MONITORING AND RESEARCH DEPARTMENT

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ODOR MONITORING PROGRAM AT METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO FACILITIES DURING 2009

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ODOR MONITORING PROGRAM AT METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO FACILITIES DURING 2009

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DISCLAIMER

Mention of proprietary equipment and chemicals 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) maintains a program of monitoring odors at five water reclamation plants (WRPs), one solids drying site, one solids processing site (SPS), and four solids drying areas (SDAs). This program started in 1990. Both Monitoring and Research (M&R) Department and Maintenance and Operations (M&O) Department personnel make subjective observations regarding the type and intensity of any odor perceived. The M&R Department staff records instantaneous hydrogen sulfide (H_2S) measurements using a handheld monitor at each monitoring site. The number of locations at each facility varies from 4 to 19. The frequency of monitoring varies from one day per week at the Ridgeland SDA to seven days per week during the summer months at the James C. Kirie (Kirie) WRP. Each odor observation is characterized as very strong, strong, easily noticeable, faint, very faint, or no odor.

During 2009 four very strong odors, out of 4,808 observations, were observed at the Stickney WRP. There were no very strong odors observed at the Calumet, North Side, or John E. Egan (Egan) WRPs, or the SDAs and SPSs. The majority of the observations at the five WRPs were characterized as faint to no odor from 79 to 99 percent of the time. At the six SDAs and sites, observations were characterized as faint to no odor from 81 to 98 percent of the time.

At each of the WRPs there are specific locations which have noticeable odors. A summary of the locations which had occasional strong odors is presented in Table 1. For example, at the Calumet WRP the area where most strong odors were observed is in the vicinity of the Sludge Concentration Building and the preliminary tanks. At the Stickney WRP the areas where most strong odors were observed are the preliminary tanks, sludge concentration tanks, Laramie Avenue and 40th Street, and Imhoff tanks. While strong odors are generally infrequent, it shows there is the potential for odors from these areas. Strong odors occurring along Laramie Avenue were identified as typical odors coming from the Koppers Industries, Inc., plant, which is just east of the Stickney WRP.

The H_2S levels generally followed a pattern similar to the odor observations with occasional high values. The average level of H_2S ranges from 3.9 to 132.8 ppbv (parts per billion by volume) at the WRPs. At the Stickney WRP the average H_2S levels along the periphery of the plant were 6 to 9 ppbv and 8 to 133 ppbv at the majority of locations within the WRP.

TABLE 1: STRONG ODOR OBSERVATIONS – 2009

Facility	Number of Strong Odor Observations	Total Number of Observations
Calumet WRP		
Plant Entrance	3	
Lagoon #19 SW Corner	3	
Sludge Concentration Building	13	
Lagoon #18 NE Corner	1	
Sludge Digester Tanks	2	
Aeration Battery A – West	6	
Preliminary Tanks	12	
	Total 40	2,619
Calumet SDS		
Hopper Building	1	
Truck Scale/Centrifuge	1	
Drying Cell #1 SE	1	
Drying Cell #1 at Gate	1	
Bituminous Road @ Gate	1	
	Total 5	1,736
Egan WRP		
Waste Gas Burner	1	
Primary Tanks	2	
South End of "A" Drive	1	
	Total 4	332
Kirie WRP		
Pump Station	1	
Airlift A1	2	
Ridge Lane – Point #1	1	
	Total 4	9,255
North Side WRP		
Final Tank Battery D3	1	
Gallery Bldg. Battery D Mix Channel	1	
	Total 2	620

TABLE 1 (Continued): STRONG ODOR OBSERVATIONS – 2009

Facility	Number of Strong Odor Observations	Total Number of Observations
Stickney WRP*		
Imhoff Tanks	9	
Digesters Sixth Avenue & B Street	1	
Centrifuges (Pre)	1	
Centrifuges (Post)	5	
Sludge Concentration Tanks	17	
Preliminary Tanks	23	
Laramie Ave. & 40th St.	12	
Laramie Ave. & 39th St.	7	
	Total 75	4,808
HASMA, Marathon, Vulcan SDAs, and LASMA SPS		
HASMA	5	
Vulcan CS	3	
Lagoon #1	1	
Lagoon #30	1	
LASMA Drying Cells	2	
Marathon West	6	
	Total 18	2,129
RASMA SDA	0	
	Total 0	68
Stony Island SDA		
NE Corner Cell #5	0	
	Total 0	299

*There were four observations of a very strong odor at the Stickney WRP.
SDS = Solids Drying Site.
SDA = Solids Drying Area.
SPS = Solids Processing Site.
WRP = Water Reclamation Plant.

INTRODUCTION

The M&R Department in conjunction with the M&O Department has been conducting an odor monitoring program at various District facilities for the past 19 years. The initial program started with the solids processing and drying sites at the Harlem Avenue Solids Management Area (HASMA), Vulcan, and Marathon SDAs, and the Lawndale Avenue Solids Management Area (LASMA) SPS in 1990, and was expanded to the WRPs and other drying sites. The latest additions were the Ridgeland Avenue Solids Management Area (RASMA) and Stony Island SDAs in 2001.

At each location a similar procedure is followed to monitor odors. M&R Department personnel, and at some facilities M&O Department personnel, visit various stations at each facility on a regular basis. The odor monitoring personnel 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, no odor, 1, very faint, 2, faint, 3, easily noticeable, 4, strong, and 5, very strong odor. In addition to the subjective odor measurements, the ambient air is sampled and analyzed for H_2S using a Jerome Model 631-X H_2S meter.

The objective of this program is to collect and maintain a database of odor levels within and around each WRP, and associated solids processing areas. The data are used to study the trends in odor levels associated with WRP operations, and to correlate odor levels to conditions related to WRP operations or changing conditions within the WRP, such as installation of odor control equipment, or sometimes to conditions unrelated to the WRP. Since several residential areas surround the WRPs in the program, the odor monitoring activities are also designed to provide early warning of odorous conditions that develop within the WRPs, and to allow control of them before they come to the notice of the residents. If a very strong odor is observed, the incident is reported at the time of observation to the respective plant operations personnel.

This report presents the odor monitoring data for the year 2009. The odor monitoring data in terms of frequency of occurrence, locations of possible odor sources, and H_2S levels has been reviewed and summarized.

A summary of the odor monitoring program 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, and who conducts the monitoring.

Maps showing the odor monitoring sites at each WRP and SDA are presented in Appendix AI.

The number of monitoring locations at each facility varies from 4 to 19, depending upon the size of the facility and the history of odor episodes in those facilities. The Calumet and Stickney WRPs and SDAs are monitored from three to five days per week. At the Kirie WRP, the M&O Department monitors the facility every day, once per shift, from the spring through fall months.

TABLE 2: ODOR MONITORING PROGRAM FOR 2009

Facility	Number of Locations Monitored	Year Began	Months of Year	Days Per Week	Departments Participating	H_2S Measured	Number of Odor Complaints	Number of Complaints Verified
Calumet WRP	15	1992	12	3 2	M&R M&O	Yes	0	0
Calumet SDS	9	1992	12	3 2	M&R M&O	Yes	0	0
Egan WRP	7	1993	12	1 **	M&R M&O**	Yes	12	8
Kirie WRP	17	1996	12	1 7*	M&R M&O	Yes	5	4
North Side WRP	13	1992	12	1 **	M&R M&O**	Yes	3	1
Stickney WRP	19	1991	12	3 2	M&R M&O	Yes	35	11
HASMA, Vulcan, Marathon SDA, and LASMA SPS	17	1990	12	3	M&R	Yes	1	0

TABLE 2 (Continued): ODOR MONITORING PROGRAM FOR 2009

Facility	Number of Locations Monitored	Year Began	Months of Year	Days Per Week	Departments Participating	H_2S Measured	Number of Odor Complaints	Number of Complaints Verified
RASMA SDA	4	2001	12	1 to 2	M&R	Yes	0	0
Stony Island SDA	4	2001	12	1	M&R	Yes	0	0

Note: SDA = Solids Drying Area
SDS = Solids Drying Site
SPS = Solids Processing Site
WRP = Water Reclamation Plant

*At Kirie, M&O Department personnel conduct odor monitoring surveys 7 days a week 3 times a day from May through November.
**The M&O Department conducts periodic odor monitoring surveys at these facilities depending upon conditions, but the data are not included in this report.

Odor complaints in 2009 at the various facilities ranged from none at the Calumet WRP, Calumet SDS, RASMA SDA, and Stony Island SDA, to 35 at the Stickney WRP.

RESULTS OF ODOR MONITORING AT METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO FACILITIES IN 2009

The results of the various odor monitoring programs at each of the District facilities for 2009 are summarized in Table 3. The results have been divided into two major groups: detected odors, which includes the very strong, strong, and easily noticeable odor categories, and non-detected odors, which are either faint, very faint, or no odor.

A general observation drawn from the table is that at those facilities where both M&R Department and M&O Department personnel conducted odor monitoring, the M&O Department personnel show a lower frequency in odors detected. This may be due to the fact that the M&O Department personnel are exposed to the specific area on a daily basis as compared to the M&R Department personnel which can result in olfactory desensitization. Thus, they may not differentiate especially well between faint and easily noticeable odors.

Calumet Water Reclamation Plant

In general, the majority of the odor monitoring observations ranged from faint to no odor; 83 percent of the time by M&R Department personnel and 95 percent of the time by M&O Department personnel, respectively. The strong odors mainly occurred around the sludge concentration building and preliminary tanks. Areas which had easily noticeable odors were mostly in the vicinity of the preliminary tanks, sludge concentration tanks and southwest corner of Lagoon #19, sludge digester tanks, southwest corner of Lagoon #16, and Aeration Battery A.

The H_2S measurements made at the time of the odor monitoring by the M&R Department personnel are summarized in Table 4. The highest instantaneous readings were at the sludge concentration building and the preliminary tanks.

Figure 1 summarizes the monthly observations of easily noticeable, strong, and very strong odors made during 2009 in terms of frequency of occurrence. The frequency of easily noticeable observations ranged between 5 and 18 percent each month with the highest percentage occurring in June. Strong odors were observed less than two percent of the time on average, and no very strong odors were observed during 2009.

No odor complaints pertaining to the Calumet WRP were received in 2009.

Calumet Solids Drying Site

The Calumet Solids Drying Site consists of the East SDA, located east of the Calumet WRP, and the West SDA, located west of the Calumet WRP. As with the Calumet WRP, the occurrence of strong odors at the drying areas, which also includes the centrifuge building located at the East SDA, was infrequent. The majority of the observations were described as faint to no odor. A few strong odors were observed at the drying areas in March, and during August through November. Strong odors were observed about 0.3 percent of the time at the SDAs. Easily

TABLE 3: ODOR MONITORING RESULTS FOR 2009

Facility	Departments Participating	Total Number of Observations	Number of Observations Odors Were Detected			Number Non-Detects*	Percent Non-Detects
			Very Strong	Strong	Easily Noticeable		
Calumet WRP	M&R	1,422	0	22	220	1,180	83
	M&O	1,197	0	18	44	1,135	95
Calumet SDS	M&R	1,021	0	4	131	886	87
	M&O	715	0	1	58	656	92
Egan WRP	M&R M&O**	332	0	4	24	304	92
Kirie WRP	M&R	670	0	3	14	653	98
	M&O	8,492	0	1	69	8,422	99
North Side WRP	M&R M&O**	607	0	2	71	534	88
Stickney WRP	M&R	2,633	2	60	484	2,087	79
	M&O	2,177	2	15	80	2,080	96
HASMA, Vulcan and Marathon SDA and LASMA SPS	M&R	2,123	0	18	384	1,721	81

TABLE 3 (Continued): ODOR MONITORING RESULTS FOR 2009

Facility	Departments Participating	Total Number of Observations	Number of Observations Odors Were Detected			Number Non-Detects*	Percent Non-Detects
			Very Strong	Strong	Easily Noticeable		
RASMA SDA	M&R	68	0	0	2	66	97
Stony Island SDA	M&R	299	0	0	5	294	98

Note: SDS = Solids Drying Site
SDA = Solids Drying Area
SPS = Solids Processing Site
WRP = Water Reclamation Plant

*Non-detects are all observations of faint, very faint, or no odor.

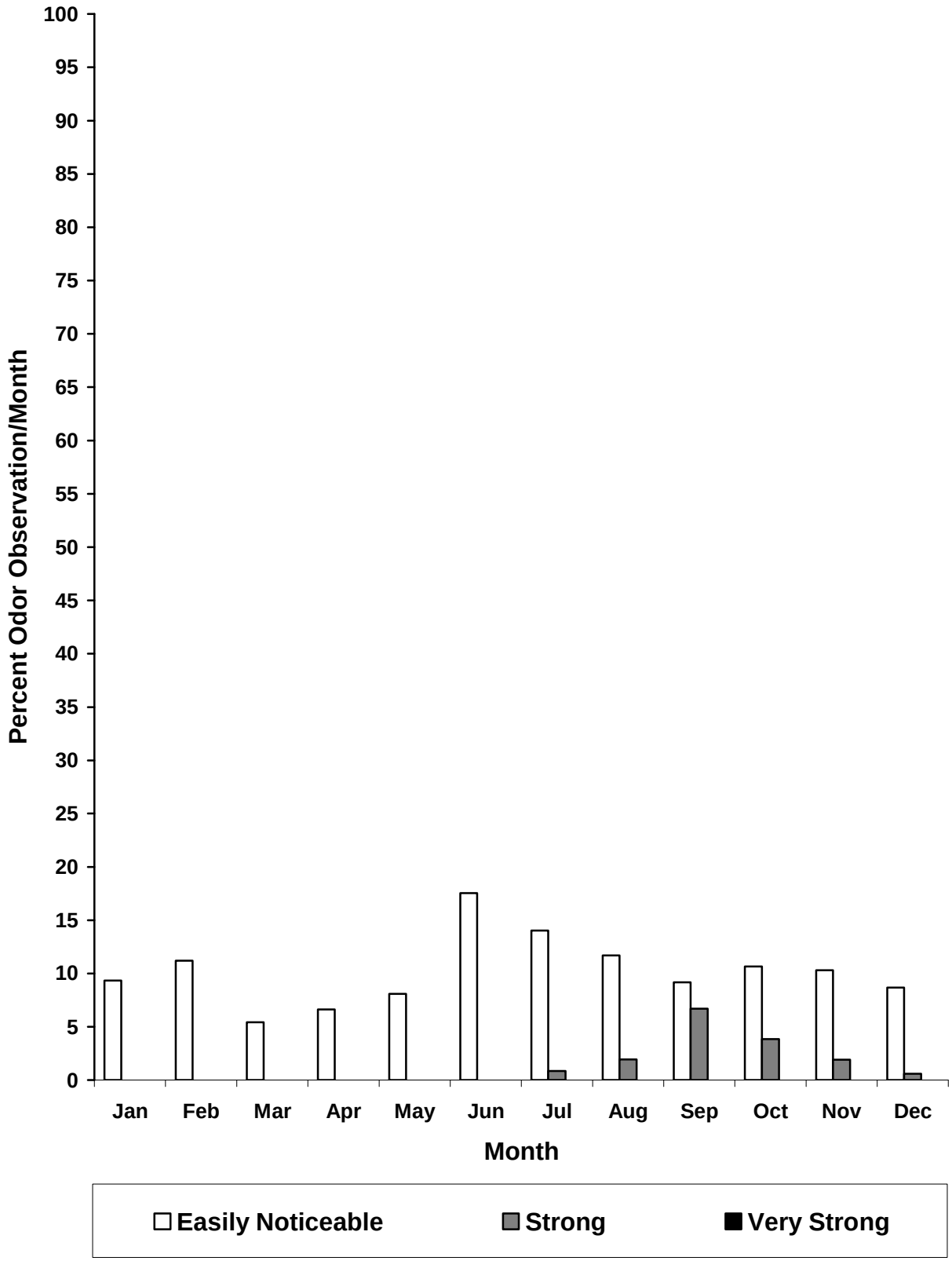
**The M&O Department conducts periodic odor monitoring surveys at these facilities but the data are not included in this Table.

TABLE 4: HYDROGEN SULFIDE READINGS AT
CALUMET WATER RECLAMATION PLANT – 2009

Location	Hydrogen Sulfide, ppbv[1]		
	Mean	Minimum	Maximum
Plant Entrance (1)[2]	6.1	0	44
Lagoon #16 SW Corner (2)	6.2	0	29
Sludge Conc. Bldg. (3)	24.7	1	1,000
Lagoon #16 NE Corner (4)	5.2	0	20
Sludge Digester Tanks (5)	5.6	1	19
Aeration Battery A – West (6)	5.5	1	19
TARP Pump Station (7)	4.9	0	19
Preliminary Tanks (8)	36.2	1	460
Gate Near Lagoon #9 (9)	3.9	0	12
Between Lagoon #7 & #8 (10)	5.2	0	18
Lagoon #1 & #2 (11)	5.5	0	22
Lagoon #3 & #4 (12)	5.2	0	16
Ellis Ave. & 130th St. (13)	5.6	0	53
H_2S Monitor – 130th St. (23)	4.3	0	14
North H_2S Monitor (24)	6.7	1	114

[1] ppbv = Parts per billion by volume.
[2] Numbers in parentheses correspond to Station numbers in Figure AI-1.

FIGURE 1: ODOR OBSERVANCES AT CALUMET
WATER RECLAMATION PLANT – 2009



noticeable odors occurred between 4 and 13 percent of the time throughout the various drying area locations. Figure 2 presents the monthly frequency of occurrence of the easily noticeable, strong, and very strong odor observations. The easily noticeable odors peaked during June 2009.

The average H_2S levels were between 4.7 and 5.3 ppbv, as shown in Table 5. The highest value observed (11 ppbv) was at West Drying Cell #4.

No odor complaints were received with regard to the Calumet Solids Drying Site.

John E. Egan Water Reclamation Plant

There were four strong odor observations at the Egan WRP in 2009. Faint or no odors were reported 92 percent of the time. The easily noticeable odor observations occurred 7 percent of the time, and occurred most frequently in the vicinity of the primary tanks and near the waste gas burner.

The percentage of observations at which easily noticeable, strong, and very strong odors were observed during 2009 are plotted by month in Figure 3.

The average H_2S measurements ranged from 5.0 to 8.3 ppbv, as shown in Table 6. The highest average level and highest instantaneous level was observed at the south end of "A" Drive.

Twelve odor complaints pertaining to the Egan WRP were received in 2009, eight of which were verified as being associated with odors originating in the WRP.

James C. Kirie Water Reclamation Plant

There were four strong odor observations at the Kirie WRP during 2009. Faint or no odors were reported 98 percent (M&R Department) and 99 percent (M&O Department) of the time. The easily noticeable odors which occurred were generally in the vicinity of air lift station A1, the return aeration channel, and air lift station A2.

Figure 4 summarizes the observations of easily noticeable or stronger odors by odor monitoring personnel during 2009. There were four strong odor episodes which were observed by M&R Department and M&O Department personnel during January, June, October, and December 2009.

The measured H_2S levels are summarized in Table 7. The highest maximum and average levels of H_2S, 50 ppbv and 6.5 ppbv, respectively, were measured in the vicinity of the return channel. All the other locations had averages ranging from 4.6 to 5.4 ppbv.

Five odor complaints were received regarding the Kirie WRP, of which four were verified as resulting from Kirie WRP operations.

FIGURE 2: ODOR OBSERVANCES AT CALUMET WATER RECLAMATION PLANT SOLIDS DRYING SITES – 2009

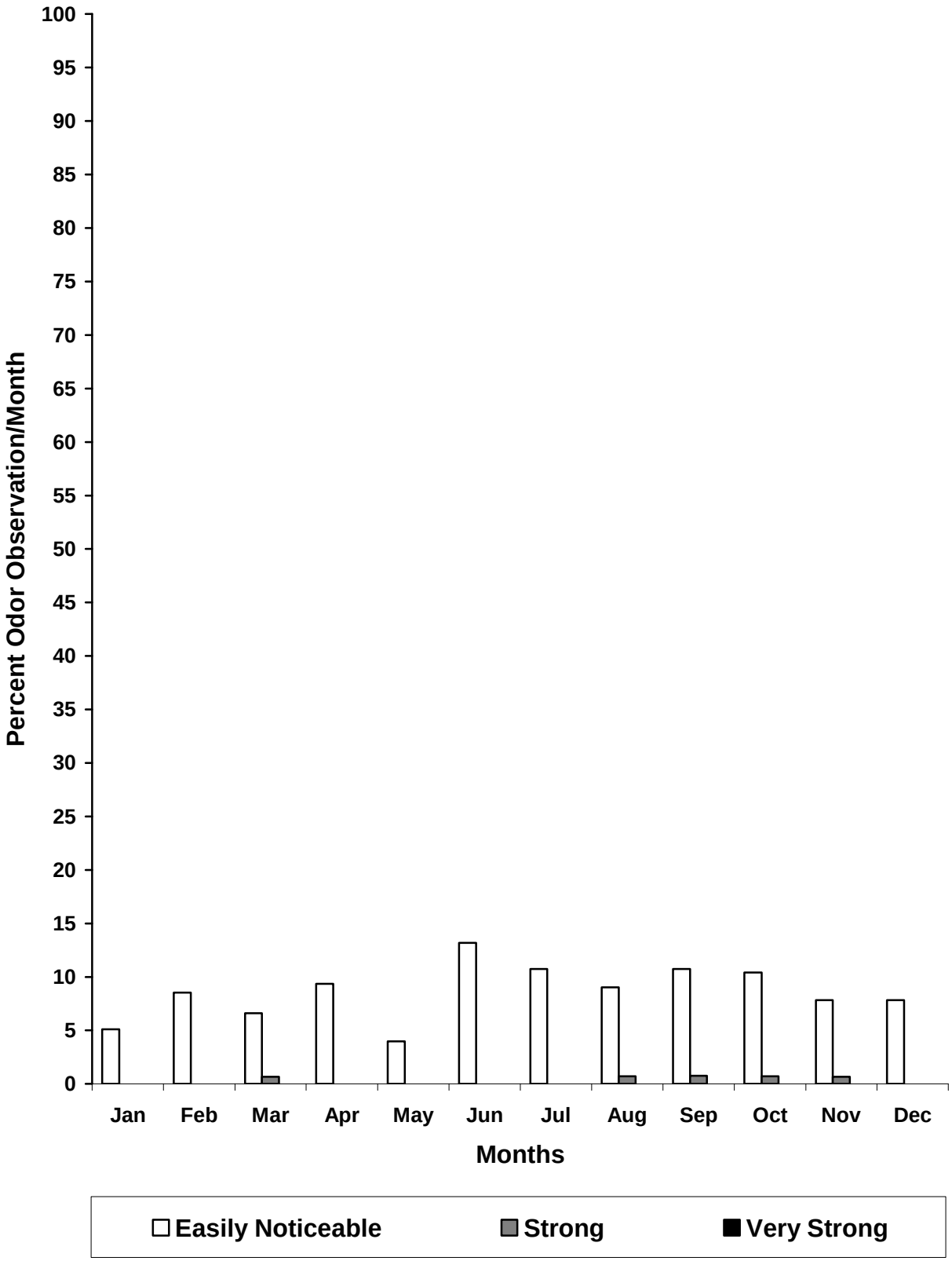


TABLE 5: HYDROGEN SULFIDE READINGS AT CALUMET SOLIDS DRYING SITES – 2009

Location	Hydrogen Sulfide, ppbv[1]		
	Mean	Minimum	Maximum
East Drying Cell #1 SW (14)[2]	4.7	0	7
Hopper Building (15)	4.8	1	8
East Drying Cell #8 NW (16)	4.7	0	8
East Drying Cell #8 NE (17)	5.1	0	9
Truck Scale/Centrifuge (18)	5.0	0	8
East Drying Cell #1 SE (19)	4.8	0	8
West Drying Cell #1 @ Gate (20)	5.0	0	9
West Drying Cell #4 (21)	5.3	0	11
Bituminous Road @ Gate (22)	4.7	0	8

[1] ppbv = Parts per billion by volume.
[2] Numbers in parentheses correspond to Station numbers in Figure AI-1.

FIGURE 3: ODOR OBSERVANCES AT JOHN E. EGAN
WATER RECLAMATION PLANT – 2009

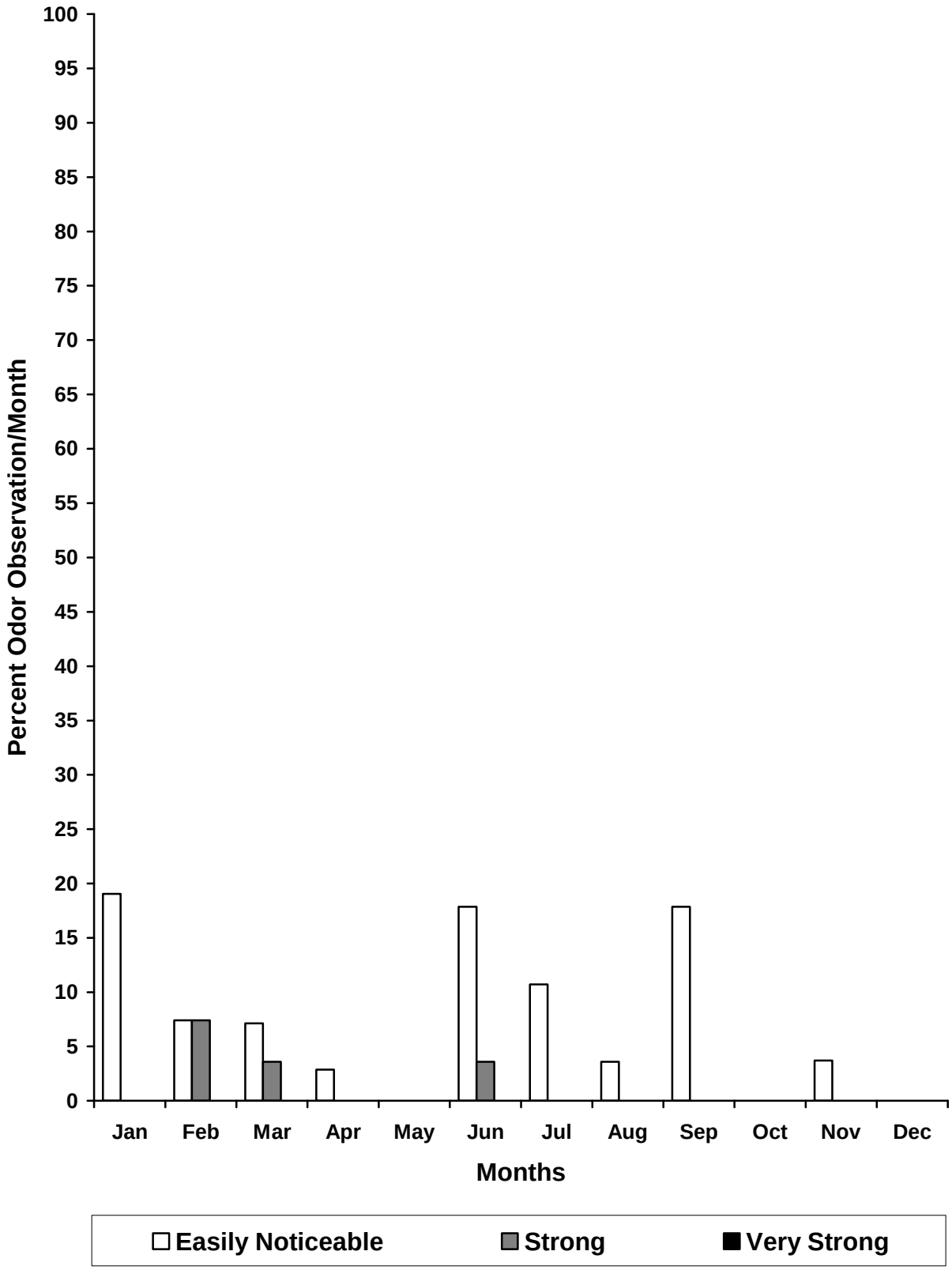


TABLE 6: HYDROGEN SULFIDE READINGS AT JOHN E. EGAN WATER RECLAMATION PLANT – 2009

Location	Hydrogen Sulfide, ppbv[1]		
	Mean	Minimum	Maximum
West Entrance Gate (1)[2]	5.4	0	14
Near Waste Gas Burner (2)	5.6	1	11
Primary Tanks (3)	5.3	1	11
South End "A" Drive (4)	8.3	0	170
Final Tanks (5)	5.0	1	12
East Entrance Gates (6)	5.0	1	11
West of Storage Building (7)	5.2	1	13

[1]ppbv = Parts per billion by volume.
[2]Numbers in parentheses correspond to Station numbers in Figure AI-2.

FIGURE 4: ODOR OBSERVANCES AT JAMES C. KIRIE
WATER RECLAMATION PLANT – 2009

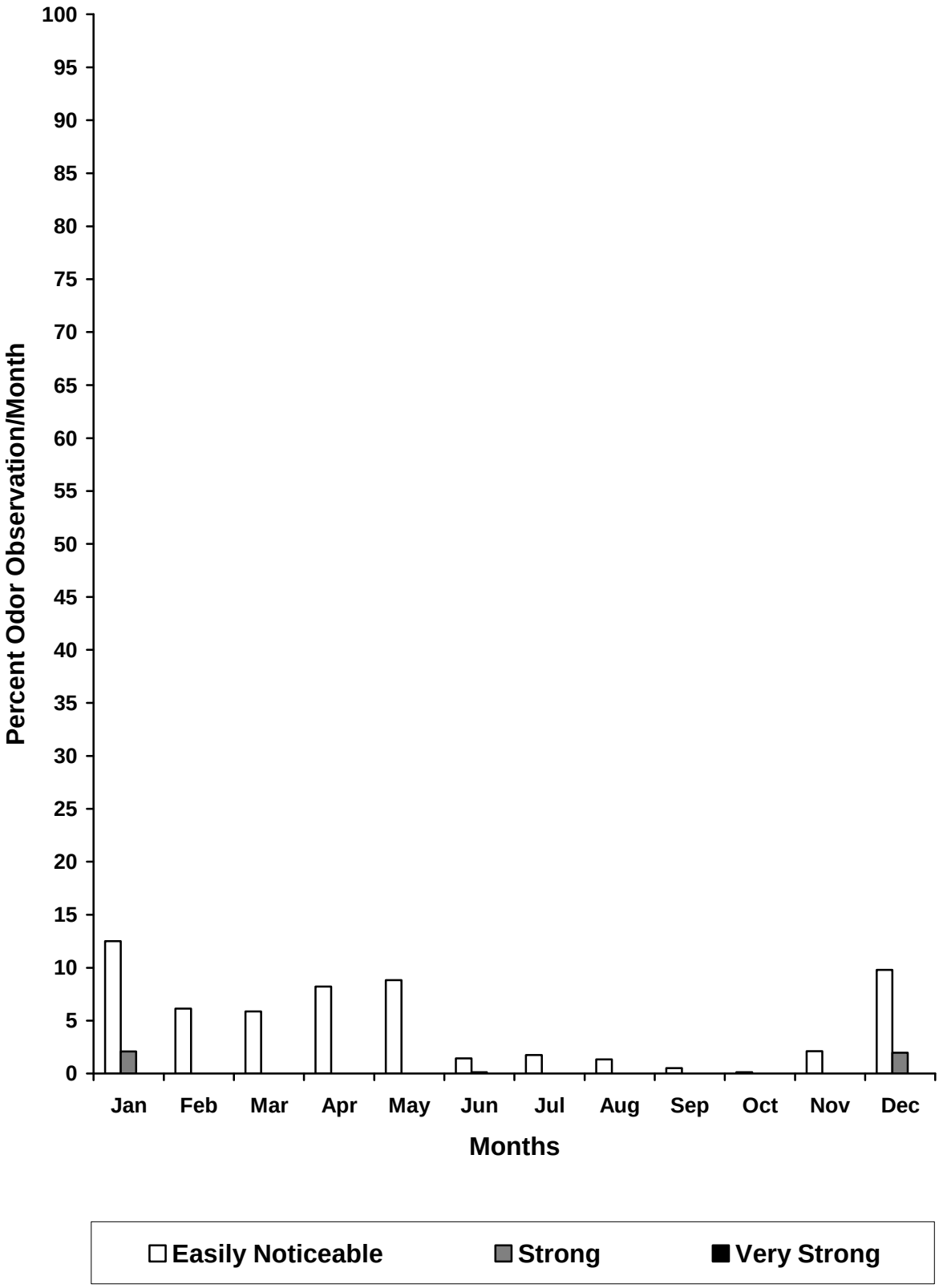


TABLE 7: HYDROGEN SULFIDE READINGS AT JAMES C. KIRIE WATER RECLAMATION PLANT – 2009

Location	Hydrogen Sulfide, ppbv[1]		
	Mean	Minimum	Maximum
Plant Entrance (1)[2]	5.4	0	10
Pump Station (2)	5.2	1	11
Air Lift B1 (3)	4.9	0	10
Road C-1 (4)	4.8	1	10
Return Channel (5)	6.5	1	50
East Gallery – North (6)	5.4	0	10
Road C-2 (7)	4.8	1	12
Road C-3 (8)	4.6	1	11
Road C-4 (9)	4.8	1	11
Air Lift A-1 (10)	5.2	1	11
Air Lift A-2 (11)	4.8	1	10
Road C-5 (12)	5.0	1	10
Road C-6 (13)	4.8	0	10
Road C-7 (14)	5.2	0	17
Air Lift B2 (15)	4.9	0	10
Ridge Lane – Point #1 (16)	5.3	1	10
Marshall and Pleasant (17) Lane – Point #2	5.3	0	10

[1]ppbv = Parts per billion by volume.
[2]Numbers in parentheses correspond to Station numbers in Figure AI-3.

North Side Water Reclamation Plant

The majority of the observations at the North Side WRP were faint to no odor. There were no very strong odor observations and two strong odor observations at this WRP during 2009. The easily noticeable odors accounted for 12 percent of the total observations, with the greatest frequency around Preliminary Tank 3.

The monthly percentage of observations at which easily noticeable, strong, and very strong odors were observed are shown in Figure 5. The frequency of occurrence of easily noticeable odors was highest in June and October 2009.

The measured H_2S levels are summarized in Table 8. The highest mean and maximum readings were at Howard Street east of McCormick Road.

Three odor complaints regarding the North Side WRP were received in 2009, of which one was verified as being associated with odors originating in the WRP.

Stickney Water Reclamation Plant

At the Stickney WRP, the majority of the observations in 2009 were faint to no odor, with 79 percent of M&R Department and 96 percent of M&O Department observations meeting this classification, respectively. Overall, there were four very strong odor observations and 75 strong odor observations, which accounts for 1.5 percent of the total number of observations. Most of these strong odors occurred in the vicinity of the preliminary tanks and concentration tanks. The strong odors observed at Laramie and 40th Street along with some of the strong odors in the vicinity of the Imhoff tanks were identified as a tar-like odor which was attributed to the adjacent chemical plant operated by Koppers Industries, Inc.

Figure 6 is a plot of the percentage of easily noticeable, strong, and very strong odors observed each month at the Stickney WRP. The frequency of occurrence of easily noticeable odors ranged from 7 percent to 15 percent of the time. The highest frequencies were observed at the preliminary tanks, predigestion and postdigestion centrifuges, concentration tanks, and Imhoff tanks. The strong odor occurrences were also spread out over the year.

The highest average H_2S level was adjacent to the preliminary tanks at Tenth Avenue, with a concentration of 132.8 ppbv (Table 9). Three extreme concentrations of H_2S, 7,000, 1,100, and 980 ppbv, were measured at the preliminary tanks at Tenth Avenue, the preliminary tanks at Twelfth Avenue, and Laramie and 40th Street, respectively. Plant management was notified of these extreme H_2S readings as required by the standard operating procedure.

Thirty-five odor complaints were received regarding the Stickney WRP, of which 11 were verified. Almost all verified complaints were made in the evening hours. The verified complaints mostly originated from the SW Preliminary Tanks and Imhoff Tanks.

FIGURE 5: ODOR OBSERVANCES AT NORTH SIDE
WATER RECLAMATION PLANT – 2009

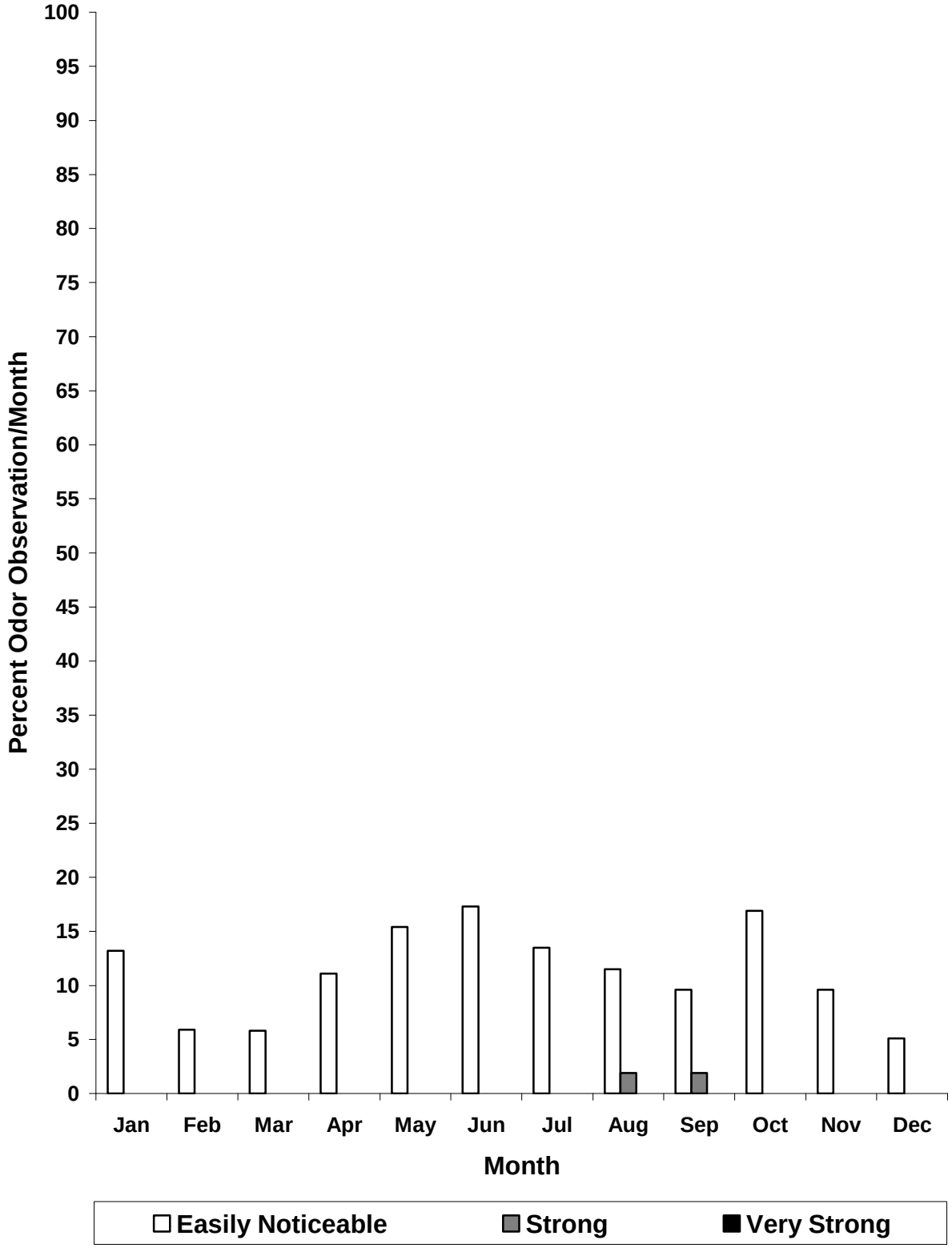


TABLE 8: HYDROGEN SULFIDE READINGS AT NORTH SIDE WATER RECLAMATION PLANT – 2009

Location	Hydrogen Sulfide, ppbv[1]		
	Mean	Minimum	Maximum
Howard Street West End (1)[2]	6.1	1	13
Howard Street East (2) of McCormick Road	11.8	2	240
McCormick Road (3)	6.9	1	34
P&B Building (4)	6.4	1	33
North Ave. Rect. Tank A6 (5)	5.3	1	13
North Ave. Rect. Tank B6 (6)	5.2	1	12
North Ave. Rect. Tank C6 (7)	5.0	0	11
Final Tank Batt. D3 (8)	5.0	0	10
Gallery Bldg. of Batt. D (9) Mix Channel	5.2	1	11
Main Street and Avenue E (10)	5.1	1	11
Covered Weir Prel. Tank 10 (11)	5.8	1	12
Weir Rect. Prel. Tank 3 (12)	6.6	1	25
Main St. Covered Sludge (13) Conc. Tanks	9.7	1	41

[1]ppbv = Parts per billion by volume.
[2]Numbers in parentheses correspond to Station numbers in Figure AI-4.

FIGURE 6: ODOR OBSERVANCES AT STICKNEY
WATER RECLAMATION PLANT – 2009

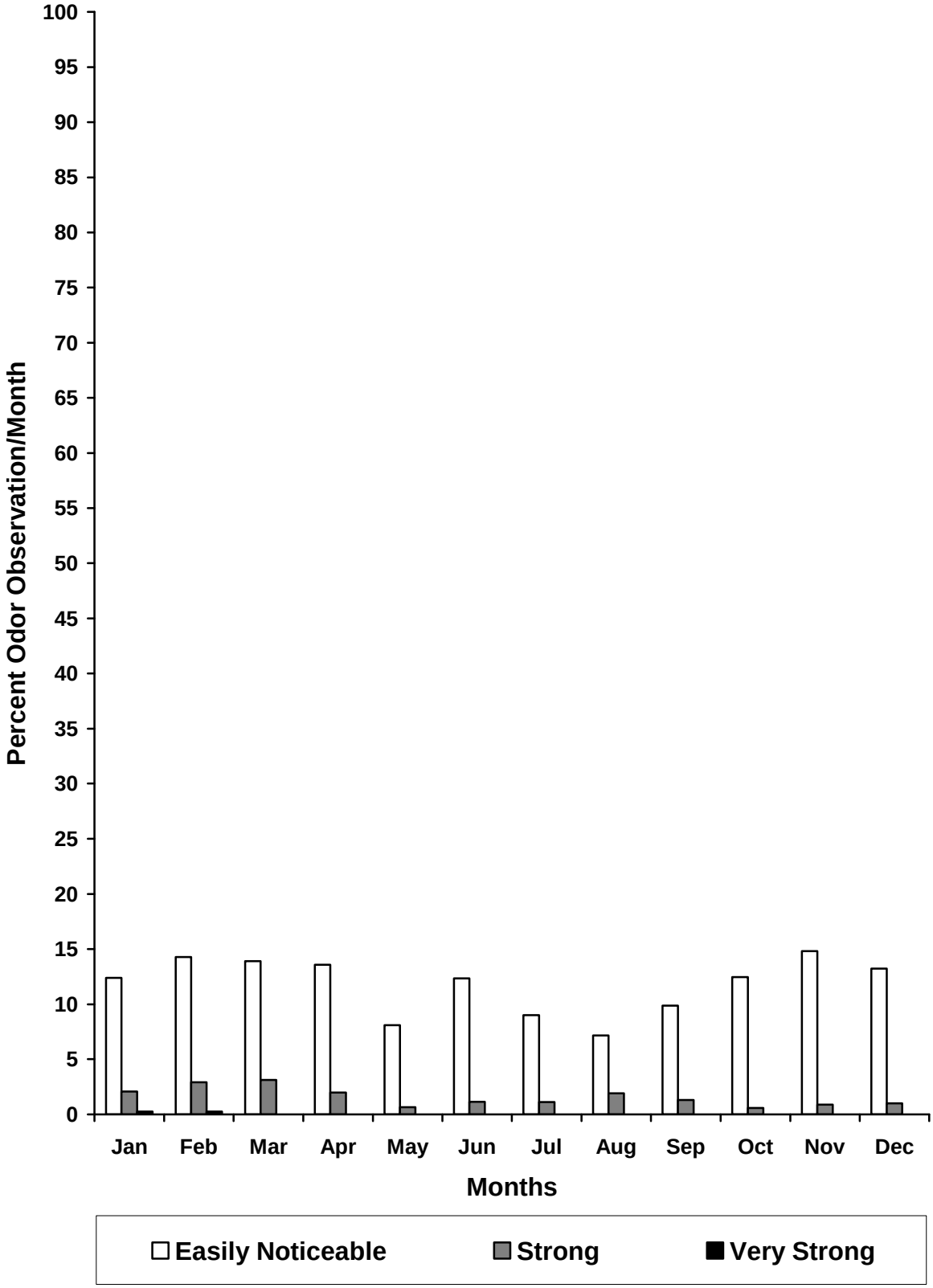


TABLE 9: HYDROGEN SULFIDE READINGS AT
STICKNEY WATER RECLAMATION PLANT – 2009

Location	Hydrogen Sulfide, ppbv[1]		
	Mean	Minimum	Maximum
Imhoff B St./3rd Ave. (1)[2]	12.7	1	462
Imhoff B St./4th Ave. (2)	16.6	0	130
Imhoff B St./5th Ave. (3)	11.4	0	140
Digester 6th Ave. @ B St. (4)	8.7	0	110
West Digester Cont. Bldg. (5)	8.1	0	120
Centrifuges 6th Ave. @ Pre. (6)	28.2	0	360
Centrifuges 6th Ave. @ Post (7)	11.1	0	120
Concentration G St. North (8)	25.5	0	500
Concentration D St. South (9)	18.8	0	370
Preliminary 12th Ave. (10)	43.2	0	1,100
Preliminary 10th Ave. (11)	132.8	0	7,000
39th St./Central Ave. (12)	7.6	0	22
39th St./Morton College Ent. (13)	7.6	0	18
39th St./Dig. @ 57th Ave. (14)	7.7	0	23
39th St./Between Austin and Lombard (15)	7.2	0	14
Battery D, B St/13th Ave. (17)	7.1	0	23
Lombard Ave. @ Gate/39th St. (18)	6.2	0	13
Laramie and 40th St. (19)	9.4	0	980
Laramie and 39th St. (20)	8.9	0	160

[1]ppbv = Parts per billion by volume.
[2]Numbers in parentheses correspond to Station numbers in Figure AI-5.

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

The HASMA, Vulcan, Marathon, and LASMA sites had 81 percent of the observations characterized as faint to no odor. There were no very strong odors and 18 strong odor observations out of 2,123 total observations. The strong odor observations were divided among the various areas (HASMA, HASMA Center, Vulcan, LASMA Cells Lagoons 24 and 30, and Marathon) 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 are presented in Figure 7. The frequency of observed odors is generally highest during the late spring through the fall months when solids processing and drying is being carried out.

The average H_2S levels at the various locations around these SDAs and SPS ranged from 6.1 and 9.7 ppbv as shown in Table 10.

One odor complaint was received in 2009 with regard to the HASMA, Vulcan, and Marathon SDAs and the LASMA SPS, but it was not verified as originating at the site mentioned in the complaint.

Ridgeland Avenue Solids Management Area and Stony Island Solids Drying Areas

The RASMA SDA had 97 percent of the observations characterized as faint to no odor. The easily noticeable odors were three percent of the total observations; all of these observations occurred in April 2009 (Figure 8) expressed as percent frequency of occurrence. There was no strong odor observation during 2009. The average H_2S levels at the various locations around the RASMA SDA ranged from 5.1 to 6.0 ppbv, as shown in Table 11.

The RASMA SDA was not used as a biosolids drying site during June through December 2009.

The Stony Island SDA had 98 percent of the observations characterized as faint to no odor, with no strong odor observation in 2009. The easily noticeable odors accounted for approximately 2 percent of the total observations.

A monthly summary of the observations at the Stony Island SDA of easily noticeable, strong, and very strong odors during 2009 is presented in Figure 9 expressed as frequency of occurrence.

The average H_2S levels around the Stony Island SDA, as shown in Table 11, varied from 4.2 to 5.8 ppbv.

No odor complaints were received in 2009 with regard to the RASMA and Stony Island SDAs.

FIGURE 7: ODOR OBSERVANCES AT HARLEM AVENUE SOLIDS MANAGEMENT AREA, VULCAN, MARATHON SOLIDS DRYING AREAS AND LAWNDALE AVENUE SOLIDS MANAGEMENT AREA SOLIDS PROCESSING SITE – 2009

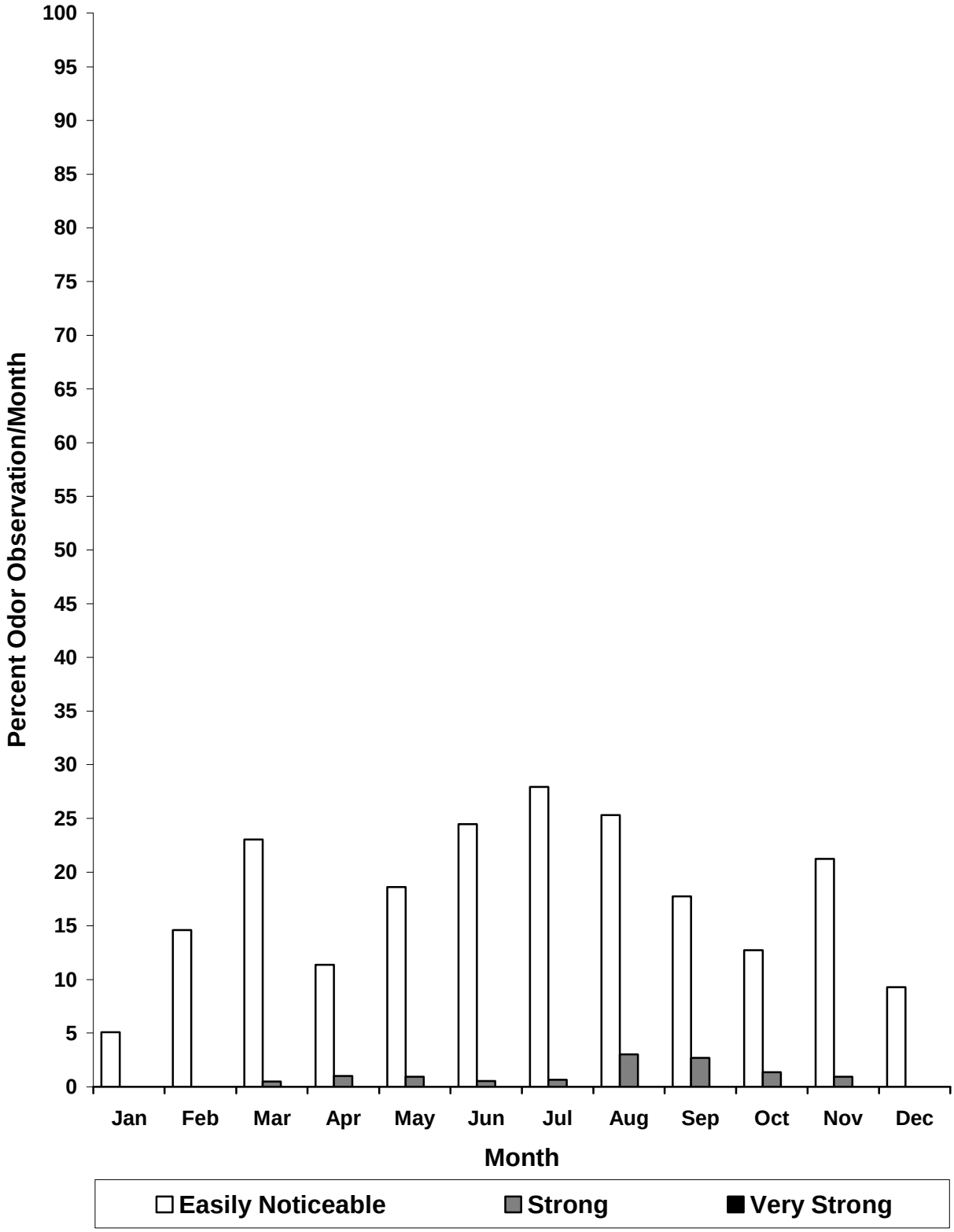


TABLE 10: HYDROGEN SULFIDE READINGS AT HARLEM AVENUE SOLIDS MANAGEMENT AREA, VULCAN, MARATHON SOLIDS DRYING AREAS AND LAWNDALE AVENUE SOLIDS MANAGEMENT AREA SOLIDS PROCESSING SITE – 2009

Location	Hydrogen Sulfide, ppbv[1]		
	Mean	Minimum	Maximum
HASMA (1)[2]	9.0	0	130
HASMA Center (1.5)	7.6	0	39
Vulcan South (2)	6.5	0	18
Vulcan North (3)	6.5	1	16
Vulcan TARP Drop Shaft (4)	8.3	1	39
Vulcan TARP Well (5)	6.8	1	21
LASMA Lagoon 1 (6)	6.6	2	18
LASMA Lagoon 16 (7)	6.8	2	20
LASMA Lagoon 24 (8)	9.7	0	82
LASMA Lagoon 30 (9)	7.6	0	42
LASMA Cell 1E-1W (10)	7.5	0	49
LASMA Cell 2E-2W (11)	6.5	0	18
LASMA Cell 3E-3W (12)	8.4	0	130
LASMA Cell 4E-4W (13)	7.9	0	110
LASMA Cell 5E-5W (14)	6.5	0	24
Marathon (15)	6.1	0	17
Marathon West (16)	6.3	0	17

[1]ppbv = Parts per billion by volume.
[2]Numbers in parentheses correspond to Station numbers in Figure AI-6.

FIGURE 8: ODOR OBSERVANCES AT RIDGELAND AVENUE
SOLIDS MANAGEMENT AREA SOLIDS DRYING AREA – 2009

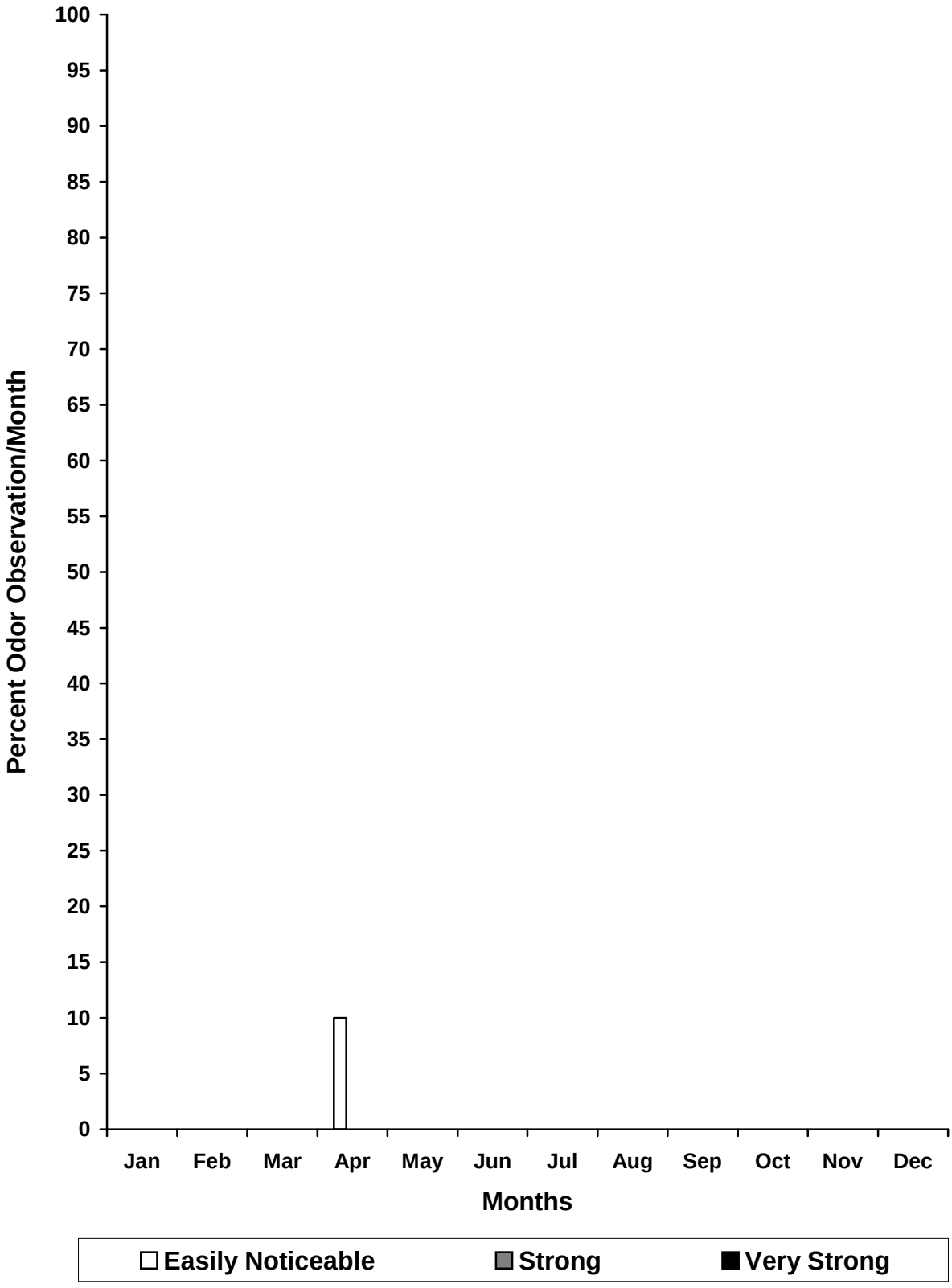
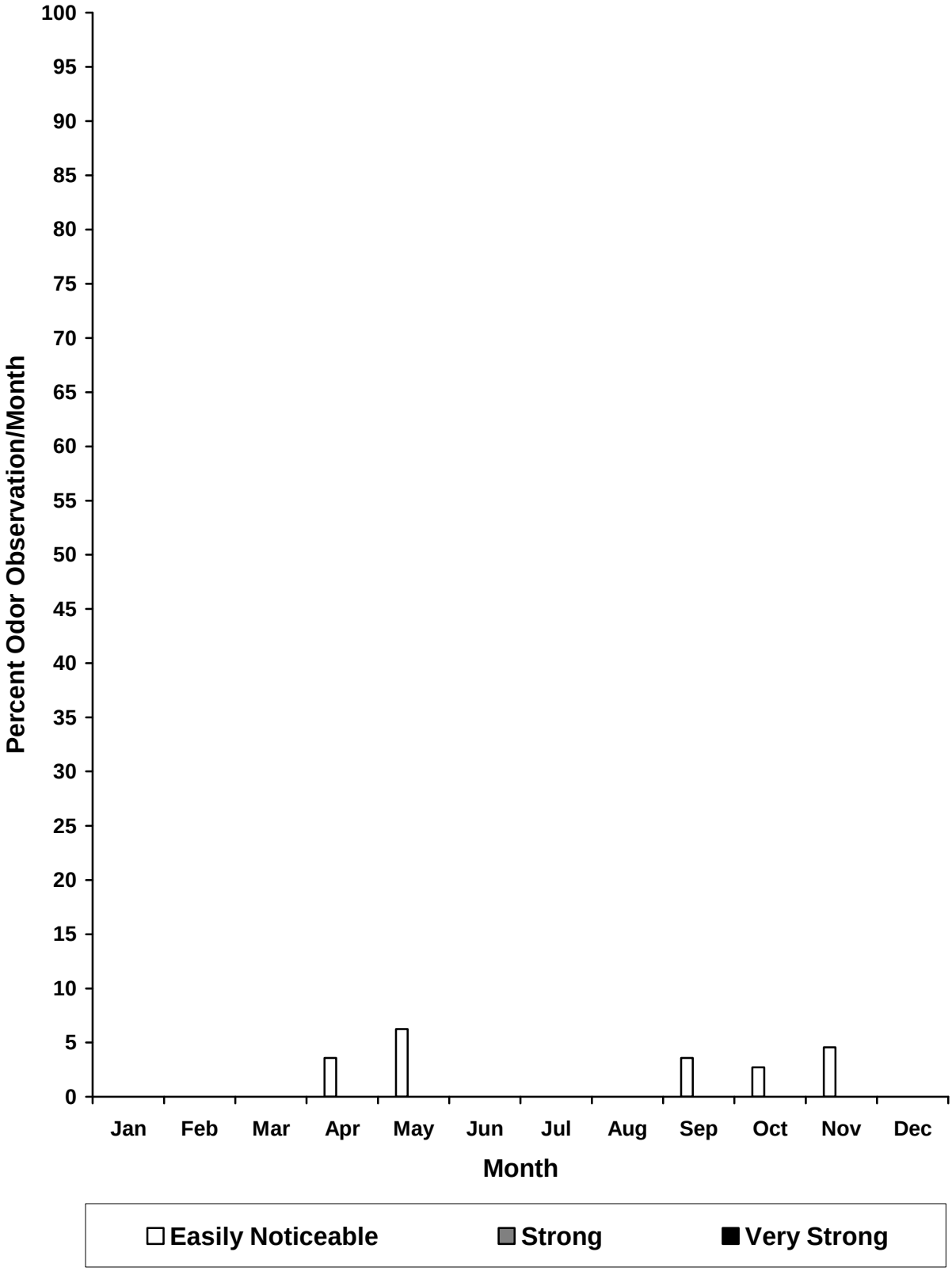


TABLE 11: HYDROGEN SULFIDE READINGS AT RIDGELAND AVENUE SOLIDS MANAGEMENT AREA AND STONY ISLAND SOLIDS DRYING AREAS – 2009

Location	Hydrogen Sulfide, ppbv[1]		
	Mean	Minimum	Maximum
RASMA			
SW Parking Area (1)[2]	5.4	0	12
North of Cell 2W (2)	5.1	0	12
NE Corner Cell 5E (3)	6.0	0	12
South of Cell 5 (4)	6.0	0	13
Stony Island			
Entrance 122nd St (1)[3]	5.8	0	14
NE Corner Cell 5 (2)	4.2	0	12
South End Cells 4 & 7 (3)	4.6	0	12
West Side of Cell 3 (4)	4.7	0	20

[1]ppbv = Parts per billion by volume.
[2]Numbers in parentheses correspond to Station numbers in Figure AI-7.
[3]Numbers in parentheses correspond to Station numbers in Figure AI-8.

FIGURE 9: ODOR OBSERVANCES AT STONY ISLAND SOLIDS DRYING AREA – 2009



APPENDIX AI

LOCATION OF ODOR MONITORING STATIONS AT DISTRICT WATER RECLAMATION PLANTS, SOLIDS DRYING AREAS, AND SOLIDS PROCESSING SITES

FIGURE AI-1: CALUMET WATER RECLAMATION PLANT
AND CALUMET WATER RECLAMATION PLANT SOLIDS DRYING AREAS
(NUMBERED CIRCLES INDICATE ODOR MONITORING STATIONS)

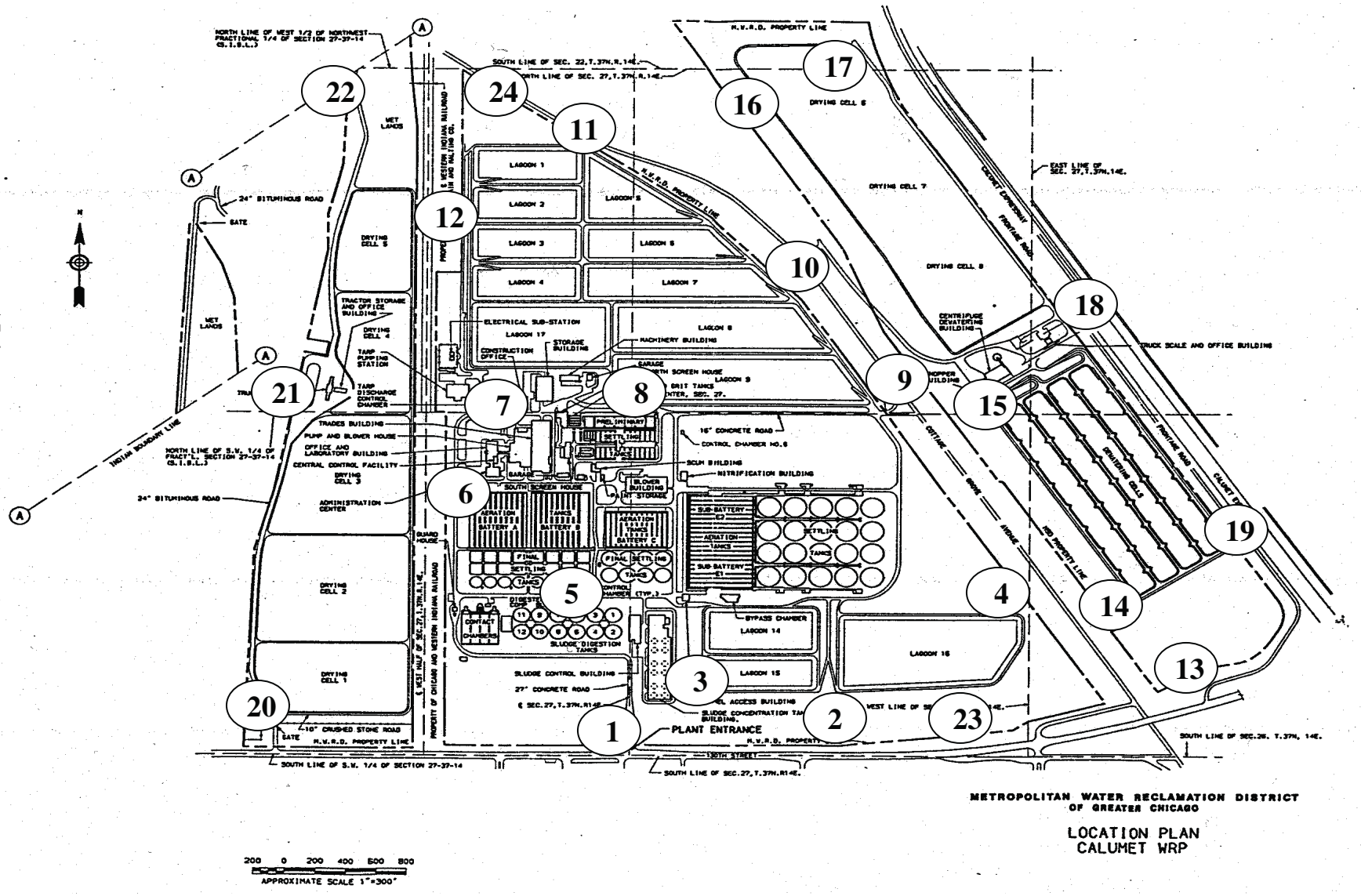
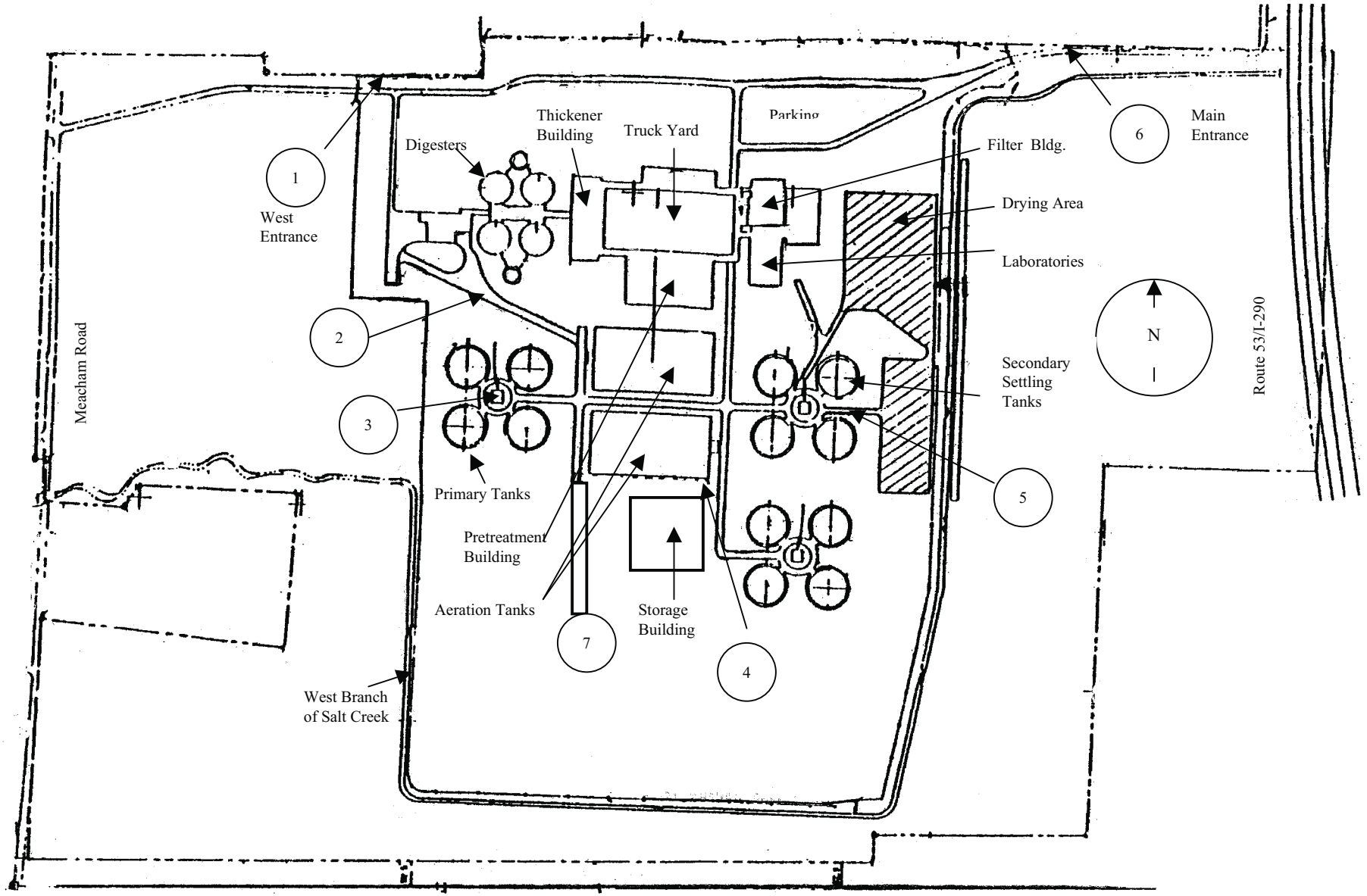
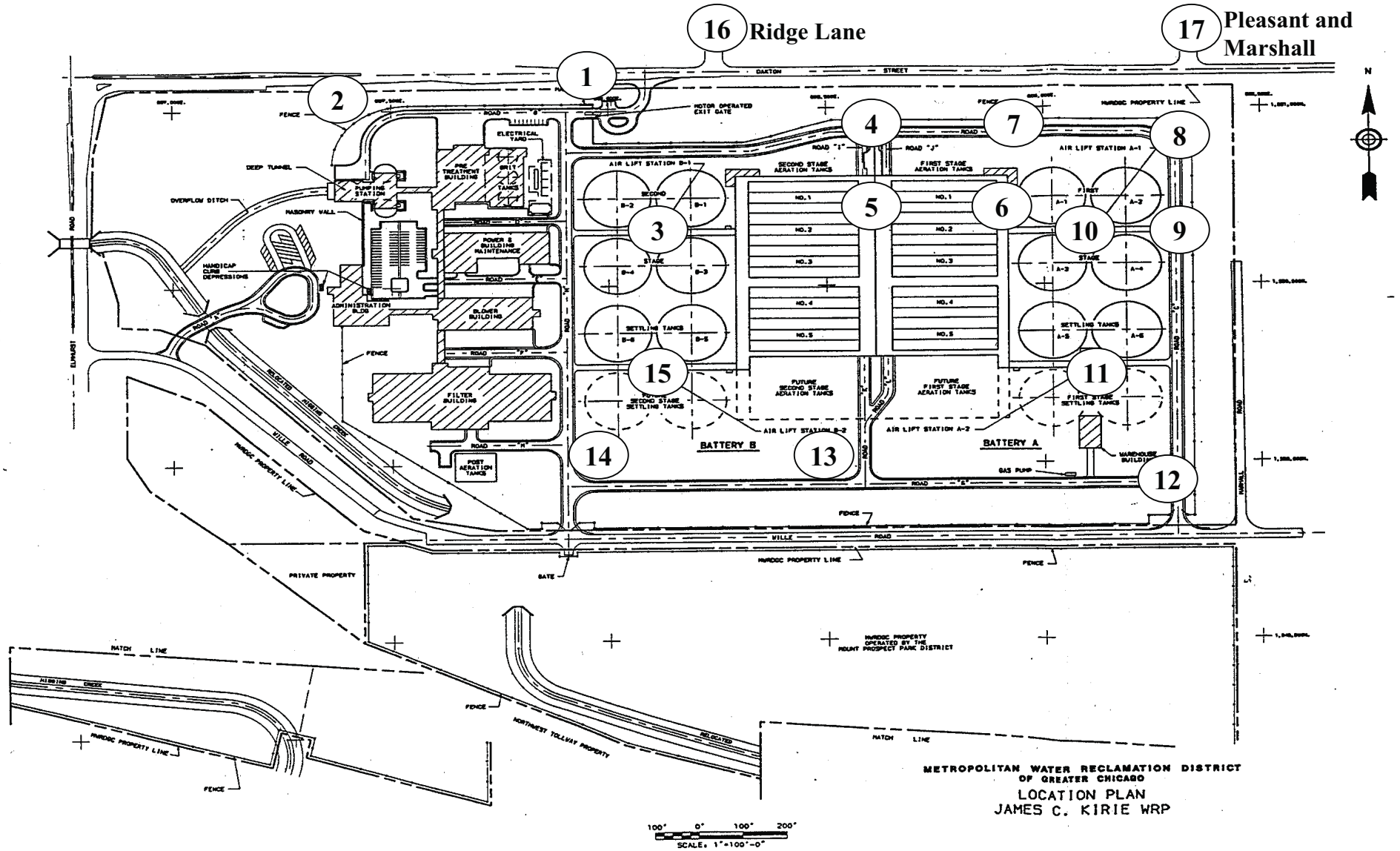


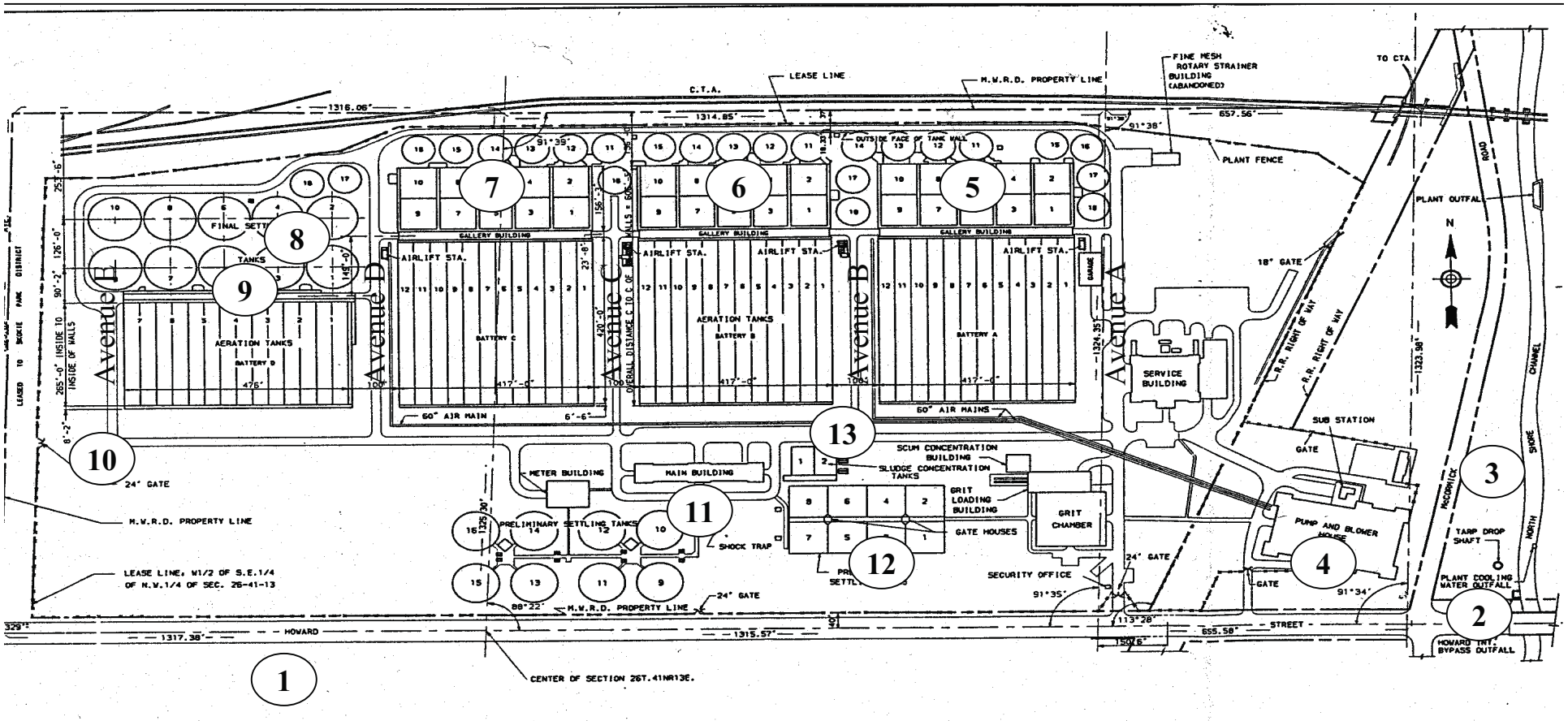
FIGURE AI-2: JOHN E.EGAN WATER RECLAMATION PLANT AND SOLIDS DRYING AREA
(NUMBERED CIRCLES INDICATE MONITORING STATIONS)



AI-3: JAMES C. KIRIE WATER RECLAMATION PLANT
(NUMBERED CIRCLES INDICATE ODOR MONITORING STATIONS)

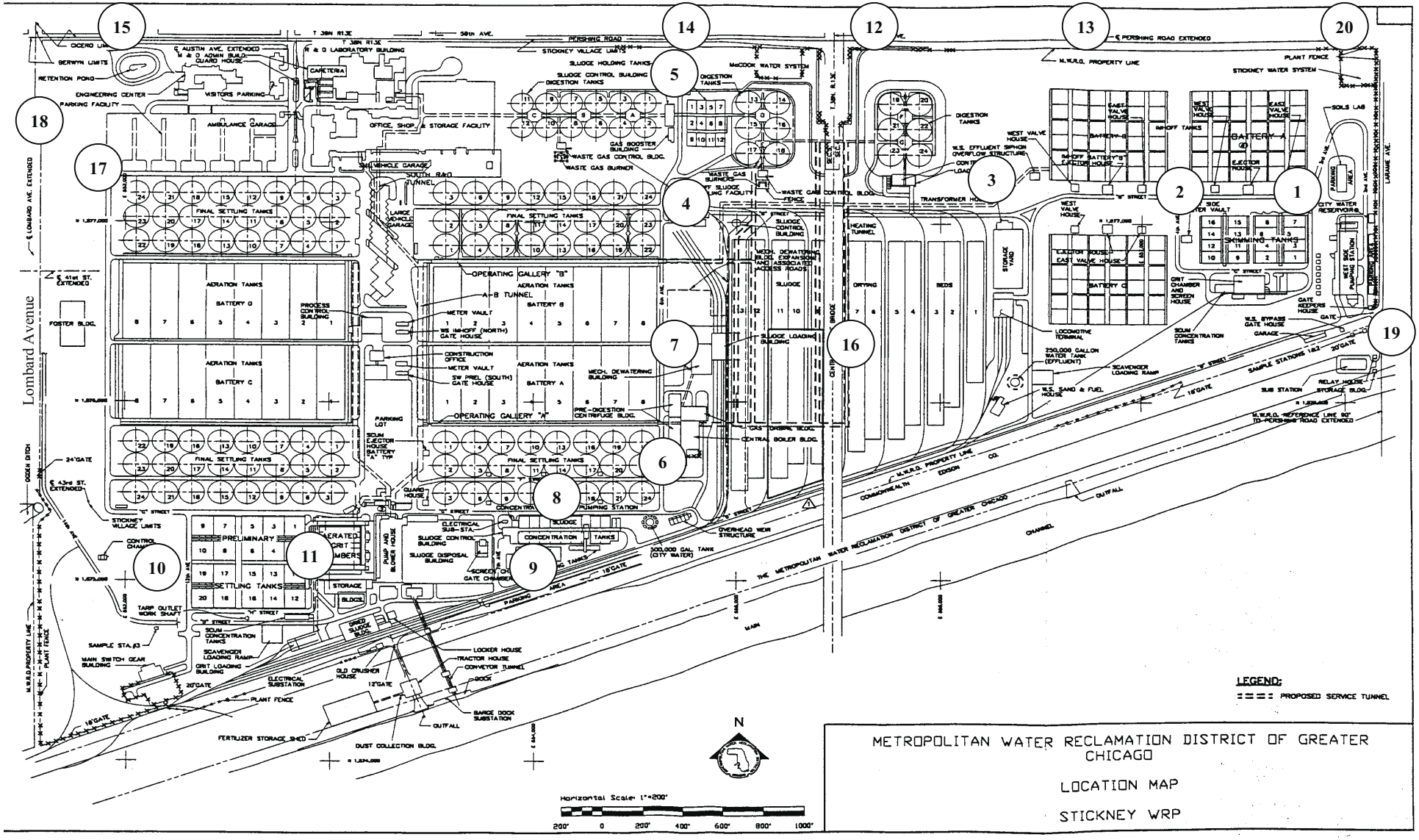


AI-4: NORTH SIDE WATER RECLAMATION PLANT
(NUMBERED CIRCLES INDICATE ODOR MONITORING STATIONS)

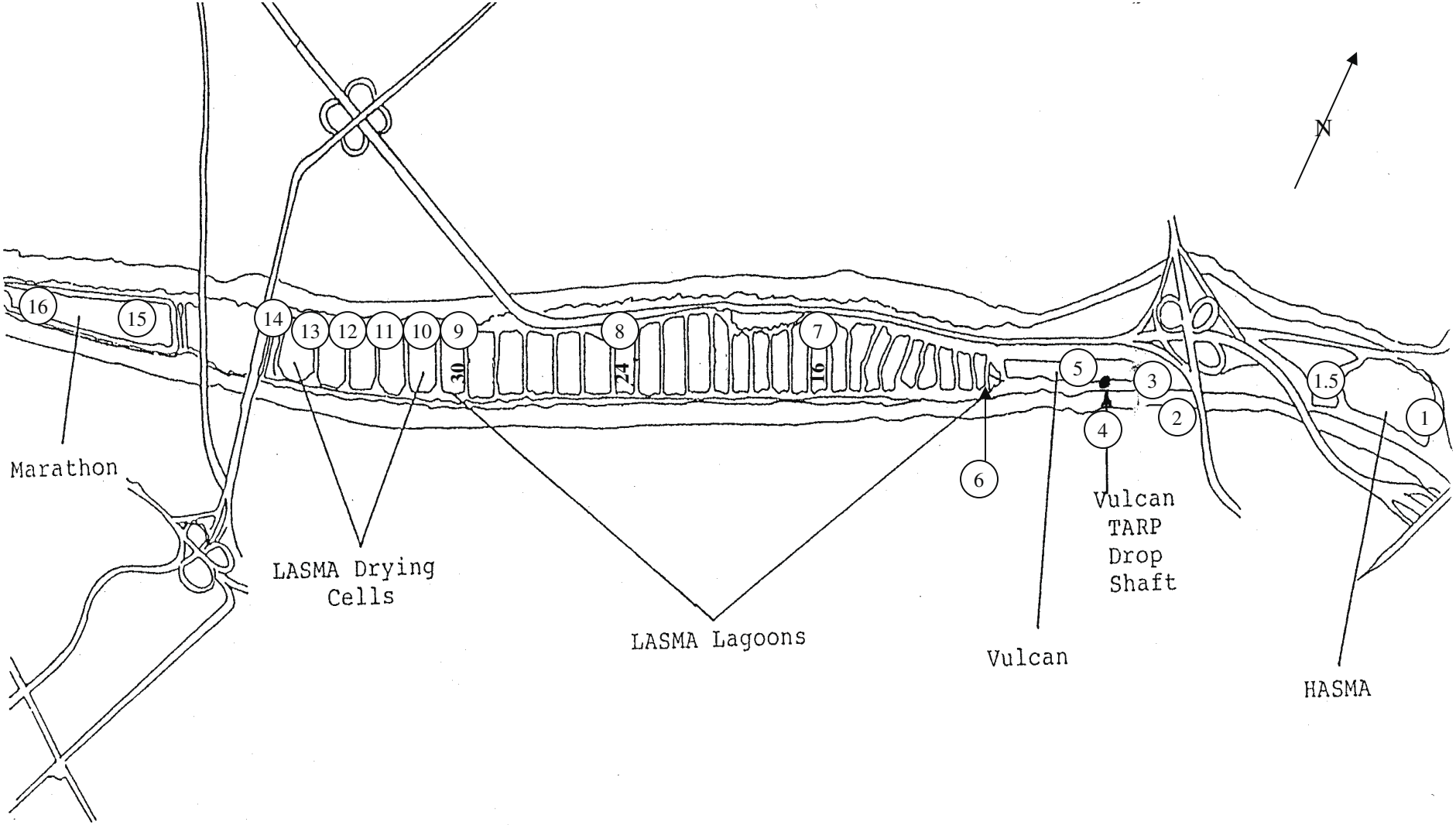


METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO
LOCATION PLAN
NORTH SIDE WRP

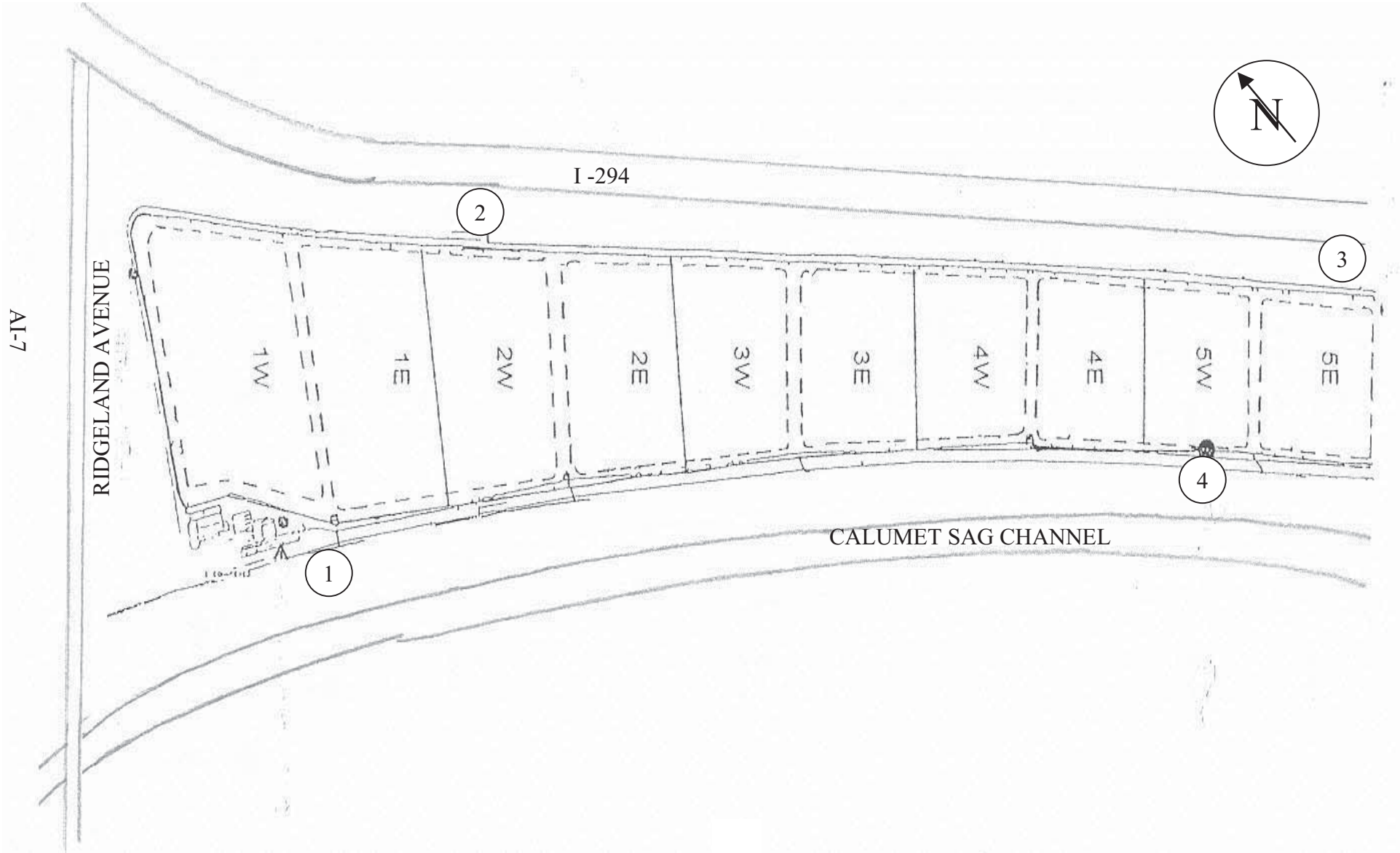
AI-5: STICKNEY WATER RECLAMATION PLANT
(NUMBERED CIRCLES INDICATE ODOR MONITORING STATIONS)



AI-6: HARLEM AVENUE SOLIDS MANAGEMENT AREA, VULCAN, AND MARATHON
SOLIDS DRYING SITES, AND LAWNDALE AVENUE SOLIDS MANAGEMENT AREA SOLIDS PROCESSING SITE
(NUMBERED CIRCLES INDICATE ODOR MONITORING STATIONS)



AI-7: RIDGELAND AVENUE SOLIDS MANAGEMENT AREA SOLIDS DRYING AREA
(NUMBERED CIRCLES INDICATE ODOR MONITORING STATIONS)



AI-8: STONY ISLAND SOLIDS DRYING AREA
(NUMBERED CIRCLES INDICATE ODOR MONITORING STATIONS)