Attachment H

Work Plan Addendum
for
Site B-001
Remediation Project

November 9, 2011

Revised
May 25, 2012

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Attachments

Introduction:

During 2010, soil samples were obtained from nine locations in the area near B-001 (referred to as Site B-001). Results have identified concentrations which exceed MDEQ generic non-residential Direct Contact Criteria (DCC) in the upper six inches of soil from within the current perimeter security fence the north, bounded by Austin Street; and to the south, bounded by Bay City Road. This area is located coincident with a historical railroad line apparent in historical aerial photographs. The historic rail lines can be observed on the property to the north across Austin Street. Due to the identified concentrations of dioxins and furans which exceed the Generic Non-Residential DCC in the upper six inches of soil in an uncontrolled location, this area was selected for remediation. A work plan was submitted to MDEQ to conduct the remediation on September 27, 2011 and subsequently approved with modification on October 7, 2011.

MDEQ stipulated that Dow must propose a plan and schedule to investigate concentrations of dioxins and furans along the former rail spur to the north of Austin Street to determine if additional remediation is necessary. This work plan addendum provides the required plan and schedule.

Summary of Existing Data:

The soils data available from the site (roughly 1 acre in extent) include samples from multiple soil intervals as well as different analytical test methods. Laboratory testing of the soil samples obtained from site B-001 was done utilizing both EPA Method 1613b and the Midland Area Soils "Fast Analysis" Method (approved October 21, 2011). Attachment 1 provides a summary of all laboratory testing data results from site B-001. Trace organic laboratory analysis detected individual concentrations of dioxins and furans in the upper six inches of soil ranging from 28 to 10,518 ng/g (ppt TEQ).

For comparison purposes, data from the intervals 0-1" and 1-6" were normalized by a layer-weighted average technique by the following method:

$$0\text{-}6\text{"LWA} = [(0\text{-}1\text{"TEQ} \times 0.1667) + (1\text{-}6\text{"TEQ} \times 0.833)]$$

Where

0-6"LWA = six inch layer-weighted average concentration

0-1"TEQ = TEQ concentration from 0-1" sample interval

1-6"TEQ = TEQ concentration from 1-6" sample interval

Normalized data are provided in Attachment 1. A 95% upper confidence limit of the mean can be established for lognormally distributed data (i.e., data from site B-001), using Land's Method:

$$UCL_{1-\infty} = \exp\left[mean + \frac{s_y^2}{2} + \frac{s_y^2 H_{1-\infty}}{\sqrt{n-1}} \right] (MDEQ, 2002)$$

Where

$H_{1-\alpha}$ = Land's Method H-statistic, in this case α=0.05

s_y = standard deviation

n = number of measurements, in this case n=35

Using this method, the 95% UCL of the mean is compared to the generic Michigan dioxin & furan non-residential DCC. The 95% UCL is 1,384 µg/Kg, prior to remediation. A drawing indicating the results of the 2011 sampling is included in Attachment 2.

Remediation Summary:

The Site B-001 Remediation Project included three specific phases of work both within and directly adjacent to the Michigan Operations Facility, as described in the Work Plan.

Outside Michigan Operations Facility

Excavation at the site was started on October 5, 2011, and completed the next day. Thirty-four (34) 15-cy loads (510 cy total) were removed from the site and transported to Salzburg Landfill for disposal. Restoration was conducted by importing 200 cy of fill on October 6, 2011 and backfilling the excavation. Topsoil was imported on October 6

and 7 to complete the backfill operation. The area was prepared and hydro-seeded on October 10, 2011. Straw blanket was installed on October 11, 2011 to complete restoration activities.

Within Michigan Operations Facility

Topsoil was imported on October 6 and 7 to provide cover over the portion of the site within the Michigan Operations Facility shown on Attachment 2. The area was prepared and hydro-seeded on October 10, 2011. Straw blanket was installed on November 11, 2011 to complete restoration activities.

A total of 960 cy of topsoil was imported on 10/6/11 and 10/7/11 to complete both areas.

Scope of Work:

North of Austin Street across from Site B-001 Remediation Project, a single parcel spans the historic rail line (14-21-20-032), being 514 Sixth St. The property is zoned 1A Industrial, and is in non-residential use. The historic rail line is visible at the surface along this property (in contrast to site B-001 where the rail and most of the rail ties had been removed). Results from previous sampling at site B-001 suggest that the source of the identified dioxins and furans at this site is potentially primarily related to the former rail bed or backfill rather than from historical aerial releases.

There are four objectives for this work plan:

1. Evaluate the soils along the former rail line as a potential alternative source other than historical aerial deposition;
2. Evaluate potential exposure for adjacent properties;
3. Determine if remedy is required along the former rail line or at adjoining properties at this location; and
4. Determine if further delineation is necessary beyond this area.

Consistent with the objectives listed above, to determine if additional actions are required, Dow proposes to attempt to obtain property access and collect one incremental

composite sample and two replicate samples from parcels 14-21-20-014, located at 613 Jefferson and 14-21-20-010, located at 91 Austin Street. These two parcels are currently zoned 1A Industrial, and will be treated as individual DUs. Parcel 14-21-20-032, located at 514 Sixth St, will consist of two DUs. One DU will be an approximately 60-ft wide by 200-ft long buffer roughly centered along the former rail line. The second DU will consist of the remaining property for that parcel. Parcels and DUs are shown on the Proposed Parcel Sampling Plan, in Attachment 2.

The incremental composite sample and replicates will each consist of ten (10) increments for DUs 2 and 3 (they are each less than 0.25-acres). The incremental composite sample and replicates from DUs 1 and 4 will each consist of twenty (20) increments (they are each larger than 0.25- acres, but less than one acre). Increment locations will be selected using a systematic random start equilateral triangular grid (EPA, 2002 and Matske, et al., 2007). The incremental composite sample will be tested for concentrations of dioxins and furans by Method 8280 MAS. If results of testing indicate that a concentration greater than 990 ppt TEQ for the DU, either the DU will be demonstrated to be below an appropriate action level for non-residential use incorporating appropriate site-specific exposure assumptions or a presumptive remedy will be implemented as specified in the Interim Response Activity Plan Designed to Meet Criteria (Section 7.4.7), submitted March 6, 2012.

If results of sampling on any of the four (4) DUs listed above indicate the soils exceed 990 ppt TEQ, Dow will submit a plan for further evaluation of the offsite area to MDEQ for review and approval within 30 days of determination.

Schedule:

Consistent with proposed schedule for the Midland Area Soils Project, it is anticipated that obtaining property access, sampling and construction (if necessary) will be implemented on the same schedule as the Year 1 Study area described in the Midland Area Soils Interim Response Designed to Meet Criteria Work Plan.

Citations:

Matzke, B., et al. 2007. *Visual Sample Plan 5.0 User's Guide*. PNHL-16939. Pacific Northwest National Laboratory, Richland, Washington.

USEPA. 2002. *Guidance on Choosing a Sampling Design for Environmental Data Collection*. EPA QA/G-5S. EPA/240/R-02/005. Office of Environmental Information, U.S. Environmental Protection Agency, Washington, D.C.

MDEQ. 2002. *Sampling Strategies and Statistics Training Materials for Part 201 Cleanup Criteria*.

Attachment 1
Soils Laboratory Data

Summary of Dioxin Furan TEQ Soil Data

Site B-001

Sample ID	WHO-TEQ 2005	Method	units (d.w.)
B1-01_0-1"_11/10/2010_DF	58.4	EPA Method 1613b	ng/Kg
B1-01_1"-6"_11/10/2010_DF	54.7	EPA Method 1613b	ng/Kg
B1-01_6"-1'_11/10/2010_DF	1031	EPA Method 1613b	ng/Kg
B1-01_1'-1'6"_11/10/2010_DF	928	EPA Method 1613b	ng/Kg
B1-01_1'6"-2'0"_11/10/2010_DF	24.4	EPA Method 1613b	ng/Kg
B1-02_0-1"_11/10/2010_DF	186	EPA Method 1613b	ng/Kg
B1-02_1"-6"_11/10/2010_DF	177	EPA Method 1613b	ng/Kg
B1-02_6"-1'_11/10/2010_DF	152	EPA Method 1613b	ng/Kg
B1-02_1'-1'6"_11/10/2010_DF	95.7	EPA Method 1613b	ng/Kg
B1-02_1'6"-2'_11/10/2010_DF	115	EPA Method 1613b	ng/Kg
B1-02R2_0-1"_11/11/2010_DF	228	EPA Method 1613b	ng/Kg
B1-02R2_1"-6"_11/11/2010_DF	267	EPA Method 1613b	ng/Kg
B1-02R2_6"-1'_11/11/2010_DF	86.4	EPA Method 1613b	ng/Kg
B1-02R2_1'0"-1'6"_11/11/10_DF	67.7	EPA Method 1613b	ng/Kg
B1-02R2_1'6"-2'0"_11/11/2010_DF	58.8	EPA Method 1613b	ng/Kg
B1-02R5_0-1"_11/10/2010_DF	276	EPA Method 1613b	ng/Kg
B1-02R5_1"-6"_11/10/2010_DF	223	EPA Method 1613b	ng/Kg
B1-02R5_6"-1'_11/10/2010_DF	143	EPA Method 1613b	ng/Kg
B1-02R5_1'-1'6"_11/10/2010_DF	64.0	EPA Method 1613b	ng/Kg
B1-02R5_1'6"-2'_11/10/2010_DF	1.3	EPA Method 1613b	ng/Kg
B1-02R10_0-1"_11/11/2010_DF	287	EPA Method 1613b	ng/Kg
B1-02R10_1"-6"_11/11/2010_DF	300	EPA Method 1613b	ng/Kg
B1-02R10_6"-1'_11/11/2010_DF	177	EPA Method 1613b	ng/Kg
B1-02R10_1'-1'6"_11/11/2010_DF	14.2	EPA Method 1613b	ng/Kg
B1-03_0-1"_11/11/2010_DF	2311	EPA Method 1613b	ng/Kg
B1-03_1"-6"_11/11/2010_DF	654	EPA Method 1613b	ng/Kg
B1-03_6"-1'_11/11/2010_DF	116	EPA Method 1613b	ng/Kg
B1-03_1'-1'6"_11/11/2010_DF	21.6	EPA Method 1613b	ng/Kg
B1-03R2_0-1"_11/11/2010_DF	1087	EPA Method 1613b	ng/Kg
B1-03R2_1"-6"_11/11/2010_DF	155	EPA Method 1613b	ng/Kg
B1-03R2_6"-1'_11/11/2010_DF	96.1	EPA Method 1613b	ng/Kg
B1-03R2_1'-1'6"_11/11/2010_DF	2.1	EPA Method 1613b	ng/Kg
B1-03R5_0-1"_11/12/2010_DF	2749	EPA Method 1613b	ng/Kg
B1-03R5_1"-6"_11/12/2010_DF	988	EPA Method 1613b	ng/Kg
B1-03R5_6"-1'_11/12/2010_DF	241	EPA Method 1613b	ng/Kg
B1-03R5_1'-1'6"_11/12/2010_DF	26.4	EPA Method 1613b	ng/Kg
B1-03R10_0-1"_11/12/2010_DF	1660	EPA Method 1613b	ng/Kg
B1-03R10_1"-6"_11/12/2010_DF	10518	EPA Method 1613b	ng/Kg
B1-03R10_6"-1'_11/12/2010_DF	1301	EPA Method 1613b	ng/Kg
B1-03R10_1'-1'6"_11/12/2010_DF	76	EPA Method 1613b	ng/Kg
B1-03R10_1'6"-2'_11/12/2010_DF	50.8	EPA Method 1613b	ng/Kg

Summary of Dioxin Furan TEQ Soil Data

Site B-001

Sample ID	WHO-TEQ 2005	Method	units (d.w.)
B1-32_0-6"_7/7/11_DF	1030	Method 8280 MAS	ng/Kg
B1-33_0-6"_7/7/11_DF	866	Method 8280 MAS	ng/Kg
B1-34_0-6"_7/7/11_DF	801	Method 8280 MAS	ng/Kg
B1-35_0-6"_7/7/11_DF	1160	Method 8280 MAS	ng/Kg
B1-07_0-6"_7/7/11_DF	473	Method 8280 MAS	ng/Kg
B1-06_0-6"_7/7/11_DF	363	Method 8280 MAS	ng/Kg
B1-05_0-6"_7/7/11_DF	389	Method 8280 MAS	ng/Kg
B1-04_0-6"_7/7/11_DF	252	Method 8280 MAS	ng/Kg
B1-09_0-6"_7/7/11_DF	2080	Method 8280 MAS	ng/Kg
B1-10_0-6"_7/7/11_DF	963	Method 8280 MAS	ng/Kg
B1-11_0-6"_7/7/11_DF	314	Method 8280 MAS	ng/Kg
B1-14_0-6"_7/7/11_DF	407	Method 8280 MAS	ng/Kg
B1-13_0-6"_7/7/11_DF	1710	Method 8280 MAS	ng/Kg
B1-08_0-6"_7/7/11_DF	668	Method 8280 MAS	ng/Kg
B1-17_0-6"_7/7/11_DF	380	Method 8280 MAS	ng/Kg
B1-18_0-6"_7/7/11_DF	699	Method 8280 MAS	ng/Kg
B1-22_0-6"_7/7/11_DF	349	Method 8280 MAS	ng/Kg
B1-21_0-6"_7/7/11_DF	1100	Method 8280 MAS	ng/Kg
B1-24_0-6"_7/7/11_DF	28	Method 8280 MAS	ng/Kg
B1-25_0-6"_7/7/11_DF	1660	Method 8280 MAS	ng/Kg
B1-26_0-6"_7/7/11_DF	865	Method 8280 MAS	ng/Kg
B1-27_0-6"_7/7/11_DF	348	Method 8280 MAS	ng/Kg
B1-28_0-6"_7/7/11_DF	146	Method 8280 MAS	ng/Kg
B1-29_0-6"_7/7/11_DF	143	Method 8280 MAS	ng/Kg
B1-30_0-6"_7/7/11_DF	94.0	Method 8280 MAS	ng/Kg
B1-31_0-6"_7/7/11_DF	141	Method 8280 MAS	ng/Kg

Layer Weighted Averages
for
0-1" and 1-6" Intervals
Site B-001

Client's sample identity	WHO-TEQ 2005	Method	units (d.w.)
B1-01_0-1"_11/10/2010_DF	58.4	EPA Method 1613b	ng/Kg
B1-01_1"-6"_11/10/2010_DF	54.7	EPA Method 1613b	ng/Kg
B1-01_0-6" Normalized	55	Normalized	ng/Kg
B1-02_0-1"_11/10/2010_DF	186	EPA Method 1613b	ng/Kg
B1-02_1"-6"_11/10/2010_DF	177	EPA Method 1613b	ng/Kg
B1-02_0-6" Normalized	178	Normalized	ng/Kg
B1-02R2_0-1"_11/11/2010_DF	228	EPA Method 1613b	ng/Kg
B1-02R2_1"-6"_11/11/2010_DF	267	EPA Method 1613b	ng/Kg
B1-02R2_0-6" Normalized	260	Normalized	ng/Kg
B1-02R5_0-1"_11/10/2010_DF	276	EPA Method 1613b	ng/Kg
B1-02R5_1"-6"_11/10/2010_DF	223	EPA Method 1613b	ng/Kg
B1-02R5_0-6" Normalized	232	Normalized	ng/Kg
B1-02R10_0-1"_11/11/2010_DF	287	EPA Method 1613b	ng/Kg
B1-02R10_1"-6"_11/11/2010_DF	300	EPA Method 1613b	ng/Kg
B1-02R10_0-6" Normalized	298	Normalized	ng/Kg
B1-03_0-1"_11/11/2010_DF	2311	EPA Method 1613b	ng/Kg
B1-03_1"-6"_11/11/2010_DF	654	EPA Method 1613b	ng/Kg
B1-03_0-6" Normalized	931	Normalized	ng/Kg
B1-03R2_0-1"_11/11/2010_DF	1087	EPA Method 1613b	ng/Kg
B1-03R2_1"-6"_11/11/2010_DF	155	EPA Method 1613b	ng/Kg
B1-03R2_0-6" Normalized	311	Normalized	ng/Kg
B1-03R5_0-1"_11/12/2010_DF	2749	EPA Method 1613b	ng/Kg
B1-03R5_1"-6"_11/12/2010_DF	988	EPA Method 1613b	ng/Kg
B1-03R5_0-6" Normalized	1283	Normalized	ng/Kg
B1-03R10_0-1"_11/12/2010_DF	1660	EPA Method 1613b	ng/Kg
B1-03R10_1"-6"_11/12/2010_DF	10518	EPA Method 1613b	ng/Kg
B1-03R10_0-6" Normalized	9042	Normalized	ng/Kg

Attachment 2
Site Maps

14-21-20-194
14-21-20-172
14-21-20-140
14-21-20-150
14-21-20-110
14-22-70-028
14-21-20-210
14-21-20-088
14-21-20-096
14-22-70-034
14-21-20-088
14-21-20-154
14-21-20-026
Former Rail Spur
14-21-20-024
14-21-20-022
14-22-70-046
DU3
14-21-20-014
Sixth Street
14-21-20-032
14-21-20-034
14-21-20-010
Jefferson Road
14-22-70-064
DU1
DU2
DU4
Austin Street
14-21-20-210
14-21-20-324
Current Facility Fenceline
14-21-20-044
14-21-20-004
14-22-70-102
14-21-20-062
Bay City Road

URS
Dow Business Unit

Proposed Parcel Sampling Plan
Site B-1
The Dow Chemical Company
Michigan Operations

Drawn: MDC	Approximate Scale: 1" = 100'
Date: 14 May 2012	Drawing File: 2011_remediation_plan-addendum.mxd

Legend

- Decision Unit for Follow-Up Sampling
- DowProperty
- Parcels
- 2011 Remediation Areas