AIR MONITORING
PVT LAND COMPANY, LTD.
NANAKULI, HAWAII

Summary Report
May 2010

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A. EPA 2010 Monitoring Schedule

1.0 INTRODUCTION

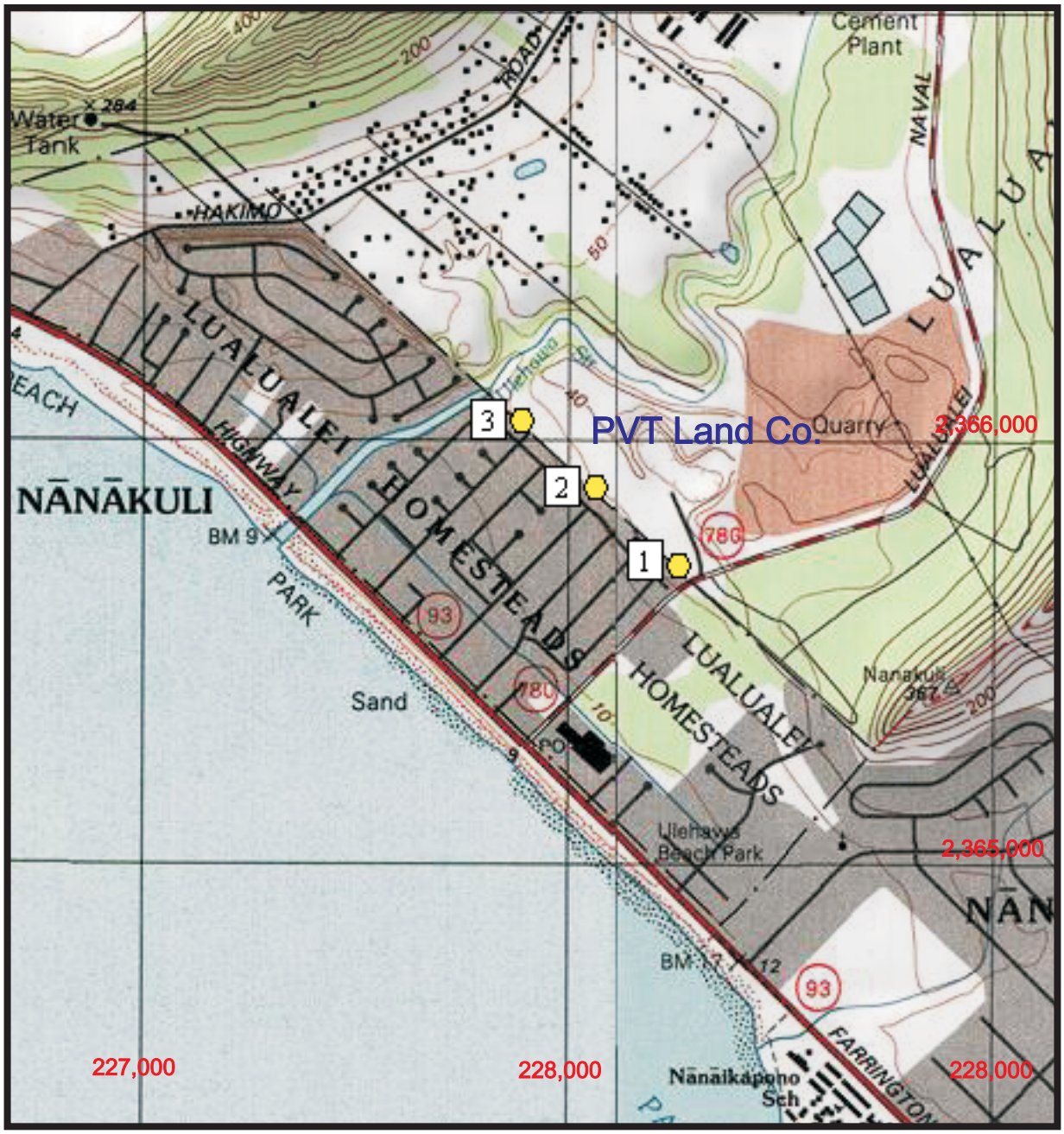
An air monitoring program at the PVT Land Company's facility in Nanakuli, Hawaii commenced on 21 November 2009. Portable samplers[1] operating at a nominal 5 liters per minute (lpm) are located at three (3) sites on the property (Figure 1). The samplers are mounted on top of an existing dust barrier 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 May 2010, and the analysis results for each of the three (3) monitoring stations are summarized in Table 1 and Figure 3.

TABLE 1

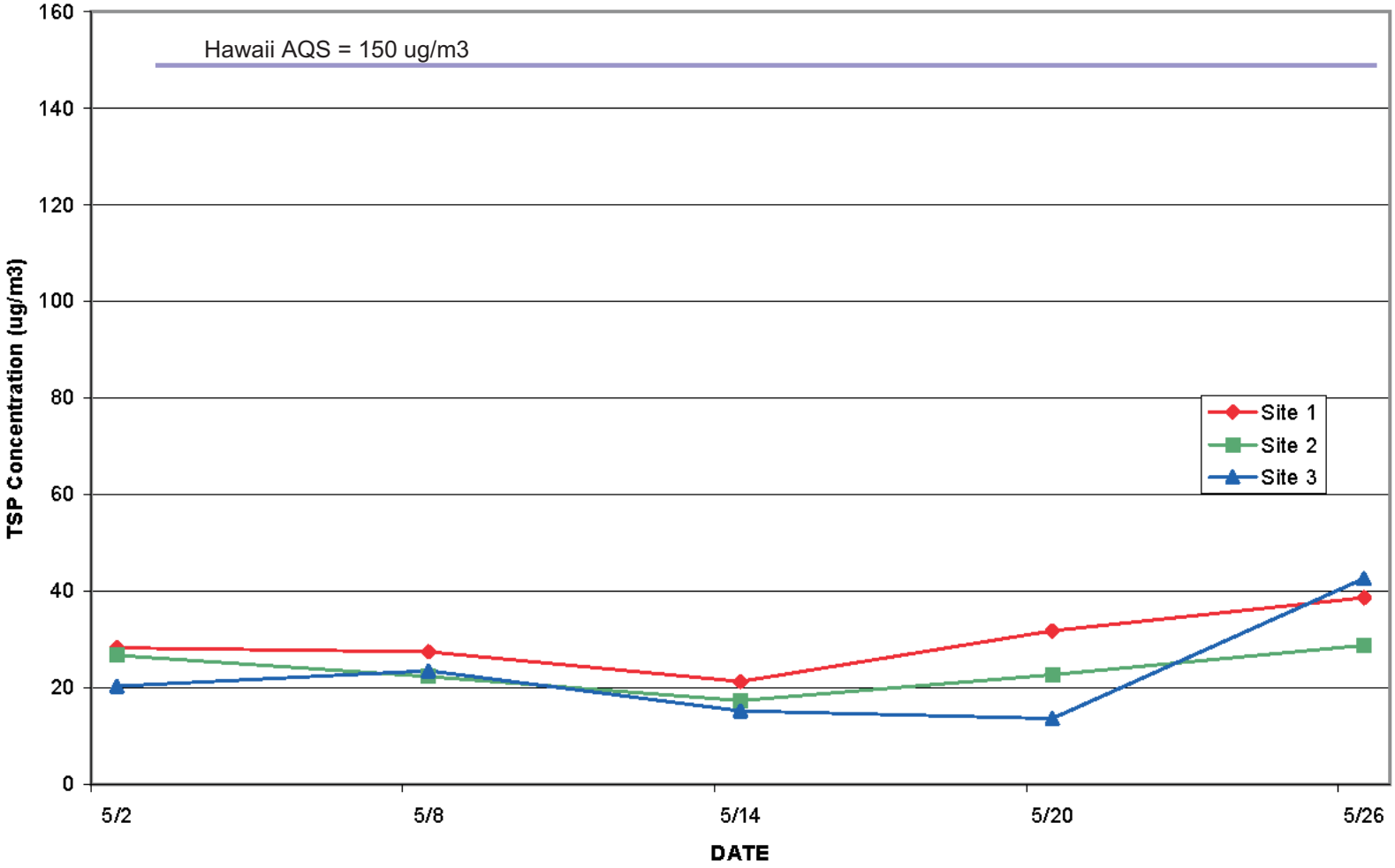
DAILY AND CUMULATIVE TSP CONCENTRATIONS MAY 2010

Site No.	Number of Samples	TSP Range ($\mu g/m^3$)	Cumulative Number of Samples	Cumulative TSP Mean ($\mu g/m^3$)
1	5	21.3 - 38.7	32	40.5
2	5	17.4 - 28.8	32	28.7
3	5	13.6 - 42.7	32	22.2

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

- TSP concentrations continued to be low during May and were variable among the three sites. The differences between the mean TSP values for <u>all the data to-date</u> from all three sites continue to be 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 (25.7 $\mu g/m^3$) continued to be significantly ($p<0.01$) less than the mean for the other five workdays (32.3 $\mu g/m^3$).

3.2 Correlation with Wind Direction. Wind directions during the sampling days are presented in Figures 4 - 8. Daytime winds on 2 May started out northwesterly and shifted to southeasterly for the rest of the day. Winds on 8 May were primarily easterly. Daytime winds on 14 May started out southeasterly, then shifted to northwesterly. On 20 May, daytime winds were predominantly easterly, and there was some data loss early in the evening. There was significant data loss on 26 May due to transmission failure from the sensors.

The data were also 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 because both high and low TSP concentrations were associated with "offsite winds".

TABLE 2

TSP AND OFFSITE WIND DIRECTIONS
MAY 2010

Date	Site 1		Site 2		Site 3	
	TSP	Offsite Winds*	TSP	Offsite Winds*	TSP	Offsite Winds*
	(ug/m^3)	(%)	(ug/m^3)	(%)	(ug/m^3)	(%)
5/2/10	28.3	92.1	26.8	84.1	20.4	92.1
5/8/10	27.5	51	22.3	0	23.5	1
5/14/10	21.3	65.9	17.4	33	15.2	35.2
5/20/10	31.8	68.4	22.7	11.8	13.6	23.7
5/26/10	**38.7**	n/d	**28.8**	n/d	**42.7**	n/d

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

FIGURE 4

HOURLY WIND DIRECTION AND TSP CONCENTRATIONS 2 May 2010 (Sunday)

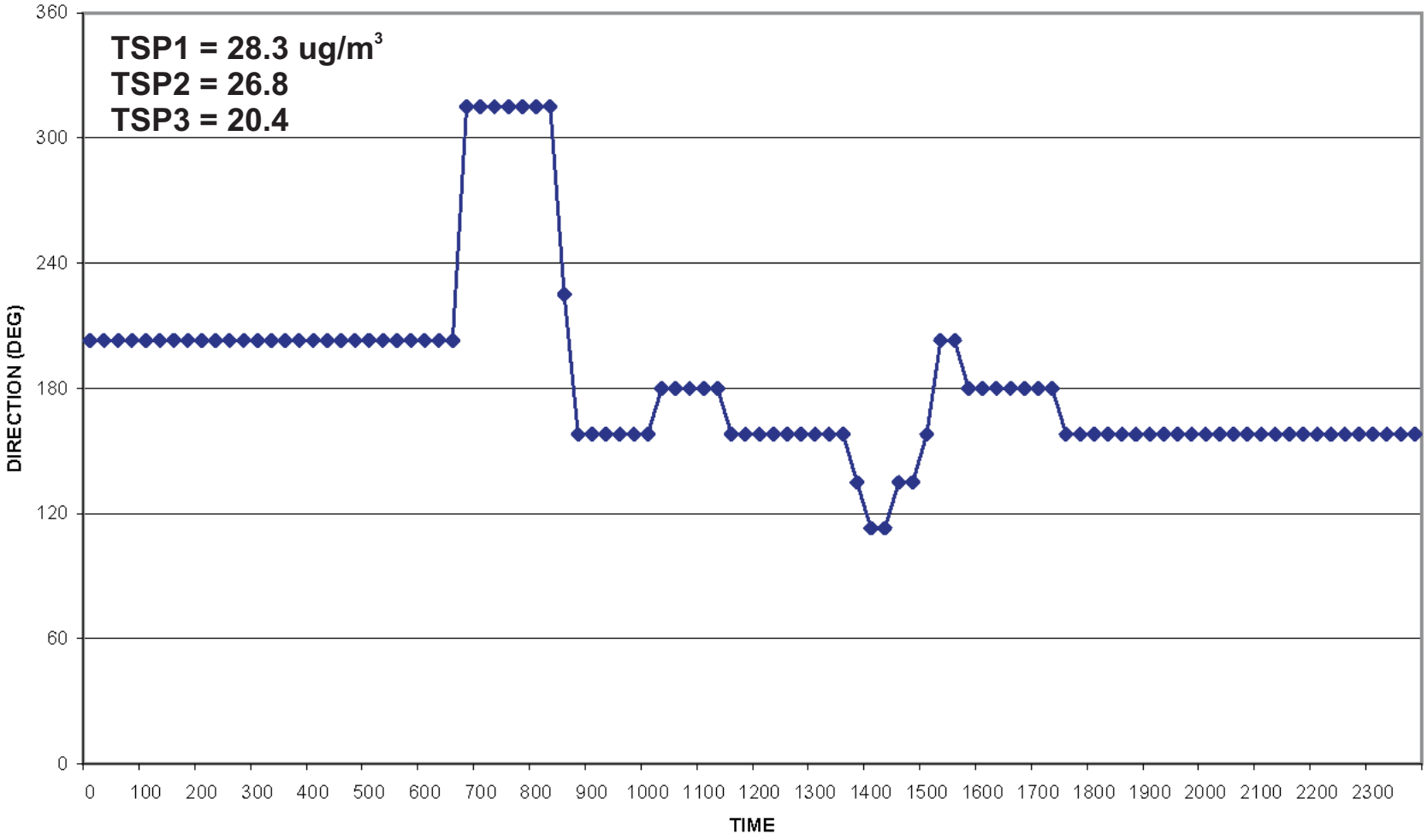


FIGURE 5

HOURLY WIND DIRECTION AND TSP CONCENTRATIONS 8 May 2010 (Saturday)

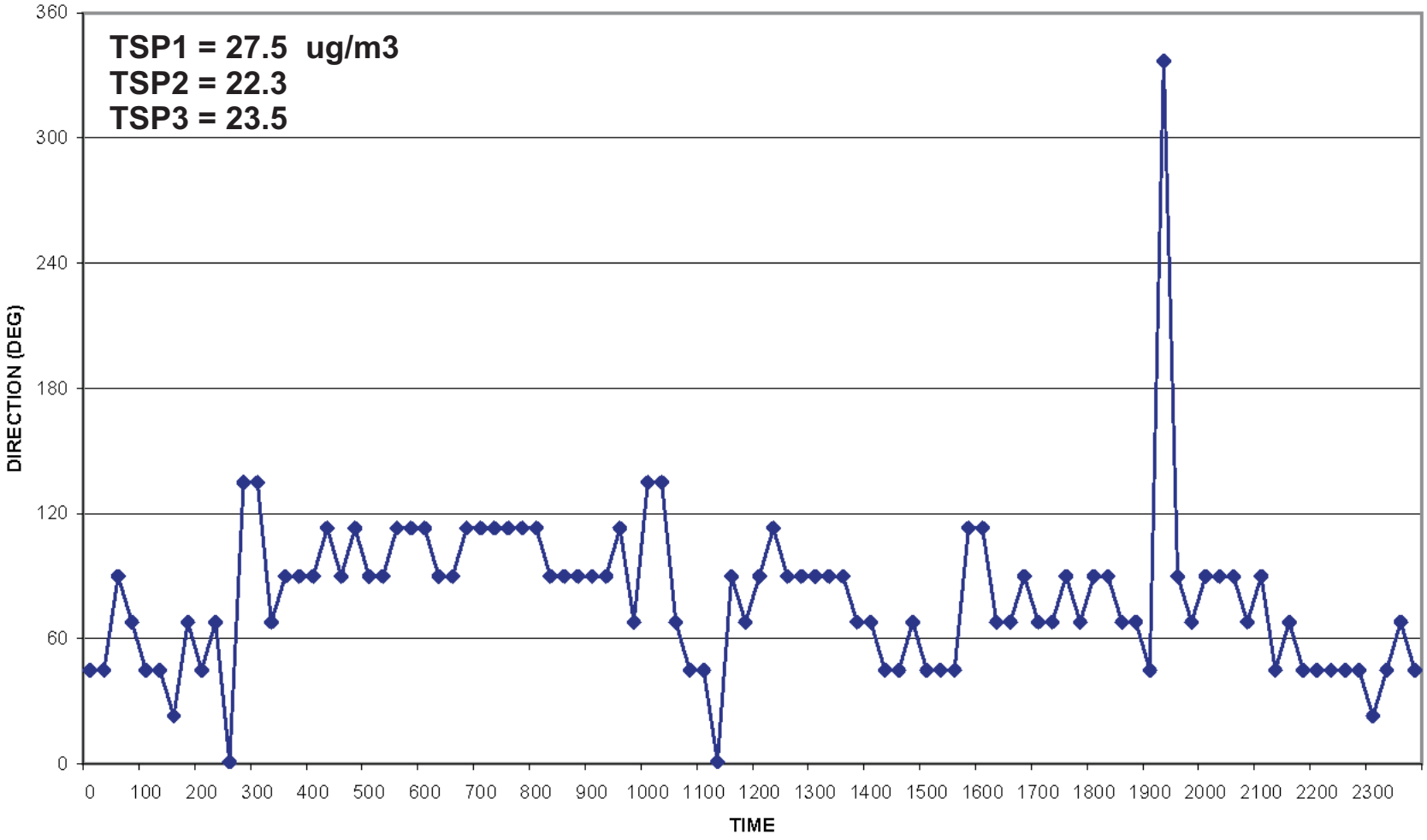


FIGURE 6

HOURLY WIND DIRECTION AND TSP CONCENTRATIONS 14 May 2010 (Friday)

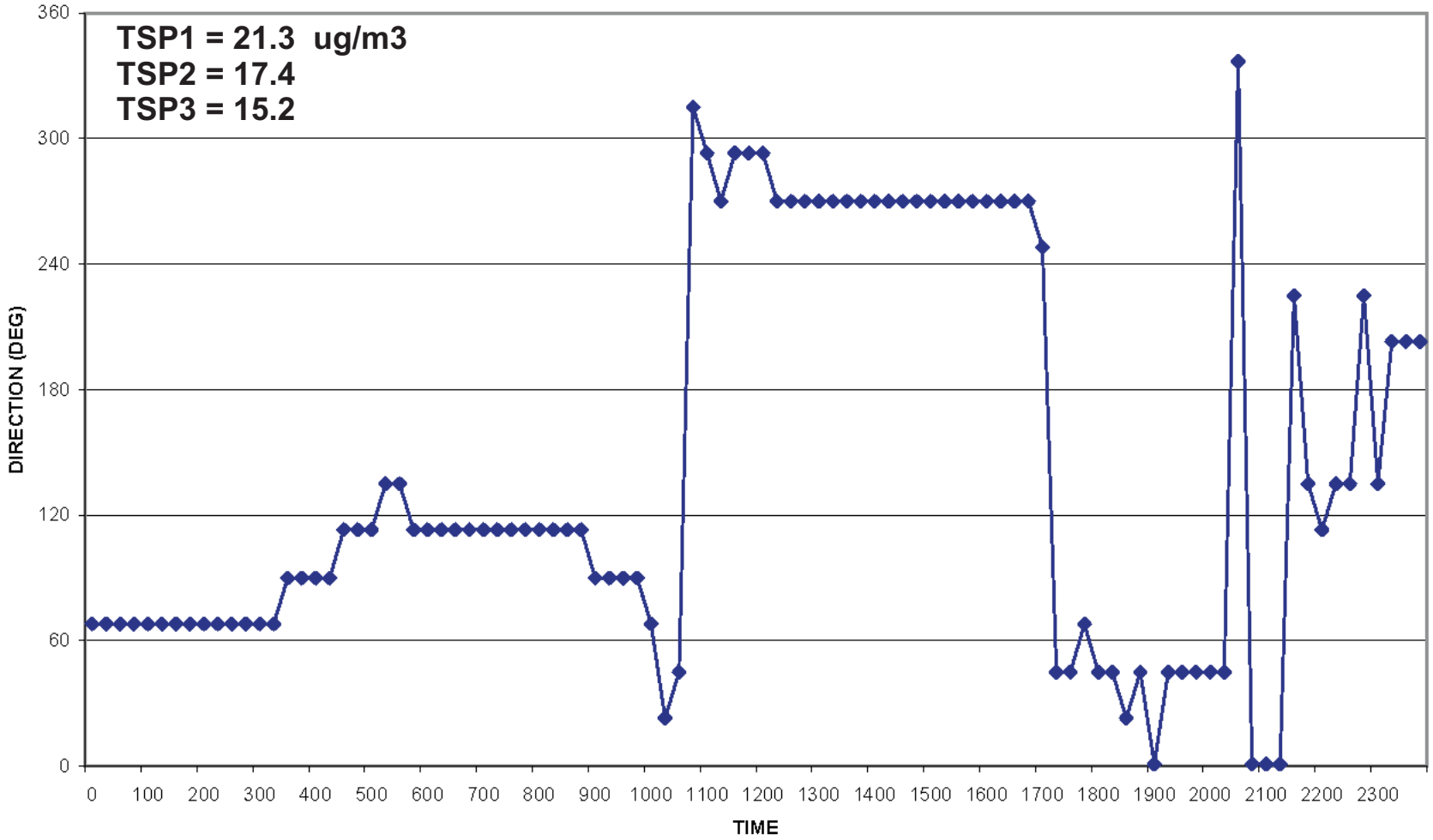


FIGURE 7

HOURLY WIND DIRECTION AND TSP CONCENTRATIONS 20 May 2010 (Thursday)

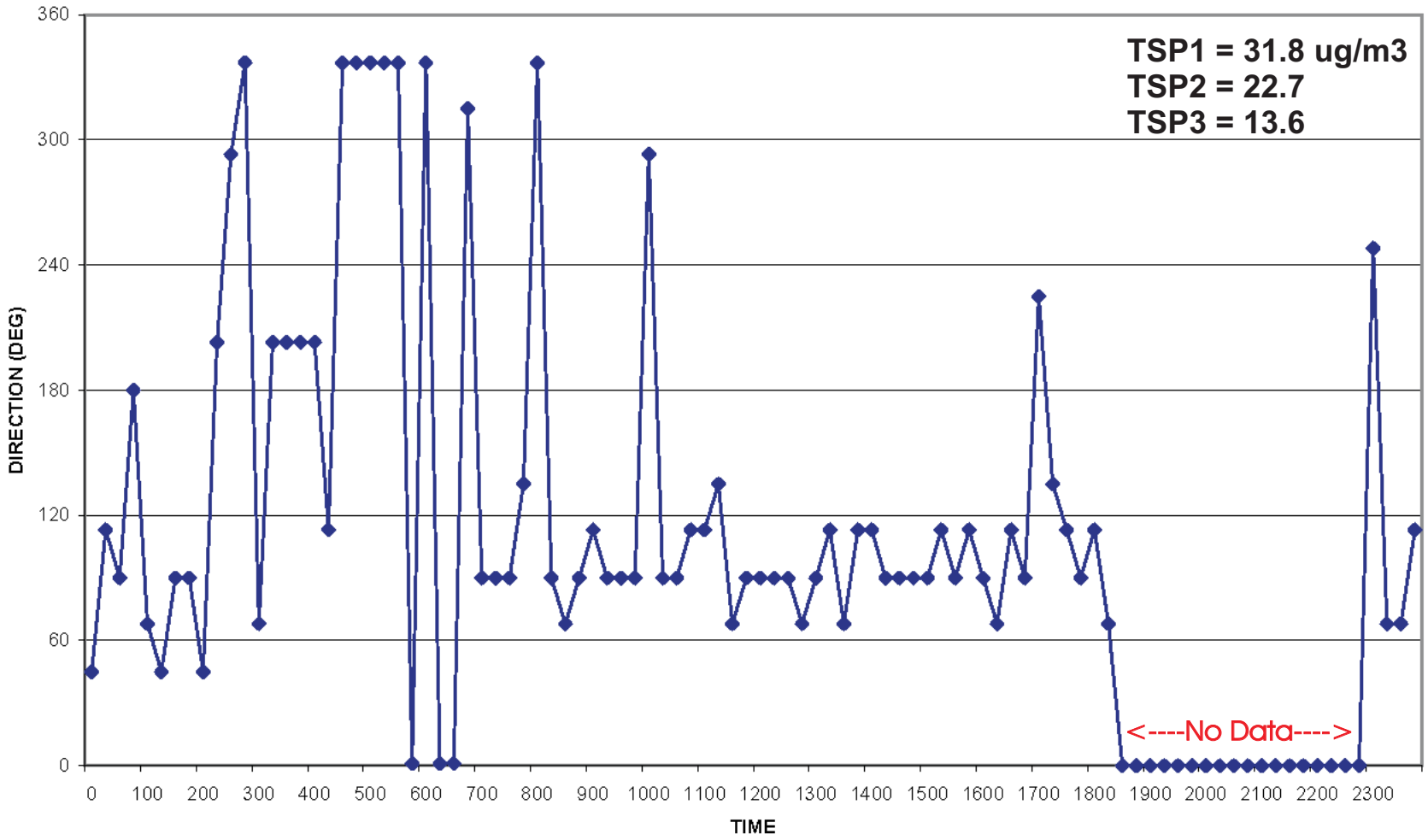
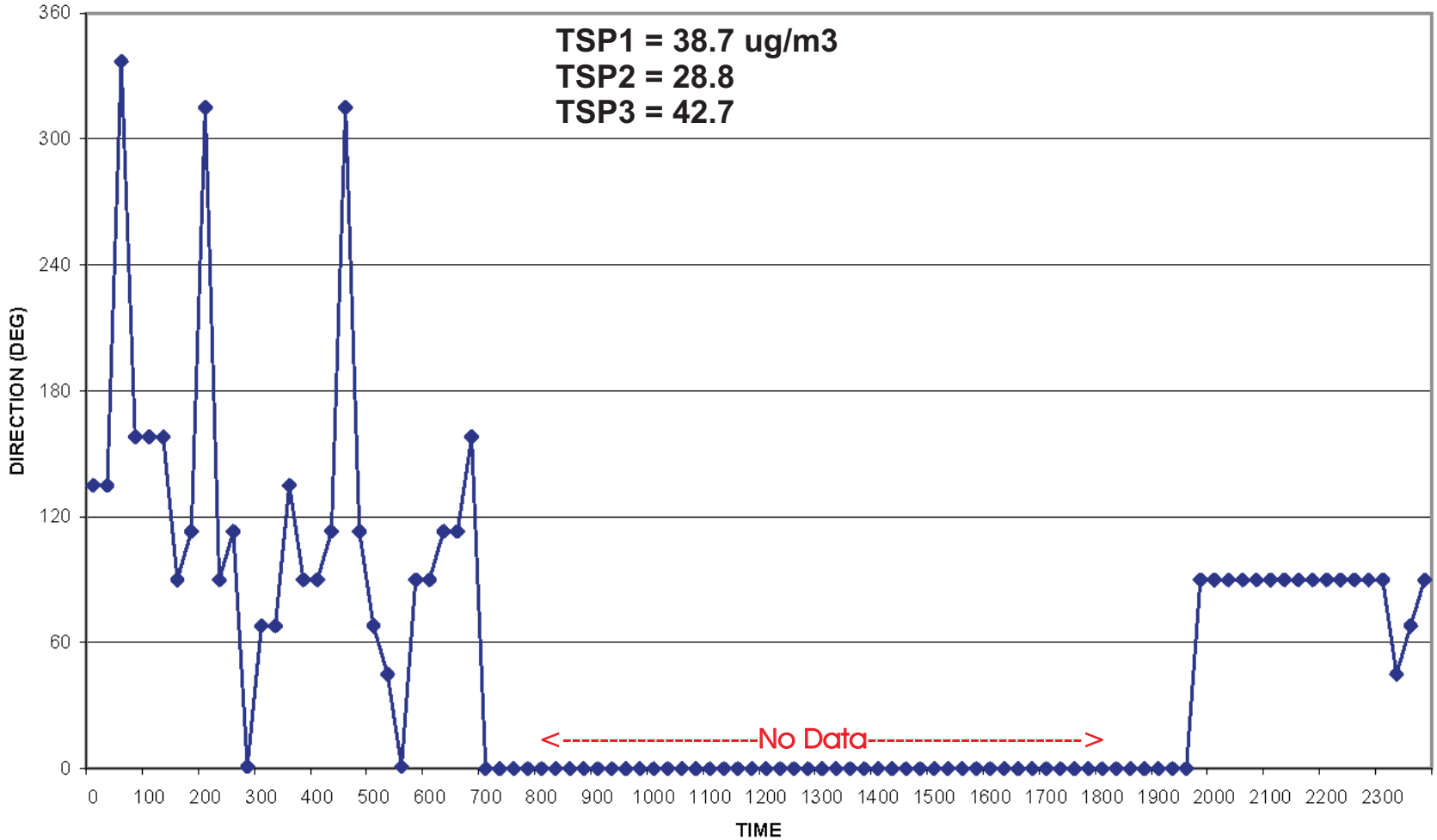


FIGURE 8

HOURLY WIND DIRECTION AND TSP CONCENTRATIONS 26 May 2010 (Wednesday)



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. For the 32 sampling days to-date, the frequency of onshore winds was 29.2% which is somewhat lower than that reported in a recent assessment of winds at the facility in which the annual frequency of sea breezes was reported as about 40%.[12] However, it should be noted that the onshore winds represent only a portion of all the "offsite winds" for the PVT facility and for those same 32 sample days the frequency of all "offsite" winds at the three (3) sites was 58.0% (Site 1), 40.0% (Site 2) and 48.5% (Site 3).

4.0 CONCLUSIONS

As was the case in the November 2009 through April 2010 monitoring, all of the 24-hr TSP concentrations in May were well below the earlier TSP standard and the current state and federal PM_{10} standards. The measured TSP concentrations were also lower than the existing maximum PM_{10} concentrations measured by the DOH at other leeward Oahu 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