



September 28, 2023

Ms. Erin Obey
Superintendent of Schools
Pembroke Public Schools
72 Pilgrim Road
Pembroke, MA 02339

RE: Limited Microbial (Mold) Assessment Report #2 for
Hobomock Elementary School
81 Learning Lanes, Pembroke, MA
PMEC Project #23-184

Dear Ms. Obey:

Paul Matuszko Environmental Consulting (**PMEC**) is pleased to submit this microbial sampling report for the assessment conducted at the Hobomock Elementary School, 81 Learning Lanes, Pembroke, Massachusetts. PMEC was retained by the Pembroke Public Schools to conduct a microbial (mold/fungal) assessment within designated locations of the school building in response to initial sampling on September 19, 2023. The microbial sampling was conducted by PMEC Principal, Paul Matuszko after school hours on September 25, 2023. The assessment included inspecting existing conditions and conducting spore trap air and surface tape lift sampling. A summary of the site assessment findings, sample methods, and analysis results are provided as follows:

1.0 Background

A. PMEC conducted sampling within the following designated classrooms:

- Spore trap air samples collected in Classrooms 225, 230, 235, 245, and 250.
- Limited surface tape lift sampling (3 samples) in classroom 225.

B. Additional visual inspection within classroom 225 was conducted with the following existing conditions:

- Under sink cabinet – dry and no visible mold.
- Within perimeter benches at heating vents – dry with no visible mold. Excessive misc. debris present.
- Ceiling exhaust vent – clean vent with visible accumulated dust and debris within the flex exhaust ducting.
- Ceiling supply vents – minor dust buildup with no visible mold present. Interior ducting also clean with no visible debris buildup.
- Ceiling plenum above ceiling tiles – dry surfaces with no visible mold present. Yellowish stains on metal joists also not mold (tape lift sample 03T). Yellow stains possible dried condensation dripping from summer months.
- No visible mold growth on ceiling tiles or other exposed surfaces.

Note: additional areas of the school building were not assessed on the sampling date.

2.0 Air Quality Measurements

A. A direct reading, thermohygrometer (Fluke Model 971) was used to collect representative temperature and relative humidity (ratio of water vapor in air) measurements. Recommended season levels are:

- Temperature (Temp.): Recommended Winter Range: 63-72 °F
Recommended Summer: 68-78 °F
- Relative Humidity (RH%) Recommended Range: between 30%-60%

B. The measurement results on the assessment date are provided in Table 1 below:

Location	Temperature	Relative Humidity %
Classroom #225	69.0 °F	72.5%
Classroom #230	69.2 °F	70.3%
Classroom #235	69.6 °F	68.6%
Classroom #245	68.4 °F	72.1%
Classroom #250	68.6 °F	71.0%
Outside ambient air (door #3)	~60.7 ° F	>80.5% (drizzle, post rain)

- The indoor measurements indicate typical conditions for a late summer, rainy day. Continued dehumidification is recommended for interior spaces where RH% levels are over 60%.

3.0 Mold Sampling and Analysis Methods

A. As part of the assessment, PMEC collected seven (7) "spore trap" air samples for mold spore analysis using air-o-cell® brand sampling cassettes. Six interior samples and one outdoor ambient sample were collected for analysis. A calibrated, battery operated Zefon IAQ 15 sampling pump was used to draw air onto the sample cassette's adhesive slide. PMEC collected the samples at 15 liters of air per minute (LPM) for a five (5) minute sample duration for a total sample collection volume of 75 liters of air. The airborne aerosols (mold, particulates, pollen, etc.) are trapped on the filter media slide for direct microscopic examination.

B. The samples were collected on September 25, 2023 at approximately 3:30 am – 4:45 pm. The results and discussion described herein are only representative of the conditions on the date and time of sample collection.

C. Additionally, PMEC collected three (3) "tape lift" surface samples (physical samples) of suspect surfaces in classroom 225. Clear adhesive microscope slide/tape is lightly pressed over a surface to adhere suspect particulate material onto the sticky tape surface. A glass slide/cover slip is placed over the slide sample area for direct visible microscopic examination. Samples are analyzed for spore levels and potential growth (mycelium). Additionally, the same samples were also analyzed for particle composition to assist in determining the source of the ghosting issue.

D. The samples were sent via chain of custody by Fed Ex to Hayes Microbial Laboratory (Hayes), located in Midlothian, Virginia. Hayes Laboratory is accredited by the American Industrial Hygiene Association (AIHA) for mold and bacteria identification and analysis (AIHA EMPAT Laboratory Accreditation ID # 188863).

- E. Results are reported as Total Fungi Counts in spores per cubic meter of air (**C/m³**). The samples were analyzed for both non-viable and viable fungi (mold) by direct analysis optical microscopy.
- F. A summary of analysis criteria of spore trap and direct identification analysis is provided in the lab analysis sheets. The sample results are provided under separate attachment to this report.

4.0 Laboratory Analysis Results

- A. The results of the mold spore air sampling are presented in Table 2 below.

Table 2 Mold Sample Analysis Results September 25, 2023 (2nd round)			
Sample #	Sample Location	Total Fungi (C/m³)	Specific Species & levels of note
3705 3109 (01)	Classroom 225 - at front desk (opposite entrance door)	750 C/m ³	Aspergillus/Penicillium – 750 C/m³
3705 3116 (02)	Classroom 225 - at back desk (near door)	243 C/m ³	Aspergillus/Penicillium – 230 C/m³ Myxomycetes – 13 C/m ³
3705 3119 (03)	Classroom 230 – at back desk	210 C/m ³	Aspergillus/Penicillium – 210 C/m³
3705 3115 (04)	Classroom 235 – at back desk	53 C/m ³	Ascospores – 40 C/m ³ Basidiospores – 13 C/m ³
3705 3118 (05)	Classroom 245 – at back desk	26 C/m ³	Basidiospores – 13 C/m ³ Cladosporium – 13 C/m ³
3592 3577 (06)	Classroom 250 – at back desk	40 C/m ³	Ascospores – 40 C/m ³
3705 3102 (07)	Outside ambient air Outside exit door 3 (comparison sample)	2,057 C/m ³	Ascospores – 1,500 C/m ³ Basidiospores – 530 C/m ³ Myxomycetes – 27 C/m ³

Notes: Additional information on species types are provided in the Laboratory Analysis results.

- B. The results of the tape lift sample mold analysis are presented in Table 3 below.

Table 3 Tape Lift (Bio-Tape) Surface Sampling Analysis Results			
Sample #	Sample Location	Mold Spore Present / Estimate	Mycelial estimate (Growth potential)
01T	Classroom 225 – left side ceiling supply vent	Myxomycetes - rare Aspergillus/Penicillium – light	None (ND) None (ND)
02T	Classroom 225 – left side ceiling supply vent	Aspergillus/Penicillium – light Cladosporium – Light	None (ND)
03T	Classroom 225 – in ceiling plenum on back side metal ceiling joist (yellow staining)	No Fungi Present	None (ND)

5.0 Discussion of Mold Results

A. Spore trap sample results:

1. Classroom 225 – Current spore levels have been reduced in comparison to the initial sample collected on September 19, 2023. The total spore levels are acceptable but the presence of aspergillus/penicillium spores is slightly elevated and dominates the results. No aspergillus/penicillium (Asp/Pen) spores were present in the outdoor comparison sample. The classroom to contain settled spores with no active growth in accordance IICRC condition level II. Therefore, a source of the Asp/Pen spores still exists in the classroom which should be addressed.
2. Classroom 230 - The analysis results for the sample collected in classroom 230 indicates generally normal levels of mold spores. However, 16 spores of Asp/Pen species were identified which indicates a potential source in and around the room. Although not an excessive level, the dominant presence of the Asp/Pen spores is noted when compared to the outside sample. This classroom should be further addressed to reduce and eliminate any sources of the Asp/Pen spores.
3. Classrooms 235, 245, 250 – The analysis results in classrooms 235, 245, and 245 indicate normal and low levels of airborne mold spores. The indoor airborne mold spore levels in the locations sampled on the assessment date are considered very low and acceptable. The current airborne spore levels on the sampling date are not representative of an amplified airborne spore condition. The analysis results did not identify any significant mold spore levels that would be a cause for concern at this time.

B. Tape lift sample results:

1. The surface tape lift analysis results indicate a **light** (low) presence of Asp/Pen spores on the HVAC supply vents. The vents were generally clean with no active mold growth. Minor levels of settled mold spores on the vent grills suggests possible contamination from the roof top air handling unit (AHU).
2. The surface tape lift results of the suspect yellow staining on the metal joists within the ceiling plenum were not fungal related. No visible mold growth was present in the ceiling plenum.

7.0 Background Mold Information

- A. Currently, there are no standards or regulations to indicate acceptable numerical levels of airborne fungal spores derived from indoor environments. Results are also assessed for specific target species that may induce allergic reactions. Specific species are reviewed for their known potential to cause allergic reactions or as an indicator of potential water damage and moisture issues. In general, indoor mold levels should be equivalent to or lower than outdoor levels or non-complaint areas with similar types and percentages of mold species. Please note that airborne mold spores are present in most indoor environments at low levels.
- B. There are no regulations for acceptable levels of mold in the indoor environment; therefore, exact numerical limits are not supported at this time. Specific fungal species of concern are recommended to have much lower levels in the indoor environment. Existing conditions and symptoms are unique to each season, building and occupant. Airborne mold spore levels may vary greatly by location, time of day and weather conditions. However, health impacts cannot be predicted based on this information; individuals experience varying levels of allergic and non-

allergic response to mold. Controlling moisture is critical to the prevention of indoor mold growth issues.

8.0 Conclusions

- A. The laboratory analysis results indicate that the airborne mold spore levels were lower than previous sampling results. Slightly elevated Asp/Pen spores still exist in classrooms 225 and 230 which should be addressed. Other classrooms sampled indicate normal and acceptable fungal spore levels.
- B. The tape lift results indicate “light” levels of Asp/Pen and cladosporium spores on the HVAC supply grills. Potential microbial growth with the AHU and associated ductwork may allow the spread of airborne spores in designated classrooms.

9.0 Recommendations

- A. The roof top AHU and associated duct work for classroom 225 and 230 should be properly cleaned and decontaminated. Additional cleaning of all duct work is recommended at the appropriate time frame.
- B. HEPA filtration via scrubber fans is recommended for classrooms 225, 230, and all adjacent areas. The process of HEPA filtration will assist in reducing airborne mold spore levels on a consistent basis over time. The fans should operate whenever school is not in session (overnight, holidays, weekends). Operating the fans during the summer and fall season (May-October) is recommended.
- C. Horizontal room surfaces may be cleaned and disinfected on a regular basis (ex. weekly, monthly) to assist in removing any settled spores that may be present. A light wet-wiping with a minor disinfectant can be used to reduce settled spore levels.
- D. If feasible, indoor relative humidity (RH%) levels should be controlled to maintain levels below 60%, and preferably below 50%. A detailed plan involving various engineering controls and proper HVAC operation should be developed to assist in controlling indoor RH% levels during the summer and early fall months.
- E. All remedial response actions should be conducted in accordance with the guidelines and standard established the US EPA & OSHA, and Institute of Inspection, Cleaning and Restoration Certification (IICRC) S520 mold remediation methods and industry standards.

11.0 Limitations

- A. The assessment provided herein is based on the professional judgment of PMEC using approved industry standards and guidelines. Assessment findings are based on the investigator’s careful consideration of field observations and interpretation of analysis results in accordance with industry standards, including, but not limited to, IICRC S520 guidelines for Condition 1 – normal fungal ecology, 2008 AIHA (Green Book) publication “Recognition, Evaluation, and Control of Indoor Mold”, and the ACGIH 1999 book “Bioaerosols – Assessment and Control”.
- B. The analysis results are only representative of the conditions of the date and time of sample collection and are considered a “snapshot in time”. PMEC’s results listed herein represent the conditions present at the time of inspection and sampling.

Should you have any additional questions regarding this assessment report or the results, please do not hesitate to contact me at 617-893-4476 or email at pmatuszko@pmecsolutions.com. PMEC appreciates the opportunity to provide our services to the Pembroke Public Schools for this project.

Respectively submitted,



Paul Matuszko, CIH, CIEC
Project Manager/Principal



ATTACHMENTS

Attachment A – Sampling Floor Plan (page 1)

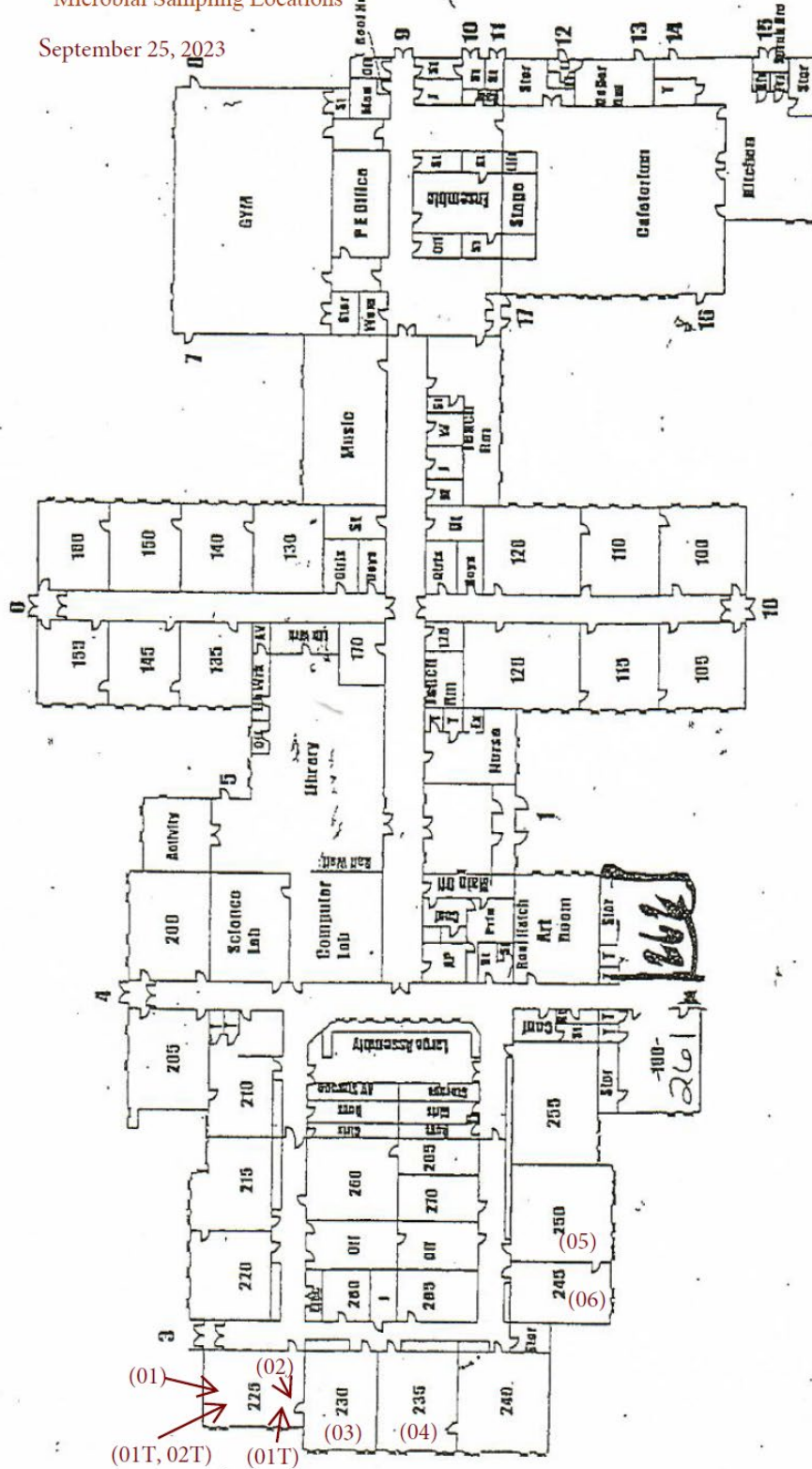
Attachment B – Hayes Microbial - Sample Analysis Results (pages 1-7)

Attachment A – Sampling Floor Plan

Hobomock Elementary School
Microbial Sampling Locations

September 25, 2023

ASAC 10/1/2023



gle Door
1down

Attachment B

Laboratory Analysis Results

Hayes Microbial – pages 1-7



#23041253

Analysis Report prepared for

Paul Matuszko Environmental Consulting

79 Cedar Street
Walpole, MA 02081

Phone: (617) 893-4476

23-184
Pembroke Public Schools
Hobomock Elem School
81 Learning Lanes
Pembroke, MA 02359

Collected: **September 25, 2023**
Received: **September 27, 2023**
Reported: **September 27, 2023**



EPA Laboratory ID: VA01419



Lab ID: #188863



DPH License: #PH-0198

We would like to thank you for trusting Hayes Microbial for your analytical needs!
We received 10 samples by FedEx in good condition for this project on September 27th, 2023.

The results in this analysis pertain only to this job, collected on the stated date, and should not be used in the interpretation of any other job. Information supplied by the customer can affect the validity of results. These results apply only to the samples as received. This report may not be duplicated, except in full, without the written consent of Hayes Microbial Consulting, LLC.

All information provided to Hayes Microbial is confidential information relating to our customers and their clients. We will not disclose, copy, or distribute any information verbally or written, except to those designated by the customer(s). We take confidentiality very seriously. No changes to the distribution list will be made without the express consent of the customer.

This laboratory bears no responsibility for sample collection activities, analytical method limitations, or your use of the test results. Interpretation and use of test results are your responsibility. Any reference to health effects or interpretation of mold levels is strictly the opinion of Hayes Microbial. In no event, shall Hayes Microbial or any of its employees be liable for lost profits or any special, incidental or consequential damages arising out of the use of these test results.

A handwritten signature in black ink that reads 'Stephen N. Hayes'.

Steve Hayes, BSMT(ASCP)
Laboratory Director
Hayes Microbial Consulting, LLC.

Sample Number*	1 3705 3109			2 3705 3116			3 3705 3119			4 3705 3115		
Sample Name*	Classroom 225 - Front Desk			Classroom 225 - Back Desk			Classroom 230 - Backdesk			Classroom 235 Back Desk		
Sample Volume*	75 L			75 L			75 L			75 L		
Reporting Limit	13 spores/m ³			13 spores/m ³			13 spores/m ³			13 spores/m ³		
Background	2			2			2			2		
Fragments	ND			ND			ND			ND		
Organism	Raw Count	Count / m ³	% of Total	Raw Count	Count / m ³	% of Total	Raw Count	Count / m ³	% of Total	Raw Count	Count / m ³	% of Total
Alternaria												
Ascospores										3	40	75.0%
Aspergillus Penicillium	56	750	100.0%	17	230	94.4%	16	210	100.0%			
Basidiospores										1	13	25.0%
Bipolaris Drechslera												
Chaetomium												
Cladosporium												
Curvularia												
Epicoccum												
Fusarium												
Memnoniella												
Myxomycetes				1	13	5.6%						
Pithomyces												
Stachybotrys												
Stemphylium												
Torula												
Ulocladium												
Total	56	750	100%	18	243	100%	16	210	100%	4	53	100%

Water Damage Indicator	Common Allergen	Slightly Higher than Baseline	Significantly Higher than Baseline	Ratio Abnormality
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* indicates data provided by the customer

Collected: **Sep 25, 2023**

Received: **Sep 27, 2023**

Reported: **Sep 27, 2023**



Project Analyst:
 Jeremiah Moore, *jeremiah moore*

Date:
09 - 27 - 2023

Reviewed By:
 Steve Hayes, BSMT *Stephen N. Hayes*

Date:
09 - 27 - 2023

Sample Number*	5 3705 3118			6 3592 3577			7 3705 3102		
Sample Name*	Classroom 245 - Back Desk			Classroom 250 - Back Desk			Outdoor Ambient Air		
Sample Volume*	75 L			75 L			75 L		
Reporting Limit	13 spores/m ³			13 spores/m ³			13 spores/m ³		
Background	2			2			2		
Fragments	ND			ND			ND		
Organism	Raw Count	Count / m ³	% of Total	Raw Count	Count / m ³	% of Total	Raw Count	Count / m ³	% of Total
Alternaria									
Ascospores				3	40	100.0%	110	1500	72.4%
Aspergillus Penicillium									
Basidiospores	1	13	50.0%				40	530	26.3%
Bipolaris Drechslera									
Chaetomium									
Cladosporium	1	13	50.0%						
Curvularia									
Epicoccum									
Fusarium									
Memnoniella									
Myxomycetes							2	27	1.3%
Pithomyces									
Stachybotrys									
Stemphylium									
Torula									
Ulocladium									
Total	2	26	100%	3	40	100%	152	2057	100%

Water Damage Indicator Common Allergen Slightly Higher than Baseline Significantly Higher than Baseline Ratio Abnormality

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 Jeremiah Moore, *Jeremiah Moore*

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09 - 27 - 2023

Reviewed By:
 Steve Hayes, BSMT *Stephen N. Hayes*

Date:
09 - 27 - 2023

#8	Bio-Tape (1.00 cm2*)	Organism	Spore Estimate	Mycelial Estimate
01T - Classroom 225 - Left Supply Vent		Myxomycetes	Rare	ND
		Aspergillus Penicillium	Light	ND
#9	Bio-Tape (1.00 cm2*)	Organism	Spore Estimate	Mycelial Estimate
02T - Classroom 225 - Right Supply Vent		Aspergillus Penicillium	Light	ND
		Cladosporium	Light	ND
#10	Bio-Tape (1.00 cm2*)	Organism	Spore Estimate	Mycelial Estimate
03T - Classroom 225 - Ceiling Metal Joist		No Fungi Detected		

* indicates data provided by the customer



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 Jeremiah Moore, *Jeremiah Moore*

Date:
09 - 27 - 2023

Reviewed By:
 Steve Hayes, BSMT *Stephen N. Hayes*

Date:
09 - 27 - 2023

Spore Trap Information

Reporting Limit	The Reporting Limit is the lowest number of spores that can be detected based on the total volume of the sample collected and the percentage of the slide that is counted. At Hayes Microbial, 100% of the slide is read so the LOD is based solely on the total volume. Raw spore counts that exceed 500 spores will be estimated.										
Blanks	Results have not been corrected for field or laboratory blanks.										
Background	<p>The Background is the amount of debris that is present in the sample. This debris consists of skin cells, dirt, dust, pollen, drywall dust and other organic and non-organic matter. As the background density increases, the likelihood of spores, especially small spores such as those of Aspergillus and Penicillium may be obscured. The background is rated on a scale of 1 to 5 and each level is determined as follows:</p> <p>NBD: No background detected due to possible pump or cassette malfunction. Recollect sample. (Field Blanks will display NBD)</p> <p>1 : <5% of field occluded. No spores will be uncountable.</p> <p>2 : 5-25% of field occluded.</p> <p>3 : 25-75% of field occluded.</p> <p>4 : 75-90% of field occluded.</p> <p>5 : >90% of field occluded. Suggested recollection of sample.</p>										
Fragments	Fragments are small pieces of fungal mycelium or spores. They are not identifiable as to type and when present in very large numbers, may indicate the presence of mold amplification.										
Control Comparisons	There are no national standards for the numbers of fungal spores that may be present in the indoor environment. As a general rule and guideline that is widely accepted in the indoor air quality field, the numbers and types of spores that are present in the indoor environment should not exceed those that are present outdoors at any given time. There will always be some mold spores present in "normal" indoor environments. The purpose of sampling and counting spores is to help determine whether an abnormal condition exists within the indoor environment and if it does, to help pinpoint the area of contamination. Spore counts should not be used as the sole determining factor of mold contamination. There are many factors that can cause anomalies in the comparison of indoor and outdoor samples due to the dynamic nature of both of those environments.										
<table border="1"> <tr> <td style="background-color: #ADD8E6;">Water Damage Indicator</td> <td>Blue: These molds are commonly seen in conditions of prolonged water intrusion and usually indicate a problem.</td> </tr> <tr> <td style="background-color: #90EE90;">Common Allergen</td> <td>Green: Although all molds are potential allergens, these are the most common allergens that may be found indoors.</td> </tr> <tr> <td style="background-color: #FFDAB9;">Slightly Higher than Baseline</td> <td>Orange: The spore count is slightly higher than the outside count and may or may not indicate a source of contamination.</td> </tr> <tr> <td style="background-color: #FFB6C1;">Significantly Higher than Baseline</td> <td>Red: The spore count is significantly higher than the baseline count and probably indicates a source of contamination.</td> </tr> <tr> <td style="background-color: #DDA0DD;">Ratio Abnormality</td> <td>Violet: The types of spores found indoors should be similar to the ones that were identified in the baseline sample. Significant increases (more than 25%) in the ratio of a particular spore type may indicate the presence of abnormal levels of mold, even if the total number of spores of that type is lower in the indoor environment than it was outdoors.</td> </tr> </table>	Water Damage Indicator	Blue: These molds are commonly seen in conditions of prolonged water intrusion and usually indicate a problem.	Common Allergen	Green: Although all molds are potential allergens, these are the most common allergens that may be found indoors.	Slightly Higher than Baseline	Orange: The spore count is slightly higher than the outside count and may or may not indicate a source of contamination.	Significantly Higher than Baseline	Red: The spore count is significantly higher than the baseline count and probably indicates a source of contamination.	Ratio Abnormality	Violet: The types of spores found indoors should be similar to the ones that were identified in the baseline sample. Significant increases (more than 25%) in the ratio of a particular spore type may indicate the presence of abnormal levels of mold, even if the total number of spores of that type is lower in the indoor environment than it was outdoors.	
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Color Coding	Fungi that are present in indoor samples at levels lower than 200 per cubic meter are not color coded on the report, unless they are one of the water damage indicators.										
Significant Figures	Raw counts and column totals may reflect more than 2 significant figures, but results should only be considered significant to 2 figures.										

Spore Estimate		Percentages
ND	None Detected	0%
Rare	Less than 10 spores	< 1%
Light	10 - 99 spores	1-10%
Moderate	100 - 999 spores	11-25%
Heavy	1000 - 9999 spores	26-50%
Very Heavy	10000 or greater spores	51-100%

Mycelial Estimate	
ND	None Detected No active growth at site.
Trace	Very small amount of Mycelium Probably no active growth at site.
Few	Some Mycelium Possible active growth at site.
Many	Large amount of Mycelium Probable active growth at site.

Ascospores	Habitat: A large group consisting of more than 3000 species of fungi. Common plant pathogens and outdoor numbers become very high following rain. Most of the genera are indistinguishable by spore trap analysis and are combined on the report.
	Effects: Health affects are poorly studied, but many are likely to be allergenic.

Aspergillus Penicillium	Habitat: The most common fungi isolated from the environment. Very common in soil and on decaying plant material. Are able to grow well indoors on a wide variety of substrates.
	Effects: This group contains common allergens and many can cause hypersensitivity pneumonitis. They may cause extrinsic asthma, and many are opportunistic pathogens. Many species produce mycotoxins which may be associated with disease in humans and other animals. Toxin production is dependent on the species, the food source, competition with other organisms, and other environmental conditions.

Basidiospores	Habitat: A common group of Fungi that includes the mushrooms and bracket fungi. They are saprophytes and plant pathogens. In wet conditions they can cause structural damage to buildings.
	Effects: Common allergens and are also associated with hypersensitivity pneumonitis.

Cladosporium	Habitat: One of the most common genera worldwide. Found in soil and plant debris and on the leaf surfaces of living plants. The outdoor numbers are lower in the winter and often relatively high in the summer, especially in high humidity. The outdoor numbers often spike in the late afternoon and evening. Indoors, it can be found growing on textiles, wood, sheetrock, moist window sills and in HVAC supply ducts.
	Effects: A common allergen, producing more than 10 allergenic antigens and a common cause of hypersensitivity pneumonitis.

Myxomycetes	Habitat: Found on decaying plant material and as a plant pathogen.
	Effects: Some allergenic properties reported, but generally pose no health concerns to humans.
