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3M Company  
St. Paul, Minnesota

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# Feasibility Study Work Plan

## Cottage Grove Site

Cottage Grove, Minnesota

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June 2007





**FEASIBILITY STUDY WORK PLAN**  
**COTTAGE GROVE SITE**

**JUNE 2007**

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# 1. INTRODUCTION

## 1.1 BACKGROUND AND SITE ASSESSMENT HISTORY

The 3M Company (3M) Cottage Grove, Minnesota plant (Cottage Grove Site), formerly the 3M Chemolite plant, has been in operation since 1947. The facility currently manufactures a range of products which includes adhesive products, specialty paper, industrial polymers, abrasives, and reflective road sign materials. The facility also engages in research and development of a proprietary nature.

In December 2004, 3M submitted to the Minnesota Pollution Control Agency (MPCA) the *Facility-wide Fluorochemical (FC) Investigation Work Plan* (FC Work Plan) which was prepared by Weston Solutions, Inc. (WESTON®) to voluntarily assess FCs at the Cottage Grove Site. The Work Plan presented a systematic approach to collect data in various environmental media related to FC manufacturing operations. In a letter to 3M dated January 31, 2005, MPCA approved the Work Plan with modifications.

During 2005, 3M implemented the FC site-related assessment program (Phase 1 program) at the Cottage Grove Site in accordance with the MPCA-approved FC Work Plan. During the course of the FC assessment program, data from the samples collected during Phase 1 were submitted to the MPCA in interim progress reports and addenda. 3M and WESTON presented the results of the assessment activities, data gaps, and recommendations for closing these data gaps to the MPCA and the Minnesota Department of Health (MDH) on March 22, 2006. Subsequently, on April 7, 2006, 3M submitted the *Fluorochemical (FC) Data Assessment Report* (FC Data Assessment Report) to the MPCA. This document contained a summary of the assessment activities, the results of these activities, identification of data needs and recommendations for the future course of action.

Based upon the agreements reached between 3M and MPCA during the March 22, 2006 meeting, 3M proceeded on a voluntary basis to initiate additional fieldwork as part of the Phase 2 FC Assessment Program. Specifically, 3M had proposed installation of



additional borings and groundwater monitoring wells around the D1/D2, D5, and D9 Areas. The MPCA gave preliminary approval for these borings and wells on May 17, 2006 and discussed the sampling approach with 3M and WESTON on May 22, 2006. Subsequently, 3M provided MPCA with a map on May 26, 2006 depicting the proposed soil boring and groundwater monitoring well locations, which was approved by the MPCA. In accordance with these communications, WESTON performed the additional soil boring and groundwater monitoring well installation in early June 2006.

Also, in May 2006, WESTON collected water level and drawdown data from existing monitoring wells during a planned shutdown of production well PW-6. The data recorded during this activity were used to evaluate the area of groundwater capture resulting from the routine and ongoing pumping of production wells PW-5 and PW-6. The *3M Cottage Grove MN Fluorochemical (FC) Assessment: Hydraulic Capture Zone Evaluation* was submitted to the MPCA in November 2006 and is included in Appendix A of this report.

In a letter to 3M dated June 13, 2006, the MPCA indicated that the primary objective of the assessment (identifying the presence of FCs in various media) was met. With respect to follow-on activities (Phase 2 assessment activities), the MPCA requested that 3M submit an addendum to the FC Data Assessment Report containing a work plan to further define the extent of FCs in soils, evaluate the groundwater to surface water pathway, and conduct additional assessment of the East and West Cove and of the Mississippi River, both near the facility and downstream. The MPCA also requested that the FC analytical parameter list be expanded.

Accordingly, 3M retained WESTON to prepare the Phase 2 Work Plan, perform the assessment work, and present the findings in a Phase 2 FC Data Assessment Report. The Work Plan incorporated the recommendations for additional assessment activities presented in the FC Data Assessment Report and requests made by MPCA in its June 13, 2006 letter to 3M. MPCA also requested a visit to the Cottage Grove Site that was conducted on June 21, 2006. During the visit, MPCA observed the on-site disposal areas, East and West Coves, Mississippi River, and soil boring activities at the D9 Area.



On July 14, 2006, 3M submitted the *Phase 2 FC Assessment Work Plan* (Phase 2 Work Plan) and met with MPCA on July 25, 2006 to discuss comments on the Work Plan. A revised Work Plan, incorporating changes made in response to the agreements reached during the July 25, 2006 meeting was submitted to the MPCA on August 7, 2006. The Phase 2 field work was completed in the fall of 2006.

In addition to overall site conditions and potential pathways, the Phase 1 and 2 FC assessment activities addressed historical waste management areas and areas of past FC manufacturing. Three of the historic waste management areas are referred to as the D1 Area (Former HF Tar Neutralization Basin), D2 Area (Former Sludge Disposal Area), and D9 Area (Former Sludge Disposal Pit). In December 2006, at the request of the MPCA, 3M submitted a document entitled “*Interim Remedial Measures Evaluation*”. The purpose of the report was to evaluate possible options for interim remedial measures (IRMs) in the aforementioned three areas based on the results of the Phase 1 and 2 FC assessment activities and provide the rationale for the initiation of the IRM.

In a letter to 3M dated February 1, 2007, the MPCA approved the *Interim Remedial Measures Evaluation* report for the D1, D2, and D9 Areas and requested a meeting to clarify the factors and assumptions for the proposed multilayer cap and then have the “final design” for the IRM submitted to the MPCA. At a meeting on February 7, 2007, 3M, WESTON, and the MPCA discussed all of the issues raised in MPCA’s February 1, 2007 letter. 3M summarized the discussions and results of the meeting in a letter to MPCA dated February 21, 2007. Subsequently, on March 15, 2007, 3M submitted to the MPCA the *Fluorochemical (FC) Interim Remedial Measures Work Plan for the D1, D2, and D9 Areas*, which addressed and incorporated the items discussed at the February 7, 2007 meeting, including the IRM design.

In April 2007, 3M commenced discussions with the MPCA to formalize, under a Settlement Agreement and Consent Order (Consent Order), the process of conducting remedial investigations and response actions to address FCs at the site. The Consent Order became effective on May 22, 2007. It requires that 3M conduct a Remedial Investigation/Feasibility Study (RI/FS) with respect to release or threatened release of



FCs at and from the site. In the Consent Order, MPCA states “An RI Report addressing all of the investigative work required under the MPCA approved *Phase 2 FC Assessment Work Plan* shall be submitted to MPCA by June 30, 2007. Upon MPCA approval of the RI Report, the approved RI Report and the April 2006 *Fluorochemical (FC) Data Assessment Report* shall be deemed to meet RI Report requirements ...”. The RI Report is being submitted concurrently with this document, the FS Work Plan.

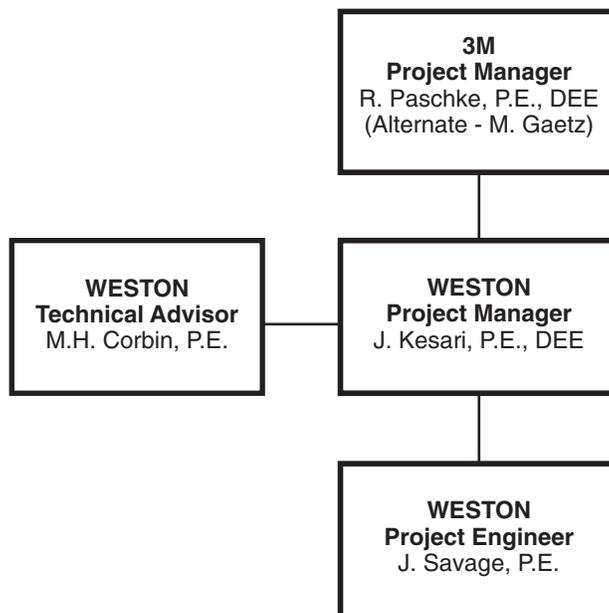
It is further stated in the Consent Order that by June 30, 2007, 3M shall submit an FS Work Plan to address possible response actions for the Cottage Grove Site. This FS Work Plan addresses possible response actions in compliance with the Consent Order.

## **1.2 PURPOSE OF THE FS WORK PLAN**

The purpose of the FS Work Plan is to describe the procedures that will be followed to conduct a Feasibility Study (FS) and prepare a FS Report for the Cottage Grove Site. The objective of the FS is to provide an evaluation of various response action alternatives which address FCs in soil, groundwater, and sediment at the Cottage Grove Site, and to provide a recommendation for implementation in accordance with the Consent Order provisions, which include MPCA guidance contained in *Guidelines: Remedy Selection* (MPCA, 1988), and United States Environmental Protection Agency (USEPA) guidance contained in *Guidance for Conducting Remedial Investigations and Feasibility Studies under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)* (USEPA, 1988).

## **1.3 PROJECT MANAGEMENT**

The performance of RI activities at the Cottage Grove Site is essentially complete and has been conducted under work plans approved by MPCA. The RI Report is being submitted concurrently with this FS Work Plan and will be reviewed shortly by MPCA staff. Thus, the following sections provide a generalized description of the organization and responsibilities of key individuals in the performance of the FS. The organization of the project responsibilities described in this section is depicted in Figure 1-1.



07P-0446-3

**FIGURE 1-1 PROJECT ORGANIZATION CHART  
FEASIBILITY STUDY  
COTTAGE GROVE SITE**



### **1.3.1 3M Company Personnel**

Mr. Robert Paschke, P.E. will serve as the 3M Project Manager. The Alternate is Mr. Mark Gaetz. To the maximum extent possible, communications between 3M and the MPCA concerning the terms and conditions of the Consent Order as they apply to response actions for the Cottage Grove Site will be directed through the 3M and MPCA-designated Project Managers. The 3M Project Manager will be responsible for assuring that all communications from the MPCA Project Manager are appropriately disseminated and processed.

The 3M Project Manager, as well as the MPCA Project Manager, has the authority to (1) take samples or direct that samples be taken; (2) direct that work at a Site stop for a period not to exceed seventy-two (72) hours if the Project Manager determines that activities at the Site may create a danger to public health or welfare or the environment; (3) observe, take photographs and make such other reports on the progress of the work as the Project Manager deems appropriate; (4) review records, files and documents relevant to the Consent Order and (5) make or authorize minor field modifications in the RI, FS, Response Action Plan (RAP) or RAs or in techniques, procedures or design utilized in carrying out the Consent Order which are necessary to the completion of those activities. Any field modifications will be approved orally by both the 3M and MPCA Project Managers. If the 3M Project Manager requests a field modification, he will within seventy-two (72) hours following the modification, prepare a memorandum detailing the modification and the reasons therefore and will provide or mail a copy of the memorandum to the MPCA Project Manager. The 3M Project Manager will either be on the Site or available on call by telephone during all hours of work at the Site. Communications from the MPCA Project Manager are appropriately disseminated and processed.



The 3M Project Manager, as well as the MPCA Project Manager, has the authority to (1) take samples or direct that samples be taken; (2) direct that work at a Site stop for a period not to exceed seventy-two (72) hours if the Project Manager determines that activities at the Site may create a danger to public health or welfare or the environment; (3) observe, take photographs and make such other reports on the progress of the work as the Project Manager deems appropriate; (4) review records, files and documents relevant to the Consent Order and (5) make or authorize minor field modifications in the RI, FS, Response Action Plan (RAP) or RAs or in techniques, procedures or design utilized in carrying out the Consent Order which are necessary to the completion of those activities. Any field modifications will be approved orally by both the 3M and MPCA Project Managers. If the 3M Project Manager requests a field modification, he will within seventy-two (72) hours following the modification, prepare a memorandum detailing the modification and the reasons therefore and will provide or mail a copy of the memorandum to the MPCA Project Manager. The 3M Project Manager will either be on the Site or available on call by telephone during all hours of work at the Site.

### **1.3.2 Weston Personnel**

Mr. Jaisimha Kesari, P.E., will serve as the WESTON Project Manager. He will be responsible for day-to-day activities on the project and planning, coordinating, integrating, and managing all project activities. These will include the activities of any subcontractors to WESTON. Mr. Kesari will also provide technical oversight and review for performance of the Feasibility Study.

Mr. Michael Corbin, P.E., will serve as the WESTON Technical Advisor. He will be responsible for guiding and providing technical oversight in the performance of the FS and ensuring that it meets Consent Order requirements and follows USEPA guidance (USEPA, 1988).

Ms. Janet Savage, P.E., will serve as the WESTON Project Engineer. She will be responsible for conducting the FS and preparing the report in accordance with the Consent Order and USEPA guidance.

## 2. LIST OF POSSIBLE TECHNOLOGY TYPES AND PROPOSED TREATABILITY STUDIES

Possible general response actions have been identified for the Cottage Grove Site based on the information and data provided in the RI report. In accordance with USEPA guidance on conducting feasibility studies, the general response actions, response technology type, and associated process options have been subjected to an initial screening process on the basis of technical implementability (USEPA, 1988). The general response action/technology types and process options that have been retained as the List of Possible Technology Types are as follows:

### LIST OF POSSIBLE TECHNOLOGY TYPES

#### Soil

- Removal – Excavation
- Treatment - Thermal
  - Incineration
- Disposal - Landfill
  - New landfill
  - Existing landfill
- Containment - Cap
  - Soil/clay cap
  - Engineered multilayer cap
- Institutional and Site Controls - Access restrictions
  - Deed restrictions
  - Fencing
- No action

#### Groundwater

- Collection - Groundwater recovery
  - Recovery wells
- Discharge – On-site

- Containment – Cap
  - Soil/clay cap
  - Engineered multilayer cap
- Treatment - Physical
  - Activated carbon
  - Ion exchange resin
  - Reverse osmosis
  - Air stripping
- Institutional and Site Controls
  - Deed restrictions
  - Fencing
  - Monitoring
- No action

### Sediment

- Removal – Excavation/Dredging
- Treatment - Physical
  - Dewatering
  - Surface water diversion
- Treatment - Thermal
  - Incineration
- Disposal - Landfill
  - New landfill
  - Existing landfill
- Containment – In Situ Cap
  - Clean sediment, sand, gravel, geotextile, or liner
- Institutional and Site Controls - Access restrictions
  - Deed restrictions
  - Fencing
- No action

Following the MPCA approval of the RI Report and FS Work Plan, these technologies will be assembled into response action alternatives and evaluated further for



implementation at the Cottage Grove Site as described in Section 3 of this FS Work Plan. Treatability testing may be conducted in an effort to collect additional information for technology evaluation and implementation. For instance, a pump test may be conducted to evaluate groundwater recovery rates, or depending upon the water quality criteria established by the MPCA, a bench- or pilot-scale test may be conducted to determine effectiveness and usage rate in the treatment of groundwater containing FCs by carbon adsorption and/or ion exchange resin. Although chemical and solidification treatment technologies have been screened out due to the lack of data regarding the use of these technologies to effectively treat FCs, 3M may choose to conduct bench-scale and/or pilot-scale testing to determine if these technologies should be considered for possible innovative application at the Cottage Grove Site.

3M will notify MPCA if a treatability study is to be conducted. 3M will prepare a work plan for submission to MPCA that will provide details on the performance of the study and reporting of results. The results of any treatability studies will be included in the FS Report and considered in the evaluation of response action alternatives.

## **2.1 RESPONSE ACTION OBJECTIVES**

During the initial stages of response alternative development, response action objectives will be established for the Cottage Grove Site. Response action objectives consist of medium-specific or operable unit-specific goals for protecting human health and the environment. Based on the response action objectives, an estimate can be prepared regarding the volume of media and area to which containment, treatment, or removal actions may be applied.

3M will work with MPCA to determine the site-specific response action objectives and cleanup levels that will be protective of human health and the environment.



### **3. DEVELOPMENT AND SCREENING OF RESPONSE ACTION ALTERNATIVES**

#### **3.1 DEVELOPMENT OF RESPONSE ACTION ALTERNATIVES**

The List of Possible Technology Types will be assembled into a range of response action alternatives. The range of alternatives developed for soil may include, but will not be limited to: an excavation and treatment alternative, an excavation and disposal alternative, a containment alternative, and a no action or limited action alternative. The range of alternatives developed for groundwater may include, but will not be limited to: an extraction and treatment alternative, an extraction alternative, and a no action or limited action alternative. The range of alternatives developed for sediment may include, but will not be limited to: an excavation/dredging and treatment alternative, an excavation/dredging and disposal alternative, a containment alternative, and a no action or limited action alternative.

#### **3.2 SCREENING OF RESPONSE ACTION ALTERNATIVES**

According to MPCA guidance, each response action alternative or evaluated alternative must meet the threshold criterion of providing overall protection of public health and welfare, and the environment (MPCA, 1998). This criterion is met if the response action alternative or evaluated alternative will achieve response action objectives and cleanup levels or provides for a permanent remedy.

As stated in the Consent Order Exhibit A, Section III.E.3.a, once the response action alternatives have been developed, they will be evaluated and screened using the site-specific response action objectives and cleanup levels discussed in Section 2.1. Those response action alternatives that do not meet the response action objectives and cleanup levels will be eliminated from further consideration. Response action alternatives that pass this screening will be designated as “evaluated alternatives” and will be further evaluated in the Detailed Analysis Report (DAR).

## **4. DETAILED ANALYSIS REPORT**

Once a set of response action alternatives meeting the threshold criterion of providing overall protection of public health and welfare, and the environment has been developed, a detailed evaluation of each alternative and a comparison of the alternatives will be performed so that a recommendation for response action alternative implementation at the Cottage Grove Site can be made. The DAR section of the FS Report will contain an assessment of each alternative with respect to balancing criteria and a comparative analysis of the alternatives as described in Sections 4.1 and 4.2, respectively.

### **4.1 DETAILED DESCRIPTION AND ASSESSMENT OF RESPONSE ACTION ALTERNATIVES**

In the DAR, each evaluated response action alternative will be described and individually assessed with respect to balancing criteria including long-term effectiveness, implementability, short-term risks, and total cost. At a minimum, the detailed description of each response action alternative will include the following information: the operable unit to which the evaluated alternative would be applied, a description of the technology type and process option, engineering considerations required for implementation (e.g., for a pilot treatment facility, identification of any additional studies that may be needed to proceed with final response action design), operation, maintenance, and monitoring requirements, off-site disposal needs and transportation plans, temporary storage requirements, safety requirements associated with implementation, a description of how other alternatives could be combined with this alternative to optimize the system or better achieve response action objectives and cleanup levels, a review of on-site or off-site treatment or disposal facilities which could be utilized to ensure compliance with applicable or relevant and appropriate requirements (ARARs), and decommissioning activities that would be conducted upon completion of the response action.

Each of the response action alternatives will be assessed in the DAR using balancing criteria. The following is a description of the balancing criteria in order of importance:



- **Long-term effectiveness** – Long-term effectiveness is the ability of an evaluated alternative to maintain the desired level of protection of public health and welfare, and the environment over time. Permanent remedies provide absolute long-term effectiveness. In the event a permanent remedy is not feasible, evaluated alternatives that significantly alter the FCs to produce significant reductions in toxicity, mobility, or volume will be preferred.

In addition, the ability of the alternative to obtain and/or manage treatment residuals, minimize transfer of contaminants to another environmental media, and maintain established response action objectives and cleanup levels over time will be a major consideration.

- **Implementability** – For this criterion, technical and administrative factors and the availability of services and materials are considered with respect to their affect on the ability to implement each alternative.
- **Short-term risks** – For this criterion, the short-term risks that may be posed as a result of implementing an evaluated alternative will be considered and weighted against the ultimate long-term benefits of implementing the alternative.
- **Total costs** – For this criterion, a conceptual cost estimate for implementation of the response action alternative will be provided including long-term monitoring, operation and maintenance, and decommissioning activities.

## 4.2 COMPARATIVE ANALYSIS OF RESPONSE ACTION ALTERNATIVES

Once the response action alternatives have been described and individually assessed using the balancing criteria, a comparative analysis of the alternatives will be conducted and presented in the DAR. The purpose of the comparative analysis is to identify the advantages and disadvantages of each response action alternative relative to one another with respect to each of the balancing criteria.

The comparative analysis will include both a narrative discussion and a tabular summary of the strengths and weaknesses of each alternative relative to one another considering specific components of each criterion. A narrative will be provided for each criterion with a discussion of each alternative's expected performance. Differences among the alternatives will be described and presented both quantitatively and qualitatively, as appropriate.



#### **4.3 RECOMMENDATION OF RESPONSE ACTION ALTERNATIVE AND CONCEPTUAL DESIGN**

Based on the detailed analysis and comparison of response action alternatives, 3M will provide a recommendation for implementation to address FCs in soil, groundwater, and sediment at the Cottage Grove Site. A conceptual design for implementation of the recommended alternative will be presented in the DAR and may include the following: conceptual plan drawings, layouts, and cross sections to depict the various components of the response action alternative, descriptions of the equipment and process used, as well as expected quantities and volumes of materials required, identification of additional data needs for the final design, discussion of operation and maintenance requirements, institutional issues, costs, and estimated schedule for implementation.



## 5. COMMUNITY RELATIONS AND PUBLIC INVOLVEMENT

3M is committed to keeping local residents and public officials informed of activities at the Cottage Grove Site and responding to inquiries they may have. This section outlines some of the approaches that will be used to conduct the community relations and public involvement components of the project. Throughout the implementation of the Consent Order requirements, 3M will be coordinating with the MPCA on the community relations activities described herein, along with many other aspects of the investigation and remediation of the Cottage Grove Site.

The communication tools below are intended to serve as an initial plan for communicating to local residents and public officials. 3M will seek the advice from the MPCA, city officials and others regarding these public communications tools.

3M offers the following for use in communicating project activities:

- **3M Fluorochemical Website:** 3M has established and maintains a website for disseminating important information on fluorochemicals. The URL for this site is: [www.3M.com/pfos-pfoa](http://www.3M.com/pfos-pfoa). The website will include a link to the Cottage Grove Site on which information will exist to direct local residents and public officials to the availability of relevant documents and meeting dates. Additionally, the website will indicate that people can contact 3M via a telephone helpline, “1-800-3M HELPS”, to make inquiries about the status of the remediation efforts.
- **Public Repository at Local Library:** Key documents about the project will be maintained and available for the public to review at the Park Grove Branch of the Washington County Library located at Cottage Grove, Minnesota. Examples of the types of documents to be available at this location would include the Settlement Agreement and Consent Order and key submittals to the MPCA such as the Remedial Investigation, Feasibility Study Work Plan and Feasibility Study Report.
- **Informational and Public Meetings:** 3M recognizes the importance of input from the public, including public officials and staff at the municipal level. Information meetings will be conducted to update interested local residents and public officials and to provide opportunities for their input. The following briefly describe some of the forums that will be used:

- **Elected Officials and Staff:** 3M will continue to provide periodic updates to Cottage Grove public officials and staff. These updates may be formal or informal. At these meetings, public officials can provide input relative to opportunities for public participation.
- **MPCA Citizens Board:** Quarterly updates to the MPCA Citizens Board will occur on the progress being made on investigations and remediation efforts at the Site. This will provide opportunities to inform the Board on developments at the Site and to address questions.
- **Public Meetings:** It is envisioned that at least two public meetings will occur prior to the implementation of any response actions at the Site.

An initial meeting will be conducted by 3M during development of the Feasibility Study Report. The purpose of this meeting is to provide the community information about the investigation and remedial alternatives so that public comments can be taken into account. 3M will work with city officials on how best to publicize the meeting to ensure timely notice to the community. Following this meeting, and with the benefit of the public's questions and comments, the comparative analysis and recommended evaluated alternatives and conceptual design steps will be completed.

A second public meeting will be convened by the MPCA after reviewing the FS Report and before selecting a remedy for the Site.



## **6. FEASIBILITY STUDY REPORT AND SCHEDULE**

3M will work with MPCA to determine site-specific response action objectives and cleanup levels. Based on the response action objectives and cleanup levels, 3M will prepare an FS Report as described in this FS Work Plan. In accordance with the Consent Order, the FS Report is due to the MPCA within 90 days of MPCA's approval of this FS Work Plan and the RI Report, which are being submitted concurrently.

## 7. REFERENCES

MPCA, 1998. *Draft Guidelines: Remedy Selection*. Working Draft, September 1998.

USEPA, 1988. *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA*. Interim Final, October 1988.