

**SPORE SAMPLING REPORT
FOR
GLENWOOD MIDDLE SCHOOL
2680 ROUTE 97
GLENWOOD, MD 21738**

PREPARED FOR:

**HOWARD COUNTY PUBLIC SCHOOL SYSTEM
10910 ROUTE 108
ELLCOTT CITY, MD 21043**

PREPARED BY:



**ARIA ENVIRONMENTAL, INC.
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WOODBINE, MD 21797**

OCTOBER 30, 2015

150876

**SPORE TRAP SAMPLING REPORT
FOR GLENWOOD MIDDLE SCHOOL
OCTOBER 7, 2015**

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**SPORE TRAP SAMPLING REPORT
FOR GLENWOOD MIDDLE SCHOOL
OCTOBER 7, 2015**

EXECUTIVE SUMMARY

Aria Environmental, Inc. (AE) was contracted by Howard County Public School System to perform spore trap sampling at the Glenwood Middle School at the end of August 2015 due to air quality concerns expressed by staff and parents and to monitor the school after a recent heating, ventilation and air-conditioning (HVAC) system upgrade. AE made measurements for temperature, humidity, carbon monoxide, carbon dioxide and particulate matter and collected microbial spore trap sampling for fungal spore identification and counting on October 7, 2015 as part of a series of spore sampling events that will occur in the first month of the 2015 - 2016 school year and less frequently throughout the school year. This report presents the results of air sampling made on October 7, 2015.

**Spore Trap Sampling Report
For Glenwood Middle School
October 7, 2015**

I. BACKGROUND

Representatives from Aria Environmental, Inc. (AE) visited Glenwood Middle School on October 7, 2015 to perform air monitoring in response to an ongoing indoor air quality complaint at the school. Measurements for temperature, humidity, carbon monoxide, carbon dioxide and particulate matter and microbial spore trap sampling were collected from classrooms 3, 9, 14, 16, 23, 30, the Music Classroom (37) and the Art Room (38) and portable classrooms 60 and 81. Outdoor air samples were also collected for comparison purposes in one courtyard and outside near portable classroom 61. This monitoring was performed in response to employee and parental complaints and as a follow up to HVAC improvements.

There was no visible evidence of mold growth nor observed odors consistent with mildew in the classrooms sampled. Weather on the day of monitoring was warm and sunny.

II. OBSERVATIONS AND MEASUREMENTS

A. Observations and Measurements on October 7, 2015

Industry guidelines or standards for seasonal temperature and humidity ranges for thermal comfort are established by the American Society for Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) standard 55-2013. These ranges are presented in Table 1. The U.S. Environmental Protection Agency (EPA) recommends maintaining indoor relative humidity below 60% and ideally between 30 and 50%. The room air temperature measured between 3:47 PM and 5:15 PM ranged from 72.4 to 77.6° F with an average of 73.5° F. The indoor relative humidity ranged from 46.2 to 62.7 percent. The temperature and relative humidity measurements are considered acceptable for summer thermal comfort in all rooms except Classroom 9 where humidity was over 60% and Classroom 3 where the temperature was slightly lower than 72.5° F. The outside temperature at 4:53 PM was 76.2° F and the outdoor relative humidity was 51.3% outside near Portable Classroom 61, and the outside temperature at 4:51 PM was 74.1° F and the relative humidity was 56.0% in the courtyard outside classroom 18. No windows or doors were observed to be open during the monitoring period. Results of temperature, relative humidity, carbon dioxide and carbon monoxide monitoring are presented in Table 2.

**Table 1- Acceptable Ranges of Temperature and
Relative Humidity in Summer and Winter^a**

Relative Humidity	Winter Temperature	Summer Temperature
30%	68.5°F – 76.0°F	74.0°F – 80°F
40%	68.5°F - 75.5°F	73.5°F – 79.5°F
50%	68.5°F - 74.5°F	73.0°F – 79.0°F
60%	68.0°F - 74.0°F	72.5°F – 78.0°F

^aadapted from ASHRAE Standard 55-2013

Carbon dioxide and carbon monoxide measurements are used to assess ventilation system performance. The exhaled breath of building occupants is the main indoor source of carbon dioxide; therefore, the build-up of carbon dioxide indicates inadequate ventilation. Air monitoring was performed after school hours when the rooms were mostly unoccupied. Carbon dioxide concentrations ranged from 424 to 2,975 ppm indoors. The concentration of concern for carbon dioxide is set by ASHRAE standard 62.1–2013 as 700 ppm above outdoor air. On the day of monitoring, the outdoor air concentration of carbon dioxide ranged from 386 to 403 ppm.

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Carbon dioxide concentrations were within the comfort parameters established by ASHRAE in all areas monitored except for Classrooms 3 (1,493 ppm) and 9 (2,975 ppm). There were no students in these rooms at the time of monitoring, but the monitoring took place soon after school ended for the day.

Carbon monoxide is mainly attributed to incomplete combustion. Concentrations of CO ranged from 0.1 to 0.4 ppm indoors and the outdoor concentrations ranged from 0.0 to 0.3 ppm in the two outdoor locations measured. CO concentrations were below the ASHRAE concentration of concern of 9 ppm.

Particulate matter or PM is the term for a mixture of solid particles and liquid droplets found in the air. It does not distinguish between the types of particles in the air (e.g., pollen, skin cells, mold spores, soil, etc.). Particulate matter includes "inhalable coarse particles," with diameters larger than 2.5 micrometers and smaller than 10 micrometers (PM 10) and "fine particles," with diameters that are 2.5 micrometers and smaller (PM 2.5). Particle loads expected to be a part of the school environment include carpet and clothing fiber, soil tracked from outside, paper dust, chalk dust, and dust and fibers from building materials. ASHRAE Standard 62.1-2013 suggests target indoor concentrations for PM 2.5 and PM 10 of 15 $\mu\text{g}/\text{m}^3$ and 50 $\mu\text{g}/\text{m}^3$, respectively. These concentrations are taken from the EPA's National Ambient Air Quality Standards (NAAQS) based on annual arithmetic means deemed acceptable for outdoor air quality. Occupational standards and guidelines for particles are nearly an order of magnitude higher than concentrations typically found in non-occupational settings and are not appropriate for comparison.

Particle measurements were taken with an Aerocet 531 particulate monitor. The particle monitor takes a two minute averaged sample of particle concentrations in 5 size fractions (PM 1, PM 2.5, PM 7, PM 10 and total suspended particles (TSP)). Results of particulate monitoring, presented in Table 2, revealed that PM 2.5 and PM 10 particle concentrations were well below the ASHRAE target concentrations in all areas monitored.

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**Table 2: Particle, Temperature, Relative Humidity, Carbon Dioxide and Carbon Monoxide
Measurements Collected on October 7, 2015 at Glenwood Middle School**

Location	Time	PM1 ($\mu\text{g}/\text{m}^3$)	PM2.5 ($\mu\text{g}/\text{m}^3$)	PM7 ($\mu\text{g}/\text{m}^3$)	PM10 ($\mu\text{g}/\text{m}^3$)	TSP ($\mu\text{g}/\text{m}^3$)	Temp (°F)	Rh (%)	CO (ppm)	CO ₂ (ppm)
CR 03	3:47 PM	1	2	4	4	4	72.4	56.4	0.4	1,493
CR 09	3:49 PM	0	1	2	2	4	72.5	62.7	0.4	2,975
CR 14	4:04 PM	0	0	1	1	1	73.9	47.1	0.4	477
CR 16	4:07 PM	0	1	1	1	5	73.9	46.2	0.4	505
CR 23	4:20 PM	0	1	1	1	1	72.8	46.4	0.4	448
CR 30	4:22 PM	0	0	1	1	1	72.8	46.9	0.1	492
CR 37	4:35 PM	0	0	2	3	5	73.1	54.6	0.2	487
CR 38	4:39 PM	0	1	8	9	10	73.2	53.4	0.4	424
PCR 60	5:05 PM	0	1	2	3	4	77.6	58.8	0.3	561
PCR 81	5:15 AM	0	0	0	1	1	73.2	55.6	0.4	571
Out 1	4:53 PM	0	0	3	3	5	76.2	51.3	0	386
Out 2 CY	4:51 PM	0	0	4	5	9	74.1	56	0.3	403

CR = Classroom; PCR = Portable Classroom; CY = Courtyard; Bold type indicates measurements above the guidelines

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B. Air Monitoring for Fungal Identification and Counting on October 7, 2015

In the absence of visual sources of mold amplification and growth in the classrooms, non-viable spore trap samples were collected from eight classrooms within the main school building (Classrooms 3, 9, 14, 16, 23, 30 and Music Room 37 and Art Room 38), two portable classrooms (60 and 81) and two outdoor locations to determine whether there was a difference between mold spore loads inside the building versus outside.

The spore trap samples were collected using AllergenCo-D cassettes attached to a Buck BioAire™ sampling pump calibrated to 15 liter per minute (LPM) air flow. The samples were collected for a period of ten minutes, the time period recommended for spore trap sampling in a clean indoor environment. The spore trap samples were submitted to Aerobiology Laboratory for analysis. The sample results are reported as the spores per cubic meter of air (spores per m³) of hyphal fragments and total fungal spores. Depending upon the morphology of the spores, they were counted by their unique genus or were grouped into spores exhibiting common characteristics (e.g., *Penicillium*/*Aspergillus* group). Tables 3 and 4 present the results of the spore trap samples collected at Glenwood Middle School on October 7, 2015.

Indoor spore counts ranged from 213 to 11,373 total spores per cubic meter of air (m³) in the main school building and from 5,707 to 14,120 in the portable classrooms on October 7, 2015. All indoor samples had total spore counts lower than the outdoor samples which ranged from 49,146 to 51,759 spores per m³. All individual spore types detected indoors were lower than the outdoor samples. Windows were not open during sampling.

No secondary colonizers including *Chaetomium* or *Stachybotrys* were detected in the indoor air samples. Hyphal elements were detected in six of the eight main building classrooms and in one of the two portable classrooms. Indoor samples ranged from 7 to 27 hyphal elements per m³, and all detected indoor hyphal elements were lower than the outdoor sample hyphal element counts ranging from 127 to 200 elements per m³. Variations in outdoor spore concentrations are a function of diurnal rhythms of spore release, weather-related factors (e.g., wind, rain, snow cover, temperature), and physical spatial factors. Certificates of analysis are included as Attachment B.

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Table 3: Results of Spore Trap Sampling in Selected Classrooms in Glenwood Middle School on October 7, 2015

Location	Outside near Room 61 (Out 1)	Outside in Courtyard (Out 2)	Room 3 (GM 03)	Room 9 (GM 09)	Room 14 (GM 14)	Room 16 (GM 16)	Room 23 (GM 23)	Room 30 (GM 30)	Music Class (GM 37)	Art Class (GM 38)
Spore Type	Spores/ m ³	Spores/ m ³	Spores/ m ³	Spores/ m ³	Spores/ m ³	Spores/ m ³	Spores/ m ³	Spores/ m ³	Spores/ m ³	Spores/ m ³
Alternaria	333	153	-	-	7	-	-	-	7	7
Ascospores	853	427	13	13	13	7	7	7	7	20
Basidiospores	35,928	31,537	547	167	2,720	2,720	2,027	60	4,053	9,227
Cercospora	53	67	-	-	-	-	-	-	-	7
Cladosporium	9,798	15,548	87	113	187	173	60	73	240	2,027
Clear brown	-	53	-	-	-	-	-	-	-	-
Curvularia	47	13	-	-	7	-	-	-	-	-
Drechslera/Bipolaris group	47	13	-	-	-	-	-	-	-	7
Epicoccum	253	367	-	7	7	13	-	-	7	7
Fusicladium	20	27	-	-	-	-	-	-	-	-
Hyphal Elements	127	200	-	13	7	7	-	7	27	13
Penicillium/Aspergillus	1,307	1,040	27	47	40	127	13	60	13	40
Pithomyces	40	67	-	7	-	-	7	-	20	7
Polythrincium	-	13	-	-	-	-	-	-	-	-
Pyricularia	-	20	-	-	-	-	-	-	-	-
Smuts, Periconia, myxomycetes	327	2133	-	20	20	7	-	7	47	13
Torula	-	47	-	-	-	-	-	-	-	-
Unknown	13	33	-	-	-	-	-	-	-	-
Total Fungi	49,146	51,759	673	387	3,007	3,053	2,113	213	4,420	11,373

Bold numbers represent spore concentrations above the outdoor counts. Dashes designate none detected.

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**Table 4: Results of Spore Trap Sampling in Portable Classrooms
at Glenwood Middle School on October 7, 2015**

Location	Outside near Room 61 (Out 1)	Outside in Courtyard (Out 2)	Room 60 (GM 60)	Room 81 (GM 81)
Spore Type	Spores/ m ³	Spores/ m ³	Spores/ m ³	Spores/ m ³
Alternaria	333	153	13	-
Ascospores	853	427	13	20
Basidiospores	35,928	31,537	10,987	4,267
Cercospora	53	67	-	-
Cladosporium	9,798	15,548	2,027	1,013
Clear brown	-	53	-	-
Curvularia	47	13	-	-
Drechslera/Bipolaris group	47	13	-	-
Epicoccum	253	367	-	-
Fusicladium	20	27	-	-
Hyphal Elements	127	200	-	20
Penicillium/ Aspergillus	1,307	1,040	1,013	160
Pithomyces	40	67	-	-
Polythrincium	-	13	-	-
Pyricularia	-	20	-	-
Smuts, Periconia, myxomycetes	327	2133	67	227
Torula	-	47	-	-
Unknown	13	33	-	-
Total Fungi	49,146	51,759	14,120	5,707

Bold numbers represent spore concentrations above the outdoor counts.
Dashes designate none detected.

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III. CONCLUSIONS AND RECOMMENDATIONS

Aria Environmental, Inc. (AE) was contracted by Howard County Public School System to perform spore trap sampling at the Glenwood Middle School at the end of August 2015 due to air quality concerns expressed by staff and parents and to monitor the school after a recent heating, ventilation and air-conditioning (HVAC) system upgrade. AE made measurements for temperature, humidity, carbon monoxide, carbon dioxide and particulate matter and collected microbial spore trap samples on October 7, 2015.

Thermal comfort parameters of temperature and humidity were measured and found to be mostly within the comfort ranges established by ASHRAE with a few exceptions slightly outside the comfort ranges. Carbon dioxide was elevated in two main building classrooms (3 and 9). Carbon monoxide and particulate matter measurements were within acceptable ranges for good indoor air quality in all areas.

Indoor spore counts ranged from 213 to 11,373 total spores per cubic meter of air (m³) in the main school building classrooms and from 5,707 to 14,120 in the portable classrooms on October 7, 2015. All indoor samples had total spore counts lower than the outdoor samples which ranged from 49,146 to 51,759 spores per m³, and all individual spore types detected indoors were lower than those detected outdoors. Indoor hyphal elements ranged from 7 to 27 elements per m³. All indoor hyphal element counts were lower than the outdoor samples ranging from 127 to 200 elements per m³. Windows were not open during sampling.

Table 5 presents a summary of spore sampling results to date in the 2015 - 2016 school year. The indoor and outdoor ranges demonstrate the variable nature of spore counts.

Table 5 – Summary of Spore Sampling Results to Date at GMS in the 2015-2016 School Year

Date	Indoor Spore Count Range Spores per m³	Outdoor Spore Count Range Spores per m³
August 25, 2015	1,787 to 8,807	34,001 to 37,316
August 27, 2015	400 to 747	9,433 to 10,960
September 2, 2015	1,860 to 7,960	33,294 to 37,306
September 9, 2015	1,053 to 3,173	21,890 to 31,876
September 16, 2015	447 to 3,493	17,543 to 20,287
September 24, 2015	273 to 2,480	24,680 to 25,020
September 30, 2015	1,267 to 12,767	55,396 to 69,421
October 7, 2015	213 to 14,120	49,146 to 51,759

Spore measurements collected in classrooms were generally acceptable compared to outdoor samples with outdoor total spore counts over 7 times higher than the indoor counts on average. Indoor sample total spore counts and individual spore counts were all lower than the outdoor sample counts with a few exceptions described above. Follow up air sampling is scheduled for October 14, 2015 and will be performed regularly in order to monitor changes in conditions affected by seasonal variations and the new HVAC system.

IV. LIMITATIONS

This report has been prepared for the exclusive use of the Howard County Public School System and/or their agents. This service has been performed in accordance with generally accepted environmental practices. No other warranty, expressed or implied, is made. Our conclusions and recommendations are based, in part, upon information provided to us by others and our site

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observations. We have not verified the completeness or accuracy of the information provided to us by others, unless otherwise noted. Our observations and recommendations are based upon conditions readily visible at the site at the time of our site visit, and upon current industry standards. Destructive sampling was not performed as part of this survey. No observations were made behind solid walls, ceilings or in pipe chases that weren't already openly visible.

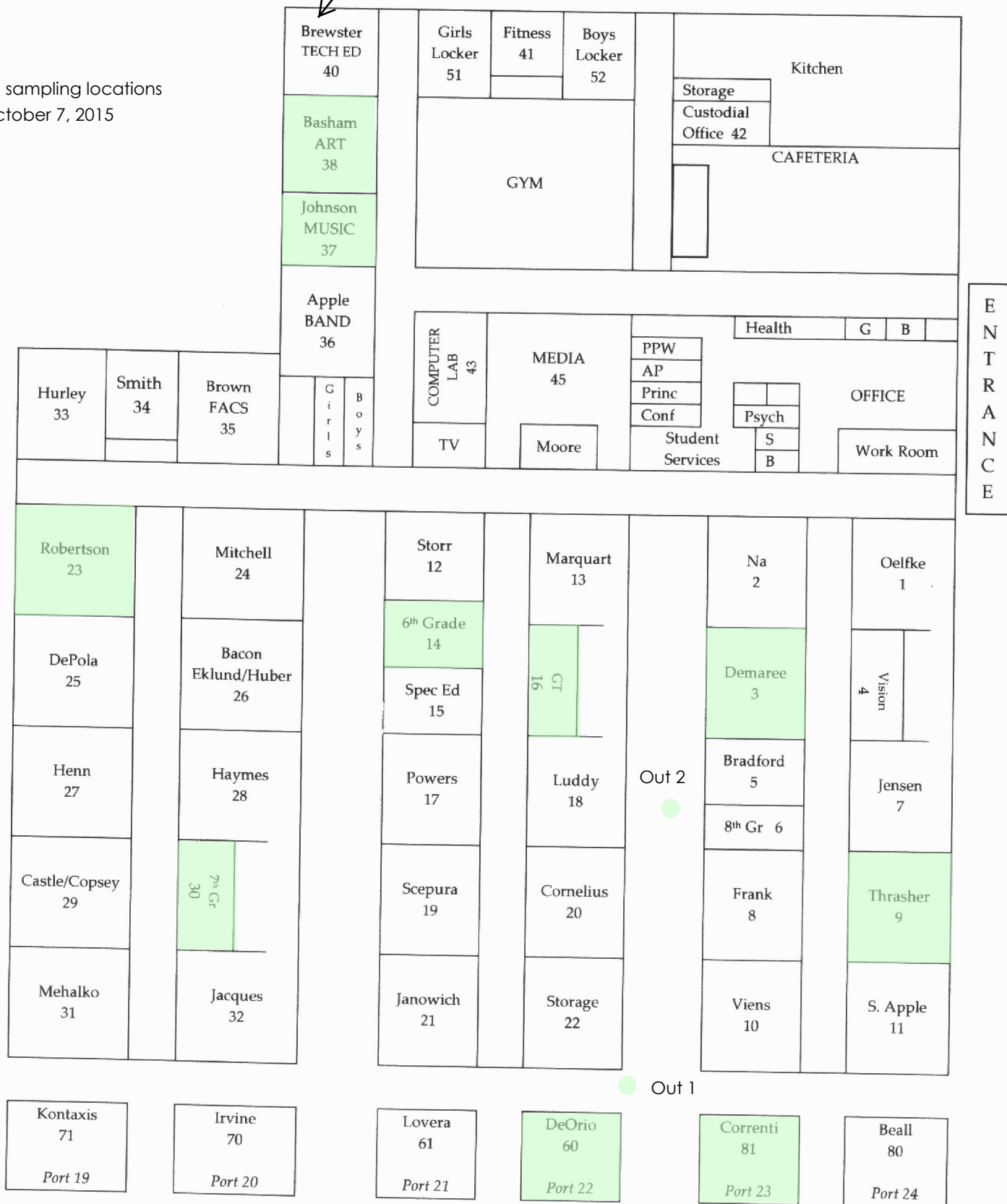
By virtue of providing the services described in this report, the preparer does not assume the responsibility of the person(s) in charge of the site, or otherwise undertake responsibility for reporting to any local, state, or federal public agencies any conditions at the site that may present a potential danger to public health, safety, or the environment. It is the Client's responsibility to notify the appropriate local, state, or federal public agencies as required by law, or otherwise to disclose, in a timely manner, any information that may be necessary to prevent any danger to public health, safety, or the environment. Under this scope of services, the preparer assumes no responsibility regarding response actions (e.g. abatement, removal, etc.) initiated as a result of these findings. Response actions are the sole responsibility of the Client and should be conducted in accordance with local, state, and/or federal requirements, and should be performed by appropriately licensed personnel as warranted.

Attachment A:

Building Layout and Sample Location Plan for October 7, 2015

Spore sampling locations
for October 7, 2015

TECH ED CLASSROOM AND LAB (39 and 40)



As of 8/02/13

Glenwood Middle School Floor Plan



Attachment B:

**Report of Analysis and Chain of Custody Forms
October 7, 2015**

Aria Environmental
P.O. Box 286
Woodbine, Maryland 21797
Attn: Julie Barth
Project: **PO# J15-876 GMS Glenwood MS**
Condition of Sample(s) Upon Receipt: Acceptable

Date Collected: 10/07/2015
Date Received: 10/09/2015
Date Analyzed: 10/15/2015
Date Reported: 10/15/2015
Project ID: 15026394
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1054 Spore Trap Analysis: SOP 3.8

Client Sample Number	GM-03				Out 2 CY			
Sample Location	Classroom 3				Outside Courtyard			
Sample Volume (L)	150				150			
Lab Sample Number	15026394-001				15026394-012			
Spore Identification	Raw Ct	spr/m ³	% Ttl	In/Out	Raw Ct	spr/m ³	% Ttl	In/Out
Alternaria	-	-	-	-	23	153	<1	-
ascospores	2	13	2	1/32	4	427	1	-
basidiospores	82	547	81	1/58	79	31537	61	-
Cercospora	-	-	-	-	10	67	<1	-
Cladosporium	13	87	13	1/179	73	15548	30	-
Clear brown	-	-	-	-	8	53	<1	-
Curvularia	-	-	-	-	2	13	<1	-
Drechslera/Bipolaris group	-	-	-	-	2	13	<1	-
Epicoccum	-	-	-	-	55	367	1	-
Fusicladium	-	-	-	-	4	27	<1	-
hyphal elements	-	-	-	-	30	200	<1	-
Penicillium/Aspergillus group	4	27	4	1/39	39	1040	2	-
Pithomyces	-	-	-	-	10	67	<1	-
Polythrincium	-	-	-	-	2	13	<1	-
Pyricularia	-	-	-	-	3	20	<1	-
Smuts,Periconia,Myxomycetes	-	-	-	-	40	2133	4	-
Torula	-	-	-	-	7	47	<1	-
Unknown	-	-	-	-	5	33	<1	-
	Debris Rating 3				Debris Rating 3			
Analytical Sensitivity	Analytical Sensitivity: 7 spr/m³				Analytical Sensitivity: 7 spr/m³			
Comments								
Total *See Footnotes	101	673	~100%	1/77	396	51759	~100%	-

Aria Environmental
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Condition of Sample(s) Upon Receipt: Acceptable

Date Collected: 10/07/2015
Date Received: 10/09/2015
Date Analyzed: 10/15/2015
Date Reported: 10/15/2015
Project ID: 15026394
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Client Sample Number	GM-09				Out 2 CY			
Sample Location	Classroom 9				Outside Courtyard			
Sample Volume (L)	150				150			
Lab Sample Number	15026394-002				15026394-012			
Spore Identification	Raw Ct	spr/m ³	% Ttl	In/Out	Raw Ct	spr/m ³	% Ttl	In/Out
Alternaria	-	-	-	-	23	153	<1	-
ascospores	2	13	3	1/32	4	427	1	-
basidiospores	25	167	43	1/189	79	31537	61	-
Cercospora	-	-	-	-	10	67	<1	-
Cladosporium	17	113	29	1/137	73	15548	30	-
Clear brown	-	-	-	-	8	53	<1	-
Curvularia	-	-	-	-	2	13	<1	-
Drechslera/Bipolaris group	-	-	-	-	2	13	<1	-
Epicoccum	1	7	2	1/55	55	367	1	-
Fusicladium	-	-	-	-	4	27	<1	-
hyphal elements	2	13	3	1/15	30	200	<1	-
Penicillium/Aspergillus group	7	47	12	1/22	39	1040	2	-
Pithomyces	1	7	2	1/10	10	67	<1	-
Polythrincium	-	-	-	-	2	13	<1	-
Pyricularia	-	-	-	-	3	20	<1	-
Smuts,Periconia,Myxomycetes	3	20	5	1/107	40	2133	4	-
Torula	-	-	-	-	7	47	<1	-
Unknown	-	-	-	-	5	33	<1	-
	Debris Rating 3				Debris Rating 3			
Analytical Sensitivity	Analytical Sensitivity: 7 spr/m³				Analytical Sensitivity: 7 spr/m³			
Comments								
Total *See Footnotes	58	387	~100%	1/134	396	51759	~100%	-

Aria Environmental
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Condition of Sample(s) Upon Receipt: Acceptable

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Date Received: 10/09/2015
Date Analyzed: 10/15/2015
Date Reported: 10/15/2015
Project ID: 15026394
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Client Sample Number	GM-14				Out 2 CY			
Sample Location	Lounge 14				Outside Courtyard			
Sample Volume (L)	150				150			
Lab Sample Number	15026394-003				15026394-012			
Spore Identification	Raw Ct	spr/m ³	% Ttl	In/Out	Raw Ct	spr/m ³	% Ttl	In/Out
Alternaria	1	7	<1	1/23	23	153	<1	-
ascospores	2	13	<1	1/32	4	427	1	-
basidiospores	51	2720	90	1/12	79	31537	61	-
Cercospora	-	-	-	-	10	67	<1	-
Cladosporium	28	187	6	1/83	73	15548	30	-
Clear brown	-	-	-	-	8	53	<1	-
Curvularia	1	7	<1	1/2	2	13	<1	-
Drechslera/Bipolaris group	-	-	-	-	2	13	<1	-
Epicoccum	1	7	<1	1/55	55	367	1	-
Fusicladium	-	-	-	-	4	27	<1	-
hyphal elements	1	7	<1	1/30	30	200	<1	-
Penicillium/Aspergillus group	6	40	1	1/26	39	1040	2	-
Pithomyces	-	-	-	-	10	67	<1	-
Polythrincium	-	-	-	-	2	13	<1	-
Pyricularia	-	-	-	-	3	20	<1	-
Smuts,Periconia,Myxomycetes	3	20	1	1/107	40	2133	4	-
Torula	-	-	-	-	7	47	<1	-
Unknown	-	-	-	-	5	33	<1	-
	Debris Rating 2				Debris Rating 3			
Analytical Sensitivity	Analytical Sensitivity: 7 spr/m ³				Analytical Sensitivity: 7 spr/m ³			
Comments								
Total *See Footnotes	94	3007	~100%	1/17	396	51759	~100%	-

Aria Environmental
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Condition of Sample(s) Upon Receipt: Acceptable

Date Collected: 10/07/2015
Date Received: 10/09/2015
Date Analyzed: 10/15/2015
Date Reported: 10/15/2015
Project ID: 15026394

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Client Sample Number	GM-16				Out 2 CY			
Sample Location	Classroom 16				Outside Courtyard			
Sample Volume (L)	150				150			
Lab Sample Number	15026394-004				15026394-012			
Spore Identification	Raw Ct	spr/m ³	% Ttl	In/Out	Raw Ct	spr/m ³	% Ttl	In/Out
Alternaria	-	-	-	-	23	153	<1	-
ascospores	1	7	<1	1/64	4	427	1	-
basidiospores	51	2720	89	1/12	79	31537	61	-
Cercospora	-	-	-	-	10	67	<1	-
Cladosporium	26	173	6	1/90	73	15548	30	-
Clear brown	-	-	-	-	8	53	<1	-
Curvularia	-	-	-	-	2	13	<1	-
Drechslera/Bipolaris group	-	-	-	-	2	13	<1	-
Epicoccum	2	13	<1	1/28	55	367	1	-
Fusicladium	-	-	-	-	4	27	<1	-
hyphal elements	1	7	<1	1/30	30	200	<1	-
Penicillium/Aspergillus group	19	127	4	1/8	39	1040	2	-
Pithomyces	-	-	-	-	10	67	<1	-
Polythrincium	-	-	-	-	2	13	<1	-
Pyricularia	-	-	-	-	3	20	<1	-
Smuts,Periconia,Myxomycetes	1	7	<1	1/320	40	2133	4	-
Torula	-	-	-	-	7	47	<1	-
Unknown	-	-	-	-	5	33	<1	-
	Debris Rating 3				Debris Rating 3			
Analytical Sensitivity	Analytical Sensitivity: 7 spr/m³				Analytical Sensitivity: 7 spr/m³			
Comments								
Total *See Footnotes	101	3053	~100%	1/17	396	51759	~100%	-

Aria Environmental
P.O. Box 286
Woodbine, Maryland 21797
Attn: Julie Barth
Project: **PO# J15-876 GMS Glenwood MS**
Condition of Sample(s) Upon Receipt: Acceptable

Date Collected: 10/07/2015
Date Received: 10/09/2015
Date Analyzed: 10/15/2015
Date Reported: 10/15/2015
Project ID: 15026394
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Client Sample Number	GM-23				Out 2 CY			
Sample Location	Classroom 23				Outside Courtyard			
Sample Volume (L)	150				150			
Lab Sample Number	15026394-005				15026394-012			
Spore Identification	Raw Ct	spr/m ³	% Ttl	In/Out	Raw Ct	spr/m ³	% Ttl	In/Out
Alternaria	-	-	-	-	23	153	<1	-
ascospores	1	7	<1	1/64	4	427	1	-
basidiospores	38	2027	96	1/16	79	31537	61	-
Cercospora	-	-	-	-	10	67	<1	-
Cladosporium	9	60	3	1/259	73	15548	30	-
Clear brown	-	-	-	-	8	53	<1	-
Curvularia	-	-	-	-	2	13	<1	-
Drechslera/Bipolaris group	-	-	-	-	2	13	<1	-
Epicoccum	-	-	-	-	55	367	1	-
Fusicladium	-	-	-	-	4	27	<1	-
hyphal elements	-	-	-	-	30	200	<1	-
Penicillium/Aspergillus group	2	13	1	1/78	39	1040	2	-
Pithomyces	1	7	<1	1/10	10	67	<1	-
Polythrincium	-	-	-	-	2	13	<1	-
Pyricularia	-	-	-	-	3	20	<1	-
Smuts,Periconia,Myxomycetes	-	-	-	-	40	2133	4	-
Torula	-	-	-	-	7	47	<1	-
Unknown	-	-	-	-	5	33	<1	-
	Debris Rating 2				Debris Rating 3			
Analytical Sensitivity	Analytical Sensitivity: 7 spr/m ³				Analytical Sensitivity: 7 spr/m ³			
Comments								
Total *See Footnotes	51	2113	~100%	1/24	396	51759	~100%	-

Aria Environmental
P.O. Box 286
Woodbine, Maryland 21797
Attn: Julie Barth
Project: **PO# J15-876 GMS Glenwood MS**
Condition of Sample(s) Upon Receipt: Acceptable

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Date Received: 10/09/2015
Date Analyzed: 10/15/2015
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Project ID: 15026394

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Client Sample Number	GM-30				Out 2 CY			
Sample Location	Lounge 30				Outside Courtyard			
Sample Volume (L)	150				150			
Lab Sample Number	15026394-006				15026394-012			
Spore Identification	Raw Ct	spr/m ³	% Ttl	In/Out	Raw Ct	spr/m ³	% Ttl	In/Out
Alternaria	-	-	-	-	23	153	<1	-
ascospores	1	7	3	1/64	4	427	1	-
basidiospores	9	60	28	1/526	79	31537	61	-
Cercospora	-	-	-	-	10	67	<1	-
Cladosporium	11	73	34	1/212	73	15548	30	-
Clear brown	-	-	-	-	8	53	<1	-
Curvularia	-	-	-	-	2	13	<1	-
Drechslera/Bipolaris group	-	-	-	-	2	13	<1	-
Epicoccum	-	-	-	-	55	367	1	-
Fusicladium	-	-	-	-	4	27	<1	-
hyphal elements	1	7	3	1/30	30	200	<1	-
Penicillium/Aspergillus group	9	60	28	1/17	39	1040	2	-
Pithomyces	-	-	-	-	10	67	<1	-
Polythrincium	-	-	-	-	2	13	<1	-
Pyricularia	-	-	-	-	3	20	<1	-
Smuts,Periconia,Myxomycetes	1	7	3	1/320	40	2133	4	-
Torula	-	-	-	-	7	47	<1	-
Unknown	-	-	-	-	5	33	<1	-
	Debris Rating 2				Debris Rating 3			
Analytical Sensitivity	Analytical Sensitivity: 7 spr/m³				Analytical Sensitivity: 7 spr/m³			
Comments								
Total *See Footnotes	32	213	~100%	1/243	396	51759	~100%	-

Aria Environmental
P.O. Box 286
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Attn: Julie Barth
Project: **PO# J15-876 GMS Glenwood MS**
Condition of Sample(s) Upon Receipt: Acceptable

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Date Received: 10/09/2015
Date Analyzed: 10/15/2015
Date Reported: 10/15/2015
Project ID: 15026394
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Client Sample Number	GM-37				Out 2 CY			
Sample Location	Music Classroom				Outside Courtyard			
Sample Volume (L)	150				150			
Lab Sample Number	15026394-007				15026394-012			
Spore Identification	Raw Ct	spr/m ³	% Ttl	In/Out	Raw Ct	spr/m ³	% Ttl	In/Out
Alternaria	1	7	<1	1/23	23	153	<1	-
ascospores	1	7	<1	1/64	4	427	1	-
basidiospores	76	4053	92	1/8	79	31537	61	-
Cercospora	-	-	-	-	10	67	<1	-
Cladosporium	36	240	5	1/65	73	15548	30	-
Clear brown	-	-	-	-	8	53	<1	-
Curvularia	-	-	-	-	2	13	<1	-
Drechslera/Bipolaris group	-	-	-	-	2	13	<1	-
Epicoccum	1	7	<1	1/55	55	367	1	-
Fusicladium	-	-	-	-	4	27	<1	-
hyphal elements	4	27	1	1/8	30	200	<1	-
Penicillium/Aspergillus group	2	13	<1	1/78	39	1040	2	-
Pithomyces	3	20	<1	1/3	10	67	<1	-
Polythrincium	-	-	-	-	2	13	<1	-
Pyricularia	-	-	-	-	3	20	<1	-
Smuts,Periconia,Myxomycetes	7	47	1	1/46	40	2133	4	-
Torula	-	-	-	-	7	47	<1	-
Unknown	-	-	-	-	5	33	<1	-
	Debris Rating 3				Debris Rating 3			
Analytical Sensitivity	Analytical Sensitivity: 7 spr/m ³				Analytical Sensitivity: 7 spr/m ³			
Comments								
Total *See Footnotes	131	4420	~100%	1/12	396	51759	~100%	-

Aria Environmental
P.O. Box 286
Woodbine, Maryland 21797
Attn: Julie Barth
Project: **PO# J15-876 GMS Glenwood MS**
Condition of Sample(s) Upon Receipt: Acceptable

Date Collected: 10/07/2015
Date Received: 10/09/2015
Date Analyzed: 10/15/2015
Date Reported: 10/15/2015
Project ID: 15026394
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Client Sample Number	GM-38				Out 2 CY			
Sample Location	Art Classroom				Outside Courtyard			
Sample Volume (L)	150				150			
Lab Sample Number	15026394-008				15026394-012			
Spore Identification	Raw Ct	spr/m ³	% Ttl	In/Out	Raw Ct	spr/m ³	% Ttl	In/Out
Alternaria	1	7	<1	1/23	23	153	<1	-
ascospores	3	20	<1	1/21	4	427	1	-
basidiospores	173	9227	81	1/3	79	31537	61	-
Cercospora	1	7	<1	1/10	10	67	<1	-
Cladosporium	38	2027	18	1/8	73	15548	30	-
Clear brown	-	-	-	-	8	53	<1	-
Curvularia	-	-	-	-	2	13	<1	-
Drechslera/Bipolaris group	1	7	<1	1/2	2	13	<1	-
Epicoccum	1	7	<1	1/55	55	367	1	-
Fusicladium	-	-	-	-	4	27	<1	-
hyphal elements	2	13	<1	1/15	30	200	<1	-
Penicillium/Aspergillus group	6	40	<1	1/26	39	1040	2	-
Pithomyces	1	7	<1	1/10	10	67	<1	-
Polythrincium	-	-	-	-	2	13	<1	-
Pyricularia	-	-	-	-	3	20	<1	-
Smuts,Periconia,Myxomycetes	2	13	<1	1/160	40	2133	4	-
Torula	-	-	-	-	7	47	<1	-
Unknown	-	-	-	-	5	33	<1	-
	Debris Rating 3				Debris Rating 3			
Analytical Sensitivity	Analytical Sensitivity: 7 spr/m ³				Analytical Sensitivity: 7 spr/m ³			
Comments								
Total *See Footnotes	229	11373	~100%	1/5	396	51759	~100%	-

Aria Environmental
P.O. Box 286
Woodbine, Maryland 21797
Attn: Julie Barth
Project: **PO# J15-876 GMS Glenwood MS**
Condition of Sample(s) Upon Receipt: Acceptable

Date Collected: 10/07/2015
Date Received: 10/09/2015
Date Analyzed: 10/15/2015
Date Reported: 10/15/2015
Project ID: 15026394
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Client Sample Number	GM-60				Out 2 CY			
Sample Location	Portable Classroom 61				Outside Courtyard			
Sample Volume (L)	150				150			
Lab Sample Number	15026394-009				15026394-012			
Spore Identification	Raw Ct	spr/m ³	% Ttl	In/Out	Raw Ct	spr/m ³	% Ttl	In/Out
Alternaria	2	13	<1	1/12	23	153	<1	-
ascospores	2	13	<1	1/32	4	427	1	-
basidiospores	103	10987	78	1/3	79	31537	61	-
Cercospora	-	-	-	-	10	67	<1	-
Cladosporium	38	2027	14	1/8	73	15548	30	-
Clear brown	-	-	-	-	8	53	<1	-
Curvularia	-	-	-	-	2	13	<1	-
Drechslera/Bipolaris group	-	-	-	-	2	13	<1	-
Epicoccum	-	-	-	-	55	367	1	-
Fusicladium	-	-	-	-	4	27	<1	-
hyphal elements	-	-	-	-	30	200	<1	-
Penicillium/Aspergillus group	152	1013	7	1/1	39	1040	2	-
Pithomyces	-	-	-	-	10	67	<1	-
Polythrincium	-	-	-	-	2	13	<1	-
Pyricularia	-	-	-	-	3	20	<1	-
Smuts,Periconia,Myxomycetes	10	67	<1	1/32	40	2133	4	-
Torula	-	-	-	-	7	47	<1	-
Unknown	-	-	-	-	5	33	<1	-
	Debris Rating 2				Debris Rating 3			
Analytical Sensitivity	Analytical Sensitivity: 7 spr/m ³				Analytical Sensitivity: 7 spr/m ³			
Comments								
Total *See Footnotes	307	14120	~100%	1/4	396	51759	~100%	-

Aria Environmental
P.O. Box 286
Woodbine, Maryland 21797
Attn: Julie Barth
Project: **PO# J15-876 GMS Glenwood MS**
Condition of Sample(s) Upon Receipt: Acceptable

Date Collected: 10/07/2015
Date Received: 10/09/2015
Date Analyzed: 10/15/2015
Date Reported: 10/15/2015
Project ID: 15026394

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Client Sample Number	GM-81				Out 2 CY			
Sample Location	Portable Classroom 70				Outside Courtyard			
Sample Volume (L)	150				150			
Lab Sample Number	15026394-010				15026394-012			
Spore Identification	Raw Ct	spr/m ³	% Ttl	In/Out	Raw Ct	spr/m ³	% Ttl	In/Out
Alternaria	-	-	-	-	23	153	<1	-
ascospores	3	20	<1	1/21	4	427	1	-
basidiospores	40	4267	75	1/7	79	31537	61	-
Cercospora	-	-	-	-	10	67	<1	-
Cladosporium	152	1013	18	1/15	73	15548	30	-
Clear brown	-	-	-	-	8	53	<1	-
Curvularia	-	-	-	-	2	13	<1	-
Drechslera/Bipolaris group	-	-	-	-	2	13	<1	-
Epicoccum	-	-	-	-	55	367	1	-
Fusicladium	-	-	-	-	4	27	<1	-
hyphal elements	3	20	<1	1/10	30	200	<1	-
Penicillium/Aspergillus group	24	160	3	1/7	39	1040	2	-
Pithomyces	-	-	-	-	10	67	<1	-
Polythrincium	-	-	-	-	2	13	<1	-
Pyricularia	-	-	-	-	3	20	<1	-
Smuts,Periconia,Myxomycetes	34	227	4	1/9	40	2133	4	-
Torula	-	-	-	-	7	47	<1	-
Unknown	-	-	-	-	5	33	<1	-
	Debris Rating 3				Debris Rating 3			
Analytical Sensitivity	Analytical Sensitivity: 7 spr/m ³				Analytical Sensitivity: 7 spr/m ³			
Comments								
Total *See Footnotes	256	5707	~100%	1/9	396	51759	~100%	-

Aria Environmental
P.O. Box 286
Woodbine, Maryland 21797
Attn: Julie Barth
Project: **PO# J15-876 GMS Glenwood MS**
Condition of Sample(s) Upon Receipt: Acceptable

Date Collected: 10/07/2015
Date Received: 10/09/2015
Date Analyzed: 10/15/2015
Date Reported: 10/15/2015
Project ID: 15026394

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Client Sample Number	Out 1				Out 2 CY			
Sample Location	Outside Near PCR 61				Outside Courtyard			
Sample Volume (L)	150				150			
Lab Sample Number	15026394-011				15026394-012			
Spore Identification	Raw Ct	spr/m ³	% Ttl	In/Out	Raw Ct	spr/m ³	% Ttl	In/Out
Alternaria	50	333	1	2/1	23	153	<1	-
ascospores	8	853	2	2/1	4	427	1	-
basidiospores	90	35928	73	1/1	79	31537	61	-
Cercospora	8	53	<1	1/1	10	67	<1	-
Cladosporium	46	9798	20	1/2	73	15548	30	-
Clear brown	-	-	-	-	8	53	<1	-
Curvularia	7	47	<1	4/1	2	13	<1	-
Drechslera/Bipolaris group	7	47	<1	4/1	2	13	<1	-
Epicoccum	38	253	1	1/1	55	367	1	-
Fusicladium	3	20	<1	1/1	4	27	<1	-
hyphal elements	19	127	<1	1/2	30	200	<1	-
Penicillium/Aspergillus group	49	1307	3	1/1	39	1040	2	-
Pithomyces	6	40	<1	1/2	10	67	<1	-
Polythrincium	-	-	-	-	2	13	<1	-
Pyricularia	-	-	-	-	3	20	<1	-
Smuts,Periconia,Myxomycetes	49	327	1	1/7	40	2133	4	-
Torula	-	-	-	-	7	47	<1	-
Unknown	2	13	<1	1/3	5	33	<1	-
	Debris Rating 3				Debris Rating 3			
Analytical Sensitivity	Analytical Sensitivity: 7 spr/m ³				Analytical Sensitivity: 7 spr/m ³			
Comments								
Total *See Footnotes	382	49146	~100%	1/1	396	51759	~100%	-

Aria Environmental
P.O. Box 286
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Footnotes and Additional Report Information

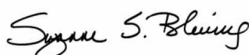
Debris Rating Table

1	Minimal (<5%) particulate present	Reported values are minimally affected by particulate load.
2	5% to 25% of the trace occluded with particulate	Negative bias is expected. The degree of bias increases directly with the percent of the trace that is occluded.
3	26% to 75% of the trace occluded with particulate	Negative bias is expected. The degree of bias increases directly with the percent of the trace that is occluded.
4	75% to 90% of the trace occluded with particulate	Negative bias is expected. The degree of bias increases directly with the percent of the trace that is occluded.
5	Greater than 90% of the trace occluded with particulate	Quantification not possible due to large negative bias. A new sample should be collected at a shorter time interval or other measures taken to reduce particulate load.

1. Penicillium/Aspergillus group spores are characterized by their small size, round to ovoid shape, being unicellular, and usually colorless to lightly pigmented. There are numerous genera of fungi whose spore morphology is similar to that of the Penicillium/Aspergillus type. Two common examples would be Paecilomyces and Acremonium. Although the majority of spores placed in this group are Penicillium, Aspergillus, or a combination of both. Keep in mind that these are not the only two possibilities.
2. Ascospores are sexually produced fungal spores formed within an ascus. An ascus is a sac-like structure designed to discharge the ascospores into the environment, e.g. Ascobolus.
3. Basidiospores are typically blown indoors from outdoors and rarely have an indoor source. However, in certain situations a high basidiospore count indoors may be indicative of a wood decay problem or wet soil.
4. The colorless group contains colorless spores which were unidentifiable to a specific genus. Examples of this group include Acremonium, Aphanocladium, Beauveria, Chrysosporium, Engyodontium microconidia, yeast, some arthrospores, as well as many others.
5. Hyphae are the vegetative mode of fungi. Hyphal elements are fragments of individual Hyphae. They can break apart and become airborne much like spores and are potentially allergenic. A mass of hyphal elements is termed the mycelium. Hyphae in high concentration may be indicative of colonization.
6. Dash (-) in this report, under raw count column means 'not detected (ND)'; otherwise 'not applicable' (NA).
7. The positive-hole correction factor is a statistical tool which calculates a probable count from the raw count, taking into consideration that multiple particles can impact on the same hole; for this reason the sum of the calculated counts may be less than the positive hole corrected total.
8. Due to rounding totals may not equal 100%.
9. Analytical Sensitivity for each spores is different for Non-viable sample when the spores are read at different percentage.
10. Minimum Reporting Limits (MRL) for BULKS, DUSTS, SWABS, and WATER samples are a calculation based on the sample size and the dilution plate on which the organism was counted. Results are a compilation of counts taken from multiple dilutions and multiple medias. This means that every genus of fungi or bacteria recovered can be counted on the plate on which it is best represented.
11. If the final quantitative result is corrected for contamination based on the blank, the blank correction is stated in the sample comments section of the report.
12. Analysis conducted on non-viable spore traps is completed using Indoor Environmental Standards Organization (IESO) Standard 2210.
13. The results in this report are related to this project and these samples only.
14. For samples with an air volume of < 100L, the number of significant figures in the result should be considered (2) two. For samples with air volumes between 100-999L, the number of significant figures in the result should be considered (3) three. For example, a sample with a result of 55,443 spr/m³ from a 75L sample using significant figures should be considered 55,000. The same result of 55,443 from a 150L sample using significant figures should be considered 55,400 spr/m³.
15. If the In/Out ratio is greater than 100 times it is indicated >100/1, rather than showing the real value.

Terminology Used in Direct Exam Reporting

Conidiophores are a type of modified hyphae from which spores are born. When seen on a surface sample in moderate to numerous concentrations they may be indicative of fungal growth.



Suzanne S. Blevins, B.S., SM (ASCP)
Laboratory Director

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15026394



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NVLAP Lab Code 200860-0 (CO)
NVLAP Lab Code 200829-0 (VA)
NVLAP Lab Code 500097-0 (AZ)



LAB #192683 (CO)
LAB #102977 (GA)
LAB #163063 (VA)
LAB #210229 (AZ)

AZ, CO, GA, VA, NJ

Aerobiology Client Aria Environmental, Inc.		Collected By/Date: 10/07/15		Relinquished By/Date: 10/08/15	
Field Contact	Julie Barth	Relinquished By/Date: 10/08/15		Received By/Date: CM 10/9/2015	
Reporting Address	PO Box 286, Woodbine, MD 21797	Sampler Type		Sample Aire	Other
Billing Address	SAME	Andersen SAS		AeroTrap	AllergencoD BioCulture
Phone/Fax	410-549-5774/410-549-4488	PO#/Job#: J15-876 GMS			
Reporting Email (s)	jbarth@ariaenviro.com	Project Name: Glenwood MS			
Routine	<input checked="" type="radio"/> 24 Hour <input type="radio"/> Same Day <input type="radio"/> 4 Hour <input type="radio"/> 2 Hour	5 Day (Asbestos Only)		Notes:	
SAMPLING LOCATION ZIP CODE 21738		CC Info:			

Sample No.	Test Code	Sample Location	Total Volume/Area
1 GM-03	1054	Classroom 3	150 L
2 GM-09	1054	Classroom 9	150 L
3 GM-14	1054	Lounge 14	150 L
4 GM-16	1054	Classroom 16	150 L
5 GM-23	1054	Classroom 23	150 L
6 GM-30	1054	Lounge 30	150 L
7 GM-37	1054	Music Classroom	150 L
8 GM-38	1054	Art Classroom	150 L
9 GM-60	1054	Portable Classroom 61	150 L
10 GM-81	1054	Portable Classroom 70	150 L
11 Out 1	1054	Outside near PCR 61	150 L
12 Out 2 CY	1054	Outside Courtyard	150 L
13			
14			

1054	Direct, Non-viable Spore Trap	1015	Culture - WATER Legionella
1051	Direct, Qualitative- Swab/Tape	1017	Culture - SWAB Legionella
1050	Direct, Qualitative- Bulk	1010	WATER - Potable - E. coli/total coliforms
1005	AIR Culture - Bacterial Count w/ ID's	1012	SWAB - E. coli/total coliforms
1030	AIR Culture - Fungal Count w/ ID's	1028	Sewage Screen (E. coli/Enterococcus/fecal coliforms)
1006	SWAB Culture - Bacterial Count w/ ID's	2056	Heterotrophic Plate Count
1031	SWAB Culture - Fungal Count w/ ID's	3001	ASBESTOS - Point count
1008	BULK Culture - Bacterial Count w/ ID's	3002	ASBESTOS - PLM Analysis
1033	BULK Culture - Fungal Count w/ ID's	3003	ASBESTOS - Particle characterization
1007	WATER Culture - Bacterial Count w/ID's	3004	ASBESTOS - PCM Analysis

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 43760 Trade Center Place, Suite 100, Dulles, VA 20166 - (877) 648-9150 Fax (877) 598-0946 - email: info@aerobiology.net
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Revision 10