



# **Statewide Vinyl Bridge Paint Testing**

## **Statewide Environmental Study Report**

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Environmental Modeling and Testing Unit**

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## **EXECUTIVE SUMMARY**

This study was conducted by Minnesota Department of Transportation's (MnDOT) Environmental Modeling and Testing Unit (EMTU) within the Office of Environmental Stewardship. The objective of the study was to determine if potentially hazardous chemical concentrations of chromium is present in vinyl bridge paint systems utilized by MnDOT from 1974 to 2009. Fifty-four randomly-selected vinyl paint bridges were sampled throughout the State of Minnesota. Analyses of various contaminants were conducted utilizing Toxicity Characteristic Leaching Procedure (TCLP) which has two United States Environmental Protection Agency (USEPA) methods: 6010c and 7470a that determine concentrations of various hazardous elements. TCLP results indicated that there were no chromium concentrations above USEPA standard to be classified as hazardous waste. However, there were three positive chromium detections in the vinyl paint on three bridges (#9351, #9352 and #27033). More specific laboratory details on each bridge result can be found in Appendix E, page 42. Based on the laboratory results of this vinyl paint study, these paint systems do not contain high concentrations of the TCLP contaminants and would not warrant further safety/abatement procedures when bridge paint restoration occurs.

## **INTRODUCTION**

The EMTU within the Office of Environmental Stewardship was charged with conducting a state-wide study to determine concentrations of key contaminants found in vinyl bridge paint systems used by MnDOT Maintenance dating from 1974 to 2009. Appendix A lists the eight contaminants tested and their respective maximum federal standard limits. Of the 248 statewide bridges with vinyl paint systems, 54 bridges (22%) had paint sampled and analyzed. (Methodology on bridge selection, sampling, and analysis will be described in the procedure section).

## **2. PROCEDURE**

### **2.1 Bridge Selection**

Collecting paint samples from the 248 bridges in Minnesota that currently have vinyl systems would not be economically feasible, therefore 54 bridges were selected at random to avoid sampling bias. The random bridge selection was done by assigning each of the bridges a number, then randomizing those numbers using Research Randomizer software, which uses a complex algorithm to generate "pseudorandom" numbers (1). The first sixty randomized numbers are listed in Table C.2 of Appendix C, page 39. The first fifty bridges that were randomly-selected were evaluated for accessibility for sampling. If a bridge was deemed inaccessible without the need for additional safety equipment, then the next bridge on the randomized list was selected as an alternative. In addition, if upon a site visit, a bridge was found inaccessible, the next alternative was selected from the randomized bridge list. Figures D.1 and D.2 of Appendix D, pages 41-42, identify locations where vinyl paint samples were collected and tested in outlying rural districts and metro area, respectively.

## 2.2 Vinyl Paint Sample Collection

Tools displayed in Figure 2.2.1 were utilized in collecting each vinyl paint sample. A total of ten grams of paint sample was collected at each bridge location. However, there were a few bridges where the paint was too thin to collect (<10 grams). In this instance, we either utilized the paint that we had collected for laboratory analysis or we chose another alternative bridge for sampling. After the vinyl paint was removed, the area was repainted with a spray paint primer displayed in Figure 2.2.1. This was done to prevent future bridge corrosion. In some cases no paint was available for sampling, resulting in the next bridge on the list to be selected as an alternative. A minimum of five grams of paint was weighed and sent to the Minnesota Department of Health for chemical analysis with the remaining paint being retained for further analysis if necessary. Figure 2.2.2 shows an example of a typical vinyl paint sample location after the paint removal was completed.



Figure 2.2.1: Vinyl paint sampling tools (spray paint, hammer, chisel, razor scraper, putty knife, and paint collection mat)



Figure 2.2.2: Example of a sampled bridge location

## 2.3 Toxicity Characteristic Leaching Procedure (TCLP) Analysis

TCLP is designed to determine the mobility of both organic and inorganic toxic materials present in liquid, solid, and multiphase wastes (2). There are two USEPA methods utilized when conducting the TCLP analysis: methods 6010c and 7470a. A summary of the USEPA TCLP methods may be found in Sections 2.3.1 and 2.3.2 of this report. These methods were used to determine the concentrations of arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver in the vinyl paint. The concentration levels were then compared to the USEPA maximum concentration levels to determine if any of the samples exceeded the standard (See Table A.1 of Appendix A, page 32 for detailed information).

### 2.3.1 EPA 6010c Method

Method 6010c describes multi-elemental determinations by inductively coupled plasma-atomic emission spectrometry (ICP-AES) using sequential or simultaneous optical systems and axial or radial viewing of the plasma. The instrument measures characteristic emission spectra by optical

spectrometry. Samples are nebulized and the resulting aerosol is transported to the plasma torch. Element-specific emission spectra are produced by a radio frequency inductively coupled plasma. The spectra are dispersed by a grating spectrometer, and the intensities of the emission lines are monitored by photosensitive devices (3).

### 2.3.2 EPA 7470a Method

Method 7470, a cold-vapor atomic absorption technique, is based on the absorption of radiation at 253.7-nm by mercury vapor. The mercury is reduced to the elemental state and aerated from solution in a closed system. The mercury vapor passes through a cell positioned in the light path of an atomic absorption spectrophotometer. Absorbance (peak height) is measured as a function of mercury concentration (4). This method is required because Method 6010c does not test for mercury.

## 3. **RESULTS**

The results section will include pictures of the sampled paint and location where the paint was taken for future reference. The TCLP Pace Analytical® test results are noted below the bridge picture(s) as well as in Table E.1 of Appendix E, page 43-46.

Table A.1: Maximum Concentration of Contaminants for Toxicity Characteristic

<b>Contaminant</b>	<b>Regulatory Level (mg/L)</b>
<b>Arsenic (As)</b>	5.0
<b>Barium (Ba)</b>	100.0
<b>Cadmium (Cd)</b>	1.0
<b>Chromium (Cr)</b>	5.0
<b>Lead (Pb)</b>	5.0
<b>Mercury (Hg)</b>	0.2
<b>Selenium (Se)</b>	1.0
<b>Silver (Ag)</b>	5.0

In addition, Figure D.1 and D.2, on pages 41-42 reveals where these sampled bridges are located in relation to the Twin Cities Metropolitan Area.

### 3.1 District #1

Ten bridges were randomly selected and sampled from District #1. Figures 3.1.1 through 3.1.14 show the bridges and locations of where the samples were collected. The individual TCLP analysis results are noted below the bridge picture(s).

### **Bridge #5718**



*Figure 3.1.1: Bridge #5718 with waterway*



*Figure 3.1.2: Bridge #5718 sampling location*

No chromium, mercury, selenium, or silver was detected for Bridge #5718. The reported level of 0.14 mg/L for arsenic, 0.15 mg/L for barium, 0.25 mg/L for cadmium, and 1.4 mg/L for lead were all below regulatory maximum concentrations.

### **Bridge #9837**



*Figure 3.1.3: Bridge #9837 sampling location with roadway*

No arsenic, chromium, lead, mercury, selenium, or silver was detected for Bridge #9837. Barium reported 0.18 mg/L and cadmium reported 0.22 mg/L; both are below the regulatory maximum concentrations.

## **Bridge #9838**



*Figure 3.1.4: Bridge #9838 sampling location with roadway*

No arsenic, chromium, mercury, selenium, or silver was detected for Bridge #9838. Barium reported 0.082 mg/L and lead reported 0.12 mg/L; both are below the regulatory maximum concentrations. Cadmium reported 0.74 mg/L which is within 0.26 mg/L of the regulated levels, but remained below the regulatory maximum concentration of 1.0 mg/L.

## **Bridge #9188**



*Figure 3.1.5: Bridge #9188 with roadway*



*Figure 3.1.6: Bridge #9188 sampling location*

No arsenic, chromium, lead, mercury, selenium, or silver was detected for Bridge #9188. The reported level of 0.31 mg/L for barium and 0.072 mg/L for cadmium were both below regulatory maximum concentrations.

### **Bridge #69808A**



*Figure 3.1.7: Bridge #69808A with roadway*



*Figure 3.1.8: Bridge #69808A sampling location*

No arsenic, chromium, mercury, selenium, or silver was detected for Bridge #69808A. The reported level of 1.3 mg/L for barium, 0.10 mg/L for cadmium, and 1.0 mg/L for lead were all below regulatory maximum concentrations.

### **Bridge #69811**



*Figure 3.1.9: Bridge #69811 with roadway*



*Figure 3.1.10: Bridge #69811 sampling location*

No arsenic, chromium, mercury, selenium, or silver was detected for Bridge #69811. The reported level of 0.53 mg/L for barium, 0.12 mg/L for cadmium, and 0.12 mg/L for lead were all below regulatory maximum concentrations.



### **Bridge #9339**



*Figure 3.1.11: Bridge #9339 sampling location with waterway*

No chromium, mercury, selenium, or silver was detected for Bridge #9339. The reported level of 0.17 mg/L for arsenic, 0.27 mg/L for barium, 0.031 mg/L for cadmium, and 0.15 mg/L for lead were all below regulatory maximum concentrations.

### **Bridge #9341**



*Figure 3.1.12: Bridge #9341 sampling location with waterway*

No cadmium, chromium, mercury, selenium, or silver was detected for Bridge #9341. The reported level of 0.15 mg/L for arsenic, 0.11 mg/L for barium, and 0.045 mg/L for lead were all below regulatory maximum concentrations.

### **Bridge #9186**



*Figure 3.1.13: Bridge #9186 with roadway*

No cadmium, chromium, mercury, selenium, or silver were detected for Bridge #9186. There were reported levels of 0.085 mg/L for barium, and 0.048 mg/L for cadmium. In contrast, 59.8 mg/L was detected for lead. This sample exceeded the maximum federal standard of 5.0 mg/L for lead.

### **Bridge #6503**



*Figure 3.1.14: Bridge #6503 sampling location with waterway*

No cadmium, chromium, mercury, selenium, or silver were detected for Bridge #6503. There were reported levels of 0.085 mg/L, 0.048 mg/L, and 0.15 mg/L for barium, cadmium and lead, respectively. All of these concentrations were below the regulatory maximum concentration.

### 3.2 District #3

Two bridges were randomly selected and sampled from District #3. Figures 3.2.1 to 3.2.3 show each bridge and locations of where the samples were collected on the bridge. The individual TCLP analysis results are noted below each bridge picture.

#### **Bridge #9480**



*Figure 3.2.1: Bridge #9480 with roadway*



*Figure 3.2.2: Bridge #9480 sample location*

No arsenic, barium, cadmium, chromium, mercury, selenium or silver was detected for Bridge #9480. However, lead concentrations were reported at 224 mg/L. This concentration is more than forty-five times greater than the USEPA regulatory maximum concentrations of 5.0 mg/L.

#### **Bridge #73818**



*Figure 3.2.3: Bridge #73818 with roadway*

No arsenic, chromium, mercury, selenium, or silver was detected for Bridge #73818. The reported level of 0.14 mg/L for barium, 0.089 mg/L for cadmium, and 1.1 mg/L for lead were all below regulatory maximum concentrations.

### 3.3 District #7

Four bridges were randomly selected and sampled from District #7. Figures 3.3.1 to 3.3.5 show the bridges and locations of where the samples were collected on the bridge. The individual TCLP analysis results are noted below each bridge picture.

#### **Bridge #67806**



*Figure 3.3.1: Bridge #67806 sampling location with waterway*

No arsenic, chromium, mercury, selenium, or silver was detected for Bridge #67806. The reported level of 0.13 mg/L for barium, 0.26 mg/L for cadmium, and 1.0 mg/L for lead were all below regulatory maximum concentrations.

#### **Bridge #53820**



*Figure 3.3.2: Bridge #53820 with roadway*



*Figure 3.3.3: Bridge #53820 sampling location*

No arsenic, cadmium, chromium, mercury, selenium, or silver was detected for Bridge #53820. The reported level of 0.057 mg/L for barium and 0.057 mg/L for lead were both below regulatory maximum concentrations.

### **Bridge #67801**



*Figure 3.3.4: Bridge #67801 sampling location with roadway shoulder*

No arsenic, chromium, mercury, selenium, or silver was detected for Bridge #67801. The reported level of 0.17 mg/L for barium, 0.21 mg/L for cadmium, and 0.83 mg/L for lead were all below regulatory maximum concentrations.

### **Bridge #40001**



*Figure 3.3.5: Bridge #40001 sampling location with waterway*

No arsenic, chromium, mercury, selenium, or silver was detected for Bridge #40001. The reported level of 0.14 mg/L for barium, 0.046 mg/L for cadmium, and 0.66 mg/L for lead were all below regulatory maximum concentrations.

## **3.4 Metro District**

Thirty-eight bridges were randomly selected and sampled within the MnDOT Metro District. Figures 3.4.1 through 3.4.65 show the bridges and locations of where the samples were collected on the bridge. The individual TCLP analysis results are noted below each bridge picture and may also be found in Appendix E, page 42.

### **Bridge #27869**



*Figure 3.4.1: Bridge #27869 with roadway*



*Figure 3.4.2: Bridge #27869 sampling location*

No arsenic, chromium, mercury, selenium, or silver was detected for Bridge #27869. Reported level of 0.49 mg/L for barium, 0.16 mg/L for cadmium, and 0.69 mg/L for lead were below the regulatory maximum concentration.

### **Bridge #27549A**



*Figure 3.4.3: Bridge #27549A with waterway*



*Figure 3.4.4: Bridge #27549A sampling location*

No arsenic, cadmium, chromium, lead, mercury, selenium, or silver was detected for Bridge #27549A. The reported level of 4.9 mg/L for barium is below the regulatory maximum concentration.

### **Bridge #27031A**



*Figure 3.4.5: Bridge #27031A with roadway*



*Figure 3.4.6: Bridge #27031A sampling location*

No arsenic, chromium, mercury, selenium, or silver was detected for Bridge #27031A. The reported levels of 0.37 mg/L for barium, 0.19 mg/L for cadmium, and 0.44 mg/L for lead were below the regulatory maximum concentration.

### **Bridge #27031B**



*Figure 3.4.7: Bridge #27031B*



*Figure 3.4.8: Bridge #27031B sampling location*

No arsenic, chromium, mercury, selenium, or silver was detected for Bridge #27031B. The reported levels of 0.30 mg/L for barium, 0.90 mg/L for cadmium, and 0.40 mg/L for lead were below the regulatory maximum concentration.

### **Bridge #27038**



*Figure 3.4.9: Bridge #27038 with roadway*



*Figure 3.4.10: Bridge #27038 sampling location*

No arsenic, chromium, mercury, selenium, or silver was detected for Bridge #27038. The reported level of 0.12 mg/L for barium 0.31 mg/l for lead and 0.13 mg/L for cadmium were both below regulatory maximum concentrations.

### **Bridge #27033**



*Figure 3.4.11: Bridge #27033 with roadway*



*Figure 3.4.12: Bridge #27033 sampling location*

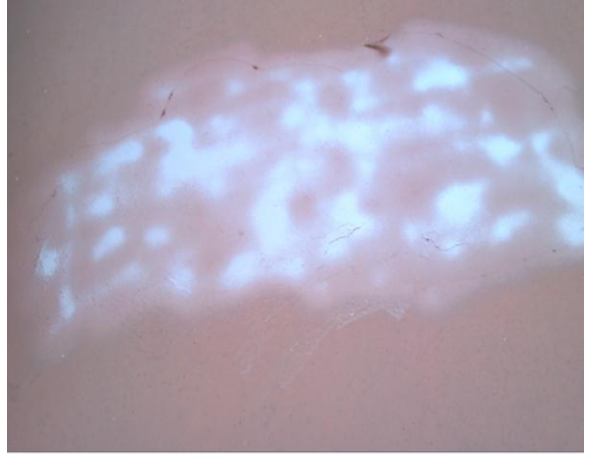
No arsenic, mercury, selenium, or silver was detected for Bridge #27033. The reported levels of 0.40 mg/L for barium, 0.15 mg/L for cadmium, 0.079 mg/L for chromium, and 0.19 mg/L for lead were below regulatory maximum concentrations.



### **Bridge #82849**



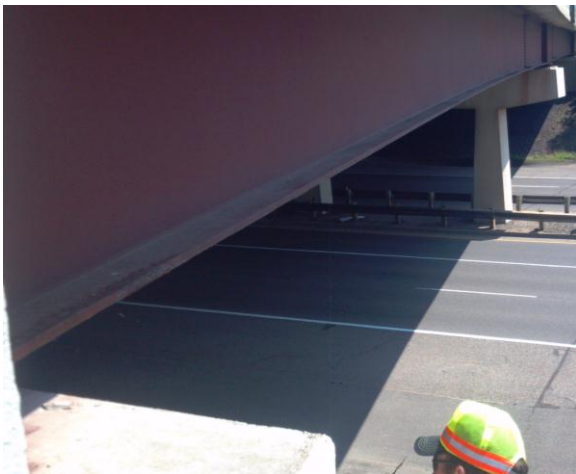
*Figure 3.4.13: Bridge #82849 with roadway*



*Figure 3.4.14: Bridge #82849 sampling location*

No arsenic, chromium, mercury, selenium, or silver was detected for Bridge #82849. The reported levels of 0.83 mg/L for barium, 0.17 mg/L for cadmium, and 0.13 mg/L for lead were below regulatory maximum concentrations.

### **Bridge #82850**



*Figure 3.4.15: Bridge #82850 with roadway*



*Figure 3.4.16: Bridge #82850 sampling location*

No arsenic, chromium, mercury, selenium, or silver was detected for Bridge #82850. The reported levels of 0.72 mg/L for barium, 0.091 for cadmium, and 0.13 for lead were below regulatory maximum concentrations.

### **Bridge #27913**



*Figure 3.4.17: Bridge #27913 with roadway*



*Figure 3.4.18: Bridge #27913 sampling location*

No arsenic, cadmium, chromium, lead, mercury, selenium, or silver was detected for Bridge #27913. The reported level of 0.055 mg/L for barium is below the regulatory maximum concentration.

### **Bridge #27734**



*Figure 3.4.19: Bridge #27734 with roadway*



*Figure 3.4.20: Bridge #27734 sampling location*

No arsenic, chromium, mercury, selenium, or silver was detected for Bridge #27734. The reported level of 10.3 mg/L for barium, 0.029 mg/L for cadmium, and 0.22 mg/L for lead were below regulatory maximum concentrations.

### **Bridge #27924**



*Figure 3.4.21: Bridge #27924 sampling location with roadway*

No arsenic, chromium, mercury, selenium, or silver was detected for Bridge #27924. The reported level of 0.18 mg/L for barium, 0.087 mg/L for cadmium, and 0.60 mg/L for lead were below regulatory maximum concentrations.

### **Bridge #82846**



*Figure 3.4.22: Bridge #82846 sampling location with roadway*

No arsenic, chromium, mercury, selenium, or silver was detected for Bridge #82846. The reported level of 0.45 mg/l for barium, 0.21 mg/l for cadmium, 0.61 mg/L for lead were below regulatory maximum concentrations.

### **Bridge #19829**



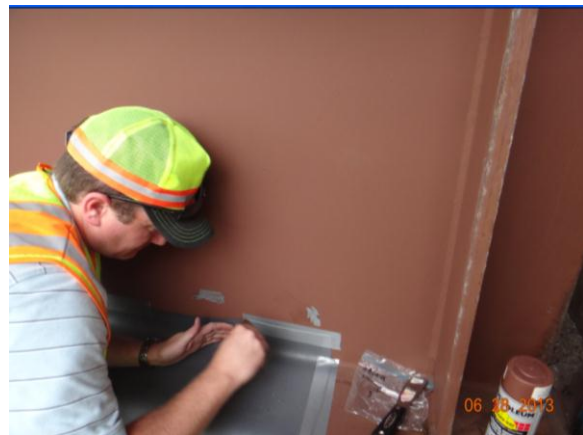
*Figure 3.4.23: Bridge #19829 sampling location*

No arsenic, chromium, mercury, selenium, or silver was detected for Bridge #19829. The reported level of 0.54 mg/L for barium, 0.099 mg/L for cadmium, and 0.057 mg/L for lead were below regulatory maximum concentrations.

### **Bridge #82844**



*Figure 3.4.24: Bridge #82844 with roadway*



*Figure 3.4.25: Bridge #82844 sampling location*

No arsenic, chromium, mercury, selenium, or silver was detected for Bridge #82844. The reported level of 0.19 mg/L for barium, 0.27 mg/L for cadmium, and 0.96 mg/L for lead were below regulatory maximum concentrations.

### **Bridge #82848**



*Figure 3.4.26: Bridge #82848 sampling location with roadway*

No arsenic, chromium, mercury, selenium, or silver was detected for Bridge #82848. The reported level of 0.32 mg/L for barium, 0.43 mg/L for cadmium, and 1.5 mg/L for lead were below regulatory maximum concentrations.

### **Bridge #27079**



*Figure 3.4.27: Bridge #27079 with roadway*

No arsenic, chromium, mercury, selenium, or silver was detected for Bridge #27079. The reported level of 0.42 mg/L for barium, 0.23 mg/L for cadmium, and 2.7 mg/L for lead were below regulatory maximum concentrations.

### **Bridge #82814**



*Figure 3.4.28: Bridge #82814 with roadway*



*Figure 3.4.29: Bridge #82814 sampling location*

No arsenic, chromium, mercury, selenium, or silver was detected for Bridge #82814. The reported level of 0.16 mg/L for barium, 0.16 mg/L for cadmium, and 0.18 mg/L for lead were below regulatory maximum concentrations.

### **Bridge #82832**



*Figure 3.4.30: Bridge #82832 with roadway*



*Figure 3.4.31: Bridge #82832 sampling location*

No arsenic, chromium, mercury, selenium, or silver was detected for Bridge #82832. The reported level of 0.65 mg/L for barium, 0.029 mg/L for cadmium, and 0.66 mg/L for lead were below regulatory maximum concentrations.

### **Bridge #9351**



*Figure 3.4.32: Bridge #9351 with roadway*



*Figure 3.4.33: Bridge #9351 sampling location*

No arsenic, mercury, selenium, or silver was detected for Bridge #9351. The reported level of 0.31 mg/L for barium, 0.11 mg/L for cadmium, 0.066 mg/L for chromium, and 0.34 mg/L for lead were below regulatory maximum concentrations.

### **Bridge #9352**



*Figure 3.4.34: Bridge #9352 with roadway*



*Figure 3.4.35: Bridge #9352 sampling location*

No arsenic, mercury, selenium, or silver was detected for Bridge #9352. The reported level of 0.63 mg/L for barium, 0.30 mg/L for cadmium, 0.18 mg/L for chromium, and 0.41 mg/L for lead were below regulatory maximum concentrations.

### **Bridge #9390**



*Figure 3.4.36: Bridge #9390 with roadway*



*Figure 3.4.37: Bridge #9390 sampling location*

No arsenic, chromium, mercury, selenium, or silver were detected for Bridge #9390. The reported levels of 0.29 mg/L for barium, 0.11 mg/L for cadmium, and 0.41 mg/L for lead were below regulatory maximum concentrations.

### **Bridge #9012**



*Figure 3.4.38: Bridge #9012 with roadway*



*Figure 3.4.39: Bridge #9012 sampling location*

No arsenic, chromium, mercury, selenium, or silver were detected for Bridge #9012. The reported levels of 0.32 mg/L of barium, 0.35 mg/L of cadmium, and 0.24 mg/L of lead were below regulatory maximum concentrations.



### **Bridge #9013**



*Figure 3.4.40: Bridge #9013 with roadway*



*Figure 3.4.41: Bridge #9013 sampling location*

No arsenic, chromium, mercury, selenium, or silver was detected for Bridge #9013. The reported level of 0.56 mg/L for barium, 0.68 mg/L for cadmium, and 0.19 mg/L for lead were below regulatory maximum concentrations.

### **Bridge #19823**



*Figure 3.4.42: Bridge #19823 with roadway*



*Figure 3.4.43: Bridge #19823 sampling location*

No arsenic, chromium, mercury, selenium, or silver was detected for Bridge #19823. The reported level of 0.74 mg/L for barium, 0.13 mg/L for cadmium, and 0.19 mg/L for lead were below regulatory maximum concentrations.

### **Bridge #19824**



*Figure 3.4.44: Bridge #19824 with roadway*



*Figure 3.4.45: Bridge #19824 sampling location*

No arsenic, chromium, mercury, selenium, or silver was detected for Bridge #19824. The reported level of 0.67 mg/L for barium, 0.11 mg/L for cadmium, and 0.26 mg/L for lead were below regulatory maximum concentrations.

### **Bridge #19882**



*Figure 3.4.46: Bridge #19882 with roadway*



*Figure 3.4.47: Bridge #19882 sampling location*

No arsenic, chromium, mercury, selenium, or silver was detected for Bridge #19882. The reported level of 0.30 mg/L for barium, 0.42 mg/L for cadmium, and 0.23 mg/L for lead were below regulatory maximum concentrations.

### **Bridge #19899**



*Figure 3.4.48: Bridge #19889 sampling location with roadway*

No arsenic, chromium, mercury, selenium, or silver was detected for Bridge #19899. The reported level of 0.54 mg/L for barium, 0.13 mg/L for cadmium, and 0.24 mg/L for lead were below regulatory maximum concentrations.

### **Bridge #19037**



*Figure 3.4.49: Bridge #19037 with roadway*



*Figure 3.4.50: Bridge #19037 sampling location*

No arsenic, chromium, mercury, selenium, or silver was detected for Bridge #19037. The reported level of 0.14 mg/L for barium, 0.020 mg/L for cadmium, and 0.84 mg/L for lead were below regulatory maximum concentrations.

### **Bridge #19832**



*Figure 3.4.51: Bridge #19832 with roadway*



*Figure 3.4.52: Bridge #19832 sampling location*

No arsenic, chromium, mercury, selenium, or silver was detected for Bridge #19832. The reported level of 0.059 mg/L for barium, 0.023 mg/L for cadmium, and 0.84 mg/L for lead were below regulatory maximum concentrations.

### **Bridge #19854**



*Figure 3.4.53: Bridge #19854 with roadway*



*Figure 3.4.54: Bridge #19854 sampling location*

No arsenic, cadmium, chromium, mercury, selenium, or silver was detected for Bridge #19854. The reported level of 0.18 mg/L for barium and 0.17 mg/L for lead were below regulatory maximum concentrations.

### **Bridge #19038**



*Figure 3.4.55: Bridge #19038 with roadway*



*Figure 3.4.56: Bridge #19038 sampling location*

No arsenic, chromium, mercury, selenium, or silver was detected for Bridge #19038. The reported level of 0.25 mg/L for barium, 0.028 mg/L for cadmium, and 0.55 mg/L for lead were below regulatory maximum concentrations.

### **Bridge #19884**



*Figure 3.4.57: Bridge #19884 sampling location with roadway*

No arsenic, chromium, mercury, selenium, or silver was detected for Bridge #19884. The reported level of 0.19 mg/L for barium, 0.026 mg/L for cadmium, and 0.53 mg/L for lead were below regulatory maximum concentrations.

### **Bridge #27513**



*Figure 3.4.58: Bridge #27513 sampling location with roadway*

No arsenic, chromium, mercury, selenium, or silver was detected for Bridge #27513. The reported level of 0.14 mg/L for barium, 0.15 mg/L for cadmium, and 0.093 mg/L for lead were below regulatory maximum concentrations.

### **Bridge #27517**



*Figure 3.4.59: Bridge #27517 sampling location*

No arsenic, chromium, mercury, selenium, or silver was detected for Bridge #27517. The reported level of 0.41 mg/L for barium, 0.18 mg/L for cadmium, and 0.25 mg/L for lead were below regulatory maximum concentrations.

### **Bridge #27106**



*Figure 3.4.60: Bridge #27106 sampling location*

No arsenic, chromium, lead, mercury, selenium, or silver was detected for Bridge #27106. The reported level of 0.094 mg/L for barium and 0.019 mg/L for cadmium were below regulatory maximum concentrations.

### **Bridge #27080**



*Figure 3.4.61: Bridge #27080 with roadway*



*Figure 3.4.62: Bridge #27080 sampling location*

No arsenic, chromium, mercury, selenium, or silver was detected for Bridge #27080. The reported level of 0.18 mg/L for barium, 0.57 mg/L for cadmium, and 0.28 mg/L for lead were below regulatory maximum concentrations.

### **Bridge #27014**



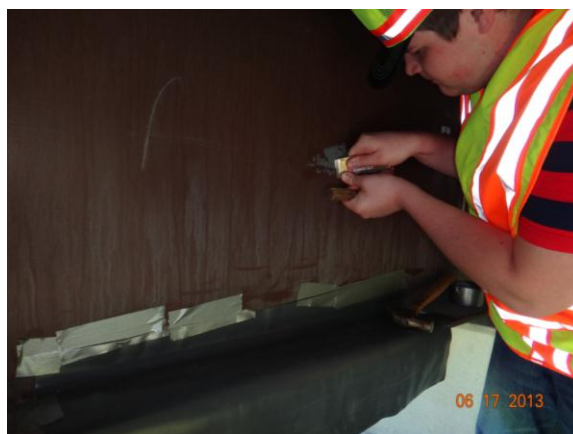
*Figure 3.4.63: Bridge #27014 with roadway*



*Figure 3.4.64: Bridge #27014 sampling location*

No arsenic, chromium, mercury, selenium, or silver was detected for Bridge #27014. The reported level of 0.26 mg/L for barium, 0.33 mg/L for cadmium, and 0.33 mg/L for lead were below regulatory maximum concentrations.

### **Bridge #27573**



*Figure 3.4.65: Bridge #27573 sample location*

No arsenic, cadmium, chromium, mercury, selenium, or silver was detected for Bridge #27573. The reported level of 0.090 mg/L for barium and 0.33 mg/L for lead were below regulatory maximum concentrations.

## **4. CONCLUSION**

In conclusion, fifty-four randomly selected vinyl paint bridges were sampled throughout the state and the results revealed generally, a very low concentration or non-detect for most elements on the TCLP analytical test (see Appendix E, pages 43-46). The laboratory results from this project indicated that no mercury or silver was detected in any of the bridges samples. However, there



were three positive detections of chromium within the Metro District (Bridge #27033, #9351, and #9352). These chromium concentrations of 0.079, 0.066, and 0.18 mg/L respectively, are below the maximum US EPA chromium standard of 5.0 mg/L. However, if future paint removal does occur on these specific bridges worker safety precautions should be taken (5). Where the employer has objective data demonstrating that a material containing chromium or a specific process, operation, or activity involving chromium cannot release dusts, fumes, or mists of chromium (VI) in concentrations at or above 0.5 µg/m<sup>3</sup> as an 8-hour time-weighted average (TWA) under any expected conditions of use. In addition to the chromium detections, Bridges #9186 (District #1) and #9480 (District #3) had lead concentrations that were 12-45 times (59.8 and 224 mg/L, respectively) above the maximum US EPA lead standard of 5.0 mg/L. Employers are required to protect workers from inorganic lead exposure under OSHA lead standards covering general industry ([1910.1025](#)), shipyards ([1915.1025](#)), and construction ([1926.62](#)). The lead standards establish a permissible exposure limit (PEL) of 50 µg/m<sup>3</sup> of lead over an eight-hour time-weighted-average for all employees covered. The standards also set an action level of 30 µg/m<sup>3</sup>, at which an employer must begin specific compliance activities. Table D describes the chemical concentration ranges for each TCLP chemical parameter tested in greater detail from the fifty-four bridges tested (see Appendix C for complete bridge listing).

Table D TCLP summarized laboratory results

	<u>Arsenic</u> <u>(As)</u> <u>mg/L</u>	<u>Barium</u> <u>(Ba)</u> <u>mg/L</u>	<u>Cadmium</u> <u>(Cd)</u> <u>mg/L</u>	<u>Chromium</u> <u>(Cr)</u> <u>mg/L</u>	<u>Lead</u> <u>(Pb)</u> <u>mg/L</u>	<u>Mercury</u> <u>(Hg)</u> <u>mg/L</u>	<u>Selenium</u> <u>(Se)</u> <u>mg/L</u>	<u>Silver</u> <u>(Ag)</u> <u>mg/L</u>
Minimum Concentration	0.055	0	0	0	0	0	0.16	0
Maximum Concentration	0.17	10.3	0.9	0.18	224*	0	0.16	0
Average Concentration	0.153	0.66	0.19	0.11	5.67*	0	0.16	0
Median Concentration	0.15	0.31	0.13	0	0.27	0	0.16	0
Number of Bridges sampled (N)	54	54	54	54	54	54	54	54
<b>TCLP Maximum limit</b>	<b>5.0</b>	<b>100.0</b>	<b>1.0</b>	<b>5.0</b>	<b>5.0</b>	<b>0.2</b>	<b>1.0</b>	<b>5.0</b>

\*denotes standard exceeded

## **Appendix A**

### **Maximum Concentration of Contaminants for Toxicity Characteristic**

The Code of Federal Regulations (CFR) 40 CFR §261.24, outlines the 40 contaminants the TCLP analysis tests for. Table A.1 below lists the maximum concentrations of the parameters that were the focus for this study.

Table A.1: Maximum Concentration of Contaminants for Toxicity Characteristic

<b>Contaminant</b>	<b>Regulatory Level (mg/L)</b>
<b>Arsenic (As)</b>	5.0
<b>Barium (Ba)</b>	100.0
<b>Cadmium (Cd)</b>	1.0
<b>Chromium (Cr)</b>	5.0
<b>Lead (Pb)</b>	5.0
<b>Mercury (Hg)</b>	0.2
<b>Selenium (Se)</b>	1.0
<b>Silver (Ag)</b>	5.0

## Appendix B 2013 Statewide Vinyl Bridge Paint Testing

Table B.1: Complete Statewide Bridge List with Assigned Numbers

<b>Asgd. #</b>	<b>District #</b>	<b>Br #</b>	<b>Facility</b>	<b>Intersecting:</b>
1	District 1	09837	CSAH 3	I 35 & RAMP
2	District 1	09838	I 35 NB ON RAMP	I 35
4	District 1	58807	I 35 SB	KETTLE RIVER
5	District 1	58808	I 35 NB	KETTLE RIVER
6	District 1	6503	TH 73	STURGEON RIVER
7	District 1	69020	US 53 SB	ST LOUIS RIVER
8	District 1	69021	US 53	DW&P RY
9	District 1	69030	US 53 NB	CLOQUET RIVER
10	District 1	69101	US 2 WB OFF RAMP	TH 35 ramp & LAKE
11	District 1	69102	US 2 EB ON RAMP	TH 35, RAMPS & LAKE
12	District 1	69565	CSAH 57	US 169
13	District 1	69808	I 535	SB GARFIELD & BNSF RR
14	District 1	69808A	I 535 NB ON RAMP	GARFIELD NB & SB & RR
15	District 1	69809	I 535 SB OFF RAMP	BNSF RR
16	District 1	69810	I 535	BNSF RR
17	District 1	69811	PEDESTRIAN	PED WALK WAY
18	District 1	69826	40TH AVE W	I 35
19	District 1	69827	MSAS 109	I 35 & SBOFF RAMP
20	District 1	69834	27TH AVE W	I 35
21	District 1	69846	CSAH 14	I 35
22	District 1	69870	5TH AVE W(MSAS135)	I 35, ACCES&RR STS,&RR
23	District 1	9186	BNSF RR	TH 65
24	District 1	9188	I 35 SB	TH 210
25	District 1	9189	I 35 NB	TH 210
26	District 1	9339	TH 61 SB	KNIFE RIVER
27	District 1	9341	TH 61 NB	KNIFE RIVER
28	District 1	9467	I 35 SB	BNSF RR
29	District 1	9468	I 35 NB	BNSF RR
30	District 1	9785	MN 48	I 35
31	District 1	9791	MN 23	I 35
32	District 2	35007	TH 171	RED RIVER OF THE NORTH
33	District 2	5401	TH 92	CLEARWATER RIVER
34	District 2	5760	US 2	MISSISSIPPI RIVER
35	District 2	5921	TH 32	CLEARWATER RIVER
36	District 3	5428	US 71	SAUK RIVER
37	District 3	73029	PEDESTRIAN	MN 15
38	District 3	73818	I 94 EB OFF RP	I 94
39	District 3	9480	BNSF RR	US 169
40	District 4	6408	BNSF RR	US 10
41	District 6	24807	I 90 WB	I 35

42	District 6	55009	US 52 NB	TH 63
43	District 6	55010	US 52 SB	TH 63
44	District 6	6679	TH 76	S FK ROOT RIVER
45	District 6	85806	CSAH 12	I 90 AND US 61
46	District 6	85811	I 90(REST ACCESS)	PC RAIL
47	District 6	85812	I 90	RAMP & RR NB & US 61 NB
48	District 6	85813	I 90 EB ON RAMP	CP RAIL
49	District 6	9320	I 90	MISSISSIPPI RIVER
50	District 7	07038	TH 30	BLUE EARTH RIVER
51	District 7	07042	TH 860D	MINN R, UP RR, & STREET
52	District 7	40001	TH 19	MINNESOTA RIVER
53	District 7	40003	CSAH 45	MN 22
54	District 7	53819	I 90 WB	UP RR & TH 60
55	District 7	53820	I 90 EB	UP RR & TH 60
56	District 7	5495	TH 13	LAKE SAKATAH CHANNEL
57	District 7	5959	TH 22	BIG COBB RIVER
58	District 7	67801	I 90 WB	CSAH 11
59	District 7	67802	I 90 EB	CSAH 11
60	District 7	67805	I 90 WB	ROCK RIVER
61	District 7	67806	I 90 EB	ROCK RIVER
62	District 7	6797	TH 30	MAPLE RIVER
63	District 7	72007	TH 93	MINNESOTA RIVER
64	District 7	9294	US 14	DM&E RR & MSAS 111
65	District 7	9687	MN 23	I 90
66	District 8	12007	TH 7	BNSF RR
67	District 8	41002	TH 68	YELLOW MEDICINE RIVER
68	District 8	41003	US 14	DM&E RR & ST
69	District 8	42012	TH 68	THREE MILE CREEK
70	District 8	87020	TH 68	N BR YELLOW MEDICINE R
71	Metro District	10009	TH 5 EB	TC&W RR
72	Metro District	19037	TH 110 WB	TH 3
73	Metro District	19038	TH 110 EB	TH 3
74	Metro District	19809	I 35E SB	I 35W
75	Metro District	19816	CLIFF RD (CSAH 32)	I 35E
76	Metro District	19817	CSAH 30	I 35E
77	Metro District	19818	CSAH 31-Pilot Knob	I 35E SB off ramp
78	Metro District	19819	TH 55	I 35E, NB COL, SB ON RMP
79	Metro District	19821	CP RR	I 35E, NB COLL
80	Metro District	19822	Wagon Wheel Trail	I 35E
81	Metro District	19823	WB I 494	I 35E
82	Metro District	19824	EB I 494	I 35E
83	Metro District	19827	TH 55	I 494, EB COL, EB RMP
84	Metro District	19829	CP RR	I 494, EB COL, EB RMP
85	Metro District	19831	Delaware Avenue	I 494
86	Metro District	19832	TH 3	I 494
87	Metro District	19835	60th St. Pieper Rd	I 494

<b>88</b>	Metro District	19836	CSAH 26	I 35E
<b>89</b>	Metro District	19837	Blaine Avenue East	I 494
<b>90</b>	Metro District	19853	TH 110 EB	I 494, WB ON RAMP
<b>91</b>	Metro District	19854	CSAH 73	I 494 Babcock Trail
<b>92</b>	Metro District	19855	US 52 SB	I 494, COLL ROADS
<b>93</b>	Metro District	19856	US 52 NB	I 494, COLL ROADS
<b>94</b>	Metro District	19857	TH 149	I 494
<b>95</b>	Metro District	19861	Mendota Heights Rd	I 35E, COLL, RAMPS
<b>96</b>	Metro District	19864	CSAH 28	I 35E, NB ON RAMP
<b>97</b>	Metro District	19865	I 494	TH 156 (Concord Street)
<b>98</b>	Metro District	19878	EB 494 to NB 35E	I 494/I 35E south ramp
<b>99</b>	Metro District	19882	Blackhawk Road	I 35E
<b>100</b>	Metro District	19883	Deerwood Drive	I 35E
<b>101</b>	Metro District	19884	TH 110 WB	I 494 WB ON RAMP
<b>102</b>	Metro District	19891	I 35W SB	Southcross Drive
<b>103</b>	Metro District	19892	I 35W NB	Southcross Drive
<b>104</b>	Metro District	19894	7th Avenue South	I 494
<b>105</b>	Metro District	19895	5th Avenue South.	I 494
<b>106</b>	Metro District	19897	I 494 WB	WB OFF RAMP TO I 35E
<b>107</b>	Metro District	19898	I 494 EB	OFF RAMP TO I 35E SB
<b>108</b>	Metro District	19899	WB 494 to SB 35E	I 494/I 35E north ramp
<b>109</b>	Metro District	19900	494 EB south ramp	off ramp to 35E SB
<b>110</b>	Metro District	27003	PED at Whitney	I 94, Lyndale & Henn Av
<b>111</b>	Metro District	27014	US 169	TH 55 (Olson Memorial)
<b>112</b>	Metro District	27015	TH 65(Central Ave)	BNSF RR
<b>113</b>	Metro District	27031A	TH 100 NB off ramp	to Glenwood Ave
<b>114</b>	Metro District	27031B	TH 100 NB on ramp	from Glenwood Ave
<b>115</b>	Metro District	27033	TH 7	US 169
<b>116</b>	Metro District	27038	Brooklyn Blvd	TH 100
<b>117</b>	Metro District	27038A	Ped Brooklyn Blvd	TH 100
<b>118</b>	Metro District	27038B	Ped Brooklyn Blvd	TH 100
<b>119</b>	Metro District	27046	KILLEBREW DR	TH 77 & NB C/D
<b>120</b>	Metro District	27048	SB CD TO LINDAU LANE	TH 77 & RAMPS
<b>121</b>	Metro District	27052A	TH 77 NB, WB 494	79th St & TH 77 on ramp
<b>122</b>	Metro District	27052B	TH 77 NB on ramp	I 494 & TH 77 NB on ramp
<b>123</b>	Metro District	27052C	TH 77 NB Coll Rd	79TH St & EB 494/5 ramps
<b>124</b>	Metro District	27052D	TH 77 NB on ramp	I 494 & TH 77 NB on ramp
<b>125</b>	Metro District	27079	US 169 SB	US 212 & TH 62
<b>126</b>	Metro District	27080	US 169 NB	US 212 & TH 62
<b>127</b>	Metro District	27100	11 ST S	TH 65
<b>128</b>	Metro District	27106	Excelsior Blvd	TH 100 & SB off ramp
<b>129</b>	Metro District	27513	US 169 NB	BNSF RR
<b>130</b>	Metro District	27517	Cedar Lake Rd	US 169
<b>131</b>	Metro District	27526	Betty Crocker Dr	US 169
<b>132</b>	Metro District	27530	PED at 40th Ave S	TH 62
<b>133</b>	Metro District	27535	PED at 14th Ave	TH 62

<b>134</b>	Metro District	27549A	42nd Ave N(Camden)	I 94
<b>135</b>	Metro District	27572	TH 62 EB	Nine Mile Creek
<b>136</b>	Metro District	27573	TH 62 WB	Nine Mile Creek
<b>137</b>	Metro District	27715	Lyndale Ave NB	I 94 & SB off ramp
<b>138</b>	Metro District	27726A	I 94 SB off ramp	BNSF RR & UP RR
<b>139</b>	Metro District	27726B	I 94 SB off ramp	Lyndale Ave N & RR
<b>140</b>	Metro District	27727	I 94	Glenwood Ave & RR's
<b>141</b>	Metro District	27727A	I 94 NB off ramp	Glenwood Ave & RR
<b>142</b>	Metro District	27727B	I 94 SB on ramp	Glenwood Ave
<b>143</b>	Metro District	27728	I 94 NB on ramp	Glenwood Ave & RR
<b>144</b>	Metro District	27734	I 694 EB	I 94 WB
<b>145</b>	Metro District	27753	394R TO&FROM 100NB	I 394 EB
<b>146</b>	Metro District	27753A	WB 394R TO 100NB	WB 394 & 394R & OFF RAMP
<b>147</b>	Metro District	27767	I 494	WB 494 & 5 to EB 494 & 5
<b>148</b>	Metro District	27776A	I 394R	I 394 WB, Dunwoody Blvd
<b>149</b>	Metro District	27776B	I 394R EB	I 394 & downtown ramps
<b>150</b>	Metro District	27776C	I 394R WB	I 394 WB on ramp
<b>151</b>	Metro District	27776F	I-394R EB ramp	I-94 WB on ramp
<b>152</b>	Metro District	27781	US 952A SB	I 94, ramp & Plymouth Av
<b>153</b>	Metro District	27782	7th St	I 94
<b>154</b>	Metro District	27785	TH 55	I 94
<b>155</b>	Metro District	27788	I 394 EB on ramp	TH 100 NB on ramp
<b>156</b>	Metro District	27789	TH 100 SB CD	SB CD RP & FRNT RD
<b>157</b>	Metro District	27789A	I 394 EB off ramp	SB TH 100
<b>158</b>	Metro District	27791	TH 100 SB ON RAMP	TH 100 SB RAMP TO I 394
<b>159</b>	Metro District	27796	PLYMOUTH AVE	I 94, US 952A & ramps
<b>160</b>	Metro District	27799R	I 94 EB on ramp	Lyndale Avenue SB
<b>161</b>	Metro District	27805	I 94 WB	TH 252 SB
<b>162</b>	Metro District	27806	57th Ave	I 94
<b>163</b>	Metro District	27807	53rd Ave	I 94
<b>164</b>	Metro District	27808	49th Ave N	I 94, Bus ramp & on ramp
<b>165</b>	Metro District	27814	26th Ave N	I 94
<b>166</b>	Metro District	27815	Broadway Ave	I 94 & US 952A
<b>167</b>	Metro District	27817	I 94 SB on ramp	SB off ramp
<b>168</b>	Metro District	27818	I 94 NB off ramp	NB on ramp
<b>169</b>	Metro District	27819	41st Ave N	I 94
<b>170</b>	Metro District	27821	CP RAIL	I 94
<b>171</b>	Metro District	27864	PED @ Shingle Crk	I 94 & I 694
<b>172</b>	Metro District	27869	EB 28th St E	I 35W
<b>173</b>	Metro District	27870	WB 26th St E	I 35W
<b>174</b>	Metro District	27872	E Franklin Ave	I 35W & TH 65
<b>175</b>	Metro District	27891	I 694	TH 252 & SB off ramp
<b>176</b>	Metro District	27910	Shingle Creek Pkwy	I 94 & I 694 EB
<b>177</b>	Metro District	27913	TH 100 SB on ramp	I 94, I694 EB & ramps
<b>178</b>	Metro District	27914	TH 100 NB off ramp	I 94, 694 EB, TH100&rmps
<b>179</b>	Metro District	27923	I 94 WB	Brooklyn Blvd Co. 152

180	Metro District	27924	I 94 EB	Brooklyn Blvd Co. 152
181	Metro District	27929	Dupont Ave	I 94, I 694 & ramp
182	Metro District	27960	I 694 EB on ramp	I 94 EB
183	Metro District	27962	TH 100 SB	I 94, I 694 EB & ramp
184	Metro District	27982	TH 100 NB	I 94 EB & EB on ramp
185	Metro District	27984	EB over TH494	I 494 & WB off ramp
186	Metro District	5114	Recreation Trail	TH 7
187	Metro District	5895	US 61	Mississippi R. & 2nd St.
188	Metro District	5983	I 35W	Minn R & Blackdog Rd
189	Metro District	62026	Lafayette (US 52)	UP RR & Eaton ST
190	Metro District	62027	US 52 (Lafayette)	Plato Blvd (CSAH 40)
191	Metro District	62090	TH 149 (SMITH AVE)	Mississippi R & Railroad
192	Metro District	62802	Grand Ave EB	I 35E & SB On Ramp
193	Metro District	62803	Ramsey-Grand	I 35E
194	Metro District	62804	Ped at Walnut St	I 35E & Thompson St
195	Metro District	62824	LEXINGTON (CSAH51)	I 694
196	Metro District	62872	PED at Bayard Ave	I 35E
197	Metro District	62896	Little Canada Rd	I 35E
198	Metro District	6347	TH 243 (Osceola)	ST CROIX RIVER
199	Metro District	6512	GATEWAY TRAIL	I 35E
200	Metro District	6513	MARYLAND (CSAH 31)	I 35E
201	Metro District	6515	I 35E	Cayuga St & BNSF RR
202	Metro District	6517	I 35E	BNSF RR
203	Metro District	6566	US 8 Taylors Falls	ST CROIX RIVER
204	Metro District	6581	CP RAIL	I 694
205	Metro District	6582	CP RAIL	I 694 & Co Rd E
206	Metro District	7264	TH 62 WB	VALLEY VIEW RD
207	Metro District	7265	TH 62 EB	VALLEY VIEW RD
208	Metro District	7269	Portland Ave	TH 62
209	Metro District	82813	I 694 SB	TH 36
210	Metro District	82814	I 694 NB	TH 36
211	Metro District	82831	I 694 SB	I 94 & COLLECTOR ROADS
212	Metro District	82832	I 694 NB	I 94 & COLLECTOR ROADS
213	Metro District	82844	CSAH 19	I 94
214	Metro District	82845	CSAH 17	I 94
215	Metro District	82846	TH 95	I 94
216	Metro District	82847	CR 71	I 94
217	Metro District	82848	CSAH 21	I 94
218	Metro District	82849	I 94 WB	TH 95
219	Metro District	82850	I 94 EB	TH 95
220	Metro District	9012	TH 51 SB	TH 36
221	Metro District	9013	TH 51 NB	TH 36
222	Metro District	9043	I 35W SB	106TH ST W
223	Metro District	9044	I 35W NB	106TH ST W
224	Metro District	9078	PED at 2nd Ave S	I 494 & N & S Front Rds
225	Metro District	9122	Mill St	TH 7, Rec Trl & Trolley

<b>226</b>	Metro District	9126	Xerxes Ave	I 494
<b>227</b>	Metro District	9265	I 35E	PENNSYLVANIA AVE
<b>228</b>	Metro District	9300	TH 5 (WEST 7 ST)	MISS RIVER & CITY ST
<b>229</b>	Metro District	9321	I 694 WB	Mississippi River
<b>230</b>	Metro District	9351	I 35W SB	BNSF RR & W FR RD
<b>231</b>	Metro District	9352	I 35W NB	BNSF RR & W FR RD
<b>232</b>	Metro District	9355	CO RD D(CSAH 19)	I 35W
<b>233</b>	Metro District	9357	CP RAIL	I 35W
<b>234</b>	Metro District	9389	5TH AVE NW(CSAH77)	I 694
<b>235</b>	Metro District	9390	MC RAIL	I 694
<b>236</b>	Metro District	9473	TH 888A SB & 35W	Mc Rail (County 88)
<b>237</b>	Metro District	9474	TH 888A NB & 35W	Mc Rail (County 88)
<b>238</b>	Metro District	9491	Edgcumbe Road NB	TH 5 EB Off Ramp
<b>239</b>	Metro District	9578	MC RAIL	I 35W
<b>240</b>	Metro District	9582	TC ARSENAL ENTRY	I 35W
<b>241</b>	Metro District	9618	PED at 40th St	I 35W
<b>242</b>	Metro District	9700	US 10	Rum River
<b>243</b>	Metro District	9725	TH 47 SB	CSAH 10
<b>244</b>	Metro District	9726	TH 47 NB	CSAH 10
<b>245</b>	Metro District	9779	TH 13 SB	I 35W
<b>246</b>	Metro District	9780	TH 13 NB	I 35W
<b>247</b>	Metro District	9800	US 52(Lafayette)	MISS R, RR & STREETS
<b>248</b>	Metro District	9888	PED at 73rd Ave	I 35W



## Appendix C

### Randomized Number List and Randomly Selected Bridges

Table C.1 Randomized Number List

Bridge #	Facility	Intersected:	District
5718	MNTH 123	KETTLE RIVER & ST	District #1
9837	CSAH 3	I 35 & RAMP	District #1
9838	I 35 NB ON RAMP	I 35	District #1
9339	TH 61 SB	KNIFE RIVER	District #1
9341	TH 61 NB	KNIFE RIVER	District #1
9188	I-35 (SB)	TH 210 (Carlton, MN)	District #1
69808A	I 535 NB ON RAMP (Duluth)	GARFIELD NB & SB & RR	District #1
69811	PEDESTRIAN bridge, (Duluth)	0.6 MI N of Jct 40th ave and I-35	District #1
9186	BNSF RR (Pengilly, MN)	TH 65	District #1
6503	TH 73, (18 mi N of Chisholm, MN)	STURGEON RIVER	District #1
9480	BNSF RR (Elk River)	US 169, 0.1 MI N of JCT TH 10	District #3
73818	I 94 (EB OFF RP)	I-94, (2.4Mi NW of jct TH 71)	District #3
67806	I 90 EB (1 MI East of Luverne, MN)	Rock River	District #7
53820	I 90 EB (Worthington)	UP RR & TH 60	District #7
67801	I-90 WB (3 mi east of Luverne, MN)	CSAH 11	District#7
40001	TH 19 (Henderson, MN) 0.3 MI E of JCT TH 93	MINNESOTA RIVER	District#7
27033	TH 7	US 169	Metro
27031b	TH 100 NB on ramp	Glenwood Ave	Metro
27870	WB 26th St E (mpls)	I 35W	Metro
27031a	TH 100 NB off ramp	Glenwood Ave	Metro
27079	TH 62	US 169 (SB)	Metro
82849	I-94 (wb)	TH 95	Metro
82846	TH 95 (Afton)	I 94	Metro
82850	I 94 EB (Lake Elmo)	TH 95	Metro
27549A	42nd Ave N (Camden)	I 94	Metro
27038	Brooklyn Blvd	TH 100	Metro
27913	TH 100 SB on ramp (Brooklyn Center)	I 94, I694 EB & ramps	Metro
27734	I 694 EB (Brooklyn Center)	I 94 WB	Metro
27924	I 94 EB (Brooklyn Park)	Brooklyn Blvd Co. 152, 1.7 mi W of Jct TH-100/I-94EB	Metro
19829	CP RR (Eagan)	494 and .2 MI west of 35E	Metro
82844	CSAH 19 (Woodbury dr)	I 94, 2.7 mi east of 494 jct	Metro
82848	CSAH 21 (Marine St. Croix)	8 MI east of jct 494, I-94	Metro
82814	I 694 NB (N. St. Paul)	TH 36 (WB)	Metro
82832	I 694 NB (Woodbury)	I 94 & COLLECTOR ROADS	Metro
9352	I-35w (nb)	W. Front RD	Metro
9351	I-35W (SB)	W. Front RD	Metro
9390	MC RAIL (New Brighton)	I-694/I-35W, 0.5 West on I-694	Metro

9012	TH 51 (SB)	TH 36	Metro
9013	TH 51 (NB)	TH 36	Metro
19823	WB I-494	I-35E	Metro
19824	EB I-494	I-35E	Metro
19882	Blackhawk Road (Eagan)	I 35E, 1.5 MI NE of JCT 77	Metro
19899	WB 494 to SB 35E (Mendota heights)	I 494/I 35E north ramp	Metro
19037	TH 110 (WB)	TH 3, Robert Street	Metro
19832	TH3	I-494	Metro
19854	CSAH 73 (Mendota Heights)	I 494 Babcock Trail (0.2 MI west of jct th 52/i-494)	Metro
19038	TH 110 EB (S.St. Paul)	TH 3, Robert Street	Metro
19884	TH 110 WB (S. St. Paul)	I 494 WB ON RAMP	Metro
27513	US 169 NB (St. Louis Park)	BNSF RR(1.1 MI N. of TH 7)	Metro
27517	Cedar Lake Rd (St. Louis Park)	US 169	Metro
27106	Excelsior Blvd	TH 100, SB off ramp	Metro
27080	US 169 NB (Edina)	TH 62 (East side)	Metro
27014	US 169	TH 55 (Olson Memorial)	Metro
27573	TH 62 WB (0.4 MI E of Jct 494/TH 62)	Nine Mile Creek (Minnetonka)	Metro

Table C.2 Randomly Selected Bridges

63	152	215	133	84	213	134	236
141	130	126	231	36	217	59	142
210	28	99	14	17	195	219	177
233	73	23	108	212	191	157	235
53	129	173	155	94	160	55	172
201	180	6	101	121	144	91	162
111	38	88	122	136	140	52	183

## Appendix D State and Metro Bridge Location Maps

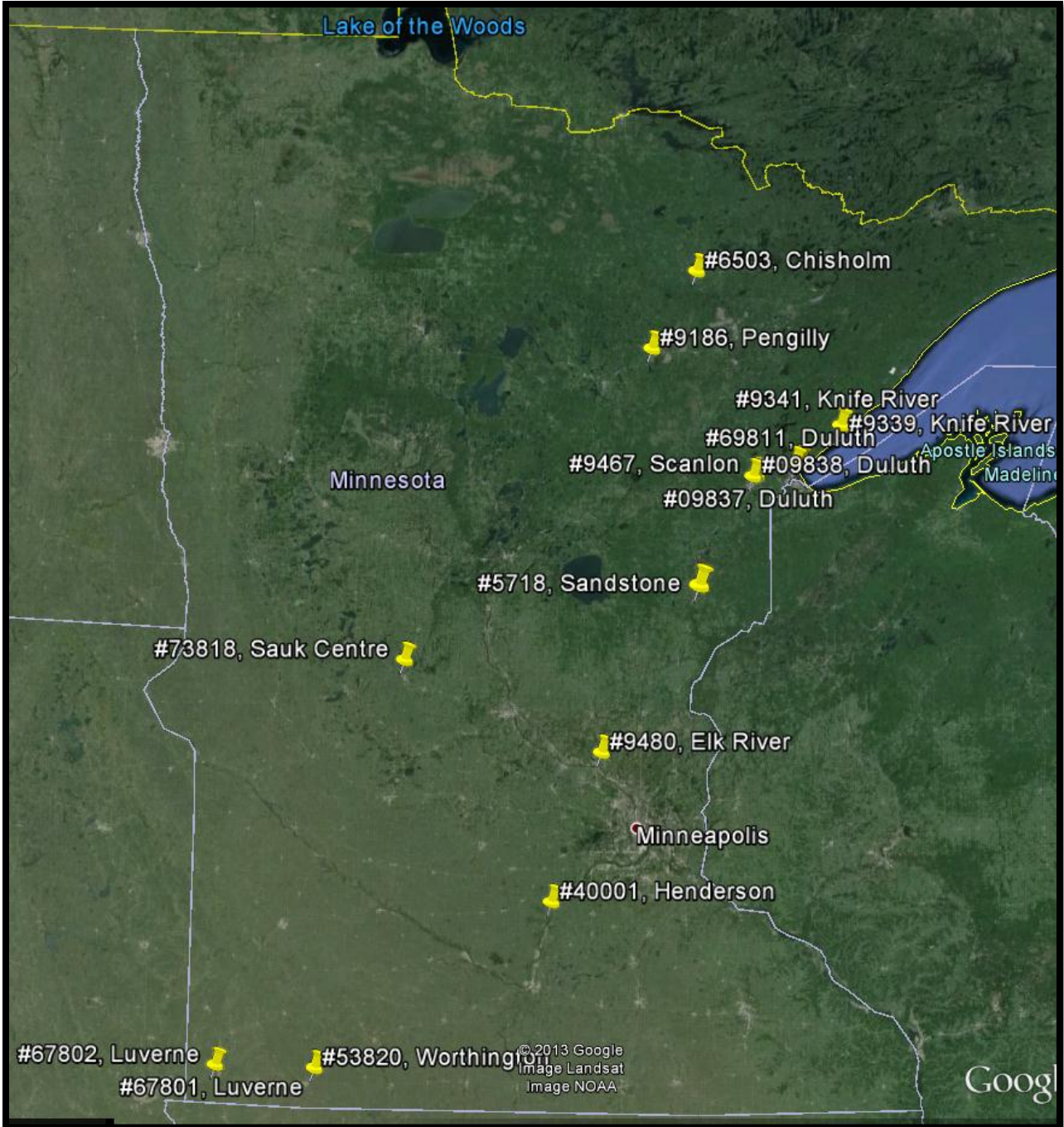


Figure D.1: State Bridge Location Map (MnDOT Districts #1, #3, #7 and Metro).

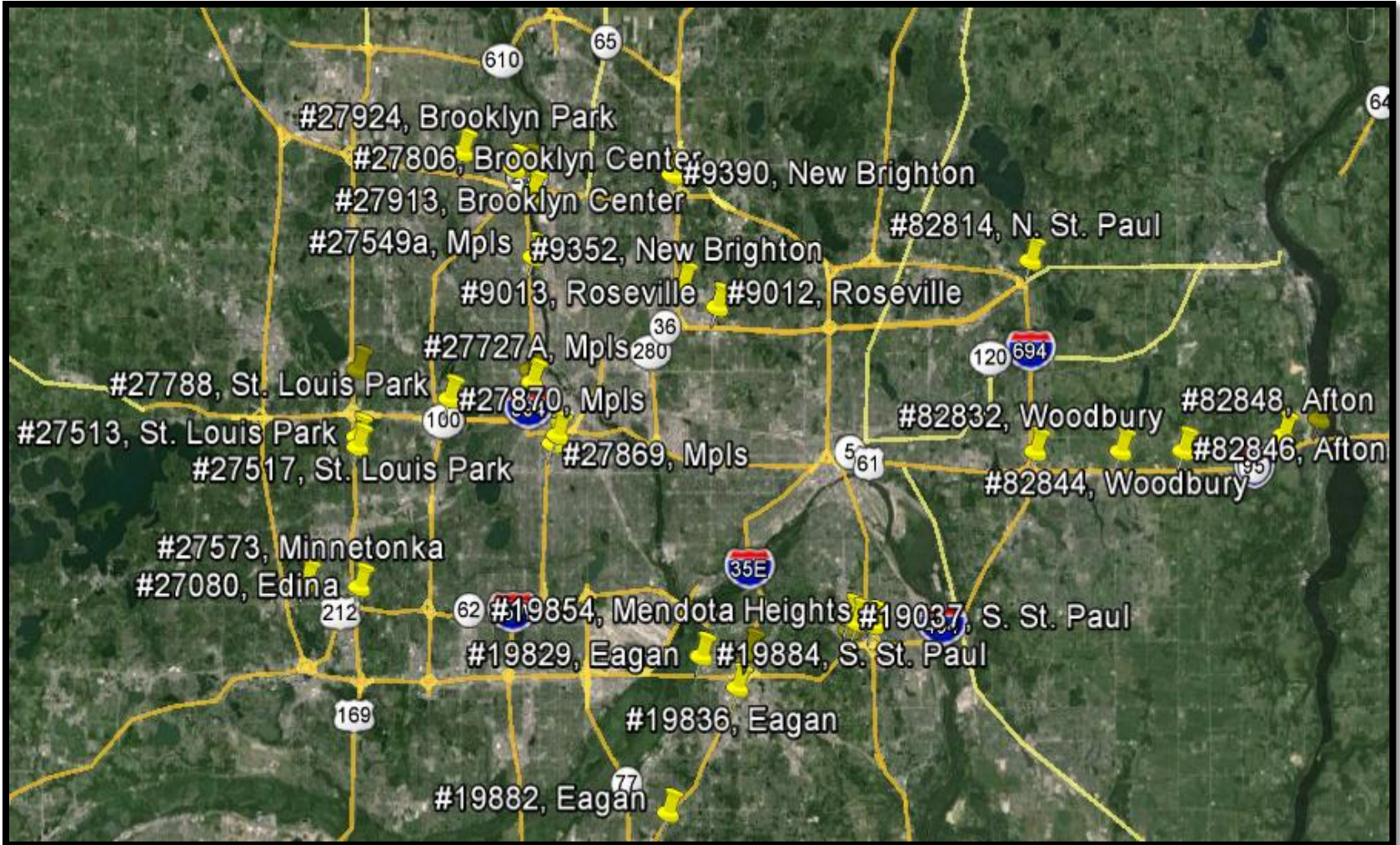


Figure D.2: Metro Bridge Location Map

## Appendix E TCLP Analysis Result Summary

Bridge #	District	Location	Lab results							
			Arsenic (mg/L)	Barium (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Lead (mg/L)	Mercury (mg/L)	Selenium (mg/L)	Silver (mg/L)
82844	Metro	Woodbury Dr. and I-94 (EB)	ND	0.19	0.27	ND	0.96	ND	ND	ND
82832	Metro	I-694 (NB) and I-94 (EB)	ND	0.65	0.029	ND	0.66	ND	ND	ND
19823	Metro	I-494 (WB) and I-35E	ND	0.74	0.13	ND	0.19	ND	ND	ND
19824	Metro	I-494 (EB) and I-35E	ND	0.67	0.11	ND	0.26	ND	ND	ND
19037	Metro	TH 110 (WB) and TH 3	ND	0.14	0.02	ND	0.6	ND	ND	ND
19832	Metro	TH 3 and I-494	ND	0.059	0.023	ND	0.84	ND	ND	ND
19854	Metro	CSAH 73 and I-494	ND	0.18	ND	ND	0.17	ND	ND	ND
19038	Metro	TH 110 EB (S. St. paul)	ND	0.25	0.028	ND	0.55	ND	ND	ND
19884	Metro	TH 110 WB (S. St. Paul)	ND	0.19	0.026	ND	0.53	ND	ND	ND
19829	Metro	CP RR (Eagan)	ND	0.54	0.099	ND	0.057	ND	ND	ND
19899	Metro	WB 494 to SB 35E (Mendota Heights)	ND	0.54	0.13	ND	0.24	ND	ND	ND
27513	Metro	TH 169 (NB) and TH 7 (RR xing)	ND	0.14	0.15	ND	0.093	ND	ND	ND
27517	Metro	Cedar lake rd and US 169	ND	0.41	0.18	ND	0.25	ND	ND	ND
27014	Metro	US 169 and TH 55	ND	0.26	0.33	ND	0.33	ND	ND	ND

27106	Metro	Excelsior Blvd. and TH 100	ND	0.094	0.019	ND	ND	ND	ND	ND
27573	Metro	Th 62 and Nine mile creek	ND	0.09	ND	ND	0.092	ND	ND	ND
27080	Metro	TH 169 (NB) and Th 62 (WB)	ND	0.18	0.57	ND	0.28	ND	ND	ND
27734	Metro	I-694 (eb) and I-94 (wb)	ND	10.3	0.029	ND	0.22	ND	ND	ND
27549	Metro	42nd and I-94	ND	4.9	ND	ND	ND	ND	ND	ND
27038	Metro	Brooklyn blvd and TH 100	ND	0.12	0.13	ND	0.31	ND	ND	ND
27913	Metro	TH 100 (sb) and I-94	ND	0.055	ND	ND	ND	ND	ND	ND
27924	Metro	I-94 (eb) and brooklyn blvd	ND	0.18	0.087	ND	0.6	ND	ND	ND
19882	Metro	Blackhawk rd and I-35E	ND	0.3	0.42	ND	0.23	ND	ND	ND
82848	Metro	CSAH 21 and I-94	ND	0.32	0.43	ND	1.5	ND	ND	ND
82814	Metro	I-694N and TH 36	ND	0.16	0.16	ND	0.18	ND	ND	ND
9779	Metro	TH 13 and I-35W (EB)	0.12	0.11	0.07	ND	0.057	ND	ND	ND
9780	Metro	TH13 and I-35W (WB)	0.14	0.18	0.014	ND	0.056	ND	ND	ND
27031A	Metro	TH 100 (NB) off ramp to Glenwood Ave.	ND	0.37	0.19	ND	0.44	ND	ND	ND
27031B	Metro	TH 100 (NB) on ramp from Glenwood Ave.	ND	0.3	0.9	ND	0.4	ND	ND	ND
27033	Metro	TH 7 and US 169	ND	0.4	0.15	<b>0.079</b>	0.19	ND	ND	ND
270079	Metro	US 169 (SB) and TH 62/212	ND	0.42	0.23	ND	2.7	ND	ND	ND

9012	Metro	TH 51 (NB) and TH 36	ND	0.32	0.35	ND	0.24	ND	ND	ND
9013	Metro	TH 51 (SB) and TH 36	ND	0.56	0.68	ND	0.19	ND	ND	ND
9351	Metro	I-35W (SB) and BNSF RR	ND	0.31	0.11	<b>0.066</b>	0.34	ND	ND	ND
9352	Metro	I-35W (NB) and BNSF RR	ND	0.63	0.3	<b>0.18</b>	0.41	ND	ND	ND
9390	Metro	MCRAIL and I-694	ND	0.29	0.11	ND	0.41	ND	ND	ND
19809	Metro	I-35E (SB) over I-35W	0.16	0.11	0.066	ND	<b>8.1</b>	ND	ND	ND
82846	Metro	TH 95 and I-94	ND	0.45	0.21	ND	0.61	ND	ND	ND
82850	Metro	I-94 (eb) and TH 95	ND	0.72	0.091	ND	0.13	ND	ND	ND
82849	Metro	I-94 (WB) and TH 95	ND	0.83	0.17	ND	0.13	ND	ND	ND
27869	Metro	28th St E and I-35W	ND	0.49	0.16	ND	0.69	ND	ND	ND
9188	District #1	I-35 (SB) and TH 210	ND	0.31	0.072	ND	ND	ND	ND	ND
69808A	District #1	I-535 (NB) on ramp	ND	1.3	0.1	ND	1	ND	ND	ND
69811	District #1	PED bridge, 40th ave and I-35	ND	0.53	0.12	ND	0.12	ND	0.16	ND
9341	District #1	Knife River (NB) and TH 61	0.15	0.11	ND	ND	0.045	ND	ND	ND
9339	District #1	Knife River (SB) and TH 61	0.17	0.27	0.031	ND	0.15	ND	ND	ND
5718	District #1	Sandstone on TH 123	0.14	0.15	0.25	ND	1.4	ND	ND	ND
9837	District #1	CSAH 3/I-35 ramp	ND	0.18	0.22	ND	ND	ND	ND	ND
9186	District #1	BNSF RR and TH 65	ND	0.33	0.25	ND	<b>59.8</b>	ND	ND	ND
6503	District #1	TH 73 and Sturgeon river	ND	0.085	0.048	ND	0.15	ND	ND	ND
9838	District #1	I-35 NB on Ramp	ND	0.082	0.74	ND	0.12	ND	ND	ND

9480	District #3	BNSF RR and 169N, 0.1 mi North	ND	ND	ND	ND	<b>224</b>	ND	ND	ND
73818	District #3	I-94 EB ramp near Sauk Centre	ND	0.14	0.089	ND	1.1	ND	ND	ND
#40001	District #7	TH 19/Minnesota River	ND	0.14	0.046	ND	0.66	ND	ND	ND
67801	District #7	I-90 (WB) and CSAH 11	ND	0.17	0.21	ND	0.83	ND	ND	ND
67806	District #7	I-90 (EB) and Rock river	ND	0.13	0.26	ND	1	ND	ND	ND
53820	District #7	I-90 (EB) and TH 60	ND	0.057	ND	ND	0.057	ND	ND	ND

\*\*\*\*ND=No detect



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