Nauset Environmental Services, Inc.

an Air Quality Company

27 April 2009

NES Job # 607B
Report No. **NES**/IAQ-09/

John & Jennifer Huntington
75 Forest Byway
Glendale, NJ 06078

Re: Post-remediation Verification Inspection + Sampling
at 4 Fred's Way (Roberttown) with Scope of Work

Dear Mr. & Mrs. Huntington:

Nauset **E**nvironmental **S**ervices, Inc. (**NES**) is pleased to submit this letter report on the investigation of post-post-remediation conditions at 4 Fred's Way (Roberttown). Under on-going written authorization, **NES** sent William M. Vaughan, PhD, QEP & CIEC back to the property on 21 April 2009 to conduct a post-remediation verification (PRV) inspection and sampling to document post-remediation conditions.

BACKGROUND: After a relief valve failed on the water heater in the basement the warm saturated air condensed on all cool interior surfaces in the building, all the way to the second floor. **NES** was retained in late March 2009 to conduct a mold/moisture inspection and take baseline air samples following initial gutting of parts of the first floor by Mold Specialists. **NES**'s baseline findings indicated that mold remediation was called for and a Scope of Work provided (Report No. **NES**/IAQ-09/898). **NES** has now been retained to determine if the mold remediation by Mold Specialists was successful.

EXECUTIVE SUMMARY The results from the PRV inspection and sampling found that visible mold growth (VMG), **Condition 3 contamination** had been successfully addressed. The air sampling revealed continued **Condition 2, settled spore, contamination** in all four interior areas sampled, calling for additional remediation.

A modified Scope of Work is provided for a second round of remediation.

ON SITE ACTIVITIES – Dr. Vaughan arrived at the house on 21 April about 12:30pm. There was no one else present during this PRV activity. Dr. Vaughan used a Tramex "Moisture Encounter Plus" non-penetrating, moisture meter (MM) to determine the moisture levels in various structural materials to a depth of about an inch.

Dr. Vaughan utilized the sample sampling plan and locations as detailed for the baseline sampling in March (Report No. **NES**/IAQ-09/898).

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OBSERVATIONS: Observations at 4 Fred's Way are provided below:

General

- There was no moldy/musty odor noted on entering the cottage. [Moldy odors come from "microbial volatile organic compounds (MVOCs)" that are released from *currently active* colonies digesting the organic matter on which they are growing.] There were still several locations where vanilla perfume sticks provided masking odors, so there may well have been some moldy odors that were still masked by these perfume sources.
- The weather conditions were cloudy with intermittent rain and light winds. The temperature was 55F with a relative humidity of 83-99% depending on whether or not it was raining.

Basement

- The basement contents were still out.
- There was no longer light visible mold growth (VMG) on some structural members. There was no longer any VMG along the drywall along the sides of the basement stairs and the underside of the stairs leading to the second floor (see photos).
- The central vacuum unit was still in place with its rust spots
- The air was damper than in March with a relative humidity at 60% at a temperature of 63F. This continued dampness is probably associated with moisture still coming out of the saturated concrete floor and calls for on-going dehumidification in the basement (see below).

Main floor

- The dining room and living room were isolated from one another by a plastic barrier. The living room was further isolated from the hall by a zipper door barrier.
- The dining room subfloor had been cleaned and sealed, as evidenced by its glossy finish. It appeared that additional the subflooring had been removed from the living room (see photos) with the remaining surfaces cleaned and sealed.
- There was no barrier separating the kitchen from the entry hall and second floor above.
- The main floor contents were still in the container in the front yard.
- There was still no obvious, readily observable visible mold growth VMG on the ceilings and walls (see photos).
- The flooring in the entry hall leading into the kitchen was less sculpted than it had been in March.
- The MM no longer indicated slightly elevated moisture levels near the refrigerator or the central island cabinets (see photos). Near the step into the dining room the MM still registered marginally acceptable levels near 15% MW (see photo).
- The door to the basement had been removed and the opening sealed with a zipper door to isolate the basement from the rest of the house.
- The stair treads leading to the second floor still had evident gaps at the corners.
- There was no plastic barrier isolating the entry hall from the kitchen or from the second floor.
- The wainscoting and drywall had been removed from the bathroom. There was no VMG on the visible back side of the now visible drywall from the kitchen and the dining room.

Second floor

- The contents in each room were collected into the center of each room and draped with plastic.
- The wall-to-wall carpeting was still in place on the second floor.
- There was no barrier isolating the entry hall from the kitchen, as noted above,

Table 1 lists the sample locations and type for the total air Cyclex-d™ samples and. Table 2 summarizes the results of the microscopic analysis from this round of sampling. Table 3 has been added to provide comparison between the two sets of air sampling data. 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 – Sampling Locations

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

Sample #	Location	Comments
607-10	Outdoors on deck	Rain at end of sample (T=55F, RH=84+%)
607-11	2nd floor hall	quiet (T=67F, RH=43%)
607-12	2nd floor hall	disturbed
607-13	Living room (right side)	quiet (T=62F, RH=48%)
607-14	Living room (right side)	disturbed
607-15	Kitchen/dining room arch	quiet (T=64F, RH=52%)
607-16	Kitchen/dining room arch	disturbed
607-17	Basement	quiet (T=63F, RH=60%)
607-18	Basement	disturbed (gently)

NOTE: Directions are referenced to approaching the cottage from the parking area.

DISCUSSION:

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

- CONTAMINATION -The terms Condition 2 and 3 used describe mold contamination are part of the December 2003 Institute for Inspection Cleaning and Restoration Certification (IICRC) S520 standard, "Standard and Reference Guide for Professional Mold Remediation." **Condition 2** involves evidence of settled spores from a contaminated area, a condition documented to some extent by "disturbed" samples. **Condition 3** refers to "actual mold growth and associated spores … active or inactive, 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 only 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 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/structure 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 unacceptable in occupied spaces. 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 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. 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.

Table 2 – Airborne Spore Levels

(**Disturbed sample numbers and results** are indicated by **bold** type.
Concentrations are expressed as spores/structures per cubic meter, S/m^3.)

Sample #	Total	Breakdown of dominant species (~80%)
Outdoors		
607-10	730	Ascospores (420) – 57%, ***Asp-Pen* like (87) - 12%**, basidiospores (230) - 31%, *Cladosporium* (NONE) - 0%
2nd floor hall		
607-11	380	Ascospores (NONE) – 0%, ***Asp-Pen* like (210) - 55%**, basidiospores (NONE) - 0%, *Cladosporium* (160) - 42%
607-12	**3,500**	Ascospores (NONE) – 0%, ***Asp-Pen* like (3,400) – 98%,** basidiospores (50) – 1%, *Cladosporium* (NONE) - 0%
Living room (right side)		
607-13	73	Ascospores (NONE) – 0%, ***Asp-Pen* like (73) - 100%**, basidiospores (NONE) - 0%, *Cladosporium* (NONE) - 0%
607-14	**4,500**	Ascospores (50) – 1%, ***Asp-Pen* like (4,200) – 93%,** basidiospores (110) – 2%, *Cladosporium* (160) - 4%
Kitchen/dining room arch		
607-15	1,100	Ascospores (50) – 5%, ***Asp-Pen* like (680) - 65%**, basidiospores (210) - 20%, *Cladosporium* (110) - 10%
607-16	**2,100**	Ascospores (NONE) – 0%, ***Asp-Pen* like (2,000) - 95%,** basidiospores (50) – 2%, *Cladosporium* (50) - 2%
Basement		
607-17	**970**	Ascospores (NONE) – 0%, ***Asp-Pen* like (970) – 99%,** basidiospores (NONE) – 0%, *Cladosporium* (NONE) - 0%
607-18	**2,700**	Ascospores (NONE) – 0%, ***Asp-Pen* like (2,600) – 94%,** basidiospores (50) – 2%, *Cladosporium* (110) - 4%

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%."

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

- The **outdoor** spore readings increased more than ten-fold from March to 730 S/m^3, with 88% being common outdoor spore types - ascospores (57%) and basidiospores (31%). This pattern is common, especially after recent heavy rains and a change in seasons. While the extremely low March sample was dominated at 76% by the most common outdoor genus found in outdoor U.S. samples, *Cladosporium*, no such spores were detected in this April sample; instead the common *Asp-Pen* like spores were now found at 12%. This mix is very different from all indoor samples.

- The quiet spore levels in **2nd floor hall** were reduced nearly 90% to 380 S/m^3, The primary moisture indicator spores, *Asp-Pen* like spores, still dominated at 55% of this lower value. The secondary leak indicator spores, *Cladosporium,* comprised 42% of the sample, still indicating impact from moisture-induced mold growth on the second floor.
- Under disturbed conditions (where three bedrooms and the bathroom were again disturbed by the fan and blown toward the hall outside the center bedroom) the **2nd floor hall** total spore level increased significantly (almost an order of magnitude or ten-fold) to 3,500 S/m^3 with 98% of this much larger number still being the *Asp-Pen* moisture/leak indicator spores (3,400 S/m^3). This pattern indicates that there is still **Condition 2, settled spore, contamination** on the second floor

- The quiet spore level in the **living room right side** was now extremely low at 73 S/m^3, down very significantly from the initial March reading of 4,800 S/m^3.. No common outdoor spore types were again detected in this sample. The only spore type detected in this low sample was again the primary moisture indicator spore, *Asp-Pen* like spores.
- Under disturbance the **living room right side** total spore level increased nearly 62-fold to the same reading of 4,500 S/m^3 as in March with 93% being the *Asp-Pen* moisture/leak indicator spores (4,300 S/m^3), well above the informal guideline. This change on disturbance clearly indicates the presence of excess **Condition 2, settled spore, contamination** in the living room dominated by the leak-indicators.

  This disturbed living room sample no longer had any detectable *Stachybotrys* spores while two had been detected in March.

- The quiet spore levels at the **kitchen/dining room arch** sample were just above the informal guideline at 1,100 S/m^3. Common outdoor spore types were detected at 25 % of this sample. The primary moisture indicator spores, *Asp-Pen* like spores, comprised 65% of this indoor sample, while the secondary leak indicator, *Cladosporium*, spores were present at 10% of the total.
- Under disturbance the **kitchen/dining room arch** total spore level doubled to a reading of 2,100 S/m^3, twice the informal guideline. 95% were the *Asp-Pen* moisture/leak indicator spores. This pattern with *Asp-Pen* like spores increasing three-fold and still dominating the sample indicates the presence of some **Condition 2**, **settled spore, contamination.** [NOTE: the absence of a barrier between the entry/second floor, may have contributed some spores to the kitchen readings.]

- The quiet spore levels in the **basement** were at 970 S/m^3, down to the informal guideline value (see above) and representing a decrease of about 88% from March. The primary moisture indicator spores, *Asp-Pen* like spores, again dominated this quiet sample at 99%
- Under full disturbance the **basement** total spore level increased nearly three-fold to a reading of 2,700 S/m^3 still with 94% being the *Asp-Pen* moisture/leak indicator spores. This pattern with *Asp-Pen* like spores increasing by 1,800 S/m^3 still indicates the presence of **Condition 2**, settled spore contamination dominated by the primary leak-indicator type.

NOTE: The "debris rating" was at "2**+**" for all samples (see Attachment B). As noted above, this rating is an indication of non-biological matter that has plated on the collection slide during the sampling, covering up some of the surface and preventing the microscopist to view/count some spores. The "2+" rating is designated when there is up to 25% occlusion of the exposed track, so these readings were not seriously affected by non-biological debris.

COMPARISON

Since the main purpose of this second round of sampling was to document the changes in mold levels between the two sets, a pair of comparison tables has been constructed. Table 3a compares the total spore readings at each location between the two sets. Table 3b compares the concentrations of individual types of spores between the two sets to show the overall changes.

Table 3a. Comparative Total Spore Data

	TOTAL SPORES			
Location	**12-Mar**	**21-Apr**	**21 Apr/12 Mar**	**Comments**
Outdoors	**70**	**730**	1042.9%	**up 942.9%**
2nd floor(quiet)	3,600	380	10.6%	**-89.4%**
2nd floor (disturbed)	2,500	3,500	140.0%	**up 40.0%**
Living Rm (quiet)	4,800	73	1.5%	**-98.5%**
Living Rm (disturbed)	4,500	4,500	100.0%	**unchanged**
Kitch/DR (quiet)	2,900	1,100	37.9%	**-62.1%**
Kitch/DR (disturbed)	6,200	2,100	33.9%	**-66.1%**
Basement (quiet)	8,300	970	11.7%	**-88.3%**
Basement (disturbed)	32,000	2,700	8.4%	**-91.6%**

In Table 3a one can see that the changes in total spore values *indoors* were erratic, increasing by 40% for the disturbed sample on the second floor but decreasing by 98% for the quiet sample in the living room, yet the disturbed living room sample was unchanged since March. These changes represent a mixed indication of the success of the remediation effort. [Note that the largest change was the over nine-fold increase in the outdoor air because of outdoor spores that was not reflected in the indoor samples.]

Table 3b. Percent Change in Types Between Two Sets

Location	Asp-Pen	Cladosporium	Stachybotrys
Outdoors	Not present initially	-100.0%	Not present initially
2nd floor(quiet)	-94.0%	Not present initially	Not present initially
2nd floor (disturbed)	41.7%	Not present initially	Not present initially
Living Rm (quiet)	-98.4%	Not present initially	Not present initially
Living Rm (disturbed)	-2.3%	Not present initially	-100.0%
Kitch/DR (quiet)	-74.8%	-47.6%	Not present initially
Kitch/DR (disturbed)	-66.7%	Not present initially	Not present initially
Basement (quiet)	-88.2%	Not present initially	Not present initially
Basement (disturbed)	-91.6%	120.0%	Not present initially

The individual species of interest in **Table 3b** also show a mixed pattern between comparable indoor

samples with one exception.

- For the *Asp-Pen* like spores there were decreases of only 2% and up to 98% in the quiet room sample with a 40% increase on the second floor. Only half of the indoor samples met the overall cleanup goal of at least 80-95% reduction in those spores.
- With six of the eight *Asp-Pen* like spores are now near or above the informal guideline of 1,000 S/m^3, improvement is still possible

- *Cladosporium* were acceptably low but were now detected in five of eight samples after the first round of remediation as opposed to being in only two of eight samples initially.

- A **good outcome following the initial remediation effort was the reduction of *Stachybotrys* spores to below the detection limit of the method, 10 S/m^3**, for the indoor samples.

SUMMARY:

The post-remediation interior air sampling still indicated levels and mixes of spores extremely different from the outdoor spore level and mix. There were now **no observations of Condition 3 contamination,** VMG.

The PRV air sampling found six of the eight interior air samples still at or well above the informal guideline of 1,000 S/m^3. In addition there were indications of some **Condition 2, settled spore**, contamination in two of the four areas sampled (kitchen/dining room and basement), while two areas showed strong indication of the presence of **Condition 2, settled spores**, (second floor and living room). More attention is needed to address these Condition 2 findings.

The basement was still damp at 60% RH, probably due to water still moving out of the concrete into the air, calling for on-going dehumidification as noted below. While the floor at the kitchen/dining room arch is still marginally damp, the other spots on the kitchen floor were now below 15% moisture in wood.

(The presence of the perfume sticks still inhibits the ability to asses for moldy odors. The likelihood of excessively damp areas promoting mold growth and hence odor production seems to be under control at this time; so this masking is of less concern.)

RECOMMENDATIONS:

MOISTURE

The moisture control in the basement should switch to the on-going practice of operating an Energy Star-rated dehumidifier in the basement on the floor. Operate it 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 to near 50%, so a modest dry or "normal" setting is usually sufficient. Periodically clean the unit following the manufacturer's instructions.

Replace the central vacuum motor/controller since there appears to be water damage on it AND as a future precaution, exhaust the vent outside the basement.

MOLD

To address the remaining **Condition2** findings discussed above, **a professional mold mitigator should be engaged.** An appropriate mold remediation professional would be one with remediation training and individual credentials recognized by the American Indoor Air Quality Council (www.iaqcouncil.org) and/or the IICRC (www.iicrc.org).

Additional mold remediation should still include all levels since elevated spores were found in samples taken on all levels:

- Any workers in the house should wear respiratory and clothing protection.
- All air scrubbers should be cleaned from the previous job 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!

- Since the contents remaining on the second floor were under plastic sheeting, **NES**'s fan disturbance did not affect them. Hence the main conclusion is that there are still considerable amounts of settled spores in the pile of the wall-to-wall carpet.. The second round of remediation on the second floor should include:
    - Set up a barrier between the entry hall and the kitchen to isolate the second floor/entry work area from the kitchen.
    - The carpet should be VERY intensely HEPA vacuumed in the accessible areas around the contents while at least one air scrubber is operated in each carpeted room.
    - As soon as possible, each room should be air polished (see below), being sure to systematically use the leaf blower on all walls and ceiling and BEING CAREFUL TO MINIMIZE BLOWING UNDER THE PLASTIC PROTECTING THE CONTENTS!
    - Operate an air scrubber in the entry hall during the above activities and keep it operating during the subsequent air polishing (see below)

- On the first floor focus on two work areas for air polishing since the entry hall will be included in the second floor activities.

- The basement should be isolated as one work area, with two air scrubbers set up there.

When done with the appropriate remediation activities on all levels, take a final step to remove settled spores knocked into the air by the action of the vacuum brushes by ***aggressively*** "polishing

the air." This step is especially important for areas that are contaminated with settled spores, as these areas are, and the goal is to significantly reduce settled spores.

NOTE: Air polishing can be sequenced through the house in coordination with the HEPA vacuuming. moving equipment to new areas calling for attention while applying the leaf blower to areas already HEPA vacuumed.

Air polishing steps include:

- Set up 3-8 oscillating fans in the various work areas to minimize stagnant air zones. Direct them to sweep the floor and other horizontal surfaces (floors or ceiling cavities) to minimize settling.
- Periodically, 2-3 times a day, use a leaf blower to stir up the settled spores left over after the remediation activities above so that they can eventually be moved to the air scrubbers on drafts from the fans and be filtered out of the air. At the same time, re-orient the oscillating fans to sweep new areas AND re-direct the exhaust from the sir scrubber to blow over different surfaces. **Be careful not to compromise the plastic barriers since that would defeat their purpose and spread spores further.**
- **Be sure to disturb ALL surfaces in the entry hall as part of this activity.**
- **Be sure to blow under the living room floor to address settled spores there that will be stirred up during re-insulation and reconstruction.**
- Operate the oscillating fans and air scrubbers for at least 24 hours after the cleanup is completed, 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.

A successful second round of remediation will be indicated by an additional 40-80+% reduction of *Asp-Pen* like spores (depending on current levels) to reduce spore levels to below 1,000 S/m^3 in any additional post-remediation verification air sampling.

To avoid problems with mold in the future, the future owner(s) should be attentive to any and all water intrusion or condensation issue, 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.
- 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.

- If there are allergic or sensitized individuals living in the cottage, use a HEPA filter-equipped vacuum for routine cleaning to capture spores and irritants.

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The above discussion and recommendations are related to the information you provided and the conditions visually observable at the time of **NES**'s site visit on 24 March and 21 April 2009 and the results of sampling at that time 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 recommendations and the effectiveness of their implementation. Thus the impact of such changes and can not be considered part of the scope of this report/work.

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

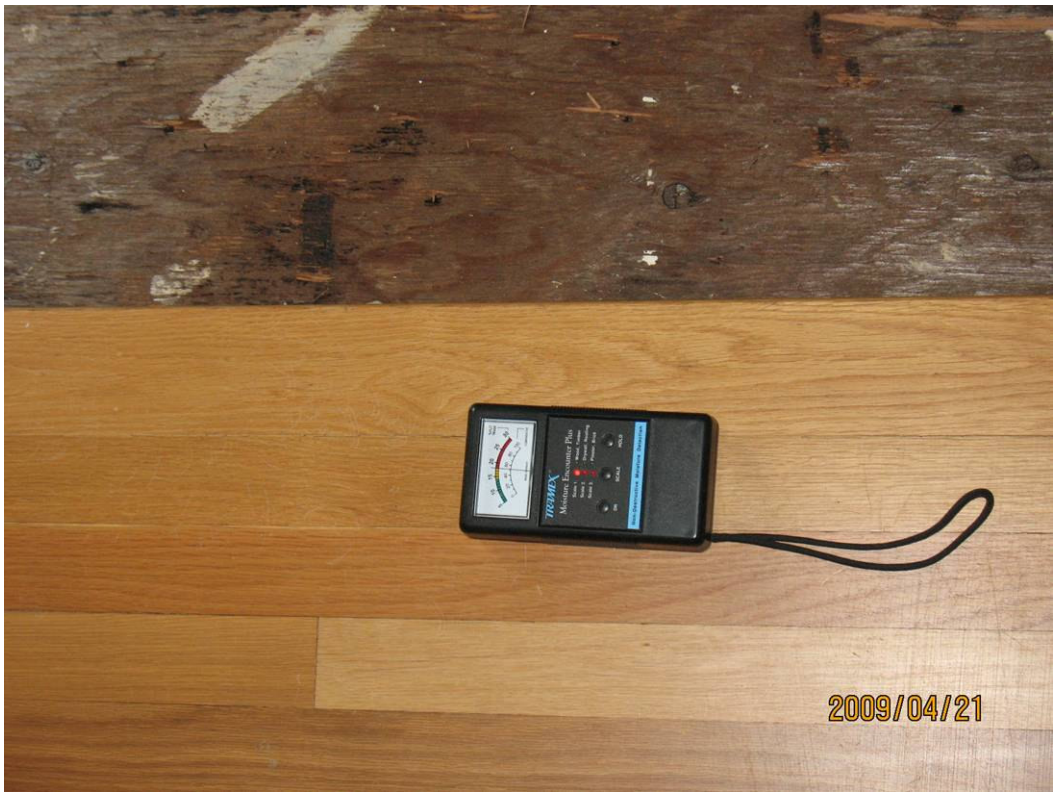
Very truly yours,

William M. Vaughan, PhD, QEP, CIEC
President, Senior Scientist
QEP=Qualified Environmental Professional (since 1994)
CIEC=Council-certified Indoor Environment Consultant (#0608032)

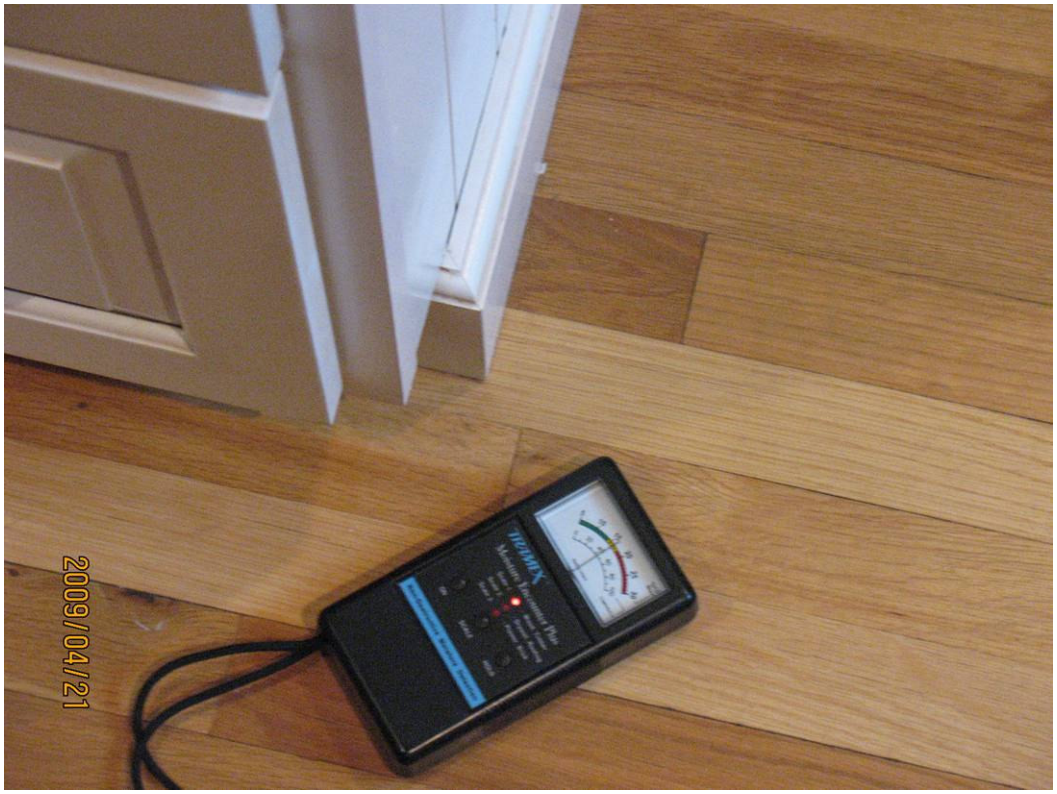
Attachment A

Photographs Taken During Inspection & Sampling

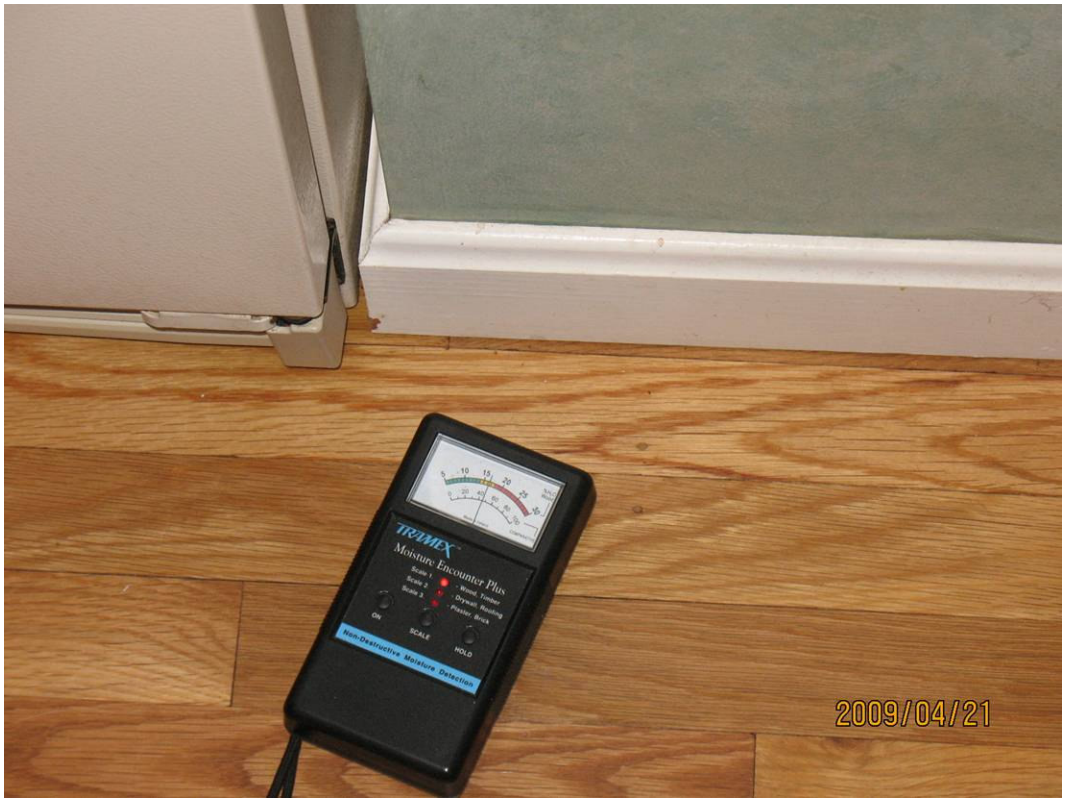
Selection of Inspection Photos



MM reading still marginal at 15+% MW near edge of kitchen step into dining room



Satisfactory MM reading near the center kitchen work island



Satisfactory MM reading near the refrigerator

Expanded open floor area in living room.

Absence of VMG on basement steps

Absence of VMG on drywall going down basement steps

Exterior of house at time of PRV inspection

Sampling photos


607-11


607-12
2009/04/21


607-13
2009/04/21


607-14
2009/04/21


607 15
2009/04/21


607 16
2009/04/21


2009/04/21


607-18
2009/04/21

ATTACHMENT B

Laboratory results from P&K Microbiology Services, Inc.

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.

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EMLab P&K
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Client: **NAUSET ENVIRONMENTAL SERVICES**
C/O: William M. Vaughan
Re: **607B; PRV Huntington**

Date of Sampling: 04-21-2009
Date of Receipt: 04-22-2009
Date of Report: 04-24-2009

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
2368976-1	300	2+	126	420	**Ascospores (24)**	**57**
607-10			68	230	**Basidiospores** (13)	**31**
Outdoors			26	**87**	Penicillium/Aspergillus types (5)	12
				§ **Total: 730**		
						Comments:
2368977-1	100	2+	16	160	**Cladosporium (3)**	**42**
607-11			21	**210**	**Penicillium/Aspergillus** types (4)	**55**
2nd floor-quiet			1	10	Ulocladium (1)	3
				§ **Total: 380**		
			1	10	Pollen (1)	N/A
						Comments:
2368978-1	100	2+	1	10	Alternaria (1)	< 1
607-12			5	50	Basidiospores (1)	1
2nd floor-disturbed			1	10	Curvularia (1)	< 1
			1	10	Myxomycetes (1)	< 1
			337	**3,400**	**Penicillium/Aspergillus** types (64)	**98**
				§ **Total: 3,500**		
			3	30	Hyphal fragments (3)	N/A
						Comments:
2368979-1	220	2+	16	**73**	**Penicillium/Aspergillus** types (3)	**100**
607-13						
Living room-quiet				§ **Total: 73**		
			3	14	Hyphal fragments (3)	N/A
			1	5	Pollen (1)	N/A
						Comments:
2368980-1	100	2+	5	50	Ascospores (1)	1
607-14			11	110	Basidiospores (2)	2
Living room-			16	160	**Cladosporium** (3)	**4**
disturbed			421	**4,200**	**Penicillium/Aspergillus** types (80)	**93**
			1	10	Pithomyces (1)	< 1
				§ **Total: 4,500**		
			4	40	Hyphal fragments (4)	N/A
						Comments:
2368981-1	100	2+	5	50	Ascospores (1)	5
607-15			21	210	**Basidiospores** (4)	**20**
K/Dining room-quiet			11	110	**Cladosporium (2)**	**10**
			68	**680**	**Penicillium/Aspergillus** types (13)	**65**
				§ **Total: 1,100**		
			1	10	Hyphal fragments (1)	N/A
						Comments:

2368982-1 **607-16** **K/Dining room-disturbed**	100	2+	5 5 195 4	50 50 **2,000** § **Total: 2,100** 40	Basidiospores (1) Cladosporium (1) **Penicillium/Aspergillus** types (37) Hyphal fragments (4)	2 **2** **95** N/A
						Comments:
2368983-1 **607-17** **Basement-quiet**	120	2+	1 116 3	8 **970** § **Total: 970** 25	Other brown (1) **Penicillium/Aspergillus** types (22) Hyphal fragments (3)	1 **99** N/A
						Comments:
2368984-1 **607-18** **Basement-disturbed**	100	2+	5 11 258	50 110 **2,600** § **Total: 2,700**	Basidiospores (1) **Cladosporium (2)** **Penicillium/Aspergillus** types (49)	2 **4** **94**
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 then reported. It is important to account for samples volumes when evaluating dust levels.
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.

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, Aerotech Laboratories, Inc. and Environmental Microbiology Lab, Inc. websites and from information provided by P&K Microbiology Services, Inc.

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.

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.

Hyphal fragments = These structures are broken parts of mold and fungal filaments (hyphae) or structures. They can be irritating to sensitized individuals.

Penicillium sp.

ECOLOGY - A wide number of organisms have placed in this genus. Identification to species 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, wallpaper, and on interior fiberglass duct insulation.

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.

Here are some links to general mold-related web sites and resources.

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

New York City Department of Health: "Guidelines on the Assessment and Remediation of Fungi (Mold) in Indoor Environments," www.nyc.gov/html/doh/html/epi/moldrpt1.html

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

Minnesota Department of Health: Mold in Homes
www.health.state.mn.us/divs/eh/aialr/iair/moldfs.html