
Revised Scope of Work Tittabawassee River Sediments and Floodplain

Prepared for
The Dow Chemical Company

47 Building
Midland, Michigan 48667

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CH2MHILL

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Appendixes

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C IRA Work Plan: Imerman Park

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Abbreviations and Acronyms

CA	corrective action
CSM	Conceptual Site Model
Dow	The Dow Chemical Company
DQO	data quality objectives
ERA	Ecological Risk Assessment
Facility	The Dow Chemical Company's Midland Plant
IRA	Interim Response Activity
License	Dow's Part 111 Hazardous Waste Facility Operating License
MDEQ	Michigan Department of Environmental Quality
MSU	Michigan State University
NOD	Notice of Deficiency
PCOI	potential constituent of interest
QA	quality assurance
QC	quality control
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
SAP	Sampling and Analysis Plan
SOP	standard operating procedure
SOW	Scope of Work
USEPA	United States Environmental Protection Agency

Revised SOW—Tittabawassee River Sediments and Floodplain

1. Purpose and Scope

This Scope of Work (SOW) is being submitted pursuant to Dow's Part 111 Hazardous Waste Facility Operating License (License), issued on June 12, 2003. Condition XI.B.3., requires Dow to submit "... a scope of work (SOW) for conducting a Remedial Investigation (RI)..." to Michigan Department of Environmental Quality (MDEQ) for review and approval. This SOW addresses the Tittabawassee River Area Soils, one of the areas identified in Condition XI.B.2 of the License. A separate SOW will be submitted by Dow for Midland Soils.

This SOW presents the general processes Dow will use to develop the RI and subsequent corrective actions (CAs). It also outlines the steps involved in the implementation of the RI, which will be elaborated upon in the RI Work Plan that will be submitted to MDEQ for review and approval following approval of this SOW. The requirements for RIs are generally set forth in R 299.5528 of the administrative rules for Part 201 of Act 451 (hereafter referred to as R 299.5528).

The License also requires Dow to propose Interim Response Activities (IRAs) and a Public Participation Plan along with the SOW. This SOW presents IRAs that will be implemented immediately to address potential exposure pathways that have been identified from existing information, as well as IRAs that will be done to develop information to determine whether there is an exposure concern. It also provides an outline of the basis and processes upon which the specific RI Work Plan and procedures will be based.

The SOW has been revised to incorporate work Dow has completed since initial submittal and to reflect responses to agency and public comments received from MDEQ between August 14, 2003, and the Notice of Deficiency transmitted to Dow on December 12, 2003. The organization of the document has also been revised such that the SOW sections correspond directly to the conditions of the License (e.g. Section III: Interim Response Actions (XI.B.3.(a)) relates to Condition XI.B.3.(a) of the License).

2. Scope of Work Objectives

The objectives of this SOW are to:

- Present the basic elements of the immediate IRAs and the RI
- Result in conditions that are protective of human health and the environment
- Meet the requirements of the applicable sections of Parts 111 and 201 of Act 451, as well as relevant Resource Conservation and Recovery Act (RCRA) regulations and guidance
- Present implementable IRA Work Plans as attachments

- Clearly outline the processes, schedules, and prioritization Dow will use to develop and implement IRAs and the RI Work Plan, consistent with the process outlined in the License
- Meet the requirements of the License

This SOW describes an overall framework for the RI Work Plan. Specific technical details for the RI Work Plan and other actions will be developed and presented in separate work plans, and submitted to MDEQ for review and approval in accordance with the requirements of the Operating License.

3. Interim Response Actions (XI.B.3.(a))

3.1 Objective

IRAs are short-term actions that are taken to control potentially unacceptable risk while site characterization is underway or before a final remedy is selected.

3.2 IRAs Identified to Date

Pursuant to Condition XI.B.3.(a) of the License, Dow will conduct IRAs as necessary for the protection of public health.

The following IRAs have been identified to date for the Tittabawassee River and Floodplain based on discussions with MDEQ and without admissions by Dow as to the need for such measures:

- Communications
 - Public Information Materials
 - Community Information Centers
 - Activity Advisory: Disturbance of Soil/Sediment
 - Advisory Signage
- Tittabawassee River Floodplain Soils
 - Exposure Pathway Mitigation at Riverside Boulevard Site
 - Mapping
 - Identification of Interim Action Properties
 - Property Owner Notification and Activity Survey
- Center Road Boat Launch
- Imerman Memorial Park
- Freeland Festival Park
- West Michigan Park

Detailed, implementable work plans for these IRAs are included as attachments to this SOW.

3.3 IRA Categories

Dow has identified the following categories for IRAs:

- Category 1: IRAs in the form of actions taken with the objective of reducing potential exposure
- Category 2: IRAs that may identify sub-areas for prioritized investigation and/or evaluation, from information that may be available before the overall RI is completed

During the course of implementing the RI, information may be developed to suggest that additional IRAs may be required. Once such an area is identified, Dow proposes the following process for review of potential future IRAs:

- The need for the IRA is identified by Dow or MDEQ.
- Dow may elect to implement an IRA at any time. Dow will communicate with MDEQ and proceed with the IRA, while documenting the effort appropriately for the purpose of obtaining MDEQ approval of the action.
- If immediate action is not required, upon concurrence with MDEQ, Dow will submit an IRA Work Plan for review and approval as provided for in Condition XI.G. Once the IRA work plan is approved, it will be implemented as provided for in Condition XI.G and in accordance with the MDEQ approved work plan.

4. Proposed RI Approach, Phasing, and Prioritization of Work (XI.B.3.(b))

The RI Work Plan will be developed to meet the applicable requirements of the Operating License, Part 111 R 299.9629 and R 299.5528. As written in R 299.5528.(1), *“The purpose of a remedial investigation is to assess site conditions in order to select an appropriate remedial action, if one is required, that adequately addresses those conditions. The remedial investigation identifies the source or sources of any contamination and defines the nature and extent of contamination originating from that source. Defining the nature and extent of contamination includes identifying contamination that may have migrated beyond the facility boundary of the source property in excess of applicable generic residential cleanup criteria...”*

This section outlines Dow’s proposed approach to development of the RI. The table below provides an overview of how the elements of R 299.5528 are being addressed in this SOW and in the RI Work Plan. Each of the elements noted below will be considered and addressed within the RI Work Plan, and the RI scope will be designed to provide information necessary for appropriate evaluations.

R 299.5528 Section	Requirement	Proposal to Address
(3)(a)	Definition of the nature and extent of contamination...	The RI will be designed to appropriately define “nature and extent.” Section VI of this SOW outlines how investigation areas will be identified and the RI Work Plan will present a detailed scope of the investigation.
(3)(b)	Risks to the public health, safety, and welfare and to the environment and natural resources, including the identification of any water wells....	The Current Conditions Report section of the RI Work Plan will make a preliminary evaluation of risk, based on existing information, and the RI will be designed to provide the additional information necessary to better evaluate potential risk. The Current Conditions Report will also identify all existing water wells and wellhead zones, and the RI will evaluate those found to be within the bounds of the investigation area.
(3)(c)	Relevant exposure pathways.	The Current Conditions Report section of the RI Work Plan will present a preliminary list of all potential exposure pathways and the investigation will obtain data to show which pathways are complete and which pathways are not relevant to future corrective action work.
(3)(d)	All of the following with respect to hazardous substances that are present: (i) Amount, (ii) Concentration; (iii) Hazardous properties, (iv) Environmental fate, (v) Bioaccumulative properties, (vi) Persistence, (vii) Mobility, and (viii) Physical state.	The Current Conditions Report will present a preliminary Conceptual Site Model of conditions in the offsite investigation area, based on currently available information. The RI will be designed to provide additional information that may be needed to complete the evaluation. Details regarding the scope of the investigation will be presented in the RI Work Plan.
(3)(e)	All of the following with respect to the physical setting of the facility: (i) Geology, (ii) Hydrology, (iii) Hydrogeology, (iv) Depth to saturated zone, (v) Hydrologic gradients, (vi) Proximity to aquifers, (vii) Proximity to surface water, (viii) Proximity to floodplains, and (ix) Proximity to wetlands.	The Current Conditions Report will present a preliminary Conceptual Site Model (CSM) of conditions in the offsite investigation area, based on currently available information. The RI will be designed to provide additional information that may be needed to complete the evaluation. Details regarding the scope of the investigation will be presented in the RI Work Plan.
(3)(f)	Current and potential groundwater use.	The Current Conditions Report will summarize all available information on current and potential groundwater use and the RI will obtain information to fill data gaps as necessary.

R 299.5528 Section	Requirement	Proposal to Address
(3)(g)	Source identification and evaluation.	The Current Conditions Report will identify potential sources, if present, and the RI Work Plan will provide detailed investigation plans as appropriate.
(3)(i)	The likelihood of future releases if the hazardous substances remain at the facility.	The potential for future releases from off-site sources will be evaluated during the RI by obtaining information on nature and extent, as well as fate and potential transport mechanisms. Details will be provided in the RI Work Plan.
(3)(j)	The extent to which natural or human-made barriers currently contain the hazardous substances and the adequacy of the barriers.	The RI will identify whether such barriers exist and the extent to which containment is provided. The Work Plan will describe the scope of the evaluation in detail.
(3)(k)	The impact of any planned demolition activities on conditions at the facility.	During the Current Conditions Report, Dow will identify planned activities within the offsite area, and address this point if applicable. It should be noted the majority of property within the offsite area is not owned by Dow and property owners are under no obligation to notify Dow of future demolition activities. Further, Dow notes that this condition is more applicable to a typical operating facility than the offsite areas being characterized under this RI.
(3)(l)	The extent to which hazardous substances have migrated or are expected to migrate from the area of release	Past and future migration potential from off-site areas will be investigated during the RI by obtaining information on nature and extent, as well as fate and potential transport mechanisms. Details will be provided in the RI Work Plan.
(3)(m)	An evaluation of injury to, destruction of, or loss of natural resources related to the release.	The Current Conditions Report will present a preliminary evaluation based on relevant available information on natural resources within the study area. The RI will be designed to provide the information necessary to fill existing data gaps. Ecological Risk Assessments (ERAs) will be performed if further evaluation is necessary.
(3)(n)	Contribution of the hazardous substances at the facility to contamination of the air, land, or water.	This will be assessed by the RI as part of the definition of nature and extent.

R 299.5528 Section	Requirement	Proposal to Address
(3)(o)	Legally applicable or relevant and appropriate state and federal requirements.	These will be cited in the RI Work Plan, as well as relevant guidance.
(3)(p)	Sampling design and rationale for parameter selection.	The RI Work Plan will provide details on both of these points. Sampling designs will be presented in site-specific work plans and will include data quality objectives. The rationale for parameter selection will consider the Potential Constituents of Interest list presented in the Current Conditions Report as well as site-specific sampling objectives.
(3)(q)	A description of monitoring well construction.	This will be provided, along with descriptions of other methodologies and protocols, as one of the Standard Operating Procedures (SOPs). These SOPs are currently under development, they will be provided to MDEQ for review, and will be referenced by all sampling plans as appropriate.
(3)(r)	A description of, and rationale for, any geophysics techniques used in the investigation.	Currently Dow does not anticipate using geophysical techniques. However, the RI Work Plan will provide details on whatever specific sampling and investigation techniques that will be used during investigations.
(3)(s)	Sample collection and preparation procedures.	This will be provided, along with descriptions of other methodologies and protocols, as one of the SOPs. These SOPs are currently under development, they will be provided to MDEQ for review, and will be referenced by all sampling plans as appropriate.
(3)(t)	Identification of the laboratory or laboratories responsible for sample analysis.	The Core Program Plans currently being drafted by Dow will include a Program Management Plan which will identify key contractors involved with the RI.
(3)(u)	Laboratory methods used to generate all remedial investigation data	The Core Program Plans currently being drafted by Dow will include a QAPP to address laboratory issues and SOPs and the site-specific sampling plans will cite specific analytical methods to be used.

R 299.5528 Section	Requirement	Proposal to Address
(3)(v)	A description of any statistical methods used to evaluate laboratory data relative to cleanup criteria	The RI Work Plan will describe the proposed approach to data evaluation. Dow will also provide a work plan for the development of site-specific cleanup criteria to MDEQ for review and approval, which will provide a detailed description of the methods proposed for use.
(3)(w)	Other matters appropriate to the facility	Will be identified and addressed as necessary.

4.1 Proposed Phasing

Work to be performed under the Offsite CA program will be generally phased as follows:

4.1.1 Perform IRAs

The first phase of offsite corrective action work will be to implement IRAs (described in detail in Appendices A and B). The primary objective of these IRAs is to identify, and if necessary, mitigate potential human exposures during this interim period prior to commencement of the RI. Additional objectives of the Tittabawassee River IRA will be to obtain information regarding conditions along the Tittabawassee River for use in the development of site-specific cleanup criteria and RI scoping. The IRA information will be incorporated into the Current Conditions Report and preliminary CSM sections of the RI Work Plan.

4.1.2 Development of Site-Specific Cleanup Criteria

While the IRAs are being conducted, Dow will be drafting the proposed approach to the development of site-specific cleanup criteria (discussed further in Section VIII of this SOW). The approach will be reviewed and submitted to MDEQ for review. Site-specific cleanup criteria will include information obtained during implementation of the IRAs. The proposed criteria will be submitted to MDEQ for review and approval, and will be considered in the development of the RI Work Plan, as well as in the data evaluation section of the RI Report.

4.1.3 RI Work Plan Preparation

Dow will prepare an RI Work Plan for the Tittabawassee River Area and Floodplain in accordance with the Operating License and Part 201 R 299.5528(3). During the implementation of the RI Work Plan, it may be necessary to propose revisions to the items shown below to appropriately reflect new information being developed during the IRAs or other work. The RI Work Plan will include an outline of the risk-based decision framework that will be used and will incorporate, if and as appropriate, site-specific cleanup criteria (as described further in Section VIII of this SOW). The RI Work Plan will consist of the following main components:

- A Current Conditions Report
- A Preliminary Conceptual Site Model (CSM)
- Site-Specific Sampling and Analysis Plans (SAPs)
- Core Program Plans

4.1.3.1 Current Conditions Report

As part of the RI work planning process, relevant existing data will be assembled, reviewed and summarized in a Current Conditions Report. Existing reports prepared by others which describe conditions along the Tittabawassee River (such as the MDEQ Phase II Sampling Report and the Ecological Assessment) will also be reviewed as part of the development of the Current Conditions Report. The Current Conditions Report will integrate information relevant to the Tittabawassee River Sediments and Floodplain Soils RI into a preliminary Conceptual Site Model, and will include, as appropriate, data on historical operations, relevant releases that have had impact beyond the facility boundary, the implementation of emission controls, physical conditions, fate and transport, land use history, other potential discharges to the river, weather events, potential exposure pathways, and potential receptors. The Current Condition report will also summarize the regional location, pertinent boundary features, general physiography, topography, ecosystems (including appropriate key plant and animal species), and current land use.

The Current Conditions Report will include map(s) that will depict the following:

- General geographic location.
- Major parcels and ownership information for parcels within the floodplain.
- Topography, drainage patterns, buildings, pavement, vegetation.
- Locations of prior sampling events.
- Color coding indicating the Michigan land uses categories of property and where available the current zoning, soil survey maps.
- A preliminary description of the geology, soils, physiography, limnology, and meteorology for the area along the river. Available results of Dow's Flow/Solids Monitoring Study, started in November 2003, will be incorporated into the Current Conditions Report as well.

One objective of the Current Conditions Report will be to evaluate existing data, including IRA data as available, in order to scope and prioritize remedial investigations. Initial investigation efforts will be focused on areas that may be identified to better understand the nature and extent of contamination and to determine the need for and focus of additional studies.

The Current Conditions Report will describe the existing information on the presence of dioxins and furans in the Tittabawassee River and Floodplain. It will also identify other Potential Constituents of Interest (PCOIs), as appropriate, based on existing and available information such as:

- Relevant operational information
- Monitoring data
- Analytical data on Tittabawassee River Sediments and Floodplain soils
- Data associated with relevant historic releases that have or may have had impact beyond the facility boundary

The Current Conditions Report will also describe constituents that will be included on the PCOI list since existing data may be insufficient to warrant eliminating constituents from consideration prior to the RI.

4.1.3.2 Preliminary Conceptual Site Model

A preliminary Conceptual Site Model (CSM) will be developed within the Current Conditions Report to integrate existing information and guide the identification of specific sampling locations. This will be a “living” model, and will be updated over time as new information is received from RI and/or IRA activities. The model will integrate information on physical site conditions, historic releases, potential migration pathways, land use, existing IRA and other analytical data into an initial picture of the investigation area. etc. and will identify data gaps to be addressed within the RI. The model will provide the basis for:

- The overall scope of the investigation
- Identification of specific areas to be investigated
- Data Quality Objectives (DQOs)
- Site-specific analyte lists

4.1.3.3 Site-Specific Sampling and Analysis Plans

As the Current Conditions Report is being finalized, Dow will be developing RI objectives and strategies for use in the design of site-specific sampling plans. These objectives and strategies will be described in the RI Work Plan, and will include:

- Process for development of DQOs as well as a list of DQOs expected to apply to all sampling activities.
- Identification of investigation objectives.
- A description of the proposed approach to sampling, to ensure that representative data sets are collected (note that approaches are anticipated to include a combination of biased/judgmental and statistical methodologies).
- Analyte lists (based on the PCOIs identified in the Current Conditions Report).
- Developing information that may be used for the selection and evaluation of remedial action alternatives
- The decision process proposed to evaluate data and determine appropriate next steps.

Site-specific SAPs will be prepared to reflect the overall RI objectives and strategies. These SAPs will provide the site-specific details associated with field sampling efforts, and will include:

- Sampling event objectives
- Site-specific DQO(s)
- Description of sampling effort
- Sampling locations (figure with locations shown on a GIS aerial photo base map)
- Sample details (a matrix indicating media to be sampled, sampling interval, and analytes)

4.1.3.4 Core Program Plans

Dow is currently drafting several Core Program Plans for use during IRA and RI activities. These plans will provide the baseline for multiple program efforts, and will be incorporated by reference into future work plans and documents. This will allow Dow to expedite and streamline the development of future deliverables, and will assure consistency across program activities. These Core Program Plans will include:

- **Project Management Plan:** The Project Management Plan will provide a more detailed discussion of the approach to management of the RI, as well as personnel expected to be responsible for conducting various elements of work. The Project Management Plan will also include:
 - A description of qualifications of the personnel performing or directing the RI, including contractor personnel
 - The overall management approach to the RI
- **Data Collection Quality Assurance Project Plan (QAPP):** The QAPP will document monitoring procedures, sampling procedures, field measurements, and sample analysis performed during the investigation to characterize the environmental setting, to ensure that all information, data, and resulting decisions are technically sound, statistically valid, and properly documented. The Data Collection Strategy section of the Data Collection Quality Assurance Project Plan will include the following:
 - Description of the intended uses for the data and of the necessary level of precision and accuracy for these intended uses
 - Description of methods and procedures to be used
 - Description of the rationale used to assure that the data accurately represent a characteristic of a population, or an environmental condition. Examples of factors which will be considered and discussed include:
 - Environmental conditions at the time of sampling
 - Number of sampling points
 - Representativeness of selected media
 - Representativeness of selected analytical parameters
- **Data Management Plan:** The Data Management Plan will outline the procedures for recording and tracking investigation data and results and will include specifications for database setup and management. This Plan will identify and set up data documentation materials and procedures.
- **Health and Safety Plan:** This plan will describe the overall objectives and procedures to be followed during implementation of field activities. Individual Sampling and Analysis plans will provide additional, site-specific Health and Safety Plans with details such as a list of hazards associated with the sampling event and area, appropriate Personal Protective Equipment, emergency contact information, routes to nearest medical facilities, etc.
- **SOPs:** SOPs are currently being developed and will describe the standard practices and methodologies and analytical reporting limits to be used across all RI work to ensure consistency and appropriate level of data quality. These SOPs will include sampling protocols for various environmental media, monitoring well details and appropriate analytical methods.

Dow anticipates providing working drafts of many of the Core Program Plan sections to MDEQ for review prior to submittal of IRA sampling plans. The SOPs will also be provided to MDEQ for review as they become available. The objective of providing these submittals early will be to allow MDEQ sufficient time to review the proposed plans, thus expediting the

overall schedule such that fieldwork under an approved work plan can begin as soon as possible.

4.1.4 Implement the MDEQ-Approved RI Work Plan

While MDEQ is performing its final review of the RI Work Plan, Dow will begin implementation preparations, such as:

- Prequalification of sampling contractors and analytical laboratories
- Identification of permits, if any, needed to perform work
- Negotiations for property access, where necessary
- Logistical planning for field equipment, sample handling, etc.

Once MDEQ has approved the RI Work Plan and appropriate site access (where necessary) has been obtained, Dow will provide MDEQ with notification of the field activities five working days prior to the scheduled start date and proceed with activities such as:

- Obtaining necessary utility clearances
- Procurement of materials and equipment
- Finalize contracts for sampling contractors and analytical laboratories
- Mobilization of sampling contractors and field teams

4.1.5 Report Preparation

Once work has been completed for a given IRA or for the RI work, the following tasks will be done, as appropriate, to prepare a draft report:

- Perform data validation to ensure appropriate quality assurance and quality control (QA/QC) and to verify that DQOs were met
- Evaluate data according to the decision process outlined within the RI Work Plan
- Identify areas for which no further action is required
- Identify areas for which further action is required
- Refine the description of contaminants and areas of concern, based on the new information
- Update the Conceptual Site Model to refine the understanding of physical site conditions, nature and extent of contamination, potential exposure pathways, fate and transport information, and potential receptors.
- Prepare a draft Report in accordance with the work plan schedule and submit it for MDEQ review and approval pursuant to Condition XI.B.5. of the License
- RI Final Report shall document compliance with the approved RI Work Plan and support further CA at the facility, if needed

Although not specifically required under Condition XI.B of the License, Dow will submit bimonthly RI Progress Reports to MDEQ as required by Condition XI.F.6 of the License. The objective of these progress reports will be to communicate interim information (general status and, as appropriate, results of activities, complete and validated analytical data packages, etc.) to MDEQ and the public during the overall RI. This will allow MDEQ and the

public to have access to the results of completed tasks while other components of the RI are being finalized and integrated into overall data and risk evaluations.

4.2 Proposed Prioritization Process

The following priorities for the Tittabawassee River and Floodplain Offsite Corrective Action work have been established using a risk-based approach:

1. First, implement the attached IRAs to immediately to begin understanding exposure potential and initiate activities for reducing exposure potential, as necessary, and in accordance with the IRA mitigation matrix, and to develop a better understanding of site conditions in the IRA areas.
2. Initiate Ecological Risk Assessment activities to take advantage of early-spring site conditions.
3. Develop site-specific cleanup criteria so RI data can be evaluated in an appropriate context for the purpose of determining the need for, and scope of, remedial actions.
4. Perform the RI field sampling, analytical and data evaluation to identify exceedences of site-specific cleanup criteria and determine the nature and extent of contamination.

As described in the attached IRA Work Plans, priority in scheduling sampling activities within the floodplain is being given to areas where fate and transport information indicates that PCOIs are likely to be present at elevated levels, activity and land use suggests human use likely, and exposure scenario suggests exposure pathways may be complete. Generally, residential, recreational, and agricultural properties will have the highest priority, with industrial and commercial parcels and areas within the floodplain having a lower priority. If industrial and/or commercial parcels are found to have active outdoor human use, their priority will be adjusted accordingly.

Priority for sampling within the riverbed will be given to areas that are found to be deposition areas and scour areas based on the results of the Flow/Solids Monitoring Study currently under way.

This initial prioritization may change based on the conclusions that are drawn from data collected (iterative approach). The specific timing of RI activities may also be affected by the need to obtain permission for access to property, the requirement to obtain permits from governmental agencies, weather, and other conditions which Dow cannot control.

4.3 SOW Schedule

The schedule provided in Attachment C illustrates the sequence and duration of activities currently envisioned for the IRA and RI work described within this SOW. The schedule also notes tentative dates for several project milestones, the actual milestones may be reached earlier or later than the dates shown. These dates are considered tentative because they are based on presumed timeframes for the public participation process, MDEQ review and approval and other factors outside of Dow's control, such as the length of property access negotiations and weather.

Dow proposes that specific compliance dates for subsequent submittals be established as follows:

Offsite Corrective Action Document	Submittal Deadline
Implementation of IRAs	Within 10 days of receipt of MDEQ final approval
RI Work Plan	Within 45 days of receipt of MDEQ final approval of site-specific cleanup criteria
RI Report	Within 60 days after completion of the RI

5. Potential Exposure Pathways Without Part 201 Generic Criteria (XI.B.3.(b)(i))

The following media, land uses, receptors, and potential exposure pathways may be applicable to the Tittabawassee River Sediments and Floodplain work, and currently do not have Part 201 Generic Criteria. . Additional pathways (based on land use) may be added in the future as warranted by information obtained during the IRAs and RI. Note that pathways associated with higher-level food chain exposures will be considered, as necessary, under appropriate human health or ERAs.

- Media
 - Sediment
 - Windblown dust
- Land use
 - Recreational use
 - Limited residential
 - Agricultural land use
 - Residential land use not covered by generic criteria assumptions (e.g., consumption)
- Utility/construction worker receptor
- Exposure pathways
 - Inhalation/ingestion of dust
 - Ingestion of animals that feed from the Tittabawassee River Floodplain
 - Ingestion of vegetables grown within the Tittabawassee River Floodplain

6. Proposed Areas for Investigation (XI.B.3.(b)(ii))

The general investigation area for the Tittabawassee River Sediments and Floodplain Soils will be as described in Conditions XI.B.2. and XI.B.3. of the License. The SAP submitted as part of the RI Work Plan will identify specific sampling locations and investigation areas based on the review of relevant existing information developed during the Current Conditions Report, and the preliminary Conceptual Site Model. The location and size of specific areas to be investigated during the RI will be designed to meet the applicable requirements of the License and Part 201 R299.5528. Information to be considered in identifying the areas for site-specific sampling will include, but is not limited to:

- Relevant information on historic operations at, and documented releases from Midland Plant that have, or may have had, an effect on the River and Floodplain
- Potential migration pathways
- Potential fate and transport mechanisms for PCOIs
- Existing sampling and analysis results
- Current and historic aerial photographs
- Location of “frequently flooded area” and floodplain boundaries
- Land use, current zoning, reasonably anticipated future land use, and use restrictions and property ownership data
- Soil survey information
- The results of initial river studies which will provide information on the structure of the riverbed and the location of scour and depositional areas.

Investigation areas will also be selected with consideration to various sampling approaches that may be used, including stratified sampling. During development of the RI Work Plan, an attempt will be made to subdivide the river and floodplain area into segments that can be considered “representative” for purposes of determining overall nature and extent and for risk evaluation. Factors to be considered in development of the river subdivisions will include land use, bank structure, floodplain boundaries, evidence of undisturbed areas and distance downstream from the Facility.

7. Outline of Process to Identify and Evaluate Potential Continuing Sources (XI.B.3.(b)(iii))

As previously noted, the RI Work Plan will be designed to meet the applicable requirements of the License, and Part 201 R299.5528. One of the investigation objectives will be to determine if there are continuing sources of dioxin and furan, or other applicable PCOIs, within the areas identified in Condition XI.B.2 of the License. These activities will be coordinated with the work being done under the Onsite Corrective Action portions of the Operating License which include requirements that address the potential for current releases from the Facility..

Historic releases that may be acting as continuing sources of contamination will be identified and evaluated as part of the nature and extent investigation. RI evaluations of historic releases will include, but not be limited to, the following:

1. As part of the Current Conditions Report, relevant existing information on current Facility operations, onsite CA activities, and current conditions will be reviewed to identify the potential for ongoing releases. At the same time, existing monitoring and sampling information will be reviewed to identify contaminants present at unacceptable levels and evaluate whether potential sources can be identified.
2. Information from the Flow/Solids Monitoring Study will be used to understand the riverbed structure and system dynamics (such as solids transport, scour and deposition patterns).

3. River hydraulics will be evaluated during flooding events to understand solids movement during flooding events.
4. Bank stability and erosion potential will be evaluated
5. Information on limnology and morphology will be superimposed on nature and extent data to see if contaminants may be present at concentrations which exceed applicable regulatory criteria in the same location as unstable areas (such as obvious areas where banks are being eroded).

IRA and RI sampling results will provide additional information to allow appropriate evaluation of the potential for ongoing releases.

8. Process for Establishing Site-Specific Cleanup Criteria (XI.B.3.(b)(iv))

Condition XI.B.3.(b)(iv) of the License states:

“The licensee has the option to propose steps to develop site-specific cleanup criteria, including proposed use of probabilistic risk assessment methods. Site-specific cleanup criteria may be developed as allowed pursuant to Part 111 of Act 451 and the associated administrative rules, provided that they are not less stringent than allowed pursuant to the provisions of RCRA. The licensee may include a description of the proposed steps to develop site-specific criteria in the SOW. A prerequisite to MDEQ approval of the site-specific criteria would be implementation of associated requirements of Part 201 of Act 451 and the applicable administrative rules.”

As previously mentioned, Dow will be developing and presenting a proposed process for the development of site-specific cleanup criteria for use in the evaluation of RI data and the determination of final remedial actions. Dow intends to evaluate all available options for the development of cleanup criteria, including the use of probabilistic risk assessment methods, and will provide the proposed approach for MDEQ review.

Dow will provide work plans describing the scope, steps, methodologies, and protocols to be followed. The preliminary schedule for preparation and submittal of the Site-Specific Cleanup Criteria Work Plans is shown in the SOW Schedule, Attachment G.

9. Provisions for Conducting Ecological Risk Assessment (XI.B.3.(b)(v))

As part of the RI, Dow will be conducting several studies to evaluate the condition of ecological resources in the Tittabawassee River and its associated floodplain. These studies will add to the current understanding of the ecosystem along the Tittabawassee River, including information presented in 2003 Tittabawassee River Aquatic Ecological Risk Assessment contracted by MDEQ, Remediation and Redevelopment Division, and conducted by Dr. Hector Galbraith of Galbraith Environmental Sciences LLC (GES ERA, 2003) and in the February 4th, 2004 letter from Mr. George Bruchmann, Chief of MDEQ's Waste Management Division to Ms. Susan Carrington, of Dow. Dow intends to submit detailed work plans for evaluating the aquatic and terrestrial resources and food

webs of the Tittabawassee River and floodplain. The RI will include a detailed description of the ecosystem, including the identification of key plant and animal species.

9.1 Proposed Approach to Ecological Risk Assessment

The ERA work plan will be based on United States Environmental Protection Agency (USEPA) ERA guidance (USEPA, 1997, 1998, 1999), applicable state regulatory guidance including Part 201 of Act 451, and the conditions of the License. The investigations that will be described in the ERA work plan as part of the RI will build upon existing data collected by Dow, MDEQ, Michigan State University (MSU), and others. Together with additional targeted information collected as part of the RI, this information will be used to make decisions on whether there are unacceptable risks to the environment presented by the presence of dioxins and furans and other potential contaminants of concern that may be identified in the soils and sediments of the Tittabawassee River and floodplain as a result of the RI.

Dow plans to solicit comments from interested agencies (e.g., MDEQ, USEPA, MDNR and US Fish & Wildlife Services) while the scope of the ERA is being developed. Such an approach is consistent with USEPA guidance that recommends multiple stakeholder involvement during the planning phase of the ERA relative to selection of assessment endpoints, ecological receptors, potential field and laboratory studies, and ERA methodology. Dow envisions holding one or two working meetings during the first quarter of 2004 in order to obtain stakeholder input, while keeping the development of the ERA work plan aligned with the overall RI Work Plan submittal schedule.

9.2 Work Plan Development

The ERA work plan will include:

- A description of the parcels of property where samples will be taken
- A detailed description of the number and type of samples to be taken, how samples will be processed and analyzed, and how results will be reported
- A description of existing data for concentrations of dioxins and furans in soils and biota from the Tittabawassee River and floodplain
- A process to evaluate usefulness of data sets for inclusion in the ERA
- A description of the DQOs
- A process to identify and evaluate key receptors, habitat quality and other potential stressors
- A detailed schedule for implementation of the ERA work plan and submission of the final report for MDEQ review and approval is included in the overall conceptual schedule attached as part the SOW

9.3 Schedule

Dow has identified several major elements, and has proposed sequencing and estimated timelines for activities related to conducting an ERA for the Tittabawassee River and floodplain. The planning and exposure analysis phases of the ERA will be coordinated with other elements of the RI, such that information can be appropriately integrated and the RI process can move forward. These phases will take approximately 2 years. Most of the data

pertaining to the exposure analysis phase will be available as input to focus the ecological response analysis phase for key ecological receptors for remedial decision making. The ecological response analysis and risk characterization phases for key receptors of the ERA is also estimated to take approximately 2 years. The ERA timeline is included in the overall RI schedule attached to this SOW.

9.4 References to be Used in the ERA Process

USEPA. 1997. Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments. EPA 540-R-97-006.

USEPA. 1998. Guidelines for Ecological Risk Assessment. EPA/630/R-95/002F.

USEPA. 1999. Issuance of Final Guidance: Ecological Risk Assessment and Risk Management Principles for Superfund Sites. OSWER Directive 9285.7-28 P.

Figure 1. USEPA's Ecological Risk Assessment Framework.

10. Proposed Plan for Public Participation (XI.B.3.(c))

The Communications IRA in Attachment A outlines Dow's plan for making information available to the public through Community Information Centers and the distribution of Public Information Materials. In the future, specific actions will be taken based on, in part, the level of community interest in various tasks and what is needed to keep the public apprised of significant developments in the RI process. In general, the following activities are envisioned to be part of a public participation program:

- **Fact Sheets.** Dow will prepare Fact Sheets to be reviewed and approved by MDEQ that will address key topics and milestones (e.g., the CA process, IRAs, the RI Work Plan, RI Findings, etc.). These Fact Sheets will be made available in the document repository and in the Community Information Center after MDEQ approval.
- **Mailing List.** Dow will utilize the "Facility" mailing list (physical addresses and e-mail addresses) maintained by the MDEQ to facilitate communication of events and information related to the RI process. The current Facility mailing list will be included in the RI Work Plan as an Appendix.
- **Document Repository.** It is expected that the Midland Grace A. Dow Memorial Library will be the official Document Repository and the location for the Community Information Center.
- **Public Meetings.** Dow will arrange for Public Meetings in Midland to be held at times and places convenient to the public. Larger, multi-party meetings or "town meetings" will be held when that is the appropriate format. Dow will coordinate the scheduling and planning of these meetings with MDEQ.

Public Meetings may be scheduled in conjunction with the initial submission and following approval of Dow's written submissions of work plans and significant reports. Public Meetings may be scheduled in coordination with any License modification activities.