AIR MONITORING
PVT LAND COMPANY, LTD.
NANAKULI, HAWAII

Summary Report
February 2010

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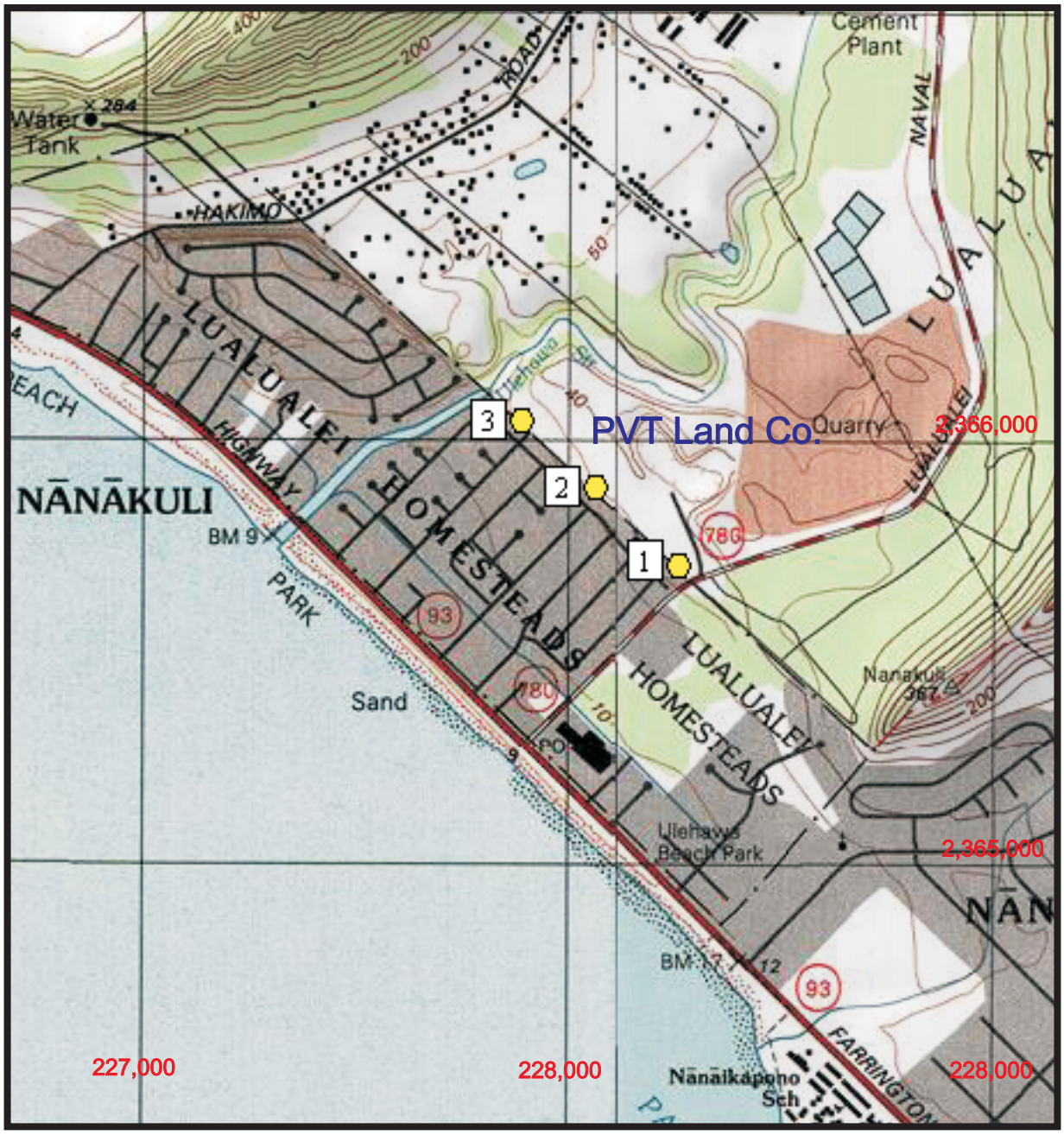
1.0 INTRODUCTION

An air monitoring program at the PVT Land Company's facility in Nanakuli, Hawaii commenced on 21 November 2009. Portable samplers[1] operating at a nominal 5 liters per minute (lpm) are located at three (3) sites on the property (Figure 1). The samplers are mounted on top of an existing dust barrier fence at a height of 17 feet (Figure 2) and collect total suspended particulate matter (TSP) on 47 millimeter (mm) glass fiber filters from midnight to midnight on sample days. The EPA's published once-every-six-days schedule [2, 3] (Appendix A) is followed. The filters, whose tare weights were initially determined in accordance with EPA guidelines by the Airmetrics laboratory in Eugene, Oregon, are sent to the same laboratory for final weighing. A weather station is already operated onsite thereby providing wind data for correlation with the air monitoring data.

2.0 QUALITY CONTROL/ASSURANCE

Monitoring is conducted in accordance with EPA and manufacturer guidelines. [1, 4, 5] All samplers were calibrated at the factory before onsite installation and will be calibrated annually in accordance with EPA and manufacturer guidelines.[1, 4, 5, 6] Sampler flow rate set points based on local temperature and pressure conditions were determined in accordance with manufacturer guidelines.[1] The field operator adjusts flow rates as necessary before each run to assure proper set points are maintained. Data sheets are maintained to record sample date, site number, sampler number, elapsed times. and start and ending flow rates. A log book is also maintained by the operator to record significant activities and observations during the sampling program.

FIGURE 1
MONITORING SITES



USGS Quad Schofield Barracks (1998)
1:24,000 (NAD-83)

FIGURE 2

AIR SAMPLER SITING

Photo by W. Lyon

Photo by W. Lyon

An independent check of sampler flow rates and sampling procedures is conducted and recorded monthly. Chain of custody accompany the filters from initial sampling through final weighing at the laboratory where the filters are archived.

3.0 RESULTS AND DISCUSSION

3.1 TSP Results. Fifteen (15) samples were collected and analyzed during February 2010, and the analysis results for each of the three (3) monitoring stations are summarized in Table 1 and Figure 3.

TABLE 1

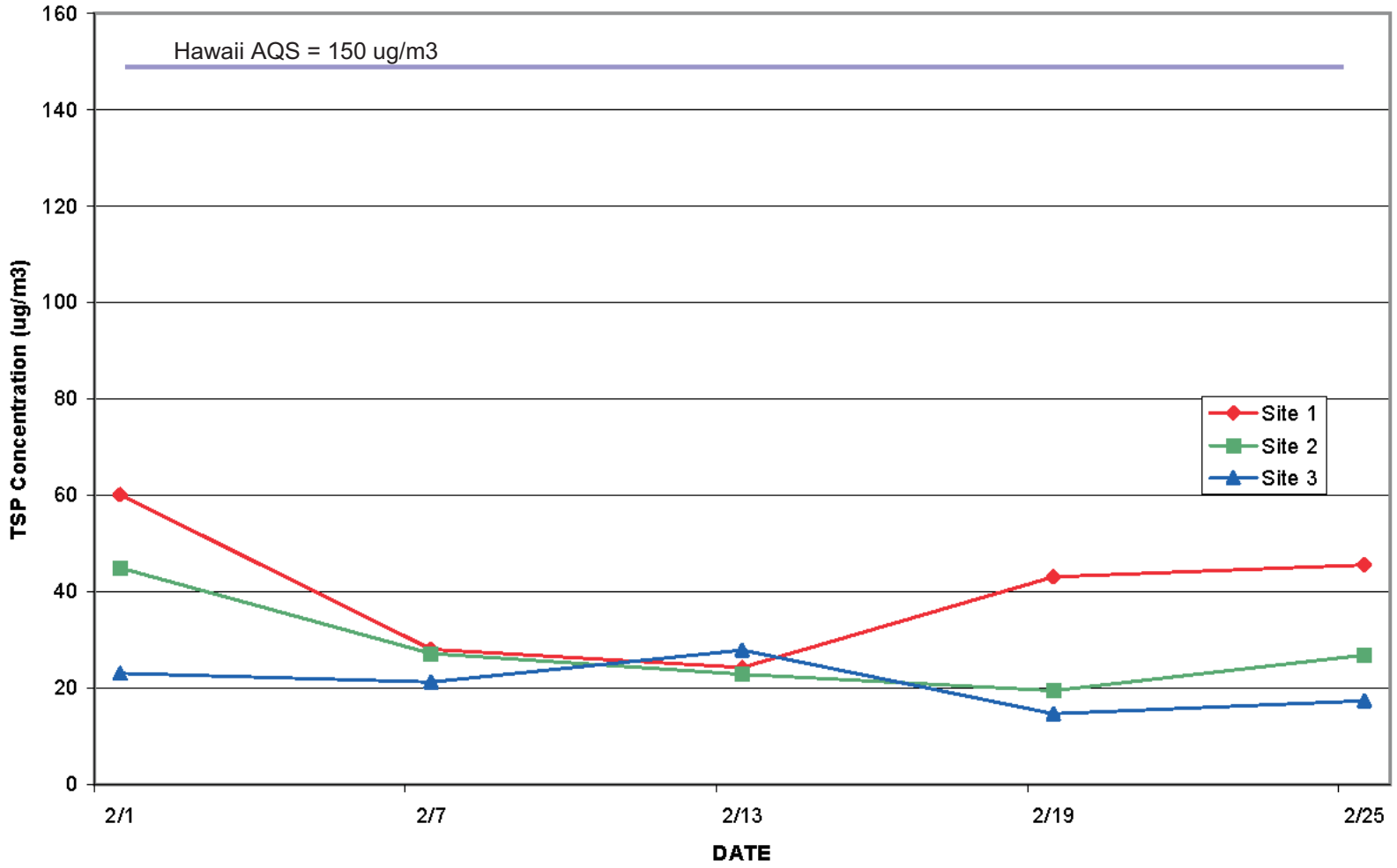
DAILY TSP CONCENTRATIONS
FEBRUARY 2010

Site No.	Number of Samples	TSP Range ($\mu g/m^3$)	Cumulative Number of Samples	Cumulative TSP Mean ($\mu g/m^3$)
1	5	24.3 - 60.2	17	48.0
2	5	19.5 - 45.0	17	30.9
3	5	14.7 - 27.9	17	23.2

Until 1987 when EPA promulgated a standard for particulate matter equal to or less than 10 microns (μ) in diameter (PM_{10}) standard, there was a 24-hour TSP standard of 150 $\mu g/m^3$[7, 8]. TSP includes particles up to 100μ in aerodynamic diameter; [6] and the fraction of PM_{10} in TSP is typically about 50%; thus, dividing the values in Table 1 by two (2) provides an approximation of PM_{10} values for comparison with the DOH monitoring results as well as the PM_{10} standards.[9]

FIGURE 3

TSP CONCENTRATIONS
February 2010



For example, when divided by two (2), the maximum 24-hour values in Table 1 are less than recent Department of Health (DOH) monitoring results at leeward Oahu sites, i.e., Kapolei and Pearl City, where maximum 24-hour PM_{10} values of 61 and 55 $\mu g/m^3$, respectively, were reported. [10]

Also, note that the undivided daily TSP concentrations are already less than the 24-hour 150 ug/m^3 PM_{10} standard, and the undivided cumulative mean values are also below the 50 ug/m^3 annual standard.

The February 2010 results continue to support the preliminary findings suggested in the previous reports:

- For normal workdays, i.e., Monday to Friday, all of the samples at Site 1 were greater than at Sites 2 and 3. The differences between the mean TSP values for <u>all the data to-date</u> from all three sites are statistically significant, i.e., most notably between Site 1 and Site 3 ($p<0.001$ by *t-test*.)[11] Site 1 is the closest to Lualualei Naval Road and Site 3 is the farthest; thus weekday activity along that road continues to be a possible factor.

- On the non-work weekend days, the mean TSP level for <u>all the data to-date</u> for all three sites was significantly ($p<0.001$) less than the mean for the other five workdays. Note in Figure 3 the convergence of data at the three sites on 2/7/10 and 2/13/10 (weekend days).

3.2 Correlation with Wind Direction. Wind directions during the sampling days are presented in Figures 4 - 8. Daytime winds tended to be light to moderate northwesterlies switching to southwesterlies on 1 and 7 February. On 13 and 19 February, morning and early afternoon northeasterly trades turned more southwesterly later in the afternoon. 25 February was characterized by northeasterly trades until mid-morning after which the winds became more variable. The data were analyzed to determine if there was any correlation between wind direction and TSP level. The results of that analysis are summarized in Table 2. "Offsite winds" were defined as wind directions which did not cross PVT lands before reaching the air samplers. They were generally in the southern quadrants and ran from southeast to northwest. No clear correlation between wind direction and TSP could be identified at this time because both high and low TSP concentrations were associated with "offsite winds".

TABLE 2

TSP AND OFFSITE WIND DIRECTIONS
FEBRUARY 2010

Date	Site 1		Site 2		Site 3	
	TSP	Offsite Winds*	TSP	Offsite Winds*	TSP	Offsite Winds*
	(ug/m^3)	(%)	(ug/m^3)	(%)	(ug/m3)	(%)
2/1/10	**60.2**	**100**	45.0	100	23.1	100
2/7/10	**28.1**	34.8	27.2	34.8	21.0	79.8
2/13/10	24.3	31.9	22.9	17.0	**27.9**	21.3
2/19/10	**43.1**	15.6	19.5	15.6	14.7	26.0
2/25/10	**45.6**	45 .6	26.9	7.4	17.4	12.6

* Winds which did not cross the PVT property during the 24-hr sampling period

FIGURE 4

HOURLY WIND DIRECTION AND TSP CONCENTRATIONS 1 February 2010 (Monday)

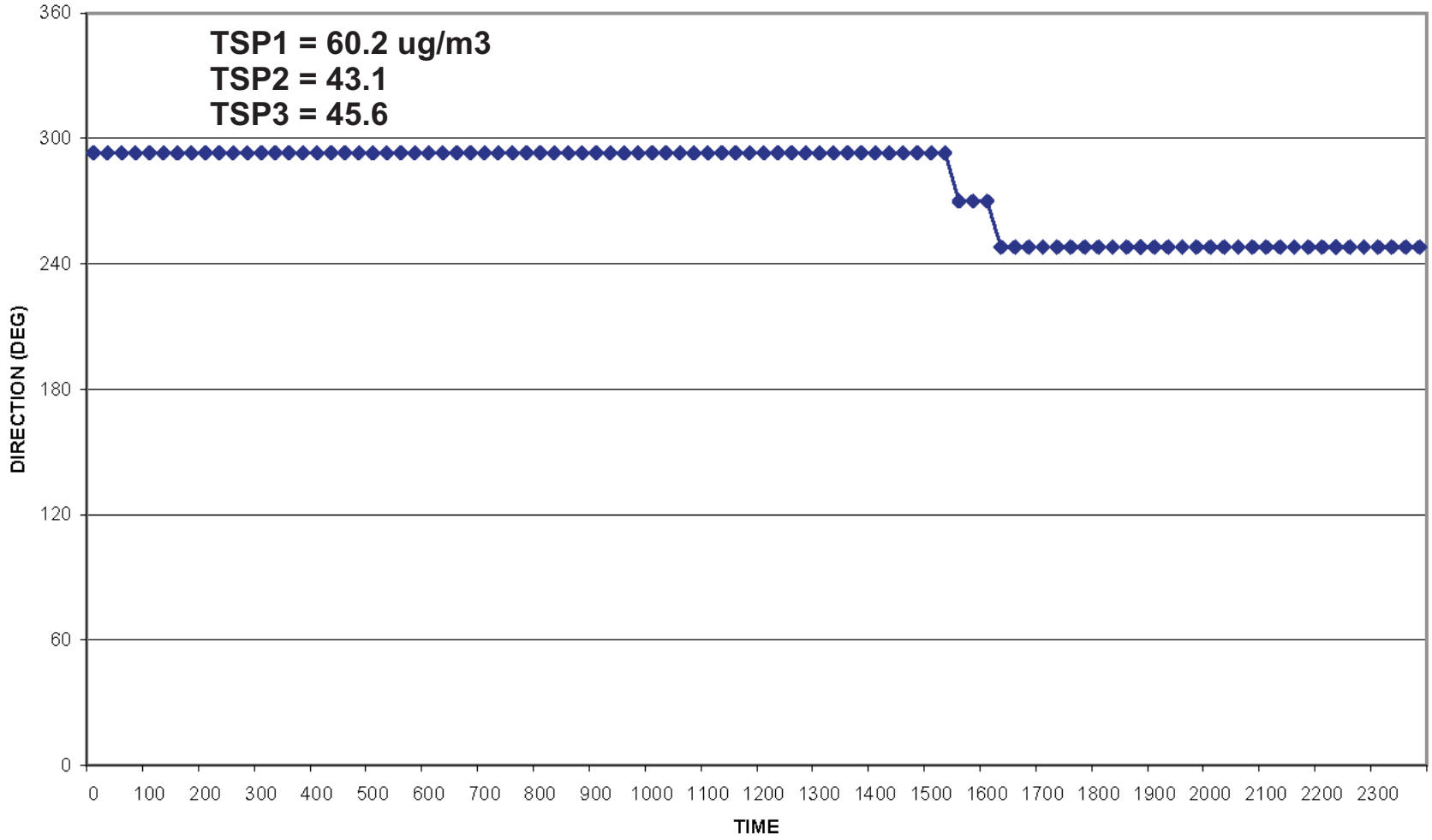


FIGURE 5

HOURLY WIND DIRECTION AND TSP CONCENTRATIONS 7 February 2010 (Sunday)

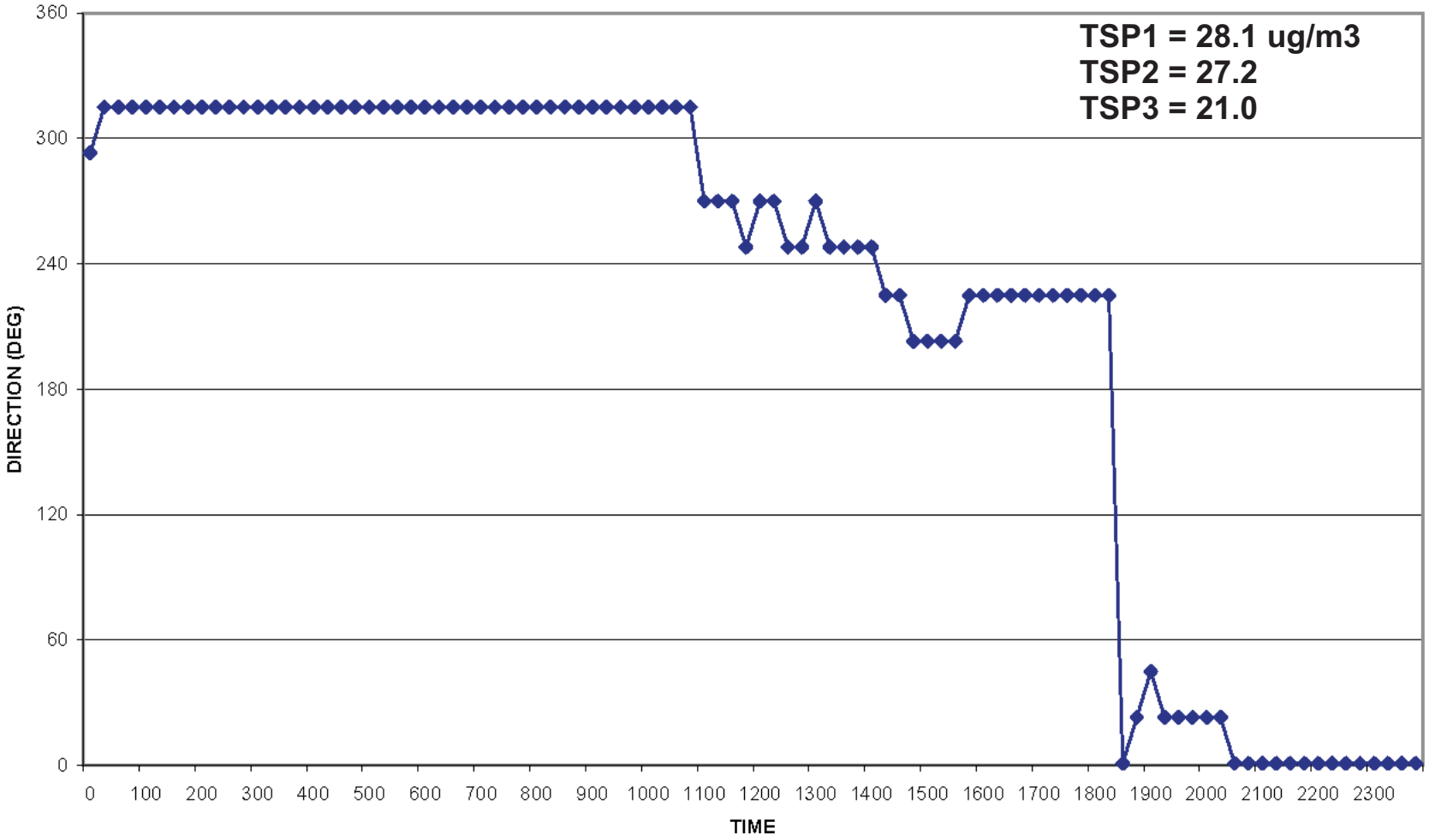


FIGURE 6

HOURLY WIND DIRECTION AND TSP CONCENTRATIONS 13 February 2010 (Saturday)

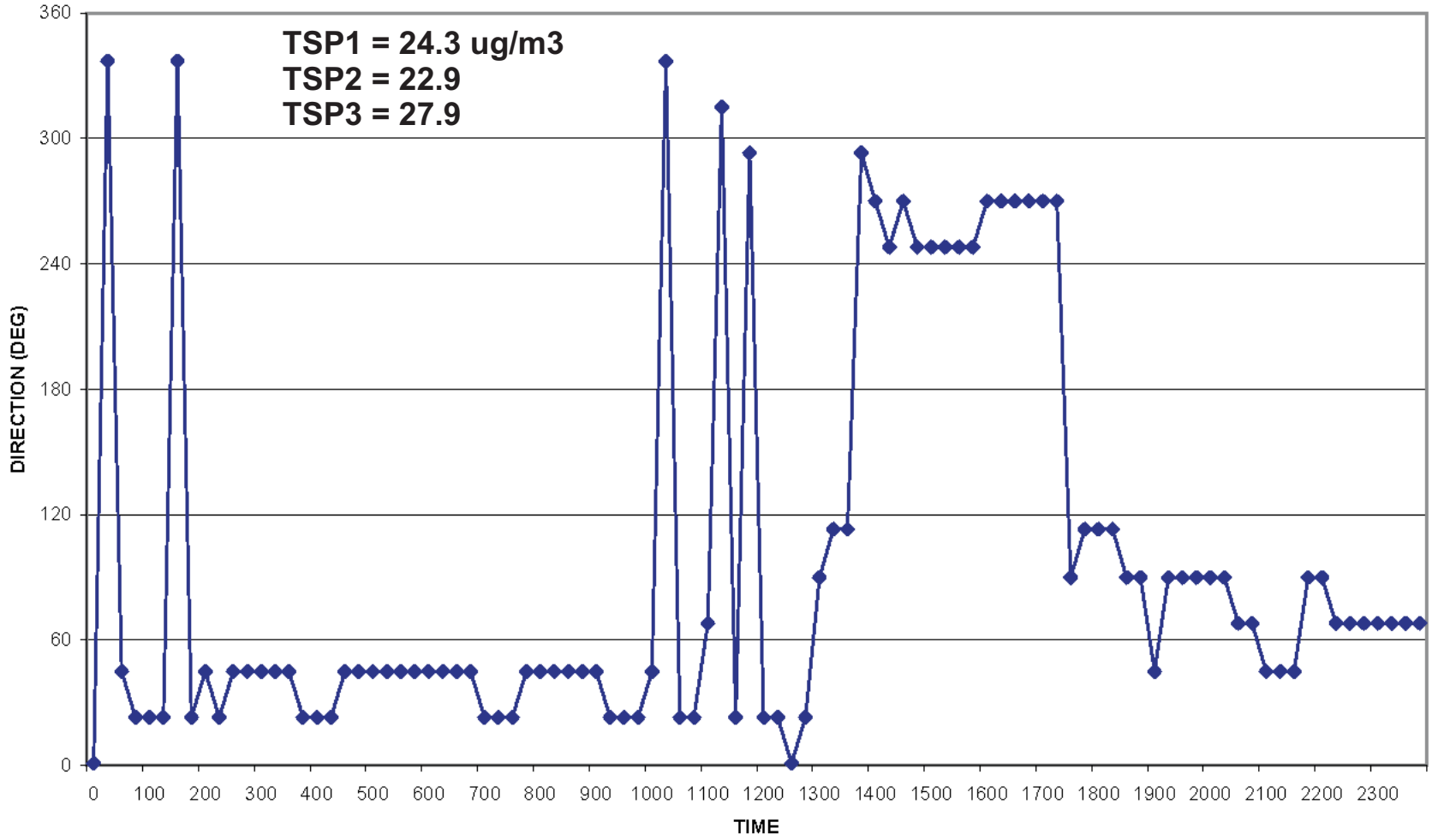


FIGURE 7

HOURLY WIND DIRECTION AND TSP CONCENTRATIONS 19 February 2010 (Friday)

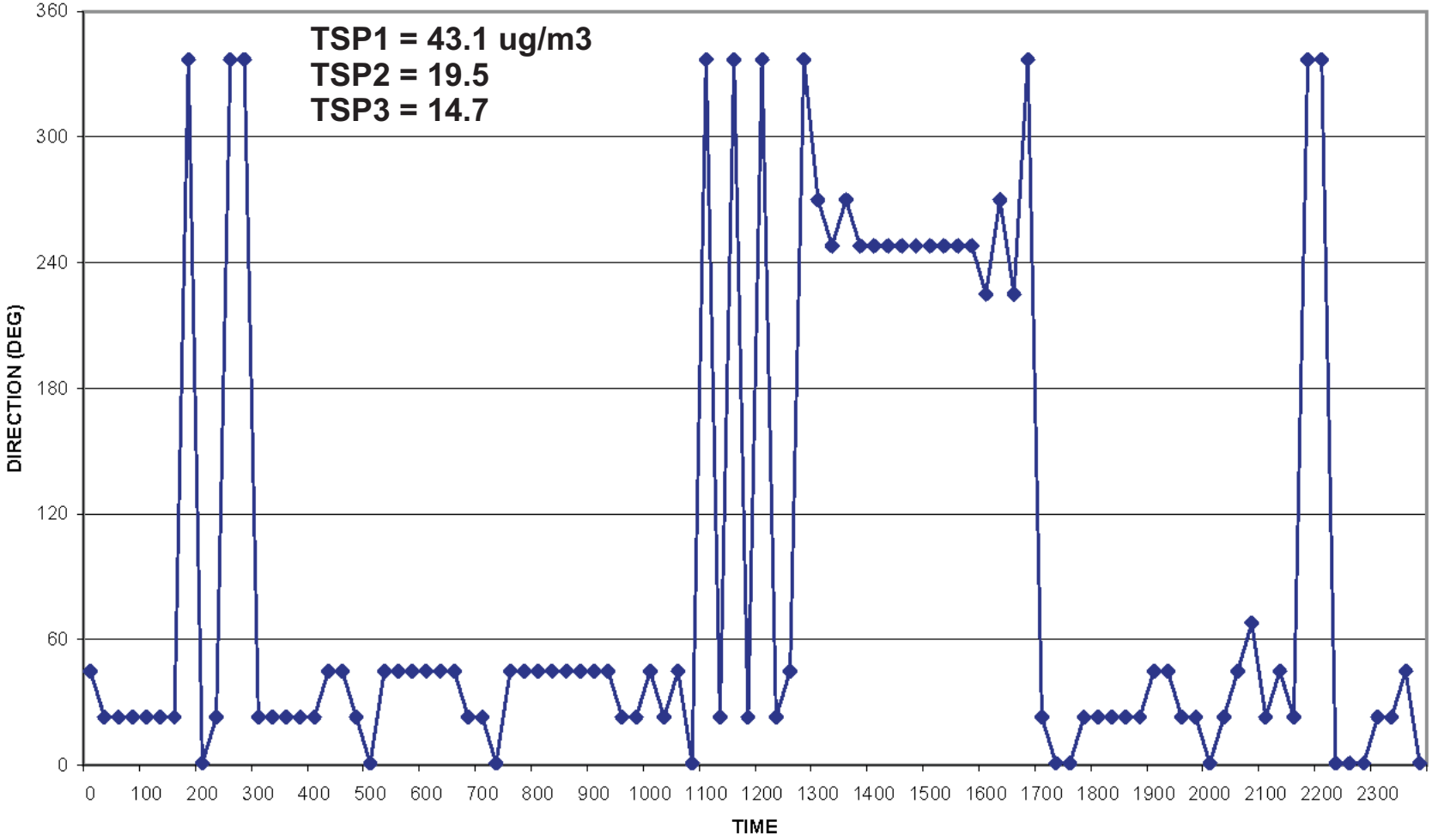
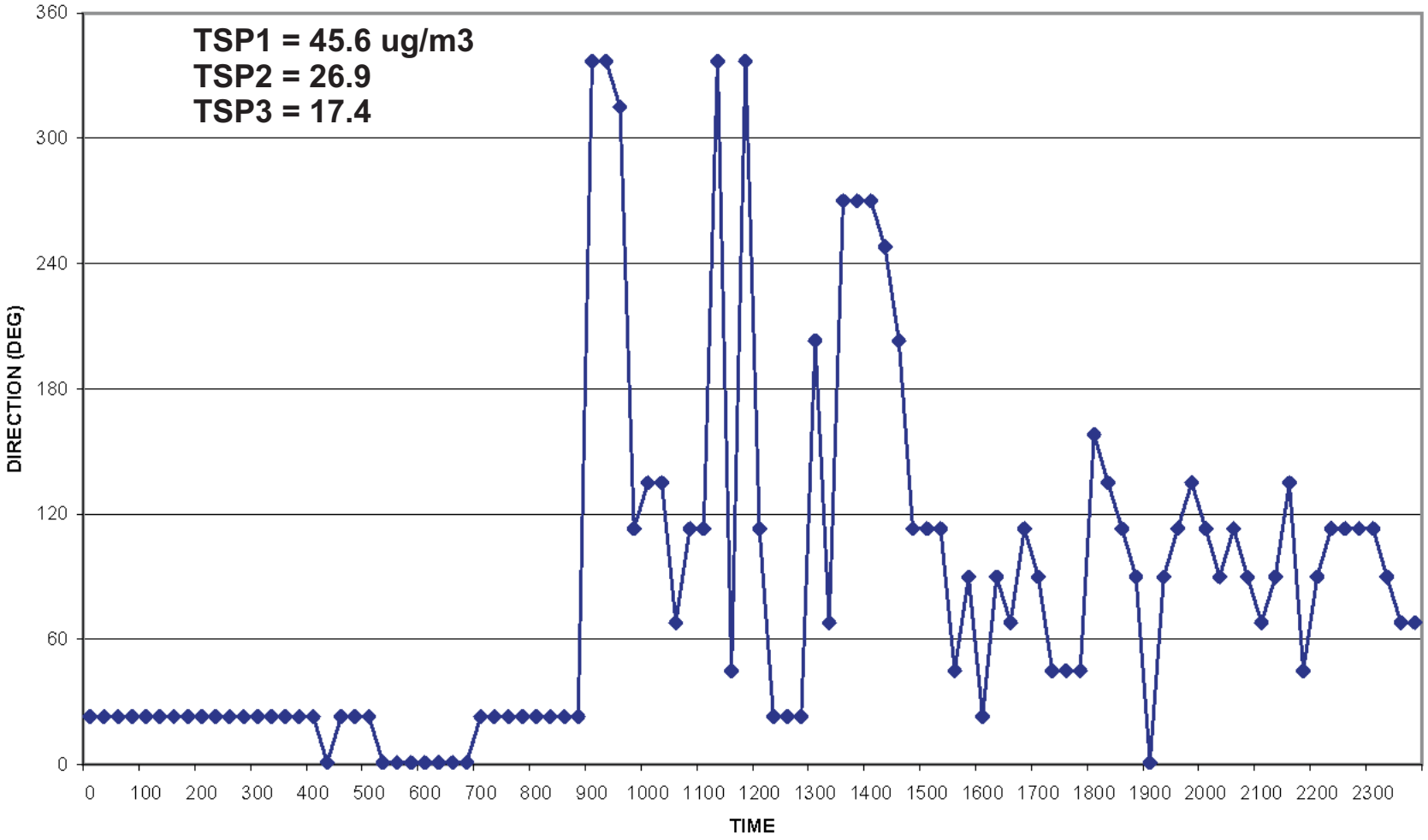


FIGURE 8

HOURLY WIND DIRECTION AND TSP CONCENTRATIONS 25 February 2010 (Thursday)



Given the facility's near shore location, one would expect a typical land - sea breeze regime to be established resulting in onshore winds during the day and offshore at night. Onshore winds would be effectively "offsite winds" for the PVT facility. For the 17 sampling days to-date, the frequency of onshore winds was 39% which is consistent with a recent assessment of winds at the facility in which the frequency of sea breezes was reported as about 40%.[12]

4.0 CONCLUSIONS

As was the case in the November through January monitoring, all of the 24-hr TSP concentrations in February were well below the earlier TSP standard and the current state and federal PM_{10} standards. The measured TSP concentrations are also comparable to existing PM_{10} concentrations measured by the DOH at other leeward Oahu sites. In fact, if one considers only the PM_{10} fraction of the TSP, it appears to be less than the PM_{10} at those other sites. The higher mean TSP level at Station 1 near Lualualei Naval Road versus the TSP means at the other two more distant stations continues to be statistically significant. Similarly, the higher TSP levels on weekdays versus weekend days also continues to be significant. No statistically significant correlation between wind direction and TSP concentration has yet been found.

5.0 REFERENCES

1. Airmetrics. *MiniVol TAS (Tactical Air Sampler) Operation Manual*, Eugene, Oregon, 2008

2. U. S. Environmental Protection Agency. *2009 6-Day and 3-Day Monitoring Schedule for TSP, Pb, PM-10, and VOC, 12-day Monitoring Schedule for PM2.5 Collocation,* 22 November 2008

3. U. S. Environmental Protection Agency. *2010 6-Day and 3-Day Monitoring Schedule for TSP, Pb, PM-10, and VOC, 12-day Monitoring Schedule for PM2.5 Collocation,* 22 October 2009

4. U.S. Environmental Protection Agency. *Quality Assurance Handbook for Air Pollution Measurement Systems, Volume I: Field Guide to Environmental Quality Assurance,* EPA/600/R-94-038a, April 1994

5. U.S. Environmental Protection Agency. *Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II, Ambient Air Specific Methods,* EPA/600-4-77-027a, 1977.

6. U.S. Environmental Protection Agency. *Compendium of Methods for the Determination of Inorganic Compounds in Ambient Air, Compendium Method IO-2.1, Sampling of Ambient Air for Total Suspended Particulate Matter (SPM) and PM10 Using High Volume (HV) Sampler*, EPA/625/R-96/010a, June 1999.

7. Code of Federal Regulations. *National secondary ambient air quality standards for particulate matter*, 40 CFR 50.7, 1 July 1982.

8. U.S. Environmental Protection Agency. *Revisions to National Ambient Air Quality Standards for Particulate Matter*, Federal Register, Vol. 52, p. 2463, 1 Jul 1987.

9. Hawaii Department of Health. *Hawaii Administrative Rules, Title 11, Chapter 59, Ambient Air Quality Standards.*

10. Hawaii Department of Health, *State of Hawaii Annual Summary 2008 Air Quality Data*, August 2009

11. Minitab, Inc. *Minitab Statistical Software*, Release 12, 1997.

12. Daniels Ph.D., Anders. *PVT Wind Assessment*, 1 Jan 09.

APPENDIX A

EPA 2010 MONITORING SCHEDULE

2010 Monitoring Schedule

3-day & 6-day Monitoring Schedule for TSP, Pb, PM-10, PM-2.5, and VOC. 12-day Monitoring Schedule for PM-2.5 Collocation.

January

Su	M	Tu	W	Th	F	Sa
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

February

Su	M	Tu	W	Th	F	Sa
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28						

March

Su	M	Tu	W	Th	F	Sa
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

April

Su	M	Tu	W	Th	F	Sa
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	

May

Su	M	Tu	W	Th	F	Sa
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

June

Su	M	Tu	W	Th	F	Sa
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30			

July

Su	M	Tu	W	Th	F	Sa
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

August

Su	M	Tu	W	Th	F	Sa
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

September

Su	M	Tu	W	Th	F	Sa
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

October

Su	M	Tu	W	Th	F	Sa
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

November

Su	M	Tu	W	Th	F	Sa
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

December

Su	M	Tu	W	Th	F	Sa
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

& & = 1/3 day sampling

& = 1/6 day sampling

= 1/12 day sampling