APPENDIX E

HEALTH AND SAFETY INCIDENT REPORT FORM

ECO-SYSTEMS, INC.

HEALTH AND SAFETY INCIDENT REPORT

Project Number_____ Date/Time of Incident_____

Project Name_____ Project Location_____

DESCRIPTION OF THE INCIDENT. Describe below, what happened and possible cause. Identify individuals involved, witnesses, and their affiliations Describe emergency and/or corrective action that was taken.

Name of Person Making Report:_____

Print Name Signature Date

NOTE: *This report must be sent to Eco-Systems HSO ASAP!*

Reviewed by:_____

Print Name Signature Date

Reviewed by:_____

Print Name Signature Date

Eco-Systems, Inc.

Distribution:

Eco-Systems Management_____

Project Manager_____

Site Manager_____

Site HSO_____

ECO-SYSTEMS, INC.

HEALTH AND SAFETY INCIDENT REPORT

Project Number_____ Date/Time of Incident_____

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Reviewed by:_____

Print Name Signature Date

Reviewed by:_____

Print Name Signature Date

Eco-Systems, Inc.

Distribution:

Eco-Systems Management_____

Project Manager_____

Site Manager_____

Site HSO_____

APPENDIX F

EMERGENCY SERVICES/PHONE NUMBERS AND ROUTE TO THE HOSPITAL

ESI

EMERGENCY SERVICES/PHONE NUMBERS AND ROUTE TO THE HOSPITAL

PROJECT: HERCULES, INC.
LOCATION: HATTIESBURG, MISSISSIPPI
PROJECT NO.: HER24100

The directions to the **hospital** are as follows:

1. From Hercules main gate on 7th Street, go left (eastward) approximately 1/8 mile to Main Street, and turn right.
2. Go approximatly 1.2 miles to the corner of Hall Ave. and Main Street.
3. Methodist Hospital is located on the southwest corner.

The list of emergency services must either be posted on-site or carried by all field personnel.

Emergency Service	Location	Telephone
Emergency Number	Hattiesburg, Mississippi	911
Fire Department	Hattiesburg, Mississippi	601/545-4691
Police Department	Hattiesburg Police Dept.	601/544-7900
Ambulance	Hattiesburg	601/
Hospital	Methodist Hospital	601/
Wesley Medical Center	Hattiesburg	601/268-8000
Poison Control Center	UMC - Jackson, Miss.	601/354-7660
Eco-Systems Physician	Rankin Medical Center Brandon, Mississippi	601/825-2811

FILE COPY

HERCULES

Corrective Action Plan
Hercules Incorporated
613 West 7th Street
Hattiesburg, Mississippi 39401

Prepared for:

Hercules Incorporated
1313 North Market Street
Wilmington, Delaware 19894

Prepared by:

Groundwater & Environmental Services, Inc.
5961 Live Oak Parkway, Suite B
Norcross, Georgia 30093

Jeffery S. Duncan, P.G.
Senior Project Manager

November 2004

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1.0 INTRODUCTION

On behalf of Hercules Incorporated (Hercules), Groundwater and Environmental Services, Inc. (GES) has prepared this Corrective Action Plan (CAP) for the Hercules facility located at 613 West 7th Street in Hattiesburg, Mississippi. A Site Location Map is included as **Figure 1**.

This CAP has been prepared in response to the Mississippi Department of Environmental Quality (MDEQ) request in a letter dated 12 August 2004. The 12 August 2004 MDEQ letter and subsequent GES response letter dated 28 September 2004 provided further clarification on the 16 July 2004 Remedial Action Evaluation (RAE) and the implications on the preparation of this CAP. GES has incorporated the intent of these communications in this CAP.

1.1 BACKGROUND

As presented in the referenced RAE prepared by Eco-Systems, Inc. (Eco-Systems), the following provides a background summary of site investigations conducted at the facility.

Site investigations at the Hercules facility in Hattiesburg Mississippi, which were conducted between April 1999 and November 2003, are discussed in the *Interim Groundwater Monitoring Report* (Eco-Systems, January 2003), the *Hercules Site Investigation Report* (Eco-Systems, April 2003), and the *Supplemental Site Investigation Report* (Eco-Systems, November 2004). The findings of the site investigations include the following:

- Detection of volatile organic compounds (VOCs) in groundwater at concentrations above Target Remediation Goals (TRGs) in the Landfill and Groundwater areas of the site;
- Delineation of the lateral limits of the Landfill based on geophysical investigation;
- Presence of VOCs and Dioxathion at concentrations less than TRGs in surface water and sediment samples collected from Green's Creek, and;
- Presence of VOCs and Dioxathion in one of three groundwater monitoring wells located hydraulically downgradient of the sludge pits. It should be noted that Dioxathion has not been detected above the TRGs in this area.

Site investigations indicated that neither VOCs nor Dioxathion, are migrating via groundwater or surface water onto off-site properties. Some of the VOCs detected in Green's Creek were detected in samples collected from the location

where Green's Creek enters the property, which indicates that, at least, some of the VOCs are due to upstream, off-site, sources.

1.2 FACILITY SETTING AND OVERVIEW

As presented in the RAE prepared by Eco-Systems, the following presents the facility settings and overview.

The Hercules facility is located on approximately 200 acres of land north of West Seventh Street in Hattiesburg, Forest County, Mississippi. More specifically, the Site is located in Sections 4 and 5, Township 4 North, Range 13 West, just north of Hattiesburg, Mississippi **(Figure 1).** The facility has been in operation since 1923. The facility is bordered to the north by Highway 42 and beyond which is Illinois-Central & Gulf Railroad, along with various residential and commercial properties. The southern property boundary is bordered by 7th Avenue; and by Roseland Park cemetery and Zeon Chemical Corporation to the south-southwest. Across from these locations are residential areas. The eastern and western boundaries are bordered by sparsely populated residential and commercial areas.

The facility's historical operations consisted of wood grinding, shredding, extraction, fractionation, refining, distillation, and processing of rosin from pine tree stumps. Historically, over 250 products were produced from the above-referenced operations and included: modified resins, polyamides, ketene dimmer, crude tall oil wax emulsions, and Delnav, an agricultural miticide. Structures at the facility include offices, a laboratory, a powerhouse, production buildings, a wastewater treatment plant, settling ponds, a landfill, and central loading and packaging areas.

Previous investigations at the Hercules facility have centered on efforts to determine whether the miticide, Dioxathion, was present in site soil and groundwater. The work has included soil, groundwater, surface water, and stream sediment sampling and analysis. The work has also included geophysical investigation to delineate the limits of the landfill and to investigate the potential for buried metal in a location identified by the MDEQ. The results of previous investigations are discussed in reports, which have been submitted to the MDEQ:

1. *Site Inspection Report*, B&V Waste Science and Technology Corp., April, 1993.
2. *Work Plan for Well Installation*, Bonner Analytical Testing Company; June, 1997.
3. *Installation, Sampling, and Analysis Report*, Bonner Analytical Testing Company; December, 1997.

4. *Quarterly Monitor Well Sampling Event Reports*, Bonner Analytical Testing Company; June, 1998 through October, 1998.
5. *Site Investigation Work Plan*, Eco-Systems, Inc., February 1999.
6. *Interim Groundwater Monitoring Report*, Eco-Systems, Inc. January 2003.
7. *Site Investigation Report*, Eco-Systems, Inc. April 2003.
8. *Work Plan for Supplemental Site Investigation*, Eco-Systems, Inc. June 2003.
9. *Supplemental Site Investigation Report*, Eco-Systems, Inc. November 2003.
10. *Remedial Action Evaluation,* Eco-Systems, Inc. July 2004.

The information discussed in the listed documents indicates that sources, source area concentrations, and vertical and horizontal extent of groundwater containing constituents of concern have been defined sufficiently for corrective action planning purposes. The existing data does not indicate that the site poses a significant threat to human health and the environment in its current use as a chemical production facility. However, if changes in land use occur or additional information is obtained, the current risk scenario for the site could also change.

1.3 PURPOSE AND SCOPE

The purpose of this CAP is to present the regarding the reflected remedial option for each of the four areas of the site included in the RAE. The scope of this CAP is presented in the following sections:

- Section 2.0 presents the completed design per area;
- Section 3.0 presents the components per area;
- Section 4.0 presents the schedule for each component;
- Section 5.0 presents the Remedial Goals;
- Section 6.0 presents the Operation & Monitoring Plan for the fencing;
- Section 7.0 presents the Performance Monitoring Plan for MNA;
- Section 8.0 presents the Compliance Monitoring Plan for each area;
- Section 9.0 presents the Contingency Plan for each area;
- Section 10.0 presents Quality Assurance Project Plan considerations per area, and;
- Section 11.0 presents Health and Safety Plan considerations.

2.0 CONCEPTUAL DESIGN

The conceptual design of this CAP is comprised of Monitored Natural Attenuation (MNA) and institutional controls consisting of fencing and deed restrictions. The specific conceptual design of each of the areas is included below.

2.1 SLUDGE PITS

For the sludge pits, this CAP presents MNA combined with a deed restriction to restrict future land use of the sludge pits and nearby surrounding areas and the maintenance of the existing chain-link fence surrounding the facility to limit current and future exposure to the Sludge Pits..

2.2 LANDFILL

For the landfill, this CAP presents MNA combined with a deed restriction to restrict future land use in the landfill area.

2.3 GROUNDWATER

For Groundwater, this CAP presents MNA combined with deed restrictions to restrict future land use in the area of groundwater containing VOCs in excess of the TRGs.

2.4 GREEN'S CREEK

For Green's Creek, this CAP presents MNA combined with a deed restriction to restrict future land use of Green's Creek and the maintenance of the existing chain link fence surrounding the facility to limit current and future exposure to Green's Creek.

3.0 SYSTEM COMPONENTS

The primary components of this CAP consist of groundwater and surface water monitoring networks, deed restrictions and fencing. All work will be completed in accordance with the Environmental Investigations Standard Operating Procedures and Quality Assurance Manual (EISOPQAM) dated November 2001. The locations of groundwater and surface water monitoring locations are presented on **Figure 2**. The analytical requirements by area are presented on **Table 1**. The specific components of each area are described below.

3.1 SLUDGE PITS

The components of this CAP for the Sludge Pits consist of the following:

- Deed amendment to restrict land use to commercial/industrial and eliminate potential future residential land use;
- Maintenance of an existing chain-link fence around the facility and;
- Collection of groundwater samples from an existing monitoring well network consisting of MW-2, MW-3, MW-4, MW-10 and MW-11. The samples will be analyzed for VOCs via USEPA SW846-8260 and Dioxathion (cis- and trans-) and Dioxenethion via the Dioxathion Sampling and Analysis Protocol (Appendix A). This method is a combination of USEPA SW846-3510/8321 using HPLC-PDA analyses.

3.2 LANDFILL

The system components of this CAP for the Landfill consist of the following:

- Deed amendment to restrict land use to commercial/industrial and eliminate potential future residential land use, and;
- Collection and analysis of groundwater samples from a monitoring well network consisting of existing wells MW-5 and MW-6 and proposed wells MW-12, MW-13 and MW-14. The samples will be analyzed for VOCs via USEPA SW846-8260.
- Proposed monitoring wells MW-12, MW-13 and MW-14 will be installed as permanent two-inch diameter wells as follows:

- Soil borings will be installed via; Hollow Stem Auger (HSA) drilling rig;

- Permanent wells will be installed in the soil borings to bracket the observed water table with a 10-foot screened interval; which will be constructed to monitor the same water-bearing zone as monitoring wells MW-5 and MW-6.

- The estimated total depths of these monitoring wells is 20-feet below ground surface.

3.3 GROUNDWATER

The components of this CAP for Groundwater consist of the following:

- Deed amendment to restrict land use to commercial/industrial and eliminate potential future residential land use, and;

- Collection of groundwater samples from a monitoring well network consisting of existing monitoring wells MW-7, MW-8 and MW-9, proposed monitoring wells MW-15, MW-16 and MW-17 and proposed compliance wells MW-18 and MW-19. It should be noted that an additional well is proposed, for a total of three proposed new wells, so that permanent wells are installed at both locations of water samples collected from GP-2 and GP-4. The samples will be analyzed for VOCs via USEPA SW846-8260 and the Dioxathion Sampling and Analysis Protocol (Appendix A). This method is a combination of USEPA SW846-3510/8321 using HPLC-PDA analyses.

- Proposed monitoring wells MW-15 through MW-19 will be installed as permanent two-inch diameter wells as follows:

  - Soil borings will be installed via; Hollow Stem Auger (HSA) drilling rig;

  - Permanent wells will be installed in the soil borings to bracket the observed water table with a 10-foot screen interval; which will be constructed to monitor the same water-bearing zone as monitoring wells MW-7, MW-8 and MW-9.

  - The estimated total depths of those monitoring wells is 20-feet below ground surface.

3.4 GREEN'S CREEK

The components of this CAP for Green's Creek consist of the following:

- Deed amendment to restrict land use to commercial/industrial and eliminate potential future land use;
- Maintenance of an existing chain-link fence around the facility, and;
- Collection and analysis of surface water samples from a surface water monitoring network consisting of CM-00 through CM-05. The samples will be analyzed for VOCs via USEPA SW846-8260 and .the Dioxathion Sampling and Analysis Protocol (Appendix A). This method is a combination of USEPA SW846-3510/8321 using HPLC-PDA analyses.

4.0 SCHEDULE

The CAP presented herein will be initiated upon approval by MDEQ. A groundwater monitoring schedule is presented as **Table 2**. An implementation schedule and duration of implementation for each component is described below.

4.1 DEED RESTRICTIONS

Deed restrictions for each of the four areas will be initiated within 30-days following MDEQ's approval of this CAP. It is currently envisioned that the necessary documentation of the deed restrictions will be provided in the first annual CAP Implementation Report.

4.2 GROUNDWATER AND SURFACE WATER MONITORING

Implementation of groundwater and surface water monitoring well be implemented within 90-days following MDEQ's approval of this CAP. The monitoring will be completed on a quarterly basis for the period of two years. At the conclusion of eight (8) quarterly monitoring events, an evaluation of the need for further monitoring and a schedule for such monitoring will be proposed to MDEQ at that time.

5.0 REMEDIAL GOALS

The overall remedial goals (RGs) of this CAP are to restrict future land use via deed restrictions, limit current and future potential exposure via fencing and document long-term natural attenuation of groundwater constituents via MNA. The following presents the rationale for determining when the remedial goals have been achieved.

The RG of restricting future land use will be considered complete once the deed restrictions are complete and the supporting documentation has been provided to MDEQ.

The RG of limiting current potential exposure considered complete since existing fencing is protective of exposure to the Sludge Pits and Green's Creek. For the RG of limiting potential future exposure an inspection and maintenance will be implemented to ensure the integrity of the fencing.

The RG of documenting long-term natural attenuation of groundwater constituents will be considered complete once a sufficient amount of MNA data has been compiled and evaluated to support the that groundwater constituents are decreasing over time and the extent of the groundwater plume(s) are reducing in areal extent over time.

6.0 *OPERATION AND MONITORING PLAN*

The only component of this CAP that requires an Operation and Monitoring (O&M) requirement is inspection of fencing. Annual inspection and maintenance will be implemented to limit future potential exposure to these areas. Documentation of the annual inspection and maintenance will be included in Annual Monitoring Reports. Barring any unforeseen circumstances, any necessary repairs to the fencing will be completed within 90-days following any observance.

7.0 *PERFORMANCE MONITORING PLAN*

The CAP component that requires a Performance Monitoring Plan is MNA. MNA will be evaluated based on groundwater constituent concentrations and areal distribution of groundwater plume(s) over time.

Implementation of this Performance Monitoring Plan will be documented in Annual Monitoring Reports that will be submitted to MDEQ. Each annual report will document the quarterly activities conducted during that year and will provide all data generated to date. The reports will contain copies of the analytical reports, chain-of-custody forms, and a discussion of the data evaluation. Liquid-level data collected during groundwater sampling will be used to determine groundwater elevations and flow direction. The groundwater analytical data will be tabulated and screened against the MDEQ TRGs. Groundwater potentiometric and quality maps will be prepared for the main constituents detected in excess of their respective TRGs to facilitate an evaluation of groundwater plume areal extent over time. Groundwater constituent trend charts will be prepared to facilitate an evaluation of groundwater constituent concentrations over time.

8.0 COMPLIANCE MONITORING PLAN

During the implementation of this CAP, compliance monitoring for the MNA component will be conducted in each of these areas. The compliance monitoring is required to ensure that contingent actions are undertaken if certain "triggers" are met. These "triggers" are identified as either: (1) a significant increase in either downgradient groundwater constituents, or; (2) a significant increase in the extent of groundwater plume(s).

8.1 SLUDGE PITS

Compliance monitoring in the Sludge Pits area will consist of evaluating the analytical data generated from downgradient monitoring wells MW-4, MW-10 and MW-11. The data generated from these monitoring wells will provide an evaluation of groundwater quality emanating from the Sludge Pits area and towards Green's Creek.

8.2 LANDFILL

Compliance monitoring in the landfill area will consist of evaluating the analytical data generated from downgradient monitoring wells MW-5, MW-12 and MW-14. The data generated from these monitoring wells will provide an evaluation of groundwater quality emanating from the landfill area and towards Green's Creek.

8.3 GROUNDWATER

Compliance monitoring in the Groundwater area will consist of evaluating the analytical data generated from downgradient monitoring wells MW-14 (landfill well) and MW-15. The data generated from these wells will provide an evaluation of groundwater quality emanating from the Groundwater area and towards Green's Creek.

8.4 GREEN'S CREEK

Compliance monitoring for Green's Creek will consist of evaluating the analytical data in downgradient surface water sampling locations CM-03, CM-04 and CM-05. The data generated from those surface water monitoring locations will

provide an evaluation of surface water in the creek on-site and quality of surface water leaving the property. The data from these points will be compared to the upgradient monitoring points CM-00, CM-01 and CM-02.

9.0 CONTINGENCY PLAN

The following Contingency Plan has been prepared and will be enacted should the specific "triggers" identified in Section 8.0 be met. The overall contingency plan approach is that if MDEQ or Hercules suspects that a 'trigger' condition has been met, a meeting will be held between both parties (and/or representatives) to facilitate an objective evaluation of the situation including; the data, the potentential risk to human health and the environment, current technologies, prior to initiation of any of the specificed contingency actions identified below. A specific plan for each area is described below.

9.1 SLUDGE PITS

Contingent measures will be necessary if it is determined that a sustained significant increase in constituents is present in monitoring wells MW-4, MW-10 and MW-11 above TRGs. A sustained significant increase in constituent concentrations in these wells would indicate that a release of constituents from the Sludge Pits area may have occurred. If deemed necessary, the contingent plan for the Sludge Pits area consists of installation of the cap as detailed in the RAE.

Upon approval of this CAP, Hercules will purchase financial assurance in the amount of $758K to cover the costs of installing a cap on the Sludge Pits should the contingent measure become necessary. The financial assurance will name MDEQ as a beneficiary should Hercules become unable to cover the potential financial responsibility of this measure.

9.2 LANDFILL

Groundwater quality in the landfill area does not exhibit constituents above the TRGs and does not pose a potential groundwater exposure risk that would require a contingency plan.

9.3 GROUNDWATER

Contingent measures will be necessary if it is determined that a sustained significant increase in constituents is present in monitoring wells MW-5, MW-12 and MW-14 above TRGs. A sustained significant increase in constituent concentrations in these wells would indicate that a significant source of groundwater constituents is present in the Groundwater area. If deemed

necessary, the contingent plan for the Groundwater consists of *in-situ* chemical oxidation (ISCO) as detailed in the RAE.

Upon approval of this CAP, Hercules will purchase financial assurance in the amount of $669K to cover the costs of implementing ISCO in the Groundwater area should the contingent measure become necessary. The financial assurance will name MDEQ as a beneficiary should Hercules become unable to cover the potential financial responsibility of this measure.

9.4 GREEN'S CREEK

Contingent measures will be necessary if it is determined that a sustained significant increase in constituents is present in downgradient surface water monitoring points CM-03, CM-04 and CM-05 as compared to the constituents observed in upgradient surface water points CM-00, CM-01 and CM-2. A sustained significant increase in constituent concentrations in the downgradient surface water monitoring points would indicate that a release of constituents from the Sludge Pits area may have occurred. If deemed necessary, the contingent plan for Green's Creek will consist of addressing the Sludge Pits area as detailed in Section 9.1.

As previously discussed, upon approval of this CAP, Hercules will purchase financial assurance in the amount of $758K to cover the costs of installing a cap on the Sludge Pits should the contingent measure become necessary. The financial assurance will name MDEQ as a beneficiary should Hercules become unable to cover the potential financial responsibility of this measure.

10.0 QUALITY ASSURANCE PROJECT PLAN

The following Quality Assurance Project Plan (QAPP) considerations have been prepared for the MNA component of this CAP. Specifically, these considerations have been made to assure the quality of the analytical data to be generated is sufficient to be used to evaluate groundwater quality trends and ensure that implementation of the CAP is protective of human health and the environment. All work will be completed in accordance with the Quality Provisions of SW846 QA/QC Protocol and EPA Region IV EISOPQA dated November 2001.

The following field sampling QAPP considerations will be followed:

- Blind Field Duplicate samples will be collected at the rate of 1 per 20 samples;
- Equipment field rinsate samples will be collected at the rate of 1 per field day per non-disposable equipment used;
- Trip blank samples will be analyzed at the rate of 1 per cooler containing samples for VOC analysis.

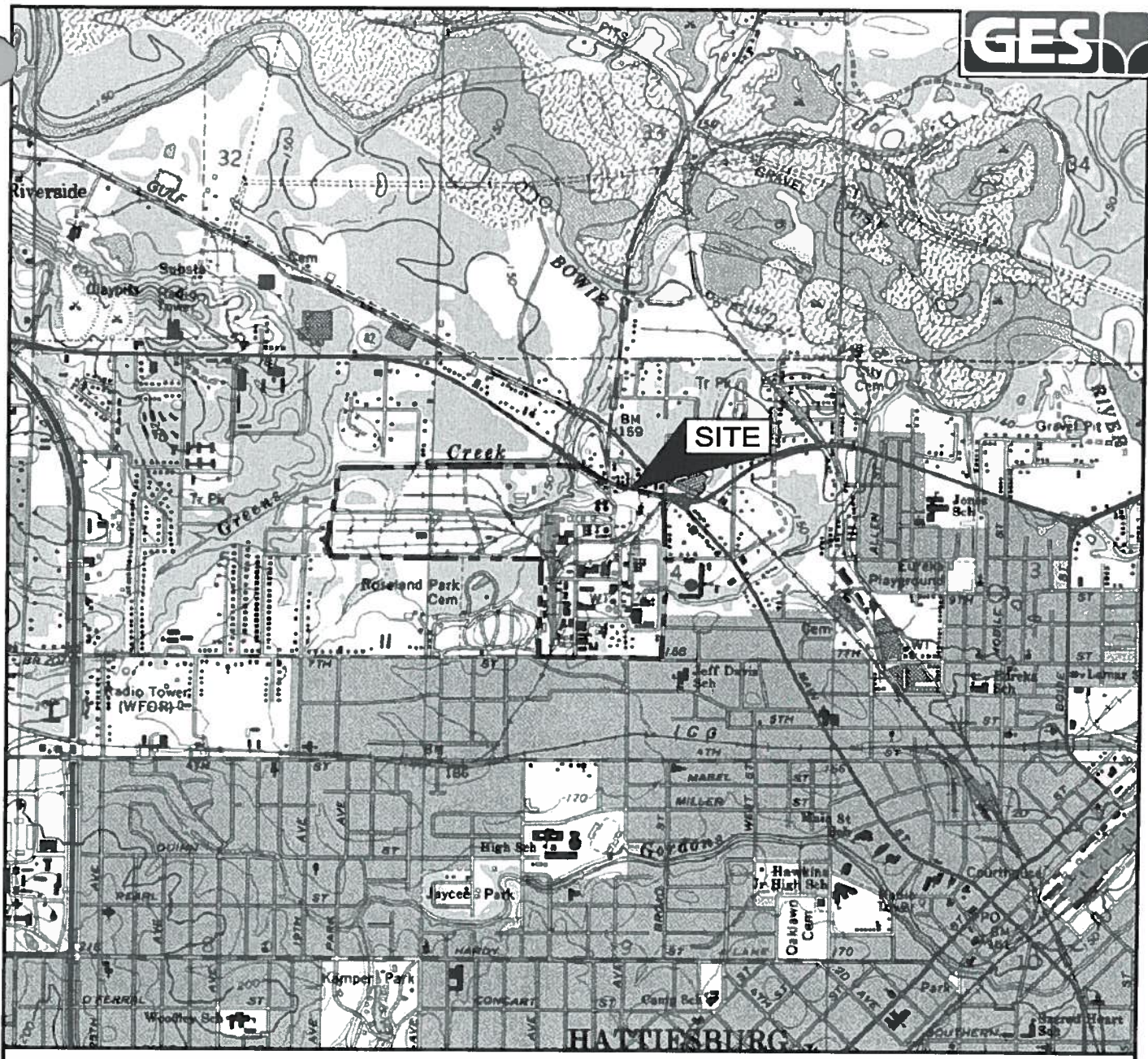
The results of these samples will be tabulated and included in the Annual Monitoring Reports.

The Data Quality Objectives (DQOs) for the groundwater data generated during implementation of this CAP will be the TRGs. The groundwater analytical parameter list is provided as **Table 3**. This table also presents the TRGs and the respective laboratory analytical reporting limits. For those compounds where the screening criteria are lower than the report limit (RL), the method detection limit (MDL) will be used. If detections are made between the RL and the MDL, the resulting detection will be j-flagged indicating that the detection is estimated. It should be noted, that this table also presents (in bold) the compounds with MDLs that exceed the TRGs.

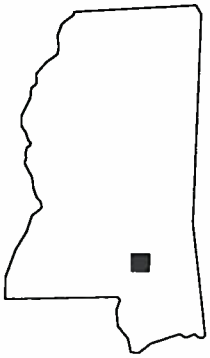
11.0 HEALTH AND SAFETY PLAN

A Health & Safety Plan (HASP), consistent with the requirements of OSHA 1910.120 Hazardous Waste Operations (Hazwoper), will be prepared prior to the conduct of any and all on-site field operations. In addition, all field personnel and subcontractors will be required to attend a Hercules Incorporated site-specific health and safety training meeting prior to commencement of field activities.

Figures



SOURCE: USGS 7.5 MINUTE SERIES
TOPOGRAPHIC QUADRANGLE 1982
HATTIESBURG, MISSISSIPPI
CONTOUR INTERVAL = 10'

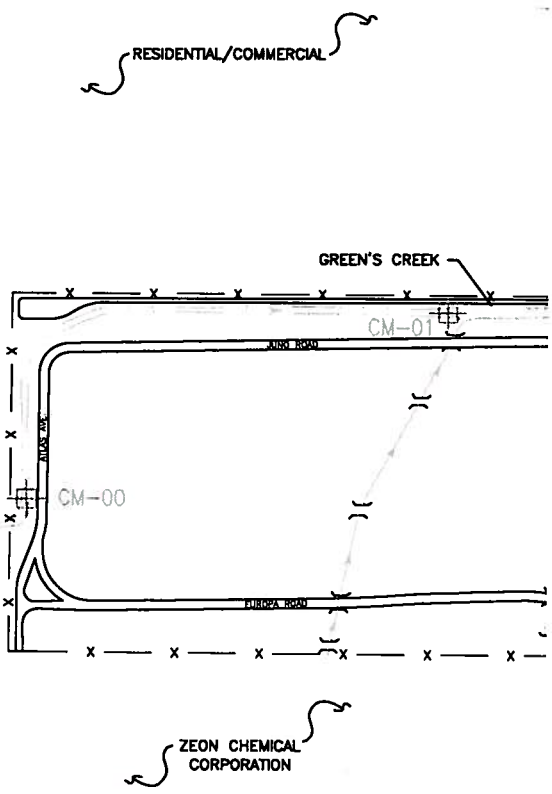


QUADRANGLE LOCATION

LAT. 031° 20' 24.78" N
LONG. 089° 18' 28.22" W
(APPROXIMATE SITE COORDINATES)

DRAFTED BY: W.A.W. (N.J.)	SITE LOCATION MAP
CHECKED BY:	HERCULES INCORPORATED 613 WEST 7th STREET HATTIESBURG, MISSISSIPPI
NORTH	Groundwater & Environmental Services, Inc. 5961 LIVE OAK PKWY, SUITE B, NORCROSS, GEORGIA 30093
SCALE IN FEET: 0 — 2000	DATE: 10-29-04 / FIGURE: 1

hlcs\2300-Atlanta\MISC\Hercules\Hattiesburg\hattiesburg SLM.dwg, 10/29/2004 11:41:07 AM, WWesterlund



LEGEND

- APPROXIMATE PROPERTY BOUNDARY
- INTERMITTENT DRAINAGE DITCH
- MONITORING WELL
- MONITORING WELL–LANDFILL
- MONITORING WELL–GROUNDWATER
- MONITORING WELL–SLUDGE PITS
- SAMPLE LOCATION–GREEN'S CREEK
- PROPOSED MONITORING WELL–GROUNDWATER
- PROPOSED MONITORING WELL–LANDFILL

MAP PREPARED FROM ECO SYSTEMS INC DRAWING MARCH 5, 2003.

SITE MAP

HERCULES INCORPORATED
613 WEST 7th STREET
HATTIESBURG, MISSISSIPPI

Groundwater & Environmental Services, Inc.
5961 LIVE OAK PKWY, SUITE B, NORCROSS, GEORGIA 30093

SCALE IN FEET (APPROXIMATE)	DATE	FIGURE
0 450	11–5–04	2

Tables

Table 1
Analytical Requirements by Area
Hercules Incorporated Facility
Hattiesburg, Mississppi

Area	Analytical Requirements	Analytical Method
Sludge Pits	(1) Appendix IX Volatile Organic Compounds (2) Dioxathion (cis- and trans-), Dioxenethion	(1) SW846-8260 (2) SW846-3510/8321, HPLC analysis
Landfill	(1) Appendix IX Volatile Organic Compounds	(1) SW846-8260
Groundwater	(1) Appendix IX Volatile Organic Compounds (2) Dioxathion (cis- and trans), Dioxenethion	(1) SW846-8260 (2) SW846-3510/8321, HPLC analysis
Green's Creek	(1) Appendix IX Volatile Organic Compounds (2) Dioxathion (cis- and trans-), Dioxenethion	(1) SW846-8260 (2) SW846-3510/8321, HPLC analysis

Table 2
Groundwater Monitoring Schedule
Hercules Incorporated Facility
Hattiesburg, Mississippi

Monitoring Location	Sample Classification	Initial Monitoring Schedule
Liquid Levels		
Piezometers		
TP-3	Groundwater Elevation	Quarterly
TP-4	Groundwater Elevation	Quarterly
TP-5	Groundwater Elevation	Quarterly
TP-6	Groundwater Elevation	Quarterly
TP-7	Groundwater Elevation	Quarterly
TP-11	Groundwater Elevation	Quarterly
Monitoring Wells		
MW-2	Groundwater Elevation	Quarterly
MW-3	Groundwater Elevation	Quarterly
MW-4	Groundwater Elevation	Quarterly
MW-5	Groundwater Elevation	Quarterly
MW-6	Groundwater Elevation	Quarterly
MW-7	Groundwater Elevation	Quarterly
MW-8	Groundwater Elevation	Quarterly
MW-9	Groundwater Elevation	Quarterly
MW-10	Groundwater Elevation	Quarterly
MW-11	Groundwater Elevation	Quarterly
MW-12	Groundwater Elevation	Quarterly
MW-13	Groundwater Elevation	Quarterly
MW-14	Groundwater Elevation	Quarterly
MW-15	Groundwater Elevation	Quarterly
MW-16	Groundwater Elevation	Quarterly
MW-17	Groundwater Elevation	Quarterly
MW-18	Groundwater Elevation	Quarterly
MW-19	Groundwater Elevation	Quarterly
Green's Creek Staff Gauges		
SG-1	Groundwater Elevation	Quarterly
SG-2	Groundwater Elevation	Quarterly
SG-3	Groundwater Elevation	Quarterly
SG-4	Groundwater Elevation	Quarterly

Table 2
Groundwater Monitoring Schedule
Hercules Incorporated Facility
Hattiesburg, Mississippi

Monitoring Location	Sample Classification	Initial Monitoring Schedule
Groundwater Sampling		
Sludge Pits		
MW-2	Upgradient Well	Quarterly
MW-3	Upgradient Well	Quarterly
MW-4	Downgradient Well	Quarterly
MW-10	Downgradient Well	Quarterly
MW-11	Downgradient Well	Quarterly
Landfill		
MW-5	Downgradient Well	Quarterly
MW-6	Upgradient Well	Quarterly
MW-12 *P*	Upgradient Well	Quarterly
MW-13 *P*	Upgradient Well	Quarterly
MW-14 *P*	Downgradient Well	Quarterly
Groundwater		
MW-7	Upgradient Well	Quarterly
MW-8	Downgradient Well	Quarterly
MW-9	Upgradient Well	Quarterly
MW-15 *P*	Downgradient Well	Quarterly
MW-16 *P*	Downgradient Well	Quarterly
MW-17 *P*		
MW-18 *P*	Point of Compliance Well	Quarterly
MW-19 *P*	Point of Compliance Well	Quarterly
Green's Creek		
CM-00	Upgradient Surface Water	Quarterly
CM-01	Upgradient Surface Water	Quarterly
CM-02	Upgradient Surface Water	Quarterly
CM-03	Downgradient Surface Water	Quarterly
CM-04	Downgradient Surface Water	Quarterly
CM-05	Downgradient Surface Water	Quarterly

Notes:
~ No Analytical Data Available
P - Proposed Monitoring Well
Initial Monitoring Schedule proposed for the first 2 years of CAP implementation

Table 3
Screening Criteria and
Reporting Limits
Hercules Incorporated Facility
Hattiesburg, Mississippi

Sample ID	MDEQ TRGs	Reporting Limit[1]
Appendix IX Volatile Organic Compounds (VOCs) *Method SW8260B* (ug/L)		
Acetone	608	25
Acetonitrile	125	40
Acrolein (Propenal)	**0.0416**	10
Acrylonitrile	**0.0367**	**5.7**
Benzene	5	1.0
Bromodichloromethane	0.168	0.14
Bromoform	8.48	1.0
Bromomethane (Methyl bromide)	8.52	1.0
2-Butanone (Methyl ethyl ketone)	1,910	10
Carbon disulfide	1,040	1.0
Carbon tetrachloride	5	1.0
Chlorobenzene	100	1.0
Chloroethane	3.64	1.0
Chloroform	**0.155**	**0.37**
Chloromethane (Methyl Chloride)	1.43	1.0
Chloroprene (1,3 Butadiene)	**0.00696**	**1.0**
3-Chloroprene (Allylchloride)	1.43	1.0
Dibromochloromethane	**0.126**	**0.5**
1,2-Dibromo-3-chloropropane	**0.2**	**0.47**
1,2-Dibromoethane (EDB)	**0.0500**	**0.39**
Dibromomethane (Methylene bromide)	60.8	1.0
trans-1,4-Dichloro-2-butene	**0.00135**	**0.78**
Dichlorodifluoromethane	348	1.0
1,1 Dichloroethane	798	1.0
1,2 Dichloroethane	5	1.0
1,1 Dichloroethene	7	1.0
cis-1,2 Dichloroethene	70	1.0
trans-1,2 Dichloroethene	100	1.0
1,2 Dichloropropane	5	1.0
cis-1,3-Dichloropropene	**0.0842**	1.0
trans-1,3-Dichloropropene	**0.0842**	1.0
Ethylbenzene	700	1.0
Ethyl methacrylate	548	1.0
2-Hexanone	1,460	10
Iodomethane (Methyl iodide)	~	1.0
Isobutanol (Isobutyl alcohol)	~	40
Methacrylonitrile	**1.04**	**20**
Methylene chloride (Dichloromethane)	5	5
Methyl methacrylate	1,420	1.0
4-Methyl-2-pentanone	139	10
Pentachloroethane	~	5
Propionitrile	~	20
Styrene	100	1.0
1,1,1,2-Tetrachlorethane	0.406	0.26
1,1,2,2-Tetrachlorethane	**0.0527**	**0.18**
Tetrachloroethene	5	1.0
Toluene	1,000	1.0
1,1,1-Trichloroethane	200	1.0
1,1,2-Trichloroethane	5	1.0
Trichloroethene	5	1.0
Trichlorofluoromethane	1,290	1.0
1,2,3-Trichloropropane	**0.00623**	**0.61**
Vinyl acetate	412	2.0
Vinyl chloride	2	1.0
Xylenes, total	10,000	2.0
Additional Parameters *Method SW846 3510C* (ug/L)		
Dioxenethion	~	0.400
Dioxathion (cis)	54.8	0.400
Dioxathion (trans)	54.8	0.400

Notes:
~ = not available or not applicable
Screening Criteria = MDEQ, Final Regulations Governing Brownsfield Voluntary Cleanup and Redevelopment in Mississippi (amended 28 Feb 2002), Appendix A, Tier 1 Target Remedial Goal
[1] For compounds where Reporting Limit > Screening Criteria, the Method Detection Limit is used
bold = method detection limit exceeds screening criteria

Appendix A

Dioxathion Sampling and Analysis Protocol

SAMPLING AND ANALYSIS PROTOCOL FOR THE DETERMINATION OF DIOXATHION IN WATER

Recent results of analyses of well water samples from the Hercules Incorporated plant in Hattiesburg, Mississippi, have exhibited a wide range in the levels of dioxathion reported. Discussions among representatives from the analytical laboratories demonstrated that the samples analyzed to date were not true split samples and that the analytical methods were applied differently. In order to minimize the effects from different water samples and from inconsistent application of the analytical methods, the following protocol has been assembled by agreement between Hercules Incorporated and the Mississippi State Chemical Laboratory. This protocol will be used in a study to determine the proper sampling and analysis methods to be used for all future water monitoring programs at the Hattiesburg plant.

1.) SAMPLE COLLECTION

Water samples will be withdrawn from the well using a Teflon bailer. The contents of the bailer will be placed into a large glass or Teflon container (one gallon, or more, in size). The container should have a Teflon-lined screw cap. Successive bailers of water will be removed from the well and placed into the container until there is enough water to supply split samples to each laboratory participating in the study. The contents of the large container will then be mixed thoroughly. After the composited water sample in the large container has been mixed, equal amounts of water will be poured into each sample jar. The sample jars should have Teflon-lined screw caps. This procedure will be repeated for each well.

Each analytical batch of a given matrix (up to 20 samples) will require the analysis of a method blank, Laboratory Control Standard (LCS), Matrix Spiked sample (MS) and Matrix Spike Duplicate (MSD). Alternately , a duplicated sample may be substituted for the (MSD). The MS and the MSD are counted as part of the analytical batch (aka Sample Delivery Group) which may be held open for up to seven (7) days.

Water samples collected from Wells #1, #4 and #5 will be submitted in duplicate to each laboratory. That is, two separate sample jars from Well #1, Well #4 and Well #5 will be filled and sent to each laboratory for analysis.

NOTE: The sample collected for the MS/MSD will require six (6) one-liter samples.

2.) EXTRACTION OF SAMPLES

All samples will be extracted with methylene chloride following the details described in the latest revision of U.S. EPA SW-846 Method 3510 C. The solvent should be exchanged into hexane, and all extracts will be adjusted to a final volume of ten milliliters (10 mL) before analysis.

3.) CLEANUP OF EXTRACTS

In order to minimize interferences in the determination of dioxathion, sample extracts that appear to contain interferences will be cleaned up using the latest revision of U.S. EPA SW-846 Method 3620, Florisil Cleanup. The volume of eluting solvent necessary for quantitative recovery of dioxathion from the Florisil column will be determined in each laboratory using the dioxathion and dioxenethiol reference standards supplied for calibration of the GC methods.

4.) SULFUR CLEANUP

If there is significant interference from sulfur compounds, the extracts may be cleaned up according to U.S. EPA SW-846 Method 3660, copper option.

5.) ANALYSIS OF EXTRACTS

Previous work performed by Bonner Analytical and Testing (BATCO) has revealed that trans dioxathion undergoes thermal degradation in the Gas Chromatograph column therefore the protocol is changed to a lower temperature analytical method. For All sample extracts will be analyzed by High Performance Liquid Chromatography (HPLC)) using a Photo Diode Array (PDA), operated in . U.S. EPA SW-846 Method 8321 A will be used as general guidance for HPLC methodology. . A five-point calibration curve will be used to calculate the results of analyses. The lowest point on the calibration curve should be equal to, or slightly higher than, the limit of detection of the GC-PDA system. The highest point on the calibration curve should be the end of the linear portion of the PDA response profile. All laboratories will follow the QA/QC criteria described in the analytical method. Those results will be stored at each laboratory for review at a later date, if necessary.

Instrumentation

HPLC – Hewlett Packard Model 10980 Series II Liquid Chromatograph with Diode Array Detector
Fluoresence Detector Hewlett Packard Series 1100 HPLC Column: Supelco Discovery C18, 250 mm X 4.6 mm ID, 5 µm Particle Size.

Method Parameters

Mobile Phase : Isocratic, 30% Deionized water and 70 % Acetone
Flow: 1.2 mls/min
Injection Volume: 25 µLs
Run Time: 20 Minutes
Oven Temperature 35 °C
Detector Wavelengths
Diode Array: Excitation at 200, 210 and 270 nms
Fluorescence: Excitation at 250 nms, Emission at 410 nms

Surrogate/Internal Standards: A surrogate will be chosen that does not coelute with any dioxathion isomer. Internal standards may or may not be used.

6.) CONFIRMATION OF ANALYSES

The preferred method for qualitative and quantitative confirmation of dioxathion and dioxenethiol is Liquid Chromatography/Mass Spectra analysis (LC/MS), however the present time Bonner Analytical and Testing does not own an LC/MS instrument. Therefore, for qualitative and quantitative confirmation of the dioxathion results, all sample extracts will be analyzed by Bonner Analytical and Testing using gas chromatography-mass spectrometry (GC-MS) using the latest revision of U.S. EPA SW-846 Method 8270, or an equivalent mass spectrometry system that is deemed appropriate to give equivalent results. A five-point calibration curve will be used to calculate the results of analyses. The lowest point on the calibration curve should be equal to, or slightly higher than, the limit of detection of the GC-MS system. The highest point on the calibration curve should be the end of the linear portion of the MS detector response profile. All laboratories will follow the QA/QC criteria described in the analytical method. Those results will be stored at each laboratory for review at a later date, if necessary. If significant differences are observed between Bonner Analytical & Testing's results and Mississippi States University Chemical Laboratory'results, BATCO will send the extracts of these samples to a third party laboratory to investigate the reasons for these differences.

GC column: 30-meter X 0.25-mm (or 0.32-mm) DB-5 fused silica capillary column, as specified in Paragraph 4.1.2 in U.S. EPA SW-846 Method 8270.

GC oven and injector conditions: As specified in Paragraph 7.3 in SW-846 Method 8270.

The specifications given in Method 8270, Section 4.0, "APPARATUS AND MATERIALS," and Section 5.0, "REAGENTS," will be followed. The guidance in Section 7.0, "PROCEDURE" will be used to perform the GC separations and GC/MS identification and quantitation. Specific criteria for peak identification are given in Section 7.6 of the method. The characteristic ions, both primary and secondary ions, listed in Table 1 of the method will be used. For cis and trans dioxathion and dioxenthiol, the primary ion is m/z 97 with secondary ions at m/z 125, 270, and 153. Instrument tuning criteria are given in Table 3 of the method. For the Internal Standard, chrysene-d_{12} is recommended because it meets the retention time criteria set forth in Section 7.3.2.

7.) GENERAL COMMENTS

a.) All samples will be extracted and analyzed within the normal holding times for organophosphorus compounds.

b.) The dioxathion standard to be used by all laboratories will be supplied by the Hercules Incorporated.

c.) Water samples spiked with cis or trans dioxathion or dioxenethiol will be prepared by the Mississippi State Department of Environmental Quality (MSDEQ) personnel and distributed to each laboratory for inclusion in this study.

d.) Within three weeks of receipt of samples, all results of analyses and all confirmatory results will be reported to MSDEQ, who will collate them and distribute the results to the participating laboratories.

e.) A meeting will be held to review the results of analyses and to decide the next step in the implementation of the analytical methods to be used in monitoring well water samples from the Hercules Incorporated Hattiesburg plant.

f.) After its approval of this sampling and analysis protocol, MSDEQ will determine the time frame for the completion of all sampling and analysis activities and will set the date and time of the review meeting.

g.) Only results greater than or equal to the Limit of Quantitation will be reported. The numerical sum of the cis and trans isomers of dioxathion will be reported as dioxathion. Dioxenethiol will be reported as separate compound.