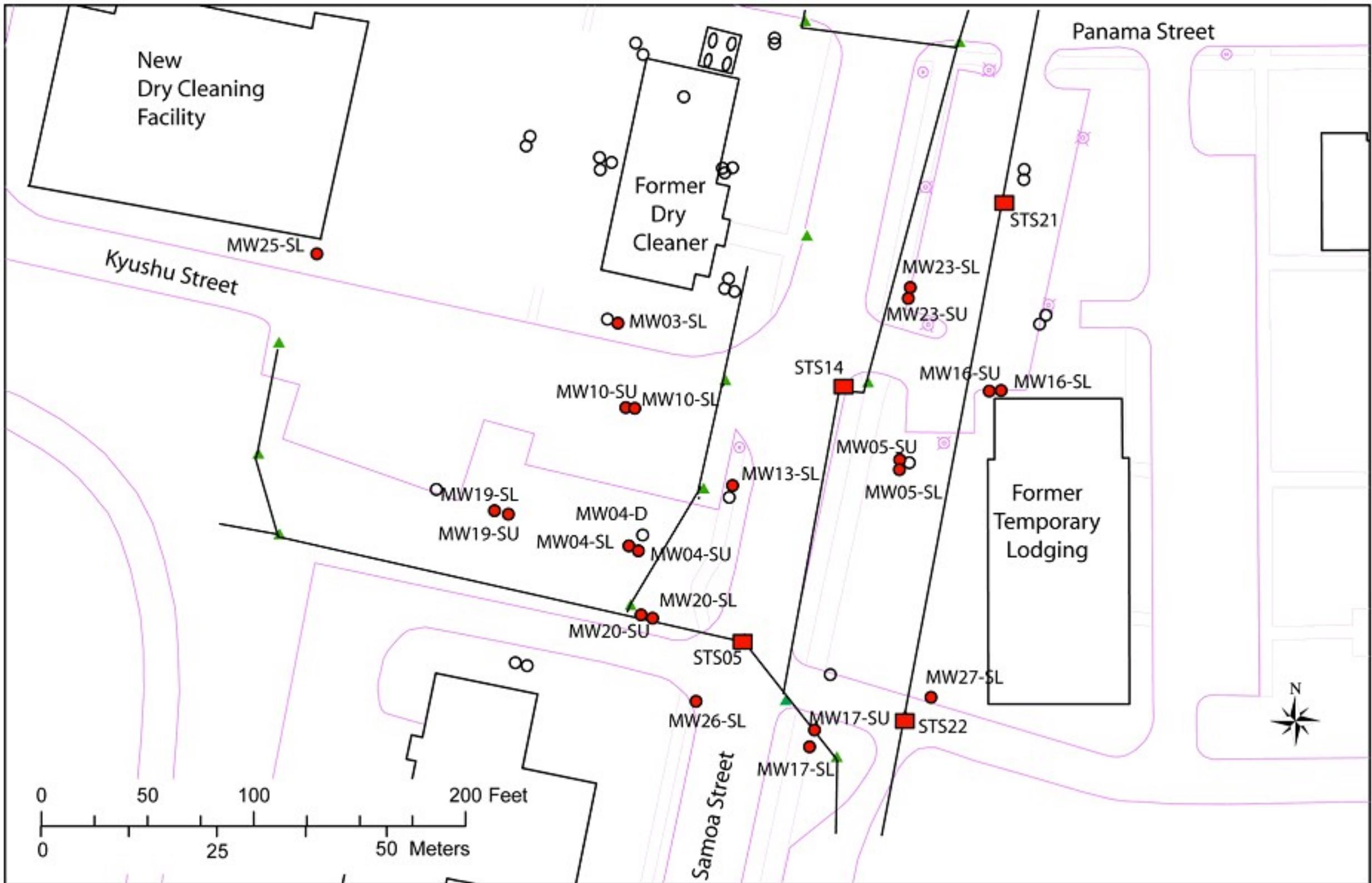
I have read and agree to abide by the contents of the Health and Safety Plan for the following project:

Signed _____

Date _____

RETURN TO:

Mr. Garmon Smith, RSKERL Health and Safety Manager, Robert S. Kerr Environmental Research Laboratory, U.S. Environmental Protection Agency, P.O. Box 1198, Ada, OK 74820



EXPLANATION

- MW04-SL Permanent well sampled in FY2007, and abbreviated identifier.
- Permanent well not sampled in FY2007.
- ▲— Storm sewer. Dashed where uncertain. Green triangle indicates drain or manhole.
- STS22 Manhole in storm sewer sampled in FY2007, and abbreviated identifier.