MARGONE, LLC

CANKTON, LOUISIANA

SOILS AND GROUNDWATER MANAGEMENT ACTIVITIES WORK PLAN

OCTOBER 2002

PREPARED FOR ENVIROCON BY:

PROVIDENCE ENGINEERING AND ENVIRONMENTAL GROUP LLC
6160 PERKINS ROAD, SUITE 100
BATON ROUGE, LOUISIANA 70808
(225) 766-7400

PROVIDENCE ENGINEERING PROJECT NUMBER 092-001

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SOILS AND GROUNDWATER MANAGEMENT ACTIVITIES WORK PLAN

1.0 INTRODUCTION

The MAR Services site is located 5.4 miles north of Interstate 10 along highway 93 in Saint Landry Parish, Louisiana. The site was in use as an oil separation and storage site from 1934 until the 1960s. MAR Services was reopened in the 1980s and shut down again in 1992 when the Louisiana Department of Natural Resources (LDNR) revoked its permit. As a result of these activities, subsurface soils were impacted with various constituents. **Figure 1** is a Site Location Map of the site and **Figure 2** is a Facility Plot Plan.

Margone, LLC (Margone) was formed in 19xx as part of a joint effort by ExxonMobil and Unocal to oversee clean-up of the site. A comprehensive site investigation was conducted in 1998 to gain a better understanding of what specific constituents had impacted the site. As a result of this investigation, there were four main categories of soil contaminants identified that require treatment in accordance with LDNR 29-B post-closure criteria. The contaminants and respective clean-up criteria are listed below:

Contaminant	Clean-up Criteria
Zinc	< 500 parts per million (ppm)
Barium	< 100,000 ppm
Oil and Grease (O&G)	< 3%
Sodium	< 12 sodium absorption ratio (SAR)

The LDNR approved a work plan on May 8, 2000 to perform the first phase of clean-up at the site. (Refer to **Figure 1** for a Site Location Map.) Nine above-ground tanks containing liquids remained on-site from when MAR Services was in operation. The Phase I activities included proper disposal of the contents of the tanks, decontamination of the tanks, dismantlement, and transportation of the tanks to a proper disposal facility. All work was performed according to the approved work plan. A closure report for the tank removal activities was submitted to the LDNR in August 2000.

The Phase II clean-up activities are the next phase for site clean-up and involve the actual treatment of the soils within the treatment units and the berms. Prior to treatment of soils in a given area, berms will be re-graded over the area within the treatment units and the berms. Metals and O&G contaminated soils will be treated by mixing to depth. Sodic soils above clean-up criteria will be remediated by means of inoculating a proprietary blend of chemical reagents to treat the top three feet of soil. Confirmatory sampling will be performed in the top three feet to document treatment effectiveness after all sodic soils are treated to below a SAR of 12 units.

Once overall treatment has proven effective, the site will be graded to match approximate pre-existing grades, and/or to provide sufficient drainage to prevent any significant ponding of water on the site. All disturbed areas will be hydroseeded, as appropriate. Perimeter silt controls, such as silt fence, will not be removed until there is at good stand of grass over the entire site.

After the site has been certified closed, the facility will enter into the post-closure phase. During this phase, the soils in the treatment zones will be analyzed on intervals of six months, one, two, and five years, and the groundwater will be monitored on a quarterly basis for a period of three years, as outlined in the Post -Closure Monitoring Plan included as **Appendix D**.

2.0 TEMPORARY CONTROLS/ENVIRONMENTAL PROTECTION PLAN

Site remediation activities will be implemented using best management practices as it pertains to environmental protection for the site. Contaminated materials and liquid waste will be properly disposed in a manner complying with existing regulations. In addition, good housekeeping practices will be used to keep construction generated trash and debris to a minimum, and will include such measures as roll-off boxes on-site to contain trash generated at the site. Control measures such as hay bales, silt fencing, or berms may be implemented to control storm water runoff at the facility. Dust problems on-site are not anticipated due to the proposed remediation measures. However, if problems with dust arise, water mist will be applied as appropriate to keep the dust down in the areas affected.

3.0 SITE PREPARATION

The MAR Services site has been closed since 1992. Over the last 10 years, vegetation has established itself on former industrial areas at the site, and water has collected and ponded in some of the former cells. Earthen berms surrounding these cells prevent storm water from draining. In order to conduct remedial activities, site preparation will be necessary, especially in those areas requiring treatment.

Site areas requiring treatment will be cleared using a combination of dozers and bush hogs, with the exception of the perimeter of the site's south, east and north boundaries. At a minimum, a tree line will be left in-place along these perimeter boundaries.

Trees less than 18-inches in diameter will be staged and downsized through the use of a chipper. Stumps will be staged and subsequently loaded onto trucks and transported to a Class III landfill facility approved by Margone. Chipped wood material will be used in the process of treating sodic soils. Excess chipped material will be used as mulch during site restoration activities.

Existing berms will be leveled across areas requiring treatment. Swales will be graded around each respective area and new berms (approximately two feet high) will be formed during the grading process. Each cell will be bermed and subdivided so that a minimum of six inches of irrigation water may be contained over all areas for the sodic soils remediation activities.

Since area flooding is an integral part of the proposed sodic soils treatment, an irrigation system will be installed on the site for the purpose of flooding cell areas requiring treatment. An electric or hydraulically operated pump will be set within and supported by a perforated concrete manhole structure to be installed in Bayou Carencro in the vicinity of the northeast corner of the site, if needed. HDPE pipe will be installed from the pump along the north and east boundaries of the site. Flat hose will connect to the header pipe to flood areas adjacent to the header. Alternatively, water will be moved from unit to unit dependent upon stored water capacity on-site during construction.

4.0 CLOSURE PROCEDURES

4.1 Treatment of Metals and Oil and Grease Impacted Soils

Metals (barium and zinc) and O&G impacted soils within dry designated treatment areas will be treated first. The impacted soils will be treated via mixing within respective cells. Treatment area soils will be excavated to variable depths based on sampling data collected during the pre-sampling event reconciled with historical sampling data. Excavation in the treatment areas will be conducted using an excavator. Excavations will be approximately 20-feet wide. In order to achieve proper mixing, it is important to scrape the walls of the excavation from bottom to top. The excavated soils will be stockpiled in a windrow parallel to the line of excavation. Using a dozer, the stockpile will be cut and material will be pushed into the open excavation employing the angling mechanism of the blade.

This method of excavation and replacement will be successful in mixing the soils from the surface to the designated depth in order to achieve clean-up criteria. No reagents are planned for the metals impacted soils scope of work.

Minimum soil volume treatment calculations for metals and O&G impacted soils are included as **Table 1**. Digging may have to occur deeper than anticipated in order to ensure adequate mixed volumes are achieved.

4.2 Treatment of Sodium Impacted Soils

For the treatment of sodium impacted soils, a different sequence of treatment is recommended than that for metals and O&G impacted soils. Upgradient cells containing sodium impacted soils will be treated initially,

which includes cells 12 and 14. Treatment will then proceed to dry down-gradient areas, followed by areas maintaining standing water. This sequence is recommended to minimize the risk of cross-contamination.

Treatment will physically and chemically alter the structure of the soil to allow for improved drainage and removal of salt contamination. Treatment will be accomplished through the use of three DeSalt™ products that are completely soluble and do not contain nitrates: ***DeSalt Plus™, DeSalt™*** *and* ***GeoRinse™. DeSalt Plus™*** is a source of readily available cationic species for soil amendment and provides vital nutrients for revegetation. ***DeSalt™*** will amend those areas below the root zone, as it is a source of readily available cationic species formulated for sodium concentrations at greater depths. ***GeoRinse™*** is a surfactant and tension reducer that will be added to dilution and irrigation water during each stage of remediation to improve percolation and flushing.

The remediation process for sodium contaminated soils will be conducted in four stages. During the initial stage of treatment, soils will be excavated to a minimum depth of two feet across a 20-foot wide area using an excavator. Metals and O&G impacted soils treatment will be done in conjunction with the impacted sodic soils treatment The walls of the excavation will be scraped from bottom to top. The soils will be stockpiled in a windrow parallel to the line of excavation. Hay bales, at an approximate rate of 100 bales per acre, will be worked into the soil (soil bulking) using a dozer or other suitable equipment. Excess wood chips generated from clearing operations may be added during this soil bulking stage in lieu of a portion of the hay bales. **Bulking of the soil is key to the remediation process as it ensures retention and percolation of any irrigation or rainwater.** Improved percolation accelerates removal of the sodium by the soil amendments and promotes new growth. A sufficient berm will be built around approximately one acre plots to hold irrigation and storm water. The bulked soil will be disked or graded and ***DeSalt™*** will be applied along with a two-to-one dilution with fresh water using irrigation sprinklers or an agricultural sprayer. **GeoRinse™** will be added to the dilution water to improve soil penetration and flushing. The site will be periodically monitored. When the soil is able to accept additional fluid, the next stage of treatment will begin. Depending on percolation rates and weather, there may be approximately two weeks to one month between stages.

The second stage of treatment will include disking the site, application of the recommended ***DeSalt Plus™***, irrigation, and site monitoring. **GeoRinse™** will again be added to the dilution and irrigation water to improve soil penetration and flushing.

The third stage of treatment will include soil plowing or conditioning, as required, and a repeated irrigation or flooding of the treated areas. After

proper sodium displacement has taken place to establish new plant growth, the final stage will be initiated. There will be a delay of at least two to four weeks between the third and final stage.

Treatment volume calculations for sodium impacted soils are included within the Solutions On Site Remediation Proposal included in **Appendix A**.

5.0 GROUNDWATER MANAGEMENT

The Groundwater Management Plan in **Appendix B** addresses the issues concerning the groundwater monitoring system at the MAR Services site. The plan discusses inspection, maintenance and repair of existing monitor wells as well as new monitor well installation, completion and development.

6.0 OFF-SITE DISPOSAL

6.1 Transportation and Disposal Plan

The stockpile of creosote timbers, debris, and a municipal waste stockpile (approximately 500 cubic yards) will be removed and properly disposed of at an approved off-site facility. The wastes will be segregated into categories dependent upon the required type of disposal facility (*i.e.*, industrial landfill, construction and demolition debris landfill, and/or municipal landfill). The materials will be placed in roll-off boxes and/or trucks for storage and transportation to a disposal facility.

Broken concrete, brick, and other inert debris may be used for erosion control on the site. The material should typically range from approximately two to eight-inches in diameter prior to placement. Larger fragments of concrete and brick will be broken by mechanical or other means to meet the specified two to eight-inch gradation, or properly disposed off-site. The broken concrete, brick, or other inert debris shall be clean materials with no visual signs of contamination. All concrete, brick, or other inert debris that will be used for erosion control materials will be identified prior to use. A log of the type, quantity, and location of the material will be maintained.

6.2 Management of Surface and Subsurface Piping

The surface and subsurface piping at the facility shall be identified, dismantled, decontaminated, and removed from the site. Approximately 3,000 feet of surface and subsurface piping, 300-feet of which will be cleaned of NORM scale, is anticipated to be addressed in this phase. The surface and subsurface pipe will be identified (including pipe size, length, and approximate location) prior to dismantling. The pipe will be removed (e.g., hot torch, air torch, or similar method) and decontaminated (e.g.,

pressure washing) prior to shipping. Wilkerson Transportation and Salvage, Inc. will transport the dismantled piping to a salvage yard located in Cameron, Louisiana. Should a more economical transporter and disposer be identified, a request for approval of their use will be submitted to LDNR. Prior to use of an alternate company, LDNR approval must be granted. Pipe that cannot be salvaged will be disposed at an approved off-site facility. All piping and NORM scale shipped to an off-site disposal facility shall be manifested and the manifests shall be maintained at the site.

7.0 FINAL SITE PREPARATION

7.1 Site-wide Grading and Vegetation

Based on the assumption that the site drains and no standing water will be left on the site, this work plan provides a design for site-wide post remedy grading and vegetation for surface water management. This plan addresses the final site grading elevation, discusses surface water management, and discusses re-vegetation plans for the site. A map showing the general layout of the natural topography and predicted drainage directions is included as **Figure 3** (Facility Layout and Drainage).

The site will be graded to match existing contours around the MAR Services Site's perimeter. The site will be graded to fill low areas that could potentially pond waters and will drain to the northeast towards Bayou Carencro. No imported fill will be needed or used during this task. Any necessary surveying of the site will be performed by Providence Engineering personnel.

7.2 Confirmation Sampling and Analysis Plan

The Confirmation Sampling and Analysis Plan will ensure that the site was properly remediated before final closure. A copy of the plan is included in **Appendix C**.

7.2.1 Site Grading

The site will be graded and vegetated following closure and remedial activities to address storm water management. The final site grading plan will bring the facility to conditions similar to pre-development. **Figure 3** provides the surface water flow directions following final site grading. Generally, a minimum slope of 1% and maximum slope of 3 horizontal (h) to 1 vertical (v) shall be maintained for surface water flow. No standing water will be permitted on the site. Any slopes steeper than 5 (h):1 (v) will receive erosion control materials (such as erosion control blankets, mats, or rip rap), and any channels with high velocity flow (>5 feet

per second) shall receive erosion control materials. A final survey will be performed prior to re-vegetation to ensure minimum slopes and grades. A topographic map of the site will be provided following the final survey.

7.2.2 Re-vegetation Plans

The site will be re-vegetated following grading activities to reduce erosion and assist in storm water management. This re-vegetation shall consist of preparing the graded site for seeding, furnishing and sowing grass seed in the disturbed areas, and fertilizing. The work shall adhere to Louisiana Department of Transportation and Development (LDOTD) Specification 717 located in the 1992 edition of *Louisiana Standard Specifications for Roads and Bridges* or equivalent methodologies.

8.0 POST-CLOSURE MONITORING

The Post-Closure Monitoring Plan is included in **Appendix D**. The plan addresses the completion of remedial action and associated work at the site, which includes a general monitoring of soils in the treatment zone, surface water runoff, and water collected in the unsaturated zone and general groundwater monitoring. The Post-Closure Management Plan also includes the following:

- Soils monitoring in the treatment zone;
- Surface water runoff;
- Water collected on the unsaturated zone;
- Inspection and maintenance of graded and vegetated areas;
- Sample frequency;
- Number of samples collected per sampling episode;
- Parameters to be analyzed at a state-certified laboratory;
- Approximate location of sample collection; and
- Monitoring for 29-B constituents and collecting water levels in all onsite-monitoring wells quarterly for three years.

The Post-Closure Monitoring Plan also sets forth procedures for submitting annual groundwater monitoring reports to LDNR for a three year period; submitting a plan for remedial measure in the shallow perched zone in the event if evidence indicates that discharge into Bayou Carencro is occurring; and submitting a report to update and revise the Groundwater Management Plan **(Appendix B)** based on new data at the conclusion of the three-year period. For proper sample container and preservation requirements, refer to the Quality Control Plan included in **Appendix E**.

9.0 RECORDKEEPING

Margone will maintain forms and documentation associated with testing and closure activities on the site. In accordance with LDNR regulations, files must be maintained for at least three year following completion of closure activities.

10.0 RECYCLE CREDITS

These protocols will include segregation, decontamination and shipment methods. Recycling vendors that will receive the materials will also be identified. Section 6.2 of this plan identifies protocols for the recycling/reuse of on-site piping and erosion control material. If additional materials are identified during the closure activities, LDNR will be provided with the protocols associated with the materials for approval. Recycling vendors that will receive the materials will also be identified.

11.0 PROJECT OVERSIGHT

Project Oversight will include activities and procedures to ensure that the project remains on schedule, within the proposed budget and remains within the project guidelines. Activities that will be included within project oversight include report submittal dates, documentation of treatment and disposal, necessary health and safety, quality control analysis, and project monitoring and control activities.

11.1 Monthly Reporting

Monthly reports will be maintained providing a summary of the activities completed and currently in progress at the site. Information included in the monthly reports will include the following:

- Percent of the project completed;
- Summary of the work performed (including documentation of treatment and disposal);
- Changes from the original scope of work;
- Summary of agency contacts;
- Potential problem areas and action to be taken;
- Changes in personnel; and
- Projected work for the next reporting period.

11.2 Quality Control Analysis

Quality control shall include processes to check and document the remediation progress and treatment at the site. The Quality Control Plan is included as **Appendix E**. Documentation of treatment shall included such items as:

- Depth of mixing/excavation in each cell as treated;
- Estimated yardage of materials mixed;
- Amount and type of bulking agent applied; and
- Rates, type and areas of amendment applied for Sodium Treatment.

This information will be included as part of the daily report sheets and included with the monthly report.

11.3 Project Monitoring and Control

11.3.1 Budget Tracking

Budget tracking will include a weekly review of the status of the each tasks currently underway or on-going and comparing the percent completion of those tasks to the approved budget amount. The percentage of the budgets expended should not exceed the percentage of each task completed.

This information will be included as part of the monthly status reports.

11.3.2 Field Activities Progress Tracking

Progress tracking of field activities will include tracking the percentage complete of each major phase of remedial activities completed. The major phases of remedial activities include the following:

- Site clearing;
- Metals and O&G treatment (soil mixing);
- Sodium treatment amendment application;
- Confirmation Sampling; and
- Final Site preparation – final grading of site/hydroseeding.

11.4 Health and Safety

Health and safety is an important issue to be addressed while remedial activities are going on at the site. A site-specific health and safety plan has been developed that addresses the safety concerns, chain-of-command in the field, as well as incident reporting. This health and safety plan is included as **Appendix F.**

TABLE 1

MINIMUM SOIL TREATMENT VOLUME CALCULATIONS FOR METALS AND OIL AND GREASE

SEE EXCEL FILE 092VT06.XLS

FIGURE 1

SITE LOCATION MAP

FIGURE 2

FACILITY PLOT PLAN

FIGURE 3

FACILITY LAYOUT AND DRAINAGE

APPENDIX A

SOLUTIONS ON SITE REMEDIATION PROPOSAL

APPENDIX B

GROUNDWATER MANAGEMENT PLAN

MARGONE, LLC

CANKTON, LOUISIANA

APPENDIX B
GROUNDWATER MANAGEMENT PLAN

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APPENDIX B
GROUNDWATER MANAGEMENT PLAN

1.0 INTRODUCTION

This plan addresses the issues concerning the groundwater monitoring system at the MAR Services site in Cankton, Louisiana. There are several wells currently on-site that were previously installed to monitor groundwater at the facility. It has been determined that two up-gradient and two down-gradient monitoring wells screened in both the Shallow Perched Zone and deeper Chicot Aquifer will need to be installed to give adequate coverage at the site.

Prior to the installation of the monitoring wells, an inspection of the drillers logs of wells installed into the Chicot aquifer within and adjacent to the site will be performed to determine if a permeable zone (sand) exists between the Shallow Perched Zone and the Chicot aquifer. If the inspection indicates that a competent permeable zone exists, Margone, LLC (Margone) will discuss the discovery with the Louisiana Department of Natural Resources (LDNR) to jointly devise an appropriate monitoring system for this zone. An inspection of the existing monitoring wells will also be performed to evaluate the integrity of each well.

2.0 INSPECTION, MAINTENANCE AND REPAIR OF EXISTING MONITOR WELLS

There are currently **seventeen** monitoring wells, five recovery wells, one injection well, and a drinking water well located on the MAR Services property. The monitoring and recovery wells will be inspected to evaluate their integrity for future use in the groundwater monitoring program. The inspection will include the following tasks:

- Perform a visual inspection on each well to look for signs of tampering, damage, corrosion, faulty locks and general condition (pad, bollards, protective casing, weep holes, etc.);
- Review well construction diagrams and installation reports available to determine screen intervals; and
- Measure the total depth of each well to the original depth on the well log to ensure that unacceptable silting of the well has not occurred.

Each well inspection will be recorded in the field logbook and noted on a monitoring well inspection sheet. A blank copy of the well inspection sheet is included as **Attachment 1** of this appendix**.**

3.0 Submittal of Drillers Logs for the Chicot Wells

A Louisiana Department of Transportation and Development (LDOTD) file search will be conducted to determine the number of registered wells that exist within 500 feet of the property. In addition, it will be reconfirmed with local residents that no shallow wells exist within 500 feet of the MAR Services property. The drillers logs for the wells that extend into the Chicot Aquifer will be evaluated to determine if there is a permeable zone (sand) between the Shallow Perched Zone and the Chicot Aquifer. Findings of the evaluation and a copy of the drillers logs will be provided to LDNR.

4.0 MONITORING WELLS

4.1 Shallow Perched Zone Installation

Two Shallow Perched Zone monitoring wells are to be installed as part of the groundwater monitoring system upgrade. One will be installed up-gradient and one will be installed down-gradient of the facility. The monitoring wells will be installed into what is referred to as the Shallow Perched Zone. This permeable zone serves as the first laterally continuous permeable zone at the facility. Typically, wells installed in this zone are approximately 25 to 30 feet deep. The installation of these wells will be in general accordance with the LDEQ and the LDOTDs document entitled, "The Construction of Geotechnical Boreholes and Groundwater Monitoring Systems Handbook" (the Handbook), December 2000. A General Well Construction Diagram for the Shallow Perched Zone is included in **Attachment 2**.

The general installation procedures for monitoring wells completed in the Shallow Perched Zone are as follows:

- A minimum six-inch diameter borehole will be advanced to the desired depth using hollow-stem drilling techniques;
- The monitoring wells will be constructed of two-inch diameter Schedule 40 PVC well materials, including a bottom cap and silt trap, 0.010-inch slotted well screen in either five or ten-foot lengths, and blank riser extending from the top of the screen to approximately three feet above ground surface;
- A sand pack (typically 20/40 grain size) will be placed in the borehole using a tremie pipe or poured around the annulus in such a manner as to be distributed two to three feet above the top of the screen;

- When drilling is completed with the hollow stem augers, the well will be set inside the augers and the augers raised a few feet at a time during placement of the sand;
- A bentonite pellet seal of two to three feet of sodium bentonite pellets will be placed on top of the sand filter and allowed to hydrate; and
- A cement/bentonite grout (four to eight percent by dry weight per 94-pound sack of Portland cement) will be placed by pumping the mixture through a tremie pipe placed about six inches above the top to the bentonite. The grout mixture will be pumped slowly into the annulus until undiluted grout is observed at the ground surface. The grout will be placed so as not to disturb the bentonite pellets. The grout will extend from the top of the pellets to ground surface to seal the annulus.

4.2 Chicot Aquifer Installation

Two monitoring wells are to be installed in the Chicot Aquifer as part of the groundwater monitoring system upgrade. One will be installed up-gradient and one will be installed down-gradient of the facility. Typically, wells installed in this zone are approximately 130 feet deep. The installation of these wells will be in general accordance with the Handbook. A General Well Construction Diagram for the Chicot Aquifer is included as **Attachment 3.**

The general installation procedures for monitoring well installed in the Chicot Aquifer are as follows:

- A pilot hole will be advanced by hollow stem or mud rotary drilling techniques with continuous soil sampling to a depth of at least two feet below the base of the first permeable zone (Shallow Perched Zone);
- The borehole will be reamed to a minimum diameter acceptable of holding the surface casing;
- About three feet of cement/bentonite grout will be pumped through a tremie pipe into the base of the borehole;
- While the grout is still fluid, a PVC or carbon steel casing will be set in the borehole and pushed or driven into the clay underlying the first permeable zone;
- Cement/bentonite grout will be mixed and pumped into the outer annulus through a tremie to fill the annular space of the borehole. The grout will be allowed to set a minimum of 12 hours;
- A smaller diameter borehole will be drilled by mud rotary drilling techniques with continuous soil classification to the completion

depth. The depth will be determined by the field geologist/engineer; and

- A two-inch diameter Schedule 40 PVC monitoring well will be installed in the boring using the general procedures outlined in the Shallow Perched Zone monitoring well installation.

4.3 Monitoring Well Completion

Each well will be inspected for settlement of the grout after a 24-hour period and additional grout added as needed. A locked protective casing will be placed on each well. The protective casing will be provided with a threaded drain plug at the base of the protective casing. The diameter of the protective casing shall be of sufficient size so as to provide a minimum annular space of two inches around the well casing.

- Locks will also be used, but may be provided by MAR Services to remain consistent with the current lock system in place at the site.
- The exterior of the protective casing shall be painted with a weather resistant orange or yellow paint. All painting required shall be completed and dried prior to the initial sampling of the well or will be performed after the initial sampling of the well.
- A concrete slab will be poured at the top of each well after the grout has been inspected and determined to be adequate. The slab will be at least four inches thick and two and one half feet square and sloped away from the well.
- Four bollards, located approximately one foot from the corner of each well, will be installed two to three feet below ground surface and extend approximately three feet above ground surface.
- Borehole cuttings, drilling fluids, and water removed from the well during installation, development, and purging will be spread along the ground and will not have to be containerized.

4.4 Monitoring Well Development

Monitoring well development will generally be conducted using the airlift method. Air lifting will be conducted using an oil free compressor with an activated carbon filter. The airlift development procedures will consist of the following:

- An initial purging by air surging for sediment removal; and
- A secondary purging by air lifting.

The monitoring well may also be developed using a pump, supplemented with a bottom discharge/filling bailer (for sediment removal) and surge block.

The development procedures for the monitoring wells will be repeated until the following criteria are met:

- A minimum of five well volumes are purged;
- The well water is clear;
- The sediment thickness remaining within the well is less than the length of the bottom sump;
- The specific conductance and/or pH measurements stabilize.

Purged water will be allowed to discharge to the ground. All monitoring well development activities will be documented in the field logbook.

5.0 SURVEYING

A Louisiana registered professional land surveyor will be used to survey the location coordinates and elevations for each site groundwater monitor well. At each well the top of casing elevation, top of cement, and ground surface elevation will be determined to the nearest 0.01 foot. The locations (horizontal coordinates) will be reported to the closet 0.1 foot. The top of casing elevation will be measured on the north side and marked with an indelible ink pen.

6.0 PLUGGING AND ABANDONMENT OF THE INJECTION WELL

Upon the completion of all on-site remedial activities and once the injection well is no longer any service, it will be properly plugged and abandoned (P&A) in general accordance with the procedures outlined in the LDNR regulations.

The general P&A procedures for the injection well are as follows:

- Mobilize to site and begin rigging up equipment;
- Load the casing and tubing with kill weight fluid;
- Nipple down tree, nipple up blow out preventers and test same;
- If no tubing is in the well, call forward 1,600 feet of $2^{3/8}$ -inch tubing work string;
- Release Guiberson at 1,539 feet and reverse circulate two tubing volumes to clean;
- Mix and pump 30 sacks cement and squeeze perforations at 1,540;
- Leave minimum of 100 feet above the same in the seven-inch casing. Wait on cement to cure then test;

- Pull out of the hole, and rack back tubing to 1,170 feet;
- Mix and pump 50 sacks of cement from 1,170 to 1070 feet in the seven-inch casing across the base of the USDW. Wait on cement to cure then tag;
- Pull out of the hole with tubing and lay down;
- Nipple down the blow-out preventers (BOPs);
- Rig up and set surface plug from 105 to 5 feet using 25 sacks of cement;
- Cut and remove all casing five feet below ground surface and weld on a ½-inch steel plate with the serial number welded to its surface; and
- Rig down equipment and demobilize.

ATTACHMENT 1

WELL INSPECTION SHEET

ATTACHMENT 2

GENERAL WELL CONSTRUCTION DIAGRAM (SHALLOW PERCHED ZONE)

ATTACHMENT 3

GENERAL WELL CONSTRUCTION DIAGRAM (CHICOT AQUIFER)

APPENDIX C

CONFIRMATION SAMPLING AND ANALYSIS PLAN

MARGONE, LLC

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APPENDIX C
CONFIRMATION SAMPLING AND ANALYSIS PLAN

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APPENDIX C
CONFIRMATION SAMPLING AND ANALYSIS PLAN

1.0 INTRODUCTION

This plan addresses the procedures and techniques used to conduct and determine when confirmation sampling at the MAR Services Site is achieved. This plan discusses sample collection techniques, soil sample procedures, and documentation procedures.

2.0 SAMPLING SCHEDULE

Soil sampling will be conducted to serve as a closure certification procedure to ensure that the soils at the site have been remediated to the acceptable levels. There are four main categories of soil contaminants identified that require treatment in accordance with the Louisiana Department of Natural Resources (LDNR) 29-B post-closure criteria. The contaminants and respective clean-up criteria are listed below:

Contaminant	Clean-up Criteria
Zinc	< 500 parts per million (ppm)
Barium	< 100,000 ppm
Oil and Grease (O&G)	< 3%
Sodium	< 12 sodium absorption ratio (SAR)

The remediation activities at the site are designed to bring the contaminants to levels that meet or exceed the levels listed above. Treatment of the impacted soils will be done in a systematic manner in which each cell located at the facility will be treated initially for barium, zinc, and O&G by blending the soils to the required depth until the clean-up criteria is met. The next phase of clean-up will address the sodium impacted soils. The sodium impacted soils will be remediated by the addition of a calcium reagent that will release the sodium to travel to deeper soils.

As the treatment activities at each cell are completed, a soil sampling event will be conducted at that cell to provide evidence that the target clean-up criteria has been achieved. The LDNR Office of Conservation will be notified in advance of the confirmation sampling event so that a representative from the LDNR can be present during sampling. The confirmation sampling activities will be conducted according to the following:

- The sample density per acre is to be based on 29-B sampling and testing requirements of two borings per acre. If an individual cell is multiple acres in size, all samples collected from that cell are to be composited for one representative analysis for each zone. Cells greater than 6.5 acres in size must be subdivided for random sample acquisition and compositing.
- The sampling intervals will be composited between zero to 18 inches and 18 to 36 inches.
- The soil samples will only be analyzed for SAR, O&G, Zinc, and true total Barium.

Based on the extensive data collected at the site and the level of understanding of the constituents of concern, only the indicator parameters will be analyzed for during laboratory analysis. During the post-closure monitoring of the facility, the groundwater monitoring wells will be sampled for the background parameters.

If analytical results indicate that the clean-up standards are not met, two additional random samples will be collected from within the non-compliant cell and analyzed. The results of the three soil samples will be averaged and if that average is less that the clean-up criteria stipulated, the cell will be considered remediated.

If the average of the three samples still does not meet the clean-up levels specified, treatment activities will be resumed until confirmation sampling confirms the area meets the remediation goals. Once each cell has been treated, confirmed to meet the required clean-up criteria, and certified as closed by the LDNR, post-closure soil monitoring will occur where all cells will be sampled during a one time event. The details of the post closure soils monitoring event will be addressed in the Post-Closure Monitoring Plan in **Appendix D** of the Soils and Groundwater Management Activities Work Plan.

3.0 SAMPLE COLLECTION

The soil samples will be collected between zero to 18 inches and 18 to 36 inches below ground surface at a sample density of two borings per acre per cell. The following section describes the two soil collection techniques that may be used during the post-closure soil monitoring activities, as required.

3.1 Direct Push (Geoprobe)

The Direct Push (Geoprobe) method hydraulically advances small diameter hollow steel probe rods to the desired sampling depth.

The probe rods are typically one or three feet in length and one to two inches in diameter. The soil borings can be sampled continuously or can be advanced to a desired depth to collect discrete samples.

The soil probe uses a direct-push method that consists of a small diameter hollow steel rod with a stainless steel sampling tool fitted to the base of the drilling rod. Soil samples are collected by pushing or driving the sampler to the desired sampling depth. The sampler uses a plastic polybutyurate liner, which is extruded upon retrieval of the sampler from the borehole.

3.2 Hand Auger

A hand auger may also be used to collect soil samples. A stainless steel bucket auger will be used to auger down to the desired depth. The bucket auger is typically one foot in length attached to a three-foot extension rod. A "T" handle is attached to the extension rod so that the auger can be manually advanced to the desired depth for sample collection. Additional rod extensions can be added if needed to extend the depth of the sample collection.

3.3 General Soil Sample Collection Procedures

For all subsurface soil sampling events, the procedure to be followed will be as follows. After the sample is removed from the sampler, the sample will be shaved with a decontaminated knife to remove the outer surface that has been in contact with the sampling device and then placed in appropriate containers and sealed. If sample compositing is required, it will be done in decontaminated stainless steel bowls, thoroughly mixed and placed in appropriate containers. All samples will be stored on ice until delivered to the laboratory.

The subsurface soil sampling will be documented in the field log book for each boring drilled. Pertinent information to be included in the log book will include the boring number, date, logger, basic lithologic description, core recovery, and boring completion depth.

4.0 SAMPLE ANALYSIS, PRESERVATION, HANDLING, AND TRANSPORTATION

Samples will be transferred in the field from the sampling equipment directly into the container that has been specifically prepared for that analysis.

Clean sample containers will be received from the contract laboratory immediately prior to each sampling event. These sample containers will be prepared by the laboratory utilizing the specific preservative necessary to maintain the integrity of the parameters to be analyzed.

Chain-of-custody procedures for each sample will be documented from the time the sample is taken until it reaches the laboratory. This will include the following types of information:

- Sample number;
- Signature of collector;
- Date and time of collection;
- Sample type (grab or composite);
- Parameters requested for analysis;
- Signature of person(s) involved in the chain of possession; and
- Inclusive dates of possession.

Sample bottles will be properly labeled, packaged and placed in ice chests with ice immediately following sample collection. The samples will be put into refrigeration at 4° C or left in coolers in a secured storage area until they are prepared for shipment. The sample coolers will be under direct observation by authorized personnel at all times until custody is assigned to the laboratory or, if not attended by authorized personnel, the coolers will be secured with custody seals and locked in a site support vehicle or other secure area. Prior to transport to the laboratory, an independent person other than the one who packed the cooler(s) will verify the samples, chain-of-custody forms and other documentation.

Samples collected will be packed into ice chests for shipment to the analytical laboratory. Information included on the sample container includes the project number, the site name and location, a sample identification code, collector, date and time. All of the containers for each sample set will have the same number. The sample identification code will be used to identify each sample in the field logbook. The labels will be sufficiently durable to remain legible even when wet.

Upon submittal of the soil sample to the laboratory, each sample will be analyzed for the following parameters:

Analysis	Method
SAR	LDNR Lab Procedures for Analysis of E&P Waste
Metals	
True Total Barium	LDNR Lab Procedures for Analysis of E&P Waste
Zinc	SW-846 6010
O&G	SW-846 5520

5.0 FIELD DOCUMENTATION

Field documentation consists of filling out standard forms, such as the Groundwater Collection Report Form and Chain-of-Custody Record. Example copies of these forms are included as **Attachment 1** and **Attachment 2**, respectively. A separate log book is also maintained.

5.1 Logbook

For additional documentation purposes, all information pertinent to field observations and sampling are recorded in a site-specific field logbook with consecutively numbered pages. Entries include at least the following:

- Project number and name;
- Location of sampling activity and address;
- Collector's name;
- Well/boring identification;
- Type of sample (grab, composite, other);
- Sampling date and time;
- Method of sampling;
- Weather conditions at time of sampling;
- Sampling characteristics;
- Containers and preservatives; and
- Recommendations/observations.

The documentation in the logbook is sufficient to reconstruct the sampling procedures without relying on the collector's memory.

5.2 Sample Labels

The sample labels should be waterproof and filled out with waterproof ink. At a minimum, the sample label should contain:

- Site, project or plant area;
- Sample number (monitor well number);
- Collector's name;
- Date and time of sample collection;
- Parameters for analysis; and
- Preservatives, if any.

6.0 DECONTAMINATION AND CROSS-CONTAMINATION CONTROL

In order to minimize the possibility of cross-contamination, strict cross-contamination control procedures should be followed.

- Sample jars should be kept in limited access areas until used.
- Latex gloves should be worn during all sampling activities and changed between sampling wells.
- Clean plastic sheeting may be placed at the sampling area and all equipment should be placed on the sheets. This plastic shall be discarded after each use.
- Equipment refueling shall be performed in designated areas. These areas should be at a distance from any sampling points to minimize the potential that vapors from fuel will affect sample quality.
- All purge water, decontamination water and discarded gloves will be properly disposed.

ATTACHMENT 1

GROUNDWATER COLLECTION REPORT FORM

ATTACHMENT 2

CHAIN-OF-CUSTODY RECORD

APPENDIX D

POST-CLOSURE MONITORING PLAN

MARGONE, LLC

CANKTON, LOUISIANA

APPENDIX D
POST-CLOSURE MONITORING PLAN

OCTOBER 2002

PREPARED FOR ENVIROCON BY:

PROVIDENCE ENGINEERING AND ENVIRONMENTAL GROUP LLC
6160 PERKINS ROAD, SUITE 100
BATON ROUGE, LOUISIANA 70808
(225) 766-7400

PROVIDENCE ENGINEERING PROJECT NUMBER 092-001

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APPENDIX D
POST-CLOSURE MONITORING PLAN

1.0 POST-CLOSURE MONITORING ACTIVITIES

The post-closure monitoring plan will be implemented following the completion of the remedial action work at the site, and includes a general monitoring of the soils in the treatments zone, surface water runoff, water collected in the unsaturated zone, and groundwater monitoring.

2.0 SOILS MONITORING IN THE TREATMENT ZONE

Soils will be monitored at random locations during the post-closure monitoring of the MAR Services site. If analytical results from post-closure monitoring indicate that the clean-up standards are not met, two additional random samples will be collected from within the non-compliant cell and analyzed for that parameter. The results of the three samples will be averaged and if that average is less than the clean-up criteria stipulated, the cell will be considered remediated.

2.1 Sample Analysis (Soil)

All samples collected are to be analyzed using only laboratories state-certified under the Louisiana Environmental Laboratory Accreditation Program (LELAP). The soils in the treatment zone will be sampled for the following parameters:

Analysis	Method
Sodium Absorption Ration (SAR)	LDNR Lab Procedures for Analysis of E&P Waste
Metals	
True Total Barium	LDNR Lab Procedures for Analysis of E&P Waste
Zinc	SW-846 6010
Oil and Grease (O&G)	SW-846 5520

Based on the extensive data collected at the site, there is a good understanding of the constituents of concern; therefore, only the parameters being remediated will be sampled.

2.2 Sampling Frequency

During the post-closure monitoring activities, the soil at the site will be sampled on intervals of six months, one, two, and five years

following certification that closure is complete as outlined in the Louisiana Department of Natural Resources (LDNR) regulations.

2.3 Sample Depth and Spacing

Soil samples will be collected from the intervals of 0 to 18 inches and 18 to 36 inches. The sample density per acre is to be based on 29-B sampling and testing requirements of two borings per acre. If an individual cell is multiple acres in size, all samples collected from that cell are to be composited for one representative analysis for each zone. Cells greater than 6.5 acres in size must be subdivided for random sample acquisition and compositing. The sample locations will be randomly selected.

Each cell's acreage will be calculated to determine the appropriate number of samples to be collected from it using the protocol listed above. A random number generator will then be used to pick each sample location within each cell. It is estimated that the site's remediated activity area is approximately 60 acres in size, exclusive of roads.

3.0 STANDARD OPERATING PROCEDURES FOR THE SOIL SAMPLING PROGRAM

3.1 Sample Collection Techniques

The following section describes two soil collection techniques that may be used during the post-closure soil monitoring activities as required.

3.1.1 Direct Push Sampling Techniques

Direct Push (Geoprobe) method hydraulically advances small diameter hollow steel probe rods to the desired sampling depth. The probe rods are typically one or three feet in length and one to two inches in diameter. The soil borings can be sampled continuously or can be advanced to a desired depth to collect discrete samples.

The soil probe uses a direct-push method that consists of a small diameter hollow steel rod with a stainless steel sampling tool fitted to the base of the drilling rod. Soil samples are collected by pushing or driving the sampler to the desired sampling depth. The sampler uses a plastic polybutyurate liner, which is extruded upon retrieval of the sampler from the borehole.

3.1.2 Hand Auger Sampling Techniques

A hand auger may also be used to collect soil samples. A stainless steel recovery auger will be used to auger down to the desired depth. The soil will be removed from the auger bucket and the outer portion shaved with a decontaminated knife to remove soil that came into contact with the auger prior to sample collection.

3.2 Soil Sample Collection

For all subsurface soil sampling events, the procedure to be followed will be as follows. After the sample is removed from the sampler, the sample will be shaved with a decontaminated knife to remove the outer surface that has been in contact with the sampling device and then placed in appropriate containers and sealed. If sample compositing is required, it will be done in decontaminated stainless steel bowls, thoroughly mixed and placed in appropriate containers. All samples will be stored on ice until delivery to the laboratory.

The subsurface soil sampling will be documented in the field log book for each boring drilled. Pertinent information to be included in the log book will include boring number, date, logger, basic lithologic description, core recovery, and boring completion depth.

3.3 Soil Disposal

Excess soil that is not used for laboratory analysis will be spread out along the surface of the treated cell.

3.4 Sample Preservation, Handling and Transportation

Samples will be transferred in the field from the sampling equipment directly into the container that has been specifically prepared for that analysis.

Clean sample containers will be received from the contract laboratory immediately prior to each sampling event. These sample containers will be prepared by the laboratory utilizing the specific preservative necessary to maintain the integrity of the parameters to be analyzed.

Chain-of-custody procedures for each sample will be documented from the time the sample is taken until the time it reaches the

laboratory. This will include the following types of information:

- Sample number;
- Signature of collector;
- Date and time of collection;
- Parameters requested for analysis;
- Signature of person(s) involved in the chain of possession; and
- Inclusive dates of possession.

Sample bottles will be properly labeled, packaged and placed in ice chests with ice immediately following sample collection. The samples will be put into refrigeration at 4°C or left in coolers in a secured storage area until they are prepared for shipment. The sample coolers will be under direct observation by authorized personnel at all times until custody is assigned to the laboratory or, if not attended by authorized personnel, will be secured with custody seals and locked in a site support vehicle or other secure area. Prior to transport to the laboratory, an independent person other than the one who packed the cooler(s), will verify the samples, chain-of-custody forms and other documentation.

Samples collected will be packed into ice chests for shipment to the analytical laboratory. Information included on the sample container includes the project number, the site name and location, a sample identification code, collector, date and time. All of the containers for each sample set will have the same number. The sample identification code will be used to identify each sample in the field logbook. The labels will be sufficiently durable to remain legible even when wet.

For documentation purposes, all information pertinent to field observations and sampling will be recorded as described in Section 4.6.

4.0 GROUNDWATER MONITORING

There are currently seventeen monitoring wells five recovery wells, one injection well, and a drinking water well located on the MAR Services property. A Monitoring Well Location Map is included as **Attachment 1**. Four monitoring well installations are proposed. It has been determined that two up-gradient and two down-gradient monitoring wells screened in both the Shallow Perched Zone and deeper Chicot Aquifer will need to be installed to give adequate coverage at the site.

4.1 Frequency of Groundwater Monitoring

During the post-closure monitoring activities, the groundwater at the site will be sampled on quarterly intervals for a period of three years following certification that closure is complete as outlined in the LDNR regulations.

4.2 Analysis (Groundwater)

The monitoring wells will be sampled for the following parameters:

Parameter	Method
EC	EPA 120.1
TDS	EPA 160.1
TSS	EPA 160.2
Ph	SW-846 904B, EPA 150.1
O&G	Method 29B/5520
Chloride	SW-846 9056/9253
Sodium	SW-846 6010
Metals	
Arsenic	SW-846 6010
Barium	SW-846 6010
Chromium	SW-846 6010
Lead	SW-846 6010
Zinc	SW-846 6010

4.3 Standard Operating Procedures For The Groundwater Sampling Program

4.3.1 Measurement of Static Groundwater Elevation and Total Depth of Monitor Wells

The elevation of the top of casing (TOC) for each well has been or will be established and marked by a licensed surveyor based on a common plant datum. The TOC elevation will be used as a reference point to measure the depth of standing water and the total depth of the well to the nearest +/- 0.01 foot. These measurements will then be used to calculate horizontal and vertical flow gradients, determine the volume of groundwater to be purged prior to sampling, and determine the integrity of the well (e.g., rate of siltation or down-hole obstruction). The following are procedures to be followed while collecting the measurements:

- In areas of known contamination, the sequence of data collection should be done, whenever possible, from the

well of least contamination to highest contamination. In areas of unknown contamination, the up-gradient wells should be sampled first, then the down-gradient wells.

- All measurements are to be recorded as per the record keeping requirements defined in Section 4.6.
- Decontamination procedures for the measuring tapes will consist of wiping exposed tape or sensor with a rag or paper towel soaked in demineralized water after measurement of each well. However, if non-aqueous phase liquid (NAPL) is encountered in a monitor well, the water level sensor and tape will be decontaminated by wiping with a paper towel or rag, then washing with a non-phosphate laboratory detergent and water, followed by a triple rinse with demineralized water.
- Static groundwater elevation measurements are not applicable for operating recovery wells or sumps.
- If a gasoline driven generator and/or compressor is used for powering purge/sampling equipment, these devices should be positioned whenever possible downwind and as far as possible from the wellhead. This will reduce the chances of contaminating water samples from airborne fumes.

4.3.2 Measurement of Static Groundwater Elevation

The device used for measuring groundwater elevation is an electronic water level sensor. The sensor probe, connected to a graduated tape, is lowered down the well casing. An indicator light and/or an audio alarm is triggered when the surface of the groundwater is encountered. The measured distance from the TOC reference point is then recorded to the nearest 0.01 foot.

4.3.3 Measurement of the Total Depth of the Well

The primary device for measuring the total depth of the well is a stainless steel tape measure with graduated weight assembly. This is a device specifically designed for this purpose and does not have adhesive tapes securing the weight that may contaminate the groundwater. The weighted tape assembly is lowered into the well and the depth to the bottom of the well is measured and recorded to the nearest 0.01 foot from the TOC reference point when the weight is resting on the bottom of the well.

The electronic water level sensor may be used as a secondary device to measure the total depth of the well using the same procedure as above. However, a correction

to the measurement may be needed to allow for the difference between the base of the weighted probe and the tip of the sensor.

Should the total depth measurement indicate that the screen area is blocked and is impairing ground water sampling, the well will be redeveloped prior to sampling. This redevelopment will be by airlift, swabbing, or bailing until the sediment thickness level is below the bottom of the screen.

4.4 Well Evacuation

4.4.1 Conventional Sampling

The water standing in a well column above the screened interval prior to purging and sampling may not be representative of in-situ groundwater quality. Therefore, in wells where conventional sampling procedures are to be utilized, the standing water in the well will be purged prior to sampling. Three purged volumes will be evacuated from the well prior to sampling. A purged volume is defined as the volume of water standing in the well between the water surface and the bottom of the well. Purged volumes are calculated using the volumetric constants established in the table below multiplied by the standing water column:

CASING DIAMETER	GALLONS/LINEAR FEET
2 inches	0.163
3 inches	0.367
4 inches	0.653

In order to ensure a good in-situ groundwater quality representation, field measurements for pH, temperature, turbidity, and conductivity will be measured between each purged volume. When the subsequent samples are observed to have less than +/- 10 percent variation in these parameters, the well is presumed to be adequately purged. At a minimum, three well volumes should be purged until the well goes dry. If the well is evacuated to dryness, samples of the groundwater should be collected whenever there is sufficient recovery, but within 24 hours of evacuation.

Evacuation rates should be maintained such that a well not be pumped to dryness. Recharge rates should not cause groundwater to vigorously cascade down the sides of the screen that can potentially cause an accelerated loss of volatiles.

If at all possible, the water should be drawn down from above the screen in the uppermost part of the water column in high yield formations to ensure that fresh water from the formation will move upward in the screen. In low-yield formations, water should be purged so that it is removed from the bottom of the screen.

The primary method of evacuation will be an electric submersible pump or disposable bailers. In deeper wells, an isolation packer may be used to minimize the purged volumes required. Operating recovery wells/sumps are regularly pumped and additional purging will not be necessary. These methods of purging are discussed below.

4.4.2 Peristaltic Pump

Peristaltic pumps can be used to evacuate wells if the static water level is within 25 feet of ground surface. These pumps are utilized at ground surface with the intake line connected to dedicated Teflon or high-density polyethylene tubing inserted into the well. A check valve should be installed at the base of the dedicated tubing to prevent possible contaminated purge water from flowing from the pump and/or purge tank into the well. This type of pump should be used for purging only and is not recommended for sampling.

4.4.3 Submersible Pump

Portable electric submersible pumps are an option for evacuating wells with water levels greater than 25 feet bls. The decontaminated pump should be carefully lowered into the well, trailing a discharge hose, electrical cables or air lines, and a stainless steel security cable (which should bear most of the weight). If these items are to be bundled, use plastic ties and not electrical or duct tape at the level to be submerged in the water column.

The submersible pump provides the advantage of high flow rates; however, care should be taken when operating to keep the flow rate within an acceptable limit for the particular well yield (recharge capability). As with the peristaltic

pumps, these pumps should be equipped with a check valve and fitted with dedicated tubing.

4.4.4 Bailer

Bailers can be used to evacuate shallow wells, and though there are no prohibitive factors preventing their use in deeper wells, the time required and physical strain on the individual purging of the well makes hand bailing a less desirable evacuation method for deeper wells. Ideally, if a bailer is used, it is dedicated to one well and often remains hanging from the well cap in the well between uses. The dedicated bailer can also be stored in a dedicated container, usually a piece of polyvinyl chloride (PVC) pipe capped on both ends. The bailer should be decontaminated prior to storing and prior to sampling.

Disposable bailers may also be used to purge a well. These particular bailers are usually constructed of polyethylene. After use, these bailers are to be properly disposed.

The preferable materials of bailer construction are Teflon, stainless steel, polypropylene, polyethylene, vitron, and PVC. The bailer should be lowered into the well using a non-porous rope made out of material such as polypropylene or Teflon-coated cord. Caution should be used when lowering the bailer into the water so as to avoid aeration of the well water. Care should be taken to keep the rope and bailer from touching the ground or other potentially contaminated surfaces.

4.4.5 Purge Water Containment and Disposal

The purge water produced from the evacuation and sampling of the monitoring wells will not have to be containerized, but all flow rates and purge volumes should be properly documented to make sure the appropriate well volumes have been removed prior to sampling. This can be achieved by either taking a flow rate if using a pump or by measuring the volume of purge water removed prior to discharging.

4.5 Sample Withdrawal

Groundwater samples will be collected with the pump used for evacuating the well or with dedicated or disposable bailers. Sampling of the monitor well should occur as soon as possible after evacuation, preferably immediately and must occur within 24 hours

of completion of purging activities. The sampling techniques that will be followed during the groundwater monitor well sampling operations include:

- Carefully operating the pumps in a continuous manner to minimize pulsating that may aerate samples in the return tube or upon discharge.
- Pumping the groundwater directly into the sample container taking care to minimize agitation and aeration. Overfilling sample containers to displace air bubbles and minimize headspace.
- Reducing the potential for contamination of sampling equipment by not placing clean sampling equipment directly on the ground or any potentially contaminated surface prior to insertion into the well.
- Sampling least contaminated wells first.
- If a bailer is used for sample collecting, the same bailer used to purge the well may be used to sample it. An effort will be made to keep the rope from touching the ground or the casing. The bailer will be lowered slowly into water. Do not let the bailer free-fall into the water. Attempt to lower the bailer to the same depth in the well each time. Retrieve the bailer smoothly but quickly, and empty the water into the sample container in a steady stream.
- If a peristaltic pump is used, the same tubing that was used to purge the well may be used to sample it. When collecting samples for the analysis, the pumping rate should not exceed 100 milliliters/minute. Higher rates can cause fluctuation in pH and pH-sensitive analyses. Operating recovery wells and sumps will be sampled from the existing sampling valves using the existing pumps.
- The first sample collected from a well will be tested for pH, temperature, turbidity, and specific conductance in the field. Samples will then be collected and containerized in order of parameter volatilization sensitivity.

4.5.1 Field Analyses

Field analyses will be performed periodically throughout the evacuation period (approximately at each well volume evacuated) and at the start of sample collection. The purge water will be tested for pH, temperature, turbidity, and specific conductance in the field. The temperature measurement will be conducted first, as this parameter changes most rapidly, followed by pH and specific conductivity. Manufacturers' instructions for the temperature and pH probe, and the conductivity meter, will be strictly

followed. All instruments will be calibrated prior to field sampling according to the manufacturers' specifications. All field measurements and calibration procedures will be documented in the log book.

4.5.2 Sample Preservation, Handling and Transportation

Samples will be transferred in the field from the sampling equipment directly into the container that has been specifically prepared for that analysis. Sample container and preservation requirements are presented in the Quality Control Plan in **Appendix E** of the Soils and Groundwater Management Activities Work Plan.

Clean sample containers will be received from the contract laboratory immediately prior to each sampling event. These sample containers will be prepared by the laboratory utilizing the specific preservative necessary to maintain the integrity of the parameters to be analyzed.

Chain-of-custody procedures for each sample will be documented from the time the sample is taken until it reaches the laboratory. This will include the following types of information:

- Sample number;
- Signature of collector;
- Date and time of collection;
- Sample type (e.g., groundwater, immiscible layer);
- Identification of well;
- Parameters requested for analysis;
- Signature of person(s) involved in the chain of possession; and
- Inclusive dates of possession.

Sample bottles will be properly labeled, packaged and placed in ice chests with ice immediately following sample collection. The samples will be put into refrigeration at 4°C or left in coolers in a secured storage area until they are prepared for shipment. The sample coolers will be under direct observation by authorized personnel at all times until custody is assigned to the laboratory or, if not attended by authorized personnel, the coolers will be secured with custody seals and locked in a site support vehicle or other secure area. Prior to transport to the laboratory, an independent person other than the one who packed the

cooler(s), will verify the samples, chain-of-custody forms and other documentation.

Samples collected will be packed into ice chests for shipment to the analytical laboratory. Information included on the sample container includes the project number, the site name and location, a sample identification code, collector, date and time. All of the containers for each sample set will have the same number. The sample identification code will be used to identify each sample in the field logbook. The labels will be sufficiently durable to remain legible even when wet.

For documentation purposes, all information pertinent to field observations and sampling will be recorded as described in Section 4.6.

Monitor Well Maintenance

At each sampling episode, the wells will be inspected for signs of tampering, damage, corrosion, faulty locking devices, etc. Any areas of concern will be noted and promptly corrected. The well depth will be compared to the original depth on the well log to ensure that unacceptable silting of the well has not occurred.

4.6 Field Documentation

4.6.1 Documentation Procedures

Field documentation consists of filling out standard forms such as the Groundwater Collection Report and Chain-of-Custody Record, included in **Attachment 2** and **3**, respectively. A separate log book is also maintained.

4.6.2 Logbook

For additional documentation purposes, all information pertinent to field observations and sampling are recorded in a site specific field logbook with consecutively numbered pages. Entries include at least the following:

- Project number and name;
- Location of sampling activity and address;
- Collector's name;
- Well identification;
- Type of sample (grab, composite, other);
- Evacuation date and time;

- Method of evacuation;
- Depth to water surface and bottom of well;
- Gallons per well volume;
- Total gallons evacuated;
- Sampling date and time;
- Method of sampling;
- Any field measurements made, such as pH, temperature, turbidity, specific conductivity or other field parameters;
- Weather conditions at time of sampling;
- Sampling characteristics;
- Containers and preservatives; and
- Recommendations/observations.

The documentation in the logbook is sufficient to reconstruct the sampling procedures without relying on the collector's memory.

4.6.3 Sample Labels

The sample labels should be waterproof and filled out with waterproof ink. At a minimum, the sample label should contain:

- Site, project or plant area;
- Sample number (monitor well number);
- Collector's name;
- Date and time of sample collection;
- Parameters for analysis; and
- Preservatives, if any.

4.6.4 Groundwater Collection Report

A separate groundwater collection report form can be used in conjunction with, or in lieu of, a logbook entry. The groundwater collection report form may be used as a stand-alone document to represent a monitor well sampling event. An example of one type of Groundwater Collection Report Form is included in **Attachment 2**.

4.6.5 Chain-of-Custody Form

Each sample collected for analysis must be recorded on a chain-of-custody form. The chain-of-custody form will become the permanent record of all sample handling and shipment. Chain-of-custody documentation will include the following information:

- Sample identification number;

- Date of sample collection;
- Date sample was submitted to the laboratory;
- Sample collector's signature;
- Number and type of containers;
- Preservation;
- Parameters to be analyzed;
- Signature of persons relinquishing and obtaining custody of samples; and
- Date and time of custody transfer.

With each transfer of sample custody, the persons involved will verify sample numbers and conditions. When custody is transferred, both the person relinquishing and receiving custody must sign in the proper place. An example of a Chain-of-Custody Form is included in **Attachment 3**.

4.7 Decontamination and Cross-Contamination Control

In order to minimize the possibility of cross-contamination, strict cross-contamination control procedures should be followed. These include:

- Sample jars should be kept in limited access areas until used.
- Latex gloves should be worn during all sampling activities and changed between sampling wells.
- Clean plastic sheeting may be placed at the sampling area and all equipment should be placed on the sheets. This plastic shall be discarded after each use.
- Equipment refueling shall be performed in designated areas. These areas should be at a distance from any sampling points to minimize the potential that vapors from fuel will affect sample quality.
- All purge water, decontamination water and discarded gloves will be properly disposed.

4.7.1 Decontamination Procedure

All equipment used to collect groundwater samples will be decontaminated prior to the collection of the samples and in between sample locations. Decontamination of this equipment will be accomplished by the following procedure:

- Washing in a phosphorous-free detergent (i.e., Liquinox);
- Triple-rinse with clean demineralized water;
- If the well has been purged or sampled using a non-dedicated peristaltic or submersible pump, the pumps used must be decontaminated between sample points;

- Decontamination of a submersible pump includes washing with soap and rinsing outside portion of pumps, then running the pump in an open-top 55-gallon drum containing a solution of Liquinox and demineralized water. After a sufficient amount of time, the pump will be rinsed by running it in a drum containing fresh demineralized water until visual evidence of soapy discharge is no longer apparent;
- Decontamination of a peristaltic pump will consist of running a sufficient amount of a solution of demineralized water and Liquinox through the pump, followed by demineralized water until there is no evidence of soapy discharge.

5.0 SURFACE WATER RUNOFF

A storm water general permit for construction activities will be obtained prior to initiating construction activities at the site. This permit will authorize storm water discharges from construction activities to waters of the state. The surface waters runoff will be addressed in this permit.

6.0 WATER COLLECTED IN THE UNSATURATED ZONE

The unsaturated zone water will be addressed by the monitoring wells located in the Shallow Perched Zone contingent upon the LDNR's approval. It is believed that the Shallow Perched Zone monitoring wells will adequately serve as a sentinel to determine if contaminants are leaching into the deeper soils.

7.0 INSPECTION AND MAINTENANCE OF GRADED AND VEGETATED AREAS

Based on the assumption that the site drains and no standing water will be left on the site, a design for site-wide post remedy grading and vegetation for surface water management will be provided. Additionally, the final site grading elevation, surface water management, and re-vegetation plans for the site will be addressed.

During final grading of the site, the area will be surveyed to ensure that natural topographical conditions are met. Original topography will be based on United States Geological Survey (USGS) topographical maps of the area that predate the facility.

8.0 POST-CLOSURE REPORTING

Post-closure reporting will be done on a quarterly basis as required by the LDNR, and all reports will be submitted to the Office of Conservation. Each quarterly report will include the following:

- The status of each cell at the time of the sampling event, the date(s) that the sampling took place, and a diagram indicating the sample locations for each cell;
- A brief description of treatment activities undertaken to bring each cell into compliance with 29-B regulations;
- A copy of the current laboratory test data; and
- The size of each land treatment cell in acres.

APPENDIX D

POST-CLOSURE MONITORING PLAN

ATTACHMENT 1

MONITORING WELL LOCATION MAP

ATTACHMENT 2

GROUNDWATER COLLECTION REPORT FORM

ATTACHMENT 3

CHAIN-OF-CUSTODY RECORD

MARGONE, LLC

CANKTON, LOUISIANA

APPENDIX E
QUALITY CONTROL PLAN

OCTOBER 2002

PREPARED FOR ENVIROCON BY:

PROVIDENCE ENGINEERING AND ENVIRONMENTAL GROUP LLC
6160 PERKINS ROAD, SUITE 100
BATON ROUGE, LOUISIANA 70808
(225) 766-7400

PROVIDENCE ENGINEERING PROJECT NUMBER 092-001

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APPENDIX E
QUALITY CONTROL PLAN

1.0 INTRODUCTION

The MAR Services site (shown on the Site Location Map in **Attachment 1**) is located 5.4 miles north of Interstate 10 along highway 93 in Saint Landry Parish, Louisiana. The site was in use as an oil separation and storage site from 1934 until the 1960s. MAR Services was reopened in the 1980s and shut down again in 1992 when the Louisiana Department of Natural Resources (LDNR) revoked its permit. As a result of these activities, subsurface soils were impacted with various constituents. Envirocon has been contracted to implement field activities associated with the restoration and remediation of the MAR Services site. Envirocon will serve as prime contractor and Providence Engineering and Environmental Group LLC (Providence Engineering) will act as Envirocon's major subcontractor. Providence Engineering will be responsible for engineering design, developing work plans, interfacing with regulatory agencies, engineering oversight, closure reporting, and quarterly ground water monitoring. Envirocon will implement all field-related services including site preparation, soils management, and site restoration.

The Quality Control (QC) Plan provides general policy and guidance for establishing quality control and quality management procedures associated with Phase II: Soils and Groundwater Management Activities to the MAR Services Site.

2.0 ROLES AND RESPONSIBILITIES

Providence Engineering will be responsible for engineering oversight and closure reporting. The construction Quality Assurance (QA) Officer is Mr. Todd Black, P.E. of Providence Engineering. Mr. Black is a licensed Registered Professional Engineer in the State of Louisiana and is experienced in the design and construction of disposal and remediation sites.

An organizational chart is provided as **Attachment 2**, which shows lines of communications for this project and responsibilities of key personnel.

3.0 GENERAL CONSTRUCTION, INSPECTION, AND DOCUMENTATION PROCEDURES

To ensure construction quality control at the site, a QC technician will be on-site during key construction activities for inspection and project documentation. The QC Technician's responsibility will include

completion of daily reports, photographic documentation, surveying, and problem/deficiency identification.

Daily Reports

A summary report will be prepared daily by the QC technician for each day of activity. A sample Daily Report is presented in **Attachment 3**. The following information will be included in each report:

- Date, project name, location, and report preparer's name;
- Time work starts and ends each construction work day. Also, the duration and reason for work stoppages;
- Data on weather conditions including temperature, humidity, wind speed and direction, cloud cover, and precipitation;
- Construction Contractor's equipment in use and materials delivered to job site;
- Description of work in progress including locations and type to work performed;
- Summary of meetings held and attendees;
- A description of materials used and references or results of testing and documentation'
- Discussion of problems/deficiencies identified and corrective actions taken;
- Identification/list of laboratory samples collected, marked, and delivered to laboratories, or clear reference to the document containing such information if samples were obtained; and
- An accurate record of standardizations performed on field testing equipment.

Photographic Documentation

Photographic documentation of all key phases of construction will be collected during the project. A photographic log sheet can be found in **Attachment 4**.

Surveying

Surveying shall be performed in accordance with good engineering practices under the direction of a Registered Professional Engineer or Registered Professional Land Surveyor. The surveying shall be used for horizontal and vertical verifications.

Problem/Deficiency Identification

All field reports and data shall be reviewed weekly by the QC Technician and QA Officer to identify problems and/or deficiencies associated with the project. Should a problem/deficiency be observed, the following corrective action steps shall be taken to correct the problem/deficiency.

- QC Technician will submit a written memo to the project file documenting the problem/deficiency;
- QC Technician and QA Officer will confer on the appropriate corrective action measure to correct the problem or deficiency;
- The project inspection and testing procedures will be changed to reflect the corrective action measures. A log of all changes to the testing and inspection procedures will be documented; and
- The corrective action procedure will be re-evaluated within ten working days to ensure that the problem/deficiency has been adequately addressed.

4.0 TESTING/INSPECTION PROCEDURES

All QA testing associated with the Phase II construction activities will be performed as detailed in the Confirmation Sampling and Analysis Plan included in **Appendix C** of the Soils and Groundwater Management Activities Work Plan. The Confirmation Sampling and Analysis Plan describes sampling techniques and testing methodology for the chosen pre-construction, construction, and post-construction design alternatives.

Daily Report

DATE:	**PAGE: _ of _**
CLIENT NAME:	**PROJECT NO:**
PROJECT DESCRIPTION:	

Weather Conditions	**Temperature:**	**Humidity:**
	Wind Speed and Direction:	
	Cloud Cover/Precipitation:	
Time	**Work Start:**	
	Work Stop:	
	Interruptions and Explanation:	

Contractor Personnel and Equipment:
Material Deliveries:

Work Completed:

Materials Used:

Comments/Pictures:

Technician:

Daily Report (continued)	
DATE:	**PAGE: __ of __**
CLIENT NAME:	**PROJECT NO:**
PROJECT DESCRIPTION:	
Samples Collected/Analysis:	
Equipment Calibrations/Recalibrations:	
Problems/Deficiencies:	
Location of Problem:	
Probable Cause:	
Recommended Corrective Action:	
Problem/ Deficiencies Resolved:	
Status of Unresolved Problems/ Deficiencies:	
Signed:	

PROVIDENCE ENGINEERING AND ENVIRONMENTAL GROUP LLC

PHOTOGRAPHIC LOG SHEET

Picture No.	Client	Project No.	Date	Location	Direction	Notes	Initials

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APPENDIX E

QUALITY CONTROL PLAN

ATTACHMENT 1

SITE LOCATION MAP

ATTACHMENT 2

ORGANIZATIONAL CHARTS

ATTACHMENT 3

DAILY REPORTS

ATTACHMENT 4

PHOTOGRAPHIC DOCUMENTATION LOG SHEET

APPENDIX F

HEALTH AND SAFETY PLAN