

**ADDENDUM 4 TO THE
INDOOR ENVIRONMENTAL QUALITY INVESTIGATION
FOR
GLENWOOD MIDDLE SCHOOL**

PREPARED FOR:

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

PREPARED BY:

**ARIA ENVIRONMENTAL, INC.
PO BOX 286
WOODBINE, MD 21797**

SEPTEMBER 10, 2014 ✓

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Reviewed by:



Michele M. Twilley, DrPH, CIH
Aria Environmental, Inc.



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EXECUTIVE SUMMARY

Aria Environmental, Inc. (AEI) was contracted by Howard County Public School System to perform an indoor environmental quality investigation of the Glenwood Middle School at the end of August 2013. A complaint was lodged by one of the teachers about high humidity, mold and adverse health effects experienced while she is in the school. AEI conducted interviews with Glenwood Middle School faculty, staff and administrators, Howard County Public School System facilities and building services personnel and Global Facilities Solutions (a mechanical engineering consultant). AEI also performed visual inspections of the classrooms, boiler room and crawlspace; made measurements for temperature, humidity, carbon monoxide, carbon dioxide, particulate matter and fungal identification and counting; and has attended meetings with HCPSS and Global Facilities Solutions. AEI performed additional air monitoring for the presence of mold spores at Glenwood Middle School on December 17, 2013, March 20, 2014 and June 11, 2014 and those results are reported in Addenda 1 - 3. HCPSS requested additional air monitoring for the presence of mold spores. This addendum report presents the results of air sampling for fungi and indoor air quality measurements for temperature, relative humidity, carbon monoxide, carbon dioxide and particulate matter made on July 31, 2014. Methods used in the investigation and background information are presented in the November 1, 2013 report.



I. BACKGROUND

A representative from Aria Environmental, Inc. (AEI) visited Glenwood Middle School on July 31, 2014 to perform additional air monitoring in response to an ongoing indoor air quality complaint at the school. Indoor air samples were collected from classrooms 7, 11, 15, 20, 23, 26, 29, 31, Art Room 38 and in the crawlspace accessed from the administrative work room. One outdoor air sample was also collected for comparison purposes. The background associated with the complaint is detailed in the Indoor Environmental Quality Investigation report dated November 1, 2013. This monitoring was performed to evaluate improvements to the outdoor air vents.

The school did not appear to be under the influence of strong negative pressure as evidenced by the ease of opening and closing doors to the outside. No measurements were made to determine pressurization of the school or air flow patterns. There was no evidence of mold growth observed in the classrooms. Weather on the day of monitoring was warm and humid.

II. OBSERVATIONS AND MEASUREMENTS

A. Observations and Measurements on July 31, 2014

The room air temperature measured between 10:20 AM and 12:58 PM ranged from 70.3 to 73.2°F with an average of 71.8°F. The temperatures are considered acceptable for summer thermal comfort. The indoor relative humidity ranged from 57.2 to 72.7 percent. 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

The outside temperature at 12:16 PM was 84.1°F and the outdoor relative humidity was 45.6%. No windows or doors were observed to be open during the monitoring period. The U.S. Environmental Protection Agency (EPA) recommends maintaining indoor relative humidity below 60% and ideally between 30 and 50%. The indoor humidity measurements were mostly above what is recommended for thermal comfort. The school was on a summer cooling schedule at the time of monitoring.

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 unoccupied. Carbon dioxide concentrations ranged from 342 to 439 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 was 216 ppm. Carbon dioxide concentrations were within the comfort parameters established by ASHRAE. Carbon monoxide is mainly attributed to incomplete combustion. Concentrations of CO ranged from 1.7 to 3.0 ppm



indoors and the outdoor concentration was 0.0 ppm. 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.

The visual inspection of the rooms visited on July 31, 2014 did not reveal any obvious sources of water damage, moisture or mold growth. The slightly chemical type odor previously observed in Classroom 15 was still noticeable. There was no obvious source of this odor. Ventilators were operating in cooling mode in all classrooms. Room 11 felt damp and construction paper taped to the wall had fallen down presumably due to moisture on the walls.



Table 2: Particle, Temperature, Relative Humidity, Carbon Dioxide and Carbon Monoxide Measurements Collected on July 31, 2014 at Glenwood Middle School

Location	Time	PM1 (mg/m ³)	PM2.5 (mg/m ³)	PM7 (mg/m ³)	PM10 (mg/m ³)	TSP (mg/m ³)	Temp (°F)	Rh (%)	CO (ppm)	CO ₂ (ppm)
Room 31	10:20 AM	0.000	0.000	0.001	0.001	0.002	71.9	63.5	1.7	411
Room 29	10:42 AM	0.000	0.000	0.001	0.001	0.001	70.3	68.2	2.7	439
Room 23	10:50 AM	0.001	0.001	0.003	0.003	0.005	71.4	72.7	3	342
Room 26	11:24 AM	0.000	0.000	0.001	0.001	0.002	71.3	68.4	2.2	388
Room 38	11:05 AM	0.001	0.001	0.003	0.003	0.004	71.4	69.3	2.3	344
Room 15	11:36 AM	0.000	0.001	0.001	0.001	0.001	72	66.7	1.7	362
Room 20	11:50 AM	0.000	0.000	0.002	0.003	0.006	73.2	64.4	1.7	363
Room 11	12:07 PM	0.001	0.002	0.004	0.005	0.006	72.9	68.7	2	344
Room 7	12:23 PM	0.000	0.001	0.003	0.003	0.004	71.8	57.2	1.7	372
Crawlspace (work room)	12:58 PM	0.000	0.001	0.001	0.001	0.001	70.5	86	3	484
Outdoors	12:16 PM	0.001	0.002	0.005	0.006	0.009	84.1	45.6	0	216



B. Air Monitoring for Fungal Identification and Counting on July 31, 2014

In the absence of visual sources of mold amplification and growth in the classrooms, non-viable spore trap samples were collected from nine classrooms (classrooms 7, 11, 15, 20, 23, 26, 29, 31 and 38), one crawlspace and one outdoor location to determine whether there was a difference between mold spore loads inside the building versus outside. Classrooms 7, 15, 26, and 29 are complaint areas and classrooms 11, 20, 23, 31 and 38 are non-complaint areas.

The spore trap samples were collected using AllergenCo-D cassettes attached to a sampling pump calibrated to 15 liter per minute (LPM) air flow. The samples were collected for a period of 10 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). Table 3 presents the results of the spore trap samples collected at Glenwood Middle School on July 31, 2014.



**Table 3 - Results of Spore Trap Sampling in Selected Classrooms in
Glenwood Middle School on July 31, 2014**

Location	Outside	Room 31	Room 29	Room 23	Room 38	Room 26	Room 15	Room 20	Room 11	Room 7	Crawlspace
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	Spores/ m ³
<i>Alternaria</i>	33	-	-	13	-	-	-	-	7	-	-
<i>Ascospores</i>	853	40	7	193	93	20	213	7	320	20	-
<i>Basidiospores</i>	32,735	533	87	907	420	333	1947	127	7,467	2,560	7
<i>Cercospora</i>	7	-	-	-	-	-	-	-	-	-	-
<i>Cladosporium</i>	1,493	53	13	653	140	27	587	247	2,133	1,333	-
<i>Curvularia</i>	13	-	-	-	-	-	7	-	-	-	-
<i>Drechslera/ Bipolaris</i>	7	-	-	-	-	-	-	-	-	-	-
<i>Epicoecum</i>	53	-	-	-	-	-	-	-	-	-	-
<i>Fusicladium</i>	20	-	-	-	-	-	-	-	-	-	-
<i>Hyphal Elements</i>	-	7	-	-	-	-	13	-	-	-	-
<i>Oidium</i>	7	-	-	-	-	-	-	-	-	-	-
<i>Penicillium/ Aspergillus</i>	260	707	273	740	347	320	453	33	133	13	-
<i>Pestalotiopsis</i>	7	-	-	-	-	-	-	-	-	-	-
<i>Pithomyces</i>	67	-	-	-	-	-	7	-	7	-	-
<i>Polythrincium</i>	20	-	-	-	-	-	-	-	-	-	-
<i>Pyricularia</i>	7	-	-	-	-	-	-	-	-	-	-
<i>Smuts, Periconia, myxomycetes</i>	27	13	20	27	13	20	33	53	7	-	-
<i>Spegazzinia</i>	7	-	-	-	-	-	-	-	-	-	-
<i>Torula</i>	-	-	-	-	-	-	7	-	-	-	-
Unknown	13	-	-	-	-	-	-	-	-	-	-
<i>Zygophiala</i>	7	-	-	-	-	-	-	-	13	-	-
Total Fungi	35,636	1,353	400	2,533	1,013	720	3,267	467	10,087	3,926	7

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

Indoor spore counts, including the crawlspace sample, ranged from 7 to 10,087 total spores per cubic meter of air (m³). All samples had total spore counts lower than the outdoor sample.

The presence of Penicillium/Aspergillus group spores was higher in six samples than outdoors: classrooms 15, 23, 26, 29, 31 and 38. Cladosporium spores were elevated above the outdoor sample count in the Room 11 sample. Windows were not open during sampling. Smuts, Periconia and Myxomycetes spores were higher in Room 20 than the outdoor sample but these counts were relatively low.

No secondary colonizers including Chaetomium or Stachybotrys were detected in the classrooms. Hyphal elements were detected in two classrooms but were very low. Certificates of analysis are included as Attachment B.

Tables 4a-4d present the spores per cubic meter of air measured in classrooms 11, 15, 26 and 29 on October 18th, 28th, 2013, December 17, 2013, March 20, 2014, June 11 and July 31, 2014. The tables show natural variability in the spore counts within in the building.

Table 4a: Spore Concentrations on October 18, 2013, December 17, 2013, June 11, 2014 and July 31, 2014 At Glenwood Middle School in Classroom 11

Spores/m ³	Classroom (CR) Number and Date of Spore Trap Sampling for Selected Spore Types				
	CR11 10/18/13	CR11 12/17/13	CR11 03/20/14	CR11 06/11/14	CR11 07/31/14
Ascospores	7	33	20	1,333	320
Basidiospores	4,480	260	93	800	7,467
Cladosporium	333	73	133*	240	2,133
Penicillium/Aspergillus group	27	53	1,973*	20	133
Total	4,947	426	2,306	2,419	10,087

Bold represents spore concentrations that were higher than outdoors.

*Sampling occurred after custodian swept this classroom.

Table 4b: Spore Concentrations on October 18, 2013, October 28, 2013, December 17, 2013, June 11, 2014 and July 31, 2014 At Glenwood Middle School in Classroom 15

Spores/m ³	Classroom (CR) Number and Date of Spore Trap Sampling for Selected Spore Types					
	CR15 10/18/13	CR15 10/28/13	CR15 12/17/13	CR15 03/20/14	CR15 06/11/14	CR15 07/31/14
Ascospores	47	33	-	7	300	213
Basidiospores	12,373	620	127	20	2,720	1,947
Cladosporium	1,067	33	107	20	100	587
Penicillium/Aspergillus group	1,440	287	4,153	40	13	453
Total	15,055	1,013	4,413	87	3,147	3,267

Bold represents spore concentrations that were higher than outdoors.

Table 4c: Spore Concentrations on October 18, 2013, December 17, 2013, March 20, 2014, June 11, 2014 and July 31, 2014 At Glenwood Middle School in Classroom 26

Spores/m ³	Classroom (CR) Number and Date of Spore Trap Sampling for Selected Spore Types				
	CR26 10/18/13	CR26 12/17/13	CR26 03/20/14	CR26 06/11/14	CR26 07/31/14
Ascospores	20	67	-	1,493	20
Basidiospores	22,062	3,200	53	4,800	333
Cladosporium	720	4,267	13	227	27
Penicillium/Aspergillus group	80	1,600	27	107	320
Total	22,942	9,134	93	6,661*	720

Bold represents spore concentrations that were higher than outdoors.

*Sampling occurred after custodian swept this classroom.

Table 4d: Spore Concentrations on October 18, 2013, October 28, 2013, December 17, 2013, March 20, 2014, June 11, 2014 and July 31, 2014 At Glenwood Middle School in Classroom 29

Spores/m ³	Classroom (CR) Number and Date of Spore Trap Sampling for Selected Spore Types				
	CR29 10/18/13	CR29 12/17/13	CR29 03/20/14	CR29 06/11/14	CR29 07/31/14
Ascospores	73	---	7	1,280	7
Basidiospores	3,627	67	173	3,520	87
Cladosporium	513	7	20	60	13
Penicillium/Aspergillus group	187	5,973	53	40	273
Total	4,447	6,054	253	4,914	400

Bold represents spore concentrations that were higher indoors than outdoors on the day of monitoring.

Table 5 presents a comparison of the outdoor spore concentrations for six days of monitoring for select spore types. The outdoor spore concentrations were within the range of expected concentrations for Maryland as reported by EMLab in their MoldRANGE tables. 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.

Table 5: Outdoor Spore Concentrations on October 18, 2013, October 28, 2013, December 17, 2013, March 20, 2014, June 11, 2014 and July 31, 2014 at Glenwood Middle School

Spores/m ³	10/18/13	10/28/13	12/17/13	03/20/14	06/11/14	07/31/14
Ascospores	173	507	13	80	1,704	853
Basidiospores	13,845	2,880	3,413	2,107	29,819	32,735
Cladosporium	5,120	107	40	127	3,627	1,493
Penicillium/Aspergillus group	80	140	313	53	20	260
Total	20,204	3,834	3,786	2,388	35,364	35,636

III. CONCLUSIONS AND RECOMMENDATIONS

Thermal comfort parameters of temperature and humidity were measured on July 31, 2014. The temperature was within the comfort range established by ASHRAE but the relative humidity measurements were above the recommended comfort ranges. Carbon monoxide, carbon



dioxide and particulate matter measurements were within acceptable ranges for good indoor air quality.

Spore measurements collected in classrooms were generally acceptable compared to outdoor samples with outdoor total spore counts exceeding indoors. All samples had total spore counts lower than the outdoor sample. The presence of *Penicillium*/*Aspergillus* group spores was higher in six samples than outdoors: classrooms 15, 23, 26, 29, 31 and 38. Follow up air sampling should occur approximately quarterly in order to monitor changes in conditions that may be related to seasonal variations.

IV. LIMITATIONS

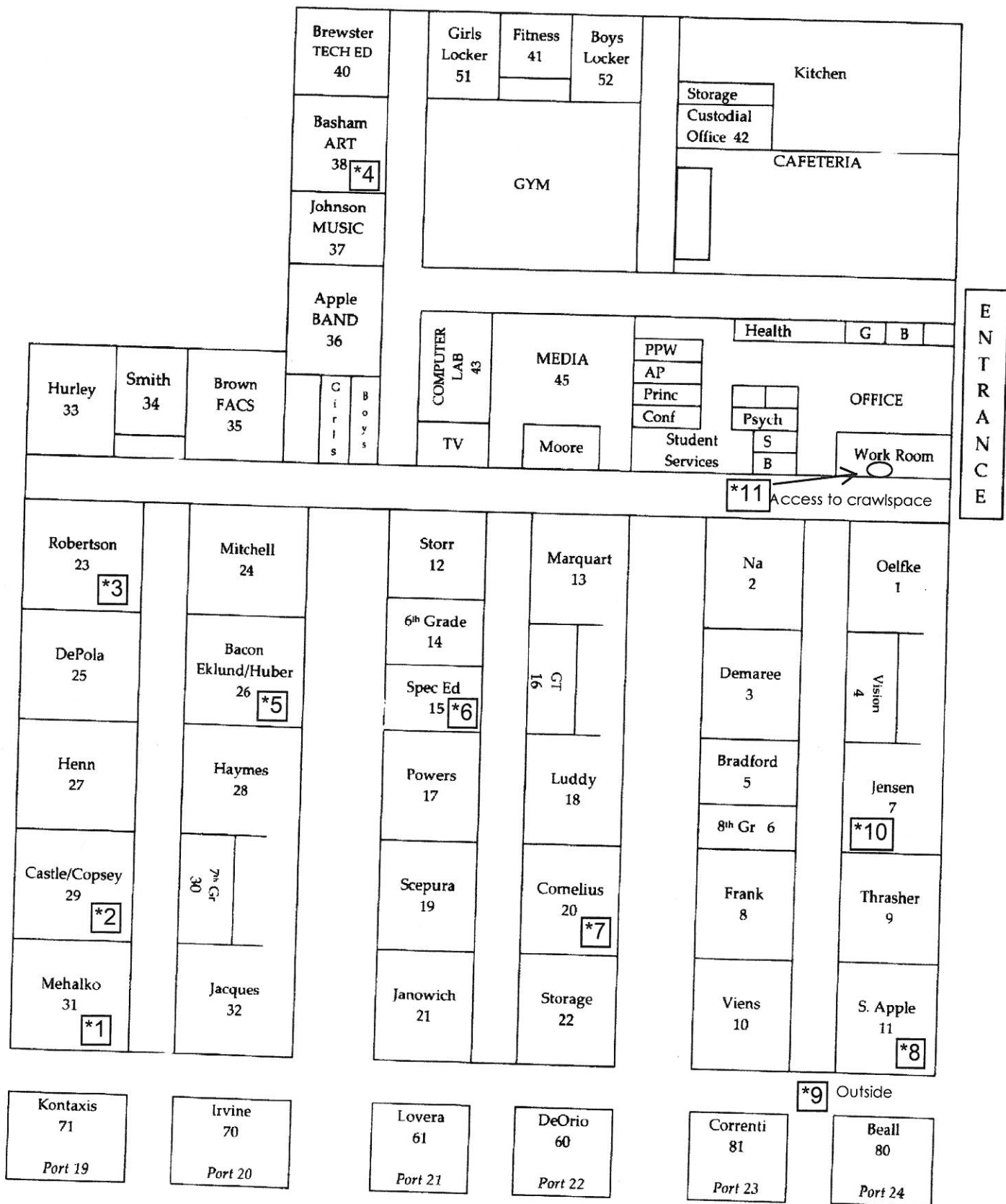
This report has been prepared for the exclusive use of the Howard County Public School System and/or their agents. This service has been performed in accordance with generally accepted environmental practices. No other warranty, expressed or implied, is made. Our conclusions and recommendations are based, in part, upon information provided to us by others and our site 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 July 31, 2014



As of 8/02/13

Glenwood Middle School Floor Plan

Sample Location Plan
July 31, 2014



Attachment B:

**Report of Analysis and Chain of Custody Forms
July 31, 2014**

Aria Environmental
P.O. Box 286
Woodbine, Maryland 21797
Attn: Julie Barth
Project: **J13-767 GMS**
Condition of Sample(s) Upon Receipt: Acceptable

Date Collected: 07/31/2014
Date Received: 08/01/2014
Date Analyzed: 08/01/2014
Date Reported: 08/04/2014
Project ID: 14016018
Page 1 of 11

1054 Spore Trap Analysis: SOP 3.8

Client Sample Number	GMS-01				GMS-09			
Sample Location	Room 31				Outside			
Sample Volume (L)	150				150			
Lab Sample Number	14016018-001				14016018-009			
Spore Identification	Raw Ct	spr/m ³	% Ttl	In/Out	Raw Ct	spr/m ³	% Ttl	In/Out
Alternaria	-	-	-	-	5	33	<1	-
Ascospores	6	40	3	1/21	8	853	2	-
Basidiospores	80	533	39	1/61	82	32735	92	-
Cercospora	-	-	-	-	1	7	<1	-
Cladosporium	8	53	4	1/28	14	1493	4	-
Curvularia	-	-	-	-	2	13	<1	-
Drechslera/Bipolaris group	-	-	-	-	1	7	<1	-
Epicoccum	-	-	-	-	8	53	<1	-
Fusicladium	-	-	-	-	3	20	<1	-
Hyphal elements	1	7	1	-	-	-	-	-
Oidium	-	-	-	-	1	7	<1	-
Penicillium/Aspergillus group	106	707	52	3/1	39	260	1	-
Pestalotiopsis	-	-	-	-	1	7	<1	-
Pithomyces	-	-	-	-	10	67	<1	-
Polythrincium	-	-	-	-	3	20	<1	-
Pyricularia	-	-	-	-	1	7	<1	-
Smuts, Periconia, Myxomycetes	2	13	1	1/2	4	27	<1	-
Spegazzinia	-	-	-	-	1	7	<1	-
Torula	-	-	-	-	-	-	-	-
Unknown	-	-	-	-	2	13	<1	-
Zygophiala	-	-	-	-	1	7	<1	-
Debris Rating 2					Debris Rating 3			
Analytical Sensitivity	Analytical Sensitivity: 7 spr/m³				Analytical Sensitivity: 7 spr/m³			
Comments								
Total *See Footnotes	203	1353	~100%	1/26	187	35636	~100%	-

Aria Environmental
P.O. Box 286
Woodbine, Maryland 21797
Attn: Julie Barth
Project: **J13-767 GMS**
Condition of Sample(s) Upon Receipt: Acceptable

Date Collected: 07/31/2014
Date Received: 08/01/2014
Date Analyzed: 08/01/2014
Date Reported: 08/04/2014
Project ID: 14016018
Page 2 of 11

Client Sample Number	GMS-02				GMS-09			
Sample Location	Room 29				Outside			
Sample Volume (L)	150				150			
Lab Sample Number	14016018-002				14016018-009			
Spore Identification	Raw Ct	spr/m³	% Ttl	In/Out	Raw Ct	spr/m³	% Ttl	In/Out
Alternaria	-	-	-	-	5	33	<1	-
Ascospores	1	7	2	1/122	8	853	2	-
Basidiospores	13	87	22	1/376	82	32735	92	-
Cercospora	-	-	-	-	1	7	<1	-
Cladosporium	2	13	3	1/115	14	1493	4	-
Curvularia	-	-	-	-	2	13	<1	-
Drechslera/Bipolaris group	-	-	-	-	1	7	<1	-
Epicoccum	-	-	-	-	8	53	<1	-
Fusicladium	-	-	-	-	3	20	<1	-
Hyphal elements	-	-	-	-	-	-	-	-
Oidium	-	-	-	-	1	7	<1	-
Penicillium/Aspergillus group	41	273	68	1/1	39	260	1	-
Pestalotiopsis	-	-	-	-	1	7	<1	-
Pithomyces	-	-	-	-	10	67	<1	-
Polythrincium	-	-	-	-	3	20	<1	-
Pyricularia	-	-	-	-	1	7	<1	-
Smuts,Periconia,Myxomycetes	3	20	5	1/1	4	27	<1	-
Spegazzinia	-	-	-	-	1	7	<1	-
Torula	-	-	-	-	-	-	-	-
Unknown	-	-	-	-	2	13	<1	-
Zygophiala	-	-	-	-	1	7	<1	-
	Debris Rating 2				Debris Rating 3			
Analytical Sensitivity	Analytical Sensitivity: 7 spr/m³				Analytical Sensitivity: 7 spr/m³			
Comments								
Total *See Footnotes	60	400	~100%	1/89	187	35636	~100%	-

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Condition of Sample(s) Upon Receipt: Acceptable

Date Collected: 07/31/2014
Date Received: 08/01/2014
Date Analyzed: 08/01/2014
Date Reported: 08/04/2014
Project ID: 14016018
Page 3 of 11

Client Sample Number	GMS-03				GMS-09			
Sample Location	Room 23				Outside			
Sample Volume (L)	150				150			
Lab Sample Number	14016018-003				14016018-009			
Spore Identification	Raw Ct	spr/m ³	% Ttl	In/Out	Raw Ct	spr/m ³	% Ttl	In/Out
Alternaria	2	13	1	1/3	5	33	<1	-
Ascospores	29	193	8	1/4	8	853	2	-
Basidiospores	136	907	36	1/36	82	32735	92	-
Cercospora	-	-	-	-	1	7	<1	-
Cladosporium	98	653	26	1/2	14	1493	4	-
Curvularia	-	-	-	-	2	13	<1	-
Drechslera/Bipolaris group	-	-	-	-	1	7	<1	-
Epicoccum	-	-	-	-	8	53	<1	-
Fusicladium	-	-	-	-	3	20	<1	-
Hyphal elements	-	-	-	-	-	-	-	-
Oidium	-	-	-	-	1	7	<1	-
Penicillium/Aspergillus group	111	740	29	3/1	39	260	1	-
Pestalotiopsis	-	-	-	-	1	7	<1	-
Pithomyces	-	-	-	-	10	67	<1	-
Polythrincium	-	-	-	-	3	20	<1	-
Pyricularia	-	-	-	-	1	7	<1	-
Smuts, Periconia, Myxomycetes	4	27	1	1/1	4	27	<1	-
Spegazzinia	-	-	-	-	1	7	<1	-
Torula	-	-	-	-	-	-	-	-
Unknown	-	-	-	-	2	13	<1	-
Zygophiala	-	-	-	-	1	7	<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	380	2533	~100%	1/14	187	35636	~100%	-

Aria Environmental
P.O. Box 286
Woodbine, Maryland 21797
Attn: Julie Barth
Project: **J13-767 GMS**
Condition of Sample(s) Upon Receipt: Acceptable

Date Collected: 07/31/2014
Date Received: 08/01/2014
Date Analyzed: 08/01/2014
Date Reported: 08/04/2014
Project ID: 14016018

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Client Sample Number	GMS-04				GMS-09			
Sample Location	Room 38				Outside			
Sample Volume (L)	150				150			
Lab Sample Number	14016018-004				14016018-009			
Spore Identification	Raw Ct	spr/m³	% Ttl	In/Out	Raw Ct	spr/m³	% Ttl	In/Out
Alternaria	-	-	-	-	5	33	<1	-
Ascospores	14	93	9	1/9	8	853	2	-
Basidiospores	63	420	41	1/78	82	32735	92	-
Cercospora	-	-	-	-	1	7	<1	-
Cladosporium	21	140	14	1/11	14	1493	4	-
Curvularia	-	-	-	-	2	13	<1	-
Drechslera/Bipolaris group	-	-	-	-	1	7	<1	-
Epicoccum	-	-	-	-	8	53	<1	-
Fusicladium	-	-	-	-	3	20	<1	-
Hyphal elements	-	-	-	-	-	-	-	-
Oidium	-	-	-	-	1	7	<1	-
Penicillium/Aspergillus group	52	347	34	1/1	39	260	1	-
Pestalotiopsis	-	-	-	-	1	7	<1	-
Pithomyces	-	-	-	-	10	67	<1	-
Polythrincium	-	-	-	-	3	20	<1	-
Pyricularia	-	-	-	-	1	7	<1	-
Smuts, Periconia, Myxomycetes	2	13	1	1/2	4	27	<1	-
Spegazzinia	-	-	-	-	1	7	<1	-
Torula	-	-	-	-	-	-	-	-
Unknown	-	-	-	-	2	13	<1	-
Zygophiala	-	-	-	-	1	7	<1	-
	Debris Rating 2				Debris Rating 3			
Analytical Sensitivity	Analytical Sensitivity: 7 spr/m³				Analytical Sensitivity: 7 spr/m³			
Comments								
Total *See Footnotes	152	1013	~100%	1/35	187	35636	~100%	-

Aria Environmental
P.O. Box 286
Woodbine, Maryland 21797
Attn: Julie Barth
Project: **J13-767 GMS**
Condition of Sample(s) Upon Receipt: Acceptable

Date Collected: 07/31/2014
Date Received: 08/01/2014
Date Analyzed: 08/01/2014
Date Reported: 08/04/2014
Project ID: 14016018
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Client Sample Number	GMS-05				GMS-09			
Sample Location	Room 26				Outside			
Sample Volume (L)	150				150			
Lab Sample Number	14016018-005				14016018-009			
Spore Identification	Raw Ct	spr/m³	% Ttl	In/Out	Raw Ct	spr/m³	% Ttl	In/Out
Alternaria	-	-	-	-	5	33	<1	-
Ascospores	3	20	3	1/43	8	853	2	-
Basidiospores	50	333	46	1/98	82	32735	92	-
Cercospora	-	-	-	-	1	7	<1	-
Cladosporium	4	27	4	1/55	14	1493	4	-
Curvularia	-	-	-	-	2	13	<1	-
Drechslera/Bipolaris group	-	-	-	-	1	7	<1	-
Epicoccum	-	-	-	-	8	53	<1	-
Fusicladium	-	-	-	-	3	20	<1	-
Hyphal elements	-	-	-	-	-	-	-	-
Oidium	-	-	-	-	1	7	<1	-
Penicillium/Aspergillus group	48	320	44	1/1	39	260	1	-
Pestalotiopsis	-	-	-	-	1	7	<1	-
Pithomyces	-	-	-	-	10	67	<1	-
Polythrincium	-	-	-	-	3	20	<1	-
Pyricularia	-	-	-	-	1	7	<1	-
Smuts,Periconia,Myxomycetes	3	20	3	1/1	4	27	<1	-
Spegazzinia	-	-	-	-	1	7	<1	-
Torula	-	-	-	-	-	-	-	-
Unknown	-	-	-	-	2	13	<1	-
Zygophiala	-	-	-	-	1	7	<1	-
	Debris Rating 2				Debris Rating 3			
Analytical Sensitivity	Analytical Sensitivity: 7 spr/m³				Analytical Sensitivity: 7 spr/m³			
Comments								
Total *See Footnotes	108	720	~100%	1/49	187	35636	~100%	-

Aria Environmental
P.O. Box 286
Woodbine, Maryland 21797
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Condition of Sample(s) Upon Receipt: Acceptable

Date Collected: 07/31/2014
Date Received: 08/01/2014
Date Analyzed: 08/01/2014
Date Reported: 08/04/2014
Project ID: 14016018
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Client Sample Number	GMS-06				GMS-09			
Sample Location	Room 15				Outside			
Sample Volume (L)	150				150			
Lab Sample Number	14016018-006				14016018-009			
Spore Identification	Raw Ct	spr/m³	% Ttl	In/Out	Raw Ct	spr/m³	% Ttl	In/Out
Alternaria	-	-	-	-	5	33	<1	-
Ascospores	8	213	7	1/4	8	853	2	-
Basidiospores	73	1947	60	1/17	82	32735	92	-
Cercospora	-	-	-	-	1	7	<1	-
Cladosporium	22	587	18	1/3	14	1493	4	-
Curvularia	1	7	<1	1/2	2	13	<1	-
Drechslera/Bipolaris group	-	-	-	-	1	7	<1	-
Epicoccum	-	-	-	-	8	53	<1	-
Fusicladium	-	-	-	-	3	20	<1	-
Hyphal elements	2	13	<1	-	-	-	-	-
Oidium	-	-	-	-	1	7	<1	-
Penicillium/Aspergillus group	17	453	14	2/1	39	260	1	-
Pestalotiopsis	-	-	-	-	1	7	<1	-
Pithomyces	1	7	<1	1/10	10	67	<1	-
Polythrincium	-	-	-	-	3	20	<1	-
Pyricularia	-	-	-	-	1	7	<1	-
Smuts,Periconia,Myxomycetes	5	33	1	1/1	4	27	<1	-
Spegazzinia	-	-	-	-	1	7	<1	-
Torula	1	7	<1	-	-	-	-	-
Unknown	-	-	-	-	2	13	<1	-
Zygophiala	-	-	-	-	1	7	<1	-
	Debris Rating 2				Debris Rating 3			
Analytical Sensitivity	Analytical Sensitivity: 7 spr/m³				Analytical Sensitivity: 7 spr/m³			
Comments								
Total *See Footnotes	130	3267	~100%	1/11	187	35636	~100%	-

Aria Environmental
P.O. Box 286
Woodbine, Maryland 21797
Attn: Julie Barth
Project: **J13-767 GMS**
Condition of Sample(s) Upon Receipt: Acceptable

Date Collected: 07/31/2014
Date Received: 08/01/2014
Date Analyzed: 08/01/2014
Date Reported: 08/04/2014
Project ID: 14016018
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Client Sample Number	GMS-07				GMS-09			
Sample Location	Room 20				Outside			
Sample Volume (L)	150				150			
Lab Sample Number	14016018-007				14016018-009			
Spore Identification	Raw Ct	spr/m³	% Ttl	In/Out	Raw Ct	spr/m³	% Ttl	In/Out
Alternaria	-	-	-	-	5	33	<1	-
Ascospores	1	7	1	1/122	8	853	2	-
Basidiospores	19	127	27	1/258	82	32735	92	-
Cercospora	-	-	-	-	1	7	<1	-
Cladosporium	37	247	53	1/6	14	1493	4	-
Curvularia	-	-	-	-	2	13	<1	-
Drechslera/Bipolaris group	-	-	-	-	1	7	<1	-
Epicoccum	-	-	-	-	8	53	<1	-
Fusicladium	-	-	-	-	3	20	<1	-
Hyphal elements	-	-	-	-	-	-	-	-
Oidium	-	-	-	-	1	7	<1	-
Penicillium/Aspergillus group	5	33	7	1/8	39	260	1	-
Pestalotiopsis	-	-	-	-	1	7	<1	-
Pithomyces	-	-	-	-	10	67	<1	-
Polythrincium	-	-	-	-	3	20	<1	-
Pyricularia	-	-	-	-	1	7	<1	-
Smuts,Periconia,Myxomycetes	8	53	11	2/1	4	27	<1	-
Spegazzinia	-	-	-	-	1	7	<1	-
Torula	-	-	-	-	-	-	-	-
Unknown	-	-	-	-	2	13	<1	-
Zygophiala	-	-	-	-	1	7	<1	-
	Debris Rating 3				Debris Rating 3			
Analytical Sensitivity	Analytical Sensitivity: 7 spr/m³				Analytical Sensitivity: 7 spr/m³			
Comments								
Total *See Footnotes	70	467	~100%	1/76	187	35636	~100%	-

Aria Environmental
P.O. Box 286
Woodbine, Maryland 21797
Attn: Julie Barth
Project: **J13-767 GMS**
Condition of Sample(s) Upon Receipt: Acceptable

Date Collected: 07/31/2014
Date Received: 08/01/2014
Date Analyzed: 08/01/2014
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Client Sample Number	GMS-08				GMS-09			
Sample Location	Room 11				Outside			
Sample Volume (L)	150				150			
Lab Sample Number	14016018-008				14016018-009			
Spore Identification	Raw Ct	spr/m³	% Ttl	In/Out	Raw Ct	spr/m³	% Ttl	In/Out
Alternaria	1	7	<1	1/5	5	33	<1	-
Ascospores	6	320	3	1/3	8	853	2	-
Basidiospores	70	7467	74	1/4	82	32735	92	-
Cercospora	-	-	-	-	1	7	<1	-
Cladosporium	40	2133	21	1/1	14	1493	4	-
Curvularia	-	-	-	-	2	13	<1	-
Drechslera/Bipolaris group	-	-	-	-	1	7	<1	-
Epicoccum	-	-	-	-	8	53	<1	-
Fusicladium	-	-	-	-	3	20	<1	-
Hyphal elements	-	-	-	-	-	-	-	-
Oidium	-	-	-	-	1	7	<1	-
Penicillium/Aspergillus group	20	133	1	1/2	39	260	1	-
Pestalotiopsis	-	-	-	-	1	7	<1	-
Pithomyces	1	7	<1	1/10	10	67	<1	-
Polythrincium	-	-	-	-	3	20	<1	-
Pyricularia	-	-	-	-	1	7	<1	-
Smuts,Periconia,Myxomycetes	1	7	<1	1/4	4	27	<1	-
Spegazzinia	-	-	-	-	1	7	<1	-
Torula	-	-	-	-	-	-	-	-
Unknown	2	13	<1	1/1	2	13	<1	-
Zygophiala	-	-	-	-	1	7	<1	-
	Debris Rating 3				Debris Rating 3			
Analytical Sensitivity	Analytical Sensitivity: 7 spr/m³				Analytical Sensitivity: 7 spr/m³			
Comments								
Total *See Footnotes	141	10087	~100%	1/4	187	35636	~100%	-

Aria Environmental
P.O. Box 286
Woodbine, Maryland 21797
Attn: Julie Barth
Project: **J13-767 GMS**
Condition of Sample(s) Upon Receipt: Acceptable

Date Collected: 07/31/2014
Date Received: 08/01/2014
Date Analyzed: 08/01/2014
Date Reported: 08/04/2014
Project ID: 14016018
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Client Sample Number	GMS-10				GMS-09			
Sample Location	Room 7				Outside			
Sample Volume (L)	150				150			
Lab Sample Number	14016018-010				14016018-009			
Spore Identification	Raw Ct	spr/m³	% Ttl	In/Out	Raw Ct	spr/m³	% Ttl	In/Out
Alternaria	-	-	-	-	5	33	<1	-
Ascospores	3	20	1	1/43	8	853	2	-
Basidiospores	48	2560	65	1/13	82	32735	92	-
Cercospora	-	-	-	-	1	7	<1	-
Cladosporium	25	1333	34	1/1	14	1493	4	-
Curvularia	-	-	-	-	2	13	<1	-
Drechslera/Bipolaris group	-	-	-	-	1	7	<1	-
Epicoccum	-	-	-	-	8	53	<1	-
Fusicladium	-	-	-	-	3	20	<1	-
Hyphal elements	-	-	-	-	-	-	-	-
Oidium	-	-	-	-	1	7	<1	-
Penicillium/Aspergillus group	2	13	<1	1/20	39	260	1	-
Pestalotiopsis	-	-	-	-	1	7	<1	-
Pithomyces	-	-	-	-	10	67	<1	-
Polythrincium	-	-	-	-	3	20	<1	-
Pyricularia	-	-	-	-	1	7	<1	-
Smuts,Periconia,Myxomycetes	-	-	-	-	4	27	<1	-
Spegazzinia	-	-	-	-	1	7	<1	-
Torula	-	-	-	-	-	-	-	-
Unknown	-	-	-	-	2	13	<1	-
Zygophiala	-	-	-	-	1	7	<1	-
	Debris Rating 2				Debris Rating 3			
Analytical Sensitivity	Analytical Sensitivity: 7 spr/m³				Analytical Sensitivity: 7 spr/m³			
Comments								
Total *See Footnotes	78	3926	~100%	1/9	187	35636	~100%	-

Aria Environmental
P.O. Box 286
Woodbine, Maryland 21797
Attn: Julie Barth
Project: **J13-767 GMS**
Condition of Sample(s) Upon Receipt: Acceptable

Date Collected: 07/31/2014
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Date Analyzed: 08/01/2014
Date Reported: 08/04/2014
Project ID: 14016018
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Client Sample Number	GMS-11				GMS-09			
Sample Location	Crawlspace in Admin Workroom				Outside			
Sample Volume (L)	150				150			
Lab Sample Number	14016018-011				14016018-009			
Spore Identification	Raw Ct	spr/m³	% Ttl	In/Out	Raw Ct	spr/m³	% Ttl	In/Out
Alternaria	-	-	-	-	5	33	<1	-
Ascospores	-	-	-	-	8	853	2	-
Basidiospores	1	7	100	1/4676	82	32735	92	-
Cercospora	-	-	-	-	1	7	<1	-
Cladosporium	-	-	-	-	14	1493	4	-
Curvularia	-	-	-	-	2	13	<1	-
Drechslera/Bipolaris group	-	-	-	-	1	7	<1	-
Epicoccum	-	-	-	-	8	53	<1	-
Fusicladium	-	-	-	-	3	20	<1	-
Hyphal elements	-	-	-	-	-	-	-	-
Oidium	-	-	-	-	1	7	<1	-
Penicillium/Aspergillus group	-	-	-	-	39	260	1	-
Pestalotiopsis	-	-	-	-	1	7	<1	-
Pithomyces	-	-	-	-	10	67	<1	-
Polythrincium	-	-	-	-	3	20	<1	-
Pyricularia	-	-	-	-	1	7	<1	-
Smuts,Periconia,Myxomycetes	-	-	-	-	4	27	<1	-
Spegazzinia	-	-	-	-	1	7	<1	-
Torula	-	-	-	-	-	-	-	-
Unknown	-	-	-	-	2	13	<1	-
Zygophiala	-	-	-	-	1	7	<1	-
	Debris Rating 1				Debris Rating 3			
Analytical Sensitivity	Analytical Sensitivity: 7 spr/m³				Analytical Sensitivity: 7 spr/m³			
Comments								
Total *See Footnotes	1	7	~100%	1/5091	187	35636	~100%	-

Aria Environmental
P.O. Box 286
Woodbine, Maryland 21797
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Date Collected: 07/31/2014
Date Received: 08/01/2014
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Footnotes and Additional Report Information

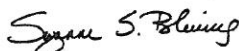
Debris Rating Table

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 Smut, Periconia, Myxomycete group is composed of three different groups whose spores have similar morphologies. Smuts are plant pathogens, Periconia is a relatively uncommon mold indoors, and Myxomycetes are not fungi but slime molds. Although these organisms do not typically proliferate indoors, their spores are potentially allergenic.
5. 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.
6. 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.
7. Dash (-) in this report, under raw count column means 'not detected (ND)'; otherwise 'not applicable' (NA).
8. 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.
9. Due to rounding totals may not equal 100%.
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.

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.



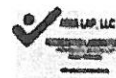
Suzanne S. Blevins, B.S., SM (ASCP)
Laboratory Director

14016018

ELITE
CO. GA. VA

NVLAP

NVLAP Lab Code 2006039
NVLAP Lab Code 2006279
NVLAP Lab Code 5000970



LAB #191681 (C)
LAB #102971 (GA)
LAB #163061 (VA)
LAB #210229 (AZ)

Aerobiology Client Aria Environmental, Inc.

Field Contact	Julie Barth	Collected By/Date:	7/31/14	Relinquished By/Date:	7/31/14
Address	PO Box 286	Relinquished By/Date	Received By/Date: <u>SAP 8/11/14 10:56a</u>		
Address	Woodbine, MD 21797	Sampler Type	Andersen <u> </u> SAS <u> </u>	Sample/Aire	Other: <u> </u>
Phone/Fax	410-549-5774/410-549-4488	PO#/Job#/Project Name:	J13-767 GMS		
Email	jbarth@ariaenviro.com				
Routine <input type="radio"/>	24 Hour <input checked="" type="radio"/>	Same Day <input type="radio"/>	4 Hour <input type="radio"/>	2 Hour <input type="radio"/>	5 Day <input type="radio"/>
					Notes/CC Info
Zip Code Where Work Is Performed		21738			

	Sample No.	Test Code	Sample Location	Total Volume/Area
1	GMS-01	1054	Room 31	150
2	GMS-02	1054	Room 29	150
3	GMS-03	1054	Room 23	150
4	GMS-04	1054	Room 38	150
5	GMS-05	1054	Room 26	150
6	GMS-06	1054	Room 15	150
7	GMS-07	1054	Room 20	165
8	GMS-08	1054	Room 11	150
9	GMS-09	1054	Outside	150
10	GMS-10	1054	Room 7	150
11	GMS-11	1054	Crawlspace in Admin Workroom	150
12				
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