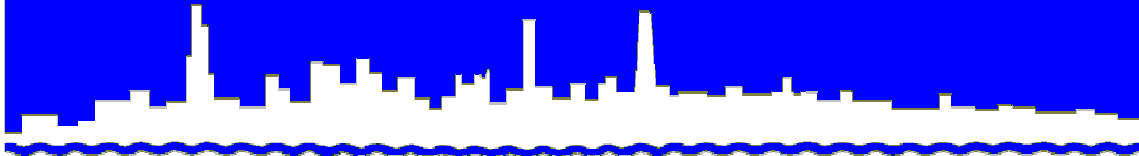


Protecting Our Water Environment



Metropolitan Water Reclamation District of Greater Chicago

***RESEARCH AND DEVELOPMENT
DEPARTMENT***

REPORT NO. 07-49

*ODOR MONITORING PROGRAM AT METROPOLITAN WATER
RECLAMATION DISTRICT FACILITIES DURING 2006*

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Metropolitan Water Reclamation District of Greater Chicago

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ODOR MONITORING PROGRAM AT METROPOLITAN WATER
RECLAMATION DISTRICT FACILITIES DURING 2006

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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 (SDAs). 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 2006 the program included five of the District WRPs and all of the SDAs. The R&D Department staff records instantaneous hydrogen sulfide (H₂S) 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 Kirie WRP. Each odor observation is characterized as very strong, strong, easily noticeable, faint, very faint, or no odor.

During 2006 two very strong odors, out of 5,245 observations, were observed at the Stickney WRP, one very strong odor out of 3,207 was observed at the Calumet WRP, and six very strong odors were observed at the Harlem Avenue Solids Management Area (HASMA), Marathon, and Vulcan SDA and the Lawndale Avenue Solids Management Area (LASMA). 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 66 to 99 percent of the time. At the six SDAs and sites, observations were characterized as faint to no odor from 65 to 90 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 Imhoff tanks, preliminary tanks, and sludge concentration 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 H₂S levels generally followed a pattern similar to the odor observations with occasional high values. It appears that the average level of H₂S is between 6 and 283 ppbv at the WRPs. At the Stickney WRP the average H₂S levels along the periphery of the plant were 7 to 19 ppbv and 10 to 283 ppbv at the majority of locations within the WRP.

TABLE 1: STRONG ODOR OBSERVATIONS—2006

Facility	Number of Strong Odor Observations	Total Number of Observations
Calumet WRP		
Plant Entrance	2	
Lagoon #16 SW Corner	7	
Sludge Concentration Building*	10	
Lagoon #16 NE Corner	5	
Preliminary Tanks	10	
Sludge Digester Tanks	4	
TARP Pump Stations	1	
Lagoons #7 and #8	1	
North H ₂ S Monitor	<u>5</u>	
	Total 45	3,207
Calumet SDS		
Drying Cell #1 SW	2	
Hopper Building	3	
Drying Cell #1 SE	1	
Drying Cell #8 NW	4	
Truck Scale/Centrifuge	2	
Drying Cell #1 at Gate	<u>3</u>	
	Total 15	1,943
Egan WRP		
Waste Gas Burner	1	
Primary Tanks	<u>1</u>	
	Total 2	363
Kirie WRP		
Airlift A1	1	
Airlift A2	<u>1</u>	
	Total 2	8,456
North Side WRP		
Gallery Bldg. Battery D Mix Channel	1	
Weir Preliminary Tank #10	2	
Weir Rect. Preliminary Tanks	1	
Main St. Sludge Conc. Tanks	<u>1</u>	
	Total 5	674

TABLE 1 (Continued): STRONG ODOR OBSERVATIONS—2006

Facility	Number of Strong Odor Observations	Total Number of Observations
Stickney WRP		
Imhoff Tanks	54	
Centrifuges (Pre)	8	
Centrifuges (Post)	12	
Sludge Concentration Tanks	27	
Preliminary Tanks**	46	
Laramie Ave. & 40th St.**	16	
Laramie Ave. & 39th St.	<u>19</u>	
	Total 182	5,245
HASMA, Marathon, Vulcan SDAs, and LASMA SPS***		
HASMA	11	
HASMA Center	9	
Vulcan TARP Construction Shaft	4	
Vulcan North	0	
Vulcan South	1	
LASMA Drying Cells	2	
Marathon	1	
Lagoons	<u>2</u>	
	Total 30	2,364
RASMA SDA	Total 0	178
Stony Island SDA		
Entrance @ 22nd St.	1	
South End Cells #4 and #7	1	
W. Side Midpt. of Cell #3	<u>1</u>	
	Total 3	354

*There was one observation of a very strong odor at the sludge concentration building at the Calumet WRP.

**There was one observation of a very strong odor at these locations at the Stickney WRP.

***There was one observation of a very strong odor at HASMA, Vulcan North, and Vulcan TARP construction shaft and three very strong odors at HASMA center point.

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 17 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 H₂S using a Jerome Model 631-X H₂S meter is also conducted.

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 operating personnel.

This report presents the odor monitoring data for the year 2006. The odor monitoring data in terms of frequency of occurrence, locations of possible odor sources, and H₂S 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 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, during the spring through fall months.

Odor complaints in 2006 with regard to the various facilities were very infrequent, ranging from none to nine at a given facility during the year.

TABLE 2: ODOR MONITORING PROGRAM FOR 2006

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	15	1992	12	3 2	R&D M&O	Yes	0	—
Calumet SDS	9	1992	12	3 2	R&D M&O	Yes	0	—
Egan WRP	7	1993	12	1 **	R&D M&O**	Yes	1	0
Kirie WRP	17	1996	12	1 7*	R&D M&O	Yes	9	7
North Side WRP	13	1992	12	1 **	R&D M&O**	Yes	1	0
Stickney WRP	19	1991	12	3 2	R&D M&O	Yes	2	0
HASMA, Vulcan, Marathon SDA, and LASMA SPS	17	1990	12	3	R&D	Yes	1	0
RASMA SDA	4	2001	12	1 to 2	R&D	Yes	0	—
Stony Island SDA	4	2001	12	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 2006.

RESULTS OF ODOR MONITORING AT DISTRICT FACILITIES IN 2006

The results of the various odor monitoring programs at each of the District facilities for 2006 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 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; 66 percent of the time by R&D Department personnel and 99 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 mainly occurred around the sludge concentration building and preliminary tanks, with 4.6 percent of the observations at each location. Areas which had easily noticeable odors were in the vicinity of the preliminary tanks, 46 percent of observations; sludge concentration tanks and northeast corner of Lagoon #16, 35 percent of observations; sludge digester tanks, 23 percent of observations; southwest corner of Lagoon #16, 28 percent of observations; Aeration Battery A and between Lagoons #7 and #8, 22 percent of observations; and the plant entrance, 19 percent of observations.

The H₂S measurements made at the time of the odor monitoring by the R&D Department personnel are summarized in Table 4. The highest instantaneous readings were at the plant entrance, the sludge concentration building, and the preliminary tanks. These locations also correspond to the highest average concentrations, which ranged from 11.4 to 26.9 ppbv. The rest of the locations averaged between 6.1 and 8.2 ppbv, with a number of nondetectable observations.

Figure 1 summarizes the monthly observations of easily noticeable, strong, and very strong odors made during 2006 in terms of frequency of occurrence. The frequency of easily noticeable observations ranged between 12.6 and 34.2 percent each month with the highest percentage occurring in June. No very strong odors were observed during 2006.

No odor calls pertaining to the Calumet WRP were received in 2006.

TABLE 3: ODOR MONITORING RESULTS FOR 2006

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	2,077	1	44	653	1,379	66
	M&O	1,130	0	1	13	1,116	99
Calumet SDS	R&D	1,252	0	15	380	857	68
	M&O	691	0	0	3	688	99
Egan WRP	R&D M&O**	363	0	2	74	287	79
Kirie WRP	R&D	883	0	2	217	664	75
	M&O	7,573	0	0	67	7,506	99
North Side WRP	R&D M&O**	674	0	5	214	455	68
Stickney WRP	R&D	2,753	2	167	1,086	1,498	54
	M&O	2,492	0	18	272	2,202	88
HASMA, Vulcan, and Marathon SDA, and LASMA SPS	R&D	2,364	6	21	806	1,531	65
RASMA SDA	R&D	178	0	0	17	161	90
Stony Island SDA	R&D	354	0	3	88	263	74

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.

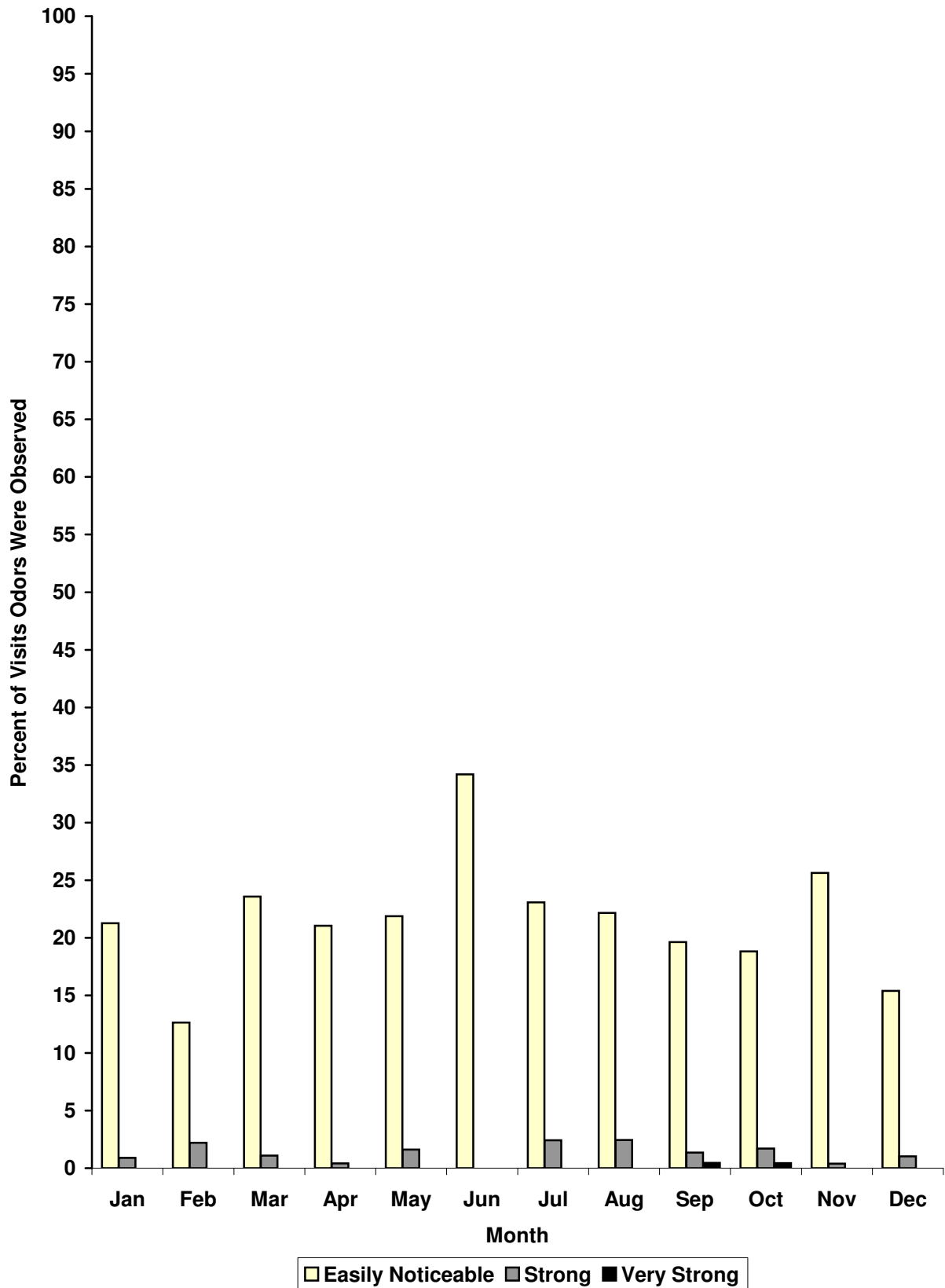
**The M&O Department conducts periodic odor monitoring surveys at these facilities, but the data are not included in this Table.

TABLE 4: HYDROGEN SULFIDE READINGS AT CALUMET WRP—2006

Location	Hydrogen Sulfide, ppbv		
	Mean	Minimum	Maximum
Plant Entrance (1) ¹	11.4	0	640
Lagoon #16 SW Corner (2)	6.7	0	42
Sludge Conc. Bldg. (3)	16.4	0	550
Lagoon #16 NE Corner (4)	7.1	0	33
Sludge Digester Tanks (5)	8.2	0	120
Aeration Battery A—West (6)	8.1	0	160
TARP Pump Station (7)	6.4	0	16
Preliminary Tanks (8)	26.9	0	330
Gate Near Lagoon #9 (9)	7.5	0	120
Between Lagoon #7 & #8 (10)	8.0	0	110
Lagoon #1 & #2 (11)	6.2	0	21
Lagoon #3 & #4 (12)	7.0	0	130
Ellis Ave. & 130th St. (13)	8.2	0	64
H ₂ S Monitor—130th St. (23)	6.8	0	18
North H ₂ S Monitor (24)	6.1	0	13

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

FIGURE 1: ODOR OBSERVANCES AT CALUMET WRP—2006



Calumet SDS

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 Drying Area, was infrequent. The majority of the observations were described as faint to no odor, 68 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 January, February, April, May, and August 2006. Strong odors occurred 0.7 percent of the time at the SDAs. Easily noticeable odors occurred between 5 and 26 percent of the time around the various drying area locations.

The average H₂S levels were between 5.9 and 11.9 ppbv, as shown in [Table 5](#). The highest values observed were in the vicinity of West Drying Cell #1 @Gate and Bituminous Road @Gate.

[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 summer months of 2006 and ranged from 8.7 to 36.7 percent.

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

John E. Egan WRP

There were two strong odor observations at the John E. Egan WRP in 2006. The easily noticeable odor observations occurred 74 out of 363 times, or 20 percent of the time. The easily noticeable odors were greatest in the vicinity of the primary tanks, with 50 percent of the observations being easily noticeable. At the West and East Gates easily noticeable odors were detected 9 percent and 4 percent of the time, respectively.

The percentage of observations at which easily noticeable, strong, and very strong odors were observed during 2006 are plotted by month in [Figure 3](#). The frequency of observance of easily noticeable odors varied from 8.6 percent in August to 41 percent in September 2006.

The average H₂S measurements ranged from 5.8 to 22.8 ppbv, as shown in [Table 6](#). The highest average level was observed in the vicinity of the final tanks.

Only one odor call was received for the John E. Egan WRP, and the call was not verified as reporting an odor that could have originated from the John E. Egan WRP.

James C. Kirie WRP

There were two strong odor observations at the James C. Kirie WRP during 2006. Faint or no odors were reported approximately 75 percent (R&D Department) and 99 percent (M&O Department) of the time for the overall WRP. The easily noticeable odors which occurred were

TABLE 5: HYDROGEN SULFIDE READINGS AT CALUMET SOLIDS DRYING SITES—2006

Location	Hydrogen Sulfide, ppbv		
	Mean	Minimum	Maximum
East Drying Cell #1 SW (14) ¹	7.1	0	150
Hopper Building (15)	5.9	0	18
East Drying Cell #8 NW (16)	5.9	0	23
East Drying Cell #8 NE (17)	5.9	0	20
Truck Scale/Centrifuge (18)	6.2	0	37
East Drying Cell #1 SE (19)	8.1	0	200
West Drying Cell #1 @ Gate (20)	11.9	0	365
West Drying Cell #4 (21)	6.8	0	31
Bituminous Road @ Gate (22)	8.1	0	250

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

FIGURE 2: ODOR OBSERVANCES AT CALUMET SOLIDS DRYING SITES—2006

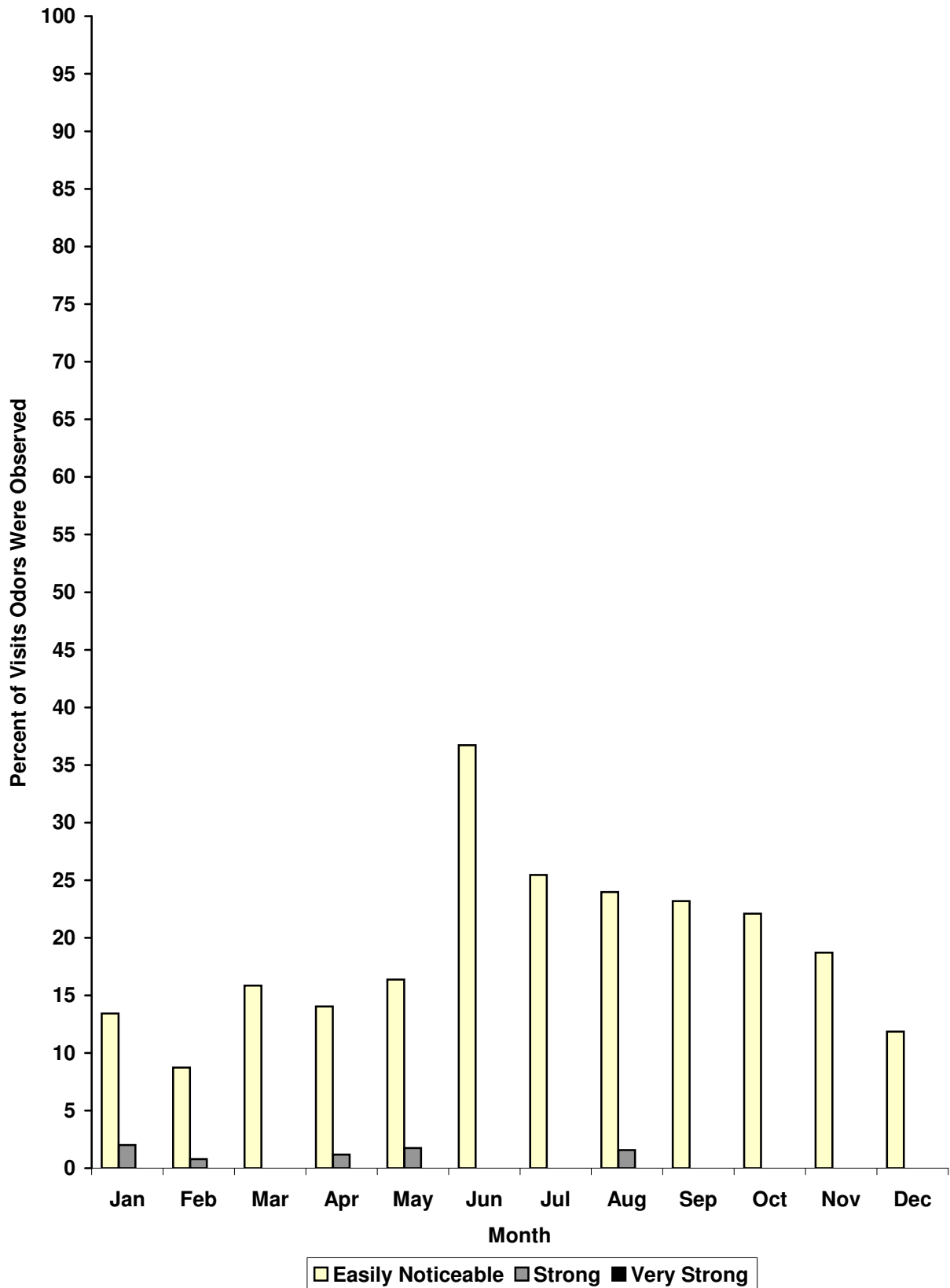


FIGURE 3: ODOR OBSERVANCES AT JOHN E. EGAN WRP—2006

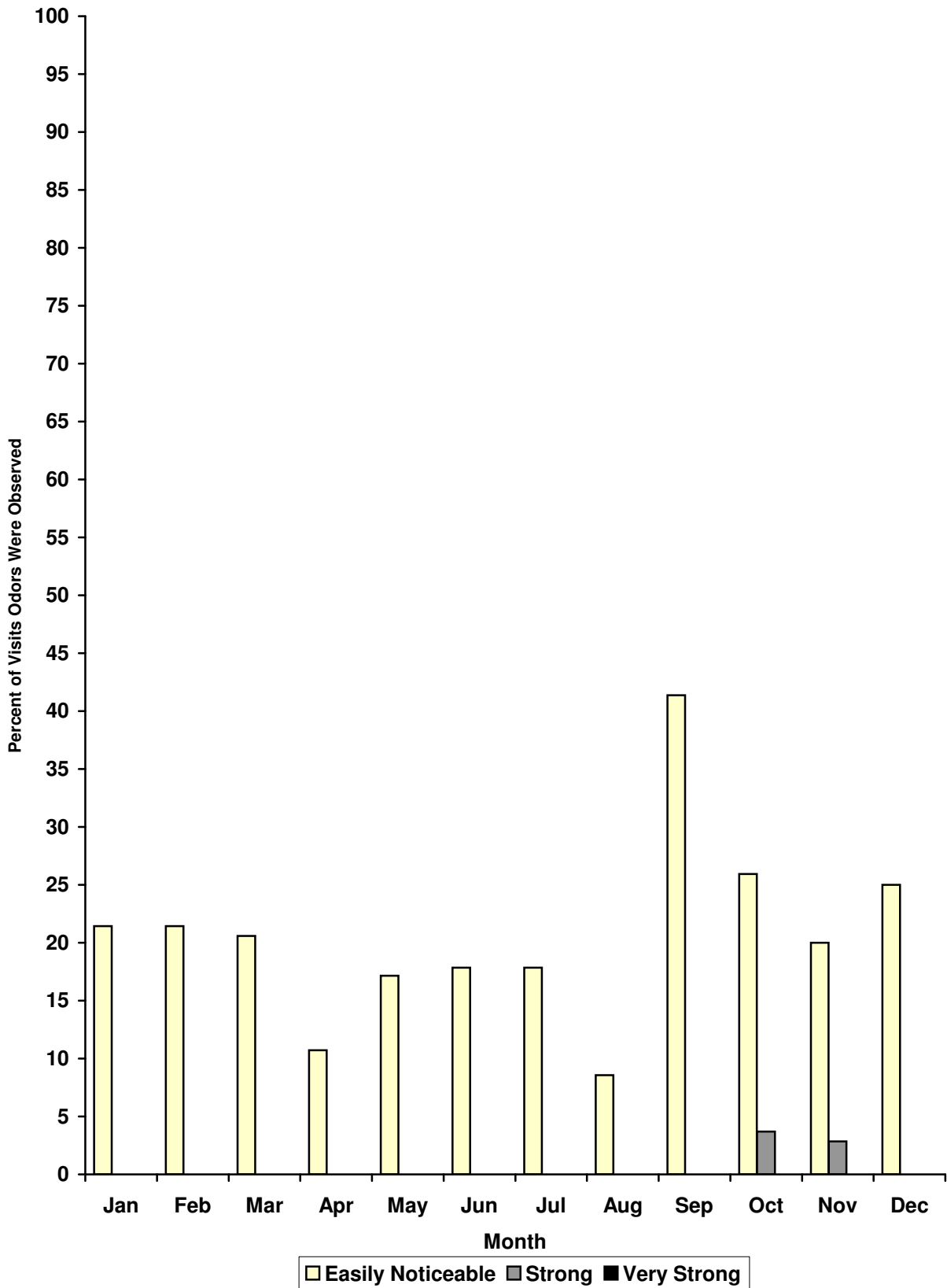


TABLE 6: HYDROGEN SULFIDE READINGS AT JOHN E. EGAN WRP—2006

Location	Hydrogen Sulfide, ppbv		
	Mean	Minimum	Maximum
West Entrance Gate (1) ¹	5.8	0	18
Near Waste Gas Burner (2)	13.8	0	170
Primary Tanks (3)	7.1	0	28
South End “A” Drive (4)	19.6	0	380
Final Tanks (5)	22.8	0	340
East Entrance Gates (6)	11.5	0	140
West of Storage Building (7)	5.9	0	17

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

generally in the vicinity of the return aeration channel (8.1 percent), air lift station A1 (17 percent), East Gallery North Channel (13 percent), air lift station A2 (11 percent), and air lift station B1 (8 percent).

Figure 4 summarizes the observations of odor monitoring personnel during 2006 in terms of easily noticeable odor or stronger. The frequency of occurrence of easily noticeable odors was about 25 percent to 30 percent in March, November, January, and December, respectively. 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 the rest of the year's observations, 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 H₂S levels are summarized in Table 7. The highest average levels of H₂S were measured in the vicinity of the Return Channel, Marshall and Pleasant Lane–Point #2, and Road C2, with averages of 22.5 ppbv, 18.8 ppbv, and 14.3 ppbv, respectively. All the other locations had averages ranging from 5.4 to 11.2 ppbv.

Nine odor calls regarding the Kirie WRP were received in 2006, seven of which were verified as reporting odors that may have originated at the Kirie WRP.

North Side WRP

The majority of the observations at the North Side WRP were faint to no odor, 68 percent of the time in 2006. There were no very strong odor observations and five strong odor observations at this WRP during 2006. The easily noticeable odors account for 32 percent of the total observations, with greatest frequency around Preliminary Tank 3, 20 percent; Preliminary Tank 10, 14 percent; and the covered sludge concentration tanks and the gallery building of Battery D mix channel, 11 percent each.

The monthly percentage of observations at which easily noticeable, strong, and very strong odors were observed are shown in Figure 5. There was no apparent trend of noticeable odors, but there was a slightly lower frequency in January through August.

The measured H₂S levels are summarized in Table 8. The highest instantaneous readings were at Covered Weir Preliminary Tank 10, Howard Street east of McCormick Road, and Main Street Covered Sludge Concentration Tanks. These locations also correspond to the highest average concentrations, which ranged from 16.7 to 21.7 ppbv.

One odor call regarding the North Side WRP was received in 2006, but the call was not verified as being associated with odors originating in the WRP.

FIGURE 4: ODOR OBSERVANCES AT JAMES C. KIRIE WRP—2006

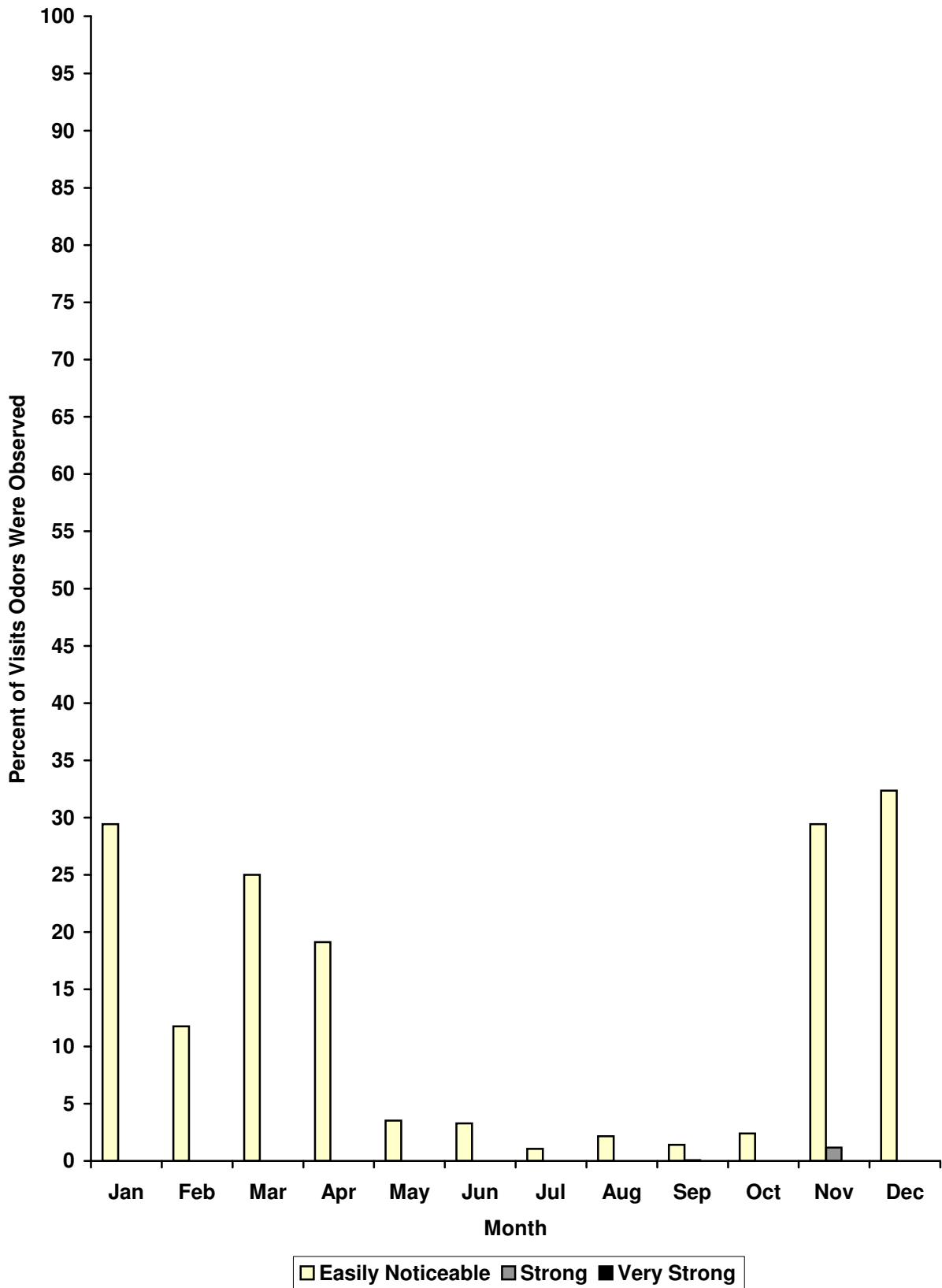


TABLE 7: HYDROGEN SULFIDE READINGS AT JAMES C. KIRIE WRP—2006

Location	Hydrogen Sulfide, ppbv		
	Mean	Minimum	Maximum
Plant Entrance (1) ¹	6.7	2	17
Pump Station (2)	6.6	0	18
Air Lift B1 (3)	6.3	0	21
Road C-1 (4)	6.6	0	19
Return Channel (5)	22.5	1	300
East Gallery—North (6)	11.2	0	140
Road C-2 (7)	14.3	0	220
Road C-3 (8)	5.8	0	18
Road C-4 (9)	6.0	0	18
Air Lift A-1 (10)	10.0	0	110
Air Lift A-2 (11)	10.6	0	110
Road C-5 (12)	5.4	0	18
Road C-6 (13)	5.6	0	14
Road C-7 (14)	5.9	0	14
Air Lift B2 (15)	6.6	2	30
Ridge Lane—Point #1 (16)	6.1	0	15
Marshall and Pleasant (17) Lane—Point #2	18.8	2	180

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

FIGURE 5: ODOR OBSERVANCES AT NORTH SIDE WRP—2006

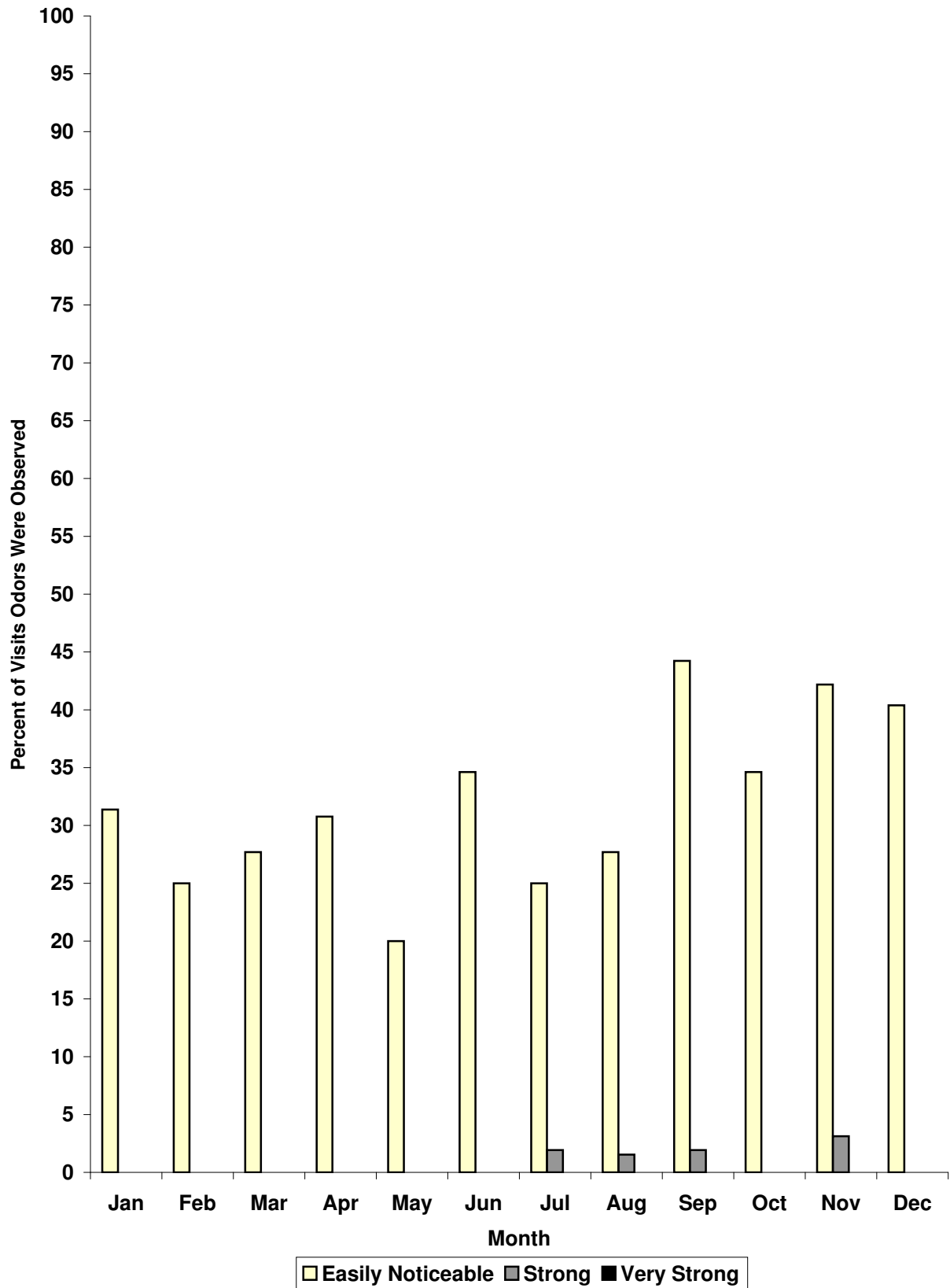


TABLE 8: HYDROGEN SULFIDE READINGS AT NORTH SIDE WRP—2006

Location	Hydrogen Sulfide, ppbv		
	Mean	Minimum	Maximum
Howard Street West End (1) ¹	9.7	3	19
Howard Street East (2) of McCormick Road	16.7	0	220
McCormick Road (3)	6.2	0	13
P&B Building (4)	12.9	4	130
North Ave. Rect. Tank A6 (5)	7.4	2	16
North Ave. Rect. Tank B6 (6)	7.2	3	16
North Ave. Rect. Tank C6 (7)	6.6	3	15
Final Tank Batt. D3 (8)	6.6	0	20
Gallery Bldg. of Batt. D (9) Mix Channel	10.3	0	110
Main Street and Avenue E (10)	7.3	0	44
Covered Weir Prel. Tank 10 (11)	19.2	2	320
Weir Rect. Prel. Tank 3 (12)	15.0	1	120
Main St. Covered Sludge (13) Conc. Tanks	21.7	2	180

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

Stickney WRP

Overall, the majority of the observations in 2006 were faint to no odor, with 54 percent of R&D Department and 88 percent of M&O Department observations meeting this classification, respectively. Overall, there were two very strong odor observations and 185 strong odor observations, or 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 77 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 59, 58, 70, 64, 70, and 56 percent of the time, respectively.

Figure 6 is a plot of the percentage of noticeable odors observed each month at the Stickney WRP. There appears to be no seasonal pattern in the odor observations. The strong odor occurrences were spread out over the year, with the lowest occurrence in November.

The five highest average H₂S levels were adjacent to the preliminary tanks at Tenth and Twelfth Avenues, the concentration tanks at G Street North, near the Imhoff tanks on Third Avenue, and the predigestion centrifuges, with concentrations of 283.3, 94.3, 75, 55.7, and 55.2 ppbv, respectively (Table 9). One extreme concentration of H₂S, 4,300 ppbv, was measured at the Preliminary Tanks on Tenth Avenue. Plant management was notified of this extreme H₂S reading as required by the standard operating procedure for odor runs.

Two odor calls were received regarding the Stickney WRP, but none was verified as resulting from Stickney WRP operations.

HASMA, Vulcan and Marathon SDAs, and LASMA Solids Processing Site

The HASMA, Vulcan, Marathon, and LASMA sites had 65 percent of the observations characterized as faint to no odor. There were six very strong odors and only 21 strong odor observations out of 2,364 observations. The strong odor observations were divided among the various areas (HASMA, HASMA Center, Vulcan, LASMA Cells 3 and 4, and Marathon) depending upon the activity at the time. Easily noticeable odors were generally observed at the west end of the Marathon site, 54 percent of the observations, around the Vulcan site, 22 to 26 percent of the observations, and at HASMA, 65 percent of the observations. The LASMA lagoon area ranged between 12 and 36 percent easily noticeable odors depending upon the location. The LASMA Drying Cell areas ranged between 21 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

FIGURE 6: ODOR OBSERVANCES AT STICKNEY WRP—2006

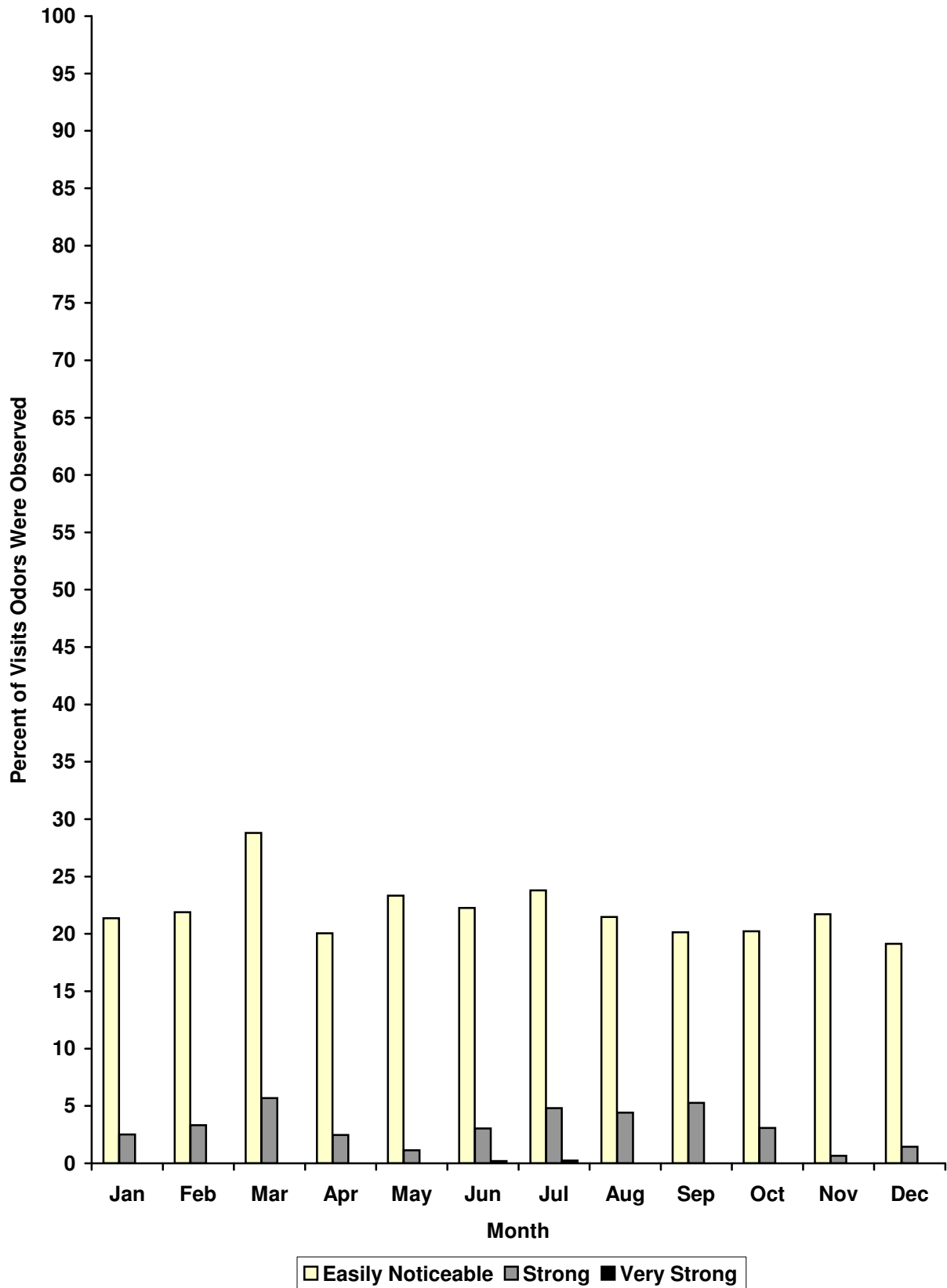
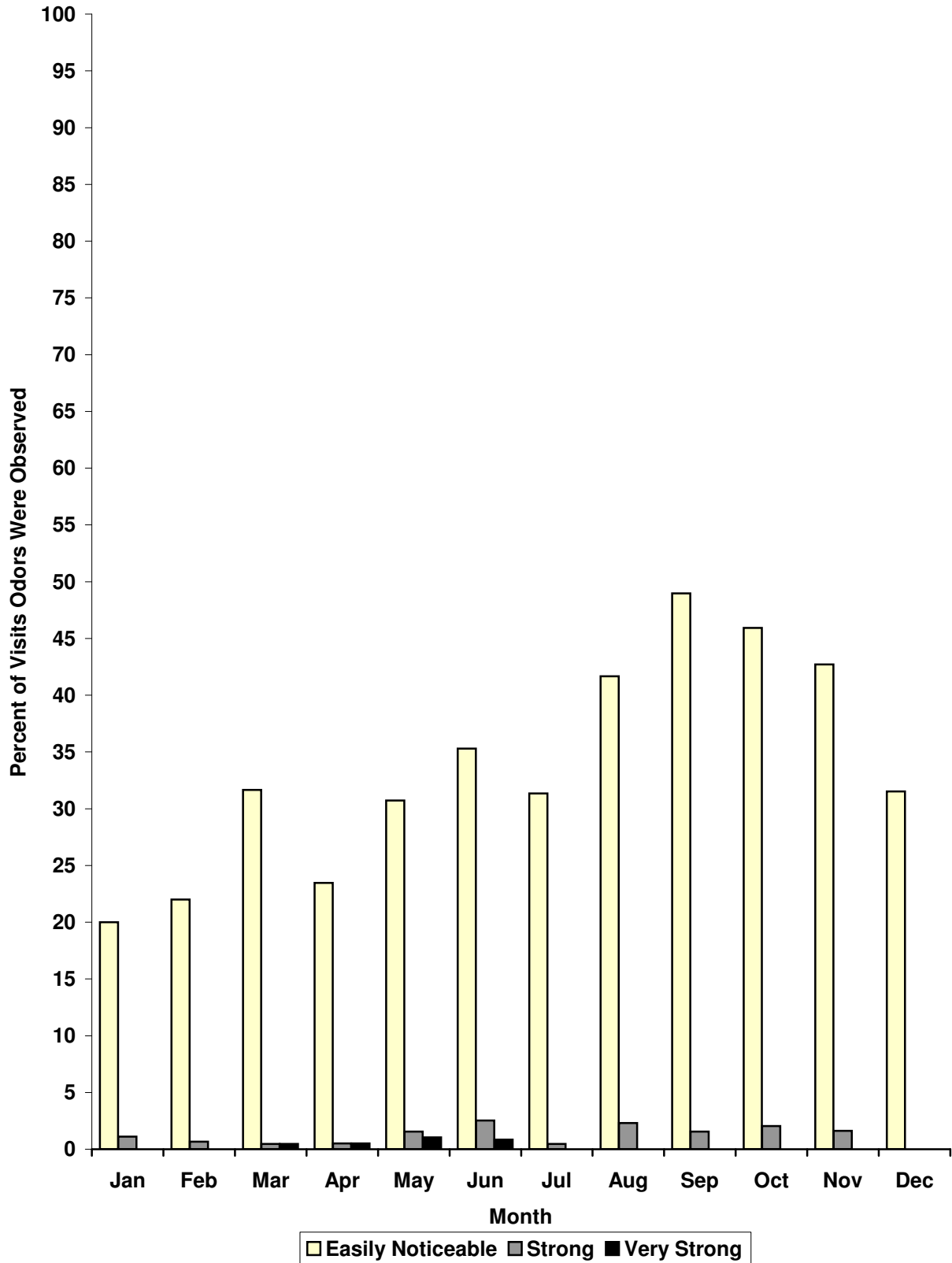


TABLE 9: HYDROGEN SULFIDE READINGS AT STICKNEY WRP—2006

Location	Hydrogen Sulfide, ppbv		
	Mean	Minimum	Maximum
Imhoff B St./3rd Ave. (1) ¹	55.7	0	817
Imhoff B St./4th Ave. (2)	42.3	0	520
Imhoff B St./5th Ave. (3)	24.8	0	240
Digester 6th Ave. @ B St. (4)	13.0	0	150
West Digester Cont. Bldg. (5)	9.8	0	33
Centrifuges 6th Ave. @ Pre. (6)	55.2	3	390
Centrifuges 6th Ave. @ Post (7)	16.6	0	111
Concentration G St. North (8)	75.0	0	630
Concentration D St. South (9)	48.0	2	230
Preliminary 12th Ave. (10)	94.3	0	815
Preliminary 10th Ave. (11)	283.3	1	4,300
39th St./Central Ave. (12)	8.9	2	28
39th St./Morton College Ent. (13)	12.8	0	110
39th St./Dig. @ 57th Ave. (14)	8.8	0	57
39th St./Between Austin and Lombard (15)	10.1	0	120
Battery D, B St/13th Ave. (16)	10.9	0	41
Lombard Ave. @ Gate/39th St. (18)	7.0	0	19
Laramie and 40th St. (19)	13.9	0	130
Laramie and 39th St. (20)	19.2	1	140

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

FIGURE 7: ODOR OBSERVANCES AT HASMA, VULCAN, MARATHON SOLIDS DRYING AREAS AND LASMA SOLIDS PROCESSING SITE—2006



odors is generally highest during the late spring through the fall months when solids processing and drying is being carried out.

The H₂S concentration averages ranged between 6.8 and 24.4 ppbv as shown in Table 10.

One odor call was received in 2006 reporting an odor that could have originated at the LASMA SPS, but that call was not verified.

RASMA and Stony Island SDAs

The RASMA SDA had 90 percent of the observations characterized as faint to no odor. There were no strong or very strong odor observations during 2006. The easily noticeable odors were 10 percent of the total observations. A monthly summary of the observations at the RASMA SDA of easily noticeable, strong, and very strong odors during 2006 is presented in Figure 8 expressed as frequency of occurrence. Easily noticeable odors occurred mainly during September and November, with the highest frequency in September.

The average H₂S levels at the various locations around the RASMA SDA ranged from 8 to 10 ppbv, as shown in Table 11.

The Stony Island SDA had 74 percent of the observations characterized as faint to no odor, with three strong odor observations or less than one percent in 2006. The easily noticeable odors accounted for approximately 25 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 2006 is presented in Figure 9 expressed as frequency of occurrence. The strong odors occurred during the months of August, September, and December.

The average H₂S levels around the Stony Island SDA, as shown in Table 11, varied from 7 to 10 ppbv.

No odor calls were received in 2006 with regard to the RASMA and Stony Island SDAs.

TABLE 10: HYDROGEN SULFIDE READINGS AT HASMA, VULCAN,
MARATHON SOLIDS DRYING AREAS AND LASMA SOLIDS PROCESSING
SITE—2006

Location	Hydrogen Sulfide, ppbv		
	Mean	Minimum	Maximum
HASMA (1) ¹	24.4	0	150
HASMA Center (1.5)	17.8	0	160
Vulcan South (2)	7.7	0	20
Vulcan North (3)	9.9	0	40
Vulcan TARP Drop Shaft (4)	15.2	0	160
Vulcan TARP Well (5)	8.0	0	36
LASMA Lagoon 1 (6)	8.1	1	26
LASMA Lagoon 16 (7)	7.2	0	17
LASMA Lagoon 24 (8)	10.6	0	53
LASMA Lagoon 30 (9)	23.3	0	290
LASMA Cell 1E-1W (10)	7.2	0	22
LASMA Cell 2E-2W (11)	15.5	0	210
LASMA Cell 3E-3W (12)	6.8	0	19
LASMA Cell 4E-4W (13)	15.6	0	170
LASMA Cell 5E-5W (14)	11.5	0	140
Marathon (15)	7.5	0	34
Marathon West (16)	7.5	0	28

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

FIGURE 8: ODOR OBSERVANCES AT RASMA SOLIDS DRYING AREA—2006

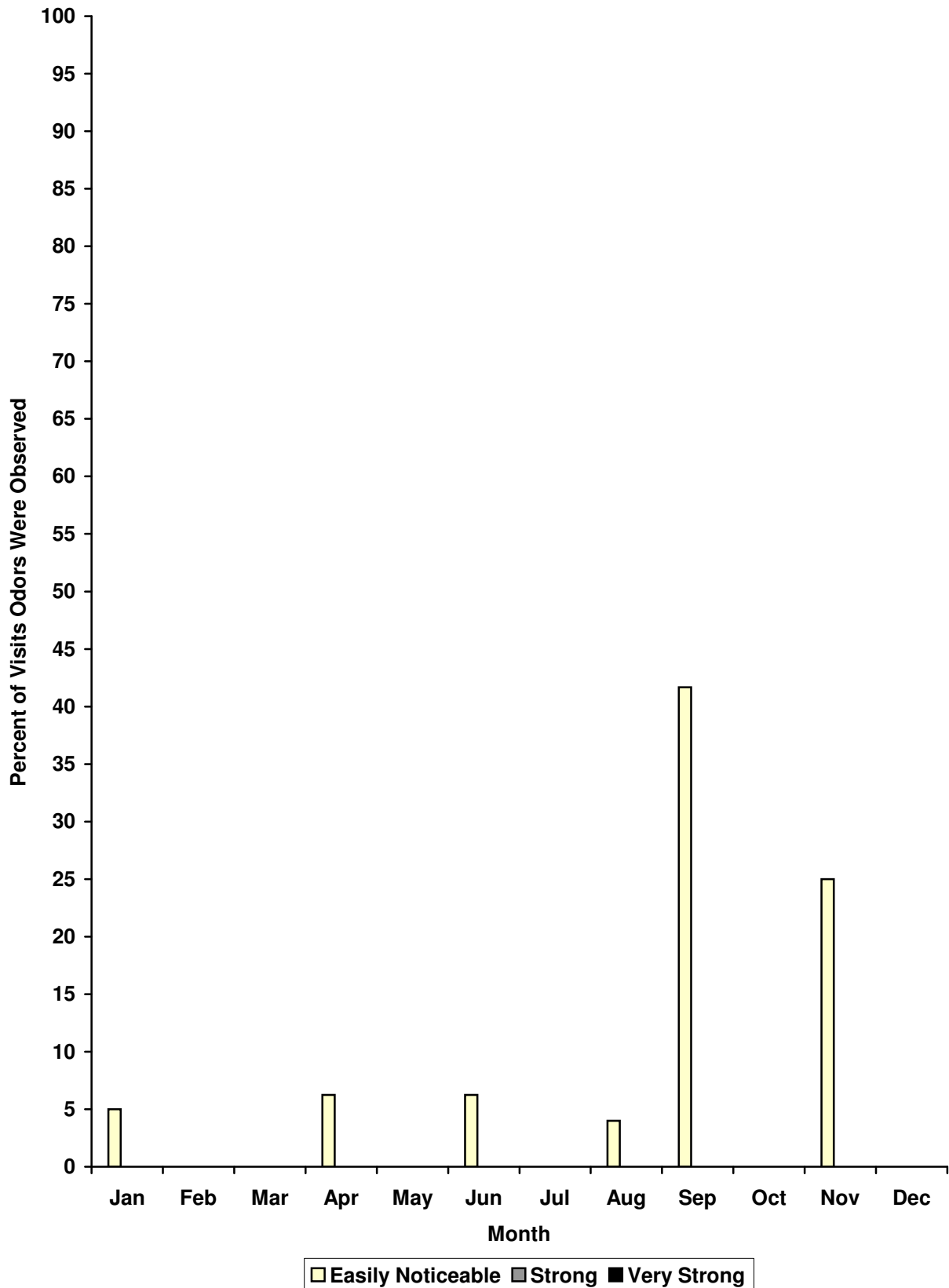


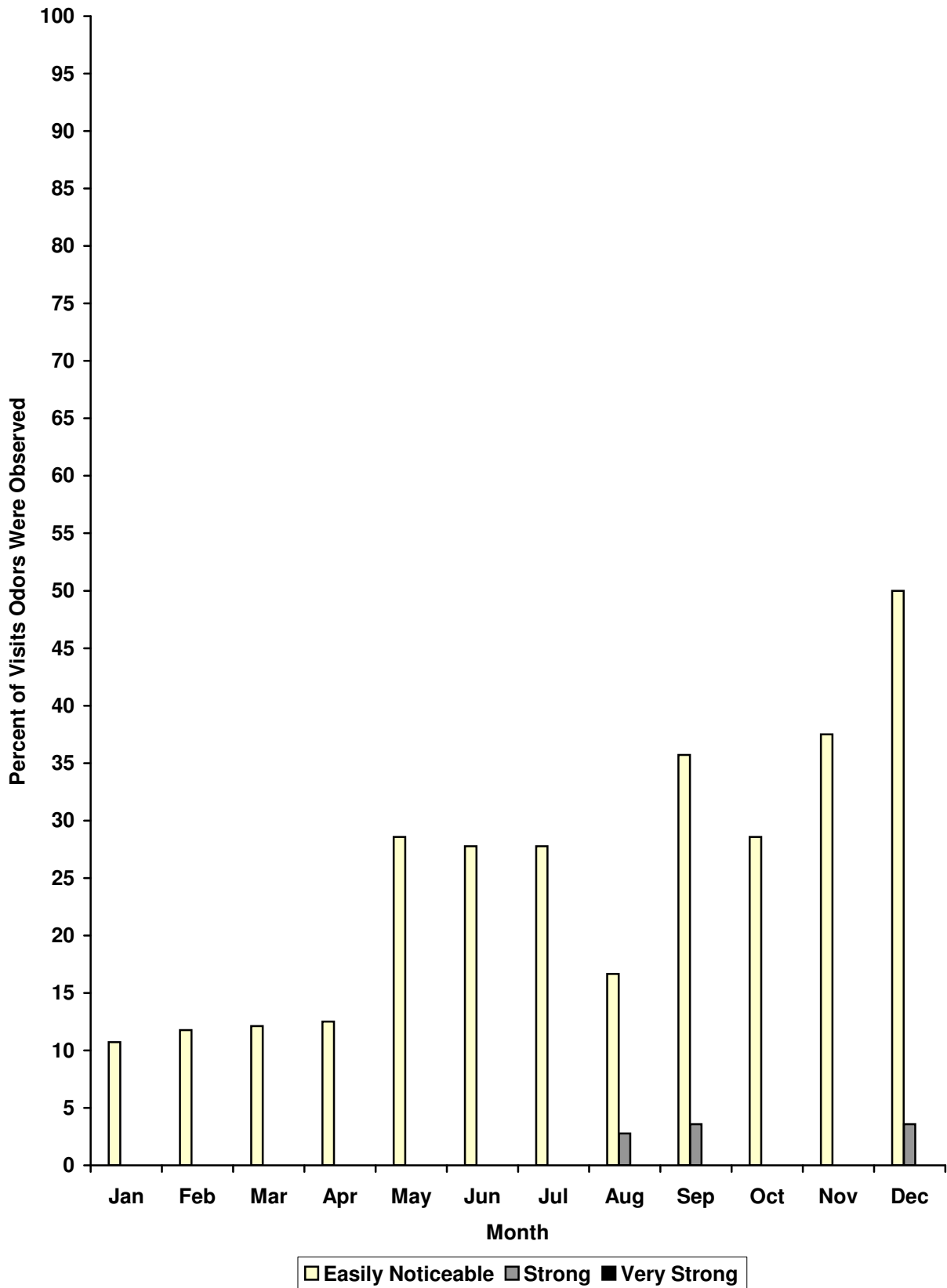
TABLE 11: HYDROGEN SULFIDE READINGS AT RASMA AND STONY ISLAND
SOLIDS DRYING AREAS—2006

Location	Hydrogen Sulfide, ppbv		
	Mean	Minimum	Maximum
<u>RASMA</u>			
SW Parking Area (1) ¹	8.0	1	18
North of Cell 2W (2)	10.0	3	62
NE Corner Cell 5E (3)	8.0	2	15
South of Cell 5 (4)	10.0	3	17
<u>Stony Island</u>			
Entrance 122nd St (1) ²	10.0	1	111
NE Corner Cell 5 (2)	8.0	2	42
South End Cells 4 & 7 (3)	7.0	0	13
West Side of Cell 3 (4)	7.0	0	48

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

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

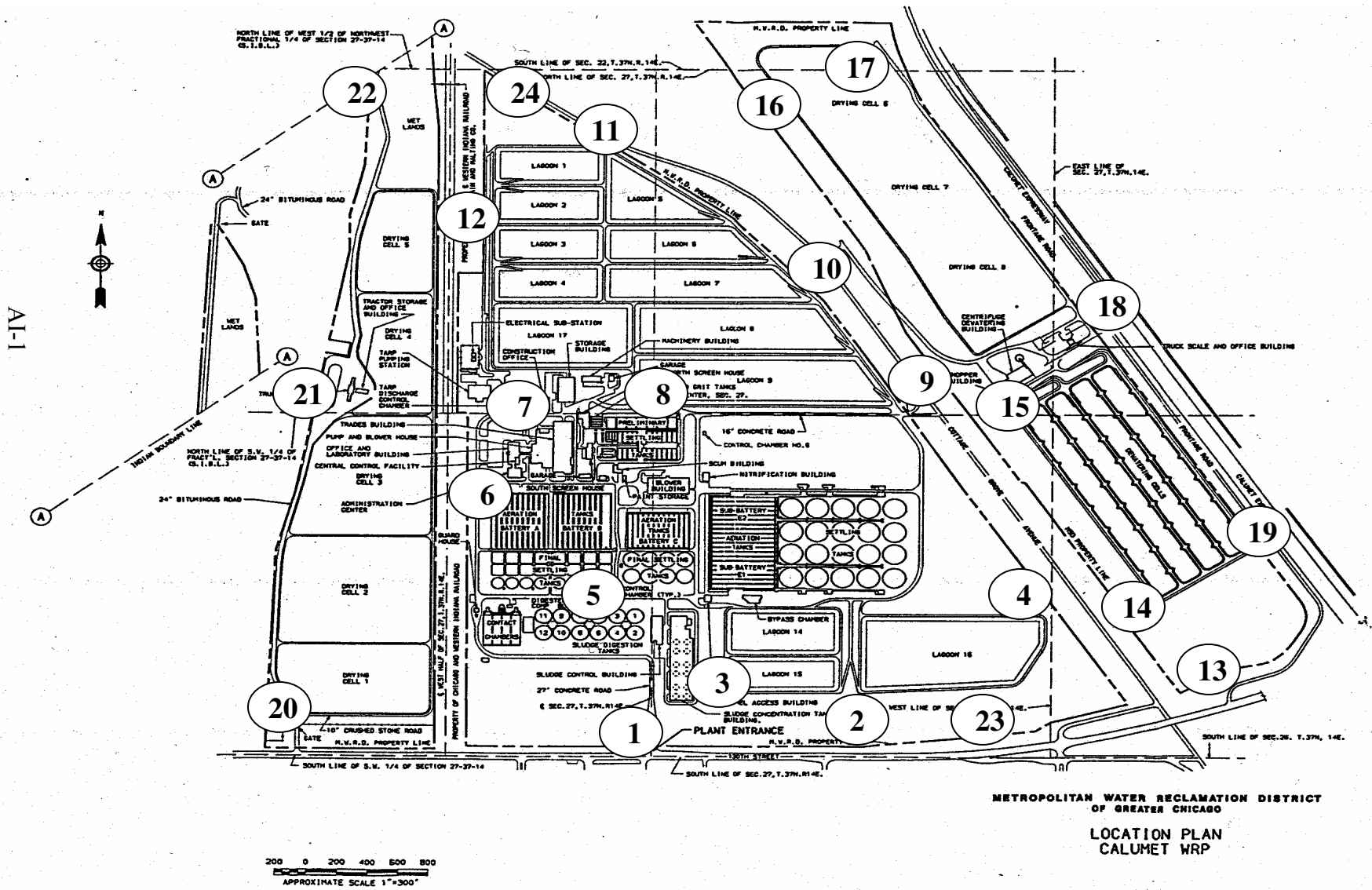
FIGURE 9: ODOR OBSERVANCES AT STONY ISLAND SOLIDS DRYING AREA—2006



APPENDIX AI

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

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



METROPOLITAN WATER RECLAMATION DISTRICT
 OF GREATER CHICAGO
 LOCATION PLAN
 CALUMET WRP

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

AI-2

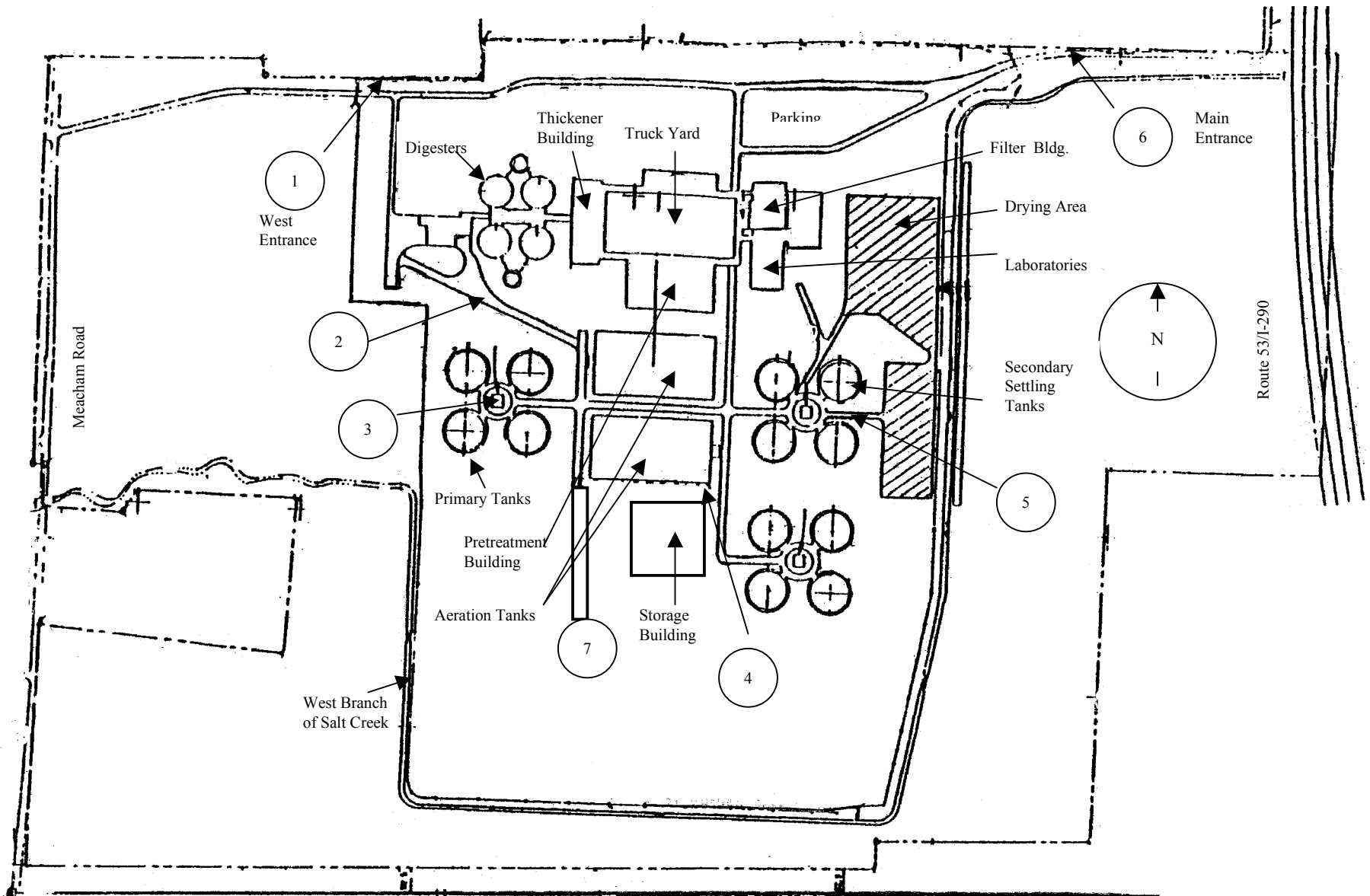
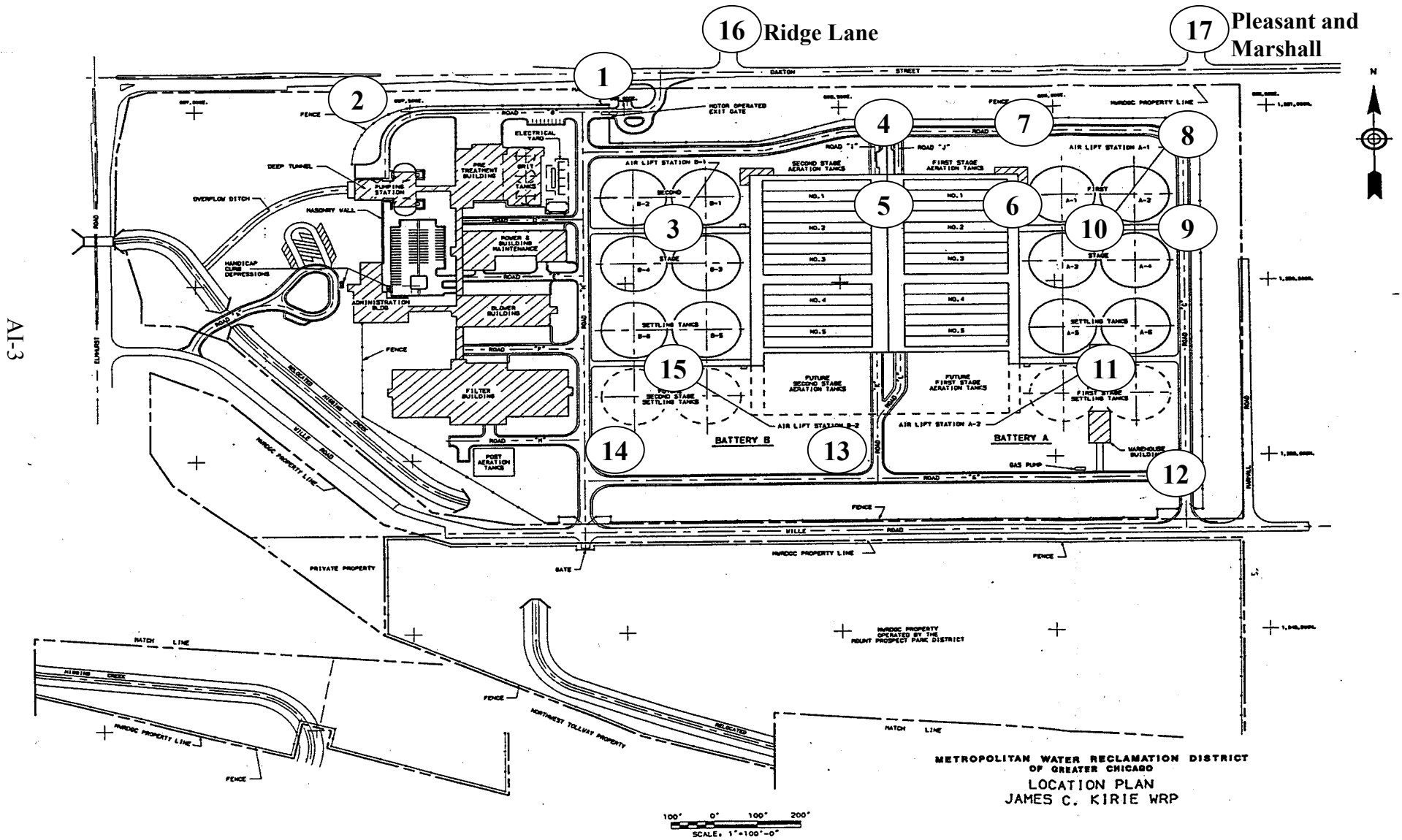


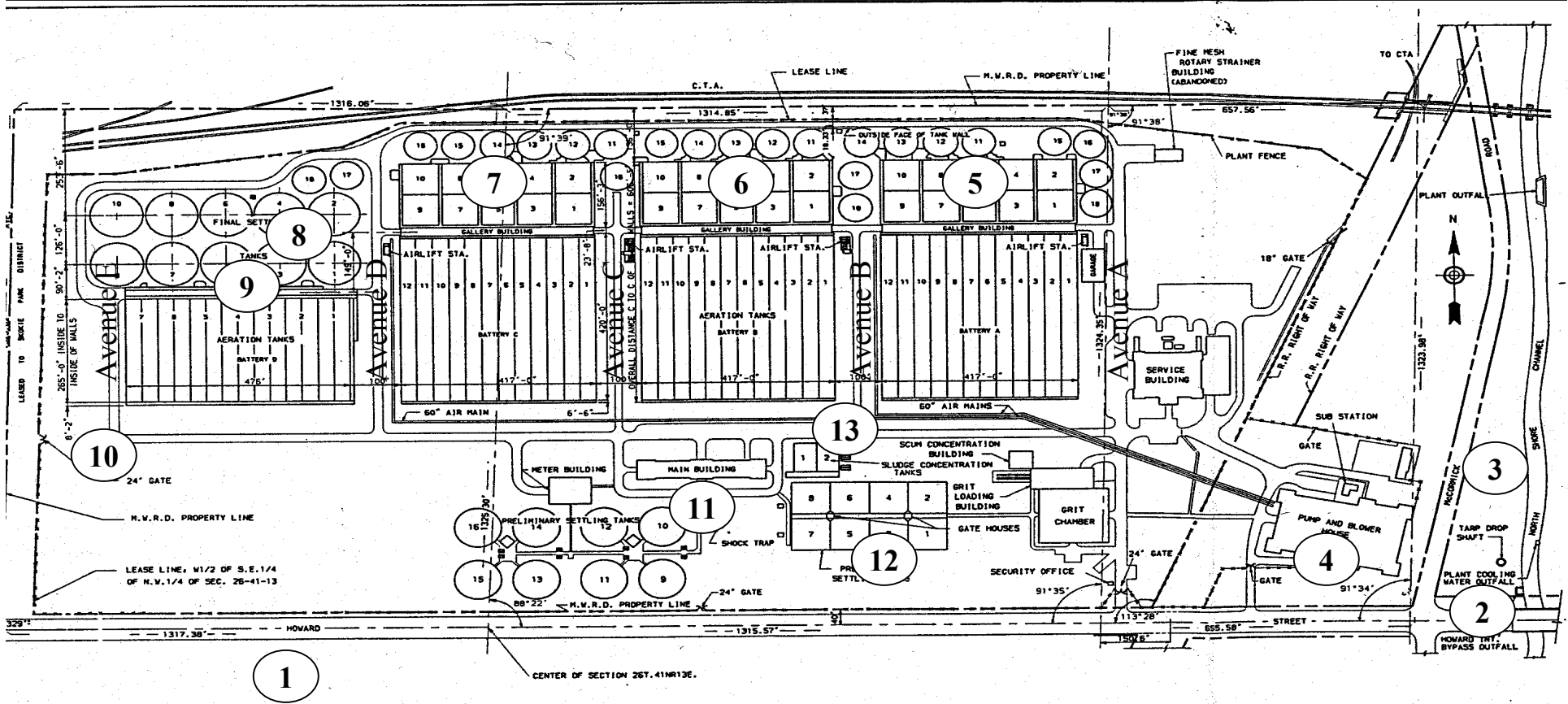
FIGURE AI-3: JAMES C. KIRIE WRP
 (NUMBERED CIRCLES INDICATE ODOR MONITORING STATIONS)



AI-3

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)



AI-4

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

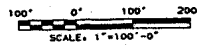


FIGURE AI-5: STICKNEY WRP
(NUMBERED CIRCLES INDICATE ODOR MONITORING STATIONS)

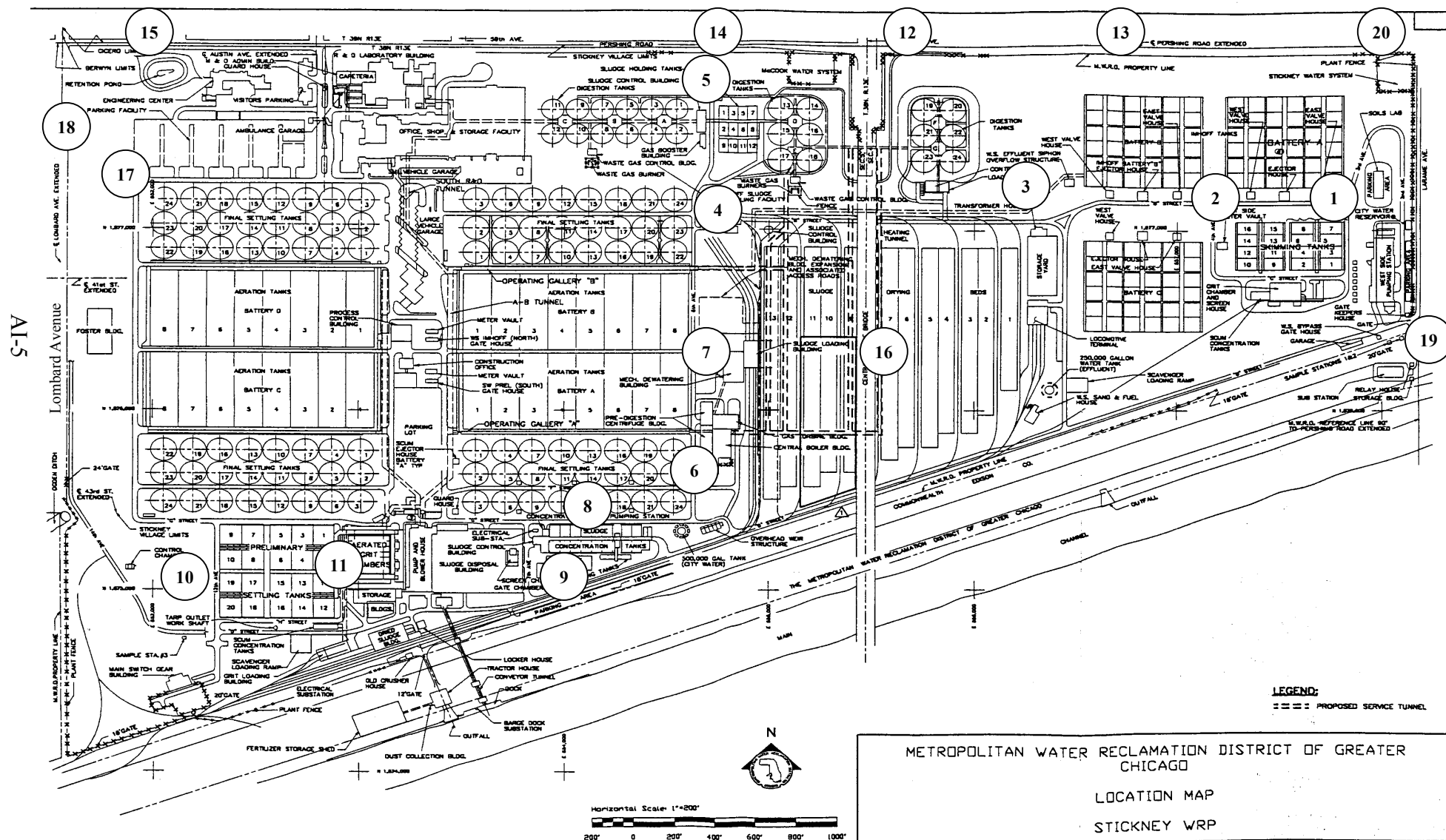


FIGURE AI-6: HASMA, VULCAN, AND MARATHON SOLIDS DRYING SITES AND LASMA SOLIDS PROCESSING SITE
(NUMBERED CIRCLES INDICATE ODOR MONITORING STATIONS)

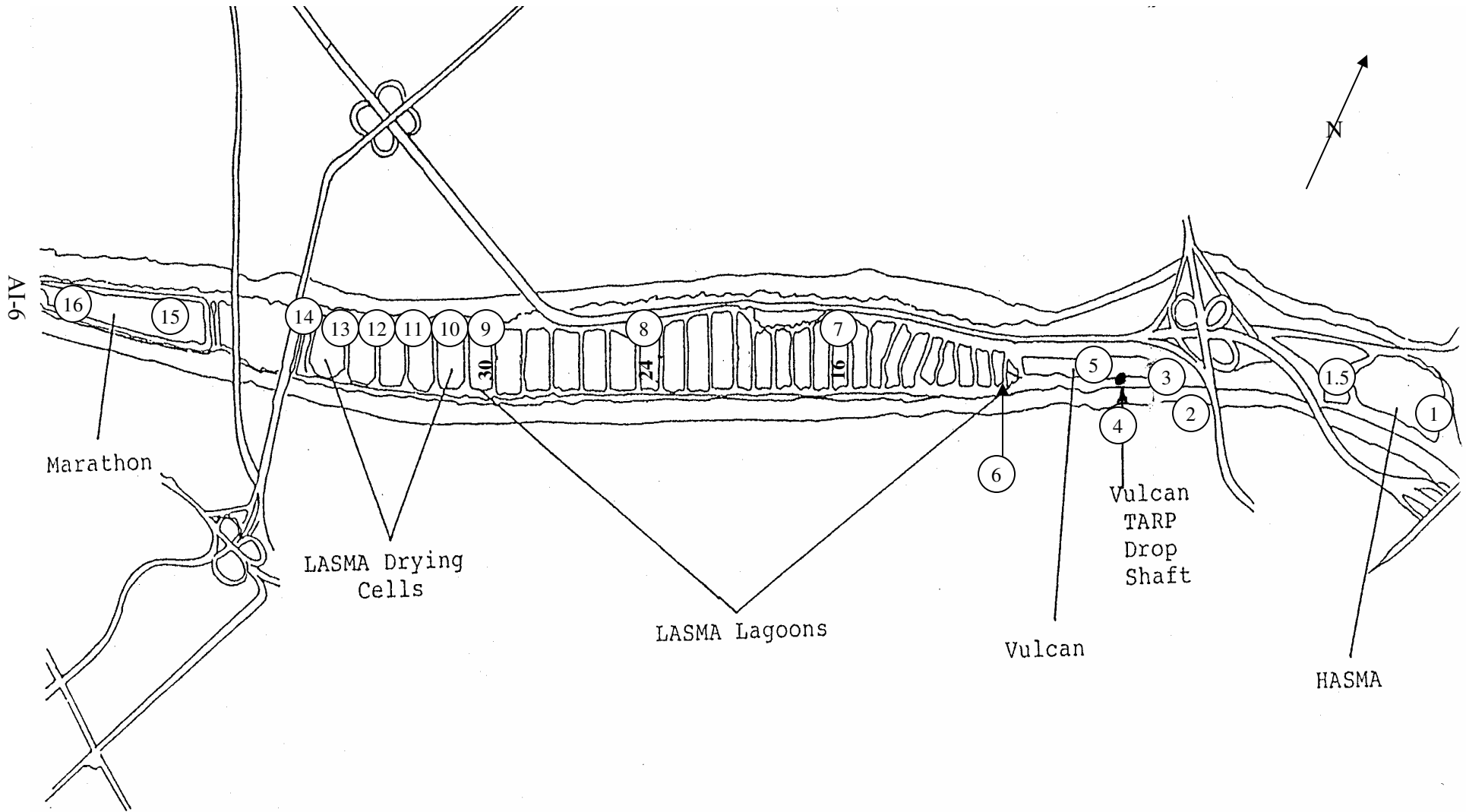


FIGURE AI-7: RASMA SOLIDS DRYING AREA
(NUMBERED CIRCLES INDICATE ODOR MONITORING STATIONS)

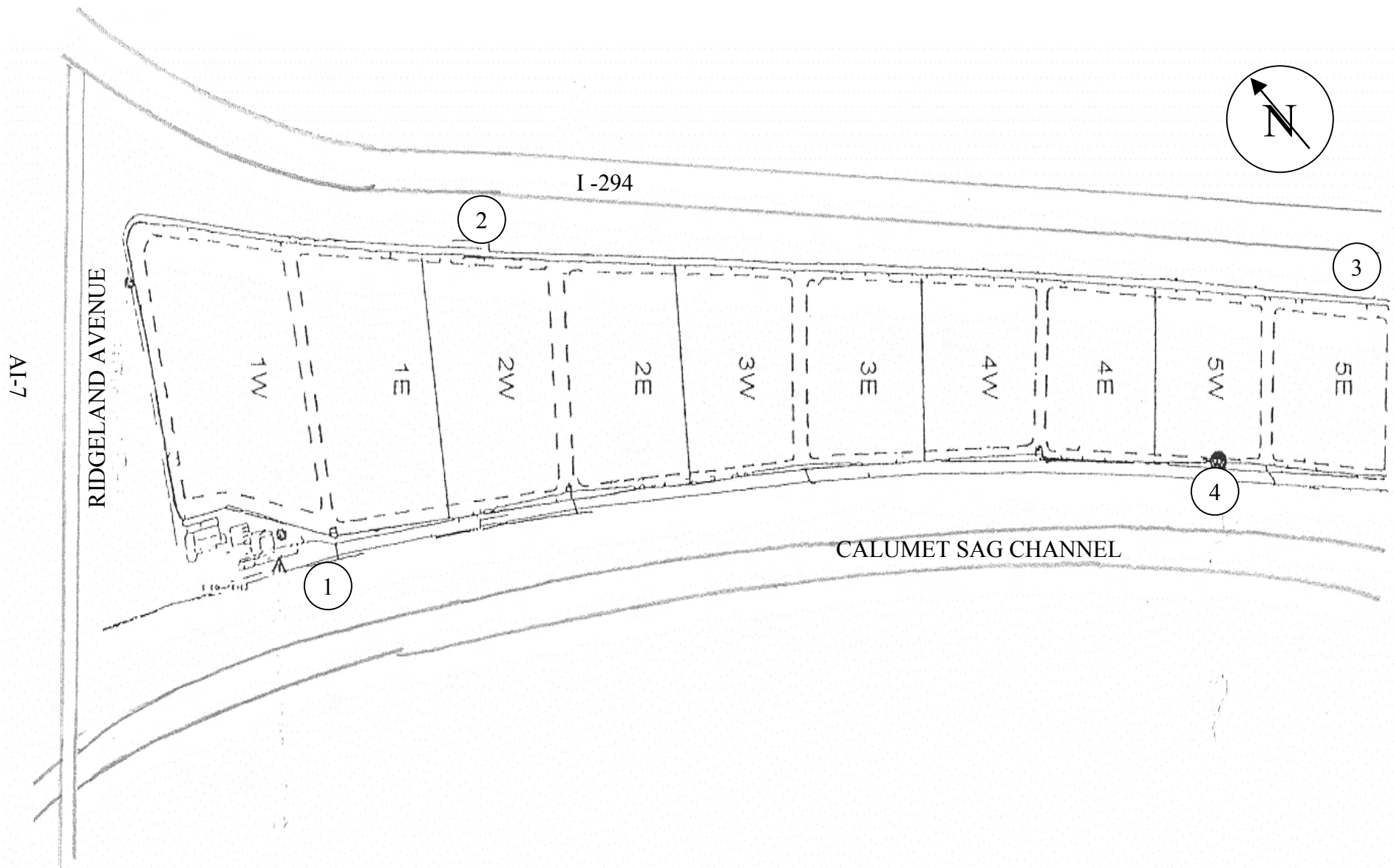


FIGURE AI-8: STONY ISLAND SOLIDS DRYING AREA
(NUMBERED CIRCLES INDICATE ODOR MONITORING STATIONS)

