

APPENDIX D

SUMMARY OF COLLECTION & ANALYSIS OF SILT SAMPLES FROM PAVED ROADS IN MARICOPA COUNTY

**SUMMARY OF COLLECTION AND ANALYSIS OF
SILT SAMPLES FROM PAVED ROADS
IN MARICOPA COUNTY**

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TABLE OF CONTENTS

| | <u>Page</u> |
|--|-------------|
| 1. INTRODUCTION..... | 1 |
| 2. SAMPLING PROGRAM | 1 |
| 2.1 Sampling Locations..... | 1 |
| 2.2 Sampling Schedule..... | 1 |
| 2.3 Sampling Methods | 2 |
| 3. SAMPLE ANALYSIS | 4 |
| 3.1 Sieve Analysis..... | 4 |
| 3.2 Filter Weighing | 6 |
| 3.3 Silt Loading | 6 |
| 4. SAMPLING RESULTS | 6 |
| | |
| APPENDIX A: AERIAL PHOTOGRAPHS OF SAMPLING SITES | |
| APPENDIX B: FIELD DATA SHEETS | |
| APPENDIX C: LABORATORY SIEVING AND FILTER WEIGHING RESULTS | |

LIST OF FIGURES

| | |
|--|---|
| Figure 2.1 Photograph of the sampling equipment..... | 3 |
| Figure 2.2 Illustration showing sampling location and collection areas for the paved road silt sampling..... | 4 |
| Figure 3.1 Photograph of the Gilson Sieve Tester, Model SS-15..... | 5 |

LIST OF TABLES

| | |
|--|---|
| Table 2.1 Sampling Schedule | 2 |
| Table 4.1 Silt Sampling Results for MAG Designated SCAMPER Segments and Traffic Volume Groups..... | 7 |

1. INTRODUCTION

Applied Environmental Consultants, Inc. (AEC) was contracted by Sierra Research, Inc. to conduct paved road silt sampling on pre-designated road segments in Maricopa County, Arizona. The results of the silt sampling program are to be used as part of a larger study being conducted by Sierra Research for the Maricopa Association of Governments (MAG) involving the calculation of PM₁₀ (particulate matter greater than 10 microns aerodynamic diameter) emission rates from paved roads in Maricopa County.

The ensuing sections of this report summarize the collection methods, analysis and results of the paved road silt sampling program. A description of the sampling methods is presented in Section 2. This is followed by a description of how the samples were analyzed in Section 3 and a summary of the results in Section 4.

2. SAMPLING PROGRAM

The MAG identified ten road segments to be sampled which are listed in Table 2.1. The selected road segments represent a range of roads with PM₁₀ emission rates and traffic volumes characteristic of paved roads within the Maricopa County PM₁₀ nonattainment area. The paved road silt sampling was conducted following the general guidance specified in *AP-42, Compilation of Air Pollution Emission Factors, Volume I (Fifth Edition), Appendix C.1*.

2.1 Sampling Locations

Sampling was conducted at the midpoint of each road segment and at generally equal distances on either side of the midpoint, for a total of three sampling locations per road segment. Each road segment and the corresponding A, B and C sampling locations are shown in the aerial photographs in Figures A.1 to A.10 in Appendix A. As shown in the photographs, some sampling locations were at 4-way intersections. At these locations, silt samples were collected prior to, or after the intersection, depending on what was suggested by the city traffic control personnel assisting with the field sampling.

2.2 Sampling Schedule

Sampling was conducted on Tuesday, Wednesday and Thursday, August 28th, 29th, and 30th, 2007. The ten road segments were segregated into three sampling groups based on their location as listed in Table 2.1.

Table 2.1 Sampling Schedule

| Tuesday, August 28, 2007 – Gilbert Road Segments | Start: | End: |
|---|---------------|-------------|
| Santan Village Parkway between Williams Field Road and Ray Road | 9:00 am | 10:00 am |
| Ray Road between Santan Village Parkway and Higley Road | 10:00 am | 10:30 am |
| Higley Road between Ray Road and Williams Field Road | 10:45 am | 11:30 am |
| Wednesday, August 29, 2007 – Phoenix Road Segments | Start: | End: |
| 39th Avenue between Thomas Road and Osborne Road | 08:30 am | 09:00 am |
| 27th Avenue between Van Buren Street and McDowell Street | 09:00 am | 09:45 pm |
| 27th Avenue between Lower Buckeye Road and Durango Street | 10:00 am | 10:30 am |
| Roosevelt Street between 7th Street and 16th Street | 10:45 am | 11:15 am |
| Thursday, August 30, 2007 – Phoenix Road Segments | Start: | End: |
| Broadway Road between 35th Avenue and 43rd Avenue | 08:30 am | 09:00 am |
| 19th Avenue between Broadway Road and Lower Buckeye Road | 09:00 am | 09:30 am |
| Central Ave between Broadway Road and Southern Ave | 10:00 am | 10:30 am |

2.3 Sampling Methods

The paved roadways were sampled using a modified hi-volume particulate sampler to “vacuum” road dust onto a pre-weighed 8”x10” quartz filter used for PM₁₀ sampling. The vacuum nozzle is 12 inches wide. A photograph of the sampling equipment is shown in Figure 2.1.

At each sampling location, a 12 inch wide sampling collection area perpendicular to the road was vacuumed using the high volume particulate sampler and a clean, pre-weighed 8”x10” filter. An illustration of the sampling location and collection areas is shown in Figure 2.2. Special consideration was made to collect only material from that portion of the road over which travel occurs. When larger loose material was present in the collection area that did not get sucked up by the vacuum, it was collected with a whisk broom and dustpan. The distance of each sampling area was also measured and recorded. Field data sheets are presented in Appendix B.

Upon completion of the sampling at each location, all of the vacuumed material within the filter holder area of the sampler, along with the material that readily detached from the filter with light brushing, was placed into a plastic sampling bag and labeled. Any material collected with the whisk broom and dust pan was also placed into the sampling bag. The filter was placed in a separate plastic bag and labeled. A new filter was then placed into the sampler in preparation for the next sampling location.

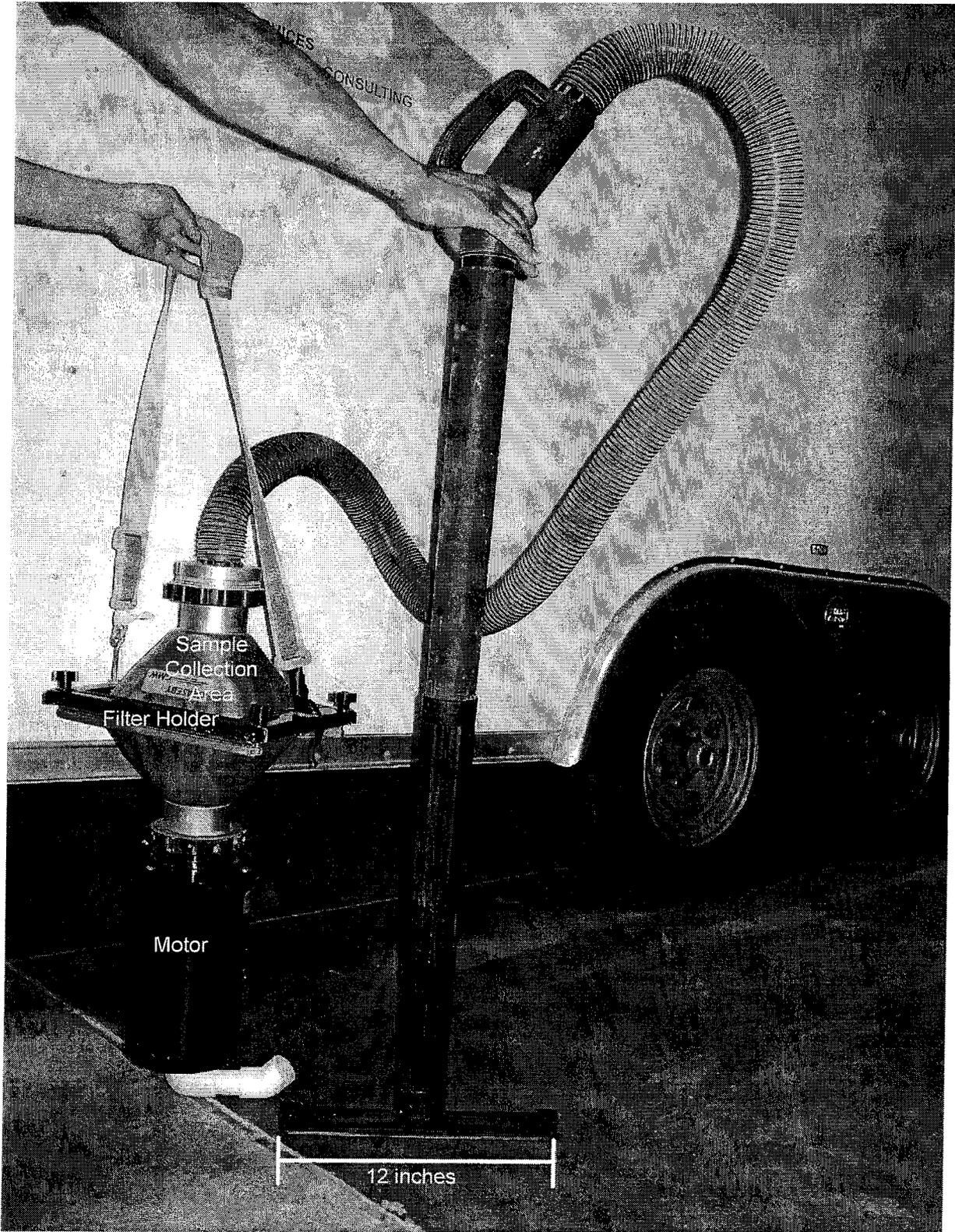


Figure 2.1 Photograph of the sampling equipment.

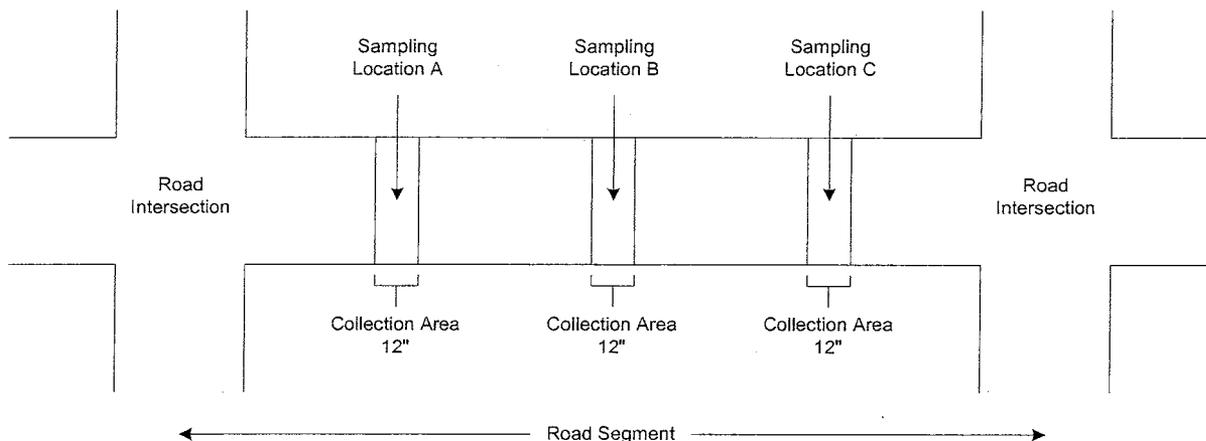


Figure 2.2 Illustration showing sampling location and collection areas for the paved road silt sampling.

3. SAMPLE ANALYSIS

The laboratory analysis was conducted in accordance with the methodologies presented in *AP-42, Appendix C.2* and the *American Society for Testing and Materials (ASTM), C-136*. As stated in Section C.2.2 of *AP-42, Appendix C.2*, paved road samples generally are not oven dried to determine moisture content. Consequently, the final mass measurements of the samples include moisture. Laboratory sieving and filter weighing results are presented in Appendix C.

3.1 Sieve Analysis

The collected road material from sampling locations A, B and C for each road segment were combined and placed into a pre-weighed pan and then weighed using a calibrated scale. After weighing, the entire sample was placed into the top sieve of a Gilson Sieve Tester, Model SS-15. The Gilson Sieve Tester consists of a series of sieves as shown in Figure 3.1. The bottom sieve has a No. 200 mesh screen. All material passing through the No. 200 sieve into the pre-weighed catchment pan represents the silt portion of the sample.

Each road segment sample was shaken for 10 minutes. The pre-weighed catchment pan was then weighed to determine the mass of the silt size material. The sieving and weighing process was then continued for each sample until the difference in successive pan weighings was less than 3.0% or 40 minutes of sieving had elapsed.

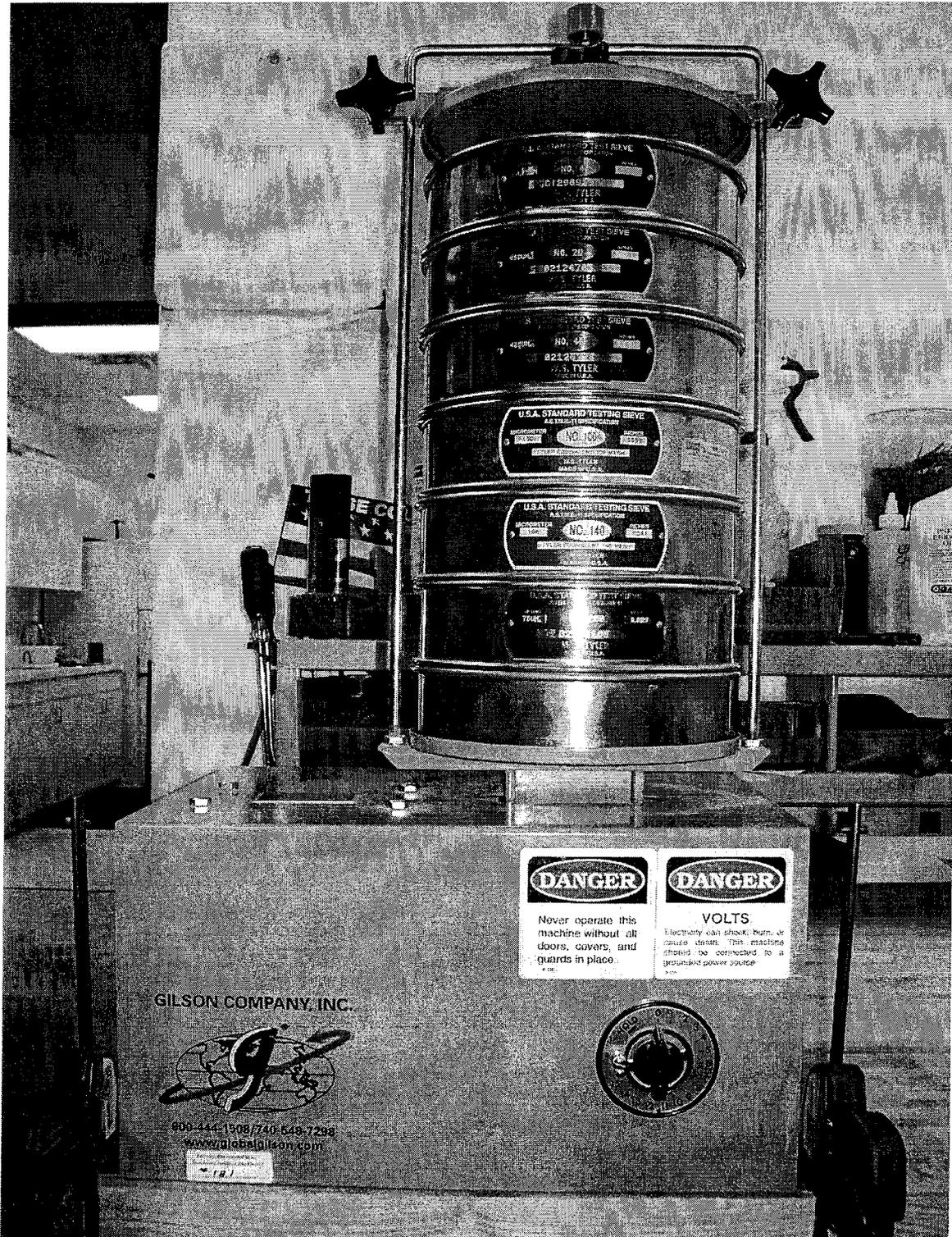


Figure 3.1 Photograph of the Gilson Sieve Tester, Model SS-15.

3.2 Filter Weighing

Each pre-weighed exposed A, B and C filter for each road segment was weighed using a calibrated scale to determine the net gain in mass. All material on the filters was considered to be silt size material. The net gains in mass for each filter were then summed and added to the sieve analysis results to determine the total weight of the silt size portion of each road segment sample.

3.3 Silt Loading

The final silt loadings in ounces per square foot were determined by dividing the weight of the silt portion of each road segment sample by the total sampling area (i.e., sum of sampling areas for locations A, B and C). The silt loading results are presented in Section 4.

4. SAMPLING RESULTS

The silt loadings for each road segment are summarized in Table 4.1. The road segments listed in Table 4.1 are organized based on the *Traffic Volume Groups* and SCAMPER (System of Continuous Aerosol Monitoring of Particulate Emissions from Roadways) Segments identified in the original MAG proposal for the sampling summarized herein. Silt loadings ranged from 0.0003 oz/ft² (Broadway Road between 35th Avenue and 43rd Avenue) to 0.0115 oz/ft² (Santan Village Parkway between Williams Field Road and Ray Road).

Table 4.1 Silt Sampling Results for MAG Designated SCAMPER Segments and Traffic Volume Groups

| Road Segment | Silt Weight (oz) | Area Sampled (ft ²) | Silt Loading (oz/ft ²) |
|--|------------------|---------------------------------|------------------------------------|
| SCAMPER Segments with Higher PM₁₀ Emission Rates | | | |
| 1. Traffic Volume Group I - Broadway Road between 35th Avenue and 43rd Avenue (Phoenix) | 0.03 | 117.8 | 0.0003 |
| 2. Traffic Volume Group I - 27th Avenue between Lower Buckeye Road and Durango Street (Phoenix) | 0.06 | 118.1 | 0.0005 |
| 3. Traffic Volume Group I - Ray Road between Santan Village Parkway and Higley Road (Gilbert) | 0.19 | 193.2 | 0.0010 |
| 4. Traffic Volume Group II - Higley Road between Ray Road and Williams Field Road (Gilbert) | 0.53 | 180.5 | 0.0030 |
| 5. Traffic Volume Group III - 19th Avenue between Broadway Road and Lower Buckeye Road (Phoenix) | 0.11 | 142.7 | 0.0007 |
| SCAMPER Segments with Lower PM₁₀ Emission Rates | | | |
| 6. Traffic Volume Group I - Roosevelt Street between 7th Street and 16th Street (Phoenix) | 0.05 | 94.2 | 0.0006 |
| 7. Traffic Volume Group I - 39th Avenue between Thomas Road and Osborne Road (Phoenix) | 0.09 | 86.6 | 0.0010 |
| 8. Traffic Volume Group II - 27th Avenue between Van Buren Street and McDowell Street (Phoenix) | 0.07 | 182.0 | 0.0004 |
| 9. Traffic Volume Group II - Santan Village Parkway between Williams Field Road and Ray Road (Gilbert) | 2.19 | 190.8 | 0.0115 |
| 10. Traffic Volume Group III - Central Ave between Broadway Road and Southern Ave (Phoenix) | 0.41 | 113.7 | 0.0036 |

APPENDIX A
AERIAL PHOTOGRAPHS OF SAMPLING SITES



Figure A.1 Air photo showing specific sampling locations on Santan Village Parkway between Williams Field Rd. and Ray Rd. (Gilbert).



Figure A.2 Air photo showing specific sampling locations on Ray Rd. between Santan Village Parkway and Higley Rd. (Gilbert).



Figure A.3 Air photo showing specific sampling locations on Higley Rd. between Ray Rd. and Williams Field Rd. (Gilbert).



Figure A.4 Air photo showing specific sampling locations on 39th Ave between Thomas Rd. and Osborne Rd. (Phoenix).