ELEMENT ENVIRONMENTAL
SOLUTIONS

February 17, 2021

Mr. Timothy Holman
Director of Facilities
Pennsbury School District
134 Yardley Avenue
Fallsington, PA 19058

RE: IEQ/IAQ and Mold Evaluation in Oxford Valley Elementary School – Basement/Crawlspace Area
File Number 1040.0012 Task 10

Dear Mr. Holman:

Element Environmental Solutions, Inc. (E2S) was contracted to conduct an Indoor Air Quality (IAQ) evaluation of the southeast wing Basement/Crawlspace Area of the Oxford Valley Elementary School located at 430 Trenton Road, Fairless Hills, Pennsylvania. This evaluation was intended to determine if there were any significant sources of airborne mold spores and of mold growth located specifically in the Basement/Crawlspace Area, which could expose susceptible occupants to mold allergens and potentially affect occupied areas of the school directly above the basement/crawlspaces.

This evaluation included analysis of samples for total airborne mold spores, and observed suspected surface mold. Direct Read IAQ/IEQ parameters (carbon dioxide (CO_2), carbon monoxide (CO), temperature (°F) and % relative humidity (% RH)) from the same interior locations as the airborne mold spore samples were also recorded. All samples were submitted with appropriate chain of custody paperwork to certified laboratory (EMSL Analytical, Inc.) for analysis.

The general air quality results and findings of the investigation are summarized below and in **Table 1** "IAQ Evaluation Analytical Results" for each parameter referenced above. Laboratory Analytical reports are included in **Appendix A** and evaluation procedures and reporting criteria are found in **Appendix B**. A synopsis of findings with initial recommendations was reported to the District upon receipt of the lab samples.

Sampling Summary

Robert Pfromm, CIH (E2S Technical Manager, IAQ), performed a visual inspection of the evaluation areas (the SE wing Basement/Crawlspace Area) on February 8, 2021, for airborne mold spores, and suspect surface mold growth. The sampled basement area is located in the southeast wing of the school and is oriented in a southwest direction from the garage door entrance, with a low divider wall at the end of the cement floored basement area (basement area dimensions approx. 23 ft. wide by 42 feet long). Beyond this low wall is a dirt floored crawlspace (approx. 23 feet wide) that proceeds for approx. 160 feet under that wing of the school with a right turn about halfway to the far end of

the crawlspace into two additional "bays". These two additional bays consist of a narrower section (approx. 9 to 10 feet wide and 200 ft. long) that is all crawlspace and parallels the previously described basement/crawlspace with the third bay also all crawlspace and approx. 24 ft. wide by 200 ft. long. The ceiling height in the basement area is about 9 ft but substantially less in areas of the crawlspace. There was also a smaller entrance to the other two adjacent crawlspaces on the north wall of the basement at the entrance end of the basement. There may be additional crawlspaces under the rest of the school building and they may interconnect (this must be determined by an additional inspection). There was a significant amount of old furnishings, boxes and other material in the basement area, much of which appeared water or humidity damaged and moldy. Total airborne mold spore count samples were collected in several locations including the right side of the basement floor area near the low divider wall, the basement floor area near the side entrance to the crawlspace, and directly outside of the of the Basement/Crawlspace Area at the entry garage door. Four tape lift surface samples were collected from suspected mold growth on water damaged furnishings in the basement. These samples were all submitted to the laboratory with appropriate chain of custody documentation. A direct read IAQ meter was used to measure standard IAQ parameters (CO_2, CO, °F and % RH).

The airborne mold spore results and general air quality results and findings of the initial investigation are detailed below and in **Table 1** "IAQ Evaluation Analytical Results". Laboratory Analytical reports are included in **Appendix A (Mold).**

Airborne Mold spore Samples

Airborne mold spore samples were sampled using Zefon® Airocell spore trap cassettes and a Zefon® Biopump sampler calibrated at 15 lpm flow. Samples were collected for 3 minutes for a total air volume of 45 liters. The cassettes were labeled and sealed in Ziplock® type bags and chain of custody paperwork was prepared and when sampling was completed the samples were delivered to EMSL lab's Plymouth Meeting, Pa facility.

Tape Lift Mold samples

Tape lift surface mold samples were collected using EMSL Biotape tape lift samplers. Suspected surface mold growth is sampled by peeling the protective cover off the sampling tape and carefully applying the sticky side of the sampler tape to the suspected mold. The tape lift sampler was then applied to a microscope slide, and each tape lift sampler collected was labeled and sealed in a ziplock type bag and chain of custody paperwork was prepared and when sampling was completed the samples were delivered with the airocell to the labs Plymouth Meeting, Pa facility.

Results Summary

There was a noticeable "musty/moldy" smell in the basement, so higher spore counts were expected. In the order of sampling: the sample from the rear of the basement area, near the low wall at the start of the crawlspace in that bay (**sample #OVES-2/8/01A**) had a very high total count of airborne **mold** spores (242,920 spores/counts/cubic meter (**S or C/m^3**)) of which 81.7% was a combination of

Basidiospores and Aspergillus/Penicillium which indicates a very significant mold problem, the second sample (**sample OVES-2/8-02A**) which was collected towards the front entrance end of the basement on the side closer to the side entrance to the adjacent (center) crawlspace also had a very high total count of airborne **mold** spores (101,710 **S or C/m^3**) of which 61.0% was a combination of Basidiospores and Aspergillus/Penicillium. This lower total count still confirms the mold problem in the basement and appears to indicate that the source mold growth is closer to the back of the basement or in the crawlspace. The third sample (**sample OVES-2/8-07A**) was collected just outside of the closed basement garage door and had an extremely low trace count of 90 **S or C/m^3,** with trace counts of Basidiospores and Cladosporium and indicates that there was NO contribution from outside mold to the total counts found inside. Four tape lift samples (OVES-2/8-03T through -06T) collected from suspected surface mold growth on a variety of items confirmed that the suspected mold for all four samples was heavy surface mold growth and all four samples had Aspergillus at High spore density with several other genera also present. All of the air and surface mold samples are reviewed in greater detail in the Mold Results section below.

For the **Direct Read Parameters**, the maximum recommended Carbon Dioxide (CO_2) level was 1145 ppm (the outside concentration plus 700 ppm) and the interior room air samples from the basement were all just slightly more than the outside sample concentration of 445 ppm. The basement/-crawlspace is not a normally occupied space and only 1 person (E2S) was inside the basement for most of the sampling. The space is unheated, so it was quite cold (but warmer than outside), ranging from 49.6 °F to 49.9 °F compared to 28.2 °F outside. The interior humidity (% RH) was similar to the outside humidity as all three locations were at the dry end of the acceptable range of 30 to 60 % RH. This was actually more humid than we normally see in the winter however, the higher humidity was very likely due to the cool temperatures outside and in the basement. The last parameter measured was Carbon Monoxide (CO), which was None Detected in all three locations (inside and outside).

Results

Table 1: IAQ Evaluation Analytical Results.

Parameter >>>		Total Airborne Mold Spore Counts	Carbon Dioxide (CO2)	Carbon Monoxide (CO)	Temperature	% RH
Units >>>		Counts or C or S/m3	ppm	ppm	°F	%
Recommended Max. IAQ Level or Acceptable Range >>>			1145	< 9	69 to 78*	30 to 60*
Sampling Location	Sample ID					
Basement/crawlspace near low rear wall	OVES-2/8-01A	242,920	451	0.0	49.6	31.3
Basement/crawlspace near front at side crawlspace entrance	OVES-2/8-02A	101,710	458	0.0	49.9	37.6
Outside the basement entrance garage door	OVES-2/8-07A	90	445	0.0	28.2	33.7

***Applies to normally occupied spaces.**

Notes:

Result Units - ppm = parts/million; C or S/M^3 = Counts or Spores/Meter^3. CO_2 recommended limit is outside ppm + 700 ppm. % RH and Temp. are all ASHRAE recommended levels. CO is a LEED recommended level.

Airborne Mold Spores

OVES-2/8-01A (Rear end of Basement near low wall to crawlspace on right side)

The total airborne mold spore count for sample OVES-2/8-01A was an extremely high 242,920 C or S/m^3, and the predominant mold was Basidiospores at an extremely high count of 158,000 C or S/m^3, with Aspergillus/Penicillium at a very high count of 40,500 C or S/m^3, followed by Ascotricha/Dicyma at a very high count of 31,400 C or S/m^3, and Scopulariopsis/Microascus at a high count of 10,700 C or S/m^3 and two additional mold genera at a much lower but still significant counts of 1,700 C or S/m^3 for Arthrospores, and 400 C or S/m^3 for Cladosporium. Five more mold genera were at trace levels of 70, 20, 40, 70, and 20 C or S/m^3 for Ascospores, Chaetomium, Curvularia, Myxomycetes, and Stachybotrys/Memnoniella, respectively. Chaetomium and Stachybotrys all like very wet conditions as does Myxomycetes (slime molds), but these concentrations are residually low and could have as easily entered from outside sometime in the past as be from any actual growth inside.

The concentrations of the three highest count molds, Basidiospores, Aspergillus/Penicillium and Ascostricha/Dicyma would be expected to produce serious asthma and allergy symptoms in anyone susceptible with allergen sensitivities to any of those mold genera and the Aspergillus/Penicillium in particular could potentially have more serious health effects for someone with a diminished immune system, if it is one of the more pathogenic species. The Scopulariopsis/Microascus would also have some potential to produce allergen and asthma symptoms, but that potential would be much less than the more numerous genera mentioned above. The two remaining mold genera at significant (non-trace levels) would have minor potential to produce symptoms and the trace level mold genera would have little to no potential.

OVES-2/8-02A (Front end of Basement on right side near side entrance to crawlspace)

The total airborne mold spore count for sample OVES-2/8-02A was an extremely high count of 101,710 C or S/m^3, and the predominant mold was Basidiospores at a very high count of 48,700 C or S/m^3, with, Ascotricha/Dicyma at a very high count of 34,700 C or S/m^3, followed by Aspergillus/Penicillium at a high count of 13,300 C or S/m^3, three additional mold genera were at much lower but still significant counts of 2,400 C or S/m^3 for Arthrospores, 2,000 C or S/m^3 for Scopulariopsis/Microascus and 400 C or S/m^3 for Cladosporium. Three more mold genera were all at trace levels of 70 C or S/m^3 for Ascospores, Chaetomium, and Unidentifiable Spores, respectively. Chaetomium likes very wet conditions but this concentration is residually low and could of as easily entered from outside sometime in the past as be from any actual growth inside.

The concentrations of the three highest count molds, Basidiospores, Ascostricha/Dicyma and Aspergillus/Penicillium would be expected to produce serious asthma and allergy symptoms in anyone susceptible with allergen sensitivities to any of those mold genera and the Aspergillus/Penicillium in particular could potentially have more serious health effects for someone with a diminished immune system, if it is one of the more pathogenic species. The three remaining mold genera at significant (non-trace levels) would be have minor potential to produce symptoms and the three trace level mold genera would have little to no potential.

OVES-2/8-07A (Outside the basement, at the garage door)

The total airborne mold spore count for sample OVES-2/8-07A was a trace count of 90 C or S/m^3. This contained trace levels of 70 C or S/m^3 Basidiospores and 20 C or S/m^3 Cladosporium. This sample would produce no allergy or asthma symptoms. Outside results this low are a rare result, and usually only possible in the winter, when conditions are cold and dry, or there is substantial snow cover.

Tape Lift Surface Mold Samples

Tape Lift Surface Mold Samples Spore Density Definitions: Rare: 1 to 10 spores/area analyzed, Low: 11 to 100 spores/area analyzed, Medium: 101 to 1000 spores/area analyzed, High: >1000 spores/area analyzed). Tape lift samples were collected using an EMSL Lab supplied tape lift sampler.

OVES-2/8- 03T (Basement – Table legs on right side near rear crawlspace)

A wooden table on right side of the basement area near the low divider wall had visible suspected surface mold growth which was sampled and found to consist of "High" spore density for Aspergillus fungi (species not determined) and "Low" spore density for Cladosporium. Aspergillus/Penicillium was found in high airborne concentration in the basement air and Cladosporium was found in low concentration in the basement air so these surface results are consistent.

OVES-2/8- 04T (Basement – Desk on right side near rear crawlspace)

A wooden desk on right side of the basement area near the low divider wall had visible suspected surface mold growth which was sampled and found to consist of "High" spore density for Aspergillus fungi (species not determined) and "High" spore density for Ascotricha/Dicyma. Aspergillus/ Penicillium and Ascotricha/Dicyma were found in high airborne concentration in the basement air so these surface results are consistent.

OVES-2/8-05T (Basement – Miscellaneous wooden furniture on right side, approx. halfway between the low dividing wall and the side crawlspace entrance)

Wooden furnishings on right side of the basement area approx. halfway between the low dividing wall and the side crawlspace entrance had visible suspected surface mold growth which was sampled and found to consist of "High" spore density for Aspergillus fungi (species not determined), and for Penicillium/Talaromyces with Low spore density for Basidiospores and Rare spore density for Myxomycetes. Aspergillus/Penicillium were found in high airborne concentration in the basement air, Basidiospores were found in Low spore density and Myxomycetes were found in trace levels. Based on the very high concentration of Basidiospores in the air samples, this concentration could have simply settled out of the air and the Myxomycetes may also have settled out of the air.

OVES-2/8-06T (Basement – Miscellaneous wooden furniture on right side, approx. halfway between the low dividing wall and the side crawlspace entrance)

Wooden furnishings on right side of the basement area approx. halfway between the low dividing wall and the side crawlspace entrance had visible suspected surface mold growth which was sampled and found to consist of "High" spore density for Aspergillus fungi (species not determined) only, Aspergillus/Penicillium was found in high airborne concentration in the basement.

Direct Read Parameters

In addition to the mold sampling, the following direct read IAQ parameters were sampled (using Direct Read instrumentation) carbon dioxide (CO_2), carbon monoxide (CO), temperature (°F) and % relative humidity (%RH), any of which could negatively affect the indoor air quality. CO_2 and CO readings were well below their maximum recommended values, respectively, and in fact CO_2 was only slightly higher than outside and CO was None Detected. The basement/crawlspace is definitely not a regularly occupied space and was occupied by only one person during the sampling (E2S), so any significant increase in CO_2 would have indicated a significant problem with the building envelope.

The space is generally unheated, so the temperature was expected to be much cooler than the recommended temperature range of 69 to 78 °F (it was actually 49.6 and 49.9 °F compared to an outside temperature of 28.2 °F). The % RH readings for Basement/Crawlspace were just within the low (dry) end of the acceptable % RH range of 30 to 60 % RH, with readings of 31.0 % and 37.6 %. The observed cold Temperature would inhibit certain mold genera from growing but other molds are capable of growing at these temperatures. The low (dry) % RH is unlikely to support mold growth until warmer weather allows higher interior % RH. Low RH is the primary source of complaints in heated buildings during the winter, as it can lead to dry eyes, sinuses and lips and other discomfort. The dry eyes and dry sinuses discomfort can when it is very dry, seem to indicate a potential upper respiratory infection, which it is not.

On the positive side, mold cannot grow at these low humidity levels, unless there is a continuous slow water leak or a large short-term water leak (plumbing or structural). All Direct Read results are included in Table 1. The conditions measured on 2/08/21, would not have supported mold growth. Update, a visual inspection of parts of the crawlspace indicated there was some ongoing groundwater intrusion into the crawlspace, this would be expected to increase the potential for mold growth, especially in warmer conditions (spring, summer, fall) if the intrusion continues.

Conclusions and Recommendations

The airborne mold spore samples indicated very high counts of three types of mold that were most predominant in the Basement Crawlspace, Basidiospores (includes mushrooms and shelf fungi), Aspergillus/Penicillium (very common interior mold that grows with humid conditions on wood and cellulose) and Ascotricha/Dicyma (two phases of the same mold, Ascotricha grows on wood and cellulose, and Dicyma prefers more easily "digested" cellulose). The airborne mold spore counts measured here were significant potential health concerns and could easily produce asthma and allergy

symptoms for anyone entering the basement/crawlspace area and more serious symptoms for susceptible individuals. Until corrective actions are completed, access to the basement/crawlspace areas should be limited.

Based on observations, the basement area has cardboard and old wood furniture, and the adjacent large crawlspace area has large quantities of old wood and framing on the dirt crawlspace floor. The crawlspace has a number of vent grills to the outside around the perimeter which would allow humidity and airborne mold spores from outside to enter easily, the dirt floor would also allow substantial amounts of moisture from the ground to evaporate into the basement/crawlspace air and further increasing the humidity. These observations indicate how it got moldy and why - (there is food (the contents), there is air (from the vents, you can't keep air out) and there is moisture (humidity from the air entering the vents and evaporation from the dirt floors).

There are several different issues that need to be addressed:

The airborne mold spore counts must be reduced substantially (this will require removal and disposal of all moldy contents and debris and junk). Most of the stored items in the basement appear to have some surface mold and most of the contents should be disposed of. Metal, or plastic items can probably be cleaned and sanitized if they are worth salvaging, but wood, cardboard, paper and fabric items should be disposed of along with any other object in the basement that is not worth salvaging. In the main portion of the basement crawlspace area, there are piles of lumber (source unknown) laying directly on the dirt floor. This wood appears to be damaged and is also very likely to have heavy surface mold growth. This wood should also be disposed of. A careful visual inspection should be performed in the rest of the crawlspace bays for additional substrate for mold growth (cardboard, paper, wood), most likely laying on the dirt floor.

Until such time as the humidity can be controlled and most of the mold eliminated, an exhaust system should be installed in the basement/crawlspace. This exhaust unit should be sized to accomplish the following: 1st) to create some negative pressure in the basement/crawlspace and prevent air movement from the basement crawlspace into the occupied space (classrooms/library/etc. above), this exhaust unit should be HEPA filtered so that the vast majority of mold spores that are being removed by the exhaust system will be trapped and removed and not have the potential to affect any one outside near the exhaust or in or near the school if the exhausted air blows back towards the school; 2nd) to reduce the spore count numbers in the basement/crawlspace, and to help control humidity and to help keep the dirt floor dry. There are also possibilities that dehumidification could help, but the space is large to attempt dehumidification. The wettest areas (where water intrusion is occurring) may need a drainage system to a sump for collection and discharge. There may be some improvement from sealing the dirt floor with plastic sheeting to reduce evaporation from the soil, but this would tend to increase humidity under the plastic and could lead to isolated mold growth (which would be under the plastic and not easily released into the air).

E2S was requested to prepare a Scope of Work for control of the airborne mold spores by reduction or elimination of the surface mold problem, and the clean up of contents and debris, and to provide additional recommendations for longer term control of the mold and moisture problems. The Scope of Work is currently in process and should be completed soon.

If and when corrective actions are implemented, it would be prudent to perform some follow-up IAQ sampling to evaluate the effectiveness of the corrective actions implemented. It was also discussed in several meetings that the school has had a history of humidity problem, primarily due to the management of the HVAC systems in warmer weather. Some additional IAQ testing when the building is back to normal occupancy would also be useful to help manage the HVAC systems to improve comfort and air quality.

Thank you for the opportunity to present Element Environmental Solutions (E2S) as a partner in your environmental management efforts. Should you have questions or require additional information, please contact me.

Sincerely,
E2S, Inc.

Robert A. Pfromm, CIH
Technical Manager, IAQ

Appendix A

Mold Spore Results

EMSL Analytical, Inc.

5221 Militia Hill Road Plymouth Meeting, PA 19462

Tel/Fax: (610) 828-3102 / (610) 828-3122

http://www.EMSL.com / plymouthmeetinglab@emsl.com

EMSL Order: 182100495
Customer ID: ELES42
Customer PO: 1040.0012-T10
Project ID:

Attention: Robert Pfromm, CIH
Element Environmental Solutions, Inc.
61 Willow Street
PO Box 921
Adamstown, PA 19501
Project: PSD - Oxford Valley ES - 1040.0012-T10

Phone: (717) 484-5111
Fax:
Collected Date:
Received Date: 02/08/2021 12:45 PM
Analyzed Date: 02/10/2021

Test Report:Air-O-Cell(™) Analysis of Fungal Spores & Particulates by Optical Microscopy (Methods MICRO-SOP-201, ASTM D7391)

Lab Sample Number:	182100495-0001			182100495-0002			182100495-0007		
Client Sample ID:	OVES-2/8-01A			OVES-2/8-02A			OVES-2/8-07A		
Volume (L):	45			45			45		
Sample Location:	Basement Near Back Crawlspace			Basement Near Side Crawlspace			Outside Basement		
Spore Types	**Raw Count**	**Count/M³**	**% of Total**	**Raw Count**	**Count/M³**	**% of Total**	**Raw Count**	**Count/M³**	**% of Total**
Alternaria (Ulocladium)	-	-	-	-	-	-	-	-	-
Ascospores	1	70	0	1	70	0.1	-	-	-
Aspergillus/Penicillium	576	40500	16.7	189	13300	13.1	-	-	-
Basidiospores	2240	158000	65	693	48700	47.9	1	70	77.8
Bipolaris++	-	-	-	-	-	-	-	-	-
Chaetomium	1*	20*	0	1	70	0.1	-	-	-
Cladosporium	5	400	0.2	5	400	0.4	1*	20*	22.2
Curvularia	2*	40*	0	-	-	-	-	-	-
Epicoccum	-	-	-	-	-	-	-	-	-
Fusarium	-	-	-	-	-	-	-	-	-
Ganoderma	-	-	-	-	-	-	-	-	-
Myxomycetes++	1	70	0	-	-	-	-	-	-
Pithomyces++	-	-	-	-	-	-	-	-	-
Rust	-	-	-	-	-	-	-	-	-
Scopulariopsis/Microascus	152	10700	4.4	29	2000	2	-	-	-
Stachybotrys/Memnoniella	1*	20*	0	-	-	-	-	-	-
Unidentifiable Spores	-	-	-	1	70	0.1	-	-	-
Zygomycetes	-	-	-	-	-	-	-	-	-
Arthrospores	24	1700	0.7	34	2400	2.4	-	-	-
Ascotricha / Dicyma	446	31400	12.9	494	34700	34.1	-	-	-
Total Fungi	**3449**	**242920**	**100**	**1447**	**101710**	**100**	**2**	**90**	**100**
Hyphal Fragment	3	200	-	4	300	-	-	-	-
Insect Fragment	1	70	-	1	70	-	-	-	-
Pollen	-	-	-	-	-	-	-	-	-
Analyt. Sensitivity 600x	-	70	-	-	70	-	-	70	-
Analyt. Sensitivity 300x	-	22*	-	-	22*	-	-	22*	-
Skin Fragments (1-4)	-	1	-	-	1	-	-	1	-
Fibrous Particulate (1-4)	-	1	-	-	1	-	-	1	-
Background (1-5)	-	1	-	-	1	-	-	1	-

++ Includes other spores with similar morphology; see EMSL's fungal glossary for each specific category.

No discernable field blank was submitted with this group of samples.

Kevin Ream, Laboratory Manager
or other Approved Signatory

Initial report from: 02/10/2021 11:52 AM

For information on the fungi listed in this report, please visit the Resources section at www.emsl.com

EMSL Analytical, Inc.

5221 Militia Hill Road Plymouth Meeting, PA 19462
Tel/Fax: (610) 828-3102 / (610) 828-3122
http://www.EMSL.com / plymouthmeetinglab@emsl.com

EMSL Order: 182100495
Customer ID: ELES42
Customer PO: 1040.0012-T10
Project ID:

Attention: Robert Pfromm, CIH
Element Environmental Solutions, Inc.
61 Willow Street
PO Box 921
Adamstown, PA 19501
Project: PSD - Oxford Valley ES - 1040.0012-T10

Phone: (717) 484-5111
Fax:
Collected Date:
Received Date: 02/08/2021
Analyzed Date: 02/10/2021

Test Report: Microscopic Examination of Fungal Spores, Fungal Structures, Hyphae, and Other Particulates from Tape Samples (EMSL Method MICRO-SOP-200)

Lab Sample Number: / Client Sample ID: / Sample Location:	182100495-0003 OVES-2/8-03T Table Legs Near Rear Crawl	182100495-0004 OVES-2/8-04T Desk Near Rear Crawl	182100495-0005 OVES-2/8-05T Furniture Between Crawl	182100495-0006 OVES-2/8-06T Furniture Between Crawl	
Spore Types	Category	Category	Category	Category	
Alternaria (Ulocladium)	-	-	-	-	
Ascospores	-	-	-	-	
Aspergillus/Penicillium	-	-	-	-	
Basidiospores	-	-	Low	-	
Bipolaris++	-	-	-	-	
Chaetomium	-	-	-	-	
Cladosporium	*Low*	-	-	-	
Curvularia	-	-	-	-	
Epicoccum	-	-	-	-	
Fusarium	-	-	-	-	
Ganoderma	-	-	-	-	
Myxomycetes++	-	-	Rare	-	
Pithomyces++	-	-	-	-	
Rust	-	-	-	-	
Scopulariopsis/Microascus	-	-	-	-	
Stachybotrys/Memnoniella	-	-	-	-	
Unidentifiable Spores	-	-	-	-	
Zygomycetes	-	-	-	-	
Ascotricha / Dicyma	-	*High*	-	-	
Aspergillus	*High*	*High*	*High*	*High*	
Penicillium/Talaromyces	-	-	*High*	-	
Hyphal Fragment	-	-	-	-	
Insect Fragment	-	-	-	-	
Pollen	-	-	-	-	

Category: Count/per area analyzed - Rare: 1 to 10 Low: 11 to 100 Medium: 101 to 1000 High: >1000

- Denotes Not Detected.
++ Includes other spores with similar morphology; see EMSL's fungal glossary for each specific category.
* = Sample contains fruiting structures and/or hyphae associated with the spores.

Kevin Ream, Laboratory Manager
or other Approved Signatory

No discernable field blank was submitted with this group of samples.

Initial report from: 02/10/2021 11:52 AM

For information on the fungi listed in this report, please visit the Resources section at www.emsl.com

OrderID: 182100495

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

182100495
EMSL Order Number (*Lab Use Only*):

EMSL ANALYTICAL, INC
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077

Company : Element Environmental Solutions, Inc.	**EMSL-Bill to:** ☒ Same ☐ Different **If Bill to is Different please note in Comments****
Street: 61 Willow Street PO Box 921	*Third Party Billing requires written authorization from third party*
City: Adamstown / **State/Province:** PA	**Zip/Postal Code:** 19501 / **Country:** USA
Report To (Name): Robert Pfromm, CIH	**Fax #:**
Telephone #: 717-484-5111	**E-mail Address:** IAQ@e2s.us bob@e2s.us
Project Name/ Number: PSD - OXFORD VALLEY ES - 1040.002-T10	
Please Provide Results: ☐ Fax ☒ E-mail	**PO#** 1040.002.T10 / **State Samples Taken:** PA

Turnaround Time (TAT) Options* - Please Check

☐ 3 Hour ☐ 6 Hour ☐ 24 Hour ☑ 48 Hour ☐ 72 Hour ☐ 96 Hour ☐ 1 Week ☐ 2 Week

**Analysis completed in accordance with EMSL's Terms and Conditions located in the Analytical Price Guide. TATs are subject to methodology requirements*

Non Culturable Air Samples (Spore Traps)

• **M001** Air-O-Cell	• **M173** Allegro M2	• **M004** Allergenco	• **M032** Allergenco-D	• **M172** Versa Trap
• **M049** BioSIS	• **M003** Burkard	• **M043** Cyclex	• **M002** Cyclex-d	
• **M030** Micro 5	• **M174** MoldSnap	• **M176** Relle Smart	• **M130** Via-Cell	

Other Microbiology Test Codes

• **M041** Fungal Direct Examination	• **M014** Endotoxin Analysis	• **M029** *Enterococci*
• **M005** Viable Fungi ID and Count	• **M015** Heterotrophic Plate Count	• **M019** Fecal Coliform
• **M006** Viable Fungi ID and Count (Speciation)	• **M180** Real Time Q-PCR-ERMI 36 Panel	• **M133** MRSA Analysis
• **M007** Culturable Fungi	• **M018** Total Coliform (Membrane Filtration)	• **M028** *Cryptococcus neoformans* Detection
• **M008** Culturable Fungi (Speciation)	• **M020** Fecal *Streptococcus* (Membrane Filtration)	• **M120** *Histoplasma capsulatum* Detection
• **M009** Gram Stain Culturable Bacteria	• **M210-215** *Legionella* Detection	• **M033-39** Allergen Testing
• **M010** Bacterial Count and ID – 3 Most Prominent	• **M026** Recreational Water Screen	• **M044** Group Allergen (Cat, Dog, Cockroach, Dustmites)
• **M011** Bacterial Count and ID – 5 Most Prominent	• **M027** Mycotoxin Analysis	• **Other** See Analytical Price Guide
• **M013** Sewage Contamination in Buildings		

Preservation Method (Water):

Name of Sampler: Robert Pfromm **Signature of Sampler:** Robert Pfromm

Sample #	Sample Location	Sample Type	Test Code	Volume/Area	Date/Time Collected
OVES-2/8-01A	BASEMENT NEAR BACK CRAWLSPACE	AIR	M001	45L	2-8-21
-02A	" " SIDE "	"	"	45L	
-03T	TABLE LEGS NEAR REAR CRAWL.	TAPE	M041	—	
-04T	DESK " " "	"		—	
-05T	FURNITURE - BETWEEN CRAWL.	"		—	
-06T	" " "	"		—	
-07A	OUTSIDE BASEMENT	AIR	M001	45L	

Client Sample # (s): OVES-2/8-01A → -07A **Total # of Samples:** 7

Relinquished (Client): Robert Pfromm **Date:** 2-8-21 **Time:**

Received (Client): [signature] **Date:** 2/8/21 **Time:** 12 45 p.m

Comments:

Appendix B

Procedures and Reporting Criteria

Sampling Methods & Results Evaluation Criteria

Evaluation Procedures

The total spore count air samples were collected using Zefon Airocell ® cassettes and a Zefon Biopump® calibrated to sample 15 lpm for 5 minutes at each location. Airborne mold spore air samples are usually collected for short periods (generally 3 to 10 minutes depending on the sampling area's conditions). Longer sampling periods and higher volumes of air can lead to samples obscured by collected dust or spore overcrowding, which could limit the lab's ability to count and identify the collected spores. All samples were sealed, labeled and submitted with appropriate chain of custody paperwork for lab analysis by an American Industrial Hygiene Association (AIHA) accredited microbiology laboratory.

The following parameters were sampled using direct read instrumentation:

- carbon dioxide
- carbon monoxide
- temperature
- % relative humidity

All of which could negatively affect the indoor air quality.

Allergen (Mold) Sampling

Criteria

If airborne mold spores are found in the interior samples, they generally should be the same varieties and similar proportions to those found in the outside samples and should be less than about 25% of the outside count. If windows in the area were open for ventilation this can result in similarity or equality between the indoor and outdoor samples collected on an Airocell cassette (an impaction sampler that uses a calibrated sampler to evaluate 15 lpm of air for a specific amount of time, usually 3 to 5 minutes). The Airocell cassette interior samples are forwarded to a certified lab for microscopic analysis and are compared to exterior samples. During the spring, summer and early fall it is not unusual to have outdoor spore counts in excess of twenty to forty thousand spores or counts per cubic meter of air (C or S/m^3). Alternatively, in late fall, winter and early spring, cold temperatures and snow cover can result in very low outside counts.

Under normal conditions, if varieties of mold are found that are not present in the outside samples, they may be artifacts having entered the building with normal air exchange when different varieties of mold were more numerous outside, or they could indicate localized mold growth occurring outside near an entry point (such as a window or a fresh air intake for an HVAC system) that did not directly affect the primary outside samples, or they could indicate mold growth occurring in a hidden or distant location within the building. If the third scenario is suspected, similar mold varieties will usually be noted in samples collected closer to the unknown source with results usually higher the closer to the source. If mold spores are found in substantially higher number than the outside sample, or elevated counts appear for varieties not found outside, then this could indicate some mold growth in the vicinity of the collected sample and a careful visual inspection is in order. Some specific varieties of mold can

indicate problems, for example: the presence of Stachybotrys and/or Chaetomium can indicate very wet conditions may be occurring at a prime mold food source such as drywall, cellulose ceiling tile, paper products including cardboard or carpeting.

For carpet or floor dust mold spore evaluation, dust is collected using a “mini-vac” procedure with a high volume air pump acting as the suction source and a 25 mm X 0.8 micron pore size membrane filter cassette as the collection medium. For actual suspected surface mold, sampling is performed using an EMSL Biotape® tape lift sampler to collect spores and mold structure for identification. Analysis is performed by direct microscopic examination and identified mold spores are quantified as follows: The concentrations used to describe surface mold density are as follows: “Rare” = 1 to 10 Spores/area, “Low” = 11 to 100 spores/area, “Medium” =101 to 1000 spores/area and “High” = > 1000 spores. Obviously, the actual area of the mold growth is important, as a spot of mold ½ inch in diameter will have a “High” spore density result but will not be a significant hazard or concern, but several square feet or larger of surface growth could be extremely serious.

Direct Read Results

Carbon Dioxide

Carbon Dioxide (CO_2) levels are measured as an indicator of adequate ventilation.

Criteria

The OSHA Permissible Exposure Limit (PEL) for carbon dioxide is 5,000 ppm.

The American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) recommended guideline for IAQ purposes is site specific. The limit is calculated as the amount of CO_2 outside the building at the time of sampling plus 700 ppm.

It should be noted that exceeding the ASHRAE maximum CO_2 level does not necessarily indicate a hazard, the primary effect of exceeding the guideline value is that odors are more noticeable.

Carbon Monoxide

Carbon Monoxide (CO) levels are measured to evaluate possible intrusion of combustion exhaust.

Criteria

The Occupational Safety and Health Administration Permissible Exposure Limit (OSHA PEL) for carbon monoxide is 50 ppm.

The National Institute of Occupational Safety and Health Recommended Exposure Limit (NIOSH REL) is 35 ppm.

The American Council of Governmental Industrial Hygienists Threshold Limit Value (ACGIH TLV) is 25 ppm.

The American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) recommended guideline for IAQ purposes is 9 ppm.

Temperature

Occupant comfort may be affected by temperatures that are either too cold or too warm.

Criteria

Based on calculations the ASHRAE 55-2010 Standard provides an acceptable temperature range for normal occupancy interior applications during the summer season of 73 to 78.5 °F; these values are for occupied, temperature controlled buildings. Note the different ranges for different humidity levels. As the % RH values frequently exceeded the 60% value and the building was unoccupied during the remediation, a full 69 to 78 °F range was used.

RECOMMENDED RANGES OF TEMPERATURE AND RELATIVE HUMIDITY

Relative humidity	Winter Temperature	Summer Temperature
30%	68.5°F – 75.5°F	74.0°F – 80.0°F
40%	68.0°F – 75.0°F	73.5°F – 80.0°F
50%	68.0°F – 74.5°F	73.0°F – 79.0°F
60%	67.5°F – 74.0°F	73.0°F – 78.5°F

Recommendations apply for persons clothed in typical summer and winter clothing, at light, mainly sedentary, activity.

Source: Adopted from ASHRAE Standard 55-1992, Thermal Environmental Conditions for Human Occupancy

Relative Humidity (% RH)

Relative humidity in excess of 60% contributes to the potential for increased microbial growth, which in turn may aggravate allergic conditions or in extreme cases create biological hazards. Values near the 60% RH level are more common in the cooling season (summer) and values lower than 30% RH are very common in the heating season (winter). Interior humidity can shift quickly depending on the outside conditions and the operation of HVAC equipment. Low Humidity is more likely to produce comfort related issues than higher humidity levels. These comfort issues include irritation from drying of skin, eyes, and mucus membranes (sinuses, mouths, lips).

Criteria

Relative humidity affects occupant comfort when it is either too high or too low. The American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) recommended range for interior comfort is 30 to 60% RH.