FINAL
CMI PLAN

(Corrective Measures Implementation Plan)

FOR

Cherokee Environmental Risk Management
Cherokee Columbus Real Estate, LLC.

(Former Borden Resins Facility)
Bainbridge, New York

November 19, 1998

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FINAL
Corrective Measures Implementation Plan
Cherokee Environmental Risk Management
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1.0 INTRODUCTION

1.1 Purpose

The purpose of this document is to present specifications for implementation of corrective measures addressing environmental contamination at the former Borden Resin Facility. These requirements include remedial goals and criteria; institutional controls; detailed design, construction, operation, and monitoring plans; and reporting.

1.2 Background

From the 1940s until 1981, Borden, Inc. owned and operated a synthetic resin manufacturing facility in Bainbridge, New York. In 1990, Borden entered into a consent agreement with New York State Department of Environmental Conservation (NYSDEC) to identify and remediate environmental contamination at the now inactive site. RCRA Facility Investigation (RFI) Reports were submitted in July 1992 and August 1996, and approved by NYSDEC in December 1996. A Corrective Measures Study (CMS) Report was submitted in February 1997, and was revised and approved by NYSDEC in April 1998. In December 1997, the site was purchased by Cherokee Columbus Real Estate, LLC.

Numerous investigative and remedial activities have been accomplished at the site since facility closure in 1981. These activities and the current conditions at the site are documented in the RFI Reports. Results of on-going interim corrective measures addressing contaminated groundwater are documented in semi-annual reports submitted to NYSDEC.

2.0 CORRECTIVE MEASURES ADDRESSING CONTAMINATED SOILS AND SEDIMENTS

Soils/sediments contaminated with polychlorinated biphenyls (PCBs) have been delineated at four separate areas at the site. The PCB Area; the Boneyard; the River Lagoon; and the Land Application Areas. Additionally, soils contaminated with volatile organic compounds (VOCs) and phenolics have been delineated in the Phenol Recovery Area coinciding with groundwater contamination. Contaminated soils are to be remediated by excavation and off-site disposal.

2.1 Remedial Goals

The remedial goal for PCB-contaminated soil and sediment is to remove and dispose of all contamination above health-based criteria in accordance with the United States Environmental Protection Agencies (EPAs) Toxic Substances Control Act (TSCA) PCB Spill Cleanup Policy.[1]

The remedial goal for VOC/phenolic-contaminated soil is to remove a hot-spot which is contributing to groundwater contamination to a degree which inhibits groundwater remediation.

2.2 Remedial Criteria

Remedial criteria for PCB-contaminated soils and sediments are as follows:

- One part per million (ppm) or less PCBs is the criterion for soils in the River Lagoon and other locations of the site for unrestricted use.

- Ten ppm or less PCBs is the criterion for unrestricted-use soils at the remainder of the site, provided 10 inches or more of clean soil (one ppm or less PCBs) is placed on top. Deed notification is required.

- Twenty-five ppm or less PCBs is the criterion for restricted-use soils at the remainder of the site. Deed notification and restrictions are required.

The remedial criterion for phenolic/VOC-contaminated soils is as follows:

- Remove all unsaturated soil in the immediate vicinity of monitoring well MW-29

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[1]As per CFR Parts 750 and 761 as amended per June 29, 1998 Federal Register, Vol. 63, No.124; Effective on August 28, 1998.

and the former phenol recovery unit, including all grossly contaminated soil. Grossly contaminated soil will be determined by visual indications of contamination (e.g., staining) and by screening of soil sample headspace. Headspace screening will be conducted by containerizing and agitating a soil sample, then analyzing the headspace with a photoionization detector (PID) equipped with a minimum 10.2 eV lamp. (The ionization potential for the two primary constituents of concern, toluene and phenol, is approximately 8.5 eV.) Based upon experience at other sites, the threshold excavation criteria will be 50 ppm VOCs in the headspace.

2.3 Institutional Controls Requirements

For areas remediated to the 1 ppm (or less) PCBs level, there will be no requirements for institutional controls.

For areas remediated to the 10 ppm criterion, the deed to the facility property, or some other document which is normally examined during title search, will incorporate a notification that residual levels of greater than 1 but less than 10 ppm PCBs remain in the soil at a depth of ten inches or greater.

For areas remediated to the 25 ppm or criterion, the deed to the facility property, or some other document which is normally examined during title search, will incorporate a notification that residual levels of soil contamination between of 25 ppm PCBs or less remain in the soil, and that land use is restricted in those contaminated areas.

2.4 Design Requirements

A plan for contaminated soil excavation, staging, characterization sampling, and disposal will be submitted as part of the Remedial Design (see Section 5.2). Specifications will include excavation depths and extent, stockpile design addressing stormwater run-on/run-off control, and the stockpile sampling program.

2.5 Performance Sampling Requirements

At each area of PCB soil/sediment contamination, the extent of PCB contamination was previously delineated utilizing a grid sampling program. In order to verify the successful removal of PCB contamination above the remedial criterion, post-excavation sampling will be conducted utilizing the same grid. For verification (performance) sampling, the number of samples and locations within excavated areas will be determined using *USEPA Publication 230/02-89/042, Methods for Evaluating the Attainment of Cleanup Standards, Volume 1: Soils and Solid Media* or equal number of samples taken within the original grid, whichever requires fewer

samples. If any verification samples exceed the remedial criteria, surrounding grid locations will be sampled as necessary to delineate the remaining area of contamination. Excavation and verification sampling will continue until all verification samples meet the remedial criterion. Remediation will be complete when all verification samples meet the remedial criterion.

The only exception to the above is the "PCB Area", which was not sampled on a grid. After excavation of the PCB Area, five excavation bottom samples and five sidewall samples will initially be collected and analyzed. The sample locations will be evenly spaced throughout the excavation. If verification samples exceed the criterion, excavation and bottom/sidewall sampling will continue until the criterion is achieved. Remediation will be complete when all verification samples meet the remedial criterion.

Details of these sampling protocols will be detailed in the Engineering Design (see Section 5.2).

2.6 (Reserved)

2.7 Post-Remediation Requirements

Where necessary to mitigate fall hazards or other excavation hazards, excavations will be backfilled with imported or site-derived clean fill. Imported fill will be obtained commercially from a quarry operation or from a soil recycling operation. If obtained from a soil recycling operation, the commercial supplier will be required to provide a certification of cleanliness based upon soil sampling and analysis. Site-derived clean fill will be obtained from "background" areas in the vicinity of the Land Application Area, which were determined to be free from contamination as documented in the RCRA Facility Investigation Report (Section 4.2.1.1). Alternatively, clean fill may be obtained from the Land Application Area (excluding Trenches) if soils are demonstrated to be clean (i.e., below remedial criteria) based upon sampling and analysis.

After remedial activities are complete at the Boneyard and PCB Area, groundwater monitoring will continue at these areas as outlined in the current Site Groundwater Monitoring Plan. Monitoring will be conducted in these areas on an annual basis for a minimum of three years. The results will evaluated with respect to the Groundwater Protection Standards (Table 1). Contingent remedial activities may be required if long-term monitoring results indicate significant impacts to groundwater.

3.0 CORRECTIVE MEASURES ADDRESSING CONTAMINATED SEWERS

Sewers formerly utilized to convey the facility's wastewater have been determined to be contaminated with PCB-contaminated sediments. Potential exposure pathways are release of infiltrated/contaminated groundwater from the sewers, and direct contact with contaminated sediments.

Sewer contamination will be remediated by removing contaminated sediment from the sewers with a water jet. Subsequent to the removal of sediment from the sewer line, the segment of sewer located from the manhole south of Route 7 to the Former River Lagoon will be removed.

3.1 Remedial Goals

The remedial goal for the sewers is removal of sediment contaminated above health-based criteria (one ppm for PCBs).

3.2 Remedial Criteria

The remedial criterion will be the absence of visual sediment in the sewers, based upon video inspection. In addition, for the segment of sewer to be removed, if evidence of a release has been observed (either during video inspection or during sewer line excavation), soil/sediment/sewer line bedding samples will be obtained to verify absence of contamination. Sampling protocol will be detailed in the Remedial Design (see Section 5.2).

3.3 Institutional Controls Requirements

In order to preclude casual access to the remaining portion of the sewer line, and to mitigate groundwater infiltration/flow through the sewers, all remaining manholes will be sealed with concrete after remedial criteria have been achieved and approval to do so has been granted by the NYSDEC.

3.4 Design Requirements

A plan for additional manhole construction (if necessary), sewer cleaning, rinsate/sediment collection and staging, characterization sampling, waste treatment/disposal, and video inspection will be submitted as part of the Remedial Design (see Section 5.2).

3.5 Performance Sampling Requirements

Performance sampling will be visual/video characterization of the cleaned sewers as discussed in Section 3.2.

3.6 (Reserved)

3.7 Post-Remediation Requirements

After remediation, the sewer segment located from the manhole south of Route 7 to the Former River Lagoon will be removed to preclude any possible problems such as sewer collapse. After sewer removal, the area will be regraded as necessary.

4.0 CORRECTIVE MEASURES ADDRESSING CONTAMINATED GROUNDWATER

In the former Phenol Recovery Area (PRA), shallow groundwater is contaminated with formaldehyde, phenolics, VOCs and several Tentatively Identified Compounds (TICs). As an interim corrective measure, the groundwater is being remediated with a pump-and-treat system. After sampling to confirm that NYSDEC-established discharge criteria are achieved, treated groundwater is discharged to the creek and/or to a spray field.

The final corrective measure technology selected to remediate groundwater contamination is in-situ bioremediation. In-situ bioremediation is the use of indigenous or commercial micro-organisms (primarily bacteria) to metabolically degrade contamination. This is accomplished by enhancing the availability of environmental factors favorable for growth, such as oxygen, nutrients, pH, moisture, and temperature. Conceptually, in-situ bioremediation at the Bainbridge site will be accomplished by aerating the contaminated portion of the aquifer. (According to the literature and experience at other sites, oxygen availability is most often the limiting factor for bioremediation, and aeration alone is often sufficient to achieve bioremediation.) This will be accomplished by injecting (sparging) air below the zone of contamination. As air rises up through the contaminated zone by buoyancy forces, oxygen will be available to indigenous microorganisms. If necessary, based upon unsatisfactory results from aeration alone, the system will be augmented by the addition of nutrients, commercial microorganisms, etc. Prior to full-scale implementation, this technology is to be demonstrated with a pilot-scale program in the vicinity of monitoring well MW-15, adjacent to the creek. While the pilot- and full-scale programs are being verified, the pump-and-treat system will continue to operate. (NYSDEC approval is required prior to dismantling the pump-and-treat system.)

4.1 Remedial Goals

Two goals have been identified for groundwater remediation:

- Prevent off-site migration of contaminants above Groundwater Protection Standards.

- Reduce contaminant mass of the plume.

4.2 Remedial Criteria

Groundwater remedial criteria for the full-scale remedial system are as follows:

- A monitoring well network will be established within the contaminant plume and downgradient of the PRA near the facility property line (wells may be located just off-site). This network will provide point-of-exposure (POE) concentrations at the site boundary. (Phenolics, VOCs, formaldehyde, and TICs are to be monitored.) The time frame for the reduction of POE concentrations shall be 25 percent within two years, 50 percent within five years, and 75 percent within seven years. Groundwater Protection Standards are presented in Table 1 of this document.

- Monitoring will also be conducted at monitoring wells elsewhere within the plume. Reduction of contaminant mass will be verified by a declining trend of contamination at MW-15, MW-29, plus any additional monitoring wells to be installed which are necessary to evaluate achievement of the remedial criteria. Reduction is to be 25 percent within two years, 50 percent within five years, and 75 percent within seven years. This percent reduction will be calculated separately for total phenols, total VOCs, formaldehyde, and total TICs.

Groundwater remedial criteria for the pilot-scale system are similar but at a smaller scale. For the pilot system, one or more POE wells will be installed downgradient of the PRA near the facility property line and MW-15 will be monitored to verify reduction of contaminant mass. Reduction of total contaminant concentration by 50 percent within one year at MW-15 is the pilot-scale remedial criterion.

Specific details will be included in the Engineering Design (see Section 5.2).

4.3 Institutional Measures Requirements

A fence will be utilized to preclude casual access to the treatment system. The deed to the facility property, or some other document which is normally examined during title search, will incorporate a notification that groundwater exceeds Groundwater Protection Standards and that withdrawal wells may not be installed or used on the property to produce groundwater from the contaminated portion of the aquifer for any industrial, commercial or potable use. The installation of wells for environmental monitoring or corrective action purposes is acceptable.

4.4 Design Requirements

A plan for the pilot-scale in-situ bioremediation system will be submitted with the Remedial Design (Section 5.2), including air sparge system design, monitoring locations, monitoring parameters and monitoring frequencies. Based upon the results of pilot-testing, and in consultation with NYSDEC, a full-scale design will subsequently be developed and implemented.

4.5 Operation, Maintenance, and Monitoring Requirements

After installation and start-up of the full-scale system, a plan for operation, maintenance, and monitoring will be developed. See Section 5.5.

Additional requirements are addressed below:

4.5.1 Inability to Obtain Representative Samples. If Cherokee determines that a monitoring well may not provide a representative sample (e.g., due to damage), or if a sample is otherwise non-representative (e.g., due to laboratory error), Cherokee shall notify NYSDEC within seven days and propose a remedy. Cherokee shall attempt to remedy the cause and, if necessary, obtain a representative sample as soon as practicable.

4.5.2 Well Maintenance. Cherokee shall implement a program to evaluate and maintain the integrity of monitoring wells. Items to be monitored and corrected as necessary include structural integrity (casing, grout, frost heave), labeling, security (locks), and siltation. This program is currently specified in the Groundwater Sampling and Analysis Plan (February 1997).

4.5.3 Collection of Samples by NYSDEC. In accordance with Condition XIV of the consent agreement, NYSDEC shall have the right to take or obtain split samples.

4.6 Termination Requirements

Groundwater remediation may be terminated when the Groundwater Protection Standards presented in Table 1 of this document have been achieved. This determination will be made based upon eight consecutive quarters of groundwater sampling results. The arithmetic mean concentrations shall be calculated for each constituent for each well within the remediated area using the eight quarterly results, and shall be compared to the groundwater protection standards. For analytical results reported as "less than the detection limit", one-half the detection limit will be used to calculate the mean.

Alternatively, NYSDEC may accept a risk-based closure assessment which demonstrates that residual groundwater contamination does not pose a significant risk to human health and the environment. For example, if it can be demonstrated that migration of the untreated plume will not cause an exceedance of Groundwater Protection Standards at POE wells, this would be grounds to petition NYSDEC to deactivate the remedial system.

4.7 Post-Termination Requirements

After termination of active remediation, post-termination monitoring will be conducted on a semi-annual basis for a minimum of three years . Groundwater Protection Standards must continue to be achieved during the post-termination monitoring period. For post-termination monitoring, this determination will be based upon the yearly arithmetic mean concentration of a particular constituent at each well within the remediated area. Notwithstanding the above, NYSDEC will be notified if any termination criterion is exceeded by a factor of 10 for any semi-annual result.

During the post-termination monitoring period, the remedial system shall be maintained in an operable condition. If post-termination requirements are not maintained, NYSDEC may require reactivation of the system.

If post-termination requirements are met for three consecutive years, the system may be dismantled .

5.0 IMPLEMENTATION SCHEDULE AND REPORTING

5.1 Public Review and Comment Period

The NYSDEC has approved this Corrective Measures Implementation (CMI) Plan. The CMI Plan and CMS Report will be made available for public review and comment for a period of 45 days. Following the public comment period, changes to the CMI Plan may be made if public comments or additional data indicate that such changes would be appropriate. NYSDEC will incorporate the final CMI Plan into the consent agreement.

5.2 Submission of Remedial Design and Start-Up Monitoring Plan

Within 90 days of the finalization of the CMI Plan, (CMI Plan will be considered final on the same date the "Final Statement of Basis," is published by the NYSDEC) Cherokee will submit to NYSDEC a Remedial Design and Start-Up Monitoring Plan prepared by a New York State registered professional engineer that meets the requirements set forth in this CMI Plan.

The Remedial Design will address soil excavation, performance sampling protocol, sewer cleaning, the pilot-scale in-situ bioremediation system for groundwater, and a preliminary design for the full scale groundwater bioremdiation system. The Start-Up Monitoring portion of the plan will address monitoring requirements to be utilized until a long-term monitoring plan is submitted and approved (Section 5.5). A schedule will be included in the Remedial Design Report that details the anticipated remedial implementation dates, milestone dates, construction completion dates and commencement of operation dates, as applicable.

Within 90 days Cherokee will also submit for review and approval, language amending the current property deed as described above in Sections 2.3, 3.3 and 4.3. The deed will be recorded and filed with the appropriate authorities, and proof of recording and filing shall be submitted to the NYSDEC within thirty (30) days of language approval.

5.3 Field Implementation

Cherokee will begin remedial activities within 30 days of NYSDEC approval of the Remedial Design and make a good faith effort to adhere to the schedule included in the Remedial Design Report. Excavation activities may be delayed only in the event that wet conditions exist at the time of commencement (e.g., recent flooding of the River Lagoon). It is anticipated that remedial activities will commence Summer 1999.

5.4 Submission of Remedial Certification Report

Within 90 days of completion of remedial excavation, cleaning, and construction, a Remedial Certification Report prepared by a registered professional engineer will be submitted to NYSDEC. Any variation in construction from the Remedial Design will be documented. Also included will be as-built drawings and photo documentation.

After implementation of a full-scale groundwater remediation system, a second certification report will be submitted within 90 days of construction.

5.5 Submission of Operation, Maintenance, and Monitoring Plan

Within 90 days after construction and start-up of the full-scale groundwater remediation system, an Operation, Maintenance, and Monitoring Plan will be submitted to NYSDEC.

5.6 Routine Reporting

Interim remedial measures and groundwater monitoring are currently documented in a semi-annual report. A semi-annual reporting frequency will be maintained for final corrective measures as well.

6.0 MODIFICATIONS TO THE REMEDIAL SYSTEM

If, after review of the performance monitoring data, the NYSDEC determines that the design or operation of the remedial systems is not sufficient to achieve the remedial criteria, the NYSDEC may require Cherokee to modify the design or operation of the systems, or to pursue alternative remedial technologies, so as to achieve the remedial criteria.

Cherokee may implement, without prior NYSDEC approval, minor adjustments to the remedial systems that will facilitate or improve groundwater control and cleanup. The description of any adjustments shall be included in the next semi-annual report. The NYSDEC shall be notified in writing prior to any major adjustments to the system.

7.0 COMPLIANCE SCHEDULE FOR ASSESSMENT OF NEWLY IDENTIFIED SOLID WASTE MANAGEMENT UNITS (SWMUs) .

7.1 Notification of Assessment. Cherokee shall notify the NYSDEC, in writing, of any additional SWMU(s) not listed in this Plan, which are identified during the course of groundwater monitoring, field investigations, environmental audits, or other means within fifteen (15) calendar days after discovery.

7.2 SWMU Assessment Report. Within thirty (30) calendar days after notification of the NYSDEC, Cherokee shall submit a SWMU Assessment Report. This Report must provide, at a minimum, the following information for each newly identified SWMU:

(1) Type of unit;

(2) Location of each unit on a topographic map of appropriate scale;

(3) Dimensions, capacities, and structural descriptions of the unit (supply available engineering drawings);

(4) Function of unit;

(5) Dates that the unit was operated;

(6) Description of the wastes that were placed or spilled at the unit;

(7) Description of any known releases from the unit (to include groundwater data, soil analyses, air monitoring data, and/or surface water data);

(8) The results of any sampling and analysis required for the purpose of determining whether releases of hazardous wastes and constituents have occurred, are occurring, or are likely to occur from the unit; and

(9) Whether this unit, individually or in combination with the other units described in this Plan is a significant source of contaminant release.

7.3 SWMU Sampling and Analysis Plan. Within thirty (30) calendar days after SWMU discovery, submit to the NYSDEC for approval a Plan in accordance with the most recent version of the RCRA Quality Assurance Project Plan

Guidance, for any sampling and analysis of groundwater, land surface and subsurface strata, surface water or air, as necessary to determine whether a release of hazardous waste including hazardous constituent(s) from such unit(s) has occurred, is likely to have occurred, or is likely to occur. The SWMU Sampling and Analysis Plan must demonstrate that the sampling and analyses program, if applicable, is capable of yielding representative samples and must include parameters sufficient to identify migration of hazardous waste and/or hazardous constituents from the newly-discovered SWMU(s) to the environment.

7.4 **SWMU Sampling and Analysis Plan Implementation.** Begin implementation of the SWMU Sampling and Analysis Plan within thirty (30) calendar days following approval from the NYSDEC for the Plan.

7.5 **SWMU Sampling and Analysis Report.** Within fourteen (14) calendar days from completion of the work specified in the approved SWMU Sampling and Analysis Plan, Cherokee shall submit a SWMU Sampling and Analysis Report to the NYSDEC. The Report shall describe all results obtained from the implementation of the approved Plan.

7.6 **SWMU RFI Workplan.** Based on the results of the SWMU Sampling and Analysis Report, the NYSDEC shall determine the need for further investigations at the specific unit(s) covered in the SWMU Assessment Report. If the NYSDEC determines that such investigations are needed, the NYSDEC shall require Cherokee to prepare a RCRA Facility Investigation (RFI) Work Plan and schedule of implementation. Cherokee shall submit to the NYSDEC for approval a RFI Work Plan for such unit(s) within thirty (30) calendar days of notification by the NYSDEC. Upon NYSDEC approval, Cherokee shall implement the RFI Work Plan and shall submit a SWMU specific RFI Report according to the schedule contained in the aforementioned RFI Work Plan. The SWMU specific RFI Report shall describe all results obtained from the completion of the approved RFI Work Plan.

7.7 **Additional Investigation or Corrective Measures.** If, after review of the SWMU specific RFI Report, the NYSDEC determines that additional investigation or Corrective Measures are needed, it shall formally notify Cherokee in writing. Thereafter, investigation and, if deemed necessary by the NYSDEC, remediation of the SWMU shall proceed in a manner consistent with past actions performed under this CMI Plan, and accordingly, shall include establishment of remedial goals and criteria, corrective measures implementation, operations and maintenance, remedial system termination, groundwater monitoring and institutional measures.

TABLE 1

GROUNDWATER PROTECTION STANDARDS

CONSTITUENT	STANDARD
Total Phenols	1.0 ug/l
Toluene	5.0 ug/l
Formaldehyde	50.0 ug/l
Semivolatile TICs	50.0 ug/l*
PCBs	0.1 ug/l
Benzene	0.7 ug/l
Xylene (total)	5.0 ug/l
Chlorobenzene	5.0 ug/l
1, 2 - Dichlorobenzene	4.7 ug/l
1, 4 - Dichlorobenzene	4.7 ug/l
Ethylbenzene	5.0 ug/l
Chloromethane	5.0 ug/l
Chloroform	7.0 ug/l
Carbon Tetrachloride	5.0 ug/l
1, 2 - Dichloroethane	5.0 ug/l
Isopropylbenzene	5.0 ug/l
Sec-Butylbenzene	5.0 ug/l
Naphthalene	10.0 ug/l
2 - Hexanone	50.0 ug/l
4 - Methyl 2-Pentanone	50.0 ug/l

* Chapter 1, State Sanitary Code, Part 5 Drinking Water Supplies, Subpart 5-1, Public Water Supplies, Table 3. Standard for Unspecified Organic Contaminant is 50.0 ug/l. Standard for Total Organic Contaminants is 100 ug/l.

ug/l = part per billion (ppb)

References

1) 6NYCRR Part 703.5(a)(3), September, 1991.
2) USEPA Maximum Concentration Limits, February, 1996.
3) USEPA Health Effects Assessment Summary (HEASTs) Data, May, 1995.
4) Chapter 1 State Sanitary Code Part 5 Drinking Water Supplies Subpart 5-1.