

Protecting Our Water Environment



Metropolitan Water Reclamation District of Greater Chicago

***MONITORING AND RESEARCH
DEPARTMENT***

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***ODOR MONITORING PROGRAM AT THE METROPOLITAN WATER
RECLAMATION DISTRICT OF GREATER CHICAGO'S SOLIDS DRYING
AND SOLIDS PROCESSING FACILITIES DURING 2018***

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ODOR MONITORING PROGRAM AT THE METROPOLITAN WATER RECLAMATION
DISTRICT OF GREATER CHICAGO'S SOLIDS DRYING AND SOLIDS PROCESSING
FACILITIES DURING 2018

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LIST OF ACRONYMS

CS	construction site
District	Metropolitan Water Reclamation District of Greater Chicago
H ₂ S	hydrogen sulfide
HASMA	Harlem Avenue Solids Management Area
LASMA	Lawndale Avenue Solids Management Area
M&O	Maintenance and Operations
M&R	Monitoring and Research
ppbv	parts per billion by volume
RASMA	Ridgeland Avenue Solids Management Area
SDA	solids drying area
SDS	solids drying site
SPS	solids processing site
TARP	Tunnel and Reservoir Plan
WRP	water reclamation plant

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DISCLAIMER

Mention of proprietary equipment in this report does not constitute endorsement by the Metropolitan Water Reclamation District of Greater Chicago.

SUMMARY

The Metropolitan Water Reclamation District of Greater Chicago (District) has maintained a program of monitoring odors at one solids drying site (SDS), one solids processing site (SPS), and five solids drying areas (SDAs) since 1990. The Ridgeland Avenue Solids Management Area and Stony Island SDA were removed from the odor monitoring program as they no longer are used by the District and the land is now leased by others. Both Monitoring and Research (M&R) Department and Maintenance and Operations (M&O) Department personnel made subjective observations regarding the type and intensity of any odor perceived during odor monitoring. The M&R Department staff recorded instantaneous hydrogen sulfide (H₂S) measurements using a handheld monitor at each monitoring site. The frequency of monitoring was one day per week at the SDS, SDAs, and SPS. Each odor observation was characterized as very strong, strong, easily noticeable, faint, very faint, or no odor.

During 2018, no very strong odors were observed at the Calumet WRP SDS; one very strong odor was observed at Harlem Avenue Solids Management Area (HASMA), Marathon, Vulcan SDAs, and Lawndale Avenue Solids Management Area (LASMA) SPS; six strong odors were observed at the Calumet WRP SDS; and eleven strong odors were observed at HASMA, Marathon, Vulcan SDAs, and LASMA SPS. At all the sites that were monitored, observations were characterized as no odor to faint 59 to 75 percent of the time.

At each of the SDS, SDAs, and SPS, there are specific locations which had noticeable odors. A summary of locations which had occasional strong or very strong odors is presented in Table 1.

The H₂S levels generally followed a pattern similar to the odor observations, with occasional high values. The average level of H₂S ranged from <3.0 to 13 parts per billion by volume (ppbv) at the SDS, SDAs, and SPS.

TABLE 1: STRONG AND VERY STRONG ODOR OBSERVATIONS – 2018

Facility (Station Number)	Number of Strong Odor Observations	Number of Very Strong Odor Observations	Total Number of Observations
Calumet Water Reclamation Plant SDS			
Drying Cell 1 SW (14)	1		
Drying Cell 8 NW (16)	1		
Drying Cell 8 NE (17)	1		
Drying Cell 1 SE (19)	2		
Drying Cell 1 Gate (20)	<u>1</u>		
	Total 6	<u>0</u>	<u>684</u>
HASMA, Marathon, and Vulcan SDAs, and LASMA SPS			
HASMA (1)	2		
HASMA Center (1.5)	1		
Vulcan CS (4)	1		
Vulcan TARP Well (5)	1		
McCook Reservoir (7)	1		
LASMA Lagoon 24 (8)	2	1	
Cell 2E – 2W (11)	1		
Marathon (15)	1		
Marathon West (16)	<u>1</u>		
	Total 11	<u>1</u>	<u>759</u>

Note: HASMA = Harlem Avenue Solids Management Area.
 LASMA = Lawndale Avenue Solids Management Area.
 CS = Construction Site.
 SDA = Solids Drying Area.
 SDS = Solids Drying Site.
 SPS = Solids Processing Site.
 TARP = Tunnel and Reservoir Plan.

INTRODUCTION

The M&R Department, in conjunction with the M&O Department, has been conducting an odor monitoring program at various District solids drying and processing facilities for the past 28 years. The program was initiated to monitor the solids processing and drying sites at LASMA, HASMA, Marathon, and Vulcan Construction Site (CS) in 1990, and was expanded to the Calumet WRP SDS in 1992 and to the Ridgeland Avenue Solids Management Area (RASMA) and SDA in 2001 as part of the District's SDA operating permits. Odor monitoring at RASMA and Stony Island SDAs was terminated as they are no longer used as biosolids drying sites and the land is leased to others.

At each location, a similar procedure is followed to monitor odors. Personnel from the M&R Department, and at some facilities M&O Department personnel as well, visit various locations at each facility on a regular basis, and make subjective observations regarding the character and intensity of odors at each of the stations. The odor intensities are ranked on a scale of 0 to 5, corresponding to no odor, very faint, faint, easily noticeable, strong, and very strong. In addition to the subjective evaluation of odors in terms of intensity and character, the ambient air is sampled and analyzed for H₂S concentration using a Jerome Model 631-X or Model J605 H₂S analyzer. The monitoring range of the Model 631-X is 3 to 50,000 ppbv, and the monitoring range of the Model J605 is 3 to 10,000 ppbv.

The objective of this program is to collect and maintain a database of odor levels within and around each solids drying and processing facility as part of a mandate requirement by the Illinois Environmental Protection Agency for odor management at the District's drying facilities. This data can also be used to study trends in odor levels associated with solids drying and processing operations and to correlate odor levels with conditions related to those operations to support changing conditions within the facility, such as application of deodorizing agents or timing certain operations to minimize odors.

This report presents the odor monitoring data for the year 2018. A summary of the odor monitoring program for the solids drying and processing facilities is presented in [Table 2](#). This table includes a brief description of the program with regard to when the monitoring commenced at each facility, the number of monitoring locations, the frequency of the monitoring, who conducts the monitoring, if H₂S is measured by M&R Department personnel, and the number of odor complaints in 2018.

Maps showing the odor monitoring locations are presented in [Appendix AI](#). The number of monitoring locations at each facility varies from 9 to 17, depending upon the size of the facility and the history of odor episodes at those facilities. The solids drying and processing facilities are monitored one day per week.

In 2018, two odor complaints were received at the Calumet WRP SDS; two odor complaints were received at the HASMA, Marathon, and Vulcan SDAs, and LASMA SPS.

TABLE 2: ODOR MONITORING PROGRAM FOR 2018

Facility	Number of Locations Monitored	Year Began	Months of Year	Days per Week	Departments Participating	H ₂ S Measured	Number of Odor Complaints	Number of Complaints Verified
Calumet WRP SDS	9	1992	12	1 Varies	M&R M&O	Yes No	2	2
HASMA, Marathon, Vulcan SDAs, and LASMA SPS	17	1990	12	1	M&R	Yes	2	2

Note: HASMA = Harlem Avenue Solids Management Area.
 LASMA = Lawndale Avenue Solids Management Area.
 SDA = Solids Drying Area.
 SDS = Solids Drying Site.
 SPS = Solids Processing Site.
 M&R = Monitoring and Research Department.
 M&O = Maintenance and Operations Department.

RESULTS OF ODOR MONITORING AT THE METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO'S SOLIDS DRYING AND SOLIDS PROCESSING FACILITIES IN 2018

The 2018 odor monitoring results for each of the monitored sites are summarized in [Table 3](#). The results have been divided into two major groups: significant odors, which include very strong, strong, or easily noticeable odors, and insignificant odors, which include no odors, very faint, or faint.

Calumet Water Reclamation Plant Solids Drying Site

The Calumet WRP SDS consists of the East SDA, located east of the Calumet WRP, and the West SDA, located west of the Calumet WRP. The Calumet WRP SDS had 83 percent of total observations characterized as faint to no odor. The occurrence of strong odors at the drying areas, which also includes the nonoperational centrifuge building located at the East SDA, was infrequent. The majority of the observations were described as faint to no odor. No very strong odors were detected in 2018. There were six strong odor observations out of 684 total observations. Six strong odors were observed at the SDS, which were spread among the various locations (Drying Cell 1 SW, Drying Cell 8 NW, Drying Cell 8 NE, Drying Cell 1 SE, and Drying Cell 1 at Gate) depending upon the activity at the time. Strong odors were observed under nine percent of the time on a monthly basis throughout the various locations. [Figure 1](#) presents the monthly frequency of occurrence of the easily noticeable, strong, and very strong odor observations. The easily noticeable odors were highest during July 2018.

The average H₂S levels were between <3.0 and 13 ppbv, as shown in [Table 4](#). The highest value observed (134 ppbv) was at the Truck Scale/Centrifuge on September 4, 2018. The M&R Department will be reviewing site specific meteorological data (wind speed and wind direction) and dispersion modeling of H₂S to assess the probability of odors from the Calumet WRP being dispersed over the drying areas, and the results will be the subject of a numbered report on the Biosolids Environmental Management System Monitoring Program, described below.

TABLE 3: ODOR MONITORING RESULTS FOR 2018

Facility	Departments Participating	Total Number of Observations	Number of Observations Significant Odors Detected				Number of Insignificant Odors ¹	Percent of Insignificant Odors
			Very Strong	Strong	Easily Noticeable			
Calumet WRP SDS	M&R	459	0	6	107	346	75%	
	M&O	225	0	0	0	225	100%	
HASMA, Marathon, Vulcan SDAs, and LASMA SPS	M&R	759	1	11	296	451	59%	

Note: HASMA = Harlem Avenue Solids Management Area.
 LASMA = Lawndale Avenue Solids Management Area.
 SDA = Solids Drying Area.
 SDS = Solids Drying Site.
 SPS = Solids Processing Site.
 M&R = Monitoring and Research Department.
 M&O = Maintenance and Operations Department.

¹Insignificant odors are all observations of faint, very faint, or no odor.

FIGURE 1: PERCENT MONTHLY ODOR OBSERVANCES AT THE CALUMET WATER RECLAMATION PLANT SOLIDS DRYING SITE – 2018

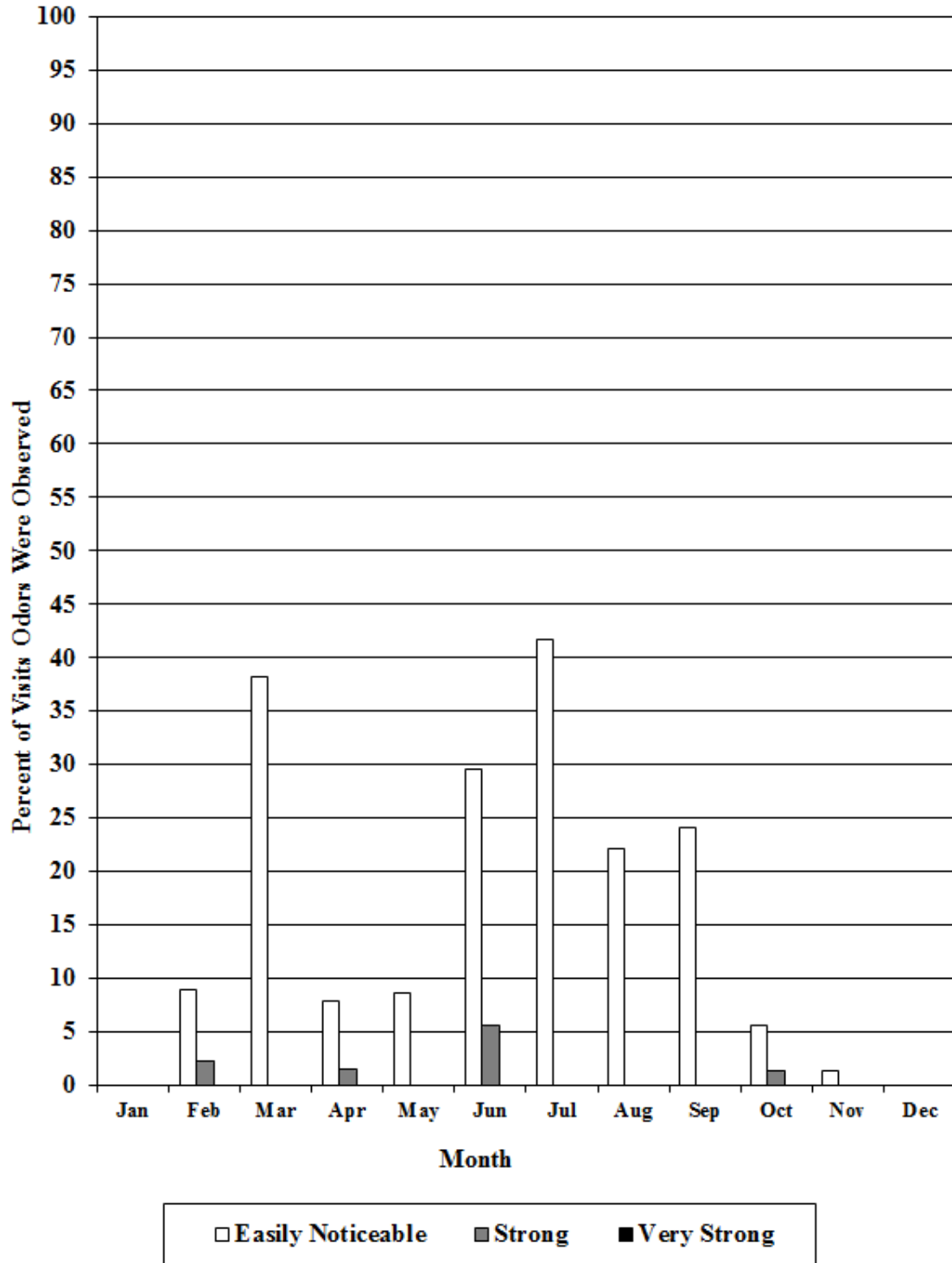


TABLE 4: HYDROGEN SULFIDE READINGS AT THE CALUMET WATER RECLAMATION PLANT SOLIDS DRYING SITE FOR 2018

Location ²	Hydrogen Sulfide, ppbv ¹		
	Mean ³	Percent of Readings Below the Detection Limit	Maximum
East Drying Cell 1 SW (14)	3.5	61%	32
Hopper Building (15)	<3	68%	10
East Drying Cell 8 NW (16)	<3	61%	15
East Drying Cell 8 NE (17)	3.1	56%	15
Truck Scale/Centrifuge (18)	13	52%	134
East Drying Cell 1 SE (19)	3.5	55%	17
West Drying Cell 1 Gate (20)	4.4	46%	62
West Drying Cell 4 (21)	3.2	50%	13
Bituminous Road Gate (22)	<3	66%	8

¹ppbv = Parts per billion by volume.

²Numbers in parentheses correspond to Station numbers in [Figure AI-1](#).

³Mean values are calculated using the average of all recordings by the Jerome hydrogen sulfide analyzer. The detection limit for the Jerome is 3 ppbv, but could display 0~3 ppbv on the meter. If the measurement was below the detection limit, the value displayed was used to calculate the mean whether it was 0 or some other number in between 0 and 3.

Harlem Avenue Solids Management Area, Vulcan Solids Drying Area, Marathon Solids Drying Area, and Lawndale Avenue Solids Management Area Solids Processing Site

The HASMA facility consists of HASMA, LASMA, Vulcan SDA, and Marathon SDA, located near the intersection of South Harlem Avenue and the Chicago Sanitary and Ship Canal, on the north bank of the Canal. The HASMA, Vulcan SDA, and Marathon SDAs and the LASMA SPS had 59 percent of the total observations characterized as faint to no odor. The occurrence of strong odors at these facilities was infrequent. The majority of the observations were described as faint to no odor. There was one very strong odor observation and 11 strong odor observations out of 759 total observations. The 11 strong odors were observed in February, March, May, June, July, and December, and were spread among the various locations (HASMA, HASMA Center, Vulcan CS, Vulcan TARP Well, McCook Reservoir, LASMA Lagoon 24, Cell 2E – 2W, Marathon, and Marathon West) depending upon the activity at the time.

The percentage of observations at which easily noticeable, strong, and very strong odors were observed was plotted by month, and is presented in [Figure 2](#). Strong odors were observed under seven percent of the time on a monthly basis. The frequency of observed odors is generally higher during the summer months (May through September), when solids processing and drying are carried out. The easily noticeable odor observations ranged from 1.6 to 76 percent during this time period. The easily noticeable odors were highest during August 2018.

The average H₂S levels at the various locations around these SDAs and SPS ranged from <3.0 to 7.6 ppbv, as shown in [Table 5](#). The highest value observed (170 ppbv) was at McCook Reservoir on July 12, 2018.

Biosolids Environmental Management System Monitoring Program

In 2018, the M&R Department initiated the Biosolids Environmental Management System Monitoring Program. The program collected baseline odor data with monitoring by odor intensity patrol, low-range OdaLog sensors, and Tedlar bag sampling and olfactory analysis during three discrete monitoring periods that covered late May through June, August to early September, and October to early November. The monitoring locations included Calumet WRP SDS, HASMA, Marathon, and Vulcan SDAs, and LASMA SPS. The Biosolids EMS Monitoring Program results are summarized in a separate report.

FIGURE 2: PERCENT MONTHLY ODOR OBSERVANCES AT THE HARLEM AVENUE SOLID MANAGEMENT AREA, VULCAN SOLIDS DRYING AREAS, MARATHON SOLIDS DRYING AREAS, AND LAWNSDALE AVENUE SOLIDS MANAGEMENT AREA SOLIDS PROCESSING SITE – 2018

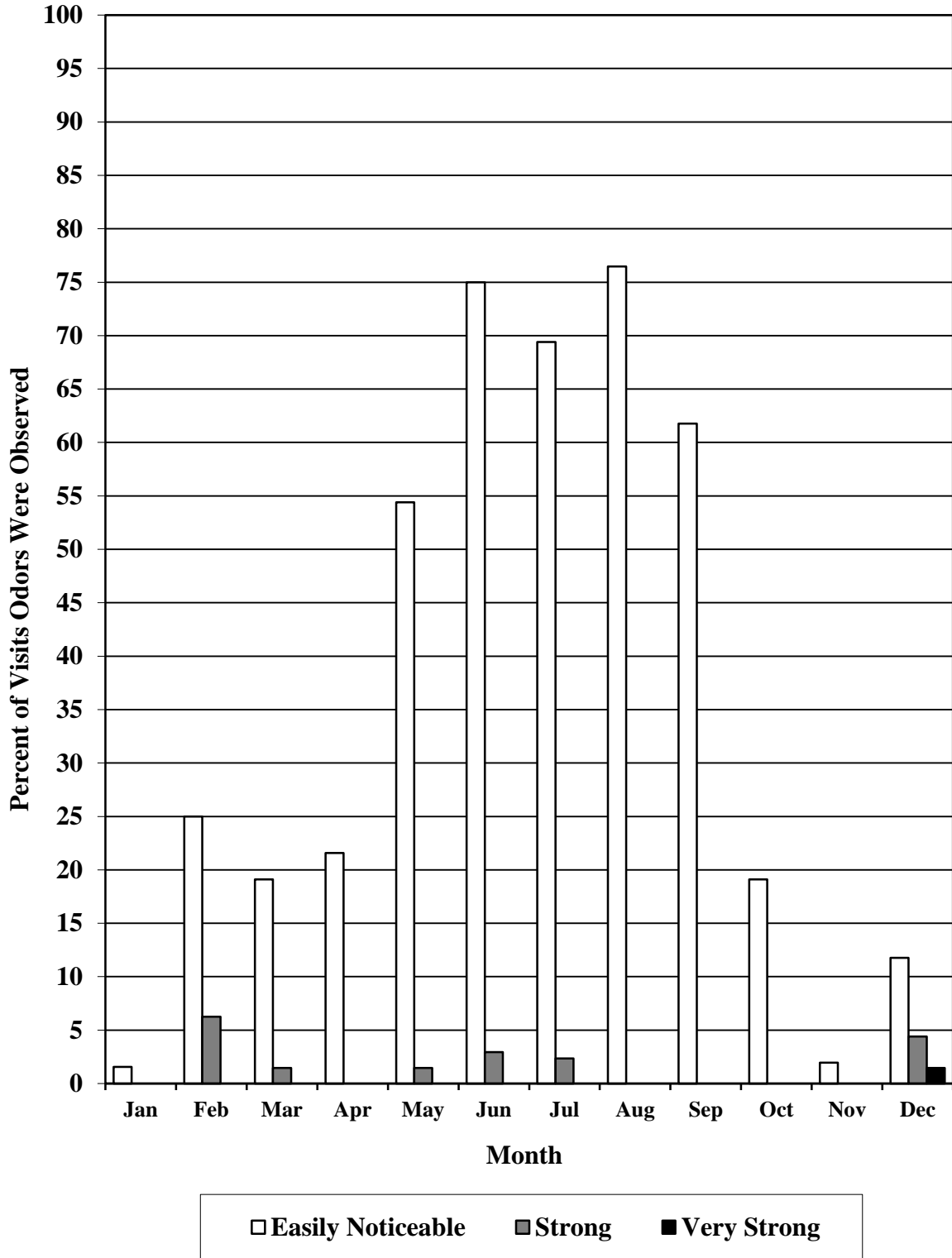


TABLE 5: HYDROGEN SULFIDE READINGS AT THE HARLEM AVENUE SOLIDS MANAGEMENT AREA, VULCAN SOLIDS DRYING AREAS, MARATHON SOLIDS DRYING AREAS, AND LAWDALE AVENUE SOLIDS MANAGEMENT AREA SOLIDS PROCESSING SITE FOR 2018

Location	Hydrogen Sulfide, ppbv ¹		
	Mean ²	Percent of Readings Below the Detection Limit	Maximum
HASMA (1) ³	3.0	69%	24
HASMA Center (1.5)	<3	70%	12
Vulcan CS South (2)	3.0	62%	18
Vulcan CS North (3)	3.5	50%	10
Vulcan CS TARP Drop Shaft (4)	4.0	53%	24
Vulcan CS TARP Well (5)	4.4	47%	17
LASMA Lagoon 1 (6)	5.3	47%	32
McCook Reservoir (7)	7.6	39%	170
LASMA Lagoon 24 (8)	6.7	31%	48
LASMA Lagoon 30 (9)	5.0	35%	18
LASMA Cell 1E-1W (10)	5.0	37%	18
LASMA Cell 2E-2W (11)	7.2	38%	120
LASMA Cell 3E-3W (12)	4.1	43%	21
LASMA Cell 4E-4W (13)	4.1	41%	16
LASMA Cell 5E-5W (14)	4.8	45%	31
Marathon (15)	4.7	37%	28
Marathon West (16)	5.4	39%	28

Note: HASMA = Harlem Avenue Solids Management Area.
 LASMA = Lawndale Avenue Solids Management Area.
 CS = Construction Site.
 TARP = Tunnel and Reservoir Plan.

¹ppbv = Parts per billion by volume.

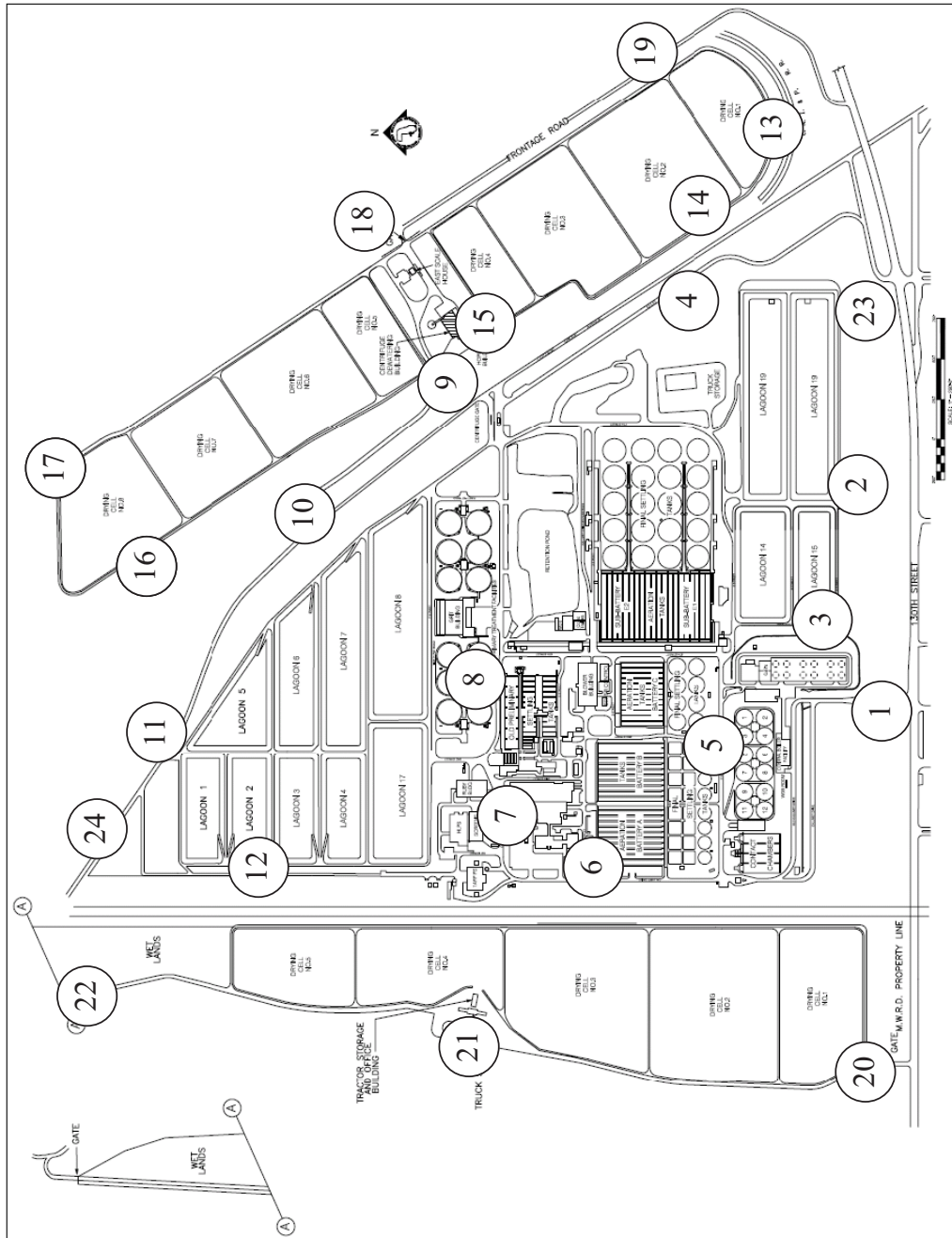
²Mean values are calculated using average of all recordings by Jerome hydrogen sulfide analyzer. The detection limit for the Jeromes is 3 ppbv, but could be displayed as 0 ppbv on meter. If the measurement is below the detection limit, the value displayed was used to calculate mean whether it was 0 or some other number in between 0 and 3.

³Numbers in parentheses correspond to Station numbers in [Figure AI-2](#).

APPENDIX I

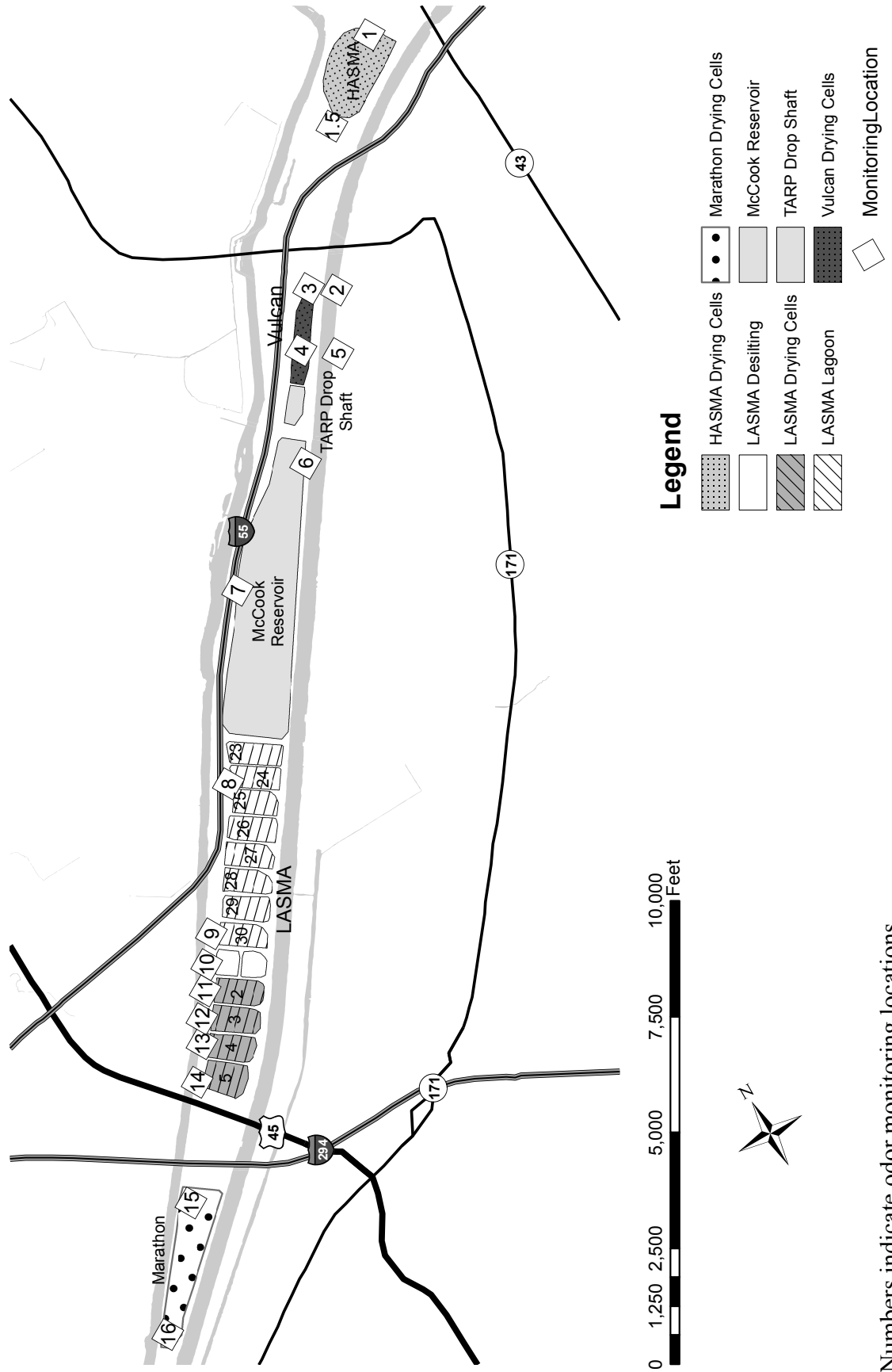
LOCATION OF ODOR MONITORING STATIONS AT THE METROPOLITAN WATER
RECLAMATION DISTRICT OF GREATER CHICAGO SOLIDS DRYING AREAS AND
SOLIDS PROCESSING SITES

FIGURE AI-1: CALUMET WATER RECLAMATION PLANT AND CALUMET WATER RECLAMATION PLANT SOLIDS DRYING AREAS*



*Numbered circles (14–22) indicate odor monitoring locations for Solids Drying Areas.

FIGURE AI-2: HARLEM AVENUE SOLID MANAGEMENT AREA, VULCAN AND MARATHON SOLID DRYING AREAS, AND LAWDALE AVENUE SOLIDS MANAGEMENT AREA SOLID PROCESSING SITE*



*Numbers indicate odor monitoring locations.