



The Dow Chemical Company
Midland, MI 48674

July 25, 2011

Ms. Mary Logan
Remediation Project Manager
U.S. Environmental Protection Agency, Region 5
77 West Jackson
Chicago, IL 60604

**Re: Reach MM In-Channel Island Removal Action Work Plan-Settlement Agreement No. V-W-11-C-974 for The Reach MM In-Channel Island Tittabawassee River
Dow Submittal Number T2. RMM.2011.003**

Ms. Logan:

Attached please find the Reach MM In-Channel Island Removal Action Work Plan prepared by The Dow Chemical Company (Dow). This submittal has been prepared in accordance with the requirements contained in Administrative Settlement Agreement and Order on Consent (AOC) (effective July 11, 2011) ("Settlement Agreement"). Please let me know if you have any questions or concerns.

Sincerely,
The Dow Chemical Company

A handwritten signature in black ink that reads "Todd Konechne".

Todd Konechne
Project Coordinator

CC: Al Taylor, MDNRE
Diane Russell, U.S. EPA
Joseph Haas, U.S. Fish and Wildlife
Greg Cochran, Dow
Steve Lucas, Dow
Peter Wright, Dow

**REACH MM IN-CHANNEL ISLAND
REMOVAL ACTION WORK PLAN
THE TITTABAWASSEE RIVER/SAGINAW
RIVER & BAY SITE**



**PREPARED BY:
THE DOW CHEMICAL COMPANY**

**JULY 25, 2011
REVISION 0
DOW SUBMITTAL NUMBER T2.RMM.2011.003**

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ACRONYMS AND ABBREVIATIONS

ARAR	applicable or relevant and appropriate requirements
ARCS	Assessment and Remediation of Contaminated Sediment
AOC	Administrative Settlement Agreement and Order on Consent
ATS	Ann Arbor Technical Services
BMP	best management practices
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
cy	cubic yard(s)
EE/CA	Engineering Evaluation / Cost Analysis
EPA	U.S. Environmental Protection Agency
IRA	Interim Response Action
MDEQ	Michigan Department of Environmental Quality
NAVD	North American Vertical Datum
NCP	National Contingency Plan
NTCRA	Non-Time Critical Removal Action
ppt	parts per trillion
TEQ	toxicity equivalent
TOC	total organic carbon
OSWER	Office of Solid Waste Emergency Response
QAPP	Quality Assurance Project Plan
QA/QC	quality assurance/quality control
USACE	U.S. Army Corps of Engineers

1.0 INTRODUCTION

This Reach MM In-Channel Removal Action Work Plan (“Work Plan”) was prepared in accordance with the requirements contained in Section VIII (“Work to be Performed”) of the Administrative Settlement Agreement and Order on Consent for the Reach MM Island (Reach MM Island AOC) of the Tittabawassee River (Settlement Agreement No. V-W-11-C-974), and the Non-Time Critical Removal Action (NTCRA) Enforcement Action Memorandum (Action Memo; Attachment A of the AOC), effective July 8, 2011 (“Settlement Agreement”). This Work Plan was prepared at the request of the U.S. Environmental Protection Agency (EPA) and the Michigan Department of Environmental Quality (MDEQ) (collectively referred to as the Agencies), consistent with Agency decisions in the Action Memo. This Work Plan provides a description of the work to be performed to address the Reach MM in-channel island, which was previously characterized in the April 6, 2011 Reach MM In-Channel Island Engineering Evaluation/Cost Analysis (EE/CA) as warranting an early response in advance of the segment-specific Response Proposal for this area. The EE/CA was conducted under the terms of the Administrative Settlement Agreement and Order on Consent for Remedial Investigation, Feasibility Study And/or Engineering Evaluation and Cost Analysis, and Response Design, Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Docket No. V-W-10-C-942 (2010 AOC).

1.1 BACKGROUND

The Task 2.1 Technical Memorandum dated July 16, 2010, which was approved by the Agencies in a letter dated September 16, 2010, identified certain in-channel deposits, in-channel center islands, and bank areas for further evaluation. One area, an in-channel center island in Reach MM (Reach MM Island), was identified to be sequenced directly into the Task 2.4 development of potential mitigation measures. As discussed in the Task 2.1 Technical Memorandum and EE/CA, early response actions were proposed for the Reach MM Island in advance of the segment specific Response Proposal for this area. The EE/CA presented three remedial alternatives for the island. The Agencies approved the EE/CA with modification on April 14, 2011.

1.2 OBJECTIVE AND PURPOSE OF WORK

This Work Plan provides a description of the removal action activities to be performed at the Reach MM Island, consistent with the Agency’s selected remedy identified in the Action Memo. The objective of the selected remedy is to remove island sediments (soil) above the low water line, to cap the remaining island sediments, and to re-establish an island river habitat. The implementation of this work will be prioritized such that work can commence and be completed in the late summer of 2011.

2.0 SITE DESCRIPTION

Reach MM contains four remnant stone piers from a bridge that once existed prior to 1937 (the earliest available aerial photograph of the area). The Reach MM Island likely formed in the early 1900s as a result of geomorphic changes to the river following construction of the bridge piers,

and the relatively high logging and agriculture related sediment loads delivered to the river during this period (ATS 2009a). A review of historical aerial photographs (at decade-level temporal scales) revealed that the size of the Reach MM Island has decreased since the initial aerial photograph was taken more than 70 years ago. The current island footprint is shown on Figure 1. This portion of the island persists above the median low water surface (approximate elevation of 579 feet North American Vertical Datum 1988 [NAVD88]) and currently supports some vegetation.

3.0 SAMPLING RESULTS

Furan and dioxins (measured as toxicity equivalent (TEQ) levels) are the primary constituents of interest in sediments on the Reach MM Island. To characterize the distribution of TEQ in the river sediments, sampling was conducted as part of the Tittabawassee River Site Investigation. Sample results included a maximum detected concentration for furans and dioxins of 17,500 parts per trillion (ppt) TEQ. Sample locations are presented on Figure 1. Figures 2a through 2c present cross sections of the bathymetry and available analytical data in the area of the Reach MM Island.

Additional monitoring was performed in December 2010 as part of Task 2.2 of the 2010 AOC, to more fully characterize the banks of the Island. A representative composite sample of sediment collected along the banks of the Reach MM Island identified a TEQ level of approximately 6,800 ppt.

As required by paragraph 16a of the Reach MM Island AOC, Dow is providing additional data which was collected in June, 2011 to delineate TEQ levels surrounding the island. Samples were collected in the channel surrounding the island along the transects shown in Figure 1. A composite sample was collected from the emergent portion of the island, over the depth range of 0 to 7.4 feet below the top of the island. This composite sample had a TEQ level of 6,750 ppt. In total, 43 samples were collected and analyzed from the island or in the area immediately surrounding the island, and delineated the extent of TEQ levels in the immediate vicinity of the Reach MM Island to provide the basis for design.

4.0 DESIGN AND IMPLEMENTATION

As discussed above, EPA's selected NTCRA remedy for the Reach MM island involves at a minimum excavation of island sediments above the water line (approximate elevation 579 feet NAVD88) during typical low-flow conditions, followed by in situ containment capping over the excavated island area and sediments in adjacent underwater areas. The additional data collected in June 2011 which is discussed above supports an excavation to approximately 579 feet NAVD88 in addition to the extent of area where capping is required. EPA's selected plan also includes reconstruction/restoration of island characteristics (e.g., promotion of sediment deposition and natural revegetation) to provide habitat in this area.

This Work Plan summarizes the remedial design and related activities that will be performed by Dow prior to and during implementation of the remedial action. Concurrent with the development of the removal action design, which is summarized in this Work Plan, a constructability review has been conducted to verify the implementability of the remedy,

considering means and methods for the removal of sediment and placement of capping materials, access, and site restoration. As discussed in Section 8, these technical design evaluations will be submitted with the Removal Action Report.

4.1 SEDIMENT REMOVAL

Sediment within the portion of the Island that is emergent during typical low-flow conditions (e.g., the visible portion of the island) will be removed. Sediment located above the water level during low water conditions (approximately elevation 579 feet NAVD88, corresponding to the median low water surface elevation) will be excavated, corresponding to an approximate volume of 100 to 200 cubic yards (cy). Excavation of the visible island will be performed under dry conditions using conventional earthwork equipment working from a temporary platform or access road constructed within the river. Appropriate construction best management practices (BMPs) will be used to minimize the disturbance of submerged sediments during excavation activities. Removed sediments will be characterized and transported for disposal to a CERCLA approved landfill. Woody vegetation and debris on the Reach MM Island will also be removed, processed by a chipper, and disposed with the sediment. All waste will be disposed of in compliance with the EPA Off-Site Rule 40 C.F.R. Section 300.400.

4.2 CAPPING

The purpose of the in-situ containment cap is to control migration of remaining sediment in the immediate vicinity of the Reach MM Island that contain or may potentially contains elevated TEQ levels. The pre-design sampling data discussed in Section 3 was used to delineate the extent of the in situ containment cap to be placed over the excavated island area, extending to sediments with similarly elevated TEQ levels located in adjacent underwater areas. Figure 1 presents the delineation of the extent of the cap.

The cap has been designed to provide physical isolation and stabilization of existing sediment in general accordance with following guidance for in situ capping developed by the EPA and the U.S. Army Corps of Engineers (USACE):

- Contaminated Sediment Remediation Guidance for Hazardous Waste Sites (EPA 2005)
- Assessment and Remediation of Contaminated Sediments (ARCS) Program Guidance for In Situ Subaqueous Capping of Contaminated Sediments (Palermo et al. 1998)

The cap has been designed to protect against erosion from the following forces:

- Hydrodynamic flows: The cap will withstand river flows with a recurrence interval of 100 years.
- Vessel impacts: The cap will withstand anticipated propeller wash and anchoring of small recreational vessels.
- Ice impacts: The cap will withstand potential impacts to cap stability from ice formation and break-up.
- Wind wave impacts: Wind wave impacts are expected to be negligible relative to other erosional considerations.

The in-situ containment cap will be constructed with natural stone with a minimum D50 (average diameter) of 1.5 inches. The cap will be installed with a 6 inch thickness with a 6-inch over placement allowance, for a likely total thickness of 1 foot to ensure the protectiveness of the remedy.

Capping will be performed following the completion of excavation activities described in Section 4.1. Capping materials will be placed using conventional earthwork equipment working from a temporary platform, an access road constructed within the river, or floating equipment, if necessary. Appropriate construction best management practices (BMPs) will be used to minimize the generation of turbidity during the placement of capping materials.

4.3 ISLAND RECONSTRUCTION

The Reach MM Island will be re-established on top of the cap by the addition of various materials including graded cobbles; similar to other island areas present in the Tittabawassee River. The purpose of the re-constructed island is to promote natural restoration of a stable island habitat that would remain an island during typical water flow conditions and provide structure for natural vegetation.

The re-constructed island will be constructed over the in-situ containment cap using suitable sand fill. The top surface of the fill material will be stabilized with geoweb and the outer edges of the island fill will be armored with cobbles. Cobbles will also be placed on top of the island fill to provide structure and to promote sediment accretion. Natural perennial aquatic species will be planted as plugs on the island and annual species would be allowed to colonize. A schematic cross section of the re-constructed island is shown on Figure 3 and a plan view schematic of the re-constructed island is shown on Figure 4.

The fill material will consist of poorly sorted silty sand. The fill material will be obtained from a suitable source. In order to encourage revegetation, total organic carbon (TOC) levels in the added material will be similar to levels observed in other island areas of the river (i.e., 2% as seen at the island in Reach N). Organic material may be added to the silty sand prior to placement in order to obtain the desired TOC level.

The armor stone will consist of a rounded or sub-angular cobble with a diameter generally between 3 and 12 inches. The average diameter will be between 4 and 8 inches. The cobbles will be placed around the perimeter of the island to a thickness that armors the sides of the island. The interstitial space between the perimeter cobbles will be filled with the silty sand fill. The same cobble material will be placed on top of the island, covering 30 to 50 percent of the island surface.

The topography of the Island will be varied, mimicking naturally occurring micro-scale topographical variation. The geoweb will be placed on top of the fill prior to placement of the cobbles. The lower approximate three quarters of the geoweb will be filled with the silty sand fill and the cobbles will be placed in and on the geoweb. Silty sand fill will then be added on top of the cobbles to fill in the remaining space in the geoweb. The geoweb will be a minimum of 6-inches thick and will have 12-inch diameter cells (GW-30V-6-08-29).

Grasses and sedges are currently established at similar elevations along the banks and at other similar in-channel islands along the Tittabawassee River. These indigenous Emergent shallow species (i.e. Carex spp., Scirpus spp., Juncus spp., Leersia spp. and Sagittaria spp.) will be collected from other areas of the river bank and relocated to the Island to promote natural re-colonization. The plant plugs will be spaced naturally across the re-constructed island at approximately a 1'-3' spacing.

5.0 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Interim actions implemented under Task 2 must comply with substantive elements of applicable or relevant and appropriate requirements (ARARs), in accordance with EPA's National Contingency Plan (NCP). Though an action performed under formal CERCLA authorities would be exempt from the procedural requirements of federal, state and local environmental laws, the action must nevertheless comply with the substantive requirements of such laws. In the Task 2.4 EE/CA, Dow identified eight action-specific and five location-specific ARARs related to work within the Reach MM Island area. Additionally, the Agency identified potential ARARs in the Reach MM Island Action Memorandum. In order to fulfill its ARAR obligation, Dow intends to meet substantive portions of these ARARs. If meeting an ARAR is not practicable in a given situation, or will result in delay, Dow will consult with the Agency to determine an appropriate path forward.

6.0 WORKING CONSTRAINTS

6.1 SITE ACCESS AND CONSTRUCTION LAYDOWN AREA

The Reach MM Island Site will likely be accessed from the bank of the river, pending access approvals to be received from land owners. A temporary access road will be created through property that is adjacent to the river. A temporary bridge or other access structure will be constructed from the bank of the river to the Island. A laydown area will be established on the bank where clean capping and backfilling material may be placed prior to installation on the Reach MM Island. Removed sediment will likely be loaded directly onto trucks during excavation and therefore will not likely be staged in the laydown area. A proposed access and laydown area will be shown on a supplemental figure once access agreements are received.

6.2 SAFETY WARNINGS AND CONTROLS

The construction area in the river will be marked off to prevent bystander access to the Reach MM Island or staging areas during the work. Off hours security and temporary safety lights may be installed in low light places around the construction activity areas. A discussion with the Agency will occur once specific details are determined for the implementation of the action.

6.2.1 Maintenance of Open River Navigation

Open river navigation past the Island will be maintained during the Reach MM Island removal action. Buoys may be used to direct vessels past the construction area. If a temporary bridge is constructed from the bank of the river to the Reach MM Island, it will allow for the passage of small watercraft.

6.2.2 Site Access Restoration

Upon completion and approval of implementation activities at the Reach MM Island, all or a portion of the temporary access features may be removed and restored based upon the property owner's decision. In the event that a complete or partial removal of temporary access features occurs, the disturbed areas will be restored to equal or better condition than originally encountered with the acceptance of the impacted property owners.

7.0 QUALITY ASSURANCE/QUALITY CONTROL

Control measures to ensure the protection of the public health and safety during the work are detailed in the Site Health and Safety Plan, included as Appendix A. Quality assurance and quality control (QA/QC) of all samples collected have been in accordance with the Quality Assurance Project Plan (QAPP) that has been developed for the Tittabawassee River and Saginaw River and Bay project pursuant to the 2010 AOC.

Dow will implement a construction QA/QC program to verify that the work is performed in accordance with the design. QA/QC activities will include the following:

- Verification of the lateral and vertical extents of excavation
- Verification of the lateral and vertical extents of in situ containment cap placement
- Verification that the physical properties of the capping material conform to the design specifications (e.g., grain size)
- Inspections/observations to confirm that construction BMPs are adequate to minimize disturbance of submerged sediments and the generation of turbidity.
- Verification that the site is restored to acceptable conditions by the impacted property owners following the demobilization of all equipment.

During the sediment removal, capping, and island reconstruction phases of the work, efforts will be made to minimize turbidity. Upon completion of the island reconstruction phase and demobilization, bank areas disturbed during the work will be restored as necessary.

8.0 REMOVAL ACTION REPORT

Within 90 days of completion of the work on the Reach MM Island, a final removal action report will be submitted to the Agencies. This report will include a good faith estimate of the total costs incurred in completing the work, a listing of the materials removed offsite, a listing of the ultimate destination of the materials removed offsite, detailed technical evaluations with calculations which support the final constructed design, and all other relevant documents generated during the removal action. This work plan and the Removal Action Report are intended to meet Dow's obligation under Task 2.5 under the 2010 AOC. Dow will also provide written reports to the Agencies every 30 days to provide progress updates for the Reach MM removal action work. These progress reports will be included in the Task 6 monthly progress reports.

9.0 MAINTENANCE AND MONITORING

Monitoring and maintenance of the containment cap will be in accordance with the post-removal site control requirements outlined in the Reach MM Island AOC. A post-removal site control plan will be submitted to the agencies for approval as part of the Removal Action Report described above. The post-removal site control plan will include monitoring to verify the continued performance and protectiveness of the cap. The monitoring may consist of single beam bathymetry and/or topography measurements across the cap along transects. Details of post-construction maintenance and monitoring will be provided as part of the Removal Action Report.

10.0 IMPLEMENTATION SCHEDULE

The following schedule is anticipated for the completion of the Reach MM Island restoration work.

Table 1: Proposed Project Schedule

	Task	Target Start Date	Target Completion Date
1	Work Plan Submittal	July 25, 2011	July 25, 2011
2	Obtain Site Access	July 28, 2011	July 28, 2011
3	Mobilization Site Access Construction	August 12, 2011	August 12, 2011
5	Sediment Removal and Disposal	August 12, 2011	August 15, 2011
6	Cap Construction	August 16, 2011	August 19, 2011
7	Island Construction	August 19, 2011	August 23, 2011
8	Site Access Restoration	September 2011	September 2011
9	Final Report	December 2011	December 2011

11.0 REFERENCES

Ann Arbor Technical Services, Inc. (ATS). 2009a. Final GeoMorph Site Characterization Report, Tittabawassee River and Floodplain Soils, Midland, Michigan. June 15.

The Dow Chemical Company (Dow). 2011. Reach MM In-Channel Island Engineering Evaluation / Cost Analysis The Tittabawassee River / Saginaw River and Bay Site. April 06.

United States Environmental Protection Agency (EPA). 2011. Administrative Settlement Agreement and Order on Consent for Removal Action – Island MM. Docket No. V-W-11-C-974. June 29.

In the Matter of The Dow Chemical Company Administrative Settlement Agreement and Order on Consent for Remedial Investigation, Feasibility Study And/or Engineering Evaluation and

Cost Analysis, and Response Design, CERCLA Docket No. V-W-10-C-942 (January 21, 2010)

EPA. 2005. Contaminated Sediment Remediation Guidance for Hazardous Waste Sites. OSWER 9355.0-85. United States Environmental Protection Agency. EPA-540-R-05-012. December.

EPA. 2011. Enforcement Action Memorandum – Reach MM Island. July 08.

Palermo, M. R., J. Miller, S. Maynard, and D. Reible. 1998. Assessment and Remediation of Contaminated Sediments (ARCS) Program Guidance for In Situ Subaqueous Capping of Contaminated Sediments. EPA 905/B-96/004. Prepared for the Great Lakes National Program Office, United States Environmental Protection Agency, Chicago, Illinois. Website: <http://www.epa.gov/glupo/sediment/iscmain>.

Figures

Figure 1 – Reach MM Island Sample Location Map

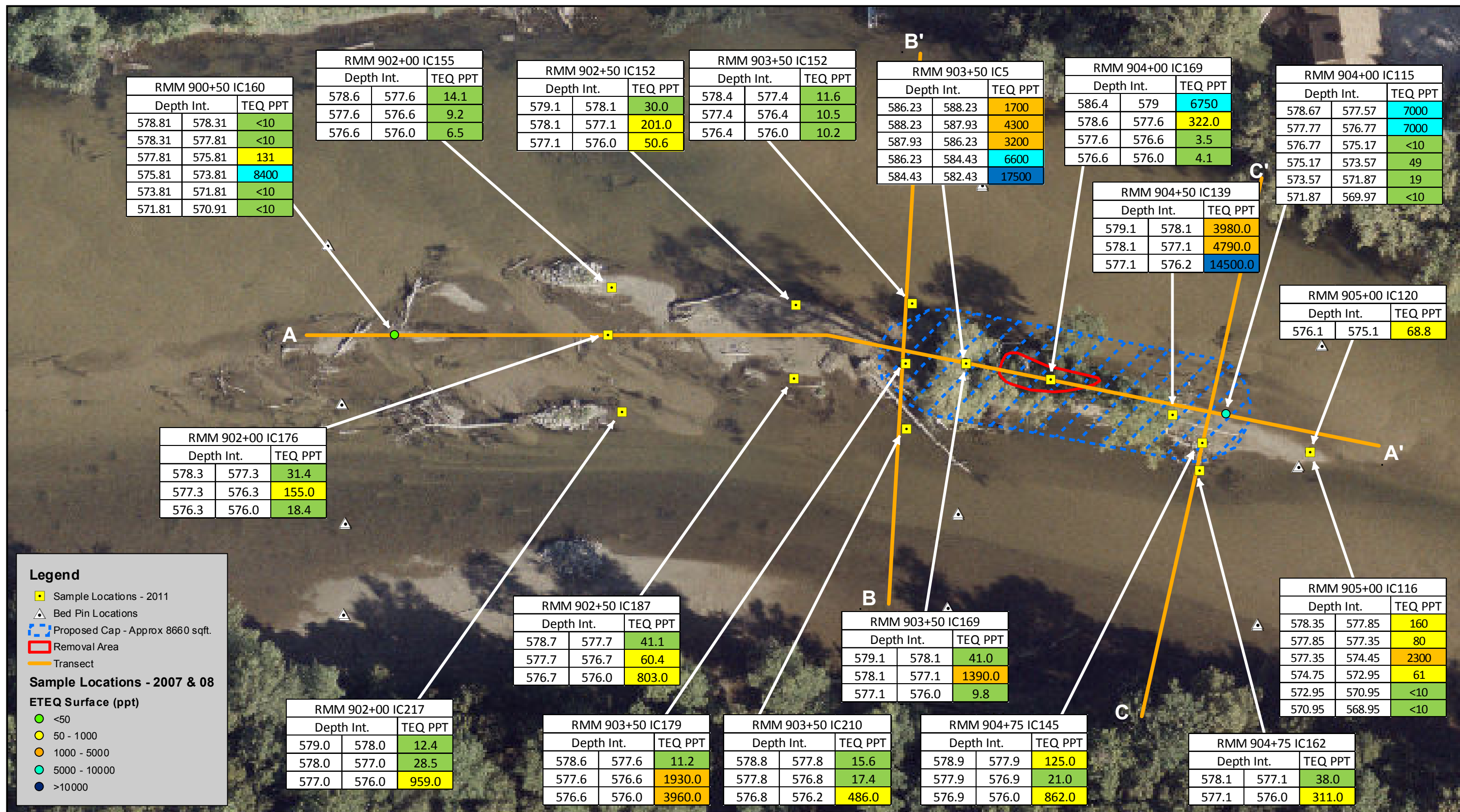
Figure 2a – Cross Section A-A’

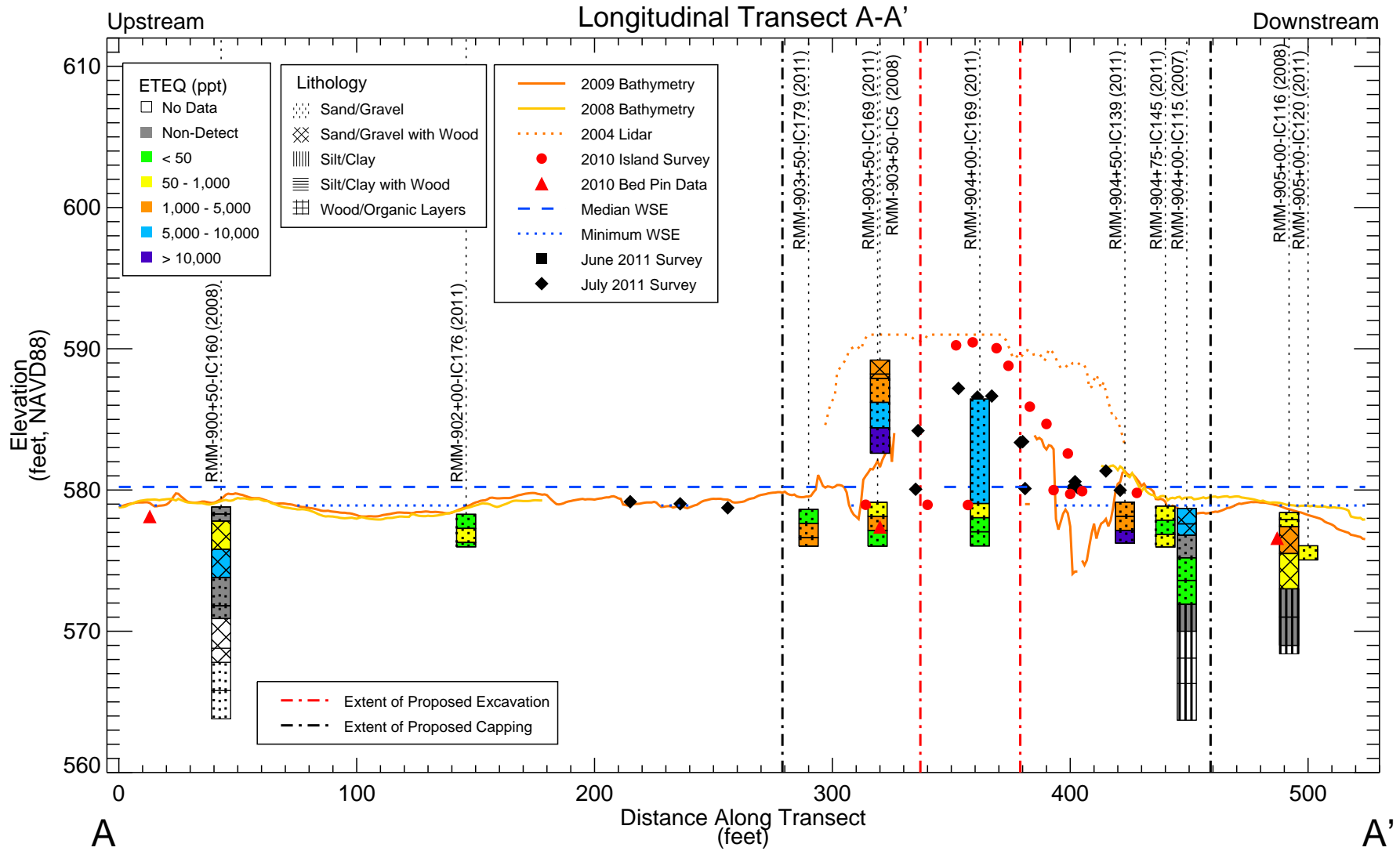
Figure 2b – Cross Section B-B’

Figure 2c – Cross Section C-C’

Figure 3 – Schematic Cross Section

Figure 4 – Schematic Plan View

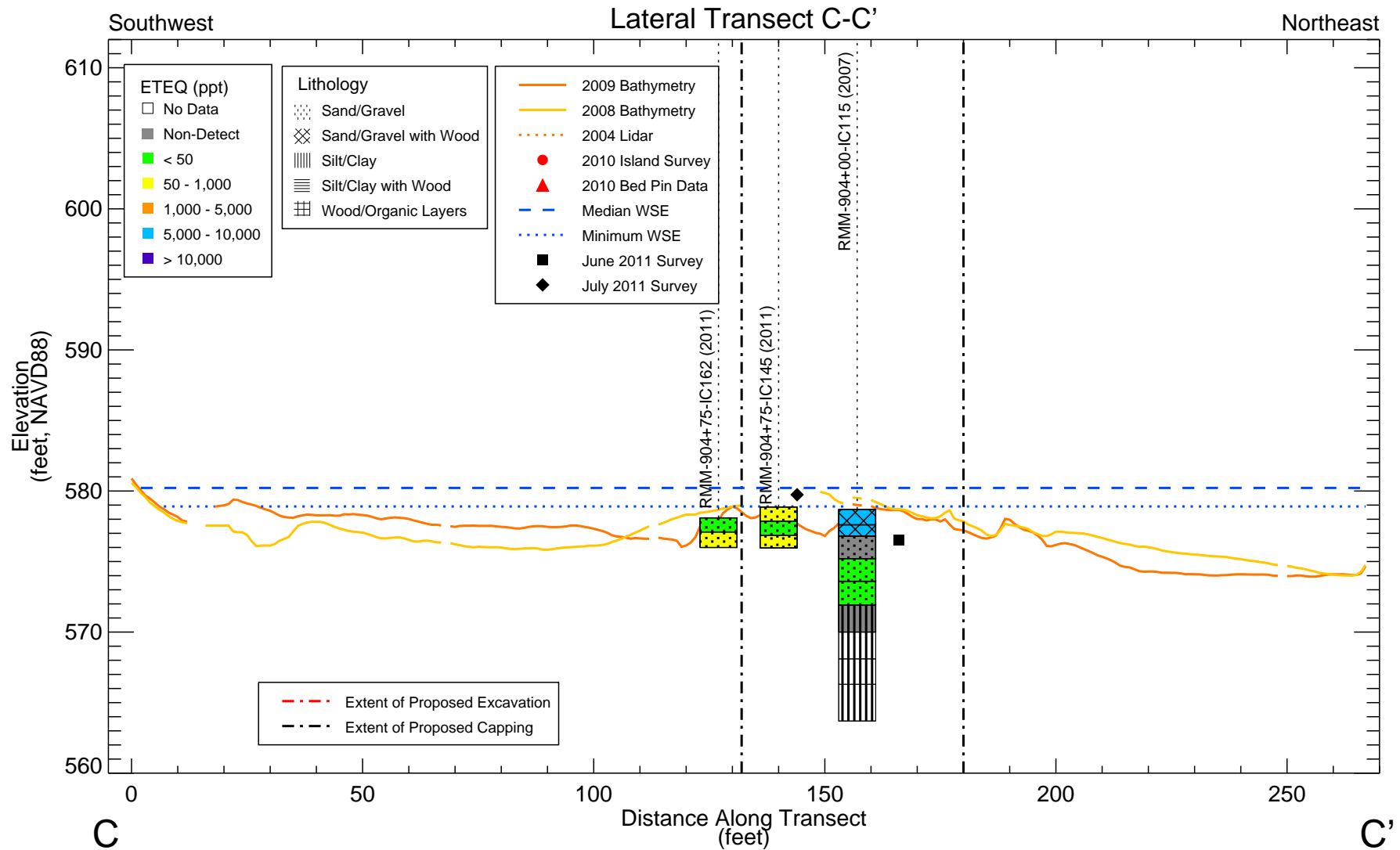




Cross Section A-A'
Reach MM Removal Action Work Plan

Figure 2A

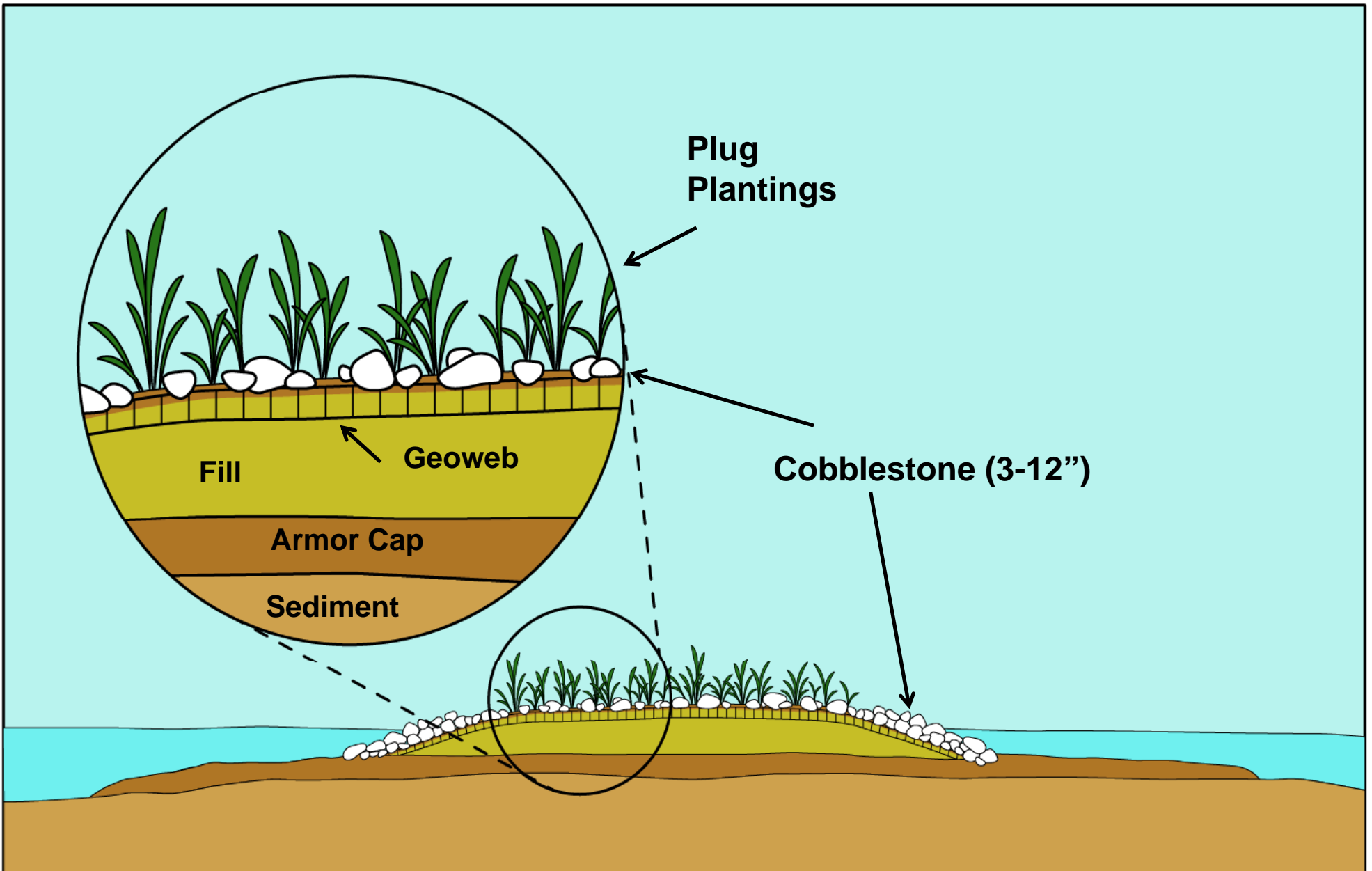
Note: Water surface elevations (WSE) are the minimum and median near the island modeled from June to November of the 2007 - 2009 hydrodynamic model using the floodplain grid. Non-detect values are set to half the reporting limit. Core intervals with field duplicates are set as the average of the parent and duplicate sample values. Only cores within 10 ft of the transect are shown. For the September 2010 reach MM island survey, only cores within 2.5 ft of the transect are shown. Cores from the 2011 survey are labeled in bold. Bed pin elevations were interpolated to the transect location. Core RMM-905+00-IC:120 is plotted 7 ft downstream for clarity.



Cross Section C-C'
Reach MM Removal Action Work Plan

Figure
2C

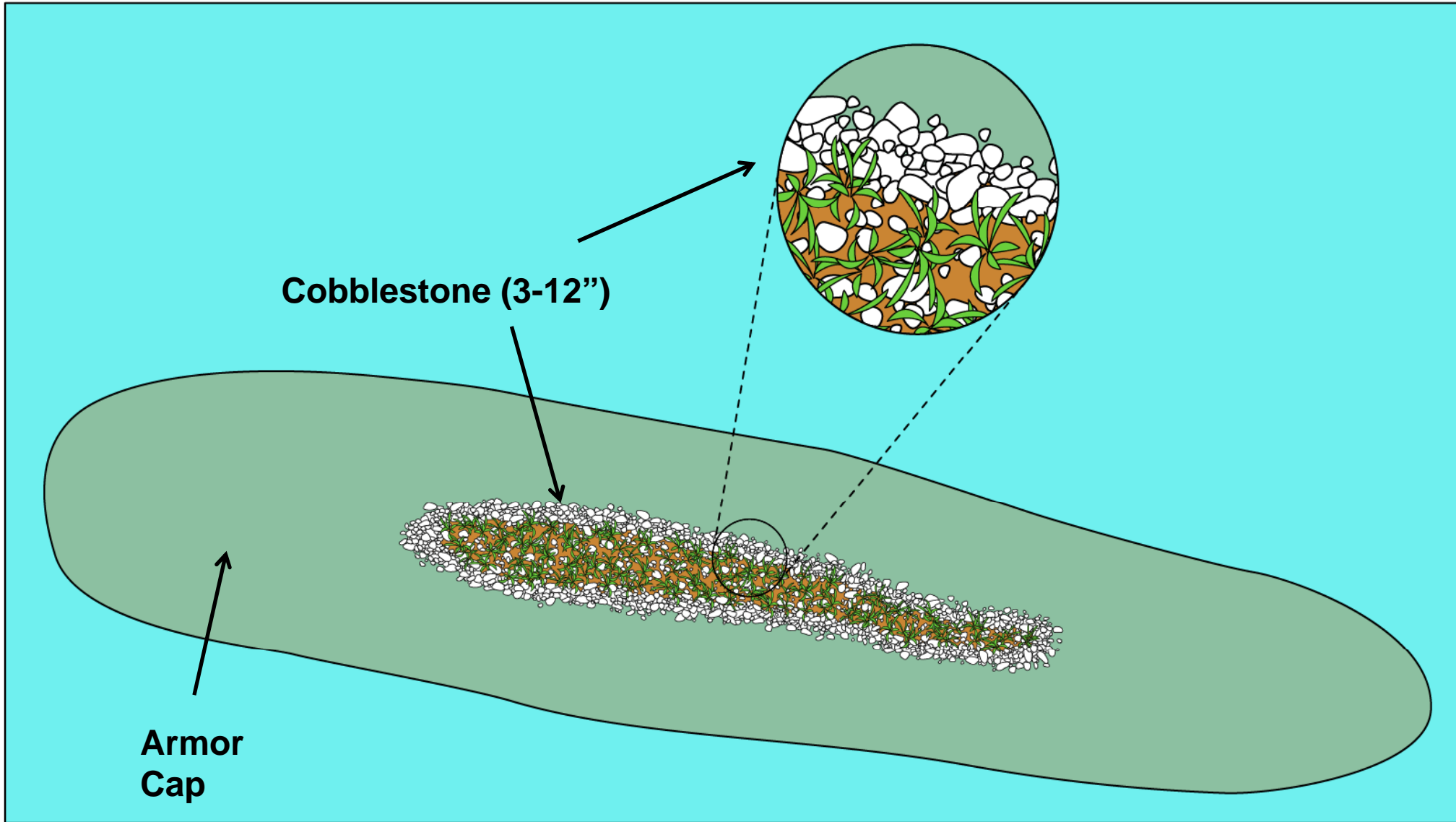
Note: Water surface elevations (WSE) are the minimum and median near the island modeled from June to November of the 2007 - 2009 hydrodynamic model using the floodplain grid. Non-detect values are set to half the reporting limit. Core intervals with field duplicates are set as the average of the parent and duplicate sample values. Only cores within 10 ft of the transect are shown. For the September 2010 reach MM island survey, only cores within 2.5 ft of the transect are shown. Cores from the 2011 survey are labeled in bold.



Cross Section View Schematic
Reach MM Removal Action Work Plan

Figure
3





Plan View Schematic
Reach MM Removal Action Work Plan

Figure
4

Appendix A
Site Health and Safety Plan

**HEALTH AND SAFETY PLAN-ADDENDUM FOR
EXCAVATION ACTIVITIES
THE TITTABAWASSEE RIVER/SAGINAW RIVER & BAY SITE**

**PREPARED BY:
THE DOW CHEMICAL COMPANY**

**JULY 25, 2011
REVISION 00**

1.0 INTRODUCTION

This Health and Safety Plan (HASP) Addendum was prepared in accordance with the requirements contained in Section IX (“Work To Be Performed”) of the Task 2 Reach MM Island Administrative Settlement Agreement and Order on Consent (AOC (Settlement Agreement No. V-W-10-C-974) effective July 11, 2011 (“Settlement Agreement”). The purpose of the Addendum is to include specific field activities not previously identified in the HASP submitted on March 7, 2010 developed under The Tittabawassee River/Saginaw River & Bay Site (Settlement Agreement No. V-W-10-C-942) to explain how contractors will interact with Dow and to safely and effectively handle potential hazards to achieve the goal of zero Occupational Safety and Health Administration (OSHA) recordable incidents. Specific activities included in this addendum include the following:

- **Site Access:** Specific activities include but are not limited to the following: modifying and/or constructing site access from adjacent roadway, constructing site access through land adjacent to river, constructing site access from land into river, tree pruning and/or removal.
- **Excavating and Managing Soils:** Specific activities include but are not limited to the following: excavating sediments/soils with excavation equipment and by hand, transporting and disposing of sediments/soils from river to disposal facility, and working near excavations.
- **Constructing Cap and Island:** Specific activities include but are not limited to the following: transporting materials, placement of materials by equipment and by hand, and grading materials by equipment and by hand.

This addendum should be reviewed, in addition, to the HASP prior to conducting any on-site work activities.

2.0 HAZARD IDENTIFICATION AND MITIGATION MEASURES

The following table describes activities which may be conducted for site access, excavations and managing sediments/soils activities, and constructing a cap and island in channel. The table identifies the potential activities, the hazards associated with that activity and mitigation measures.

TASK	HAZARD	MITIGATION
Walking Site	Uneven Ground, Slippery Surface	Small Steps, Ice Control Proper Foot Wear, Travel Slow
	Trip Hazards	Awareness, Eliminate When Possible

TASK	HAZARD	MITIGATION
RiverEdge Work Within 6 feet of River	Water	Tie Offs/Lanyards, Buddy System Work Team, Life Jackets, Life Line, Throwable Life Ring
	Wet/Soft Banks	Small Steps, Awareness
RiverBank Work	Slippery Surface	Small Steps, Buddy System Work Teams, Lanyards as Needed
	Climbing Up/Down	Sure Footing, Three Point Contact, Safety Ropes to Assist Climbing
Equipment Operation	Noise	Ear Protection
	Ground Crews	Communication/Work Patterns, - Establish Travel Routes, Travel Alarms, Slow Ground Speeds, Establish Eye Contact Between Ground Crews and Operator
	Climbing On/Off	Three Point Contact, Be Aware of Ice/Slippery Steel
	Environment	Turn Slow/No Tearing, Twisting, Contain spills
	Blind Spots	Ground Spotters as Needed, Walk Site and Travel Area before Working, Evaluate Surroundings
	Caught Between	Barricades, Eye Contact with Operator, High Visibility Shirt or Vest
	Underground Lines Cables and Other Objects	Underground Prints, Permits, Contact Miss Dig
	General Public	Communication, Spotters, Signage, Designated Areas
Chain Saw Operation	Noise	Hearing Protection
	Flying Debris	Safety Glasses, Face Shield, Long Sleeve Clothing
	Sharp Edges	Leather Gloves, Cutting Chaps, Equipment Guard

TASK	HAZARD	MITIGATION
Excavating and Grading Materials with Hand Tools	Lifting	Bend at Knees, No Twisting under Load, Use Buddy System Lifting, Mechanical Lifting when possible
	Sharp Edges/Pinch Points	Leather Gloves/Awareness to Hand Position
	Direct Contact with Soils	Tyvek/Coveralls, Rubber Boot Covers, Good Hygiene, Boot Wash/Dry Decontamination Station
Working Around or Near Excavations	Engulfment	Lay back loose dirt 2 feet or more from the excavation edge, proper sloping
	Hazardous Atmosphere	Use Air Monitor, Egress Ladder Every 25 feet
911 Response	Location	Meet Responders at Entrance Along Public Road, Phone Contact with Field Crew, Evaluate Best Access
Loading/Unloading Equipment	Falls/Trips	Load/Unload on Level Ground, Use Slow Ground Speeds when Loading/Unloading, Qualified Operators Only
Loading/Unloading Materials	Caught Between	Maintain Distances, Recognition of Turning Radiuses, Communication, Spotter, Designated Areas
	Struck By	Designated Areas, Awareness of Surroundings, Cover Overhead Utilities
	Flying Debris	Personal Protection Equipment (PPE), Communication, Designated Areas

TASK	HAZARD	MITIGATION
Site Access – Land	Site Traffic	Designated Areas, Communication, High Visibility Vests, Signage, Sign-in/Sign-out Requirements
	Roadway Traffic	Communication, Traffic Plan for Entrance, Signage, Flag Man, Speed Limits, High Visibility Vests,
	Personal Property	Identify, Relocate or Avoid, Communication
	General Public	Communication, Inform, Signage, Designated Areas
	Underground and Above Ground Utilities	Underground Drawings, Miss-dig, Protect, Cover Wires, Communication
	Weather	Communication, Weather Information Systems, Stop Work During Lighting
Site Access – River	Water Hazards	Tie Offs/Lanyards, Buddy System Work Team, Life Jackets, Life Line, Throwable Life Ring
	Falls	Barricades, Tie-Offs/Lanyards, Buddy System
	Site Traffic	Designated Areas, Communication, High Visibility Vests, Signage, Sign-in/Sign-out Requirements
	Boaters (General Public)	Designated Areas, Communications, Spotters, Signage
	Heavy Equipment	Standard PPE, Maintain Eye Contact and Distance, High Visibility Vests, Communication
	Material Transport	Contain Material, Communications, Logistic Management
	Weather	Communication, Weather Information Systems, Stop Work during Lighting, River Gauge

Work when weather and temperatures, wind speed and direction are favorable (Refer to Section 7 for General Requirements related to weather). Spotters and site communication will mitigate overhead hazards. Prior to daily work commencement, a weather assessment will be made by the contractors and The Dow Safety Representative (temperature, precipitation, wind speed, direction, etc.).

Travel roads for equipment will be established and communicated to all ground crews and equipment operators. These roads shall not be deviated from at any point unless a new entry/exit has been approved by Dow. All equipment will have travel alarms and be inspected daily. Daily safety meetings each morning will communicate new and existing hazards, and reinforce the importance of site safety. Prior to beginning excavation, a strategized plan will be agreed upon by all parties involved. No work will start until everyone involved is in agreement with the plan.

No work can start without a safe work permit each day, if work is taking place within the fence line of Dow's Michigan operations until appropriate Dow personnel have been notified. Brian Hicks will be the permit writer for Dow. He can be reached at (989) 600-5043. A back up permit writer and Dow safety representative will be identified on a project by project basis and communicated to all contractors.

3.0 PPE REQUIREMENTS

At a minimum, all employees will always have required PPE, including: hardhat, safety glasses including side shields (dark eye protection is allowed only during sunny daylight hours), leather gloves (or specific gloves based upon task), safety toed boots and high visibility apparel. If any of the minimum required PPE hinders the task or creates a hazard, workers are encouraged to contact the safety representative for a re-evaluation.

The following describes the required PPE based upon the specific job task:

- **Excavation, Site Access or Cap/Island Construction Activities:** Hi visibility shirt or vest, long sleeves for areas where poison ivy is present.
- **Activities within 6 feet of water:** Personal floatation device, type (2), and a ring buoy with 90 feet of rope attached. The buddy system must be utilized and tie offs/lanyards, as required based upon consultation with the on-site safety representative.

4.0 REQUIRED INSPECTION AND MAINTENANCE

All vehicles must be inspected daily to ensure that back up alarms are operating correctly, and that all windows are clean and clear. When there are practical areas that present pinch and crush hazards, barricades and a spotter will be utilized. Maintain eye contact with operator when possible. All personnel must be made aware of this hazard and of poor visibility from large machines. Should there be a leak/release of fluids from the equipment during the day, an absorbent material will be placed on the spill, and it will be shoveled up and placed in properly labeled packs.

5.0 EMERGENCY PROCEDURE

In the event of an emergency or injury on site that will require external medical assistance, an employee will immediately call **9-1-1**. Following the phone call, a separate employee shall travel via vehicle to the main entrance of the site along the closest public road to meet the ambulance.

6.0 COMMUNICATION

Direct connect or walkie talkie devices will be permitted for use by operators if a critical task is taking place.

7.0 GENERAL REQUIREMENTS

1. Worker Intervention Recognition and Incentive Programs: Intervention to ensure good work ethics and compliance with safety measures is a major key to the successful completion of this project. Assisting co-workers with proper usage of safety task analysis cards (STACs), as well as politely reminding others who have forgotten their PPE is imperative to the job.

- All workers will fill out a STAC daily. They will update it throughout the day as their task changes. When the weather changes to colder conditions, an ice/snow awareness card will also be filled out each morning prior to the start of work. A Continuous Hazard Analysis Tool (CHAT) card will be filled out once a week in place of a STAC. Properly meeting the requirements may enter the crew member into a weekly incentive drawing. Items listed on the STAC or CHAT will include but not be limited to the items listed within the tasks, hazards and mitigation section (2) listed above or as compiled at the day zero training.

2. Contractor Safety Representative Duties: Dow requires contractor safety representatives to provide the following support:

- Maintain safety binder for this project (foreman and Dow safe work permit writer will maintain) which will include:
 - Pre-Job.
 - Safety Activity Plan (SAP).
 - Daily Sign-In Sheets (with Safety Talk Topic and Weather Information).
 - Copy of Weekly Tool Box Talks.
 - At Risk/Buddy-Mentor Paperwork.
 - Employee Training Records.
 - Signed Employee Commitments.
 - Weekly Documentation of STAC, Behavior Based Performance (BBP) and Site Audits.
- Turn the Safety Binder into the Dow Safety Rep upon completion of the project.
- Guarantee that everyone who works onsite has reviewed and signed onto:
 - Pre-Job

- Appropriate SAP.
 - Day Zero Information.
 - Any Specific Work Task Procedures.
- Assist or conduct the work-specific morning safety talk.
 - Deliver daily weather information at the safety talk (temperatures and wind direction).
 - Supply the employees with the correct PPE to accomplish their daily work tasks.
 - Ensure hydration fluids are available (i.e. water, sports drinks).
 - Conduct daily jobsite inspections.
 - Conduct BBP Observations.
 - Furnish weekly documentation of the STAC, BBP and Daily Inspections to the Dow Safety Rep.
 - Ensure that truck drivers on the site understand the Dow and job specific rules and regulations, as well as their duties and truck routes for the project. Over the road delivery drivers will be escorted onto the site, and will follow the rules outlined in the trucking policy.
 - Communicate with the project foreman regarding upcoming work so that the safety rep can plan to ensure all the safety provisions are made.
 - Assess weather conditions prior to work.
3. **Morning Safety Meetings:** A morning safety meeting will be conducted prior to any field work. These meetings will determine if weather conditions are appropriate for the tasks being done on that day.
4. **Housekeeping:** Housekeeping is a key task to completing the project safely. It is a continuous operation and is the responsibility of every person on the project. This includes the staging and storage of all materials. Prior to beginning the daily work routine, the work area and walk paths will be cleared of all hazardous elements. There are not to be any material bags, grease tubes, earplugs, or hand tools left on the ground. Contractors will prepare the area by clearing smaller trees and creating pathways to remove trees and brush.
5. **Bad Weather**
- Rainstorm / Snowstorm:
 - No climbing is allowed when it is raining/snowing.
 - Weather information will be communicated at the morning safety meetings.
 - If rainy weather is present, it will be determined if work will begin for the day.
 - If work begins with bad weather approaching, the safety representative will keep an eye on weather radar and notify all foremen when storms are imminent. On occasion, Dow will notify work groups via the Dow emergency radios of approaching storms. Work will stop when weather threatens and all employees will take shelter at the designated assembly area.
 - Lightning:
 - If there is lightning, work will cease, employees assemble, and work will not resume until at least 30 minutes past the last seen lightning strike. New work permits must be issued before resuming work.

- Tornado:
 - If a tornado warning is issued, work will stop.
 - Employees will take shelter at the designated assembly area.
 - Roll will be taken and decision will be made as to whether or not to evacuate the site.
 - Work will resume when the warning has been lifted by the National Weather Service.

6. **Congested Work Areas and General Public:** Pre-planning and good lines of communication with all companies involved on the project will aid in keeping congestion in the work zone(s) to a minimum. This can be accomplished by daily and weekly scheduling by the various foremen and/or project managers. Open lines of communication of the current and upcoming scheduled activities to the impacted property owners, adjacent property owners and public right-of-way groups will help ensure a safe and efficient work-site.

7. **Stinging Insects:** Workers that are stung by insects in the course of their duties will leave the area and notify the foreman and/or safety representative upon which insect spray can be used as needed if insect nest is located.

8. **Slips, Trips, and Falls:** Workers are trained to:

- Watch where they step.
- Pre-plan their routes of travel.
- Use three points of contact while climbing stairs, steps, getting in/out on/off vehicles and equipment.
- Look up for overhead hazards before they walk near buildings, trees, pipelines, and before entering doorways, particularly on days when ice or snow may be thawing.
- Continuous housekeeping.

9. **Ergonomic Injuries:** Workers are instructed to:

- Do warm up exercises prior to starting work each day.
- Never twist or turn when lifting.
- Stand straight, but shift weight from one foot to the other during long standing periods.
- Use padded gloves.
- Perform wrist/hand stretching as necessary.

10. **Back Injuries:** Workers are instructed to:

- Do warm up exercises prior to starting work each day.
- Never twist or turn when lifting.
- Stand straight, but shift weight from one foot to the other during long standing periods.
- Lifting of heavy items heavier than 50 pounds is done by the buddy system, or whenever possible by the use of heavy equipment or other mechanical means.

11. Pinch Points: Workers are to look their tasks over prior to starting them. The employee should take cramped areas into consideration. Is there enough room for total tool usage in the area? Will there be a chance of kick back from the tool? Can the employee maintain a good lasting grip on the tool? Careful hand placement needs to be mentioned on their STAC, and followed through with.

12. Hand Tools: Workers are not to use any hand tools without prior training on that specific tool. If there is a chance of flying debris from the tool a face shield will be used with that tool. Glove usage while operating each tool will be determined by the safety representative. Form fitting gloves may be used while operating some rotating tools, so as not to risk getting caught up into the tool. This also applies to loose fitting apparel. If there is vibration from the tool, during normal and/or extended use, special padded gloves are to be worn for ergonomic purposes. Hearing protection (muff style) will be used when cutting. Cutting chaps will be worn when chain saws are in operation.