May 23, 2016

Clemson University
310 Klugh Avenue
Clemson, South Carolina 29634

Attn: Mr. W. Robert Newberry, IV
E-mail: wnewber@clemson.edu

Re: Post Cleaning Mold Sampling
104A Eaton Circle – Thornhill Village
Clemson, South Carolina
Terracon Project No. 86127158 – Task 59

Dear Mr. Newberry:

Terracon Consultants, Inc. (Terracon) conducted follow-up testing to our previous limited mold investigation in the residential unit at 104A Eaton Circle in Thornhill Village on the Clemson University campus in Clemson, South Carolina. This service was conducted in general accordance with our Master Service Agreement with Clemson University.

PROJECT DESCRIPTION

Scope of Services

At the request of Clemson University, Terracon representative Mr. Benjamin Hestir conducted airborne mold testing in the residential housing unit at 104A Eaton Circle on May 5, 2016. Specifically, our efforts focused on the air quality in the residence after the unit was cleaned after resident move out at the end of the spring semester.

Thornhill Village was originally constructed in the early 1960's as undergraduate residential housing. The buildings within Thornhill are duplexes and 104A Eaton Circle is a 2-bedroom, 1-bathroom unit which includes a living room, storage closet and kitchen. Terracon conducted airborne mold sampling which consisted of collecting air samples in five locations inside the residence and two additional samples outside for comparison. Temperature and relative humidity measurements were also collected.

Standard of Care

This sampling was conducted in a manner consistent with the level of care and skill ordinarily exercised by members of the profession currently practicing under similar conditions in the same locale. Terracon did not attempt to identify every potential exposure or hazard present in the subject building. The results, findings, conclusions, and recommendations expressed in this report

are based on conditions observed during our sampling. Many factors, such as weather conditions, building occupancy, ventilation patterns, and seasonal variations in fungal/bacterial concentrations or local sources of volatile chemicals, can affect the conditions observed. The information contained in this report should not be relied upon to represent conditions that existed prior to or after this sampling. Terracon does not warrant the services of regulatory agencies, laboratories, or other third parties supplying information that may have been used in the preparation of this report.

Mold Sampling

Total non-viable (non-culturable) fungal spore trap samples were collected using Air-O-Cell™ spore trap cassettes specifically designed for the collection of airborne mold spores. Air samples were collected using a calibrated Zefon Bio-Pump™ at a flow rate of 15 liters per minute (LPM) for 5 minutes at each location.

After air sample collection, the samples were hand delivered to Southeast Environmental Microbiology Laboratories, Inc. (SEEML), accredited by the American Industrial Hygiene Association (AIHA®) Laboratory Accreditation Programs, LLC under the Environmental Microbiology Laboratory Accreditation Program (EMLAP), Accreditation #173667. Air samples were analyzed by direct microscopic examination and are reported in spores per cubic meter of air (spores/m^3).

To help interpret the sampling results, we compared indoor air and outdoor air measurements. High variability in airborne fungal spore concentrations can exist in different geographic locations, during different seasons, and weather patterns, and over the course of a given day. As a general rule, indoor air fungal spore concentrations in an HVAC-supplied building are typically less than, but qualitatively similar to, fungal spore concentrations found in the outside environment.

There are no state or federal exposure limits established for fungal aerosols. There are currently no regulatory standards or medically based threshold limit or dose-response relationships for exposure to airborne or surface concentrations of mold spores. Terracon relies upon experience, professional judgment, current scientific literature, guidelines and recommendations made by professional organizations and experts, and statistical methods in interpreting mold sampling results.

Temperature and Relative Humidity

Indoor air temperature and relative humidity are physical conditions important to the perception of comfort. The American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) has published recommendations regarding thermal comfort. ASHRAE Standard 55-2004, Thermal Environmental Conditions for Human Occupancy, identifies six primary factors that affect comfort: metabolic rate (affected by the activity being performed); clothing insulation; air temperature; radiant temperature; air speed; and humidity.

Although the relationships are complex, a temperature range between 73 and 79 degrees Fahrenheit (°F) with relative humidity between roughly 20 and 60 percent (%) are recommended for persons in a conditioned setting wearing light summer clothing. Higher temperatures require lower humidity for comfort. For persons in winter clothing, temperatures can range between 68 and 75 °F, with relative humidity between 30 and 60%.

EPA recommends maintaining indoor humidity below 60%, ideally 30-50%, if possible.

Readings of temperature and relative humidity were collected with an Extech Model 445580 IAQ instrument which was calibrated by the manufacturer.

FINDINGS

Mold Air Sampling

On the afternoon of Thursday, May 5, 2016, Terracon collected five (5) non-viable mold spore trap samples inside the residence at 104A Eaton Circle and two (2) outdoor samples for comparison. Evidence of water intrusion or mold growth was not observed during a cursory visual inspection. The strong sewage-like odor previously observed in the interior storage closet in the residence was no longer present. At the time of our assessment, the two student residents had moved out and the residence had been cleaned by University staff/contractors. Sample locations and total spore count samples analyses are summarized in Table 1 below.

Table 1: Summary of Total Spore Count Analyses – May 5, 2016

Sample #	**104A-1**	**104A-2**	**104A-3**	**104A-5**	**104A-4**	**104A-6**	**104A-7**
Location Description	**Living Room**	**Storage Closet**	**Kitchen**	**Left Bedroom**	**Right Bedroom**	**Outside Front**	**Outside Back**
Spore Type	**Spores/m³**	**Spores/m³**	**Spores/m³**	**Spores/m³**	**Spores/m³**	**Spores/m³**	**Spores/m³**
Alternaria	---	---	---	---	13	**13**	---
Ascospores	---	39	---	---	78	416	273
Basidiospores	---	312	39	78	---	897	819
Bipolaris	---	---	---	---	---	---	---
Cladosporium	78	234	234	78	117	312	39
Curvalaria	---	---	---	---	13	13	---
Epiccocum	---	---	---	---	26	13	13-
Aspergillis / Penicillium	78	780	507	1,520	1,050	---	---
Rusts	---	---	---	---	---	---	---
Smuts/Periconia/ Myxomy	---	13	---	---	13	---	---
Spegazzinia	---	---	---	---	---	---	---
Oidium	---	---	---	---	---	26	---
Total	**156**	**1,380**	**780**	**1,680**	**1,310**	**1,690**	**1,140**

Although the highest total spore count inside was slightly lower than the highest outside total spore count, the dominant indoor genus (*Aspergillus/Penicillium)* was not detected in the outdoor samples. The dominant genera outdoors were *Basidiospores* and *Ascospores.*

The laboratory analytical report is attached.

Temperature and Relative Humidity

The indoor temperature was 68.5º F and indoor relative humidity was 39.4%. The outdoor temperatures was 64.9º F and outdoor relative humidity was 27.6% on a cloudy, cool day.

Indoor temperatures and humidity levels were within recommended comfort ranges.

CONCLUSIONS AND RECOMMENDATIONS

The following conclusions and recommendations are provided based on our assessment:

- No visual evidence of water intrusion or mold growth was observed in the residence at 104A Eaton Circle. The previous sewage-like odor in the storage closet was no longer observed.
- The dominant indoor mold genera (*Aspergillis/Penicillium)* was not detected in the outdoor samples. Based on the past mold event reportedly being triggered by a humidity problem causing fungal growth on personal belongings, there is the possibility the spores detected indoors could be a remnant of the previous indoor growth. Details of the unit cleaning were not provided. Terracon recommends additional cleaning (see below) and air scrubbing/filtration using portable HEPA filtered systems to further reduce the concentration of *Aspergillis/Penicillium* type mold spores in the residence.
- To minimize indoor particulate, Terracon recommends Cleanup Methods 2 & 3 from EPA's guidance document *"Mold Remediation in Schools and Commercial Buildings"*, damp wiping and high-efficiency particulate air (HEPA) filtered vacuuming, starting at the highest point in each room and working down to the floor. To be effective, the vacuum should be sealed such that all air drawn into the vacuum is expelled through the HEPA filter. This design is typically found in vacuums specifically designed for environmental remediation.
- The EPA guidance document can be found at https://www.epa.gov/mold
- Temperature and relative humidity readings were within normal comfort levels for a residential environment in spring.

Terracon appreciates the opportunity to provide this service to Clemson University. If you have any questions regarding this limited mold investigation report, please contact the undersigned at 864-292-2901.

Sincerely,
Terracon Consultants, Inc.

Benjamin Hestir, P.E.
Project Industrial Hygienist

Jeffrey A. Gurrie
Senior Industrial Hygienist

Attachments: Laboratory Results

Laboratory Results

SEEML Reference Number:
160509020

Southeast Environmental Microbiology Laboratories
506 Laurens Rd
Greenville, SC 29607
Phone: (864) 233-3770
FAX: (864) 233-6589

The information and data for **Terracon** has been checked for thoroughness and accuracy. The following reports are contained within this document:

- ☐ Direct Exam Report
- ☒ Spore Trap Report
- ☐ Quantitative Fungal Report
- ☐ Andersen Fungal Report
- ☐ Quantitative Direct Exam Report

Lab Manager Review: Rafael Berrios Date: 05/09/16

Thank you for using SEEML laboratories. We strive to provide superior quality and service.
SEEML laboratories are AIHA (American Industrial Hygiene Association) Environmental Microbiology Accredited laboratory for only fungal analysis Air-Direct Examination (EMLAP # 173667).

The data within this report is reliable to three significant figures. The third significant figure is technically unjustified. In this instance, the third figure is reported as an estimate to facilitate the interpretation by the customer.

Confidentiality Notice:
The document(s) contained herein are confidential and privileged information, intended for the exclusive use of the individual or entity named above. If the reader of this message is not the intended recipient, or the employee or agent responsible for delivering it to the intended recipient, you are hereby notified that any dissemination, distribution or copying of the document(s) is strictly prohibited. If you have received this document in error, please immediately notify us by telephone to arrange for its return. Thank you.

Guidelines for Interpretation:
No accepted quantitative regulatory standards currently exist by which to assess the health risks related to mold and bacterial exposure. Molds and bacteria have been associated with a variety of health effects and sensitivity varies from person to person.
Several organizations, including: the American Conference of Government Industrial Hygienists (ACGIH); the American Industrial Hygiene Association (AIHA); the Indoor Air Quality Association (IAQA); the United States Environmental Protection Agency (USEPA); the Centers for Disease Control (CDC), as well as the California Department of Health Services (CADHS), have all published guidelines for assessment and interpretation of mold resulting from water intrusion in buildings.

Interpretation of the data and information within this document is left to the company, consultant, and/or persons who conducted the fieldwork.

Spore Trap Report

Attention: Ben Hestir	Date Sampled: 5/5/2016
Terracon	Date Received: 5/9/2016
72 Pointe Circle	Date Analyzed: 5/9/2016
Greenville, SC 29615	Date Reported: 5/9/2016
	Date Revised:
	Project Name: 86127158 Task 59
	Project Address: 104A Eaton Circle
	Project City, State, ZIP: Clemson, SC
	SEEML Reference # : 160509020

TEST METHOD: DIRECT MICROSCOPY EXAMINATION AT 400X (100% OF TRACE ANALYZED) SEEML SOP 7

Client Sample ID	104A-1			104A-2			104A-3		
Location	Living Room			Closet Living Room			Kitchen		
Lab Sample ID	160509020-054			160509020-055			160509020-056		
Detection Limit (spores/m^3)	13			13			13		
Hyphal Fragments				7	91				
Pollen	1	13		5	65				
Spore Trap Used	AOC			AOC			AOC		
	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%
Alternaria									
Ascospores				3	39	3			
Basidiospores				24	312	23	3	39	5
Bipolaris/Drechslera									
Chaetomium									
Cladosporium	6	78	50	18	234	17	18	234	30
Curvularia									
Epicoccum									
Cercospora									
Fusarium									
Memnoniella									
Nigrospora									
Penicillium/Aspergillus	6	78	50	60	780	57	39	507	65
Polythrincium									
Rusts									
Smuts/Periconia/Myxomy				1	13	<1			
Spegazzinia									
Stachybotrys									
Stemphylium									
Tetraploa									
Torula									
Ulocladium									
Colorless/Other Brown 2									
Oidium									
Zygomycetes									
Pithomyces									
Background debris (1-5)3	3			3			3		
Sample Volume(liters)	75			75			75		
TOTAL SPORES/M^3	12	**156**		106	**1380**		60	**780**	

Comments: Condition of the sample(s) upon receipt: Acceptable.

1=Total % may not equal 100 due to rounding.

2 = Colorless,other Brown are spores without a distinctive morphology on spore traps and non-viable surface samples.

3 = Background debris is the amount of particulate matter present on the slide and is graded from 1-5 with 1 = very light, 2= Light, 3 = Medium, 4 = Heavy, 5 = Very Heavy. The higher the rating the more likelihood spores may be underestimated. A rating of 5 should be interpreted as minimal counts and may actually be higher than reported.

The reporting limit is 1 Spore/sample.

Disclaimer: This report relates only to the samples tested

Respectfully submitted, SEEML

Rafael Berrios

Rafael Berrios, Approved Laboratory Signatory

506 Laurens Road
Greenville, SC 29607
Phone: (864) 233- 3770
Fax: (864) 233-6589
AIHA-LAP, LLC EMLAP # 173667

Spore Trap Report

Attention: Ben Hestir	Date Sampled: 5/5/2016
Terracon	Date Received: 5/9/2016
72 Pointe Circle	Date Analyzed: 5/9/2016
Greenville, SC 29615	Date Reported: 5/9/2016
	Date Revised:
	Project Name: 86127158 Task 59
	Project Address: 104A Eaton Circle
	Project City, State, ZIP: Clemson, SC
	SEEML Reference # : 160509020

TEST METHOD: DIRECT MICROSCOPY EXAMINATION AT 400X (100% OF TRACE ANALYZED) SEEML SOP 7

Client Sample ID	104A-4			104A-5			104A-6		
Location	Right Bedroom			Left Bedroom			Outside Front		
Lab Sample ID	160509020-057			160509020-058			160509020-059		
Detection Limit (spores/m^3)	13			13			13		
Hyphal Fragments	3	39					3	39	
Pollen							24	312	
Spore Trap Used	AOC			AOC			AOC		
	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%
Alternaria	1	13	<1				1	13	<1
Ascospores	6	78	6				32	416	25
Basidiospores				6	78	5	69	897	53
Bipolaris/Drechslera									
Chaetomium									
Cladosporium	9	117	9	6	78	5	24	312	18
Curvularia	1	13	<1				1	13	<1
Epicoccum	2	26	2				1	13	<1
Cercospora									
Fusarium									
Memnoniella									
Nigrospora									
Penicillium/Aspergillus	81	1050	80	117	1520	90			
Polythrincium									
Rusts									
Smuts/Periconia/Myxomy	1	13	<1						
Spegazzinia									
Stachybotrys									
Stemphylium									
Tetraploa									
Torula									
Ulocladium									
Colorless/Other Brown 2									
Oidium							2	26	2
Zygomycetes									
Pithomyces									
Background debris (1-5)3	3			3			3		
Sample Volume(liters)	75			75			75		
TOTAL SPORES/M^3	101	**1310**		129	**1680**		130	**1690**	

Comments: Condition of the sample(s) upon receipt: Acceptable.

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3 = Background debris is the amount of particulate matter present on the slide and is graded from 1-5 with 1 = very light, 2= Light, 3 = Medium, 4 = Heavy, 5 = Very Heavy. The higher the rating the more likelihood spores may be underestimated. A rating of 5 should be interpreted as minimal counts and may actually be higher than reported.

The reporting limit is 1 Spore/sample.

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Respectfully submitted, SEEML

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Spore Trap Report

Attention: Ben Hestir	Date Sampled: 5/5/2016
Terracon	Date Received: 5/9/2016
72 Pointe Circle	Date Analyzed: 5/9/2016
Greenville, SC 29615	Date Reported: 5/9/2016
	Date Revised:
	Project Name: 86127158 Task 59
	Project Address: 104A Eaton Circle
	Project City, State, ZIP: Clemson, SC
	SEEML Reference # : 160509020

TEST METHOD: DIRECT MICROSCOPY EXAMINATION AT 400X (100% OF TRACE ANALYZED) SEEML SOP 7

Client Sample ID	104A-7								
Location	Outside Back								
Lab Sample ID	160509020-060								
Detection Limit (spores/m^3)	13								
Hyphal Fragments	4	52							
Pollen	32	416							
Spore Trap Used	AOC								
	raw ct.	spores/m^3	%						
Alternaria									
Ascospores	21	273	24						
Basidiospores	63	819	72						
Bipolaris/Drechslera									
Chaetomium									
Cladosporium	3	39	3						
Curvularia									
Epicoccum	1	13	1						
Cercospora									
Fusarium									
Memnoniella									
Nigrospora									
Penicillium/Aspergillus									
Polythrincium									
Rusts									
Smuts/Periconia/Myxomy									
Spegazzinia									
Stachybotrys									
Stemphylium									
Tetraploa									
Torula									
Ulocladium									
Colorless/Other Brown 2									
Oidium									
Zygomycetes									
Pithomyces									
Background debris (1-5)3	3								
Sample Volume(liters)	75								
TOTAL SPORES/M^3	88	**1140**							

Comments: Condition of the sample(s) upon receipt: Acceptable.

1=Total % may not equal 100 due to rounding.

2 = Colorless,other Brown are spores without a distinctive morphology on spore traps and non-viable surface samples.

3 = Background debris is the amount of particulate matter present on the slide and is graded from 1-5 with 1 = very light, 2= Light, 3 = Medium, 4 = Heavy, 5 = Very Heavy. The higher the rating the more likelihood spores may be underestimated. A rating of 5 should be interpreted as minimal counts and may actually be higher than reported.

The reporting limit is 1 Spore/sample.

Disclaimer: This report relates only to the samples tested

Respectfully submitted, SEEML

Rafael Berrios

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Greenville, SC 29607
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Southeast Environmental Microbiology Laboratories
Chain of Custody

506 Laurens Rd, Greenville, SC 29607

Phone : 864-233-3770, Fax: 864-233-6589, www.seeml.com, AIHA-LAP, LLC. (EMLAP) #173667

For Lab Use Only			
Condition of samples is acceptable	☑ YES ☐ NO	SEEML Ref #: 1605090220	Lab ID: 054-060

Company Information	Client Information		Environmental Conditions	
Terracon	Date Sampled:	May 5, 2016	Precipitation in last 16hrs:	No
72 Pointe Circle	Project Name:	86127158 Task 59	Relative Humidity I/O:	39.4% / 27.6%
Greenville, SC 29615	Project Address:	104A Eaton Circle	Temperature I/O:	68.5°F / 64.9°F
Ben Hesfir	City, State, Zip:	Clemson, SC	Wind Conditions	Breezy 5-10mph
ben.hesfir@terracon.com				
864-293-7348				

Sample Type Abbreviations:
A- Allergenco S-Swab AP-Andersen Plate
AOC- Air O Cell T-Tape W- Water
M5- Micro 5 B- Bulk D- Dust

Analysis Type:
1. SporeTrap, Air Sample Analysis-Same Day
2. Direct Exam Surface Sample Analysis -Same Day
3. Culturable Air / Surface Samples -7-10 days

Sample ID	Sample Location	Sample Type	Analysis Type	*Area	**Volume (L)	Notes
104A-1	Living Room	AOC	1		75	
104A-2	Closet at Living Room	"	"		"	
104A-3	Kitchen	"	"		"	
104A-4	Right Bedroom	"	"		"	
104A-5	Left Bedroom	"	"		"	
104A-6	Outside - front	"	"		"	
104A-7	Outside - back	"	"		"	

Reliquished By:	Date/Time	Recieved By:	Date/Time
Ben Hesfir	5/9/2016 9:32 am	Lauren Bi	5-9-16

* Area is only required for culturable surface samples.

** Volume = Pump setting (L/min) x minutes