AIR MONITORING
PVT LAND COMPANY, LTD.
NANAKULI, HAWAII

Summary Report
January 2010

Prepared by:

J. W. Morrow, DrPH
Environmental Management Consultant
Honolulu, Hawaii

22 March 2010
CONTENTS

LIST OF TABLES
LIST OF FIGURES

1.0 INTRODUCTION ..............................................................................................1

2.0 QUALITY CONTROL/ASSURANCE..............................................................1

3.0 RESULTS AND DISCUSSION.........................................................................4

4.0 CONCLUSIONS ................................................................................................13

5.0 REFERENCES ...................................................................................................14

APPENDIX A
LIST OF TABLES

1. Daily TSP Concentrations, January 2010
2. TSP and Offsite Wind Directions

LIST OF FIGURES

1. Monitoring Sites
2. Air Sampler Siting
3. TSP Concentrations, January 2010
4. Hourly Wind Direction and TSP Concentration, 2 January 2010 (Saturday)
5. Hourly Wind Direction and TSP Concentration, 8 January 2010 (Friday)
6. Hourly Wind Direction and TSP Concentration, 14 January 2010 (Thursday)
7. Hourly Wind Direction and TSP Concentration, 20 January 2010 (Wednesday)
8. Hourly Wind Direction and TSP Concentration, 26 January 2010 (Tuesday)

APPENDICES

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
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 January 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
JANUARY 2010

<table>
<thead>
<tr>
<th>Site No.</th>
<th>Number of Samples</th>
<th>TSP Range (µg/m³)</th>
<th>Cumulative Number of Samples</th>
<th>Cumulative TSP Mean (µg/m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5</td>
<td>50.3 - 88.9</td>
<td>12</td>
<td>51.2</td>
</tr>
<tr>
<td>2</td>
<td>5</td>
<td>9.1 - 49.9</td>
<td>12</td>
<td>32.0</td>
</tr>
<tr>
<td>3</td>
<td>5</td>
<td>18.7 - 30.5</td>
<td>12</td>
<td>24.2</td>
</tr>
</tbody>
</table>

Until 1987 when EPA promulgated a standard for particulate matter equal to or less than 10 microns (µ) in diameter (PM₁₀) standard, there was a 24-hour TSP standard of 150 µg/m³. TSP includes particles up to 100µ in aerodynamic diameter;⁶ and the fraction of PM₁₀ in TSP is typically about 50%; thus, dividing the values in Table 1 by two (2) provides an approximation of PM₁₀ values for comparison with the DOH monitoring results as well as the PM₁₀ standards.⁹
FIGURE 3

TSP CONCENTRATIONS
January 2010

Hawaii AQS = 150 ug/m³
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.\textsuperscript{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 cumulative mean values divided by two (2) are below the 50 ug/m$^3$ annual standard. Since this monitoring program has only just begun, it remains to be seen what the actual annual means will be.

The January 2010 results tend to support the preliminary findings suggested in the previous report (November - December 2009):

- 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 all the data to-date from all three sites are statistically significant, i.e., most notably between Site 1 and Site 3 (p<0.001 by \textit{t-test}).\textsuperscript{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 all the data to-date for all three sites was significantly (p<0.01) less than the mean for the other five workdays.
3.2 Correlation with Wind Direction. Wind directions during the sampling days are presented in Figures 4 - 8. They tended to be light southwesterlies on 2 and 8 January but became moderate to strong northeasterly trade winds on 14 and 20 January. 26 January was characterized by moderate southerly winds most of the day, gradually becoming more southwesterly and turning to light northeasterly trades at night. 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**
**JANUARY 2010**

<table>
<thead>
<tr>
<th>Date</th>
<th>Site 1 TSP (ug/m³)</th>
<th>Offsite Winds* (%)</th>
<th>Site 2 TSP (ug/m³)</th>
<th>Offsite Winds* (%)</th>
<th>Site 3 TSP (ug/m³)</th>
<th>Offsite Winds* (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2/10</td>
<td>54.6</td>
<td>100</td>
<td>24.1</td>
<td>100</td>
<td>23.1</td>
<td>100</td>
</tr>
<tr>
<td>1/8/10</td>
<td>68.1</td>
<td>100</td>
<td>34.2</td>
<td>100</td>
<td>27.5</td>
<td>100</td>
</tr>
<tr>
<td>1/14/10</td>
<td>62.7</td>
<td>2.2</td>
<td>49.9</td>
<td>2.2</td>
<td>30.5</td>
<td>10.9</td>
</tr>
<tr>
<td>1/20/10</td>
<td>50.3</td>
<td>4.3</td>
<td>30.3</td>
<td>0</td>
<td>18.7</td>
<td>4.3</td>
</tr>
<tr>
<td>1/26/10</td>
<td>88.9</td>
<td>88.2</td>
<td>9.1</td>
<td>88.2</td>
<td>27.1</td>
<td>88.2</td>
</tr>
</tbody>
</table>

* Winds which did not cross the PVT property during the 24-hr sampling period
FIGURE 4

HOURLY WIND DIRECTION
AND TSP CONCENTRATIONS
2 January 2010
(Saturday)

TSP1 = 54.6 ug/m³
TSP2 = 24.1
TSP3 = 23.1
FIGURE 5

HOURLY WIND DIRECTION
AND TSP CONCENTRATIONS
8 January 2010
(Friday)

TSP1 = 68.1 µg/m³
TSP2 = 34.2
TSP3 = 27.5
FIGURE 6

HOURLY WIND DIRECTION
AND TSP CONCENTRATIONS
14 January 2010
(Thursday)

TSP1 = 62.7 ug/m³
TSP2 = 49.9
TSP3 = 30.5
FIGURE 7
HOURLY WIND DIRECTION
AND TSP CONCENTRATIONS
20 January 2010
(Wednesday)

TSP1 = 50.3 ug/m³
TSP2 = 30.3
TSP3 = 18.7
FIGURE 8

HOURLY WIND DIRECTION
AND TSP CONCENTRATIONS
26 January 2010
(Tuesday)

TSP1 = 88.9 ug/m3
TSP2 = 9.1
TSP3 = 27.1
This is the winter season in Hawaii, and light, variable and southerly "kona" winds occur more frequently. As the monitoring progresses into the summer months the northeasterly trade winds will become more frequent. However, 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. A recent assessment of winds at the facility demonstrated this effect with a significantly higher percentage of onshore winds during the day than at night.¹²

4.0 CONCLUSIONS

As was the case in November and December, all of the 24-hr TSP concentrations in January were well below the earlier TSP standard and the current state and federal PM₁₀ standards. The measured TSP concentrations are also comparable to existing PM₁₀ concentrations measured by the DOH at other leeward Oahu sites. In fact, if one considers only the PM₁₀ fraction of the TSP, it appears to be less than the PM₁₀ 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


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.

<table>
<thead>
<tr>
<th>January</th>
<th>February</th>
<th>March</th>
</tr>
</thead>
<tbody>
<tr>
<td>Su M Tu W Th F Sa</td>
<td>Su M Tu W Th F Sa</td>
<td>Su M Tu W Th F Sa</td>
</tr>
<tr>
<td>3 4 5 6 7 8</td>
<td>7 8 9 10 11 12 13</td>
<td>7 8 9 10 11 12 13</td>
</tr>
<tr>
<td>10 11 12 13 14 15 16</td>
<td>14 15 16 17 18 19 20</td>
<td>14 15 16 17 18 19 20</td>
</tr>
<tr>
<td>17 18 19 20 21 22 23</td>
<td>21 22 23 24 25 26 27</td>
<td>21 22 23 24 25 26 27</td>
</tr>
<tr>
<td>24 25 26 27 28 29 30</td>
<td>28</td>
<td>28</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>April</th>
<th>May</th>
<th>June</th>
</tr>
</thead>
<tbody>
<tr>
<td>Su M Tu W Th F Sa</td>
<td>Su M Tu W Th F Sa</td>
<td>Su M Tu W Th F Sa</td>
</tr>
<tr>
<td>4 5 6 7 8 9 10</td>
<td>9 10 11 12 13 14 15</td>
<td>6 7 8 9 10 11 12</td>
</tr>
<tr>
<td>11 12 13 14 15 16 17</td>
<td>16 17 18 19 20 21 22</td>
<td>13 14 15 16 17 18 19</td>
</tr>
<tr>
<td>18 19 20 21 22 23 24</td>
<td>23 24 25 26 27 28 29</td>
<td>20 21 22 23 24 25 26</td>
</tr>
<tr>
<td>25 26 27 28 29 30 31</td>
<td>30 31</td>
<td>27 28 29 30</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>July</th>
<th>August</th>
<th>September</th>
</tr>
</thead>
<tbody>
<tr>
<td>Su M Tu W Th F Sa</td>
<td>Su M Tu W Th F Sa</td>
<td>Su M Tu W Th F Sa</td>
</tr>
<tr>
<td>4 5 6 7 8 9 10</td>
<td>1 2 3 4 5 6 7</td>
<td>5 6 7 8 9 10 11</td>
</tr>
<tr>
<td>11 12 13 14 15 16 17</td>
<td>8 9 10 11 12 13 14</td>
<td>12 13 14 15 16 17 18</td>
</tr>
<tr>
<td>18 19 20 21 22 23 24</td>
<td>15 16 17 18 19 20 21</td>
<td>19 20 21 22 23 24 25</td>
</tr>
<tr>
<td>25 26 27 28 29 30 31</td>
<td>22 23 24 25 26 27 28</td>
<td>26 27 28 29 30</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>October</th>
<th>November</th>
<th>December</th>
</tr>
</thead>
<tbody>
<tr>
<td>Su M Tu W Th F Sa</td>
<td>Su M Tu W Th F Sa</td>
<td>Su M Tu W Th F Sa</td>
</tr>
<tr>
<td>3 4 5 6 7 8 9</td>
<td>7 8 9 10 11 12 13</td>
<td>5 6 7 8 9 10 11</td>
</tr>
<tr>
<td>10 11 12 13 14 15 16</td>
<td>14 15 16 17 18 19 20</td>
<td>12 13 14 15 16 17 18</td>
</tr>
<tr>
<td>17 18 19 20 21 22 23</td>
<td>21 22 23 24 25 26 27</td>
<td>19 20 21 22 23 24 25</td>
</tr>
<tr>
<td>24 25 26 27 28 29 30</td>
<td>28 29 30</td>
<td>26 27 28 29 30 31</td>
</tr>
</tbody>
</table>

- Yellow & Green & Pink = 1/3 day sampling
- Green & Pink = 1/6 day sampling
- Pink = 1/12 day sampling