

February 28, 2024

Ms. Kathryn Serier
Minnesota Pollution Control Agency
520 Lafayette Road North
St. Paul, MN 55155

RE: MPCA PRP Vapor Review Summary Report
L#79007 Vapor File Review Project
FY23 Vapor Review Support
Bay West Project #J230654

Dear Ms. Serier:

Bay West LLC (Bay West) has prepared this letter report to summarize the project activities and findings for the Minnesota Pollution Control Agency (MPCA) Petroleum Remediation Program (PRP) leak site vapor review project. The MPCA requested Bay West to prepare this report under MPCA work order #3000032232, dated February 14, 2023.

1.0 BACKGROUND AND SCOPE OF WORK

In 2014, the MPCA retained Bay West to review PRP leak site files for properties that were closed prior to when the PRP vapor intrusion (VI) assessment guidance was developed. The purpose of the file reviews was to determine if there are potential risks to human building inhabitants associated with the closed leak sites based on current MPCA PRP soil vapor intrusion guidance. Leak sites that were closed before January 2006 and had light non-aqueous phase liquid (LNAPL) historically detected at the property were targeted by the MPCA for this project. Bay West reviewed the leak files for the properties identified by the MPCA, prepared property information summary tables and figures, and provided recommendations regarding whether soil gas sampling should be performed at each property to evaluate potential VI risks. The MPCA contracted Terracon Consultants, Inc. to perform the soil gas sampling at the properties with potential VI risks.

Bay West also created and maintains a web-based mapping application (webapp) of the properties evaluated for VI risk under this project. The webapp includes the historical groundwater contaminant plume boundaries and the new soil gas sampling locations and results. The MPCA uses the webapp to track the project progress and evaluate VI risks based on the new soil gas sampling results. Administration of the webapp will be transferred to the MPCA when Bay West's work on this project is completed.

A general summary of the properties reviewed during this project is included in **Table 1**. For the purposes of this project, a "property" is a property with one or more MPCA leak files. Under this project, Bay West and the MPCA reviewed MPCA leak files for 750 properties. No further VI assessment was recommended for 496 of the properties based on the MPCA file reviews. Soil gas sampling was recommended to further evaluate VI risk at 254 properties; for 224 of these properties, no further VI assessment was recommended based on the soil gas sampling results. The MPCA has reopened the leak files to further evaluate and mitigate VI risks at 30 properties

as a result of this project; these properties are called “Reopened Properties” for the purposes of this report. Counts by county of the properties with file reviews performed, properties sampled to evaluate VI risk, and the properties that were reopened as a result of this project are provided in **Table 2** and on **Figure 1**.

2.0 REOPENED PROPERTIES DATA EVALUATION

The MPCA requested that Bay West review property-specific physical setting, contaminant distribution, and remediation activity data associated with the Reopened Properties to identify any potential commonalities between the properties that may be an indication of heightened VI risk. Bay West also reviewed these data for 30 randomly selected properties that were sampled for VI assessment under this project but were determined to not pose VI risks and thus were not reopened; these properties are called the “Control Group Properties.” The 30 Control Group Properties were selected from the same or neighboring counties as the Reopened Properties are located in, when possible, to control for general regional differences across the state. Other than the geographic location constraint, the Control Group Properties were randomly selected. The data review results between the Reopened Properties and Control Group Properties were compared to determine if commonalities among the Reopened Properties could be attributed to heightened VI risk. Finally, Bay West evaluated the current MPCA PRP vapor intrusion guidance considering the findings from the Reopened/Control Group Properties data review to determine if any modifications to the guidance may be warranted.

The lists of Reopened Properties and Control Group Properties used for this project are included in **Table 3**. The Reopened and Control Group Properties locations are shown on **Figure 2**. Bay West evaluated and compared the Reopened Properties and Control Group Properties using the following criteria (called the “evaluation criteria”), which were developed by Bay West and the MPCA:

Subsurface conditions

- Soil stratigraphy: fine or coarse grained soils?
- Depth to groundwater

MPCA Leak Site Information

- Number of releases reported
- First release date
- Most recent release date
- Date of original field work report submitted to MPCA
- Site closure date

Nature of Contamination

- Was greater than (>) 2 feet (ft) of light non-aqueous phase liquid (LNAPL; i.e., free product) ever detected in a monitoring well at the property?
- Was LNAPL present at site closure?
- What was the contaminant product carbon range: low (<13); high (>13); or both?
- Were chlorinated solvents detected in groundwater or soil gas at the property?
- Was methane detected in soil gas at concentrations greater than 1 percent (%) at the property?
- Was methane detected in soil gas at concentrations greater than 4% at the property?

Remediation Activities

- Was a remediation system operated at the property?

- Was contaminated soil excavated from the property?

Other Criteria

- What is the distance from the plume to the nearest occupiable building?
- Type of nearest off-property building: residential or commercial?
- Is the property in an MPCA Environmental Justice Area?

Table 4 presents the Reopened Properties data evaluation. **Table 5** presents the Control Group Properties data evaluation. The evaluation criteria were generally structured so that each can be answered by “yes,” “no,” or a numerical value, to aid in comparing the data among the properties.

3.0 REOPENED PROPERTIES DATA EVALUATION FINDINGS AND CONCLUSIONS

The compiled results of the Reopened Properties and Control Group Properties were compared to identify potential commonalities among the Reopened Properties that may identify factors that indicate heightened potential for VI risk. The findings are summarized in **Table 6** and are discussed below.

3.1 Subsurface Conditions

Soil Stratigraphy: 53% of the Reopened Properties and 40% of the Control Group Properties had primarily fine-grained soils (i.e., silt and/or clay) in the vadose zone. The distribution between properties with fine-grained versus coarse-grained soil (i.e., sand and/or gravel) in the vadose zone is similar among the Reopened Properties and Control Group Properties, indicating that this may not be a significant factor related to VI risk.

Depth to Groundwater: The average depth to groundwater for the Reopened Properties was 8.9 ft below ground surface (bgs) and for the Control Group Properties was 13.6 ft bgs. The reopened Properties had shallower average depth to groundwater by 4.7 ft, indicating that shallower depth to groundwater is likely a factor related to heightened VI risk.

3.2 MPCA Leak Site Information

Number of Releases Reported: The Reopened Properties had an average of 1.23 releases and the Control Group Properties had an average of 1.20 releases. The average number of releases for the Reopened Properties and Control Group Properties is similar, indicating that this may not be a significant factor related to VI risk.

Petroleum Release, Original Field Work, and Site Closure Dates:

- **First Release Date:** The average first release dates for the Reopened Properties and Control Group Properties were June 1992 and May 1990, respectively.
- **Most Recent Release Date:** The average most recent release dates for the Reopened Properties and Control Group Properties were December 1993 and August 1991, respectively.
- **Original Field Work Report Date:** The average original field work report dates for the Reopened Properties and Control Group Properties were October 1994 and March 1992, respectively.
- **Site Closure Date:** The average site closure dates for the Reopened Properties and Control Group Properties were January 2001 and October 1998, respectively.

The Reopened Properties had slightly later average dates for first releases, most recent releases, original field work reports, and site closure than the Control Group Properties. This indicates that earlier releases may be slightly less likely to have heightened VI risk, which could be related to

longer periods for natural attenuation to occur. However, the differences between the average release and closure dates for the Reopened and Control Group Properties are minimal, indicating that these are not significant factors related to VI risk potential.

3.3 Nature of Contamination

Greater than 2 ft of LNAPL detected: 17% of the Reopened Properties and 3% of the Control Group Properties had >2 ft of LNAPL detected in a monitoring well at the property. The Reopened Properties were more than five times as likely to have >2 ft of LNAPL in a monitoring well than the Control Group Properties, indicating that >2 ft of LNAPL in a monitoring well is a factor related to heightened VI risk.

LNAPL Present at Site Closure: 7% of the Reopened Properties and 0% of the Control Group Properties had LNAPL present during site closure, indicating that the presence of LNAPL during site closure is likely a factor related to heightened VI risk.

Release Product Carbon Range: For the Reopened Properties, 47% of properties had low carbon range product released (i.e., gasoline range organics [GRO] hydrocarbons) and 13% of properties had high carbon range product released (i.e., diesel range organics [DRO] hydrocarbons). For the Control Group Properties, 40% of properties had low carbon range product released (i.e., GRO) and 30% of properties had high carbon range product released (i.e., DRO). See **Table 6** for number of properties with both low and high carbon range product. The Reopened Properties had slightly more properties with low carbon range product released (i.e., GRO) and considerably fewer properties with high carbon range product released (i.e., DRO), indicating that having low carbon range product released is likely a factor related to heightened VI risk.

Chlorinated Solvents Detected in Groundwater or Soil Gas: 63% of Reopened Properties and 63% of Control Group Properties had chlorinated solvents detected in groundwater or soil gas; therefore, no insightful information was obtained or generalities were noted while comparing the Reopened Properties and Control Group Properties.

Methane Detected in Soil Gas:

- **Methane Detected at >1%:** 73% of the Reopened Properties and 17% of the Control Group Properties had methane detected in soil gas at >1%.
- **Methane Detected at >4%:** 53% of the Reopened Properties and 13% of the Control Group Properties had methane detected in soil gas at >4%.

Significantly more of the Reopened Properties had methane detected in soil gas at >1% and >4%, indicating that the presence of elevated methane concentrations may be indicative of heightened VI risk. Methane can be generated during bioremediation of petroleum; therefore, bioremediation is the likely source of methane at the Reopened and Control Group Properties.

3.4 Remediation Activities

Was a Remediation System Operated at the Property?: 30% of Reopened Properties and 53% of Control Group Properties had a remediation system operated, indicating that the absence of a remediation system may be related to heightened VI risk.

Was Contaminated Soil Excavated from the Property?: 77% of Reopened Properties and 83% of Control Group Properties had contaminated soil removed. The Reopened Properties had an average of 376 cubic yards (cy) of contaminated soil removed and the Control Group Properties had an average of 465 cy of contaminated soil removed. This indicates that less removal of contaminated soil may be related to heightened VI risk.

3.5 Other Criteria

Distance from plume to nearest occupiable building: The average lateral distance from the groundwater plume edge to the nearest occupiable building for the Reopened Properties was 7 ft and for the Control Group Properties it was 8 ft. For the Reopened Properties, 87% of the nearest occupiable buildings were within 10 ft of the plume. For the Control Group Properties, 93% of the nearest occupiable buildings were within 10 ft of the plume. This indicates that the distance from the plume to the nearest occupiable building may not be a significant factor related to heightened VI risk.

Type of Nearest Off-Property Building: Residential or Commercial?: 57% of Reopened Properties and 27% of Control Group Properties had a commercial building as the nearest off-property building to the plume. This indicates that plumes that have a commercial building as the nearest off-property building to the plume may be more likely to have heightened VI risk. This may be related to the property being located in a more commercially-focused zoning area, which allows for more intensive commercial/industrial land use.

Is the Property in an MPCA Environmental Justice Area?: 43% of Reopened Properties and 53% of Control Group Properties were located within an MPCA Environmental Justice Area. However, the Control Group Properties were selected from the same or neighboring counties as the Reopened Properties, so a comparison of properties within Environmental Justice Areas between the Reopened Properties and Control Group Properties is not insightful.

3.6 Summary of Reopened Properties Data Evaluation

In summary, based on the property-specific data evaluation, the Reopened Properties had the following attributes when compared to the Control Group Properties:

- Shallower average depth to groundwater (by 4.7 ft bgs);
- More likely to have historical LNAPL thicknesses greater than 2 ft in a monitoring well and have LNAPL remaining during site closure;
- More likely to be contaminated with lower carbon range hydrocarbons (i.e., GRO);
- More likely to have elevated methane soil gas concentrations (>1% and >4% methane);
- More likely to have less contaminated soil excavated; and
- More likely to be located in a commercial area versus residential area.

Based on the Reopened/Control Group Properties data evaluation findings, the above attributes may be indicative of heightened VI risk at a property. These findings are generally consistent with what would be expected based on professional judgement as an environmental professional. It is important to note that any one of the above attributes is likely not determinative of VI risk; however, when several of these attributes are present at a property, a heightened VI risk may be more likely.

Table 7 presents a summary of the Reopened Properties attributes and counts of how many attributes were identified for each of the Reopened Properties. A comparison of how many of the Reopened Properties attributes were identified for each of the Control Group Properties is provided in **Table 8**.

4.0 MPCA GUIDANCE DOCUMENT EVALUATION

Bay West reviewed the following MPCA guidance documents considering the findings from the Reopened/Control Group Properties data evaluation to determine if any modifications to the guidance may be warranted:

- *Vapor Investigation and Mitigation Decision Best Management Practices*, c-rem3-06e, April 2020; and
- *Vapor Intrusion Assessments Performed During Site Investigations*, c-prp4-01a, July 2022.

Based on the results from the Reopened/Control Group Properties data evaluation and other general considerations regarding the current understanding of VI assessment in the industry, Bay West makes the following recommendations:

- Increased oxygen concentrations (>4%) in soil gas within petroleum-contaminated soil or above a petroleum groundwater plume can indicate that a more active bioattenuation zone is present, which can be indicative of reduced VI risk. Therefore, the MPCA should consider incorporating into guidance the evaluation of oxygen soil gas concentrations as an indicator of the bioattenuation zone during VI assessments.
- In Section B of the *Vapor Intrusion Assessments Performed During Site Investigations* (c-prp4-01a), the recommended receptor-specific soil gas sampling distances and scenarios could be clarified. For example, determining if sampling is required to evaluate VI risks to receptors that are greater than 100 ft from the source area depends on the lateral extent of the groundwater plume; however, the groundwater plume is not typically defined when soil gas investigations are completed (the groundwater and soil gas investigations are often completed concurrently). Therefore, the MPCA should consider revising the guidance to clarify that the extent of the groundwater plume must be defined to be able to investigate VI risk to receptors within 100 ft of the groundwater plume.

Bay West appreciates the opportunity to be of continued service to the MPCA on this project. Please contact me if you have any questions or concerns regarding this project.

Respectfully Submitted,



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Attachments

Figure 1	MPCA PRP Vapor Review Project: Number of Properties Reviewed, Sampled, and Reopened by County
Figure 2	MPCA PRP Vapor Review Project: Reopened and Control Group Properties
Table 1	General Summary of Properties Reviewed
Table 2	Number of Properties Sampled and Reopened Under this Project by County
Table 3	Summary of Reopened Properties and Control Group Properties
Table 4	Reopened Properties Data Evaluation
Table 5	Control Group Properties Data Evaluation
Table 6	Reopened Properties Versus Control Group Properties Data Evaluation
Table 7	Reopened Properties Attributes Summary
Table 8	Reopened Properties Attributes – Applied to Control Group Properties

Figures

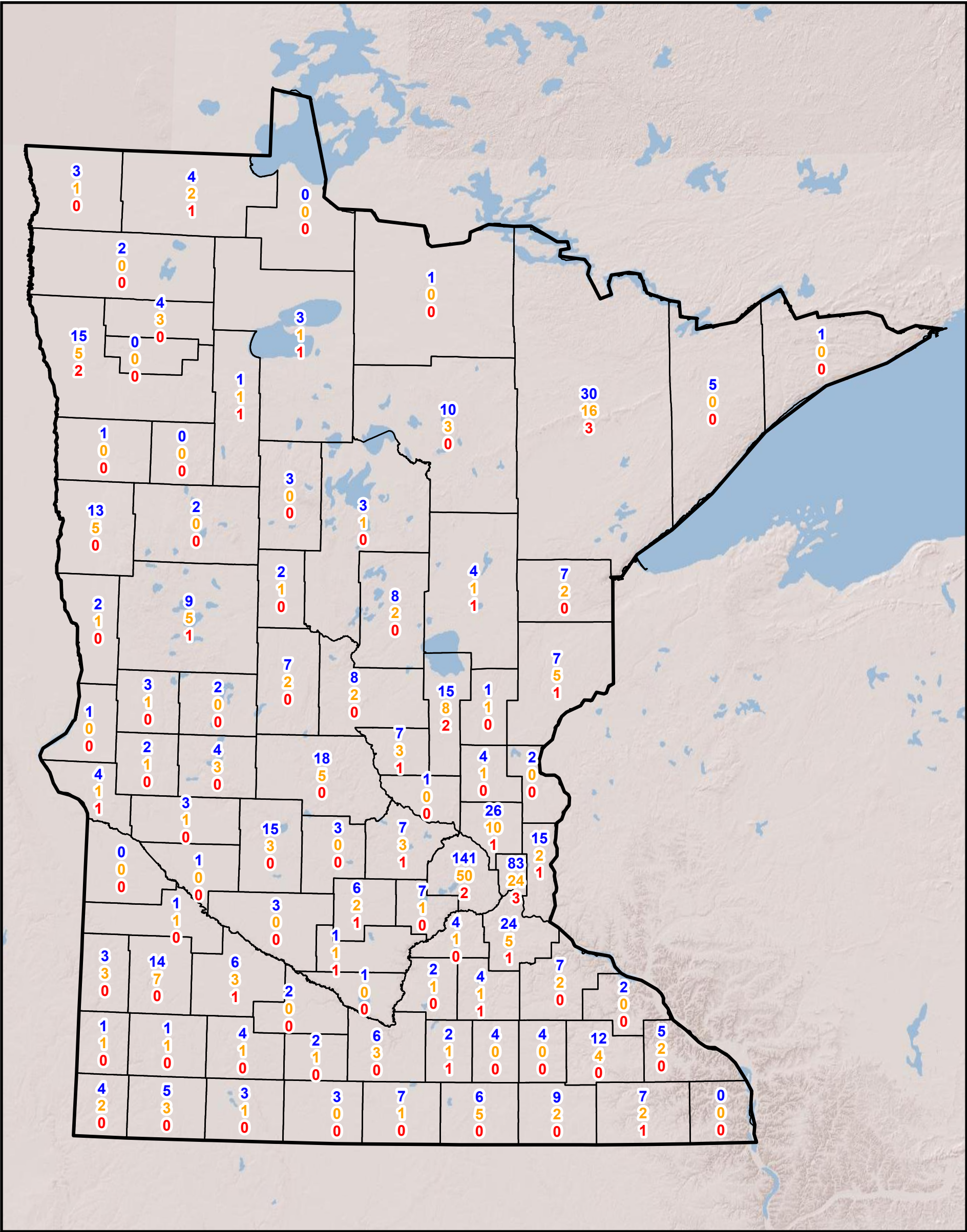
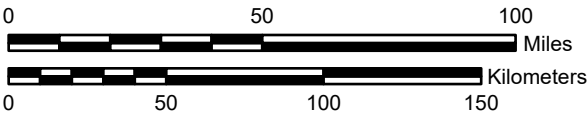


Figure 1

Number of properties with file reviews performed
Number of properties sampled
Number of properties reopened

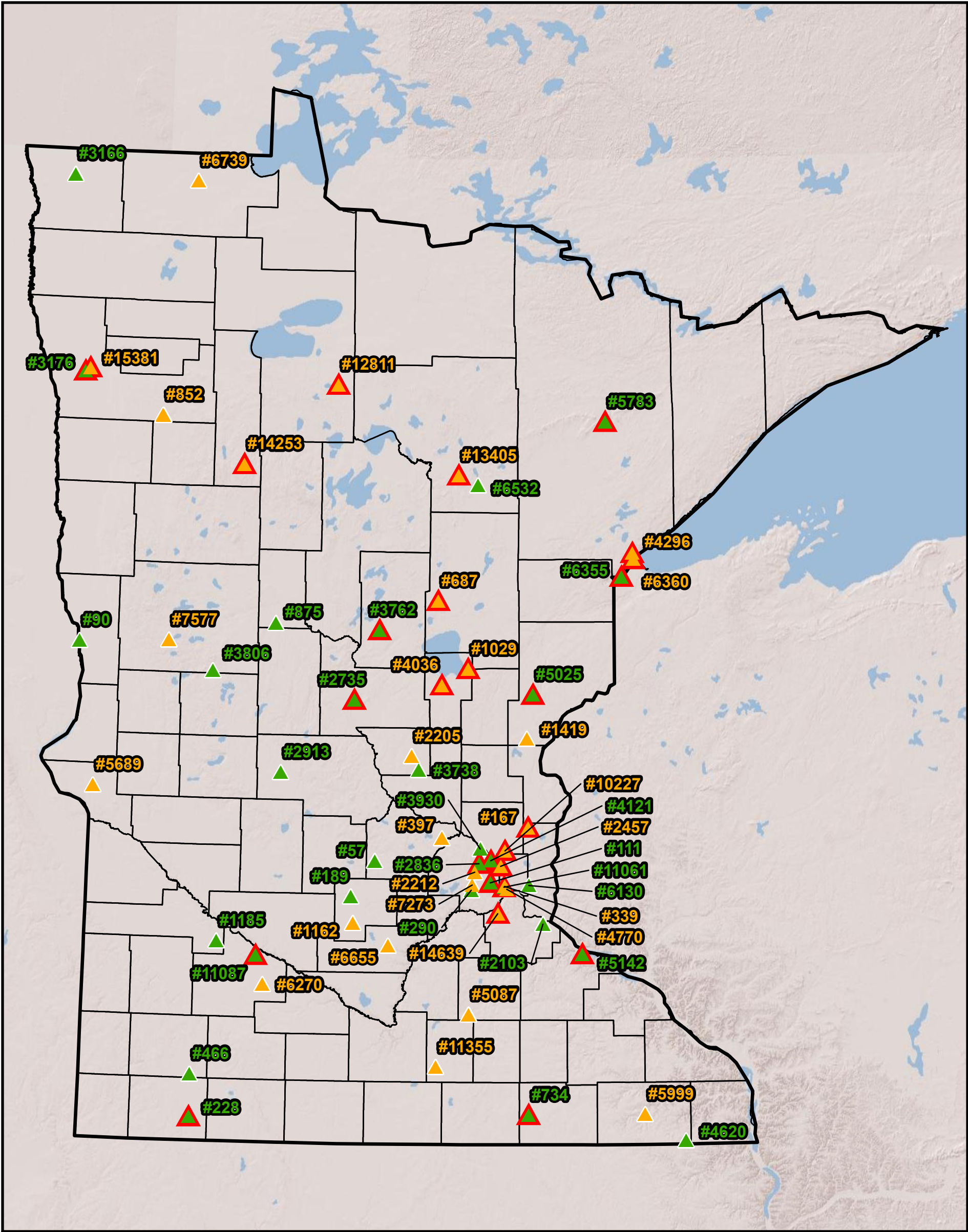
MPCA PRP
Vapor Review Project:
Number of Properties Reviewed,
Sampled, and Reopened by County

Note:
The data on this figure is also summarized on Table 2



Map Projection: NAD 1983 UTM Zone 15 N, Meters
Basemap: ESRI World Shaded Relief WMS
10/12/2023 Project No. J230654





- ▲ Reopened Site with MPCA Leak ID#
- ▲ Control Group Site with MPCA Leak ID#
- ▲ Properties in Environmental Justice Areas are Outlined in Red

Note:

See Table 3 of this report for the site names and addresses for the Reopened and Control Group Properties.

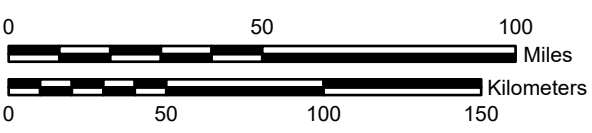


Figure 2

MPCA PRP

Vapor Review Project:

Reopened and Control Group

Properties

Map Projection: NAD 1983 UTM Zone 15 N, Meters
Basemap: ESRI World Shaded Relief WMS
10/12/2023 Project No. J230654



Tables

Table 1
General Summary of Properties Reviewed
MPCA PRP Vapor Review Summary Report

Vapor Intrusion Review/Assessment Status	Number of Properties*
Total Number of Properties Reviewed under this Project	750
Properties Recommended for No Further VI Assessment Based on File Review	496
Properties Recommended for No Further VI Assessment based on Vapor Sampling Results Collected Under this Project	224
Properties Reopened by the MPCA Based on VI Sampling Results**	30

Notes:

* For the purposes of this project, a "property" is a property with one or more MPCA leak files.

** In addition to the 30 properties reopened due to VI risk, two properties were reopened for non-VI reasons during this project.

Table 2
Number of Properties Reviewed, Sampled, and Reopened Under this Project by County
MPCA PRP Vapor Review Summary Report

County	Number of Properties File Reviewed	Number of Properties Sampled	Number of Properties Reopened	Percentage Reopened (Properties Reopened/ Properties Sampled)
Aitkin	4	1	1	100
Anoka	26	10	1	10
Becker	2	0	0	0
Beltrami	3	1	1	100
Benton	7	3	1	33
Big Stone	4	1	1	100
Blue Earth	6	3	0	0
Brown	2	0	0	0
Carlton	7	2	0	0
Carver	7	1	0	0
Cass	3	1	0	0
Chippewa	1	0	0	0
Chisago	2	0	0	0
Clay	13	5	0	0
Clearwater	1	1	1	100
Cook	1	0	0	0
Cottonwood	4	1	0	0
Crow Wing	8	2	0	0
Dakota	24	5	1	20
Dodge	4	0	0	0
Douglas	2	0	0	0
Faribault	7	1	0	0
Fillmore	7	2	1	50
Freeborn	6	5	0	0
Goodhue	7	2	0	0
Grant	3	1	0	0
Hennepin	141	50	2	4
Houston	0	0	0	0
Hubbard	3	0	0	0
Isanti	4	1	0	0
Itasca	10	3	0	0
Jackson	3	1	0	0
Kanabec	1	1	0	0
Kandiyohi	15	3	0	0
Kittson	3	1	0	0
Koochiching	1	0	0	0
Lac qui Parle	0	0	0	0
Lake	5	0	0	0
Lake of the Woods	0	0	0	0
Le Sueur	2	1	0	0
Lincoln	3	3	0	0
Lyon	14	7	0	0
Mahnomen	0	0	0	0
Marshall	2	0	0	0
Martin	3	0	0	0

Table 2
Number of Properties Reviewed, Sampled, and Reopened Under this Project by County
MPCA PRP Vapor Review Summary Report

County	Number of Properties File Reviewed	Number of Properties Sampled	Number of Properties Reopened	Percentage Reopened (Properties Reopened/ Properties Sampled)
McLeod	6	2	1	50
Meeker	3	0	0	0
Mille Lacs	15	8	2	25
Morrison	8	2	0	0
Mower	9	2	0	0
Murray	1	1	0	0
Nicollet	1	0	0	0
Nobles	5	3	0	0
Norman	1	0	0	0
Olmsted	12	4	0	0
Otter Tail	9	5	1	20
Pennington	4	3	0	0
Pine	7	5	1	20
Pipestone	1	1	0	0
Polk	15	5	2	40
Pope	4	3	0	0
Ramsey	83	24	3	13
Red Lake	0	0	0	0
Redwood	6	3	1	33
Renville	3	0	0	0
Rice	4	1	1	100
Rock	4	2	0	0
Roseau	4	2	1	50
Scott	4	1	0	0
Sherburne	1	0	0	0
Sibley	1	1	1	100
St. Louis	30	16	3	19
Stearns	18	5	0	0
Steele	4	0	0	0
Stevens	2	1	0	0
Swift	3	1	0	0
Todd	7	2	0	0
Traverse	1	0	0	0
Wabasha	2	0	0	0
Wadena	2	1	0	0
Waseca	2	1	1	100
Washington	15	2	1	50
Watonwan	2	1	0	0
Wilkin	2	1	0	0
Winona	5	2	0	0
Wright	7	3	1	33
Yellow Medicine	1	1	0	0

Table 3
Summary of Reopened Properties and Control Group Properties
MPCA PRP Vapor Review Summary Report

	Reopened Properties			
	Leak ID#	MPCA AI Number	Leak Site Name	Leak Site Address
	13405	3673	DAVIS PETROLEUM WAREHOUSE	1402 NW 4TH STREET, GRAND RAPIDS, MN
	14639 (16827 & 16351)	21562	HOLIDAY STATION STORE 232	4595 NICOLS RD, EAGAN, MN
	2457 (1072 and 13101)	111520	ARNEL OIL CO	383 OLD HIGHWAY 8 NW, NEW BRIGHTON, MN
	2212	18939	SINCLAIR GAS STATION	9605 36TH AVE N, PLYMOUTH, MN
	687	119247	ROBERT GRAFF	104 3RD STREET NW, AITKIN, MN
	14253	206950	KEITH DAVIS RESIDENCE	22572 LONG LAKE DRIVE, SHEVLIN, MN
	6360	107965	ERLING R HANSEN CONSTRUCTION	2224 WEST 2ND ST, DULUTH, MN
	4036	203049	MILLE LACS COUNTY HWY DEPT GARAGE	35611 125TH AVE, ONAMIA TOWNSHIP, MN
	4296	194266	OLD CROWN AUTO	103 W CENTRAL ENTRANCE, DULUTH, MN
	5689	8336	FORMER BIG STONE CO CO-OP OIL ASSOCIATION	119 MAIN STREET, CLINTON, MN
	6655	44439	ARLINGTON - MAIN ST.	117 W MAIN ST, ARLINGTON, MN
	12811	9640	FORMER STANDARD	288 MAIN ST. N, BLACKDUCK, MN
	15381	106770	L&L BULK SITE	100 5TH AVE N, CROOKSTON, MN
	1162 (5795)	116225	MATHENY OIL CO/BROWNTON OIL BULK PLANT	418 DIVISION STREET, BROWNTON, MN
	5999 (6258)	3424	WISCONSIN DAIRIES COOP	220 ST. PAUL ST., PRESTON, MN
	852	190883	FARMERS EQUITY COOP	7 MINNESOTA AVE E, WINGER, MN
	6739	10962	D & E SPORTS	203 3RD ST. NW, ROSEAU, MN
	11355	109421	DAVES GROCERY	129 MAIN ST., WALDORF, MN
	167 (170)	25765	LYONS PRIDE	731 SOUTH LAKE STREET, FOREST LAKE, MN
	397 (13738)	118860	DALE'S 66 STATION	101 CENTRAL AVE E., ST. MICHAEL, MN
	5087 (18452)	236828	KABES CONOCO (FORMER PETES PIT STOP)	114 DIVISION STREET N, MORRISTOWN, MN
	6270	106598	REDWOOD COUNTY HIGHWAY DEPARTMENT	1ST STREET & ELM STREET, CLEMENTS, MN
	339 (14442)	26462	SUPERAMERICA #4356	56 SNELLING AVE N, ST. PAUL, MN
	4770	112435	AMOCO SS #5161	1191 RANDOLPH AVE, ST PAUL, MN
	1419	131365	ROCK CREEK MOTOR STOP	5737 STATE HIGHWAY 70, PINE CITY, MN
	7577 (3248)	195162	SERVICE OIL CO & BULK PLANT	110 SOUTH MAIN ST, UNDERWOOD, MN
	10227	29722	FOOD N FUEL	9300 LEXINGTON AVE, CIRCLE PINES, MN
	2205	192708	BENTON COUNTY HIGHWAY DEPARTMENT	241 6TH AVE, FOLEY, MN
	1029	192364	JOHNSON PORTSIDE CONOCO	42099 HIGHWAY 47, ISLE, MN
	7273	105080	HEDBURG & SONS	11303 WEST CEDAR LAKE RD, MINNETONKA, MN
	Control Group Properties			
	Leak ID#	MCPA AI Number	Leak Site Name	Leak Site Address
	90	105135	BRECKENRIDGE FREIGHT HOUSE (LS90 AND 8048)	MN & 4TH STREET, BRECKENRIDGE, MN
	111	110671	FORMER AMOCO #5258	1934 NICOLET AVENUE, MINNEAPOLIS, MN
	189	189553	MIKE'S MOBILE (LS189)	903 HIGHWAY 15 SOUTH SERVICE ROAD, HUTCHINSON, MN
	228	16015	FORMER FISCHER STANDARD (LS0000228)	1322 OXFORD STREET, WORTHINGTON, MN
	466	190440	FORMER FULDA INDEPENDENT COOP	DAVIS STREET, FULDA, MN
	734	111718	FORMER AMOCO (LS734)	410 OAKLAND AVENUE WEST, AUSTIN, MN
	1185	195912	FARMERS COOP OIL COMPANY - LS#0001185	510 2ND AVENUE WEST, ECHO, MN
	2103	101065	PINECREST ELEMENTARY SCHOOL	975 WEST 12TH STREET, HASTINGS, MN
	2836	111564	FORMER AMOCO #8288	6300 LAKELAND AVENUE, BROOKLYN PARK, MN
	2913	113416	FORMER EIBENSTEINER GAS STATION (LS2913)	97 STATE STREET, ELROSA, MN
	3166	190959	BERNSTROM OIL COMPANY	214 WISCONSIN AVENUE, LANCASTER, MN
	3176	189121	AMOCO OIL #5284	123 WEST 6TH STREET, CROOKSTON, MN
	3738	194502	KAMPA RESIDENCE	15045 MN HIGHWAY 95, FOLEY, MN
	3762	16204	BRAINERD CAR WASH (LS3762)	801 MILL AVENUE, BRAINERD, MN
	3806	186336	GENE'S PHILLIPS 66 (LS3806)	7 MAIN STREET EAST, URBANK, MN
	3930	115532	CHAMPLIN PARK HIGH SCHOOL	6025 109TH AVENUE NORTH, BROOKLYN PARK, MN
	4121	107246	RIVERSIDE AUTOWASH (LS4121)	6520 EAST RIVER ROAD, FRIDLEY, MN
	4620	190828	MABEL FARM SERVICE (LS4620)	214 SOUTH MAPLE STREET, MABEL, MN
	5142	113969	POTTERY PLACE (LS5142)	2000 OLD WEST MAIN STREET, RED WING, MN
	5783	195953	ROBERT BRYAN PROPERTY (LS5783)	116 FIRST AVENUE NORTH, BIWABIK, MN
	6130	20464	LANDFALL TERRACE	2967 HUDSDON ROAD, LANDFALL, MN
	6355	23702	CHEPELNIK PROPERTY PVI	1206 COMMONWEALTH AVENUE, DULUTH, MN
	6532	2315	BLACKBERRY COUNTRY STORE	25306 DOVE LANE, GRAND RAPIDS, MN
	11061	117034	MACALESTER UNITED CHURCH	1658 LINCOLN AVENUE, ST. PAUL, MN
	11087	200766	FORMER TRIPP OIL CO.	621 EAST BRIDGE STREET, REDWOOD FALLS, MN
	2735 (11977)	101032	SUPERAMERICA #4009 (LS0002735/11977)	100 LINDBERG DRIVE SOUTH, LITTLE FALLS, MN
	290 (11477)	105085	FORMER JET #23314 (LS290)	4548 SHADY OAK ROAD, MINNETONKA, MN
	5025 (7559 & 125)	186613	FORMER TOWN & COUNTRY OIL (LS5025)	210 OLD HIGHWAY 61 SOUTH, HINCKEY, MN
	57 (8434)	24239	FORMER LAKE REGION CO-OP - LS#0000057	100 COKATO STREET WEST, COKATO, MN
	875 (796)	191812 (113724)*	ANDY'S OIL CO (BULK SITE)	COUNTY RD 104 W, VERNDALE, MN

Notes:

* = The AI#s for Leak sites 875 and 796 will be merged into one AI# by the MPCA.

Table 4
Reopened Properties Data Evaluation
MPCA PRP Vapor Review Summary Report

Evaluation Criteria:			Subsurface Conditions		Leak Site Information				
			Soil Stratigraphy	Depth to Groundwater	Number of Releases Reported	First Release Date	Most Recent Release Date	Original Field Work Report Submitted	Site Closure Date
Leak ID#	AI#	Vapor Review Project Phase	Fine/Coarse Grained	ft bgs	Quantity	Date	Date	Date	Date
687	119247	3	Coarse	10.25	1	6/5/1988	6/5/1988	9/13/1994	3/14/2002
852	190883	3	Fine	21.8	1	12/5/1988	12/5/1988	3/28/1991	7/3/1997
1029	192364	2	Coarse	13.19	1	1/1/1989	1/1/1989	1/12/1994	7/14/1999
1419	131365	3	Fine	7.7	1	8/7/1989	8/7/1989	11/2/1989	12/23/1997
2205	192708	2	Coarse	5	1	11/20/1989	11/20/1989	11/20/1991	1/5/2000
2212	18939	2	Coarse	9.5	1	1/19/1990	1/19/1990	10/28/1991	2/2/1998
4036	203049	3	Coarse	9.5	1	5/14/1991	5/14/1991	12/11/1991	10/4/1994
4296	194266	3	Fine	3.4	1	7/22/1991	7/22/1991	6/8/1992	11/29/1994
4770	112435	3	Coarse	11	1	10/29/1991	10/29/1991	4/30/1993	5/11/2004
5689	8336	3	Fine	7.5	1	9/18/1992	9/18/1992	6/3/1993	5/27/2005
6270	106598	3	Fine	10	1	5/3/1993	05/03/1993	08/03/1993	10/10/1997
6360	107965	3	Fine	12	1	5/20/1993	05/20/1993	11/5/1993	8/2/1994
6655	44439	3	Fine	9	1	6/22/1993	6/22/1993	2/13/1998	9/9/2005
6739	10962	3	Fine	4	1	8/28/1990	8/28/1990	12/20/1993	2/12/1997
7273	105080	2	Coarse	15.5	1	3/8/1994	3/8/1994	10/11/1994	6/19/1996
10227	29722	2	Coarse	10	1	9/27/1996	9/27/1996	10/23/1998	4/6/2005
11355	109421	3	Fine	5.45	1	3/23/1998	3/23/1998	5/3/1999	10/23/2001
12811	9640	3	Fine	4	1	7/28/1999	7/28/1999	8/30/2002	9/9/2004
13405	3673	1	Fine	8.2	1	4/13/2000	4/13/2000	2/10/2003	7/15/2005
14253	206950	3	Fine	5.2	1	5/21/2001	5/21/2001	6/6/2001	6/6/2001
15381	106770	3	Fine	15	1	7/17/2003	7/17/2003	12/8/2003	8/6/2004
1162 (5795)	116225	3	Fine	6.25	1	5/9/1988	5/9/1988	4/4/1991	7/3/1997
14639 (16827 & 16351)	21562	3	Coarse	7.52	3	2/18/2002	5/14/2007	1/21/2003	9/25/2008
167 (170)	25765	3	Coarse	4.65	2	8/9/1973	4/14/1983	7/26/1993	10/29/2001
2457 (1072 and 13101)	111520	1	Coarse	12	3	5/2/1989	10/19/1999	7/13/1990	1/7/2005
339 (14442)	26462	3	Coarse	12	2	9/9/1986	9/5/2001	2/5/1988	5/3/2004
397 (13738)	118860	3	Fine	7	1	10/28/1987	10/28/1987	4/13/1989	10/16/1997
5087 (18452)	236828	3	Coarse	5	1	5/3/1993	5/3/1993	8/3/1993	10/10/1997
5999 (6258)	3424	3	Coarse	8	2	12/8/1992	4/27/1993	11/9/1993	12/06/2000
7577 (3248)	195162	3	Fine	8	1	7/6/1994	7/6/1994	9/20/1994	3/16/2000
Data Evaluation Findings:			Count	Average	Average	Earliest, average, and most recent dates			
			Fine-grained: 16 properties (53%); Coarse-grained: 14 properties (47%)	8.9 ft bgs	1.23	Earliest: 8/9/1973	Earliest: 4/14/1983	Earliest: 2/5/1988	Earliest: 8/2/1994
						Average: 7/24/1992	Average: 12/16/1993	Average: 10/11/1994	Average: 1/4/2001
						Most Recent: 7/17/2003	Most Recent: 5/14/2007	Most Recent: 12/8/2003	Most Recent: 9/25/2008

Notes:
CY = cubic yards
DRO = diesel range organics
GRO = gasoline range organics
ft bgs = feet below ground surface
LNAPL = light non-aqueous phase liquid
Res. = residential
Com. = commercial
* = This excavation amount was not used in averaging,
as it is an outlier.
** = A result of zero (0) in this column indicates that an inhabited
building is located over the plume.

Table 4
Reopened Properties Data Evaluation
MPCA PRP Vapor Review Summary Report

Evaluation Criteria:			Nature of Contamination						Remediation Activities	
			>2 ft of LNAPL Detected in Monitoring Well	LNAPL Present at Site Closure	Release Product Carbon Range	Chlorinated Solvents Detected	Methane >1%	Methane >4%	Was a Remediation System Operated?	Amount of Contaminated Soil Excavated/Removed
Leak ID#	AI#	Vapor Review Project Phase	Yes/No	Yes/No	Low (<13)/High (>13)/Both	Yes/No	Yes/No	Yes/No	Yes/No	Property Count/Cubic Yards
687	119247	3	No	No	Low	Yes	No	No	Yes	303
852	190883	3	No	No	Both	No	No	No	No	700
1029	192364	2	Yes	No	Low	Yes	Yes	No	Yes	400
1419	131365	3	No	No	Both	No	No	No	Yes	200
2205	192708	2	Yes	No	Both	No	Yes	Yes	No	460
2212	18939	2	Yes	No	Both	Yes	No	No	No	812
4036	203049	3	No	No	High	Yes	Yes	No	No	1,580
4296	194266	3	No	No	High	No	Yes	Yes	No	142
4770	112435	3	No	No	Both	Yes	Yes	Yes	Yes	893
5689	8336	3	No	No	Both	Yes	Yes	Yes	No	382
6270	106598	3	No	No	Low	Yes	Yes	Yes	No	10
6360	107965	3	No	No	Low	No	Yes	Yes	No	192
6655	44439	3	No	No	Low	Yes	No	No	No	644
6739	10962	3	No	No	Low	No	No	No	No	0
7273	105080	2	Yes	No	Both	Yes	Yes	No	No	16,900*
10227	29722	2	Yes	No	Low	Yes	Yes	Yes	No	0
11355	109421	3	No	No	Both	No	Yes	Yes	No	194
12811	9640	3	No	No	Both	Yes	Yes	Yes	No	0
13405	3673	1	No	Yes	High	Yes	No	No	No	0
14253	206950	3	No	No	High	No	Yes	No	No	0
15381	106770	3	No	No	Both	No	Yes	Yes	No	0
1162 (5795)	116225	3	No	No	Both	Yes	No	No	No	200
14639 (16827 & 16351)	21562	3	No	No	Low	No	Yes	No	No	0
167 (170)	25765	3	No	No	Low	No	Yes	Yes	Yes	1,989
2457 (1072 and 13101)	111520	1	No	Yes	Low	Yes	Yes	Yes	Yes	150
339 (14442)	26462	3	No	No	Low	Yes	Yes	Yes	Yes	120
397 (13738)	118860	3	No	No	Low	Yes	Yes	Yes	Yes	710
5087 (18452)	236828	3	No	No	Low	Yes	Yes	Yes	No	223
5999 (6258)	3424	3	No	No	Low	Yes	Yes	No	Yes	38
7577 (3248)	195162	3	No	No	Both	Yes	Yes	Yes	No	560
Data Evaluation Findings:			Count	Count	Count	Count	Count	Count	Count	Count/Average
			Yes: 5 properties (17%); No: 25 properties (83%)	Yes: 2 properties (7%); No: 28 properties (93%)	Low: 14 properties	Yes: 19 properties (63%); No: 11 properties (37%)	Yes: 22 properties (73%); No: 8 properties (27%)	Yes: 16 properties (53%); No: 14 properties (47%)	Yes: 9 properties (30%); No: 21 properties (70%)	Soil removed: 23 properties (77%); No soil removed: 7 properties (23%); Average amount of soil removed: 376 CY
					High: 4 properties					
					Both: 12 properties					

Notes:
CY = cubic yards
DRO = diesel range organics
GRO = gasoline range organics
ft bgs = feet below ground surface
LNAPL = light non-aqueous phase liquid
Res. = residential
Com. = commercial
* = This excavation amount was not used in averaging, as it is an outlier.
** = A result of zero (0) in this column indicates that an inhabited building is located over the plume.

Table 4
Reopened Properties Data Evaluation
MPCA PRP Vapor Review Summary Report

Evaluation Criteria:			Other Criteria		
			Distance from Plume to Nearest Occupiable Building**	Type of Nearest Off-Property Building	In an Environmental Justice Area?
Leak ID#	AI#	Vapor Review Project Phase	Feet	Com./Res.	Yes/No
687	119247	3	0	Com.	Yes
852	190883	3	0	Com.	No
1029	192364	2	0	Res.	Yes
1419	131365	3	0	Com.	No
2205	192708	2	0	Com.	No
2212	18939	2	10	Com.	No
4036	203049	3	0	Com.	Yes
4296	194266	3	0	Res.	Yes
4770	112435	3	0	Com.	No
5689	8336	3	0	Com.	No
6270	106598	3	0	Res.	No
6360	107965	3	0	Res.	Yes
6655	44439	3	0	Com.	No
6739	10962	3	0	Com.	No
7273	105080	2	0	Res.	No
10227	29722	2	0	Com.	Yes
11355	109421	3	0	Com.	No
12811	9640	3	23	Res.	Yes
13405	3673	1	130	Com.	Yes
14253	206950	3	0	Res.	Yes
15381	106770	3	23	Res.	Yes
1162 (5795)	116225	3	0	Com.	No
14639 (16827 & 16351)	21562	3	20	Res.	Yes
167 (170)	25765	3	0	Res.	Yes
2457 (1072 and 13101)	111520	1	0	Com.	Yes
339 (14442)	26462	3	0	Res.	No
397 (13738)	118860	3	0	Com.	No
5087 (18452)	236828	3	0	Res.	No
5999 (6258)	3424	3	0	Res.	No
7577 (3248)	195162	3	10	Com.	No
Data Evaluation Findings:			Average		Count
			Average distance: 7 ft; 87% of properties had a building within 10 ft of plume	Res.: 13 properties (43%); Com.: 17 properties (57%)	Yes: 13 properties (43%); No: 17 properties (57%)

Notes:
CY = cubic yards
DRO = diesel range organics
GRO = gasoline range organics
ft bgs = feet below ground surface
LNAPL = light non-aqueous phase liquid
Res. = residential
Com. = commercial
* = This excavation amount was not used in averaging, as it is an outlier.
** = A result of zero (0) in this column indicates that an inhabited building is located over the plume.

Table 5
Control Group Properties Data Evaluation
MPCA PRP Vapor Review Summary Report

Evaluation Criteria:			Subsurface Conditions		Leak Site Information				
			Soil Stratigraphy	Depth to Groundwater	Number of Releases Reported	First Release Date	Most Recent Release Date	Original Field Work Report Submitted	Site Closure Date
Leak ID#	AI#	Vapor Review Project Phase	Fine/Coarse-Grained	Feet Below Grade	Quantity	Date	Date	Date	Date
90	105135	3	Fine	6	2	5/7/1987	11/23/1994	9/14/1994	5/7/1996
111	110671	3	Fine	18	1	1/9/1987	1/9/1987	8/3/1990	5/23/1994
189	189553	3	Coarse	5	1	10/18/1983	10/18/1983	11/7/1983	11/30/2005
228	16015	3	Fine	6	1	7/22/1986	7/22/1986	10/9/1986	1/20/1995
466	190440	3	Fine	8	1	3/4/1985	3/4/1985	5/5/1986	12/17/2002
734	111718	3	Coarse	25	1	09/30/1988	09/30/1988	11/13/1989	02/12/2001
1185	195912	3	Coarse	6	1	6/9/1989	6/9/1989	8/9/1989	3/31/1993
2103	101065	3	Coarse	65	1	12/19/1989	12/19/1989	8/30/1990	4/16/1996
2836	111564	3	Coarse	11	1	7/9/1990	7/9/1990	3/30/1992	1/13/2003
2913	113416	3	Fine	11	2	7/17/1990	10/30/1991	12/13/1990	7/3/2000
3166	190959	3	Coarse	5	1	8/4/1990	8/4/1990	11/11/1991	7/29/1997
3176	189121	3	Coarse	12	1	9/5/1990	9/5/1990	11/01/1993	11/19/2003
3738	194502	3	Fine	7	1	1/1/1988	1/1/1988	10/17/1991	7/20/1992
3762	16204	2	Fine	10	1	1/17/1991	1/17/1991	6/28/1994	4/15/1999
3806	186336	3	Fine	10	1	2/12/1991	2/12/1991	3/6/1992	9/26/2000
3930	115532	3	Coarse	18	1	10/4/1990	10/4/1990	5/14/1991	6/27/1991
4121	107246	3	Coarse	20	1	5/30/1991	5/30/1991	10/19/1992	10/30/1995
4620	190828	3	Coarse	10	1	9/30/1991	9/30/1991	9/2/1992	5/24/2001
5142	113969	3	Coarse	32	1	4/27/1992	4/27/1992	7/15/1993	4/9/2002
5783	195953	3	Coarse	39	1	10/8/1992	10/8/1992	3/26/1993	7/29/1997
6130	20464	3	Fine	3	2	2/12/1993	7/19/1993	6/7/1993	4/7/1999
6355	23702	3	Coarse	7.5	1	05/23/1993	05/23/1993	10/08/1993	1/9/1997
6532	2315	3	Coarse	7	1	7/11/1993	7/11/1993	3/21/1994	8/13/1997
11061	117034	3	Coarse	12	1	1/8/1998	1/8/1998	5/8/1998	4/20/2001
11087	200766	3	Fine	9	1	1/29/1998	1/29/1998	6/25/1998	10/15/2002
2735 (11977)	101032	3	Coarse	6.5	2	6/22/1990	10/6/1998	10/30/1991	1/16/2001
290 (11477)	105085	3	Coarse	10	2	9/23/1987	4/22/1998	1/12/1989	10/29/2002
5025 (7559 & 125)	186613	3	Fine	18	1	3/11/1992	3/11/1992	6/17/1993	9/2/1998
57 (8434)	24239	3	Fine	7	2	2/19/1987	6/1/1995	9/30/1996	3/12/1997
875 (796)	191812 (113724)*	3	Coarse	2.5	1	12/13/1988	12/13/1988	4/14/1997	8/19/1997
Data Evaluation Findings:			Count	Average	Average	Earliest, average, and latest dates			
			Fine-grained: 12 properties (40%); Coarse-grained: 18 properties (60%)	13.6 ft bgs	1.20	Earliest: 10/18/1983	Earliest: 10/18/1983	Earliest: 11/7/1983	Earliest: 6/27/1991
						Average: 5/10/1990	Average: 8/28/1991	Average: 3/23/1992	Average: 10/25/1998
						Most Recent: 1/29/1998	Most Recent: 10/6/1998	Most Recent: 6/25/1998	Most Recent: 11/30/2005

Notes:
CY = cubic yards
DRO = diesel range organics
GRO = gasoline range organics
ft bgs = feet below ground surface
LNAPL = light non-aqueous phase liquid
Res. = residential
Com. = commercial
* = The AI#s for Leak sites 875 and 796 will be merged into one AI# by the MPCA.
** = A result of zero (0) in this column indicates that an inhabited building is located over the plume.

Table 5
Control Group Properties Data Evaluation
MPCA PRP Vapor Review Summary Report

Evaluation Criteria:			Nature of Contamination						Remediation Activities	
			>2 ft of LNAPL Detected in Monitoring Well	LNAPL Present at Site Closure	Release Product Carbon Range	Chlorinated Solvents Detected	Methane >1%	Methane >4%	Was a Remediation System Operated?	Amount of Contaminated Soil Excavated/ Removed?
Leak ID#	AI#	Vapor Review Project Phase	Yes/No	Yes/No	Low (<13)/High (>13)/Both	Yes/No	Yes/No	Yes/No	Yes/No	Property Count/Cubic Yards
90	105135	3	No	No	High	No	No	No	No	26
111	110671	3	No	No	Both	Yes	No	No	Yes	0
189	189553	3	No	No	Low	Yes	Yes	Yes	Yes	30
228	16015	3	No	No	Low	No	No	No	Yes	350
466	190440	3	No	No	High	Yes	Yes	Yes	Yes	0
734	111718	3	No	No	Low	No	No	No	Yes	400
1185	195912	3	No	No	Both	Yes	Yes	Yes	No	400
2103	101065	3	No	No	High	Yes	No	No	Yes	0
2836	111564	3	No	No	Both	Yes	No	No	No	300
2913	113416	3	No	No	Low	No	No	No	No	145
3166	190959	3	No	No	Both	Yes	No	No	Yes	403
3176	189121	3	No	No	Low	Yes	No	No	Yes	230
3738	194502	3	No	No	High	Yes	No	No	No	15
3762	16204	2	Yes	No	Low	Yes	No	No	Yes	800
3806	186336	3	No	No	Both	No	No	No	No	150
3930	115532	3	No	No	High	Yes	No	No	No	8
4121	107246	3	No	No	Low	Yes	No	No	No	443
4620	190828	3	No	No	Both	No	No	No	No	345
5142	113969	3	No	No	High	No	No	No	No	0
5783	195953	3	No	No	High	Yes	No	No	No	16
6130	20464	3	No	No	High	Yes	Yes	Yes	No	5,873
6355	23702	3	No	No	Low	No	Yes	No	No	400
6532	2315	3	No	No	Low	No	No	No	Yes	0
11061	117034	3	No	No	High	Yes	No	No	Yes	4
11087	200766	3	No	No	Both	Yes	No	No	No	620
2735 (11977)	101032	3	No	No	Low	No	No	No	Yes	102
290 (11477)	105085	3	No	No	Low	Yes	No	No	Yes	1,600
5025 (7559 & 125)	186613	3	No	No	Both	Yes	No	No	Yes	975
57 (8434)	24239	3	No	No	Low	No	No	No	Yes	220
875 (796)	191812 (113724)*	3	No	No	Both	Yes	No	No	Yes	100
Data Evaluation Findings:			Count	Count	Count	Count	Count	Count	Count	Count/Average
			Yes: 1 property (3%); No: 29 properties (97%)	Yes: 0 properties (0%); No: 30 properties (100%)	Low: 12 properties	Yes: 19 property (63%); No: 11 properties (37%)	Yes: 5 properties (17%); No: 25 properties (83%)	Yes: 4 properties (13%); No: 26 properties (87%)	Yes: 16 properties (53%); No: 14 properties (47%)	Soil removed: 25 properties (83%); No soil removed: 5 properties (17%); Average amount of soil removed: 465 CY
					High: 9 properties					
					Both: 9 properties					

Notes:
CY = cubic yards
DRO = diesel range organics
GRO = gasoline range organics
ft bgs = feet below ground surface
LNAPL = light non-aqueous phase liquid
Res. = residential
Com. = commercial
* = The AI#s for Leak sites 875 and 796 will be merged into one AI# by the MPCA.
** = A result of zero (0) in this column indicates that an inhabited building is located over the plume.

Table 5
Control Group Properties Data Evaluation
MPCA PRP Vapor Review Summary Report

Evaluation Criteria:			Other Criteria		
			Distance from Plume to Nearest Occupiable Building**	Type of Nearest Off-Property Building	In an Environmental Justice Area?
Leak ID#	AI#	Vapor Review Project Phase	Feet	Com./Res.	Yes/No
90	105135	3	0	Res.	No
111	110671	3	20	Com.	Yes
189	189553	3	0	Com.	No
228	16015	3	0	Res.	Yes
466	190440	3	0	Res.	No
734	111718	3	0	Res.	Yes
1185	195912	3	0	Com.	No
2103	101065	3	0	Res.	No
2836	111564	3	0	Res.	Yes
2913	113416	3	0	Res.	No
3166	190959	3	0	Com.	No
3176	189121	3	0	Res.	Yes
3738	194502	3	0	Res.	No
3762	16204	2	0	Res.	Yes
3806	186336	3	0	Res.	No
3930	115532	3	210	Com.	No
4121	107246	3	0	Res.	Yes
4620	190828	3	0	Res.	No
5142	113969	3	0	Com.	Yes
5783	195953	3	0	Res.	Yes
6130	20464	3	0	Res.	No
6355	23702	3	0	Res.	Yes
6532	2315	3	0	Res.	No
11061	117034	3	0	Res.	Yes
11087	200766	3	0	Com.	Yes
2735 (11977)	101032	3	0	Res.	Yes
290 (11477)	105085	3	0	Com.	No
5025 (7559 & 125)	186613	3	0	Res.	Yes
57 (8434)	24239	3	0	Res.	No
875 (796)	191812 (113724)*	3	0	Res.	No
Data Evaluation Findings:			Average	Count	Count
			Average distance: 8 ft; 93% of properties had a building within 10 ft of plume	Res.: 22 properties (73%); Com.: 8 properties (27%)	Yes: 14 properties (53%); No: 16 properties (47%)

Notes:
CY = cubic yards
DRO = diesel range organics
GRO = gasoline range organics
ft bgs = feet below ground surface
LNAPL = light non-aqueous phase liquid
Res. = residential
Com. = commercial
* = The AI#s for Leak sites 875 and 796 will be merged into one AI# by the MPCA.
** = A result of zero (0) in this column indicates that an inhabited building is located over the plume.

Table 6
Reopened Properties versus Control Group Properties Data Evaluation
MPCA PRP Vapor Review Summary Report

Evaluation Criteria:	Subsurface Conditions		Leak Site Information				
	Soil Stratigraphy	Depth to Groundwater	Number of Releases Reported	First Release Date	Most Recent Release Date	Original Field Work Report Submitted	Site Closure Date
	Fine/Coarse Grained	ft bgs	Quantity	Date	Date	Date	Date
	Count	Average	Average	Earliest, average, and most recent dates			
Reopened Properties Evaluation Findings:	Fine-grained: 16 properties (53%); Coarse-grained: 14 properties (47%)	8.9 ft bgs	1.23	Earliest: 8/9/1973	Earliest: 4/14/1983	Earliest: 2/5/1988	Earliest: 8/2/1994
				Average: 7/24/1992	Average: 12/16/1993	Average: 10/11/1994	Average: 1/4/2001
				Most Recent: 7/17/2003	Most Recent: 5/14/2007	Most Recent: 12/8/2003	Most Recent: 9/25/2008
Control Group Properties Evaluation Findings:	Fine-grained: 12 properties (40%); Coarse-grained: 18 properties (60%)	13.6 ft bgs	1.20	Earliest: 10/18/1983	Earliest: 10/18/1983	Earliest: 11/7/1983	Earliest: 6/27/1991
				Averaage: 5/10/1990	Average: 8/28/1991	Average: 3/23/1992	Average: 10/25/1998
				Most Recent: 1/29/1998	Most Recent: 10/6/1998	Most Recent: 6/25/1998	Most Recent: 11/30/2005
In summary, Reopened Properties generally had:	Slightly more fine-grained soil	Shallower groundwater	Similar number of releases as the Control Group Properties	Slightly later first releases	Slightly later most recent releases	Slightly later first field work	Slightly later site closure date

Notes:
CY = cubic yards
DRO = diesel range organics
GRO = gasoline range organics
ft bgs = feet below ground surface
LNAPL = light non-aqueous phase liquid
Res. = residential
Com. = commercial
* = The Control Group Properties were selected from the same counties as the Reopened Properties, so a comparison of properties within Environmental Justice Areas between the Reopened Properties and Control Group Properties is not insightful.

Table 6
Reopened Properties versus Control Group Properties Data Evaluation
MPCA PRP Vapor Review Summary Report

Evaluation Criteria:	Nature of Contamination					
	>2 ft of LNAPL Detected in Monitoring Well	LNAPL Present at Site Closure	Release Product Carbon Range	Chlorinated Solvents Detected	Methane >1%	Methane >4%
	Yes/No	Yes/No	Low (<13)/High (>13)/Both	Yes/No	Yes/No	Yes/No
	Count	Count	Count	Count	Count	Count
Reopened Properties Evaluation Findings:	Yes: 5 properties (17%); No: 25 properties (83%)	Yes: 2 properties (7%); No: 28 properties (93%)	Low: 14 properties (47%)	Yes: 19 properties (63%); No: 11 properties (37%)	Yes: 22 properties (73%); No: 8 properties (27%)	Yes: 16 properties (53%); No: 14 properties (47%)
			High: 4 properties (13%)			
			Both: 12 properties (40%)			
Control Group Properties Evaluation Findings:	Yes: 1 property (3%); No: 29 properties (97%)	Yes: 0 properties (0%); No: 30 properties (100%)	Low: 12 properties (40%)	Yes: 19 properties (63%); No: 11 properties (37%)	Yes: 5 properties (17%); No: 25 properties (83%)	Yes: 4 properties (13%); No: 26 properties (87%)
			High: 9 properties (30%)			
			Both: 9 properties (30%)			
In summary, Reopened Properties generally had:	More properties with >2 ft LNAPL detected	More properties with LNAPL at closure	Less high carbon range (i.e., DRO) and more low carbon range (i.e., GRO) releases	No Difference	More properties with elevated methane concentrations	

Notes:

CY = cubic yards

DRO = diesel range organics

GRO = gasoline range organics

ft bgs = feet below ground surface

LNAPL = light non-aqueous phase liquid

Res. = residential

Com. = commercial

* = The Control Group Properties were selected from the same counties as the Reopened Properties, so a comparison of properties within Environmental Justice Areas between the Reopened Properties and Control Group Properties is not insightful.

Table 6
Reopened Properties versus Control Group Properties Data Evaluation
MPCA PRP Vapor Review Summary Report

Evaluation Criteria:	Remediation Activities		Other Criteria		
	Was a Remediation System Operated?	Amount of Contaminated Soil Excavated/ Removed?	Distance from Plume to Nearest Occupiable Building	Type of Nearest Off-Property Building to Plume	In an Environmental Justice Area?
	Yes/No	Property Count/Cubic Yards	Feet	Residential/Commercial	Yes/No
	Count	Count/Average	Average	Count	Count
Reopened Properties Evaluation Findings:	Yes: 9 properties (30%); No: 21 properties (70%)	Soil removed: 23 properties (77%); No soil removed: 7 properties (23%); Average amount of soil removed: 376 CY	Average distance: 7 ft; 87% of properties had a building within 10 ft of plume	Res.: 13 properties (43%); Com.: 17 properties (57%)	Yes: 13 properties (43%); No: 17 properties (57%)
Control Group Properties Evaluation Findings:	Yes: 16 properties (53%); No: 14 properties (47%)	Soil removed: 25 properties (83%); No soil removed: 5 properties (17%); Average amount of soil removed: 465 CY	Average distance: 8 ft; 93% of properties had a building within 10 ft of plume	Res.: 22 properties (73%); Com.: 8 properties (27%)	Yes: 14 properties (53%); No: 16 properties (47%)
In summary, Reopened Properties generally had:	Fewer remediation systems	Less soil excavated	No difference	Fewer nearby residential properties	NA*

Notes:
CY = cubic yards
DRO = diesel range organics
GRO = gasoline range organics
ft bgs = feet below ground surface
LNAPL = light non-aqueous phase liquid
Res. = residential
Com. = commercial
* = The Control Group Properties were selected from the same counties as the Reopened Properties, so a comparison of properties within Environmental Justice Areas between the Reopened Properties and Control Group Properties is not insightful.

Table 7
Reopened Properties Attributes Summary
MPCA PRP Vapor Review Summary Report

Reopened Properties Attributes ¹ :	Shallower average depth to GW	More likely to have historical LNAPL thicknesses > 2 ft in a MW	LNAPL remaining during site closure	More likely to be contaminated with lower carbon range hydrocarbons (i.e., GRO)	More likely to have elevated methane soil gas concentrations (>1% and >4% methane)		More likely to have less contaminated soil excavated ³		More likely to be located in commercial versus residential area	TOTAL ⁴
Criteria used for Attributes Counts:	Depth to GW < 13 ft bgs ²	LNAPL thickness > 2 ft in MW	LNAPL remaining during site closure	Release product carbon range was low or both low/high	Has methane soil gas >1%	Has methane soil gas >4%	<= 200 CY of soil removed	<= 400 CY of soil removed	Nearest off-property building is commercial use	
Reopened Properties - Leak ID#										
687	X			X				X	X	3
852				X					X	2
1029		X		X	X			X		3
1419	X			X			X	X	X	4
2205	X	X		X	X	X				5
2212	X	X		X					X	4
4036	X				X				X	3
4296	X				X	X	X	X		4
4770	X			X	X	X			X	5
5689	X			X	X	X		X	X	5
6270	X			X	X	X	X	X		5
6360	X			X	X	X	X	X		5
6655	X			X					X	3
6739	X			X			X	X	X	4
7273		X		X	X					3
10227	X	X		X	X	X	X	X		6
11355	X			X	X	X	X	X	X	6
12811	X			X	X	X	X	X		5
13405	X		X				X	X		3
14253	X				X		X	X		3
15381				X	X	X	X	X		4
1162 (5795)	X			X			X	X	X	4
14639 (16827 & 16351)	X			X	X		X	X		4
167 (170)	X			X	X	X				4
2457 (1072 and 13101)	X		X	X	X	X	X	X		6
339 (14442)	X			X	X	X	X	X		5
397 (13738)	X			X	X	X			X	5
5087 (18452)	X			X	X	X		X		4
5999 (6258)	X			X	X		X	X		4
7577 (3248)	X			X	X	X			X	5
TOTAL	26	5	2	26	22	16	16	20	13	

Notes:

¹ These attributes were identified based on the evaluation vs the Control Group Properties; see Table 6.

² MPCA staff selected 13 feet (ft) below ground surface (bgs) as the threshold for evaluating this attribute.

³ MPCA staff selected 200 and 400 cubic yards (CY) as thresholds for evaluating this attribute.

⁴ This total does not include the count for properties with <= 400 CY of soil removed, so as to only count one attribute associated with contaminated soil removal.

GRO = gasoline range organics

GW = groundwater

LNAPL = light non-aqueous phase liquid

MW = monitoring well

Average Number of Attributes per Property:	4.2
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Table 8
Reopened Properties Attributes - Applied to Control Group Properties
MPCA PRP Vapor Review Summary Report

Reopened Properties Attributes ¹ :	Shallower average depth to GW	More likely to have historical LNAPL thicknesses > 2 ft in a MW	LNAPL remaining during site closure	More likely to be contaminated with lower carbon range hydrocarbons (i.e., GRO)	More likely to have elevated methane soil gas concentrations (>1% and >4% methane)		More likely to have less contaminated soil excavated ³		More likely to be located in commercial versus residential area	TOTAL ⁴
Criteria used for Attributes Counts:	Depth to GW < 13 ft bgs ²	LNAPL thickness > 2 ft in MW	LNAPL remaining during site closure	Release product carbon range was low or both low/high	Has methane soil gas >1%	Has methane soil gas >4%	<= 200 CY of soil removed	<= 400 CY of soil removed	Nearest off-property building is commercial use	
Control Group Properties - Leak ID#										
90	X						X	X		2
111				X			X	X		2
189	X			X	X	X	X	X		5
228	X			X				X		2
466	X				X	X	X	X		4
734				X				X		1
1185	X			X	X	X		X		4
2103							X	X		1
2836	X			X				X		2
2913	X			X			X	X		3
3166	X			X					X	3
3176	X			X				X		2
3738	X						X	X		2
3762	X	X		X						3
3806	X			X			X	X		3
3930							X	X	X	2
4121				X						1
4620	X			X				X		2
5142							X	X	X	2
5783							X	X		1
6130	X				X	X				3
6355	X			X	X			X		3
6532	X			X			X	X		3
11061	X						X	X		2
11087	X			X						2
2735 (11977)	X			X			X	X		3
290 (11477)	X			X						2
5025 (7559 & 125)				X						1
57 (8434)	X			X				X		2
875 (796)	X			X			X	X		3
TOTAL	22	1	0	21	5	4	15	23	3	

Notes:

¹ These attributes were identified based on the evaluation vs the Control Group Properties; see Table 6.

² MPCA staff selected 13 feet (ft) below ground surface (bgs) as the threshold for evaluating this attribute.

³ MPCA staff selected 200 and 400 cubic yards (CY) as thresholds for evaluating this attribute.

⁴ This total does not include the count for properties with <= 400 CY of soil removed, so as to only count one attribute associated with contaminated soil removal.

GRO = gasoline range organics

GW = groundwater

LNAPL = light non-aqueous phase liquid

MW = monitoring well

Average Number of Attributes per Property:	2.4
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