**Enbridge Energy,
Limited Partnership
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3300
Houston, Texas 77002
(713)821-2000
Fax: (832)214-9318**

ENBRIDGE

Ralph Dollhopf [via email – dollhopf.ralph@epa.gov]
U.S. EPA (ME-W)
Superfund Response Section 1
25089 Center Ridge Road
Westlake, OH 44145

July 29, 2010

Re: Response of Enbridge Energy Partners, L.P. to Work Plan Requirement
(Paragraph 19) of Removal Administrative Order dated 7/27/10
Docket Number: CWA 1321-5-10-001

Dear Mr. Dollhopf:

Following please find our response to Paragraph 19 of subject Order:

19. Within 2 business days from the effective date of this Order, Respondent must develop and submit to USEPA for approval, a work plan (Work Plan) that includes a schedule for completing the tasks described below. Respondent must being work within 1 business day of USEPA approval of the Work Plan. The Work Plan must include the following tasks:

- Health and Safety Plan
- Pipeline Repair workplan
- Sampling and Analysis Plan
- QAPP
- Oil recovery and containment plan
- Source release area remediation plan
- Remediation Plan for downstream impacted areas
- Waste treatment, transportation, and disposal plan

[signature on next page]

Sincerely,

ENBRIDGE ENERGY, LIMITED PARTNERSHIP
By Enbridge Pipelines (Lakehead) L.L.C.
Its General Partner

/S/
Leon Zupan
Vice President, Operations

Attachments

C: Joel W. Kanvik, Enbridge
Chris Paul, McAfee & Taft
Leon Zupan, Enbridge
Tom Fridel, Enbridge
Steve Wuori, Enbridge
Bob Steede, Enbridge
Leslie Kirby-Miles, EPA Region 5 [kirby-miles.leslie@epa.gov]
Brian Kelly, EPA Region 5 [kelly.brian@epa.gov]
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Work Plan
Enbridge Marshall Pipeline Release
Marshall, Michigan

July 29, 2010

Submitted By:
Enbridge Energy, Limited Partnership

Table of Contents

Introduction

Enbridge Energy Limited Partnership (Enbridge) is pleased to submit this Work Plan for the pipeline release incident near Marshall, Michigan. This Work Plan is submitted in response to the July 27, 2010 United States Environmental Protection Agency (USEPA) Removal Administrative Order Under Section 311(c) OF THE CLEAN WATER ACT REGION 5, Docket Number: CWA 1321-5-10-001. Specifically, this Work Plan addresses Article V. Order, Paragraph 19.

OPERATIONAL HEALTH AND SAFETY PLAN

Marshall Area Oil Pipeline Release

Mile Post 608-630

Calhoun County, MI

PART 1 - GENERAL

1.01 Scope of Work

For the purposes of employee and contractor protection the following work categories have been developed:

Tasks:

- **Crude Oil Recovery (subtasks)**
  - Vacuum Truck Operations
  - Heavy Equipment Operations
  - Right of Way Work
  - Surface Water Recovery

- Pipeline Repair

- Observation/Documentation and Sampling related activity

The entire scope of work is located and maintained at the operations command center at 455 Leggitt Rd., Marshall, MI. An incident command organizational chart has been established and is being maintained at the Operations Command Center.

The following attachments provide additional contact, safety information, and Task Hazard Assessment.

1.02 Related Work

As appropriate

1.03 Applicable Standards

A. United States Department of Labor Publications
  29 Code of Federal Regulations (CFR) Part 1910 Occupational Safety and Health
  Standards for General Industry

29 CFR Part 1926 Occupational Safety and Health Regulations for Construction
49 CFR Part 195 Department of Transportation Pipeline and Hazardous Materials Safety

B. State and Local Publications
MIOSHA Regulations
MDEQ Regulations

C. Enbridge O&MPs
Book 1 – General Reference
Book 2 - Safety
Book 7 – Emergency Response / Region Specific / ERD

D. Contractor Safety Program
Safety and Environmental Guidelines for Contractors Handbook

1.04 Documentation

This Health and Safety Plan will be maintained in the Operations Command Center under the control of the incident commander and the safety officer.

A working copy shall be maintained in the Operations Command Center, these copies will be the working copies utilized in the field. The working copies will be signed by Enbridge employees and contractors during all on-site activities. Additionally, the Health and Safety Plan will be communicated to contractors during the contractor safety orientation so they may become familiar with the plan and site hazards.

PART 2 - PRODUCTS

MSDS (appendix A)
Heavy Crude Oil - Heavy Crude Oil/Diluent Mix – Christina Lake/Foster Creek

PART 3 - EXECUTION

3.01 Introduction

A. The plan purpose is to provide measures to prevent incidents and injuries to site workers from possible contamination that may be encountered during oil recovery activities. Any employee or contractor is responsible to stop any work that they believe places any worker in imminent danger. Surface contamination may be encountered in numerous areas under assessment/recovery. The following information was completed by the Safety Officer:

B. Operational Dates: July 27, 2010 - TBD.

Incident Commanders: Rich Adams – Day Shift; Tom Fridel – Night Shift

Office and Phone Adams cell 218 269-1369; Fridel cell 219-793-5280

Site Owner: Enbridge Energy, Inc.

Owner Phone 269-781-4434 office

The Incident Commanders shall discuss/delegate compliance with the Health and Safety Plan to all emergency response personnel who shall be working at the site(s) during assessment and recovery operations. All site workers shall sign the log (appendix B) to signify they understand the Health and Safety Plan through their management structure. Personnel shall not be allowed on-site until thoroughly briefed on anticipated hazards and any additional safety practices to be followed.

3.02 Potential Hazards

Some potential hazards that field personnel may be exposed to during field activities are chemical and physical. The potential chemical hazards at the site are petroleum vapors, hydrogen sulfide, benzene, and n-hexane. Exposure pathways to chemical hazards include skin contact, inhalation of vapors, and ingestion.

Potential physical hazards include excavation into buried utilities, contact with overhead power lines, all hazards associated with heavy equipment operations, vacuum trucks, and the recovery of contaminated soil, vegetation, and surface/groundwater. Additional physical hazards are manual lifting of booms and other containment equipment; slips, trips, and falls from uneven terrain; and fire.

Other hazards that employees and contractors may be exposed to at the site include heat stress; heat exhaustion, and heat stroke; hazards associated with operating a motorized vehicle; and water hazards (i.e. drowning) associated with working adjacent to the river, including fast moving water.

A job task hazard assessment (appendix C) is developed to cover the overall job's hazards however, work site hazards will be identified with appropriate control measures documented and maintained on the field level hazard assessment/safe work permit at each site.

Cold work activities that do not agitate the crude oil may be exempt from FR clothing when accompanied by a hazard assessment.

3.03 Site Control

A. Only personnel with appropriate training may enter the hot work zones.

General Rules:

1. Contractors operating in the hot work zone that are recovering oil shall use caution tape/barricades/fencing, etc. to cordon off sufficient space around the work (minimum 50-feet from the last visible crude oil/free phase product) area to prevent unprotected or unauthorized personnel from entering the work area.
2. No eating, drinking, smoking, gum or tobacco chewing, or any other practice in the work area that increases the probability of hand-to-mouth transfer of contaminants. The site supervisor shall designate safe areas away from the work area where eating can be done. The entire site is designated a no smoking zone.
3. Hands shall be thoroughly washed upon leaving the work area and before eating, drinking, or any other non-working activity.
4. During recovery activities, on site workers shall act as the safety backup to each other.
5. Entrance and exit locations shall be designated and emergency escape routes away from the operations areas shall be delineated by the site supervisor. The following hand signals will be used where verbal communications cannot occur or are not practical:

Signal	Translation
Hand gripping throat	**Out of air/can't breath**
Grip partners wrist or both hands around waist	**Leave area immediately**
Hands on top of head	**Need assistance**

Thumbs up	**O.K., I'm all right, I understand**
Thumbs down	**No, negative**
Raised clenched fist	**Stop**

6. Potable water shall be available on-site for drinking and cleaning purposes.
7. There shall be at a minimum of two 30#, or four 20# ABC dry-chemical fire extinguisher on-site at each operational area.
8. All excavations (if needed) shall be in accordance with OSHA and all applicable regulations. These regulations include that workers shall not enter any excavation deeper than 4 feet, unless acceptable sloping, shoring, or other means of protection are provided. Open excavations deeper than 4 feet shall not be entered unless appropriate entry precautions are taken with trained staff.
9. Employees will not be permitted to work alone in a deemed “hot zone” or adjacent (within six feet) to water.
10. When employees will be working during the night light plants will be utilized to ensure the site is appropriately illuminated.

Personal Protective Equipment:

Based on the evaluation of potential hazards, the level of protection deemed appropriate for this site is general level D for all operations as follows (unless air monitoring dictates that PPE upgrades or ventilation are required):

- Hard Hat
- Safety Glasses
- Steel-Toed Boots
- Disposable suits (e.g. Tyvek)/booties, as needed
- Rubber or Latex Gloves, as needed

The level of protection may be upgraded if monitoring results or other indications of increased levels of contamination become evident during any phase of work. Work within the hot zone requires FR clothing. The hot zone is identified as 50 feet within the visible product. The hot zone may be extended based on air monitoring results.

Any items that come into contact with contaminants shall either be disposed of properly or thoroughly washed before reuse.

Working Near Water:
OSHA Construction Industry Standards (1926) state: “employees working over or near water, where the danger of drowning exists, shall be provided a Coast Guard-approved PFD (Personal Flotation Device).” An approved PFD will be required to be worn any time an employee is in a boat. A PFD may also be required at the discretion of the site supervisor when working adjacent to swift moving water, or when entering slow moving water above the waist during daylight hours.

When working at night, all employees working on or adjacent (within six feet) to water shall wear a Coast Guard- approved PFD.

Monitoring:
Ambient air monitoring will be provided on a continuous basis with a personal four gas monitor (LEL, H_2S, CO, O_2). Periodic samples with be performed with a PID, Drager CMS, or Ultra Rae devices in the breathing zone and area of the recovery workers for benzene. The results shall be documented on the gas test record form, daily or field reports, or through computer data retrievable (download) methods.

Personal samples will be taken in representative locations using both passive methods, 3M badges, and active methods, sampling pumps and charcoal tubes for 25 contaminants.

The acceptable level for work on this site under level D protection is 0.5 ppm for benzene.

Permissible exposure limits (PEL)

Petroleum vapors	Not Established (500 ppm reference petroleum distillates)	Ing, Resp, Flam, Cont
Hydrogen Sulfide	10 ppm	Inhalation
Benzene	1 ppm	Inhalation, ingestion, absorption
n-hexane	500 ppm	Inhalation, absorption

Should levels exceed the established PELs all personnel shall move upwind, stop work activities, and contact the site supervisor and safety officer in that specific recovery area.

Respiratory Protection:

A respiratory protection program will be followed as per OSHA regulations in 1910.134.

Medical Evaluations

All new field employees who may be required to wear a tightfitting respirator must have an initial medical evaluation that is reviewed by a physician (i.e., baseline pulmonary function test or spirometry examination).

Respirator Fit

Physical conditions (e.g., facial hair or temple pieces on glasses) must allow an effective facial seal with the respirator.

All workers, including field and office employees, who may be required to wear respiratory protection that depends on an effective seal must be clean-shaven where the facepiece contacts the skin; this may require trimming or removing mustaches.

Fit-Testing

Before wearing a respirator, employees must be fit-tested for the brand and model used.

Before each use of a respirator, perform a positive and negative pressure field fittest to check the seal of the face mask.

Inspection and Maintenance

Inspect and maintain respiratory equipment in accordance with the manufacturer’s specifications.

Visually inspect all respirators before and after each use.

For shared respiratory equipment, disinfect after each use and clean as necessary. For all other respirators, sanitize after each use and clean as necessary.

Workers may perform minor maintenance on hoseline breathing equipment (e.g., replace headbands, valves, gaskets, hoses, and clamps). Major maintenance and repairs must be performed by (a) a qualified worker (i.e., trained in cleaning, inspecting, and maintaining respirators), or (b) a certified technician from the supplier or manufacturer.

Cartridges

Replace organic vapor (OV) cartridges and organic vapor/acid gas (OV/AG) cartridges after a total of 6 hours of use.

Immediately replace OV/AG cartridges if:

- used for escape from H_2S concentrations >10 ppm
- damaged
- there is odor breakthrough
-

Replace filters when plugged, damaged, or soiled, or when breathing is difficult. If used in environments containing oil aerosols, replace oil-resistant filters after a total of 40-hrs use or 30 days, whichever comes first.

Enbridge
Respiratory Protection for Exposure Concentrations

Breathing Hazard	**Exposure Concentration**	**Respiratory Protection**	**Model**
Benzene	0 to 0.5 ppm	none	
	0.6 to 5 ppm	half-mask APR with OV cartridge	3M 6000 with 6003 cartridge
	6 to 25 ppm	full-face APR[1] with OV cartridge or SAR	3M 6000 or 7000 full-face with 6003 cartridge
	greater than (>) 25 ppm	SCBA or SAR	Scott Air-Pak
	greater than (>) 500 ppm (IDLH)[2]	planned work is not permitted[3]	
carbon monoxide	25 ppm to 500 ppm	SCBA or SAR	Scott Air-Pak
	greater than (>) 500 ppm	planned work is not permitted[3]	
hydrogen sulfide (H_2S) [4]	0 to 10 ppm	none	
	11 to 99 ppm	SCBA or SAR with escape pak[6]	Scott Air-Pak or Type C SAR
	greater than (>) 100 ppm (IDLH)	planned work is not permitted[3]	
oxygen deficiency	less than (<) 19.5%	SCBA	Scott Air Pak
petroleum vapors	less than (>) 3% LEL	none	
	greater than or equal to (≥) 3% LEL to less than (<) 10% LEL	half-mask APR with OV cartridge	3M 6000 with 6003 cartridge
	greater than or equal to (≥) 10% LEL to less than (<) 20% LEL	SCBA (or equivalent) for cold work; hot work is not permitted	Scott Air-Pak

	greater than or equal to (≥) 20% LEL	planned work is not permitted[3]	

NOTES
1 If quantitative fit test performed.
2 Immediately dangerous to life and health.
3 Emergency work is allowed if SCBA or SAR with escape pak is used and all ignition sources are eliminated.
4 If the concentration exceeds the maximum detection limit of the H_2S detector, planned work is not permitted until the concentration has been verified.
5 Where possible, reset gas detectors monitoring H_2S to alarm at 10 ppm (low level) and 100 ppm (high level).
6 A safety watch with SCBA or SAR must be present.

Hearing protection:

Hearing protection will be utilized during recovery operations when noise levels exceed 85- decibels.

3.04 Equipment

Bonding and Grounding:

All vac trucks and other similar equipment utilized when collecting crude will be appropriately grounded and bonded.

Operation of Boats:

When operating boats during the day, the following criteria must be met:

- Verification must be performed of the site to confirm understanding of site safety plan by the individual in charge of the site.
- A JHA/hazard assessment must be performed to identify specific hazards and controls at the site prior to work beginning.
- A shore watch with the responsibility of tracking hazards in the water, and to coordinate boats in the event an individual would fall overboard.
- A rope and buoy will be with the shore watch at all times.

Operation of Boats after Dusk:

Boats may be operated after dusk only if it is necessary to deploy boom, or in the event that damages to boom will need to be repaired. In the event a boat is operated after dusk, all of the above items must be met in addition to the following conditions:

- Only sites that have already been confirmed to be free of underwater obstacles and other hazards through a job hazard assessment during daylight hours will be allowed to have boats operating on them at night.
- A minimum of two light plants will be utilized for each work crew
- A stable boat, preferably a flat bottom, will be utilized if possible
- A secondary manned boat must be in the water at the location to potentially act as a rescue boat.
- Boats must be equipped with running lights appropriate for night use and a spotlight
- All employees must wear appropriate PPE, including a Coast Guard-approved PFD
- Radio contact must be maintained between the shore watch and boats.

3.05 Emergency Procedures and First Aid

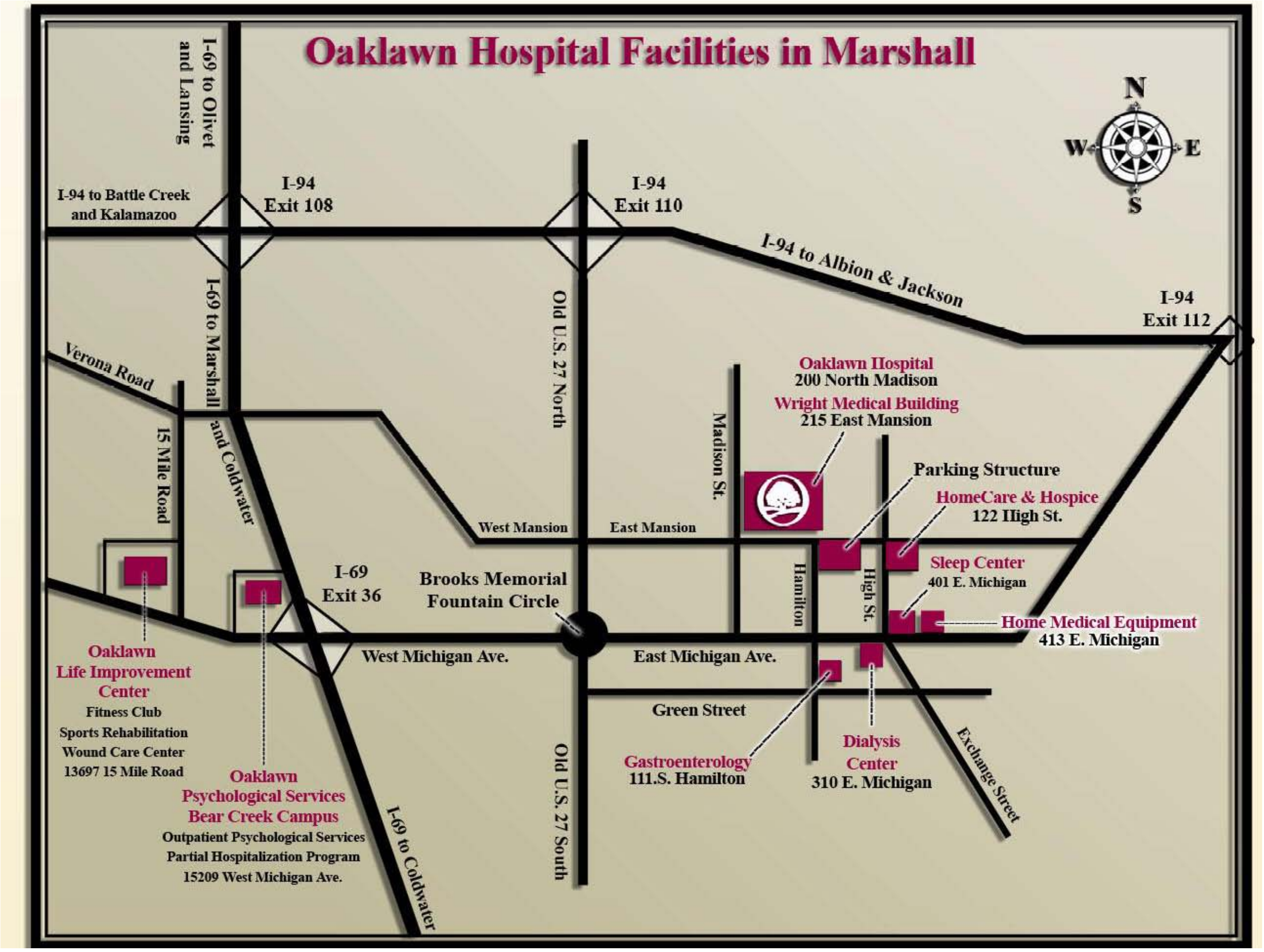
The following emergency contacts shall be maintained for problems at the site. Each respective site will have site specific safety plans (attachment A).

A. Emergency Communication:

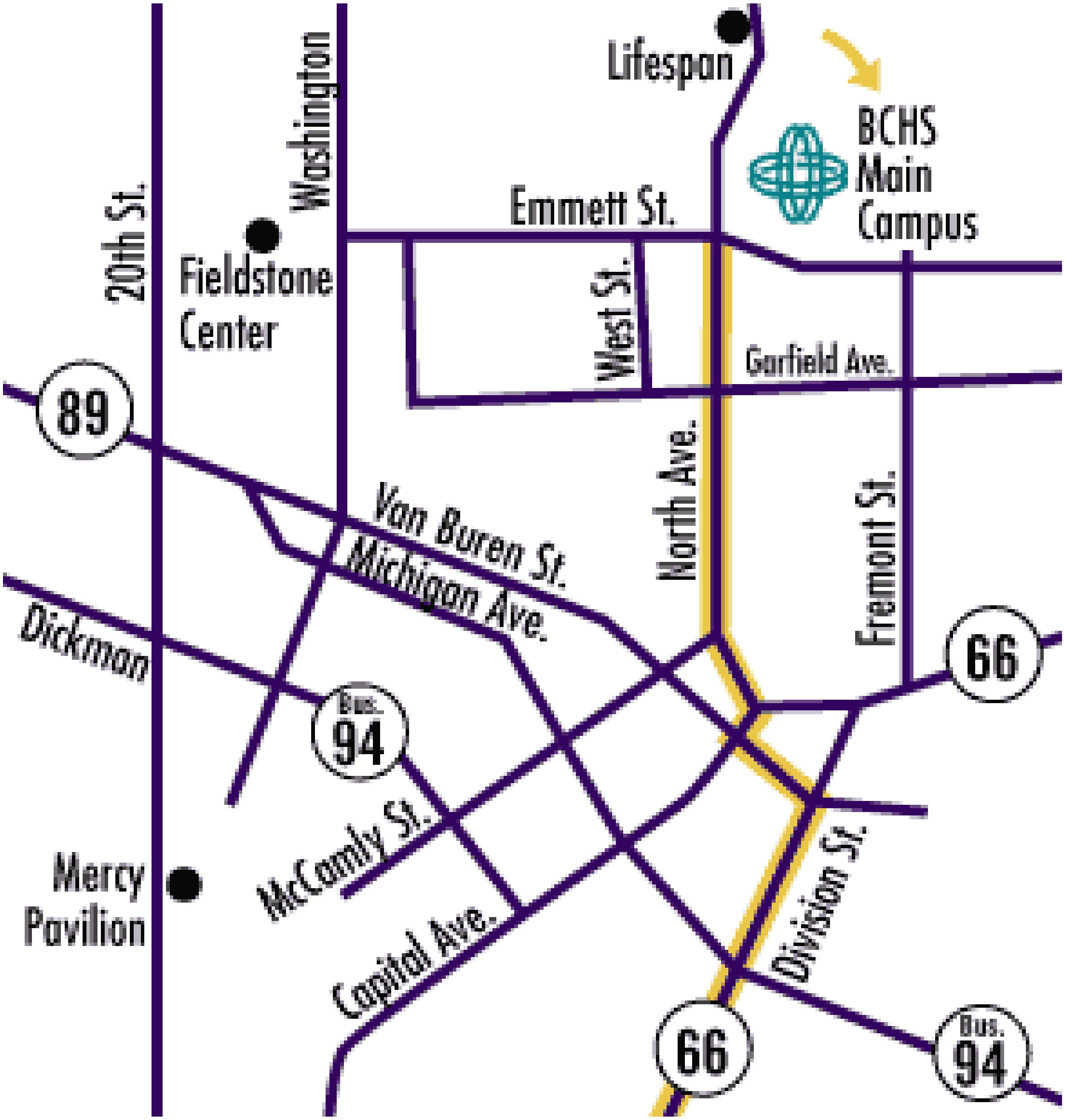
Fire Department ___911___
Ambulance ___911___
Police Department ___911___

Emergency Planning Coordinator: ___911___

Hospital: **Oaklawn Hospital (269) 781-4271**
200 N. Madison, Marshall, MI
Emergency Room (269) 789-3916


Oaklawn Hospital Facilities in Marshall
N
W
E
S
I-69 to Olivet and Lansing
I-94 to Battle Creek and Kalamazoo
I-94 Exit 108
I-94 Exit 110
I-94 to Albion & Jackson
I-94 Exit 112
I-69 to Marshall and Coldwater
Old U.S. 27 North
Verona Road
15 Mile Road
Madison St.
Oaklawn Hospital
200 North Madison
Wright Medical Building
215 East Mansion
Parking Structure
HomeCare & Hospice
122 High St.
West Mansion
East Mansion
Hamilton
High St.
Sleep Center
401 E. Michigan
Home Medical Equipment
413 E. Michigan
I-69 Exit 36
Brooks Memorial Fountain Circle
West Michigan Ave.
East Michigan Ave.
Green Street
Oaklawn Life Improvement Center
Fitness Club
Sports Rehabilitation
Wound Care Center
13697 15 Mile Road
Oaklawn Psychological Services Bear Creek Campus
Outpatient Psychological Services
Partial Hospitalization Program
15209 West Michigan Ave.
Gastroenterology
111.S. Hamilton
Dialysis Center
310 E. Michigan
Exchange Street
Old U.S. 27 South
I-69 to Coldwater

Battle Creek Health System 300 North Avenue
Battle Creek, MI 49017   269-966-8000



B. Incident Reporting:

In the event of any incident or close call, we will investigate to identify both the immediate and all underlying causes. Any incident resulting in personal injury, close call, or property damage shall be verbally reported immediately to the site supervisor. The site supervisor will communicate the information to the safety officer.

C. First Aid

Most injuries sustained shall be initially treated on-site if appropriate based on the nature of the illness/injury. A fully-stocked first aid kit shall be available to all recovery personnel to treat minor injuries. An ambulance (911) shall be called for emergencies and transportation to a hospital. All efforts will be made to ensure that there is at least one individual trained in first aid/CPR at each location. The following procedures shall be followed for correct first aid treatment on-site:

1. SKIN - Prolonged or repeated exposure may cause skin irritation. Repeated contact may cause drying or flaking of the skin.

If a worker's skin is irritated by coming into contact with contaminated soil or fluid, the area shall be washed for 15 minutes before applying dressings secured by adhesive tape.

Wash cuts and abrasions with water for 15 minutes before applying dressings secured by adhesive tape. Keep contaminated media away from open wounds.

2. BREATHING - Excessive inhalation of vapors can cause nasal and respiratory irritation; central nervous system effects including dizziness, weakness, fatigue, nausea, headache and possible unconsciousness, and even death.

If a worker experiences dizziness, headache, or nausea from inhalation of vapors, they shall leave the work area immediately. If breathing stops, administer CPR and obtain medical attention.

3. EYES - Liquid may cause pain and slight corneal injury. Vapors may irritate the eyes. Wash irritated eyes with abundant amounts of clean water by holding the eye open and flooding it with water (eye wash bottles will be available in all vehicles). All surfaces shall be washed thoroughly, then repeat the process. Seek medical attention.

4. SWALLOWING - Aspiration of material into the lungs can cause chemical pneumonitis which can be fatal. If aspirated, material may be rapidly absorbed through the lungs and result in injury to other body systems.

Medical attention shall be requested for all victims of sickness due to ingestion of contaminated materials. Do not induce vomiting. Drink two glasses of water.

5. GENERAL SAFETY - Immediately report all safety problems to the Site Supervisor. The Site Supervisor shall keep a permanent record of all such occurrences and shall report serious problems to the Health and Safety Coordinator. All occurrences shall be documented by the completion of an accident report.

D. Evacuation

If the site activities require evacuation because of fire, security purposes, personnel injury, excessive vapors, or lightning hazards, the site supervisor shall immediately direct the personnel along the evacuation routes. Workers shall observe wind direction such as smoke movement, and then proceed upwind for a sufficient distance to be out of range of the incident. All personnel shall assemble at a point established by the site supervisor, and await further instructions.

Inclement Weather

Check weather reports before issuing and approving safe work permits. If potential or imminent weather is in the forecast, these hazards need to be identified and controls implemented in the hazard assessment.

The 30-30 rule

- The 30-30 rule is recommended when working outside in with lightning in the area.
  - When you can count 30 seconds or less between lightning and thunder, head for safe shelter
  - Remain sheltered for 30 minutes after the last thunder.

If lightening is encountered, it is further recommended to:

- Go inside a fully enclosed building or vehicle
- Avoid water and boats
- Stay away from doors, windows, metal indoor fixtures and electrical devices
- Stay off the telephone
- Avoid open high ground and isolated large trees
- Avoid contact with metal objects, such as vehicles

Supporting Information and Sources
CCOHS Volume 5, Issue 6 - June 2007
~~Environment Canada~~
~~National Weather Service~~, US

Lightning incidents can be prevented by having a preparedness plan and taking some basic safety measures.
Lightning tends to strike higher ground and prominent objects, especially materials that are good conductors of electricity, such as metal. Thunder can be a good indicator of lightning - loud crackling means its close, whereas rumbling means it's further away.

Because light travels faster than sound, you will see lightning before you hear the thunder. Each second between the flash and the thunderclap represents about 1000 feet. As a rule of thumb, if you can count less than 30 seconds between the lightning strike and the thunder, the storm is less than 6 miles away. There is an 80% chance that the next strike will happen within that 6 miles, and if you can hear thunder, you are within striking distance. Run immediately to the nearest safe building or a fully enclosed, metal-topped vehicle … there is NO safe place to be outside in a thunderstorm.

Safe Shelters from Lightning
The safest place to be in a thunderstorm is in a safe building. A safe building is one that is fully enclosed and serviced. Keep as many walls as possible between you and the outside. Stay away from doors, windows, fireplaces, and anything that will conduct electricity such as radiators, stoves, sinks and metal pipes. Avoid handling electrical appliances and telephones. Use battery operated appliances only.

The next best source of shelter is an enclosed metal car, truck or van (but NOT a tractor, golf cart, topless or soft top vehicle). Make sure the vehicle is not parked near trees or other tall objects that could fall over during a storm. When inside a vehicle during a lightning storm, roll up the windows and sit with hands in lap, waiting out the storm. Don't touch any part of the metal frame or any wired device in the vehicle (including the steering wheel or plugged-in cell phone). A direct strike to your car will flow through the frame of the vehicle and usually jump over or through the tires to reach ground.

Be aware of downed power lines that may be touching your car. You are safe inside the car, but you may receive a shock if you step outside.

Unsafe Shelters
Buildings or structures without electricity or plumbing to ground the lightning do not provide any lightning protection. Shelters that are unsafe include covered picnic shelters, carports, tents, baseball dugouts as well as other small non-metal buildings (sheds and greenhouses).

If you absolutely can't get to safety …
There is no safe place to be outdoors during a thunderstorm. However, there are areas that might be less dangerous - and help reduce the risk of being struck by lightning outside.

Stay away from things that are tall (trees, flagpoles or posts), water, and other objects that conduct electricity (tractors, metal fences, lawnmowers, golf clubs).

You do not want to become a prime target by being the highest object on the landscape. Take shelter in low-lying areas such as valleys or ditches but watch for flooding.

If you are in a group in the open, spread out several feet apart from one another.

If you get caught in a level field far from shelter and you feel your hair stand on end, lightning may be about to hit you. Crouch down on the balls of your feet immediately, with feet together, place your arms around your knees and bend forward. Be the smallest target possible, and minimize your contact with the ground. Don't lie flat.

Lightning is an electrical discharge caused when static electricity builds up between thunderclouds, or thunderclouds and the ground. Lightning strokes carry up to 100 million volts of electricity and leap from cloud to cloud, or cloud to ground and vice versa. Lightning tends to strike higher ground and prominent objects, especially good conductors of electricity such as metal.

Thunder is the noise caused by the explosive expansion of air due to the heat generated by a lightning discharge. Thunder may have a sharp cracking sound when lightning is close by, compared to a rumbling noise produced by more distant strokes.

Because light travels at a faster speed than sound, you can see a lightning bolt before the sound of thunder reaches you.

Lightning may strike several miles away from the parent cloud and precautions should be taken even if the thunderstorm is not directly overhead.

If caught outdoors:
Keep a safe distance from tall objects, such as trees, hilltops, and telephone poles.

Avoid projecting above the surrounding landscape. Seek shelter in low-lying areas such as valleys, ditches and depressions but be aware of flooding.

Stay away from water. Don't go boating or swimming if a storm threatens and land as quickly as possible if you are on the water. Lightning can strike the water and travel some distance from its point of contact. Don't stand in puddles even if you are wearing rubber boots.

Stay away from objects that conduct electricity, such as tractors, golf carts, golf clubs, metal fences, motorcycles, lawnmowers and bicycles.

Avoid being the highest point in an open area. Swinging a golf club or holding an umbrella or fishing rod can make you the tallest object and a target for lightning. Take off shoes with metal cleats.

You are safe inside a car during lightning, but don't park near or under trees or other tall objects which may topple over during a storm. Be aware of downed power lines which may be touching your car. You are safe inside the car, but you may receive a shock if you step outside.

In a forest, seek shelter in a low-lying area under a thick growth of small trees or bushes.

Keep alert for flash floods, sometimes caused by heavy rainfall, if seeking shelter in a ditch or low-lying area.
If caught in a level field far from shelter and you feel your hair stand on end, lightning may be about to hit you.

Kneel on the ground immediately, with feet together, place your hands on your knees and bend forward. Don't lie flat.

If you are in a group in the open, spread out, keeping people several yards apart.

Indoor Precautions:
Before the storm hits, disconnect electrical appliances including radios and television sets. Do not touch them during the storm.

Don't go outside unless absolutely necessary.

Keep away from doors, windows, fireplaces, and anything that will conduct electricity, such as radiators, stoves, sinks, and metal pipes. Keep as many walls as possible between you and the outside.

Don't handle electrical equipment or telephones. Use battery operated appliances only.

Note: Persons who have been struck by lightning receive an electrical shock but do not carry an electrical charge and can be safely handled. Victims may be suffering from burns or shock and should receive medical attention immediately. If breathing has stopped, mouth-to-mouth resuscitation should be administered. If breathing and pulse are absent, cardio-pulmonary resuscitation is required.

In the United States, there are an ~~estimated 25 million lightning~~ flashes each year. During the past 30 years, ~~lightning killed an average of 58 people per year~~. This is higher than 57 deaths per year caused by tornadoes and average 48 deaths to hurricanes. Yet because lightning usually claims only one or two victims at a time and does not cause mass destruction of property, it is underrated as a risk. While documented lightning injuries in the United States average about 300 per year, undocumented injuries are likely much higher.

Watch for Developing Thunderstorms: ~~Thunderstorms are most likely to develop~~ on spring or summer days but can occur year round. As the sun heats the air, pockets of warmer air start to rise and cumulus clouds form. Continued heating can cause these clouds to grow vertically into towering cumulus clouds, often the first sign of a developing thunderstorm.

When to Seek ~~Safe Shelter~~: Lightning can strike as far as 10 miles from the area where it is raining. That's about the distance you can hear thunder. If you can hear thunder, you are within striking distance. Seek safe shelter immediately.

Outdoor Activities: Minimize the risk of being struck. Most lightning deaths and injuries occur in the summer. Where organized ~~outdoor~~ sports activities take place, ~~coaches, camp counselors~~ and other adults must stop activities at the first roar of thunder to ensure everyone has time to get to a large building or enclosed vehicle. Leaders of outdoors events should have a written plan that all staff are aware of and enforce.

Indoor Activities: ~~Inside~~ buildings, stay off corded phones, computers and other electrical equipment that put you in direct contact with electricity. Stay away from pools (indoor or outdoor), tubs, showers and other plumbing. Buy surge suppressors for key equipment. Install ground fault protectors on circuits near water or outdoors. When inside, wait 30 minutes after the last clap of thunder, before going outside again.

Helping a Lightning Strike Victim: Lightning victims do not carry an electrical charge, are safe to touch, and need urgent medical attention. Cardiac arrest is the immediate cause of death for those who die. Some deaths can be prevented if the victim receives the proper first aid immediately. Call 911 immediately and perform CPR if the person is unresponsive or not breathing. Use an Automatic External Defibrillator if one is available.
Summary: ~~Lightning is dangerous.~~ With common sense, you can greatly increase your safety and the safety of those you are with. At the first clap of thunder, go to a large building or fully enclosed vehicle and wait 30 minutes after the last clap of thunder before you to go back outside.

E. Training Requirements

All personnel shall be up-to-date on the requirements set forth in 29 CFR 1910.120. It is the responsibility of all recovery personnel to maintain the required training and annual 8 hours of refresher training for all personnel.

F. Decontamination Procedures

1. Personnel

Decontamination of personnel is to be provided with mild detergent and clean water rinse. Boot covers and gloves are to be rinsed prior to removal or disposed of properly. Gloves are to be changed as needed or at a minimum at least daily.

Every site will have a poly area, cleaning detergent and absorbent materials to assist in decontamination processes.

15 decontamination units will be added throughout the work area.

2. *Equipment*

Following work activity, all other field/sampling equipment shall be properly decontaminated with a phosphate-free solution and water rinse.

Appendix A………………………………. Material Safety Data Sheet (MSDS)

Appendix B………………………………. Health & Safety Plan Sign-in Log

Appendix C……………………………..…Job Task Hazard Assessment

Attachment A…………………………….Site Safety Plan Package

Appendix A

MSDS for Crude Oil

EnCana Corporation Material Safety Data Sheet

Heavy Crude Oil/Diluent Mix – Christina Lake/Foster Creek Page 1 of 2

SECTION 1 – MATERIAL IDENTIFICATION AND USE

Material Name: HEAVY CRUDE OIL/DILUENT MIX (CHRISTINA LAKE/FOSTER CREEK)
Use: Process stream, fuels and lubricants production
WHMIS Classification: Class B, Div. 2, Class D, Div. 2, Sub-Div. A and B
NFPA: Fire: 2 **Reactivity**: 0 **Health**: 3
TDG Shipping Name: Petroleum Crude Oil
TDG Class: 3 **UN**: 1267
TDG Packing Group: II (boiling point 35 deg. C or above, and flash point less than 23 deg. C)
Manufacturer/Supplier: ENCANA CORPORATION
#1800, 855 - 2nd Street S.W., P.O. BOX 2850,
CALGARY, ALBERTA, T2P 2S5
Emergency Telephone: 403-645-3333
Chemical Family: Crude oil/condensate mix

SECTION 2 – HAZARDOUS INGREDIENTS OF MATERIAL

Hazardous Approximate C.A.S. LD50/LC50 Exposure
Ingredients Concentrations (%) Nos. Specify Species Limits
& Route
Crude oil 50 - 70 8002-05-9 LD50,rat, skin,>2 g/kg 5 mg/m3 (OEL,TLV)
Hydrocarbon Diluent 30 - 50 N.Av. N.Av. 900 mg/m3 (OEL)*
Benzene 0.03 - 0.3 71-43-2 LD50,rat,oral,930 mg/kg 1 ppm (OEL),
LC50,rat,4 hr,13200 ppm 0.5 ppm (TLV)
Hydrogen Sulphide <0.5 7783-06-04 LC50, rat, 4 hrs, 444 ppm 10 ppm (OEL,TLV)
OEL = 8 hr. Alberta Occupational Exposure Limit; TLV = Threshold Limit Value (8 hrs)
*OEL for gasoline

SECTION 3 – PHYSICAL DATA FOR MATERIAL

Physical State: Liquid **Vapour Pressure (kPa**): 2.5 – 36.5 @ 20C
Specific Gravity: 0.65 – 0.75 **Odour Threshold (ppm)**: N.Av.
Vapour Density (air=1): 2.5 -5.0 **Evaporation Rate**: N.Av.
Percent Volatiles, by volume: 20 - 30 (estimated) **Boiling Pt. (deg.C)**: 40 - 180
pH: N.Av. **Freezing Pt. (deg.C**): <0
Coefficient of Water/Oil Distribution: <0.1
Odour & Appearance: Brown/black liquid, hydrocarbon odour
(N.Av. = not available N.App. = not applicable)

SECTION 4 – FIRE AND EXPLOSION

Flammability: Yes **Conditions**: Material will ignite at normal temperatures.
Means of Extinction: Foam, CO2, dry chemical. Explosive accumulations can build up in areas of poor ventilation.

Special Procedures: Use water spray to cool fire-exposed containers, and to disperse vapors if spill has not
ignited. Cut off fuel and allow flame to burn out.
Flash Point (deg.C) & Method: <-35 (PMCC)
Upper Explosive Limit (% by vol.): 8 (estimated) **Sensitivity to Impact**: No
Lower Explosive Limit (% by vol.): 0.8 (estimated) **Sensitivity to Static Discharge**: Yes, at normal temperatures
Auto-Ignition Temp. (deg.C): 250 (estimated) **TDG Flammability Classification**: 3
Hazardous Combustion Products: Carbon monoxide, carbon dioxide, sulphur oxides

SECTION 5 – REACTIVITY DATA

Chemical Stability: Stable **Conditions**: Heat
Incompatibility: Yes **Substances**: Oxidizing agents (e.g. chlorine)
Reactivity: Yes **Conditions**: Heat, strong sunlight
Hazardous Decomposition Products: Carbon monoxide, carbon dioxide, sulphur oxides
EnCana Corporation Material Safety Data Sheet
Heavy Crude Oil/Diluent Mix – Christina Lake/Foster Creek Page 2 of 2

SECTION 6 – TOXICOLOGICAL PROPERTIES OF PRODUCT

Routes of Entry:
Skin Absorption : Yes **Skin Contact**: Yes **Eye Contact**: Yes
Inhalation: **Acute**: Yes **Chronic**: Yes **Ingestion**: Yes
Effects of Acute Exposure: Vapour may cause irritation of eyes, nose and throat, dizziness and drowsiness. Contact with
skin may cause irritation and possibly dermatitis. Contact of liquid with eyes may cause severe irritation/burns.
Effects of Chronic Exposure: Due to presence of benzene, long term exposure may increase the risk of anaemia and
leukemia. Repeated skin contact may increase the risk of skin cancer.
Sensitization to Product: No.
Exposure Limits of Product: 1 ppm (Alberta 8 hr OEL for benzene)
Irritancy: Yes
Synergistic Materials: None reported
Carcinogenicity: Yes **Reproductive Effects**: Possibly **Teratogenicity**: Possibly
Mutagenicity: Possibly

SECTION 7 – PREVENTIVE MEASURES

Personal Protective Equipment: Use positive pressure self-contained breathing apparatus, supplied air breathing
apparatus or cartridge air purifying respirator approved for organic vapours where concentrations may exceed exposure
limits (note: cartridge respirator not suitable for hydrogen sulphide, oxygen deficiency or IDLH situations) – see also
Storage below).
Gloves: Viton (nitrile adequate for short exposure to liquid)

Eye: Chemical splash goggles. **Footwear**: As per safety policy **Clothing**: As per fire protection policy
Engineering Controls: Use only in well ventilated areas. Mechanical ventilation required in confined areas. Equipment
must be explosion proof.
Leaks & Spills: Stop leak if safe to do so. Use personal protective equipment. Use water spray to cool containers.
Remove all ignition sources. Provide explosion-proof clearing ventilation, if possible. Prevent from entering confined
spaces. Dyke and pump into containers for recycling or disposal. Notify appropriate regulatory authorities.
Waste Disposal: Contact appropriate regulatory authorities for disposal requirements.
Handling Procedures & Equipment: Avoid contact with liquid. Avoid inhalation. Bond and ground all transfers.
Avoid sparking conditions.
Storage Requirements: Store in a cool, dry, well ventilated area away from heat, strong sunlight, and ignition sources.
Caution: hydrogen sulphide may accumulate in headspaces of tanks and other equipment, even when concentrations in the
liquid product are low. Overexposure to hydrogen sulphide may cause dizziness, headache, nausea and possibly knockdown
and death. Factors increasing this risk include heating, agitation and contact of the liquid with acids or acid salts.
Assess the exposure risk by gas monitoring. Wear air supplying breathing apparatus if necessary.
Special Shipping Provisions: N.App.

SECTION 8 – FIRST AID MEASURES

Skin: Flush skin with water, removing contaminated clothing. Get medical attention if irritation persists or
large area of contact. Decontaminate clothing before re-use.
Eye: Immediately flush with large amounts of luke warm water for 15 minutes, lifting upper and lower lids at
intervals. Seek medical attention if irritation persists.
Inhalation: Ensure own safety. Remove victim to fresh air. Give oxygen, artificial respiration, or CPR if needed.
Seek medical attention immediately.
Ingestion: Give 2-3 glasses of milk or water to drink. DO NOT INDUCE VOMITING. Keep warm and at rest.
Get immediate medical attention.

SECTION 9 – PREPARATION DATE OF MSDS

Prepared By: EnCana Environment, Health and Safety (EHS)
Phone Number: (403) 645-2000 Preparation Date: October 15, 2008 Expiry Date: October 15, 2011

Appendix B

SITE HEALTH AND SAFETY PLAN

Company Name	**Signature**	**Date**

SITE HEALTH AND SAFETY PLAN

Company Name	**Signature**	**Date**

Appendix C

TASK HAZARD ASSESSMENT

Job Position &/or Task :__Site Prep ,vacuum truck, Boom Deployment, Hydrocarbon Skimmer, Creek Diversion, Contaminated soil, contaminated material handling, Liquid waste holding, Tank set up and transfer operation.

Position Status : Company x Contractor X

Project & Site Location : _Marshall Leak sites________

Date Completed &/or Revised : __July 29, 2010____

KEY JOB FUNCTIONS &/OR TASKS	EQUIPMENT, MATERIALS,TOOLS & MACHINERY UTILIZED	RISKS (HEALTH & SAFETY HAZARDS)	HAZARD CONTROLS (PROTECTIVE DEVICES & EQUIPMENT, SAFE WORK PROCEDURES)
Access Site	Personnel, Trucks , Vacuum Trucks, Frac Tanks, and Tanker Trucks.	No Site contact. LEL 10%, H_2S 10 PPM, CO 35 ppm and Benzene 0.5 ppm levels to high	Security in place for access control. All personnel must have site contact; all personnel must have site orientation to access site. Safe work permit with Initial atmospheric testing required Equipment to meet spark arrestor / shut-off requirements. Site conditions to be checked for soft areas and gravel or matting in place for access to be maintained
Control zones	Cold zone Staging areas Hot zone	No site access approval No control of work zones	Cold zone- security, orientation decals, equipment tracing and assignment.

		No control of equipment Risk of spreading contaminated material	Staging area- Tool and equipment storage, PPE. Supplies. Hot zone area cordoned off restricted access - permit required area monitoring .
MSDS	Heavy Crude Diluent Mix (i.e. Cold Lake)	Fire , exposure to H_2S, Benzene Light hydrocarbons vapors will release from product at normal temperatures creating an explosive atmosphere.	Ventilation (natural or mechanical) may be required. Gas detection equipment for continuous LEL monitoring is required. Proper binding techniques to prevent static. Proper bins for hydrocarbon waste store as vapors may release from waste materials.
Labor Personnel	Response workers Personnel exposure to LEL, H_2S, benzene. Uneven ground Working with loose product. Vegetation clean up at stream banks Booms	No training records, Exposure greater than 3% LEL Strains, slips, trips falls, eye injuries, Worker exposed to crude oil, LEL, H_2S,CO, benzene No respirator fit testing.	Identify training requirements. Respirator fit testing required Fit testing records. Review Christina Lake (Cold Lake) MSDS for product leaked and surrounding area. Spill cleanup meets precautions higher risk of exposure for working with hydrocarbons. Continuous Atmospheric monitoring for LEL and H_2S and spot sample for benzene. Safe work permits required for all work in restricted areas.

			Life jackets when required.
Site excavation for culvert installation for stream diversion	Heavy equipment	Line strike , ignition source, excavation slough in	Excavation checklist, Line locates, stake out excavation. Spotters Continuous gas monitoring Proper rigging techniques High visibility vests
Dry shrub, grass area	Trucks	Fire	Vehicles equipped with fire extinguishers. Monitor area Check area for equipment staging to prevent ignition of dry grass. Smoking in designated areas only.
Staging vacuum trucks	Vacuum truck	Limited truck access, striking property, Backing incidents, static, hose rupture, gasket leaks, worker exposed to crude oil, LEL, H_2S, benzene, noise levels above 85DbA	Drive through preferable, Use spotters for backing and positioning, Trucks bond to ground. Check hose condition, ensure gaskets are the proper material and in good condition and use a spill pail for drip containment. Exhaust hose to safe location. Continuous gas monitoring. Ensure workers have current Hazard Communication training and respiratory fit testing. Hearing protection
Leak containment	Boom Deployment	Drowning, Slips, trips and falls. Potential to be pinned in current against dams or barrier in the stream. Manual	Stream, Booms/dams to be at checked for potential hazards, life jackets to be worn on boats and at night adjacent to waterways, in high

		lifting and carrying of equipment and supplies. Personnel exposure, Contaminated clothing. Unstable stream banks. Underwater hazards.	current areas. Booms to be checked for breech. Stages to be monitored to maintain containment and boom control. Area monitoring LEL H_2S. Proper PPE to be worn. Decontamination zone- remove outer layer of clothing to prevent spreading oil contamination. Fast currents by hidden underwater terrain – no entry (risk of someone getting pinned.)
Material transfer Tank farm operation	Skimmers, Vacuum Trucks, Tanker trucks.	Fire, over fill, vents overflow. Leaks. Workers not trained for tank loading or unloading. Exposure to LEL, H_2S, benzene. Tank overflow-spill Over pressure tank vacuum. Static build-up potential ignition source. Valve left open or closed or operated by unauthorized worker.	Personal protection standard leak site PPE. Continuous gas monitoring, open vents at all time to prevent over pressure/ vacuum. Exhaust vents hose to safe location. Valve to be in good operating order. Tank setup stable ground. Grounding in place for tanks. Known tank volume Level gage and log book. Tank transfer to be operated by tanker personnel at all time while truck loading and unloading. Proper bonding techniques to be used while transferring products.

			All personnel to be on Safe work permits. Safety eye wear, respirator fit testing, Hearing protection Proper PPE to worn at all times during transfers if required. Continuous gas monitoring and checks for benzene.
Contaminated soil and contaminated material.	Heavy haul trucks	Spill contaminated ground in clean zones. Hot material fire hazard, over exposure Containment area loading. Contaminated material in trucks. Contaminates Uneven loads on trucks Truck over turn, Jack knife. People walking in area No Identification on tank bins	100% containment. Soil testing to confirm soil characterization-Flash point-hydrocarbon content, area monitoring for LEL H_2S, benzene. Assess truck loading ramp for slope, slippage and turning radius for loading and unloading verify with test runs. Line trucks with poly Uneven loads on trucks Wind and weather conditions may effect -off loading. Proper bonding techniques to be used while transferring products. All personnel to be on Safe work permits. Safety eye wear, respirator fit testing, Hearing protection Proper PPE to worn at all times during transfers if required. Continuous gas monitoring and checks for benzene. No foot traffic on rig mats

			Waste manifest and labels if required.
Leak site excavation	Heavy equipment	Hazardous area, Chemical exposure, Fire, Trench walls unstable. Contact pipeline.	Soft terrain rig matting where required for unstable ground. Atmosphere monitoring for benzene, H_2S, LEL. Cordon off hot zone area applicable signage in place No smoking Wind socks in place Fire watch, spotters Fit testing requirement may apply for respirators.
Site Grading and material handling	Heavy equipment Culvert piping Transport trucks	Fire, Noise, equipment strike , underground cables, overhead line, towing vehicles, people traffic	Fire watch with reflective vests and fire extinguisher, Hearing protection, good communication practice to be followed between equipment operators for operating in congested areas. Continuous monitoring for LEL Spotters to wear high visibility vest. Proper rigging techniques. Proper signal persons, Proper use of tag lines. Transport trucks fit for transporting wet waste material.
Tank farm set up	Holding tank and Piping	Spill containment, static charge, truck loading, Fire, wrong valve operation in tank farm.	Lining for containment, piping off loading using proper rigging practices, Grounding in place for tanks and truck loading.

			Only workers in charge of operating tanks operate tank farm valve header and operate off loading pump. Only worker operating trucks operate truck valves. Vac unit must have drip pans in place spill containment.
Vehicle Maintenance	Heavy equipment	Worker not involved in clean up create hazard	All work at site to be permitted and authorized.
Air monitoring	Public concerns	Odors , fugitive emissions Vehicle traffic. Pedestrian traffic.	Maintain good communication with landowners, environment to set up perimeter air sampling for fugitive emission measurement. Drive within speed limits. Monitor roads for debris. Share awareness to work force. Limit parking alongside Leggitt Road leading to Marshall PLM shop.
Health	People	Mosquitoes Heat Stress	Use insect repellant with 10-25% DEET. Follow procedures for working in extreme temperatures (frequent water breaks)

Worker (Print Name) : _________________________

Worker Signature : _______________________________

Site Supervisor : ___________________________________

Site Supervisor Signature : ___________________

Enbridge Marshall Pipeline Release
Pipeline Repair Workplan - Response

July 29, 2010

Prepared by Enbridge Energy

Resources

Pipeline Repair WorkPlan

Enbridge is currently developing a excavation and repair plan that addresses the preparation of the site for excavation and appropriate handling of adjacent contaminated soils as well as the safe removal of soil around the affected pipe segment.

The National Transportation Safety Board is overseeing and approving the excavation, identification and removal of the effected pipe joint to preserve and take custody of pipe for further investigation and analysis, with Enbridge and the Pipeline and Hazardous Materials Safety Administration (PHMSA) as additional parties providing input into the analysis.

PHMSA has also issued a Corrective Action Order which details the conditions which Enbridge must adhere to when returning the pipeline to service following the repair.

Enbridge Energy, Limited Partners
(Enbridge) Marshall Pipeline Release
Sampling and Analysis Plan
Enbridge, Marshall Michigan

July 29, 2010

Prepared by URS Corporation

ENBRIDGE MARSHALL RESPONSE TO PIPELINE RELEASE SAMPLING AND ANALYSIS PLAN

July 29, 2010

The Enbridge petroleum pipeline in the vicinity of Marshall, Michigan experienced a release discovered on July 26, 2010. Two areas have been impacted by this release - the upstream Source Release Area and the Downstream Area. This sample and analysis plan will be used as appropriate in both areas.

SOIL AND WATER SMAPLING TECHNIQUES AND ANALYSIS

Chemical and Physical Characterization of Soil

Soil samples will be collected during investigation and remediation activities at the site. The soil samples will be used to characterize the nature and extent of impact and verify remedial activates. Soil samples will be collected from direct push and conventional auger sampling devices, hand augers, grab samples from the ground surface, excavation floors and sidewalls, and other sampling locations. The soil samples will be analyzed for the following parameters;

Parameter

- Volatile Organic hydrocarbons (BTEX, TMB, 2-methylnapthalene, naphthalene)
- Semi-Volatile Organic Compounds (Polynuclear Aromatic Hydrocarbons, Extractable Petroleum Hydrocarbons)

Chemical Characterization of Sediments

Sediment samples will be collected and analyzed to characterize the nature and extent of impact and to verify remedial activities. Potential sediment sampling devices include the following which will be used as appropriate:

- Driven Probes Box Core
- Gravity Core
- Piston Core
- Hand Driven Multi Sampler
- Clam Shell Sampler
- Vibracore
- Outer Pipe with hand auger bucket
- Water Trap (if needed)

The samples will be analyzed for the following parameters:

Parameter

- Volatile Organic hydrocarbons (BTEX, TMB, 2-methylnapthalene, naphthalene)

- Semi-Volatile Organic Compounds (Polynuclear Aromatic Hydrocarbons, Extractable Petroleum Hydrocarbons)

Chemical Characterization of Groundwater, Surface Water and Potable Water

Groundwater samples may be collected from temporary sampling points or permanent monitoring wells to characterize the nature and extent of impact. Where practicable, the groundwater samples will be collected using low flow sampling methodology.

Surface water samples will be collected using pumps and/or grab sampling devices. Potable well samples will be collected from the tap. The potable well system will be purged a sufficient time prior to sampling to ensure fresh ground water is collected.

The samples will be analyzed for the following parameters:

Parameter

- Volatile Organic hydrocarbons (BTEX, TMB, 2-methylnapthalene, naphthalene)
- Semi-Volatile Organic Compounds (Polynuclear Aromatic Hydrocarbons, Extractable Petroleum Hydrocarbons)
- GRO

The samples will be collected in 40 ml acid preserved VOA vials and 1 liter amber glass containers.

Sample Testing for Waste Characterization

Waste characterization samples will be collected for waste characterization and disposal. The samples will be analyzed for the specific parameters required by the selected disposal facilities.

Sample Preservation

Volatile organic hydrocarbon sediment and soil samples are to be preserved in the field using the methanol soil preservation procedure (USEPA Method 5035). Volatile organic hydrocarbon and GRO groundwater, surface water and potable well water samples will be preserved with hydrochloric acid. All samples are placed on ice in a cooler after collection, and maintained at 4 degrees C.

Sample Labeling

Sample jars and vials are to be clearly labeled with the following information:

- Unique sample identification;
- Sample Type (discrete or composite);
- Sampler name or initials;

- Date sample collected;
- Time sample collected; and
- Analysis to be performed.

Chain of Custody Procedures

All samples are logged on a chain-of-custody record form. Transfer or shipment will include the chain-of-custody record form. A release and/or receipt signature is required for a change in custody of samples. The last person to sign the form retains responsibility for the samples.

Quality Assurance/Quality Control

Accuracy and precision of results are to be evaluated by the use of duplicate sample analyses and field blank analyses. Duplicate samples will be collected and analyzed to verify that data are sufficiently repeatable, or precise. One duplicate sample or analysis will be collected or made for each twenty (20) samples collected. Surrogate recoveries during analyses of matrix spike samples will be used to evaluate the accuracy of results. Recoveries within established ranges specified by the specific laboratory test methods are acceptable. Testing of field blank samples will be completed to evaluate potential cross-contamination from field activities.

SOIL, SEDIMENT, AND WATER SAMPLING LOCAITONS

Soil

Soil sample locations have yet to be determined and will depend on site access and sample locations. In general soil sampling will be used to delineate the horizontal and vertical extent of the crude oil impacts. Samples will be taken within the impact zone to characterize severity of the impacts and samples will be obtained at the depth that corresponds with apparently unimpacted soils. Visual observations and head space tests will be used to guide the determination of apparently clean soils. The horizontal extents of the soils impacts will be confirmed with laboratory analysis as outlined n the previous sections.

Surface Water

Enbridge is currently conducting water sampling as outlined in the Draft Water Monitoring Plan dated July 27, 2010. Enbridge has added additional sample points since the draft was completed. These points are included on Figure 1.

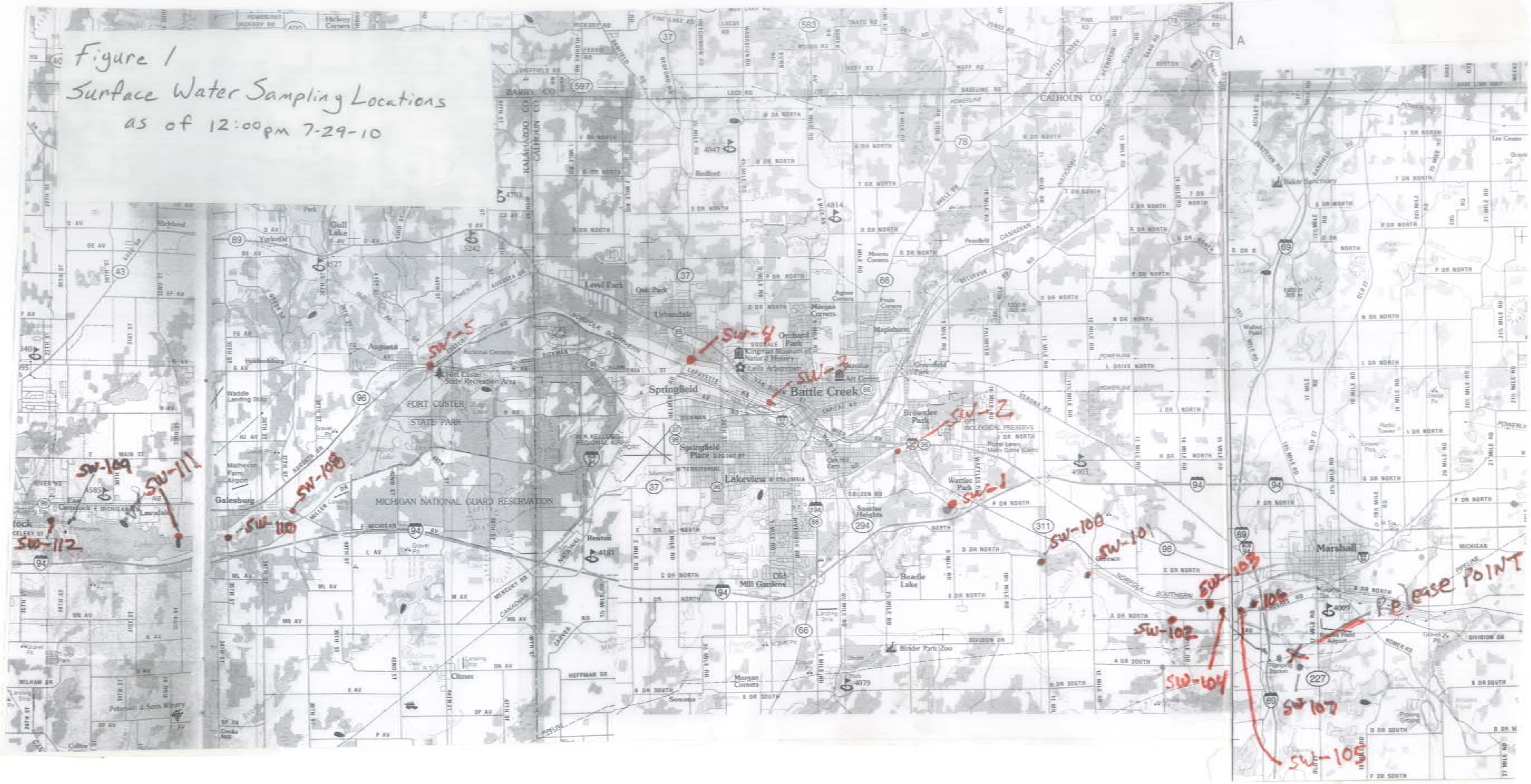
Sediment

Enbridge has initiated sediment sampling on the North side of Morrow Lake, upstream of release site in Talmadge Creek, and in Kalamazoo River upstream of the confluence of the creek and the river. Additional sample locations may be added based on the analytical results of these locations.

Potable Water

The potable water sampling plan has been provided in the Draft Water Monitoring Plan dated July 27, 2010. Modifications to this plan will continue and changes will be communicated to the EPA based on results and public demand.

Figure 1
Surface Water Sampling Locations
as of 12:00pm 7-29-10



Title and Signature Page

Title of Plan: **QUALITY ASSURANCE PROJECT PLAN**
ENBRIDGE MARSHALL RELEASE PROJECT

Implemented By: **ENBRIDGE ENERGY, LIMITED PARTNERSHIP(ENBRIDGE)**

Effective Date: **July 2010**

Project Coordinator/Manager	Date
Project Chemist	Date
Quality Assurance Officer	Date
United States Environmental Protection Agency On Scene Coordinator	Date

By signing this page, the individual agrees to the conditions of this Quality Assurance Project Plan.

TABLE OF CONTENTS

TABLE OF CONTENTS

List of Tables

TABLE OF CONTENTS

Acronyms and Abbreviations

µg	Microgram(s)
%D	Percent Difference
%R	Percent Recovery
ADR	Automated Data Review
APPL	Agriculture and Priority Pollutant Laboratories, Inc.
°C	Degrees Celsius
CCC	Calibration Check Compounds
CCV	Continuing Calibration Verification
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CLP	Contract Laboratory Program
COC	Chain-of-Custody
COD	Coefficient of Determination
COPC	Compound of Potential Concern
CQCP	Contractor Quality Control Plan
CV	Calibration Verification
CVAA	Cold Vapor Atomic Absorption
DDT	Dichloro-Diphenyl-Trichloroethane
DOD	Department of Defense
DQO	Data Quality Objective
ECD	Electron Capture Detector
EDD	Electronic Data Deliverable
EMAX	EMAX Laboratories, Inc.
GC/MS	Gas Chromatography and Mass Spectrometer
GO/CO	Government Owned/Contractor Operated
HAZWOPER	Hazardous Waste Operations and Emergency Response
HCl	Hydrochloric acid
HDPE	High Density Polyethylene
Hg	Mercury
HNO_3	Nitric acid
ICAL	Initial Calibration
ICP	Inductively Coupled Plasma
ICS	Interference Check Sample
ICV	Internal Calibration Verification
IDL	Instrument Detection Limit

IS	Internal Standard
J	Estimated
kg	Kilogram(s)
KDHE	Kansas Department of Health and Environment
KSAAP	Kansas Army Ammunition Plant
LCG	Louisville Chemistry Guideline
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
LDC	Laboratory Data Consultants, Inc.
MDL	Method Detection Limit
MS/MD	Matrix Spike/Matrix Duplicate
MS/MSD	Matrix Spike/Matrix Spike Duplicate
NA	Not Applicable
NELAC	National Environmental Laboratory Accreditation Conference
NELAP	National Environmental Laboratory Accreditation Program
nm	Nanometer
OSHA	Occupational Safety and Health Administration
PAH	Polynuclear Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PDS	Post Digestion Spike
pH	Hydrion Ion Exponent
PM	Project Manager
ppb	Part Per Billion
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
QSM	Quality Systems Manual
R	Rejected
r	Correlation Coefficient
RF	Response Factor
RL	Reporting Limit
RPD	Relative Percent Difference
RRT	Relative Retention Time
RSD	Relative Standard Deviation
SCFS	Sample Collection Field Sheet
SIM	Selected Ion Monitoring
SOP	Standard Operating Procedure

SOW	Scope of Work
SPCC	System Performance Check Compounds
SSHP	Site Safety and Health Plan
SAP	Site Sampling and Analysis Plan
SVOC	Semivolatile Organic Compound
TAL	Target Analyte List
TM	Technical Manager
U	Nondetect
UJ	Estimated Nondetect
URS	URS Corporation
USEPA	United States Environmental Protection Agency
UV	Ultraviolet
VOA	Volatile Organic Analysis
VOC	Volatile Organic Compound

1.1 INTRODUCTION

This Quality Assurance Project Plan (QAPP) presents the organization, objectives, planned activities, and specific quality assurance/quality control (QA/QC) procedures associated with the Enbridge Marshall Pipeline Release Project to be completed performed in Marshall, Michigan. Specific protocols for sampling, sample handling and storage, chain-of-custody (COC), and laboratory and field analyses are described in this QAPP. All QA/QC procedures are structured in accordance with applicable technical standards and United States Environmental Protection Agency's (USEPA's) requirements, regulations and guidance (Comprehensive Environmental Response, Compensation, and Liability Act [CERCLA]). This QAPP has been prepared in accordance with USEPA *Requirements for Quality Assurance Project Plans* (USEPA 2001), and *Guidance for Quality Assurance Project Plans* (USEPA 2002). The Data Quality Objectives (DQOs) are presented as Attachment 1 in the Site Sampling and Analysis Plan (SAP).

This QAPP is part of the overall Work Plans, which consists of the following documents:

- Work Plan;
- Site Safety and Health Plan (SSHP);
- Pipeline Repair Work Plan;
- Sampling and Analysis Plan (SAP);
- Oil Recovery and Containment Plan;
- Source Release Area Remediation Plan;
- Remediation Plan for Downstream Impacted Areas; and
- Waste Treatment, Transportation and Disposal Plan.

1.1.1 Project/Task Organization

The project management team organization is discussed below. The proper names of individuals for the positions identified below will be included in **Section 1.1.2** as an addendum for each project or specific activity.

1.1.1.1 Management Responsibilities

Project Coordinator/Manager

The Project Coordinator/Manager (PCM) is responsible for implementing the project, and has the authority to commit the resources necessary to meet project objectives and requirements. The PCM's primary function is to ensure that technical, financial, and scheduling objectives are achieved successfully. The PCM will:

- Oversee project objectives and develop a detailed work schedule;

- Establish project policy and procedures to address the specific needs of the project as a whole, as well as the objectives of each task;
- Acquire and apply technical and corporate resources as needed to ensure performance within budget and schedule constraints;
- Orient all field leaders and support staff concerning the project's special considerations;
- Monitor and direct the field leaders;
- Develop and meet ongoing project and/or task staffing requirements, including mechanisms to review and evaluate each task product;
- Review the work performed on each task to ensure its quality, responsiveness, and timeliness;
- Review and analyze overall task performance with respect to planned requirements and authorizations;
- Approve all reports (deliverables) before their submission to USEPA;
- Ultimately be responsible for the preparation and quality of interim and final reports;
- Represent the project team at meetings and public hearings; and
- Submit monthly progress reports.

1.1.1.2 Quality Assurance Responsibilities

QA Officer

The QA Officer reports directly to the PCM and will be responsible for ensuring that all procedures for this project are being followed. In addition, the QA Officer will be responsible for the data verification of all sample results from the analytical laboratory. The QA Officer is also responsible for coordination of the Data Validator and integration of all the results into the final documents. The QA officer or designee will complete any field or laboratory audits. Details of the audit procedures are presented in **Section 3**.

Program Health and Safety Officer

The Health and Safety Officer reports directly to the PCM and will be responsible for ensuring that all safety procedures for this project are being followed.

Data Validator

The Data Validator reports directly to the Project Chemist and is responsible for the validation of 10% of the investigative data. The Data Validator will submit a validation reports to the QA Officer.

1.1.1.3 Technical Personnel Responsibilities

Project Health and Safety Officer

The Project Health and Safety Officer is responsible for assisting in the development and thhe implementation of the SSHP for the project and communication of all health and safety issues with the Field Area Coordinators. The Project Health and Safety Officer will address any issues that arise during field operations.

Project Chemist

The Project Chemist will be responsible for development of the laboratory SOW, procurement of laboratory services, and the daily communication with the laboratory. Additionally, the Project Chemist will address any chain-of-custody discrepancies or laboratory QA/QC anomalies, complete the data management and data verification, write a quality control summary report (QCSR) summarizing the data verification findings, and determine the usability of the analytical data.

1.1.1.4 Laboratory Responsibilities

Laboratory QA Officer

The Laboratory QA Officer has the overall responsibility for data generated by that laboratory, as well as the adherence to acceptable practice. The Laboratory QA Officer will communicate data issues through the laboratory project manager. In addition, the Laboratory QA Officer will:

- Oversee laboratory QA;
- Oversee QA/QC documentation;
- Conduct a detailed data review;
- Determine whether to implement laboratory corrective actions, if required;
- Define appropriate laboratory QA procedures; and
- Prepare laboratory Standard Operating Procedures (SOPs).

1.1.1.5 Field Responsibilities

Area Coordinators

The Area Coordinators are responsible for implementing the Sampling and Analysis Plan (SAP). They are further responsible for field equipment calibration, oversight of sample collection, field documentation, submittal of samples to contract laboratories and preparation of a summary report.

The Area Coordinators are responsible for leading and coordinating the day-to-day activities of the various resource specialists under their supervision. The Area Coordinators are highly experienced environmental/construction professionals and report directly to the PCM. Specific field team leader responsibilities include:

- Day-to-day coordination with the PCM on technical issues in specific areas of expertise;
- Development and implementation of field-related work plans, assurance of schedule compliance, and adherence to management-developed study requirements;
- Coordinating and managing field staff;
- Implementing QC for technical data provided by the field staff including field measurement data;
- Adhering to work schedules provided by the PCM;
- Authoring and approving of text and graphics required for field team efforts;
- Identifying problems at the field team level, resolving difficulties in consultation with the USEPA On Scene Coordinator (OSC) and the PCM, implementing and documenting corrective action procedures, and provision of communication between team and upper management; and
- Participating in preparation of the final report.

1.1.2 QAPP Distribution List

The PCM and QA Officer will be responsible for ensuring that each project member has access to the most current version of the QAPP. Documents required as a result of this investigation include laboratory audit reports (if completed), field audit reports (if completed), monthly progress reports, draft-final and final report. The distribution list is as follows:

Role	Name	Telephone
Project Coordinator/Manager	Mr. Bob Steele	
Project QA/QC Officer		
Project Chemist		
Area Coordinator(s)		
Subcontract Laboratory (ALS)	Mr. Les Arnold	916.673.1520

1.2 PROBLEM DEFINITION/BACKGROUND INFORMATION

1.2.1 Overall Project Objectives

The overall project objective is to conduct sampling to delineate the extent of impacted soil, groundwater, surface water, potable water, and post soil removal sampling.

1.2.2 Site / Facility Description

The impacted area encompasses approximately 8 miles of upland, creek bed, and river bed areas, located in Calhoun and Kalamazoo Counties. Additional surface water sampling is conducted outside of this impacted area.

1.2.3 Site / Facility History

The Enbridge pipeline in the vicinity of Marshall, Michigan experienced a crude oil release discovered on July 27, 2010. Two main areas have been impacted by this release and include the upstream release area and the downstream release area. The upstream release area mainly impacts upland areas, and the downstream areas include impacts to bank and in river areas.

1.3 PROJECT/TASK DESCRIPTION AND SCHEDULE

1.3.1 Project Schedule

Fieldwork has commenced.

1.4 QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT OF DATA

The overall QA objective for this project is to develop and implement procedures for field and laboratory activities that will provide results that meet the project objectives and are legally defensible in a court of law. This section will provide in greater detail specific project objectives and intended data usages mentioned in **Section 1** of this QAPP. Specific procedures for sampling, COC, laboratory instrument calibration, laboratory analysis, reporting of data, internal QC, audits, preventive maintenance of field equipment, and corrective action are described in other sections of this QAPP. QC parameters and the frequency of analysis are identified in **Table 1-1**.

The following subsection summarizes the precision, accuracy, completeness, representativeness, comparability and sensitivity to be used for all sample analyses.

1.4.1 Precision

1.4.1.1 Definition

Precision is a measure of the degree to which two or more measurements are in agreement.

1.4.1.2 Field Precision Objectives

Field precision is assessed through the collection and measurement of field duplicates and QA splits. Field duplicates samples will be collected at an approximate rate of one duplicate per 10 analytical samples collected and QA splits samples one per method/per matrix. The anticipated number of duplicates for this project is found in the SAP.

1.4.1.3 Laboratory Precision Objectives

Precision in the laboratory is assessed through the calculation of relative percent differences (RPD) between sample results. The equations to be used for precision in this project can be found in **Section 3** of this QAPP. Precision control limits for chemical data are provided in **Tables 1-2** through **1-13**.

For inorganic analyses, laboratory precision will be assessed through the analysis of a laboratory control sample/laboratory control sample duplicate (LCS/LCSD); sample/sample duplicate pair and field duplicate pairs. For organic analyses, laboratory precision will be assessed through the analysis of LCS/LCSD, matrix spike/matrix spike duplicate (MS/MSD) and field duplicate sample results.

1.4.2 Accuracy

1.4.2.1 Definition

Accuracy is the degree of agreement between an observed value and an accepted reference or true value.

1.4.2.2 Field Accuracy Objectives

Accuracy in the field is assessed through the use of trip blanks to assess the potential of cross contamination. Every cooler with aqueous volatile organic compound (VOC) samples will contain a trip blank sample. In addition, field accuracy is assessed by the adherence to all sample handling, preservation, and holding time criteria.

1.4.2.3 Laboratory Accuracy Objectives

Laboratory accuracy is assessed through the analysis of MS/MSD, LCS, surrogate compounds, or equivalent and the determination of percent recoveries. MS/MSD samples will be collected at a five percent frequency. The equation to be used for accuracy in this project can be found in **Section 3** of this QAPP. Accuracy control limits are given in **Tables 1-2** through **1-14**.

1.4.3 Completeness

1.4.3.1 Definition

Completeness is a measure of the amount of valid data obtained from a measurement system compared to the amount that expected under normal conditions.

1.4.3.2 Field Completeness Objectives

Field completeness is a measure of the amount of valid measurements obtained from all the measurements taken in the project. The equation for completeness is presented in **Section 3** of this QAPP. The field completeness goal for this project is greater than 95 percent.

1.4.3.3 Laboratory Completeness Objectives

Laboratory completeness is a measure of the amount of valid measurements obtained from all the measurements taken in the project. The equation for completeness is presented in **Section 3** of this QAPP. The laboratory completeness objective for this project, with respect to parameters identified in **Table 1-15** of this QAPP, is 95 percent or greater.

1.4.4 Representativeness

1.4.4.1 Definition

Representativeness expresses the degree to which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition within a defined spatial and/or temporal boundary.

1.4.4.2 Measures to Ensure Representativeness of Field Data

Representativeness is dependent upon the proper design of the sampling program and will be satisfied by ensuring that the SAP is followed and that proper sampling techniques are used. These will include the analysis of trip blank, method blank and field blank data. In designing the sampling program, media of concern have been specified.

1.4.4.3 Measures to Ensure Representativeness of Laboratory Data

Laboratory representativeness is ensured by using the proper analytical procedures, appropriate methods, meeting sample holding times and analyzing and assessing field duplicate samples. The sampling network was designed to provide data representative of facility conditions. During development of this network, consideration was given to historical activities, existing analytical data, physical setting and processes.

1.4.5 Comparability

1.4.5.1 Definition

Comparability is an expression of the confidence with which one data set can be compared to another.

1.4.5.2 Measures to Ensure Comparability of Field Data

Comparability is dependent upon the proper design of the sampling program and will be satisfied by ensuring that the SAP is followed and that proper sampling techniques are used.

1.4.5.3 Measures to Ensure Comparability of Laboratory Data

Analytical data will be comparable when similar sampling and analytical methods are used as documented in the QAPP. Comparability is also dependent on similar QA objectives and will be measured through QA split samples.

1.4.6 Sensitivity

1.4.6.1 Definition

Sensitivity is defined as the capability of a method or instrument to discriminate between measurement responses representing different levels of a variable of interest. Method detection limit (MDL) is defined as the minimum concentration of a substance that can be identified, measured, and reported with a 99 percent confidence that the analyte concentration is greater than zero and is determined from repeated analysis of a sample in a given matrix containing the analyte. MDLs have been determined as required in Title 40 of the Code of Federal Regulation (CFR) Part 136B. The reporting limit (RL) is greater than or equal to the lowest standard used to establish the calibration curve. The RLs for this investigation are generally at least 3 times greater than the MDL. Results greater than the MDL and less than the RL will be qualified estimated (**J**) by the laboratory.

1.4.6.2 Sensitivity Requirements for Field Data

The sensitivity goals for the field data are identified in the SAP.

1.4.6.3 Sensitivity Requirements for Laboratory Data

The laboratory MDLs, RLs and project sensitivity goals are identified in **Tables 1-16** through **1-24** of this QAPP. The laboratory will analyze MDL verification samples on a quarterly basis.

1.5 SPECIAL TRAINING REQUIREMENTS AND CERTIFICATION

1.5.1 Training

The field activities may consist of soil and surface water sampling. Personnel completing these activities have sufficient knowledge and on-the-job training to follow the procedures required for the activities listed above, including sampling for and composition samples. Field personnel have completed the Occupational Safety and Health Administration (OSHA)-approved basic 40-hour health and safety training Hazardous Waste Operations and Emergency Response (HAZWOPER) course and annual refreshers of the same. The Dredge Area and Containment

Facility Coordinators (a.k.a., Field Area Coordinators) will have OSHA approved 8-hour site supervisor training. Personnel training are included in the Site Safety and Health Plan, sample collection techniques are included in the SAP. Laboratory requirements for laboratory analysts are listed in the QSM and the laboratory has self-declared compliance with the QSM.

1.5.2 Certification

The contract laboratory must have current National Environmental Laboratory Accreditation Conference (NELAC) certification. No additional certifications are required for this investigation.

1.6 DOCUMENTS AND RECORDS

1.6.1 Data Reporting Format and Content

The hard copy and electronic copy of the laboratory data will be reported following the format identified below. For this project, a QC summary package and raw data package will be required. Hard copy reports will be submitted to URS. The chemical data will also be submitted electronically to the USEPA on-scene coordinator, the QA Officer for verification, and the third party validator for validation. The contents of the QC summary package include:

- Cover sheet;
- Laboratory case narrative;
- Cooler receipt forms;
- COC copy;
- Analytical results;
- Surrogate summary forms;
- Blank summary forms;
- Laboratory control sample summary forms; and
- Matrix spike/matrix spike duplicate/laboratory duplicates summary forms.

The raw data package will consist of the elements presented in the QC summary package but will additionally include the raw data. The raw data includes chromatograms, mass spectra, manual integration correction data, quantitation reports, calibration data, preparation logs, and analytical logs. The raw data package will be similar in content to the Contract Laboratory Program (CLP) Level IV data package where applicable to the referenced methods. All chemical data will also be submitted in electronic format.

1.6.2 Records Disposition

All project files and records will be stored on-site until the Final Report has been approved by USEPA. The project files will be moved to an off-site storage facility for 10 years. Project information can be attained through a written request to the PCM. The requested information should be available within 7 working days.

1.6.3 Use of Historic Data

Only visual extent of the release was used to determine potential areas of concern. No historic data was available.

2.1 SAMPLING PROCESS DESIGN

2.1.1 Sampling Procedures and Methods

The sampling procedures to be used during the field activities will be consistent for the objectives of this project. The procedures are presented in SAP. Sample containers, preservatives, and holding time requirements for each parameter and matrix are presented in **Table 2-1**.

2.1.2 Custody Procedures

Custody is one of several factors that are necessary for the admissibility of environmental data as evidence in a court of law. Custody procedures help to satisfy the two major requirements for admissibility: relevance and authenticity. Sample custody is addressed in three parts: field sample collection, laboratory analysis, and final evidence files. Final evidence files, including originals of all laboratory reports and purge files, are maintained under document control in a secure area.

A sample or evidence file is under your custody if:

- The item is in actual possession of a person;
- The item is in the view of the person after being in actual possession of the person;
- The item was in actual physical possession but is locked up to prevent tampering; or
- The item is in a designated and identified secure area.

2.1.2.1 Field Custody and Documentation Procedures

Field Logbook

Field logbooks will provide the means of recording data collecting activities performed during the investigation. As such, entries will be described in as much detail as possible so that persons going to the facility could reconstruct a particular situation without reliance on memory.

Field logbooks will be bound field survey books or notebooks. A project-specific document number will identify each logbook.

The title page of each logbook will contain the following:

- Person to whom the log book is assigned;
- Log book number;
- Project name;
- Project start date; and

- Estimated project end date.

Entries into the logbook will contain a variety of information. At the beginning of each entry, the date, start time, weather, names of all sampling team members present, level of personal protection equipment being used, and the signature of the person making the entry will be entered. The names of visitors to the site, field sampling or investigation team personnel, and the purpose of their visit will also be recorded in the field logbook.

Measurements made and samples collected will be recorded. All entries will be made in permanent ink, signed, and dated. If an incorrect entry is made, the information will be crossed out with a single strike mark that is signed and dated by the sampler. Whenever a sample is collected or a measurement is made, a detailed description of the location, which may include compass and distance measurements or latitude and longitude information (e.g., obtained by using a global positioning system) will be recorded. The number of the photographs taken, if any, will also be noted. All equipment used to make measurements will be identified, along with the date of calibration.

Chain-of-Custody (COC)

The purpose of the COC procedure is to prevent misidentification of samples, prevent tampering of the samples during shipment and storage, allow easy identification of tampering, and allow for easy tracking of possession. If the COC is broken at any time from sample collection through sample analysis, the QA Officer will be notified. The QA Officer is responsible for implementing corrective action and responsible for ensuring that all necessary documentation is completed.

If an incorrect entry is made on the COC, the incorrect information will be crossed out with a single strike mark, and the change initialed and dated by the person making the COC change. A copy will be kept by the sampling team and will be included in the field activity documentation file.

The laboratory will compare the samples entered on the COC forms with the sample containers received by the laboratory. If the laboratory finds any discrepancies, the laboratory will contact the Project Chemist for resolution. The COC forms will be the primary source of information for the laboratory to enter data into the laboratory's sample tracking system. Sample coolers packaging is an integral part of field activities. Procedures for proper sample packaging will be followed as identified SAP.

When samples leave the sampler’s immediate control (e.g., shipment to laboratory), custody seals will be placed on both the front and back of the shipping container. The custody seals will bear the collector’s name and the date signed. The sample custody seal is used to ensure that the samples in the shipping container have not been tampered with, therefore ensuring sample integrity. At the beginning of the project, an example cooler custody seal will be sent to the laboratory so the laboratory has the signatures of the samplers on file.

Sample Collection Field Sheets

To supplement the information recorded in the field logbook, sample collection field sheets (SCFSs) will also be completed for each soil sampling location. The SCFS will be crosschecked for completeness and accuracy at the end of each day. The SCFS will be signed and dated by the sampler making entries on the SCFS.

Field Custody Procedures

Samples will be collected following the procedures presented in the SAP. The equipment used to collect samples will be noted, along with the time of sampling, sample description, depth at which the sample was collected, volume, and number of containers in the field logbook. Sample identification numbers will be assigned prior to sample collection. Field duplicate samples, which will receive a unique sample identification number, will be noted in the field logbook and on the SCFS.

The sample packaging and shipment procedures summarized below will ensure that the samples will arrive at the laboratory with the COC intact. The protocol for specific sample numbering and other sample designations are included in the SAP.

- The Field Area Coordinators are personally responsible for the care and custody of the samples until they are relinquished or properly dispatched. Field procedures have been designed such that as few individuals as possible will handle the samples.
- All bottles will be identified by the use of sample labels with sample numbers, sampling locations, date/time of collection, and type of analysis. The sample numbering system is presented in SAP.
- Sample labels will be completed for each sample using waterproof ink unless prohibited by weather conditions. For example, a logbook notation would explain that a pencil was used to fill out the sample tag because the ballpoint pen would not function in freezing weather. Sample labels will be affixed to the sample containers using clear tape.
- A properly completed COC form will accompany samples. The sample numbers and locations will be listed on the chain-of-custody form. When transferring the possession of samples, the individuals relinquishing and receiving will sign, date, and note the time on the record. This record documents transfer of custody of samples from the sampler to another person, to the permanent laboratory, or to/from a secure storage area.
- Samples will be properly packaged on ice at 4 degree Celsius (°C) ± 2^{o}C for shipment and dispatched to the appropriate laboratory for analysis, with a separate signed custody record enclosed in and secured to the inside top of each sample box or cooler. Shipping containers will be closed and secured with strapping tape and custody seals for shipment to the laboratory. The custody seals will be attached to the front right and back left of the cooler and covered with clear plastic tape after being signed by the field team leader. The cooler will be secured with strapping tape in at least two locations.

2.1.2.2 Laboratory Custody Procedures

Laboratory custody procedures for sample receiving and login, sample storage and numbering, tracking during sample preparation and analysis, and storage of data are described in the laboratory Quality Programs.

2.1.2.3 Final Evidence File

The final evidence file will be the central repository for all documents, which constitute evidence relevant to sampling and analysis activities as described in this QAPP. Enbridge's Command Center Environmental Office is the custodian of the evidence file and maintains the contents of evidence files for the investigation, including all relevant records, reports, logs, field notebooks, pictures, subcontractor reports, and data reviews in a secured, limited-access area and under custody of the PCM.

The final evidence file will include at a minimum:

- Field logbooks;
- Field data and data deliverables;
- Photographs;
- Drawings;
- Soil boring logs;
- Laboratory data deliverables
- Data review/validation reports;
- Data assessment reports;
- Progress reports, QA reports, interim project reports, etc.; and
- All custody documentation (tags, forms, air bills, etc.).

2.2 ANALYTICAL METHODS

Sediment, soil, surface water, and groundwater samples will be collected during field sampling activities as part of the investigation. All investigative samples will be sent to offsite or onsite laboratories as identified in the SAP. QA split samples will be sent to each laboratory as well. Analyses will be completed following the respective analytical methods as identified in the SAP.

2.2.1 Field Analytical Procedures

If called for in the SAP, field analytical measurements for aqueous samples and their respective field instrument are listed in the following table. Analytical procedures for field analyses are presented in the respective SAP.

Field Measurement	Field Instrument
Specific Conductance (surface water)	Oakton Model 10 or equivalent
pH (surface water)	Oakton Model 10 or equivalent
Temperature (surface water)	Oakton Model 10 or equivalent
Headspace	MiniRae 2000 Photoionization Detector or equivalent

2.2.2 Laboratory Analytical Procedures

The contract laboratories will implement the project-required SOPs. These laboratory SOPs for sample preparation, cleanup, and analysis are based on USEPA Test Method for Evaluating Solid Waste, Physical/Chemical Methods, Final Update IIIB, June 2005 and other applicable methods. The analytical procedures will follow laboratory in-house limits; as appropriate. The laboratory will report all detections above the MDL. Values above the MDL and below the RL will be qualified as estimated (**J**). MDLs were determined as outlined in 40 CFR, Part 136B. The RLs are typically 3 to 5 times the MDL (the MDL should be below half any applicable action level where achievable). Available technology may limit the achievability of this for certain analysts. The laboratory will analyze a RL check sample for each parameter and an MDL check sample for organic parameters. In house limits will be used where no QSM limits exist.

Table 1-15 identifies the laboratory analytical methods and the proceeding sections summarize the analytical methods that will be used during this investigation. The process for determining compounds of potential concern (COPCs) is detailed in the SAP.

2.2.2.1 Volatile Organic Compounds (VOCs)

VOCs include compounds among varying classes, such as halogenated organics, nonhalogenated organics, and aromatic organics. The first two classes includes compounds associated with fuels, such as benzene, ethylbenzene, toluene, and xylenes. Samples requiring VOC analysis will be prepared using USEPA SW-846 Methods 5035 (soil/sediment) and analyzed using USEPA SW-846 Method 8260. USEPA SW-846 Method 8260 utilizes gas chromatography/mass spectrometry (GC/MS) for separation and detection, respectively. The power of GC/MS lies in the capacity for positive identification of relatively low detection limits. The target analytes, MDLs and laboratory RLs are presented in **Table 1-16** (soil/sediment).

2.2.2.2 Semivolatile Organic Compounds (SVOCs)

USEPA SW-846 Method 8270C is a GC/MS method for determining semivolatile organic compounds (SVOCs). The target analytes, MDLs and laboratory RLs are presented in **Table 1-17** (soil/sediment).

2.2.2.3 Polynuclear Aromatic Hydrocarbons (PAHs)

USEPA SW-846 Method 8270 is a GC/MS method for determining polynuclear aromatic hydrocarbons (PAHs). The target analytes, MDLs and laboratory RLs are presented in **Table 1-18** (soil/sediment).

2.2.3 Field Quality Control Checks

The QC criteria for each field measurement are provided in **Section 1** of this QAPP. The collection of field duplicates and quality assurance duplicates for laboratory analysis will make an assessment of field sampling precision and bias. Collection of the samples will be in accordance with the SAP as referenced in **Section 2.1** and will be collected at the frequency indicated in **Table 1-1** of this QAPP.

2.2.4 Laboratory Quality Control Checks

The contract laboratories have a QC program in place to ensure the reliability and validity of the analysis performed at the laboratory. All analytical procedures are documented in writing as SOPs, and each SOP includes a QC section, which addresses the minimum QC requirements for the procedure. The internal QC checks differ slightly for each individual procedure, but, in general, the QC requirements include the following:

- Method blanks;
- Reagent/preparation/calibration blanks (applicable to inorganic analysis);
- Instrument blanks;
- Initial calibration (ICAL);
- Initial calibration verification (ICV);
- Continuing calibration verification (CCV);
- Method detection limit verification;
- Method reporting limit verification;
- MS/MSDs;
- Surrogate spikes;
- Laboratory duplicates;
- Laboratory control standards;
- Internal standard areas for GC/MS analysis; and
- Mass tuning for GC/MS analysis.

All data obtained will be properly recorded. The data package will include a full deliverable package capable of allowing the recipient to reconstruct QC information and compare it to QC criteria. The laboratory will reanalyze any samples analyzed in nonconformance with the QC criteria, if sufficient volume is available. It is expected that sufficient volumes/weights of samples will be collected to allow for reanalysis when necessary. Data packages will be available in electronic form.

2.2.5 Level of Quality Control Effort

Method blank, field duplicate, laboratory duplicate, laboratory control and matrix spike samples will be analyzed to assess the quality of the data resulting from the field sampling and analytical programs.

- Method blank samples are generated within the laboratory and used to assess contamination resulting from laboratory procedures. A method blank will be analyzed by the laboratory with each analytical batch samples for organic analyses and will be re-analyzed if common laboratory contaminants are detected above the RL or when non-laboratory contaminants are reported > ½ the RL. Samples for metals analyses will be re-analyzed if the blank concentration is > than the RL.
- Duplicate samples are analyzed to check for sampling and analytical reproducibility. Field duplicate samples will be collected at an approximate 5 percent frequency. The laboratory will analyze laboratory duplicates with each metals analytical batch.
- MS/MSDs provide information about the effect of the sample matrix on the digestion and measurement methodology. Depending on site-specific circumstances, one MS/MSD will be collected for every 20 or fewer investigative samples of a given matrix. MS/MSD samples are designated/collected for organic analyses only. A MS/MD will be collected for metals analyses and will also be collected at a frequency of 5 percent.
- LCSs provide information about the accuracy of the analytical system, independent of matrix. LCSs are laboratory-generated sample spikes with target analytes. An LCS is analyzed as part of every analytical batch. Investigative samples and the associated LCS will be re-analyzed if more than 5 percent of the LCS recoveries are less than the lower limit or any one recovery is less than ½ the lower limit.

The general level of the QC effort will be one field duplicate for every 10 investigative samples and one MS/MSD, LCS and blank for every 20 investigative samples. The number of duplicate and field blank samples to be collected is listed in the SAP.

In addition to the QC parameters identified above, the laboratory analyzes additional QC samples as part of the analytical method. **Table 1-1** summarizes all QC parameters and frequency of analysis.

2.2.6 Level of Quality Assurance Effort

QA samples will be collected at a frequency of 5% and will be analyzed by each respective laboratory.

2.3 CALIBRATION PROCEDURES AND FREQUENCY

This section describes the calibration procedures and the frequency at which these procedures will be performed for both field and laboratory instruments.

2.3.1 Field Instrument Calibration

The field instruments will be calibrated as described in the manufacturer’s manual and procedures identified in the SAP. In general, instruments will be calibration checked at the beginning of each day and calibrated weekly. For specific instructions on the calibration frequency, the acceptance criteria, and the conditions that will require more frequent calibration, refer to the specific SOPs.

All calibration procedures performed will be documented in the field logbook and will include the date/time of calibration, name of person performing the calibration, reference standard used, temperature at which readings were taken, and the readings. Multiple readings on one sample or standard, as well as readings on replicate samples, will likewise be documented.

2.3.2 Laboratory Instrument Calibration

All laboratory instrumentation will be calibrated in accordance with the respective analytical method. In general, calibration procedures for a specific laboratory instrument will consist of initial calibrations (3 or 5 points), initial calibration verifications, and continuing calibration verification.

The laboratory maintains a sample logbook for each instrument which will contain the following information: instrument identification, serial number, date of calibration, analyst, calibration solutions run, and the samples associated with these calibrations.

2.4 PREVENTIVE MAINTENANCE

To ensure that all analytical data generated for this project are reliable, all equipment and instruments will have a prescribed routine maintenance schedule in addition to a calibration schedule. Preventive maintenance will be completed and documented by qualified project personnel.

2.4.1 Field Instrument Preventive Maintenance

The field equipment for this project includes a multiparameter probe for the analysis of pH, temperature and specific conductance. Specific preventative maintenance procedures to be followed for field equipment are based on those recommended by the manufacturer. Field instruments will be calibration checked daily before use and calibrated weekly. Calibration checks will be documented in the field logbook. Critical spare parts, such as tape and batteries, will be kept on site to reduce potential downtime. Backup instruments and equipment will be available within one-day shipment to avoid delays in the field schedule.

2.4.2 Laboratory Instrument Preventive Maintenance

As part of the QA Program Plan, the contract laboratory conducts a routine preventative maintenance program to minimize the occurrence of instrument failure and other system malfunctions. Designated laboratory employees regularly perform routine scheduled maintenance and repair of (or coordinate with the vendor for the repair of) all instruments. All maintenance that is performed is documented in the laboratory's operating record. All laboratory instruments are maintained in accordance with manufacturer's specifications. The frequency of laboratory preventive maintenance is identified in the laboratory Quality Programs.

2.4.3 Inspection/Acceptance Requirements for Supplies and Consumables

The Area Field Coordinators are responsible for ensuring that all consumable materials and ancillary sampling equipment is adequate for its intended use, compatible with other equipment, and free of defects. An inspection of all field supplies should be done and recorded in the logbook. The table below summarizes the supply and consumables inspection and acceptance requirements.

Supply Name	Inspection/ Testing Requirements	Acceptance Criteria	Testing Method	Frequency of Testing	Responsible Individual	Expiration Date	Handling / Storage Requirements
En Core® or Terra Core™ samplers	Certified as pre-cleaned by supplier	Certified as pre-cleaned by supplier / laboratory	Review of documentation and visual inspection	Upon receipt	Area Field Coordinators	3 years	Store in dry and secure location
Preserved sample containers	Certified as pre-cleaned by supplier and containing appropriate preservative	Certified as pre-cleaned by laboratory	Review of documentation and visual inspection	Upon receipt	Area Field Coordinators Area Field Coordinators	3 months	Store in dry and secure location
Unpreserved sample containers	Certified as pre-cleaned by supplier	Certified as pre-cleaned by laboratory	Review of documentation and visual inspection	Upon receipt	Area Field Coordinators	None	Store in dry and secure location

A field audit may be conducted to verify that sampling is performed in accordance with the procedures established in the SAP and QAPP. A performance and system audit of the laboratory may be conducted to verify analyses are completed as identified in the SOPs. The audits of field and laboratory activities include two independent parts: internal and external audits.

3.1 FIELD PERFORMANCE AND SYSTEM AUDITS

3.1.1 Internal Field Audits

3.1.1.1 Internal Field Audit Responsibilities

If performed, internal audits of field activities, including sampling and field measurements, will be conducted prior to, at the start of, or at any time during field sampling activities by the QA Officer or designee. These audits will verify that all established procedures are being followed. The audit will be completed at the beginning of the project and will include a review of all field activities completed at that time.

3.1.1.2 Internal Field Audit Frequency

Internal field audits will be conducted at least once at the beginning of the site sample collection activities. If warranted, additional field audits may be completed.

3.1.1.3 Internal Field Audit Procedures

The audits will include examination of field sampling records; field screening analytical results; field instrument operating records; sample collection, handling, and packaging in compliance with the established procedures; maintenance of QA procedures; chain-of-custody; etc. Follow-up audits may be required to correct deficiencies and to verify that QA procedures are maintained throughout the investigation. The audits will involve review of field measurement records, instrumentation calibration records, and sample documentation. The QA Officer will issue an audit report to the PCM. Nonconformances will be addressed and resolved by the PCM.

3.1.2 External Field Audits

3.1.2.1 External Field Audit Responsibilities

If performed, external field audits may be conducted prior to, at the start of, or at any time during field sampling activities.

3.1.2.2 External Field Audit Frequency

External field audits may be conducted any time during the field operations. These audits may or may not be announced.

3.1.2.3 External Field Audit Procedures

External field audits will be conducted according to the field activity information presented in the procedures in the SAP. The external field audit process can include (but not be limited to): sampling equipment decontamination procedures, sample bottle preparation procedures, sampling procedures, examination of field sampling and safety plans, sample vessel cleanliness and QA procedures, procedures for verification of field duplicates, sample preservation and preparation for shipment, as well as field screening practices. The QA Officer will issue an audit report to the PCM. Nonconformances will be addressed and resolved by the PCM.

3.2 PERFORMANCE AND SYSTEM AUDITS

Performance and system audits may be conducted to verify documentation and implementation of the QA program, assess the effectiveness of the work plan, identify any nonconformances, and verify corrective action of identified deficiencies. Repeated failure or gross irregularities in field duplicate, QA split, and calibration or quality control samples may warrant the need for an audit.

3.2.1 Performance Audits

Performance audits of the laboratories participating in the project are performed in accordance with the procedures and frequencies established for SW-846 methodologies by the USEPA.

The QA Officer will evaluate the need for additional performance audits with due consideration given to the recommendations of the PCM. Performance audits are used to quantitatively assess the accuracy of measurement data through the use of performance evaluation and blind check samples. The performance audit, if needed, will be performed by the QA Officer or his/her designee in accordance with documented procedures.

3.2.2 System Audits

The QA Officer may conduct a system audit of the fieldwork performance. The Field Area Coordinators are responsible for supervising and checking that samples are collected and handled in accordance with the approved project plans and that documentation of work is adequate and complete. The PCM is responsible for overseeing that the project field team follows the field procedures set forth in the SAP. Reports and technical correspondence will be peer reviewed by an assigned qualified individual, otherwise external to the project, before being finalized.

3.2.3 Audit Records

If an audit is completed, the original records generated for all audits will be retained within the central project files. Records will include audit reports, written replies, the record of completion of corrective actions, and documents associated with the conduct of audits, which support audit findings and corrective actions as appropriate.

3.3 LABORATORY PERFORMANCE AND SYSTEMS AUDITS

3.3.1 Internal Laboratory Audits

3.3.1.1 Internal Laboratory Audit Responsibilities

If performed during this project, the QA Officer will conduct the internal laboratory audit prior to, at the start of, or at any time during field sampling activities.

3.3.1.2 Internal Laboratory Audit Frequency

The internal system audits will be done on an annual basis, while the internal performance audits will be conducted on a quarterly basis.

3.3.1.3 Internal Laboratory Audit Procedures

The internal system audits will include an examination of laboratory documentation on sample receiving, sample log-in, sample storage, COC procedures, sample preparation and analysis, instrument operating records, etc.

The performance audits, if performed will involve preparing blind QC samples and submitting them, along with project samples, to the laboratory for analysis throughout the project. The URS QA Officer will evaluate the analytical results of these blind performance samples to ensure the laboratory maintains acceptable QC performance. If the laboratory fails the QC sample analysis, they will be given another opportunity for blind QC sample analysis. A second failure will be cause for termination of the laboratory from the project.

3.3.2 External Laboratory Audits

3.3.2.1 External Laboratory Audit Responsibilities

An external audit may be conducted, as required, by the QA Officer or designee.

3.3.2.2 External Laboratory Audit Frequency

If performed, the external audit will be conducted prior to, during, or after sampling and analysis activities. These audits may or may not be announced. Repeated failure or gross irregularities in the field duplicate, QA split, and calibration or quality control samples may warrant the need for an audit.

3.3.2.3 Overview of the External Laboratory Audit Process

External audits may include any or all of: review of laboratory analytical procedures, laboratory on-site visits, and/or submission of performance evaluation samples to the laboratory for analysis. Nonconformances will be listed by the QA Officer or designee and a report will be issued to the PCM and the laboratory. The laboratory will be given a week to address the nonconformances to the satisfaction of the QA Officer or designee and the PCM. Failure to resolve any or all audit procedures chosen can lead to laboratory disqualification and the requirement that another suitable laboratory be chosen.

An external on-site review can consist of: sample receipt procedures, custody, and sample security and log in procedures, sample throughput tracking procedure, review of instrument calibration records, instrument logs and statistics (number and type), review of QA procedures, logbooks, sample prep procedures, sample analytical SOP review, instrument (normal or extends quantitation report) reviews, personnel interviews, review of deadlines and glassware prep, and a close out to offer potential corrective action.

It is common practice when conducting an external laboratory audit to review one or more data packages from sample lots recently analyzed by the laboratory. This review will most likely include, but not be limited to, the following:

- Comparison of resulting data to the SOP or method, including coding for deviations;
- Verification of initial and continuing calibrations within control limits;
- Verification of surrogate recoveries and instrument timing results, where applicable;
- Review of extended quantitation reports for comparisons of library spectra to instrument spectra, where applicable;
- Recoveries on control standard runs;
- Review of run logs with run times, ensuring proper order of runs;
- Review of spike recoveries/QC sample data;
- Review of suspected manually integrated GC data and its cause (where applicable);
- Review of GC peak resolution for isolated compounds as compared to reference spectra (where applicable); and
- Assurance that samples are run within holding times.

An external audit may initiate within the laboratory to review procedures and verify the list above. Data packages may be requested either in hard copy or electronic form to be reviewed on or off the laboratory premises.

3.4 SPECIFIC ROUTINE PROCEDURES USED TO EVALUATE DATA PRECISION, ACCURACY, AND COMPLETENESS

The purpose for this investigation falls in line with the data quality objectives (DQOs) for the site. Factors considered in this assessment include, but are not limited to:

- Evaluation of site conditions and potential receptors;

- Evaluation of contaminants known and/or suspected to be of concern at the site, as they relate to the data quality level parameters chosen; and
- The choice of analytical and sample preparation methods for contaminants of concern whose method reportable limits will meet or exceed the data quality level concentrations for those contaminants.

Analytical data quality will be assessed based on these chosen goals and objectives to determine if the objectives have been met. In addition, the data will be reviewed for indications of interferences to results caused by sample matrices, cross contamination during sampling, cross contamination in the laboratory, and sample preservation and storage anomalies (i.e., samples holding time or analytical instrument problems).

3.4.1 Accuracy Assessment

In order to assure the accuracy of the analytical procedures, an environmental sample will be spiked with a known amount of the analytes included in **Tables 1-2** through **1-14**. At a minimum, one sample spike should be included in every set of 20 samples tested on each instrument, for each sample matrix to be tested (i.e., groundwater and soil). The increase in concentration of the analyte observed in the spiked sample, due to the addition of a known quantity of the analyte, compared to the reported value of the same analyte in the parent sample determines the percent recovery.

Accuracy is similarly assessed by determining percent recoveries for surrogate compounds added to each field and QC sample to be analyzed for organic analyses. Accuracy for metals analysis will also be further assessed through determination of percent recoveries for laboratory control samples (as well as MS samples).

Percent recovery for MS/MSD results is determined according to the following equation:

$$\%R = \left(\frac{\text{Amount in Spiked Sample - Amount in Parent Sample}}{Amount\ of\ Spike\ Added} \right) * 100$$

Percent recovery for LCS and surrogate compound results is determined according to the following equation:

$$\%R = \left(\frac{Amount\ Found\ in\ Spiked\ Sample}{Amount\ of\ Spike\ Added} \right) * 100$$

3.4.2 Precision Assessment

The RPD between the spike and matrix spike, or matrix spike and sample duplicate in the case of metals, and field duplicate pair or laboratory duplicate pair is calculated to compare to precision DQOs and plotted. The RPD is calculated according to the following formula.

$$RPD = \left[\frac{| Amount\ in\ Sample\ 1 - Amount\ in\ Sample\ 2 |}{\frac{Amount\ in\ Sample\ 1 + Amount\ in\ Sample\ 2}{2}} \right] * 100$$

3.4.3 Completeness Assessment

Completeness is the ratio of the number of valid sample results to the total number of samples analyzed with a specific matrix and/or analysis. Following completion of the analytical testing, the percent completeness will be calculated by the following equation:

$$Completeness = \left(\frac{Number\ of\ Valid\ Measurements}{Total\ Number\ of\ Measurements} \right) * 100$$

3.5 OVERALL ASSESSMENT OF DATA

The laboratory QC results will be compared to the objectives presented in **Tables 1-2** through **1-14** of this QAPP and assess the apparent human and/or ecological risks associated from any contamination found. Only data generated in association with QC results meeting these objectives will be considered usable for decision-making purposes, which is used to evaluate the nature and extent of contamination at the site.

In addition, the data obtained will be both qualitatively and quantitatively assessed on a project-wide, matrix-specific, parameter-specific, and unit-specific basis. The QA Officer will perform this assessment and the results presented and discussed in detail in the final investigation report. Factors to be considered in this assessment of field and laboratory data will include, but not necessarily be limited to, the following.

- Were all samples obtained using the methodologies proposed in the SAP?
- Were all proposed analyses performed according to the SOPs provided in the QAPP?
- Were samples obtained from all proposed sampling locations and depths?
- Do any analytical results exhibit elevated detection limits due to matrix interferences or contaminants present at high concentrations?
- Were any analytes not expected to be present at the facility, or a given unit, identified as target parameters?
- Were all field and laboratory data validated according to the validation protocols, including project-specific QC objectives, proposed in the QAPP?
- Which data sets were found to be unusable (qualified as "**R"**) based on the data validation results?
- Which data sets were found to be usable for limited purposes (qualified as "**J**") based on the data validation results?

- What effects do qualifiers applied as a result of data validation have on the ability to implement the project decision rules?
- Has sufficient data of appropriate quality been generated to support a human health and/or ecological screening risk assessment?
- Were the human health and/or ecological screening risk assessments conducted properly?
- Can valid conclusions be drawn for all matrices at each unit and/or area under investigation?
- Were all issues requiring corrective action, as presented in the monthly QA Reports to management fully resolved?
- Were the project-specific decision rules used as proposed during the actual investigation?
- For any cases where the proposed procedures and/or requirements have not been met, has the effect of these issues on the project objectives been evaluated?
- Have any remaining data gaps been identified and summarized in the final investigation report?

Based on the overall findings of the investigation and this assessment, were the original project objectives appropriately defined? If not, have revised project objectives been developed?

Corrective action is the process of identifying, recommending, approving, and implementing measures to counter unacceptable procedures or out-of-QC performance that can affect data quality. Corrective action can occur during field activities, laboratory analyses, data validation, and data assessment. All corrective action proposed and implemented will be documented in the regular QA reports to management. Corrective action will only be implemented after approval by the PCM, or designee.

For noncompliance problems, a formal corrective action program will be determined and implemented at the time the problem is identified. The person who identifies the problem is responsible for notifying the PCM, who in turn will notify the USEPA OSC. If the problem is analytical in nature, information on these problems will be promptly communicated to the QA Officer.

Any nonconformance with the established QC procedures in the QAPP or SAP will be identified and corrected in accordance with the QAPP. The PCM or designee, will issue a nonconformance report for each nonconformance condition.

3.6 CORRECTIVE ACTIONS

3.6.1 Field Corrective Action

Corrective action in the field may be needed when the sample network is changed (i.e., more/less samples, sampling locations other than those specified in the SSA, etc.), sampling procedures and/or field analytical procedures require modification, etc., due to unexpected conditions. In general, the Field Area Coordinators, QA Officer, or the PCM may identify the need for corrective action. The field staff in consultation with the Field Area Coordinators will recommend a corrective action. The PCM will approve the corrective measure which will be implemented by the field team. It will be the responsibility of the PCM to ensure the corrective action has been implemented. All corrective actions implemented will be documented in the field logbooks.

3.6.2 Laboratory Corrective Action

Corrective action in the laboratory may occur prior to, during, and after initial analyses. A number of conditions (such as broken sample containers, multiple phases, low/high pH readings, potentially high concentration samples) may be identified during sample login or just prior to analysis. Following consultation with lab analysts and section leaders, it may be necessary for the QA Officer to approve the implementation of corrective action. Depending on the condition encountered, the laboratory QA Officer may consult the QA Officer for input. Conditions during or after analysis that may automatically trigger corrective action or optional procedures include dilution of samples, additional sample extract cleanup, automatic reinjection/reanalysis when certain QC criteria are not met, etc. A summary of method-specific corrective actions is available in the laboratory QAPP (available upon request). All laboratory corrective actions will be documented and also identified in the case narrative of the data packages.

3.6.3 Corrective Action During Data Review/Validation and Assessment

The need for corrective action may be required during either the data review/validation or data assessment. Potential types of corrective action may include resampling by the field team or re-extraction/re-analysis of samples by the laboratory. These actions are dependent upon the ability to mobilize the field team, whether the data to be collected is necessary to meet the required QA objectives (e.g., the holding time for samples is not exceeded, etc.). If the Project Chemist identifies a corrective action situation, it is the PCM who will be responsible for approving the implementation of corrective action, including re-sampling, during data assessment. All corrective actions of this type will be documented by the PCM.

3.7 QUALITY ASSURANCE REPORTS TO MANAGEMENT

3.7.1 Contents of Project QA Reports

The Field Area Coordinators will report to the PCM on a daily basis regarding progress of the fieldwork and quality control issues associated with field activities.

The laboratory maintains detailed procedures for laboratory recordkeeping in order to support the validity of all analytical work. Each data set report submitted to the QA Officer will contain the laboratory's written certification that the requested analytical methods were run and that all QA/QC checks were within established control limits for all samples analyzed.

After receipt of all analytical data, the Project Chemist will submit a Data Review Report for each data set to the QA Officer and the PCM describing the accuracy and precision of the data. Verbal reports will be provided following the receipts of individual packages as they are received. If any QA problems are encountered, the laboratory Project Manager will call the Project Chemist immediately for corrective action and also issue a written report to the Project Chemist. The Project Chemist will immediately report the QA problem to the QA Officer and the PCM.

After the fieldwork is complete and the final analyses are completed, reviewed and validated, a final report will be prepared. The report will summarize the quality assurance and audit information (if completed), indicating any corrective actions taken and the overall results of QAPP compliance. The Project Chemist (or designee) will prepare this final summary and submit this to the QA Officer for review. The report will be utilized during the decision-making process and will be incorporated as part of the Final Report.

4.1 DATA REDUCTION

All data generated through field activities or by the laboratory operation, will be reduced and validated prior to reporting. The laboratory will not disseminate data until it has been subjected to these procedures, which are summarized in subsections below.

4.1.1 Field Data Reduction Procedures

All field data will be written into field logbooks immediately after measurements are taken. If errors are made, results will be legibly crossed out, initialed, and dated by the field member, and corrected in a space adjacent to the original (erroneous) entry. Periodically throughout the field sampling effort, the Field Area Coordinators will review the forms to determine whether the field crew has made any errors.

4.1.2 Laboratory Data Reduction Procedures

Laboratory data reduction procedures are located in the laboratory Quality Programs.

4.2 DATA REVIEW AND VALIDATION

One hundred percent of the data will undergo a data review by the Project Chemist or designee using ADR. The data review will include the review of the QC parameters listed below. The criteria used to evaluate the QC parameters are those criteria identified in **Tables 1-2** through **1-14** and **4-1** through **4-3**.

- Chain of custody;
- Laboratory case narrative/cooler receipt form;
- Holding time / sample preparation;
- Method blanks
- Reagent/preparation blanks (applicable to inorganic analysis);
- MS/MSDs;
- Surrogate spikes;
- Laboratory duplicates;
- Laboratory control standards; and
- Field duplicates.

All data obtained will be properly recorded. The data package will include a full deliverable package capable of allowing the recipient to reconstruct QC information and compare it to QC criteria. The laboratory will reanalyze any samples analyzed in nonconformance with the QC criteria, if sufficient volume is available. It is expected that sufficient volumes/weights of samples will be collected to allow for possible reanalysis if necessary.

Tables 4-1 through **4-3** summarize the general criteria to be used during the review and validation procedures.

4.3 DATA REPORTING

Data reporting procedures will be carried out for field and laboratory operations as indicated below.

4.3.1 Field Data Reporting

Field data reporting will be conducted principally through the transmission of report sheets containing tabulated results of all measurements made in the field and documentation of all field calibration activities.

4.3.2 Laboratory Data Reporting

The task of reporting laboratory data begins after the independent validation activity has been concluded. The QA Officer must perform a final review of the report summaries and case narratives to determine whether the report meets project requirements. In addition to the record of COC, the report format will consist of the following:

4.3.2.1 Case Narrative

- Date of issuance;
- Laboratory analysis performed;
- Any deviations from intended analytical strategy;
- Laboratory batch number;
- Numbers of samples and respective matrices;
- QC procedures utilized and also references to the acceptance criteria;
- Laboratory report contents;
- Project name and number;
- Condition of samples ‘as-received’;
- Discussion of whether or not sample holding times were met;
- Discussion of technical problems or other observations which may have created analytical difficulties; and
- Discussion of any laboratory QC checks which failed to meet project criteria.

4.3.2.2 Chemistry Data Package

- Case narrative for each analyzed batch of samples;
- Summary page indicating dates of analyses for samples and laboratory QC checks;
- Cross referencing of laboratory sample to project sample identification numbers;
- Description of data qualifiers to be used;
- Sample preparation and analyses for samples;
- Sample results (Analytical results will be reported as estimated **J** when detected above the MDL and below the RL);
- Raw data for sample results and laboratory QC samples (including LCS, MS/MSD, surrogates, serial dilutions, blanks, etc.);
- Results of (dated) initial and continuing calibration checks; and
- GC/MS tuning results.

All chemical data will also be submitted in electronic format.

4.4 DATA ASSESSMENT

After all data have been reviewed and validated, a list of all data points having either a high or low bias (qualified data) will be compiled and evaluated for determination of data usability. **Tables 4-1** through **4-3** state how biased data will be qualified.

National Environmental Laboratory Accreditation Conference (NELAC). 2003. July.

United States Army Corps of Engineers (USACE). 1997. Chemical Quality Assurance for HTRW Projects. EM 200-1-6. October.

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United States Environmental Protection Agency (USEPA). 2001. EPA Requirements for Quality Assurance Project Plans. March.

United States Environmental Protection Agency (USEPA). 2002. Guidance for Quality Assurance Project Plans. December.

United States Environmental Protection Agency (USEPA). 2005. Test Methods for Evaluating Solid Waste Physical/Chemical Methods. SW-846. Third Edition. Final Update IIIB. June.

United States Environmental Protection Agency (USEPA). 2006. National Recommended Water Quality Criteria.

Will be supplied under separate cover on a CD-ROM

ATTACHMENT 2 Laboratory Standard Operating Procedures

TABLE 1-1
QUALITY CONTROL LEVEL OF EFFORT FOR ANALYTICAL TESTING

Parameter	QC Measure	Minimum Frequency
All Parameters	Initial Calibration	Initially
All Parameters	Initial Calibration Verification	After each Initial Calibration
All Parameters	Reporting Limit Verification	Bracket project samples
All Parameters	Method Detection Limit Verification	Once per quarter per instrument used
All Parameters	Method Blank	Every analytical batch
VOCs/SVOCs/PAHs	Instrument Tuning	Every 12 hours
Organic Parameters	Continuing Calibration	Every 12 hour period of analysis
Metals	Continuing Calibration	Every 10 samples
Metals	Continuing Calibration Blank	Every 10 samples
All Parameters	Laboratory Control Sample	Every preparation batch
All Parameters	Matrix Spike	Every preparation batch
Organic Parameters	Matrix Spike Duplicate	Every preparation batch
Metals	Matrix Duplicate	Every preparation batch
VOCs/SVOCs/PAHs	Internal Standard	Every sample
Pesticides	Endrin/DDT Breakdown	Every 12 hour period of analysis
Organic Parameters	Surrogate	All QC and project samples
ICP Metals	Interelement Check Standard	Beginning of analytical sequence
Metals	Serial Dilution	As needed to assess new and unusual matrices
Metals	Post digestion spike	As needed to confirm matrix effect
All Parameters	Quality Assurance	At a frequency of 5%
All Parameters	Field Duplicate	Every 10 investigative samples

Note: An analytical batch consists of 20 or fewer samples extracted/analyzed together.
While the frequency of MS/MSD and duplicates is for every analytical batch, URS will submit MS/MSD at a frequency of 1/20 and field duplicates at a rate of 1/10. QA split samples will be collected at a frequency of 5%.
Samples will be submitted to the QA Lab.
DDT - Dichloro-diphenyl-trichloroethane
ICP - Inductively Coupled Plasma

PAHs - Polynuclear Aromatic Hydrocarbons
QA - Quality Assurance
QC - Quality Control
SVOCs - Semivolatile Organic Compounds
VOCs - Volatile Organic Compounds

TABLE 1-2
LABORATORY CONTROL SAMPLE ACCURACY AND PRECISION CRITERIA FOR VOC ANALYSIS

Spiking Compound	Accuracy (%R)		Precision (RPD)	
	Aqueous	Soil/Sediment	Aqueous	Soil/Sediment
1,1,1-Trichloroethane	N/A	70 - 135	N/A	30
1,1,2,2-Tetrachloroethane	N/A	55 - 130	N/A	30
1,1,2-Trichloroethane	N/A	60 - 125	N/A	30
1,1-Dichloroethane	N/A	75 - 125	N/A	30
1,1-Dichloroethene	N/A	65 - 135	N/A	30
1,1,2-Trichloro-1,2,2-trifluoroethane	N/A	60 - 140	N/A	30
1,2-Dichloroethane	N/A	70 - 135	N/A	30
1,2-Dichloropropane	N/A	70 - 120	N/A	30
2-Butanone	N/A	30 - 160	N/A	30
2-Hexanone	N/A	45 - 145	N/A	30
4-Methyl-2-pentanone	N/A	45 - 145	N/A	30
Acetone	N/A	20 - 160	N/A	30
Benzene	N/A	75 - 125	N/A	30
Bromodichloromethane	N/A	70 - 130	N/A	30
Bromoform	N/A	55 - 135	N/A	30
Bromomethane	N/A	30 - 160	N/A	30
Carbon disulfide	N/A	45 - 160	N/A	30
Carbon tetrachloride	N/A	65 - 135	N/A	30
Chlorobenzene	N/A	75 - 125	N/A	30
Chloroethane	N/A	40 - 155	N/A	30
Chloroform	N/A	70 - 125	N/A	30
Chloromethane	N/A	50 - 130	N/A	30
cis-1,2-Dichloroethene	N/A	65 - 125	N/A	30
cis-1,3-Dichloropropene	N/A	70 - 125	N/A	30
Dibromochloromethane	N/A	65 - 130	N/A	30
Dichlorodifluoromethane	N/A	35 - 135	N/A	30
Ethylbenzene	N/A	75 - 125	N/A	30
m,p-Xylenes	N/A	80 - 125	N/A	30
Methylene chloride	N/A	55 - 140	N/A	30
Methyl-tert butyl ether	N/A	60 - 150	N/A	30
o-Xylenes	N/A	75 - 125	N/A	30
Styrene	N/A	75 - 125	N/A	30
Tetrachloroethene	N/A	65 - 140	N/A	30
Toluene	N/A	70 - 125	N/A	30
trans-1,2-Dichloroethene	N/A	65 - 135	N/A	30
trans-1,3-Dichloropropene	N/A	65 - 125	N/A	30
Trichloroethene	N/A	75 - 125	N/A	30
Vinyl chloride	N/A	60 - 125	N/A	30

N/A - Not applicable
%R - Percent Recovery
RPD - Relative Percent Difference
VOC - Volatile Organic Compound
Note: Samples will be re-analyzed if more than 5% of the LCS recoveries are below the evaluation criteria
or any single recovery is < 1/2 the lower limit.
Samples will be prepared using Method 5035 (soil/sediment) and analyzed by Method 8260B

TABLE 1-3
MS/MSD ACCURACY AND PRECISION CRITERIA FOR VOC ANALYSIS

Spiking Compound	Accuracy (%R)		Precision (RPD)	
	Aqueous	Soil/Sediment	Aqueous	Soil/Sediment
1,1,1-Trichloroethane	N/A	60 - 130	N/A	30
1,1,2,2-Tetrachloroethane	N/A	60 - 160	N/A	30
1,1,2-Trichloroethane	N/A	70 - 160	N/A	30
1,1-Dichloroethane	N/A	70 - 140	N/A	30
1,1-Dichloroethene	N/A	50 - 140	N/A	30
1,1,2-Trichloro-1,2,2-trifluoroethane	N/A	60 - 140	N/A	30
1,2-Dichloroethane	N/A	60 - 160	N/A	30
1,2-Dichloropropane	N/A	70 - 150	N/A	30
2-Butanone	N/A	40 - 160	N/A	30
2-Hexanone	N/A	40 - 160	N/A	30
4-Methyl-2-pentanone	N/A	40 - 160	N/A	30
Acetone	N/A	30 - 160	N/A	30
Benzene	N/A	60 - 150	N/A	30
Bromodichloromethane	N/A	60 - 150	N/A	30
Bromoform	N/A	50 - 160	N/A	30
Bromomethane	N/A	40 - 160	N/A	30
Carbon disulfide	N/A	40 - 140	N/A	30
Carbon tetrachloride	N/A	50 - 150	N/A	30
Chlorobenzene	N/A	70 - 130	N/A	30
Chloroethane	N/A	60 - 150	N/A	30
Chloroform	N/A	70 - 140	N/A	30
Chloromethane	N/A	50 - 150	N/A	30
cis-1,2-Dichloroethene	N/A	70 - 140	N/A	30
cis-1,3-Dichloropropene	N/A	60 - 140	N/A	30
Dibromochloromethane	N/A	70 - 150	N/A	30
Dichlorodifluoromethane	N/A	70 - 130	N/A	30
Ethylbenzene	N/A	70 - 130	N/A	30
m,p-Xylenes	N/A	70 - 130	N/A	30
Methylene chloride	N/A	60 - 150	N/A	30
Methyl-tert butyl ether	N/A	60 - 150	N/A	30
o-Xylenes	N/A	70 - 130	N/A	30
Styrene	N/A	30 - 150	N/A	30
Tetrachloroethene	N/A	70 - 130	N/A	30
Toluene	N/A	70 - 140	N/A	30
trans-1,2-Dichloroethene	N/A	70 - 130	N/A	30
trans-1,3-Dichloropropene	N/A	60 - 150	N/A	30
Trichloroethene	N/A	60 - 140	N/A	30
Vinyl chloride	N/A	60 - 150	N/A	30

MS/MSD - Matrix Spike/Matrix Spike Duplicate
N/A - Not Applicable
%R - Percent Recovery
RPD - Relative Percent Difference
VOC - Volatile Organic Compound
Samples will be prepared using Method 5035 (soil/sediment) and analyzed by Method 8260B

TABLE 1-4
LABORATORY CONTROL SAMPLE ACCURACY AND PRECISION CRITERIA FOR SVOC ANALYSIS

Spiking Compound	**Accuracy (%R)**		**Precision (RPD)**	
	Aqueous	**Soil/Sediment**	**Aqueous**	**Soil/Sediment**
1,2,4-Trichlorobenzene	N/A	45 - 110	N/A	30
1,2-Dichlorobenzene	N/A	45 - 95	N/A	30
1,3-Dichlorobenzene	N/A	40 - 100	N/A	30
1,4-Dichlorobenzene	N/A	35 - 105	N/A	30
2,4,5-Trichlorophenol	N/A	50 - 110	N/A	30
2,4,6-Trichlorophenol	N/A	45 - 110	N/A	30
2,4-Dichlorophenol	N/A	45 - 110	N/A	30
2,4-Dimethylphenol	N/A	30 - 105	N/A	30
2,4-Dinitrophenol	N/A	15 - 130	N/A	30
2,4-Dinitrotoluene	N/A	50 - 115	N/A	30
2,6-Dinitrotoluene	N/A	50 - 110	N/A	30
2-Chloronaphthalene	N/A	45 - 105	N/A	30
2-Chlorophenol	N/A	45 - 105	N/A	30
2-Methylnaphthalene	N/A	45 - 105	N/A	30
2-Methylphenol	N/A	40 - 105	N/A	30
2-Nitroaniline	N/A	45 - 120	N/A	30
2-Nitrophenol	N/A	40 - 110	N/A	30
3,3'-Dichlorobenzidine	N/A	10 - 130	N/A	30
3/4-Methylphenol	N/A	40 - 105	N/A	30
3-Nitroaniline	N/A	25 - 110	N/A	30
4,6-Dinitro-2-methylphenol	N/A	30 - 135	N/A	30
4-Bromophenyl phenyl ether	N/A	45 - 115	N/A	30
4-Chloro-3-methylphenol	N/A	45 - 115	N/A	30
4-Chloroaniline	N/A	10 - 95	N/A	30
4-Chlorophenyl phenyl ether	N/A	45 - 110	N/A	30
4-Nitroaniline	N/A	35 - 115	N/A	30
4-Nitrophenol	N/A	15 - 140	N/A	30
Acenaphthylene	N/A	45 - 105	N/A	30
Acenaphthene	N/A	45 - 110	N/A	30
Anthracene	N/A	55 - 105	N/A	30
Benzo(a)anthracene	N/A	50 - 110	N/A	30
Benzo(a)pyrene	N/A	50 - 110	N/A	30
Benzo(b)fluoranthene	N/A	45 - 115	N/A	30
Benzo(g,h,i)perylene	N/A	40 - 125	N/A	30
Benzo(k)fluoranthene	N/A	45 - 125	N/A	30
Benzoic acid	N/A	0 - 110	N/A	30
Benzyl alcohol	N/A	20 - 125	N/A	30
bis(2-Chloroethoxy) methane	N/A	45 - 110	N/A	30
bis(2-Chloroethyl) ether	N/A	40 - 105	N/A	30
bis(2-Chloroisopropyl) ether	N/A	20 - 115	N/A	30
bis(2-Ethylhexyl) phthalate	N/A	45 - 125	N/A	30
Butyl benzyl phthalate	N/A	50 - 125	N/A	30
Carbazole	N/A	45 - 115	N/A	30
Chrysene	N/A	55 - 110	N/A	30
Dibenz(a,h)anthracene	N/A	40 - 125	N/A	30
Dibenzofuran	N/A	50 - 105	N/A	30
Diethyl phthalate	N/A	50 - 115	N/A	30
Dimethyl phthalate	N/A	50 - 110	N/A	30
Di-n-butyl phthalate	N/A	55 - 110	N/A	30
Di-n-octyl phthalate	N/A	40 - 130	N/A	30
Fluoranthene	N/A	55 - 115	N/A	30

TABLE 1-4
LABORATORY CONTROL SAMPLE ACCURACY AND PRECISION CRITERIA FOR SVOC ANALYSIS

Spiking Compound	Accuracy (%R)		Precision (RPD)	
	Aqueous	Soil/Sediment	Aqueous	Soil/Sediment
Fluorene	N/A	50 - 110	N/A	30
Hexachlorobenzene	N/A	45 - 120	N/A	30
Hexachlorobutadiene	N/A	40 - 115	N/A	30
Hexachlorocyclopentadiene	N/A	10 - 130	N/A	30
Hexachloroethane	N/A	35 - 110	N/A	30
Indeno(1,2,3-cd)pyrene	N/A	40 - 120	N/A	30
Isophorone	N/A	45 - 110	N/A	30
Naphthalene	N/A	40 - 105	N/A	30
Nitrobenzene	N/A	40 - 115	N/A	30
N-Nitroso-di-n-propylamine	N/A	40 - 115	N/A	30
N-Nitrosodiphenylamine	N/A	50 - 115	N/A	30
Pentachlorophenol	N/A	25 - 120	N/A	30
Phenanthrene	N/A	50 - 110	N/A	30
Phenol	N/A	40 - 100	N/A	30
Pyrene	N/A	45 - 125	N/A	30

N/A - Not applicable
%R - Percent Recovery
RPD - Relative Percent Difference
SVOCs - Semivolatile Organic Compound
Note: Samples will be re-analyzed if more than 5% of the LCS recoveries are below the evaluation criteria
or any single recovery is < 1/2 the lower limit.
Samples will be prepared using Method 3540C (soil/sediment) and analyzed by Method 8270C

TABLE 1-5
MS/MSD ACCURACY AND PRECISION CRITERIA FOR SVOC ANALYSIS

Spiking Compound	**Accuracy (%R)**		**Precision (RPD)**	
	Aqueous	**Soil/Sediment**	**Aqueous**	**Soil/Sediment**
1,2,4-Trichlorobenzene	N/A	10 - 130	N/A	50
1,2-Dichlorobenzene	N/A	30 - 130	N/A	50
1,3-Dichlorobenzene	N/A	30 - 130	N/A	50
1,4-Dichlorobenzene	N/A	10 - 130	N/A	50
2,4,5-Trichlorophenol	N/A	40 - 130	N/A	50
2,4,6-Trichlorophenol	N/A	40 - 130	N/A	50
2,4-Dichlorophenol	N/A	30 - 130	N/A	50
2,4-Dimethylphenol	N/A	30 - 130	N/A	50
2,4-Dinitrophenol	N/A	20 - 130	N/A	50
2,4-Dinitrotoluene	N/A	20 - 130	N/A	50
2,6-Dinitrotoluene	N/A	50 - 130	N/A	50
2-Chloronaphthalene	N/A	40 - 130	N/A	50
2-Chlorophenol	N/A	20 - 130	N/A	50
2-Methylnaphthalene	N/A	30 - 130	N/A	50
2-Methylphenol	N/A	30 - 130	N/A	50
2-Nitroaniline	N/A	40 - 130	N/A	50
2-Nitrophenol	N/A	30 - 130	N/A	50
3,3'-Dichlorobenzidine	N/A	40 - 130	N/A	50
3/4-Methylphenol	N/A	30 - 130	N/A	50
3-Nitroaniline	N/A	50 - 130	N/A	50
4,6-Dinitro-2-methylphenol	N/A	40 - 130	N/A	50
4-Bromophenyl phenyl ether	N/A	50 - 130	N/A	50
4-Chloro-3-methylphenol	N/A	30 - 130	N/A	50
4-Chloroaniline	N/A	30 - 130	N/A	50
4-Chlorophenyl phenyl ether	N/A	50 - 130	N/A	50
4-Nitroaniline	N/A	50 - 130	N/A	50
4-Nitrophenol	N/A	20 - 130	N/A	50
Acenaphthylene	N/A	30 - 130	N/A	50
Acenaphthene	N/A	20 - 130	N/A	50
Anthracene	N/A	30 - 130	N/A	50
Benzo(a)anthracene	N/A	40 - 130	N/A	50
Benzo(a)pyrene	N/A	40 - 130	N/A	50
Benzo(b)fluoranthene	N/A	50 - 130	N/A	50
Benzo(g,h,i)perylene	N/A	40 - 130	N/A	50
Benzo(k)fluoranthene	N/A	40 - 130	N/A	50
Benzoic acid	N/A	10 - 130	N/A	50
Benzyl alcohol	N/A	30 - 130	N/A	50
bis(2-Chloroethoxy) methane	N/A	30 - 130	N/A	50
bis(2-Chloroethyl) ether	N/A	20 - 130	N/A	50
bis(2-Chloroisopropyl) ether	N/A	20 - 130	N/A	50
bis(2-Ethylhexyl) phthalate	N/A	50 - 130	N/A	50
Butyl benzyl phthalate	N/A	50 - 130	N/A	50
Carbazole	N/A	50 - 130	N/A	50
Chrysene	N/A	40 - 130	N/A	50
Dibenz(a,h)anthracene	N/A	40 - 130	N/A	50
Dibenzofuran	N/A	40 - 130	N/A	50
Diethyl phthalate	N/A	50 - 130	N/A	50
Dimethyl phthalate	N/A	50 - 130	N/A	50
Di-n-butyl phthalate	N/A	50 - 130	N/A	50
Di-n-octyl phthalate	N/A	50 - 130	N/A	50

TABLE 1-5
MS/MSD ACCURACY AND PRECISION CRITERIA FOR SVOC ANALYSIS

Spiking Compound	**Accuracy (%R)**		**Precision (RPD)**	
	Aqueous	**Soil/Sediment**	**Aqueous**	**Soil/Sediment**
Fluoranthene	N/A	40 - 130	N/A	50
Fluorene	N/A	30 - 130	N/A	50
Hexachlorobenzene	N/A	10 - 160	N/A	50
Hexachlorobutadiene	N/A	30 - 130	N/A	50
Hexachlorocyclopentadiene	N/A	10 - 130	N/A	50
Hexachloroethane	N/A	30 - 130	N/A	50
Indeno(1,2,3-cd)pyrene	N/A	40 - 130	N/A	50
Isophorone	N/A	40 - 130	N/A	50
Naphthalene	N/A	20 - 130	N/A	50
Nitrobenzene	N/A	30 - 130	N/A	50
N-Nitroso-di-n-propylamine	N/A	20 - 130	N/A	50
N-Nitrosodiphenylamine	N/A	20 - 140	N/A	50
Pentachlorophenol	N/A	20 - 130	N/A	50
Phenanthrene	N/A	30 - 130	N/A	50
Phenol	N/A	20 - 130	N/A	50
Pyrene	N/A	10 - 160	N/A	50

MS/MSD - Matrix Spike/Matrix Spike Duplicate

N/A - Not applicable

%R - Percent Recovery

RPD - Relative Percent Difference

SVOC - Semivolatile Organic Compound

Samples will be prepared using Method 3540C (soil/sediment) and analyzed by Method 8270C

TABLE 1-6
LABORATORY CONTROL SAMPLE ACCURACY AND PRECISION CRITERIA FOR PAH ANALYSIS

Spiking Compound	Accuracy (%R)		Precision (RPD)	
	Aqueous	Soil/Sediment	Aqueous	Soil/Sediment
Acenaphthylene	N/A	45 - 105	N/A	30
Acenaphthene	N/A	45 - 110	N/A	30
Anthracene	N/A	55 - 105	N/A	30
Benzo(a)anthracene	N/A	50 - 110	N/A	30
Benzo(a)pyrene	N/A	50 - 110	N/A	30
Benzo(b)fluoranthene	N/A	45 - 115	N/A	30
Benzo(g,h,i)perylene	N/A	40 - 125	N/A	30
Benzo(k)fluoranthene	N/A	45 - 125	N/A	30
Chrysene	N/A	55 - 110	N/A	30
Dibenz(a,h)anthracene	N/A	40 - 125	N/A	30
Fluoranthene	N/A	55 - 115	N/A	30
Fluorene	N/A	50 - 110	N/A	30
Indeno(1,2,3-cd)pyrene	N/A	40 - 120	N/A	30
Naphthalene	N/A	40 - 105	N/A	30
Phenanthrene	N/A	50 - 110	N/A	30
Pyrene	N/A	45 - 125	N/A	30

N/A - Not applicable
PAH - Polynuclear Aromatic Hydrocarbon
%R - Percent Recovery
RPD - Relative Percent Difference
Note: Samples will be re-analyzed if more than 5% of the LCS recoveries are below the evaluation criteria or any single recovery is < 1/2 the lower limit.
Samples will be prepared using Method 3540C (soil/sediment) and analyzed by Method 8270C-SIM

TABLE 1-7
MS/MSD ACCURACY AND PRECISION CRITERIA FOR PAH ANALYSIS

Spiking Compound	Accuracy (%R)		Precision (RPD)	
	Aqueous	Soil/Sediment	Aqueous	Soil/Sediment
Acenaphthylene	N/A	30 - 130	N/A	50
Acenaphthene	N/A	20 - 130	N/A	50
Anthracene	N/A	30 - 130	N/A	50
Benzo(a)anthracene	N/A	40 - 130	N/A	50
Benzo(a)pyrene	N/A	40 - 130	N/A	50
Benzo(b)fluoranthene	N/A	50 - 130	N/A	50
Benzo(g,h,i)perylene	N/A	40 - 130	N/A	50
Benzo(k)fluoranthene	N/A	40 - 130	N/A	50
Chrysene	N/A	40 - 130	N/A	50
Dibenz(a,h)anthracene	N/A	40 - 130	N/A	50
Fluoranthene	N/A	40 - 130	N/A	50
Fluorene	N/A	30 - 130	N/A	50
Indeno(1,2,3-cd)pyrene	N/A	40 - 130	N/A	50
Naphthalene	N/A	20 - 130	N/A	50
Phenanthrene	N/A	30 - 130	N/A	50
Pyrene	N/A	10 - 160	N/A	50

MS/MSD - Matrix Spike/Matrix Spike Duplicate

N/A - Not applicable

PAH - Polynuclear Aromatic Hydrocarbon

%R - Percent Recovery

RPD - Relative Percent Difference

Samples will be prepared using Method 3540C (soil/sediment) and analyzed by Method 8270C-SIM

TABLE 1-8
LABORATORY CONTROL SAMPLE ACCURACY AND PRECISION CRITERIA FOR NITROAROMATIC/NITRAMINE ANALYSIS

Spiking Compound	**Accuracy (%R)**		**Precision (RPD)**	
	Aqueous	**Soil/Sediment**	**Aqueous**	**Soil/Sediment**
1,3,5-Trinitrobenzene	65 - 140	75 - 125	30	30
1,3-Dinitrobenzene	45 - 160	80 - 125	30	30
2,4,6-Trinitrotoluene	50 - 145	55 - 140	30	30
2,4-Dinitrotoluene	60 - 135	80 - 125	30	30
2,6-Dinitrotoluene	60 - 135	80 - 120	30	30
2-Amino-4,6-Dinitrotoluene	50 - 155	80 - 125	30	30
2-Nitrotoluene	45 - 135	80 - 125	30	30
3-Nitrotoluene	50 - 130	75 - 120	30	30
4-Amino-2,6-Dinitrotoluene	55 - 155	80 - 125	30	30
4-Nitrotoluene	50 - 130	75 - 125	30	30
HMX	80 - 115	75 - 125	30	30
Nitrobenzene	50 - 140	75 - 125	30	30
RDX	50 - 160	70 - 135	30	30
Tetryl	70 - 130	10 - 150	30	30

HMX - Cyclotetramethylenetetranitramine

%R - Percent Recovery
RDX - Cyclotrimethylenetrinitramine
RPD - Relative Percent Difference
Note: Samples will be re-analyzed if more than one of the LCS recoveries are below the evaluation criteria
or any single recovery is < 1/2 the lower limit.
Samples will be prepared and analyzed using Method 8330

TABLE 1-9
MS/MSD ACCURACY AND PRECISION CRITERIA FOR NITROAROMATIC/NITRAMINE ANALYSIS

Spiking Compound	Accuracy (%R)		Precision (RPD)	
	Aqueous	Soil/Sediment	Aqueous	Soil/Sediment
1,3,5-Trinitrobenzene	70 - 130	70 - 130	30	50
1,3-Dinitrobenzene	60 - 130	70 - 130	30	50
2,4,6-Trinitrotoluene	70 - 130	70 - 130	30	50
2,4-Dinitrotoluene	70 - 130	70 - 130	30	50
2,6-Dinitrotoluene	70 - 130	70 - 130	30	50
2-Amino-4,6-Dinitrotoluene	70 - 130	70 - 130	30	50
2-Nitrotoluene	60 - 130	70 - 130	30	50
3-Nitrotoluene	60 - 130	70 - 130	30	50
4-Amino-2,6-Dinitrotoluene	70 - 130	70 - 130	30	50
4-Nitrotoluene	60 - 130	70 - 130	30	50
HMX	70 - 130	70 - 130	30	50
Nitrobenzene	60 - 130	70 - 130	30	50
RDX	60 - 130	70 - 130	30	50
Tetryl	60 - 130	60 - 130	30	50

HMX - Cyclotetramethylenetetranitramine

MS/MSD - Matrix Spike/Matrix Spike Duplicate
%R - Percent Recovery
RDX - Cyclotrimethylenetrinitramine
RPD - Relative Percent Difference
Samples will be prepared and analyzed using Method 8330

TABLE 1-10
LABORATORY CONTROL SAMPLE ACCURACY AND PRECISION CRITERIA FOR ORGANOCHLORINE PESTICIDE/POLYCHLORINATED BIPHENYL ANALYSIS

Spiking Compound	**Accuracy (%R)**		**Precision (RPD)**	
	Aqueous	**Soil/Sediment**	**Aqueous**	**Soil/Sediment**
Organochlorine pesticides				
Aldrin	25 - 140	45 - 140	30	50
alpha-BHC	60 - 130	60 - 125	30	50
beta-BHC	65 - 125	60 - 125	30	50
delta-BHC	45 - 135	55 - 130	30	50
gamma-BHC	25 - 135	60 - 125	30	50
alpha-Chlordane	65 - 125	65 - 120	30	50
gamma-Chlordane	60 - 125	65 - 125	30	50
4,4'-DDD	25 - 150	30 - 135	30	50
4,4'-DDE	35 - 140	70 - 125	30	50
4,4'-DDT	45 - 140	45 - 140	30	50
Dieldrin	60 - 130	65 - 125	30	50
Endosulfan I	50 - 110	15 - 135	30	50
Endosulfan II	30 - 130	35 - 140	30	50
Endosulfan sulfate	55 - 135	60 - 135	30	50
Endrin	55 - 135	60 - 135	30	50
Endrin aldehyde	55 - 135	35 - 145	30	50
Endrin ketone	75 - 125	65 - 135	30	50
Heptachlor	40 - 130	50 - 140	30	50
Heptachlor epoxide	60 - 130	65 - 130	30	50
Methoxychlor	55 - 150	55 - 145	30	50
Polychlorinated Biphenyls				
Aroclor 1016	25 - 145	40 - 140	30	50
Aroclor 1260	30 - 145	60 - 130	30	50

N/A - Not applicable

%R - Percent Recovery

RPD - Relative Percent Difference

Note: Samples will be re-analyzed if more than 5% of the LCS recoveries are below the evaluation criteria or any single recovery is < 1/2 the lower limit.

Samples will be prepared using Methods 3540C (soil/sediment) and 3520C (aqueous) and analyzed by Methods 8081A and 8082.

TABLE 1-11
MS/MSD ACCURACY AND PRECISION CRITERIA FOR ORGANOCHLORINE PESTICIDE/POLYCHLORINATED BIPHENYL ANALYSIS

Spiking Compound	Accuracy (%R)		Precision (RPD)	
	Aqueous	Soil/Sediment	Aqueous	Soil/Sediment
Organochlorine pesticides				
Aldrin	40 - 140	20 - 160	30	50
alpha-BHC	30 - 150	30 - 150	30	50
beta-BHC	30 - 150	50 - 140	30	50
delta-BHC	30 - 150	30 - 150	30	50
gamma-BHC	50 - 130	20 - 150	30	50
alpha-Chlordane	30 - 150	50 - 140	30	50
gamma-Chlordane	30 - 150	60 - 160	30	50
4,4'-DDD	30 - 150	50 - 160	30	50
4,4'-DDE	30 - 150	50 - 150	30	50
4,4'-DDT	60 - 140	30 - 160	30	50
Dieldrin	50 - 160	10 - 160	30	50
Endosulfan I	30 - 150	50 - 160	30	50
Endosulfan II	30 - 150	40 - 160	30	50
Endosulfan sulfate	30 - 150	40 - 160	30	50
Endrin	50 - 140	20 - 160	30	50
Endrin aldehyde	30 - 150	50 - 140	30	50
Endrin ketone	30 - 150	50 - 160	30	50
Heptachlor	40 - 130	20 - 140	30	50
Heptachlor epoxide	30 - 150	40 - 140	30	50
Methoxychlor	30 - 150	60 - 160	30	50
Polychlorinated Biphenyls				
Aroclor 1016	50 - 130	20 - 160	30	50
Aroclor 1260	70 - 160	20 - 160	30	50

MS/MSD - Matrix Spike/Matrix Spike Duplicate

%R - Percent Recovery

RPD - Relative Percent Difference

Samples will be prepared using Method 3540C (soil/sediment) and analyzed by Methods 8081A and 8082

TABLE 1-12
LABORATORY CONTROL SAMPLE ACCURACY AND PRECISION CRITERIA FOR METALS ANALYSIS

Spiking Compound	**Accuracy (%R)**		**Precision (RPD)**	
	Aqueous	**Soil/Sediment**	**Aqueous**	**Soil/Sediment**
Aluminum	80 - 120	80 - 120	20	20
Antimony	80 - 120	80 - 120	20	20
Arsenic	80 - 120	80 - 120	20	20
Barium	80 - 120	80 - 120	20	20
Beryllium	80 - 120	80 - 120	20	20
Cadmium	80 - 120	80 - 120	20	20
Calcium	80 - 120	80 - 120	20	20
Chromium	80 - 120	80 - 120	20	20
Cobalt	80 - 120	80 - 120	20	20
Copper	80 - 120	80 - 120	20	20
Iron	80 - 120	80 - 120	20	20
Lead	80 - 120	80 - 120	20	20
Magnesium	80 - 120	80 - 120	20	20
Manganese	80 - 120	80 - 120	20	20
Mercury*	80 - 120	80 - 120	20	20
Nickel	80 - 120	80 - 120	20	20
Potassium	80 - 120	80 - 120	20	20
Selenium	80 - 120	80 - 120	20	20
Silver	80 - 120	75 - 120	20	20
Sodium	80 - 120	80 - 120	20	20
Thallium	80 - 120	80 - 120	20	20
Vanadium	80 - 120	80 - 120	20	20
Zinc	80 - 120	80 - 120	20	20

N/A - Not Applicable

%R - Percent Recovery

RPD - Relative Percent Difference

Note: Samples will be re-analyzed if more than 5% of the LCS recoveries are below the evaluation criteria or any single recovery is < 1/2 the lower limit.

All metals will be prepared by Methods 3050B (soil/sediment) and 3010A (aqueous) and analyzed by Method 6010B unless noted otherwise

*Prepared and analyzed by Methods 7470A (aqueous) / 7471A (soil/sediment)

TABLE 1-13
MS/MD ACCURACY AND PRECISION CRITERIA FOR METALS ANALYSIS

Spiking Compound	**Accuracy (%R)**		**Precision (RPD)**	
	Aqueous	**Soil/Sediment**	**Aqueous**	**Soil/Sediment**
Aluminum	75 - 125	75 - 125	20	20
Antimony	75 - 125	75 - 125	20	20
Arsenic	75 - 125	75 - 125	20	20
Barium	75 - 125	75 - 125	20	20
Beryllium	75 - 125	75 - 125	20	20
Cadmium	75 - 125	75 - 125	20	20
Calcium	75 - 125	75 - 125	20	20
Chromium	75 - 125	75 - 125	20	20
Cobalt	75 - 125	75 - 125	20	20
Copper	75 - 125	75 - 125	20	20
Iron	75 - 125	75 - 125	20	20
Lead	75 - 125	75 - 125	20	20
Magnesium	75 - 125	75 - 125	20	20
Manganese	75 - 125	75 - 125	20	20
Mercury*	75 - 125	75 - 125	20	20
Nickel	75 - 125	75 - 125	20	20
Potassium	75 - 125	75 - 125	20	20
Selenium	75 - 125	75 - 125	20	20
Silver	75 - 125	75 - 125	20	20
Sodium	75 - 125	75 - 125	20	20
Thallium	75 - 125	75 - 125	20	20
Vanadium	75 - 125	75 - 125	20	20
Zinc	75 - 125	75 - 125	20	20

MS/MD - Matrix Spike/Matrix Duplicate
N/A - Not Applicable
%R - Percent Recovery
RPD - Relative Percent Difference

All metals will be prepared by Methods 3050B (soil/sediment) and 3010A (aqueous) and analyzed by Method 6010B unless noted otherwise

*Prepared and analyzed by Methods 7470A (aqueous) / 7471A (soil/sediment)

TABLE 1-14
SURROGATE COMPOUND ACCURACY CRITERIA FOR ORGANIC PARAMETERS

Analysis	**Spiking Compound**	**Accuracy**	
		Aqueous	**Soil/Sediment**
VOCs	1,2-Dichloroethane-d_4	N/A	70 - 140
	4-Bromofluorobenzene	N/A	85 - 120
	Toluene-d_8	N/A	85 - 115
SVOCs/PAHs	2,4,6-Tribromophenol	N/A	35 - 125
	2-Fluorobiphenyl	N/A	45 - 105
	2-Fluorophenol	N/A	35 - 105
	Nitrobenzene-d_5	N/A	35 - 100
	Phenol-d_5	N/A	40 - 100
	Terphenyl-d_{14}	N/A	30 - 125
	Tetrachloro-m-xylene	30 - 130	70 - 125

N/A -Not applicable
PAHs - Polynuclear Aromatic Hydrocarbons
SVOCs - Semivolatile Organic Compounds
VOCs - Volatile Organic Compounds

TABLE 1-15
LABORATORY ANALYTICAL METHODS

Parameter	Analyte List	Preparation Method		Method Reference
		Aqueous	Soil/Sediment	
Volatile Organic Compounds	See QAPP Table 1-16	N/A	5035	USEPA SW-846 8260B
Semivolatile Organic Compounds	See QAPP Table 1-17	N/A	3540C	USEPA SW-846 8270C
Metals	See QAPP Table 1-23	3010A/7470A	3050B/7471A	USEPA SW-846 6010B/7470A/7471A

Note: All metals will be analyzed by Method 6010B with the exception of mercury (7470A/7471A).
USEPA SW-846 - USEPA Test Methods for Evaluating Solid Waste, Physical/Chemical Properties, Final Update IIIB, June 2005

N/A -Not applicable
[1] Preparation method is provided in the analytical method.

TABLE 1-16
METHOD DETECTION LIMITS AND REPORTING LIMITS FOR SOIL/SEDIMENT SAMPLES ANALYZED FOR VOCs

Volatile Organic Compounds (µg/kg)	MDL	RL
1,1,1-Trichloroethane	2	5
1,1,2,2-Tetrachloroethane	2	5
1,1,2-Trichloroethane	2	5
1,1-Dichloroethane	2	5
1,1-Dichloroethene	2	5
1,1,2-Trichloro-1,2,2-trifluoroethane	2	5
1,2-Dichloroethane	2	5
1,2-Dichloropropane	2	5
2-Butanone	5	10
2-Hexanone	5	10
4-Methyl-2-Pentanone (MIBK)	5	10
Acetone	5	10
Benzene	2	5
Bromodichloromethane	2	5
Bromoform	2	5
Bromomethane	2	5
Carbon disulfide	2	5
Carbon tetrachloride	2	5
Chlorobenzene	2	5
Chloroethane	2	10
Chloroform	2	5
Chloromethane	2	5
cis-1,2-Dichlorethene	2	5
cis-1,3-Dichloropropene**	2	5
Dibromochloromethane	2	5
Dichlorodifluoromethane	3	10
Ethylbenzene	2	5
m,p-Xylene*	2	10
Methylene chloride	2	10
Methyl-tert butyl ether	2	5
o-Xylene*	2	5
Styrene	2	5
Tetrachloroethene	2	5
Toluene	2	5
trans-1,2-Dichloroethene	2	5
trans-1,3-Dichloropropene**	2	5
Trichloroethene	2	5
Vinyl chloride	2	5

Notes: 1. Values detected above the MDL and below the RL will b

2. The actual RLs may be higher than those listed above. T
adjusted for moisture content and sample volume variatio

MDL - Method Detection Limit
N/A - Not Applicable
RL - Reporting Limit
µg/kg - microgram per kilogram
VOCs - Volatile Organic Compounds

Samples will be prepared using Methods 5035 (soil and sediment)

* KDHE pathway for Xylene (mixed)

** KDHE pathway for 1,3-Dichloropropene

TABLE 1-17
METHOD DETECTION LIMITS AND REPORTING LIMITS FOR SOIL/SEDIMENT SAMPLES ANALYZED FOR SVOCs

Semivolatile Organic Hydrocarbons (µg/kg)	MDL	RL
1,2,4-Trichlorobenzene	167	330
1,2-Dichlorobenzene	167	330
1,3-Dichlorobenzene	167	330
1,4-Dichlorobenzene	167	330
2,4,5-Trichlorophenol	167	330
2,4,6-Trichlorophenol	184	330
2,4-Dichlorophenol	167	330
2,4-Dimethylphenol	167	330
2,4-Dinitrophenol	167	660
2,4-Dinitrotoluene	167	330
2,6-Dinitrotoluene	167	330
2-Chloronaphthalene	167	330
2-Chlorophenol	167	330
2-Methylnaphthalene	167	330
2-Methylphenol	167	330
2-Nitroaniline	167	330
2-Nitrophenol	167	330
3,3'-Dichlorobenzidine	167	330
3-Nitroaniline	167	330
4,6-Dinitro-2-methylphenol	167	660
4-Bromophenyl phenyl ether	167	330
4-Chloro-3-methylphenol	167	330
4-Chloroaniline	167	330
4-Chlorophenyl phenyl ether	167	330
4-Methylphenol	167	330
4-Nitroaniline	167	330
4-Nitrophenol	167	660
Acenaphthylene	167	330
Acenaphthene	167	330
Anthracene	167	330
Benzo(a)anthracene	167	330
Benzo(a)pyrene	167	330
Benzo(b)fluoranthene	167	330
Benzo(g,h,i)perylene	167	330
Benzo(k)fluoranthene	167	330
Benzoic acid	420	830
Benzyl alcohol	167	330
bis(2-Chloroethoxy) methane	167	330
bis(2-Chloroethyl) ether	167	330
bis(2-Chloroisopropyl) ether	167	330
bis(2-Ethylhexyl) phthalate	167	330
Butyl benzyl phthalate	167	330
Carbazole	167	330
Chrysene	167	330
Dibenz(a,h)anthracene	167	330
Dibenzofuran	167	330
Diethyl phthalate	167	330

TABLE 1-17
METHOD DETECTION LIMITS AND REPORTING LIMITS FOR SOIL/SEDIMENT SAMPLES ANALYZED FOR SVOCs

Semivolatile Organic Hydrocarbons (µg/kg)	MDL	RL
Dimethyl phthalate	167	330
Di-n-butyl phthalate	167	330
Di-n-octyl phthalate	167	330
Fluoranthene	167	330
Fluorene	167	330
Hexachlorobenzene	167	330
Hexachlorobutadiene	190	330
Hexachlorocyclopentadiene	167	330
Hexachloroethane	167	330
Indeno(1,2,3-cd)pyrene	167	330
Isophorone	167	330
Naphthalene	167	330
Nitrobenzene	167	330
N-Nitroso-di-n-propylamine	167	330
N-Nitrosodiphenylamine	167	330
Pentachlorophenol	175	660
Phenanthrene	167	330
Phenol	167	330
Pyrene	167	330

Notes: 1. Values detected above the MDL and below the

2. The actual RLs will be higher than those listed a
for moisture content.

MDL - Method Detection Limit
N/A - Not Applicable
RL - Reporting Limit
µg/kg - micrograms per kilogram
Samples will be prepared using Method 3540C and analy

TABLE 1-18
METHOD DETECTION LIMITS AND REPORTING LIMITS FOR SOIL/SEDIMENT SAMPLES ANALYZED FOR PAHs

Polynuclear Aromatic Hydrocarbons (μg/kg)	MDL	RL
Acenaphthylene	10	20
Acenaphthene	10	20
Anthracene	10	20
Benzo(a)anthracene	10	20
Benzo(a)pyrene	10	20
Benzo(b)fluoranthene	10	20
Benzo(g,h,i)perylene	10	20
Benzo(k)fluoranthene	10	20
Chrysene	10	20
Dibenz(a,h)anthracene	10	20
Fluoranthene	10	20
Fluorene	10	20
Indeno(1,2,3-cd)pyrene	10	20
Naphthalene	10	20
Phenanthrene	10	20
Pyrene	10	20

Notes: 1. Values detected above the MDL and below the
2. The actual RLs will be higher than those listed a
for moisture content.

MDL - Method Detection Limit
N/A - Not applicable
RL - Reporting Limit
μg/kg - microgram per kilogram
Samples will be prepared using Method 3540C and analy

TABLE 1-19

METHOD DETECTION LIMITS AND REPORTING LIMITS FOR SOIL/SEDIMENT SAMPLES ANALYZED FOR NITROAROMATICS/NITRAMINES

Nitroaromatics/Nitramines (µg/kg)	MDL	RL
1,3,5-Trinitrobenzene	200	400
1,3-Dinitrobenzene	200	400
2,4,6-Trinitrotoluene	200	400
2,4-Dinitrotoluene	200	400
2,6-Dinitrotoluene	200	400
2-Amino-4,6-Dinitrotoluene	200	400
2-Nitrotoluene	200	400
3-Nitrotoluene	200	400
4-Amino-2,6-Dinitrotoluene	200	400
4-Nitrotoluene	200	400
HMX	200	400
Nitrobenzene	200	400
RDX	200	400
Tetryl	200	400

Notes: 1. Values detected above the MDL and below the
2. The actual RLs will be higher than those listed
for moisture content.

MDL - Method Detection Limit
N/A - Not Applicable
RL - Reporting Limit
µg/kg- microgram per kilogram
Samples will be prepared and analyzed using Method 8

TABLE 1-20
METHOD DETECTION LIMITS AND REPORTING LIMITS FOR AQUEOUS SAMPLES ANALYZED FOR NITROAROMATICS/NITRAMINES

Nitroaromatics/Nitramines (µg/L)	MDL	RL
1,3,5-Trinitrobenzene	0.2	1
1,3-Dinitrobenzene	0.2	1
2,4,6-Trinitrotoluene	0.2	1
2,4-Dinitrotoluene	0.2	1
2,6-Dinitrotoluene	0.2	1
2-Amino-4,6-Dinitrotoluene	0.2	1
2-Nitrotoluene	0.2	1
3-Nitrotoluene	0.3	1
4-Amino-2,6-Dinitrotoluene	0.2	1
4-Nitrotoluene	0.2	1
HMX	0.2	1
Nitrobenzene	0.2	1
RDX	0.2	1
Tetryl	0.2	1

Note: Values detected above the MDL and below the RL will be

MDL - Method Detection Limit
N/A - Not Applicable
RL - Reporting Limit
µg/L - microgram per liter
USEPA - United States Environmental Protection Agency
Samples will be prepared and analyzed using Method 8330

TABLE 1-21
METHOD DETECTION LIMITS AND REPORTING LIMITS FOR SOIL/SEDIMENT SAMPLES ANALYZED FOR ORGANOCHLORINE PESTICIDES/POLYCHLORINATED BIPHENYLS

Organochlorine Pesticides (µg/kg)	MDL	RL
Aldrin	0.6	2
alpha-BHC*	0.6	2
beta-BHC*	0.6	2
delta-BHC*	0.6	2
gamma-BHC (lindane)	0.6	2
alpha-Chlordane**	0.6	2
gamma-Chlordane**	0.6	2
4,4'-DDD	1.2	4
4,4'-DDE	1.2	4
4,4'-DDT	1.2	4
Dieldrin	1.2	4
Endosulfan I***	0.6	2
Endosulfan II***	1.2	4
Endosulfan sulfate***	1.5	4
Endrin	1.2	4
Endrin aldehyde****	1.2	4
Endrin ketone****	1.2	4
Heptachlor	0.6	2
Heptachlor epoxide	0.6	2
Methoxychlor	4	20
Polychlorinated Biphenyls (µg/kg)		
Aroclor 1016#	20	50
Aroclor 1221#	20	50
Aroclor 1232#	20	50
Aroclor 1242#	20	50
Aroclor 1248#	20	50
Aroclor 1254#	20	50
Aroclor 1260#	20	50

Notes: 1. Values detected above the MDL and below the RL wi

2. The actual RLs will be higher than those listed above.
for moisture content.

KDHE - Kansas Department of Health and Environment
KSAAP - Kansas Army Ammunition Plant
MDL - Method Detection Limit
RL - Reporting Limit
µg/kg- microgram per kilogram
Samples will be prepared using Method 3540C and analyzed by
* KDHE for Lindane
** KDHE for Chlordane
*** KDHE pathway for Endosulfan
**** KDHE pathway for Endrin
# KDHE pathway for PCBs

TABLE 1-22
METHOD DETECTION LIMITS AND REPORTING LIMITS FOR AQUEOUS SAMPLES ANALYZED FOR ORGANOCHLORINE PESTICIDES/POLYCHLORINATED BIPHENYLS
KSAAP SI

Organochlorine Pesticides (µg/L)	**MDL**	**RL**	**Sensitivity Goal**	**KDHE Residential Groundwater Pathway**	**KDHE Non-Residential Groundwater Pathway**
Aldrin	0.02	0.1		0.05	0.2
alpha-BHC*	0.02	0.1		0.2	0.2
beta-BHC*	0.02	0.1		0.2	0.2
delta-BHC*	0.02	0.1		0.2	0.2
gamma-BHC (lindane)	0.02	0.1		0.2	0.2
alpha-Chlordane**	0.02	0.1		2	2
gamma-Chlordane**	0.02	0.1		2	2
4,4'-DDD	0.02	0.2		0.9	3
4,4'-DDE	0.02	0.2		0.7	2
4,4'-DDT	0.02	0.2		0.5	2
Dieldrin	0.02	0.2		0.05	0.2
Endosulfan I***	0.02	0.1		90	590
Endosulfan II***	0.02	0.2		90	590
Endosulfan sulfate***	0.02	0.2		90	590
Endrin	0.02	0.2		2	2
Endrin aldehyde****	0.02	0.2		2	2
Endrin ketone****	0.02	0.2		2	2
Heptachlor	0.02	0.1		0.4	0.4
Heptachlor epoxide	0.02	0.1		0.2	0.2
Methoxychlor	0.2	1		40	40
Polychlorinated Biphenyls (µg/L)					
Aroclor 1016#	0.5	1		0.5	0.5
Aroclor 1221#	0.5	1		0.5	0.5
Aroclor 1232#	0.5	1		0.5	0.5
Aroclor 1242#	0.5	1		0.5	0.5
Aroclor 1248#	0.5	1		0.5	0.5
Aroclor 1254#	0.5	1		0.5	0.5
Aroclor 1260#	0.5	1		0.5	0.5

Notes: 1. Values detected above the MDL and below the RL will be reported as estimated J.

2. The actual RLs will be higher than those listed above. The listed reporting limits will be adjusted for moisture content.

KDHE - Kansas Department of Health and Environment

MDL - Method Detection Limit
RL - Reporting Limit
µg/L- microgram per liter
Samples will be prepared using Method 3520C and analyzed by Methods 8081A and 8082
* KDHE for Lindane
** KDHE for Chlordane
*** KDHE pathway for Endosulfan
**** KDHE pathway for Endrin
# KDHE pathway for PCBs

TABLE 1-23

METHOD DETECTION LIMITS AND REPORTING LIMITS FOR SOIL/SEDIMENT SAMPLES ANALYZED FOR METALS

Metals (mg/kg)	MDL	RL
Aluminum	5	20
Antimony	2	10
Arsenic	0.4	1
Barium	0.2	1
Beryllium	0.2	1
Cadmium	0.1	1
Calcium	10	100
Chromium	0.2	1
Cobalt	0.2	1
Copper	0.2	1
Iron	3	20
Lead	0.2	1
Magnesium	10	100
Manganese	0.1	1
Mercury*	0.033	0.1
Nickel	0.2	1
Potassium	25	100
Selenium	0.5	1
Silver	0.25	1
Sodium	10	100
Thallium	0.5	1
Vanadium	0.5	1
Zinc	0.5	1

Notes: 1. Values detected above the MDL and belov

2. The actual RLs will be higher than those li

<DL - Calculate tolerance limit is less than the detec

KDHE - Kansas Department of Health and Environr

MDL - Method Detection Limit

mg/kg - milligram per kilogram

N/A - Not applicable

RL - Reporting Limit

analyzed by Method 6010B unless noted otherwise

*Prepared and analyzed by Method 7471A

TABLE 1-24

METHOD DETECTION LIMITS AND REPORTING LIMITS FOR AQUEOUS SAMPLES ANALYZED FOR METALS

Metals (µg/L)	MDL	RL
Aluminum	60	200
Antimony*	0.2	1
Arsenic*	0.2	1
Barium	2	10
Beryllium*	0.12	1
Cadmium*	0.27	0
Calcium	100	1000
Chromium	2.5	10
Cobalt	2.5	10
Copper	2	10
Iron	40	200
Lead*	0.1	1
Magnesium	100	1000
Manganese	3	10
Mercury**	0.1	0.5
Nickel	2.5	10
Potassium	2.5	10
Selenium	5	10
Silver	3	10
Sodium	100	1000
Thallium	5	10
Vanadium	5	10
Zinc	5	10

Note: Values detected above the MDL and below the RL will be
KDHE - Kansas Department of Health and Environment

MDL - Method Detection Limit
N/A - Not applicable
RL - Reporting Limit
µg/L - microgram per liter
USEPA - United States Environmental Protection Agency
All metals will be prepared by Method 3010A and analyzed by
* - Indicates that these metals will be prepared by Method 3010A
** - Mercury will be prepared and analyzed by Method 7470A

TABLE 2-1
SAMPLE CONTAINERS, PRESERVATION AND HOLDING TIMES

	Parameter	Method Number	Container	Preservative	Holding Time
Aqueous Samples	Semivolatile Organic Compounds	8270C	(2) 500 mL amber bottles	4°C	7 days to extract, 40 days to analysis
	DRO - Wisconsin Modified	8015	(3) 40 mL VOA glass bottl	4°C, HCL	7 days to extract, 40 days to analysis
	Polynuclear Aromatic Hydrocarbons- ext Petro Hydro	8270	(2) 500 mL amber bottles	4°C	7 days to extract, 40 days to analysis
Soil / Sediment Samples	Volatile Organic Compounds	8260B	(3) 40 mL VOA vials	4°C, two vials reagent water, one vial methanol	48 hours until frozen by laboratory (< -7°C) 14 days to analysis
	Semivolatile Organic Compounds	8270C	8 oz jar	4°C	14 days to extract, 40 days to analysis
	Polynuclear Aromatic Hydrocarbons- ext Petro Hydro	8270C-SIM	8 oz jar	4°C	14 days to extract, 40 days to analysis

Sample containers will arrive on site already prepared with the appropriate preservative.
HDPE - High-Density Polyethylene
HNO_3 - Nitric acid

SIM - Selected Ion Monitoring
VOA - Volatile Organic Anlaysis

TABLE 4-1
DATA REVIEW/VALIDATION CRITERIA FOR USEPA METHODS SW8260B, SW8270C AND SW8270C-SIM

QC Check	Minimum Frequency	Acceptance Criteria	Laboratory Corrective Action	Comments	URS Flagging Criteria
MDL study	At initial set-up and subsequently once per 12-month period; otherwise quarterly MDL verification checks shall be performed.	See 40 CFR 136B. MDL verification checks must produce a signal at least 3 times the instrument's noise level.	Run MDL verification check at higher level and set MDL higher or reconduct MDL study.	Samples cannot be analyzed without a valid MDL.	Apply **R**-flag to data without a valid MDL study
Holding time	Every sample	Soil VOCs: 48 hours until frozen by laboratory (< -7°C), 14 days to analysis. Soil SVOCs: 14 days to extract, 40 days to analysis	Contact URS as to additional measures to be taken.		Apply **J**-flag to detects and **UJ**-flag to nondetects to samples < 2X holding time criteria. Apply **J**-flag to detects and **R**-flag to nondetects to samples > 2X holding time criteria.
Sample temperature	Every cooler	4+2 °C	Contact URS as to additional measures to be taken.	None	Samples arriving at temperature 6-10°C, apply **J**-flag to detects and **UJ**-flag to nondetects. Samples arriving at temperature > 10°C, apply **J**-flag to detects and **R**-flag to nondetects (SVOCs only). VOC samples received at temperature > 10°C, **R**-flag all results.
Tuning	Prior to calibration and every 12 hours during sample analysis	Refer to method for specific ion criteria.	Retune instrument and verify. Rerun affected samples.	Problem must be corrected. No samples may be accepted without a valid tune.	Apply **R**-flag to data without a valid tune
Breakdown check (DDT Method 8270C only)	Daily prior to analysis of samples	Degradation ≤ 20% for DDT	Correct problem then repeat breakdown check	No samples shall be run until degradation ≤ 20%. Benzidine and pentachlorophenol should be present at their normal responses and no peak tailing should be observed.	Apply **R**-flag to data without a valid breakdown check
Minimum five point initial calibration for all analytes (ICAL)	Initial calibration prior to sample analysis	1. Average response factor (RF) for SPCCs: VOCs - ≥ 0.30 for Chlorobenzene and 1,1,2,2- tetrachloroethane, ≥ 0.1 for chloromethane, bromoform, and 1,1-dichloroethane. SVOCs - ≥ 0.050.	Correct problem then repeat initial calibration	Problem must be corrected. No samples may be run until ICAL has passed	Apply **R**-flag to data without a valid ICAL

TABLE 4-1
DATA REVIEW/VALIDATION CRITERIA FOR USEPA METHODS SW8260B, SW8270C AND SW8270C-SIM

QC Check	Minimum Frequency	Acceptance Criteria	Laboratory Corrective Action	Comments	URS Flagging Criteria
		Average response factor (RF) for non-SPCCs: VOCs and SVOCs ≥ 0.050.			
		2. RSD for RFs for CCCs: VOCs and SVOCs - ≤ 30% and one option below; Option 1: RSD for each analyte ≤ 15% Option 2: linear least squares regression r ≥ 0.995 Option 3: non-linear regression - coefficient of determination (COD) r^2 ≥ 0.99 (6 points shall be used for second order, 7 points shall be used for third order)			Apply **R**-flag to data without a valid ICAL
		3. RSD for RFs for non-CCCs: VOCs and SVOCs - ≤ 15% and one option below; Option 1: RSD for each analyte ≤ 15% Option 2: linear least squares regression r ≥ 0.995 Option 3: non-linear regression - coefficient of determination (COD) r^2 ≥ 0.99 (6 points shall be used for second order, 7 points shall be used for third order)			Apply **J**-flag to detects and **R**-flag to nondetects.
Second source calibration verification	Once after each initial calibration	Value of second source for all analytes within ± 20% for VOCs and ± 30% for SVOCs of expected value (initial source)	Correct problem and verify second source standard. Rerun second source verification. If that fails, correct problem and repeat initial calibration.	None	**VOCs** High bias: Apply **J**-flag to detects Low bias : Apply **J**-flag to detects and **UJ**-flag to nondetects. Very low bias (%R<60%): Apply **J**-flag to detects and **R**-flag to nondetects. **SVOCs** High bias: Apply **J**-flag to detects Low bias : Apply **J**-flag to detects and **UJ**-flag to nondetects. Very low bias (%R<50%): Apply **J**-flag to detects and **R**-flag to nondetects.

TABLE 4-1
DATA REVIEW/VALIDATION CRITERIA FOR USEPA METHODS SW8260B, SW8270C AND SW8270C-SIM

QC Check	Minimum Frequency	Acceptance Criteria	Laboratory Corrective Action	Comments	URS Flagging Criteria
Evaluation of relative retention times	Each sample	RRT of each target analyte in each calibration standard within ± 0.06 RRT units.	Correct problem, then rerun ICAL	None	Apply **R**-flag to data outside retention time window
Manual Integration	All	Acceptance by URS Chemist or 3rd Party validator	Provide justification for each instance of manual integration	Laboratory will provide chromatograms before and after each manual integration	Apply **R**-flag to all compounds with improper integration
Calibration verification (CV)	Daily, before sample analysis, and every 12 hours of analysis time.	Average RF for SPCCs: VOCs ≥ 0.30 for Chlorobenzene and 1,1,2,2-tetrachlorolethane, ≥ 0.1 for chloromethane, bromoform, and 1,1-dichloroethane. SVOCs ≥ 0.050.			Apply **J**-flag to detects and **UJ**-flag to nondetects if average RF not met
		Average RF for non-SPCCs: VOCs and SVOCs ≥ 0.050.			Apply **J**-flag to detects and **UJ**-flag to nondetects if average RF not met
		% Difference/Drift for CCCs: VOCs and SVOCs ≤ 20%D (Note: D ≤ difference when using RFs or drift when using least squares regression or non-linear calibration.)	Correct problem, then rerun CV. If that fails, repeat initial calibration.	None	High bias: Apply **J**-flag to detects Low bias: Apply **J**-flag to detects and **R**-flag to nondetects
		% Difference/Drift for non-CCCs: VOCs and SVOCs ≤ 20%D (Note: D ≤ difference when using RFs or drift when using least squares regression or non-linear calibration.)	Correct problem, then rerun CV.	None	High bias: Apply **J**-flag to detects Low bias: Apply **J**-flag to detects and **R**-flag to nondetects
Internal standards verification	In all field samples and standards	Retention time ± 30 seconds from retention time of the midpoint standard in the CV	Inspect mass spectrometer and GC for malfunctions. Reanalysis of samples analyzed while system was malfunctioning is mandatory.	Sample results are not acceptable without a valid IS verification.	If corrective action fails in field samples, apply **J**-flag to detects and **UJ**-flag to nondetects to analytes with IS recoveries between 30%-50% or > 150%. Apply **R**-flag to samples with IS recoveries < 30%.
		EICP area within - 50% to + 100% of ICAL midpoint standard			

TABLE 4-1
DATA REVIEW/VALIDATION CRITERIA FOR USEPA METHODS SW8260B, SW8270C AND SW8270C-SIM

QC Check	Minimum Frequency	Acceptance Criteria	Laboratory Corrective Action	Comments	URS Flagging Criteria
Method blank	One per preparatory batch	No analytes detected > 1/2 RL. For common laboratory contaminants, no anlaytes detected > RL.	Correct problem. If required, reprep and reanalyze method blank and all samples processed with the contaminated blank.	None	Apply **U**-flag to analytes detected in field samples < 5X blank contamination (<10X for common laboratory contaminants).
Laboratory control sample (LCS)	One per preparatory batch	QC acceptance criteria specified in QAPP Tables 1-2, 1-4 and 1-6.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available.	LCS should contain all analytes to be reported, including surrogates	High bias: Apply **J**-flag to detects. Low bias: Apply **J**-flag to detects and **UJ**-flag to nondetects. Very low bias (%R<30%): Apply **J**-flag to detects and **R**-flag to nondetects.
Matrix spike/Matrix spike duplicate (MS/MSD)	One per preparatory batch per matrix	QC acceptance criteria specified in QAPP Tables 1-3, 1-5 and 1-7.	Examine the project-specific DQOs. Contact URS as to additional measures to be taken.	For matrix evaluation only. If MS results are outside QC limits, the data shall be evaluated to determine the source of difference and to determine if there is a matrix effect or analytical error.	For the specific analyte(s) in the parent sample, apply **J**-flag to detects if acceptance criteria are not met. MS/MSD data should not be used alone to qualify data.
Laboratory sample duplicate	One per preparatory batch per matrix (if MS/MSD is not performed)	RPD ≤ 30% (sample and sample duplicate)	Examine the project-specific DQOs. Contact URS as to additional measures to be taken.	For the specific analyte(s) in the parent sample, apply **J**-flag to detects if acceptance criteria are not met.	Data shall be evaluated to determine the source of difference. Apply **J**-flag to detects if acceptance criteria are not met.

TABLE 4-1
DATA REVIEW/VALIDATION CRITERIA FOR USEPA METHODS SW8260B, SW8270C AND SW8270C-SIM

QC Check	Minimum Frequency	Acceptance Criteria	Laboratory Corrective Action	Comments	URS Flagging Criteria
Surrogate spike	All field and QC samples	QC acceptance criteria specified in QAPP Table 1-14.	For QC and field samples, correct problem, then reprep and reanalyze all failed samples for failed surrogates in the associated preparatory batch, if sufficient sample material is available.	Analytes identified in QAPP Table 1-14.	SW8260B: High bias: Apply **J**-flag to detects Low bias: Apply **J**-flag to detects and **UJ**-flag to nondetects. Very low bias (%R<10%): Apply **J**-flag to detects and **R**-flag to nondetects. SW8270C: Must be two or more surrogate recoveries from the same fraction outside criteria. Each fraction will be qualified separately. High bias: Apply **J**-flag to detects Low bias: Apply **J**-flag to detects and **UJ**-flag to nondetects. Very low bias (%R<10%): Apply **J**-flag to detects and **R**-flag to nondetects.
Field Duplicate	One per 10 field samples	See Table 4-1 of the LCG, Ver 5	N/A	N/A	None

TABLE 4-2
DATA REVIEW/VALIDATION CRITERIA FOR USEPA METHODS SW8081A, SW8082 AND SW8330

QC Check	Minimum Frequency	Acceptance Criteria	Laboratory Corrective Action	Comments	Flagging Criteria
MDL study	At initial set-up and subsequently once per 12-month period; otherwise quarterly MDL verification checks shall be performed.	See 40 CFR 136B. MDL verification checks must produce a signal at least 3 times the instrument's noise level.	Run MDL verification check at higher level and set MDL higher or reconduct MDL study.	Samples cannot be analyzed without a valid MDL.	Apply **R**-flag to data without a valid MDL study
Holding time	Every sample	Soil samples: 14 days to extract, 40 days to analysis Aqueous samples: 7 days to extract, 40 days to analysis	Contact URS as to additional measures to be taken.		Apply **J**-flag to detects and **UJ**-flag to nondetects to samples < 2X holding time criteria. Apply **J**-flag to detects and **R**-flag to nondetects to samples > 2X holding time criteria.
Sample temperature	Every cooler	4+2 °C	Contact URS as to additional measures to be taken.	None	Samples arriving at temperature 6-10°C, apply **J**-flag to detects and **UJ**-flag to nondetects. Samples arriving at temperature > 10°C, apply **J**-flag to detects and **R**-flag to nondetects.
Breakdown check (Endrin/DDT Method 8081A only)	Daily prior to analysis of samples	Degradation ≤ 15% for both endrin and DDT	Correct problem then repeat breakdown check	No samples shale be analyzed until degradation ≤ 15%	Apply **R**-flag to data without valid breakdown check
Minimum five point initial calibration for all analytes (ICAL)	Initial calibration prior to sample analysis	One of the options below: Option 1: RSD for each analyte ≤ 20% Option 2: linear least squares regression r ≥ 0.995 Option 3: non-linear regression: coefficient of determination (COD) $r^2 \geq$ 0.99 (6 points shall be used for second order, 7 points shall be used for third order)	Correct problem then repeat initial calibration		Apply **R**-flag to data without a valid ICAL

TABLE 4-2
DATA REVIEW/VALIDATION CRITERIA FOR USEPA METHODS SW8081A, SW8082 AND SW8330

QC Check	Minimum Frequency	Acceptance Criteria	Laboratory Corrective Action	Comments	Flagging Criteria
Second source calibration verification	Once after each initial calibration	Value of second source for all analytes within ± 15% of expected value (initial source)	Correct problem and verify second source standard. Rerun second source verification. If that fails, correct problem and repeat initial calibration.	Problem must be corrected. No samples may be run until calibration has been verified.	High bias: Apply **J**-flag to detects. Slight Low bias : Apply **J**-flag to detects and **UJ**-flag to nondetects. Low bias (%R<80%): Apply **J**-flag to detects and **R**-flag to nondetects.
Retention time window verification	Each calibration verification standard	Analyte within established window	Correct problem, then reanalyze all samples analyzed since the last acceptable retention time check. If they fail, redo ICAL and reset retention time window	No samples shall be run without a verified retention time window at the initial calibration	Apply **R**-flag to data outside retention time window
Manual Integration	All	Acceptance by URS Chemist or 3rd Party validator	Provide justification for each instance of manual integration	Laboratory will provide chromatograms before and after each manual integration	Apply **R**-flag to all compounds with improper integration
Calibration verification (CCV)	After every 12 hours and at the end of the analysis sequence.	All analytes within ± 15% of expected value form ICAL	Correct problem then repeat CCV and reanalyze all samples since last successful calibration verification	If %D for an individual analyte is > 15%, no samples may be analyzed until the problem has been corrected	High bias: Apply **J**-flag to detects. Low bias: Apply **J**-flag to detects and **R**-flag to nondetects.
Method blank	One per preparatory batch	No analytes detected > 1/2 RL. For common laboratory contaminants, no anlaytes detected > RL.	Correct problem. If required, reprep and reanalyze method blank and all samples processed with the contaminated blank.	None	Apply **U**-flag to analytes detected in field samples < 5X blank contamination.
Laboratory control sample (LCS)	One per preparatory batch	QC acceptance criteria specified in QAPP Tables 1-8 and 1-10.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available.	LCS should contain all analytes to be reported, including surrogates	High bias: Apply **J**-flag to detects. Low bias: Apply **J**-flag to detects and **UJ**-flag to nondetects. Very low bias (%R<30%): Apply **J**-flag to detects and **R**-flag to nondetects.

TABLE 4-2
DATA REVIEW/VALIDATION CRITERIA FOR USEPA METHODS SW8081A, SW8082 AND SW8330

QC Check	Minimum Frequency	Acceptance Criteria	Laboratory Corrective Action	Comments	Flagging Criteria
Matrix spike/Matrix spike duplicate (MS/MSD)	One per preparatory batch per matrix	QC acceptance criteria specified in QAPP Tables 1-9 and 1-11.	Examine the project-specific DQOs. Contact URS as to additional measures to be taken.	For matrix evaluation only. If MS results are outside QC limits, the data shall be evaluated to determine the source of difference and to determine if there is a matrix effect or analytical error.	For the specific analyte(s) in the parent sample, apply **J**-flag to detects if acceptance criteria are not met. MS/MSD data should not be used alone to qualify data.
Laboratory sample duplicate	One per preparatory batch per matrix (if MS/MSD is not performed)	RPD ≤ 30% (sample and sample duplicate)	Examine the project-specific DQOs. Contact URS as to additional measures to be taken.	For the specific analyte(s) in the parent sample, apply **J**-flag to detects if acceptance criteria are not met.	Data shall be evaluated to determine the source of difference. Apply **J**-flag to detects if acceptance criteria are not met.
Surrogate spike	All field and QC samples	QC acceptance criteria specified in QAPP Table 1-14	For QC and field samples, correct problem, then reprep and reanalyze all failed samples for failed surrogates in the associated preparatory batch, if sufficient sample material is available.	Analytes identified in QAPP Table 1-14	<u>High bias</u>: Apply **J**-flag to detects <u>Low bias</u>: Apply **J**-flag to detects and **UJ**-flag to nondetects. <u>Very low bias</u> (%R<10%): Apply **J**-flag to detects and **R**-flag to nondetects.
Confirmation of positive results (second column or detector)	All positive results must be confirmed	Calibration and QC criteria same as for initial or primary column analysis. Results between primary and second column RPD ≤ 40%	N/A	Report the higher of two confirmed results unless overlapping peaks are causing erroneously high results, then report the non-affected result and document in the case narrative.	Apply **J**-flag if RPD >40%. Apply **U**-flag if primary result not confirmed.
Field Duplicate	One per 10 field samples	See Table 4-1 of the LCG, Ver 5	N/A	N/A	None

TABLE 4-3
DATA REVIEW/VALIDATION CRITERIA FOR USEPA METHODS 6010B, 6020, AND 7470A/7471A

QC Check	Minimum Frequency	Acceptance Criteria	Laboratory Corrective Action	Comments	Flagging Criteria
MDL study	At initial set-up and subsequently once per 12-month period; otherwise quarterly MDL verification checks shall be performed.	See 40 CFR 136B. MDL verification checks must produce a signal at least 3 times the instrument's noise level.	Run MDL verification check at higher level and set MDL higher or reconduct MDL study.	Samples cannot be analyzed without a valid MDL.	Apply **R**-flag to data without a valid MDL study
IDL study (ICP only)	At initial set-up and after significant change	Detection limits established shall be ≤ MDL	N/A	Samples cannot be analyzed without a IDL.	Apply **R**-flag to data without a valid IDL study
Holding time	Every sample	Soil samples: 6 months (Hg 28 days) Aqueous samples (preserved with HNO_3, pH<2): 6 months (Hg 28 days)	Contact URS as to additional measures to be taken.		Apply **J**-flag to detects and **UJ**-flag to nondetects to samples < 2X holding time criteria. Apply **J**-flag to detects and **R**-flag to nondetects to samples > 2X holding time criteria.
Tuning (6020 only)	Prior to initial calibration	Mass calibration ≤ 0.1 amu from the true value; resolution < 0.9 amu full width at 10% peak height; for stability, RSD ≤ 5% for at least four replicate analytes.	Retune instrument then reanalyze tuning solutions	No analysis shall be performed without a valid MS tune	Apply **R**-flag to data without a valid MS tune
Initial calibration for all analytes (ICAL) ICP: minimum of two standards and a blank CVAA: minimum 5 standards and a calibration blank	Initial calibration prior to sample analysis	r ≥ 0.995	Correct problem then repeat initial calibration		Apply **R**-flag to data without a valid ICAL
Second source calibration verification (ICV)	Once after each initial calibration, prior to sample analysis	Value of second source for all analytes within ± 10% of expected value (initial source)	Correct problem and verify second source standard. Rerun ICV. If that fails, correct problem and repeat initial calibration.	Problem must be corrected. No samples may be run until calibration has been verified.	Apply **R**-flag to data without second source verification

TABLE 4-3
DATA REVIEW/VALIDATION CRITERIA FOR USEPA METHODS 6010B, 6020, AND 7470A/7471A

QC Check	Minimum Frequency	Acceptance Criteria	Laboratory Corrective Action	Comments	Flagging Criteria
Calibration verification (CCV)	After every 10 samples and at the end of the analysis sequence.	ICP: All analytes within ± 10% of expected value from ICAL. CVAA: Mercury within ± 20% of expected value	Correct problem, rerun calibration verification. If that fails, then repeat initial calibration. Reanalyze all samples since the last successful calibration verification.	Problem must be corrected. Results may not be reported without a valid CCV.	Apply **R**-flag to data with CCV outside criteria.
Method blank	One per preparatory batch	No analytes detected > 1/2 RL. For common laboratory contaminants, no anlaytes detected > RL.	Correct problem. If required, reprep and reanalyze method blank and all samples processed with the contaminated blank.	None	Apply **U**-flag to analytes detected in field samples < 5X blank contamination.
Interference check solutions (ICS) (ICP only)	At the beginning of an analytical run	ICS-A: Absolute value of concentration for all nonspiked analytes < 2X MDL (unless they are a verified trace impurity from one of the spiked analytes). ICS-AB: Within ± 20% of expected value.	Terminate analysis; locate and correct problem; reanalyze ICS.	No samples may be analyzed without a valid ICS	Apply **R**-flag to data with ICS outside criteria.
Laboratory control sample (LCS)	One per preparatory batch	QC acceptance criteria specified in QAPP Table 1-12.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available.	LCS should contain all analytes to be reported.	High bias: Apply **J**-flag to detects. Low bias: Apply **J**-flag to detects and **UJ**-flag to nondetects. Very low bias (ICP Metals %R<60%, Hg %R < 50%): Apply **J**-flag to detects and **R**-flag to nondetects.
Dilution test	Each preparatory batch or when a new or unusual matrix is encountered	Five fold dilution must agree within ± 10% of the original determination.	ICP: Perform post-digestion spike (PDS) addition. CVAA: Perform matrix spike	Only applicable for samples with concentrations > 50X MDL (6010B), >100X (6020) or > 25X MDL (CVAA)	Apply **J**-flag to data from parent sample outside criteria

TABLE 4-3
DATA REVIEW/VALIDATION CRITERIA FOR USEPA METHODS 6010B, 6020, AND 7470A/7471A

QC Check	Minimum Frequency	Acceptance Criteria	Laboratory Corrective Action	Comments	Flagging Criteria
Post-digestion spike (ICP only)	When dilution test fails or analyte concentration in all samples < 50X MDL (6010B) or < 100X MDL (6020)	75-125%	Run samples by method of standard additions	The spike addition should produce a level between 10-100X MDL	Apply **J**-flag to data from parent sample outside criteria
Matrix spike/Matrix spike duplicate (MS/MSD)	One per preparatory batch per matrix	QC acceptance criteria specified in QAPP Table 1-13.	Examine the project-specific DQOs. Contact URS as to additional measures to be taken.	For matrix evaluation only. If MS results are outside QC limits, the data shall be evaluated to determine the source of difference and to determine if there is a matrix effect or analytical error. No data flagging if native concentrations are > 4X spiking amount	For the specific analyte(s) in the batch. High bias: Apply **J**-flag to detects. Low bias: Apply **J**-flag to detects and **UJ**-flag to nondetects. Very low bias (%R<30%): Apply **J**-flag to detects and **R**-flag to nondetects.
Laboratory sample duplicate	One per preparatory batch per matrix (if MS/MSD is not performed)	RPD ≤ 20% (sample and sample duplicate)	Examine the project-specific DQOs. Contact URS as to additional measures to be taken.	For the specific analyte(s) in the parent sample, apply **J**-flag to detects if acceptance criteria are not met.	Data shall be evaluated to determine the source of difference. Apply **J**-flag to detects if acceptance criteria are not met.
Field Duplicate	One per 10 field samples	See Table 4-1 of the LCG, Ver 5	N/A	N/A	None

Enbridge Marshall Pipeline Release
Oil Containment
and Recovery Plan
Enbridge, Marshall Michigan

July 29, 2010

Prepared by URS Corporation

As required in the Federal Response Framework and Area Contingency Plans, Enbridge Energy, Limited Parternship (Enbridge) owns and maintains extensive emergency response equipment throughout its operating liquids pipeline system. In addition, Enbridge has working agreements with qualified contractors to supply supplemental resources in the case of a significant case discharge scenario.

For the Enbridge Marshall, Michigan pipeline release, Enbridge has enacted its Emergency Response Plan to provide a rapid and comprehensive response. Oil Spill Response Organizations (OSRO) as classified by the United States Coast Guard (USGC) have been deployed in force along with other HAZWOPER trained contractors for the recovery and containment of oil.

Enbridge, in tandem with the Unified Incident Command Organization, has developed objectives for the recovery and containment of oil which are intended to be protective of human health and the environment:

- Remove the ongoing active source of crude oil by shutting down oil flow to the ruptured pipeline. This objective was completed;
- Remove the ongoing residual source of crude oil to Talmadge Creek via installing berm(s) between the pipeline and Talmadge Creek;
- Remove and/or treatment of crude oil and impacted media in the vicinity of the pipeline release;
- Containment and recovery of oil at the Talmadge Creek flume via continued engineering controls, deployment of water-based skimmers and booms; and
- Containment and recovery of recoverable oil in Talmadge Creek and the Kalamazoo River via a system of water-deployed booms and skimmers.

A zone-based system to strategically recover oil as safely and quickly as possible has been implemented. These zones include:

- Division A: Leak Site to Downgradient Flume
- Division B: Flume Site to Fourteen Mile Rd.
- Division C: Fourteen Mile Rd. to Ange
- Division D: Linear Park to County Line
- Division E: Kalamazoo County

Resources to individually address each of these zones have been organized and deployed to contain and collect oil. As of the date of this plan, the following resource have been deployed to address the containment and recovery of oil:

- 250 personnel as of July 28, 2010 with an expected peak of over 450 personnel;
- 12 boats
- 12,310 feet of boom
- 13 high volume oil skimmers

- 46 vacuum trucks
- 17 light plants (for night time illumination- 24/7 operations)
- 60 portable frac tanks

This plan and resources will continue to be modified to reflect ongoing and/or changing conditions.

Enbridge Energy, Limited Partnership
(Enbridge) Marshall Pipeline Release

Source Release Area
Remediation Plan
Enbridge, Marshall Michigan

July 29, 2010

Prepared by URS Corporation

ENBRIDGE MARSHALL RESPONSE TO PIPELINE RELEASE REMEDIATION PLAN FOR UPSTREAM IMPACTED AREAS

July 29, 2010

The Enbridge pipeline in the vicinity of Marshall, Michigan experienced a release on July 26, 2010. Two main areas have been impacted by this release and include the upstream release area and the downstream release area. The upstream release area is a lowland area with marshy terrain. The downstream areas include impacts to the banks of Talmadge Creek and Kalamazoo River area. This work plan titled "Remediation Plan for Upstream Impacted Areas" will address lowland areas and a separate and companion document titled as "Remediation Plan for Downstream Impacted Areas" that will address the bank and in creek/river areas.

Source Release Area Remediation Plan Overview

The Source Release Area Remediation Plan (Source Remediation Plan) is being submitted in response to a release of crude oil from a pipeline operated by Enbridge near Marshall, Michigan. The source release area (Source Area) is located south of Enbridge pipeline 6B between the pipeline release point and Talmadge Creek. The Source Area consists of wooded lowland with marshy terrain.

The objectives of the Source Remediation Plan are as follows:

- Prevent additional product from entering Talmadge Creek;
- Define the horizontal and vertical extent of impact from the release in the Source Area;
- Evaluate exposure routes and potential receptors;
- Remediate source area; and

- Collect and analyze verification of remediation samples.

Source Area Product Containment

To prevent additional crude oil from entering Talmadge Creek, a low berm (i.e. <5 feet) and temporary impoundment will be constructed and maintained across the marshy area at the point of product entry into Talmadge Creek. The berm will be equipped with underflow culverts to allow surface water to continue to flow into Talmadge Creek. Product will be collected and removed from the ponded surface water behind the berm.

Definition of the horizontal and vertical extent of product impact

The horizontal and vertical extent of crude oil impact will be determined to direct remediation efforts. Methods used to determine the extent of product impact may include the following;

- Visual identification;
- Installation of monitoring wells;
- Analytical data;
- Geophysical surveys;
- Test pits; and
- Hand auger inspections.

Extensive geographical information systems (GIS) mapping of the watershed is available at www.kalamazooriver.net. The location of data points used to define the horizontal and vertical extent of product impact will be collected using a sub meter geographical positioning system (GPS) to be consistent with existing GIS data for the area. The location and corresponding data will be entered into a GIS system. Maps of the known extent of product impact within the Source Area will be regularly updated from the GIS data to efficiently manage the remediation effort.

Receptor Survey

A receptor survey has been implemented and will continue to be modified to effectively identify potential migration pathways and potential receptors for product within the Source Area. If the survey determines that a potential receptor is at risk a site specific monitoring program will be implemented. Monitoring may include sampling of potable wells, groundwater, surface water and air.

Source Area Product Remediation

Product identified within the Source Area will be remediated by excavation and disposal and/or other acceptable means including:

- Installation of product recovery trenches; and
- Vacuuming and skimming.

If the above methods prove to be ineffective, Enbridge will examine other product recovery or control options. Any changes will be communicated to and coordinated with the EPA prior to proceeding. Remediation waste will be transported and disposed of at a USEPA approved disposal facility as outlined in the Waste Treatment, Transportation and Disposal Plan.

Confirmation Sampling

Soil and/or ground water samples will be collected from the excavation to verify that remediation of the Source Area has been completed. The verification samples will be collected following the Michigan Department of Natural Resources and Environment Operational Memoranda *Sampling Strategies and Statistics Training Materials for Part 201 Cleanup Criteria*, dated 2002. This confirmatory sampling plan may be modified as appropriate, based on the excavation observations. All changes will be communicated to and coordinated with the EPA.

Enbridge Energy, Limited Partnership
(Enbridge) Marshall Pipeline Release

Remediation Plan for Downstream Impacted Areas

July 29, 2010

Prepared by URS Corporation

ENBRIDGE MARSHALL RESPONSE TO PIPELINE RELEASE
REMEDIATION PLAN FOR DOWNSTREAM IMPACTED AREAS
July 29, 2010

The Enbridge petroleum pipeline in the vicinity of Marshall, Michigan experienced a release of crude oil on July 26, 2010. Two main areas have been impacted by this release and include the upstream release area and the downstream release area. The upstream release area is a lowland low area with marshy terrain , and the downstream areas include impacts to bank and in river areas. This work plan titled “Remediation Plan for Downstream Impacted Areas” will address the bank and in river areas. A separate document titled as “Source Release Area Remediation Plan” will address the source area.

DOWNSTREAM IMPACTED AREA REMEDIATION OVERVIEW

Downstream impacted areas will be assessed and then appropriate remedial responses will be implemented. Aerial photography and visual surveys will be conducted on a regular basis during the product recovery efforts to document impacted areas downstream of the source area. Those bank and in river areas found to be adversely impacted may require a combination of methods, possibly including low pressure rinsing and/or vegetation cutting and bagging. Any removed vegetation will be managed as required by USEPA and disposed of at a USEPA approved disposal facility.

The sequencing and scheduling of the bank and sediment removal process will be driven by decisions made in the field based on existing site conditions as they are encountered during the phased assessment work described in this workplan.

SITE ASSESSMENT

Based on the recovery phase aerial photo documentation and visual inspections, those areas showing where free oil or sheen is evident will be prioritized based on location and volume, and then addressed.

IMPACTED AREA PREPARATION

Subsequent to mobilization to the site, the following preparatory activities will take place prior to the initiation of sediment removal:

1. **Pre-removal Survey**: The removal contractor personnel will evaluate existing data from the area and familiarize themselves with current site conditions by conducting their own on-site survey of the site to acquire site-specific data.
2. **Maintenance of Existing Boom and Skimmer Operations:** Areas to be rinsed will have an existing boom and skimmer system inspection to ensure that freed residual oil will be captured.

REMEDIAL ACTIONS

To facilitate the riverbank remedial Enbridge's contractors may employ the following remedial actions:

1. **Low Pressure Rinsing:** Impacted riverbank and vegetation will be rinsed with a land or boat based river water low pressure rinse,. Work will be performed in an upstream to downstream progression.
2. **Vegetation Bagging:** In areas where rinsing is difficult or impracticable, direct cutting and bagging of affected vegetation may be employed. Bagged vegetation will be characterized and disposed at a USEPA acceptable facility. This will entail cutting vegetation above the root mass to deter erosion and allow the existing plants to regenerate.

POST REMEDIAL ASSESSMENT

The effectiveness of the cleaning will be assessed as the completion of areas progresses downstream. Areas still showing visual impacts will be re-rinsed. For those areas continuing to show signs of impact, further evaluation, which may include sampling will be conducted.

Enbridge believes minimum disturbance of the river banks and beds are in the best interests of the environment. Therefore, Enbridge proposes intrusive disturbance of the river banks and beds will only be conducted if sample results indicate there will be an adverse affect that is more detrimental than intrusive remedial techniques. If additional remedial measures are nessesary, such as excavation, appropriate mitigative measures will be employed. Enbridge will communicate analytical results to the EPA on a regular basis.

POST REMEDIATION

If additional investigation/remedial action is warranted, any necessary site specific action plan will be developed and submitted to USEPA for review and approval.

If intrusive remediation is required soil and/or ground water samples will be collected to verify that remediation of the Source Area has been completed. The verification samples will be collected following the Michigan Department of Natural Resources and Environment Operational Memoranda *Sampling Strategies and Statistics Training Materials for Part 201 Cleanup Criteria*, dated 2002. The samples will be collected and analyzed according to the Sampling and Analysis Plan.

DEMOBILIZATION

Equipment requiring decontamination will be appropriately decontaminated by washing, and demobilized from the project site. All decontamination water will be disposed at a USEPA approved disposal facility.

Enbridge Marshall Pipeline Release
Waste Treatment, Transportation, and Disposal Plan
Enbridge, Marshall Michigan

July 29, 2010

Prepared by URS Corporation

TABLE OF CONTENTS

This Waste Treatment, Transportation, and Disposal Plan (Plan) has been prepared for Enbridge Energy, Limited Partnerhsip's crude oil release site in Marshall, Michigan.

1.1 OBJECTIVES

The Plan's objectives are to comply with Federal, State and County waste regulations, prevent or minimize human health and environmental risks associated with managing petroleum contaminated media, and to provide a beneficial reuse of the material where feasible.

1.2 TYPE AND QUANTITY OF WASTE

The released petroleum product is a crude oil. The Material Safety Data Sheet (MSDS) for the product is attached. Released crude oil has impacted soil, surface water, and debris. At this time, quantities of impacted media have not been determined.

1.3 EPA IDENTIFICATION NUMBER

The site's EPA Identification Number is MIK752366161, which is assigned to Enbridge Energy Partners, Inc. If waste streams are determined to be characteristically hazardous or Enbridge chooses to manage impacted media as a hazardous waste, a new EPA Identification Number will be required for each location where hazardous waste is recovered.

Enbridge has contracted a number of waste disposal companies for this response with the capabilities to treat, transport, and dispose of impacted media. Identified disposal companies, their contact information, and capabilities are listed in **Table 1**, below.

2.1 TREATMENT OPTIONS

Treatment options available for impacted media include the following:

- Landfilling of non-hazardous soils and/or solid wastes
- Landfilling and/or fuel blending, solidification and incineration for hazardous soils
- Carbon filtration of impacted waters
- Waste water (high water/low oil content) processing

2.2 TRANSPORTATION

Transportation of regulated materials will be conducted in compliance with applicable Federal, State, and local requirements. Transportation will be coordinated by Enbridge through the chosen prime transportation contractor.

2.3 DISPOSAL

Non-hazardous solid waste will be disposed at EPA-approved Subtitle-D solid waste disposal facilities. Recovered oil product will be reclaimed by Enbridge and reinjected into a break-out tank at Enbridge’s Hartsdale, IN Terminal.

Table 1. WASTE MANAGEMENT VENDORS (continued on next page)

SITE	ADDRESS	EPA ID	PHONE	ANALYTICAL	CAPABILITIES	TRANSPORTER #
Safety Kleen			Guy Dinninger 517-525-2086	PCBs, Total Metals, Silicone		
Safety-Kleen Systems Inc.	700 Zimmerman Blvd Mason, MI 48854	MID981000359	(517) 676-6221		Oily Water Non-hazardous materials	TXR000050930
Disposal Companies	615 East 138th Street Dolton, IL 60419	ILD98613913	(708) 225-8500		Hazardous materials in drums Fuel blending	
Safety-Kleen Systems Inc.	261 Eiler Avenue Louisville, KY 40214	KYD985072610	(502) 368-0322		Hazardous materials in drums Fuel blending	
Safety-Kleen Systems Inc.	1506 E Villa Street Elgin, IL 60120	ILD000805911	(847) 468-6600		Oil re-refinery Reclamation of oil	
Ross Environmental Services	36790 Giles Road Grafton OH 44044	OHD048415665	(440) 366-2000		Hazardous material 5,000 BTU Incineration	
Liquid Industrial Waste Services	11325 E Lakewood Blvd Holland MI 49424	MID006546121	(616) 396-5994		Waste water Waste oily water Waste water processor (high water and low oil content)	MID006546121
Covanta NY dba American Re-Fuel Niagara	100 Energy Blvd @ 56th Street Niagara Falls, NY 14304	NYD986930543	(716) 278-8509		Waste energy incineration	
Republic Services C&C Landfill (Subtitle D Type II)	5007 C&C Landfill, Mason MI		Tom Moore 616-437-8396	TCLP Benzene 1 Composite Sample Needed for Solid Waste	Non-Hazardous Waste Solid Waste	Republic

Table 1. WASTE MANAGEMENT VENDORS (continued)

SITE	ADDRESS	EPA ID	PHONE	ANALYTICAL	CAPABILITIES	TRANSPORTER #
EQ	various locations			TCLP Benzene, BTEX, PNAs, PCBs, TCLP Metals, Flash Point	All waste streams including hazardous soil and water	EQ
Clean Harbors	Chicago, IL, Cleveland, OH, Cincinnati, OH		Michael Bowen 773-418-7637	TCLP Metals, TCLP Benzene, Semi-volatiles, Volatiles, Flashpoint	Carbon Filtration/All Waste Disposal including hazardous soil and water	Clean Harbors
Proact					Carbon Filtration	
Waste Management			James 616-831-8495		Non-Hazardous Waste Solid Waste - TCLP Benzene	

Work Plan Schedule

As requested by USEPA, the following schedule is presented:

- Health and Safety Plan – A health and safety plan has been prepared for the incident and incident related activities and is submitted with this Work Plan.
- Pipeline Repair Workplan – The schedule for this task will depend upon approvals from U.S. Department of Transportation Pipeline Hazardous Materials Administration (PHMSA) as well as USEPA.
- Sampling and Analysis Plan – A sampling and analysis plan has been prepared for the incident and incident related activities and is submitted with this Work Plan. Activities under this task are already occurring in support of emergency response efforts. Certain activities under this task will be scheduled upon approvals from USEPA.
- QAPP – A QAPP has been prepared for the incident and incident related activities and is submitted with this Work Plan. The implementation of all activities under the QAPP will be dependent upon approvals from USEPA.
- Oil Recovery and Containment Plan – An Oil Recovery and Containment Plan has been prepared for the incident and incident related activities and is submitted with this Work Plan. Activities under this task are already occurring in support of emergency response efforts. Certain activities under this task will be scheduled upon approvals from USEPA.
- Source Release Area Remediation Plan and Remediation Plan for Downstream Impacted Areas - These plans have been prepared for the incident and incident related activities and are contained in this Work Plan. Tasks within these plans will be accomplished as approved by USEPA and the company will work with all appropriate agencies to implement the approved Work Plan to remediate these areas by the required deadline(s). These plans are submitted with this Work Plan.
- Waste Treatment, Transportation and Disposal Plan - A Waste Treatment, Transportation and Disposal Plan has been prepared for the incident and incident related activities and is submitted with this Work Plan. Activities under this plan are already occurring in support of emergency response activities. A USEPA Generator Number has been released by USEPA for waste activities.