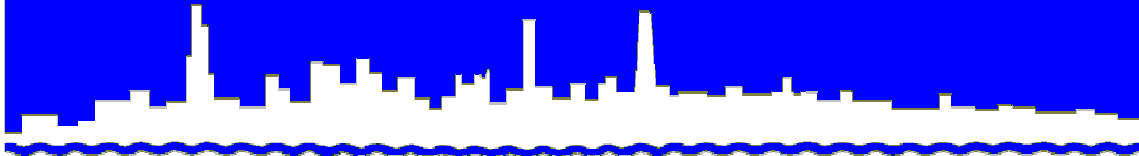


Protecting Our Water Environment



Metropolitan Water Reclamation District of Greater Chicago

***RESEARCH AND DEVELOPMENT
DEPARTMENT***

REPORT NO. 05-16

*ODOR MONITORING PROGRAM AT MWRDGC FACILITIES
DURING 2004*

OCTOBER 2005

Metropolitan Water Reclamation District of Greater Chicago

100 East Erie Street Chicago, Illinois 60611-2803 312-751-5600

ODOR MONITORING PROGRAM AT METROPOLITAN WATER
RECLAMATION DISTRICT FACILITIES DURING 2004

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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, and four solids drying areas. This program started in 1990. Both Research and Development (R&D) Department and Maintenance and Operations (M&O) Department personnel make subjective observations regarding the type and intensity of any odor perceived. In 2004 the program included five of the District WRPs and all of the Solids Drying Areas. 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 Solids Drying Area to seven days per week during the summer months at the Kirie WRP. Each odor observation is characterized as very strong, strong, easily noticeable, faint, very faint, or no odor.

During 2004 only one very strong odor, out of 4,651 observations, was observed at the Stickney WRP. No very strong odors were perceived at any of the other facilities being monitored. The majority of the observations at the five WRPs were characterized as faint to no odor from 69 to 98 percent of the time. At the six solids drying areas and sites, observations were characterized as faint to no odor from 65 to 88 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. As an 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 predigestion centrifuges, preliminary tanks, 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 hydrogen sulfide levels generally followed a similar pattern as the odor observations with an occasional relatively high value (greater than 100 ppbv). It appears that the average level of hydrogen sulfide is between 5 and 8 ppbv at the WRPs. At the Stickney WRP the average hydrogen sulfide levels along the periphery of the plant were 6 to 9 ppbv and 8 to 23 ppbv at the majority of locations within the WRP.

TABLE 1: STRONG ODOR OBSERVATIONS—2004

Facility	Number of Strong Observations	Total Number of Observations
Calumet WRP		
Sludge Concentration Building	10	
Preliminary Tanks	7	
Sludge Digester	1	
Lagoons #7 and #8	1	
Lagoons #3 and #4	<u>1</u>	
Total	20	3,084
Calumet SDS		
Drying Cell #1 SE	1	
Drying Cell #8 NW	<u>1</u>	
Total	2	1,842
Egan WRP	Total 0	357
Kirie WRP	Total 0	8,532
North Side WRP	Total 1	659
Stickney WRP		
Imhoff Tanks	7	
Centrifuges (Pre)	25	
Sludge Concentration Tanks	1	
Preliminary Tanks	13	
39th St./Morton College	1	
Laramie Ave. & 40th St.	1	
Laramie Ave. & 39th St.	<u>11</u>	
Total	59	4,651
HASMA, Marathon, Vulcan SDA, and LASMA SPS		
HASMA	4	
HASMA Center	8	
Vulcan TARP Construction Shaft	2	
Vulcan North	1	
Vulcan TARP Well	2	
LASMA Drying Cells	2	
Marathon	<u>1</u>	
Total	20	2,292

TABLE 1 (Continued): STRONG ODOR OBSERVATIONS—2004

Facility	Number of Strong Observations	Total Number of Observations
RASMA SDA	Total 1	192
Stony Island SDA	Total 0	332

Note: There was only one observation of a very strong odor which was noticed at the Stickney WRP.

SDS = Solids Drying Site.

SDA = Solids Drying Area.

SPS = Solids Processing Site.

WRP = Water Reclamation Plant.

INTRODUCTION

The R&D Department in conjunction with the M&O Department has been carrying out an odor monitoring program at various District facilities for the past 15 years. The initial program started with the solids processing and drying sites at LASMA, HASMA, Marathon, and Vulcan in 1990, and was expanded to the WRPs and other drying sites. The latest additions were the Ridgeland and Stony Island solids drying sites in 2001.

At each location a similar procedure is followed to monitor odors. R&D 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, an analysis of the ambient air for hydrogen sulfide using a Jerome Model 631-X hydrogen sulfide meter is also conducted.

The objective of all the programs 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 operating personnel.

This report presents the odor monitoring data for the year 2004. The odor monitoring data in terms of frequency of occurrence, locations of possible odor sources, and hydrogen sulfide 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 began 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 Solids Drying Area are presented in [Appendix AI](#).

The number of monitoring locations at each facility varies from 4 to 19, depending upon the facility and previous odor conditions. The Calumet and Stickney WRPs and Solids Drying Areas 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, during the spring through fall months.

Odor complaints in 2004 with regard to the various facilities were very infrequent, ranging from none to ten at a given facility during the year.

TABLE 2: ODOR MONITORING PROGRAM FOR 2004

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	13	1992	12	3 2	R&D M&O	Yes	0	—
Calumet SDS	9	1992	12	3 2	R&D M&O	Yes	6	6
Egan WRP	7	1993	12	1 **	R&D M&O**	Yes	2	0
Kirie WRP	17	1996	12	1 7*	R&D M&O	Yes	6	2
North Side WRP	13	1992	12	1 **	R&D M&O**	Yes	10	0
Stickney WRP	19	1991	12	3 2	R&D M&O	Yes	5	1
HASMA, Vulcan, Marathon SDA, and LASMA SPS	17	1990	12	3	R&D	Yes	1	0
RASMA SDA	4	2001	8	1 to 2	R&D	Yes	0	—
Stony Island SDA	4	2001	7	1	R&D	Yes	0	—

Note: SDA = Solids Drying Area

SDS = Solids Drying Site

SPS = Solids Processing Site

WRP = Water Reclamation Plant

* At Kirie, M&O Department 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 for 2003.

RESULTS AT DISTRICT FACILITIES IN 2004

The results of the various odor monitoring programs at each of the District facilities for 2004 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 categories, and for all practical purposes nondetected odors, which are either faint, very faint, or no odor.

A general observation drawn from the table is that at those facilities where both R&D 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 R&D Department personnel which can result in olfactory desensitization. Thus, they may not differentiate especially well between faint and easily noticeable odors.

Calumet WRP

In general, the majority of the odor monitoring observations ranged from faint to no odor; 75 percent of the time by R&D Department personnel and 96 percent of the time by M&O Department personnel, respectively. As noted previously, the main difference between the M&O and R&D observations are between easily noticeable and nondetects. The strong odors that are observed occurred around the sludge concentration building and preliminary tanks, with 4.8 and 3.3 percent, respectively, of the observations registered as strong. Areas which had easily noticeable odors were in the vicinity of the preliminary tanks, 47.4 percent of observations, sludge concentration tanks, 44.5 percent of observations, sludge digester tanks, 31.1 percent of observations, Aeration Battery A, 21 percent of observations, and the plant entrance, 17.2 percent of observations.

The hydrogen sulfide measurements made at the time of the odor monitoring by the R&D Department personnel are summarized in Table 4. As expected, the highest levels are in the vicinity of the sludge concentration building, averaging 46.8 ppbv. The next highest values were at the preliminary tanks, with an average of 15.3 ppbv. The rest of the locations averaged between 5.2 and 7.3 ppbv, with a number of nondetectable observations.

Figure 1 summarizes the monthly observations of easily noticeable, strong, and very strong odors made during 2004 in terms of frequency of occurrence. The frequency of easily noticeable observations showed no seasonal trend, ranging between 13.7 and 29.1 percent each month with the highest percentage occurring in October. No very strong odors were observed during 2004.

No odor calls pertaining to the Calumet WRP were received in 2004.

Calumet Solids Drying Areas

The Calumet Solids Drying Site consists of the East Solids Drying Area, located east of the Calumet WRP, and the West Solids Drying Area, 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 Drying Area, was infrequent. The majority of the observations were described as faint to no odor, 82 percent by the R&D Department and 99 percent by the M&O Department, respectively. A few strong odors were observed at the drying areas during October 2004. Strong odors occurred 0.48 percent of the time at East Drying Cell #1 and at East Drying Cell #8. Easily noticeable odors occurred between 4 and 29 percent of the time around the various drying area locations.

TABLE 3: ODOR MONITORING RESULTS FOR 2004

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	R&D	2,019	0	10	491	1,518	75
	M&O	1,065	0	10	33	1,022	96
Calumet SDS	R&D	1,195	0	2	236	957	80
	M&O	647	0	0	9	638	99
Egan WRP	R&D M&O**	357	0	0	52	305	85
Kirie WRP	R&D	866	0	0	154	712	82
	M&O	7,666	0	0	7	7,659	99.9
North Side WRP	R&D M&O**	659	0	1	206	452	69
Stickney WRP	R&D	2,585	0	49	915	1,621	63
	M&O	2,066	1	10	385	1,670	81
HASMA, Vulcan, and Marathon SDA, and LASMA SPS	R&D	2,292	0	20	620	1,652	72
RASMA SDA	R&D	192	0	1	24	167	87
Stony Island SDA	R&D	332	0	10	107	215	65

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.

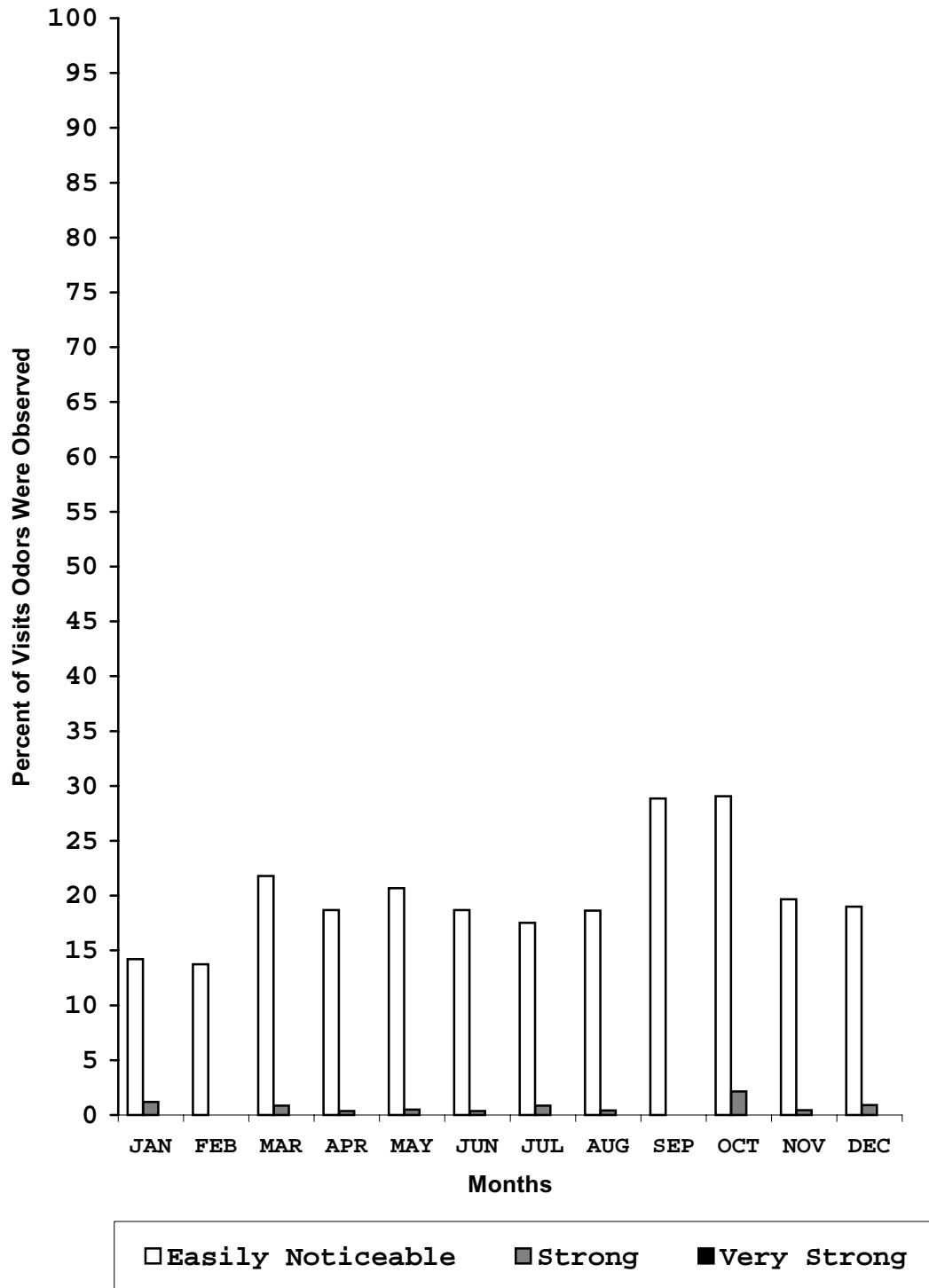
**The M&O Department conducts periodic odor monitoring surveys at these facilities, but the data are not included in this Table.

TABLE 4: HYDROGEN SULFIDE READINGS AT CALUMET WRP—2004

Location	Hydrogen Sulfide, ppbv		
	Mean	Minimum	Maximum
Plant Entrance (1) ¹	7.2	0	49
Lagoon #16 SW Corner (2)	7.2	0	36
Sludge Conc. Bldg. (3)	46.8	1	2,200
Lagoon #16 NE Corner (4)	6.8	0	36
Sludge Digester Tanks (5)	7.2	2	45
Aeration Battery A—West (6)	5.8	0	14
TARP Pump Station (7)	7.2	0	111
Preliminary Tanks (8)	15.3	0	300
Gate Near Lagoon #9 (9)	5.6	0	12
Between Lagoon #7 & #8 (10)	6.2	0	43
Lagoon #1 & #2 (11)	6.0	1	11
Lagoon #3 & #4 (12)	5.2	0	11
Ellis Ave. & 130th St. (13)	7.3	0	70
H ₂ S Monitor—130th St. (23)	6.8	0	130
North H ₂ S Monitor (24)	5.8	0	17

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

FIGURE 1: ODOR OBSERVANCES AT CALUMET WRP—2004



The hydrogen sulfide levels averaged between 5.3 and 6.7 ppbv, as shown in [Table 5](#). The highest values observed were in the vicinity of West Drying Cell #1.

[Figure 2](#) presents the monthly frequency of occurrence of the easily noticeable, strong, and very strong odor observations. The easily noticeable odors peaked during the fall months of 2004 and ranged from 1.7 to 32.4 percent.

Six odor calls were received with regard to the Calumet Solids Drying Site over the period of October 22 through October 25, 2004. All were related to the same incident of stockpiled biosolids at the East Drying Area.

John E. Egan WRP

There were no very strong odor or strong odor observations at the John E. Egan WRP locations in 2004. The easily noticeable odor observations occurred 52 out of 357 times, or 15 percent of the time. The easily noticeable odors were greatest in the vicinity of the primary tanks, with 45 percent of the observations being easily noticeable. At the West and East Gates easily noticeable odors were detected 15.7 percent and 2 percent of the time, respectively.

The percentage of observations at which easily noticeable, strong, and very strong odors were observed during 2004 are plotted by month in [Figure 3](#). The frequency of observance of easily noticeable odors varied from 7.1 percent in both January and February to 23 percent in March and 25 percent in October 2004.

The average hydrogen sulfide measurements ranged from 5.0 to 6.2 ppbv, as shown in [Table 6](#). The highest average level was observed in the vicinity of the primary tanks.

Only two odor calls were received for the John E. Egan WRP. Neither call was verified as

reporting an odor that could have originated from the John E. Egan WRP.

James C. Kirie WRP

There were no very strong or strong odor observations at the James C. Kirie WRP during 2004. Faint or no odors were reported approximately 82 percent (R&D Department) and practically 100 percent (M&O Department) of the time for the overall WRP. The easily noticeable odors which occurred were generally in the vicinity of the return aeration channel (5.6 percent), East Gallery North Channel (5 percent), and air lift stations A1 (7.2 percent) and A2 (4.4 percent).

[Figure 4](#) summarizes the observations of odor monitoring personnel during 2004 in terms of easily noticeable odor or greater. There were very few noticeable odors. It should be noted that from June through November, M&O Department personnel conducted an odor monitoring survey three times a day, seven days a week, thus, there were a greater number of observations during these months as compared to December through March, resulting in a relatively very low percentage of easily noticeable odors during this time period. Looking at the monthly variations using only the R&D observations, which occur at the same frequency for the whole year, there is no significant pattern.

The measured hydrogen sulfide levels are summarized in [Table 7](#). The highest average levels of hydrogen sulfide were measured in the vicinity of Air Lift A1 and the Return Channel, with averages of 6.2 ppbv and 6.0 ppbv, respectively. All the other locations had averages ranging from 4.6 to 5.9 ppbv.

Six odor calls regarding the Kirie WRP were received in 2004, but only two of the calls were verified as reporting odors that may have originated at the Kirie WRP.

TABLE 5: HYDROGEN SULFIDE READINGS AT CALUMET SOLIDS DRYING AREAS—2004

Location	Hydrogen Sulfide, ppbv		
	Mean	Minimum	Maximum
East Drying Cell #1 SW (14) ¹	5.8	0	24
Hopper Building (15)	5.8	0	24
East Drying Cell #8 NW (16)	5.6	0	18
East Drying Cell #8 NE (17)	5.8	0	22
Truck Scale/Centrifuge (18)	5.9	1	13
East Drying Cell #1 SE (19)	6.6	0	34
West Drying Cell #1 @ Gate (20)	6.7	0	93
West Drying Cell #4 (21)	6.1	1	24
Bituminous Road @ Gate (22)	5.3	1	11

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

FIGURE 2: ODOR OBSERVANCES AT CALUMET WRP SOLIDS DRYING AREAS—2004

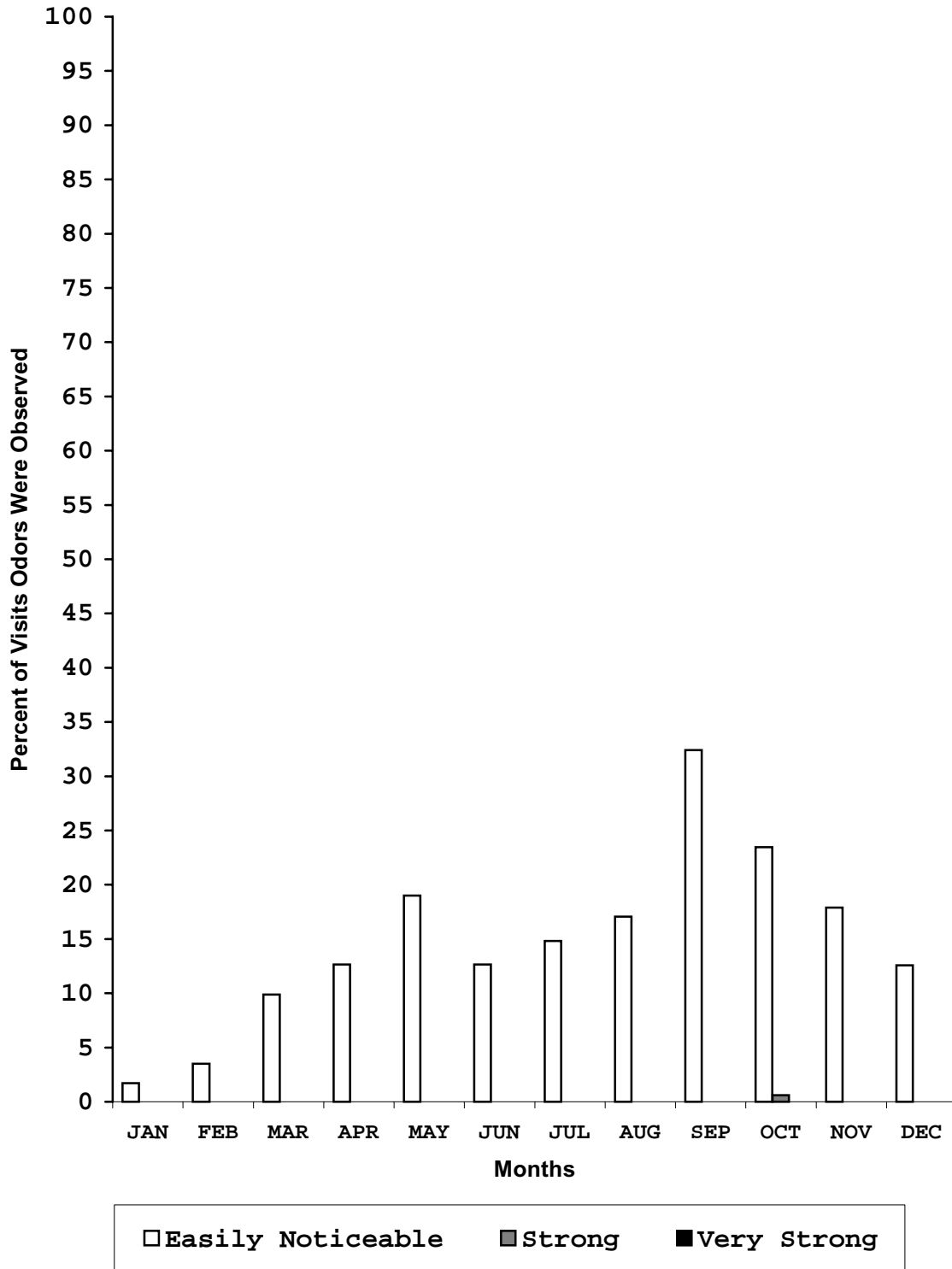


FIGURE 3: ODOR OBSERVANCES AT JOHN E. EGAN WRP —2004

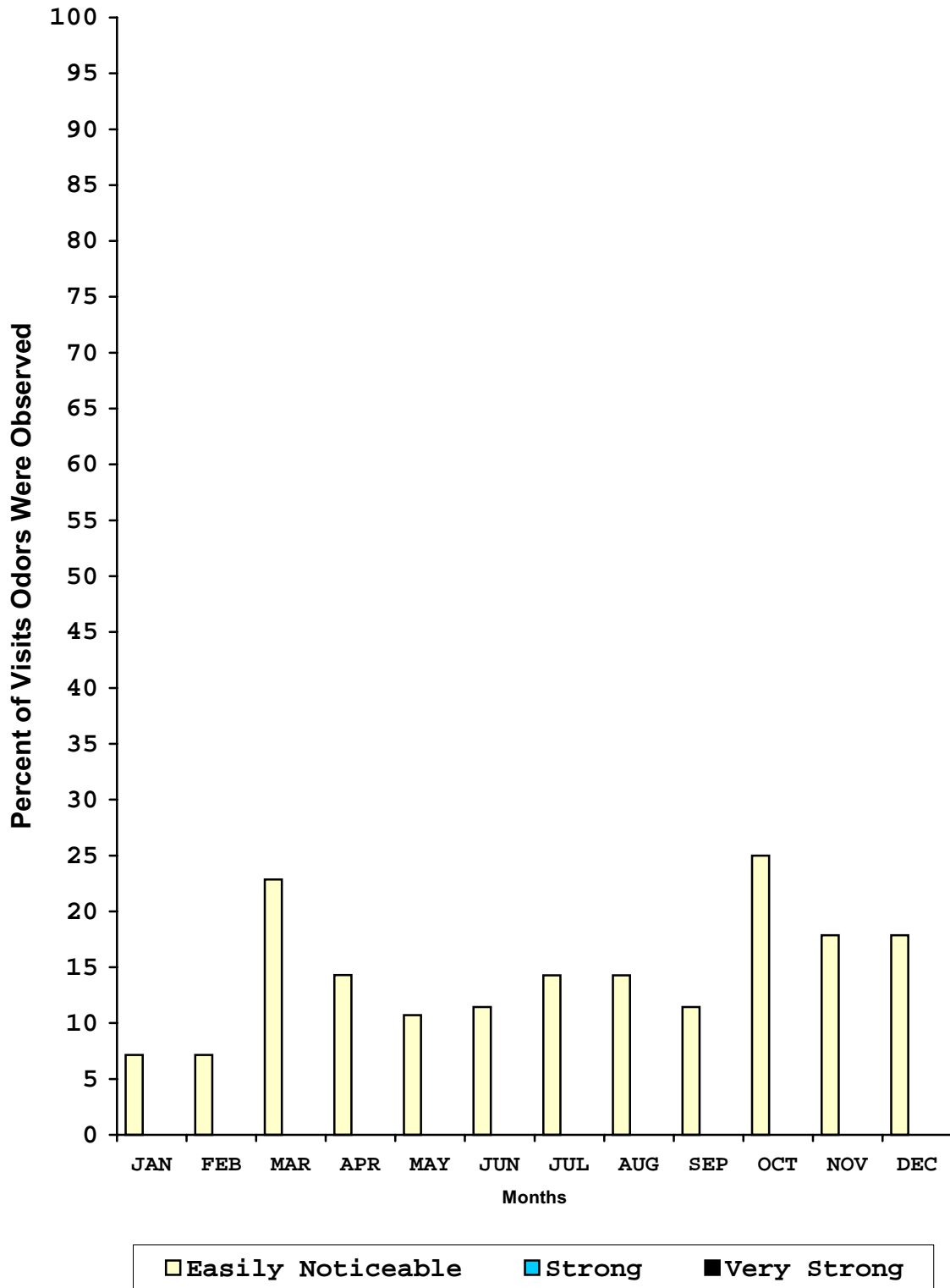


TABLE 6: HYDROGEN SULFIDE READINGS AT JOHN E. EGAN WRP—2004

Location	Hydrogen Sulfide, ppbv		
	Mean	Minimum	Maximum
West Entrance Gate (1) ¹	5.7	0	15
Near Waste Gas Burner (2)	5.3	0	14
Primary Tanks (3)	6.2	0	13
South End “A” Drive (4)	5.0	0	11
Final Tanks (5)	5.2	0	11
East Entrance Gates (6)	5.6	0	24
West of Storage Building (7)	5.2	0	12

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

FIGURE 4: ODOR OBSERVANCES AT JAMES C. KIRIE WRP—2004

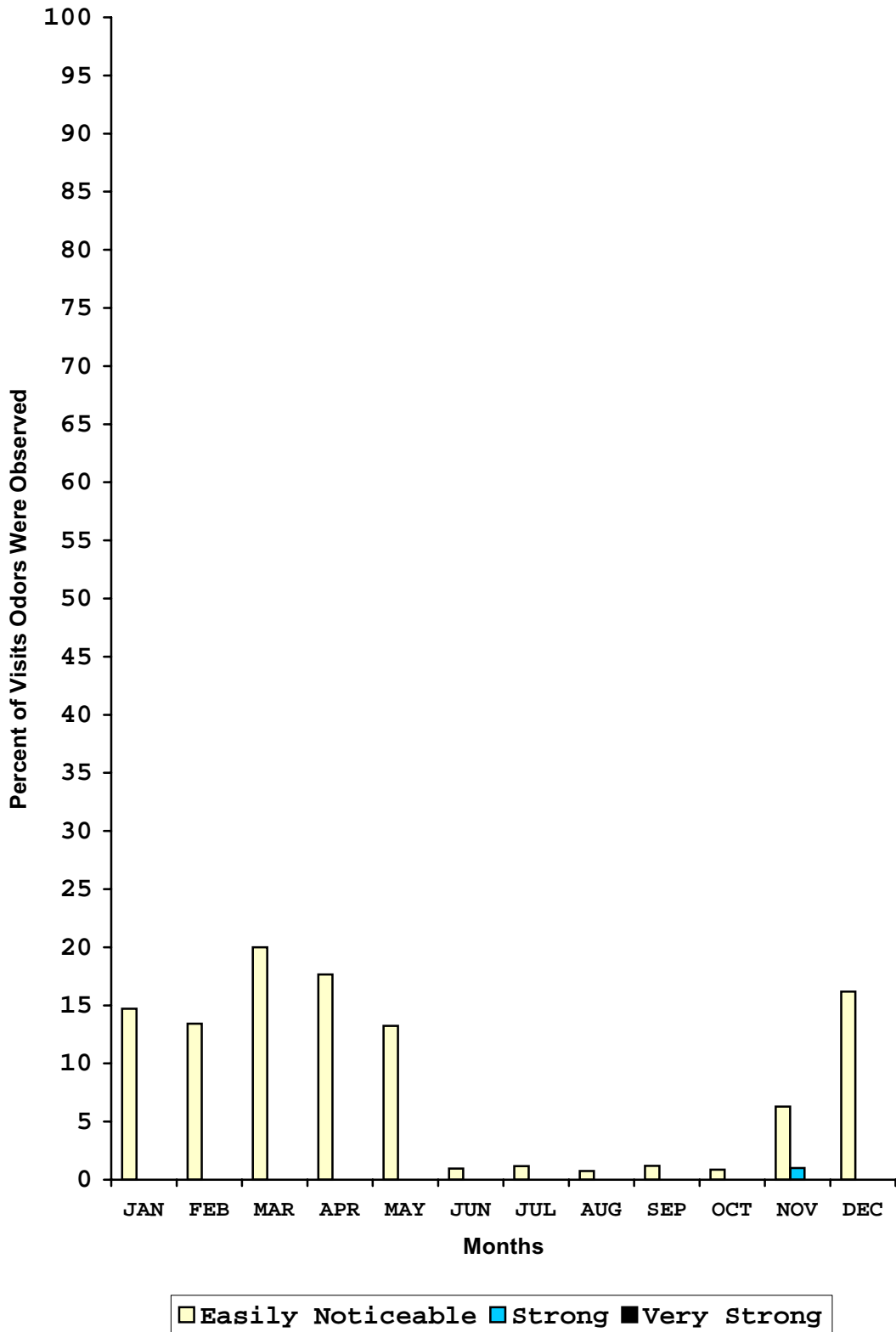


TABLE 7: HYDROGEN SULFIDE READINGS AT JAMES C. KIRIE WRP—2004

Location	Hydrogen Sulfide, ppbv		
	Mean	Minimum	Maximum
Plant Entrance (1) ¹	5.4	0	11
Pump Station (2)	5.3	0	11
Air Lift B1 (3)	5.4	1	14
Road C-1 (4)	5.4	0	12
Return Channel (5)	6.0	0	15
East Gallery—North (6)	4.6	0	10
Road C-2 (7)	5.7	0	43
Road C-3 (8)	5.0	0	17
Road C-4 (9)	4.9	0	12
Air Lift A-1 (10)	6.2	1	26
Air Lift A-2 (11)	5.9	0	24
Road C-5 (12)	5.4	0	11
Road C-6 (13)	5.0	0	13
Road C-7 (14)	5.6	0	13
Air Lift B2 (15)	5.6	2	12
Ridge Lane—Point #1 (16)	4.8	0	10
Marshall and Pleasant (17) Lane—Point #2	4.8	0	11

¹Numbers in parentheses correspond to Station numbers in [Figure AI-3](#).

North Side WRP

The majority of the observations at the North Side WRP were faint to no odor, 69 percent of the time in 2004. There were no very strong odor observations and only one strong odor observation, in May, at this WRP during 2004. The easily noticeable odors account for approximately 31 percent of the total observations, with greatest frequency around Preliminary Tank 3, 88 percent, the covered sludge concentration tanks, 71 percent, Preliminary Tank 10, 59 percent, and the gallery building of Battery D mix channel, 59 percent.

The monthly percentage of observations at which easily noticeable, strong, and very strong odors were observed are shown in [Figure 5](#). There no apparent trend of noticeable odors with slightly higher frequency in October and November.

The hydrogen sulfide levels are summarized in [Table 8](#). The highest levels were generally observed in the vicinity of the covered sludge concentration tanks with an average of 22.1 ppbv and Preliminary Tank 3 with an average of 17.8 ppbv. The average hydrogen sulfide levels at the other locations ranged between 4.9 and 8.5 ppbv. The single highest values were observed at the covered sludge concentration tanks and Preliminary Tank 3.

None of the ten odor calls pertaining to the North Side WRP were verified as resulting from odors originating at the North Side WRP. Seven out of ten odor calls came from an area just east of the WRP and North Shore Channel.

Stickney WRP

Overall, the majority of the observations in 2004 were faint to no odor, with 63 percent of R&D Department and 81 percent of M&O Department observations meeting this classification, respectively. Overall, there was only one

very strong odor observation and 59 strong odor observations, or 1.3 percent of the total number of observations. These occurred in the vicinity of the Imhoff tanks, the centrifuges, the sludge concentration tanks, the preliminary tanks, and the intersection of Laramie and 39th Street. The strong odors observed at Laramie and 39th 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. These same locations had the majority of easily noticeable odors.

At the predigestion centrifuges, approximately 69 percent of the observations were easily noticeable odors. The Imhoff tanks (at Fourth Avenue and Third Avenue), the concentration tanks at G Street North, the preliminary tanks at Tenth and Twelfth Avenues, and the post-digestion centrifuges had easily noticeable odors 50, 49, 59, 44, 45, and 42 percent of the time, respectively.

[Figure 6](#) is a plot of the percentage of noticeable odors observed each month at the Stickney WRP. While there appears to be no real seasonal pattern in the odor observations, some of the lowest percentages occurred in January, November, and December. The strong odor occurrences were spread out over the year.

The hydrogen sulfide levels measured in the vicinity of the sludge concentration tanks at G Street and the preliminary tanks at Tenth and Twelfth Avenues had average levels of 36.1, 65.5, and 39.6 ppbv, respectively, as shown in [Table 9](#). The pre-digestion centrifuges had an average hydrogen sulfide concentration of 97.5 ppbv. In general, the hydrogen sulfide levels are slightly higher than observed at the other District WRPs.

Only one odor call out of five calls regarding the Stickney WRP was verified as reporting an

FIGURE 5: ODOR OBSERVANCES AT NORTH SIDE WRP—2004

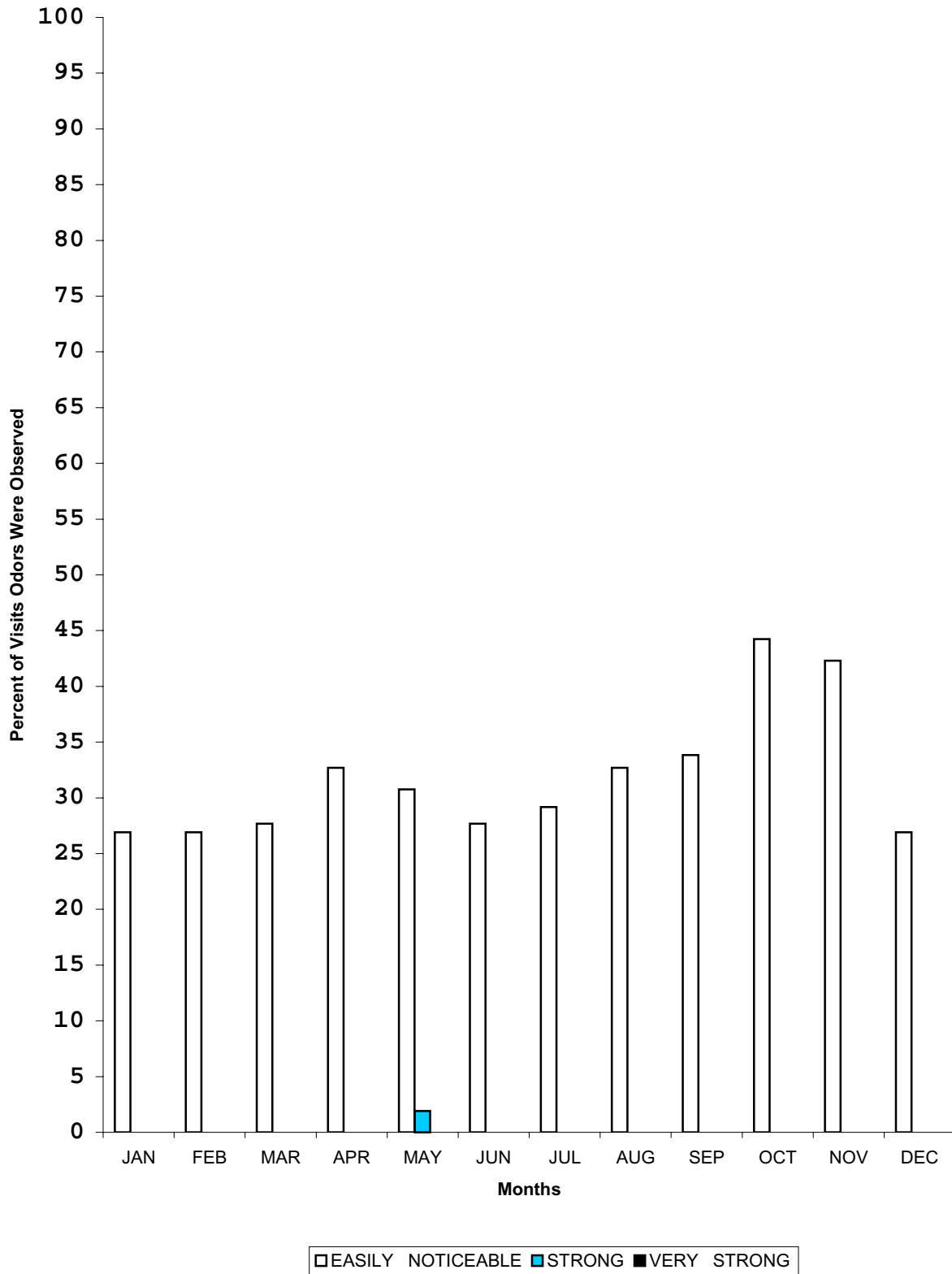


TABLE 8: HYDROGEN SULFIDE READINGS AT NORTH SIDE WRP—2004

Location	Hydrogen Sulfide, ppbv		
	Mean	Minimum	Maximum
Howard Street West End (1) ¹	6.5	0	18
Howard Street East (2) of McCormick Road	8.5	1	40
McCormick Road (3)	6.3	0	23
P&B Building (4)	6.0	0	17
North Ave. Rect. Tank A6 (5)	5.6	1	16
North Ave. Rect. Tank B6 (6)	5.5	1	16
North Ave. Rect. Tank C6 (7)	5.6	0	17
Final Tank Batt. D3 (8)	5.2	0	13
Gallery Bldg. of Batt. D (9). Mix Channel	5.1	1	13
Main Street and Avenue E (10)	4.9	1	12
Covered Weir Prel. Tank 10 (11)	7.2	0	36
Weir Rect. Prel. Tank 3 (12)	17.8	0	420
Main St. Covered Sludge (13) Conc. Tanks	22.1	0	500

¹Numbers in parentheses correspond to Station numbers in [Figure AI-4](#).

FIGURE 6: ODOR OBSERVANCES AT STICKNEY WRP —2004

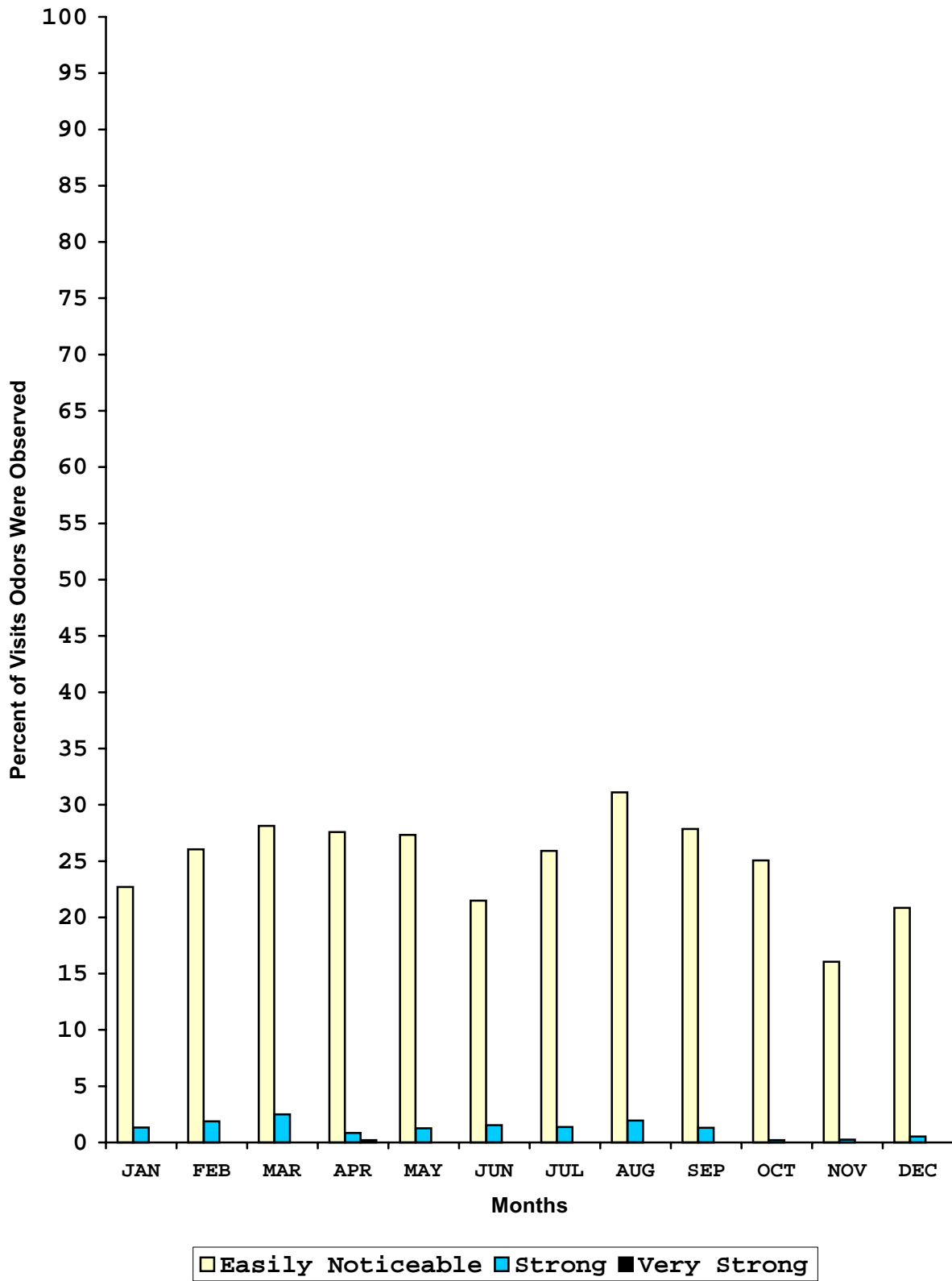


TABLE 9: HYDROGEN SULFIDE READINGS AT STICKNEY WRP—2004

Location	Hydrogen Sulfide, ppbv		
	Mean	Minimum	Maximum
Imhoff B St./3rd Ave. (1) ¹	23.2	0	400
Imhoff B St./4th Ave. (2)	22.9	0	130
Imhoff B St./5th Ave. (3)	11.3	0	98
Digester 6th Ave. @ B St. (4)	10.8	1	120
West Digester Cont. Bldg. (5)	8.1	0	49
Centrifuges 6th Ave. @ Pre. (6)	97.5	2	1,500
Centrifuges 6th Ave. @ Post (7)	11.4	0	150
Concentration G St. North (8)	36.1	2	1,170
Concentration D St. South (9)	13.7	0	76
Preliminary 12th Ave. (10)	39.6	1	1,600
Preliminary 10th Ave. (11)	65.5	1	1,080
39th St./Central Ave. (12)	7.8	0	43
39th St./Morton College Ent. (13)	8.1	0	35
39th St./Dig. @ 57th Ave. (14)	8.8	0	190
39th St./Between Austin and Lombard (15)	6.4	0	16
Battery D, B St/13th Ave. (16)	6.9	0	50
Lombard Ave. @ Gate/39th St. (18)	6.6	0	66
Laramie and 40th St. (19)	8.7	0	37
Laramie and 39th St. (20)	9.3	0	39

¹Numbers in parentheses correspond to Station numbers in [Figure AI-5](#).

odor that could potentially have originated at the Stickney WRP.

HASMA, Vulcan and Marathon Solids Drying Areas, and LASMA Solids Processing Area

The HASMA, LASMA, Marathon, and Vulcan sites had 72 percent of the observations characterized as faint to no odor. There were no very strong odors and only 20 strong odor observations out of 2,292 observations. The strong odor observations were divided among the various areas (HASMA, Vulcan, LASMA Cell 2, and LASMA Cell 5) depending upon the activity at the time. Easily noticeable odors were generally observed at the west end of the Marathon site, 45 percent of the observations, around the Vulcan site, 26 to 44 percent of the observations, and at HASMA, 79 percent of the observations. The LASMA lagoon area ranged between 2 and 45 percent easily noticeable odors depending upon the location. The LASMA Drying Cell areas ranged between 16 and 41 percent easily noticeable odors.

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 early fall months when solids processing and drying is being carried out. The few strong odor observations are spread out over April through September.

The hydrogen sulfide concentration averages ranged between 6.2 and 11 ppbv as shown in [Table 10](#).

One odor call was received in 2004 reporting an odor that could have originated at the LASMA SPS. The odor it reported was not verified as originating from the LASMA SPS.

RASMA and Stony Island Solids Drying Areas

The RASMA Solids Drying Area had 87 percent of the observations characterized as faint to no odor. This is similar to what was observed at the HASMA, LASMA, Marathon, Vulcan, and Calumet Drying Areas. There was only one strong odor observation and no very strong odor observations during 2004. The easily noticeable odors were 12 percent of the total observations. A monthly summary of the observations at the RASMA Solids Drying Area of easily noticeable, strong, and very strong odors during 2004 is presented in [Figure 8](#) expressed as frequency of occurrence. Easily noticeable odors occurred mainly during the August through December period, with the highest frequency in August and September.

The average hydrogen sulfide levels at the various locations around the RASMA Solids Drying Area ranged from 7 to 13 ppbv, as shown in [Table 11](#). The Stony Island Solids Drying Area had 65 percent of the observations characterized as faint to no odor, with 10 strong odor observations or 3 percent in 2004. The easily noticeable odors accounted for approximately 32 percent of the total observations.

A monthly summary of the observations at the Stony Island Solids Drying Area of easily noticeable, strong, and very strong odors during 2004 is presented in [Figure 9](#) expressed as frequency of occurrence. The strong odors occurred during the period of June through November. The frequency of easily noticeable odors was greatest during summer and fall months.

The average hydrogen sulfide levels around the Stony Island Solids Drying Area, as shown in [Table 11](#), varied from 5 to 14 ppbv.

FIGURE 7: ODOR OBSERVANCES AT HASMA, LASMA, VULCAN, AND MARATHON SITES —2004

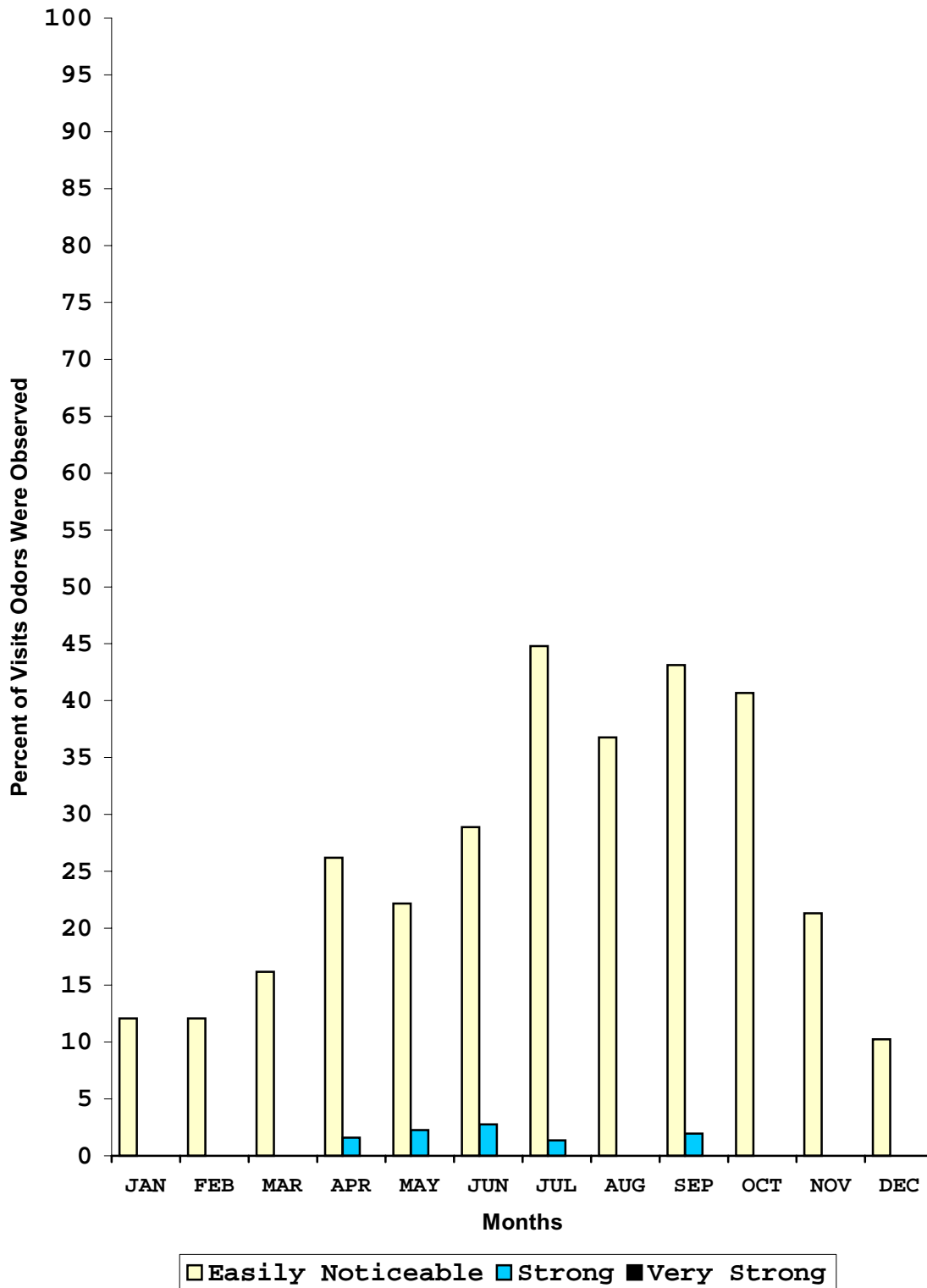
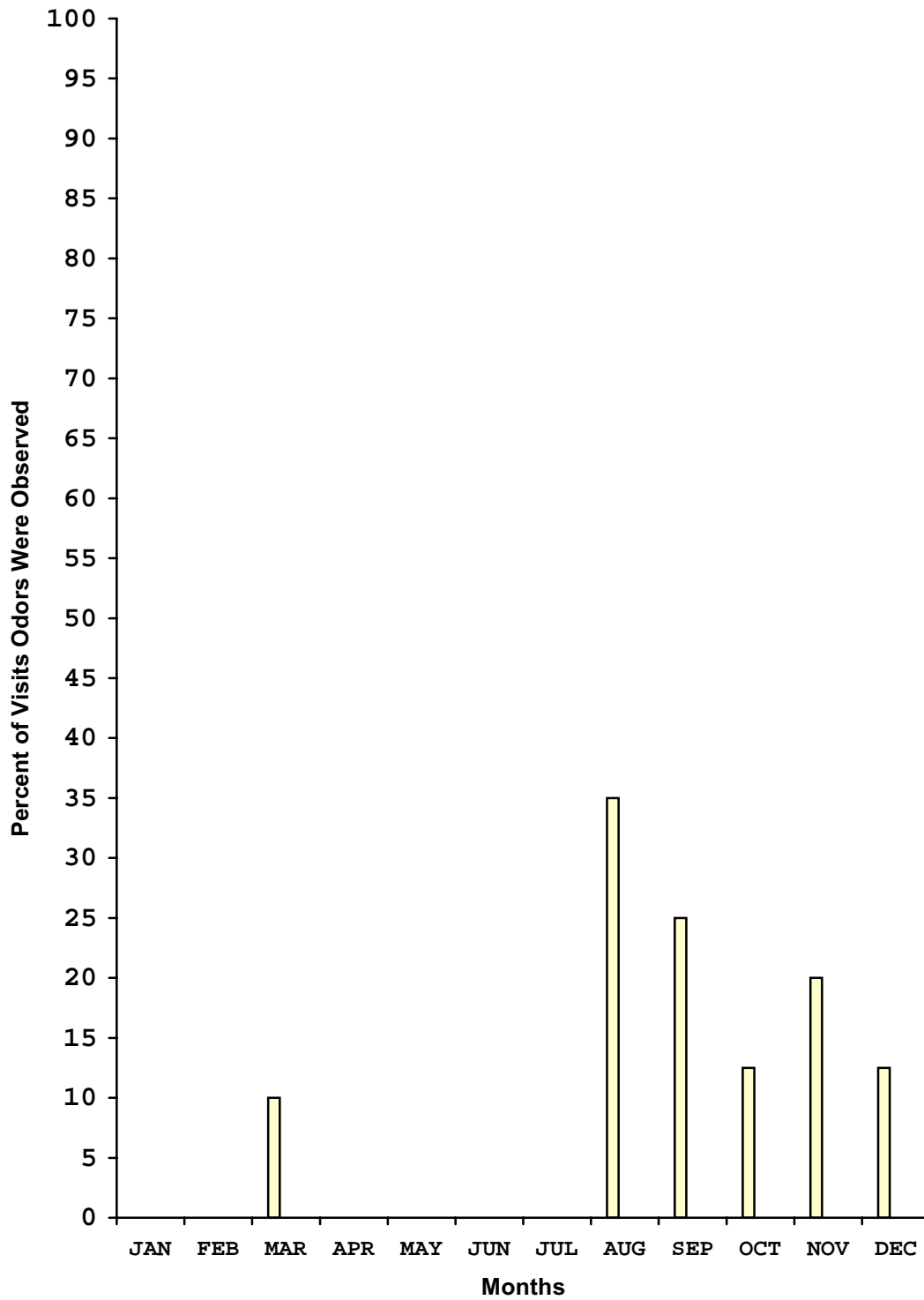


TABLE 10: HYDROGEN SULFIDE READINGS AT HASMA, VULCAN,
MARATHON SOLIDS DRYING AREAS AND LASMA SOLIDS PROSESSING
SITE—2004

Location	Hydrogen Sulfide, ppbv		
	Mean	Minimum	Maximum
HASMA (1) ¹	11	0	61
HASMA Center (1.5)	9.9	0	98
Vulcan South (2)	10	0	146
Vulcan North (3)	9.6	0	150
Vulcan TARP Drop Shaft (4)	9.2	0	62
Vulcan TARP Well (5)	9.8	0	150
LASMA Lagoon 1 (6)	6.8	0	27
LASMA Lagoon 16 (7)	7.3	0	36
LASMA Lagoon 24 (8)	7.4	0	25
LASMA Lagoon 30(9)	7.5	0	130
LASMA Cell 1E-1W (10)	7.0	0	38
LASMA Cell 2E-2W (11)	6.2	0	33
LASMA Cell 3E-3W (12)	7.4	0	120
LASMA Cell 4E-4W (13)	7.1	0	56
LASMA Cell 5E-5W (14)	6.5	0	33
Marathon (15)	8.5	0	121
Marathon West (16)	7.4	0	36

¹Numbers in parentheses correspond to Station numbers in [Figure AI-6](#).

FIGURE 8: ODOR OBSERVANCE AT RASMA SOLIDS DRYING AREA—2004



□ Easily Noticeable ■ Strong ■ Very Strong

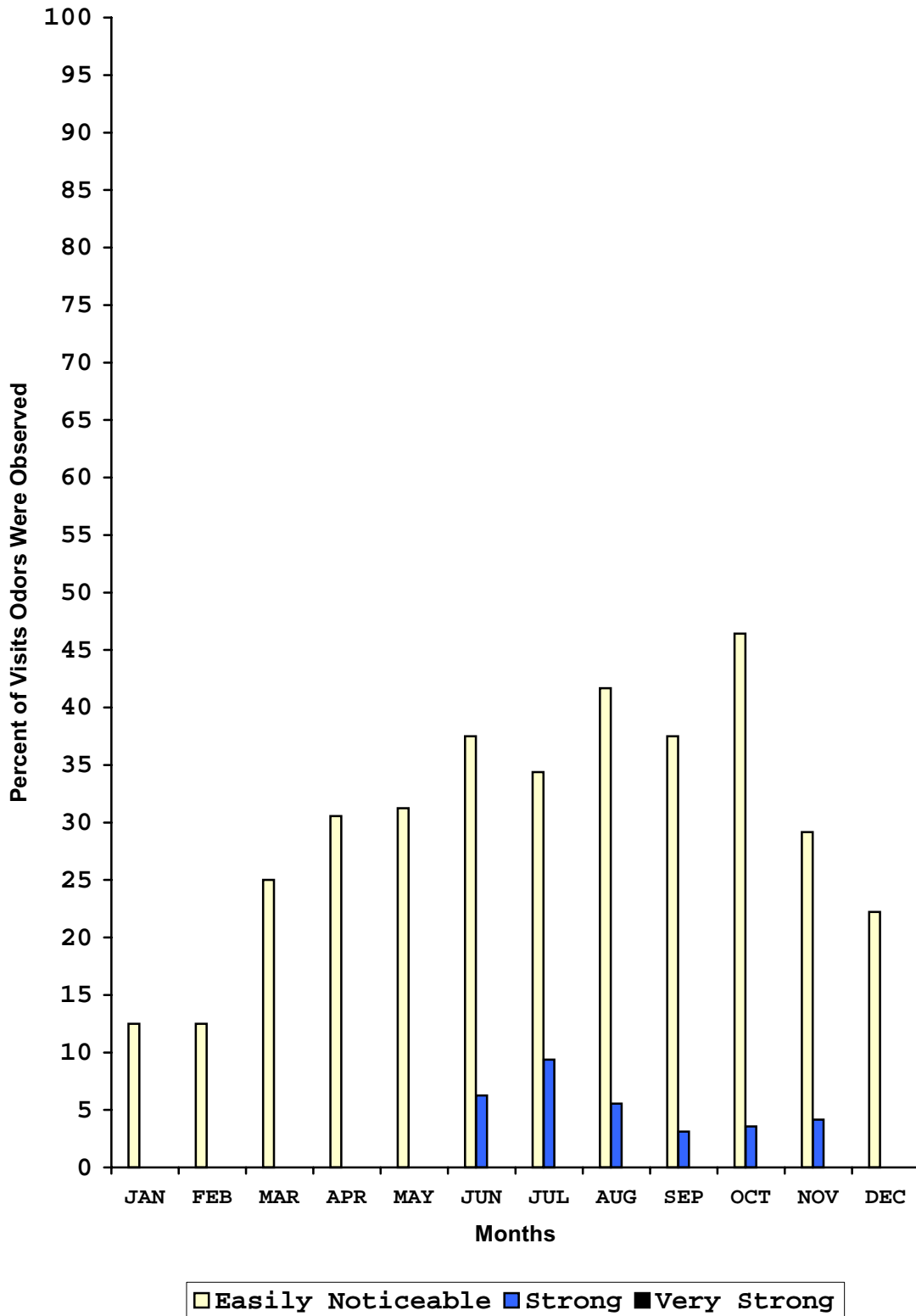
TABLE 11: HYDROGEN SULFIDE READINGS AT RASMA AND STONY ISLAND
SOLIDS DRYING AREAS—2004

Location	Hydrogen Sulfide, ppbv		
	Mean	Minimum	Maximum
<u>RASMA</u>			
SW Parking Area (1) ¹	6	0	12
North of Cell 2W (2)	13	0	290
NE Corner Cell 5E (3)	8	0	67
South of Cell 5 (4)	7	0	63
<u>Stony Island</u>			
Entrance 122nd St (1) ²	5	0	17
NE Corner Cell 5 (2)	14	0	290
South End Cells 4 & 7 (3)	10	0	290
West Side of Cell 3 (4)	8	0	70

¹Numbers in parentheses correspond to Station numbers in Figure AI-7.

²Numbers in parentheses correspond to Station numbers in Figure AI-8.

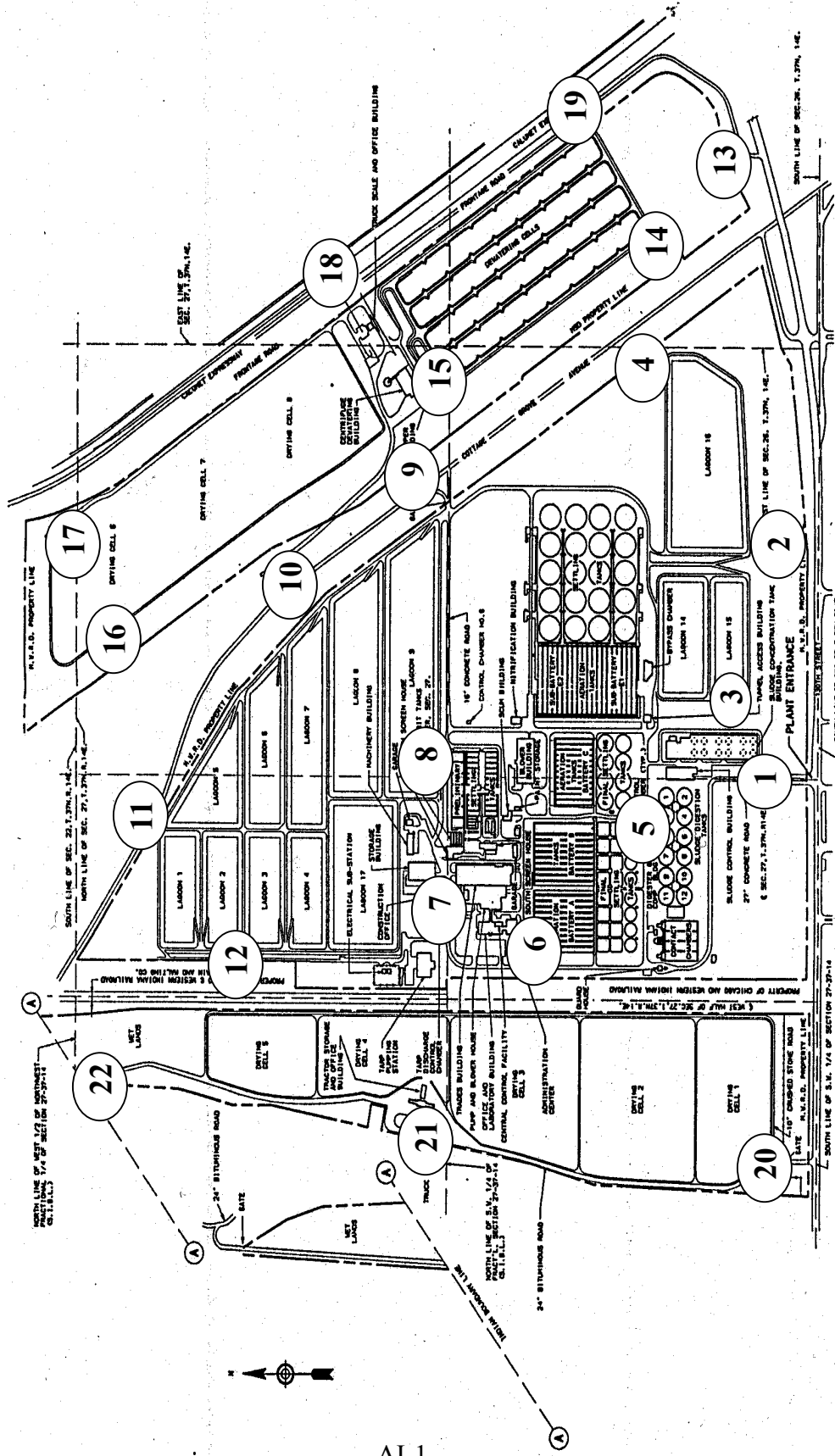
FIGURE 9: ODOR OBSERVANCES AT STONY ISLAND SOLIDS DRYING AREA—2004



No odor calls were received in 2004 with regard to the RASMA and Stony Island Sludge Drying Areas.

LOCATION OF ODOR MONITORING STATIONS AT DISTRICT WRPs,
SOLIDS DRYING AREAS, AND SOLIDS PROCESSING SITES

FIGURE AI-1: CALUMET WRP AND CALUMET SOLIDS DYING AREAS
(NUMBERED CIRCLES INDICATE ODOR MONITORING STATIONS)



METROPOLITAN WATER RECLAMATION DISTRICT
OF GREATER CHICAGO
LOCATION PLAN
CALUMET WRP

200 0 200 400 600 800
APPROXIMATE SCALE 1"=300'

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

AI-2

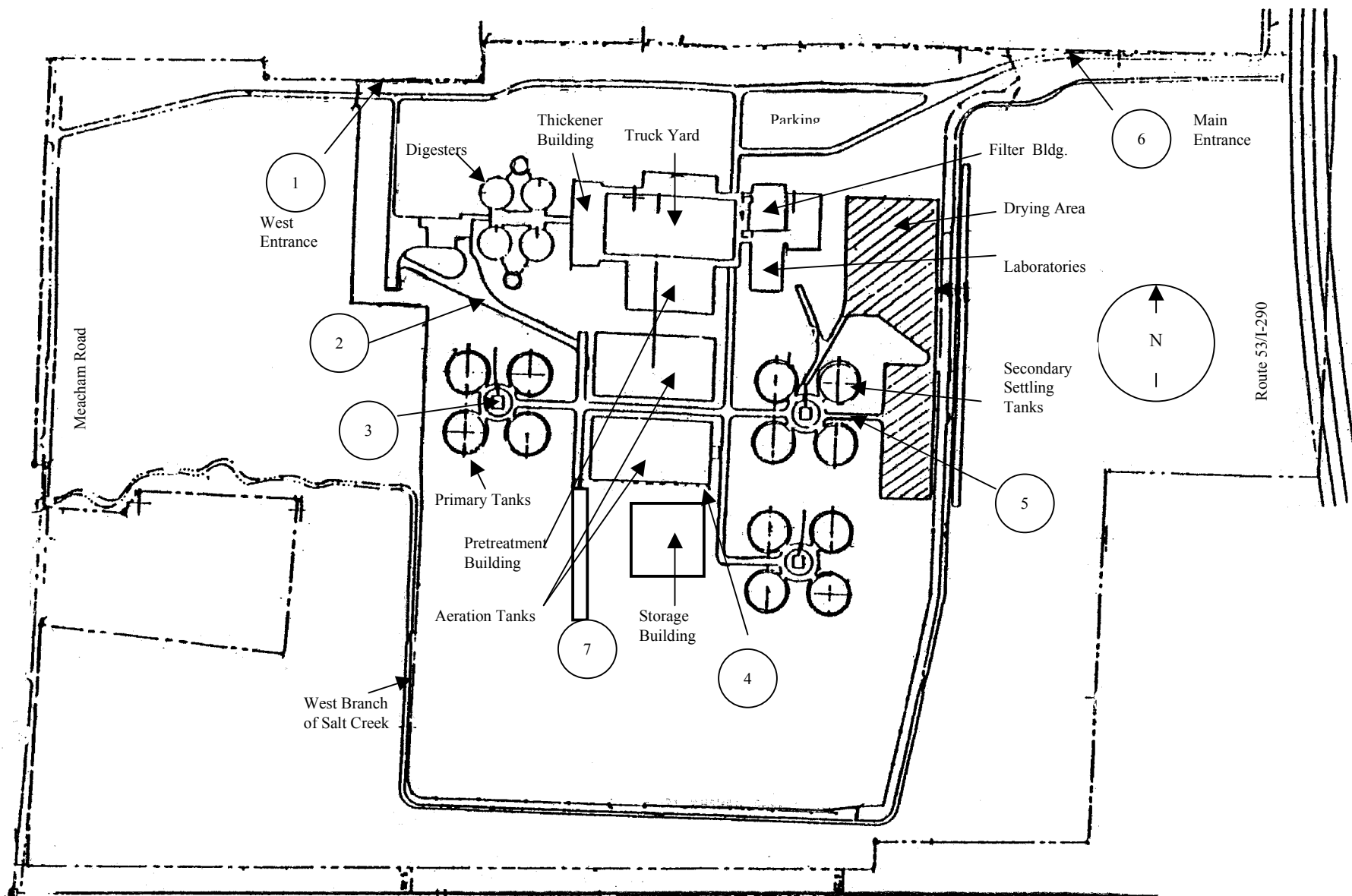
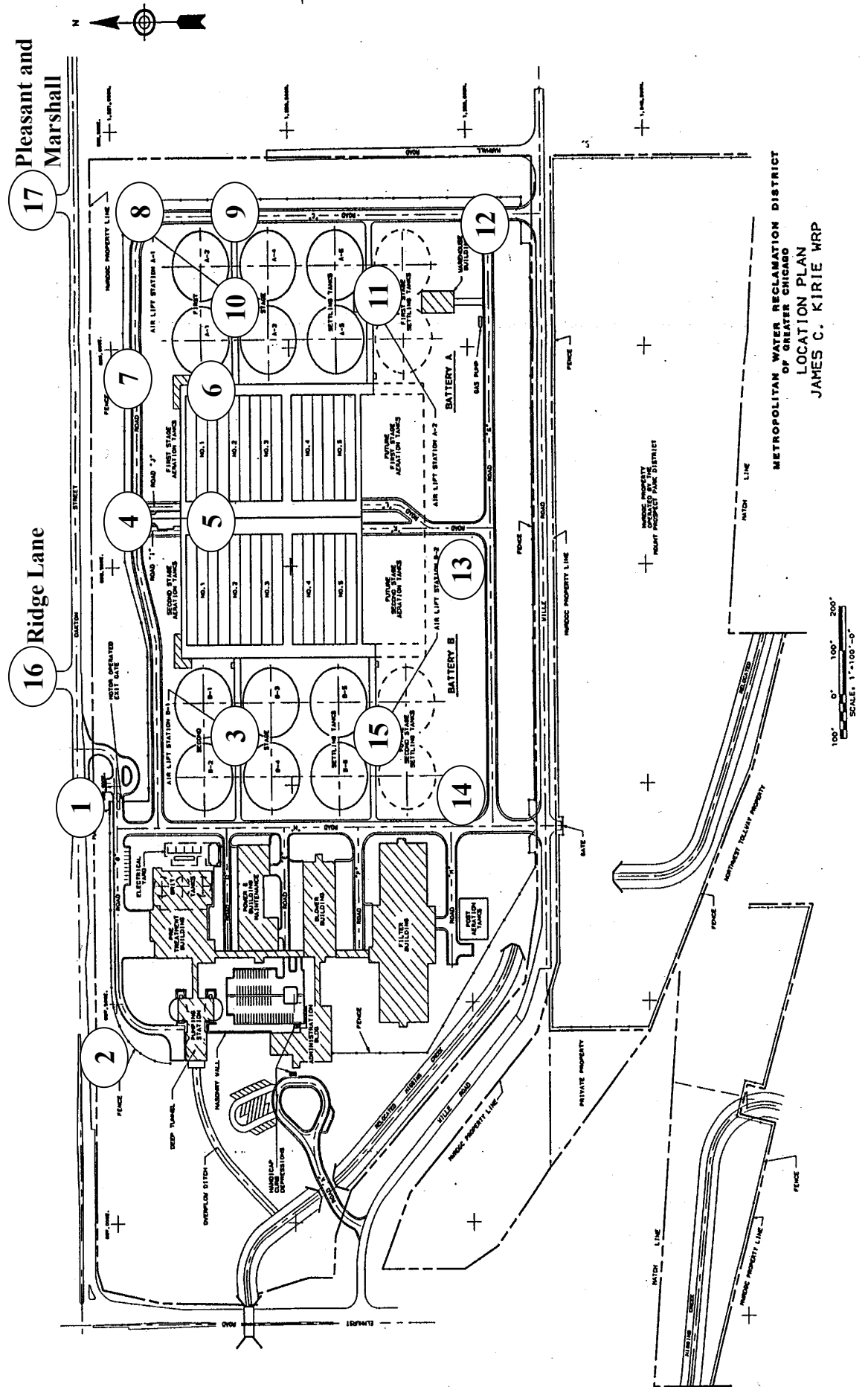
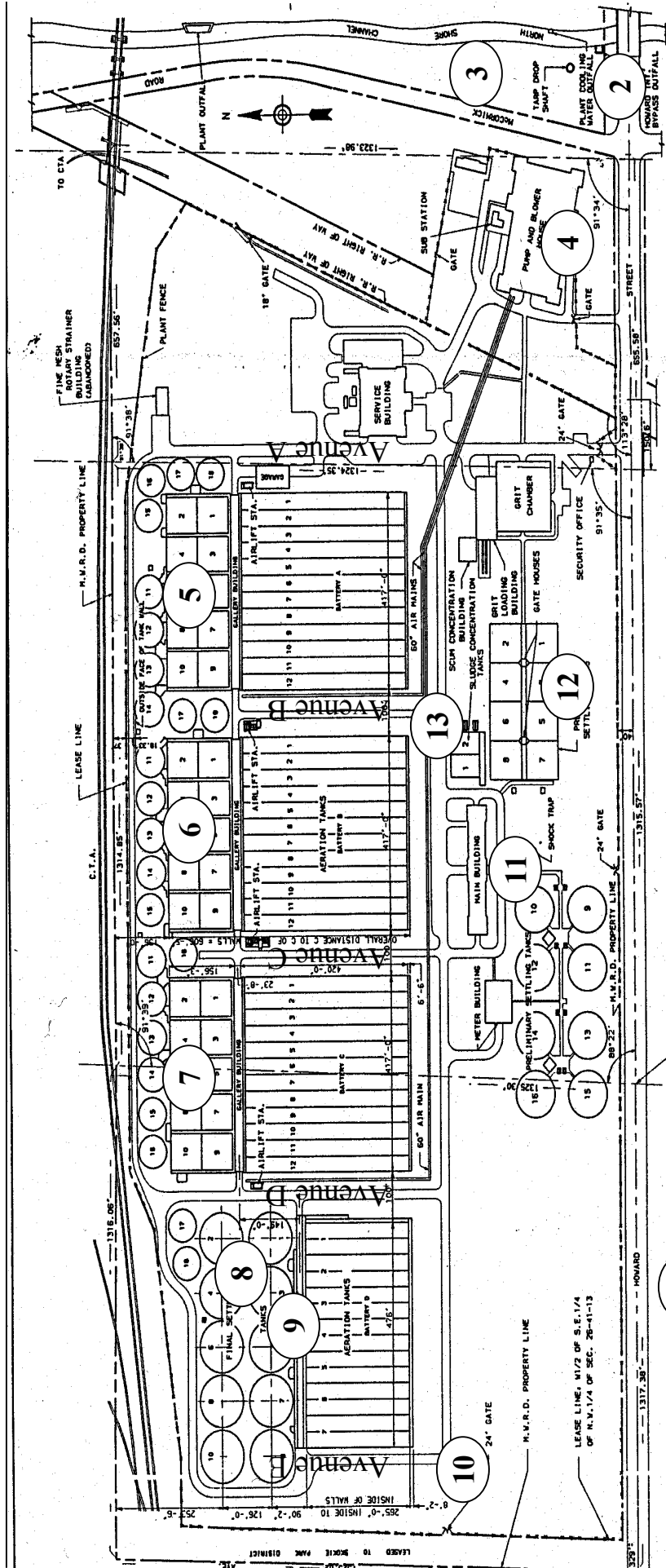


FIGURE AI-3: JAMES C. KIRIE WRP
 (NUMBERED CIRCLES INDICATE ODOR MONITORING STATIONS)



METROPOLITAN WATER RECLAMATION DISTRICT
 OF GREATER CHICAGO
 LOCATION PLAN
 JAMES C. KIRIE WRP

FIGURE AI-4:NORTH SIDE WRP
(NUMBERED CIRCLES INDICATE ODOR MONITORING STATIONS)



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

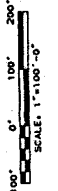


FIGURE AI-5: STICKNEY WRP
(NUMBERED CIRCLES INDICATE ODOR MONITORING STATIONS)

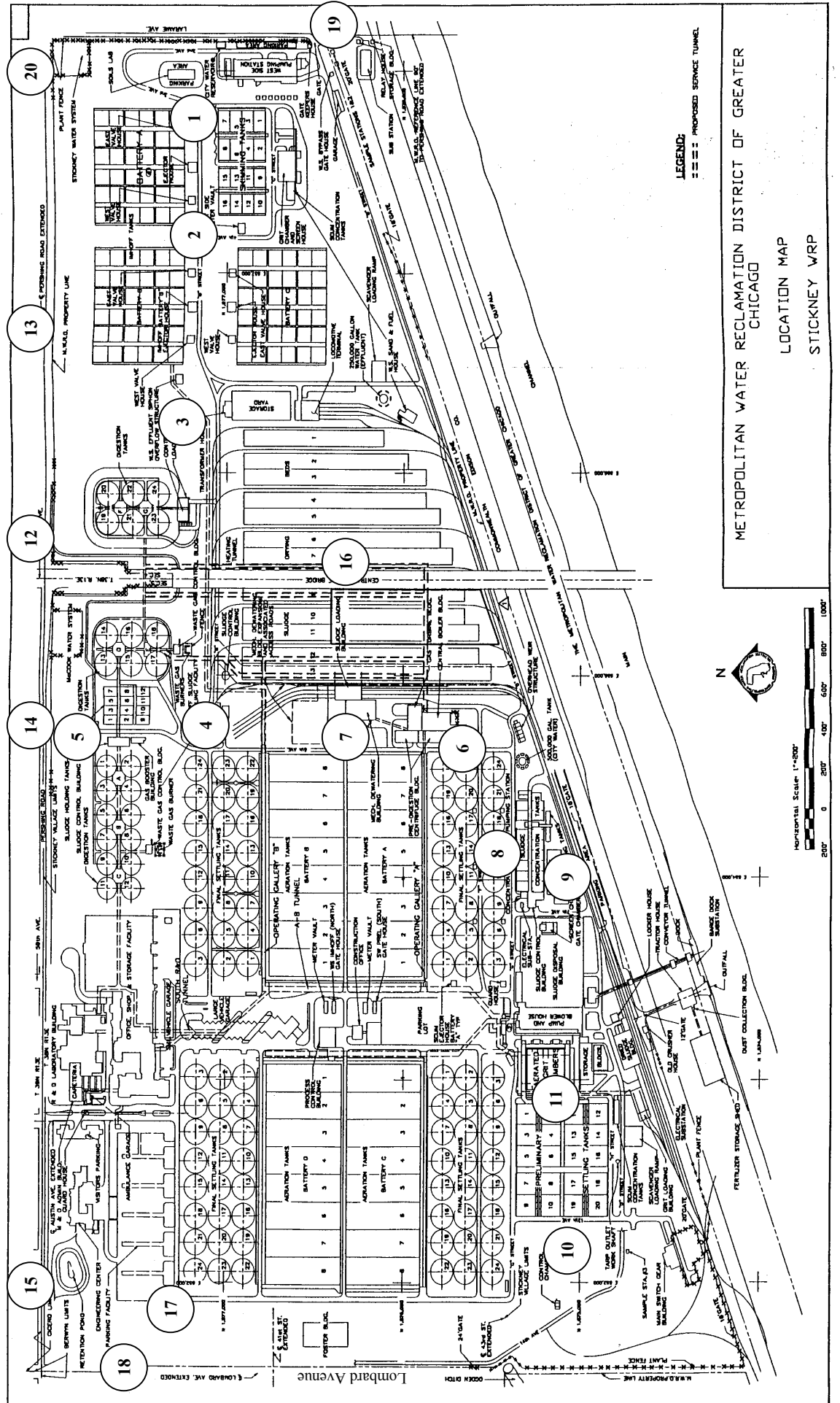


FIGURE AI-6: HASMA, VULCAN AND MARATHON SOLIDS DRYING AREAS AND LASMA SOLIDS PROCESSING SITE
(NUMBERED CIRCLES INDICATE ODOR MONITORING STATIONS)

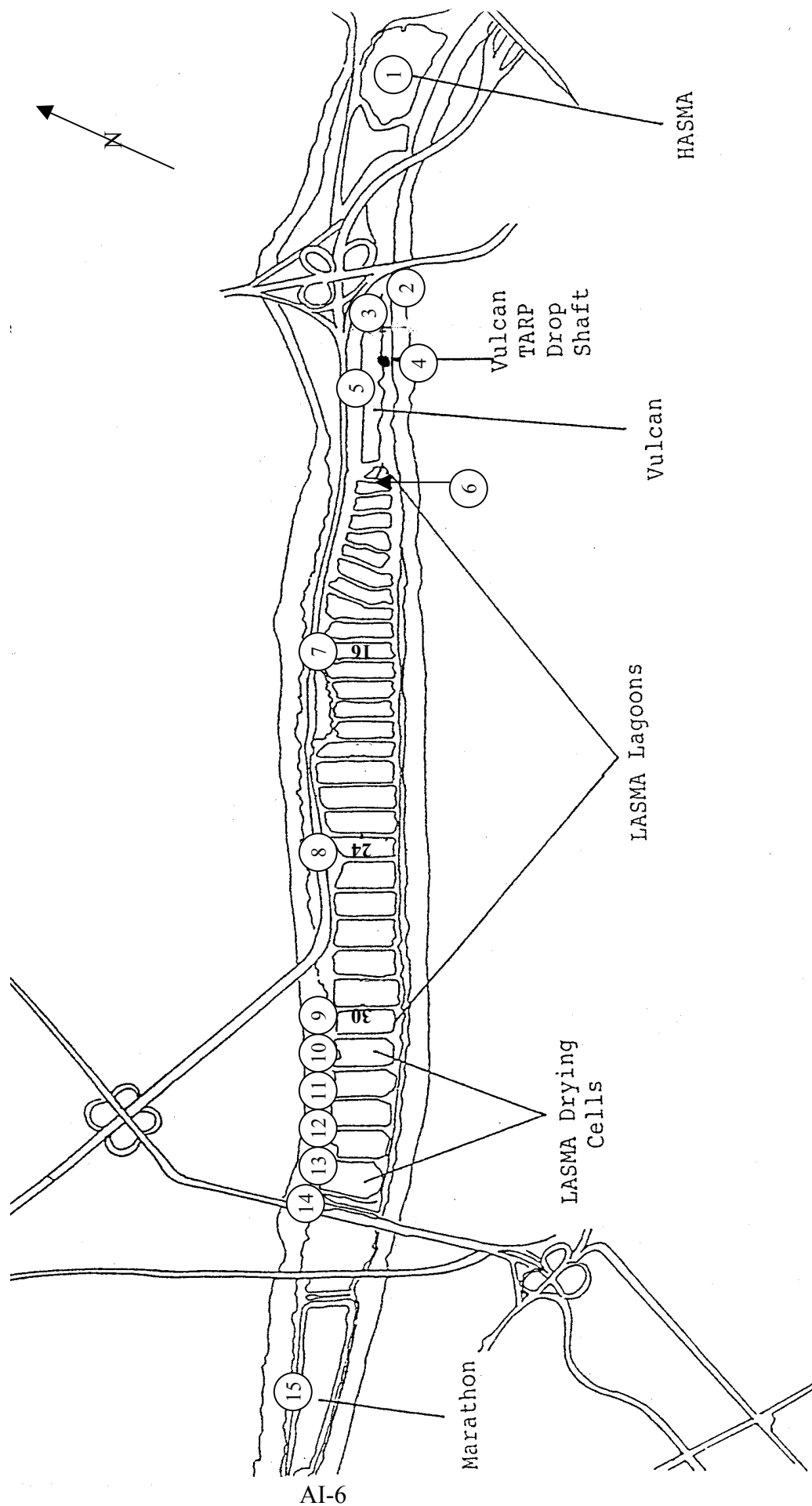


FIGURE AI-7: RASMA SOLIDS DRYING AREA
(NUMBERED CIRCLES INDICATE ODOR MONITORING STATIONS)

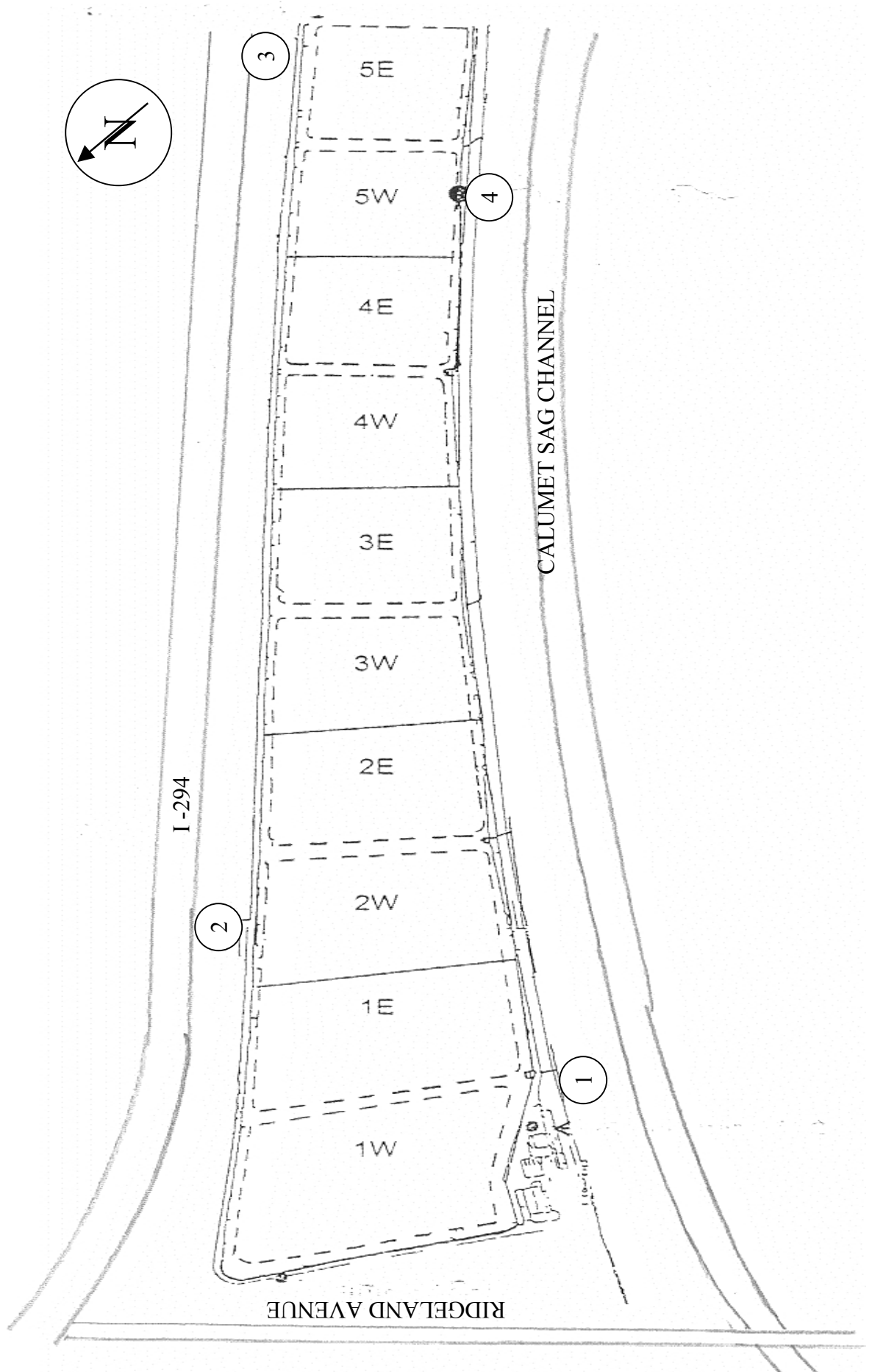


FIGURE AI-8: STONY ISLAND SOLIDS DRYING AREA
(NUMBERED CIRCLES INDICATE ODOR MONITORING STATIONS)

