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May 31, 2013
File: 193700825

**Attention: Shanna Schmitt**
Minnesota Pollution Control Agency
MNTBA Program Assistant Coordinator
VICP Remediation Division
520 Lafayette Road North
St. Paul, MN 55155

**Reference: Phase II Investigation Report – Addendum. Former H.D. Hudson Manufacturing Facility, 200 West 2nd Street, Hastings, MN. Tax Base Revitalization Account Contaminated Cleanup Site Investigation Grant Program Grant No. SG011-064**

Dear Ms. Schmitt,

Stantec Consulting Services, Inc. (Stantec), on behalf of the City of Hastings/Hastings Economic Development and Redevelopment Authority (HEDRA) has prepared the following addendum to the Phase II Investigation Report for the referenced property. This addendum provides the modifications and additional information requested in your email communication dated November 30, 2012 on the report submittal dated September 5, 2012. Preparation of this addendum was delayed in order to permit reuse plans for the Site to become more clearly defined. Our response is being provided as an addendum both to minimize waste associated with reissuing copies of the full report, and facilitate review of the new information without having to review the 90% or more of the report sections in which no changes were made.

Revisions are presented below for the following report sections: 4.3.1, 4.4, 5.3, 5.7, and 6.0. Each section is preceded by the applicable MPCA comments as well as any necessary Stantec explanatory comments.

***MPCA Comment #1:*** *At this Site proximity to the Mississippi River brings Surface Water Quality Standards (SWQS) into play. The MPCA evaluates groundwater to surface water discharges by measuring groundwater constituents in the wells closest to the river and compares them to the SWQS for that stretch of the river. The SWQS for the Mississippi River should be listed as regulatory criteria for the Site. If SWQS are exceeded in the wells then SWQSs are considered to be in exceedance and remedial action is required. Please modify this section to include SWQSs. Please evaluate groundwater data and update this section to include comparison to SWQSs.*

***Stantec Response:*** MPCA Tier 1 Surface Water Screening Values have been added to Table 5. As directed, Stantec contacted Phil Monson at MPCA and discussed the SWQS. Mr. Monson stated that while the MPCA Tier 1 Surface Water Screening Value for barium is 4 micrograms per liter (µg/L), he would not recommend using this concentration for decisions regarding site remediation as it is a very conservative value. The barium

MPCA Tier 1 Surface Water Screening Value was left on Table 5 but Mr. Monson comment was added to the table notation.

***Revised Report Section:***

**4.3.1 Regulatory Criteria Used to Evaluate Groundwater Chemistry Data**

Groundwater chemistry data were evaluated by comparing the measured concentrations to the following four criteria:

- MPCA Tier 1 Surface Water Screening Values
- MDH HRLs for groundwater,
- U.S. EPA maximum contaminant levels (MDLs), and
- U.S. EPA maximum contaminant level goals (MCLGs).

These criteria are presented in Table 5 together with the groundwater chemistry data. Concentrations that exceed one or more of the criteria are designated with green, purple, red or blue colored text.

The MPCA Tier 1 Surface Water Screening Value for barium is 4 µg/L. In an email exchange with Phil Monson, a research scientist with MPCA, Mr. Monson stated that this is a very conservative value and that he would not recommend using this concentration for decisions regarding site remediation.

***MPCA Comment #2:*** *Please modify this section regarding the previous modification.*

***Stantec Response:*** The revised report section is presented below.

***Revised Report Section:***

**4.4 RESULTS OF SURFACE WATER AND ECOLOGICAL INVESTIGATION**

An ecological evaluation was not conducted as the Site in it's entirely is either covered by buildings, asphalt pavement, or grass-covered landscaped areas. The Site is not directly bordered by any properties with sensitive environments.

Surface water was not directly evaluated as part of the Phase II Investigation. The nature, magnitude and extent of surface water impacts was evaluated by comparing laboratory analytical results from the most recent groundwater sample collected from monitoring well MW-3, the off-site well closest to the Mississippi River.

**4.4.1 Regulatory Criteria Used to Evaluate Surface Water Chemistry Data**

Surface water chemistry data were evaluated by comparing the measured concentrations in the groundwater sample collected by Stantec in 2012 from monitoring well MW-3 to the following three criteria:

- MPCA Tier 1 Surface Water Screening Values,
- U.S. EPA MDLs, and
- U.S. EPA MCLGs.

These criteria are presented in Table 5 together with the groundwater chemistry data. Concentrations that exceed one or more of the criteria are designated with green, purple or orange colored text.

### 4.4.2 VOCs

At monitoring well MW-3, located just north of the property boundary in the northeast corner of the Property, the concentrations of chlorinated VOCs in the groundwater sample collected by Stantec in 2012 exceed the MPCA Tier 1 Surface Water Screening Values for:

- vinyl chloride (for which the measured concentration of 0.48 µg/L is 2.8 times greater than the MPCA Tier 1 Surface Water Screening Values of 0.17 µg/L),
- cis-1,2-DCE (for which the measured concentration of 108 µg/L is 1.5 times greater than the MPCA Tier 1 Surface Water Screening Values of 70 µg/L), and
- TCE (for which the measured concentration of 34.4 µg/L is 6.9 times greater than the MPCA Tier 1 Surface Water Screening Values of 5 µg/L).

No other VOC concentrations in groundwater samples collected from monitoring well MW-3 exceeded the MPCA Tier 1 Surface Water Screening Values.

### 4.4.3 Barium

As shown in Table 5, the barium concentration measured in the groundwater sample collected by Stantec in 2012 from monitoring well MW-3 (94.2 µg/L) is 23.6 times the MPCA Tier 1 Surface Water Screening Values of 4 µg/L. No other RCRA metal concentration in the groundwater sample collected by Stantec in 2012 from monitoring well MW-3 exceeded the MPCA Tier 1 Surface Water Screening Values.

***MPCA Comment #3:*** *Please add the groundwater to surface water pathway to this section.*

***Stantec Response:*** Stantec has added two additional pathways of concern to Table 10 – Stormwater and Surface Water. The potential receptors have remained the same. The revised report section is presented below.

**Reference: Phase II Investigation Report Addendum, Former H.D. Hudson Manufacturing Facility**

***Revised Report Section:***

**5.3 POTENTIAL EXPOSURE PATHWAYS OF CONCERN**

The potential exposure pathways evaluated were:

- Contaminated surface soil (from 0.0 to 0.5 feet bgs)
- Subsurface soil and bedrock (from 0.5 feet bgs to the water table surface)
- Groundwater
- Stormwater
- Surface water

The potential receptors that were evaluated were:

- Future on-site outdoor commercial or industrial workers
- Future on-site indoor commercial or industrial workers
- Future on-site recreational users
- Future on-site construction workers
- Future on-site residents
- Current and future off-site residents
- Current trespassers

Table 10 presents a summary of these exposure pathways, and whether the pathways are considered to be potentially complete or likely incomplete for each receptor category. Threats to current construction workers using a portion of the northeast quadrant of the Site during reconstruction of the Highway 61 bridge are not evaluated in this report, as this portion of the Site was evaluated independently (by URS) as part of planning for the bridge project and assessment of exposure risks for those workers is the responsibility of others (contractors working for the State of Minnesota with full access information regarding the environmental condition of this portion of the Property). A copy of this report will be made available to the designated contact for this project so that the additional data acquired as part of the Phase II Investigation and relevant to environmental conditions in the northeast quadrant will be available for their future consideration as appropriate.

***MPCA Comment #4:*** *It is uncertain if dilution of groundwater in the Mississippi River is allowed at this location on the river. Please see modification above to Section 4.3.1 to determine how groundwater to surface water should be evaluated. Phil Monson of the MPCA (phil.monson@state.mn.us) should be contacted to SWQS information and dilution information.*

***Stantec Response:*** Phil Monson of the MPCA was contacted. The section was revised to include dilution information based on the 7Q10 flow rate per Mr. Monson. The revised report section on the surface water risk evaluation is presented below. Conclusions and recommendations related to surface water have been added to the revised text for Section 6.0, presented later in this letter.

**Reference: Phase II Investigation Report Addendum, Former H.D. Hudson Manufacturing Facility**

***Revised Report Section:***

### 5.7 SURFACE WATER RISK EVALUATION

As noted in Section 4.4, surface water was not specifically investigated as part of the Phase II Investigation. The Mississippi River directly borders a portion of the Site. Impacts to surface water flowing into the River could occur via a number of pathways – in particular: (a) via contamination of surface water runoff via overland flow across areas of exposed contaminated soil, and continued flow and discharge to the edge of the River, and (b) via subsurface flow and discharge of contaminated groundwater. It is anticipated that threats to surface water from contaminated surface water runoff would be limited. It is also anticipated that whatever measures are necessary to address this exposure pathway will be accomplished in conjunction with measures to address this same soil for risks associated with direct contact by humans. It is anticipated that these measures will consist of a combination of removal and off-site disposal, and construction of engineered barriers to prevent both direct contact and exposure to surface water runoff.

It is unconfirmed whether contaminated groundwater is discharging to the Mississippi River. It is considered likely that some discharge is occurring due to: (a) the presence of documented groundwater impacts within approximately 70 feet of the edge of the River, (b) the presence of contaminated groundwater within bedrock (presumably fractured), (c) the documented flow direction for shallow groundwater towards the River (as shown in Figure 6), and (d) previous studies in similar geologic settings. The volume of contaminated groundwater discharging to the River is also undetermined, and dependent on a large number of variables, including whether the contamination is associated with an on-site source or one or more undocumented upgradient contamination sources.

As noted in Section 5.6, the primary constituents of concern for groundwater are cis-1,2-DCE, TCE, and vinyl chloride. In the impacted monitoring well located closest to the River, MW-3, the concentrations of these constituents measured in the groundwater sample collected in June 2012 were approximately 2.5 to 7 times greater than the MDH HRLs and 1.5 to 7 times greater than the MPCA Tier 1 Surface Water Screening Values, with the exception of barium.

Using the methodology outlined in the MPCA *Working Draft Surface Water Pathway Evaluation User's Guide* (MPCA, 2006), the plume discharge from stormwater/surface water effects can be calculated using the equation:

$$Pf = P * A * 0.07753$$

where:

Pf = Plume discharge in liters/day;

P = Annual site precipitation; 31 inches/yr or 2.58 ft/yr;

A = Site area that contains significantly impacted soil not covered by building slabs or pavement; (estimated based on Figure 10 to equal 0.42 acres for TCE – or 18,300 $ft^2$ in the equation).

The plume discharge is estimated to be 3,660 liters per day (L/d).

A mass balance equation was used to calculate the downstream concentration of these constituents, after dilution, using the concentrations observed in monitoring well MW-3 as the plume concentration. Using the equation:

$$Dc = \frac{(Pc * Pf) + (Rc * Rf)}{Pf * Rf}$$

where:

Dc = Downstream concentration in µg/L

Pc = Plume concentration in µg/L from Table 5;

Pf = Plume discharge in liters/day;

Rc = River background concentration in µg/L; 0 µg/L for VOCs per Mr. Monson at MPCA and 15 µg/L for barium per the Agency for Toxic Substances and Disease Registry;

Rf = low flow 7Q10 of the River in liters/day; 1700 cubic feet per second (cfs) or 4,160,000,000 L/d per Mr. Monson at MPCA

The calculated downstream concentrations for cis-1,2-DCE, TCE, and vinyl chloride, after dilution, are:

- cis-1,2-DCE = $2.59 \times 10^{-8}$ µg/L
- TCE = $8.27 \times 10^{-9}$ µg/L
- Vinyl chloride = $1.15 \times 10^{-10}$ µg/L
- Barium = 0.0041µg/L

Using the simple Tier 2 screening methodology outlined in the MPCA *Working Draft Surface Water Pathway Evaluation User's Guide* (MPCA, 2006), these values were compared to the MPCA Tier 1 Surface Water Screening Values, the most conservative of all Tier 2 standards, shown on Table 5.

| Chemical | Calculated Downstream Concentration After Dilution (µg/L) | Most Conservative Tier 2 Standard (µg/L) |
|---|---|---|
| cis-1,2-DCE | $2.59 \times 10^{-8}$ | 70 |
| TCE | $8.27 \times 10^{-9}$ | 5 |
| Vinyl chloride | $1.15 \times 10^{-10}$ | 0.17 |
| Barium | 0.0041 | 4 |

The calculated downstream VOC concentrations, after dilution, are millions of times less than the most conservative Tier 2 standard. The calculated downstream concentration for barium, after dilution, is approximately one thousand times less than the most conservative Tier 2 standard. Per MPCA guidelines, no remediation for protection of a stream or river is needed when the concentration of each contaminant does not and will not exceed the most restrictive standard after mixing.

***MPCA Comment #5:*** *Prior to preparation of the RAP the applicable soil cleanup scenario for the land uses for the Site should be considered. The MPCA VIC program uses the following cleanup scenario:*

- *Green Space Areas – Soil should be cleaned up to a minimum of 4 feet in depth using residential SRVs, and for VOCs the SLVs should also be meet in green space areas since infiltration to the bedrock aquifers below is a potential pathway for groundwater and surface water impacts.*
- *Beneath Impervious Parking Lots Roads or Buildings – The MPCA requires 2 feet of clean buffer soil beneath building and impervious surfaces. Source area for vapor and groundwater impacts should be removed before construction.*
- *Utility Corridors – Utility corridors should be backfilled with soil that meets the land use of the overlying property. In addition, vapor barrier measures should be used to prevent vapor migration from the Site into Site buildings. At some sites developers use "clean corridors" for utility installations.*
- *Vapor Mitigation – Vapor mitigation measures should be applied to new and old building in the event that vapors below existing or proposed structures exceed 10-times (10X) the appropriate ISV for the building use.*
- *Groundwater to Surface Water Discharge – Impacted groundwater that is expected to discharge to the Mississippi River should meet the appropriate SWQSs for the location of the Site on the Mississippi River*

***Stantec Response:*** The referenced MPCA VIC program cleanup scenarios have been incorporated into the conclusions and recommendations regarding soil, soil vapor, and surface water impacts presented below.

***Revised Report Section:***

**6.0 CONCLUSIONS AND RECOMMENDATIONS**

The most significant conclusions resulting from the findings of the Phase II Investigation are presented below, together with any associated recommendations for addressing site conditions as part of future site development.

**1) Soil Impacts:** Significant soil impacts are present at the Site. The most significant impacts in soil appear to be associated with arsenic, lead, DRO, and TCE, and these four constituents will likely determine most remedial requirements for soil at the Site. Contaminants of secondary importance include antimony, cadmium, copper, mercury, selenium, and silver as well as other chlorinated VOCs (1,1,1-TCA, 1,1-DCE, and cis-1,2-DCE), and BaP equivalent. These "secondary" contaminants occur at select sampling locations at concentrations that exceed MPCA guidance criteria, but the locations appear to coincide with areas where measures to address the primary contaminants will already be necessary. Constituents that were not detected in soil by Stantec at levels that exceed Tier 1 or Tier 2 SRVs or Tier 1 SLVs include cyanide, GRO, PCBs, pesticides, individual SVOCs, petroleum and other VOCs not referenced above, and other metals (barium, beryllium, chromium, nickel, and zinc).

Soil within approximately 80% of the Property is currently covered by either building slabs or asphalt or concrete pavement. Threats to human health from direct contact are currently limited to an approximate 0.40-acre portion of the Site that contains significantly impacted soil that is not covered by building slabs or pavement. This soil is located primarily in three areas: (a) the northwest quadrant in areas north of the 1974 building addition near the Mississippi River, (b) in the northeast quadrant in the former area of the building demolished during 2011 as part of Highway 61 bridge project, and (c) the landscaped area in the southeast quadrant. Additional areas of impacted soil will be exposed in the near future if the 1974 building addition is demolished as planned.

**Recommendation(s):** A development response action plan (DRAP) should be prepared to address the impacted soil areas for which one or more contaminants exceed Tier 1 or Tier 2 SRVs or Tier 1 SLVs. Prior to preparation of the DRAP, the soil cleanup scenarios applicable to the specific development plan should be considered. A significant portion of the impacted soil can potentially be managed in place using either engineering or institutional controls. This may be particularly applicable to areas of the Site that will be developed for public greenspace or other public use and remain under ownership by the City/HEDRA. In areas that are intended to be sold and transferred to private ownership, it is likely that there will be increased benefits from removing the soil rather than managing the soil in place. This is particularly true for VOC or petroleum-related contaminants for which there could be on-going vapor intrusion concerns if the soil remains in place, or for which there are documented groundwater or surface water impacts (such as TCE) where the impacted soil could act as or be perceived as a continuing source for groundwater or surface water impacts.

Areas to be developed as greenspace will require the presence at the surface of a 4-foot thick or greater layer of clean soil that meets the residential SRVs. Soil in these areas impacted with VOCs will also need to meet the SLVs due to the potential for infiltration of surface water runoff and leaching of VOCs from soil into the underlying bedrock aquifer. Areas to be developed as parking lots or covered by buildings will require presence of at least a 2-foot thick buffer layer of clean soil below the slabs/pavement, and removal of soil that could represent an on-going source of contamination for vapor or groundwater. Soil removed from utility corridors will need to meet the soil standards applicable for the land use of the overlying property if placed back into the corridor.

**2) Groundwater Impacts:** Significant groundwater impacts are present beneath or immediately adjacent to the Site. The most significant groundwater impacts appear to be associated with TCE, degradation products of TCE (cis-1,2-DCE and vinyl chloride), and DRO. Groundwater contaminants of lesser significance include GRO, several petroleum VOCs, and several dissolved metals.

**Recommendation(s):** At least one additional round of monitoring for VOCs should be conducted at wells MW-3 and 1_MW_5 to further assess trends in the concentrations of TCE, cis-1,2-DCE, and vinyl chloride. A request for a "No Association Determination Letter" should be submitted to MPCA staff in the VIC Program with respect to groundwater contamination at the Site. If future development activities that may result in excavation or construction below the water table, and the potential need for dewatering, these activities should be planned in a manner that fully considers: (a) the potential influence on areas of contaminated groundwater, including both the possibility that pumping will alter the groundwater flow conditions at the Site and cause contaminated groundwater to move into areas of the Site that were previously not impacted, and (b) the potential need to manage and treat any groundwater that is extracted during dewatering.

**3) Surface Water Impacts:** Per MPCA *Working Draft Surface Water Pathway Evaluation User's Guide* (MPCA, 2006), no remediation for protection of surface water is needed as the concentration of each contaminant in monitoring well MW-3, the well closest to the River, does not and will not exceed the most restrictive standard after mixing.

**Recommendation(s):** If MPCA concurs with the evaluation of risks to surface water presented herein, then no further assessment or measures to address potential risks to surface water are recommended.

**4) Soil Vapor Impacts:** Significant soil vapor impacts are present at the Site, with the measured concentration of TCE in one sample (1_VP_10) being nearly 1,000 times greater than the risk ISV for industrial sites, and more than 2,500 times greater than the risk ISV for residential sites. Three VOCs (benzene in one sample, carbon tetrachloride in one sample, and TCE in 6 samples) were detected at concentrations that exceed 10X the residential ISVs. The sample with the high benzene concentration (1_VP_6) was collected near the south property boundary adjacent to well MW-1. The samples with TCE at concentrations that exceed 10X the residential ISV were located within the east wing of the "F"-shaped building (1_VP_8), within the north-central building (1_VP_9), and near the north property boundary in the area of TCE-impacted soil in the northeast quadrant (1_VP_10). Results obtained by Stantec suggest that data for two samples collected by Liesch as part of the Phase II ESA (SV-1 and SV-4) are not reliable, as the samples appear to have been switched or mislabeled.

**Recommendation(s):** Response actions will likely be required to address the soil gas concentrations that exceed 10X the ISVs. These could include: (a) remediation of the source of the vapor contamination through soil excavation and disposal or soil vapor extraction, (b) preventing vapor intrusion at the receptor using building control technologies (such as venting systems or passive vapor barriers for new construction), or (c) controlling vapor intrusion risks through institutional controls, long-term monitoring, engineering controls or other long-term management tools. The specific response actions utilized will depend in part on specific redevelopment plans, available funding to pay for response actions, and developer or other future user requirements.

Source areas for on-going vapor impacts should be removed from beneath areas where impervious roads, parking lots, or building slabs will be constructed. Vapor barrier measures should be used to prevent vapor migration from the Site into Site buildings where utilities enter buildings

**5) Historic Fill:** Historic fill materials are present at the Site, including materials associated with two documented historic dump sites. Much of the fill material is impacted with metals and petroleum constituents. Some of the fill material is significantly impacted with lead. Some of the material contains waste materials that would result in the material needing to be handled as a solid waste if excavated, irrespective of contaminant concentrations. TCLP and other analyses performed on samples of fill materials suggest that it is not characteristically hazardous and also that it will likely meet Dakota County-specific landfill acceptance criteria, if excavated. A majority of the historic fill materials are located beneath the western portion of the 1974 building addition. Not all fill within this area is contaminated as it appears from field observations that some historic fill was removed as part of site preparation for construction of the building addition, and "clean" sand fill was likely placed in other areas to level the Site for construction of the floor slab, which is level throughout this area of the Site.

**Recommendation(s):** Planning for future construction within the areas of historic fill should consider both the areas having documented contaminant concentrations that exceed Tier 1 or Tier 2 SRVs or Tier 1 SLVs, as well as additional areas that may be minimally impacted with contaminants but contain fill materials that will be to be managed as a waste if excavated.

**6) Historic Land Uses:** The Site has a more than 145-year history of multiple commercial, industrial, and residential uses. At least 14 structures (including several multi-story warehouse or industrial buildings) were present at the Property by 1867. A map dated 1884 shows at least 30 separate

buildings on the Property – none of which are still in existence. In addition, several streets that occupied portions of the Property were vacated as part of historic development of the Property, and may be associated with abandoned or undocumented sewers or utility lines.

**Recommendation(s):** The long, complex, and varied history of land uses should be carefully considered in interpreting soil chemistry data at the Site, as well as in designing remedial measures. There are likely numerous buried utility lines, foundations, and other anthropogenic features in the subsurface associated with these historic buildings and vacated streets. Any plans for remedial excavation should include the expectation that numerous buried foundations may be encountered within planned excavation areas. Soil vapor extraction, if proposed, should anticipate the potential presence of abandoned sewers or other historic subsurface conduits that could provide preferential pathways for vapor migration, complicating design of remedial measures for soil vapors. As a consequence, remedial measures that can address both documented and undocumented occurrences of contamination and potential migration pathways within the soil will be added value in developing cost effective cleanup plans. These could include full removal of impacted soil in areas where the depth to bedrock is relatively shallow, or use of engineered caps throughout areas subject to direct contact or infiltration of precipitation.

**7) Hydrogeological Conditions:** The site hydrogeology is relatively complex, with shallow bedrock beneath much of the Site, and at least a 45-foot drop in the elevation of the bedrock surface along the northern portion of the Property, where the water table emerges from the bedrock aquifer into an alluvial aquifer bordering the Mississippi River. Flow within the bedrock aquifer may be complex and controlled by as yet undefined vertical fracture zones and horizontal dissolution horizons. Infiltration of surface water to groundwater is likely to be highly variable across the Site, and controlled by as yet unmapped fracture occurrences. Variations in the elevation of the Mississippi River are likely to have a significant influence on groundwater flow patterns at the Site, with possible reversals of flow occurring during periods of flooding.

**Recommendation(s):** Future planning for the Site should carefully consider the shallow depth to bedrock as well as the possibility of significant increases in the elevation of the water table at the Site during periods of high water in the Mississippi River.

***Additional Stantec Comments:*** The following additional references have been added to Section 8.0.

**8.0 REFERENCES**

MPCA, *Working Draft Surface Water Pathway Evaluation User's Guide*, 2006.
ATSDR, *Toxicological Profile – Barium*, PB2008-100003, August 2007

**Reference: Phase II Investigation Report Addendum, Former H.D. Hudson Manufacturing Facility**

Please contact us if you have any questions regarding this report addendum.

Sincerely,

**STANTEC CONSULTING SERVICES INC.**

David C. Constant, P.G.
Project Manager/Senior Hydrogeologist

**STANTEC CONSULTING SERVICES INC.**

David B. Holmes, P.G.
Senior Environmental Scientist

Attachments: Table 5 – Groundwater Chemistry Data (All Consultants, 2009-2012)
Table 10 – Exposure Pathways

c. Cathy Undem, Hydrogeologist, Dakota County
Rosita Clarke-Moreno, U.S. EPA
John Hinzman, City of Hastings/HEDRA
John Betcher, MPCA

TABLE 5 - GROUNDWATER CHEMISTRY DATA (ALL CONSULTANTS, 2009-2012)
PHASE II INVESTIGATION REPORT, FORMER H.D. HUDSON MANUFACTURING FACILITY PROPERTY, HASTINGS, MN

| Source of Data | Well or Boring Designation | Sample Type | Sample Location (On-Site or Off-Site) | Sample Number | Date | Screen Interval for Wells (feet below grade) | Total Boring Depth for Grab Samples (feet below grade) | Description of Aquifer | GRO/DRO (mg/L) | | Volatile Organic Compounds (ug/L) | | | | | | | | | | | | | | | | | Metals and Cyanides (ug/L) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | DRO | GRO | Benzene | 1,1 - Dichloroethane | 1,1 - Dichloroethylene | cis-1,2 - Dichloroethylene | Trans-1,2-Dichloroethylene | Ethylbenzene | Isopropylbenzene (Cumene) | Naphthalene | n-Propylbenzene | Tetrachloroethylene | Toluene | Trichloroethylene | 1,2,4-Trimethylbenzene | 1,3,5-Trimethylbenzene | Vinyl chloride | Xylene (Total) | m&p-Xylene | o-Xylene | Arsenic | Barium | Cadmium | Chromium | Lead | Mercury | Selenium | Silver | Cyanide |
| MPCA Tier 1 Surface Water Screening Values (ug/L) | | | | | | | | | NE | NE | 5 | 3.5 | 7 | 70 | 100 | 68 | NE | 81 | NE | 3.8 | 253 | 5 | NE | NE | 0.17 | 166 | NE | NE | 2.00 | 4 (4) | 2.1 | 395 | 8.7 | 0.01 | 5 | 0.12 | 5.2 |
| MDH Health Risk Limits (HRLs) for Groundwater (ug/L) | | | | | | | | | 0.2 (1) | 0.2 (1) | 2 | 100 | 200 | 50 | 100 | 50 | 300 | 300 | NE | 5 | 200 | 5 | 100 | 100 | 0.2 | 300 | NE | NE | NE | 2,000 | 4 | NE | 15 (2) | NE | 30 | 30 | 100 |
| U.S. EPA Maximum Contaminant Level Goal (MCLG) (ug/L) | | | | | | | | | NE | NE | 0 | NE | 7 | 70 | 100 | 700 | NE | NE | NE | 0 | 1000 | 0 | NE | NE | 0 | 10000 | NE | NE | 0 | 2,000 | 5 | 100 | 0 | 2 | 50 | NE | 200 |
| U.S. EPA Maximum Contaminant Level (MCL) (ug/L) | | | | | | | | | NE | NE | 5 | NE | 7 | 70 | 100 | 700 | NE | NE | NE | 5 | 1000 | 5 | NE | NE | 2 | 10000 | NE | NE | 10 | 2,000 | 5 | 100 | NE | 2 | 50 | NE | 200 |
| Stantec - Phase II Investigation | MW-1 | Well | On | 1_MW_1 | 06/11/12 | 8.5-28.5 | NA | Limestone | - | - | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <4.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <0.40 | <3.0 | <2.0 | <1.0 | <10 | 96.5 | <2.0 | <10 | <3.0 | <0.20 | <20 | <10 | - |
| | MW-2 | Well | Off (W) | 1_MW_2 | 06/11/12 | 8-28 | NA | Silt | - | - | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <4.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <0.40 | <3.0 | <2.0 | <1.0 | <10 | 82.4 | <2.0 | <10 | <3.0 | <0.20 | <20 | <10 | - |
| | MW-3 | Well | Off (N) | 1_MW_3 | 06/11/12 | 9.5-29.5 | NA | Limestone | - | - | <1.0 | <1.0 | <1.0 | 108 | <1.0 | <1.0 | <1.0 | <4.0 | <1.0 | <1.0 | <1.0 | 34.4 | <1.0 | <1.0 | 0.48 | <3.0 | <2.0 | <1.0 | <10 | 94.2 | <2.0 | 16.2 | <3.0 | <0.20 | <20 | <10 | - |
| | MW-4 | Well | On | 1_MW_4 | 06/11/12 | 35-45 | NA | Limestone | - | - | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <4.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <0.40 | <3.0 | <2.0 | <1.0 | <10 | 76.2 | <2.0 | <10 | <3.0 | <0.20 | <20 | <10 | - |
| | MW-5 | Well | On | 1_MW_5 | 06/11/12 | 20-40 | NA | Limestone | - | - | <1.0 | <1.0 | 4.7 | 706 | 3.9 | <1.0 | <1.0 | <4.0 | <1.0 | 1.5 | <1.0 | 417 | <1.0 | <1.0 | 98.2 | <3.0 | <2.0 | <1.0 | <10 | 262 | <2.0 | 78.2 | <3.0 | <0.20 | <20 | <10 | - |
| | NA | QA/QC | NA | 1_MW_7 (field blank) | 06/11/12 | NA | NA | NA | - | - | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <4.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <0.40 | <3.0 | <2.0 | <1.0 | - | - | - | - | - | - | - | - | - |
| | MW-3 | QA/QC | Off (N) | 1_MW_8 (field duplicate) | 06/11/12 | 9.5-29.5 | NA | Limestone | - | - | <1.0 | <1.0 | <1.0 | 109 | <1.0 | <1.0 | <1.0 | <4.0 | <1.0 | <1.0 | <1.0 | 33.9 | <1.0 | <1.0 | 0.53 | <3.0 | <2.0 | <1.0 | <10 | 94.7 | <2.0 | 17.7 | <3.0 | <0.20 | <20 | <10 | - |
| | NA | QA/QC | NA | Trip Blank | 06/11/12 | NA | NA | NA | - | - | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <4.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <0.40 | <3.0 | <2.0 | <1.0 | - | - | - | - | - | - | - | - | - |
| Stantec - Supplemental Phase II ESA (former H.D. Hudson facility) | SB-1 | Grab | On | 1_MW_1 | 09/22/11 | NA | 24 | Silty clay | - | <0.1 | <2.0 | <2.0 | <2.0 | <2.0 | <8.0 | <2.0 | <2.0 | <8.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <0.8 | <6.0 | <4.0 | <2.0 | Note 3 | Note 3 | Note 3 | Note 3 | Note 3 | Note 3 | Note 3 | Note 3 | <10 |
| Liesch Phase II ESA (H.D. Hudson facility) | MW-1 | Well | On | MW-1 | 10/13/10 | 8.5-28.5 | NA | Limestone | 0.39 | <0.04 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | <2 | 120 | <0.2 | <1 | <0.5 | <0.2 | 2.24 | <0.2 | - |
| | MW-2 | Well | Off (W) | MW-2 | 10/14/10 | 8-28 | NA | Silt | 0.1 | <0.04 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | <2 | 97.3 | <0.2 | <1 | <0.5 | <0.2 | <1 | <0.2 | - |
| | MW-3 | Well | Off (N) | MW-3 | 10/15/10 | 9.5-29.5 | NA | Limestone | 0.09 | 1.1 | ND | 1.9 | 15 | 3400 | 33 | ND | ND | ND | ND | ND | ND | 170 | ND | ND | 17 | ND | ND | ND | <2 | 270 | <0.2 | 29.6 | 0.54 | <0.2 | 1.39 | <0.2 | - |
| URS (Soil Investigation for Hwy 61 Bridge) | BR-2 | Grab | Off (SE) | BR-2-GW | 05/20/09 | - | 40 | Limestone | 0.67 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | - | - | - | - | - | - | - | - | - |
| | BR-3 | Grab | Off (E) | BR-3-GW | 05/21/09 | - | 29 | Limestone | 4.4 | 19 | 270 | ND | ND | ND | ND | 330 | 25 | 260 | 66 | ND | 1700 | ND | 730 | 180 | ND | 2430 | 1700 | 730 | - | - | - | - | - | - | - | - | - |
| | BR-4 | Grab | Off (NE) | BR-4-GW | 05/19/09 | - | 34 | Limestone | - | - | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | BR-5 | Grab | Off (E) | BR-5-GW | 05/20/09 | - | 38 | Limestone | 0.79 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | - | - | - | - | - | - | - | - | - |

Notes:

Only VOCs detected in at least one sample are included on this table

XXX = designates concentrations that exceed MDH HRL values

XXX = designates concentrations that exceed MPCA Tier 1 Surface Water Screening Values

XXX = designates concentrations that exceed MDH HRL and MPCA Tier 1 Surface Water Screening Values

XXX = designates concentrations that exceed MDH HRL, MPCA Tier 1 Surface Water Screening Values, MCLG and MCL values

XXX = designates concentrations that exceed MCLG or MCL values, but which do not exceed an established MDH HRL

(1) = MDH HRLs shown for DRO and GRO are for TPH

(2) = MDH HRL shown is for lead "at the tap"

(3) = This sample was not filtered and the metals data are not directly comparable to either the HRLs, MCLGs or MCL values or to the results reported for the field-filtered samples. Detected metals included arsenic (167 ug/L), barium (2,050 ug/L), chromium (362 ug/L), lead (1,900 ug/L), and mercury (4.2 ug/L).

(4) = Criteria value developed by Suter and Tsao (1996) using Tier II method described in EPA's Water Quality Guidance for the Great Lakes System. Phil Monson at MPCA does not recommend using this value for remediation decisions.

- = Not analyzed

DRO = diesel range organic
ESA = environmental site assessment
GRO = gasoline range organic
MCL = Maximum contaminant level
MCLG = Maximum contaminant level goal
MDH = Minnesota Department of Health
mg/L = milligrams per liter
NA = not applicable
ND = not detected (analyte concentration is below reportable detection limit)
NE = not established
TPH = total petroleum hydrocarbon
U.S. EPA = United States Environmental Protection Agency
VOC = volatile organic compound

TABLE 10 - EXPOSURE PATHWAYS
PHASE II INVESTIGATION REPORT
FORMER H.D. HUDSON MANUFACTURING FACILITY PROPERTY, HASTINGS, MN

| Media | Receptor | Ingestion | Dermal Contact | Inhalation |
|---|---|---|---|---|
| Contaminated Surface Soil (0-0.5 feet bgs) | Future On-site Outdoor Commercial Worker | PC | PC | PC |
| | Future On-site Indoor Commercial Worker | | | |
| | Future On-site Recreational User | PC | PC | PC |
| | Future On-site Construction Worker | PC | PC | PC |
| | Future On-Site Resident | PC | PC | PC |
| | Current/Future Off-Site Resident | | | PC |
| | Current Trespasser | PC | PC | PC |
| Contaminated Subsurface Soil and Bedrock (0.5 feet bgs to water table) | Future On-site Outdoor Commercial Worker | | | |
| | Future On-site Indoor Commercial Worker | | | PC |
| | Future On-site Recreational User | | | |
| | Future On-site Construction Worker | PC | PC | PC |
| | Future On-Site Resident | | | PC |
| | Current/Future Off-Site Resident | | | PC |
| | Current Trespasser | | | |
| Groundwater | Future On-site Outdoor Commercial Worker | PC | | |
| | Future On-site Indoor Commercial Worker | PC | | PC |
| | Future On-site Recreational User | | | |
| | Future On-site Construction Worker | | | |
| | Future On-Site Resident | PC | | PC |
| | Current/Future Off-Site Resident | PC | | PC |
| | Current Trespasser | | | |
| Stormwater | Future On-site Outdoor Commercial Worker | | PC | PC |
| | Future On-site Indoor Commercial Worker | | | |
| | Future On-site Recreational User | | PC | PC |
| | Future On-site Construction Worker | | PC | PC |
| | Future On-Site Resident | | PC | PC |
| | Current/Future Off-Site Resident | | PC | PC |
| | Current Trespasser | | PC | PC |
| Surface Water | Future Off-site Outdoor Commercial Worker | PC | PC | PC |
| | Future Off-site Indoor Commercial Worker | | | |
| | Future Off-site Recreational User | PC | PC | PC |
| | Future Off-site Construction Worker | PC | PC | PC |
| | Current/Future Off-Site Resident | | | |
| | Current Trespasser | | | |

| | |
|---|---|
| PC | = indicates potentially complete exposure pathway |
| | = indicates likely incomplete exposure pathway |