Nauset Environmental Services, Inc.

an Air Quality Company

7 February 2018

NES Job #959
Report No. **NES**/IAQ-18/2222

Jack & Jill Jones
130 Crabgrass Lane
Greenwich, CT 02666

Re: Post-remediation verification (PRV) mold/moisture inspection and sampling
at 10 Honeysuckle Way (Taunton)

Dear Mr. & Mrs. Jones:

Nauset **E**nvironmental **S**ervices, Inc. (**NES**) is pleased to submit this letter report on a PRV mold/moisture inspection and sampling at 10 Honeysuckle Way (Taunton). Following written authorization, **NES** sent William Vaughan, PhD, QEP, CIEC and to the house on 5 February 2018. This report is CONFIDENTIAL and proprietary and can only be distributed by or with the approval of the Clients to whom it is addressed.

BACKGROUND: A hot water leak in the bedroom shower above the garage traveled down to the basement through the first-floor utility room and the humid vapors coated surfaces in the garage bedroom and the first-floor family room. Acme, Inc. responded with drying operations and removal of moisture and water-impacted drywall and flooring and interacted with **NES** as they planned remediation. **NES** was then authorized to see what the PRV conditions are.

EXECUTIVE SUMMARY: This mold/moisture inspection by **NES** found **unacceptably damp conditions** in the utility room and garage bathroom subflooring.

There were no moldy odors noted on entering the house that would indicate active mold growth at the time of this inspection. There was no readily observable VMG at the time of this inspection.

The hypothesis-based, air sampling revealed that **mold spore readings were well above NES's informal guidelines for sensitized individuals,** especially for the indoor molds of concern in response to leaks - *Aspergillin/Penicillium*-like spores. In addition, the increase in *Asp/Pen* like spores on fan disturbance indicated the presence of **Condition2, settled spore contamination**, especially on the left side on all levels.

A Scope of Work (SOW) is provided for a second round of mold remediation.

ON SITE ACTIVITIES – Dr. Vaughan arrived at 10 Honeysuckle Way on 5 February at about 11:15 am. No one was present during this inspection and sampling.

During this inspection, Dr. Vaughan used a calibrated Extech Hygro-Thermometers Pen (Model 445580) to measure temperature and relative humidity that is periodically calibrated to two known humidities. He also sued a Tramex Non-penetrating digital moisture meter to test for damp conditions is remaining materials. Photographs taken during the inspection and sampling are found in Attachment A.

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AIR SAMPLING - HYPOTHESIS TESTING

Dr. Vaughan determined that an air sampling strategy was needed to address possible residual mold spore contamination in four areas of concern – basement, family room, utility room, and bedroom/bathroom over the garage. The sampling concern was to address the following hypothesis regarding possible environmental issues:

> Hypothesis A There **are** elevated mold spores and/or irritant levels of concern in four areas of the house especially under disturbed conditions when **Condition 2**, settled spores, and spores from hidden mold growth, **Condition 3**, are suspended into the air.

The airborne mold spore samples were taken under quiet and worst case (fan-disturbed) conditions in four areas – bathroom, kitchen/living room and front bedroom. The disturbed samples were taken after blowing the surfaces in each area. The air samples were collected on a Cyclex-d™ cassette for microscopic analysis. [The expiration date for the Cyclex-d™ cassettes used was July 2018.]

After the sampling flow rate was confirmed for the pumps at 20 lpm using a rotameter transfer standard (traceable to NIST via a BIOS DryCal calibrator), the interior air samples were taken for a timed ten-minute interval using a digital timer. Each sampling location was documented with a photograph seen in Attachment A. A log sheet documented the activity and conditions during the sampling. No outdoor reference sample was taken since the focus was on indoor conditions.

The "disturbed" samples were taken after disturbing the surfaces in the area using a 12" fan set on high speed for a couple of minutes. Soft goods in the living room – furniture and bedding – were also physically disturbed in the bedroom and living room. The drafts from the fan also suspend the mold spores and irritants from hard-to-reach areas where they have settled but would be dislodged by infrequent servicing activities as well as spores from latent (not yet visible) mold growth. The disturbed air sampling began following at least a 3-5-minute calm period that allowed larger particles/debris to settle out of the air and minimize interference/obscurance on the collecting surface in the cassette.

The exposed and labeled air sample cassettes were combined with a completed chain of custody form and shipped to EMLab P&K, LLC. (Marlton, NJ). The air samples were designated for "Fungi - Spore Trap Analysis." The following perspective indicates why EMLab P&K, LLC was selected:

- "Because there is currently no governmental certification for environmental microbiology laboratories (except for drinking water and wastewater microbiology), EMLab P&K, LLC is an active participant in the EMPAT (Environmental Microbiology Proficiency Analytical Testing) program sponsored by the American Industrial Hygiene Association (AIHA). P&K has been formally accredited by the AIHA in Environmental Microbiology since July 1300 with a laboratory identification number of 103005."
- EMLab P&K is one the largest commercial analytical laboratories and is unique in that all of their analytical employees are degreed analysts, the majority with Masters or Ph.D.'s in mycology, microbiology or a related field.
- "EMLab P&K has modeled its quality control system after the ISO guidelines, one of the most stringent sets of international standards in the industry, to ensure that its customers receive the high standard of accuracy, reliability and impartiality that they have come to expect from a leader in the environmental industry."

OBSERVATIONS: Observations at 10 Honeysuckle Way during the 5 February site visit are provided below. [Directions left-right and front-back refer to viewing the building from the street.]

General

- The weather was sunny and breezy with temperatures in the low 40s and a relative humidity of 55%.
- There was no noticeable biological/moldy odor noted on entering the house. [Moldy/biological odors come from *currently active* "microbial volatile organic compounds (MVOCs)" that are released from active colonies digesting the organic matter on which they are growing.]
- Some contents had been removed to the rear deck and covered in plastic pending disposal decisions (see photos).

Basement

- [Photos from Acme had showed puddled water in the basement, mostly to the left side under the utility room.]
- There were some contents still stored in the basement (see photos).
- There was an Acme commercial dehumidifier operating to continue post-leak drying. [It was turned off during the air sampling activity.]
- The relative humidity was acceptable at 42% (59F).
- There were observations of fluffy debris on the floor, a possible indication of less than thorough "air polishing" during the initial round of remediation.

- The moisture meter readings in the basement were:
    - Subfloor under utility room – 16-17% moisture content in wood (MC) {marginal + see below}
    - Joists under utility room - 6-7% MC
    - Center – subfloor – 12% MC
    - Center – joists – 6-7% MC
    - Steps – side – 6-7% MC treads – 12-14% MC

  [These basement readings do not indicate that serious dampening continued into the center of the rear basement that would have impacted above the insulation, probably because any water draining to the basement after going through 2 floors would have cooled extensively.]

Family room

- Wall-to-wall carpeting and some of the flooring had been removed (see photos).
- Part of the rear cathedral ceiling had been removed because of mold/moisture impact (see photos).
- There was an Acme commercial dehumidifier operating to continue post-leak drying. [It was turned off during the air sampling activity.]
- The relative humidity was dry at 30% (62F).
- The moisture meter readings were acceptably dry:
  - at several locations across the subfloor and near the utility room (left, rear) – 0-7% MC
- There was water staining around the recessed lights in the front ceiling (see photo). [If there had been no readily observable visible mold growth seen near the rear recessed light when the nearby drywall was removed, there should be no concern for VMG in the front ceiling. **HOWEVER**, if VMG was observed in the rear ceiling near those recessed lights, the front ceiling should be opened near these lights (see SOW below).]

Utility room

- The area had been gutted from floor to ceiling (see photos) with contents removed, some placed in the kitchen and garage (see photos).
- There was an Acme commercial dehumidifier operating to continue post-leak drying. [It was turned off during the air sampling activity.]
- The relative humidity was dry at 41% (59F).
- The moisture meter readings ranged from 17-45% MC with the highest readings in the half bath to the left side (see photo). [This elevated reading is unacceptable indicating that the subflooring needs extended drying or replacement.]

Bedroom/bathroom above garage

- The area had been gutted from floor to ceiling (see photos) with contents removed.
- There was an Acme commercial dehumidifier operating in the bathroom to continue post-leak drying. [It was turned off during the air sampling activity.]
- There were observations of fluffy debris on the floor, a possible indication of less than thorough "air polishing" during the initial round of remediation.
- The relative humidity was dry at 44% (58F).
- The moisture meter readings were:
  - Bathroom – 55% MC near the shower (see photo). [This elevated reading is unacceptable indicating that the subflooring needs extended drying or replacement.]
  - Bedroom – several locations across subfloor – 8-10% MC

Mold spore sampling proceeded from the area expected to be the cleanest (basement) on to the areas expected to have the most mold spores (bedroom/bathroom over the garage) in an attempt to avoid cross contamination. Table 1 lists the sample locations for the total spore Cyclex-d™ air sampling for this PRV sampling.

Table 2 summarizes the results of the microscopic analysis of air samples from this round of sampling. The EMLab P&K mold report is found in Attachment B. Attachment C describes the properties of the dominant spores and structures found.

Table 1 – Mold Spore Sampling Locations

(**Bold** sample numbers indicate disturbed air samples)

Sample #	Location	Comments
959-1	Basement	quiet (T=59, RH=42%)
959-2	Basement	disturbed
959-3	Family room	quiet
959-4	Family room	disturbed (T=62, RH=30%)
959-5	Utility room	quiet
959-6	Utility room	disturbed (T=59, RH=41%)
959-7	Bedroom/bathroom	quiet (T=58, RH=44%)
959-8	Bedroom/bathroom	disturbed

DISCUSSION:

MOLD - There are several terms and concepts that should be explained before looking in detail at the data from these samples:

There are several terms and concepts that should be explained before looking in detail at the data from these samples along with the visual observations:

- CONTAMINATION -The terms Condition 2 and 3 used describe mold contamination are part of the December 2015 Institute for Inspection Cleaning and Restoration Certification (IICRC), ANSI/IICRC S520-2015, "Standard for Professional Mold Remediation." **Condition 2** involves evidence of "settled spores or fungal fragments dispersed from a **Condition 3** contaminated area," a condition documented to some extent by "disturbed" air samples. **Condition 3** refers to "actual mold growth, associated spores and fungal fragment … active or dormant, visible or hidden."

- OUTDOOR SPORES - While ALL molds ultimately originate in nature, outdoors, there are some molds that are referred to as "outdoor fungi." This term means that that they are found primarily outdoors because they depend on plants, other fungi or animals to complete their life cycle. Others need a complex ecosystem to complete their life cycle. These outdoor spores *may* be found indoors because they were transported there but hardly ever develop colonies indoors. These include the ascospores, basidiospores (some coming from mushrooms that develop in the wild) and rusts. *When found indoors these "outdoor" spores indicate the space has been experienced air exchange with the outdoors, not growth in response to moist conditions*.

- INDOOR SPORES - There are some molds that have adapted to a variety of food sources - organic debris, processed wood (i.e. cellulose, paper, etc.) and more - that are commonly found indoors - loosely referred to as "indoor spores," even though they initially came in from outdoors. With the proper level of damp to wet conditions some of them amplify/grow indoors and serve as moisture/leak indicators. In our area of southern New England, **NES** has found that the primary moisture/leak-indicators are the *Aspergillus* and *Penicillium* molds (referred to as "*Asp/Pen*-like" when their spores are counted under a microscope since their spores are indistinguishable). Less often **NES** has found that *Cladosporium*, the most abundant spore type found in U.S. outdoor air samples, can also amplify under moist conditions indoors and may serve as a secondary moisture/leak indicator.
- STANDARDS - Many people look for standards to compare mold readings to with the desire to define a healthy or unhealthy space. Obviously very high spore readings found by counting spores/structures in a collected sample under a microscope (**S/m^3** - spores/structures per cubic meter sampled) or colony readings found by counting the colonies that develop/grow on a nutrient media after sampled air has impacted that nutrient media (**CFU/m^3** - colony forming units per cubic meter) are undesirable. Because of the wide range of human sensitivities or allergic reactions to the irritants in/on mold spores AND the limited scientific research linking spore levels to various immune system reaction, no scientifically-based "standards" have yet been developed by medical or governmental agencies.

  [One medical commentary was issued in May 2004 by the Institute of Medicine (part of the National Academy of Sciences) in its report on "Damp Indoor Spaces and Health," in which they state, "there are no generally accepted health-based standards for acceptable concentrations of fungal (mold) spores, hyphae or metabolites in the air." However, there is informal guidance from industrial hygienists and some allergists to try to keep indoor spore levels below 1,000 S/m^3 in order to minimize the irritation for the *general* population. Some have suggested that a "healthy" level be considered at 500 CFU/m^3 or 500 S/m^3. **NES** uses 1,000 S/m^3 of *Asp/Pen* like spores as its **informal guideline** for the general population (see explanatory note at www.NausetEnvironmental.com) and 500 S/m^3 of *Asp/Pen* like spores for sensitized individuals. Sensitized or allergic individuals may well be irritated and react at levels well below that guideline level. More information can be found on mold and health at the Centers for Disease Control and Prevention website - http://www.cdc.gov/mold/dampness_facts.htm.]

- DEBRIS RATING - This column in the Attachment B data report for the Cyclex-D spore trap results is an evaluation of the "non-biological debris on the impact area examined by the microscopist." As more non-biological debris is plated on the impact area during the sampling, it coats and covers spores laid down earlier so that the microscopist cannot see/count the spores. Hence, higher debris ratings indicate difficulty in determining the number/type of spores collected on the sticky surface of the impact area. In addition, the more debris, the greater the chance that a spore would miss a sticky area and NOT even be collected. Hence, higher debris ratings lead to *under counting* of spores actually in the air. The Debris Rating for each sample is given next to the sample number in Table 2 as **DR-#**.

AIR SAMPLING FINDINGS

Looking at the data from Attachment B extracted into Table 2, one sees that:

Table 2 – Airborne Spore Levels (see Attachment B)
(**Disturbed sample numbers and results** are indicated by **bold** type.
Concentrations are expressed as spores/structures per cubic meter, S/m^3.)
(Acceptable and elevated readings compared to **NES**'s informal guideline are indicated.)

Sample #	Total	Breakdown of dominant species (~80%)
Basement		
959-1 [**DR-3**]	2,600	Ascospores (NONE) – 0%, ***Asp-Pen* like (1,800) – 71%,** basidiospores (740) – 28%, *Cladosporium* (20) – 1%
959-2 [**DR-3**]	**9,500**	Ascospores (NONE) – 0%, ***Asp-Pen* like (8,200) – 86%,** basidiospores (1,100) – 11%, *Cladosporium* (220) – 2%
Family room		
959 3 [**DR-2**]	1,600	Ascospores (NONE) – 0%, ***Asp-Pen* like (720) – 85%,** basidiospores (900) – 55%, *Cladosporium* (NONE) – 0%
959 4 [**DR-3**]	**2,900**	Ascospores (NONE) – 0%, ***Asp-Pen* like (500) – 17%,** basidiospores (2,400) – 81%, *Cladosporium* (40) – 1%
Utility room		
959 5 [**DR-3**]	2,100	Ascospores (NONE) – 0%, ***Asp-Pen* like (260) – 12%,** basidiospores (1,800) – 85%, *Cladosporium* (60) – 3%
959 6 [**DR-3**]	**190,000**	Ascospores (NONE) – 0%, ***Asp-Pen* like (190,000) – 98%,** basidiospores (2,900) – 2%, *Cladosporium* (200) – <1%
Bedroom/bathroom		
959 7 [**DR-3**]	9,400	Ascospores (NONE) – 0%, ***Asp-Pen* like (7,800) – 83%,** basidiospores (1,500) – 16%, *Cladosporium* (80) –1%
959 8 [**DR-3**]	**140,000**	Ascospores (NONE) – 0%, ***Asp-Pen* like (140,000) – 97%,** basidiospores (3,700) – 3%, *Cladosporium* (120) – <1%

NOTE: "*Asp-Pen* like" refers to *Aspergillus* and *Penicillium* spores that are indistinguishable under the light microscope. The symbol "<1%" is read as "less than 1%." **DR** = Debris rating (see above)

- The **total** spore levels were elevated in all eight samples, above 1,600 S/m^3 in all samples.
- Of concern are the *Asp-Pen*-like spore levels. **NES** refers to those spores as common moisture/leak indicators (see above) that can be irritating to sensitized individuals. They are the focus of **NES**'s informal guideline since they grow readily in response to interior damp conditions AND lowering their level is the goal for any remediation effort – 500 S/m^3 where sensitized individuals are present – as is the case in this household.
  - The lowest two levels are 500 S/m^3 in the disturbed family room sample (#959-4) and the quiet sample in the utility room (#959-5) at 260 S/m^3 (52% of the sensitized informal guideline).
  - Six other readings were ABOVE the sensitized informal guideline.

  - Of concern is the indication of **Condition 2, settled spore contamination** in three locations where the disturbed spore readings increased over the quiet readings:
    - 4.6-fold in the basement
    - 731-fold in the utility room – statistically significant!!
    - 18-fold in the bedroom/bathroom – also statistically significant!

- The other spores detected were common Outdoor Spores – Basidiospores and *Cladosporium*.
- NO *Stachybotrys* spores were detected in the post leak, PRV sampling. They are the "toxic black mold" touted in the press

- The debris ratings were mostly at "3+", indicating that 26-75% of the collecting slide was obscured by non-biological material, leading to a possible under count of spores. However, the general level of spores was elevated in 7 of 8samples, an undercount would not affect the interpretation of the general pattern found.

SUMMARY:

GENERAL: There are areas where dehumidification has not yet been sufficient to reduce subfloor moisture to acceptable levels below 18% MC (see SOW below).

AIR SAMPLING: The hypothesis testing by air sampling ***CONFIRMED*** **hypothesis A for all spore samples**.

> Hypothesis A There **are** elevated mold spores and/or irritant levels of concern in four areas of the house especially under disturbed conditions when **Condition 2**, settled spores, and spores from hidden mold growth, **Condition 3**, are suspended into the air.

In other words, **unacceptable mold spore levels** were found in the house, especially after disturbance and worst on the left side where the leak occurred.

RECOMMENDATIONS (Scope of Work):
It is important to realize that moisture and biological growth are intimately linked. Moisture/leak control is essential since **even a 99.9+% effective mold remediation effort will leave spores behind that will multiply and produce new colonies if additional water/moisture is provided**! Hence this SOW includes moisture-control items as a priority as well as possible mold remediation measures.

MOISTURE: After a couple of weeks of drying, the subfloor in the bathroom where the leak occurred as well as the subfloor in the utility room below are well above **NES**'s guideline for acceptably dry conditions – 18% MC – two options exist:

- Continue operation of the dehumidifiers until the MM readings at several locations in the subflooring are below 18% MC.
  OR

- Remove and replace the damp subflooring.

MOLD:
In light of the Condition2 contamination in this house following an initial round of mold remediation it should be cleaned again by Acme following these instructions.

In particular since three of the four work areas are still enclosed in plastic barriers, only one barrier needs to be set up:

- In the basement, set up a containment barrier to isolate the right side from the bulk of the basement, probably ending at the stairs.

- Any workers in a contained area should wear respiratory and clothing protection per the general guidance of ANSI/IICRC S520-2015, "Standard for Professional Mold Remediation" Section 8, and IICRC R520-2015 (Reference Guide), Chapter 6.
- All air scrubbers should be cleaned from the previous job (see IICRC S520-2015, Section 12.1.4) AND, *most importantly*, checked (preferably using a particle counter to document its collection efficiency) to be sure that the HEPA filter in each unit is seated/sealed properly to ensure that particles are being captured and NOT recirculated!
- Air scrubbers should be set up in each work area with this suggested distribution [and relocated through work areas as work proceeds, leaving the barriers in place until the next round of PRV evaluation is successful].
    - Basement – 2
    - Family room – 1
    - Utility room – 1
    - Over garage – 2-3

- Basement contents should be cleaned under the general guidance of ANSI/IICRC S520-2015 Section 14 and IICRC R520-2015, **Chapter 13**. Follow the details in Chapter 13 to guide owner and remediator actions before items are placed in a clean, dry storage area before return/reuse.
    - Those items to be saved, be HEPA vacuumed using a commercial unit, then covered in plastic taped to the floor and stored in the right side of the basement.
    - Hard items like boats, bicycles, tables, shelves and chairs should be HEPA vacuumed ON ALL SIDES, including drawers, and wiped down before being wrapped and stored, pending reuse.
- Since there was water staining near the recessed lights at the front of the family room, there is a possibility that condensation water impacted the nearby drywall enough to support VMG. However, a similar situation existed on the rear ceiling that was partially removed. IF VMG was observed near the similar staining on the rear ceiling THEN the area around the front lights should be opened and examined; OTHERWISE no additional opening/removal is called for.

When done with the above remediation activities in each area, take a final step to remove settled spores knocked into the air by the action of the vacuum brushes by "polishing the air." This step is especially important for areas that are contaminated with settled spores, as this basement likely is, and the goal is to significantly reduce these settled spores.

The "air polishing" steps are:

- Set up at least the air scrubbers as noted above, as opposed to operating in the negative air mode.
- Set up oscillating fans in the various work areas as indicated below in addition to the air scrubber(s)to minimize stagnant air zones. Direct them to sweep the floor and other horizontal surfaces to minimize spore settling. Relocated the fans through work areas as work proceeds, leaving the barriers in place until the next round of PRV evaluation is successful.
  - Basement – 5-6
  - Family room – 3-5
  - Utility room – 2-3
  - Over garage – 6-8
- Periodically, 2-3 times a day, use a leaf blower (or large fan) to stir up the settled spores so that they can eventually be moved to the air scrubbers on drafts from the oscillating fans and be filtered out of the air. At the same time, *re-orient/re-position* the oscillating fans to sweep new areas and *re-direct* the exhaust from the air scrubber to blow over different surfaces.
- Operate the oscillating fans and air scrubbers for at least 48 hours in each work space, periodically revisiting the areas for leaf blower mixing and **ALSO** repositioning the smaller fans and scrubber exhaust.
- Operate the oscillating fans and air scrubbers **an ADDITIONAL 24 HOURS AFTER the last aggressive leaf blowing** to reduce the cloud of stirred-up spores.

- Turn off all fans/scrubbers at least 12 hours before any post-remediation air sampling is scheduled to allow particles to settle into a "normal" quiet state.

Post-cleaning sampling - To confirm the success of the second round of remediation, PRV air sampling ***could*** be carried out in all work areas at the same locations as above. The goal for a successful remediation would be that that the moisture/leak indicator spores, *Aspergillus/Penicillium* like spores, are below 500 S/m^3 for the disturbed samples to protect sensitized individuals and that *Stachybotrys* is found at no more than single digit spore levels in a single sample.

To avoid problems with mold in the future, be attentive to any and all water intrusion or condensation issues, taking general advice from The Mold Survival Guide for Your Home and for Your Health by Jeff and Connie May (2004). In particular:

- Respond quickly to correct any leaks that may develop or become evident.
- Operate an Energy Star-rated dehumidifier on the floor of the basement throughout the year with adequate separation from solid objects and in conjunction with a small bilge pump in the collection bucket or a condensate pump outside the unit that discharges the collected water to a suitable drain. The goal is to lower the humidity below 60%, so a

modest dry setting of 50-55% is usually sufficient. Periodically clean the unit's filter following the manufacturer's instructions.

- Be pro-active to prevent large water releases when the building is unoccupied. *IF it will not compromise the operation of your heating system* SHUT OFF THE MAIN SUPPLY VALVE/PUMP when leaving the house for several days, e*specially in winter when freezing conditions can occur in conjunction with power outages!* Following this simple precaution, you will only have limited leaks IF pipes should have frozen and burst in your absence, but now will be noticed as soon as the water is turned back on and then can be immediately attended to, rather than leaking uncontrolled for extended periods.
- Turn off the water to the washing machine ANY TIME you leave for several days since rubber hose failure can occur in any season and cause massive water damage! **Better still**, treat the water valve as if it were a "switch" and turn off the water after each washing.
- If there are allergic or sensitized individuals living in the house, use a HEPA filter-equipped vacuum for routine cleaning of flooring and upholstery (at least quarterly) to capture spores and irritants.

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The above discussion and recommendations are related to background information provided and the conditions visually observable at the time of **NES**'s site visit on 5 February along with the results of sampling activities and are thus limited to these activities and timeframe. Future events and changes in the condition and operation of the building may well alter the conditions for biological activity/growth, especially moisture. Such changes will alter the relative significance of these suggestions and the effectiveness of their implementation. Thus the impact of such changes and cannot be considered part of the scope of this report/work.

I trust the above information is sufficient for your current needs. Please call us with any questions or to clarify points.

Very truly yours,

William M. Vaughan, PhD, QEP, CIEC
President, Senior Scientist
QEP=Qualified Environmental Professional (since 1994)
CIEC=Council-certified Indoor Environment Consultant (#0608142)

Attachment A

Photographs Taken During the Inspection & Sampling

Inspection photos

10 Honeysuckle Way (Taunton)

Contents removed from impacted areas

Basement

Under utility room

Viewing right

Viewing left

Under rear

Family Room

Staining around front recessed lights

Utility (half bath) room

Bedroom/Bathroom above garage

Moisture meter readings

Unacceptable reading of 44% MC in utility room subfloor

Unacceptable reading of 55& MC in bathroom subfloor over the garage

SAMPLING LOCATIONS


959-5
2018/02/05


959-6
2018/02/05


959-8
2018/02/05

ATTACHMENT B

Laboratory results from EMLab P&K, LLC

The "Debris Rating" column in the data report is an evaluation of the "non-microbial debris on the impact area examined by the microscopist. Here is a summary of the meaning/significance of those codes.

Non-Microbial Particulate Debris Rating	Description	Interpretation
0	No particles detected in impaction line area.	No particulates on slide in impaction line area. The absence of particulates could *indicate improper sampling or a blank sample*, as most air samples typically contain some particulates
1	Minimal non-microbial debris present.	Reported values are *not affected by debris*.
2	Up to 25% of the trace occluded with non-microbial particulates.	Non-microbial particulates can mask the presence of fungal spores. As a result, *actual values could be higher than the numbers reported*. Higher debris ratings increase the probability of this bias.
3	26% to 75% of the trace occluded with non-microbial particulates.	
4	76% to 90% of the trace occluded with non-microbial particulates	
5	Greater than 90% of the trace occluded with non-microbial particulates.	Sample *could not be read due to excessive debris*. Reported concentrations are estimations calculated from the number of spores observed on the perimeter of debris. The sample should be collected at shorter time interval, or other measures taken to reduce the collection of non-microbial debris.

The Limit of Detection is the product of a raw count of 1 and 100 divided by the percent read. The analytical sensitivity (counts/m3) is the product of the Limit of Detection and 1000 divided by the sample volume.

*All AIHA accredited laboratories are required to provide raw counts of fungal structures in spore trap reports. These counts are defined by AIHA as "Actual count without extrapolation or calculation". The number in parentheses next to the fungal type represents the exact number (or raw count) of fungal structures observed.

‡ A "Version" greater than 1 indicates amended data.

§ Total has been rounded to two significant figures to reflect analytical precision.

EMLab P&K
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Client: **NAUSET ENVIRONMENTAL SERVICES**
C/O: William M. Vaughan
Re: **959; JONES - PRV**

Date of Sampling: 02-05-2018
Date of Receipt: 02-06-2018
Date of Report: 02-07-2018

SPORE TRAP REPORT: NON-VIABLE METHODOLOGY

Lab ID-Version‡ Location	Air vol. (L)	Background Debris	Counts of Fungal Structures	Fungal Structures/m3	Presumptive Fungal ID (raw counts*)	Percentage
8786747-1 02/06/2018 **959-1** **Basement - Quiet**	200	**3+**	148 4 368	740 20 **1,800** **§ Total: 2,600**	**Basidiospores (37)** **Cladosporium (1)** **Penicillium/Aspergillus** types (92)	**28** **1** **71**
Comments:						
8786748-1 02/06/2018 **959-2** **Basement - Disturbed**	200	**3+**	212 44 1,636	1,100 220 **8,200** § **Total: 9,500**	**Basidiospores (53)** **Cladosporium (11)** **Penicillium/Aspergillus types** (409)	**11** **2** **86**
Comments:						
8786749-1 02/07/2018 **959-3** **Family Room - Quiet**	200	**2+**	180 1 144 2	900 5 **720** **§ Total: 1,600** 10	**Basidiospores (45)** Myxomycetes (1) **Penicillium/Aspergillus** types (36) Hyphal fragments (2)	**55** < 1 **44** N/A
Comments:						
8786750-1 02/06/2018 **959-4** **Family Room - Disturbed**	200	**3+**	472 8 100	2,400 40 **500** § **Total: 2,900**	**Basidiospores** (118) **Cladosporium (2)** **Penicillium/Aspergillus** types (25)	**81** **1** **17**
Comments:						
8786751-1 02/06/2018 **959-5** **Utility Room - Quiet**	200	**3+**	356 12 1 52	1,800 60 5 **260** § **Total: 2,100**	**Basidiospores (89)** **Cladosporium** (3) Curvularia (1) **Penicillium/Aspergillus** types (13)	**85** **3** < 1 **12**
Comments:						
8786752-1 02/06/2018 **959-6** **Utility Room - Disturbed**	200	**3+**	576 40 37,200	2,900 200 **190,000** § **Total: 190,000**	**Basidiospores (144)** **Cladosporium (10)** **Penicillium/Aspergillus** types (372)	**2** **< 1** **98**
Comments:						

8786753-1 02/07/2018 **959-7** **Bedroom - Quiet**	200	**3+**	300 16 1 1,556	1,500 80 5 **7,800** § **Total: 9,400**	**Basidiospores (75)** **Cladosporium** (4) Myxomycetes (1) **Penicillium/Aspergillus** types (389)	**16** **1** < 1 **83**
Comments:						
8786754-1 02/07/2018 **959-8** **Bedroom - Disturbed**	200	**3+**	744 24 28,100	3,700 120 **140,000** § **Total: 140,000**	**Basidiospores (186)** **Cladosporium (6)** **Penicillium/Aspergillus** types (281)	**3** **< 1** **97**
Comments:						

Background debris indicates the amount of non-biological particulate matter present on the trace (dust in the air) and the resulting visibility for the analyst. It is rated from 1+ (low) to 4+ (high). Counts from areas with 4+ background debris should be regarded as minimal counts and may be higher than reported. It is important to account for samples volumes when evaluating dust levels.

The analytical sensitivity is the spores/m3 divided by the raw count. The limit of detection is the analytical sensitivity multiplied by the sample volume divided by 1000.

*All AIHA accredited laboratories are required to provide raw counts of fungal structures in spore trap reports. These counts are defined by AIHA as "Actual count without extrapolation or calculation". The number in parentheses next to the fungal type represents the exact number (or raw count) of fungal structures observed.

‡ A "Version" indicated by -"x" after the Lab ID# with a value greater than 1 indicates a sample with amended data. The revision number is reflected by the value of "x".
§ Total has been rounded to two significant figures to reflect analytical precision.

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Attachment C

Ecology and Pathology of Species Reported

NOTE: Characteristics of the major species found at levels above 10% and listed above have been collected from the University of Minnesota, Dr. Fungus and EMLab P&K, LLC websites.

ascospores

ECOLOGY - A general category of spores that have been produced by means of sexual reproduction. Many ascospores can germinate and later produce asexual spores (conidia). To further complicate matters, some asexual fungi can also become sexual under specific conditions, these are considered ascomycetes.

PATHOLOGY - This generalized group contains potential opportunistic pathogens and toxin producers. They are suspected allergens, though not yet proven.

Aspergillus species

ECOLOGY – Spores from this genus are commonly found in outdoor air, but less frequently than *Cladosporium*, *Penicillium*, Basidomycetes or yeasts. (Their spores are difficult to differentiate from *Penicillium* spores hence they are reported with those spores when only microscopic identification is requested, rather than culturing.)

PATHOLOGY – Of the more than 150 species and varieties of *Aspergillus*, some are known to cause diseases in animals and humans. Several species are commonly isolated in buildings. Many *Asp.* Species can produce mycotoxins depending on the substrate on which they are growing. Antigens of *Asp.* species are available commercially.

basidiospores

ECOLOGY - Sexual spores from a variety of molds that do not thrive in the indoor environment.

PATHOLOGY - Some basidiospores have been shown to cause allergies and asthma.

Cladosporium sp.

ECOLOGY - They are the most commonly identified outdoor fungus (48-60 species). The most common ones include *Cladosporium elatum*, *Cladosporium herbarum*, *Cladosporium sphaerospermum*, and *Cladosporium cladosporioides*. *C. herbarum* is the most frequently found species in outdoor air in temperate climates. Since it is a "dry" spore formed in very fragile chains, it is easily dispersed, hence often found in air samples. The outdoor numbers are reduced in the winter and are often high in the summer. While often found indoors their numbers are less than outdoor numbers, implying that the outdoor environment is the source of these spores. Indoor *Cladosporium* sp. are commonly found on the surface of fiberglass duct liner in the interior of supply ducts, on windows with occasional condensation and on wall surfaces in high humidity conditions or occasional condensation. A wide variety of plants serve as food sources for this fungus. It is found on dead plants, woody plants, food, straw, soil, paint and textiles. They are common in soils, dead organic matter and the air. These fungi can decompose cellulose and are considered

"ubiquitous."

PATHOLOGY - The ability to sporulate heavily, ease of dispersal, and buoyant spores makes this fungus the most important fungal airway allergen; causes asthma and hay fever in the Western hemisphere. They are a rare human pathogen. They can cause mycosis and produce greater than 10 antigens (initiators of allergic response) available commercially. They are a common cause of extrinsic asthma (immeadiate-type hypersensitivity: Type I allergen), Type III hypersensitivity pneumonitis: hot tub lung, moldy wall hypersensitivity, etc. Acute symptoms include edema and bronchiospasms, chronic cases may develop pulmonary emphysema.

***Penicillium* sp**.

ECOLOGY - A wide number of organisms have placed in this genus and they are well studied because of their value as producers of antibiotics. Identification to species, among the 200 or so identified to date, is difficult and expensive. They are often found in aerosol and soil samples. They are a ubiquitous saprophyte (meaning they live on dead or decaying organic matter) and "are found everywhere." They are commonly found in temperate regions in soil, food, cellulose and grains as well as on living vegetation. They are also found in paint and compost piles and soils. They are commonly found in water-damaged dry wall, damp latex paint, carpet, wall paper, and on interior fiberglass duct insulation. (Their spores are difficult to differentiate from *Aspergillus* spores hence they are reported with those spores when only microscopic identification is requested, rather than culturing.)

PATHOLOGY - They may cause hypersensitivity pneumonitis and/or allergic alveolitis in susceptible individuals. They are reported to be allergenic (skin). Some species can produce mycotoxins. They are a common cause of extrinsic asthma (immeadiate-type hypersensitivity: type I). Acute symptoms include edema and bronchiospasms, chronic cases may develop pulmonary emphysema. Can cause allergic reactions to sensitized people and are associated with mycotic keratosis in humans.

Molds - www.epa.gov/iaq/molds [provides link to mold resources]

Building Sciences - http://www.buildingscience.com/resources/more-topics/mold/

Centers for Disease Control**:** http://www.cdc.gov/mold/dampness_facts.htm

Minnesota Department of Health: Mold in Homes
http://www.health.state.mn.us/divs/eh/indoorair/mold/index.html