ATTACHMENT I

SCOPE OF WORK FOR A RCRA FACILITY INVESTIGATION AT OCCIDENTAL CHEMICAL COMPANY MONTAGUE, MICHIGAN

PURPOSE

The purpose of this RCRA Facility Investigation is to determine the nature and extent of releases of hazardous waste or hazardous waste constituents from regulated units, solid waste management units, and other source areas at the facility and to gather all necessary data to support the Corrective Measure Study. Occidental Chemical shall furnish all personnel, materials, and services necessary for, or incidental to performing the RCRA Facility Investigation at the Montague, Michigan facility.

SCOPE

The RCRA Facility Investigation consists of six tasks:

Task I: Description of Current Conditions

- A. Facility Background
- B. Nature and Extent of Contamination
- C. Implementation of Interim Measures (optional)

Task II: Pre-Investigation Evaluation of Corrective Measure Technologies

Task III: RFI Workplan Requirements

- A. Project Management Plan
- B. Quality Assurance Project Plan (QAPjP)
- C. Data Management Plan
- D. Health and Safety Plan
- E. Community Relations Plan

Task IV: Facility Investigation

- A. Environmental Setting
- B. Source Characterization
- C. Contamination Characterization
- D. Potential Receptors

Task V: Investigation Analysis

- A. Data Analysis
- B. Protection Standards

Task VI: Reports

- A. Preliminary and Workplan
- B. Progress
- C. Draft and Final

TASK I: DESCRIPTION OF CURRENT CONDITIONS

Occidental Chemical shall submit for U.S. EPA approval, a report providing the background information pertinent to the facility and contamination as set forth below. The data gathered during any previous investigations, and other relevant data shall be included.

A. Facility Background

Occidental Chemical's report shall summarize the regional location, pertinent boundary features, general facility physiography, hydrogeology, and historical use of the facility for the treatment, storage, or disposal of solid and hazardous waste. Occidental Chemical's report shall include:

1. Maps depicting the following:

   a. General geographic location;

   b. Property lines with owners of all adjacent property clearly indicated;

   c. Topography and surface drainage depicting all waterways, wetlands, floodplains, water features, drainage patterns, and surfacewater containment areas;

   d. All tanks, buildings, utilities, paved areas, easements, rights-of-way, and other features;

   e. All solid or hazardous waste treatment, storage, or disposal areas active after November 19, 1980;

   f. All known past solid or hazardous waste treatment, storage or disposal areas regardless of whether they were active on November 19, 1980;

   g. All known past and present product and waste underground tanks or piping;

   h. Surrounding land uses (residential, commercial, agricultural, recreational);

   i. The location of all past and present production, recovery, and groundwater monitoring wells. These wells shall be clearly labeled, and ground and top of casing elevations and construction details included. These elevations and details may be included as an attachment which outlines well depth, aquifer(s) screened, screen length, screen interval (AMSL), well diameter, well material and openhole or sand/gravel pack interval (AMSL); and

   j. Terrestrial Habitat Cover - Types (i.e. vegetation communities).

All maps shall be consistent with the requirements set forth in 40 CFR 270.14 and be of sufficient detail and accuracy to locate and report all current and future work performed at the site.

2. A history and description of the ownership and operation, solid and hazardous waste generation, treatment, storage, and disposal activities at the facility.

3. Exact dates or approximate periods of past product and waste spills or deposits, identification of the materials spilled, the amount spilled, the amount recovered, the location where spilled, media impacted, and a description of the response actions conducted (local, State, or Federal response units or private parties), including any inspection reports or technical reports generated as a result of the response.

4. A summary of past and present environmental permits requested and/or received, any enforcement actions and their subsequent responses, and a list of documents and studies prepared for the facility.

5. Description of major habitat types (e.g., grasslands, forests, lakes, streams, wetlands) located in, adjacent to, or affected by the facility. In delineating wetlands, the U.S. Fish and Wildlife Service's National Wetland Inventory maps should be consulted. In addition, if the facility is located in Michigan, the Michigan Department of Natural Resources (MDNR) should be consulted, and wetlands should be delineated using the MDNR Wetland Determination Manual. If the facility is located in another state, the U.S. Army Corps of Engineers should be consulted and wetlands should be delineated using the Federal Manual for Identifying and Delineating Jurisdictional Wetlands (This manual is currently undergoing revision. Until the revision is finalized, the Corps should be consulted to determine which wetland delineation manual should be utilized.).

6. Description of plants and animals at and adjacent to the site. Should include the following: qualitative observations of resident plants and animals (birds, mammals, fish, stream benthos, etc.); classification of vegetation community types. Threatened and endangered species possibly on or near the site should be identified as early as possible.

B. Nature and Extent of Contamination

Occidental Chemical shall prepare and submit for U.S. EPA approval, a preliminary report describing the existing information on the nature and extent of contamination.

1. Occidental Chemical's report shall summarize all possible source areas of contamination. This, at a minimum, should include all

regulated units, solid waste management units, spillage areas, and other suspected source areas of contamination. For each area, Occidental Chemical shall identify the following:

a. Location of unit/area (which shall be depicted on a facility map);

b. Quantities of solid and hazardous wastes present;

c. Hazardous waste or constituents, to the extent known; and

d. Identification of areas where additional information is necessary.

2. Occidental Chemical shall prepare an assessment and description of the existing degree and extent of contamination. This should include:

a. Available monitoring data and qualitative information on locations and levels of contamination at the facility;

b. All potential migration pathways including information on geology, pedology, physiography, hydrogeology, physiography, hydrology, water quality, meteorology, air quality, and migration through food chains; and

c. Any known or observed effects of site contaminants to biota, such as fish kills, stressed vegetation, or other obvious impacts.

d. Potential impacts of contaminants on human health and the environment, including demography, groundwater and surface water use, land use, and potential ecological receptors, including any threatened and endangered species. This assessment should be based on existing site information, literature-based information on contaminant fate and toxicity, and available criteria and standards (e.g., Ambient Water Quality Criteria).

C. Implementation of Interim Measures

If an interim measure is determined to be necessary, Occidental Chemical shall prepare and submit for approval, an Interim Measures Workplan in accordance with Appendix I to this Scope of Work.

TASK II: PRE-INVESTIGATION EVALUATION OF CORRECTIVE MEASURE TECHNOLOGIES

Prior to starting the facility investigation, Occidental Chemical shall submit to U.S. EPA a report that identifies the potential corrective measure technologies that may be used on-site or off-site for the containment, treatment, remediation, and/or disposal of contamination from the Facility. This report shall also identify any field data that needs to be collected in the facility investigation to facilitate the evaluation and selection of the final corrective measures (e.g., compatibility of waste and construction materials, information to evaluate effectiveness, treatability of wastes, etc.).

TASK III: RFI WORKPLAN REQUIREMENTS

Occidental Chemical shall prepare a RCRA Facility Investigation (RFI) Workplan. The RFI Workplan shall include the development of several plans, which shall be prepared concurrently. During the RCRA Facility Investigation, it may be necessary to revise the RFI Workplan to increase or decrease the detail of information collected to accommodate the facility specific situation. The RFI Workplan includes the following:

A. Project Management Plan

Occidental Chemical shall prepare a Project Management Plan which will include a discussion of the technical approach, schedules, budget, and personnel. The Project Management Plan also will include a description of the qualifications of personnel performing or directing the RFI, including contractor personnel. This plan shall document the overall management approach to the RCRA Facility Investigation.

B. Quality Assurance Project Plan (QAPjP)

Occidental Chemical shall prepare a plan to document all monitoring procedures, sampling, field measurements, and sample analyses performed during the investigation to characterize the environmental setting, source, and contamination, so as to ensure that all information, data, and resulting decisions are technically sound, statistically valid, and properly documented. The QAPjP shall be prepared in accordance with Attachment IV. A pre-QAPjP meeting shall be held prior to preparation of the QAPjP. Participants should include, but are not limited to Occidental Chemical, their QAPjP preparer, laboratory representatives, U.S. EPA Project Coordinator, U.S. EPA Quality Assurance and Laboratory representatives.

(A performance audit will be conducted by U.S. EPA on laboratories selected by Occidental Chemical. This audit must be completed and laboratories approved for use on the project prior to the start of field work for the RFI.)

C. Data Management Plan

Occidental Chemical shall develop and initiate a Data Management Plan to document and track investigation data and results. This plan shall identify and set up data documentation materials and procedures, project file requirements, and project-related progress reporting procedures and documents. The plan shall also provide the format to be used to present the raw data and conclusions of the investigation.

All groundwater data shall be submitted in a computer accessible format, i.e., diskette. The format used shall be compatible with the U.S. EPA, Region V groundwater database known as the Ground Water Information Tracking System (GRITS), Version 4.0.

1. Data Record

The Data record shall include the following:

a. Unique sample or field measurement code;

b. Sampling or field measurement location and sample or measurement type;

c. Sampling or field measurement raw data;

d. Laboratory analysis ID number;

e. Property or component measured; and

f. Result of analysis (e.g., concentration).

2. Tabular Displays

The following data shall be presented in tabular displays:

a. Unsorted (raw) data;

b. Results for each medium, or for each constituent monitored;

c. Data reduction for statistical analysis;

d. Sorting of data by potential stratification factors (e.g., location, soil layer, topography); and

e. Summary data.

3. Graphical Displays

The following data shall be presented in graphical formats (e.g., bar-graphs, line graphs, area or plan maps, isopleth plots, cross-sectional plots or transects, three dimensional graphs, etc.):

a. Display sampling location and sampling grid;

b. Indicate boundaries of sampling area, and areas where more data are required;

c. Display levels of contamination at each sampling location;

d. Display geographical extent of contamination;

e. Display contamination levels, averages, and maxima;

f. Illustrate changes in concentration in relation to distance from the source, time, depth or other parameters; and

g. Indicate features affecting intramedia transport and show potential receptors.

D. Health and Safety Plan

Occidental Chemical shall prepare a Health and Safety Plan.

1. The Health and Safety Plan shall:

a. Provide a facility description, including availability of resources such as roads, water supplies, electricity, and telephone service;

b. Describe the known hazards and evaluate the risks associated with the incident and with each activity conducted;

c. List key personnel and alternates responsible for site safety, response operations, and for protection of human health;

d. Delineate work area;

e. Describe levels of protection to be worn by personnel;

f. Establish procedures to control site access;

g. Describe decontamination procedures for personnel and equipment;

h. Establish site emergency procedures;

i. Address emergency medical care for injuries and toxicological problems;

j. Describe requirements for an environmental surveillance program;

k. Specify any routine and special training required for responders; and

l. Establish procedures for protecting workers from weather-related problems.

2. The Facility Health and Safety Plan shall be consistent with:

a. NIOSH Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities (1985);

b. U.S. EPA Order 1440.1 - Respiratory Protection;

c. U.S. EPA Order 1440.3 - Health and Safety Requirements for Employees engaged in Field Activities;

d. Facility Contingency Plan;

e. U.S. EPA Standard Operating Safety Guide (1984);

f. OSHA regulations, particularly those in 29 CFR 1910 and 1926;

g. State and local regulations; and

h. Other U.S. EPA guidance as provided.

E. Community Relations Plan

Occidental Chemical shall prepare a plan, for the dissemination of information to the public regarding investigation activities and results.

TASK IV: FACILITY INVESTIGATION

Occidental Chemical shall conduct those investigations necessary to: characterize the facility (Environmental Setting); define the source (Source Characterization); define the degree and extent of contamination (Contamination Characterization); and identify actual or potential receptors (Potential Receptor Identification). The investigations should result in data of adequate technical content to support the development and evaluation of the corrective measure alternatives during the Corrective Measures Study.

The site investigation activities shall follow the plans set forth in Task III. All sampling and analyses shall be conducted in accordance with the Data Collection Quality Assurance Plan. All sampling locations shall be documented in a log and identified on a detailed site map.

A. Environmental Setting

Occidental Chemical shall collect information to supplement and verify existing information on the environmental setting at the facility. Occidental Chemical shall characterize the following:

1. Hydrogeology

Occidental Chemical shall conduct a program to evaluate hydrogeologic conditions at the facility. This program shall provide the following information:

a. A description of the regional and facility specific geologic and hydrogeologic characteristics affecting groundwater flow beneath the facility, including:

i) Regional and facility specific stratigraphy: description of strata including strike and dip; and identification of stratigraphic contacts;

ii) Structural geology: description of local and regional structural features (e.g., folding, faulting, tilting, jointing, etc.);

iii) Depositional history;

iv) Identification and characterization of areas and amounts of recharge and discharge;

v) Regional and facility specific groundwater flow patterns; and

vi) Seasonal variations in the groundwater flow regime;

b. An analysis of any topographic features that might influence the groundwater flow system;

c. Based on field data, tests, and cores, a representative and accurate classification and description of the hydrogeologic units which may be part of the migration pathways at the facility (i.e., the aquifers and any intervening saturated and unsaturated units), including:

   i) Hydraulic conductivity and porosity (total and effective);

   ii) Lithology, grain size, sorting;

   iii) An interpretation of hydraulic interconnections between saturated zones; and

   iv) The attenuation capacity and mechanisms of the natural earth materials (e.g., ion exchange capacity, organic carbon content, mineral content etc.);

d. Based on field studies and cores, structural geology and hydrogeological cross-sections showing the extent (depth, thickness, lateral extent) of hydrogeologic units which may be part of the migration pathways, identifying:

   i) Sand and gravel deposits in unconsolidated deposits;

   ii) Zones of fracturing or channeling in consolidated or unconsolidated deposits;

   iii) Zones of high permeability or low permeability that might direct or restrict the flow of contaminants;

   iv) The uppermost aquifer (geologic formation, group of formations, or part of a formation capable of yielding a significant amount of groundwater to wells or springs); and

   v) Water-bearing zones above the first confining layer that may serve as a pathway for contaminant migration, including perched zones of saturation;

e. Based on data obtained from groundwater monitoring wells and piezometers installed upgradient and downgradient of the potential contaminant source, a representative description of water level or fluid pressure monitoring, including:

   i) Water-level contour and/or potentiometric maps;

   ii) Hydrogeologic cross-sections showing vertical gradients;

   iii) The flow system, including the vertical and horizontal components of flow; and

iv) Any temporal changes in hydraulic gradients, for example due to tidal or seasonal influences; and

f. A description of man-made influences that may affect the hydrogeology of the site, identifying:

i) Active and inactive local water-supply and production wells with an approximate schedule of pumping; and

ii) Man-made hydraulic structures (pipelines, French drains, ditches, unlined ponds, septic tanks, NPDES outfalls, retention areas, etc.).

2. Soils

Occidental Chemical shall conduct a program to characterize the soil and rock units above the water table in the vicinity of the contaminant releases. Such characterization shall include but not be limited to, the following information:

a. SCS soil classification;

b. Surface soil distribution;

c. Soil profile, including ASTM classification of soils;

d. Transects of soil stratigraphy;

e. Hydraulic conductivity (saturated and unsaturated);

f. Relative permeability;

g. Bulk density;

h. Porosity;

i. Soil sorptive capacity;

j. Cation exchange capacity (CEC);

k. Soil organic content;

l. Soil pH;

m. Particle size distribution;

n. Depth of water table;

o. Moisture content;

p. Effect of stratification on unsaturated flow;

q. Infiltration;

r. Evapotranspiration;

s. Storage capacity;

t. Vertical flow rate; and

u. Mineral content.

3. Surface Water and Sediment

Occidental Chemical shall conduct a program to characterize the surface water bodies in the vicinity of the facility. Such characterization shall include, but not be limited to, the following activities and information:

a. Description of the temporal and permanent surface water bodies including:

i) For lakes: location, elevation, surface area, inflow, outflow, depth, temperature stratification, volume, and a description of substrate and cover;

ii) For impoundments: location, elevation, surface area, depth, volume, freeboard, and purpose of impoundment;

iii) For streams, ditches, wetlands, and channels: location, elevation, flow, velocity, depth, width, seasonal fluctuations, and flooding tendencies (i.e., 100 year event), and a description of substrate and surface cover.

iv) Drainage patterns; and

v) Evapotranspiration;

b. Description of the chemistry of the natural surface water and sediments. This includes determining the pH, total dissolved solids, total suspended solids, biological oxygen demand, alkalinity, conductivity, dissolved oxygen profiles, nutrients (NH_3, NO_3-/NO_2-, PO_4^{-3}), chemical oxygen demand, total organic carbon, specific contaminant concentrations, etc; and

c. Description of sediment characteristics including:

i) Depositional area;

ii) Thickness profile; and

iii) Physical and chemical parameters (e.g., grain size, distribution, density, organic carbon content, ion exchange capacity, pH, etc., and other parameters as directed by U.S. EPA.

4. Air

Occidental Chemical shall provide information characterizing the climate in the vicinity of the facility. Such information shall include, but not be limited to:

a. A description of the following parameters:

i) Annual and monthly rainfall averages;

ii) Monthly temperature averages and extremes;

iii) Wind speed and direction;

iv) Relative humidity/dew point;

v) Atmospheric pressure;

vi) Evaporation data;

vii) Development of inversions; and

viii) Climate extremes that have been known to occur in the vicinity of the facility, including frequency of occurrence; and

b. A description of topographic and man-made features which affect air flow and emission patterns, including:

i) Ridges, hills, or mountain areas;

ii) Canyons or valleys;

iii) Surface water bodies (e.g., rivers, lakes, bays, etc.);

iv) Wind breaks and forests; and

v) Buildings.

B. Source Characterization

Occidental Chemical shall collect analytical data to completely characterize the wastes and the areas where wastes have been placed, collected, or removed, including: type; quantity; physical form; disposition (containment or nature of deposits); and facility characteristics affecting release (e.g., facility security, and

engineered barriers). This shall include quantification of the following specific characteristics, at each source area:

1. Unit/Disposal area characteristics:

    a. Location of unit/disposal area;

    b. Type of unit/disposal area;

    c. Design features;

    d. Operating practices (past and present);

    e. Period of operation;

    f. Age of unit/disposal area;

    g. General physical conditions; and

    h. Method used to close the unit/disposal area.

2. Waste characteristics:

    a. Type of wastes placed in each unit, including:

        i) Hazardous classification (e.g., flammable, reactive corrosive, oxidizing or reducing agent);

        ii) Quantity;

        iii) Chemical composition; and

        iv) Waste form (bulk or containerized);

    b. Physical and chemical characteristics:

        i) Physical form (solid, liquid, gas);

        ii) Physical description (e.g., powder, oily sludge);

        iii) Temperature;

        iv) pH;

        v) General chemical class (e.g., acid, base, solvent);

        vi) Molecular weight;

        vii) Density;

        viii) Boiling point;

ix) Viscosity;

x) Solubility in water;

xi) Cohesiveness of the waste;

xii) Vapor pressure; and

xiii) Flash point; and

c. Migration and dispersion characteristics:

i) Sorption;

ii) Biodegradability, bioconcentration, biotransformation;

iii) Photodegradation rates;

iv) Hydrolysis rates; and

v) Chemical transformation.

Occidental Chemical shall document the procedures used in making the above determinations.

C. Contamination Characterization

Occidental Chemical shall collect analytical data on groundwater, soils, surface water, sediment, air, and subsurface gas contamination in the vicinity of the facility. This data shall be sufficient to define the extent, origin, direction, and rate of movement of contaminant plumes. Data shall include time and location of samplings, medias sampled, concentrations of contaminants found, conditions during sampling, and the identity of the individuals performing the sampling and analysis. Occidental Chemical shall address the following types of contamination at the facility:

1. Groundwater Contamination

Occidental Chemical shall conduct a Groundwater Investigation to characterize any plumes of contamination at the facility. This investigation shall at a minimum provide the following information:

a. A description of the horizontal and vertical extent of any immiscible or dissolved plumes originating from the facility;

b. The horizontal and vertical directions of contamination movement;

c. The velocities of contaminant movement;

d. The horizontal and vertical concentration profiles of Appendix IX constituents in the plumes;

e. An evaluation of factors influencing the plume movement; and

f. An extrapolation of future contaminant movement. Occidental Chemical shall document the procedures to be used in making the above determinations (e.g., well design, well construction, geophysics, modeling, etc.).

2. Soil Contamination

Occidental Chemical shall conduct an investigation to characterize the contamination of the soil and rock units above the water table in the vicinity of the contaminant release. The investigation shall include the following information:

a. A description of the vertical and horizontal extent of contamination;

b. A description of contaminant and soil chemical properties within the contaminant source area and plume. This includes contaminant solubility, speciation, adsorption, leachability, exchange capacity, biodegradability, hydrolysis, photolysis, oxidation, and other factors that might affect contaminant migration and transformation;

c. Specific contaminant concentrations;

d. The velocity and direction of contaminant movement; and

e. An extrapolation of future contaminant movement.

Occidental Chemical shall document the procedures used in making the above determinations.

3. Surface Water and Sediment Contamination

Occidental Chemical shall conduct a surface water investigation to characterize contamination in surface water bodies resulting from the contaminant releases at the facility. The investigation shall include, but not be limited to, the following information:

a. A description of the horizontal and vertical extent of any immiscible or dissolved plume(s) originating from the facility, and the extent of contamination in underlying sediments;

b. The horizontal and vertical direction of contaminant movement;

c. The contaminant velocities;

d. An evaluation of the physical, biological, and chemical factors influencing contaminant movement;

e. An extrapolation of future contaminant movement; and

f. A description of the chemistry of the contaminated surface waters and sediments. This includes determining the pH, total dissolved solids, and specific contaminant concentrations, etc.

Occidental Chemical shall document the procedures used in making the above determinations.

4. Air Contamination

Occidental Chemical shall conduct an investigation to characterize the particulate and gaseous contaminants released into the atmosphere. This investigation shall provide the following information:

a. A description of the horizontal and vertical direction and velocity of contaminant movement;

b. The rate and amount of releases; and

c. The chemical and physical composition of the contaminants released, including horizontal and vertical concentration profiles.

Occidental Chemical shall document the procedures used in making the above determinations.

5. Subsurface Gas Contamination

Occidental Chemical shall conduct an investigation to characterize subsurface gases emitted from buried hazardous waste and hazardous constituents in the groundwater. This investigation shall provide the following information:

a. A description of the horizontal and vertical extent of subsurface gas migration;

b. The chemical composition of the gases being emitted;

c. The rate, amount, and density of the gases being emitted; and

d. Horizontal and vertical concentration profiles of the subsurface gases emitted.

Occidental Chemical shall document the procedures used in making the above determinations.

D. Potential Receptors Identification

Occidental Chemical shall collect data describing the human populations and environmental systems that are susceptible to contaminant exposure from the facility. Chemical analysis of biological samples may be needed. Data on observable effects in ecosystems also may be needed. The following characteristics shall be identified:

1. Local uses and possible future uses of groundwater:

   a. Type of use (e.g., drinking water source, municipal, residential, agricultural, domestic/non-potable, and industrial); and

   b. Locations of groundwater users, including wells and discharge areas.

2. Local uses and possible future uses of surface water draining from the facility:

   a. Domestic and municipal (e.g., potable, lawn/gardening watering);

   b. Recreational (e.g., swimming, fishing);

   c. Agricultural;

   d. Industrial; and

   e. Environmental (e.g., fish and wildlife propagation).

3. Human use or access to the facility and adjacent lands, including but not limited to:

   a. Recreation;

   b. Hunting;

   c. Residential;

   d. Commercial; and

   e. Relationship between population locations and prevailing wind direction.

4. A demographic profile of the people who use or have access to the facility and adjacent land, including, but not limited to: age; sex; and sensitive subgroups.

5. Ecological characteristics of the facility. Data required for this may include the following:

   a. Chemical sampling in potentially exposed habitats and reference sites.

   b. Toxicity testing.

   c. Tissue analyses.

   d. Biological community assessment.

   e. Habitat assessment of aquatic and terrestrial habitats on or potentially affected by the site.

   f. Revised assessment of ecological impacts on receptors. Impacts should include those occurring at individual level (e.g., mortality, growth, and reproductive impairments) and those occurring at higher levels of biological organization (i.e., at population, community, and ecosystem levels).

TASK V: INVESTIGATION ANALYSIS

Occidental Chemical shall prepare an analysis and summary of all facility investigations and their results. The objective of this task shall be to ensure that the investigation data are sufficient in quality (e.g., quality assurance procedures have been followed) and quantity to describe the nature and extent of contamination, potential threat to human health and the environment, and to support the Corrective Measures Study.

A. Data Analysis

Occidental Chemical shall analyze all facility investigation data outlined in Task IV and prepare a report on the type and extent of contamination at the facility including sources and migration pathways. The report shall describe the extent of contamination (qualitative/quantitative) in relation to the background levels indicative for the area.

B. Protection Standards

1. Groundwater Protection Standards

Occidental Chemical shall provide information to support the Agency's selection/development of Groundwater Protection Standards for all of the Appendix IX constituents found in the groundwater during the Facility Investigation (Task IV).

a. The Groundwater Protection Standards shall consist of:

i) Maximum Contaminants Levels (MCLs) for constituents listed in the National Primary Drinking Water Regulations (40 CFR Part 141), if the background level of the constituent is below the given MCL; or

ii) The background level of that constituent in the groundwater; or

iii) A U.S. EPA-approved Alternate Concentration Limit (ACL).

iv) Applicable and substantive State of Michigan standards.

b. Information to support the Agency's subsequent selection of Alternate Concentration Limits (ACL's) shall be developed by Occidental Chemical in accordance with U.S. EPA guidance. For any proposed ACL's, Occidental Chemical shall include a justification based upon the criteria set forth in 40 CFR 264.94(b).

c. Within thirty (30) days of receipt of any proposed ACL's, the U.S. EPA shall notify Occidental Chemical in writing of

approval, disapproval or modifications. The U.S. EPA shall specify in writing the reasons for any disapproval or modification.

d. Within thirty (30) days of receipt of the U.S. EPA's notification of disapproval of any proposed ACL, Occidental Chemical shall amend and submit revisions to the U.S. EPA.

2. Other Relevant Protection Standards

Occidental Chemical shall identify and consider all relevant and applicable standards or criteria for protection of human health and the environment (e.g., National Ambient Air Quality Standards, Federally-approved State water quality standards, water quality criteria, health advisories, proposed MCLs, etc.).

TASK VI: REPORTS

A. Preliminary and Workplan

Occidental Chemical shall submit to the U.S. EPA reports on Tasks I and II when it submits the RCRA Facility Investigation Workplan (Task III).

B. Progress

Occidental Chemical shall at a minimum provide U.S. EPA with signed, monthly progress reports containing:

1. A description and estimate of the percentage of the RFI completed;

2. Summaries of all findings;

3. Summaries of all changes made in the RFI during the reporting period;

4. Summaries of all contacts with representatives of local community public interest groups or State government during the reporting period;

5. Summaries of all problems or potential problems encountered during the reporting period;

6. Actions being taken to rectify problems;

7. Changes in personnel during the reporting period;

8. Projected work for the next reporting period; and

9. Copies of daily reports, inspection reports, laboratory/monitoring data, etc.

C. Draft and Final

Upon U.S. EPA approval, Occidental Chemical shall prepare a RCRA Facility Investigation Report to present Tasks IV and V. The RCRA Facility Investigation Report shall be developed in draft form for U.S. EPA review. The RCRA Facility Investigation Report shall be developed in final format incorporating comments received on the Draft RCRA Facility Investigation Report.

Three copies of all reports, including the Task I report, Task II report, Task III workplan, and both the Draft and Final RCRA Facility Investigation Reports (Tasks IV and V) shall be provided by Occidental Chemical to U.S. EPA.

Facility Submission Summary

A summary of the information reporting requirements contained in the RCRA Facility Investigation Scope of Work is presented below.

Facility Submission	Due Date
Description of Current Situation (Task I)	60 days within the effective date of the Consent Order
Pre-Investigation Evaluation of Corrective Measure Technologies (Task II)	60 days within the effective date of the Consent Order
RFI Workplan (Task III)	60 days within the effective date of the Consent Order
Final RFI Report	contingent on schedule imposed in Workplan
Progress Reports on Tasks I through V	Monthly

ATTACHMENT II

SCOPE OF WORK FOR A CORRECTIVE MEASURES STUDY
AT
OCCIDENTAL CHEMICAL COMPANY

PURPOSE

The purpose of the Corrective Measures Study (CMS) is to develop and evaluate the corrective action alternatives and to recommend the corrective measures to be taken at Occidental Chemical Company, Montague, Michigan. Respondent shall furnish the personnel, materials, and services necessary to prepare the corrective measures study, except as otherwise specified.

SCOPE

Respondent shall prepare a Corrective Measures Study Work Plan which consists of four tasks:

Task VII: Identification and Development of the Corrective Measure Alternatives

A. Description of Current Situation
B. Establishment of Corrective Action Objectives
C. Screening of Corrective Measure Technologies
D. Identification of the Corrective Measure Alternatives

Task VIII: Necessary Laboratory and Bench-Scale Studies

Task IX: Evaluation of the Corrective Measures Alternatives

A. Technical/Environmental/Human Health/Institutional
B. Cost Estimates

Task X: Justification and Recommendation of the Corrective Measures

A. Technical
B. Environmental
C. Human Health

Task XI: Reports

A. Progress
B. Draft
C. Final

TASK VII: IDENTIFICATION AND DEVELOPMENT OF THE CORRECTIVE MEASURE ALTERNATIVES

Based upon the results of the RCRA Facility Investigation and consideration of the identified Preliminary Corrective Measure Technologies (Task II), Respondent shall identify, screen, and develop the alternatives for removal, containment, treatment, and/or other remediation of the contamination based on the objectives established for the corrective action.

A. Description of Current Situation

Respondent shall submit an update to the information describing the current situation at the facility and the known nature and extent of the contamination as documented by the RCRA Facility Investigation Report. Respondent shall provide an update to the information presented in Task I of the RFI to the Agency regarding previous response activities and any interim measures which have been implemented at the facility. Respondent shall also make a facility-specific statement of the purpose for the response, based on the results of the RCRA Facility Investigation. The statement of purpose should identify the actual or potential exposure pathways that should be addressed by corrective measures.

B. Establishment of Corrective Action Objectives

Respondent, in conjunction with the U.S. EPA, shall establish site specific objectives for the corrective action needed to protect human health and the environment. These objectives shall be based on public health and environmental criteria, information gathered during the RCRA Facility Investigation, U.S. EPA guidance, and the requirements of any applicable Federal statutes. All corrective actions concerning groundwater releases must be consistent with, and as stringent as, those required under 40 CFR 264.100.

C. Screening of Corrective Measure Technologies

Respondent shall review the results of the RCRA Facility Investigation and reassess the technologies specified in Task II to identify any additional technologies which are applicable at the facility. Respondent shall screen the preliminary corrective measure technologies identified in Task II of the RCRA Facility Investigation and any supplemental technologies to eliminate those that may not prove feasible to implement, that rely on technologies unlikely to perform satisfactorily or reliably, or that do not achieve the corrective measure objective within a reasonable time period. This screening process focuses on elimination those technologies which have several limitations for a given set of waste and site specific condition. The screening step may also eliminate technologies based on inherent technology limitations.

Site, waste, and technology characteristics which are used to screen inapplicable technologies are described in more detail below:

1. Site Characteristics

   Site data should be reviewed to identify conditions that may limit or promote the use of certain technologies. Technologies whose use is clearly precluded by site characteristics should be eliminated from further consideration;

2. Waste Characteristics

   Identification of waste characteristics that limit the effectiveness or feasibility of technologies is an important part of the screening process. Technologies clearly limited by these waste characteristics should be eliminated from consideration. Waste characteristics particularly affect the feasibility of in-situ methods, direct treatment methods, and land disposal (on/off-site); and

3. Technology Limitations

   During the screening process, the level of technology development, performance record, and inherent construction, operation, and maintenance problems should be identified for each technology considered. Technologies that are unreliable, perform poorly, or are not fully demonstrated may be eliminated in the screening process. For example, certain treatment methods have been developed to a point where they can be implemented in the field without extensive technology transfer or development.

D. Identification of the Corrective Measure Alternatives

Respondent shall develop the corrective measure alternatives based on the corrective action objectives and analysis of Preliminary Corrective Measure Technologies, as presented in Task II of the RCRA Facility Investigation, and as supplemented following the preparation of the RFI Report. Respondent shall rely on sound engineering practices to determine which of the previously identified technologies appear most suitable for the site. Technologies can be combined to form the overall corrective measure alternatives. The alternatives developed should represent a workable number of options that appear to adequately address all site problems and corrective action objectives. Each alternative may consist of an individual technology or a combination of technologies. Respondent shall document the reasons for excluding technologies identified in Task II, as supplemented in the development of the alternatives.

TASK VIII: LABORATORY AND BENCH-SCALE STUDIES

The Respondent shall conduct laboratory and/or bench-scale studies to determine the applicability of corrective measure technologies to facility conditions. Respondent shall analyze the technologies based on literature review, vendor contacts, and past experience to determine the testing requirements.

Respondent shall develop a testing plan identifying the types and goals of the studies, the level of effort needed, and the procedures to be used for data management and interpretation.

Upon completion of the testing, Respondent shall evaluate the testing results to assess the technologies with respect to the site-specific questions identified in the test plan.

Respondent shall prepare a report summarizing the testing program and its results, both positive and negative.

TASK IX: EVALUATION OF THE CORRECTIVE MEASURE ALTERNATIVES

Respondent shall describe each corrective measure alternative that passes through the Initial Screening in Task VII and evaluate each corrective measure alternative and its components. The evaluation shall be based on technical, environmental, human health, and institutional concerns. Respondent shall also develop cost estimates for each corrective measure.

A. Technical/Environmental/Human Health/Institutional

Respondent shall provide a description of each corrective measure alternative which includes, but is not limited to the following: preliminary process flow sheets; preliminary sizing and types of construction for buildings and structures; and rough quantities of utilities required. Respondent shall evaluate each alternative in the four following areas:

1. Technical

Respondent shall evaluate each corrective measure alternative based on performance, reliability, implementability, and safety.

a. Respondent shall evaluate each corrective measure alternative based on the effectiveness and useful life of the corrective measure:

i) Effectiveness shall be evaluated in terms of the ability to perform intended functions, such as containment, diversion, removal, destruction, or treatment. The effectiveness of each corrective measure shall be determined either through design specifications or by performance evaluation. Any specific waste or site characteristic which could potentially impede effectiveness shall be considered. The evaluation should also consider the effectiveness of combinations of technologies; and

ii) Useful life is defined as the length of time the level of effectiveness can be maintained. Most corrective measure technologies, with the exception of destruction, deteriorate with time. Often, deterioration can be slowed through proper system operation and maintenance, but the technology eventually may require replacement. Each corrective measure shall be evaluated in terms of the projected service lives of its component technologies. Resource availability in the future life of the technology, as well as appropriateness of the technologies, must be considered in estimating the useful life of the project.

b. Respondent shall provide information on the reliability of each corrective measure including its operation and maintenance requirements and demonstrated reliability:

i) Operation and maintenance requirements include the frequency and complexity of necessary operation and maintenance. Technologies requiring frequent or complex operation and maintenance activities should be regarded as less reliable than technologies requiring little or straightforward operation and maintenance. The availability of labor and materials to meet these requirements shall also be considered; and

ii) Demonstrated and expected reliability is a way of measuring the risk and effect of failure. Respondent shall evaluate whether the technologies have been used effectively under analogous conditions; whether the combinations of tech- nologies have been used together effectively; whether failure of any one technology has an immediate impact on receptors; and whether the corrective measure has the flexibility to deal with uncontrollable changes at the site.

c. Respondent shall describe the implementability of each corrective measure, including the relative ease of installation (constructability) and the time required to achieve a given level of response:

i) Constructability is determined by conditions both internal and external to the facility conditions, and includes such items as location of underground utilities, depth to water table, homogeneity of subsurface materials, and location of the facility (i.e., remote location vs. a congested urban area). Respondent shall evaluate what measures can be taken to facilitate construction under these conditions. External factors which affect implementation include the need for special permits or agreements, equipment availa- bility, and the location of suitable off-site treatment or disposal facilities; and

ii) Time has two components that shall be addressed: the time it takes to implement a corrective measure; and the time it takes to actually see beneficial results. Beneficial results are defined as the reduction of contaminants to some acceptable, pre-established level.

d. Respondent shall evaluate each corrective measure alternative with regard to safety. This evaluation shall include threats to the safety of nearby communities and environments as well as threats to workers during implementation. Factors to consider are fire, explosion, and exposure to hazardous substances.

2. Environmental

Respondent shall assess each alternative to determine its short and long-term beneficial and adverse effects on the environment. Each

alternative will be evaluated for its impact on habitat types and plant and animal receptors located in, adjacent to, or affected by the facility. Receptor impacts should include those occurring at the individual level (e.g., mortality, growth and reproductive impairments) and those occurring at higher levels of biological organization (i.e., at population, community, and ecosystem levels). The assessment should include proposed measures for mitigating adverse impacts.

3. Human Health

Respondent shall assess each alternative in terms of the extent to which it mitigates short and long-term potential exposure to any residual contamination and how it protects human health both during and after implementation of the corrective measure. The assessment will describe the levels and characterizations of contaminants onsite, potential exposure routes, and the potentially affected population. Each alternative will be evaluated to determine the level of exposure to contaminants and the reduction over time. For management of mitigation measures, the relative reduction of impact will be determined by comparing residual levels of each alternative with existing criteria, standards, or guidelines acceptable to U.S. EPA.

4. Institutional

Respondent shall assess relevant institutional needs for each alternative. Specifically, the effects of Federal, State, and local environmental and public health standards, regulation, guidance, advisories, ordinances, or community relation on the design, operation, and timing of each alternative.

B. Cost Estimate

Respondent shall develop an estimate of the cost of each corrective measure alternative (and for each phase or segment of the alternative). The cost estimate shall include both capital and operation and maintenance costs.

1. Capital costs consist of direct (construction) and indirect (nonconstruction and overhead) costs.

a. Direct capital costs include:

i) Construction costs: Costs of materials, labor (including fringe benefits and worker's compensation); and equipment required to install the corrective measure;

ii) Equipment costs: Cost of treatment, containment, disposal and/or service equipment necessary to implement the action; these materials remain until the corrective action is complete;

iii) Land and site-development costs: Expenses associated with purchase of land and development of existing property; and

b. Indirect capital costs include:

i) Engineering expenses: Costs of administration, design, construction supervision, drafting, and testing of corrective measure alternatives;

ii) Legal fees and license or permit costs: Administrative and technical costs necessary to obtain licenses and permits for installation and operation;

iii) Startup and shakedown costs: Costs incurred during corrective measure startup; and

iv) Contingency allowances: Funds to cover costs resulting from unforeseen circumstances, such as adverse weather conditions, strikes, and inadequate facility characterization.

2. Operation and maintenance costs are post-construction costs necessary to ensure continued effectiveness of a corrective measure. Respondent consider the following operation and maintenance cost components:

a. Operating labor costs: Wages, salaries, training, overhead, and fringe benefits associated with the labor needed for post-construction operations;

b. Maintenance materials and labor costs: Cost for labor, parts, and other resources required for routine maintenance of facilities and equipment;

c. Auxiliary materials and energy: Costs of such items as chemicals and electricity for treatment plant operations, water and sewer service, and fuel;

d. Purchased services: Sampling cost, laboratory fees, and professional fees for which the need can be predicted;

e. Disposal and treatment costs: Costs of transporting, treating, and disposing of waste materials, such as treatment plant residues, generated during operations;

f. Administrative costs: Costs associated with administration of corrective measure operation and maintenance not included under other categories;

g. Insurance, taxes, and licensing costs: Costs of such items as liability and sudden accidental insurance; real estate taxes on purchased land or right-of-way; licensing fees for certain technologies; and permit renewal and reporting costs;

h. Maintenance reserve and contingency funds: Annual payments into escrow to cover: (1) costs of anticipated replacement or rebuilding of equipment; and (2) any large unanticipated operation and maintenance costs; and

i. Other costs: Items that do not fit any of the above categories.

TASK X: JUSTIFICATION AND RECOMMENDATION OF THE CORRECTIVE MEASURES

Respondent shall justify and recommend corrective measure alternatives using technical, human health, and environmental criteria. The recommendation shall include summary tables which allow the alternatives to be easily understood. Tradeoffs among health risks, environmental effects, and other pertinent factors shall be highlighted. The U.S. EPA will select the corrective measure alternatives to be implemented based on the results of Tasks IX and X. At a minimum, the following criteria will be used to justify the final corrective measures.

A. Technical

1. Performance - corrective measures which are most effective at performing their intended functions and maintaining the performance over extended periods of time will be preferred;

2. Reliability - corrective measures which do not require frequent or complex operation and maintenance activities and that have proven effective under waste and facility conditions similar to those anticipated will be preferred;

3. Implementability - corrective measures which can be constructed and operated to reduce levels of contamination that attain or exceed applicable standards in the shortest period of time will be preferred; and

4. Safety - corrective measures which pose the least threat to the safety of nearby residents and environment as well as workers during implementation will be preferred.

B. Human Health

The corrective measures must comply with existing U.S. EPA criteria, standards, or guidelines for the protection of human health. Corrective measures which provide the minimum level of exposure to contaminants and the maximum reduction in exposure with time will be preferred.

C. Environmental

The corrective measures posing the least adverse impact (or greatest improvement) over the shortest period of time on the environment will be preferred.

TASK XI: REPORTS

Respondent shall prepare a Corrective Measures Study (CMS) Report presenting the results of Tasks VII through X and recommending corrective measure alternatives. Three (3) copies of the draft report shall be provided by Respondent.

A. Progress

Respondent shall at a minimum provide U.S. EPA with signed, monthly progress reports containing:

1. A description and estimate of the percentage of the CMS completed;

2. Summaries of all findings;

3. Summaries of all changes made in the CMS during the reporting period;

4. Summaries of all contacts with representatives of the local community, public interest groups, or State government during the reporting period;

5. Summaries of all problems or potential problems encountered during the reporting period;

6. Actions being taken to rectify problems;

7. Changes in personnel during the reporting period;

8. Projected work for the next reporting period; and

9. Copies of daily reports, inspection reports, laboratory/monitoring data, etc.

B. Draft

The Report shall, at a minimum, include:

1. A description of the facility, including a site topographic map (which includes depiction of plant communities and fish and wildlife habitat types) and preliminary layouts;

2. A summary of the corrective measures:

   a. Description of the corrective measures and rationale for selection;

   b. Performance expectations;

   c. Preliminary design criteria and rationale;

d. General operation and maintenance requirements; and

e. Long-term monitoring requirements to assess attainment of goals relative to groundwater, surface waters and ecological integrity (ecological monitoring, where applicable, could include assessment of wetland vegetation, soils and hydrology; biotoxicity of surface waters, soils and/or sediments; analysis of biological tissues; and assessment of stream fish and benthic macroinvertebrate communities);

3. A summary of the RCRA Facility Investigation and impact on the selected corrective measures;

4. A summary of any necessary laboratory and bench-scale studies;

5. Design and Implementation Precaution:

   a. Special technical problems;

   b. Additional engineering data required;

   c. Permits and regulatory requirements;

   d. Access, easements, right-of-way;

   e. Health and safety requirements; and

   f. Community relations activities; and

6. Cost Estimates and Schedules:

   a. Capital cost estimate;

   b. Operation and maintenance cost estimate; and

   c. Project schedule (design, construction, operation).

B. Final

Respondent shall finalize the Corrective Measures Study Report, incorporating comments received from the public, and U.S. EPA on the Draft Final Corrective Measures Study Report.

Facility Submission Summary

A summary of the information requirements contained in the Corrective Measure Study Scope of Work is presented below:

Facility Submission	Due Date
CMS Workplan	30 days after submittal of the Final RFI
Draft CMS Report (Tasks VII, VIII, IX, and X)	90 days after submittal of the Final RFI
Final CMS Report (Tasks VII, VIII, IX, and X)	45 days after Public and U.S. EPA - Comments on the Draft Final CMS
Progress Reports on Tasks VII Through X	Monthly

ATTACHMENT III

CORRECTIVE MEASURES IMPLEMENTATION PROGRAM PLAN
SCOPE OF WORK
AT
OCCIDENTAL CHEMICAL COMPANY

PURPOSE

The purpose of the Corrective Measures Implementation (CMI) program is to design, construct, operate, maintain and monitor the performance of the corrective measure or measures selected by U.S. EPA. Occidental Chemical will furnish all personnel, materials and services necessary for the implementation of the corrective measures.

SCOPE

The CMI program shall consist of four tasks:

Task I: Corrective Measure Implementation Program Plan

A. Program Management Plan
B. Community Relations Plan

Task II: Corrective Measure Design

A. Design Plans and Specifications
B. Operation and Maintenance Plan
C. Cost Estimate
D. Project Schedule
E. Construction Quality Assurance Objectives
F. Health and Safety Plan
G. Design Phases

Task III: Corrective Measures Construction

A. Responsibility and Authority
B. Construction Quality Assurance Personnel Qualifications
C. Inspection Activities
D. Sampling Requirements
E. Documentation

Task IV: Reports

A. Progress
B. Draft
C. Final

Task I: CMI Program Plan

The Respondent shall prepare and submit a CMI Program Plan. This program will include the development and implementation of several plans, which shall be prepared concurrently. The Program Plan includes the following:

A. Program Management Plan

The Respondent shall prepare a Program Management Plan which will document the overall management strategy for performing the design, construction, operation, maintenance and monitoring of Corrective Measures for U.S. EPA review and approval. The plan shall document the responsibility and authority of all organizations and key personnel involved with the implementation. The Program Management Plan shall also include a description of qualifications of key personnel directing the Corrective Measure Design and Implementation, including contractor personnel. The Respondent shall submit a final CMI Program Plan incorporating U.S. EPA's comments on the Draft CMI Program Plan according to the schedule identified in the Submission Summary.

B. Community Relations Plan

The Community Relations Plan (CRP) shall be revised to describe the community relations program to be implemented by the Respondent during the design and construction subject to the approval of U.S. EPA. Specific activities which must be conducted include the revision of the CRP to reflect knowledge of community concerns and involvement during design and construction and the preparation of a fact sheet at the completion of the engineering design. At the request of U.S. EPA, Respondent shall participate in the preparation of information disseminated to the public and in providing information for public meetings that may be held or sponsored by the U.S. EPA.

TASK II: CORRECTIVE MEASURE DESIGN

The Respondent shall prepare final construction plans and specifications to implement the Corrective Measures at the facility which have been selected by U.S. EPA.

A. Design Plans and Specifications

The Respondent shall develop clear and comprehensive design plans and specifications which include but are not limited to the following:

1. Discussion of the design strategy and the design basis, including:

    a. Compliance with all applicable or relevant environmental and public health standards; and

    b. Minimization of environmental and public impacts.

2. Discussion of the technical factors of importance including:

    a. Use of currently accepted environmental control measures and technology;

    b. The constructability of the design; and

    c. Use of currently acceptable construction practices techniques.

3. Description of assumptions made and detailed justification of these

assumptions;

4. Discussion of the possible sources of error and references to possible operation and maintenance problems;

5. Detailed drawings of the proposed design including:

   a. Qualitative flow sheets; and

   b. Quantitative flow sheets.

6. Tables listing equipment and specifications;

7. Tables giving material and energy balances;

8. Appendices including:

   a. Sample calculations (one example presented and explained clearly for significant or unique design calculations);

   b. Derivation of equations essential to understanding of the report; and

   c. Results of laboratory or field tests.

B. Operation and Maintenance Plan

The Respondent shall prepare an Operation and Maintenance Plan to cover both implementation and long term maintenance of the Corrective Measures. An initial Draft Operation and Maintenance Plan shall be submitted simultaneously with the Prefinal Design Document submission and the Final Operation and Maintenance Plan with the Final Design documents. The plan shall include the following elements:

1. Description of normal operation and maintenance (O&M):

   a. Description of tasks for operation;

   b. Description of tasks for maintenance;

   c. Description of prescribed treatment or operation conditions; and

   d. Schedule showing frequency of each O&M task.

2. Description of potential operating problems:

   a. Description and analysis of potential operation problems;

   b. Sources of information regarding problems; and

   c. Common and/or anticipated remedies.

3. Description of routine monitoring and laboratory testing:

   a. Description of monitoring tasks;

   b. Description of required laboratory tasks and their interpretation;

   c. Required data collection, Quality Assurance Project Plan (QAPP);

   d. Schedule of monitoring frequency; and

   e. Description of triggering mechanisms for ground water/surface water monitoring results.

4. Description of alternate O&M:

   a. Should system fail, alternate procedures to prevent release or threatened releases of hazardous substances, pollutants or contaminants which may endanger public health and the environment or exceed cleanup standards; and

   b. Analysis of vulnerability and additional resource requirements should a failure occur.

5. Corrective Steps:

   a. Description of corrective steps to be implemented in the event that cleanup or performance standards are not met; and

   b. Schedule for implementing these corrective steps

6. Safety Plan:

   a. Description of precautions, of necessary equipment, etc., for site personnel; and

   b. Safety tasks required in event of systems failure.

7. Description of equipment:

   a. Equipment identification;

   b. Installation of monitoring components;

   c. Maintenance of site equipment; and

   d. Replacement schedule for equipment and installed components.

8. Records and reporting mechanisms required:

   a. Daily operating logs;

b. Laboratory records;

c. Records for operating costs;

d. Mechanism for reporting emergencies;

e. Personnel and maintenance records; and

f. Monthly/annual reports to State agencies.

C. Cost Estimate

The Respondent shall refine the cost estimate developed in the CMS to reflect the more detailed/accurate design plans and specifications being developed. The cost estimate shall include both capital and operation and maintenance costs. An Initial Cost Estimate shall be submitted simultaneously with the Prefinal Design submission and the Final Cost Estimate with the Final Design Document.

D. Project Schedule

The Respondent shall develop a project schedule for construction and implementation of the Corrective Measures which identifies timing for initiation and completion of all critical path tasks. Respondent shall specifically identify dates for completion of the project and major interim milestones. An initial project schedule shall be submitted simultaneously with the Prefinal Design Document submission and the Final Project Schedule with the Final Design Document.

E. Construction Quality Assurance Objectives

The Respondent shall identify and document the objectives and framework for the development of a construction quality assurance program including, but not limited to the following: responsibility and authority; personnel qualifications; inspection activities; sampling requirements and documentation. Draft Construction Quality Assurance Objectives shall be submitted simultaneously with the Prefinal Design Submission and the Final Construction Quality Assurance Objectives shall be submitted following U.S. EPA approval of the Final Design Document.

F. Health and Safety Plan

The Respondent shall submit a Health and Safety Plan to address the activities to be performed at the facility to implement the Corrective Measures.

G. Design Phases

The Respondent shall meet regularly with U.S. EPA to discuss design issues. The design of the Corrective Measures shall include the phases outlined below.

1. Preliminary design

The Respondent shall submit the preliminary design when the design effort is approximately 30% complete according to the schedule in the Submission Summary. At this stage, the Respondent shall have field verified the existing conditions at the facility. The preliminary design shall reflect a level of effort such that the technical requirements of the project have been addressed and outlined so that they may be reviewed to determine if the final design will provide an operable and usable Corrective Measure. Supporting data and documentation shall be provided with the design documents defining the functional aspects of the program. The preliminary construction drawings by the Respondent shall reflect organization and clarity. The scope of the technical specifications shall be outlined in a manner reflecting the final specifications. The Respondent shall include with their preliminary submission, design calculations reflecting the same percentage of completion as the design they support. Predesign work, if required by U.S. EPA, shall be reported at this time.

2. Intermediate design

The intermediate design shall be submitted at 60% completion of the project. The intermediate design submittal should include the following sections:

- Invitation to bid (without date)

- Bid proposal forms (without units)

- Subcontract forms

- Standard conditions

- Preliminary technical specifications

The detailed plans will have been started at this point. General correlation between drawings and technical specifications is a basic requirement of any set of working construction plans and specifications. Before submitting the project specifications, the Respondent shall:

a. Coordinate and cross-check the specifications and drawings; and

b. Complete the proofing of the edited specifications and required cross-checking of all drawings and specifications.

The Respondent shall prepare, and include in the technical specifications governing treatment systems, contractor requirements for providing: appropriate service visits by experienced personnel to supervise the installation, adjustment, start up and operation of the treatment systems, and training covering appropriate operational procedures once the startup has been successfully accomplished.

3. Prefinal Design

The Respondent shall submit the Prefinal Design according to the schedule in the Submission Summary. The submission shall be at 95% completion of design (i.e., prefinal). After approval of the prefinal submission, the Respondent shall execute the required revisions and submit the final design (100% completion) with reproducible drawings and specifications.

The prefinal design submittal shall consist of the Design Plans and specifications, Operation and Maintenance Plan, Capital and Operating and Maintenance Cost Estimate, Project Schedule, Construction Quality Assurance Objectives and Specifications for the Health and Safety Plan.

4. Final Design

The Respondent shall submit a Final Design according to the schedule in the Submission Summary. The Final Design consists of the Final Design Plans and Specifications (100% complete), the Respondent's Final Construction Cost Estimate, the Final Operation and Maintenance Plan, Construction Quality Assurance Objectives, Final Project Schedule and Final Health and Safety Plan Specifications. The quality of the design documents shall be such that they will be ready, as is, for bid advertisement.

5. Additional Studies

The U.S. EPA may require additional studies to supplement the available technical data. The Respondent shall furnish all equipment and personnel necessary to complete any additional work needed. Draft and final reports shall be prepared presenting all data obtained during the additional studies, summary of the results and conclusions.

Task III: CORRECTIVE MEASURE CONSTRUCTION

The Respondent shall finalize the Construction Quality Assurance Plan incorporating comments received on the draft Construction Quality Assurance Plan submitted with the Prefinal Design. Within ***** days of U.S. EPA approval of the final design, the Respondent shall implement a construction quality assurance (CQA) program to ensure, with a reasonable degree of certainty, that a completed Corrective Measure will meet or exceed all design criteria, plans and specifications. The CQA plan is a facility specific document which must be approved by U.S. EPA prior to the start of the construction. At a minimum, the CQA plan should include the elements which are summarized below. Within ***** days of U.S. EPA approval of the CQA Plan, the Respondent shall construct and implement the Corrective Measures in accordance with the approved design, schedule and CQA plan. Respondent shall also implement the elements of the approved operation and maintenance plan.

A. Responsibility and Authority

The Respondent shall describe fully in the CQA Plan the responsibility and authority of all organizations (i.e., technical consultants, construction

firms, etc.) and key personnel involved in the construction of the corrective measure. The Respondent shall identify a CQA Plan. The Respondent shall also identify a CQA officer and the necessary supporting inspection staff.

B. Construction Quality Assurance Personnel Qualifications

The Respondent shall set forth the qualifications of the CQA Officer and supporting inspection personnel shall be presented in the CQA plan to demonstrate that they possess the training and experience necessary to fulfill their identified responsibilities.

C. Inspection Activities

The Respondent shall summarize in the CQA plan the observations and tests that will be used to monitor the construction and/or installation of the components of the Corrective Measures. The plan shall include the scope and frequency of each type of inspection. Inspections shall verify compliance with environmental requirements and include, but not be limited to air quality and emissions monitoring records, waste disposal records (e.g., RCRA transportation manifests), etc. The inspection shall also ensure compliance with all health and safety procedures. In addition to the oversight inspections, the Respondent shall conduct the following activities:

1. Preconstruction inspection and meeting

The Respondent shall conduct a preconstruction inspection and meeting to:

a. Review methods for documenting and reporting inspection data;

b. Review methods for distributing and storing documents and reports;

c. Review work area security and safety protocol;

d. Discuss any appropriate modifications of the construction quality assurance plan to ensure that site-specific considerations are addressed; and

e. Conduct a site walk-around to verify that the design criteria, plans and specifications are understood and to review material and equipment storage locations. The preconstruction inspection and meeting shall be documented by a designated person and minutes shall be transmitted to all parties.

2. Prefinal inspection

Upon preliminary project completion, Respondent shall notify U.S. EPA for the purposes of conducting a prefinal inspection. The prefinal inspection shall consist of a walk-through inspection of the entire project site. The inspection is to determine whether the project is complete and consistent with the contract documents and the U.S. EPA

approved Corrective Measure. Any outstanding construction items discovered during the inspection shall be identified and noted. Additionally, treatment equipment shall be operationally tested by Respondent. The Respondent shall certify that the equipment has performed to meet the purpose and intent of the specifications. Retesting will be completed where deficiencies are revealed. The Respondent shall outline in the prefinal inspection report the outstanding construction items, actions required to resolve items, completion date for these items and date for final inspection.

3. Final inspection

Upon completion of any outstanding construction items, the Respondent shall notify U.S. EPA for the purposes of conducting a final inspection. The final inspection shall consist of a walk-through inspection of the project site. The prefinal inspection report will be used as a checklist with the final inspection focusing on the outstanding construction items identified in the prefinal inspection. Confirmation shall be made that outstanding items have been resolved.

D. Sampling Requirements

The Respondent shall present in the CQA plan the sampling activities, sample size, sample locations, frequency of testing, criteria for acceptance and rejection and plans for correcting problems as addressed in the project specifications.

E. Documentation

The Respondent shall describe in detail in the CQA plan the reporting requirements for CQA activities. This shall include such items as daily summary reports, inspection data sheets, problem identification, and corrective measures reports, design acceptance reports and final documentation. Provisions for the final storage of all records shall be presented in the CQA plan.

TASK IV: Other Reports and Submissions

The Respondent shall prepare plans, specifications and reports as set forth in Tasks I through Task IV to document the design, construction, operation, maintenance, and monitoring of the Corrective Measure. Other documentation shall include, but not be limited to the following:

A. Progress

The Respondent shall at a minimum provide the U.S. EPA with signed monthly progress reports during the design and construction phases and semi-annual progress reports for operation and maintenance activities containing:

1. A description and estimate of the percentage of the CMI completed;

2. Summaries of all findings;

3. Summaries of all changes made in the CMI during the reporting period;

4. Summaries of all contacts with representatives of the local community, public interest groups or State government during the reporting period;

5. Summaries of all problems or potential problems encountered during the reporting period;

6. Actions being taken to rectify problems;

7. Changes in personnel during the reporting period;

8. Projected work for the next reporting period; and

9. Copies of daily reports, inspection reports, laboratory/monitoring data, etc.

B. Draft Submittals

1. The Respondent shall submit draft CMI work plans as outlined in Task I;

2. The Respondent shall submit draft Construction Plans and Specifications, Design Reports, Cost Estimates, Schedules, Operation and Maintenance Plans and study Reports as outlined in Task II;

3. The Respondent shall submit a draft Construction Quality Assurance Program Plan and Documentation as outlined in Task III; and

4. At the completion of the project, the Respondent shall submit a draft Corrective Measure Implementation Report to the Agency. The report shall document that the project is consistent with the design specifications, and that the corrective measure is performing adequately. The Report shall include, but not be limited to the following elements:

   a. Synopsis of the corrective measure and certification of the design and construction;

   b. Explanation of any modifications to the plans and why these were necessary for the project;

   c. Listing of the criteria, established before the remedial action was initiated, for judging the functioning of the remedial action and also providing explanation of any modification to these criteria;

   d. Results of facility monitoring, indicating that the remedial action will meet or exceed the performance criteria;

   e. Explanation of the operation and maintenance (including

monitoring) to be undertaken at the facility; and

f. Data demonstrating that the Cleanup Standards have been achieved.

C. Final Submittals

The Respondent shall finalize the Corrective Measure Implementation Program Plans, Design Reports, Construction Plans and Specifications, Cost Estimates. Project Schedule, Operation and Maintenance Plan, Study Reports, Construction Quality Assurance Program Plan/Documentation and the Corrective Measure Implementation Report incorporating comments received on draft submissions.

Submission Schedule

The Respondent shall comply with the information reporting requirements presented below.

FACILITY SUBMISSION	DUE DATE
Draft Program Plans (Task I)	45 days after U.S. EPA final selection of Corrective Measures for facility
Final Program Plan	21 days after receipt of U.S. EPA comments on draft Program Plan
Design Phases (Task IIG) - Preliminary Design (30% completion) - Intermediate Design (60% completion) - Prefinal Design (95% completion) - Final Design (100% completion) (Tasks IIA through F) Draft Submittals Construction Designs and Specifications; Operation and Maintenance Plans; Cost Estimate; Additional Studies: Draft Report; Project Schedule; Construction Quality Assurance Objectives; and Health and Safety Plan. Final Submittals Construction Designs and Specifications; Operation and Maintenance Plans; Cost Estimate; Additional Studies: Final Report; Project Schedule; and Health and Safety Plan.	 - 45 days after U.S. EPA approval of final Program Plans - 90 days after U.S. EPA approval of final Program Plans - 135 days after U.S. EPA approval of the final Program Plans - 30 days after U.S. EPA approval of the Prefinal Design Concurrent with submittal of Prefinal Design (95% Design Completion) Concurrent with submittal of Final Design (100% Design Completion)
Draft Construction Quality Assurance Plan (Task II)	Concurrent with submittal of Prefinal Design (95% Design Completion)

FACILITY SUBMISSION	DUE DATE
Final Construction Quality Assurance Plan (Task III)	21 days after receipt of U.S. EPA comments on draft Construction Quality Assurance Plan
Construction of Corrective Measures	As approved in the Final Design
Prefinal Inspection Report	30 days after Prefinal Inspection
Draft CMI Report (Task IV)	45 days after completion of the construction phase
Final CMI Report (Task IV)	21 days after receipt of U.S. EPA comments on draft CMI Report
Progress Reports for Tasks I through IV	Monthly
Reports during Operation and Maintenance	Semi-annual