

ENVIRONMENTAL ANALYSIS ASSOCIATES, INC.

306 5th Street, Suite 2A - Bay City, MI 48708



LABORATORY REPORT

OPTICAL PARTICLE SIZE IMAGE ANALYSIS
Environmental Surface/Bulk Dust Analysis

Report prepared for : ABC Environmental

Client Project # / Description : 21-1020 - 123 Elm Street

Client Contact : Mr. John Doe

EAA Project # : 21-3000

Samples Collected : 1/15/21

Samples received : 1/18/21

Date of Analysis : 1/20/21

Authorized / data reviewed by : *Joseph R. Heintskill*

Joseph R. Heintskill
Laboratory Manager

The EAA sample results are only applicable to the items tested and locations as received. Sample descriptions and volumetric data are provided by the client. All particle concentrations are rounded to 3 significant figures. In order for chart clarity, cells where the particle category was not detected are intentionally left blank.

Environmental Analysis Associates, Inc. (EAA) shall not be liable to the client or the client's customer with respect to interpretation, recommendations made or actions implemented by either the client or the client's customer as a result of or based upon the test results.

All samples were received in acceptable condition unless noted in the General Comments section of the data report.



Optical Microscopy Dust Analysis - Size Distribution Summary Report

Environmental Surface/Bulk Dust Analysis

Client Name : ABC Environmental	Analysis Method : DF-D01
Contact : Mr. John Doe	Sample collected : 1/15/21
Client Project# : 21-1020 - 123 Elm Street	Sample received : 1/18/21
Client Sample # : 1020-1A	EAA Project # : 21-3000
Sample Description : Room 125A - Counter top divider	EAA Sample # : 3000-1
Sample type : Environmental Surface/Bulk Dust Analysis	Fields/transects counted : 1
Analysis Magnification : 200	Field area counted (mm ²) : 0.174
Scale (µm/div.) : 1	Particles / mm ² : 3540
Total particles counted : 616	Particles/sampled area : 616
Min./Max. size range (µm) : 2.0 / 2000	

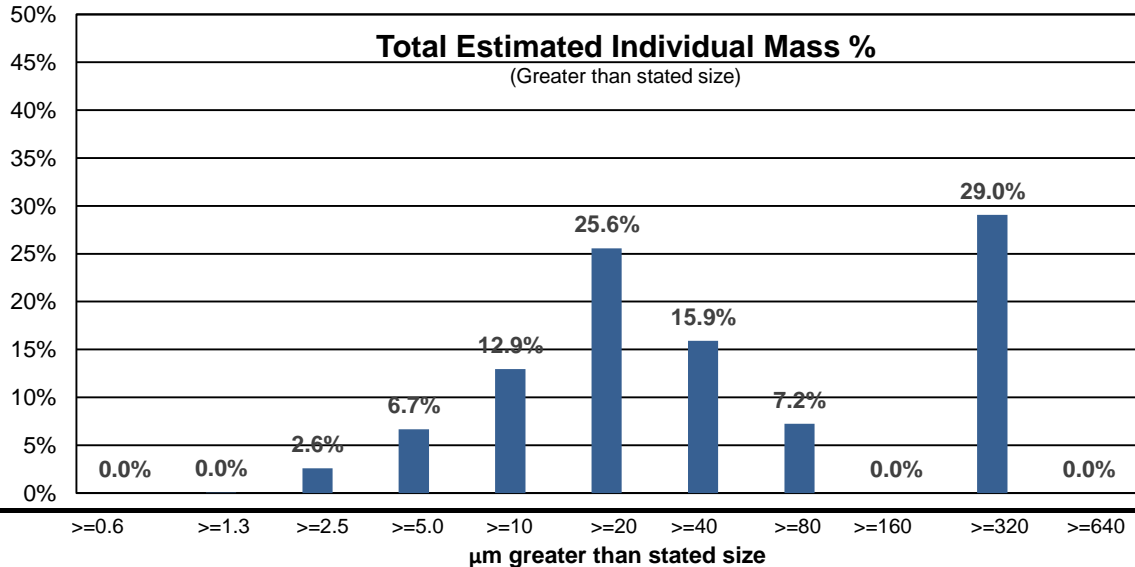
SUMMARY CONCLUSIONS - SIZE DISTRIBUTION (TSP, PM₁₀, PM_{2.5} size scale)

Estimated mass concentrations based on assuming a particle specific gravity of 2.0. The "calculated" mass is positively skewed based on the presence of one large particle with an estimated size > 320µm.

Arithmetic mean size (µm) :	9.9 ±18.5	Estimated total mass (TSP) :	389.4 ug/mm2
Mass mean size (µm) :	37.9 ±107.5	Estimated mass PM ₁₀ (<10µm) :	36.2 ug/mm2
Numerical Skewness :	1.7 (positive)	Estimated mass PM _{2.5} (<2.5µm) :	0.2 ug/mm2
Numerical Kurtosis :	1.8 (peaked)	Thickness ratio (l / S) / Spec. Gravity (SG) :	0.7 / 2.00

Numerical & Mass % Concentration Summary

Particle Classification	# Cted	Mean (µm)	*Calc. Num. %	*Theo. Mass %	Spec. Grav	Part. / area analyzed	Part. / mm ²	*Theo. ug/mm2	Calc. Mass ug/cm2
Crystalline particles	448	10.1	72.7%	96.4%	2.00	448	2574	375	37544
Opaque particles	168	9.2	27.3%	3.6%	2.00	168	965	14	1399



* The estimated mass calculations are based on the sum total of each particle volume & theoretical specific gravity. Calculations assume an estimated thickness ratio and should be used as rough comparative mass estimates only.

** The mean mass (µg/m³) is calculated using the mean particle size only.

Authorized / Data reviewed by : Joseph R. Heintskill

Date : 1/20/21

The results only apply to the location and materials tested.

OPTICAL MICROSCOPY - NUMERICAL SIZE DISTRIBUTION ANALYSIS



Environmental Surface/Bulk Dust Analysis

Client Name: ABC Environmental
Contact : Mr. John Doe
Client Project# : 21-1020 - 123 Elm Street
Client Sample # : 1020-1A
Sample Description : Room 125A - Counter top divider
Sample type : Environmental Surface/Bulk Dust Analysis
Analysis Magnification : 200
Scale (µm/div.) : 1.0
Total particles counted : 616 **Particles/mm² :** 3540 **IMAGE J pixels / µm :** 5.86

Analysis Date : 1/15/21
EAA Project # : 21-3000
EAA Sample # : 3000-1

SIZE DISTRIBUTION STATISTICS				MORPHOLOGY STATISTICS (all particles)			
Description	Mean	Std.Dev.	95%CL	Description	Mean	Std.Dev.	95%CL
Arithmetic Mean Aerodynamic Dia.(µm) :	9.9	±18.5	±1.5	Aspect Ratio (average) :	3.4	±15.6	±1.2
Arithmetic Mean Projected Dia.(µm) :	12.1	±36.0	±2.8	Estimated Particle Sphericity :	0.7	±0.1	±0.01
Median aerodynamic dia.(µm) :	5.6			Shape (roundness) :	0.5		
Numerical Mode (size category) :	>=2.5			Particle counts / mm ² :	3540		
Mass/Volume Mode (size category) :	>=320.0			Field area counted (mm ²) :	0.17		
Numerical Skewness :	1.7	(positive)		Estimated particle area (mm ²) :	0.148		
Numerical Kurtosis :	1.8	(peaked)		Field area covered by particles(%) :	85.1%		

Numerical Size Distribution (µm >= aerodynamic stated size)											
Particle Size (µm)	>=0.6	>=1.3	>=2.5	>=5.0	>=10.0	>=20	>=40	>=80	>=160	>=320	>=640
Midpoint size (µm)	0.9	2	4	8	15	30	60	120	240	480	>=640
Cumulative Count	616	616	606	347	159	67	14	3	1	1	
Individual Count		10	259	188	92	53	11	2		1	
Estimated Particle Counts/mm2		57	1488	1080	529	305	63	11		6	
Individual Numerical %		1.6%	42.0%	30.5%	14.9%	8.6%	1.8%	0.3%		0.2%	
Cumulative Numerical %		1.6%	43.7%	74.2%	89.1%	98%	100%	100%	100%	100.0%	

*** Estimated Aerodynamic Mass (Volume) Distribution											
Particle Size (µm)	>=0.6	>=1.3	>=2.5	>=5.0	>=10.0	>=20	>=40	>=80	>=160	>=320	>=640
Individual Volume %		0.0%	2.6%	6.7%	12.9%	25.6%	15.9%	7.2%		29.0%	
Cumulative Volume %		0.0%	2.6%	9.3%	22.3%	48%	64%	71%	71%	100.0%	

* All numerical size distribution statistics are based on the estimated arithmetic mean diameter.

** The largest size category is reported in bimodal distributions.

*** The estimated mass distribution is based on particle volume in each size category, and uses an average estimate of particle specific gravity.

Statistical Parameter Definitions:

Arithmetic Mean Aerodynamic Diameter	Arithmetic mean of feret length, width, and approximate thickness using the sphericity coefficient.
Arithmetic Mean Projected Diameter	Arithmetic mean of particle size based on length and width and not accounting for particle thickness.
Median	Number in the middle of a distribution; that is, half the values are greater than the median, and half the values below.
Mode	Most frequently occurring size category/range in a size distribution
Skewness	Degree of symmetry of a population around its mean. Positive skewness indicates a distribution with an asymmetric tail towards more positive values. Negative skewness indicates an asymmetric tail towards more negative values.
Kurtosis	Relative peakedness or flatness of a distribution compared to the normal distribution. Positive kurtosis indicates a relatively peaked distribution. Negative kurtosis indicates a relatively flat distribution.
95% C.L.	95% Confidence Limit (i.e. probability that 95% of time the mean value will fall within the specified size range).
Aspect Ratio	Ratio of the particle feret length divided by the minimum particle feret diameter
Particle Sphericity	Measure of effective particle size based on the three perpendicular axes = (thickness ² / (length*width)) ^{0.333}
Shape (Roundness)	Measure of the sharpness or smoothness of the particle surface = 4*area / (π x L ²). Higher values indicate more roundness (0.1-10)
Field area covered by particles (%)	Theoretical percentage of field area occupied by particles (projected particle area / total area examined)

Optical Microscopy Dust Analysis - Size Distribution Summary Report (Graphical Mass & Size Distribution)

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(End of report)



Client Name : ABC Environmental

Contact : Mr. John Doe

Client Project# : 21-1020 - 123 Elm Street

Client Sample # : 1020-1A

Sample Description : Room 125A - Counter top divider

Analysis Method : Environmental Surface/Bulk Dust Analysis

Sample received : 1/18/21

EAA Project # : 21-3000

EAA Sample # : 3000-1

EAA Method # : DF-D01

Magnification : 200x

