ATTACHMENT 7b:

Contamination and Toxic Substances

Mold Investigations/ Background Air Sampling, and associated Mold/Biological Contaminant Remediation Protocols

Woodbridge Apartments (20 Units) at 302 Grass Lane, Wilmington, NC 28405 (Unit #s 101-110, 201-205, 207 & 209-212)

July 7, 2021

Quanesha Mullins
Wilmington Housing Authority
1524 S. 16th Street
Wilmington, NC 28401

RE: PEC Job # 21-21-178A-IAQ-M – 302 Grass Lane, Unit 101, Wilmington, NC - Mold Investigation

Enclosed are the results of the mold investigation conducted at the above referenced unit on June 24, 2021. Phoenix EnviroCorp (PEC) was retained to conduct a mold investigation and provide a mold remediation protocol.

Background Information: PEC conducted a mold investigation on June 1, 2021, identifying elevated airborne mold spore levels of *Penicillium/Aspergillus* within the bathroom and surface mold growth of *Cladosporium* on the bathroom ceiling.

This is a two-story apartment building on a slab. The subject unit is on the first floor. The unit is vacant with minimal contents/trash and without carpet.

The HVAC system was operating in the cool mode, set at 70º F upon PEC's arrival and during sampling.

Related Documents:
- PEC initial investigation report dated June 8, 2021

Note: For directional purposes "front" is determined by facing Grass Lane from inside the unit, unless otherwise stated.

Visual Inspection: PEC's visual inspection noted the following (see enclosed photographic documentation):

Living room
- Suspect visible mold growth on the rear wall

Kitchen
- Apparent water damage within the cabinet on the front wall

Front right bedroom
- Apparent water damage/irregularities to the ceiling
- Apparent water damage to the rear and right baseboards

Bathroom
- Suspect visible mold growth on the ceiling and the front wall
- Apparent water damage within the cabinet on the front wall

Mold Testing – Surface: A non-viable surface sample was collected from an area of suspect visible mold growth. The quantifications of fungal growth are reported as scattered spores, 21-100 fungal spores = very light (VL), 101-1,000 fungal spores = light (L), 1,001-10,000 fungal spores = moderate (M), > 10,000 fungal spores = heavy (H). The 'General Impressions' of fungal growth are reported as no fungal growth (NFG), fungal growth (FG), minimal fungal growth or growth in vicinity (MFG), and no fungal spores detected (ND). *Clear tape was utilized for the collection of surface samples. Each sample was assigned a unique ID number and shipped to a third-party laboratory for analysis.* Sampling locations and results are as follows:

Location	Result
Living room rear wall	**L – FG** *Penicillium/Aspergillus* **L – FG** *Chaetomium* **M – FG** *Stachybotrys*

Moisture Readings: Moisture readings were collected with either a Delmhorst moisture meter or a Tramex Survey Encounter. Multiple readings were taken to represent areas and materials reported. *Readings are marked with either a D or T to denote which meter was used.* For drywall products, readings should be less than or equal to twelve percent (≤ 12%) by Delmhorst and below fifty percent (50%) by Tramex. For wood products, normal moisture content should be less than fifteen percent (<15%) for both meters.

Moisture content measurements were as follows:

Living room
- Drywall walls = ≤ 10% (D) and (T)
- Wood baseboards = ≤ 10% (D)

Kitchen
- Wood cabinets = ≤ 10% (D)

Front right bedroom
- Wood baseboards = ≤ 10% (D)
- Ceiling drywall = ≤ 20% (T)
- Drywall walls = ≤ 10% (T)

Conclusions: Sample results identified surface mold growth of *Chaetomium*, *Stachybotrys,* and *Penicillium/Aspergillus* within the unit, in addition to elevated airborne mold spore levels and surface mold growth identified in PEC's investigative report date June 8, 2021. A mold remediation protocol that outlines remediation activities is attached.

Prior to commencement of mold remediation, the source of any water intrusions, leaks, and/or moisture/humidity issues shall be remedied. If water intrusions/moisture issues exist and are not remedied, mold can be expected to return.

After remediation activities are completed, but before put-back of removed components, post remediation verification shall be conducted. Upon notice, and for an additional fee, PEC can conduct post remediation verification testing.

Enclosed in this report are the laboratory analysis and the Chain of Custody.

Should you have any questions, please do not hesitate to call.

Thank you,

Shaenaz Mirmohamed
IH Technician

Tommie Green, CIEC
Professional Industrial Hygienist

Enclosures

Photo 1

Suspect visible mold growth on the living room rear wall

Photo 2

View of contents left within the unit

Photo 3

Apparent water damage in the kitchen cabinet on the front wall

Photo 4

Apparent water damage/irregularity to the front right bedroom ceiling

Photo 5

Apparent water damage to the front right bedroom rear and right baseboards

Photo 6

Apparent water damage and suspect visible mold growth on the bathroom ceiling and front wall

Photo 7

Apparent water damage within the bathroom cabinet on the front wall

samples accepted

Phoenix EnviroCorp
4020 SHIPYARD BLVD.
WILMINGTON, NC 28403

CHAIN OF CUSTODY

LABORATORY TEST REQUEST

Seem RS# 2106250 12 MI ID: 044

CONTACT: Shaenaz Mirmohamed	TELEPHONE (910) 397-0370 FAX (910) 313-6094	Sample date: 6/24/2021
PEC Job #: 21-21-178A-IAQ-M	SITE ADDRESS: 302 Grass Lane, Unit 101, Wilmington, NC 28405	

PLEASE EMAIL RESULTS TO: KMGREEN@PHOENIXENVIROCORP.COM

SAMPLE TYPE:	NUMBER OF SAMPLES:	TURN AROUND TIME SPECIFIED:
Spore Trap - Micro-5		____ Immediate ____ 24 hr ____ 48 hr __X__ Standard
Surface Samples	1	

Sample #	Sample	Sample Volume	Lab Analysis Requested	% Relative Humidity	Temperature °F
062421-SM-01	Living room rear wall	1 cm sq	S001T	NA	NA

Samples Collected By (Printed Name and Signature): Shaenaz Mirmohamed Date Signed: 6/24/2021

CHAIN OF CUSTODY RECORD

DATE:	Time:	Condition of Samples:	RELINQUISHED BY: (Printed Name and Signature)	ACCEPTED BY: (Printed Name and Signature)
6/24/2021	13:30	Intact	Shaenaz Mirmohamed AFFILIATION:	DM 6/25/21 AFFILIATION:

SEEML Reference Number:
210625012

Southeast Environmental Microbiology Laboratories
102 Edinburgh Court
Greenville, SC 29607
Phone: (864) 233-3770
FAX: (864) 233-6589

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

- ☒ Surface/Bulk Report
- ☐ Spore Trap Report
- ☐ Andersen Fungal Report
- ☐ Quantitative Fungal Report

Lab Manager Review: *Angel Gosnell* Date: 06/25/21

Thank you for using SEEML laboratories. We strive to provide superior quality and service.
SEEML laboratories are accredited through AIHA-LAP, LLC (EMLAP # 173667) for the analysis of Spore Traps and Surface/Bulk Samples.

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

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

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

Surface and Bulk Sample Report

	Date Sampled: 06/24/21
Attn: ***Phoenix Enviro Corp.***	Date Received: 06/25/21
4020 Shipyard Blvd.	Date Analyzed: 06/25/21
Wilmington, NC 28403	Date Reported: 06/25/21
	Date Revised:
	Project Name: 21-21-178A-IAQ-M
	Project Address: 302 Grass Lane, Unit 101
	Project City, State ZIP: Wilmington, NC 28405
	SEEML Reference #: 210625012

TEST METHOD: Direct Microscopic Examination (SEEML SOP 18)

Client Sample ID	062421-SM-01			
Location	Living Room Rear Wall			
SEEML Sample ID	210625012-044			
Sample Type	Tape			
	Quantification*			
Hyphal Fragments	**L**			
Pollen				
General Impressions **	**FG**			
Fungal Spore:				
Alternaria				
Acremonium				
Ascospores				
Basidiospores				
Bipolaris/Drechslera				
Cercospora				
Chaetomium	**L**			
Cladosporium				
Curvularia				
Epicoccum				
Fusarium				
Geotrichum sp.				
Memnoniella				
Myxomycetes				
Nigrospora				
Penicillium/Aspergillus	**L**			
Pithomyces				
Rusts/Smuts				
Stachybotrys	**M**			
Tetraploa				
Ulocladium				

**** General Impressions: NFG = No Fungal Growth, FG = Fungal Growth, MFG = Minimal Fungal Growth Or Growth in vicinity**

Quantification of fungal growth is done by semi-quantitative grading using the following ranges:

Scattered Spores, 1-20 fungal spores

VL = 21-100 fungal spores **L = 101-1,000 fungal spores** **M = 1,001-10,000 fungal spores** **H = >10,000 fungal spores**

ND = No Fungal Spores Detected

Disclaimer: This report relates only to the samples tested

Respectfully submitted, SEEML

Angel Gosnell, **Approved Laboratory Signatory**

102 Edinburgh Court
Greenville, SC 29607
Phone: (864) 233- 3770
Fax: (864) 233- 6589

AIHA-LAP, LLC EMLAP # 173667

Texas License: LAB1016

Fungal Descriptions

Alternaria sp.

Aw - 0.89. Conidia dimensions: 18-83 x 7-18 microns. A very common allergen with an IgE mediated response. It is often found in carpets, textiles and on horizontal surfaces in building interiors. Often found on window frames. Outdoors it may be isolated from samples of soil, seeds and plants. It is commonly found in outdoor samples. The large spore size, 20 - 200 microns in length and 7 - 18 microns in sizes, suggests that the spores from these fungi will be deposited in the nose, mouth and upper respiratory tract. It may be related to bakers' asthma. It has been associated with hypersensitivity pneumonitis. The species *Alternaria alternata* can produce tenuazonic acid and other toxic metabolites that may be associated with disease in humans or animals. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include edema and bronchospasms; chronic cases may develop pulmonary emphysema.

Ascospore

A spore borne in a special cell called an ascus. Spores of this type are reported to be allergenic. All ascomycetes, members of a group of fungi called Ascomycotina, have this type of spore. The minute black dots on rotting wood and leaves or the little cups on lichens are examples of ascomycetes; another is the "truffle" mushroom.

Aspergillus/Penicillium

These are two of the most commonly found allergenic fungi in problem buildings. *Aspergillus* comes in many varieties (species). Many of the varieties produce toxic substances. It may be associated with symptoms such as sinusitis, allergic bronchopulmonary aspergillosis, and other allergic symptoms. *Penicillium* is a variety of mold that is very common indoors and is found in increased numbers in problem buildings. It also has many varieties, some of which produce toxic substances. The symptoms are allergic reactions, mucous membrane irritation, headaches, vomiting, and diarrhea. Due to the morphological similarity of *Aspergillus* and *Penicillium*, they are not differentiated by microscopic analysis and are reported together.

Aspergillus sp.

Aw 0.75 - 0.82. Reported to be allergenic. Members of this genus are reported to cause ear infections. Many species produce mycotoxins that may be associated with disease in humans and other animals. Toxin production is dependent on the species or a strain within a species and on the food source for the fungus. Some of these toxins have been found to be carcinogenic in animal species. Several toxins are considered potential human carcinogens. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include edema and bronchospasms; chronic cases may develop pulmonary emphysema; may also be associated with sinusitis, allergic bronchopulmonary aspergillosis, and other allergic symptoms.

Basidiospore

Spore from basidiomycetes. Many varieties are reported to be allergenic.

Bipolaris sp.

A fungus with large spores that could be expected to be deposited in the upper respiratory tract. This fungus can produce the mycotoxin - sterigmatocystin, which has been shown to produce liver and kidney damage when ingested by laboratory animals.

Botrytis sp.

Aw 0.93. Conidia dimensions: 7-14 x 5-9 microns. It is parasitic on plants and soft fruits. Found in soil and on house plants and vegetables, it is also known as "gray mold". It causes leaf rot on grapes, strawberries, lettuce, etc. It is a well-known allergen, producing asthma type symptoms in greenhouse workers and "wine grower's lung".

Cercaspora

Common outdoors in agricultural areas, especially during harvest. Parasite of higher plants, causing leaf spot. Commonly found as parasites on higher plants.

Chaetomium sp.

large ascomycetous fungus producing perithecia. It is found on a variety of substrates containing cellulose, including paper and plant compost. It has been found on paper in sheetrock. It can produce an *Acremonium*-like state on fungal media. Varieties are considered allergenic and have been associated with peritonitis, cutaneous lesions, and system mycosis.

Cladosporium sp.

Aw 0.88; Aw 0.84. Most commonly identified outdoor fungus. The outdoor numbers are reduced in the winter. The numbers are often high in the summer. Often found indoors in numbers less than outdoor numbers. It is a common allergen. Indoor *Cladosporium* sp. may be different than the species identified outdoors. It is commonly found on the surface of fiberglass duct liners in the interior of supply ducts. A wide variety of plants are food sources for this fungus. It is found on dead plants, woody plants, food, straw, soil, paint, and textiles. Produces greater than 10 antigens. Antigens in commercial extracts are of variable quality and may degrade within weeks of preparation. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include skin lesions, eye ulceration, mycosis (including onychomycosis, an infection of the nails of the feet or hands) edema and bronchospasms; chronic cases may develop pulmonary emphysema.

Curvularia sp.

Reported to be allergenic and has been associated with allergic fungal sinusitis. It may cause corneal infections, mycetoma, and infections in immune compromised hosts.

Dreschlera sp.

Conidia dimensions: 40-120 x 17-28 microns. Found on grasses, grains and decaying food. It can occasionally cause a corneal infection of the eye.

Epicoccum sp.

Conidia dimensions: 15-25 microns. A common allergen. It is found in plants, soil, grains, textiles and paper products.

Fusarium sp.

Aw 0.90. A common soil fungus. It is found on a wide range of plants. It is often found in humidifiers. Several species in this genus can produce potent trichothecene toxins. The trichothecene (scirpene) toxin targets the following systems: circulatory, alimentary, skin, and nervous. Produces vomitoxin on grains during unusually damp growing conditions. Symptoms may occur either through ingestion of contaminated grains or possibly inhalation of spores. The genera can produce hemorrhagic syndrome in humans (alimentary toxic aleukia). This is characterized by nausea, vomiting, diarrhea, dermatitis, and extensive internal bleeding. Reported to be allergenic. Frequently involved in eye, skin, and nail infections.

Myxomycetes

Members of a group of fungi that is included in the category of "slime molds". They're occasionally found indoors, but mainly reside in forested regions on decaying logs, stumps, and dead leaves. Myxomycetes display characteristics of fungi *and* protozoans. In favorable (wet) conditions they exhibit motile, amoeba-like cells, usually bounded only by a plasma membrane, that are variable in size and form. During dry spells, they form a resting body (sclerotium) with dry, airborne spores. These fungi are not known to produce toxins but can cause hay fever and asthma.

Memnoniella

Contaminant found most often with *Stachybotrys* on wet cellulose. Forms in chains, but it are very similar to *Stachybotrys* and sometimes is considered to be in the *Stachybotrys* family. Certain species do produce toxins very similar to the ones produced by *Stachybotrys chartarum* and many consider the IAQ importance of *Memnoniella* to be on par with *Stachybotrys*. Allergenic and infectious properties are not well studied.

Nigrospora sp.

Commonly found in warm climates, this mold may be responsible for allergic reactions such as hay fever and asthma. It is found on decaying plant material and in the soil. It is not often found indoors.

Oidium sp.

The asexual phase of *Erysiphe* sp. It is a plant pathogen causing powdery mildews. It is very common on the leaf's stems, and flowers of plants. The health effects and allergenicity have not been studied. It does not grow on non-living surfaces such as wood or drywall.

Penicillium sp.

Aw 0.78 - 0.88. A wide number of organisms have been placed in this genus. Identification to species is difficult. Often found in aerosol samples. Commonly found in soil, food, cellulose and grains. It is also found in paint and compost piles. It may cause hypersensitivity pneumonitis, allergic alveolitis in susceptible individuals. It is reported to be allergenic (skin). It is commonly found in carpet, wallpaper, and in interior fiberglass duct insulation. Some species can produce mycotoxins. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include edema and bronchospasms; chronic cases may develop pulmonary emphysema. It may also cause headaches, vomiting, and diarrhea.

Periconia sp.

Periconia sp. are found in soil, blackened and dead herbaceous stems leaf spots, grasses, rushes, and sedges. Almost always associated with other fungi. Rarely found growing indoors. Reportedly associated with a rare case of mycotic keratitis.

Pithomyces sp.

A common mold found on dead leaves, plants, soil and especially grasses. Causes facial eczema in ruminants. It exhibits distinctive multi-celled brown conidia. It is not known to be a human allergen or pathogen. It is rarely found indoors, although it can grow on paper.

Rusts/Smuts

These fungi are associated with plant diseases. In the classification scheme of the fungi, the smuts have much in common with the rusts, and they are frequently discussed together. Both groups produce wind-borne, resistant teliospores that serve as the basis for their classification and their means of spread. Rusts usually attack vegetative regions (i.e., leaves and stems) of plants; smuts usually are associated with the reproductive structures (seeds). They can cause hay fever and asthma.

Spegazzinia

Spegazzinia species comprise a very small proportion of the fungal biota. This genus is somewhat related to other lobed or ornamented genera such as *Candelabrum*. No information is available regarding health effects or toxicity. Allergenicity has not been studied. Usually identified on spore trap samples where it is seen every few weeks. (Spores have very distinctive morphology.) May also be found in air by culturable (Andersen) samples if a long enough incubation period is provided so that sporulation occurs. Our laboratory has never found this organism growing on indoor environmental surfaces. Natural habitat includes soil and many kinds of trees and plants.

Stachybotrys sp.

Aw - 0.94, optimum Aw ->0.98. Several strains of this fungus (*S. atra, S. chartarum* and *S. alternans* are synonymous) may produce a trichothecene mycotoxin- Satratoxin H - which is poisonous by inhalation. The toxins are present on the fungal spores. This is a slow growing fungus on media. It does not compete well with other rapidly growing fungi. The dark colored fungus grows on building material with high cellulose content and low nitrogen content. Areas with a relative humidity above 55%, and are subject to temperature fluctuations, are ideal for toxin production. Individuals with chronic exposure to the toxin produced by this fungus reported cold and flu symptoms, sore throats, diarrhea, headaches, fatigue, dermatitis, intermittent local hair loss and generalized malaise. Other symptoms include coughs, rhinitis, nosebleed, a burning sensation in the nasal passages, throat, and lungs, and fever. The toxins produced by this fungus will suppress the immune system affecting the lymphoid tissue and the bone marrow. Animals injected with the toxin from this fungus exhibited the following symptoms: necrosis and hemorrhage within the brain, thymus, spleen, intestine, lung, heart, lymph node, liver, and kidney. Affects by absorption of the toxin in the human lung are known as pneumomycosis.

This organism is rarely found in outdoor samples. It is usually difficult to find in indoor air samples unless it is physically disturbed (or possibly -this is speculation- a drop in the relative humidity). The spores are in a gelatinous mass. Appropriate media for the growth of this organism will have high cellulose content and low nitrogen content. The spores will die readily after release. The dead spores are still allergenic and toxigenic. Percutaneous absorption has caused mild symptoms.

Stemphylium sp.

Reported to be allergenic. Isolated from dead plants and cellulose materials.

Torula sp.

Found outdoors in air, soil, on dead vegetation, wood, and grasses. Also found indoors on cellulose materials. Reported to be allergenic and may cause hay fever and asthma.

Tetraploa

Tetraploa species comprise a very small proportion of the fungal biota. This genus is somewhat related to *Triposporium* and Diplocladiella. The only reported human infections are two cases of keratitis (1970, 1980) and one case of subcutaneous infection of the knee (1990). No information is available regarding other health effects or toxicity. Allergenicity has not been studied. Usually identified on spore trap samples where it is seen every few weeks. (Spores have very distinctive morphology.) Our laboratory has never found this organism growing on indoor environmental surfaces. Natural habitat includes leaf bases and stems just above the soil on many kinds of plants and trees.

Ulocladium sp.

Aw 0.89. Isolated from dead plants and cellulose materials. Found on textiles.

Zygomycetes

Zygomycetes are one of the four major groups of fungi, the others being the Oomycetes, the Ascomycetes, and the Basidiomycetes. Zygomycetes are common, fast growing, and often overgrow and/or inhibit other fungi nearby. Rhizopus and Mucor are two of the most common Zygomycetes seen in the indoor environment. However, others are seen as well, including *Syncephalastrum*, *Circinella*, *Mortierella*, *Mycotypha*, *Cunninghamella*, and *Choanephora*. For further information, please see descriptions of these individual genera.

The following table lists mycotoxins that are produced by certain types of fungi:

Fungi	Mycotoxin
Acremonium crotocinigenum	Crotocin
Aspergillus favus	Alfatoxin B, cyclopiazonic acid
Aspergillus fumigatus	Fumagilin, gliotoxin
Aspergillus carneus	Critrinin
Aspergillus clavatus	Cytochalasin, patulin
Aspergillus Parasiticus	Alfatoxin B
Aspergillus nomius	Alfatoxin B
Aspergillus niger	Ochratoxin A, malformin, oxalicacid
Acremonium crotocinigenum	Crotocin
Aspergillus nidulans	Sterigmatocystin
Aspergillus ochraceus	Ochratoxin A, penicillic acid
Aspergillus versicolor	Sterigmatocystin, 5 ethoxysterigmatocystin
Aspergillus ustus	Ausdiol, austamide, austocystin,brevianamide
Aspergillus terreus	Citreoviridin
Alternaria	Alternariol, altertoxin, altenuene, altenusin, tenuazonic acid
Arthrinium	Nitropropionic acid
Bioploaris	Cytochalasin, sporidesmin, sterigmatocystin
Chaetomium	Chaetoglobosin A,B,C. Sterigmatocystin
Cladosporium	Cladosporic acid
Clavipes purpurea	Ergotism
Cylindrocorpon	Trichothecene
Diplodia	Diplodiatoxin
Fusarium	Trichothecene, zearalenone
Fusarium moniliforme	Fumonisins
Emericella nidulans	Sterigmatocystin
Gliocladium	Gliotoxin
Memnoniella	Griseofulvin , dechlorogriseofulvin, epi-decholorgriseofulvin, trichodermin, trichodermol
Myrothecium	Trichothecene
Paecilomyces	Patulin, viriditoxin
Penicillium aurantiocandidum	Penicillic acid
Penicillium aurantiogriseum	Penicillic acid
Penicillium brasilanum	Penicillic acid
Penicillium brevicompactum	Mycophenolic acid
Penicillium camemberti	Cyclopiazonic acid
Penicillium carneum	Mycophenolic acid, Roquefortine C
Penicillium crateriforme	Rubratoxin

Fungi	Mycotoxin
Penicillium citrinum	Citrinin
Penicillium commune	Cyclopiazonic acid
Penicillium crustosum	Roquefortine C
Penicillium chrysogenum	Roquefortine C
Penicillium discolor	Chaetoglobosin C
Penicillium expansum	Citrinin, Roquefortine C
Penicillium griseofulvum	Roquefortine C, cyclopiazonic acid, griseofulvin
Penicillium hirsutum	Roquefortine C
Penicillium hordei	Roquefortine C
Penicillium nordicum	Ochratoxin A
Penicillium paneum	Roquefortine C
Penicillium palitans	Cyclopiazonic acid
Penicillium polonicum	Penicillic acid
Penicillum roqueforti	Roquefortine C, Mycophenolic acid
Penicillium veridicatum	Penicillic acid
Penicillium verrucosum	Citrinin, ochratoxin A
Penicillium/ Aspergillus	Patulin
Penicillium/ Aspergillus/Alternaria	Glitoxin
Phomopsis	Macrocyclic trichothecenes
Phoma	Brefeldin, cytochalasin, secalonic acid, tenuazonic acid
Pithomyces	Sporidesmin
Rhizoctonia	Slaframine
Rhizopus	Rhizonin
Sclerotinia	Furanocoumarins
Stachybotrys chartarum	Iso-satratoxin F, roridin E, L-2, satratoxin G & H, trichodermin, trichodermol, trichothecene
Torula	Cytotoxins
Trichoderma	Trichodermin, trichodermol, gliotoxin
Trichothecium	Trichothecene
Wallemia	Walleminol
Zygosporium	Cytochalasin

General terms

Allergen

An allergen is a substance that elicits an IgE antibody response and is responsible for producing allergic reactions. Chemicals are released when IgE on certain cells contact an allergen. These chemicals can cause injury to surrounding tissue - the visible signs of an allergy. Only a few fungal allergens have been characterized but all fungi are thought to be potentially allergenic. Fungal allergens are proteins found in either the mycelium or spores

"Black mold"

A poorly defined term. Black mold or toxic black mold has usually been associated with the mold *Stachybotrys chartarum*. While there are only a few molds that are truly black, there are many that can appear black. Not all molds that appear to be black are *Stachybotrys*.

Fungi

Fungi are neither animals nor plants and are classified in a kingdom of their own. The Kingdom of Fungi. Fungi include a very large group of organisms, including molds, yeasts, mushrooms and puffballs. There are >100,000 accepted fungal species but current estimates range to 1.5 million species. Mycologists (people who study fungi) have grouped fungi into four large groups according to their method of reproduction.

Hidden mold

This refers to visible mold growth on building structures that is not easily seen, including the areas above drop ceilings, within a wall cavity (the space between the inner and outer structure of a wall), inside air handlers, or within the ducting of a heating/ventilation system.

Microbial Volatile Organic Compounds (MVOCs)

Fungi produce chemicals as a result of their metabolism. Some of these chemicals, MVOCs, are responsible for the characteristic moldy, musty, or earthy smell of fungi, whether mushrooms or molds. Some MVOCs are considered offensive or annoying. Specific MVOCs are thought to be characteristic of wood rot and mold growth on building materials. The human nose is very sensitive to mold odors and sometimes more so than current analytical instruments.

Mold

Molds are a group of organisms that belong to the Kingdom of Fungi (see Fungi). Even though the terms mold and fungi had been commonly referred to interchangeably, all molds are fungi, but not all fungi are molds.

Mycotoxin

Mycotoxins are compounds produced by some fungi that are toxic to humans or animals. By convention, the term? Mycotoxin. Excludes mushroom toxins. Fungi that produce mycotoxins are called "toxigenic fungi."

Spore

General term for a reproductive structure in fungi, bacteria and some plants. In fungi, the spore is the structure which may be used for dissemination and may be resistant to adverse environmental conditions.

Toxic mold

The term "toxic mold" has no scientific meaning since the mold itself is not toxic. The metabolic byproducts of some molds may be toxic (see mycotoxin).

Hypha (plural, hyphae)

An individual fungal thread or filament of connected cells; the thread that represents the individual parts of the fungal body.

Phoenix EnviroCorp

MOLD/BIOLOGICAL CONTAMINANT REMEDIATION PROTOCOL

Date: July 7, 2021

For: Quanesha Mullins
Wilmington Housing Authority
1524 S. 16th Street
Wilmington, NC 28401

Remediation Contractor: Not determined

On-Site Consultant: Phoenix EnviroCorp (PEC)
4020 Shipyard Boulevard
Wilmington, NC 28403
(910) 397-0370

Approved Signatory:

Shaenaz Mirmohamed
IH Technician

Tommie Green, CIEC
Professional Industrial Hygienist

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SECTION 1.0 REMEDIATION PROCEDURES

1.1 Project Set Up

- The owner or powers that be shall supply temporary power for remediation equipment. The existing electrical system may be utilized, with permission of the owner or powers that be. Determining specific electrical load/safety requirements, including, but not limited to, the use of a temporary GFCI electrical panel box shall be the responsibility of the abatement contractor.
- HVAC system shall be isolated.
- 6-mil polyethylene sheathing shall be erected to separate primary control areas (PCA) from remaining areas. Control areas shall be selected so that specified building materials (specified herein, in section 1.3, under primary control areas) may be removed or cleaned and dried.
- HEPA Air Filtration Devices shall be utilized for each separate control area. Critical barriers shall consist of 6-mil polyethylene so that primary control areas are isolated from remaining areas. HEPA filtration units shall be exhausted from the PCA to the outside of the building through windows/doors. Dehumidification units must be installed in the PCA to sufficiently dry components.
- A remote wash off station shall be set up to allow for employees to wash hands and faces after egress from the work area.
- Ingress/Egress to the control area(s) shall be, at minimum, sealed with a 2-way polyethylene air lock.
- Entrances to the building shall be marked as indicated in Section 7.4 of this document.

1.2 Local Exhaust System

- Once sealed, the primary control area shall be ventilated with a local HEPA air filtration device that shall ensure a minimum of four (4) air changes per hour. The air filtration device shall be placed within the containment work area.
- Local HEPA exhaust shall be utilized where cleaning of contents is required and/or in the immediate vicinity of remediation activities of building materials.
- In interior sections requiring surface area cleaning, local HEPA filtration may be exhausted within the area to scrub microbials from ambient air. This process shall only be conducted after fine cleaning has been completed.
- Negative pressure within the contained work area shall be maintained throughout the project until clearance is obtained.
- Negative air machines shall be exhausted to exterior portions of the building to adequately ensure that negative pressure is achieved.
- Negative air pressure within the work area shall be tested and recorded at initiation of the project and hourly thereafter by use of a manometer to ensure the desired pressure of -0.02 inches of water, which is comparable to four changes per hour.
- Dehumidification devices with HEPA filtration may be incorporated as filtration devices in conjunction with true HEPA filtration devices; they may not replace the true HEPA filtration devices.

Note: Formula for determination of adequate HEPA filtration:

Total feet per minute =Volume of work area (ft^3)/15 minutes
#AFD Units needed = (Total feet per minute)/Capacity of Unit (ft^3)

- At initiation of final cleaning stages, relative humidity shall be at 40% (+/-3%) and moisture content of wooden components shall be at or below 15% as determined by Delmhorst moisture meter or equivalent meter. Moisture mapping and direct read T/RH shall be recorded by the remediation contractor until the

specified levels have been achieved. Control areas shall be dehumidified during cleaning and mold remediation activities to ensure removal of surface moisture created during application of water. Drying of structural components that have been treated with encapsulating anti-microbial agents will be necessary.

- Moisture levels shall be recorded and documented by the remediation contractor upon successful completion of dehumidification.

1.3 Remediation Specifications

- Prior to commencement of mold remediation activities by the remediation contractor, the source of any water intrusions, leaks, and/or moisture/humidity problems shall be remedied by the owner. If water intrusions, leaks, and/or moisture/humidity problems exist and are not corrected, mold growth can be expected to return.
- All remediation procedures listed that involve the removal of building materials shall employ polyethylene critical barriers, negative air pressure, and HEPA filtration (i.e., primary control areas).
- The remediation contractor shall ensure that the filters are properly capped prior to switching off the air scrubbers. If the filters are not properly capped, the backflow can cause mold spores to re-release back into the control area, essentially re-contaminating an area that has already been cleaned.
- All remediation activities shall be conducted in a manner that does not allow dissemination of mold spores. Remediation procedures shall begin from the side of the control area furthest away from air filtration devices.
- Cleaning procedures shall be repeated until the area is visibly free of dust and debris.
- Engineering controls set up during the remediation process shall remain in place until remediation has been completed and acceptable post remediation sampling results have been achieved.
- **Federal and/or state regulations require that suspect asbestos containing materials in public and commercial buildings shall be inspected for asbestos prior to renovations or demolition. Based on these regulations, PEC recommends that building materials that may be disturbed during mold remediation be tested for asbestos content prior to their disturbance to prevent asbestos contamination.**
- If cleaning procedures outlined in this remediation plan outweigh the cost of replacement for selected items, the remediation contractor shall give the owner the option to clean or dispose of those items.
- Reinstallation of building materials and/or components shall only be conducted once acceptable post remediation results are obtained.
- Any chemicals used on this project shall be EPA approved and used only as directed by the manufacturer. MSDS shall be available for review upon request.

HVAC System

- The HVAC system(s) that services or run through the primary control area/affected area shall be shut down prior to remediation activities.
- The spaces that are normally climate-controlled by the HVAC system that have been shut down shall be maintained under proper humidity levels (between 30 and 60% utilizing dehumidifiers, etc.) while the system is not in operation.
- All HVAC supply/return vents within the primary control area/affected area shall be isolated with a critical barrier (i.e., plastic, etc.) to prevent air flow. Prior to isolating the vents, the register covers (diffusers) shall be removed, and the supply shall be isolated at the metal boot. Once isolated, the registers and surrounding building materials shall be cleaned.
- The interior of the air handler, rigid duct system, intake box, etc. shall be thoroughly cleaned by an HVAC professional experienced in mold remediation. The interior can be cleaned with mechanical methods that aggressively disturb all interior surfaces and filter the disturbed airborne particulates.

- Cleaning of components shall consist of a method that thoroughly removes visible mold growth, settled concentrations of mold spores, and/or dust and debris.
- PEC recommends the removal and disposal of the flex ducts when feasible, as well as any interior duct board where cleaning will damage the duct board. Once removed, the remediation contractor shall isolate the connection point where the flex duct and/or duct board was detached with a critical barrier (such as plastic, etc.) to prevent air flow.
- Once the HVAC system components are cleaned or replaced anew, the system shall remain off and isolated until acceptable post remediation results are obtained.
- A written document shall be obtained from the remediation contractor verifying that the HVAC system has been cleaned by an HVAC cleaning company with mold experience. This document shall include the property address and date of services and shall be filed with other mold remediation documents.

Note: For directional purposes "front" is determined by facing Grass Lane from inside the unit, unless otherwise noted.

Primary Control Areas/Affected Areas

Critical barriers, negative air pressure, and HEPA filtration shall be established to isolate the following areas as Primary Control Areas to perform the specified mold remediation.

Within the living room:

- Remove drywall from the rear wall. The length of this removal shall be the entire length of the wall beginning at the left wall and extending 8 feet to the right wall. The height of this removal shall be 3 feet beginning at the floor and extending towards the ceiling.

Within the kitchen:

- Detach the floor mounted cabinet from the front wall, and remove any affected drywall (i.e., drywall with apparent water damage/suspect visible mold growth) and extend the drywall removal within a 2-foot radius of the affected area when possible.

Within the front right bedroom:

- Remove the ceiling drywall entirely (12 feet by 10 feet).
- Remove the baseboards entirely from the rear and right walls, and remove any affected drywall (i.e., drywall with apparent water damage/suspect visible mold growth) and extend the drywall removal within a 2-foot radius of the affected area when possible.

Within the bathroom:

- Detach the floor mounted cabinet from the front wall, and remove any affected drywall (i.e., drywall with apparent water damage/suspect visible mold growth) and extend the drywall removal within a 2-foot radius of the affected area when possible.
- Remove ceiling drywall. The length of this removal shall be 5 feet beginning at the left wall and extending towards the right wall. The width of this removal shall be 2 feet beginning at the front wall and extending towards the rear wall.
- Remove drywall from the front wall. The length of this removal shall be 5 feet, beginning at the left wall and extending towards the right wall. The height of this removal shall be 2 feet beginning at the ceiling and extending towards the floor.

Throughout the unit (Negative air pressure is not required in areas where building components are not specified for removal, but HEPA filtration is required):

- Discard contents/trash (excluding appliances) or clean contents as specified herein under general specifications for primary control areas. Cleaning or discarding the contents shall be confirmed by the owners or powers that be.
- Clean all remaining surfaces as specified herein under general specifications for primary control areas.
- **Areas of specified ceiling removal shall be sealed with poly (i.e., critical barrier) after cleaning, but before HEPA air scrubbing after cleaning, to prevent air flow from areas outside the containment area. An access door (i.e., poly flap taped in place, zipper, etc.) shall be installed in the critical barrier for easy access to conduct a visual inspection of the building materials behind the critical barrier.**

General Specifications for Primary Control Areas

- Open plumbing lines and drains within the control areas shall be isolated with a critical barrier consisting of 6-mil poly.
- The water line to toilets within the control areas shall be shut off and the toilets shall be isolated with a critical barrier consisting of 6-mil poly.
- Cleaning of components/materials shall consist of a method that thoroughly removes visible mold growth, settled concentrations of mold spores, and/or dust and debris (i.e., HEPA vacuuming, wet wiping, or other approved methods), followed by dehumidification/drying.
- Non-porous, semi-porous, and porous furnishings and contents shall be cleaned. If items cannot be cleaned efficiently, the abatement contractor shall consult with the owner/powers that be to determine if they shall be disposed.
- All machine washable porous cloth items shall be cleaned and dried in a household washer and dryer. Other specialty items shall be cleaned by a dry cleaner that specializes in cleaning materials affected with mold. These items shall be removed from affected area(s) and shall not be reintroduced back into the area(s) until acceptable post remediation testing is established. If porous articles cannot be cleaned efficiently, the abatement contractor shall consult with the owner/powers that be.
- Exterior surfaces of electrical appliances, electrical equipment, and light fixtures shall be cleaned, utilizing wet method and HEPA vacuuming. These items shall be disconnected from all electrical sources prior to cleaning. If these items cannot be cleaned efficiently, the abatement contractor shall consult with the owner/powers that be.
- All wall/ceiling cavity insulation shall be disposed in areas that specify the removal of drywall/wallboard. The abatement contractor shall visually inspect the back side of surrounding drywall/wallboard for water damage and/or suspect mold growth and document any findings. If additional suspect mold growth or water damage is observed beyond the specified removal area, additional drywall/wallboard shall be removed until no suspect mold growth or water damage is observed.
- All penetrations within the controlled area that adjoin unaffected or non-accessible areas, including outdoor areas, crawlspaces, etc., shall be cleaned (as far as one can reach) and then sealed with 6-mil poly, extending six (6) inches on all sides.
- In areas of specified wallboard removal, all components within the wall/ceiling cavities shall be cleaned. Any wooden structural components with mold stains or mold growth in pitted surfaces shall be HEPA sanded (or other approved methods) to eliminate embedded mold growth.
- All joints or sills (where the structural system meets, where the sill plate meets the floor, etc.) shall be aggressively disturbed to remove embedded mold growth and spores.

1.4 Removal Procedures

The contractor shall maintain surfaces of the control area free of accumulation of dust and debris. Additionally, they shall restrict the spread of dust and debris, keeping waste from being distributed over the work area. Materials shall be removed in a fashion to ensure that previously cleaned areas are not

recontaminated (i.e. working from one end of the control area to the other). The contractor may be required to re-clean areas based on a visual inspection by the CIEC/CIE/IH, if the areas are not visibly clean.

Contaminated building materials that have been removed, and additional materials and debris generated during remediation, shall be bagged or wrapped with 6-mil polyethylene sheeting, sealed with duct tape, and carried to the waste container prior to visual inspection by the CIEC/CIE/IH. Materials shall be bagged and sealed directly after removal from unaffected building components.

Areas shall be allowed to dry for a period until specified RH and moisture levels have been achieved. Any remaining building products that are directly impacted by remediation shall be tested for moisture content. Wooden and cellulosic building components (e.g., wall studs, drywall, etc.) shall be tested for moisture content. If the moisture content is > 15% in wood products or > 12% in cellulosic products (utilizing a Delmhorst moisture meter), dehumidification shall be required until moisture levels are at or below said levels, and the RH level is at or below 40% +/-3% (for all interior areas). The remediation contractor shall verify water content of all wooden and cellulosic building components within the impacted areas, as well as temperature and RH prior to scheduling post remediation verification.

1.5 Cleanup Overview

The contractor shall personally review the cleaning process prior to contacting the CIEC/CIE/IH for the post remediation testing. If accumulations of debris and dust are significant, the CIEC/CIE/IH will require re-cleaning prior to post remediation verification sampling.

The CIEC/CIE/IH shall make a visual inspection and conduct post remediation sampling after the final cleaning is complete.

1.6 Post Remediation Verification Testing

Prior to conducting post remediation sampling, HEPA filtration devices shall be allowed to operate for a minimum of 48 hours (the equivalent of 192 air changes), following fine cleaning, in all areas where remediation has been conducted. The HEPA filtration devices shall be sealed at the intake and turned off approximately two hours prior to post testing and reconvene within one hour after post testing, until acceptable post remediation results are established.

Post remediation sampling shall be conducted utilizing viable and/or non-viable sample methods. Air samples shall be collected in representative areas of the control areas. Surface sampling may be conducted at the discretion of the CIEC/CIE/IH.

Sampling shall be conducted in areas directly impacted by remediation procedures, where cleaning was conducted. The CIEC/CIE/IH shall determine acceptable post remediation status through interpretation of air sampling results, which will be based on indoor/outdoor comparisons, in combination with any surface samples collected, moisture readings, RH readings, visual observations, and any other pertinent information.

The owner/client will be responsible for post remediation testing. If air sample results indicate unacceptable airborne concentrations, the contractor shall be required to conduct a re-cleaning at the contractor's expense and absorb the cost for re-testing, until acceptable results are achieved.

SECTION 2.0 SCOPE OF WORK (Note: Section 2 and Section 1.3 are essential to the full Scope of the Contractor's Work)

2.1 Investigative Reports and Other Related Documents

Phoenix EnviroCorp initial investigative report dated June 8, 2021.

Phoenix EnviroCorp investigative report dated July 7, 2021.

Phoenix EnviroCorp Chain of Custody dated June 1, 2021, and June 24, 2021.

Analytical reports dated June 2, 2021, and June 25, 2021.

2.2 Project Description

The procedures covered by this program include the enclosure and drying of the said structure, the removal, handling, and disposal of building components compromised by mold/fungal growth, and the cleaning and disinfecting of existing building materials. Procedures for reconstruction are not considered in these specifications. Reconstruction of interior portions may not be conducted until procedures for remediation have been completed, the control areas have been inspected, and testing has returned acceptable post remediation results. Reconstruction of exterior portions may be conducted during the restoration to ensure that water intrusion is abated.

The objectives covered by the program include the remediation of materials shown to have surface contamination, water damage, and/or exposure to elevated airborne mold spore levels, without subjecting the workers, installation employees, and occupants to microbial contaminants. In addition, contract employees, occupants, and materials will be appropriately protected during the removal process so that present and future exposures will not occur.

This protocol is provided as a guideline. Any deviation requests from this protocol shall be addressed to the CIEC/CIE/IH for consideration. At present there are no Federal or State requirements regarding microbial remediation projects; however, OSHA General Construction Code of Federal Regulations (29 CFR 1926) shall be followed.

Remediation shall be completed as close to the date that this protocol was drafted, as the specifications outlined within represent conditions at the time the investigative services were conducted. Due to the volatility of mold, the current protocol may not reflect all necessary remediation if conditions are allowed to continue. Further, if time lapses allowing conditions to change, it will become increasingly difficult to obtain successful clearance testing results.

SECTION 3.0 AIR MONITORING

3.1 Responsibilities of the CIEC/CIE/IH

Monitoring of airborne concentrations will be performed in accordance with the requirements of this program. Prior to conducting air sampling and/or surface sampling for clearances, the CIEC/CIE/IH shall conduct a visual inspection of the area. Temperature and RH shall be recorded during the air sampling phase of clearance. All air sampling shall be conducted in such a manner as to provide a valid representation of airborne mold levels both inside and outside the work areas. If analysis of air samples indicates that airborne concentrations exceed acceptable limits, the contractor shall conduct re-cleaning at the contractor’s expense.

3.2 Personal Monitoring

No personal monitoring will be conducted by the CIEC/CIE/IH unless the remediation contractor requests monitoring for OSHA compliance. Presently there are no guidelines (PELs or TLVs) for microbial

contaminants. It is the remediation contractor's responsibility to determine if OSHA personal sampling may be required during application of anti-microbial agents.

3.3 Sample Integrity and Reporting

Samples shall be sealed, labeled, and a chain of custody initiated according to laboratory procedures.

Sample results shall be available within seven (7) days of the completion of collection of all samples and will include the following information:

- Site Address
- Sample Number
- Location Sampled
- Analytical Method
- Collection Date(s)
- Person Taking Sample(s)
- Additional Comments (if any)
- Analyst Signature

SECTION 4.0 MATERIAL REPLACEMENT

4.1 Material Replacement

The general contractor/replacement contractor may begin material replacement after the CIEC/CIE/IH informs all parties of acceptable post remediation sample results.

With ongoing construction activities ambient air levels are expected to be elevated over what might be normally expected. Additional testing should not be necessary after remediation procedures have been completed and successful results have been obtained. In the event of another water intrusion (i.e. broken-pipe-line, improper HVAC function, or building envelope compromise), an investigation shall be conducted within 24 to 48 hours of the event. Proper drying, if initiated within this time frame, should minimize the potential for microbial growth.

SECTION 5.0 SPILL CLEANUP REQUIREMENTS

5.1 Spills

MSDS shall be kept on site for all chemical products brought to the site by the remediation contractor. In the event of a chemical spill, the contractor shall initiate cleanup immediately. The contractor shall mop up any liquid with rags or other conventional absorbent. The spent absorbent shall be properly contained and disposed of as waste.

SECTION 6.0 WASTE CONTROL

6.1 Waste Disposal

Waste shall be disposed of at a locally selected landfill. Waste bags shall be checked for integrity and hauled in an enclosed truck/vehicle or container to ensure that transportation to the landfill does not pose a potential hazard to the environment.

SECTION 7.0 SUPPLEMENTAL INFORMATION

7.1 Applicable Publications

The publications listed below form part of this program. Written programs shall accompany all referenced CFR publications. IICRC and NYCDOH guidelines for work procedures shall be followed by the remediation contractor. A copy of the NYCDOH protocols shall be on-site, along with this design, for reference by the site supervisor. ACGIH, IAQA, and ASHRAE publications shall be utilized as guidelines for interpretation by the CIEC/CIE/IH. This design shall be reviewed by the remediation supervisor prior to initiation of set-up for the project. Any questions regarding this project may be addressed with the on-site consultant listed for Phoenix EnviroCorp.

Code of Federal Regulation (CFR Publications)

29 CFR 1910.134	Respiratory Protection
29 CFR 1910.145	Specifications for Accident Prevention, Signs and Tags
29 CFR 1926.28	Personal Protective Equipment
29 CFR 1926.59	Hazard Communication
29 CFR 1926.96	Occupational Foot Protection
29 CFR 1926.100	Head Protection
29 CFR 1926.101	Hearing Protection
29 CFR 1926.102	Eye and Face Protection
29 CFR 1926.403	Electrical General Requirements
29 CFR 1926.416	Safety General Requirements
29 CFR 1926.852	Demolition, Chutes
29 CFR 1926.1091	Record Keeping Requirements

Supplemental Guidelines

IICRC S520 2nd ed.	Standard and Reference Guide for Professional Water Damage Restoration
NYCDOH	Guidelines on Assessment and Remediation of Fungi in Indoor Environments
ACGIH	Bioaerosols: Assessment and Control
IAQA 01-2000	Recommended Guidelines for Indoor Environments
ASHRAE 62.2-2007	Ventilation for Acceptable Indoor Air Quality in Low-Rise Residential Buildings

7.2 Definitions

Air Lock: A system that permits ingress and egress between a control area and non-control area, or other work areas, without allowing air movement between areas (e.g., three stage decon, three-way polyethylene flaps).

Air Sample: Refers to samples collected with spore trap air sample media (e.g., Micro-5, Cyclex D, or equivalent); also referred to as a non-viable air sample. May also refer to a sample collected on a disposable petri dish with Agar media by means of an Andersen Impactor (or equivalent) and sampling pump; also referred to as air culture (viable) sample. Sample media to be used in project is described under Section 1.6 (Post Remediation Verification Testing).

Area Monitoring: The sampling of airborne microbial concentrations outside the exclusion boundary, which may reach the breathing zone of the contractor or installation employees.

Asbestos Containing Materials (ACM): Refers to asbestos containing building materials that contain more than 1% asbestos by Polarized Light Microscopy (PLM) or Transmission Electron Microscopy (TEM).

Biocide: Refers to chemical agents that are specifically designed to eliminate viable microbial contamination, with a phenol equivalent efficiency (e.g., Sodium Hypochlorite, Quaternary Ammonia Compounds).

Blower Door Test: Refers to the testing of static pressure and draw of air through the HVAC in cubic feet per minute (CFM) to rate the efficiency of the system.

Clearance Monitoring: Refers to air, bulk, or swab sampling conducted as a means to demonstrate that the area specified for remediation has been completed by the contractor, left with present acceptable mold spore levels, and ready for re-construction.

Control Area: The area where microbial contaminants removal is performed, which is isolated by physical boundaries to prevent unauthorized entry of personnel, thereby preventing exposure to or the spread of microbial contaminants. Physical boundaries will be established and located such that the airborne contaminants are not allowed to escape the boundaries.

HEPA: High Efficiency Particulate Air. Refers to ventilation devices that are specifically designed to filter ambient air to an efficiency of 99.97%.

HVAC: Refers to the Heating, Ventilation, and Air Conditioning system.

Industrial Hygienist: Refers to a person who practices industrial hygiene and may act as a competent person regarding visual inspection of contaminated surfaces and clearance air and/or swab/bulk sampling. May also refer to a Certified Industrial Hygienist (CIH) as defined by the American Board of Industrial Hygiene (ABIH), a Certified Indoor Environmental Consultant as defined by the American Council for Accredited Certification (ACAC), or a Certified Indoor Environmentalist (CIE) as defined by the American Council for Accredited Certification (ACAC).

Microbial Contaminant: Refers to viable mold, fungi, pollen, bacteria, and or particulate, or their metabolites, that may be causative of epidemiological, immunotoxic, dermotoxic, neurotoxic, or enterotoxic disorders in the human population, or may be considered a pathogen or an opportunistic pathogen.

Non-Porous Materials: Refers to building materials with solid surfaces that may be successfully treated and cleaned by means of HEPA vacuuming or other approved method. Materials include flooring, hard goods, plastic, vinyl, and some wallboard systems.

Porous Materials: Refers to building materials and household goods that may allow microscopic particles (3-20 micron) to become trapped within the material that will not allow adequate cleaning. Materials include carpet, mattresses, and clothing.

Primary Control Area (PCA): Refers to a section of a facility that has been isolated by 6-mil polyethylene barriers where specific engineering controls (e.g., HEPA filtration, negative air pressurization, dehumidification, etc.) are required. In general, it is the area where remediation of water and mold damaged building materials is to be conducted.

Refrigerant Dehumidifier: Device used to remove water content from air and materials.

Relative Humidity (RH): Refers to the ratio of water vapor in the atmosphere to the amount required to saturate it at a given temperature.

Semi-Porous Materials: Refers to materials that may be somewhat porous, yet they may still allow for adequate cleaning. Materials include wooden beams and some wallboard systems.

Swab Sample: Refers to collection of a sample onto a sterile swab for analysis of mold, fungi, and bacteria by viable and/or non-viable analysis.

Tape-Lift Sample: Refers to collection of a sample onto clear scotch tape for analysis by direct microscopic examination (non-viable).

7.3 Quality Assurance

Medical Examinations

Before potential exposure to microbial contaminants, the remediation contractor shall provide workers with a comprehensive medical examination as required by 29 CFR 1910.134 as outlined by the Medical Monitoring Program.

Medical Records

The remediation contractor shall maintain complete and accurate medical records on employees as required by OSHA and the contractor's Medical Monitoring Program. The contractor may be asked to provide a copy of all medical records for approval by the consultant's representative.

Training

Each employee working on this contract shall be trained prior to the time of initial job assignment in accordance with mold specific and chemical specific training as indicated by the OSHA General Duty Clause and the Hazard Communication Standard. Each employee shall also receive training required by Federal guidelines listed in Section 7.1 of this document and project specifications.

Hazard Communication Program

The remediation contractor has established and implemented a Hazard Communication Program as required by 29 CFR 1910.1200 and may be asked to provide a copy of this written program. Hazard Communication training must include occupational hazards as directly related to working with fungi/mold and contamination of building components by fungal contamination, specific training for chemical hazards associated with biocide usage, and site specific MSDS sheets for commercial detergents and biocides utilized on the job site.

Respiratory Protection Program

The remediation contractor has established a Respiratory Protection Program, which complies with 29 CFR 1910.134. Physical examinations and fit testing are required for use of respiratory protection greater than an N-95 dust mask. Workers removing building materials contaminated by mold growth, applying anti-microbial agents, or workers subjected to exposures to anti-microbial agents shall be required to wear, at minimum, a tight-fitting negative pressure ½ mask respirator with P-100 filters. Therefore, -he OSHA Respiratory Protection Standard applies.

Analytical Testing Laboratory

Analysis of culturable biological samples collected on this project shall be conducted by a laboratory that participates in the Environmental Microbiological Proficiency Analytical Testing Program (EMPAT) of the American Industrial Hygiene Association (AIHA) and has shown to be proficient by proficiency analytical testing (PAT) samples. Analysis of non-viable air and surface samples shall be conducted by a competent person.

7.4 Materials and Equipment

Equipment

The contractor shall make available to employees a complete set of personal protective equipment (PPE) as required by this program for entry into the controlled area. All personnel while in the control area or handling microbial contaminated waste shall wear protective clothing, respirators, and other PPE.

Respirators

Contractor shall furnish the appropriate respirator in accordance with 29 CFR 1910.134 and approved by NIOSH for protection in environments that contain microbial contaminants. The selected respirator for this project shall be a tight-fitting negative pressure ½ respirator equipped with HEPA cartridge (P-95, P-100). At minimum, an N-95 dust mask may be utilized during fine cleaning activities; however, the tight fitting ½ mask respirator shall be utilized during application of anti-microbial agents or biocides.

Special Clothing

Employees shall be provided with and required to wear: whole body disposable protective clothing, full body tyvek suits with head coverings, and latex gloves *(see table)* during all activities in the controlled area.

Chemical	Recommended Rubber Glove
Sodium Hypochlorite	Neoprene or Nitrile
Phenolic Compounds	Neoprene
Quaternary Ammonia Compounds	Polyvinyl Chloride (PVC)
Detergents	Latex

Eye Protection

The contractor shall provide chemical-resistant goggles to personnel engaged in cleaning and treatment activities and require them to be worn during application of anti-microbial agents and biocides.

Warning Signs and Labels

Standard approved warning signs shall be erected at all approaches to the control area as specified in 29 CFR 1910.145.

Anti-Microbial Agents

Anti-microbial agents utilized in interior quarters shall consist of quaternary ammonia compounds. No phenolic compounds shall be used in interior quarters with exception of Micro Ban Plus. Approval must be granted by the owner/powers that be prior to application. Anti-microbial agents shall be EPA approved. Commercial grade detergents shall be used to remove fungal contamination during cleaning phases prior to anti-microbial application, to include encapsulation.

Phoenix EnviroCorp

June 8, 2021

Quanesha Mullins
Wilmington Housing Authority
1524 S. 16th Street
Wilmington, NC 28401

RE: PEC Job # 21-21-178-IAQ-M - 302 Grass Lane, Apartment 102, Wilmington, NC - Mold Investigation/Background air sampling

Enclosed are the results of the mold investigation conducted at the above referenced residence on June 1, 2021. Phoenix EnviroCorp (PEC) was retained to conduct background air sampling to determine airborne mold spore levels and to collect surface samples of suspect visible mold growth.

Background Information: The resident called to report that the hot water heater is leaking and has leaked into her closet.

The unit was occupied and fully furnished with contents throughout.

The HVAC system was operating in the cool mode, set at 70º F upon PEC's arrival and during sampling.

Note: For directional purposes "front" is determined by facing the grass area adjacent to the parking lot from inside the building, unless otherwise stated.

Visual Inspection: PEC's visual inspection noted the following (see enclosed photographic documentation):

- Apparent minor water damage/staining in the bathroom cabinet underneath the sink
- Apparent minor water damage/staining in the kitchen cabinet underneath the sink
- No suspect visible mold growth observed

Mold Testing – Air: Non-viable spore trap air samples were collected to determine airborne mold spore levels. Samples were collected within the kitchen/living room, the bathroom, the rear left bedroom, and the rear right bedroom. *Micro 5 sampling media was utilized for the collection of spore trap air samples. Each sample ran for five (5) minutes at a flow rate of five (5) liters per minute for a total volume of twenty-five (25) liters per sample. Each sample was assigned a unique ID number and shipped to a third-party laboratory for analysis. All air samples were collected from centralized locations (within their respective areas) and within the breathing zone, unless otherwise noted.* Two samples were also collected outdoors for comparative purposes.

Results indicated acceptable levels of airborne mold spores in all sampled locations.

The interpretation of air sample results is based on indoor/outdoor comparisons, in combination with a study by Daniel M. Baxter, entitled "A Regional Comparison of Mold Spore Concentrations Outdoors and Inside "Clean" and "Mold Contaminated" Southern California Buildings", and other industry guidelines, as well as over 20 years of experience in industrial hygiene and mold testing.

In layman terms, acceptable levels indicate that the levels are below the outdoor level and/or the baseline levels (whichever is higher) stated below. Elevated levels indicate that the levels are above the outdoor level and/or the baseline level.

Baseline levels for indoor spore trap air samples are as follows: < 900 spores/m³ for Penicillium/ Aspergillus; 0 spores/m³ for Stachybotrys and Chaetomium; and < 350 spores/m³ for other individual mold groups.

Relative Humidity (RH): *Temperature and relative humidity readings were collected in the same locations as the spore trap air samples.* RH levels within the residence ranged from 65.0% - 70.9% with an outdoor RH level of 58.8% (see the enclosed Chain of Custody for details). Per the American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) Standard 62-1999, relative humidity should range between 30% and 60%. Consistent RH levels above 60% is conducive to mold growth.

Conclusions: Air sampling within the tested areas did not indicate a problem with the indoor air quality regarding mold, and no surface mold growth was identified.

Enclosed in this report are the laboratory analysis and the Chain of Custody.

Should you have any questions, please do not hesitate to call.

Thank you,

Philip Green
IH Technician

Tommie Green, CIEC
Professional Industrial Hygienist

Enclosures

Photo 1

Apparent minor water damage/staining in the cabinet underneath the bathroom sink

Photo 2

Apparent minor water damage/staining in the cabinet underneath the kitchen sink

samples accepted

Phoenix EnviroCorp
4020 SHIPYARD BLVD.
WILMINGTON, NC 28403

CHAIN OF CUSTODY

LABORATORY TEST REQUEST

Seem1 Ref# 21060203 5 lab ID: 107-110

CONTACT: Philip Green	TELEPHONE (910) 397-0370 FAX (910) 313-6094	6/1/2021
PEC Job #: 21-21-179-IAQ-M	SITE ADDRESS: 302 Grass Lane, Apt.102, Wilmington, NC 28405	

PLEASE EMAIL RESULTS TO: KMGREEN@PHOENIXENVIROCORP.COM

SAMPLE TYPE:	NUMBER OF SAMPLES:	TURN AROUND TIME SPECIFIED:
Spore Trap - Micro-5 Surface Samples	4	____ Immediate ____ 24 hr ____ 48 hr __X__ Standard

Sample #	Sample Area	Sample Volume	Lab Analysis Requested	% Relative Humidity	Temperature °F
060121-PG-201	Kitchen/Living Room	25L	S001	67.1	72.4
060121-PG-202	Bathroom	25L	S001	65.0	71.5
060121-PG-203	Rear Left Bedroom	25L	S001	67.9	70.3
060121-PG-204	Rear Right Bedroom	25L	S001	70.9	73.2

Samples Collected By (Printed Name and Signature): [signature] Date Signed: 6/1/2021

CHAIN OF CUSTODY RECORD

DATE:	Time:	Condition of Samples:	RELINQUISHED BY: (Printed Name and Signature)	ACCEPTED BY: (Printed Name and Signature)
6/1/2021	14:30:00 PM	Intact	[signature] AFFILIATION:	JM 6-10-21 AFFILIATION:

SEEML Reference Number:
210602035

Southeast Environmental Microbiology Laboratories
102 Edinburgh Court
Greenville, SC 29607
Phone: (864) 233-3770
FAX: (864) 233-6589

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

☐	Surface/Bulk Report	☐	Andersen Fungal Report
☒	Spore Trap Report	☐	Quantitative Fungal Report

Lab Manager Review: *Angel Gosnell* Date: 06/02/21

Thank you for using SEEML laboratories. We strive to provide superior quality and service.
SEEML laboratories are accredited through AIHA-LAP, LLC (EMLAP # 173667) for the analysis of Spore Traps and Surface/Bulk Samples.

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

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

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

Spore Trap Report

	Date Sampled: 06/01/21
Attn: ***Phoenix Enviro Corp.***	Date Received: 06/02/21
4020 Shipyard Blvd.	Date Analyzed: 06/02/21
Wilmington, NC 28403	Date Reported: 06/02/21
	Date Revised:
	Project Name: 21-21-179-IAQ-M
	Project Address: 302 Grass Lane, Apt. 102
	Project City, State, ZIP: Wilmington, NC 28405
	SEEML Reference # : 210602035

TEST METHOD: DIRECT MICROSCOPY EXAMINATION SEEML SOP 7

Client Sample ID	060121-PG-201			060121-PG-202			060121-PG-203		
Location	Kitchen/Living Room			Bathroom			Rear Left Bedroom		
Lab Sample ID	210602035-107			210602035-108			210602035-109		
Comments									
Hyphal Fragments									
Pollen									
Spore Trap Used	M5			M5			M5		
	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%
Alternaria									
Ascospores									
Basidiospores	1	40	14						
Bipolaris/Drechslera									
Chaetomium									
Cladosporium	3	120	43	13	520	87	None		
Curvularia							Detected		
Epicoccum									
Cercospora									
Fusarium									
Memnoniella									
Nigrospora									
Penicillium/Aspergillus	3	120	43	2	80	13			
Polythrincium									
Rusts									
Smuts/Periconia/Myxomy									
Spegazzinia									
Stachybotrys									
Stemphylium									
Tetraploa									
Torula									
Ulocladium									
Colorless/Other Brown*									
Oidium									
Zygomycetes									
Pithomyces									
Background debris (1-5)**	3			3			1		
Sample Volume(liters)	25			25			25		
TOTAL SPORES/M^3	7	**280**		15	**600**		0		

Revisions:

Spore types listed without a count or data entry were not detected during the course of the analysis for the respective sample, indicating a raw count of <1 spore.

The analytical sensitivity is the spores/m^3 divided by the raw count, expressed in spores/m^3. The limit of detection is the analytical sensitivity (in spores/m^3) multiplied by the sample volume (in liters) divided by 1000 liters.

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

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

Disclaimer: The sample results are determined by the sample volume, which is provided by the customer.
This report relates only to the samples tested as they were received.

102 Edinburgh Court
Greenville, SC. 29607
Phone: (864) 233-3770

Angel Gosnell

Angel Gosnell, Approved Laboratory Signatory

AIHA-LAP, LLC EMLAP #173667

Texas Lic: LAB1016

Spore Trap Report

	Date Sampled: 06/01/21
Attn: ***Phoenix Enviro Corp.***	Date Received: 06/02/21
4020 Shipyard Blvd.	Date Analyzed: 06/02/21
Wilmington, NC 28403	Date Reported: 06/02/21
	Date Revised:
	Project Name: 21-21-179-IAQ-M
	Project Address: 302 Grass Lane, Apt. 102
	Project City, State, ZIP: Wilmington, NC 28405
	SEEML Reference # : 210602035

TEST METHOD: DIRECT MICROSCOPY EXAMINATION SEEML SOP 7

Client Sample ID	060121-PG-204								
Location	Rear Right Bedroom								
Lab Sample ID	210602035-110								
Comments									
Hyphal Fragments									
Pollen									
Spore Trap Used	M5								
	raw ct.	spores/m^3	%						
Alternaria									
Ascospores									
Basidiospores									
Bipolaris/Drechslera									
Chaetomium									
Cladosporium	1	40	20						
Curvularia									
Epicoccum									
Cercospora									
Fusarium									
Memnoniella									
Nigrospora									
Penicillium/Aspergillus	4	160	80						
Polythrincium									
Rusts									
Smuts/Periconia/Myxomy									
Spegazzinia									
Stachybotrys									
Stemphylium									
Tetraploa									
Torula									
Ulocladium									
Colorless/Other Brown*									
Oidium									
Zygomycetes									
Pithomyces									
Background debris (1-5)**	2								
Sample Volume(liters)	25								
TOTAL SPORES/M^3	5	**200**							

Revisions:

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AIHA-LAP, LLC EMLAP #173667 Texas Lic: LAB1016
Form 18.0 Rev 09 07/30/20

Phoenix EnviroCorp
4020 SHIPYARD BLVD.
WILMINGTON, NC 28403

CHAIN OF CUSTODY

LABORATORY TEST REQUEST

CONTACT: Philip Green	TELEPHONE (910) 397-0370 FAX (910) 313-6094	6/1/2021
PEC Job #: 21-21-178,179,181-IAQ-M	SITE ADDRESS: 302 Grass Lane, Wilmington, NC 28405	

PLEASE EMAIL RESULTS TO: KMGREEN@PHOENIXENVIROCORP.COM

SAMPLE TYPE:	NUMBER OF SAMPLES:	TURN AROUND TIME SPECIFIED:
Spore Trap - Micro-5	2	_____ Immediate _____ 24 hr _____ 48 hr __X__ Standard
Surface Samples	0	

Sample #	Sample Area	Sample Volume	Lab Analysis Requested	% Relative Humidity	Temperature °F
060121-PG-301	Outside - Front	25L	S001	58.8	75.5
060121-PG-302	Outside - Rear	25L	S001		

Samples Collected By (Printed Name and Signature): [signature] Date Signed: 6/1/2021

CHAIN OF CUSTODY RECORD

DATE:	Time:	Condition of Samples:	RELINQUISHED BY: (Printed Name and Signature)	ACCEPTED BY: (Printed Name and Signature)
6/1/2021	14:30:00 PM	Intact	[signature] AFFILIATION:	AFFILIATION:

SEEML Reference Number: 210602034

Southeast Environmental Microbiology Laboratories
102 Edinburgh Court
Greenville, SC 29607
Phone: (864) 233-3770
FAX: (864) 233-6589

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- ☐ Surface/Bulk Report
- ☒ Spore Trap Report
- ☐ Andersen Fungal Report
- ☐ Quantitative Fungal Report

Lab Manager Review: *Angel Gosnell* Date: 06/02/21

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Spore Trap Report

	Date Sampled: 06/01/21
Attn: ***Phoenix Enviro Corp.***	Date Received: 06/02/21
4020 Shipyard Blvd.	Date Analyzed: 06/02/21
Wilmington, NC 28403	Date Reported: 06/02/21
	Date Revised:
	Project Name: 21-21-178,179,181-IAQ-M
	Project Address: 302 Grass Lane
	Project City, State, ZIP: Wilmington, NC 28405
	SEEML Reference # : 210602034

TEST METHOD: DIRECT MICROSCOPY EXAMINATION SEEML SOP 7

Client Sample ID	060121-PG-301			060121-PG-302					
Location	Outside-Front			Outside-Rear					
Lab Sample ID	21060234-105			21060234-106					
Comments									
Hyphal Fragments	1	40							
Pollen	2	80		1	40				
Spore Trap Used	M5			M5					
	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%			
Alternaria	18	720	5	3	120	2			
Ascospores	50	2000	13	64	2560	34			
Basidiospores	50	2000	13	57	2280	31			
Bipolaris/Drechslera	2	80	<1						
Chaetomium									
Cladosporium	253	10100	63	58	2320	31			
Curvularia	1	40	<1	1	40	<1			
Epicoccum	22	880	6	1	40	<1			
Cercospora									
Fusarium									
Memnoniella									
Nigrospora									
Penicillium/Aspergillus				2	80	1			
Polythrincium									
Rusts	3	120	<1						
Smuts/Periconia/Myxomy	2	80	<1						
Spegazzinia									
Stachybotrys									
Stemphylium									
Tetraploa									
Torula									
Ulocladium									
Colorless/Other Brown*									
Oidium									
Zygomycetes									
Pithomyces									
Background debris (1-5)**	3			3					
Sample Volume(liters)	25			25					
TOTAL SPORES/M^3	401	**16000**		186	**7440**				

Revisions:

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Fungal Descriptions

Alternaria sp.

Aw - 0.89. Conidia dimensions: 18-83 x 7-18 microns. A very common allergen with an IgE mediated response. It is often found in carpets, textiles and on horizontal surfaces in building interiors. Often found on window frames. Outdoors it may be isolated from samples of soil, seeds and plants. It is commonly found in outdoor samples. The large spore size, 20 - 200 microns in length and 7 - 18 microns in sizes, suggests that the spores from these fungi will be deposited in the nose, mouth and upper respiratory tract. It may be related to bakers' asthma. It has been associated with hypersensitivity pneumonitis. The species *Alternaria alternata* can produce tenuazonic acid and other toxic metabolites that may be associated with disease in humans or animals. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include edema and bronchospasms; chronic cases may develop pulmonary emphysema.

Ascospore

A spore borne in a special cell called an ascus. Spores of this type are reported to be allergenic. All ascomycetes, members of a group of fungi called Ascomycotina, have this type of spore. The minute black dots on rotting wood and leaves or the little cups on lichens are examples of ascomycetes; another is the "truffle" mushroom.

Aspergillus/Penicillium

These are two of the most commonly found allergenic fungi in problem buildings. *Aspergillus* comes in many varieties (species). Many of the varieties produce toxic substances. It may be associated with symptoms such as sinusitis, allergic bronchopulmonary aspergillosis, and other allergic symptoms. *Penicillium* is a variety of mold that is very common indoors and is found in increased numbers in problem buildings. It also has many varieties, some of which produce toxic substances. The symptoms are allergic reactions, mucous membrane irritation, headaches, vomiting, and diarrhea. Due to the morphological similarity of *Aspergillus* and *Penicillium*, they are not differentiated by microscopic analysis and are reported together.

Aspergillus sp.

Aw 0.75 - 0.82. Reported to be allergenic. Members of this genus are reported to cause ear infections. Many species produce mycotoxins that may be associated with disease in humans and other animals. Toxin production is dependent on the species or a strain within a species and on the food source for the fungus. Some of these toxins have been found to be carcinogenic in animal species. Several toxins are considered potential human carcinogens. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include edema and bronchospasms; chronic cases may develop pulmonary emphysema; may also be associated with sinusitis, allergic bronchopulmonary aspergillosis, and other allergic symptoms.

Basidiospore

Spore from basidiomycetes. Many varieties are reported to be allergenic.

Bipolaris sp.

A fungus with large spores that could be expected to be deposited in the upper respiratory tract. This fungus can produce the mycotoxin - sterigmatocystin, which has been shown to produce liver and kidney damage when ingested by laboratory animals.

Botrytis sp.

Aw 0.93. Conidia dimensions: 7-14 x 5-9 microns. It is parasitic on plants and soft fruits. Found in soil and on house plants and vegetables, it is also known as "gray mold". It causes leaf rot on grapes, strawberries, lettuce, etc. It is a well-known allergen, producing asthma type symptoms in greenhouse workers and "wine grower's lung".

Cercaspora

Common outdoors in agricultural areas, especially during harvest. Parasite of higher plants, causing leaf spot. Commonly found as parasites on higher plants.

Chaetomium sp.

large ascomycetous fungus producing perithecia. It is found on a variety of substrates containing cellulose, including paper and plant compost. It has been found on paper in sheetrock. It can produce an *Acremonium*-like state on fungal media. Varieties are considered allergenic and have been associated with peritonitis, cutaneous lesions, and system mycosis.

Cladosporium sp.

Aw 0.88; Aw 0.84. Most commonly identified outdoor fungus. The outdoor numbers are reduced in the winter. The numbers are often high in the summer. Often found indoors in numbers less than outdoor numbers. It is a common allergen. Indoor *Cladosporium* sp. may be different than the species identified outdoors. It is commonly found on the surface of fiberglass duct liners in the interior of supply ducts. A wide variety of plants are food sources for this fungus. It is found on dead plants, woody plants, food, straw, soil, paint, and textiles. Produces greater than 10 antigens. Antigens in commercial extracts are of variable quality and may degrade within weeks of preparation. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include skin lesions, eye ulceration, mycosis (including onychomycosis, an infection of the nails of the feet or hands) edema and bronchospasms; chronic cases may develop pulmonary emphysema.

Curvularia sp.

Reported to be allergenic and has been associated with allergic fungal sinusitis. It may cause corneal infections, mycetoma, and infections in immune compromised hosts.

Dreschlera sp.

Conidia dimensions: 40-120 x 17-28 microns. Found on grasses, grains and decaying food. It can occasionally cause a corneal infection of the eye.

Epicoccum sp.

Conidia dimensions: 15-25 microns. A common allergen. It is found in plants, soil, grains, textiles and paper products.

Fusarium sp.

Aw 0.90. A common soil fungus. It is found on a wide range of plants. It is often found in humidifiers. Several species in this genus can produce potent trichothecene toxins. The trichothecene (scirpene) toxin targets the following systems: circulatory, alimentary, skin, and nervous. Produces vomitoxin on grains during unusually damp growing conditions. Symptoms may occur either through ingestion of contaminated grains or possibly inhalation of spores. The genera can produce hemorrhagic syndrome in humans (alimentary toxic aleukia). This is characterized by nausea, vomiting, diarrhea, dermatitis, and extensive internal bleeding. Reported to be allergenic. Frequently involved in eye, skin, and nail infections.

Myxomycetes

Members of a group of fungi that is included in the category of "slime molds". They're occasionally found indoors, but mainly reside in forested regions on decaying logs, stumps, and dead leaves. Myxomycetes display characteristics of fungi *and* protozoans. In favorable (wet) conditions they exhibit motile, amoeba-like cells, usually bounded only by a plasma membrane, that are variable in size and form. During dry spells, they form a resting body (sclerotium) with dry, airborne spores. These fungi are not known to produce toxins but can cause hay fever and asthma.

Memnoniella

Contaminant found most often with *Stachybotrys* on wet cellulose. Forms in chains, but it are very similar to *Stachybotrys* and sometimes is considered to be in the *Stachybotrys* family. Certain species do produce toxins very similar to the ones produced by *Stachybotrys chartarum* and many consider the IAQ importance of *Memnoniella* to be on par with *Stachybotrys*. Allergenic and infectious properties are not well studied.

Nigrospora sp.

Commonly found in warm climates, this mold may be responsible for allergic reactions such as hay fever and asthma. It is found on decaying plant material and in the soil. It is not often found indoors.

Oidium sp.

The asexual phase of *Erysiphe* sp. It is a plant pathogen causing powdery mildews. It is very common on the leaf's stems, and flowers of plants. The health effects and allergenicity have not been studied. It does not grow on non-living surfaces such as wood or drywall.

Penicillium sp.

Aw 0.78 - 0.88. A wide number of organisms have been placed in this genus. Identification to species is difficult. Often found in aerosol samples. Commonly found in soil, food, cellulose and grains. It is also found in paint and compost piles. It may cause hypersensitivity pneumonitis, allergic alveolitis in susceptible individuals. It is reported to be allergenic (skin). It is commonly found in carpet, wallpaper, and in interior fiberglass duct insulation. Some species can produce mycotoxins. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include edema and bronchospasms; chronic cases may develop pulmonary emphysema. It may also cause headaches, vomiting, and diarrhea.

Periconia sp.

Periconia sp. are found in soil, blackened and dead herbaceous stems leaf spots, grasses, rushes, and sedges. Almost always associated with other fungi. Rarely found growing indoors. Reportedly associated with a rare case of mycotic keratitis.

Pithomyces sp.

A common mold found on dead leaves, plants, soil and especially grasses. Causes facial eczema in ruminants. It exhibits distinctive multi-celled brown conidia. It is not known to be a human allergen or pathogen. It is rarely found indoors, although it can grow on paper.

Rusts/Smuts

These fungi are associated with plant diseases. In the classification scheme of the fungi, the smuts have much in common with the rusts, and they are frequently discussed together. Both groups produce wind-borne, resistant teliospores that serve as the basis for their classification and their means of spread. Rusts usually attack vegetative regions (i.e., leaves and stems) of plants; smuts usually are associated with the reproductive structures (seeds). They can cause hay fever and asthma.

Spegazzinia

Spegazzinia species comprise a very small proportion of the fungal biota. This genus is somewhat related to other lobed or ornamented genera such as *Candelabrum*. No information is available regarding health effects or toxicity. Allergenicity has not been studied. Usually identified on spore trap samples where it is seen every few weeks. (Spores have very distinctive morphology.) May also be found in air by culturable (Andersen) samples if a long enough incubation period is provided so that sporulation occurs. Our laboratory has never found this organism growing on indoor environmental surfaces. Natural habitat includes soil and many kinds of trees and plants.

Stachybotrys sp.

Aw - 0.94, optimum Aw ->0.98. Several strains of this fungus (*S. atra, S. chartarum* and *S. alternans* are synonymous) may produce a trichothecene mycotoxin- Satratoxin H - which is poisonous by inhalation. The toxins are present on the fungal spores. This is a slow growing fungus on media. It does not compete well with other rapidly growing fungi. The dark colored fungus grows on building material with high cellulose content and low nitrogen content. Areas with a relative humidity above 55%, and are subject to temperature fluctuations, are ideal for toxin production. Individuals with chronic exposure to the toxin produced by this fungus reported cold and flu symptoms, sore throats, diarrhea, headaches, fatigue, dermatitis, intermittent local hair loss and generalized malaise. Other symptoms include coughs, rhinitis, nosebleed, a burning sensation in the nasal passages, throat, and lungs, and fever. The toxins produced by this fungus will suppress the immune system affecting the lymphoid tissue and the bone marrow. Animals injected with the toxin from this fungus exhibited the following symptoms: necrosis and hemorrhage within the brain, thymus, spleen, intestine, lung, heart, lymph node, liver, and kidney. Affects by absorption of the toxin in the human lung are known as pneumomycosis.

This organism is rarely found in outdoor samples. It is usually difficult to find in indoor air samples unless it is physically disturbed (or possibly -this is speculation- a drop in the relative humidity). The spores are in a gelatinous mass. Appropriate media for the growth of this organism will have high cellulose content and low nitrogen content. The spores will die readily after release. The dead spores are still allergenic and toxigenic. Percutaneous absorption has caused mild symptoms.

Stemphylium sp.

Reported to be allergenic. Isolated from dead plants and cellulose materials.

Torula sp.

Found outdoors in air, soil, on dead vegetation, wood, and grasses. Also found indoors on cellulose materials. Reported to be allergenic and may cause hay fever and asthma.

Tetraploa

Tetraploa species comprise a very small proportion of the fungal biota. This genus is somewhat related to *Triposporium* and Diplocladiella. The only reported human infections are two cases of keratitis (1970, 1980) and one case of subcutaneous infection of the knee (1990). No information is available regarding other health effects or toxicity. Allergenicity has not been studied. Usually identified on spore trap samples where it is seen every few weeks. (Spores have very distinctive morphology.) Our laboratory has never found this organism growing on indoor environmental surfaces. Natural habitat includes leaf bases and stems just above the soil on many kinds of plants and trees.

Ulocladium sp.

Aw 0.89. Isolated from dead plants and cellulose materials. Found on textiles.

Zygomycetes

Zygomycetes are one of the four major groups of fungi, the others being the Oomycetes, the Ascomycetes, and the Basidiomycetes. Zygomycetes are common, fast growing, and often overgrow and/or inhibit other fungi nearby. Rhizopus and Mucor are two of the most common Zygomycetes seen in the indoor environment. However, others are seen as well, including *Syncephalastrum*, *Circinella*, *Mortierella*, *Mycotypha*, *Cunninghamella*, and *Choanephora*. For further information, please see descriptions of these individual genera.

The following table lists mycotoxins that are produced by certain types of fungi:

Fungi	Mycotoxin
Acremonium crotocinigenum	Crotocin
Aspergillus favus	Alfatoxin B, cyclopiazonic acid
Aspergillus fumigatus	Fumagilin, gliotoxin
Aspergillus carneus	Critrinin
Aspergillus clavatus	Cytochalasin, patulin
Aspergillus Parasiticus	Alfatoxin B
Aspergillus nomius	Alfatoxin B
Aspergillus niger	Ochratoxin A, malformin, oxalicacid
Acremonium crotocinigenum	Crotocin
Aspergillus nidulans	Sterigmatocystin
Aspergillus ochraceus	Ochratoxin A, penicillic acid
Aspergillus versicolor	Sterigmatocystin, 5 ethoxysterigmatocystin
Aspergillus ustus	Ausdiol, austamide, austocystin,brevianamide
Aspergillus terreus	Citreoviridin
Alternaria	Alternariol, altertoxin, altenuene, altenusin, tenuazonic acid
Arthrinium	Nitropropionic acid
Bioploaris	Cytochalasin, sporidesmin, sterigmatocystin
Chaetomium	Chaetoglobosin A,B,C. Sterigmatocystin
Cladosporium	Cladosporic acid
Clavipes purpurea	Ergotism
Cylindrocorpon	Trichothecene
Diplodia	Diplodiatoxin
Fusarium	Trichothecene, zearalenone
Fusarium moniliforme	Fumonisins
Emericella nidulans	Sterigmatocystin
Gliocladium	Gliotoxin
Memnoniella	Griseofulvin , dechlorogriseofulvin, epi-decholorgriseofulvin, trichodermin, trichodermol
Myrothecium	Trichothecene
Paecilomyces	Patulin, viriditoxin
Penicillium aurantiocandidum	Penicillic acid
Penicillium aurantiogriseum	Penicillic acid
Penicillium brasilanum	Penicillic acid
Penicillium brevicompactum	Mycophenolic acid
Penicillium camemberti	Cyclopiazonic acid
Penicillium carneum	Mycophenolic acid, Roquefortine C
Penicillium crateriforme	Rubratoxin

Fungi	Mycotoxin
Penicillium citrinum	Citrinin
Penicillium commune	Cyclopiazonic acid
Penicillium crustosum	Roquefortine C
Penicillium chrysogenum	Roquefortine C
Penicillium discolor	Chaetoglobosin C
Penicillium expansum	Citrinin, Roquefortine C
Penicillium griseofulvum	Roquefortine C, cyclopiazonic acid, griseofulvin
Penicillium hirsutum	Roquefortine C
Penicillium hordei	Roquefortine C
Penicillium nordicum	Ochratoxin A
Penicillium paneum	Roquefortine C
Penicillium palitans	Cyclopiazonic acid
Penicillium polonicum	Penicillic acid
Penicillum roqueforti	Roquefortine C, Mycophenolic acid
Penicillium veridicatum	Penicillic acid
Penicillium verrucosum	Citrinin, ochratoxin A
Penicillium/ Aspergillus	Patulin
Penicillium/ Aspergillus/Alternaria	Glitoxin
Phomopsis	Macrocyclic trichothecenes
Phoma	Brefeldin, cytochalasin, secalonic acid, tenuazonic acid
Pithomyces	Sporidesmin
Rhizoctonia	Slaframine
Rhizopus	Rhizonin
Sclerotinia	Furanocoumarins
Stachybotrys chartarum	Iso-satratoxin F, roridin E, L-2, satratoxin G & H, trichodermin, trichodermol, trichothecene
Torula	Cytotoxins
Trichoderma	Trichodermin, trichodermol, gliotoxin
Trichothecium	Trichothecene
Wallemia	Walleminol
Zygosporium	Cytochalasin

General terms

Allergen

An allergen is a substance that elicits an IgE antibody response and is responsible for producing allergic reactions. Chemicals are released when IgE on certain cells contact an allergen. These chemicals can cause injury to surrounding tissue - the visible signs of an allergy. Only a few fungal allergens have been characterized but all fungi are thought to be potentially allergenic. Fungal allergens are proteins found in either the mycelium or spores

"Black mold"

A poorly defined term. Black mold or toxic black mold has usually been associated with the mold *Stachybotrys chartarum*. While there are only a few molds that are truly black, there are many that can appear black. Not all molds that appear to be black are *Stachybotrys*.

Fungi

Fungi are neither animals nor plants and are classified in a kingdom of their own. The Kingdom of Fungi. Fungi include a very large group of organisms, including molds, yeasts, mushrooms and puffballs. There are >100,000 accepted fungal species but current estimates range to 1.5 million species. Mycologists (people who study fungi) have grouped fungi into four large groups according to their method of reproduction.

Hidden mold

This refers to visible mold growth on building structures that is not easily seen, including the areas above drop ceilings, within a wall cavity (the space between the inner and outer structure of a wall), inside air handlers, or within the ducting of a heating/ventilation system.

Microbial Volatile Organic Compounds (MVOCs)

Fungi produce chemicals as a result of their metabolism. Some of these chemicals, MVOCs, are responsible for the characteristic moldy, musty, or earthy smell of fungi, whether mushrooms or molds. Some MVOCs are considered offensive or annoying. Specific MVOCs are thought to be characteristic of wood rot and mold growth on building materials. The human nose is very sensitive to mold odors and sometimes more so than current analytical instruments.

Mold

Molds are a group of organisms that belong to the Kingdom of Fungi (see Fungi). Even though the terms mold and fungi had been commonly referred to interchangeably, all molds are fungi, but not all fungi are molds.

Mycotoxin

Mycotoxins are compounds produced by some fungi that are toxic to humans or animals. By convention, the term? Mycotoxin. Excludes mushroom toxins. Fungi that produce mycotoxins are called "toxigenic fungi."

Spore

General term for a reproductive structure in fungi, bacteria and some plants. In fungi, the spore is the structure which may be used for dissemination and may be resistant to adverse environmental conditions.

Toxic mold

The term "toxic mold" has no scientific meaning since the mold itself is not toxic. The metabolic byproducts of some molds may be toxic (see mycotoxin).

Hypha (plural, hyphae)

An individual fungal thread or filament of connected cells; the thread that represents the individual parts of the fungal body.

Phoenix EnviroCorp

MOLD/BIOLOGICAL CONTAMINANT REMEDIATION PROTOCOL

Date: December 26, 2021

For: Quanesha Mullins
Wilmington Housing Authority
1524 S. 16th Street
Wilmington, NC 28401

Remediation Contractor: Not determined

On-Site Consultant: Phoenix EnviroCorp (PEC)
4020 Shipyard Boulevard
Wilmington, NC 28403
(910) 397-0370

Approved Signatory:

Philip Green
IH Technician

Tommie Green, CIEC
Professional Industrial Hygienist

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SECTION 1.0 REMEDIATION PROCEDURES

1.1 Project Set Up

- The owner or powers that be shall supply temporary power for remediation equipment. The existing electrical system may be utilized, with permission of the owner or powers that be. Determining specific electrical load/safety requirements, including, but not limited to, the use of a temporary GFCI electrical panel box shall be the responsibility of the abatement contractor.
- HVAC system shall be isolated.
- 6-mil polyethylene sheathing shall be erected to separate primary control areas (PCA) from remaining areas. Control areas shall be selected so that specified building materials (specified herein, in section 1.3, under primary control areas) may be removed or cleaned and dried.
- HEPA Air Filtration Devices shall be utilized for each separate control area. Critical barriers shall consist of 6-mil polyethylene so that primary control areas are isolated from remaining areas. HEPA filtration units shall be exhausted from the PCA to the outside of the building through windows/doors. Dehumidification units must be installed in the PCA to sufficiently dry components.
- A remote wash off station shall be set up to allow for employees to wash hands and faces after egress from the work area.
- Ingress/Egress to the control area(s) shall be, at minimum, sealed with a 2-way polyethylene air lock.
- Entrances to the building shall be marked as indicated in Section 7.4 of this document.

1.2 Local Exhaust System

- Once sealed, the primary control area shall be ventilated with a local HEPA air filtration device that shall ensure a minimum of four (4) air changes per hour. The air filtration device shall be placed within the containment work area.
- Local HEPA exhaust shall be utilized where cleaning of contents is required and/or in the immediate vicinity of remediation activities of building materials.
- In interior sections requiring surface area cleaning, local HEPA filtration may be exhausted within the area to scrub microbials from ambient air. This process shall only be conducted after fine cleaning has been completed.
- Negative pressure within the contained work area shall be maintained throughout the project until clearance is obtained.
- Negative air machines shall be exhausted to exterior portions of the building to adequately ensure that negative pressure is achieved.
- Dehumidification devices with HEPA filtration may be incorporated as filtration devices in conjunction with true HEPA filtration devices; they may not replace the true HEPA filtration devices.

Note: Formula for determination of adequate HEPA filtration:

Total feet per minute =Volume of work area (ft^3)/15 minutes
#AFD Units needed = (Total feet per minute)/Capacity of Unit (ft^3)

- At initiation of final cleaning stages, relative humidity shall be at 40% (+/-3%) and moisture content of wooden components shall be at or below 15% as determined by Delmhorst moisture meter or equivalent meter. Moisture mapping and direct read T/RH shall be recorded by the remediation contractor until the specified levels have been achieved. Control areas shall be dehumidified during cleaning and mold remediation activities to ensure removal of surface moisture created during application of water. Drying of structural components that have been treated with encapsulating anti-microbial agents will be necessary.

- Moisture levels shall be recorded and documented by the remediation contractor upon successful completion of dehumidification.

1.3 Remediation Specifications

- Prior to commencement of mold remediation activities by the remediation contractor, the source of any water intrusions, leaks, and/or moisture/humidity problems shall be remedied by the owner. If water intrusions, leaks, and/or moisture/humidity problems exist and are not corrected, mold growth can be expected to return.
- All remediation procedures listed that involve the removal of building materials shall employ polyethylene critical barriers, negative air pressure, and HEPA filtration (i.e., primary control areas).
- The remediation contractor shall ensure that the filters are properly capped prior to switching off the air scrubbers. If the filters are not properly capped, the backflow can cause mold spores to re-release back into the control area, essentially re-contaminating an area that has already been cleaned.
- All remediation activities shall be conducted in a manner that does not allow dissemination of mold spores. Remediation procedures shall begin from the side of the control area furthest away from air filtration devices.
- Cleaning procedures shall be repeated until the area is visibly free of dust and debris.
- Engineering controls set up during the remediation process shall remain in place until remediation has been completed and acceptable post remediation sampling results have been achieved.
- **Federal and/or state regulations require that suspect asbestos containing materials in public and commercial buildings shall be inspected for asbestos prior to renovations or demolition. Based on these regulations, PEC recommends that building materials that may be disturbed during mold remediation be tested for asbestos content prior to their disturbance to prevent asbestos contamination.**
- If cleaning procedures outlined in this remediation plan outweigh the cost of replacement for selected items, the remediation contractor shall give the owner the option to clean or dispose of those items.
- Reinstallation of building materials and/or components shall only be conducted once acceptable post remediation results are obtained.
- Any chemicals used on this project shall be EPA approved and used only as directed by the manufacturer. MSDS shall be available for review upon request.

HVAC System

- The HVAC system(s) that services or run through the primary control area/affected area shall be shut down prior to remediation activities.
- The spaces that are normally climate-controlled by the HVAC system that have been shut down shall be maintained under proper humidity levels (between 30 and 60% utilizing dehumidifiers, etc.) while the system is not in operation.
- All HVAC supply/return vents within the primary control area/affected area shall be isolated with a critical barrier (i.e., plastic, etc.) to prevent air flow. Prior to isolating the vents, the register covers (diffusers) shall be removed, and the supply shall be isolated at the metal boot. Once isolated, the registers and surrounding building materials shall be cleaned.
- The interior of the air handler, rigid duct system, intake box, etc. shall be thoroughly cleaned by an HVAC professional experienced in mold remediation. The interior shall be cleaned with mechanical methods that aggressively disturb all interior surfaces and filter the disturbed airborne particulates to avoid cross contamination, or other equivalent methods.
- Cleaning of components shall consist of a method that thoroughly removes visible mold growth, settled concentrations of mold spores, and/or dust and debris.

- PEC recommends the removal and disposal of any fibrous or porous materials (i.e., insulation, etc.) from the interior of the HVAC system, to include but not limited to the air handler and rigid ductwork system. PEC also recommends that an HVAC professional design the re-insulation of the HVAC system without the use of porous interior insulation when possible.
- PEC recommends the removal and disposal of the flex ducts when feasible, as well as any interior duct board where cleaning will damage the duct board. Once removed, the remediation contractor shall isolate the connection point where the flex duct and/or duct board was detached with a critical barrier (such as plastic, etc.) to prevent air flow.
- The remediation contractor shall be responsible for coordinating the cleaning of the HVAC system and other specified remediation to avoid cross contamination.
- Once the HVAC system components are cleaned or replaced anew, the system shall remain off and isolated until acceptable post remediation results are obtained.
- A written document shall be obtained from the remediation contractor verifying that the HVAC system has been cleaned by an HVAC cleaning company with mold experience. This document shall include the property address and date of services and shall be filed with other mold remediation documents.

Note: For directional purposes "front" is determined by facing the playground from inside the unit, unless otherwise noted.

Primary Control Areas/Affected Areas

Critical barriers, negative air pressure, and HEPA filtration shall be established to isolate the following areas as Primary Control Areas to perform the specified mold remediation.

Within the kitchen:
- Detach the kitchen floor-mounted cabinet with sink along the left wall and discard the water damaged components.
- Remove all drywall from the left wall associated with the sink (approximately 7-foot-by-4-foot).

Within the bathroom:
- Detach the floor-mounted cabinet with sink along the front wall and discard all water damaged components.
- Remove all baseboards.
- Assess the drywall uncovered by the removal of the specified cabinet and baseboards and remove any affected drywall (i.e., drywall with suspect visible mold growth/apparent water damage) and extend the drywall removal within a 2-foot radius of any affected area when possible.
- Remove any loose floor tiles.

Within the rear left bedroom closet:
- Remove the water heater to allow access to the floor and walls obstructed by the water heater.
- Remove all baseboards.
- Assess the drywall behind the water heater and baseboards specified for removal and remove any affected drywall (i.e., drywall with apparent water damage/suspect visible mold growth) and extend the drywall removal within a 2-foot radius of any affected drywall when possible.
- Remove any loose floor tiles.

Throughout the unit (Negative air pressure is not required in areas where building components are not specified for removal, but HEPA filtration is required):
- Clean all surfaces, furnishings and contents as specified herein under general specifications for primary control areas.

General Specifications for Primary Control Areas

- Open plumbing lines and drains within the control areas shall be isolated with a critical barrier consisting of 6-mil poly.
- The water line to toilets within the control areas shall be shut off and the toilets shall be isolated with a critical barrier consisting of 6-mil poly.
- Cleaning of components/materials shall consist of a method that thoroughly removes visible mold growth, settled concentrations of mold spores, and/or dust and debris (i.e., HEPA vacuuming, wet wiping, or other approved methods), followed by dehumidification/drying.
- The contractor shall use precaution when utilizing wet methods for cleaning of components and furnishings. If the contractor determines that wet methods will damage materials/components, those items shall be HEPA vacuumed only.
- Non-porous, semi-porous, and porous furnishings and contents shall be cleaned. If items cannot be cleaned efficiently, the abatement contractor shall consult with the owner/powers that be to determine if they shall be disposed.
- All machine washable porous cloth items shall be cleaned and dried in a household washer and dryer. Other specialty items shall be cleaned by a dry cleaner that specializes in cleaning materials affected with mold. These items shall be removed from affected area(s) and shall not be reintroduced back into the area(s) until acceptable post remediation testing is established. If porous articles cannot be cleaned efficiently, the abatement contractor shall consult with the owner/powers that be.
- Mattresses shall be cleaned utilizing HEPA vacuuming, NOT by pressure extraction or wet methods. If suspect visible mold growth is on the mattress or if the mattress cannot be cleaned efficiently, the abatement contractor shall consult with the owner/powers that be prior to disposal.
- Exterior surfaces of electrical appliances, electrical equipment, and light fixtures shall be cleaned, utilizing wet method and HEPA vacuuming. These items shall be disconnected from all electrical sources prior to cleaning. If these items cannot be cleaned efficiently, the abatement contractor shall consult with the owner/powers that be.
- All wall cavity insulation shall be disposed in areas that specify the removal of drywall/wallboard. The abatement contractor shall visually inspect the back side of surrounding drywall/wallboard for water damage and/or suspect mold growth and document any findings. If additional suspect mold growth or water damage is observed beyond the specified removal area, additional drywall/wallboard shall be removed until no suspect mold growth or water damage is observed.
- All penetrations within the controlled area that adjoin unaffected or non-accessible areas, including outdoor areas, crawlspaces, etc., shall be cleaned (as far as one can reach) and then sealed with 6-mil poly, extending six (6) inches on all sides.
- In areas of specified wallboard removal, all components within the wall cavities shall be cleaned. Any wooden structural components with mold stains or mold growth in pitted surfaces shall be HEPA sanded (or other approved methods) to eliminate embedded mold growth.
- All joints or sills (where the structural system meets, where the sill plate meets the floor, etc.) shall be aggressively disturbed to remove embedded mold growth and spores.
- Furnishings and contents that are specified for cleaning shall be protected with polyethylene in areas where building components are specified for removal, prior to the removal of building components to avoid cross contamination. The protective covering shall be removed, and the furnishings and contents shall be cleaned prior to post visual inspection and testing.
- The remediation contractor shall document any drywall/wallboard that requires removal, in addition to the specified amount, prior to removal (i.e., drywall that is specified to be assessed by the remediation contractor, etc.). Documentation shall include photos and specific location at a minimum.

1.4 Removal Procedures

The contractor shall maintain surfaces of the control area free of accumulation of dust and debris. Additionally, they shall restrict the spread of dust and debris, keeping waste from being distributed over the work area. Materials shall be removed in a fashion to ensure that previously cleaned areas are not re-contaminated (i.e., working from one end of the control area to the other). The contractor may be required to re-clean areas based on a visual inspection by the CIEC/CIE/IH, if the areas are not visibly clean.

Contaminated building materials that have been removed, and additional materials and debris generated during remediation, shall be placed in an enclosed container prior to transporting the material through the building and to the waste container, and prior to visual inspection by the CIEC/CIE/IH.

Areas shall be allowed to dry for a period until RH and moisture levels specified below have been achieved. Any remaining building products that are directly impacted by remediation shall be tested for moisture content. Wooden and cellulosic building components (e.g., wall studs, drywall, etc.) shall be tested for moisture content. If the moisture content is > 15% in wood products or > 12% in cellulosic products (utilizing a Delmhorst moisture meter or equivalent), dehumidification shall be required until moisture levels are at or below said levels, and the RH level is at or below 40% +/-3% (for all interior areas). The remediation contractor shall verify moisture content of all wooden and cellulosic building components within the impacted areas, as well as RH levels prior to scheduling post remediation verification.

1.5 Cleanup Overview

The contractor shall personally review the cleaning process prior to contacting the CIEC/CIE/IH for the post remediation testing. If accumulations of debris and dust are significant, the CIEC/CIE/IH will require re-cleaning prior to post remediation verification sampling.

The CIEC/CIE/IH shall make a visual inspection and conduct post remediation sampling after the final cleaning is complete.

1.6 Post Remediation Verification Testing

Prior to conducting post remediation sampling, HEPA filtration devices shall be allowed to operate for a minimum of 48 hours (the equivalent of 192 air changes), following fine cleaning, in all areas where remediation has been conducted. The HEPA filtration devices shall be sealed at the intake and turned off approximately two hours prior to post testing and reconvene within one hour after post testing, until acceptable post remediation results are established.

Post remediation sampling shall be conducted utilizing viable and/or non-viable sample methods. Air samples shall be collected in representative areas of the control areas. Surface sampling may be conducted at the discretion of the CIEC/CIE/IH.

Sampling shall be conducted in areas directly impacted by remediation procedures, where cleaning was conducted. The CIEC/CIE/IH shall determine acceptable post remediation status through interpretation of air sampling results, which will be based on indoor/outdoor comparisons, in combination with any surface samples collected, moisture readings, RH readings, visual observations, and any other pertinent information.

The owner/client will be responsible for post remediation testing. If air sample results indicate unacceptable airborne concentrations, the contractor shall be required to conduct a re-cleaning at the contractor’s expense and absorb the cost for re-testing, until acceptable results are achieved.

Criteria for post remediation air sampling can be viewed in PEC's investigative report(s) listed in Section 2.1 below. This information can be found within the air sampling section of said report(s).

SECTION 2.0 SCOPE OF WORK (Note: Section 2.1 and Section 1.3 are essential to the full Scope of the Contractor's Work)

2.1 Investigative Reports and Other Related Documents

Phoenix EnviroCorp initial investigative report dated June 8, 2021.

Phoenix EnviroCorp investigative report dated August 30, 2021, and December 26, 2021.

Phoenix EnviroCorp Chain of Custody dated June 1, 2021, August 18, 2021, and December 14, 2021.

Analytical reports dated June 2, 2021, August 20, 2021, and December 16, 2021.

2.2 Project Description

The procedures covered by this program/protocol include the enclosure and drying of the said structure, the removal, handling, and disposal of building components compromised by mold/fungal growth, and the cleaning and disinfecting of existing building materials. Procedures for reconstruction are not considered in these specifications. Reconstruction of interior portions may not be conducted until procedures for remediation have been completed, the control areas have been inspected, and testing has returned acceptable post remediation results. Reconstruction of exterior portions may be conducted during the restoration to ensure that water intrusion is abated.

The objectives covered by this program/protocol include the remediation of materials shown to have surface contamination, water damage, and/or exposure to elevated airborne mold spore levels, without subjecting the workers, installation employees, and occupants to microbial contaminants. In addition, contract employees, occupants, and materials shall be appropriately protected during the removal process to avoid exposure.

This program/protocol is provided as a guideline. Any deviation requests from this protocol shall be addressed to the CIEC/CIE/IH for consideration. At present there are no Federal or State requirements regarding microbial remediation projects; however, OSHA General Construction Code of Federal Regulations (29 CFR 1926) shall be followed.

Remediation shall be completed as close as possible to the date that this protocol was drafted, as the specifications outlined within represent conditions at the time the investigative services were conducted. Due to the volatility of mold, the current protocol may not reflect all necessary remediation if conditions are allowed to continue. Further, if time lapses allowing conditions to change, it may become increasingly difficult to obtain successful clearance testing results.

SECTION 3.0 AIR MONITORING

3.1 Responsibilities of the CIEC/CIE/IH

Monitoring of airborne concentrations will be performed in accordance with the requirements of this program. Prior to conducting air sampling and/or surface sampling for clearances, the CIEC/CIE/IH shall conduct a visual inspection of the area. Temperature and RH shall be recorded during the air sampling phase of

clearance. All air sampling shall be conducted in such a manner as to provide a valid representation of airborne mold levels both inside and outside the work areas. If analysis of air samples indicates that airborne concentrations exceed acceptable limits, the contractor shall conduct re-cleaning at the contractor's expense.

3.2 Personal Monitoring

No personal monitoring will be conducted by the CIEC/CIE/IH unless the remediation contractor requests monitoring for OSHA compliance. Presently there are no PELs or TLVs for microbial contaminants. It is the remediation contractor's responsibility to determine if OSHA personal sampling may be required during application of anti-microbial agents.

3.3 Sample Integrity and Reporting

Samples shall be sealed, labeled, and a chain of custody initiated according to laboratory procedures.

Post remediation sample results shall be available within seven (7) business days of the completion of collection and will include the following information:

- Site Address
- Sample Number
- Location Sampled
- Collection Date(s)
- Person Taking Sample(s)
- Additional Comments (if any)
- Analyst Signature

SECTION 4.0 MATERIAL REPLACEMENT

4.1 Material Replacement

The general contractor/replacement contractor may begin material replacement after the CIEC/CIE/IH informs all parties of acceptable post remediation sample results.

With ongoing construction activities ambient air levels are expected to be elevated over what might be normally expected. Additional testing should not be necessary after remediation procedures have been completed and successful results have been obtained. In the event of another water intrusion (i.e., broken-pipeline, improper HVAC function, or building envelope compromise), an investigation shall be conducted within 24 to 48 hours of the event. Proper drying, if initiated within this time frame, should minimize the potential for microbial growth.

SECTION 5.0 SPILL CLEANUP REQUIREMENTS

5.1 Spills

MSDS shall be kept on site for all chemical products brought to the site by the remediation contractor. In the event of a chemical spill, the contractor shall initiate cleanup immediately. The contractor shall mop up any liquid with rags or other conventional absorbent. The spent absorbent shall be properly contained and disposed of as waste.

SECTION 6.0 WASTE CONTROL

6.1 Waste Disposal

Waste shall be disposed of at a locally selected landfill. Waste shall be transported to the landfill in such a way to ensure that it does not pose a potential hazard to the environment.

SECTION 7.0 SUPPLEMENTAL INFORMATION

7.1 Applicable Publications

The publications listed below form part of this program. This protocol shall be reviewed by the remediation contractor prior to initiation of set-up for the project. Any questions regarding this protocol shall be addressed with the generator or appropriate Phoenix EnviroCorp personnel.

Code of Federal Regulation (CFR Publications)

29 CFR 1910.134	Respiratory Protection
29 CFR 1910.145	Specifications for Accident Prevention, Signs and Tags
29 CFR 1926.28	Personal Protective Equipment
29 CFR 1926.59	Hazard Communication
29 CFR 1926.96	Occupational Foot Protection
29 CFR 1926.100	Head Protection
29 CFR 1926.101	Hearing Protection
29 CFR 1926.102	Eye and Face Protection
29 CFR 1926.403	Electrical General Requirements
29 CFR 1926.416	Safety General Requirements
29 CFR 1926.852	Demolition, Chutes
29 CFR 1926.1091	Record Keeping Requirements

Supplemental Guidelines

IICRC S520 2nd ed.	Standard and Reference Guide for Professional Water Damage Restoration
NYCDOH	Guidelines on Assessment and Remediation of Fungi in Indoor Environments
ACGIH	Bioaerosols: Assessment and Control
IAQA 01-2000	Recommended Guidelines for Indoor Environments
ASHRAE 62.2-2007	Ventilation for Acceptable Indoor Air Quality in Low-Rise Residential Buildings

7.2 Definitions

Air Lock: A system that permits ingress and egress between a control area and non-control area, or other work areas, without allowing air movement between areas (e.g., three stage decon, three-way polyethylene flaps).

Air Sample: Refers to samples collected with spore trap air sample media (e.g., Micro-5, Cyclex D, or equivalent); also referred to as a non-viable air sample. May also refer to a sample collected on a disposable petri dish with Agar media by means of an Andersen Impactor (or equivalent) and sampling pump; also referred to as air culture (viable) sample. Sample media to be used in project is described under Section 1.6 (Post Remediation Verification Testing).

Area Monitoring: The sampling of airborne microbial concentrations outside the exclusion boundary, which may reach the breathing zone of the contractor or installation employees.

Asbestos Containing Materials (ACM): Refers to asbestos containing building materials that contain more than 1% asbestos by Polarized Light Microscopy (PLM) or Transmission Electron Microscopy (TEM).

Biocide: Refers to chemical agents that are specifically designed to eliminate viable microbial contamination, with a phenol equivalent efficiency (e.g., Sodium Hypochlorite, Quaternary Ammonia Compounds).

Blower Door Test: Refers to the testing of static pressure and draw of air through the HVAC in cubic feet per minute (CFM) to rate the efficiency of the system.

Clearance Monitoring: Refers to air, bulk, or swab sampling conducted as a means to demonstrate that the area specified for remediation has been completed by the contractor, left with present acceptable mold spore levels, and ready for re-construction.

Control Area: The area where microbial contaminants removal is performed, which is isolated by physical boundaries to prevent unauthorized entry of personnel, thereby preventing exposure to or the spread of microbial contaminants. Physical boundaries will be established and located such that the airborne contaminants are not allowed to escape the boundaries.

HEPA: High Efficiency Particulate Air. Refers to ventilation devices that are specifically designed to filter ambient air to an efficiency of 99.97%.

HVAC: Refers to the Heating, Ventilation, and Air Conditioning system.

Industrial Hygienist: Refers to a person who practices industrial hygiene and may act as a competent person regarding visual inspection of contaminated surfaces and clearance air and/or swab/bulk sampling. May also refer to a Certified Industrial Hygienist (CIH) as defined by the American Board of Industrial Hygiene (ABIH), a Certified Indoor Environmental Consultant as defined by the American Council for Accredited Certification (ACAC), or a Certified Indoor Environmentalist (CIE) as defined by the American Council for Accredited Certification (ACAC).

Microbial Contaminant: Refers to viable mold, fungi, pollen, bacteria, and or particulate, or their metabolites, which may be causative of epidemiological, immunotoxic, dermotoxic, neurotoxic, or enterotoxic disorders in the human population, or may be considered a pathogen or an opportunistic pathogen.

Non-Porous Materials: Refers to building materials with solid surfaces that may be successfully treated and cleaned by means of HEPA vacuuming or other approved method. Materials include flooring, hard goods, plastic, vinyl, and some wallboard systems.

Porous Materials: Refers to building materials and household goods that may allow microscopic particles (3-20 micron) to become trapped within the material that will not allow adequate cleaning. Materials include carpet, mattresses, and clothing.

Primary Control Area (PCA): Refers to a section of a facility that has been isolated by 6-mil polyethylene barriers where specific engineering controls (e.g., HEPA filtration, negative air pressurization, dehumidification, etc.) are required. In general, it is the area where remediation of water and mold damaged building materials is to be conducted.

Refrigerant Dehumidifier: Device used to remove water content from air and materials.

Relative Humidity (RH): Refers to the ratio of water vapor in the atmosphere to the amount required to saturate it at a given temperature.

Semi-Porous Materials: Refers to materials that may be somewhat porous, yet they may still allow for adequate cleaning. Materials include wooden beams and some wallboard systems.

Swab Sample: Refers to collection of a sample onto a sterile swab for analysis of mold, fungi, and bacteria by viable and/or non-viable analysis.

Tape-Lift Sample: Refers to collection of a sample onto clear scotch tape for analysis by direct microscopic examination (non-viable).

7.3 Quality Assurance

Medical Examinations

Before potential exposure to microbial contaminants, the remediation contractor shall provide workers with a comprehensive medical examination as required by 29 CFR 1910.134 as outlined by the Medical Monitoring Program.

Medical Records

The remediation contractor shall maintain complete and accurate medical records on employees as required by OSHA and the contractor's Medical Monitoring Program. The contractor may be asked to provide a copy of all medical records for approval by the consultant's representative.

Training

Each employee working on this contract shall be trained prior to the time of initial job assignment in accordance with mold specific and chemical specific training as indicated by the OSHA General Duty Clause and the Hazard Communication Standard. Each employee shall also receive training required by Federal guidelines listed in Section 7.1 of this document and project specifications.

Hazard Communication Program

The remediation contractor has established and implemented a Hazard Communication Program as required by 29 CFR 1910.1200 and may be asked to provide a copy of this written program. Hazard Communication training must include occupational hazards as directly related to working with fungi/mold and contamination of building components by fungal contamination, specific training for chemical hazards associated with biocide usage, and site specific MSDS sheets for commercial detergents and biocides utilized on the job site.

Respiratory Protection Program

The remediation contractor has established a Respiratory Protection Program, which complies with 29 CFR 1910.134. Physical examinations and fit testing are required for use of respiratory protection greater than an N-95 dust mask. Workers removing building materials contaminated by mold growth, applying anti-microbial agents, or workers subjected to exposures to anti-microbial agents shall be required to wear, at minimum, a tight-fitting negative pressure ½ mask respirator with P-100 filters. Therefore, -he OSHA Respiratory

Protection Standard applies.

Analytical Testing Laboratory

Analysis of culturable biological samples collected on this project shall be conducted by a laboratory that participates in the Environmental Microbiological Proficiency Analytical Testing Program (EMPAT) of the American Industrial Hygiene Association (AIHA) and has shown to be proficient by proficiency analytical testing (PAT) samples. Analysis of non-viable air and surface samples shall be conducted by a competent person.

7.4 Materials and Equipment

Equipment

The contractor shall make available to employees a complete set of personal protective equipment (PPE) as required by this program for entry into the controlled area. All personnel while in the control area or handling microbial contaminated waste shall wear protective clothing, respirators, and other PPE.

Respirators

The contractor shall furnish the appropriate respirator in accordance with 29 CFR 1910.134. At a minimum, an N-95 dust mask shall be utilized.

Special Clothing

Employees shall be provided with and required to wear: whole body disposable protective clothing, full body tyvek suits with head coverings, and latex gloves *(see table)* during all activities in the controlled area.

Chemical	Recommended Rubber Glove
Sodium Hypochlorite	Neoprene or Nitrile
Phenolic Compounds	Neoprene
Quaternary Ammonia Compounds	Polyvinyl Chloride (PVC)
Detergents	Latex

Eye Protection

The contractor shall provide chemical-resistant goggles to personnel engaged in cleaning and treatment activities and require them to be worn during application of anti-microbial agents and biocides.

Warning Signs and Labels

Standard approved warning signs shall be erected at all approaches to the control area as specified in 29 CFR 1910.145.

Anti-Microbial Agents

Anti-microbial agents utilized in interior quarters shall consist of quaternary ammonia compounds. No phenolic compounds shall be used in interior quarters with exception of Micro Ban Plus. Approval must be granted by the owner/powers that be prior to application. Anti-microbial agents shall be EPA approved. Commercial grade detergents shall be used to remove fungal contamination during cleaning phases prior to anti-microbial application, to include encapsulation.

Phoenix EnviroCorp

July 23, 2021

Quanesha Mullins
Wilmington Housing Authority
1524 S. 16th Street
Wilmington, NC 28401

RE: PEC Job # 21-21-238-IAQ-M; 302 Grass Lane, Apartment 103, Wilmington, NC – Mold Investigation/Background air sampling

Enclosed are the results of the mold investigation conducted at the above referenced unit on July 14, 2021. Phoenix EnviroCorp (PEC) was retained to conduct background air sampling and to collect surface samples of suspect visible mold growth.

Background Information: The HVAC system was operating in the cool mode, set at 69º F upon PEC's arrival and during sampling.

Note: For directional purposes, "front" is determined by facing the parking lot and the playground from inside the unit, unless otherwise stated.

Visual Inspection: PEC's visual inspection noted the following (see enclosed photographic documentation):

- Suspect visible mold growth on and around the HVAC supply vent in the bathroom
- Paint peeling from the ceiling in the bathroom
- Suspect visible mold growth/dust on the HVAC supply vent in the rear right bedroom

Mold Testing – Surface: Non-viable surface samples were collected from areas of suspect visible mold growth. The quantifications of fungal growth are reported as scattered spores, 21-100 fungal spores = very light (VL), 101-1,000 fungal spores = light (L), 1,001-10,000 fungal spores = moderate (M), > 10,000 fungal spores = heavy (H). The 'General Impressions' of fungal growth are reported as no fungal growth (NFG), fungal growth (FG), minimal fungal growth or growth in vicinity (MFG), and no fungal spores detected (ND). *Clear tape was utilized for the collection of surface samples. Each sample was assigned a unique ID number and shipped to a third-party laboratory for analysis.* Sampling locations and results are as follows:

Location	Result
HVAC supply vent in the bathroom	**NFG - ND**
HVAC supply vent in the rear right bedroom	**Scattered Spores** *Penicillium/Aspergillus*

Mold Testing – Air: Non-viable spore trap air samples were collected to determine airborne mold spore levels. Samples were collected within the kitchen, the bathroom, the rear right bedroom, and the rear left bedroom. *Micro 5 sampling media was utilized for the collection of spore trap air samples. Each sample ran for five (5) minutes at a flow rate of five (5) liters per minute for a total volume of twenty-five (25) liters per sample. Each sample was assigned a unique ID number and shipped to a third-party laboratory for analysis. All air samples were collected from centralized locations (within*

their respective areas) and within the breathing zone, unless otherwise noted. Two samples were also collected outdoors for comparative purposes.

Results indicated acceptable levels of airborne mold spores in all sampled locations.

The interpretation of air sample results is based on indoor/outdoor comparisons, in combination with a study by Daniel M. Baxter, entitled "A Regional Comparison of Mold Spore Concentrations Outdoors and Inside "Clean" and "Mold Contaminated" Southern California Buildings", and other industry guidelines, as well as over 20 years of experience in industrial hygiene and mold testing.

In layman terms, acceptable levels indicate that the levels are below the outdoor level and/or the baseline levels (whichever is higher) stated below. Elevated levels indicate that the levels are above the outdoor level and/or the baseline level.

Baseline levels for indoor spore trap air samples are as follows: < 900 spores/m³ for Penicillium/ Aspergillus; 0 spores/m³ for Stachybotrys and Chaetomium; and < 350 spores/m³ for other individual mold groups.

Relative Humidity (RH): *Temperature and relative humidity readings were collected in the same locations as the spore trap air samples.* RH levels within the unit ranged from 50.6% - 65.4% with an outdoor RH level of 64.8% (see the enclosed Chain of Custody for details). Per the American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) Standard 62-1999, relative humidity should range between 30% and 60%. **Consistent RH levels above 60% is conducive to mold growth.**

Conclusions: Air sampling within the tested areas did not indicate a problem with the indoor air quality regarding mold, and there was no surface mold growth identified.

Based on this investigation, it is PEC's opinion that the peeling paint in the bathroom is due to high humidity. PEC recommends having the HVAC system assessed by a competent HVAC professional for proper installation and functioning, paying special attention to high humidity issues.

Enclosed in this report are the laboratory analysis and the Chain of Custody.

Should you have any questions, please do not hesitate to call.

Thank you,

Philip Green
IH Technician

Tommie Green, CIEC
Professional Industrial Hygienist

Enclosures

Photo 1

Suspect visible mold growth/dust on and around the HVAC supply vent in the bathroom

Photo 2

Paint peeling from the ceiling in the bathroom

Photo 3

Suspect visible mold growth/dust on the HVAC supply vent in the rear right bedroom

Samples accepted

Phoenix EnviroCorp
4020 SHIPYARD BLVD.
WILMINGTON, NC 28403

CHAIN OF CUSTODY

LABORATORY TEST REQUEST

Seem Ref # 21071602o

lab ID: 057-064

CONTACT: Philip Green	TELEPHONE (910) 397-0370 FAX (910) 313-6094	7/14/2021
PEC Job #: 21-21-237-IAQ-M	SITE ADDRESS: 302 Grass Lane, Apt. 103, Wilmington, NC 28405	

PLEASE EMAIL RESULTS TO: KMGREEN@PHOENIXENVIROCORP.COM

SAMPLE TYPE:	NUMBER OF SAMPLES:	TURN AROUND TIME SPECIFIED:
Spore Trap - Micro-5	6	_____ Immediate _____ 24 hr _____ 48 hr __X__ Standard
Surface Samples	2	

Sample #	Sample Area	Sample Volume	Lab Analysis Requested	% Relative Humidity	Temperature °F
071421-PG-01	Kitchen/Living Room	25L	S001	50.6	75.6
071421-PG-02	Bathroom	25L	S001	54.0	75.8
071421-PG-03	Rear Right Bedroom	25L	S001	65.4	73.7
071421-PG-04	Rear Left Bedroom	25L	S001	53.9	70.4
071421-PG-05	Outside - Front	25L	S001	64.8	87.1
071421-PG-06	Outside - Rear	25L	S001		
071421-PG-101	Black SVMG/Dust on HVAC supply vent in the bathroom	1 cm sq	S001T		
071421-PG-102	Black SVMG/Dust on HVAC supply vent in rear right bedroom	1 cm sq	S001T		

Samples Collected By (Printed Name and Signature): [signature] Date Signed: 7/14/2021

CHAIN OF CUSTODY RECORD

DATE:	Time:	Condition of Samples:	RELINQUISHED BY: (Printed Name and Signature)	ACCEPTED BY: (Printed Name and Signature)
7/14/2021	17:00 PM	Intact	[signature] AFFILIATION:	JH 7624 AFFILIATION:

SEEML Reference Number: 210716020

Southeast Environmental Microbiology Laboratories
102 Edinburgh Court
Greenville, SC 29607
Phone: (864) 233-3770
FAX: (864) 233-6589

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

- ☒ Surface/Bulk Report
- ☒ Spore Trap Report
- ☐ Andersen Fungal Report
- ☐ Quantitative Fungal Report

Lab Manager Review: *Angel Gosnell* Date: 07/16/21

Thank you for using SEEML laboratories. We strive to provide superior quality and service.
SEEML laboratories are accredited through AIHA-LAP, LLC (EMLAP # 173667) for the analysis of Spore Traps and Surface/Bulk Samples.

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

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

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

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

Spore Trap Report

	Date Sampled: 07/14/21
Attn: ***Phoenix Enviro Corp.***	Date Received: 07/16/21
4020 Shipyard Blvd.	Date Analyzed: 07/16/21
Wilmington, NC 28403	Date Reported: 07/16/21
	Date Revised:
	Project Name: 21-21-237-IAQ-M
	Project Address: 302 Grass Lane, Apt 103
	Project City, State, ZIP: Wilmington, NC 28405
	SEEML Reference # : 210716020

TEST METHOD: DIRECT MICROSCOPY EXAMINATION SEEML SOP 7

Client Sample ID	071421-PG-01			071421-PG-02			071421-PG-03		
Location	Kitchen/Living Room			Bathroom			Rear Right Bedroom		
Lab Sample ID	210716020-057			210716020-058			210716020-059		
Comments									
Hyphal Fragments									
Pollen	1	40							
Spore Trap Used	M5			M5			M5		
	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%
Alternaria									
Ascospores				2	80	4	2	80	3
Basidiospores	27	1080	51	36	1440	71	45	1800	74
Bipolaris/Drechslera									
Chaetomium									
Cladosporium	6	240	11	1	40	2	2	80	3
Curvularia	1	40	2				1	40	2
Epicoccum							1	40	2
Cercospora									
Fusarium									
Memnoniella									
Nigrospora									
Penicillium/Aspergillus	19	760	36	12	480	24	10	400	16
Polythrincium									
Rusts									
Smuts/Periconia/Myxomy									
Spegazzinia									
Stachybotrys									
Stemphylium									
Tetraploa									
Torula									
Ulocladium									
Colorless/Other Brown*									
Oidium									
Zygomycetes									
Pithomyces									
Background debris (1-5)**	3			3			3		
Sample Volume(liters)	25			25			25		
TOTAL SPORES/M^3	53	**2120**		51	**2040**		61	**2440**	

Revisions:

Spore types listed without a count or data entry were not detected during the course of the analysis for the respective sample, indicating a raw count of <1 spore.

The analytical sensitivity is the spores/m^3 divided by the raw count, expressed in spores/m^3. The limit of detection is the analytical sensitivity (in spores/m^3) multiplied by the sample volume (in liters) divided by 1000 liters.

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

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

Disclaimer: The sample results are determined by the sample volume, which is provided by the customer.
This report relates only to the samples tested as they were received.

102 Edinburgh Court
Greenville, SC. 29607
Phone: (864) 233-3770

Angel Gosnell

Angel Gosnell, Approved Laboratory Signatory

Spore Trap Report

	Date Sampled: 07/14/21
Attn: ***Phoenix Enviro Corp.***	Date Received: 07/16/21
4020 Shipyard Blvd.	Date Analyzed: 07/16/21
Wilmington, NC 28403	Date Reported: 07/16/21
	Date Revised:
	Project Name: 21-21-237-IAQ-M
	Project Address: 302 Grass Lane, Apt 103
	Project City, State, ZIP: Wilmington, NC 28405
	SEEML Reference # : 210716020

TEST METHOD: DIRECT MICROSCOPY EXAMINATION SEEML SOP 7

Client Sample ID	071421-PG-04			071421-PG-05			071421-PG-06		
Location	Rear Left Bedroom			Outside - Front			Outside - Rear		
Lab Sample ID	210716020-060			210716020-061			210716020-062		
Comments									
Hyphal Fragments									
Pollen									
Spore Trap Used	M5			M5			M5		
	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%
Alternaria									
Ascospores				13	520	39	10	400	8
Basidiospores	8	320	42	14	560	42	82	3280	67
Bipolaris/Drechslera									
Chaetomium									
Cladosporium	1	40	5	3	120	9	1	40	<1
Curvularia				1	40	3	13	520	11
Epicoccum									
Cercospora				1	40	3			
Fusarium									
Memnoniella									
Nigrospora									
Penicillium/Aspergillus	9	360	47				12	480	10
Polythrincium									
Rusts				1	40	3			
Smuts/Periconia/Myxomy							5	200	4
Spegazzinia									
Stachybotrys									
Stemphylium									
Tetraploa									
Torula									
Ulocladium									
Colorless/Other Brown*									
Oidium									
Zygomycetes	1	40	5						
Pithomyces									
Background debris (1-5)**	3			3			3		
Sample Volume(liters)	25			25			25		
TOTAL SPORES/M^3	19	**760**		33	**1320**		123	**4920**	

Revisions:

Spore types listed without a count or data entry were not detected during the course of the analysis for the respective sample, indicating a raw count of <1 spore.

The analytical sensitivity is the spores/m^3 divided by the raw count, expressed in spores/m^3. The limit of detection is the analytical sensitivity (in spores/m^3) multiplied by the sample volume (in liters) divided by 1000 liters.

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

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

Disclaimer: The sample results are determined by the sample volume, which is provided by the customer.
This report relates only to the samples tested as they were received.

102 Edinburgh Court
Greenville, SC. 29607
Phone: (864) 233-3770

Angel Gosnell

Angel Gosnell, Approved Laboratory Signatory

Surface and Bulk Sample Report

	Date Sampled: 07/14/21
Attn: ***Phoenix Enviro Corp.***	Date Received: 07/16/21
4020 Shipyard Blvd.	Date Analyzed: 07/16/21
Wilmington, NC 28403	Date Reported: 07/16/21
	Date Revised:
	Project Name: 21-21-237-IAQ-M
	Project Address: 302 Grass Lane, Apt 103
	Project City, State ZIP: Wilmington, NC 28405
	SEEML Reference #: 210716020

TEST METHOD: Direct Microscopic Examination (SEEML SOP 18)

Client Sample ID	071421-PG-101	071421-PG-102		
Location	Black SVMG/Dust On HVAC Supply Vent In The Bathroom	Black SVMG/Dust On HVAC Supply Vent In Rear Right Bedroom		
SEEML Sample ID	210716020-063	210716020-064		
Sample Type	Tape	Tape		
	Quantification*	Quantification*		
Hyphal Fragments				
Pollen	**Scattered**	**Scattered**		
General Impressions **	**NFG**	**NFG**		
Fungal Spore:	**ND**			
Alternaria				
Acremonium				
Ascospores				
Basidiospores				
Bipolaris/Drechslera				
Cercospora				
Chaetomium				
Cladosporium				
Curvularia				
Epicoccum				
Fusarium				
Geotrichum sp.				
Memnoniella				
Myxomycetes				
Nigrospora				
Penicillium/Aspergillus		**Scattered Spores**		
Pithomyces				
Rusts/Smuts				
Stemphylium				
Tetraploa				
Ulocladium				

**** General Impressions: NFG = No Fungal Growth, FG = Fungal Growth, MFG = Minimal Fungal Growth Or Growth in vicinity**

Quantification of fungal growth is done by semi-quantitative grading using the following ranges:

Scattered Spores, 1-20 fungal spores

VL = 21-100 fungal spores **L = 101-1,000 fungal spores** **M = 1,001-10,000 fungal spores** **H = >10,000 fungal spores**

ND = No Fungal Spores Detected

Disclaimer: This report relates only to the samples tested

Respectfully submitted, SEEML

Angel Gosnell, **Approved Laboratory Signatory**

102 Edinburgh Court
Greenville, SC 29607
Phone: (864) 233- 3770
Fax: (864) 233- 6589

AIHA-LAP, LLC EMLAP # 173667

Texas License: LAB1016

Fungal Descriptions

Alternaria sp.

Aw - 0.89. Conidia dimensions: 18-83 x 7-18 microns. A very common allergen with an IgE mediated response. It is often found in carpets, textiles and on horizontal surfaces in building interiors. Often found on window frames. Outdoors it may be isolated from samples of soil, seeds and plants. It is commonly found in outdoor samples. The large spore size, 20 - 200 microns in length and 7 - 18 microns in sizes, suggests that the spores from these fungi will be deposited in the nose, mouth and upper respiratory tract. It may be related to bakers' asthma. It has been associated with hypersensitivity pneumonitis. The species *Alternaria alternata* can produce tenuazonic acid and other toxic metabolites that may be associated with disease in humans or animals. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include edema and bronchospasms; chronic cases may develop pulmonary emphysema.

Ascospore

A spore borne in a special cell called an ascus. Spores of this type are reported to be allergenic. All ascomycetes, members of a group of fungi called Ascomycotina, have this type of spore. The minute black dots on rotting wood and leaves or the little cups on lichens are examples of ascomycetes; another is the "truffle" mushroom.

Aspergillus/Penicillium

These are two of the most commonly found allergenic fungi in problem buildings. *Aspergillus* comes in many varieties (species). Many of the varieties produce toxic substances. It may be associated with symptoms such as sinusitis, allergic bronchopulmonary aspergillosis, and other allergic symptoms. *Penicillium* is a variety of mold that is very common indoors and is found in increased numbers in problem buildings. It also has many varieties, some of which produce toxic substances. The symptoms are allergic reactions, mucous membrane irritation, headaches, vomiting, and diarrhea. Due to the morphological similarity of *Aspergillus* and *Penicillium*, they are not differentiated by microscopic analysis and are reported together.

Aspergillus sp.

Aw 0.75 - 0.82. Reported to be allergenic. Members of this genus are reported to cause ear infections. Many species produce mycotoxins that may be associated with disease in humans and other animals. Toxin production is dependent on the species or a strain within a species and on the food source for the fungus. Some of these toxins have been found to be carcinogenic in animal species. Several toxins are considered potential human carcinogens. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include edema and bronchospasms; chronic cases may develop pulmonary emphysema; may also be associated with sinusitis, allergic bronchopulmonary aspergillosis, and other allergic symptoms.

Basidiospore

Spore from basidiomycetes. Many varieties are reported to be allergenic.

Bipolaris sp.

A fungus with large spores that could be expected to be deposited in the upper respiratory tract. This fungus can produce the mycotoxin - sterigmatocystin, which has been shown to produce liver and kidney damage when ingested by laboratory animals.

Botrytis sp.

Aw 0.93. Conidia dimensions: 7-14 x 5-9 microns. It is parasitic on plants and soft fruits. Found in soil and on house plants and vegetables, it is also known as "gray mold". It causes leaf rot on grapes, strawberries, lettuce, etc. It is a well-known allergen, producing asthma type symptoms in greenhouse workers and "wine grower's lung".

Cercaspora

Common outdoors in agricultural areas, especially during harvest. Parasite of higher plants, causing leaf spot. Commonly found as parasites on higher plants.

Chaetomium sp.

large ascomycetous fungus producing perithecia. It is found on a variety of substrates containing cellulose, including paper and plant compost. It has been found on paper in sheetrock. It can produce an *Acremonium*-like state on fungal media. Varieties are considered allergenic and have been associated with peritonitis, cutaneous lesions, and system mycosis.

Cladosporium sp.

Aw 0.88; Aw 0.84. Most commonly identified outdoor fungus. The outdoor numbers are reduced in the winter. The numbers are often high in the summer. Often found indoors in numbers less than outdoor numbers. It is a common allergen. Indoor *Cladosporium* sp. may be different than the species identified outdoors. It is commonly found on the surface of fiberglass duct liners in the interior of supply ducts. A wide variety of plants are food sources for this fungus. It is found on dead plants, woody plants, food, straw, soil, paint, and textiles. Produces greater than 10 antigens. Antigens in commercial extracts are of variable quality and may degrade within weeks of preparation. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include skin lesions, eye ulceration, mycosis (including onychomycosis, an infection of the nails of the feet or hands) edema and bronchospasms; chronic cases may develop pulmonary emphysema.

Curvularia sp.

Reported to be allergenic and has been associated with allergic fungal sinusitis. It may cause corneal infections, mycetoma, and infections in immune compromised hosts.

Dreschlera sp.

Conidia dimensions: 40-120 x 17-28 microns. Found on grasses, grains and decaying food. It can occasionally cause a corneal infection of the eye.

Epicoccum sp.

Conidia dimensions: 15-25 microns. A common allergen. It is found in plants, soil, grains, textiles and paper products.

Fusarium sp.

Aw 0.90. A common soil fungus. It is found on a wide range of plants. It is often found in humidifiers. Several species in this genus can produce potent trichothecene toxins. The trichothecene (scirpene) toxin targets the following systems: circulatory, alimentary, skin, and nervous. Produces vomitoxin on grains during unusually damp growing conditions. Symptoms may occur either through ingestion of contaminated grains or possibly inhalation of spores. The genera can produce hemorrhagic syndrome in humans (alimentary toxic aleukia). This is characterized by nausea, vomiting, diarrhea, dermatitis, and extensive internal bleeding. Reported to be allergenic. Frequently involved in eye, skin, and nail infections.

Myxomycetes

Members of a group of fungi that is included in the category of "slime molds". They're occasionally found indoors, but mainly reside in forested regions on decaying logs, stumps, and dead leaves. Myxomycetes display characteristics of fungi *and* protozoans. In favorable (wet) conditions they exhibit motile, amoeba-like cells, usually bounded only by a plasma membrane, that are variable in size and form. During dry spells, they form a resting body (sclerotium) with dry, airborne spores. These fungi are not known to produce toxins but can cause hay fever and asthma.

Memnoniella

Contaminant found most often with *Stachybotrys* on wet cellulose. Forms in chains, but it are very similar to *Stachybotrys* and sometimes is considered to be in the *Stachybotrys* family. Certain species do produce toxins very similar to the ones produced by *Stachybotrys chartarum* and many consider the IAQ importance of *Memnoniella* to be on par with *Stachybotrys*. Allergenic and infectious properties are not well studied.

Nigrospora sp.

Commonly found in warm climates, this mold may be responsible for allergic reactions such as hay fever and asthma. It is found on decaying plant material and in the soil. It is not often found indoors.

Oidium sp.

The asexual phase of *Erysiphe* sp. It is a plant pathogen causing powdery mildews. It is very common on the leaf's stems, and flowers of plants. The health effects and allergenicity have not been studied. It does not grow on non-living surfaces such as wood or drywall.

Penicillium sp.

Aw 0.78 - 0.88. A wide number of organisms have been placed in this genus. Identification to species is difficult. Often found in aerosol samples. Commonly found in soil, food, cellulose and grains. It is also found in paint and compost piles. It may cause hypersensitivity pneumonitis, allergic alveolitis in susceptible individuals. It is reported to be allergenic (skin). It is commonly found in carpet, wallpaper, and in interior fiberglass duct insulation. Some species can produce mycotoxins. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include edema and bronchospasms; chronic cases may develop pulmonary emphysema. It may also cause headaches, vomiting, and diarrhea.

Periconia sp.

Periconia sp. are found in soil, blackened and dead herbaceous stems leaf spots, grasses, rushes, and sedges. Almost always associated with other fungi. Rarely found growing indoors. Reportedly associated with a rare case of mycotic keratitis.

Pithomyces sp.

A common mold found on dead leaves, plants, soil and especially grasses. Causes facial eczema in ruminants. It exhibits distinctive multi-celled brown conidia. It is not known to be a human allergen or pathogen. It is rarely found indoors, although it can grow on paper.

Rusts/Smuts

These fungi are associated with plant diseases. In the classification scheme of the fungi, the smuts have much in common with the rusts, and they are frequently discussed together. Both groups produce wind-borne, resistant teliospores that serve as the basis for their classification and their means of spread. Rusts usually attack vegetative regions (i.e., leaves and stems) of plants; smuts usually are associated with the reproductive structures (seeds). They can cause hay fever and asthma.

Spegazzinia

Spegazzinia species comprise a very small proportion of the fungal biota. This genus is somewhat related to other lobed or ornamented genera such as *Candelabrum*. No information is available regarding health effects or toxicity. Allergenicity has not been studied. Usually identified on spore trap samples where it is seen every few weeks. (Spores have very distinctive morphology.) May also be found in air by culturable (Andersen) samples if a long enough incubation period is provided so that sporulation occurs. Our laboratory has never found this organism growing on indoor environmental surfaces. Natural habitat includes soil and many kinds of trees and plants.

Stachybotrys sp.

Aw - 0.94, optimum Aw ->0.98. Several strains of this fungus (*S. atra, S. chartarum* and *S. alternans* are synonymous) may produce a trichothecene mycotoxin- Satratoxin H - which is poisonous by inhalation. The toxins are present on the fungal spores. This is a slow growing fungus on media. It does not compete well with other rapidly growing fungi. The dark colored fungus grows on building material with high cellulose content and low nitrogen content. Areas with a relative humidity above 55%, and are subject to temperature fluctuations, are ideal for toxin production. Individuals with chronic exposure to the toxin produced by this fungus reported cold and flu symptoms, sore throats, diarrhea, headaches, fatigue, dermatitis, intermittent local hair loss and generalized malaise. Other symptoms include coughs, rhinitis, nosebleed, a burning sensation in the nasal passages, throat, and lungs, and fever. The toxins produced by this fungus will suppress the immune system affecting the lymphoid tissue and the bone marrow. Animals injected with the toxin from this fungus exhibited the following symptoms: necrosis and hemorrhage within the brain, thymus, spleen, intestine, lung, heart, lymph node, liver, and kidney. Affects by absorption of the toxin in the human lung are known as pneumomycosis.

This organism is rarely found in outdoor samples. It is usually difficult to find in indoor air samples unless it is physically disturbed (or possibly -this is speculation- a drop in the relative humidity). The spores are in a gelatinous mass. Appropriate media for the growth of this organism will have high cellulose content and low nitrogen content. The spores will die readily after release. The dead spores are still allergenic and toxigenic. Percutaneous absorption has caused mild symptoms.

Stemphylium sp.

Reported to be allergenic. Isolated from dead plants and cellulose materials.

Torula sp.

Found outdoors in air, soil, on dead vegetation, wood, and grasses. Also found indoors on cellulose materials. Reported to be allergenic and may cause hay fever and asthma.

Tetraploa

Tetraploa species comprise a very small proportion of the fungal biota. This genus is somewhat related to *Triposporium* and Diplocladiella. The only reported human infections are two cases of keratitis (1970, 1980) and one case of subcutaneous infection of the knee (1990). No information is available regarding other health effects or toxicity. Allergenicity has not been studied. Usually identified on spore trap samples where it is seen every few weeks. (Spores have very distinctive morphology.) Our laboratory has never found this organism growing on indoor environmental surfaces. Natural habitat includes leaf bases and stems just above the soil on many kinds of plants and trees.

Ulocladium sp.

Aw 0.89. Isolated from dead plants and cellulose materials. Found on textiles.

Zygomycetes

Zygomycetes are one of the four major groups of fungi, the others being the Oomycetes, the Ascomycetes, and the Basidiomycetes. Zygomycetes are common, fast growing, and often overgrow and/or inhibit other fungi nearby. Rhizopus and Mucor are two of the most common Zygomycetes seen in the indoor environment. However, others are seen as well, including *Syncephalastrum*, *Circinella*, *Mortierella*, *Mycotypha*, *Cunninghamella*, and *Choanephora*. For further information, please see descriptions of these individual genera.

The following table lists mycotoxins that are produced by certain types of fungi:

Fungi	Mycotoxin
Acremonium crotocinigenum	Crotocin
Aspergillus favus	Alfatoxin B, cyclopiazonic acid
Aspergillus fumigatus	Fumagilin, gliotoxin
Aspergillus carneus	Critrinin
Aspergillus clavatus	Cytochalasin, patulin
Aspergillus Parasiticus	Alfatoxin B
Aspergillus nomius	Alfatoxin B
Aspergillus niger	Ochratoxin A, malformin, oxalicacid
Acremonium crotocinigenum	Crotocin
Aspergillus nidulans	Sterigmatocystin
Aspergillus ochraceus	Ochratoxin A, penicillic acid
Aspergillus versicolor	Sterigmatocystin, 5 ethoxysterigmatocystin
Aspergillus ustus	Ausdiol, austamide, austocystin,brevianamide
Aspergillus terreus	Citreoviridin
Alternaria	Alternariol, altertoxin, altenuene, altenusin, tenuazonic acid
Arthrinium	Nitropropionic acid
Bioploaris	Cytochalasin, sporidesmin, sterigmatocystin
Chaetomium	Chaetoglobosin A,B,C. Sterigmatocystin
Cladosporium	Cladosporic acid
Clavipes purpurea	Ergotism
Cylindrocorpon	Trichothecene
Diplodia	Diplodiatoxin
Fusarium	Trichothecene, zearalenone
Fusarium moniliforme	Fumonisins
Emericella nidulans	Sterigmatocystin
Gliocladium	Gliotoxin
Memnoniella	Griseofulvin , dechlorogriseofulvin, epi-decholorgriseofulvin, trichodermin, trichodermol
Myrothecium	Trichothecene
Paecilomyces	Patulin, viriditoxin
Penicillium aurantiocandidum	Penicillic acid
Penicillium aurantiogriseum	Penicillic acid
Penicillium brasilanum	Penicillic acid
Penicillium brevicompactum	Mycophenolic acid
Penicillium camemberti	Cyclopiazonic acid
Penicillium carneum	Mycophenolic acid, Roquefortine C
Penicillium crateriforme	Rubratoxin

Fungi	Mycotoxin
Penicillium citrinum	Citrinin
Penicillium commune	Cyclopiazonic acid
Penicillium crustosum	Roquefortine C
Penicillium chrysogenum	Roquefortine C
Penicillium discolor	Chaetoglobosin C
Penicillium expansum	Citrinin, Roquefortine C
Penicillium griseofulvum	Roquefortine C, cyclopiazonic acid, griseofulvin
Penicillium hirsutum	Roquefortine C
Penicillium hordei	Roquefortine C
Penicillium nordicum	Ochratoxin A
Penicillium paneum	Roquefortine C
Penicillium palitans	Cyclopiazonic acid
Penicillium polonicum	Penicillic acid
Penicillum roqueforti	Roquefortine C, Mycophenolic acid
Penicillium veridicatum	Penicillic acid
Penicillium verrucosum	Citrinin, ochratoxin A
Penicillium/ Aspergillus	Patulin
Penicillium/ Aspergillus/Alternaria	Glitoxin
Phomopsis	Macrocyclic trichothecenes
Phoma	Brefeldin, cytochalasin, secalonic acid, tenuazonic acid
Pithomyces	Sporidesmin
Rhizoctonia	Slaframine
Rhizopus	Rhizonin
Sclerotinia	Furanocoumarins
Stachybotrys chartarum	Iso-satratoxin F, roridin E, L-2, satratoxin G & H, trichodermin, trichodermol, trichothecene
Torula	Cytotoxins
Trichoderma	Trichodermin, trichodermol, gliotoxin
Trichothecium	Trichothecene
Wallemia	Walleminol
Zygosporium	Cytochalasin

General terms

Allergen

An allergen is a substance that elicits an IgE antibody response and is responsible for producing allergic reactions. Chemicals are released when IgE on certain cells contact an allergen. These chemicals can cause injury to surrounding tissue - the visible signs of an allergy. Only a few fungal allergens have been characterized but all fungi are thought to be potentially allergenic. Fungal allergens are proteins found in either the mycelium or spores

"Black mold"

A poorly defined term. Black mold or toxic black mold has usually been associated with the mold *Stachybotrys chartarum*. While there are only a few molds that are truly black, there are many that can appear black. Not all molds that appear to be black are *Stachybotrys*.

Fungi

Fungi are neither animals nor plants and are classified in a kingdom of their own. The Kingdom of Fungi. Fungi include a very large group of organisms, including molds, yeasts, mushrooms and puffballs. There are >100,000 accepted fungal species but current estimates range to 1.5 million species. Mycologists (people who study fungi) have grouped fungi into four large groups according to their method of reproduction.

Hidden mold

This refers to visible mold growth on building structures that is not easily seen, including the areas above drop ceilings, within a wall cavity (the space between the inner and outer structure of a wall), inside air handlers, or within the ducting of a heating/ventilation system.

Microbial Volatile Organic Compounds (MVOCs)

Fungi produce chemicals as a result of their metabolism. Some of these chemicals, MVOCs, are responsible for the characteristic moldy, musty, or earthy smell of fungi, whether mushrooms or molds. Some MVOCs are considered offensive or annoying. Specific MVOCs are thought to be characteristic of wood rot and mold growth on building materials. The human nose is very sensitive to mold odors and sometimes more so than current analytical instruments.

Mold

Molds are a group of organisms that belong to the Kingdom of Fungi (see Fungi). Even though the terms mold and fungi had been commonly referred to interchangeably, all molds are fungi, but not all fungi are molds.

Mycotoxin

Mycotoxins are compounds produced by some fungi that are toxic to humans or animals. By convention, the term? Mycotoxin. Excludes mushroom toxins. Fungi that produce mycotoxins are called "toxigenic fungi."

Spore

General term for a reproductive structure in fungi, bacteria and some plants. In fungi, the spore is the structure which may be used for dissemination and may be resistant to adverse environmental conditions.

Toxic mold

The term "toxic mold" has no scientific meaning since the mold itself is not toxic. The metabolic byproducts of some molds may be toxic (see mycotoxin).

Hypha (plural, hyphae)

An individual fungal thread or filament of connected cells; the thread that represents the individual parts of the fungal body.

Phoenix EnviroCorp

MOLD/BIOLOGICAL CONTAMINANT REMEDIATION PROTOCOL

Date: December 23, 2021

For: Quanesha Mullins
Wilmington Housing Authority
1524 S. 16th Street
Wilmington, NC 28401

Remediation Contractor: Not determined

On-Site Consultant: Phoenix EnviroCorp (PEC)
4020 Shipyard Boulevard
Wilmington, NC 28403
(910) 397-0370

Approved Signatory:

Shaenaz Mirmohamed
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SECTION 1.0 REMEDIATION PROCEDURES

1.1 Project Set Up

- The owner or powers that be shall supply temporary power for remediation equipment. The existing electrical system may be utilized, with permission of the owner or powers that be. Determining specific electrical load/safety requirements, including, but not limited to, the use of a temporary GFCI electrical panel box shall be the responsibility of the abatement contractor.
- HVAC system shall be isolated.
- 6-mil polyethylene sheathing shall be erected to separate primary control areas (PCA) from remaining areas. Control areas shall be selected so that specified building materials (specified herein, in section 1.3, under primary control areas) may be removed or cleaned and dried.
- HEPA Air Filtration Devices shall be utilized for each separate control area. Critical barriers shall consist of 6-mil polyethylene so that primary control areas are isolated from remaining areas. HEPA filtration units shall be exhausted from the PCA to the outside of the building through windows/doors. Dehumidification units must be installed in the PCA to sufficiently dry components.
- A remote wash off station shall be set up to allow for employees to wash hands and faces after egress from the work area.
- Ingress/Egress to the control area(s) shall be, at minimum, sealed with a 2-way polyethylene air lock.
- Entrances to the building shall be marked as indicated in Section 7.4 of this document.

1.2 Local Exhaust System

- Once sealed, the primary control area shall be ventilated with a local HEPA air filtration device that shall ensure a minimum of four (4) air changes per hour. The air filtration device shall be placed within the containment work area.
- Local HEPA exhaust shall be utilized where cleaning of contents is required and/or in the immediate vicinity of remediation activities of building materials.
- In interior sections requiring surface area cleaning, local HEPA filtration may be exhausted within the area to scrub microbials from ambient air. This process shall only be conducted after fine cleaning has been completed.
- Negative pressure within the contained work area shall be maintained throughout the project until clearance is obtained.
- Negative air machines shall be exhausted to exterior portions of the building to adequately ensure that negative pressure is achieved.
- Dehumidification devices with HEPA filtration may be incorporated as filtration devices in conjunction with true HEPA filtration devices; they may not replace the true HEPA filtration devices.

Note: Formula for determination of adequate HEPA filtration:

Total feet per minute =Volume of work area (ft^3)/15 minutes
#AFD Units needed = (Total feet per minute)/Capacity of Unit (ft^3)

- At initiation of final cleaning stages, relative humidity shall be at 40% (+/-3%) and moisture content of wooden components shall be at or below 15% as determined by Delmhorst moisture meter or equivalent meter. Moisture mapping and direct read T/RH shall be recorded by the remediation contractor until the specified levels have been achieved. Control areas shall be dehumidified during cleaning and mold remediation activities to ensure removal of surface moisture created during application of water. Drying of structural components that have been treated with encapsulating anti-microbial agents will be necessary.

- Moisture levels shall be recorded and documented by the remediation contractor upon successful completion of dehumidification.

1.3 Remediation Specifications

- Prior to commencement of mold remediation activities by the remediation contractor, the source of any water intrusions, leaks, and/or moisture/humidity problems shall be remedied by the owner. If water intrusions, leaks, and/or moisture/humidity problems exist and are not corrected, mold growth can be expected to return.
- All remediation procedures listed that involve the removal of building materials shall employ polyethylene critical barriers, negative air pressure, and HEPA filtration (i.e., primary control areas).
- The remediation contractor shall ensure that the filters are properly capped prior to switching off the air scrubbers. If the filters are not properly capped, the backflow can cause mold spores to re-release back into the control area, essentially re-contaminating an area that has already been cleaned.
- All remediation activities shall be conducted in a manner that does not allow dissemination of mold spores. Remediation procedures shall begin from the side of the control area furthest away from air filtration devices.
- Cleaning procedures shall be repeated until the area is visibly free of dust and debris.
- Engineering controls set up during the remediation process shall remain in place until remediation has been completed and acceptable post remediation sampling results have been achieved.
- **Federal and/or state regulations require that suspect asbestos containing materials in public and commercial buildings shall be inspected for asbestos prior to renovations or demolition. Based on these regulations, PEC recommends that building materials that may be disturbed during mold remediation be tested for asbestos content prior to their disturbance to prevent asbestos contamination.**
- If cleaning procedures outlined in this remediation plan outweigh the cost of replacement for selected items, the remediation contractor shall give the owner the option to clean or dispose of those items.
- Reinstallation of building materials and/or components shall only be conducted once acceptable post remediation results are obtained.
- Any chemicals used on this project shall be EPA approved and used only as directed by the manufacturer. MSDS shall be available for review upon request.

HVAC System

- The HVAC system(s) that services or run through the primary control area/affected area shall be shut down prior to remediation activities.
- The spaces that are normally climate-controlled by the HVAC system that have been shut down shall be maintained under proper humidity levels (between 30 and 60% utilizing dehumidifiers, etc.) while the system is not in operation.
- All HVAC supply/return vents within the primary control area/affected area shall be isolated with a critical barrier (i.e., plastic, etc.) to prevent air flow.
- Once the HVAC system is shut down, the system shall remain off and isolated until acceptable post remediation results are obtained.

Note: For directional purposes "front" is determined by facing Green Lane from inside the residence, unless otherwise noted.

Primary Control Areas/Affected Areas

Critical barriers, negative air pressure, and HEPA filtration shall be established to isolate the following areas as Primary Control Areas to perform the specified mold remediation. **All non-stable furnishings and contents shall be removed from the containment area/primary control area prior to specified remediation to avoid cross contamination of furnishings and contents. If elected, said furnishings and contents can be precleaned (i.e., HEPA vacuum, etc.) and stored in the primary control area, but shall be protected (i.e., covered with poly, etc.) to avoid cross contamination.**

Within the kitchen/living room:

- Remove the ceiling drywall. The width of this removal shall be 10 feet beginning at the rear wall and extending towards the front wall. The length of this removal shall be 12 feet beginning at the left wall and extending towards the right wall.

Within the bathroom:

- Scrape the textured peeling paint from the ceiling until smooth to properly assess the ceiling drywall and remove any affected drywall (i.e., drywall with apparent water damage/suspect visible mold growth) and extend the drywall removal within a 2- foot radius of the affected area when possible.

Within the kitchen/living room and the bathroom (Negative air pressure is not required in areas where building components are not specified for removal, but HEPA filtration is required):

- Clean all remaining surfaces as specified herein under general specifications for primary control areas.
- **Areas of specified ceiling removal shall be sealed with poly (i.e., critical barrier) after cleaning, but before HEPA air scrubbing after cleaning, to prevent air flow from areas outside the containment area. An access door (i.e., poly flap taped in place, zipper, etc.) shall be installed in the critical barrier for easy access to conduct a visual inspection of the building materials behind the critical barrier.**

General Specifications for Primary Control Areas

- Open plumbing lines and drains within the control areas shall be isolated with a critical barrier consisting of 6-mil poly.
- The water line to toilets within the control areas shall be shut off and the toilets shall be isolated with a critical barrier consisting of 6-mil poly.
- Cleaning of components/materials shall consist of a method that thoroughly removes visible mold growth, settled concentrations of mold spores, and/or dust and debris (i.e., HEPA vacuuming, wet wiping, or other approved methods), followed by dehumidification/drying.
- Exterior surfaces of electrical appliances, electrical equipment, and light fixtures shall be cleaned, utilizing wet method and HEPA vacuuming. These items shall be disconnected from all electrical sources prior to cleaning. If these items cannot be cleaned efficiently, the abatement contractor shall consult with the owner/powers that be.
- In areas where drywall removal is specified around windows and doors, remove trim boards. The door casing(s) shall also be assessed to determine if they have sustained mold/water damage. If so, they shall be cleaned, or removed.
- All wall/ceiling cavity insulation shall be disposed in areas that specify the removal of drywall/wallboard. The abatement contractor shall visually inspect the back side of surrounding drywall/wallboard for water damage and/or suspect mold growth and document any findings. If additional suspect mold growth or water damage is observed beyond the specified removal area, additional drywall/wallboard shall be removed until no suspect mold growth or water damage is observed.

- All penetrations within the controlled area that adjoin unaffected or non-accessible areas, including outdoor areas, crawlspaces, etc., shall be cleaned (as far as one can reach) and then sealed with 6-mil poly, extending six (6) inches on all sides.
- In areas of specified wallboard removal, all components within the wall/ceiling cavities shall be cleaned. Any wooden structural components with mold stains or mold growth in pitted surfaces shall be HEPA sanded (or other approved methods) to eliminate embedded mold growth.
- All joints or sills (where the structural system meets, where the sill plate meets the floor, etc.) shall be aggressively disturbed to remove embedded mold growth and spores.
- The remediation contractor shall document any drywall/wallboard that requires removal, in addition to the specified amount, prior to removal (i.e., drywall that is specified to be assessed by the remediation contractor, etc.). Documentation shall include photos and specific location at a minimum.

1.4 Removal Procedures

The contractor shall maintain surfaces of the control area free of accumulation of dust and debris. Additionally, they shall restrict the spread of dust and debris, keeping waste from being distributed over the work area. Materials shall be removed in a fashion to ensure that previously cleaned areas are not re-contaminated (i.e., working from one end of the control area to the other). The contractor may be required to re-clean areas based on a visual inspection by the CIEC/CIE/IH, if the areas are not visibly clean.

Contaminated building materials that have been removed, and additional materials and debris generated during remediation, shall be placed in an enclosed container prior to transporting the material through the building and to the waste container, and prior to visual inspection by the CIEC/CIE/IH.

Areas shall be allowed to dry for a period until RH and moisture levels specified below have been achieved. Any remaining building products that are directly impacted by remediation shall be tested for moisture content. Wooden and cellulosic building components (e.g., wall studs, drywall, etc.) shall be tested for moisture content. If the moisture content is > 15% in wood products or > 12% in cellulosic products (utilizing a Delmhorst moisture meter or equivalent), dehumidification shall be required until moisture levels are at or below said levels, and the RH level is at or below 40% +/-3% (for all interior areas). The remediation contractor shall verify moisture content of all wooden and cellulosic building components within the impacted areas, as well as RH levels prior to scheduling post remediation verification.

1.5 Cleanup Overview

The contractor shall personally review the cleaning process prior to contacting the CIEC/CIE/IH for the post remediation testing. If accumulations of debris and dust are significant, the CIEC/CIE/IH will require re-cleaning prior to post remediation verification sampling.

The CIEC/CIE/IH shall make a visual inspection and conduct post remediation sampling after the final cleaning is complete.

1.6 Post Remediation Verification Testing

Prior to conducting post remediation sampling, HEPA filtration devices shall be allowed to operate for a minimum of 25 hours (the equivalent of 100 air changes), following fine cleaning, in all areas where remediation has been conducted. The HEPA filtration devices shall be sealed at the intake and turned off approximately two hours prior to post testing and reconvene within one hour after post testing, until acceptable post remediation results are established.

Post remediation sampling shall be conducted utilizing viable and/or non-viable sample methods. Air samples shall be collected in representative areas of the control areas. Surface sampling may be conducted at the discretion of the CIEC/CIE/IH.

Sampling shall be conducted in areas directly impacted by remediation procedures, where cleaning was conducted. The CIEC/CIE/IH shall determine acceptable post remediation status through interpretation of air sampling results, which will be based on indoor/outdoor comparisons, in combination with any surface samples collected, moisture readings, RH readings, visual observations, and any other pertinent information.

The owner/client will be responsible for post remediation testing. If air sample results indicate unacceptable airborne concentrations, the contractor shall be required to conduct a re-cleaning at the contractor's expense and absorb the cost for re-testing, until acceptable results are achieved.

Criteria for post remediation air sampling can be viewed in PEC's investigative report(s) listed in Section 2.1 below. This information can be found within the air sampling section of said report(s).

SECTION 2.0 SCOPE OF WORK (Note: Section 2.1 and Section 1.3 are essential to the full Scope of the Contractor's Work)

2.1 Investigative Reports and Other Related Documents

Phoenix EnviroCorp initial investigative report dated July 23, 2021.

Phoenix EnviroCorp investigative report dated December 23, 2021.

Phoenix EnviroCorp Chain of Custody dated July 14, 2021, and December 10, 2021.

Analytical reports dated July 16, 2021, and December 14, 2021.

2.2 Project Description

The procedures covered by this program/protocol include the enclosure and drying of the said structure, the removal, handling, and disposal of building components compromised by mold/fungal growth, and the cleaning and disinfecting of existing building materials. Procedures for reconstruction are not considered in these specifications. Reconstruction of interior portions may not be conducted until procedures for remediation have been completed, the control areas have been inspected, and testing has returned acceptable post remediation results. Reconstruction of exterior portions may be conducted during the restoration to ensure that water intrusion is abated.

The objectives covered by this program/protocol include the remediation of materials shown to have surface contamination, water damage, and/or exposure to elevated airborne mold spore levels, without subjecting the workers, installation employees, and occupants to microbial contaminants. In addition, contract employees, occupants, and materials shall be appropriately protected during the removal process to avoid exposure.

This program/protocol is provided as a guideline. Any deviation requests from this protocol shall be addressed to the CIEC/CIE/IH for consideration. At present there are no Federal or State requirements regarding microbial remediation projects; however, OSHA General Construction Code of Federal Regulations (29 CFR 1926) shall be followed.

Remediation shall be completed as close as possible to the date that this protocol was drafted, as the

specifications outlined within represent conditions at the time the investigative services were conducted. Due to the volatility of mold, the current protocol may not reflect all necessary remediation if conditions are allowed to continue. Further, if time lapses allowing conditions to change, it may become increasingly difficult to obtain successful clearance testing results.

SECTION 3.0 AIR MONITORING

3.1 Responsibilities of the CIEC/CIE/IH

Monitoring of airborne concentrations will be performed in accordance with the requirements of this program. Prior to conducting air sampling and/or surface sampling for clearances, the CIEC/CIE/IH shall conduct a visual inspection of the area. Temperature and RH shall be recorded during the air sampling phase of clearance. All air sampling shall be conducted in such a manner as to provide a valid representation of airborne mold levels both inside and outside the work areas. If analysis of air samples indicates that airborne concentrations exceed acceptable limits, the contractor shall conduct re-cleaning at the contractor's expense.

3.2 Personal Monitoring

No personal monitoring will be conducted by the CIEC/CIE/IH unless the remediation contractor requests monitoring for OSHA compliance. Presently there are no PELs or TLVs for microbial contaminants. It is the remediation contractor's responsibility to determine if OSHA personal sampling may be required during application of anti-microbial agents.

3.3 Sample Integrity and Reporting

Samples shall be sealed, labeled, and a chain of custody initiated according to laboratory procedures.

Post remediation sample results shall be available within seven (7) business days of the completion of collection and will include the following information:

- Site Address
- Sample Number
- Location Sampled
- Collection Date(s)
- Person Taking Sample(s)
- Additional Comments (if any)
- Analyst Signature

SECTION 4.0 MATERIAL REPLACEMENT

4.1 Material Replacement

The general contractor/replacement contractor may begin material replacement after the CIEC/CIE/IH informs all parties of acceptable post remediation sample results.

With ongoing construction activities ambient air levels are expected to be elevated over what might be normally expected. Additional testing should not be necessary after remediation procedures have been completed and successful results have been obtained. In the event of another water intrusion (i.e., broken-pipeline, improper HVAC function, or building envelope compromise), an investigation shall be conducted within 24 to 48 hours of the event. Proper drying, if initiated within this time frame, should minimize the

potential for microbial growth.

SECTION 5.0 SPILL CLEANUP REQUIREMENTS

5.1 Spills

MSDS shall be kept on site for all chemical products brought to the site by the remediation contractor. In the event of a chemical spill, the contractor shall initiate cleanup immediately. The contractor shall mop up any liquid with rags or other conventional absorbent. The spent absorbent shall be properly contained and disposed of as waste.

SECTION 6.0 WASTE CONTROL

6.1 Waste Disposal

Waste shall be disposed of at a locally selected landfill. Waste shall be transported to the landfill in such a way to ensure that it does not pose a potential hazard to the environment.

SECTION 7.0 SUPPLEMENTAL INFORMATION

7.1 Applicable Publications

The publications listed below form part of this program. This protocol shall be reviewed by the remediation contractor prior to initiation of set-up for the project. Any questions regarding this protocol shall be addressed with the generator or appropriate Phoenix EnviroCorp personnel.

Code of Federal Regulation (CFR Publications)

29 CFR 1910.134	Respiratory Protection
29 CFR 1910.145	Specifications for Accident Prevention, Signs and Tags
29 CFR 1926.28	Personal Protective Equipment
29 CFR 1926.59	Hazard Communication
29 CFR 1926.96	Occupational Foot Protection
29 CFR 1926.100	Head Protection
29 CFR 1926.101	Hearing Protection
29 CFR 1926.102	Eye and Face Protection
29 CFR 1926.403	Electrical General Requirements
29 CFR 1926.416	Safety General Requirements
29 CFR 1926.852	Demolition, Chutes
29 CFR 1926.1091	Record Keeping Requirements

Supplemental Guidelines

IICRC S520 2nd ed.	Standard and Reference Guide for Professional Water Damage Restoration
NYCDOH	Guidelines on Assessment and Remediation of Fungi in Indoor Environments
ACGIH	Bioaerosols: Assessment and Control
IAQA 01-2000	Recommended Guidelines for Indoor Environments
ASHRAE 62.2-2007	Ventilation for Acceptable Indoor Air Quality in Low-Rise Residential Buildings

7.2 Definitions

Air Lock: A system that permits ingress and egress between a control area and non-control area, or other work areas, without allowing air movement between areas (e.g., three stage decon, three-way polyethylene flaps).

Air Sample: Refers to samples collected with spore trap air sample media (e.g., Micro-5, Cyclex D, or equivalent); also referred to as a non-viable air sample. May also refer to a sample collected on a disposable petri dish with Agar media by means of an Andersen Impactor (or equivalent) and sampling pump; also referred to as air culture (viable) sample. Sample media to be used in project is described under Section 1.6 (Post Remediation Verification Testing).

Area Monitoring: The sampling of airborne microbial concentrations outside the exclusion boundary, which may reach the breathing zone of the contractor or installation employees.

Asbestos Containing Materials (ACM): Refers to asbestos containing building materials that contain more than 1% asbestos by Polarized Light Microscopy (PLM) or Transmission Electron Microscopy (TEM).

Biocide: Refers to chemical agents that are specifically designed to eliminate viable microbial contamination, with a phenol equivalent efficiency (e.g., Sodium Hypochlorite, Quaternary Ammonia Compounds).

Blower Door Test: Refers to the testing of static pressure and draw of air through the HVAC in cubic feet per minute (CFM) to rate the efficiency of the system.

Clearance Monitoring: Refers to air, bulk, or swab sampling conducted as a means to demonstrate that the area specified for remediation has been completed by the contractor, left with present acceptable mold spore levels, and ready for re-construction.

Control Area: The area where microbial contaminants removal is performed, which is isolated by physical boundaries to prevent unauthorized entry of personnel, thereby preventing exposure to or the spread of microbial contaminants. Physical boundaries will be established and located such that the airborne contaminants are not allowed to escape the boundaries.

HEPA: High Efficiency Particulate Air. Refers to ventilation devices that are specifically designed to filter ambient air to an efficiency of 99.97%.

HVAC: Refers to the Heating, Ventilation, and Air Conditioning system.

Industrial Hygienist: Refers to a person who practices industrial hygiene and may act as a competent person regarding visual inspection of contaminated surfaces and clearance air and/or swab/bulk sampling. May also refer to a Certified Industrial Hygienist (CIH) as defined by the American Board of Industrial Hygiene (ABIH), a Certified Indoor Environmental Consultant as defined by the American Council for Accredited Certification (ACAC), or a Certified Indoor Environmentalist (CIE) as defined by the American Council for Accredited Certification (ACAC).

Microbial Contaminant: Refers to viable mold, fungi, pollen, bacteria, and or particulate, or their metabolites, which may be causative of epidemiological, immunotoxic, dermotoxic, neurotoxic, or enterotoxic disorders in the human population, or may be considered a pathogen or an opportunistic pathogen.

Non-Porous Materials: Refers to building materials with solid surfaces that may be successfully treated and cleaned by means of HEPA vacuuming or other approved method. Materials include flooring, hard goods,

plastic, vinyl, and some wallboard systems.

Porous Materials: Refers to building materials and household goods that may allow microscopic particles (3-20 micron) to become trapped within the material that will not allow adequate cleaning. Materials include carpet, mattresses, and clothing.

Primary Control Area (PCA): Refers to a section of a facility that has been isolated by 6-mil polyethylene barriers where specific engineering controls (e.g., HEPA filtration, negative air pressurization, dehumidification, etc.) are required. In general, it is the area where remediation of water and mold damaged building materials is to be conducted.

Refrigerant Dehumidifier: Device used to remove water content from air and materials.

Relative Humidity (RH): Refers to the ratio of water vapor in the atmosphere to the amount required to saturate it at a given temperature.

Semi-Porous Materials: Refers to materials that may be somewhat porous, yet they may still allow for adequate cleaning. Materials include wooden beams and some wallboard systems.

Swab Sample: Refers to collection of a sample onto a sterile swab for analysis of mold, fungi, and bacteria by viable and/or non-viable analysis.

Tape-Lift Sample: Refers to collection of a sample onto clear scotch tape for analysis by direct microscopic examination (non-viable).

7.3 Quality Assurance

Medical Examinations

Before potential exposure to microbial contaminants, the remediation contractor shall provide workers with a comprehensive medical examination as required by 29 CFR 1910.134 as outlined by the Medical Monitoring Program.

Medical Records

The remediation contractor shall maintain complete and accurate medical records on employees as required by OSHA and the contractor's Medical Monitoring Program. The contractor may be asked to provide a copy of all medical records for approval by the consultant's representative.

Training

Each employee working on this contract shall be trained prior to the time of initial job assignment in accordance with mold specific and chemical specific training as indicated by the OSHA General Duty Clause and the Hazard Communication Standard. Each employee shall also receive training required by Federal guidelines listed in Section 7.1 of this document and project specifications.

Hazard Communication Program

The remediation contractor has established and implemented a Hazard Communication Program as required by 29 CFR 1910.1200 and may be asked to provide a copy of this written program. Hazard Communication

training must include occupational hazards as directly related to working with fungi/mold and contamination of building components by fungal contamination, specific training for chemical hazards associated with biocide usage, and site specific MSDS sheets for commercial detergents and biocides utilized on the job site.

Respiratory Protection Program

The remediation contractor has established a Respiratory Protection Program, which complies with 29 CFR 1910.134. Physical examinations and fit testing are required for use of respiratory protection greater than an N-95 dust mask. Workers removing building materials contaminated by mold growth, applying anti-microbial agents, or workers subjected to exposures to anti-microbial agents shall be required to wear, at minimum, a tight-fitting negative pressure ½ mask respirator with P-100 filters. Therefore, -he OSHA Respiratory Protection Standard applies.

Analytical Testing Laboratory

Analysis of culturable biological samples collected on this project shall be conducted by a laboratory that participates in the Environmental Microbiological Proficiency Analytical Testing Program (EMPAT) of the American Industrial Hygiene Association (AIHA) and has shown to be proficient by proficiency analytical testing (PAT) samples. Analysis of non-viable air and surface samples shall be conducted by a competent person.

7.4 Materials and Equipment

Equipment

The contractor shall make available to employees a complete set of personal protective equipment (PPE) as required by this program for entry into the controlled area. All personnel while in the control area or handling microbial contaminated waste shall wear protective clothing, respirators, and other PPE.

Respirators

The contractor shall furnish the appropriate respirator in accordance with 29 CFR 1910.134. At a minimum, an N-95 dust mask shall be utilized.

Special Clothing

Employees shall be provided with and required to wear: whole body disposable protective clothing, full body tyvek suits with head coverings, and latex gloves *(see table)* during all activities in the controlled area.

Chemical	Recommended Rubber Glove
Sodium Hypochlorite	Neoprene or Nitrile
Phenolic Compounds	Neoprene
Quaternary Ammonia Compounds	Polyvinyl Chloride (PVC)
Detergents	Latex

Eye Protection

The contractor shall provide chemical-resistant goggles to personnel engaged in cleaning and treatment activities and require them to be worn during application of anti-microbial agents and biocides.

Warning Signs and Labels

Standard approved warning signs shall be erected at all approaches to the control area as specified in 29 CFR 1910.145.

Anti-Microbial Agents

Anti-microbial agents utilized in interior quarters shall consist of quaternary ammonia compounds. No phenolic compounds shall be used in interior quarters with exception of Micro Ban Plus. Approval must be granted by the owner/powers that be prior to application. Anti-microbial agents shall be EPA approved. Commercial grade detergents shall be used to remove fungal contamination during cleaning phases prior to anti-microbial application, to include encapsulation.

July 7, 2021

Quanesha Mullins
Wilmington Housing Authority
1524 S. 16th Street
Wilmington, NC 28401

RE: PEC Job # 21-21-180A-IAQ-M – 302 Grass Lane, Unit 104, Wilmington, NC - Mold Investigation

Enclosed are the results of the mold investigation conducted at the above referenced unit on June 25, 2021. Phoenix EnviroCorp (PEC) was retained to conduct a mold investigation and provide a mold remediation protocol.

Background Information: PEC conducted a mold investigation on June 2, 2021, identifying elevated airborne mold spore levels within all sampled locations and apparent water damage within the unit.

This is a two-story apartment building on a slab. The subject unit is on the 1st floor and is vacant and without carpet.

The HVAC system was operating in the cool mode, set at 74º F upon PEC's arrival and during sampling.

Related Documents:
- PEC initial investigation report dated June 7, 2021

Note: For directional purposes "front" is determined by facing the park from inside the unit, unless otherwise stated.

Visual Inspection: PEC's visual inspection noted the following (see enclosed photographic documentation):
Kitchen
- Apparent water damage and suspect visible mold growth within the rear floor mounted cabinet
- Apparent water damage within the front floor mounted cabinet
- Apparent water damage to the ceiling

Bathroom
- Suspect visible mold growth within the toilet tank
- Apparent water damage within the floor mounted cabinet
- Apparent water damage to the ceiling
- Apparent water damage to the baseboard on the front wall

Front left bedroom
- Apparent water damage to the ceiling

Mold Testing – Surface: Non-viable surface samples were collected from areas of suspect visible mold growth. The quantifications of fungal growth are reported as scattered spores, 21-100 fungal spores = very light (VL), 101-1,000 fungal spores = light (L), 1,001-10,000 fungal spores = moderate

(M), > 10,000 fungal spores = heavy (H). The 'General Impressions' of fungal growth are reported as no fungal growth (NFG), fungal growth (FG), minimal fungal growth or growth in vicinity (MFG), and no fungal spores detected (ND). *Clear tape was utilized for the collection of surface samples. Each sample was assigned a unique ID number and shipped to a third-party laboratory for analysis.* Sampling locations and results are as follows:

Location	Result
Floor mounted cabinet on the kitchen rear wall	**L - FG** *Cladosporium* **VL – FG** *Penicillium/Aspergillus*
Bathroom toilet tank	**M - FG** *Cladosporium* **M – FG** *Penicillium/Aspergillus*

Moisture Readings: Moisture readings were collected with either a Delmhorst moisture meter or a Tramex Survey Encounter. Multiple readings were taken to represent areas and materials reported. *Readings are marked with either a D or T to denote which meter was used.* For drywall products, readings should be less than or equal to twelve percent (≤ 12%) by Delmhorst and below fifty percent (50%) by Tramex. For wood products, normal moisture content should be less than fifteen percent (<15%) for both meters.

Moisture content measurements were as follows:

Kitchen
- Wood cabinets = ≤ 10% (D)
- Ceiling drywall = ≤ 10% (T)

Bathroom
- Wood cabinets = ≤ 10% (D)
- Ceiling drywall = ≤ 10% (T)
- Wood baseboards = ≤ 10% (D)

Front left bedroom
- Ceiling drywall = ≤ 10% (T)

Conclusions: Surface mold growth and apparent water damage to building materials were identified within the unit, in addition to elevated airborne mold spore levels identified in PEC June 7, 2021's report. A mold remediation protocol that outlines remediation activities is attached.

Prior to commencement of mold remediation, the source of any water intrusions, leaks, and/or moisture/humidity issues shall be remedied. If water intrusions/moisture issues exist and are not remedied, mold can be expected to return.

After remediation activities are completed, but before put-back of removed components, post remediation verification shall be conducted. Upon notice, and for an additional fee, PEC can conduct post remediation verification testing.

Enclosed in this report are the laboratory analysis and the Chain of Custody.

Should you have any questions, please do not hesitate to call.

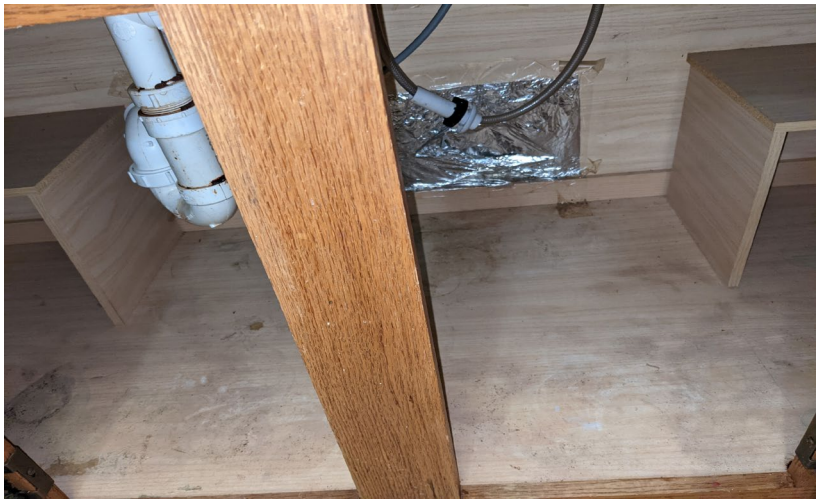
Thank you,

Shaenaz Mirmohamed
IH Technician

Tommie Green, CIEC
Professional Industrial Hygienist

Enclosures

Photo 1



Apparent water damage in the kitchen floor mounted cabinet on the front wall

Photo 2

Apparent water damage in the kitchen floor mounted cabinet on the rear wall (right side)

Photo 3

Apparent water damage in the kitchen floor mounted cabinet on the rear wall (left side)

Photo 4

Apparent water damage to the kitchen ceiling

Photo 5

Apparent water damage to the bathroom ceiling

Photo 6

Suspect visible mold growth in the bathroom toilet tank

Photo 7

Apparent water damage to the bathroom cabinet

Photo 8

Apparent water damage to the ceiling in the front left bedroom

Phoenix EnviroCorp
4020 SHIPYARD BLVD.
WILMINGTON, NC 28403

CHAIN OF CUSTODY

LABORATORY TEST REQUEST

Seeml Ref # 21062803O
Lab ID: 105 - 106

CONTACT: Shaenaz Mirmohamed	TELEPHONE (910) 397-0370 FAX (910) 313-6094	Sample date: 6/25/2021
PEC Job #: 21-21-180A-IAQ-M	SITE ADDRESS: 302 Grass Lane, Unit 104, Wilmington, NC 28405	

PLEASE EMAIL RESULTS TO: KMGREEN@PHOENIXENVIROCORP.COM

SAMPLE TYPE:	NUMBER OF SAMPLES:	TURN AROUND TIME SPECIFIED:
Spore Trap - Micro-5 Surface Samples	2	____ Immediate _____ 24 hr _____ 48 hr __X__ Standard

Sample #	Sample	Sample Volume	Lab Analysis Requested	% Relative Humidity	Temperature °F
062521-SM-01	Floor mounted cabinet on the kitchen right wall	1 cm sq	S001T	NA	NA
062521-SM-02	Bathroom toilet tank	1 cm sq	S001T	NA	NA
	Samples accepted				

Samples Collected By (Printed Name and Signature): Shaenaz Mirmohamed Date Signed: 6/25/2021

CHAIN OF CUSTODY RECORD

DATE:	Time:	Condition of Samples:	RELINQUISHED BY: (Printed Name and Signature)	ACCEPTED BY: (Printed Name and Signature)
6/25/2021	15:30	Intact	Shaenaz Mirmohamed AFFILIATION:	Melody M 6.28.21 AFFILIATION:

SEEML Reference Number:
210628030

Southeast Environmental Microbiology Laboratories
102 Edinburgh Court
Greenville, SC 29607
Phone: (864) 233-3770
FAX: (864) 233-6589

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

- ☒ Surface/Bulk Report
- ☐ Spore Trap Report
- ☐ Andersen Fungal Report
- ☐ Quantitative Fungal Report

Lab Manager Review: *Angel Gosnell* Date: 06/28/21

Thank you for using SEEML laboratories. We strive to provide superior quality and service.
SEEML laboratories are accredited through AIHA-LAP, LLC (EMLAP # 173667) for the analysis of Spore Traps and Surface/Bulk Samples.

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

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

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

Surface and Bulk Sample Report

	Date Sampled: 06/25/21
Attn: ***Phoenix Enviro Corp.***	Date Received: 06/28/21
4020 Shipyard Blvd.	Date Analyzed: 06/28/21
Wilmington, NC 28403	Date Reported: 06/28/21
	Date Revised:
	Project Name: 21-21-180A-IAQ-M
	Project Address: 302 Grass Lane, Unit 104
	Project City, State ZIP: Wilmington, NC 28405
	SEEML Reference #: 210628030

TEST METHOD: Direct Microscopic Examination (SEEML SOP 18)

Client Sample ID	062521-SM-01	062521-SM-02		
Location	Floor Mounted Cabinet On The Kitchen Right Wall	Bathroom Toilet Tank		
SEEML Sample ID	210628030-105	210628030-106		
Sample Type	Tape	Tape		
	Quantification*	Quantification*		
Hyphal Fragments		**M**		
Pollen				
General Impressions **	**FG**	**FG**		
Fungal Spore:				
Alternaria				
Acremonium				
Ascospores				
Basidiospores				
Bipolaris/Drechslera				
Cercospora				
Chaetomium				
Cladosporium	**L**	**M**		
Curvularia				
Epicoccum				
Fusarium				
Geotrichum sp.				
Memnoniella				
Myxomycetes				
Nigrospora				
Penicillium/Aspergillus	**VL**	**M**		
Pithomyces				
Rusts/Smuts				
Stemphylium				
Tetraploa				
Ulocladium				

**** General Impressions: NFG = No Fungal Growth, FG = Fungal Growth, MFG = Minimal Fungal Growth Or Growth in vicinity**

Quantification of fungal growth is done by semi-quantitative grading using the following ranges:

Scattered Spores, 1-20 fungal spores

VL = 21-100 fungal spores **L = 101-1,000 fungal spores** **M = 1,001-10,000 fungal spores** **H = >10,000 fungal spores**

ND = No Fungal Spores Detected

Disclaimer: This report relates only to the samples tested

Respectfully submitted, SEEML

Angel Gosnell, **Approved Laboratory Signatory**

102 Edinburgh Court
Greenville, SC 29607
Phone: (864) 233- 3770
Fax: (864) 233- 6589

AIHA-LAP, LLC EMLAP # 173667

Texas License: LAB1016

Fungal Descriptions

Alternaria sp.

Aw - 0.89. Conidia dimensions: 18-83 x 7-18 microns. A very common allergen with an IgE mediated response. It is often found in carpets, textiles and on horizontal surfaces in building interiors. Often found on window frames. Outdoors it may be isolated from samples of soil, seeds and plants. It is commonly found in outdoor samples. The large spore size, 20 - 200 microns in length and 7 - 18 microns in sizes, suggests that the spores from these fungi will be deposited in the nose, mouth and upper respiratory tract. It may be related to bakers' asthma. It has been associated with hypersensitivity pneumonitis. The species *Alternaria alternata* can produce tenuazonic acid and other toxic metabolites that may be associated with disease in humans or animals. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include edema and bronchospasms; chronic cases may develop pulmonary emphysema.

Ascospore

A spore borne in a special cell called an ascus. Spores of this type are reported to be allergenic. All ascomycetes, members of a group of fungi called Ascomycotina, have this type of spore. The minute black dots on rotting wood and leaves or the little cups on lichens are examples of ascomycetes; another is the "truffle" mushroom.

Aspergillus/Penicillium

These are two of the most commonly found allergenic fungi in problem buildings. *Aspergillus* comes in many varieties (species). Many of the varieties produce toxic substances. It may be associated with symptoms such as sinusitis, allergic bronchopulmonary aspergillosis, and other allergic symptoms. *Penicillium* is a variety of mold that is very common indoors and is found in increased numbers in problem buildings. It also has many varieties, some of which produce toxic substances. The symptoms are allergic reactions, mucous membrane irritation, headaches, vomiting, and diarrhea. Due to the morphological similarity of *Aspergillus* and *Penicillium*, they are not differentiated by microscopic analysis and are reported together.

Aspergillus sp.

Aw 0.75 - 0.82. Reported to be allergenic. Members of this genus are reported to cause ear infections. Many species produce mycotoxins that may be associated with disease in humans and other animals. Toxin production is dependent on the species or a strain within a species and on the food source for the fungus. Some of these toxins have been found to be carcinogenic in animal species. Several toxins are considered potential human carcinogens. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include edema and bronchospasms; chronic cases may develop pulmonary emphysema; may also be associated with sinusitis, allergic bronchopulmonary aspergillosis, and other allergic symptoms.

Basidiospore

Spore from basidiomycetes. Many varieties are reported to be allergenic.

Bipolaris sp.

A fungus with large spores that could be expected to be deposited in the upper respiratory tract. This fungus can produce the mycotoxin - sterigmatocystin, which has been shown to produce liver and kidney damage when ingested by laboratory animals.

Botrytis sp.

Aw 0.93. Conidia dimensions: 7-14 x 5-9 microns. It is parasitic on plants and soft fruits. Found in soil and on house plants and vegetables, it is also known as "gray mold". It causes leaf rot on grapes, strawberries, lettuce, etc. It is a well-known allergen, producing asthma type symptoms in greenhouse workers and "wine grower's lung".

Cercaspora

Common outdoors in agricultural areas, especially during harvest. Parasite of higher plants, causing leaf spot. Commonly found as parasites on higher plants.

Chaetomium sp.

large ascomycetous fungus producing perithecia. It is found on a variety of substrates containing cellulose, including paper and plant compost. It has been found on paper in sheetrock. It can produce an *Acremonium*-like state on fungal media. Varieties are considered allergenic and have been associated with peritonitis, cutaneous lesions, and system mycosis.

Cladosporium sp.

Aw 0.88; Aw 0.84. Most commonly identified outdoor fungus. The outdoor numbers are reduced in the winter. The numbers are often high in the summer. Often found indoors in numbers less than outdoor numbers. It is a common allergen. Indoor *Cladosporium* sp. may be different than the species identified outdoors. It is commonly found on the surface of fiberglass duct liners in the interior of supply ducts. A wide variety of plants are food sources for this fungus. It is found on dead plants, woody plants, food, straw, soil, paint, and textiles. Produces greater than 10 antigens. Antigens in commercial extracts are of variable quality and may degrade within weeks of preparation. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include skin lesions, eye ulceration, mycosis (including onychomycosis, an infection of the nails of the feet or hands) edema and bronchospasms; chronic cases may develop pulmonary emphysema.

Curvularia sp.

Reported to be allergenic and has been associated with allergic fungal sinusitis. It may cause corneal infections, mycetoma, and infections in immune compromised hosts.

Dreschlera sp.

Conidia dimensions: 40-120 x 17-28 microns. Found on grasses, grains and decaying food. It can occasionally cause a corneal infection of the eye.

Epicoccum sp.

Conidia dimensions: 15-25 microns. A common allergen. It is found in plants, soil, grains, textiles and paper products.

Fusarium sp.

Aw 0.90. A common soil fungus. It is found on a wide range of plants. It is often found in humidifiers. Several species in this genus can produce potent trichothecene toxins. The trichothecene (scirpene) toxin targets the following systems: circulatory, alimentary, skin, and nervous. Produces vomitoxin on grains during unusually damp growing conditions. Symptoms may occur either through ingestion of contaminated grains or possibly inhalation of spores. The genera can produce hemorrhagic syndrome in humans (alimentary toxic aleukia). This is characterized by nausea, vomiting, diarrhea, dermatitis, and extensive internal bleeding. Reported to be allergenic. Frequently involved in eye, skin, and nail infections.

Myxomycetes

Members of a group of fungi that is included in the category of "slime molds". They're occasionally found indoors, but mainly reside in forested regions on decaying logs, stumps, and dead leaves. Myxomycetes display characteristics of fungi *and* protozoans. In favorable (wet) conditions they exhibit motile, amoeba-like cells, usually bounded only by a plasma membrane, that are variable in size and form. During dry spells, they form a resting body (sclerotium) with dry, airborne spores. These fungi are not known to produce toxins but can cause hay fever and asthma.

Memnoniella

Contaminant found most often with *Stachybotrys* on wet cellulose. Forms in chains, but it are very similar to *Stachybotrys* and sometimes is considered to be in the *Stachybotrys* family. Certain species do produce toxins very similar to the ones produced by *Stachybotrys chartarum* and many consider the IAQ importance of *Memnoniella* to be on par with *Stachybotrys*. Allergenic and infectious properties are not well studied.

Nigrospora sp.

Commonly found in warm climates, this mold may be responsible for allergic reactions such as hay fever and asthma. It is found on decaying plant material and in the soil. It is not often found indoors.

Oidium sp.

The asexual phase of *Erysiphe* sp. It is a plant pathogen causing powdery mildews. It is very common on the leaf's stems, and flowers of plants. The health effects and allergenicity have not been studied. It does not grow on non-living surfaces such as wood or drywall.

Penicillium sp.

Aw 0.78 - 0.88. A wide number of organisms have been placed in this genus. Identification to species is difficult. Often found in aerosol samples. Commonly found in soil, food, cellulose and grains. It is also found in paint and compost piles. It may cause hypersensitivity pneumonitis, allergic alveolitis in susceptible individuals. It is reported to be allergenic (skin). It is commonly found in carpet, wallpaper, and in interior fiberglass duct insulation. Some species can produce mycotoxins. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include edema and bronchospasms; chronic cases may develop pulmonary emphysema. It may also cause headaches, vomiting, and diarrhea.

Periconia sp.

Periconia sp. are found in soil, blackened and dead herbaceous stems leaf spots, grasses, rushes, and sedges. Almost always associated with other fungi. Rarely found growing indoors. Reportedly associated with a rare case of mycotic keratitis.

Pithomyces sp.

A common mold found on dead leaves, plants, soil and especially grasses. Causes facial eczema in ruminants. It exhibits distinctive multi-celled brown conidia. It is not known to be a human allergen or pathogen. It is rarely found indoors, although it can grow on paper.

Rusts/Smuts

These fungi are associated with plant diseases. In the classification scheme of the fungi, the smuts have much in common with the rusts, and they are frequently discussed together. Both groups produce wind-borne, resistant teliospores that serve as the basis for their classification and their means of spread. Rusts usually attack vegetative regions (i.e., leaves and stems) of plants; smuts usually are associated with the reproductive structures (seeds). They can cause hay fever and asthma.

Spegazzinia

Spegazzinia species comprise a very small proportion of the fungal biota. This genus is somewhat related to other lobed or ornamented genera such as *Candelabrum*. No information is available regarding health effects or toxicity. Allergenicity has not been studied. Usually identified on spore trap samples where it is seen every few weeks. (Spores have very distinctive morphology.) May also be found in air by culturable (Andersen) samples if a long enough incubation period is provided so that sporulation occurs. Our laboratory has never found this organism growing on indoor environmental surfaces. Natural habitat includes soil and many kinds of trees and plants.

Stachybotrys sp.

Aw - 0.94, optimum Aw ->0.98. Several strains of this fungus (*S. atra, S. chartarum* and *S. alternans* are synonymous) may produce a trichothecene mycotoxin- Satratoxin H - which is poisonous by inhalation. The toxins are present on the fungal spores. This is a slow growing fungus on media. It does not compete well with other rapidly growing fungi. The dark colored fungus grows on building material with high cellulose content and low nitrogen content. Areas with a relative humidity above 55%, and are subject to temperature fluctuations, are ideal for toxin production. Individuals with chronic exposure to the toxin produced by this fungus reported cold and flu symptoms, sore throats, diarrhea, headaches, fatigue, dermatitis, intermittent local hair loss and generalized malaise. Other symptoms include coughs, rhinitis, nosebleed, a burning sensation in the nasal passages, throat, and lungs, and fever. The toxins produced by this fungus will suppress the immune system affecting the lymphoid tissue and the bone marrow. Animals injected with the toxin from this fungus exhibited the following symptoms: necrosis and hemorrhage within the brain, thymus, spleen, intestine, lung, heart, lymph node, liver, and kidney. Affects by absorption of the toxin in the human lung are known as pneumomycosis.

This organism is rarely found in outdoor samples. It is usually difficult to find in indoor air samples unless it is physically disturbed (or possibly -this is speculation- a drop in the relative humidity). The spores are in a gelatinous mass. Appropriate media for the growth of this organism will have high cellulose content and low nitrogen content. The spores will die readily after release. The dead spores are still allergenic and toxigenic. Percutaneous absorption has caused mild symptoms.

Stemphylium sp.

Reported to be allergenic. Isolated from dead plants and cellulose materials.

Torula sp.

Found outdoors in air, soil, on dead vegetation, wood, and grasses. Also found indoors on cellulose materials. Reported to be allergenic and may cause hay fever and asthma.

Tetraploa

Tetraploa species comprise a very small proportion of the fungal biota. This genus is somewhat related to *Triposporium* and Diplocladiella. The only reported human infections are two cases of keratitis (1970, 1980) and one case of subcutaneous infection of the knee (1990). No information is available regarding other health effects or toxicity. Allergenicity has not been studied. Usually identified on spore trap samples where it is seen every few weeks. (Spores have very distinctive morphology.) Our laboratory has never found this organism growing on indoor environmental surfaces. Natural habitat includes leaf bases and stems just above the soil on many kinds of plants and trees.

Ulocladium sp.

Aw 0.89. Isolated from dead plants and cellulose materials. Found on textiles.

Zygomycetes

Zygomycetes are one of the four major groups of fungi, the others being the Oomycetes, the Ascomycetes, and the Basidiomycetes. Zygomycetes are common, fast growing, and often overgrow and/or inhibit other fungi nearby. Rhizopus and Mucor are two of the most common Zygomycetes seen in the indoor environment. However, others are seen as well, including *Syncephalastrum*, *Circinella*, *Mortierella*, *Mycotypha*, *Cunninghamella*, and *Choanephora*. For further information, please see descriptions of these individual genera.

The following table lists mycotoxins that are produced by certain types of fungi:

Fungi	Mycotoxin
Acremonium crotocinigenum	Crotocin
Aspergillus favus	Alfatoxin B, cyclopiazonic acid
Aspergillus fumigatus	Fumagilin, gliotoxin
Aspergillus carneus	Critrinin
Aspergillus clavatus	Cytochalasin, patulin
Aspergillus Parasiticus	Alfatoxin B
Aspergillus nomius	Alfatoxin B
Aspergillus niger	Ochratoxin A, malformin, oxalicacid
Acremonium crotocinigenum	Crotocin
Aspergillus nidulans	Sterigmatocystin
Aspergillus ochraceus	Ochratoxin A, penicillic acid
Aspergillus versicolor	Sterigmatocystin, 5 ethoxysterigmatocystin
Aspergillus ustus	Ausdiol, austamide, austocystin,brevianamide
Aspergillus terreus	Citreoviridin
Alternaria	Alternariol, altertoxin, altenuene, altenusin, tenuazonic acid
Arthrinium	Nitropropionic acid
Bioploaris	Cytochalasin, sporidesmin, sterigmatocystin
Chaetomium	Chaetoglobosin A,B,C. Sterigmatocystin
Cladosporium	Cladosporic acid
Clavipes purpurea	Ergotism
Cylindrocorpon	Trichothecene
Diplodia	Diplodiatoxin
Fusarium	Trichothecene, zearalenone
Fusarium moniliforme	Fumonisins
Emericella nidulans	Sterigmatocystin
Gliocladium	Gliotoxin
Memnoniella	Griseofulvin , dechlorogriseofulvin, epi-decholorgriseofulvin, trichodermin, trichodermol
Myrothecium	Trichothecene
Paecilomyces	Patulin, viriditoxin
Penicillium aurantiocandidum	Penicillic acid
Penicillium aurantiogriseum	Penicillic acid
Penicillium brasilanum	Penicillic acid
Penicillium brevicompactum	Mycophenolic acid
Penicillium camemberti	Cyclopiazonic acid
Penicillium carneum	Mycophenolic acid, Roquefortine C
Penicillium crateriforme	Rubratoxin

Fungi	Mycotoxin
Penicillium citrinum	Citrinin
Penicillium commune	Cyclopiazonic acid
Penicillium crustosum	Roquefortine C
Penicillium chrysogenum	Roquefortine C
Penicillium discolor	Chaetoglobosin C
Penicillium expansum	Citrinin, Roquefortine C
Penicillium griseofulvum	Roquefortine C, cyclopiazonic acid, griseofulvin
Penicillium hirsutum	Roquefortine C
Penicillium hordei	Roquefortine C
Penicillium nordicum	Ochratoxin A
Penicillium paneum	Roquefortine C
Penicillium palitans	Cyclopiazonic acid
Penicillium polonicum	Penicillic acid
Penicillum roqueforti	Roquefortine C, Mycophenolic acid
Penicillium veridicatum	Penicillic acid
Penicillium verrucosum	Citrinin, ochratoxin A
Penicillium/ Aspergillus	Patulin
Penicillium/ Aspergillus/Alternaria	Glitoxin
Phomopsis	Macrocyclic trichothecenes
Phoma	Brefeldin, cytochalasin, secalonic acid, tenuazonic acid
Pithomyces	Sporidesmin
Rhizoctonia	Slaframine
Rhizopus	Rhizonin
Sclerotinia	Furanocoumarins
Stachybotrys chartarum	Iso-satratoxin F, roridin E, L-2, satratoxin G & H, trichodermin, trichodermol, trichothecene
Torula	Cytotoxins
Trichoderma	Trichodermin, trichodermol, gliotoxin
Trichothecium	Trichothecene
Wallemia	Walleminol
Zygosporium	Cytochalasin

General terms

Allergen

An allergen is a substance that elicits an IgE antibody response and is responsible for producing allergic reactions. Chemicals are released when IgE on certain cells contact an allergen. These chemicals can cause injury to surrounding tissue - the visible signs of an allergy. Only a few fungal allergens have been characterized but all fungi are thought to be potentially allergenic. Fungal allergens are proteins found in either the mycelium or spores

"Black mold"

A poorly defined term. Black mold or toxic black mold has usually been associated with the mold *Stachybotrys chartarum*. While there are only a few molds that are truly black, there are many that can appear black. Not all molds that appear to be black are *Stachybotrys*.

Fungi

Fungi are neither animals nor plants and are classified in a kingdom of their own. The Kingdom of Fungi. Fungi include a very large group of organisms, including molds, yeasts, mushrooms and puffballs. There are >100,000 accepted fungal species but current estimates range to 1.5 million species. Mycologists (people who study fungi) have grouped fungi into four large groups according to their method of reproduction.

Hidden mold

This refers to visible mold growth on building structures that is not easily seen, including the areas above drop ceilings, within a wall cavity (the space between the inner and outer structure of a wall), inside air handlers, or within the ducting of a heating/ventilation system.

Microbial Volatile Organic Compounds (MVOCs)

Fungi produce chemicals as a result of their metabolism. Some of these chemicals, MVOCs, are responsible for the characteristic moldy, musty, or earthy smell of fungi, whether mushrooms or molds. Some MVOCs are considered offensive or annoying. Specific MVOCs are thought to be characteristic of wood rot and mold growth on building materials. The human nose is very sensitive to mold odors and sometimes more so than current analytical instruments.

Mold

Molds are a group of organisms that belong to the Kingdom of Fungi (see Fungi). Even though the terms mold and fungi had been commonly referred to interchangeably, all molds are fungi, but not all fungi are molds.

Mycotoxin

Mycotoxins are compounds produced by some fungi that are toxic to humans or animals. By convention, the term? Mycotoxin. Excludes mushroom toxins. Fungi that produce mycotoxins are called "toxigenic fungi."

Spore

General term for a reproductive structure in fungi, bacteria and some plants. In fungi, the spore is the structure which may be used for dissemination and may be resistant to adverse environmental conditions.

Toxic mold

The term "toxic mold" has no scientific meaning since the mold itself is not toxic. The metabolic byproducts of some molds may be toxic (see mycotoxin).

Hypha (plural, hyphae)

An individual fungal thread or filament of connected cells; the thread that represents the individual parts of the fungal body.

Phoenix EnviroCorp

MOLD/BIOLOGICAL CONTAMINANT REMEDIATION PROTOCOL

Date: July 7, 2021

For: Quanesha Mullins
Wilmington Housing Authority
1524 S. 16th Street
Wilmington, NC 28401

Remediation Contractor: Not determined

On-Site Consultant: Phoenix EnviroCorp (PEC)
4020 Shipyard Boulevard
Wilmington, NC 28403
(910) 397-0370

Approved Signatory:

Shaenaz Mirmohamed
IH Technician

Tommie Green, CIEC
Professional Industrial Hygienist

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SECTION 1.0 REMEDIATION PROCEDURES

1.1 Project Set Up

- The owner or powers that be shall supply temporary power for remediation equipment. The existing electrical system may be utilized, with permission of the owner or powers that be. Determining specific electrical load/safety requirements, including, but not limited to, the use of a temporary GFCI electrical panel box shall be the responsibility of the abatement contractor.
- HVAC system shall be isolated.
- 6-mil polyethylene sheathing shall be erected to separate primary control areas (PCA) from remaining areas. Control areas shall be selected so that specified building materials (specified herein, in section 1.3, under primary control areas) may be removed or cleaned and dried.
- HEPA Air Filtration Devices shall be utilized for each separate control area. Critical barriers shall consist of 6-mil polyethylene so that primary control areas are isolated from remaining areas. HEPA filtration units shall be exhausted from the PCA to the outside of the building through windows/doors. Dehumidification units must be installed in the PCA to sufficiently dry components.
- A remote wash off station shall be set up to allow for employees to wash hands and faces after egress from the work area.
- Ingress/Egress to the control area(s) shall be, at minimum, sealed with a 2-way polyethylene air lock.
- Entrances to the building shall be marked as indicated in Section 7.4 of this document.

1.2 Local Exhaust System

- Once sealed, the primary control area shall be ventilated with a local HEPA air filtration device that shall ensure a minimum of four (4) air changes per hour. The air filtration device shall be placed within the containment work area.
- Local HEPA exhaust shall be utilized where cleaning of contents is required and/or in the immediate vicinity of remediation activities of building materials.
- In interior sections requiring surface area cleaning, local HEPA filtration may be exhausted within the area to scrub microbials from ambient air. This process shall only be conducted after fine cleaning has been completed.
- Negative pressure within the contained work area shall be maintained throughout the project until clearance is obtained.
- Negative air machines shall be exhausted to exterior portions of the building to adequately ensure that negative pressure is achieved.
- Negative air pressure within the work area shall be tested and recorded at initiation of the project and hourly thereafter by use of a manometer to ensure the desired pressure of -0.02 inches of water, which is comparable to four changes per hour.
- Dehumidification devices with HEPA filtration may be incorporated as filtration devices in conjunction with true HEPA filtration devices; they may not replace the true HEPA filtration devices.

Note: Formula for determination of adequate HEPA filtration:

Total feet per minute =Volume of work area (ft^3)/15 minutes
#AFD Units needed = (Total feet per minute)/Capacity of Unit (ft^3)

- At initiation of final cleaning stages, relative humidity shall be at 40% (+/-3%) and moisture content of wooden components shall be at or below 15% as determined by Delmhorst moisture meter or equivalent meter. Moisture mapping and direct read T/RH shall be recorded by the remediation contractor until the

specified levels have been achieved. Control areas shall be dehumidified during cleaning and mold remediation activities to ensure removal of surface moisture created during application of water. Drying of structural components that have been treated with encapsulating anti-microbial agents will be necessary.

- Moisture levels shall be recorded and documented by the remediation contractor upon successful completion of dehumidification.

1.3 Remediation Specifications

- Prior to commencement of mold remediation activities by the remediation contractor, the source of any water intrusions, leaks, and/or moisture/humidity problems shall be remedied by the owner. If water intrusions, leaks, and/or moisture/humidity problems exist and are not corrected, mold growth can be expected to return.
- All remediation procedures listed that involve the removal of building materials shall employ polyethylene critical barriers, negative air pressure, and HEPA filtration (i.e., primary control areas).
- The remediation contractor shall ensure that the filters are properly capped prior to switching off the air scrubbers. If the filters are not properly capped, the backflow can cause mold spores to re-release back into the control area, essentially re-contaminating an area that has already been cleaned.
- All remediation activities shall be conducted in a manner that does not allow dissemination of mold spores. Remediation procedures shall begin from the side of the control area furthest away from air filtration devices.
- Cleaning procedures shall be repeated until the area is visibly free of dust and debris.
- Engineering controls set up during the remediation process shall remain in place until remediation has been completed and acceptable post remediation sampling results have been achieved.
- **Federal and/or state regulations require that suspect asbestos containing materials in public and commercial buildings shall be inspected for asbestos prior to renovations or demolition. Based on these regulations, PEC recommends that building materials that may be disturbed during mold remediation be tested for asbestos content prior to their disturbance to prevent asbestos contamination.**
- If cleaning procedures outlined in this remediation plan outweigh the cost of replacement for selected items, the remediation contractor shall give the owner the option to clean or dispose of those items.
- Reinstallation of building materials and/or components shall only be conducted once acceptable post remediation results are obtained.
- Any chemicals used on this project shall be EPA approved and used only as directed by the manufacturer. MSDS shall be available for review upon request.

HVAC System

- The HVAC system(s) that services or run through the primary control area/affected area shall be shut down prior to remediation activities.
- The spaces that are normally climate-controlled by the HVAC system that have been shut down shall be maintained under proper humidity levels (between 30 and 60% utilizing dehumidifiers, etc.) while the system is not in operation.
- All HVAC supply/return vents within the primary control area/affected area shall be isolated with a critical barrier (i.e., plastic, etc.) to prevent air flow. Prior to isolating the vents, the register covers (diffusers) shall be removed, and the supply shall be isolated at the metal boot. Once isolated, the registers and surrounding building materials shall be cleaned.
- The interior of the air handler, rigid duct system, intake box, etc. shall be thoroughly cleaned by an HVAC professional experienced in mold remediation. The interior can be cleaned with mechanical methods that aggressively disturb all interior surfaces and filter the disturbed airborne particulates.

- Cleaning of components shall consist of a method that thoroughly removes visible mold growth, settled concentrations of mold spores, and/or dust and debris.
- PEC recommends the removal and disposal of any fibrous or porous materials (i.e., insulation, etc.) from the interior of the HVAC system, to include but not limited to the air handler and rigid ductwork system. PEC also recommends that an HVAC professional design the re-insulation of the HVAC system without the use of porous interior insulation when possible.
- PEC recommends the removal and disposal of the flex ducts when feasible, as well as any interior duct board where cleaning will damage the duct board. Once removed, the remediation contractor shall isolate the connection point where the flex duct and/or duct board was detached with a critical barrier (such as plastic, etc.) to prevent air flow.
- Once the HVAC system components are cleaned or replaced anew, the system shall remain off and isolated until acceptable post remediation results are obtained.
- A written document shall be obtained from the remediation contractor verifying that the HVAC system has been cleaned by an HVAC cleaning company with mold experience. This document shall include the property address and date of services and shall be filed with other mold remediation documents.

Note: For directional purposes "front" is determined by facing Grass Lane from inside the residence/building, unless otherwise noted.

Primary Control Areas/Affected Areas

Critical barriers, negative air pressure, and HEPA filtration shall be established to isolate the following areas as Primary Control Areas to perform the specified mold remediation.

Within the kitchen:
- Detach the floor mounted cabinet from the front and rear walls, and remove any affected drywall (i.e., drywall with apparent water damage/suspect visible mold growth) and extend the drywall removal within a 2-foot radius of the affected area when possible.
- Remove ceiling drywall. The width of this removal shall be 7 feet beginning at the front wall and extending to the rear wall. The length of this removal shall be 8 feet beginning at the left wall and extending to the right wall.

Within the bathroom:
- Detach the floor mounted cabinet and baseboard from the front wall, and remove any affected drywall (i.e., drywall with apparent water damage/suspect visible mold growth) and extend the drywall removal within a 2-foot radius of the affected area when possible.
- Remove ceiling drywall. The width of this removal shall be 3 feet beginning at the front wall and extending to the rear wall. The length of this removal shall be 8 feet beginning at the right wall and extending to the left wall.

Within the front left bedroom:
- Remove ceiling drywall. The width of this removal shall be 7 feet beginning at the left wall and extending to the right wall. The length of this removal shall be 10 feet beginning at the rear wall and extending to the front wall.

Throughout the unit (Negative air pressure is not required in areas where building components are not specified for removal, but HEPA filtration is required):
- Clean all surfaces as specified herein under general specifications for primary control areas.
- **Areas of specified ceiling removal shall be sealed with poly (i.e., critical barrier) after cleaning, but before HEPA air scrubbing after cleaning, to prevent air flow from areas outside the containment area. An access door (i.e., poly flap taped in place, zipper, etc.) shall be installed in the critical**

barrier for easy access to conduct a visual inspection of the building materials behind the critical barrier.

General Specifications for Primary Control Areas

- Open plumbing lines and drains within the control areas shall be isolated with a critical barrier consisting of 6-mil poly.
- The water line to toilets within the control areas shall be shut off and the toilets shall be isolated with a critical barrier consisting of 6-mil poly.
- Cleaning of components/materials shall consist of a method that thoroughly removes visible mold growth, settled concentrations of mold spores, and/or dust and debris (i.e., HEPA vacuuming, wet wiping, or other approved methods), followed by dehumidification/drying.
- Exterior surfaces of electrical appliances, electrical equipment, and light fixtures shall be cleaned, utilizing wet method and HEPA vacuuming. These items shall be disconnected from all electrical sources prior to cleaning. If these items cannot be cleaned efficiently, the abatement contractor shall consult with the owner/powers that be.
- All wall/ceiling cavity insulation shall be disposed in areas that specify the removal of drywall/wallboard. The abatement contractor shall visually inspect the back side of surrounding drywall/wallboard for water damage and/or suspect mold growth and document any findings. If additional suspect mold growth or water damage is observed beyond the specified removal area, additional drywall/wallboard shall be removed until no suspect mold growth or water damage is observed.
- All penetrations within the controlled area that adjoin unaffected or non-accessible areas, including outdoor areas, crawlspaces, etc., shall be cleaned (as far as one can reach) and then sealed with 6-mil poly, extending six (6) inches on all sides.
- In areas of specified wallboard removal, all components within the wall/ceiling cavities shall be cleaned. Any wooden structural components with mold stains or mold growth in pitted surfaces shall be HEPA sanded (or other approved methods) to eliminate embedded mold growth.
- All joints or sills (where the structural system meets, where the sill plate meets the floor, etc.) shall be aggressively disturbed to remove embedded mold growth and spores.

1.4 Removal Procedures

The contractor shall maintain surfaces of the control area free of accumulation of dust and debris. Additionally, they shall restrict the spread of dust and debris, keeping waste from being distributed over the work area. Materials shall be removed in a fashion to ensure that previously cleaned areas are not recontaminated (i.e. working from one end of the control area to the other). The contractor may be required to re-clean areas based on a visual inspection by the CIEC/CIE/IH, if the areas are not visibly clean.

Contaminated building materials that have been removed, and additional materials and debris generated during remediation, shall be bagged or wrapped with 6-mil polyethylene sheeting, sealed with duct tape, and carried to the waste container prior to visual inspection by the CIEC/CIE/IH. Materials shall be bagged and sealed directly after removal from unaffected building components.

Areas shall be allowed to dry for a period until specified RH and moisture levels have been achieved. Any remaining building products that are directly impacted by remediation shall be tested for moisture content. Wooden and cellulosic building components (e.g., wall studs, drywall, etc.) shall be tested for moisture content. If the moisture content is > 15% in wood products or > 12% in cellulosic products (utilizing a Delmhorst moisture meter), dehumidification shall be required until moisture levels are at or below said levels, and the RH level is at or below 40% +/-3% (for all interior areas). The remediation contractor shall verify water content of all wooden and cellulosic building components within the impacted areas, as well as temperature and RH prior to scheduling post remediation verification.

1.5 Cleanup Overview

The contractor shall personally review the cleaning process prior to contacting the CIEC/CIE/IH for the post remediation testing. If accumulations of debris and dust are significant, the CIEC/CIE/IH will require re-cleaning prior to post remediation verification sampling.

The CIEC/CIE/IH shall make a visual inspection and conduct post remediation sampling after the final cleaning is complete.

1.6 Post Remediation Verification Testing

Prior to conducting post remediation sampling, HEPA filtration devices shall be allowed to operate for a minimum of 48 hours (the equivalent of 192 air changes), following fine cleaning, in all areas where remediation has been conducted. The HEPA filtration devices shall be sealed at the intake and turned off approximately two hours prior to post testing and reconvene within one hour after post testing, until acceptable post remediation results are established.

Post remediation sampling shall be conducted utilizing viable and/or non-viable sample methods. Air samples shall be collected in representative areas of the control areas. Surface sampling may be conducted at the discretion of the CIEC/CIE/IH.

Sampling shall be conducted in areas directly impacted by remediation procedures, where cleaning was conducted. The CIEC/CIE/IH shall determine acceptable post remediation status through interpretation of air sampling results, which will be based on indoor/outdoor comparisons, in combination with any surface samples collected, moisture readings, RH readings, visual observations, and any other pertinent information.

The owner/client will be responsible for post remediation testing. If air sample results indicate unacceptable airborne concentrations, the contractor shall be required to conduct a re-cleaning at the contractor's expense and absorb the cost for re-testing, until acceptable results are achieved.

SECTION 2.0 SCOPE OF WORK (Note: Section 2 and Section 1.3 are essential to the full Scope of the Contractor's Work)

2.1 Investigative Reports and Other Related Documents

Phoenix EnviroCorp initial investigative report dated June 7, 2021.

Phoenix EnviroCorp investigative report dated July 7, 2021.

Phoenix EnviroCorp Chain of Custody dated June 1, 2021, and June 25, 2021.

Analytical reports dated June 4, 2021, and June 28, 2021.

2.2 Project Description

The procedures covered by this program include the enclosure and drying of the said structure, the removal, handling, and disposal of building components compromised by mold/fungal growth, and the cleaning and disinfecting of existing building materials. Procedures for reconstruction are not considered in these

specifications. Reconstruction of interior portions may not be conducted until procedures for remediation have been completed, the control areas have been inspected, and testing has returned acceptable post remediation results. Reconstruction of exterior portions may be conducted during the restoration to ensure that water intrusion is abated.

The objectives covered by the program include the remediation of materials shown to have surface contamination, water damage, and/or exposure to elevated airborne mold spore levels, without subjecting the workers, installation employees, and occupants to microbial contaminants. In addition, contract employees, occupants, and materials will be appropriately protected during the removal process so that present and future exposures will not occur.

This protocol is provided as a guideline. Any deviation requests from this protocol shall be addressed to the CIEC/CIE/IH for consideration. At present there are no Federal or State requirements regarding microbial remediation projects; however, OSHA General Construction Code of Federal Regulations (29 CFR 1926) shall be followed.

Remediation shall be completed as close to the date that this protocol was drafted, as the specifications outlined within represent conditions at the time the investigative services were conducted. Due to the volatility of mold, the current protocol may not reflect all necessary remediation if conditions are allowed to continue. Further, if time lapses allowing conditions to change, it will become increasingly difficult to obtain successful clearance testing results.

SECTION 3.0 AIR MONITORING

3.1 Responsibilities of the CIEC/CIE/IH

Monitoring of airborne concentrations will be performed in accordance with the requirements of this program. Prior to conducting air sampling and/or surface sampling for clearances, the CIEC/CIE/IH shall conduct a visual inspection of the area. Temperature and RH shall be recorded during the air sampling phase of clearance. All air sampling shall be conducted in such a manner as to provide a valid representation of airborne mold levels both inside and outside the work areas. If analysis of air samples indicates that airborne concentrations exceed acceptable limits, the contractor shall conduct re-cleaning at the contractor's expense.

3.2 Personal Monitoring

No personal monitoring will be conducted by the CIEC/CIE/IH unless the remediation contractor requests monitoring for OSHA compliance. Presently there are no guidelines (PELs or TLVs) for microbial contaminants. It is the remediation contractor's responsibility to determine if OSHA personal sampling may be required during application of anti-microbial agents.

3.3 Sample Integrity and Reporting

Samples shall be sealed, labeled, and a chain of custody initiated according to laboratory procedures.

Sample results shall be available within seven (7) days of the completion of collection of all samples and will include the following information:

- Site Address
- Sample Number
- Location Sampled

- Analytical Method
- Collection Date(s)
- Person Taking Sample(s)
- Additional Comments (if any)
- Analyst Signature

SECTION 4.0 MATERIAL REPLACEMENT

4.1 Material Replacement

The general contractor/replacement contractor may begin material replacement after the CIEC/CIE/IH informs all parties of acceptable post remediation sample results.

With ongoing construction activities ambient air levels are expected to be elevated over what might be normally expected. Additional testing should not be necessary after remediation procedures have been completed and successful results have been obtained. In the event of another water intrusion (i.e. broken-pipe-line, improper HVAC function, or building envelope compromise), an investigation shall be conducted within 24 to 48 hours of the event. Proper drying, if initiated within this time frame, should minimize the potential for microbial growth.

SECTION 5.0 SPILL CLEANUP REQUIREMENTS

5.1 Spills

MSDS shall be kept on site for all chemical products brought to the site by the remediation contractor. In the event of a chemical spill, the contractor shall initiate cleanup immediately. The contractor shall mop up any liquid with rags or other conventional absorbent. The spent absorbent shall be properly contained and disposed of as waste.

SECTION 6.0 WASTE CONTROL

6.1 Waste Disposal

Waste shall be disposed of at a locally selected landfill. Waste bags shall be checked for integrity and hauled in an enclosed truck/vehicle or container to ensure that transportation to the landfill does not pose a potential hazard to the environment.

SECTION 7.0 SUPPLEMENTAL INFORMATION

7.1 Applicable Publications

The publications listed below form part of this program. Written programs shall accompany all referenced CFR publications. IICRC and NYCDOH guidelines for work procedures shall be followed by the remediation contractor. A copy of the NYCDOH protocols shall be on-site, along with this design, for reference by the site supervisor. ACGIH, IAQA, and ASHRAE publications shall be utilized as guidelines for interpretation by the CIEC/CIE/IH. This design shall be reviewed by the remediation supervisor prior to initiation of set-up for the project. Any questions regarding this project may be addressed with the on-site consultant listed for Phoenix EnviroCorp.

Code of Federal Regulation (CFR Publications)

29 CFR 1910.134	Respiratory Protection
29 CFR 1910.145	Specifications for Accident Prevention, Signs and Tags
29 CFR 1926.28	Personal Protective Equipment
29 CFR 1926.59	Hazard Communication
29 CFR 1926.96	Occupational Foot Protection
29 CFR 1926.100	Head Protection
29 CFR 1926.101	Hearing Protection
29 CFR 1926.102	Eye and Face Protection
29 CFR 1926.403	Electrical General Requirements
29 CFR 1926.416	Safety General Requirements
29 CFR 1926.852	Demolition, Chutes
29 CFR 1926.1091	Record Keeping Requirements

Supplemental Guidelines

IICRC S520 2nd ed.	Standard and Reference Guide for Professional Water Damage Restoration
NYCDOH	Guidelines on Assessment and Remediation of Fungi in Indoor Environments
ACGIH	Bioaerosols: Assessment and Control
IAQA 01-2000	Recommended Guidelines for Indoor Environments
ASHRAE 62.2-2007	Ventilation for Acceptable Indoor Air Quality in Low-Rise Residential Buildings

7.2 Definitions

Air Lock: A system that permits ingress and egress between a control area and non-control area, or other work areas, without allowing air movement between areas (e.g., three stage decon, three-way polyethylene flaps).

Air Sample: Refers to samples collected with spore trap air sample media (e.g., Micro-5, Cyclex D, or equivalent); also referred to as a non-viable air sample. May also refer to a sample collected on a disposable petri dish with Agar media by means of an Andersen Impactor (or equivalent) and sampling pump; also referred to as air culture (viable) sample. Sample media to be used in project is described under Section 1.6 (Post Remediation Verification Testing).

Area Monitoring: The sampling of airborne microbial concentrations outside the exclusion boundary, which may reach the breathing zone of the contractor or installation employees.

Asbestos Containing Materials (ACM): Refers to asbestos containing building materials that contain more than 1% asbestos by Polarized Light Microscopy (PLM) or Transmission Electron Microscopy (TEM).

Biocide: Refers to chemical agents that are specifically designed to eliminate viable microbial contamination, with a phenol equivalent efficiency (e.g., Sodium Hypochlorite, Quaternary Ammonia Compounds).

Blower Door Test: Refers to the testing of static pressure and draw of air through the HVAC in cubic feet per minute (CFM) to rate the efficiency of the system.

Clearance Monitoring: Refers to air, bulk, or swab sampling conducted as a means to demonstrate that the area specified for remediation has been completed by the contractor, left with present acceptable mold spore levels, and ready for re-construction.

Control Area: The area where microbial contaminants removal is performed, which is isolated by physical boundaries to prevent unauthorized entry of personnel, thereby preventing exposure to or the spread of microbial contaminants. Physical boundaries will be established and located such that the airborne contaminants are not allowed to escape the boundaries.

HEPA: High Efficiency Particulate Air. Refers to ventilation devices that are specifically designed to filter ambient air to an efficiency of 99.97%.

HVAC: Refers to the Heating, Ventilation, and Air Conditioning system.

Industrial Hygienist: Refers to a person who practices industrial hygiene and may act as a competent person regarding visual inspection of contaminated surfaces and clearance air and/or swab/bulk sampling. May also refer to a Certified Industrial Hygienist (CIH) as defined by the American Board of Industrial Hygiene (ABIH), a Certified Indoor Environmental Consultant as defined by the American Council for Accredited Certification (ACAC), or a Certified Indoor Environmentalist (CIE) as defined by the American Council for Accredited Certification (ACAC).

Microbial Contaminant: Refers to viable mold, fungi, pollen, bacteria, and or particulate, or their metabolites, that may be causative of epidemiological, immunotoxic, dermotoxic, neurotoxic, or enterotoxic disorders in the human population, or may be considered a pathogen or an opportunistic pathogen.

Non-Porous Materials: Refers to building materials with solid surfaces that may be successfully treated and cleaned by means of HEPA vacuuming or other approved method. Materials include flooring, hard goods, plastic, vinyl, and some wallboard systems.

Porous Materials: Refers to building materials and household goods that may allow microscopic particles (3-20 micron) to become trapped within the material that will not allow adequate cleaning. Materials include carpet, mattresses, and clothing.

Primary Control Area (PCA): Refers to a section of a facility that has been isolated by 6-mil polyethylene barriers where specific engineering controls (e.g., HEPA filtration, negative air pressurization, dehumidification, etc.) are required. In general, it is the area where remediation of water and mold damaged building materials is to be conducted.

Refrigerant Dehumidifier: Device used to remove water content from air and materials.

Relative Humidity (RH): Refers to the ratio of water vapor in the atmosphere to the amount required to saturate it at a given temperature.

Semi-Porous Materials: Refers to materials that may be somewhat porous, yet they may still allow for adequate cleaning. Materials include wooden beams and some wallboard systems.

Swab Sample: Refers to collection of a sample onto a sterile swab for analysis of mold, fungi, and bacteria by viable and/or non-viable analysis.

Tape-Lift Sample: Refers to collection of a sample onto clear scotch tape for analysis by direct microscopic examination (non-viable).

7.3 Quality Assurance

Medical Examinations

Before potential exposure to microbial contaminants, the remediation contractor shall provide workers with a comprehensive medical examination as required by 29 CFR 1910.134 as outlined by the Medical Monitoring Program.

Medical Records

The remediation contractor shall maintain complete and accurate medical records on employees as required by OSHA and the contractor's Medical Monitoring Program. The contractor may be asked to provide a copy of all medical records for approval by the consultant's representative.

Training

Each employee working on this contract shall be trained prior to the time of initial job assignment in accordance with mold specific and chemical specific training as indicated by the OSHA General Duty Clause and the Hazard Communication Standard. Each employee shall also receive training required by Federal guidelines listed in Section 7.1 of this document and project specifications.

Hazard Communication Program

The remediation contractor has established and implemented a Hazard Communication Program as required by 29 CFR 1910.1200 and may be asked to provide a copy of this written program. Hazard Communication training must include occupational hazards as directly related to working with fungi/mold and contamination of building components by fungal contamination, specific training for chemical hazards associated with biocide usage, and site specific MSDS sheets for commercial detergents and biocides utilized on the job site.

Respiratory Protection Program

The remediation contractor has established a Respiratory Protection Program, which complies with 29 CFR 1910.134. Physical examinations and fit testing are required for use of respiratory protection greater than an N-95 dust mask. Workers removing building materials contaminated by mold growth, applying anti-microbial agents, or workers subjected to exposures to anti-microbial agents shall be required to wear, at minimum, a tight-fitting negative pressure ½ mask respirator with P-100 filters. Therefore, -he OSHA Respiratory Protection Standard applies.

Analytical Testing Laboratory

Analysis of culturable biological samples collected on this project shall be conducted by a laboratory that participates in the Environmental Microbiological Proficiency Analytical Testing Program (EMPAT) of the American Industrial Hygiene Association (AIHA) and has shown to be proficient by proficiency analytical testing (PAT) samples. Analysis of non-viable air and surface samples shall be conducted by a competent person.

7.4 Materials and Equipment

Equipment

The contractor shall make available to employees a complete set of personal protective equipment (PPE) as

required by this program for entry into the controlled area. All personnel while in the control area or handling microbial contaminated waste shall wear protective clothing, respirators, and other PPE.

Respirators

Contractor shall furnish the appropriate respirator in accordance with 29 CFR 1910.134 and approved by NIOSH for protection in environments that contain microbial contaminants. The selected respirator for this project shall be a tight-fitting negative pressure ½ respirator equipped with HEPA cartridge (P-95, P-100). At minimum, an N-95 dust mask may be utilized during fine cleaning activities; however, the tight fitting ½ mask respirator shall be utilized during application of anti-microbial agents or biocides.

Special Clothing

Employees shall be provided with and required to wear: whole body disposable protective clothing, full body tyvek suits with head coverings, and latex gloves *(see table)* during all activities in the controlled area.

Chemical	Recommended Rubber Glove
Sodium Hypochlorite	Neoprene or Nitrile
Phenolic Compounds	Neoprene
Quaternary Ammonia Compounds	Polyvinyl Chloride (PVC)
Detergents	Latex

Eye Protection

The contractor shall provide chemical-resistant goggles to personnel engaged in cleaning and treatment activities and require them to be worn during application of anti-microbial agents and biocides.

Warning Signs and Labels

Standard approved warning signs shall be erected at all approaches to the control area as specified in 29 CFR 1910.145.

Anti-Microbial Agents

Anti-microbial agents utilized in interior quarters shall consist of quaternary ammonia compounds. No phenolic compounds shall be used in interior quarters with exception of Micro Ban Plus. Approval must be granted by the owner/powers that be prior to application. Anti-microbial agents shall be EPA approved. Commercial grade detergents shall be used to remove fungal contamination during cleaning phases prior to anti-microbial application, to include encapsulation.

Phoenix EnviroCorp

December 3, 2021

Quanesha Mullins
Wilmington Housing Authority
1524 S. 16th Street
Wilmington, NC 28401

RE: PEC Job # 21-21-181A-IAQ-M – 302 Grass Lane, Unit 105, Wilmington, NC - Mold Investigation

Enclosed are the results of the mold investigation conducted at the above referenced unit on December 02, 2021. Phoenix EnviroCorp (PEC) was retained to conduct a mold investigation and provide a mold remediation protocol

Background Information: PEC conducted an investigation on June 1, 2021, identifying elevated airborne mold spore levels and surface mold growth to include *Chaetomium* withing the residence.

Note: There appears to have been additional damage (i.e., suspect visible mold growth/Apparent water damage) since PEC's initial investigation conducted on June 1, 2021. Additional investigative activities were conducted accordingly.

This is a two-story apartment building built on a slab. The subject unit is on the 1st floor, is vacant with miscellaneous contents throughout, and is without carpet.

The HVAC system was off upon PEC's arrival and during sampling.

Related Documents:
- PEC initial investigation report dated June 7, 2021

Note: For directional purposes "front" is determined by facing Grass Lane from inside the unit, unless otherwise stated.

Visual Inspection: PEC's visual inspection noted the following (see enclosed photographic documentation):
The unit is vacant, but contents/trash were left in the unit.
Kitchen
- Suspect visible mold growth on the interior and exterior of the kitchen cabinets
- Standing water on the floor

Living room
- Irregular/apparent water damage on the ceiling throughout
- Suspect visible mold growth on the contents (i.e., chairs, sofa, etc.)
- Water damage/hole on the rear wall
- Discoloration/suspect visible mold growth in the rear wall cavity

Bathroom
- Suspect visible mold growth/apparent water damage on the ceiling
- Suspect visible mold growth on the front wall

- Suspect visible mold growth in the cabinet on the front wall

Rear left bedroom
- Suspect visible mold growth in the closet on the front, right, rear, and left walls
- Suspect visible mold growth on the closet ceiling
- Suspect visible mold growth on the front right and right walls of the bedroom

Rear right bedroom
- Suspect visible mold growth on the contents left in the room
- Suspect visible mold growth in the closet on the rear left wall
- Suspect visible mold growth on the front left wall of the bedroom

Mold Testing – Surface: Non-viable surface samples were collected from areas of suspect visible mold growth. The quantifications of fungal growth are reported as scattered spores, 21-100 fungal spores = very light (VL), 101-1,000 fungal spores = light (L), 1,001-10,000 fungal spores = moderate (M), > 10,000 fungal spores = heavy (H). The 'General Impressions' of fungal growth are reported as no fungal growth (NFG), fungal growth (FG), minimal fungal growth or growth in vicinity (MFG), and no fungal spores detected (ND). *Clear tape was utilized for the collection of surface samples. Each sample was assigned a unique ID number and shipped to a third-party laboratory for analysis.* Sampling locations and results are as follows:

Location	Result
Inside of the floor-mounted cabinet in the kitchen	**M – FG** *Chaetomium*
Exterior of kitchen cabinets	**H – FG** *Penicillium/Aspergillus*
Living room rear wall cavity	**VL – FG** *Basidiospores* **M – FG** *Chaetomium*
Bathroom ceiling	**H – FG** *Penicillium/Aspergillus*

Mold Testing – Air: Non-viable spore trap air samples were collected to determine airborne mold spore levels. Samples were collected within the front right bedroom, the living room/kitchen, the rear right bedroom, the rear left bedroom, and the bathroom. *Micro 5 sampling media was utilized for the collection of spore trap air samples. Each sample ran for five (5) minutes at a flow rate of five (5) liters per minute for a total volume of twenty-five (25) liters per sample. Each sample was assigned a unique ID number and shipped to a third-party laboratory for analysis. All air samples were collected from centralized locations (within their respective areas) and within the breathing zone, unless otherwise noted.* Two samples were also collected outdoors for comparative purposes.

Results identified elevated airborne levels of *Penicillium/Aspergillus* within all sampled locations, and *Stachybotrys* within the front right bedroom and the bathroom.

The interpretation of air sample results is based on indoor/outdoor comparisons, in combination with a study by Daniel M. Baxter, entitled "A Regional Comparison of Mold Spore Concentrations Outdoors and Inside "Clean" and "Mold Contaminated" Southern California Buildings", and other industry guidelines, as well as over 20 years of experience in industrial hygiene and mold testing.

In layman terms, acceptable levels indicate that the levels are below the outdoor level and/or the baseline levels (whichever is higher) stated below. Elevated levels indicate that the levels are above the outdoor level and/or the baseline level.

Baseline levels for indoor spore trap air samples are as follows: < 900 spores/m³ for Penicillium/Aspergillus; 0 spores/m³ for Stachybotrys and Chaetomium; and < 350 spores/m³ for

other individual mold groups.

Moisture Readings: Moisture readings were collected with either a Delmhorst moisture meter or a Tramex Survey Encounter. Multiple readings were taken to represent areas and materials reported. *Readings are marked with either a D or T to denote which meter was used.* For drywall products, readings should be less than or equal to twelve percent (≤ 12%) by Delmhorst and below fifty percent (50%) by Tramex. For wood products, normal moisture content should be less than fifteen percent (<15%) for both meters.

Moisture content measurements were as follows:
Kitchen
- Front drywall wall in cabinet = ≤ 10% (D), wood cabinet on the front wall = ≤ 10% (T)
- Wood baseboards = < 10% (D)

Living room
- Ceiling drywall = < 10% (T), wood baseboard on the front, left, and right walls = < 10% (D), wood baseboard on rear wall = ≤ 15% (D)
- Rear drywall wall = 10-40% (D)

Bathroom
- Ceiling drywall = 20-100% (T)
- Cabinet wood front wall = 25% (T), cabinet wood floorboard = 30% (T)
- Wood baseboards = 15-20% (D)

Rear left bedroom
- Ceiling drywall = 20-30% (T), drywall walls 20-40% (T)
- Front drywall wall 20-40% (T), right drywall walls = ≤ 20-40% (T)

Rear right bedroom
- Drywall walls = < 20% (T), wood baseboards = < 10% (D)
- Drywall walls = ≤ 20% (T), wood baseboards = ≤ 10% (D)

Hallway
- Wood baseboards in the hallway = 23% (D), remaining baseboards = < 15% (D)

Relative Humidity (RH): *Temperature and relative humidity readings were collected in the same locations as the spore trap air samples.* RH levels within the unit ranged from 68.6% – 70.8% with an outdoor reading of 43.3% (see the enclosed Chain of Custody for details). Per the American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) Standard 62-1999, relative humidity should range between 30% and 60%. **Consistent RH levels above 60% are conducive to mold growth.**

Conclusions: Sample results identified elevated airborne mold spore levels, to include *Stachybotrys*, and surface mold growth, to include *Chaetomium*, in addition to apparent water damage within the residence. A mold remediation protocol that outlines remediation activities is attached.

Prior to commencement of mold remediation, the source of any water intrusions, leaks, and/or moisture/humidity issues shall be remedied. If water intrusions/moisture issues exist and are not remedied, mold can be expected to return.

After remediation activities are completed, but before put-back of removed components, post remediation verification shall be conducted. Upon notice, and for an additional fee, PEC can conduct post remediation verification testing.
Enclosed in this report are the laboratory analysis and the Chain of Custody.

Should you have any questions, please do not hesitate to call.

Thank you,

Shaenaz Mirmohamed
IH Technician

Tommie Green, CIEC
Professional Industrial Hygienist

Enclosures

Photo 1

Suspect visible mold growth in the kitchen floor mounted cabinet on the front wall

Photo 2

Suspect visible mold growth on the kitchen cabinets

Photo 3

Suspect visible mold growth on the kitchen cabinets

Photo 4

Standing water on the kitchen floor

Photo 5

Apparent water damage on the living room ceiling

Photo 6

Suspect visible mold growth on furniture in the living room

Photo 7

Hole and suspect visible mold growth in the living room rear wall

Photo 8

Suspect visible mold growth on the bathroom front wall

Photo 9

Suspect visible mold growth in the bathroom cabinet

Photo 10

Suspect visible mold growth on the rear left bedroom closet ceiling

Photo 11

Suspect visible mold growth on the rear left bedroom closet walls

Photo 12

Suspect visible mold growth on the rear left bedroom front and front right walls

Photo 13

Suspect visible mold growth on the rear right bedroom rear left wall

Photo 14

Suspect visible mold growth on contents left in the rear right bedroom

Phoenix EnviroCorp

CHAIN OF CUSTODY

LABORATORY TEST REQUEST

Ref #: 211203030 Lab ID: 104-118

CONTACT: Shaenaz Mirmohamed	TELEPHONE (910) 397-0370 FAX (910) 313-6094	Sample date: 12/2/2021
PEC Job #: 21-21-181A-IAQ-M	SITE ADDRESS:	302 Grass Lane, Unit 105, Wilmington, NC 28405

PLEASE EMAIL RESULTS TO: KMGREEN@PHOENIXENVIROCORP.COM

SAMPLE TYPE:	NUMBER OF SAMPLES:	TURN AROUND TIME SPECIFIED:
Spore Trap - Micro-5	7	____ Immediate ____ 24 hr ____ 48 hr __X__ Standard
Surface Samples	8	

Sample #	Sample	Sample Volume	Lab Analysis Requested	% Relative Humidity	Temperature °F
120221-SM-101	Front right bedroom	25L	S001	68.7	68.2
120221-SM-102	Living room/kitchen	25L	S001	68.6	68.5
120221-SM-103	Rear right bedroom	25L	S001	70.7	67.5
120221-SM-104	Rear left bedroom	25L	S001	69.9	67.7
120221-SM-105	Bathroom	25L	S001	70.8	76.8
120221-SM-106	Front yard	25L	S001	43.3	76.6
120221-SM-107	Back yard	25L	S001		
120221-SM-01	Inside of the kitchen floor mounted cabinet on the front wall	1 cm sq	S001T	NA	NA
120221-SM-02	Exterior of kitchen cabinets	1 cm sq	S001T	NA	NA
120221-SM-03	Living room rear wall cavity	1 cm sq	S001T	NA	NA
120221-SM-04	Bathroom ceiling	1 cm sq	S001T	NA	NA
120221-SM-05	Bathroom cabinet	1 cm sq	S001T	NA	NA
120221-SM-06	Bathroom front wall	1 cm sq	S001T	NA	NA
120221-SM-07	Rear left bedroom closet wall	1 cm sq	S001T	NA	NA
120221-SM-08	Rear right bedroom front wall	1 cm sq	S001T	NA	NA

Samples Collected By (Printed Name and Signature): Shaenaz Mirmohamed Date Signed: 12/2/2021

CHAIN OF CUSTODY RECORD

DATE:	Time:	Condition of Samples:	RELINQUISHED BY: (Printed Name and Signature)	ACCEPTED BY: (Printed Name and Signature)
12/2/2021	16:30	Intact	Shaenaz Mirmohamed AFFILIATION:	AFFILIATION: 12/3/21

SEEML Reference Number:
211203030

Southeast Environmental Microbiology Laboratories
102 Edinburgh Court
Greenville, SC 29607
Phone: (864) 233-3770
FAX: (864) 233-6589

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

- ☒ Surface/Bulk Report
- ☒ Spore Trap Report
- ☐ Andersen Fungal Report
- ☐ Quantitative Fungal Report

Lab Manager Review: *Angel Gosnell* Date: 12/03/21

Thank you for using SEEML laboratories. We strive to provide superior quality and service.
SEEML laboratories are accredited through AIHA-LAP, LLC (EMLAP # 173667) for the analysis of Spore Traps and Surface/Bulk Samples.

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

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

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

Spore Trap Report

	Date Sampled: 12/02/21
Attn: ***Phoenix Enviro Corp.***	Date Received: 12/03/21
4020 Shipyard Blvd.	Date Analyzed: 12/03/21
Wilmington, NC 28403	Date Reported: 12/03/21
	Date Revised:
	Project Name: 21-21-181A-IAQ-M
	Project Address: 302 Grass Lane, Unit 105
	Project City, State, ZIP: Wilmington, NC 28405
	SEEML Reference # : 211203030

TEST METHOD: DIRECT MICROSCOPY EXAMINATION SEEML SOP 7

Client Sample ID	120221-SM-101			120221-SM-102			120221-SM-103		
Location	Front Right Bedroom			Living Room/Kitchen			Rear Right Bedroom		
Lab Sample ID	211203030-104			211203030-105			211203030-106		
Comments									
Hyphal Fragments	3	120		2	80				
Pollen									
Spore Trap Used	M5			M5			M5		
	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%
Alternaria									
Ascospores									
Basidiospores									
Bipolaris/Drechslera									
Chaetomium									
Cladosporium	1	40	2	1	40	<1			
Curvularia									
Epicoccum									
Cercospora									
Fusarium									
Memnoniella									
Nigrospora									
Penicillium/Aspergillus	27	1080	50	450	18000	100	90	3600	100
Polythrincium									
Rusts									
Smuts/Periconia/Myxomy									
Spegazzinia									
Stachybotrys	26	1040	48						
Stemphylium									
Tetraploa									
Torula									
Ulocladium									
Colorless/Other Brown*									
Oidium									
Zygomycetes									
Pithomyces									
Background debris (1-5)**	3			3			3		
Sample Volume(liters)	25			25			25		
TOTAL SPORES/M^3	54	**2160**		451	**18000**		90	**3600**	

Revisions:

Spore types listed without a count or data entry were not detected during the course of the analysis for the respective sample, indicating a raw count of <1 spore.

The analytical sensitivity is the spores/m^3 divided by the raw count, expressed in spores/m^3. The limit of detection is the analytical sensitivity (in spores/m^3) multiplied by the sample volume (in liters) divided by 1000 liters.

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

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

Disclaimer: The sample results are determined by the sample volume, which is provided by the customer.

This report relates only to the samples tested as they were received.

102 Edinburgh Court
Greenville, SC. 29607
Phone: (864) 233-3770

Angel Gosnell

Angel Gosnell, Approved Laboratory Signatory

AIHA-LAP, LLC EMLAP #173667 Texas Lic: LAB1016

Spore Trap Report

	Date Sampled: 12/02/21
Attn: ***Phoenix Enviro Corp.***	Date Received: 12/03/21
4020 Shipyard Blvd.	Date Analyzed: 12/03/21
Wilmington, NC 28403	Date Reported: 12/03/21
	Date Revised:
	Project Name: 21-21-181A-IAQ-M
	Project Address: 302 Grass Lane, Unit 105
	Project City, State, ZIP: Wilmington, NC 28405
	SEEML Reference # : 211203030

TEST METHOD: DIRECT MICROSCOPY EXAMINATION SEEML SOP 7

Client Sample ID	120221-SM-104			120221-SM-105			120221-SM-106		
Location	Rear Left Bedroom			Bathroom			Front Yard		
Lab Sample ID	211203030-107			211203030-108			211203030-109		
Comments									
Hyphal Fragments	3	120		2	80		3	120	
Pollen									
Spore Trap Used	M5			M5			M5		
	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%
Alternaria									
Ascospores									
Basidiospores							8	320	38
Bipolaris/Drechslera									
Chaetomium									
Cladosporium	1	40	<1	1	40	<1	4	160	19
Curvularia									
Epicoccum									
Cercospora									
Fusarium									
Memnoniella									
Nigrospora									
Penicillium/Aspergillus	132	5280	99	214	8560	99	9	360	43
Polythrincium									
Rusts									
Smuts/Periconia/Myxomy									
Spegazzinia									
Stachybotrys				1	40	<1			
Stemphylium									
Tetraploa									
Torula									
Ulocladium									
Colorless/Other Brown*									
Oidium									
Zygomycetes									
Pithomyces									
Background debris (1-5)**	3			3			3		
Sample Volume(liters)	25			25			25		
TOTAL SPORES/M^3	133	**5320**		216	**8640**		21	**840**	

Revisions:

Spore types listed without a count or data entry were not detected during the course of the analysis for the respective sample, indicating a raw count of <1 spore.

The analytical sensitivity is the spores/m^3 divided by the raw count, expressed in spores/m^3. The limit of detection is the analytical sensitivity (in spores/m^3) multiplied by the sample volume (in liters) divided by 1000 liters.

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

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

Disclaimer: The sample results are determined by the sample volume, which is provided by the customer.

This report relates only to the samples tested as they were received.

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Angel Gosnell

Angel Gosnell, Approved Laboratory Signatory

AIHA-LAP, LLC EMLAP #173667

Texas Lic: LAB1016

Spore Trap Report

	Date Sampled: 12/02/21
Attn: ***Phoenix Enviro Corp.***	Date Received: 12/03/21
4020 Shipyard Blvd.	Date Analyzed: 12/03/21
Wilmington, NC 28403	Date Reported: 12/03/21
	Date Revised:
	Project Name: 21-21-181A-IAQ-M
	Project Address: 302 Grass Lane, Unit 105
	Project City, State, ZIP: Wilmington, NC 28405
	SEEML Reference # : 211203030

TEST METHOD: DIRECT MICROSCOPY EXAMINATION SEEML SOP 7

Client Sample ID	120221-SM-107								
Location	Back Yard								
Lab Sample ID	211203030-110								
Comments									
Hyphal Fragments	1	40							
Pollen	1	40							
Spore Trap Used	M5								
	raw ct.	spores/m^3	%						
Alternaria									
Ascospores	2	80	11						
Basidiospores	10	400	56						
Bipolaris/Drechslera									
Chaetomium									
Cladosporium	3	120	17						
Curvularia									
Epicoccum									
Cercospora									
Fusarium									
Memnoniella									
Nigrospora									
Penicillium/Aspergillus	2	80	11						
Polythrincium									
Rusts									
Smuts/Periconia/Myxomy	1	40	6						
Spegazzinia									
Stachybotrys									
Stemphylium									
Tetraploa									
Torula									
Ulocladium									
Colorless/Other Brown*									
Oidium									
Zygomycetes									
Pithomyces									
Background debris (1-5)**	3								
Sample Volume(liters)	25								
TOTAL SPORES/M^3	18	**720**							

Revisions:

Spore types listed without a count or data entry were not detected during the course of the analysis for the respective sample, indicating a raw count of <1 spore.

The analytical sensitivity is the spores/m^3 divided by the raw count, expressed in spores/m^3. The limit of detection is the analytical sensitivity (in spores/m^3) multiplied by the sample volume (in liters) divided by 1000 liters.

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

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

Disclaimer: The sample results are determined by the sample volume, which is provided by the customer.

This report relates only to the samples tested as they were received.

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Phone: (864) 233-3770

Angel Gosnell

Angel Gosnell, Approved Laboratory Signatory

AIHA-LAP, LLC EMLAP #173667 Texas Lic: LAB1016

Surface and Bulk Sample Report

	Date Sampled: 12/02/21
Attn: ***Phoenix Enviro Corp.***	Date Received: 12/03/21
4020 Shipyard Blvd.	Date Analyzed: 12/03/21
Wilmington, NC 28403	Date Reported: 12/03/21
	Date Revised:
	Project Name: 21-21-181A-IAQ-M
	Project Address: 302 Grass Lane, Unit 105
	Project City, State ZIP: Wilmington, NC 28405
	SEEML Reference #: 211203030

TEST METHOD: Direct Microscopic Examination (SEEML SOP 18)

Client Sample ID	120221-SM-01	120221-SM-02	120221-SM-03	120221-SM-04
Location	Inside Of The Kitchen Floor Mounted Cabinet On the Floor Wall	Exterior Of Kitchen Cabinets	Living Room Rear Wall Cavity	Bathroom Ceiling
SEEML Sample ID	211203030-111	211203030-112	211203030-113	211203030-114
Sample Type	Tape	Tape	Tape	Tape
	Quantification*	Quantification*	Quantification*	Quantification*
Hyphal Fragments	**L**	**M**	**VL**	**L**
Pollen				
General Impressions **	**FG**	**FG**	**FG**	**FG**
Fungal Spore:				
Alternaria				
Acremonium				
Ascospores				
Basidiospores			**VL**	
Bipolaris/Drechslera				
Cercospora				
Chaetomium	**M**		**M**	
Cladosporium				
Curvularia				
Epicoccum				
Fusarium				
Geotrichum sp.				
Memnoniella				
Myxomycetes				
Nigrospora				
Penicillium/Aspergillus		**H**		**H**
Pithomyces				
Rusts/Smuts				
Stemphylium				
Tetraploa				
Ulocladium				

**** General Impressions: NFG = No Fungal Growth, FG = Fungal Growth, MFG = Minimal Fungal Growth Or Growth in vicinity**

Quantification of fungal growth is done by semi-quantitative grading using the following ranges:

Scattered Spores, 1-20 fungal spores

VL = 21-100 fungal spores **L = 101-1,000 fungal spores** **M = 1,001-10,000 fungal spores** **H = >10,000 fungal spores**

ND = No Fungal Spores Detected

Disclaimer: This report relates only to the samples tested

Respectfully submitted, SEEML

Angel Gosnell, **Approved Laboratory Signatory**

102 Edinburgh Court
Greenville, SC 29607
Phone: (864) 233- 3770
Fax: (864) 233- 6589

AIHA-LAP, LLC EMLAP # 173667

Texas License: LAB1016

Surface and Bulk Sample Report

	Date Sampled: 12/02/21
Attn: ***Phoenix Enviro Corp.***	Date Received: 12/03/21
4020 Shipyard Blvd.	Date Analyzed: 12/03/21
Wilmington, NC 28403	Date Reported: 12/03/21
	Date Revised:
	Project Name: 21-21-181A-IAQ-M
	Project Address: 302 Grass Lane, Unit 105
	Project City, State ZIP: Wilmington, NC 28405
	SEEML Reference #: 211203030

TEST METHOD: Direct Microscopic Examination (SEEML SOP 18)

Client Sample ID	120221-SM-05	120221-SM-06	120221-SM-07	120221-SM-08
Location	Bathroom Cabinet	Bathroom Front Wall	Rear Left Bedroom Closet Wall	Rear Right Bedroom Front Wall
SEEML Sample ID	211203030-115	211203030-116	211203030-117	211203030-118
Sample Type	Tape	Tape	Tape	Tape
	Quantification*	Quantification*	Quantification*	Quantification*
Hyphal Fragments	**VL**	**M**	**M**	**M**
Pollen				
General Impressions **	**FG**	**FG**	**FG**	**FG**
Fungal Spore:				
Alternaria				
Acremonium				
Ascospores				
Basidiospores	**M**			
Bipolaris/Drechslera				
Cercospora				
Chaetomium	**VL**			
Cladosporium				
Curvularia				
Epicoccum				
Fusarium				
Geotrichum sp.				
Memnoniella				
Myxomycetes				
Nigrospora				
Penicillium/Aspergillus			**L**	
Pithomyces				
Rusts/Smuts				
Stachybotrys		**M**	**M**	**H**
Tetraploa				
Ulocladium				

**** General Impressions: NFG = No Fungal Growth, FG = Fungal Growth, MFG = Minimal Fungal Growth Or Growth in vicinity**

Quantification of fungal growth is done by semi-quantitative grading using the following ranges:

Scattered Spores, 1-20 fungal spores

VL = 21-100 fungal spores **L = 101-1,000 fungal spores** **M = 1,001-10,000 fungal spores** **H = >10,000 fungal spores**

ND = No Fungal Spores Detected

Disclaimer: This report relates only to the samples tested

Respectfully submitted, SEEML

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Fungal Descriptions

Alternaria sp.

Aw - 0.89. Conidia dimensions: 18-83 x 7-18 microns. A very common allergen with an IgE mediated response. It is often found in carpets, textiles and on horizontal surfaces in building interiors. Often found on window frames. Outdoors it may be isolated from samples of soil, seeds and plants. It is commonly found in outdoor samples. The large spore size, 20 - 200 microns in length and 7 - 18 microns in sizes, suggests that the spores from these fungi will be deposited in the nose, mouth and upper respiratory tract. It may be related to bakers' asthma. It has been associated with hypersensitivity pneumonitis. The species *Alternaria alternata* can produce tenuazonic acid and other toxic metabolites that may be associated with disease in humans or animals. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include edema and bronchospasms; chronic cases may develop pulmonary emphysema.

Ascospore

A spore borne in a special cell called an ascus. Spores of this type are reported to be allergenic. All ascomycetes, members of a group of fungi called Ascomycotina, have this type of spore. The minute black dots on rotting wood and leaves or the little cups on lichens are examples of ascomycetes; another is the "truffle" mushroom.

Aspergillus/Penicillium

These are two of the most commonly found allergenic fungi in problem buildings. *Aspergillus* comes in many varieties (species). Many of the varieties produce toxic substances. It may be associated with symptoms such as sinusitis, allergic bronchopulmonary aspergillosis, and other allergic symptoms. *Penicillium* is a variety of mold that is very common indoors and is found in increased numbers in problem buildings. It also has many varieties, some of which produce toxic substances. The symptoms are allergic reactions, mucous membrane irritation, headaches, vomiting, and diarrhea. Due to the morphological similarity of *Aspergillus* and *Penicillium*, they are not differentiated by microscopic analysis and are reported together.

Aspergillus sp.

Aw 0.75 - 0.82. Reported to be allergenic. Members of this genus are reported to cause ear infections. Many species produce mycotoxins that may be associated with disease in humans and other animals. Toxin production is dependent on the species or a strain within a species and on the food source for the fungus. Some of these toxins have been found to be carcinogenic in animal species. Several toxins are considered potential human carcinogens. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include edema and bronchospasms; chronic cases may develop pulmonary emphysema; may also be associated with sinusitis, allergic bronchopulmonary aspergillosis, and other allergic symptoms.

Basidiospore

Spore from basidiomycetes. Many varieties are reported to be allergenic.

Bipolaris sp.

A fungus with large spores that could be expected to be deposited in the upper respiratory tract. This fungus can produce the mycotoxin - sterigmatocystin, which has been shown to produce liver and kidney damage when ingested by laboratory animals.

Botrytis sp.

Aw 0.93. Conidia dimensions: 7-14 x 5-9 microns. It is parasitic on plants and soft fruits. Found in soil and on house plants and vegetables, it is also known as "gray mold". It causes leaf rot on grapes, strawberries, lettuce, etc. It is a well-known allergen, producing asthma type symptoms in greenhouse workers and "wine grower's lung".

Cercaspora

Common outdoors in agricultural areas, especially during harvest. Parasite of higher plants, causing leaf spot. Commonly found as parasites on higher plants.

Chaetomium sp.

large ascomycetous fungus producing perithecia. It is found on a variety of substrates containing cellulose, including paper and plant compost. It has been found on paper in sheetrock. It can produce an *Acremonium*-like state on fungal media. Varieties are considered allergenic and have been associated with peritonitis, cutaneous lesions, and system mycosis.

Cladosporium sp.

Aw 0.88; Aw 0.84. Most commonly identified outdoor fungus. The outdoor numbers are reduced in the winter. The numbers are often high in the summer. Often found indoors in numbers less than outdoor numbers. It is a common allergen. Indoor *Cladosporium* sp. may be different than the species identified outdoors. It is commonly found on the surface of fiberglass duct liners in the interior of supply ducts. A wide variety of plants are food sources for this fungus. It is found on dead plants, woody plants, food, straw, soil, paint, and textiles. Produces greater than 10 antigens. Antigens in commercial extracts are of variable quality and may degrade within weeks of preparation. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include skin lesions, eye ulceration, mycosis (including onychomycosis, an infection of the nails of the feet or hands) edema and bronchospasms; chronic cases may develop pulmonary emphysema.

Curvularia sp.

Reported to be allergenic and has been associated with allergic fungal sinusitis. It may cause corneal infections, mycetoma, and infections in immune compromised hosts.

Dreschlera sp.

Conidia dimensions: 40-120 x 17-28 microns. Found on grasses, grains and decaying food. It can occasionally cause a corneal infection of the eye.

Epicoccum sp.

Conidia dimensions: 15-25 microns. A common allergen. It is found in plants, soil, grains, textiles and paper products.

Fusarium sp.

Aw 0.90. A common soil fungus. It is found on a wide range of plants. It is often found in humidifiers. Several species in this genus can produce potent trichothecene toxins. The trichothecene (scirpene) toxin targets the following systems: circulatory, alimentary, skin, and nervous. Produces vomitoxin on grains during unusually damp growing conditions. Symptoms may occur either through ingestion of contaminated grains or possibly inhalation of spores. The genera can produce hemorrhagic syndrome in humans (alimentary toxic aleukia). This is characterized by nausea, vomiting, diarrhea, dermatitis, and extensive internal bleeding. Reported to be allergenic. Frequently involved in eye, skin, and nail infections.

Myxomycetes

Members of a group of fungi that is included in the category of "slime molds". They're occasionally found indoors, but mainly reside in forested regions on decaying logs, stumps, and dead leaves. Myxomycetes display characteristics of fungi *and* protozoans. In favorable (wet) conditions they exhibit motile, amoeba-like cells, usually bounded only by a plasma membrane, that are variable in size and form. During dry spells, they form a resting body (sclerotium) with dry, airborne spores. These fungi are not known to produce toxins but can cause hay fever and asthma.

Memnoniella

Contaminant found most often with *Stachybotrys* on wet cellulose. Forms in chains, but it are very similar to *Stachybotrys* and sometimes is considered to be in the *Stachybotrys* family. Certain species do produce toxins very similar to the ones produced by *Stachybotrys chartarum* and many consider the IAQ importance of *Memnoniella* to be on par with *Stachybotrys*. Allergenic and infectious properties are not well studied.

Nigrospora sp.

Commonly found in warm climates, this mold may be responsible for allergic reactions such as hay fever and asthma. It is found on decaying plant material and in the soil. It is not often found indoors.

Oidium sp.

The asexual phase of *Erysiphe* sp. It is a plant pathogen causing powdery mildews. It is very common on the leaf's stems, and flowers of plants. The health effects and allergenicity have not been studied. It does not grow on non-living surfaces such as wood or drywall.

Penicillium sp.

Aw 0.78 - 0.88. A wide number of organisms have been placed in this genus. Identification to species is difficult. Often found in aerosol samples. Commonly found in soil, food, cellulose and grains. It is also found in paint and compost piles. It may cause hypersensitivity pneumonitis, allergic alveolitis in susceptible individuals. It is reported to be allergenic (skin). It is commonly found in carpet, wallpaper, and in interior fiberglass duct insulation. Some species can produce mycotoxins. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include edema and bronchospasms; chronic cases may develop pulmonary emphysema. It may also cause headaches, vomiting, and diarrhea.

Periconia sp.

Periconia sp. are found in soil, blackened and dead herbaceous stems leaf spots, grasses, rushes, and sedges. Almost always associated with other fungi. Rarely found growing indoors. Reportedly associated with a rare case of mycotic keratitis.

Pithomyces sp.

A common mold found on dead leaves, plants, soil and especially grasses. Causes facial eczema in ruminants. It exhibits distinctive multi-celled brown conidia. It is not known to be a human allergen or pathogen. It is rarely found indoors, although it can grow on paper.

Rusts/Smuts

These fungi are associated with plant diseases. In the classification scheme of the fungi, the smuts have much in common with the rusts, and they are frequently discussed together. Both groups produce wind-borne, resistant teliospores that serve as the basis for their classification and their means of spread. Rusts usually attack vegetative regions (i.e., leaves and stems) of plants; smuts usually are associated with the reproductive structures (seeds). They can cause hay fever and asthma.

Spegazzinia

Spegazzinia species comprise a very small proportion of the fungal biota. This genus is somewhat related to other lobed or ornamented genera such as *Candelabrum*. No information is available regarding health effects or toxicity. Allergenicity has not been studied. Usually identified on spore trap samples where it is seen every few weeks. (Spores have very distinctive morphology.) May also be found in air by culturable (Andersen) samples if a long enough incubation period is provided so that sporulation occurs. Our laboratory has never found this organism growing on indoor environmental surfaces. Natural habitat includes soil and many kinds of trees and plants.

Stachybotrys sp.

Aw - 0.94, optimum Aw ->0.98. Several strains of this fungus (*S. atra, S. chartarum* and *S. alternans* are synonymous) may produce a trichothecene mycotoxin- Satratoxin H - which is poisonous by inhalation. The toxins are present on the fungal spores. This is a slow growing fungus on media. It does not compete well with other rapidly growing fungi. The dark colored fungus grows on building material with high cellulose content and low nitrogen content. Areas with a relative humidity above 55%, and are subject to temperature fluctuations, are ideal for toxin production. Individuals with chronic exposure to the toxin produced by this fungus reported cold and flu symptoms, sore throats, diarrhea, headaches, fatigue, dermatitis, intermittent local hair loss and generalized malaise. Other symptoms include coughs, rhinitis, nosebleed, a burning sensation in the nasal passages, throat, and lungs, and fever. The toxins produced by this fungus will suppress the immune system affecting the lymphoid tissue and the bone marrow. Animals injected with the toxin from this fungus exhibited the following symptoms: necrosis and hemorrhage within the brain, thymus, spleen, intestine, lung, heart, lymph node, liver, and kidney. Affects by absorption of the toxin in the human lung are known as pneumomycosis.

This organism is rarely found in outdoor samples. It is usually difficult to find in indoor air samples unless it is physically disturbed (or possibly -this is speculation- a drop in the relative humidity). The spores are in a gelatinous mass. Appropriate media for the growth of this organism will have high cellulose content and low nitrogen content. The spores will die readily after release. The dead spores are still allergenic and toxigenic. Percutaneous absorption has caused mild symptoms.

Stemphylium sp.

Reported to be allergenic. Isolated from dead plants and cellulose materials.

Torula sp.

Found outdoors in air, soil, on dead vegetation, wood, and grasses. Also found indoors on cellulose materials. Reported to be allergenic and may cause hay fever and asthma.

Tetraploa

Tetraploa species comprise a very small proportion of the fungal biota. This genus is somewhat related to *Triposporium* and Diplocladiella. The only reported human infections are two cases of keratitis (1970, 1980) and one case of subcutaneous infection of the knee (1990). No information is available regarding other health effects or toxicity. Allergenicity has not been studied. Usually identified on spore trap samples where it is seen every few weeks. (Spores have very distinctive morphology.) Our laboratory has never found this organism growing on indoor environmental surfaces. Natural habitat includes leaf bases and stems just above the soil on many kinds of plants and trees.

Ulocladium sp.

Aw 0.89. Isolated from dead plants and cellulose materials. Found on textiles.

Zygomycetes

Zygomycetes are one of the four major groups of fungi, the others being the Oomycetes, the Ascomycetes, and the Basidiomycetes. Zygomycetes are common, fast growing, and often overgrow and/or inhibit other fungi nearby. Rhizopus and Mucor are two of the most common Zygomycetes seen in the indoor environment. However, others are seen as well, including *Syncephalastrum*, *Circinella*, *Mortierella*, *Mycotypha*, *Cunninghamella*, and *Choanephora*. For further information, please see descriptions of these individual genera.

The following table lists mycotoxins that are produced by certain types of fungi:

Fungi	Mycotoxin
Acremonium crotocinigenum	Crotocin
Aspergillus favus	Alfatoxin B, cyclopiazonic acid
Aspergillus fumigatus	Fumagilin, gliotoxin
Aspergillus carneus	Critrinin
Aspergillus clavatus	Cytochalasin, patulin
Aspergillus Parasiticus	Alfatoxin B
Aspergillus nomius	Alfatoxin B
Aspergillus niger	Ochratoxin A, malformin, oxalicacid
Acremonium crotocinigenum	Crotocin
Aspergillus nidulans	Sterigmatocystin
Aspergillus ochraceus	Ochratoxin A, penicillic acid
Aspergillus versicolor	Sterigmatocystin, 5 ethoxysterigmatocystin
Aspergillus ustus	Ausdiol, austamide, austocystin,brevianamide
Aspergillus terreus	Citreoviridin
Alternaria	Alternariol, altertoxin, altenuene, altenusin, tenuazonic acid
Arthrinium	Nitropropionic acid
Bioploaris	Cytochalasin, sporidesmin, sterigmatocystin
Chaetomium	Chaetoglobosin A,B,C. Sterigmatocystin
Cladosporium	Cladosporic acid
Clavipes purpurea	Ergotism
Cylindrocorpon	Trichothecene
Diplodia	Diplodiatoxin
Fusarium	Trichothecene, zearalenone
Fusarium moniliforme	Fumonisins
Emericella nidulans	Sterigmatocystin
Gliocladium	Gliotoxin
Memnoniella	Griseofulvin , dechlorogriseofulvin, epi-decholorgriseofulvin, trichodermin, trichodermol
Myrothecium	Trichothecene
Paecilomyces	Patulin, viriditoxin
Penicillium aurantiocandidum	Penicillic acid
Penicillium aurantiogriseum	Penicillic acid
Penicillium brasilanum	Penicillic acid
Penicillium brevicompactum	Mycophenolic acid
Penicillium camemberti	Cyclopiazonic acid
Penicillium carneum	Mycophenolic acid, Roquefortine C
Penicillium crateriforme	Rubratoxin

Fungi	Mycotoxin
Penicillium citrinum	Citrinin
Penicillium commune	Cyclopiazonic acid
Penicillium crustosum	Roquefortine C
Penicillium chrysogenum	Roquefortine C
Penicillium discolor	Chaetoglobosin C
Penicillium expansum	Citrinin, Roquefortine C
Penicillium griseofulvum	Roquefortine C, cyclopiazonic acid, griseofulvin
Penicillium hirsutum	Roquefortine C
Penicillium hordei	Roquefortine C
Penicillium nordicum	Ochratoxin A
Penicillium paneum	Roquefortine C
Penicillium palitans	Cyclopiazonic acid
Penicillium polonicum	Penicillic acid
Penicillum roqueforti	Roquefortine C, Mycophenolic acid
Penicillium veridicatum	Penicillic acid
Penicillium verrucosum	Citrinin, ochratoxin A
Penicillium/ Aspergillus	Patulin
Penicillium/ Aspergillus/Alternaria	Glitoxin
Phomopsis	Macrocyclic trichothecenes
Phoma	Brefeldin, cytochalasin, secalonic acid, tenuazonic acid
Pithomyces	Sporidesmin
Rhizoctonia	Slaframine
Rhizopus	Rhizonin
Sclerotinia	Furanocoumarins
Stachybotrys chartarum	Iso-satratoxin F, roridin E, L-2, satratoxin G & H, trichodermin, trichodermol, trichothecene
Torula	Cytotoxins
Trichoderma	Trichodermin, trichodermol, gliotoxin
Trichothecium	Trichothecene
Wallemia	Walleminol
Zygosporium	Cytochalasin

General terms

Allergen

An allergen is a substance that elicits an IgE antibody response and is responsible for producing allergic reactions. Chemicals are released when IgE on certain cells contact an allergen. These chemicals can cause injury to surrounding tissue - the visible signs of an allergy. Only a few fungal allergens have been characterized but all fungi are thought to be potentially allergenic. Fungal allergens are proteins found in either the mycelium or spores

"Black mold"

A poorly defined term. Black mold or toxic black mold has usually been associated with the mold *Stachybotrys chartarum*. While there are only a few molds that are truly black, there are many that can appear black. Not all molds that appear to be black are *Stachybotrys*.

Fungi

Fungi are neither animals nor plants and are classified in a kingdom of their own. The Kingdom of Fungi. Fungi include a very large group of organisms, including molds, yeasts, mushrooms and puffballs. There are >100,000 accepted fungal species but current estimates range to 1.5 million species. Mycologists (people who study fungi) have grouped fungi into four large groups according to their method of reproduction.

Hidden mold

This refers to visible mold growth on building structures that is not easily seen, including the areas above drop ceilings, within a wall cavity (the space between the inner and outer structure of a wall), inside air handlers, or within the ducting of a heating/ventilation system.

Microbial Volatile Organic Compounds (MVOCs)

Fungi produce chemicals as a result of their metabolism. Some of these chemicals, MVOCs, are responsible for the characteristic moldy, musty, or earthy smell of fungi, whether mushrooms or molds. Some MVOCs are considered offensive or annoying. Specific MVOCs are thought to be characteristic of wood rot and mold growth on building materials. The human nose is very sensitive to mold odors and sometimes more so than current analytical instruments.

Mold

Molds are a group of organisms that belong to the Kingdom of Fungi (see Fungi). Even though the terms mold and fungi had been commonly referred to interchangeably, all molds are fungi, but not all fungi are molds.

Mycotoxin

Mycotoxins are compounds produced by some fungi that are toxic to humans or animals. By convention, the term? Mycotoxin. Excludes mushroom toxins. Fungi that produce mycotoxins are called "toxigenic fungi."

Spore

General term for a reproductive structure in fungi, bacteria and some plants. In fungi, the spore is the structure which may be used for dissemination and may be resistant to adverse environmental conditions.

Toxic mold

The term "toxic mold" has no scientific meaning since the mold itself is not toxic. The metabolic byproducts of some molds may be toxic (see mycotoxin).

Hypha (plural, hyphae)

An individual fungal thread or filament of connected cells; the thread that represents the individual parts of the fungal body.

Phoenix EnviroCorp

MOLD/BIOLOGICAL CONTAMINANT REMEDIATION PROTOCOL

Date: December 3, 2021

For: Quanesha Mullins
Wilmington Housing Authority
1524 S. 16th Street
Wilmington, NC 28401

Remediation Contractor: Not determined

On-Site Consultant: Phoenix EnviroCorp (PEC)
4020 Shipyard Boulevard
Wilmington, NC 28403
(910) 397-0370

Approved Signatory:

Shaenaz Mirmohamed
IH Technician

Tommie Green, CIEC
Professional Industrial Hygienist

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SECTION 1.0 REMEDIATION PROCEDURES

1.1 Project Set Up

- The owner or powers that be shall supply temporary power for remediation equipment. The existing electrical system may be utilized, with permission of the owner or powers that be. Determining specific electrical load/safety requirements, including, but not limited to, the use of a temporary GFCI electrical panel box shall be the responsibility of the abatement contractor.
- HVAC system shall be isolated.
- 6-mil polyethylene sheathing shall be erected to separate primary control areas (PCA) from remaining areas. Control areas shall be selected so that specified building materials (specified herein, in section 1.3, under primary control areas) may be removed or cleaned and dried.
- HEPA Air Filtration Devices shall be utilized for each separate control area. Critical barriers shall consist of 6-mil polyethylene so that primary control areas are isolated from remaining areas. HEPA filtration units shall be exhausted from the PCA to the outside of the building through windows/doors. Dehumidification units must be installed in the PCA to sufficiently dry components.
- A remote wash off station shall be set up to allow for employees to wash hands and faces after egress from the work area.
- Ingress/Egress to the control area(s) shall be, at minimum, sealed with a 2-way polyethylene air lock.
- Entrances to the building shall be marked as indicated in Section 7.4 of this document.

1.2 Local Exhaust System

- Once sealed, the primary control area shall be ventilated with a local HEPA air filtration device that shall ensure a minimum of four (4) air changes per hour. The air filtration device shall be placed within the containment work area.
- Local HEPA exhaust shall be utilized where cleaning of contents is required and/or in the immediate vicinity of remediation activities of building materials.
- In interior sections requiring surface area cleaning, local HEPA filtration may be exhausted within the area to scrub microbials from ambient air. This process shall only be conducted after fine cleaning has been completed.
- Negative pressure within the contained work area shall be maintained throughout the project until clearance is obtained.
- Negative air machines shall be exhausted to exterior portions of the building to adequately ensure that negative pressure is achieved.
- Dehumidification devices with HEPA filtration may be incorporated as filtration devices in conjunction with true HEPA filtration devices; they may not replace the true HEPA filtration devices.

Note: Formula for determination of adequate HEPA filtration:

Total feet per minute =Volume of work area (ft^3)/15 minutes
#AFD Units needed = (Total feet per minute)/Capacity of Unit (ft^3)

- At initiation of final cleaning stages, relative humidity shall be at 40% (+/-3%) and moisture content of wooden components shall be at or below 15% as determined by Delmhorst moisture meter or equivalent meter. Moisture mapping and direct read T/RH shall be recorded by the remediation contractor until the specified levels have been achieved. Control areas shall be dehumidified during cleaning and mold remediation activities to ensure removal of surface moisture created during application of water. Drying of structural components that have been treated with encapsulating anti-microbial agents will be necessary.

- Moisture levels shall be recorded and documented by the remediation contractor upon successful completion of dehumidification.

1.3 Remediation Specifications

- Prior to commencement of mold remediation activities by the remediation contractor, the source of any water intrusions, leaks, and/or moisture/humidity problems shall be remedied by the owner. If water intrusions, leaks, and/or moisture/humidity problems exist and are not corrected, mold growth can be expected to return.
- All remediation procedures listed that involve the removal of building materials shall employ polyethylene critical barriers, negative air pressure, and HEPA filtration (i.e., primary control areas).
- The remediation contractor shall ensure that the filters are properly capped prior to switching off the air scrubbers. If the filters are not properly capped, the backflow can cause mold spores to re-release back into the control area, essentially re-contaminating an area that has already been cleaned.
- All remediation activities shall be conducted in a manner that does not allow dissemination of mold spores. Remediation procedures shall begin from the side of the control area furthest away from air filtration devices.
- Cleaning procedures shall be repeated until the area is visibly free of dust and debris.
- Engineering controls set up during the remediation process shall remain in place until remediation has been completed and acceptable post remediation sampling results have been achieved.
- **Federal and/or state regulations require that suspect asbestos containing materials in public and commercial buildings shall be inspected for asbestos prior to renovations or demolition. Based on these regulations, PEC recommends that building materials that may be disturbed during mold remediation be tested for asbestos content prior to their disturbance to prevent asbestos contamination.**
- If cleaning procedures outlined in this remediation plan outweigh the cost of replacement for selected items, the remediation contractor shall give the owner the option to clean or dispose of those items.
- Reinstallation of building materials and/or components shall only be conducted once acceptable post remediation results are obtained.
- Any chemicals used on this project shall be EPA approved and used only as directed by the manufacturer. MSDS shall be available for review upon request.

HVAC System

- The HVAC system(s) that services or run through the primary control area/affected area shall be shut down prior to remediation activities.
- The spaces that are normally climate-controlled by the HVAC system that have been shut down shall be maintained under proper humidity levels (between 30 and 60% utilizing dehumidifiers, etc.) while the system is not in operation.
- All HVAC supply/return vents within the primary control area/affected area shall be isolated with a critical barrier (i.e., plastic, etc.) to prevent air flow. Prior to isolating the vents, the register covers (diffusers) shall be removed, and the supply shall be isolated at the metal boot. Once isolated, the registers and surrounding building materials shall be cleaned.
- The interior of the air handler, rigid duct system, intake box, etc. shall be thoroughly cleaned by an HVAC professional experienced in mold remediation. The interior shall be cleaned with mechanical methods that aggressively disturb all interior surfaces and filter the disturbed airborne particulates to avoid cross contamination, or other equivalent methods.
- Cleaning of components shall consist of a method that thoroughly removes visible mold growth, settled concentrations of mold spores, and/or dust and debris.

- PEC recommends the removal and disposal of any fibrous or porous materials (i.e., insulation, etc.) from the interior of the HVAC system, to include but not limited to the air handler and rigid ductwork system. PEC also recommends that an HVAC professional design the re-insulation of the HVAC system without the use of porous interior insulation when possible.
- PEC recommends the removal and disposal of the flex ducts when feasible, as well as any interior duct board where cleaning will damage the duct board. Once removed, the remediation contractor shall isolate the connection point where the flex duct and/or duct board was detached with a critical barrier (such as plastic, etc.) to prevent air flow.
- The remediation contractor shall be responsible for coordinating the cleaning of the HVAC system and other specified remediation to avoid cross contamination.
- Once the HVAC system components are cleaned or replaced anew, the system shall remain off and isolated until acceptable post remediation results are obtained.
- A written document shall be obtained from the remediation contractor verifying that the HVAC system has been cleaned by an HVAC cleaning company with mold experience. This document shall include the property address and date of services and shall be filed with other mold remediation documents.

Note: For directional purposes "front" is determined by facing Green Lane from inside the unit, unless otherwise noted.

Primary Control Areas/Affected Areas

Critical barriers, negative air pressure, and HEPA filtration shall be established to isolate the following areas as Primary Control Areas to perform the specified mold remediation.

Within the kitchen:
- Detach and dispose of the floor-mounted cabinet from the front wall and remove the affected drywall (i.e., drywall with apparent water damage/suspect visible mold growth) beginning at the floor and extending 3 feet towards the ceiling. The width of this removal shall be 8 feet beginning at the left wall and extending toward the right wall.
- Remove vinyl floor tiles and thoroughly assess the floorboard for any apparent water damage/suspect visible mold growth and remove or clean the affected floorboard accordingly.

Within the living room:
- Remove the entire ceiling drywall (approximately 18-feet-by-13-feet).
- Remove drywall from the rear wall. The length of this removal shall be 4 feet beginning at the floor and extending toward the ceiling. The width of this removal shall be 8 feet beginning at the left wall and extending toward the right wall.

Within the bathroom:
- Detach the floor-mounted cabinet from the front wall and remove the affected drywall from the front wall (i.e., drywall with apparent water damage/suspect visible mold growth) beginning at the floor and extending toward the ceiling. The length of this removal shall be 5 feet beginning at the left wall and extending toward the right wall.
- Remove the ceiling drywall entirely (approximately 7.5-feet-by-4.5-feet).

Within the rear left bedroom:
- Remove the drywall from the front right wall, adjacent to the door. The length of this removal shall be 4 feet beginning at the floor and extending toward the ceiling. The width of this removal shall be the entire width of the front right wall (the front right wall adjacent to the door is less than 2 feet wide).

- Remove the drywall from the right wall. The length of this removal shall be 4 feet beginning at the floor and extending toward the ceiling. The width of this removal shall be approximately 4 feet beginning at the front wall and extending toward the rear.

Within the rear left bedroom closet:
- Remove the entire ceiling drywall (approximately 9-feet-by-2-feet).
- Remove drywall from the right wall beginning at the floor and extending 8 feet toward the ceiling. The width shall be approximately 9 feet beginning at the front wall and extending toward the rear wall.
- Remove drywall from the rear, front, and left walls entirely (8-feet-by-2-feet).

Within the rear right bedroom:
- Remove the drywall from the front left wall beginning at the floor and extending 4 feet towards the ceiling. The width of this removal shall be the entire width from the left wall to the right wall, adjacent to the door (≤ 2 feet).

Within the rear right bedroom closet:
- Remove the drywall from the rear wall. The length of this removal shall be 3 feet beginning at the floor and extending towards the ceiling. The width of this removal shall be 2 feet beginning at the left wall and extending towards the right wall.

Throughout the Residence (Negative air pressure is not required in areas where building components are not specified for removal, but HEPA filtration is required):
- Discard contents/trash (excluding appliances) or clean contents as specified herein under general specifications for primary control areas. Cleaning or discarding the contents shall be confirmed by the owners or powers that be.
- Clean all surfaces, furnishings and contents as specified herein under general specifications for primary control areas.
- Due to the apparent water damage and standing water in various locations, remove any loose floor tiles and thoroughly assess the floorboard for any apparent water damage/suspect visible mold growth and remove or clean the affected floorboard accordingly
- Remove the baseboards entirely from all walls in the unit allowing access to all walls, to thoroughly inspection the walls for apparent water damage/suspect visible mold growth. Remove any affected drywall (i.e., drywall with apparent water damage/suspect visible mold growth) and extend the drywall removal within a 2- foot radius of the affected area when possible
- **Areas of specified ceiling removal shall be sealed with poly (i.e., critical barrier) after cleaning, but before HEPA air scrubbing after cleaning, to prevent air flow from areas outside the containment area. An access door (i.e., poly flap taped in place, zipper, etc.) shall be installed in the critical barrier for easy access to conduct a visual inspection of the building materials behind the critical barrier.**

General Specifications for Primary Control Areas

- Open plumbing lines and drains within the control areas shall be isolated with a critical barrier consisting of 6-mil poly.
- The water line to toilets within the control areas shall be shut off and the toilets shall be isolated with a critical barrier consisting of 6-mil poly.
- Cleaning of components/materials shall consist of a method that thoroughly removes visible mold growth, settled concentrations of mold spores, and/or dust and debris (i.e., HEPA vacuuming, wet wiping, or other approved methods), followed by dehumidification/drying.

- Non-porous, semi-porous, and porous furnishings and contents shall be cleaned. If items cannot be cleaned efficiently, the abatement contractor shall consult with the owner/powers that be to determine if they shall be disposed.
- All machine washable porous cloth items shall be cleaned and dried in a household washer and dryer. Other specialty items shall be cleaned by a dry cleaner that specializes in cleaning materials affected with mold. These items shall be removed from affected area(s) and shall not be reintroduced back into the area(s) until acceptable post remediation testing is established. If porous articles cannot be cleaned efficiently, the abatement contractor shall consult with the owner/powers that be.
- Mattresses shall be cleaned utilizing HEPA vacuuming, NOT by pressure extraction or wet methods. If suspect visible mold growth is on the mattress or if the mattress cannot be cleaned efficiently, the abatement contractor shall consult with the owner/powers that be prior to disposal.
- Exterior surfaces of electrical appliances, electrical equipment, and light fixtures shall be cleaned, utilizing wet method and HEPA vacuuming. These items shall be disconnected from all electrical sources prior to cleaning. If these items cannot be cleaned efficiently, the abatement contractor shall consult with the owner/powers that be.
- In areas where drywall removal is specified around windows and doors, remove trim boards. The door casing(s) shall also be assessed to determine if they have sustained mold/water damage. If so, they shall be cleaned, or removed.
- All wall/ceiling cavity insulation shall be disposed in areas that specify the removal of drywall/wallboard. The abatement contractor shall visually inspect the back side of surrounding drywall/wallboard for water damage and/or suspect mold growth and document any findings. If additional suspect mold growth or water damage is observed beyond the specified removal area, additional drywall/wallboard shall be removed until no suspect mold growth or water damage is observed.
- All penetrations within the controlled area that adjoin unaffected or non-accessible areas, including outdoor areas, crawlspaces, etc., shall be cleaned (as far as one can reach) and then sealed with 6-mil poly, extending six (6) inches on all sides.
- In areas of specified wallboard removal, all components within the wall/ceiling cavities shall be cleaned. Any wooden structural components with mold stains or mold growth in pitted surfaces shall be HEPA sanded (or other approved methods) to eliminate embedded mold growth.
- All joints or sills (where the structural system meets, where the sill plate meets the floor, etc.) shall be aggressively disturbed to remove embedded mold growth and spores.
- Furnishings and contents that are specified for cleaning shall be protected with polyethylene in areas where building components are specified for removal, prior to the removal of building components to avoid cross contamination. The protective covering shall be removed, and the furnishings and contents shall be cleaned prior to post visual inspection and testing.
- The remediation contractor shall document any drywall/wallboard that requires removal, in addition to the specified amount, prior to removal (i.e., drywall that is specified to be assessed by the remediation contractor, etc.). Documentation shall include photos and specific location at a minimum.

1.4 Removal Procedures

The contractor shall maintain surfaces of the control area free of accumulation of dust and debris. Additionally, they shall restrict the spread of dust and debris, keeping waste from being distributed over the work area. Materials shall be removed in a fashion to ensure that previously cleaned areas are not re-contaminated (i.e., working from one end of the control area to the other). The contractor may be required to re-clean areas based on a visual inspection by the CIEC/CIE/IH, if the areas are not visibly clean.

Contaminated building materials that have been removed, and additional materials and debris generated during remediation, shall be placed in an enclosed container prior to transporting the material through the building and to the waste container, and prior to visual inspection by the CIEC/CIE/IH.

Areas shall be allowed to dry for a period until RH and moisture levels specified below have been achieved. Any remaining building products that are directly impacted by remediation shall be tested for moisture content. Wooden and cellulosic building components (e.g., wall studs, drywall, etc.) shall be tested for moisture content. If the moisture content is > 15% in wood products or > 12% in cellulosic products (utilizing a Delmhorst moisture meter or equivalent), dehumidification shall be required until moisture levels are at or below said levels, and the RH level is at or below 40% +/-3% (for all interior areas). The remediation contractor shall verify moisture content of all wooden and cellulosic building components within the impacted areas, as well as RH levels prior to scheduling post remediation verification.

1.5 Cleanup Overview

The contractor shall personally review the cleaning process prior to contacting the CIEC/CIE/IH for the post remediation testing. If accumulations of debris and dust are significant, the CIEC/CIE/IH will require re-cleaning prior to post remediation verification sampling.

The CIEC/CIE/IH shall make a visual inspection and conduct post remediation sampling after the final cleaning is complete.

1.6 Post Remediation Verification Testing

Prior to conducting post remediation sampling, HEPA filtration devices shall be allowed to operate for a minimum of 48 hours (the equivalent of 192 air changes), following fine cleaning, in all areas where remediation has been conducted. The HEPA filtration devices shall be sealed at the intake and turned off approximately two hours prior to post testing and reconvene within one hour after post testing, until acceptable post remediation results are established.

Post remediation sampling shall be conducted utilizing viable and/or non-viable sample methods. Air samples shall be collected in representative areas of the control areas. Surface sampling may be conducted at the discretion of the CIEC/CIE/IH.

Sampling shall be conducted in areas directly impacted by remediation procedures, where cleaning was conducted. The CIEC/CIE/IH shall determine acceptable post remediation status through interpretation of air sampling results, which will be based on indoor/outdoor comparisons, in combination with any surface samples collected, moisture readings, RH readings, visual observations, and any other pertinent information.

The owner/client will be responsible for post remediation testing. If air sample results indicate unacceptable airborne concentrations, the contractor shall be required to conduct a re-cleaning at the contractor's expense and absorb the cost for re-testing, until acceptable results are achieved.

Criteria for post remediation air sampling can be viewed in PEC's investigative report(s) listed in Section 2.1 below. This information can be found within the air sampling section of said report(s).

SECTION 2.0 SCOPE OF WORK (Note: Section 2.1 and Section 1.3 are essential to the full Scope of the Contractor's Work)

2.1 Investigative Reports and Other Related Documents

Phoenix EnviroCorp investigative report dated June 7, 2021, and December 3, 2021.

Phoenix EnviroCorp Chain of Custody dated June 1, 2021, and December 2, 2021.

Analytical reports dated June 2, 2021, and December 3, 2021.

2.2 Project Description

The procedures covered by this program/protocol include the enclosure and drying of the said structure, the removal, handling, and disposal of building components compromised by mold/fungal growth, and the cleaning and disinfecting of existing building materials. Procedures for reconstruction are not considered in these specifications. Reconstruction of interior portions may not be conducted until procedures for remediation have been completed, the control areas have been inspected, and testing has returned acceptable post remediation results. Reconstruction of exterior portions may be conducted during the restoration to ensure that water intrusion is abated.

The objectives covered by this program/protocol include the remediation of materials shown to have surface contamination, water damage, and/or exposure to elevated airborne mold spore levels, without subjecting the workers, installation employees, and occupants to microbial contaminants. In addition, contract employees, occupants, and materials shall be appropriately protected during the removal process to avoid exposure.

This program/protocol is provided as a guideline. Any deviation requests from this protocol shall be addressed to the CIEC/CIE/IH for consideration. At present there are no Federal or State requirements regarding microbial remediation projects; however, OSHA General Construction Code of Federal Regulations (29 CFR 1926) shall be followed.

Remediation shall be completed as close as possible to the date that this protocol was drafted, as the specifications outlined within represent conditions at the time the investigative services were conducted. Due to the volatility of mold, the current protocol may not reflect all necessary remediation if conditions are allowed to continue. Further, if time lapses allowing conditions to change, it may become increasingly difficult to obtain successful clearance testing results.

SECTION 3.0 AIR MONITORING

3.1 Responsibilities of the CIEC/CIE/IH

Monitoring of airborne concentrations will be performed in accordance with the requirements of this program. Prior to conducting air sampling and/or surface sampling for clearances, the CIEC/CIE/IH shall conduct a visual inspection of the area. Temperature and RH shall be recorded during the air sampling phase of clearance. All air sampling shall be conducted in such a manner as to provide a valid representation of airborne mold levels both inside and outside the work areas. If analysis of air samples indicates that airborne concentrations exceed acceptable limits, the contractor shall conduct re-cleaning at the contractor’s expense.

3.2 Personal Monitoring

No personal monitoring will be conducted by the CIEC/CIE/IH unless the remediation contractor requests monitoring for OSHA compliance. Presently there are no PELs or TLVs for microbial contaminants. It is the remediation contractor’s responsibility to determine if OSHA personal sampling may be required during application of anti-microbial agents.

3.3 Sample Integrity and Reporting

Samples shall be sealed, labeled, and a chain of custody initiated according to laboratory procedures.

Post remediation sample results shall be available within seven (7) business days of the completion of collection and will include the following information:

- Site Address
- Sample Number
- Location Sampled
- Collection Date(s)
- Person Taking Sample(s)
- Additional Comments (if any)
- Analyst Signature

SECTION 4.0 MATERIAL REPLACEMENT

4.1 Material Replacement

The general contractor/replacement contractor may begin material replacement after the CIEC/CIE/IH informs all parties of acceptable post remediation sample results.

With ongoing construction activities ambient air levels are expected to be elevated over what might be normally expected. Additional testing should not be necessary after remediation procedures have been completed and successful results have been obtained. In the event of another water intrusion (i.e., broken-pipeline, improper HVAC function, or building envelope compromise), an investigation shall be conducted within 24 to 48 hours of the event. Proper drying, if initiated within this time frame, should minimize the potential for microbial growth.

SECTION 5.0 SPILL CLEANUP REQUIREMENTS

5.1 Spills

MSDS shall be kept on site for all chemical products brought to the site by the remediation contractor. In the event of a chemical spill, the contractor shall initiate cleanup immediately. The contractor shall mop up any liquid with rags or other conventional absorbent. The spent absorbent shall be properly contained and disposed of as waste.

SECTION 6.0 WASTE CONTROL

6.1 Waste Disposal

Waste shall be disposed of at a locally selected landfill. Waste shall be transported to the landfill in such a way to ensure that it does not pose a potential hazard to the environment.

SECTION 7.0 SUPPLEMENTAL INFORMATION

7.1 Applicable Publications

The publications listed below form part of this program. This protocol shall be reviewed by the remediation

contractor prior to initiation of set-up for the project. Any questions regarding this protocol shall be addressed with the generator or appropriate Phoenix EnviroCorp personnel.

Code of Federal Regulation (CFR Publications)

29 CFR 1910.134	Respiratory Protection
29 CFR 1910.145	Specifications for Accident Prevention, Signs and Tags
29 CFR 1926.28	Personal Protective Equipment
29 CFR 1926.59	Hazard Communication
29 CFR 1926.96	Occupational Foot Protection
29 CFR 1926.100	Head Protection
29 CFR 1926.101	Hearing Protection
29 CFR 1926.102	Eye and Face Protection
29 CFR 1926.403	Electrical General Requirements
29 CFR 1926.416	Safety General Requirements
29 CFR 1926.852	Demolition, Chutes
29 CFR 1926.1091	Record Keeping Requirements

Supplemental Guidelines

IICRC S520 2nd ed.	Standard and Reference Guide for Professional Water Damage Restoration
NYCDOH	Guidelines on Assessment and Remediation of Fungi in Indoor Environments
ACGIH	Bioaerosols: Assessment and Control
IAQA 01-2000	Recommended Guidelines for Indoor Environments
ASHRAE 62.2-2007	Ventilation for Acceptable Indoor Air Quality in Low-Rise Residential Buildings

7.2 Definitions

Air Lock: A system that permits ingress and egress between a control area and non-control area, or other work areas, without allowing air movement between areas (e.g., three stage decon, three-way polyethylene flaps).

Air Sample: Refers to samples collected with spore trap air sample media (e.g., Micro-5, Cyclex D, or equivalent); also referred to as a non-viable air sample. May also refer to a sample collected on a disposable petri dish with Agar media by means of an Andersen Impactor (or equivalent) and sampling pump; also referred to as air culture (viable) sample. Sample media to be used in project is described under Section 1.6 (Post Remediation Verification Testing).

Area Monitoring: The sampling of airborne microbial concentrations outside the exclusion boundary, which may reach the breathing zone of the contractor or installation employees.

Asbestos Containing Materials (ACM): Refers to asbestos containing building materials that contain more than 1% asbestos by Polarized Light Microscopy (PLM) or Transmission Electron Microscopy (TEM).

Biocide: Refers to chemical agents that are specifically designed to eliminate viable microbial contamination, with a phenol equivalent efficiency (e.g., Sodium Hypochlorite, Quaternary Ammonia Compounds).

Blower Door Test: Refers to the testing of static pressure and draw of air through the HVAC in cubic feet per minute (CFM) to rate the efficiency of the system.

Clearance Monitoring: Refers to air, bulk, or swab sampling conducted as a means to demonstrate that the area specified for remediation has been completed by the contractor, left with present acceptable mold spore levels, and ready for re-construction.

Control Area: The area where microbial contaminants removal is performed, which is isolated by physical boundaries to prevent unauthorized entry of personnel, thereby preventing exposure to or the spread of microbial contaminants. Physical boundaries will be established and located such that the airborne contaminants are not allowed to escape the boundaries.

HEPA: High Efficiency Particulate Air. Refers to ventilation devices that are specifically designed to filter ambient air to an efficiency of 99.97%.

HVAC: Refers to the Heating, Ventilation, and Air Conditioning system.

Industrial Hygienist: Refers to a person who practices industrial hygiene and may act as a competent person regarding visual inspection of contaminated surfaces and clearance air and/or swab/bulk sampling. May also refer to a Certified Industrial Hygienist (CIH) as defined by the American Board of Industrial Hygiene (ABIH), a Certified Indoor Environmental Consultant as defined by the American Council for Accredited Certification (ACAC), or a Certified Indoor Environmentalist (CIE) as defined by the American Council for Accredited Certification (ACAC).

Microbial Contaminant: Refers to viable mold, fungi, pollen, bacteria, and or particulate, or their metabolites, which may be causative of epidemiological, immunotoxic, dermotoxic, neurotoxic, or enterotoxic disorders in the human population, or may be considered a pathogen or an opportunistic pathogen.

Non-Porous Materials: Refers to building materials with solid surfaces that may be successfully treated and cleaned by means of HEPA vacuuming or other approved method. Materials include flooring, hard goods, plastic, vinyl, and some wallboard systems.

Porous Materials: Refers to building materials and household goods that may allow microscopic particles (3-20 micron) to become trapped within the material that will not allow adequate cleaning. Materials include carpet, mattresses, and clothing.

Primary Control Area (PCA): Refers to a section of a facility that has been isolated by 6-mil polyethylene barriers where specific engineering controls (e.g., HEPA filtration, negative air pressurization, dehumidification, etc.) are required. In general, it is the area where remediation of water and mold damaged building materials is to be conducted.

Refrigerant Dehumidifier: Device used to remove water content from air and materials.

Relative Humidity (RH): Refers to the ratio of water vapor in the atmosphere to the amount required to saturate it at a given temperature.

Semi-Porous Materials: Refers to materials that may be somewhat porous, yet they may still allow for adequate cleaning. Materials include wooden beams and some wallboard systems.

Swab Sample: Refers to collection of a sample onto a sterile swab for analysis of mold, fungi, and bacteria by viable and/or non-viable analysis.

Tape-Lift Sample: Refers to collection of a sample onto clear scotch tape for analysis by direct microscopic

examination (non-viable).

7.3 Quality Assurance

Medical Examinations

Before potential exposure to microbial contaminants, the remediation contractor shall provide workers with a comprehensive medical examination as required by 29 CFR 1910.134 as outlined by the Medical Monitoring Program.

Medical Records

The remediation contractor shall maintain complete and accurate medical records on employees as required by OSHA and the contractor's Medical Monitoring Program. The contractor may be asked to provide a copy of all medical records for approval by the consultant's representative.

Training

Each employee working on this contract shall be trained prior to the time of initial job assignment in accordance with mold specific and chemical specific training as indicated by the OSHA General Duty Clause and the Hazard Communication Standard. Each employee shall also receive training required by Federal guidelines listed in Section 7.1 of this document and project specifications.

Hazard Communication Program

The remediation contractor has established and implemented a Hazard Communication Program as required by 29 CFR 1910.1200 and may be asked to provide a copy of this written program. Hazard Communication training must include occupational hazards as directly related to working with fungi/mold and contamination of building components by fungal contamination, specific training for chemical hazards associated with biocide usage, and site specific MSDS sheets for commercial detergents and biocides utilized on the job site.

Respiratory Protection Program

The remediation contractor has established a Respiratory Protection Program, which complies with 29 CFR 1910.134. Physical examinations and fit testing are required for use of respiratory protection greater than an N-95 dust mask. Workers removing building materials contaminated by mold growth, applying anti-microbial agents, or workers subjected to exposures to anti-microbial agents shall be required to wear, at minimum, a tight-fitting negative pressure ½ mask respirator with P-100 filters. Therefore, -he OSHA Respiratory Protection Standard applies.

Analytical Testing Laboratory

Analysis of culturable biological samples collected on this project shall be conducted by a laboratory that participates in the Environmental Microbiological Proficiency Analytical Testing Program (EMPAT) of the American Industrial Hygiene Association (AIHA) and has shown to be proficient by proficiency analytical testing (PAT) samples. Analysis of non-viable air and surface samples shall be conducted by a competent person.

7.4 Materials and Equipment

Equipment

The contractor shall make available to employees a complete set of personal protective equipment (PPE) as required by this program for entry into the controlled area. All personnel while in the control area or handling microbial contaminated waste shall wear protective clothing, respirators, and other PPE.

Respirators

The contractor shall furnish the appropriate respirator in accordance with 29 CFR 1910.134. At a minimum, an N-95 dust mask shall be utilized.

Special Clothing

Employees shall be provided with and required to wear: whole body disposable protective clothing, full body tyvek suits with head coverings, and latex gloves *(see table)* during all activities in the controlled area.

Chemical	Recommended Rubber Glove
Sodium Hypochlorite	Neoprene or Nitrile
Phenolic Compounds	Neoprene
Quaternary Ammonia Compounds	Polyvinyl Chloride (PVC)
Detergents	Latex

Eye Protection

The contractor shall provide chemical-resistant goggles to personnel engaged in cleaning and treatment activities and require them to be worn during application of anti-microbial agents and biocides.

Warning Signs and Labels

Standard approved warning signs shall be erected at all approaches to the control area as specified in 29 CFR 1910.145.

Anti-Microbial Agents

Anti-microbial agents utilized in interior quarters shall consist of quaternary ammonia compounds. No phenolic compounds shall be used in interior quarters with exception of Micro Ban Plus. Approval must be granted by the owner/powers that be prior to application. Anti-microbial agents shall be EPA approved. Commercial grade detergents shall be used to remove fungal contamination during cleaning phases prior to anti-microbial application, to include encapsulation.

Phoenix EnviroCorp

June 10, 2021

Quanesha Mullins
Wilmington Housing Authority
1524 S. 16th Street
Wilmington, NC 28401

RE: PEC Job # 21-21-182-IAQ-M - 302 Grass Lane Apartment 106, Wilmington, NC - Mold Investigation/Background air sampling

Enclosed are the results of the mold investigation conducted at the above referenced unit on June 3, 2021. Phoenix EnviroCorp (PEC) was retained to conduct background air sampling to determine airborne mold spore levels and to collect surface samples of suspect visible mold growth.

Background Information: The resident reported past leaks from plumbing in the bathroom and in the kitchen.

The unit is occupied and fully furnished with content throughout.

The HVAC system was off upon PEC's arrival and during sampling.

Note: For directional purposes "front" is determined by facing the parking lot off of Grass Lane from inside the building, unless otherwise stated.

Visual Inspection: PEC's visual inspection noted the following (see enclosed photographic documentation):

- Apparent water damage within the kitchen cabinet underneath the sink
- Apparent water damage within the bathroom cabinet underneath the sink
- Apparent water damage on the ceiling in the bathroom
- Apparent water damage on the ceiling in the closet of the rear left bedroom
- No suspect visible mold growth observed.

Mold Testing – Air: Non-viable spore trap air samples were collected to determine airborne mold spore levels. Samples were collected within the kitchen/living room, the bathroom, the rear right bedroom, and the rear left bedroom. *Micro 5 sampling media was utilized for the collection of spore trap air samples. Each sample ran for five (5) minutes at a flow rate of five (5) liters per minute for a total volume of twenty-five (25) liters per sample. Each sample was assigned a unique ID number and shipped to a third-party laboratory for analysis. All air samples were collected from centralized locations (within their respective areas) and within the breathing zone, unless otherwise noted.* Two samples were also collected outdoors for comparative purposes.

Results indicated acceptable levels of airborne mold spores in all sampled locations.

The interpretation of air sample results is based on indoor/outdoor comparisons, in combination with a study by Daniel M. Baxter, entitled "A Regional Comparison of Mold Spore Concentrations Outdoors and Inside "Clean" and "Mold Contaminated" Southern California Buildings", and other industry guidelines, as well as over 20 years of experience in industrial hygiene and mold testing.

In layman terms, acceptable levels indicate that the levels are below the outdoor level and/or the baseline levels (whichever is higher) stated below. Elevated levels indicate that the levels are above the outdoor level and/or the baseline level.

Baseline levels for indoor spore trap air samples are as follows: < 900 spores/m³ for Penicillium/ Aspergillus; 0 spores/m³ for Stachybotrys and Chaetomium; and < 350 spores/m³ for other individual mold groups.

Relative Humidity (RH): *Temperature and relative humidity readings were collected in the same locations as the spore trap air samples.* RH levels within the unit ranged from 40.3% – 45.9% with an outdoor reading of 85.0% (see the enclosed Chain of Custody for details). Per the American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) Standard 62-1999, relative humidity should range between 30% and 60%. Consistent RH levels above 60% can be conducive to mold growth.

Conclusions: Air sampling within the tested areas did not indicate a problem with the indoor air quality regarding mold and there was no surface mold growth identified. However, apparent water damage was noted. Upon request, and for an additional fee, PEC can conduct additional investigative activities to address the apparent water damage and provide a mold remediation protocol if needed.

Enclosed in this report are the laboratory analysis and the Chain of Custody.

Should you have any questions, please do not hesitate to call.

Thank you,

Philip Green
IH Technician

Tommie Green, CIEC
Professional Industrial Hygienist

Enclosures

Photo 1

Apparent water damage in the kitchen cabinet underneath the sink

Photo 2

Apparent water damage in the bathroom cabinet underneath the sink

Photo 3

Apparent water damage on the ceiling in the rear left bedroom

Photo 4

Apparent water damage on the ceiling in the closet of the rear left bedroom

Samples collected

Phoenix EnviroCorp
4020 SHIPYARD BLVD.
WILMINGTON, NC 28403

CHAIN OF CUSTODY

LABORATORY TEST REQUEST

Seem / Res# 210604025 lab ID: 095-098

CONTACT: Philip Green	TELEPHONE (910) 397-0370 FAX (910) 313-6094	6/3/2021
PEC Job #: 21-21-182-IAQ-M	SITE ADDRESS: 302 Grass Lane, Apt. 106, Wilmington, NC 28405	

PLEASE EMAIL RESULTS TO: KMGREEN@PHOENIXENVIROCORP.COM

SAMPLE TYPE:	NUMBER OF SAMPLES:	TURN AROUND TIME SPECIFIED:
Spore Trap - Micro-5	4	____ Immediate ____ 24 hr ____ 48 hr __X__ Standard
Surface Samples	0	

Sample #	Sample Area	Sample Volume	Lab Analysis Requested	% Relative Humidity	Temperature °F
060321-PG-01	Kitchen/Living Room	25L	S001	40.3	74.7
060321-PG-02	Bathroom	25L	S001	42.8	74.7
060321-PG-03	Rear Right Bedroom	25L	S001	44.0	72.6
060321-PG-04	Rear Left Bedroom	25L	S001	45.9	71.8

Samples Collected By (Printed Name and Signature): [signature] Date Signed: 6/3/2021

CHAIN OF CUSTODY RECORD

DATE:	Time:	Condition of Samples:	RELINQUISHED BY: (Printed Name and Signature)	ACCEPTED BY: (Printed Name and Signature)
6/3/2021	14:30:00 PM	Intact	[signature] AFFILIATION:	[signature] 6-4-21 AFFILIATION:

SEEML Reference Number: 210604025

Southeast Environmental Microbiology Laboratories
102 Edinburgh Court
Greenville, SC 29607
Phone: (864) 233-3770
FAX: (864) 233-6589

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

- ☐ Surface/Bulk Report
- ☒ Spore Trap Report
- ☐ Andersen Fungal Report
- ☐ Quantitative Fungal Report

Lab Manager Review: *Angel Gosnell* Date: 06/04/21

Thank you for using SEEML laboratories. We strive to provide superior quality and service.
SEEML laboratories are accredited through AIHA-LAP, LLC (EMLAP # 173667) for the analysis of Spore Traps and Surface/Bulk Samples.

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

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

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

Spore Trap Report

	Date Sampled: 06/03/21
Attn: ***Phoenix Enviro Corp.***	Date Received: 06/04/21
4020 Shipyard Blvd.	Date Analyzed: 06/04/21
Wilmington, NC 28403	Date Reported: 06/04/21
	Date Revised:
	Project Name: 21-21-182-IAQ-M
	Project Address: 302 Grass Lane, Apt 106
	Project City, State, ZIP: Wilmington, NC 28405
	SEEML Reference # : 210604025

TEST METHOD: DIRECT MICROSCOPY EXAMINATION SEEML SOP 7

Client Sample ID	060321-PG-01			060321-PG-02			060321-PG-03		
Location	Kitchen / Living Room			Bathroom			Rear Right Bedroom		
Lab Sample ID	210604025-095			210604025-096			210604025-097		
Comments									
Hyphal Fragments									
Pollen									
Spore Trap Used	M5			M5			M5		
	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%
Alternaria									
Ascospores	7	280	14				3	120	13
Basidiospores	8	320	16	6	240	21	2	80	8
Bipolaris/Drechslera									
Chaetomium									
Cladosporium	17	680	35	9	360	32	9	360	38
Curvularia									
Epicoccum									
Cercospora									
Fusarium									
Memnoniella									
Nigrospora									
Penicillium/Aspergillus	17	680	35	13	520	46	10	400	42
Polythrincium									
Rusts									
Smuts/Periconia/Myxomy									
Spegazzinia									
Stachybotrys									
Stemphylium									
Tetraploa									
Torula									
Ulocladium									
Colorless/Other Brown*									
Oidium									
Zygomycetes									
Pithomyces									
Background debris (1-5)**	3			3			3		
Sample Volume(liters)	25			25			25		
TOTAL SPORES/M^3	49	**1960**		28	**1120**		24	**960**	

Revisions:

Spore types listed without a count or data entry were not detected during the course of the analysis for the respective sample, indicating a raw count of <1 spore.

The analytical sensitivity is the spores/m^3 divided by the raw count, expressed in spores/m^3. The limit of detection is the analytical sensitivity (in spores/m^3) multiplied by the sample volume (in liters) divided by 1000 liters.

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

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

Disclaimer: The sample results are determined by the sample volume, which is provided by the customer.

This report relates only to the samples tested as they were received.

Angel Gosnell

Angel Gosnell, Approved Laboratory Signatory

102 Edinburgh Court
Greenville, SC. 29607
Phone: (864) 233-3770

Spore Trap Report

	Date Sampled: 06/03/21
Attn: ***Phoenix Enviro Corp.***	Date Received: 06/04/21
4020 Shipyard Blvd.	Date Analyzed: 06/04/21
Wilmington, NC 28403	Date Reported: 06/04/21
	Date Revised:
	Project Name: 21-21-182-IAQ-M
	Project Address: 302 Grass Lane, Apt 106
	Project City, State, ZIP: Wilmington, NC 28405
	SEEML Reference # : 210604025

TEST METHOD: DIRECT MICROSCOPY EXAMINATION SEEML SOP 7

Client Sample ID	060321-PG-04								
Location	Rear Left Bedroom								
Lab Sample ID	210604025-098								
Comments									
Hyphal Fragments									
Pollen									
Spore Trap Used	M5								
	raw ct.	spores/m^3	%						
Alternaria									
Ascospores									
Basidiospores	2	80	7						
Bipolaris/Drechslera									
Chaetomium									
Cladosporium	12	480	41						
Curvularia									
Epicoccum									
Cercospora									
Fusarium									
Memnoniella									
Nigrospora									
Penicillium/Aspergillus	15	600	52						
Polythrincium									
Rusts									
Smuts/Periconia/Myxomy									
Spegazzinia									
Stachybotrys									
Stemphylium									
Tetraploa									
Torula									
Ulocladium									
Colorless/Other Brown*									
Oidium									
Zygomycetes									
Pithomyces									
Background debris (1-5)**	3								
Sample Volume(liters)	25								
TOTAL SPORES/M^3	29	**1160**							

Revisions:

Spore types listed without a count or data entry were not detected during the course of the analysis for the respective sample, indicating a raw count of <1 spore.
The analytical sensitivity is the spores/m^3 divided by the raw count, expressed in spores/m^3. The limit of detection is the analytical sensitivity (in spores/m^3) multiplied by the sample volume (in liters) divided by 1000 liters.
*Colorless,other Brown are spores without a distinctive morphology on spore traps and non-viable surface samples.
**Background debris is the amount of particulate matter present on the slide and is graded from 1-5 with 1 = very light, 2= Light, 3 = Medium, 4 = Heavy, 5 = Very Heavy. The higher the rating the more likelihood spores may be underestimated. A rating of 5 should be interpreted as minimal counts and may actually be higher than reported.

Disclaimer: The sample results are determined by the sample volume, which is provided by the customer.
This report relates only to the samples tested as they were received.

102 Edinburgh Court
Greenville, SC. 29607
Phone: (864) 233-3770

Angel Gosnell
Angel Gosnell, Approved Laboratory Signatory

Samples Created

Phoenix EnviroCorp
4020 SHIPYARD BLVD.
WILMINGTON, NC 28403

CHAIN OF CUSTODY

LABORATORY TEST REQUEST

Seem PEC# 21060402 9 Lab ID: 118-119

CONTACT: Philip Green	TELEPHONE (910) 397-0370 FAX (910) 313-6094	6/3/2021
PEC Job #: 21-21-182,183,184,185-IAQ-M	SITE ADDRESS: 302 Grass Lane, Wilmington, NC 28405	

PLEASE EMAIL RESULTS TO: KMGREEN@PHOENIXENVIROCORP.COM

SAMPLE TYPE:	NUMBER OF SAMPLES:	TURN AROUND TIME SPECIFIED:
Spore Trap - Micro-5	2	____ Immediate ____ 24 hr ____ 48 hr __X__ Standard
Surface Samples	0	

Sample #	Sample Area	Sample Volume	Lab Analysis Requested	% Relative Humidity	Temperature °F
060321-PG-701	Outside - Front	25L	S001	85.0	83.2
060321-PG-702	Outside - Rear	25L	S001		

Samples Collected By (Printed Name and Signature): [signature] Date Signed: 6/3/2021

CHAIN OF CUSTODY RECORD

DATE:	Time:	Condition of Samples:	RELINQUISHED BY: (Printed Name and Signature)	ACCEPTED BY: (Printed Name and Signature)
6/3/2021	14:30:00 PM	Intact	[signature] AFFILIATION:	AFFILIATION: PM 0441

SEEML Reference Number: 210604029

Southeast Environmental Microbiology Laboratories
102 Edinburgh Court
Greenville, SC 29607
Phone: (864) 233-3770
FAX: (864) 233-6589

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

- ☐ Surface/Bulk Report
- ☒ Spore Trap Report
- ☐ Andersen Fungal Report
- ☐ Quantitative Fungal Report

Lab Manager Review: *Angel Gosnell* Date: 06/04/21

Thank you for using SEEML laboratories. We strive to provide superior quality and service.
SEEML laboratories are accredited through AIHA-LAP, LLC (EMLAP # 173667) for the analysis of Spore Traps and Surface/Bulk Samples.

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

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

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

Spore Trap Report

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	Project Name: 21-21-182,183,184,185-IAQ-M
	Project Address: 302 Grass Lane
	Project City, State, ZIP: Wilmington, NC 28405
	SEEML Reference # : 210604029

TEST METHOD: DIRECT MICROSCOPY EXAMINATION SEEML SOP 7

Client Sample ID	060321-PG-701			060321-PG-702					
Location	Outside - Front			Outside - Rear					
Lab Sample ID	210604029-118			210604029-119					
Comments									
Hyphal Fragments				1	40				
Pollen	4	160		2	80				
Spore Trap Used	M5			M5					
	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%			
Alternaria									
Ascospores	279	11200	73	51	2040	27			
Basidiospores	81	3240	21	27	1080	14			
Bipolaris/Drechslera									
Chaetomium									
Cladosporium	9	360	2	78	3120	41			
Curvularia									
Epicoccum									
Cercospora									
Fusarium									
Memnoniella									
Nigrospora									
Penicillium/Aspergillus	7	280	2	30	1200	16			
Polythrincium									
Rusts	9	360	2	3	120	2			
Smuts/Periconia/Myxomy									
Spegazzinia									
Stachybotrys									
Stemphylium									
Tetraploa									
Torula									
Ulocladium									
Colorless/Other Brown*									
Oidium									
Zygomycetes									
Pithomyces									
Background debris (1-5)**	3			3					
Sample Volume(liters)	25			25					
TOTAL SPORES/M^3	385	**15400**		189	**7560**				

Revisions:

Spore types listed without a count or data entry were not detected during the course of the analysis for the respective sample, indicating a raw count of <1 spore.

The analytical sensitivity is the spores/m^3 divided by the raw count, expressed in spores/m^3. The limit of detection is the analytical sensitivity (in spores/m^3) multiplied by the sample volume (in liters) divided by 1000 liters.

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102 Edinburgh Court
Greenville, SC. 29607
Phone: (864) 233-3770

Angel Gosnell

Angel Gosnell, Approved Laboratory Signatory

Fungal Descriptions

Alternaria sp.

Aw - 0.89. Conidia dimensions: 18-83 x 7-18 microns. A very common allergen with an IgE mediated response. It is often found in carpets, textiles and on horizontal surfaces in building interiors. Often found on window frames. Outdoors it may be isolated from samples of soil, seeds and plants. It is commonly found in outdoor samples. The large spore size, 20 - 200 microns in length and 7 - 18 microns in sizes, suggests that the spores from these fungi will be deposited in the nose, mouth and upper respiratory tract. It may be related to bakers' asthma. It has been associated with hypersensitivity pneumonitis. The species *Alternaria alternata* can produce tenuazonic acid and other toxic metabolites that may be associated with disease in humans or animals. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include edema and bronchospasms; chronic cases may develop pulmonary emphysema.

Ascospore

A spore borne in a special cell called an ascus. Spores of this type are reported to be allergenic. All ascomycetes, members of a group of fungi called Ascomycotina, have this type of spore. The minute black dots on rotting wood and leaves or the little cups on lichens are examples of ascomycetes; another is the "truffle" mushroom.

Aspergillus/Penicillium

These are two of the most commonly found allergenic fungi in problem buildings. *Aspergillus* comes in many varieties (species). Many of the varieties produce toxic substances. It may be associated with symptoms such as sinusitis, allergic bronchopulmonary aspergillosis, and other allergic symptoms. *Penicillium* is a variety of mold that is very common indoors and is found in increased numbers in problem buildings. It also has many varieties, some of which produce toxic substances. The symptoms are allergic reactions, mucous membrane irritation, headaches, vomiting, and diarrhea. Due to the morphological similarity of *Aspergillus* and *Penicillium*, they are not differentiated by microscopic analysis and are reported together.

Aspergillus sp.

Aw 0.75 - 0.82. Reported to be allergenic. Members of this genus are reported to cause ear infections. Many species produce mycotoxins that may be associated with disease in humans and other animals. Toxin production is dependent on the species or a strain within a species and on the food source for the fungus. Some of these toxins have been found to be carcinogenic in animal species. Several toxins are considered potential human carcinogens. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include edema and bronchospasms; chronic cases may develop pulmonary emphysema; may also be associated with sinusitis, allergic bronchopulmonary aspergillosis, and other allergic symptoms.

Basidiospore

Spore from basidiomycetes. Many varieties are reported to be allergenic.

Bipolaris sp.

A fungus with large spores that could be expected to be deposited in the upper respiratory tract. This fungus can produce the mycotoxin - sterigmatocystin, which has been shown to produce liver and kidney damage when ingested by laboratory animals.

Botrytis sp.

Aw 0.93. Conidia dimensions: 7-14 x 5-9 microns. It is parasitic on plants and soft fruits. Found in soil and on house plants and vegetables, it is also known as "gray mold". It causes leaf rot on grapes, strawberries, lettuce, etc. It is a well-known allergen, producing asthma type symptoms in greenhouse workers and "wine grower's lung".

Cercaspora

Common outdoors in agricultural areas, especially during harvest. Parasite of higher plants, causing leaf spot. Commonly found as parasites on higher plants.

Chaetomium sp.

large ascomycetous fungus producing perithecia. It is found on a variety of substrates containing cellulose, including paper and plant compost. It has been found on paper in sheetrock. It can produce an *Acremonium*-like state on fungal media. Varieties are considered allergenic and have been associated with peritonitis, cutaneous lesions, and system mycosis.

Cladosporium sp.

Aw 0.88; Aw 0.84. Most commonly identified outdoor fungus. The outdoor numbers are reduced in the winter. The numbers are often high in the summer. Often found indoors in numbers less than outdoor numbers. It is a common allergen. Indoor *Cladosporium* sp. may be different than the species identified outdoors. It is commonly found on the surface of fiberglass duct liners in the interior of supply ducts. A wide variety of plants are food sources for this fungus. It is found on dead plants, woody plants, food, straw, soil, paint, and textiles. Produces greater than 10 antigens. Antigens in commercial extracts are of variable quality and may degrade within weeks of preparation. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include skin lesions, eye ulceration, mycosis (including onychomycosis, an infection of the nails of the feet or hands) edema and bronchospasms; chronic cases may develop pulmonary emphysema.

Curvularia sp.

Reported to be allergenic and has been associated with allergic fungal sinusitis. It may cause corneal infections, mycetoma, and infections in immune compromised hosts.

Dreschlera sp.

Conidia dimensions: 40-120 x 17-28 microns. Found on grasses, grains and decaying food. It can occasionally cause a corneal infection of the eye.

Epicoccum sp.

Conidia dimensions: 15-25 microns. A common allergen. It is found in plants, soil, grains, textiles and paper products.

Fusarium sp.

Aw 0.90. A common soil fungus. It is found on a wide range of plants. It is often found in humidifiers. Several species in this genus can produce potent trichothecene toxins. The trichothecene (scirpene) toxin targets the following systems: circulatory, alimentary, skin, and nervous. Produces vomitoxin on grains during unusually damp growing conditions. Symptoms may occur either through ingestion of contaminated grains or possibly inhalation of spores. The genera can produce hemorrhagic syndrome in humans (alimentary toxic aleukia). This is characterized by nausea, vomiting, diarrhea, dermatitis, and extensive internal bleeding. Reported to be allergenic. Frequently involved in eye, skin, and nail infections.

Myxomycetes

Members of a group of fungi that is included in the category of "slime molds". They're occasionally found indoors, but mainly reside in forested regions on decaying logs, stumps, and dead leaves. Myxomycetes display characteristics of fungi *and* protozoans. In favorable (wet) conditions they exhibit motile, amoeba-like cells, usually bounded only by a plasma membrane, that are variable in size and form. During dry spells, they form a resting body (sclerotium) with dry, airborne spores. These fungi are not known to produce toxins but can cause hay fever and asthma.

Memnoniella

Contaminant found most often with *Stachybotrys* on wet cellulose. Forms in chains, but it are very similar to *Stachybotrys* and sometimes is considered to be in the *Stachybotrys* family. Certain species do produce toxins very similar to the ones produced by *Stachybotrys chartarum* and many consider the IAQ importance of *Memnoniella* to be on par with *Stachybotrys*. Allergenic and infectious properties are not well studied.

Nigrospora sp.

Commonly found in warm climates, this mold may be responsible for allergic reactions such as hay fever and asthma. It is found on decaying plant material and in the soil. It is not often found indoors.

Oidium sp.

The asexual phase of *Erysiphe* sp. It is a plant pathogen causing powdery mildews. It is very common on the leaf's stems, and flowers of plants. The health effects and allergenicity have not been studied. It does not grow on non-living surfaces such as wood or drywall.

Penicillium sp.

Aw 0.78 - 0.88. A wide number of organisms have been placed in this genus. Identification to species is difficult. Often found in aerosol samples. Commonly found in soil, food, cellulose and grains. It is also found in paint and compost piles. It may cause hypersensitivity pneumonitis, allergic alveolitis in susceptible individuals. It is reported to be allergenic (skin). It is commonly found in carpet, wallpaper, and in interior fiberglass duct insulation. Some species can produce mycotoxins. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include edema and bronchospasms; chronic cases may develop pulmonary emphysema. It may also cause headaches, vomiting, and diarrhea.

Periconia sp.

Periconia sp. are found in soil, blackened and dead herbaceous stems leaf spots, grasses, rushes, and sedges. Almost always associated with other fungi. Rarely found growing indoors. Reportedly associated with a rare case of mycotic keratitis.

Pithomyces sp.

A common mold found on dead leaves, plants, soil and especially grasses. Causes facial eczema in ruminants. It exhibits distinctive multi-celled brown conidia. It is not known to be a human allergen or pathogen. It is rarely found indoors, although it can grow on paper.

Rusts/Smuts

These fungi are associated with plant diseases. In the classification scheme of the fungi, the smuts have much in common with the rusts, and they are frequently discussed together. Both groups produce wind-borne, resistant teliospores that serve as the basis for their classification and their means of spread. Rusts usually attack vegetative regions (i.e., leaves and stems) of plants; smuts usually are associated with the reproductive structures (seeds). They can cause hay fever and asthma.

Spegazzinia

Spegazzinia species comprise a very small proportion of the fungal biota. This genus is somewhat related to other lobed or ornamented genera such as *Candelabrum*. No information is available regarding health effects or toxicity. Allergenicity has not been studied. Usually identified on spore trap samples where it is seen every few weeks. (Spores have very distinctive morphology.) May also be found in air by culturable (Andersen) samples if a long enough incubation period is provided so that sporulation occurs. Our laboratory has never found this organism growing on indoor environmental surfaces. Natural habitat includes soil and many kinds of trees and plants.

Stachybotrys sp.

Aw - 0.94, optimum Aw ->0.98. Several strains of this fungus (*S. atra, S. chartarum* and *S. alternans* are synonymous) may produce a trichothecene mycotoxin- Satratoxin H - which is poisonous by inhalation. The toxins are present on the fungal spores. This is a slow growing fungus on media. It does not compete well with other rapidly growing fungi. The dark colored fungus grows on building material with high cellulose content and low nitrogen content. Areas with a relative humidity above 55%, and are subject to temperature fluctuations, are ideal for toxin production. Individuals with chronic exposure to the toxin produced by this fungus reported cold and flu symptoms, sore throats, diarrhea, headaches, fatigue, dermatitis, intermittent local hair loss and generalized malaise. Other symptoms include coughs, rhinitis, nosebleed, a burning sensation in the nasal passages, throat, and lungs, and fever. The toxins produced by this fungus will suppress the immune system affecting the lymphoid tissue and the bone marrow. Animals injected with the toxin from this fungus exhibited the following symptoms: necrosis and hemorrhage within the brain, thymus, spleen, intestine, lung, heart, lymph node, liver, and kidney. Affects by absorption of the toxin in the human lung are known as pneumomycosis.

This organism is rarely found in outdoor samples. It is usually difficult to find in indoor air samples unless it is physically disturbed (or possibly -this is speculation- a drop in the relative humidity). The spores are in a gelatinous mass. Appropriate media for the growth of this organism will have high cellulose content and low nitrogen content. The spores will die readily after release. The dead spores are still allergenic and toxigenic. Percutaneous absorption has caused mild symptoms.

Stemphylium sp.

Reported to be allergenic. Isolated from dead plants and cellulose materials.

Torula sp.

Found outdoors in air, soil, on dead vegetation, wood, and grasses. Also found indoors on cellulose materials. Reported to be allergenic and may cause hay fever and asthma.

Tetraploa

Tetraploa species comprise a very small proportion of the fungal biota. This genus is somewhat related to *Triposporium* and Diplocladiella. The only reported human infections are two cases of keratitis (1970, 1980) and one case of subcutaneous infection of the knee (1990). No information is available regarding other health effects or toxicity. Allergenicity has not been studied. Usually identified on spore trap samples where it is seen every few weeks. (Spores have very distinctive morphology.) Our laboratory has never found this organism growing on indoor environmental surfaces. Natural habitat includes leaf bases and stems just above the soil on many kinds of plants and trees.

Ulocladium sp.

Aw 0.89. Isolated from dead plants and cellulose materials. Found on textiles.

Zygomycetes

Zygomycetes are one of the four major groups of fungi, the others being the Oomycetes, the Ascomycetes, and the Basidiomycetes. Zygomycetes are common, fast growing, and often overgrow and/or inhibit other fungi nearby. Rhizopus and Mucor are two of the most common Zygomycetes seen in the indoor environment. However, others are seen as well, including *Syncephalastrum*, *Circinella*, *Mortierella*, *Mycotypha*, *Cunninghamella*, and *Choanephora*. For further information, please see descriptions of these individual genera.

The following table lists mycotoxins that are produced by certain types of fungi:

Fungi	Mycotoxin
Acremonium crotocinigenum	Crotocin
Aspergillus favus	Alfatoxin B, cyclopiazonic acid
Aspergillus fumigatus	Fumagilin, gliotoxin
Aspergillus carneus	Critrinin
Aspergillus clavatus	Cytochalasin, patulin
Aspergillus Parasiticus	Alfatoxin B
Aspergillus nomius	Alfatoxin B
Aspergillus niger	Ochratoxin A, malformin, oxalicacid
Acremonium crotocinigenum	Crotocin
Aspergillus nidulans	Sterigmatocystin
Aspergillus ochraceus	Ochratoxin A, penicillic acid
Aspergillus versicolor	Sterigmatocystin, 5 ethoxysterigmatocystin
Aspergillus ustus	Ausdiol, austamide, austocystin,brevianamide
Aspergillus terreus	Citreoviridin
Alternaria	Alternariol, altertoxin, altenuene, altenusin, tenuazonic acid
Arthrinium	Nitropropionic acid
Bioploaris	Cytochalasin, sporidesmin, sterigmatocystin
Chaetomium	Chaetoglobosin A,B,C. Sterigmatocystin
Cladosporium	Cladosporic acid
Clavipes purpurea	Ergotism
Cylindrocorpon	Trichothecene
Diplodia	Diplodiatoxin
Fusarium	Trichothecene, zearalenone
Fusarium moniliforme	Fumonisins
Emericella nidulans	Sterigmatocystin
Gliocladium	Gliotoxin
Memnoniella	Griseofulvin , dechlorogriseofulvin, epi-decholorgriseofulvin, trichodermin, trichodermol
Myrothecium	Trichothecene
Paecilomyces	Patulin, viriditoxin
Penicillium aurantiocandidum	Penicillic acid
Penicillium aurantiogriseum	Penicillic acid
Penicillium brasilanum	Penicillic acid
Penicillium brevicompactum	Mycophenolic acid
Penicillium camemberti	Cyclopiazonic acid
Penicillium carneum	Mycophenolic acid, Roquefortine C
Penicillium crateriforme	Rubratoxin

Fungi	Mycotoxin
Penicillium citrinum	Citrinin
Penicillium commune	Cyclopiazonic acid
Penicillium crustosum	Roquefortine C
Penicillium chrysogenum	Roquefortine C
Penicillium discolor	Chaetoglobosin C
Penicillium expansum	Citrinin, Roquefortine C
Penicillium griseofulvum	Roquefortine C, cyclopiazonic acid, griseofulvin
Penicillium hirsutum	Roquefortine C
Penicillium hordei	Roquefortine C
Penicillium nordicum	Ochratoxin A
Penicillium paneum	Roquefortine C
Penicillium palitans	Cyclopiazonic acid
Penicillium polonicum	Penicillic acid
Penicillum roqueforti	Roquefortine C, Mycophenolic acid
Penicillium veridicatum	Penicillic acid
Penicillium verrucosum	Citrinin, ochratoxin A
Penicillium/ Aspergillus	Patulin
Penicillium/ Aspergillus/Alternaria	Glitoxin
Phomopsis	Macrocyclic trichothecenes
Phoma	Brefeldin, cytochalasin, secalonic acid, tenuazonic acid
Pithomyces	Sporidesmin
Rhizoctonia	Slaframine
Rhizopus	Rhizonin
Sclerotinia	Furanocoumarins
Stachybotrys chartarum	Iso-satratoxin F, roridin E, L-2, satratoxin G & H, trichodermin, trichodermol, trichothecene
Torula	Cytotoxins
Trichoderma	Trichodermin, trichodermol, gliotoxin
Trichothecium	Trichothecene
Wallemia	Walleminol
Zygosporium	Cytochalasin

General terms

Allergen

An allergen is a substance that elicits an IgE antibody response and is responsible for producing allergic reactions. Chemicals are released when IgE on certain cells contact an allergen. These chemicals can cause injury to surrounding tissue - the visible signs of an allergy. Only a few fungal allergens have been characterized but all fungi are thought to be potentially allergenic. Fungal allergens are proteins found in either the mycelium or spores

"Black mold"

A poorly defined term. Black mold or toxic black mold has usually been associated with the mold *Stachybotrys chartarum*. While there are only a few molds that are truly black, there are many that can appear black. Not all molds that appear to be black are *Stachybotrys*.

Fungi

Fungi are neither animals nor plants and are classified in a kingdom of their own. The Kingdom of Fungi. Fungi include a very large group of organisms, including molds, yeasts, mushrooms and puffballs. There are >100,000 accepted fungal species but current estimates range to 1.5 million species. Mycologists (people who study fungi) have grouped fungi into four large groups according to their method of reproduction.

Hidden mold

This refers to visible mold growth on building structures that is not easily seen, including the areas above drop ceilings, within a wall cavity (the space between the inner and outer structure of a wall), inside air handlers, or within the ducting of a heating/ventilation system.

Microbial Volatile Organic Compounds (MVOCs)

Fungi produce chemicals as a result of their metabolism. Some of these chemicals, MVOCs, are responsible for the characteristic moldy, musty, or earthy smell of fungi, whether mushrooms or molds. Some MVOCs are considered offensive or annoying. Specific MVOCs are thought to be characteristic of wood rot and mold growth on building materials. The human nose is very sensitive to mold odors and sometimes more so than current analytical instruments.

Mold

Molds are a group of organisms that belong to the Kingdom of Fungi (see Fungi). Even though the terms mold and fungi had been commonly referred to interchangeably, all molds are fungi, but not all fungi are molds.

Mycotoxin

Mycotoxins are compounds produced by some fungi that are toxic to humans or animals. By convention, the term? Mycotoxin. Excludes mushroom toxins. Fungi that produce mycotoxins are called "toxigenic fungi."

Spore

General term for a reproductive structure in fungi, bacteria and some plants. In fungi, the spore is the structure which may be used for dissemination and may be resistant to adverse environmental conditions.

Toxic mold

The term "toxic mold" has no scientific meaning since the mold itself is not toxic. The metabolic byproducts of some molds may be toxic (see mycotoxin).

Hypha (plural, hyphae)

An individual fungal thread or filament of connected cells; the thread that represents the individual parts of the fungal body.

Phoenix EnviroCorp

MOLD/BIOLOGICAL CONTAMINANT REMEDIATION PROTOCOL

Date: July 1, 2021

For: Quanesha Mullins
Wilmington Housing Authority
1524 S. 16th Street
Wilmington, NC 28401

Remediation Contractor: Not determined

On-Site Consultant: Phoenix EnviroCorp (PEC)
4020 Shipyard Boulevard
Wilmington, NC 28403
(910) 397-0370

Approved Signatory:

Tommie Green, CIEC
Professional Industrial Hygienist

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SECTION 1.0 REMEDIATION PROCEDURES

1.1 Project Set Up

- The owner or powers that be shall supply temporary power for remediation equipment. The existing electrical system may be utilized, with permission of the owner or powers that be. Determining specific electrical load/safety requirements, including, but not limited to, the use of a temporary GFCI electrical panel box shall be the responsibility of the abatement contractor.
- HVAC system shall be isolated.
- 6-mil polyethylene sheathing shall be erected to separate primary control areas (PCA) from remaining areas. Control areas shall be selected so that specified building materials (specified herein, in section 1.3, under primary control areas) may be removed or cleaned and dried.
- HEPA Air Filtration Devices shall be utilized for each separate control area. Critical barriers shall consist of 6-mil polyethylene so that primary control areas are isolated from remaining areas. HEPA filtration units shall be exhausted from the PCA to the outside of the building through windows/doors. Dehumidification units must be installed in the PCA to sufficiently dry components.
- A remote wash off station shall be set up to allow for employees to wash hands and faces after egress from the work area.
- Ingress/Egress to the control area(s) shall be, at minimum, sealed with a 2-way polyethylene air lock.
- Entrances to the building shall be marked as indicated in Section 7.4 of this document.

1.2 Local Exhaust System

- Once sealed, the primary control area shall be ventilated with a local HEPA air filtration device that shall ensure a minimum of four (4) air changes per hour. The air filtration device shall be placed within the containment work area.
- Local HEPA exhaust shall be utilized where cleaning of contents is required and/or in the immediate vicinity of remediation activities of building materials.
- In interior sections requiring surface area cleaning, local HEPA filtration may be exhausted within the area to scrub microbials from ambient air. This process shall only be conducted after fine cleaning has been completed.
- Negative pressure within the contained work area shall be maintained throughout the project until clearance is obtained.
- Negative air machines shall be exhausted to exterior portions of the building to adequately ensure that negative pressure is achieved.
- Negative air pressure within the work area shall be tested and recorded at initiation of the project and hourly thereafter by use of a manometer to ensure the desired pressure of -0.02 inches of water, which is comparable to four changes per hour.
- Dehumidification devices with HEPA filtration may be incorporated as filtration devices in conjunction with true HEPA filtration devices; they may not replace the true HEPA filtration devices.

Note: Formula for determination of adequate HEPA filtration:

Total feet per minute =Volume of work area (ft^3)/15 minutes
#AFD Units needed = (Total feet per minute)/Capacity of Unit (ft^3)

- At initiation of final cleaning stages, relative humidity shall be at 40% (+/-3%) and moisture content of wooden components shall be at or below 15% as determined by Delmhorst moisture meter or equivalent meter. Moisture mapping and direct read T/RH shall be recorded by the remediation contractor until the

specified levels have been achieved. Control areas shall be dehumidified during cleaning and mold remediation activities to ensure removal of surface moisture created during application of water. Drying of structural components that have been treated with encapsulating anti-microbial agents will be necessary.

- Moisture levels shall be recorded and documented by the remediation contractor upon successful completion of dehumidification.

1.3 Remediation Specifications

- Prior to commencement of mold remediation activities by the remediation contractor, the source of any water intrusions, leaks, and/or moisture/humidity problems shall be remedied by the owner. If water intrusions, leaks, and/or moisture/humidity problems exist and are not corrected, mold growth can be expected to return.
- All remediation procedures listed that involve the removal of building materials shall employ polyethylene critical barriers, negative air pressure, and HEPA filtration (i.e., primary control areas).
- The remediation contractor shall ensure that the filters are properly capped prior to switching off the air scrubbers. If the filters are not properly capped, the backflow can cause mold spores to re-release back into the control area, essentially re-contaminating an area that has already been cleaned.
- All remediation activities shall be conducted in a manner that does not allow dissemination of mold spores. Remediation procedures shall begin from the side of the control area furthest away from air filtration devices.
- Cleaning procedures shall be repeated until the area is visibly free of dust and debris.
- Engineering controls set up during the remediation process shall remain in place until remediation has been completed and acceptable post remediation sampling results have been achieved.
- **Federal and/or state regulations require that suspect asbestos containing materials in public and commercial buildings shall be inspected for asbestos prior to renovations or demolition. Based on these regulations, PEC recommends that building materials that may be disturbed during mold remediation be tested for asbestos content prior to their disturbance to prevent asbestos contamination.**
- If cleaning procedures outlined in this remediation plan outweigh the cost of replacement for selected items, the remediation contractor shall give the owner the option to clean or dispose of those items.
- Reinstallation of building materials and/or components shall only be conducted once acceptable post remediation results are obtained.
- Any chemicals used on this project shall be EPA approved and used only as directed by the manufacturer. MSDS shall be available for review upon request.

HVAC System

- The HVAC system(s) that services or run through the primary control area/affected area shall be shut down prior to remediation activities.
- The spaces that are normally climate-controlled by the HVAC system that have been shut down shall be maintained under proper humidity levels (between 30 and 60% utilizing dehumidifiers, etc.) while the system is not in operation.
- All HVAC supply/return vents within the primary control area/affected area shall be isolated with a critical barrier (i.e., plastic, etc.) to prevent air flow.
- Once the HVAC system is shut down, the system shall remain off and isolated until acceptable post remediation results are obtained.

Note: For directional purposes "front" is determined by facing Grass Lane from inside the unit, unless otherwise noted.

Primary Control Areas/Affected Areas

Critical barriers, negative air pressure, and HEPA filtration shall be established to isolate the following areas as Primary Control Areas to perform the specified mold remediation. **All non-stable furnishings and contents shall be removed from the containment area/primary control area prior to specified remediation to avoid cross contamination of furnishings and contents. If elected, said furnishings and contents can be precleaned (i.e., HEPA vacuum, etc.) and stored in the primary control area, but shall be protected (i.e., covered with poly, etc.) to avoid cross contamination.**

Within the rear left bedroom closet:
- Remove the entire drywall ceiling.

Within the bathroom:
- Remove the entire drywall ceiling.
- Detach and discard the floor mounted cabinet (with sink) from the front.
- Remove all baseboards from the front and left walls.
- Remove the toe molding along the bathtub.
- Detach the toilet.
- Remove an approximately 6-foot by 3-foot section of drywall from the front wall, beginning at the bathtub and extending to the left wall (approximately 6 feet); and beginning at the floor and extending up 3 feet.
- Remove an approximately 3-foot by 3-foot section of drywall from the left wall, beginning at the front wall and extending to the door (approximately 3 feet); and beginning at the floor and extending up 3 feet. Also remove the trim board from the front side of the door.
- Remove any loose floor tiles.

Within the kitchen:
- Detach the floor mounted cabinets associated with the sink along the left wall, and discard apparent water damaged components (i.e., cabinet floor, etc.).
- Assess the drywall uncovered by the removal of specified cabinet and remove any affected drywall (i.e., drywall with suspect visible mold growth/apparent water damage) and extend the drywall removal within a 2-foot radius of any affected areas when possible.
- Remove any loose floor tiles.

Within the rear bedroom, the bathroom, and the kitchen:
- Remove all contents from the containment area prior to commencement of other specified remediation.
- Clean all remaining surfaces within the containment areas as specified below under general specifications for primary control areas.

General Specifications for Primary Control Areas

- Open plumbing lines and drains within the control areas shall be isolated with a critical barrier consisting of 6-mil poly.
- The water line to toilets within the control areas shall be shut off and the toilets shall be isolated with a critical barrier consisting of 6-mil poly.
- Cleaning of components/materials shall consist of a method that thoroughly removes visible mold growth, settled concentrations of mold spores, and/or dust and debris (i.e., HEPA vacuuming, wet wiping, or other approved methods), followed by dehumidification/drying.

- Exterior surfaces of electrical appliances, electrical equipment, and light fixtures shall be cleaned, utilizing wet method and HEPA vacuuming. These items shall be disconnected from all electrical sources prior to cleaning. If these items cannot be cleaned efficiently, the abatement contractor shall consult with the owner/powers that be.
- All wall/ceiling cavity insulation shall be disposed in areas that specify the removal of drywall/wallboard. The abatement contractor shall visually inspect the back side of surrounding drywall/wallboard for water damage and/or suspect mold growth and document any findings. If additional suspect mold growth or water damage is observed beyond the specified removal area, additional drywall/wallboard shall be removed until no suspect mold growth or water damage is observed.
- All penetrations within the controlled area that adjoin unaffected or non-accessible areas, including outdoor areas, crawlspaces, etc., shall be cleaned (as far as one can reach) and then sealed with 6-mil poly, extending six (6) inches on all sides.
- In areas of specified wallboard removal, all components within the wall/ceiling cavities shall be cleaned. Any wooden structural components with mold stains or mold growth in pitted surfaces shall be HEPA sanded (or other approved methods) to eliminate embedded mold growth.
- All joints or sills (where the structural system meets, where the sill plate meets the floor, etc.) shall be aggressively disturbed to remove embedded mold growth and spores.

1.4 Removal Procedures

The contractor shall maintain surfaces of the control area free of accumulation of dust and debris. Additionally, they shall restrict the spread of dust and debris, keeping waste from being distributed over the work area. Materials shall be removed in a fashion to ensure that previously cleaned areas are not recontaminated (i.e. working from one end of the control area to the other). The contractor may be required to re-clean areas based on a visual inspection by the CIEC/CIE/IH, if the areas are not visibly clean.

Contaminated building materials that have been removed, and additional materials and debris generated during remediation, shall be bagged or wrapped with 6-mil polyethylene sheeting, sealed with duct tape, and carried to the waste container prior to visual inspection by the CIEC/CIE/IH. Materials shall be bagged and sealed directly after removal from unaffected building components.

Areas shall be allowed to dry for a period until specified RH and moisture levels have been achieved. Any remaining building products that are directly impacted by remediation shall be tested for moisture content. Wooden and cellulosic building components (e.g., wall studs, drywall, etc.) shall be tested for moisture content. If the moisture content is > 15% in wood products or > 12% in cellulosic products (utilizing a Delmhorst moisture meter), dehumidification shall be required until moisture levels are at or below said levels, and the RH level is at or below 40% +/-3% (for all interior areas). The remediation contractor shall verify water content of all wooden and cellulosic building components within the impacted areas, as well as temperature and RH prior to scheduling post remediation verification.

1.5 Cleanup Overview

The contractor shall personally review the cleaning process prior to contacting the CIEC/CIE/IH for the post remediation testing. If accumulations of debris and dust are significant, the CIEC/CIE/IH will require re-cleaning prior to post remediation verification sampling.

The CIEC/CIE/IH shall make a visual inspection and conduct post remediation sampling after the final cleaning is complete.

1.6 Post Remediation Verification Testing

Prior to conducting post remediation sampling, HEPA filtration devices shall be allowed to operate for a minimum of 48 hours (the equivalent of 192 air changes), following fine cleaning, in all areas where remediation has been conducted. The HEPA filtration devices shall be sealed at the intake and turned off approximately two hours prior to post testing and reconvene within one hour after post testing, until acceptable post remediation results are established.

Post remediation sampling shall be conducted utilizing viable and/or non-viable sample methods. Air samples shall be collected in representative areas of the control areas. Surface sampling may be conducted at the discretion of the CIEC/CIE/IH.

Sampling shall be conducted in areas directly impacted by remediation procedures, where cleaning was conducted. The CIEC/CIE/IH shall determine acceptable post remediation status through interpretation of air sampling results, which will be based on indoor/outdoor comparisons, in combination with any surface samples collected, moisture readings, RH readings, visual observations, and any other pertinent information.

The owner/client will be responsible for post remediation testing. If air sample results indicate unacceptable airborne concentrations, the contractor shall be required to conduct a re-cleaning at the contractor's expense and absorb the cost for re-testing, until acceptable results are achieved.

SECTION 2.0 SCOPE OF WORK (Note: Section 2 and Section 1.3 are essential to the full Scope of the Contractor's Work)

2.1 Investigative Reports and Other Related Documents

Phoenix EnviroCorp investigative report dated June 10, 2021, and July 1, 2021.

Phoenix EnviroCorp Chain of Custody dated June 3, 2021.

Analytical reports dated June 4, 2021.

2.2 Project Description

The procedures covered by this program include the enclosure and drying of the said structure, the removal, handling, and disposal of building components compromised by mold/fungal growth, and the cleaning and disinfecting of existing building materials. Procedures for reconstruction are not considered in these specifications. Reconstruction of interior portions may not be conducted until procedures for remediation have been completed, the control areas have been inspected, and testing has returned acceptable post remediation results. Reconstruction of exterior portions may be conducted during the restoration to ensure that water intrusion is abated.

The objectives covered by the program include the remediation of materials shown to have surface contamination, water damage, and/or exposure to elevated airborne mold spore levels, without subjecting the workers, installation employees, and occupants to microbial contaminants. In addition, contract employees, occupants, and materials will be appropriately protected during the removal process so that present and future exposures will not occur.

This protocol is provided as a guideline. Any deviation requests from this protocol shall be addressed to the CIEC/CIE/IH for consideration. At present there are no Federal or State requirements regarding microbial remediation projects; however, OSHA General Construction Code of Federal Regulations (29 CFR 1926) shall be followed.

Remediation shall be completed as close to the date that this protocol was drafted, as the specifications outlined within represent conditions at the time the investigative services were conducted. Due to the volatility of mold, the current protocol may not reflect all necessary remediation if conditions are allowed to continue. Further, if time lapses allowing conditions to change, it will become increasingly difficult to obtain successful clearance testing results.

SECTION 3.0 AIR MONITORING

3.1 Responsibilities of the CIEC/CIE/IH

Monitoring of airborne concentrations will be performed in accordance with the requirements of this program. Prior to conducting air sampling and/or surface sampling for clearances, the CIEC/CIE/IH shall conduct a visual inspection of the area. Temperature and RH shall be recorded during the air sampling phase of clearance. All air sampling shall be conducted in such a manner as to provide a valid representation of airborne mold levels both inside and outside the work areas. If analysis of air samples indicates that airborne concentrations exceed acceptable limits, the contractor shall conduct re-cleaning at the contractor's expense.

3.2 Personal Monitoring

No personal monitoring will be conducted by the CIEC/CIE/IH unless the remediation contractor requests monitoring for OSHA compliance. Presently there are no guidelines (PELs or TLVs) for microbial contaminants. It is the remediation contractor's responsibility to determine if OSHA personal sampling may be required during application of anti-microbial agents.

3.3 Sample Integrity and Reporting

Samples shall be sealed, labeled, and a chain of custody initiated according to laboratory procedures.

Sample results shall be available within seven (7) days of the completion of collection of all samples and will include the following information:

- Site Address
- Sample Number
- Location Sampled
- Analytical Method
- Collection Date(s)
- Person Taking Sample(s)
- Additional Comments (if any)
- Analyst Signature

SECTION 4.0 MATERIAL REPLACEMENT

4.1 Material Replacement

The general contractor/replacement contractor may begin material replacement after the CIEC/CIE/IH informs all parties of acceptable post remediation sample results.

With ongoing construction activities ambient air levels are expected to be elevated over what might be normally expected. Additional testing should not be necessary after remediation procedures have been completed and successful results have been obtained. In the event of another water intrusion (i.e. broken-pipe-

line, improper HVAC function, or building envelope compromise), an investigation shall be conducted within 24 to 48 hours of the event. Proper drying, if initiated within this time frame, should minimize the potential for microbial growth.

SECTION 5.0 SPILL CLEANUP REQUIREMENTS

5.1 Spills

MSDS shall be kept on site for all chemical products brought to the site by the remediation contractor. In the event of a chemical spill, the contractor shall initiate cleanup immediately. The contractor shall mop up any liquid with rags or other conventional absorbent. The spent absorbent shall be properly contained and disposed of as waste.

SECTION 6.0 WASTE CONTROL

6.1 Waste Disposal

Waste shall be disposed of at a locally selected landfill. Waste bags shall be checked for integrity and hauled in an enclosed truck/vehicle or container to ensure that transportation to the landfill does not pose a potential hazard to the environment.

SECTION 7.0 SUPPLEMENTAL INFORMATION

7.1 Applicable Publications

The publications listed below form part of this program. Written programs shall accompany all referenced CFR publications. IICRC and NYCDOH guidelines for work procedures shall be followed by the remediation contractor. A copy of the NYCDOH protocols shall be on-site, along with this design, for reference by the site supervisor. ACGIH, IAQA, and ASHRAE publications shall be utilized as guidelines for interpretation by the CIEC/CIE/IH. This design shall be reviewed by the remediation supervisor prior to initiation of set-up for the project. Any questions regarding this project may be addressed with the on-site consultant listed for Phoenix EnviroCorp.

Code of Federal Regulation (CFR Publications)

29 CFR 1910.134	Respiratory Protection
29 CFR 1910.145	Specifications for Accident Prevention, Signs and Tags
29 CFR 1926.28	Personal Protective Equipment
29 CFR 1926.59	Hazard Communication
29 CFR 1926.96	Occupational Foot Protection
29 CFR 1926.100	Head Protection
29 CFR 1926.101	Hearing Protection
29 CFR 1926.102	Eye and Face Protection
29 CFR 1926.403	Electrical General Requirements
29 CFR 1926.416	Safety General Requirements
29 CFR 1926.852	Demolition, Chutes
29 CFR 1926.1091	Record Keeping Requirements

Supplemental Guidelines

IICRC S520 2nd ed.	Standard and Reference Guide for Professional Water Damage Restoration
NYCDOH	Guidelines on Assessment and Remediation of Fungi in Indoor Environments
ACGIH	Bioaerosols: Assessment and Control
IAQA 01-2000	Recommended Guidelines for Indoor Environments
ASHRAE 62.2-2007	Ventilation for Acceptable Indoor Air Quality in Low-Rise Residential Buildings

7.2 Definitions

Air Lock: A system that permits ingress and egress between a control area and non-control area, or other work areas, without allowing air movement between areas (e.g., three stage decon, three-way polyethylene flaps).

Air Sample: Refers to samples collected with spore trap air sample media (e.g., Micro-5, Cyclex D, or equivalent); also referred to as a non-viable air sample. May also refer to a sample collected on a disposable petri dish with Agar media by means of an Andersen Impactor (or equivalent) and sampling pump; also referred to as air culture (viable) sample. Sample media to be used in project is described under Section 1.6 (Post Remediation Verification Testing).

Area Monitoring: The sampling of airborne microbial concentrations outside the exclusion boundary, which may reach the breathing zone of the contractor or installation employees.

Asbestos Containing Materials (ACM): Refers to asbestos containing building materials that contain more than 1% asbestos by Polarized Light Microscopy (PLM) or Transmission Electron Microscopy (TEM).

Biocide: Refers to chemical agents that are specifically designed to eliminate viable microbial contamination, with a phenol equivalent efficiency (e.g., Sodium Hypochlorite, Quaternary Ammonia Compounds).

Blower Door Test: Refers to the testing of static pressure and draw of air through the HVAC in cubic feet per minute (CFM) to rate the efficiency of the system.

Clearance Monitoring: Refers to air, bulk, or swab sampling conducted as a means to demonstrate that the area specified for remediation has been completed by the contractor, left with present acceptable mold spore levels, and ready for re-construction.

Control Area: The area where microbial contaminants removal is performed, which is isolated by physical boundaries to prevent unauthorized entry of personnel, thereby preventing exposure to or the spread of microbial contaminants. Physical boundaries will be established and located such that the airborne contaminants are not allowed to escape the boundaries.

HEPA: High Efficiency Particulate Air. Refers to ventilation devices that are specifically designed to filter ambient air to an efficiency of 99.97%.

HVAC: Refers to the Heating, Ventilation, and Air Conditioning system.

Industrial Hygienist: Refers to a person who practices industrial hygiene and may act as a competent person regarding visual inspection of contaminated surfaces and clearance air and/or swab/bulk sampling. May also refer to a Certified Industrial Hygienist (CIH) as defined by the American Board of Industrial Hygiene (ABIH), a Certified Indoor Environmental Consultant as defined by the American Council for Accredited Certification (ACAC), or a Certified Indoor Environmentalist (CIE) as defined by the American Council for Accredited Certification (ACAC).

Microbial Contaminant: Refers to viable mold, fungi, pollen, bacteria, and or particulate, or their metabolites, that may be causative of epidemiological, immunotoxic, dermotoxic, neurotoxic, or enterotoxic disorders in the human population, or may be considered a pathogen or an opportunistic pathogen.

Non-Porous Materials: Refers to building materials with solid surfaces that may be successfully treated and cleaned by means of HEPA vacuuming or other approved method. Materials include flooring, hard goods, plastic, vinyl, and some wallboard systems.

Porous Materials: Refers to building materials and household goods that may allow microscopic particles (3-20 micron) to become trapped within the material that will not allow adequate cleaning. Materials include carpet, mattresses, and clothing.

Primary Control Area (PCA): Refers to a section of a facility that has been isolated by 6-mil polyethylene barriers where specific engineering controls (e.g., HEPA filtration, negative air pressurization, dehumidification, etc.) are required. In general, it is the area where remediation of water and mold damaged building materials is to be conducted.

Refrigerant Dehumidifier: Device used to remove water content from air and materials.

Relative Humidity (RH): Refers to the ratio of water vapor in the atmosphere to the amount required to saturate it at a given temperature.

Semi-Porous Materials: Refers to materials that may be somewhat porous, yet they may still allow for adequate cleaning. Materials include wooden beams and some wallboard systems.

Swab Sample: Refers to collection of a sample onto a sterile swab for analysis of mold, fungi, and bacteria by viable and/or non-viable analysis.

Tape-Lift Sample: Refers to collection of a sample onto clear scotch tape for analysis by direct microscopic examination (non-viable).

7.3 Quality Assurance

Medical Examinations

Before potential exposure to microbial contaminants, the remediation contractor shall provide workers with a comprehensive medical examination as required by 29 CFR 1910.134 as outlined by the Medical Monitoring Program.

Medical Records

The remediation contractor shall maintain complete and accurate medical records on employees as required by OSHA and the contractor's Medical Monitoring Program. The contractor may be asked to provide a copy of all medical records for approval by the consultant's representative.

Training

Each employee working on this contract shall be trained prior to the time of initial job assignment in accordance with mold specific and chemical specific training as indicated by the OSHA General Duty Clause

and the Hazard Communication Standard. Each employee shall also receive training required by Federal guidelines listed in Section 7.1 of this document and project specifications.

Hazard Communication Program

The remediation contractor has established and implemented a Hazard Communication Program as required by 29 CFR 1910.1200 and may be asked to provide a copy of this written program. Hazard Communication training must include occupational hazards as directly related to working with fungi/mold and contamination of building components by fungal contamination, specific training for chemical hazards associated with biocide usage, and site specific MSDS sheets for commercial detergents and biocides utilized on the job site.

Respiratory Protection Program

The remediation contractor has established a Respiratory Protection Program, which complies with 29 CFR 1910.134. Physical examinations and fit testing are required for use of respiratory protection greater than an N-95 dust mask. Workers removing building materials contaminated by mold growth, applying anti-microbial agents, or workers subjected to exposures to anti-microbial agents shall be required to wear, at minimum, a tight-fitting negative pressure ½ mask respirator with P-100 filters. Therefore, -he OSHA Respiratory Protection Standard applies.

Analytical Testing Laboratory

Analysis of culturable biological samples collected on this project shall be conducted by a laboratory that participates in the Environmental Microbiological Proficiency Analytical Testing Program (EMPAT) of the American Industrial Hygiene Association (AIHA) and has shown to be proficient by proficiency analytical testing (PAT) samples. Analysis of non-viable air and surface samples shall be conducted by a competent person.

7.4 Materials and Equipment

Equipment

The contractor shall make available to employees a complete set of personal protective equipment (PPE) as required by this program for entry into the controlled area. All personnel while in the control area or handling microbial contaminated waste shall wear protective clothing, respirators, and other PPE.

Respirators

Contractor shall furnish the appropriate respirator in accordance with 29 CFR 1910.134 and approved by NIOSH for protection in environments that contain microbial contaminants. The selected respirator for this project shall be a tight-fitting negative pressure ½ respirator equipped with HEPA cartridge (P-95, P-100). At minimum, an N-95 dust mask may be utilized during fine cleaning activities; however, the tight fitting ½ mask respirator shall be utilized during application of anti-microbial agents or biocides.

Special Clothing

Employees shall be provided with and required to wear: whole body disposable protective clothing, full body tyvek suits with head coverings, and latex gloves *(see table)* during all activities in the controlled area.

Chemical	Recommended Rubber Glove

Sodium Hypochlorite	Neoprene or Nitrile
Phenolic Compounds	Neoprene
Quaternary Ammonia Compounds	Polyvinyl Chloride (PVC)
Detergents	Latex

Eye Protection

The contractor shall provide chemical-resistant goggles to personnel engaged in cleaning and treatment activities and require them to be worn during application of anti-microbial agents and biocides.

Warning Signs and Labels

Standard approved warning signs shall be erected at all approaches to the control area as specified in 29 CFR 1910.145.

Anti-Microbial Agents

Anti-microbial agents utilized in interior quarters shall consist of quaternary ammonia compounds. No phenolic compounds shall be used in interior quarters with exception of Micro Ban Plus. Approval must be granted by the owner/powers that be prior to application. Anti-microbial agents shall be EPA approved. Commercial grade detergents shall be used to remove fungal contamination during cleaning phases prior to anti-microbial application, to include encapsulation.

Phoenix EnviroCorp

June 10, 2021

Quanesha Mullins
Wilmington Housing Authority
1524 S. 16th Street
Wilmington, NC 28401

RE: PEC Job # 21-21-183-IAQ-M - 302 Grass Lane Apartment 107, Wilmington, NC - Mold Investigation/Background air sampling

Enclosed are the results of the mold investigation conducted at the above referenced unit on June 3, 2021 and June 15, 2021. Phoenix EnviroCorp (PEC) was retained to conduct background air sampling to determine airborne mold spore levels and to collect surface samples of suspect visible mold growth.

Background Information: The tenant was concerned with mold growth/dust around the HVAC supply vents.

The unit is occupied and fully furnished with content throughout.

The HVAC system was operating in the cool mode, set at 73º F upon PEC's arrival and during sampling.

The surface sample collected from on/around the HVAC supply vent in the rear right bedroom on June 3 2021 was lost during transite, but recollected on June 15, 2021 at no additional charge.

Note: For directional purposes "front" is determined by facing the parking lot off Grass Lane from inside the unit, unless otherwise stated.

Visual Inspection: PEC's visual inspection noted the following (see enclosed photographic documentation):

- Suspect visible mold growth in the kitchen cabinet underneath the sink.
- Suspect visible mold growth/dust on and around the HVAC supply vent in the rear right bedroom

Mold Testing – Surface: Non-viable surface samples were collected from areas of suspect visible mold growth. The quantifications of fungal growth are reported as scattered spores, 21-100 fungal spores = very light (VL), 101-1,000 fungal spores = light (L), 1,001-10,000 fungal spores = moderate (M), > 10,000 fungal spores = heavy (H). The 'General Impressions' of fungal growth are reported as no fungal growth (NFG), fungal growth (FG), minimal fungal growth or growth in vicinity (MFG), and no fungal spores detected (ND). *Clear tape was utilized for the collection of surface samples. Each sample was assigned a unique ID number and shipped to a third-party laboratory for analysis.* Sampling locations and results are as follows:

Location	Result
Kitchen cabinet underneath the sink	**Scattered Spores –** *Basidiospores*
On/around the HVAC supply vent in the rear right bedroom	**Scattered Spores –** *Cladosporium*

Scattered Spores –
Penicillium/Aspergillus

Mold Testing – Air: Non-viable spore trap air samples were collected to determine airborne mold spore levels. Samples were collected within the kitchen/living room, the bathroom, the rear right bedroom, and the rear left bedroom. *Micro 5 sampling media was utilized for the collection of spore trap air samples. Each sample ran for five (5) minutes at a flow rate of five (5) liters per minute for a total volume of twenty-five (25) liters per sample. Each sample was assigned a unique ID number and shipped to a third-party laboratory for analysis. All air samples were collected from centralized locations (within their respective areas) and within the breathing zone, unless otherwise noted.* Two samples were also collected outdoors for comparative purposes.

Results indicated acceptable levels of airborne mold spores in all sampled locations.

The interpretation of air sample results is based on indoor/outdoor comparisons, in combination with a study by Daniel M. Baxter, entitled "A Regional Comparison of Mold Spore Concentrations Outdoors and Inside "Clean" and "Mold Contaminated" Southern California Buildings", and other industry guidelines, as well as over 20 years of experience in industrial hygiene and mold testing.

In layman terms, acceptable levels indicate that the levels are below the outdoor level and/or the baseline levels (whichever is higher) stated below. Elevated levels indicate that the levels are above the outdoor level and/or the baseline level.

Baseline levels for indoor spore trap air samples are as follows: < 900 spores/m³ for Penicillium/ Aspergillus; 0 spores/m³ for Stachybotrys and Chaetomium; and < 350 spores/m³ for other individual mold groups.

Relative Humidity (RH): *Temperature and relative humidity readings were collected in the same locations as the spore trap air samples.* RH levels within the residence ranged from 71.0% - 72.8% with an outdoor RH level of 85.0% (see the enclosed Chain of Custody for details). Per the American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) Standard 62-1999, relative humidity should range between 30% and 60%. **Consistent RH levels above 60% is conducive to mold growth.**

Conclusions: Air sampling within the tested areas did not indicate a problem with the indoor air quality regarding mold, and no fungal growth or apparent water damage was identified.

Enclosed in this report are the laboratory analysis and the Chain of Custody.

Should you have any questions, please do not hesitate to call.

Thank you,

Philip Green
IH Technician

Tommie Green, CIEC
Professional Industrial Hygienist

Enclosures

Photo 1

Suspect visible mold growth in the kitchen cabinet underneath sink.

Photo 2

Dust/suspect visible mold growth on and around the HVAC supply vent in rear right bedroom

Phoenix EnviroCorp
4020 SHIPYARD BLVD.
WILMINGTON, NC 28403

CHAIN OF CUSTODY

LABORATORY TEST REQUEST

EMLab Ref #: 2106116029 Lab ID: 097

CONTACT: Philip Green	TELEPHONE (910) 397-0370 FAX (910) 313-6094	6/15/2021
PEC Job #: 21-21-183A-IAQ-M	SITE ADDRESS: 302 Grass Lane, Apt. 107, Wilmington, NC 28405	

PLEASE EMAIL RESULTS TO: KMGREEN@PHOENIXENVIROCORP.COM

SAMPLE TYPE:	NUMBER OF SAMPLES:	TURN AROUND TIME SPECIFIED:
Spore Trap - Micro-5	0	____ Immediate ____ 24 hr ____ 48 hr __X__ Standard
Surface Samples	1	

Sample #	Sample Area	Sample Volume	Lab Analysis Requested	% Relative Humidity	Temperature °F
061521-PG-301	Suspect visible mold growth/dust around the HVAC supply vent in the rear right room	1 cm sq	S001T		
		Sample	accepted		

Samples Collected By (Printed Name and Signature): [signature] Date Signed: 6/15/2021

CHAIN OF CUSTODY RECORD

DATE:	Time:	Condition of Samples:	RELINQUISHED BY: (Printed Name and Signature)	ACCEPTED BY: (Printed Name and Signature)
6/15/2021	15:30:00 PM	Intact	[signature] AFFILIATION:	AFFILIATION: [signature] 6/16/21

SEEML Reference Number:
210616029

Southeast Environmental Microbiology Laboratories
102 Edinburgh Court
Greenville, SC 29607
Phone: (864) 233-3770
FAX: (864) 233-6589

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

- ☒ Surface/Bulk Report
- ☐ Spore Trap Report
- ☐ Andersen Fungal Report
- ☐ Quantitative Fungal Report

Lab Manager Review: *Angel Gosnell* Date: 06/16/21

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SEEML laboratories are accredited through AIHA-LAP, LLC (EMLAP # 173667) for the analysis of Spore Traps and Surface/Bulk Samples.

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

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

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

Surface and Bulk Sample Report

	Date Sampled: 06/15/21
Attn: ***Phoenix Enviro Corp.***	Date Received: 06/16/21
4020 Shipyard Blvd.	Date Analyzed: 06/16/21
Wilmington, NC 28403	Date Reported: 06/16/21
	Date Revised:
	Project Name: 21-21-183A-IAQ-M
	Project Address: 302 Grass Lane, Apt 107
	Project City, State ZIP: Wilmington, NC 28405
	SEEML Reference #: 210616029

TEST METHOD: Direct Microscopic Examination (SEEML SOP 18)

Client Sample ID	061521-PG-301			
Location	Suspect Visible Mold Growth / Dust Around The HVAC Supply Vent In The			
SEEML Sample ID	210616029-097			
Sample Type	Tape			
	Quantification*			
Hyphal Fragments	**Scattered**			
Pollen				
General Impressions **	**NFG**			
Fungal Spore:				
Alternaria				
Acremonium				
Ascospores				
Basidiospores				
Bipolaris/Drechslera				
Cercospora				
Chaetomium				
Cladosporium	**Scattered Spores**			
Curvularia				
Epicoccum				
Fusarium				
Geotrichum sp.				
Memnoniella				
Myxomycetes				
Nigrospora				
Penicillium/Aspergillus	**Scattered Spores**			
Pithomyces				
Rusts/Smuts				
Stemphylium				
Tetraploa				
Ulocladium				

** General Impressions: NFG = No Fungal Growth, FG = Fungal Growth, MFG = Minimal Fungal Growth Or Growth in vicinity

Quantification of fungal growth is done by semi-quantitative grading using the following ranges:

Scattered Spores, 1-20 fungal spores

VL = 21-100 fungal spores L = 101-1,000 fungal spores M = 1,001-10,000 fungal spores H = >10,000 fungal spores

ND = No Fungal Spores Detected

Disclaimer: This report relates only to the samples tested

Respectfully submitted, SEEML

Angel Gosnell, **Approved Laboratory Signatory**

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Fax: (864) 233- 6589

AIHA-LAP, LLC EMLAP # 173667

Texas License: LAB1016

Samples accepted

Phoenix EnviroCorp
4020 SHIPYARD BLVD.
WILMINGTON, NC 28403

CHAIN OF CUSTODY

LABORATORY TEST REQUEST

Seem/ Ref# 210604024 lab ID: 090-094

CONTACT: Philip Green	TELEPHONE (910) 397-0370 FAX (910) 313-6094	6/3/2021
PEC Job #: 21-21-183-IAQ-M	SITE ADDRESS: 302 Grass Lane, Apt. 107, Wilmington, NC 28405	

PLEASE EMAIL RESULTS TO: KMGREEN@PHOENIXENVIROCORP.COM

SAMPLE TYPE:	NUMBER OF SAMPLES:	TURN AROUND TIME SPECIFIED:
Spore Trap - Micro-5	4	____ Immediate ____ 24 hr ____ 48 hr __X__ Standard
Surface Samples	1	

Sample #	Sample Area	Sample Volume	Lab Analysis Requested	% Relative Humidity	Temperature °F
060321-PG-101	Kitchen/Living Room	25L	S001	71.3	74.5
060321-PG-102	Bathroom	25L	S001	71.3	71.3
060321-PG-103	Rear Right Bedroom	25L	S001	72.8	74.9
060321-PG-104	Rear Left Bedroom	25L	S001	71.0	74.7
060321-PG-201	Black VSMG in kitchen cabinet underneath sink	1 cm sq	S001T		

Samples Collected By (Printed Name and Signature): [signature] Date Signed: 6/3/2021

CHAIN OF CUSTODY RECORD

DATE:	Time:	Condition of Samples:	RELINQUISHED BY: (Printed Name and Signature)	ACCEPTED BY: (Printed Name and Signature)
6/3/2021	14:30:00 PM	Intact	[signature] AFFILIATION:	[signature] 6-4-21 AFFILIATION:

SEEML Reference Number: 210604024

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- ☒ Surface/Bulk Report
- ☒ Spore Trap Report
- ☐ Andersen Fungal Report
- ☐ Quantitative Fungal Report

Lab Manager Review: *Angel Gosnell* Date: 06/04/21

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Spore Trap Report

	Date Sampled: 06/03/21
Attn: ***Phoenix Enviro Corp.***	Date Received: 06/04/21
4020 Shipyard Blvd.	Date Analyzed: 06/04/21
Wilmington, NC 28403	Date Reported: 06/04/21
	Date Revised:
	Project Name: 21-21-183-IAQ-M
	Project Address: 302 Grass Lane, Apt 107
	Project City, State, ZIP: Wilmington, NC 28405
	SEEML Reference # : 210604024

TEST METHOD: DIRECT MICROSCOPY EXAMINATION SEEML SOP 7

Client Sample ID	060321-PG-101			060321-PG-102			060321-PG-103		
Location	Kitchen / Living Room			Bathroom			Rear Right Bedroom		
Lab Sample ID	210604024-090			210604024-091			210604024-092		
Comments									
Hyphal Fragments									
Pollen									
Spore Trap Used	M5			M5			M5		
	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%
Alternaria									
Ascospores	4	160	14	1	40	9	1	40	11
Basidiospores	3	120	11	3	120	27			
Bipolaris/Drechslera									
Chaetomium									
Cladosporium	17	680	61	4	160	36	4	160	44
Curvularia									
Epicoccum									
Cercospora									
Fusarium									
Memnoniella									
Nigrospora									
Penicillium/Aspergillus	4	160	14	3	120	27	4	160	44
Polythrincium									
Rusts									
Smuts/Periconia/Myxomy									
Spegazzinia									
Stachybotrys									
Stemphylium									
Tetraploa									
Torula									
Ulocladium									
Colorless/Other Brown*									
Oidium									
Zygomycetes									
Pithomyces									
Background debris (1-5)**	2			2			3		
Sample Volume(liters)	25			25			25		
TOTAL SPORES/M^3	28	**1120**		11	**440**		9	**360**	

Revisions:

Spore types listed without a count or data entry were not detected during the course of the analysis for the respective sample, indicating a raw count of <1 spore.
The analytical sensitivity is the spores/m^3 divided by the raw count, expressed in spores/m^3. The limit of detection is the analytical sensitivity (in spores/m^3) multiplied by the sample volume (in liters) divided by 1000 liters.
*Colorless,other Brown are spores without a distinctive morphology on spore traps and non-viable surface samples.
**Background debris is the amount of particulate matter present on the slide and is graded from 1-5 with 1 = very light, 2= Light, 3 = Medium, 4 = Heavy, 5 = Very Heavy. The higher the rating the more likelihood spores may be underestimated. A rating of 5 should be interpreted as minimal counts and may actually be higher than reported.

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Angel Gosnell
Angel Gosnell, Approved Laboratory Signatory

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Greenville, SC. 29607
Phone: (864) 233-3770

Spore Trap Report

	Date Sampled: 06/03/21
Attn: ***Phoenix Enviro Corp.***	Date Received: 06/04/21
4020 Shipyard Blvd.	Date Analyzed: 06/04/21
Wilmington, NC 28403	Date Reported: 06/04/21
	Date Revised:
	Project Name: 21-21-183-IAQ-M
	Project Address: 302 Grass Lane, Apt 107
	Project City, State, ZIP: Wilmington, NC 28405
	SEEML Reference # : 210604024

TEST METHOD: DIRECT MICROSCOPY EXAMINATION SEEML SOP 7

Client Sample ID	060321-PG-104		
Location	Rear Left Bedroom		
Lab Sample ID	210604024-093		
Comments			
Hyphal Fragments			
Pollen			
Spore Trap Used	M5		
	raw ct.	spores/m^3	%
Alternaria	2	80	18
Ascospores	3	120	27
Basidiospores	2	80	18
Bipolaris/Drechslera			
Chaetomium			
Cladosporium	4	160	36
Curvularia			
Epicoccum			
Cercospora			
Fusarium			
Memnoniella			
Nigrospora			
Penicillium/Aspergillus			
Polythrincium			
Rusts			
Smuts/Periconia/Myxomy			
Spegazzinia			
Stachybotrys			
Stemphylium			
Tetraploa			
Torula			
Ulocladium			
Colorless/Other Brown*			
Oidium			
Zygomycetes			
Pithomyces			
Background debris (1-5)**	3		
Sample Volume(liters)	25		
TOTAL SPORES/M^3	11	**440**	

Revisions:

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Surface and Bulk Sample Report

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4020 Shipyard Blvd.	Date Analyzed: 06/04/21
Wilmington, NC 28403	Date Reported: 06/04/21
	Date Revised:
	Project Name: 21-21-183-IAQ-M
	Project Address: 302 Grass Lane, Apt 107
	Project City, State ZIP: Wilmington, NC 28405
	SEEML Reference #: 210604024

TEST METHOD: Direct Microscopic Examination (SEEML SOP 18)

Client Sample ID	060321-PG-201			
Location	Black VSMG In Kitchen Cabinet Underneath Sink			
SEEML Sample ID	210604024-094			
Sample Type	Tape			
	Quantification*			
Hyphal Fragments	**Single**			
Pollen	**Single**			
General Impressions **	**NFG**			
Fungal Spore:				
Alternaria				
Acremonium				
Ascospores				
Basidiospores	**Scattered Spores**			
Bipolaris/Drechslera				
Cercospora				
Chaetomium				
Cladosporium				
Curvularia				
Epicoccum				
Fusarium				
Geotrichum sp.				
Memnoniella				
Myxomycetes				
Nigrospora				
Penicillium/Aspergillus				
Pithomyces				
Rusts/Smuts				
Stemphylium				
Tetraploa				
Ulocladium				

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Scattered Spores, 1-20 fungal spores

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AIHA-LAP, LLC EMLAP # 173667

Texas License: LAB1016

Samples Created

Phoenix EnviroCorp
4020 SHIPYARD BLVD.
WILMINGTON, NC 28403

CHAIN OF CUSTODY

LABORATORY TEST REQUEST

Seem PEC# 21060402 9 Lab ID: 118-119

CONTACT: Philip Green	TELEPHONE (910) 397-0370 FAX (910) 313-6094	6/3/2021
PEC Job #: 21-21-182,183,184,185-IAQ-M	SITE ADDRESS: 302 Grass Lane, Wilmington, NC 28405	

PLEASE EMAIL RESULTS TO: KMGREEN@PHOENIXENVIROCORP.COM

SAMPLE TYPE:	NUMBER OF SAMPLES:	TURN AROUND TIME SPECIFIED:
Spore Trap - Micro-5	2	____ Immediate ____ 24 hr ____ 48 hr __X__ Standard
Surface Samples	0	

Sample #	Sample Area	Sample Volume	Lab Analysis Requested	% Relative Humidity	Temperature °F
060321-PG-701	Outside - Front	25L	S001	85.0	83.2
060321-PG-702	Outside - Rear	25L	S001		

Samples Collected By (Printed Name and Signature): [signature] Date Signed: 6/3/2021

CHAIN OF CUSTODY RECORD

DATE:	Time:	Condition of Samples:	RELINQUISHED BY: (Printed Name and Signature)	ACCEPTED BY: (Printed Name and Signature)
6/3/2021	14:30:00 PM	Intact	[signature] AFFILIATION:	AFFILIATION: PM 0441

SEEML Reference Number: 210604029

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Spore Trap Report

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Attn: ***Phoenix Enviro Corp.***	Date Received: 06/04/21
4020 Shipyard Blvd.	Date Analyzed: 06/04/21
Wilmington, NC 28403	Date Reported: 06/04/21
	Date Revised:
	Project Name: 21-21-182,183,184,185-IAQ-M
	Project Address: 302 Grass Lane
	Project City, State, ZIP: Wilmington, NC 28405
	SEEML Reference # : 210604029

TEST METHOD: DIRECT MICROSCOPY EXAMINATION SEEML SOP 7

Client Sample ID	060321-PG-701			060321-PG-702					
Location	Outside - Front			Outside - Rear					
Lab Sample ID	210604029-118			210604029-119					
Comments									
Hyphal Fragments				1	40				
Pollen	4	160		2	80				
Spore Trap Used	M5			M5					
	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%			
Alternaria									
Ascospores	279	11200	73	51	2040	27			
Basidiospores	81	3240	21	27	1080	14			
Bipolaris/Drechslera									
Chaetomium									
Cladosporium	9	360	2	78	3120	41			
Curvularia									
Epicoccum									
Cercospora									
Fusarium									
Memnoniella									
Nigrospora									
Penicillium/Aspergillus	7	280	2	30	1200	16			
Polythrincium									
Rusts	9	360	2	3	120	2			
Smuts/Periconia/Myxomy									
Spegazzinia									
Stachybotrys									
Stemphylium									
Tetraploa									
Torula									
Ulocladium									
Colorless/Other Brown*									
Oidium									
Zygomycetes									
Pithomyces									
Background debris (1-5)**	3			3					
Sample Volume(liters)	25			25					
TOTAL SPORES/M^3	385	**15400**		189	**7560**				

Revisions:

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Fungal Descriptions

Alternaria sp.

Aw - 0.89. Conidia dimensions: 18-83 x 7-18 microns. A very common allergen with an IgE mediated response. It is often found in carpets, textiles and on horizontal surfaces in building interiors. Often found on window frames. Outdoors it may be isolated from samples of soil, seeds and plants. It is commonly found in outdoor samples. The large spore size, 20 - 200 microns in length and 7 - 18 microns in sizes, suggests that the spores from these fungi will be deposited in the nose, mouth and upper respiratory tract. It may be related to bakers' asthma. It has been associated with hypersensitivity pneumonitis. The species *Alternaria alternata* can produce tenuazonic acid and other toxic metabolites that may be associated with disease in humans or animals. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include edema and bronchospasms; chronic cases may develop pulmonary emphysema.

Ascospore

A spore borne in a special cell called an ascus. Spores of this type are reported to be allergenic. All ascomycetes, members of a group of fungi called Ascomycotina, have this type of spore. The minute black dots on rotting wood and leaves or the little cups on lichens are examples of ascomycetes; another is the "truffle" mushroom.

Aspergillus/Penicillium

These are two of the most commonly found allergenic fungi in problem buildings. *Aspergillus* comes in many varieties (species). Many of the varieties produce toxic substances. It may be associated with symptoms such as sinusitis, allergic bronchopulmonary aspergillosis, and other allergic symptoms. *Penicillium* is a variety of mold that is very common indoors and is found in increased numbers in problem buildings. It also has many varieties, some of which produce toxic substances. The symptoms are allergic reactions, mucous membrane irritation, headaches, vomiting, and diarrhea. Due to the morphological similarity of *Aspergillus* and *Penicillium*, they are not differentiated by microscopic analysis and are reported together.

Aspergillus sp.

Aw 0.75 - 0.82. Reported to be allergenic. Members of this genus are reported to cause ear infections. Many species produce mycotoxins that may be associated with disease in humans and other animals. Toxin production is dependent on the species or a strain within a species and on the food source for the fungus. Some of these toxins have been found to be carcinogenic in animal species. Several toxins are considered potential human carcinogens. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include edema and bronchospasms; chronic cases may develop pulmonary emphysema; may also be associated with sinusitis, allergic bronchopulmonary aspergillosis, and other allergic symptoms.

Basidiospore

Spore from basidiomycetes. Many varieties are reported to be allergenic.

Bipolaris sp.

A fungus with large spores that could be expected to be deposited in the upper respiratory tract. This fungus can produce the mycotoxin - sterigmatocystin, which has been shown to produce liver and kidney damage when ingested by laboratory animals.

Botrytis sp.

Aw 0.93. Conidia dimensions: 7-14 x 5-9 microns. It is parasitic on plants and soft fruits. Found in soil and on house plants and vegetables, it is also known as "gray mold". It causes leaf rot on grapes, strawberries, lettuce, etc. It is a well-known allergen, producing asthma type symptoms in greenhouse workers and "wine grower's lung".

Cercaspora

Common outdoors in agricultural areas, especially during harvest. Parasite of higher plants, causing leaf spot. Commonly found as parasites on higher plants.

Chaetomium sp.

large ascomycetous fungus producing perithecia. It is found on a variety of substrates containing cellulose, including paper and plant compost. It has been found on paper in sheetrock. It can produce an *Acremonium*-like state on fungal media. Varieties are considered allergenic and have been associated with peritonitis, cutaneous lesions, and system mycosis.

Cladosporium sp.

Aw 0.88; Aw 0.84. Most commonly identified outdoor fungus. The outdoor numbers are reduced in the winter. The numbers are often high in the summer. Often found indoors in numbers less than outdoor numbers. It is a common allergen. Indoor *Cladosporium* sp. may be different than the species identified outdoors. It is commonly found on the surface of fiberglass duct liners in the interior of supply ducts. A wide variety of plants are food sources for this fungus. It is found on dead plants, woody plants, food, straw, soil, paint, and textiles. Produces greater than 10 antigens. Antigens in commercial extracts are of variable quality and may degrade within weeks of preparation. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include skin lesions, eye ulceration, mycosis (including onychomycosis, an infection of the nails of the feet or hands) edema and bronchospasms; chronic cases may develop pulmonary emphysema.

Curvularia sp.

Reported to be allergenic and has been associated with allergic fungal sinusitis. It may cause corneal infections, mycetoma, and infections in immune compromised hosts.

Dreschlera sp.

Conidia dimensions: 40-120 x 17-28 microns. Found on grasses, grains and decaying food. It can occasionally cause a corneal infection of the eye.

Epicoccum sp.

Conidia dimensions: 15-25 microns. A common allergen. It is found in plants, soil, grains, textiles and paper products.

Fusarium sp.

Aw 0.90. A common soil fungus. It is found on a wide range of plants. It is often found in humidifiers. Several species in this genus can produce potent trichothecene toxins. The trichothecene (scirpene) toxin targets the following systems: circulatory, alimentary, skin, and nervous. Produces vomitoxin on grains during unusually damp growing conditions. Symptoms may occur either through ingestion of contaminated grains or possibly inhalation of spores. The genera can produce hemorrhagic syndrome in humans (alimentary toxic aleukia). This is characterized by nausea, vomiting, diarrhea, dermatitis, and extensive internal bleeding. Reported to be allergenic. Frequently involved in eye, skin, and nail infections.

Myxomycetes

Members of a group of fungi that is included in the category of "slime molds". They're occasionally found indoors, but mainly reside in forested regions on decaying logs, stumps, and dead leaves. Myxomycetes display characteristics of fungi *and* protozoans. In favorable (wet) conditions they exhibit motile, amoeba-like cells, usually bounded only by a plasma membrane, that are variable in size and form. During dry spells, they form a resting body (sclerotium) with dry, airborne spores. These fungi are not known to produce toxins but can cause hay fever and asthma.

Memnoniella

Contaminant found most often with *Stachybotrys* on wet cellulose. Forms in chains, but it are very similar to *Stachybotrys* and sometimes is considered to be in the *Stachybotrys* family. Certain species do produce toxins very similar to the ones produced by *Stachybotrys chartarum* and many consider the IAQ importance of *Memnoniella* to be on par with *Stachybotrys*. Allergenic and infectious properties are not well studied.

Nigrospora sp.

Commonly found in warm climates, this mold may be responsible for allergic reactions such as hay fever and asthma. It is found on decaying plant material and in the soil. It is not often found indoors.

Oidium sp.

The asexual phase of *Erysiphe* sp. It is a plant pathogen causing powdery mildews. It is very common on the leaf's stems, and flowers of plants. The health effects and allergenicity have not been studied. It does not grow on non-living surfaces such as wood or drywall.

Penicillium sp.

Aw 0.78 - 0.88. A wide number of organisms have been placed in this genus. Identification to species is difficult. Often found in aerosol samples. Commonly found in soil, food, cellulose and grains. It is also found in paint and compost piles. It may cause hypersensitivity pneumonitis, allergic alveolitis in susceptible individuals. It is reported to be allergenic (skin). It is commonly found in carpet, wallpaper, and in interior fiberglass duct insulation. Some species can produce mycotoxins. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include edema and bronchospasms; chronic cases may develop pulmonary emphysema. It may also cause headaches, vomiting, and diarrhea.

Periconia sp.

Periconia sp. are found in soil, blackened and dead herbaceous stems leaf spots, grasses, rushes, and sedges. Almost always associated with other fungi. Rarely found growing indoors. Reportedly associated with a rare case of mycotic keratitis.

Pithomyces sp.

A common mold found on dead leaves, plants, soil and especially grasses. Causes facial eczema in ruminants. It exhibits distinctive multi-celled brown conidia. It is not known to be a human allergen or pathogen. It is rarely found indoors, although it can grow on paper.

Rusts/Smuts

These fungi are associated with plant diseases. In the classification scheme of the fungi, the smuts have much in common with the rusts, and they are frequently discussed together. Both groups produce wind-borne, resistant teliospores that serve as the basis for their classification and their means of spread. Rusts usually attack vegetative regions (i.e., leaves and stems) of plants; smuts usually are associated with the reproductive structures (seeds). They can cause hay fever and asthma.

Spegazzinia

Spegazzinia species comprise a very small proportion of the fungal biota. This genus is somewhat related to other lobed or ornamented genera such as *Candelabrum*. No information is available regarding health effects or toxicity. Allergenicity has not been studied. Usually identified on spore trap samples where it is seen every few weeks. (Spores have very distinctive morphology.) May also be found in air by culturable (Andersen) samples if a long enough incubation period is provided so that sporulation occurs. Our laboratory has never found this organism growing on indoor environmental surfaces. Natural habitat includes soil and many kinds of trees and plants.

Stachybotrys sp.

Aw - 0.94, optimum Aw ->0.98. Several strains of this fungus (*S. atra, S. chartarum* and *S. alternans* are synonymous) may produce a trichothecene mycotoxin- Satratoxin H - which is poisonous by inhalation. The toxins are present on the fungal spores. This is a slow growing fungus on media. It does not compete well with other rapidly growing fungi. The dark colored fungus grows on building material with high cellulose content and low nitrogen content. Areas with a relative humidity above 55%, and are subject to temperature fluctuations, are ideal for toxin production. Individuals with chronic exposure to the toxin produced by this fungus reported cold and flu symptoms, sore throats, diarrhea, headaches, fatigue, dermatitis, intermittent local hair loss and generalized malaise. Other symptoms include coughs, rhinitis, nosebleed, a burning sensation in the nasal passages, throat, and lungs, and fever. The toxins produced by this fungus will suppress the immune system affecting the lymphoid tissue and the bone marrow. Animals injected with the toxin from this fungus exhibited the following symptoms: necrosis and hemorrhage within the brain, thymus, spleen, intestine, lung, heart, lymph node, liver, and kidney. Affects by absorption of the toxin in the human lung are known as pneumomycosis.

This organism is rarely found in outdoor samples. It is usually difficult to find in indoor air samples unless it is physically disturbed (or possibly -this is speculation- a drop in the relative humidity). The spores are in a gelatinous mass. Appropriate media for the growth of this organism will have high cellulose content and low nitrogen content. The spores will die readily after release. The dead spores are still allergenic and toxigenic. Percutaneous absorption has caused mild symptoms.

Stemphylium sp.

Reported to be allergenic. Isolated from dead plants and cellulose materials.

Torula sp.

Found outdoors in air, soil, on dead vegetation, wood, and grasses. Also found indoors on cellulose materials. Reported to be allergenic and may cause hay fever and asthma.

Tetraploa

Tetraploa species comprise a very small proportion of the fungal biota. This genus is somewhat related to *Triposporium* and Diplocladiella. The only reported human infections are two cases of keratitis (1970, 1980) and one case of subcutaneous infection of the knee (1990). No information is available regarding other health effects or toxicity. Allergenicity has not been studied. Usually identified on spore trap samples where it is seen every few weeks. (Spores have very distinctive morphology.) Our laboratory has never found this organism growing on indoor environmental surfaces. Natural habitat includes leaf bases and stems just above the soil on many kinds of plants and trees.

Ulocladium sp.

Aw 0.89. Isolated from dead plants and cellulose materials. Found on textiles.

Zygomycetes

Zygomycetes are one of the four major groups of fungi, the others being the Oomycetes, the Ascomycetes, and the Basidiomycetes. Zygomycetes are common, fast growing, and often overgrow and/or inhibit other fungi nearby. Rhizopus and Mucor are two of the most common Zygomycetes seen in the indoor environment. However, others are seen as well, including *Syncephalastrum*, *Circinella*, *Mortierella*, *Mycotypha*, *Cunninghamella*, and *Choanephora*. For further information, please see descriptions of these individual genera.

The following table lists mycotoxins that are produced by certain types of fungi:

Fungi	Mycotoxin
Acremonium crotocinigenum	Crotocin
Aspergillus favus	Alfatoxin B, cyclopiazonic acid
Aspergillus fumigatus	Fumagilin, gliotoxin
Aspergillus carneus	Critrinin
Aspergillus clavatus	Cytochalasin, patulin
Aspergillus Parasiticus	Alfatoxin B
Aspergillus nomius	Alfatoxin B
Aspergillus niger	Ochratoxin A, malformin, oxalicacid
Acremonium crotocinigenum	Crotocin
Aspergillus nidulans	Sterigmatocystin
Aspergillus ochraceus	Ochratoxin A, penicillic acid
Aspergillus versicolor	Sterigmatocystin, 5 ethoxysterigmatocystin
Aspergillus ustus	Ausdiol, austamide, austocystin,brevianamide
Aspergillus terreus	Citreoviridin
Alternaria	Alternariol, altertoxin, altenuene, altenusin, tenuazonic acid
Arthrinium	Nitropropionic acid
Bioploaris	Cytochalasin, sporidesmin, sterigmatocystin
Chaetomium	Chaetoglobosin A,B,C. Sterigmatocystin
Cladosporium	Cladosporic acid
Clavipes purpurea	Ergotism
Cylindrocorpon	Trichothecene
Diplodia	Diplodiatoxin
Fusarium	Trichothecene, zearalenone
Fusarium moniliforme	Fumonisins
Emericella nidulans	Sterigmatocystin
Gliocladium	Gliotoxin
Memnoniella	Griseofulvin , dechlorogriseofulvin, epi-decholorgriseofulvin, trichodermin, trichodermol
Myrothecium	Trichothecene
Paecilomyces	Patulin, viriditoxin
Penicillium aurantiocandidum	Penicillic acid
Penicillium aurantiogriseum	Penicillic acid
Penicillium brasilanum	Penicillic acid
Penicillium brevicompactum	Mycophenolic acid
Penicillium camemberti	Cyclopiazonic acid
Penicillium carneum	Mycophenolic acid, Roquefortine C
Penicillium crateriforme	Rubratoxin

Fungi	Mycotoxin
Penicillium citrinum	Citrinin
Penicillium commune	Cyclopiazonic acid
Penicillium crustosum	Roquefortine C
Penicillium chrysogenum	Roquefortine C
Penicillium discolor	Chaetoglobosin C
Penicillium expansum	Citrinin, Roquefortine C
Penicillium griseofulvum	Roquefortine C, cyclopiazonic acid, griseofulvin
Penicillium hirsutum	Roquefortine C
Penicillium hordei	Roquefortine C
Penicillium nordicum	Ochratoxin A
Penicillium paneum	Roquefortine C
Penicillium palitans	Cyclopiazonic acid
Penicillium polonicum	Penicillic acid
Penicillum roqueforti	Roquefortine C, Mycophenolic acid
Penicillium veridicatum	Penicillic acid
Penicillium verrucosum	Citrinin, ochratoxin A
Penicillium/ Aspergillus	Patulin
Penicillium/ Aspergillus/Alternaria	Glitoxin
Phomopsis	Macrocyclic trichothecenes
Phoma	Brefeldin, cytochalasin, secalonic acid, tenuazonic acid
Pithomyces	Sporidesmin
Rhizoctonia	Slaframine
Rhizopus	Rhizonin
Sclerotinia	Furanocoumarins
Stachybotrys chartarum	Iso-satratoxin F, roridin E, L-2, satratoxin G & H, trichodermin, trichodermol, trichothecene
Torula	Cytotoxins
Trichoderma	Trichodermin, trichodermol, gliotoxin
Trichothecium	Trichothecene
Wallemia	Walleminol
Zygosporium	Cytochalasin

General terms

Allergen

An allergen is a substance that elicits an IgE antibody response and is responsible for producing allergic reactions. Chemicals are released when IgE on certain cells contact an allergen. These chemicals can cause injury to surrounding tissue - the visible signs of an allergy. Only a few fungal allergens have been characterized but all fungi are thought to be potentially allergenic. Fungal allergens are proteins found in either the mycelium or spores

"Black mold"

A poorly defined term. Black mold or toxic black mold has usually been associated with the mold *Stachybotrys chartarum*. While there are only a few molds that are truly black, there are many that can appear black. Not all molds that appear to be black are *Stachybotrys*.

Fungi

Fungi are neither animals nor plants and are classified in a kingdom of their own. The Kingdom of Fungi. Fungi include a very large group of organisms, including molds, yeasts, mushrooms and puffballs. There are >100,000 accepted fungal species but current estimates range to 1.5 million species. Mycologists (people who study fungi) have grouped fungi into four large groups according to their method of reproduction.

Hidden mold

This refers to visible mold growth on building structures that is not easily seen, including the areas above drop ceilings, within a wall cavity (the space between the inner and outer structure of a wall), inside air handlers, or within the ducting of a heating/ventilation system.

Microbial Volatile Organic Compounds (MVOCs)

Fungi produce chemicals as a result of their metabolism. Some of these chemicals, MVOCs, are responsible for the characteristic moldy, musty, or earthy smell of fungi, whether mushrooms or molds. Some MVOCs are considered offensive or annoying. Specific MVOCs are thought to be characteristic of wood rot and mold growth on building materials. The human nose is very sensitive to mold odors and sometimes more so than current analytical instruments.

Mold

Molds are a group of organisms that belong to the Kingdom of Fungi (see Fungi). Even though the terms mold and fungi had been commonly referred to interchangeably, all molds are fungi, but not all fungi are molds.

Mycotoxin

Mycotoxins are compounds produced by some fungi that are toxic to humans or animals. By convention, the term? Mycotoxin. Excludes mushroom toxins. Fungi that produce mycotoxins are called "toxigenic fungi."

Spore

General term for a reproductive structure in fungi, bacteria and some plants. In fungi, the spore is the structure which may be used for dissemination and may be resistant to adverse environmental conditions.

Toxic mold

The term "toxic mold" has no scientific meaning since the mold itself is not toxic. The metabolic byproducts of some molds may be toxic (see mycotoxin).

Hypha (plural, hyphae)

An individual fungal thread or filament of connected cells; the thread that represents the individual parts of the fungal body.

Phoenix EnviroCorp

April 14, 2021

Quanesha Mullins
Wilmington Housing Authority
1524 S. 16th Street
Wilmington, NC 28401

RE: PEC Job # 21-21-113-IAQ-M; 302 Grass Lane, Unit 108, Wilmington, NC – Mold Investigation/Background air sampling

Enclosed are the results of the mold investigation conducted at the above referenced unit on April 13, 2021. Phoenix EnviroCorp (PEC) was retained to conduct background air sampling and to collect surface samples of suspect visible mold growth.

Background Information: The tenant reported mold growth in the hallway bathroom and in the kitchen cabinet.

The HVAC system was operating in the heat mode, set at 72º F upon PEC's arrival and during sampling.

Note: For directional purposes, "front" is determined by facing Grass Lane from inside the unit, unless otherwise stated.

Visual Inspection: PEC's visual inspection noted the following (see enclosed photographic documentation):

- Suspect visible mold growth on the rear wall in the bathroom
- Suspect visible mold growth within the kitchen cabinet on the rear wall

Mold Testing – Surface: Non-viable surface samples were collected from areas of suspect visible mold growth. The quantifications of fungal growth are reported as scattered spores, 21-100 fungal spores = very light (VL), 101-1,000 fungal spores = light (L), 1,001-10,000 fungal spores = moderate (M), > 10,000 fungal spores = heavy (H). The 'General Impressions' of fungal growth are reported as no fungal growth (NFG), fungal growth (FG), minimal fungal growth or growth in vicinity (MFG), and no fungal spores detected (ND). *Clear tape was utilized for the collection of surface samples. Each sample was assigned a unique ID number and shipped to a third-party laboratory for analysis.* Sampling locations and results are as follows:

Location	Result
Bathroom rear wall	**ND – NFG**
Kitchen cabinet	**Scattered Spore** *Penicillium/Aspergillus*

Mold Testing – Air: Non-viable spore trap air samples were collected to determine airborne mold spore levels. Samples were collected within kitchen/living room, the front bedroom, the bathroom, the rear right bedroom, and the rear left bedroom. *Micro 5 sampling media was utilized for the collection of spore trap air samples. Each sample ran for five (5) minutes at a flow rate of five (5) liters per minute for a total volume of twenty-five (25) liters per sample. Each sample was assigned a unique ID*

number and shipped to a third-party laboratory for analysis. All air samples were collected from centralized locations (within their respective areas) and within the breathing zone, unless otherwise noted. Two samples were also collected outdoors for comparative purposes.

Results indicated acceptable levels of airborne mold spores in all sampled locations.

The interpretation of air sample results is based on indoor/outdoor comparisons, in combination with a study by Daniel M. Baxter, entitled "A Regional Comparison of Mold Spore Concentrations Outdoors and Inside "Clean" and "Mold Contaminated" Southern California Buildings", and other industry guidelines, as well as over 20 years of experience in industrial hygiene and mold testing.

In layman terms, acceptable levels indicate that the levels are below the outdoor level and/or the baseline levels (whichever is higher) stated below. Elevated levels indicate that the levels are above the outdoor level and/or the baseline level.

Baseline levels for indoor spore trap air samples are as follows: < 900 spores/m³ for Penicillium/ Aspergillus; 0 spores/m³ for Stachybotrys and Chaetomium; and < 350 spores/m³ for other individual mold groups.

Relative Humidity (RH): *Temperature and relative humidity readings were collected in the same locations as the spore trap air samples.* RH levels within the unit ranged from 54.1% - 58.1% with an outdoor RH level of 49.3% (see the enclosed Chain of Custody for details). Per the American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) Standard 62-1999, relative humidity should range between 30% and 60%.

Conclusions: Air sampling within the tested areas did not indicate a problem with the indoor air quality regarding mold, and there was no fungal growth identified. However, scattered spores were identified on the kitchen cabinet.

PEC recommends cleaning the suspect visible mold growth and any like areas with an over-the-counter product designed specifically for cleaning mold growth. Such a product can be purchased at most hardware stores, and the manufacturer's instructions shall be followed.

Enclosed in this report are the laboratory analysis and the Chain of Custody.

Should you have any questions, please do not hesitate to call.

Thank you,

Shaenaz Mirmohamed
IH Technician

Tommie Green, CIEC
Professional Industrial Hygienist

Enclosures

Photo 1

Suspect visible mold growth on the rear wall in the bathroom

Photo 2

Suspect visible mold growth on the rear cabinets in the kitchen

Samples accepted

Phoenix EnviroCorp
4020 SHIPYARD BLVD.
WILMINGTON, NC 28403

CHAIN OF CUSTODY

LABORATORY TEST REQUEST

Seem Res# 2104141019 lab ID: 053-059

CONTACT: Shaenaz Mirmohamed	TELEPHONE (910) 397-0370 FAX (910) 313-6094	Sample date: 4/13/2021
PEC Job #: 21-21-113-IAQ-M	SITE ADDRESS: 302 Grass Lane, Unit 108, Wilmington, NC 28401	

PLEASE EMAIL RESULTS TO: KMGREEN@PHOENIXENVIROCORP.COM

SAMPLE TYPE:	NUMBER OF SAMPLES:	TURN AROUND TIME SPECIFIED:
Spore Trap - Micro-5	5	____ Immediate ____ 24 hr ____ 48 hr __X__ Standard
Surface Samples	2	

Sample #	Sample Area	Sample Volume	Lab Analysis Requested	% Relative Humidity	Temperature °F
041321-SM-201	Kitchen/living room	25L	S001	54.1	72.8
041321-SM-202	Front bedroom	25L	S001	55.6	72.5
041321-SM-203	Bathroom	25L	S001	55.6	72.7
041321-SM-204	Rear right bedoom	25L	S001	58.1	71.2
041321-SM-205	Rear left bedroom	25L	S001	57.9	71.9
041321-SM-206	Bathroom rear wall	1 cm sq	S001T	NA	NA
041321-SM-207	Kitchen cabinet	1 cm sq	S001T	NA	NA

Samples Collected By (Printed Name and Signature): Shaenaz Mirmohamed Date Signed: 4/13/2021

CHAIN OF CUSTODY RECORD

DATE:	Time:	Condition of Samples:	RELINQUISHED BY: (Printed Name and Signature)	ACCEPTED BY: (Printed Name and Signature)
4/13/2021	14:00	Intact	Shaenaz Mirmohamed	VH 4-14-21
			AFFILIATION:	AFFILIATION:

SEEML Reference Number:
210414019

SEEML Labs
Analytical Solutions For a Healthy Indoor Environment

Southeast Environmental Microbiology Laboratories
102 Edinburgh Court
Greenville, SC 29607
Phone: (864) 233-3770
FAX: (864) 233-6589

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

- ☒ Surface/Bulk Report
- ☒ Spore Trap Report
- ☐ Andersen Fungal Report
- ☐ Quantitative Fungal Report

Lab Manager Review: *Angel Gosnell* Date: 04/14/21

Thank you for using SEEML laboratories. We strive to provide superior quality and service.
SEEML laboratories are accredited through AIHA-LAP, LLC (EMLAP # 173667) for the analysis of Spore Traps and Surface/Bulk Samples.

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

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

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

Spore Trap Report

	Date Sampled: 04/13/21
Attn: ***Phoenix Enviro Corp.***	Date Received: 04/14/21
4020 Shipyard Blvd.	Date Analyzed: 04/14/21
Wilmington, NC 28403	Date Reported: 04/14/21
	Date Revised:
	Project Name: 21-21-113-IAQ-M
	Project Address: 302 Grass Lane, Unit 108
	Project City, State, ZIP: Wilmington, NC 28401
	SEEML Reference # : 210414019

TEST METHOD: DIRECT MICROSCOPY EXAMINATION SEEML SOP 7

Client Sample ID	041321-SM-201			041321-SM-202			041321-SM-203		
Location	Kitchen / Living Room			Front Bedroom			Bathroom		
Lab Sample ID	210414019-053			210414019-054			210414019-055		
Comments									
Hyphal Fragments	4	160		1	40		2	80	
Pollen	2	80					1	40	
Spore Trap Used	M5			M5			M5		
	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%
Alternaria									
Ascospores	4	160	33	1	40	8			
Basidiospores	4	160	33	1	40	8	2	80	33
Bipolaris/Drechslera									
Chaetomium									
Cladosporium	2	80	17	4	160	31	3	120	50
Curvularia									
Epicoccum									
Cercospora				1	40	8			
Fusarium									
Memnoniella									
Nigrospora									
Penicillium/Aspergillus	2	80	17	6	240	46	1	40	17
Polythrincium									
Rusts									
Smuts/Periconia/Myxomy									
Spegazzinia									
Stachybotrys									
Stemphylium									
Tetraploa									
Torula									
Ulocladium									
Colorless/Other Brown*									
Oidium									
Zygomycetes									
Pithomyces									
Background debris (1-5)**	3			3			3		
Sample Volume(liters)	25			25			25		
TOTAL SPORES/M^3	12	**480**		13	**520**		6	**240**	

Revisions:

Spore types listed without a count or data entry were not detected during the course of the analysis for the respective sample, indicating a raw count of <1 spore.
The analytical sensitivity is the spores/m^3 divided by the raw count, expressed in spores/m^3. The limit of detection is the analytical sensitivity (in spores/m^3) multiplied by the sample volume (in liters) divided by 1000 liters.
*Colorless,other Brown are spores without a distinctive morphology on spore traps and non-viable surface samples.
**Background debris is the amount of particulate matter present on the slide and is graded from 1-5 with 1 = very light, 2= Light, 3 = Medium, 4 = Heavy, 5 = Very Heavy. The higher the rating the more likelihood spores may be underestimated. A rating of 5 should be interpreted as minimal counts and may actually be higher than reported.

Disclaimer: The sample results are determined by the sample volume, which is provided by the customer.
This report relates only to the samples tested as they were received.

102 Edinburgh Court
Greenville, SC. 29607
Phone: (864) 233-3770

Angel Gosnell
Angel Gosnell, Approved Laboratory Signatory

AIHA-LAP, LLC EMLAP #173667
Texas Lic: LAB1016
Form 18.0 Rev 09 07/30/20

Spore Trap Report

	Date Sampled: 04/13/21
Attn: ***Phoenix Enviro Corp.***	Date Received: 04/14/21
4020 Shipyard Blvd.	Date Analyzed: 04/14/21
Wilmington, NC 28403	Date Reported: 04/14/21
	Date Revised:
	Project Name: 21-21-113-IAQ-M
	Project Address: 302 Grass Lane, Unit 108
	Project City, State, ZIP: Wilmington, NC 28401
	SEEML Reference # : 210414019

TEST METHOD: DIRECT MICROSCOPY EXAMINATION SEEML SOP 7

Client Sample ID	041321-SM-204			041321-SM-205					
Location	Rear Right Bedroom			Rear Left Bedroom					
Lab Sample ID	210414019-056			210414019-057					
Comments									
Hyphal Fragments				3	120				
Pollen	8	320							
Spore Trap Used	M5			M5					
	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%			
Alternaria									
Ascospores	10	400	22						
Basidiospores	22	880	49	3	120	75			
Bipolaris/Drechslera									
Chaetomium									
Cladosporium	12	480	27	1	40	25			
Curvularia									
Epicoccum									
Cercospora									
Fusarium									
Memnoniella									
Nigrospora									
Penicillium/Aspergillus	1	40	2						
Polythrincium									
Rusts									
Smuts/Periconia/Myxomy									
Spegazzinia									
Stachybotrys									
Stemphylium									
Tetraploa									
Torula									
Ulocladium									
Colorless/Other Brown*									
Oidium									
Zygomycetes									
Pithomyces									
Background debris (1-5)**	3			3					
Sample Volume(liters)	25			25					
TOTAL SPORES/M^3	45	**1800**		4	**160**				

Revisions:

Spore types listed without a count or data entry were not detected during the course of the analysis for the respective sample, indicating a raw count of <1 spore.
The analytical sensitivity is the spores/m^3 divided by the raw count, expressed in spores/m^3. The limit of detection is the analytical sensitivity (in spores/m^3) multiplied by the sample volume (in liters) divided by 1000 liters.
*Colorless,other Brown are spores without a distinctive morphology on spore traps and non-viable surface samples.
**Background debris is the amount of particulate matter present on the slide and is graded from 1-5 with 1 = very light, 2= Light, 3 = Medium, 4 = Heavy, 5 = Very Heavy. The higher the rating the more likelihood spores may be underestimated. A rating of 5 should be interpreted as minimal counts and may actually be higher than reported.

Disclaimer: The sample results are determined by the sample volume, which is provided by the customer.
This report relates only to the samples tested as they were received.

102 Edinburgh Court
Greenville, SC. 29607
Phone: (864) 233-3770

Angel Gosnell
Angel Gosnell, Approved Laboratory Signatory

Surface and Bulk Sample Report

	Date Sampled: 03/31/21
Attn: ***Phoenix Enviro Corp.***	Date Received: 04/01/21
4020 Shipyard Blvd.	Date Analyzed: 04/01/21
Wilmington, NC 28403	Date Reported: 04/01/21
	Date Revised:
	Project Name: 21-21-113-IAQ-M
	Project Address: 302 Grass Lane, Unit 108
	Project City, State ZIP: Wilmington, NC 28401
	SEEML Reference #: 210414019

TEST METHOD: Direct Microscopic Examination (SEEML SOP 18)

Client Sample ID	041321-SM-206	041321-SM-207		
Location	Bathroom Rear Wall	Kitchen Cabinet		
SEEML Sample ID	210414019-058	210414019-059		
Sample Type	Tape	Tape		
	Quantification*	Quantification*		
Hyphal Fragments				
Pollen		**Single**		
General Impressions **	**NFG**	**NFG**		
Fungal Spore:	**ND**			
Alternaria				
Acremonium				
Ascospores				
Basidiospores				
Bipolaris/Drechslera				
Cercospora				
Chaetomium				
Cladosporium				
Curvularia				
Epicoccum				
Fusarium				
Geotrichum sp.				
Memnoniella				
Myxomycetes				
Nigrospora				
Penicillium/Aspergillus		**Scattered Spore**		
Pithomyces				
Rusts/Smuts				
Stemphylium				
Tetraploa				
Ulocladium				

** General Impressions: NFG = No Fungal Growth, FG = Fungal Growth, MFG = Minimal Fungal Growth Or Growth in vicinity

Quantification of fungal growth is done by semi-quantitative grading using the following ranges:

Scattered Spores, 1-20 fungal spores

VL = 21-100 fungal spores L = 101-1,000 fungal spores M = 1,001-10,000 fungal spores H = >10,000 fungal spores

ND = No Fungal Spores Detected

Disclaimer: This report relates only to the samples tested

Respectfully submitted, SEEML

Angel Gosnell, **Approved Laboratory Signatory**

102 Edinburgh Court
Greenville, SC 29607
Phone: (864) 233- 3770
Fax: (864) 233- 6589

AIHA-LAP, LLC EMLAP # 173667

Texas License: LAB1016

Samples aliented

Phoenix EnviroCorp
4020 SHIPYARD BLVD.
WILMINGTON, NC 28403

CHAIN OF CUSTODY

LABORATORY TEST REQUEST

Seemi Rs#2104140 18

lab ID: 051-052

CONTACT: Shaenaz Mirmohamed	TELEPHONE (910) 397-0370 FAX (910) 313-6094	Sample date: 4/13/2021
PEC Job #: 21-21-113, 114, &116-IAQ-M	SITE ADDRESS:	302 Grass Lane, Units 210, 211, & 108, Wilmington, NC 28401

PLEASE EMAIL RESULTS TO: KMGREEN@PHOENIXENVIROCORP.COM

SAMPLE TYPE:	NUMBER OF SAMPLES:	TURN AROUND TIME SPECIFIED:
Spore Trap - Micro-5 Surface Samples	2	____ Immediate ____ 24 hr ____ 48 hr __X__ Standard

Sample #	Sample Area	Sample Volume	Lab Analysis Requested	% Relative Humidity	Temperature °F
041321-SM-301	Outside - Front - 2nd floor	25L	S001	49.3	70.5
041321-SM-302	Outside - Front - 1st floor	25L	S001		

Samples Collected By (Printed Name and Signature): Shaenaz Mirmohamed Date Signed: 4/13/2021

CHAIN OF CUSTODY RECORD

DATE:	Time:	Condition of Samples:	RELINQUISHED BY: (Printed Name and Signature)	ACCEPTED BY: (Printed Name and Signature)
4/13/2021	14:00	Intact	Shaenaz Mirmohamed AFFILIATION:	JM 4-14-21 AFFILIATION:

SEEML Reference Number: 210414018

Southeast Environmental Microbiology Laboratories
102 Edinburgh Court
Greenville, SC 29607
Phone: (864) 233-3770
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The information and data for **Phoenix Enviro Corp.** has been checked for thoroughness and accuracy. The following reports are contained within this document:

- ☐ Surface/Bulk Report
- ☒ Spore Trap Report
- ☐ Andersen Fungal Report
- ☐ Quantitative Fungal Report

Lab Manager Review: *Angel Gosnell* Date: 04/14/21

Thank you for using SEEML laboratories. We strive to provide superior quality and service.
SEEML laboratories are accredited through AIHA-LAP, LLC (EMLAP # 173667) for the analysis of Spore Traps and Surface/Bulk Samples.

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

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

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

Spore Trap Report

	Date Sampled: 04/13/21
Attn: ***Phoenix Enviro Corp.***	Date Received: 04/14/21
4020 Shipyard Blvd.	Date Analyzed: 04/14/21
Wilmington, NC 28403	Date Reported: 04/14/21
	Date Revised:
	Project Name: 21-21-113, 114, & 116-IAQ-M
	Project Address: 302 Grass Lane, Units 210,211, & 108
	Project City, State, ZIP: Wilmington, NC 28401
	SEEML Reference # : 210414018

TEST METHOD: DIRECT MICROSCOPY EXAMINATION SEEML SOP 7

Client Sample ID	041321-SM-301			041321-SM-302					
Location	Outside - Front - 2nd Floor			Outside - Front - 1st Floor					
Lab Sample ID	210414018-051			210414018-052					
Comments									
Hyphal Fragments	4	160							
Pollen	29	1160							
Spore Trap Used	M5			M5					
	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%			
Alternaria									
Ascospores	122	4880	31	10	400	17			
Basidiospores	142	5680	36	19	760	32			
Bipolaris/Drechslera									
Chaetomium									
Cladosporium	125	5000	32	30	1200	50			
Curvularia									
Epicoccum									
Cercospora									
Fusarium									
Memnoniella									
Nigrospora									
Penicillium/Aspergillus				1	40	2			
Polythrincium	1	40	<1						
Rusts									
Smuts/Periconia/Myxomy									
Spegazzinia									
Stachybotrys									
Stemphylium									
Tetraploa									
Torula									
Ulocladium									
Colorless/Other Brown*									
Oidium									
Zygomycetes									
Pithomyces									
Background debris (1-5)**	3			3					
Sample Volume(liters)	25			25					
TOTAL SPORES/M^3	390	**15600**		60	**2400**				

Revisions:

Spore types listed without a count or data entry were not detected during the course of the analysis for the respective sample, indicating a raw count of <1 spore.

The analytical sensitivity is the spores/m^3 divided by the raw count, expressed in spores/m^3. The limit of detection is the analytical sensitivity (in spores/m^3) multiplied by the sample volume (in liters) divided by 1000 liters.

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

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

Disclaimer: The sample results are determined by the sample volume, which is provided by the customer.
This report relates only to the samples tested as they were received.

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Greenville, SC. 29607
Phone: (864) 233-3770

Angel Gosnell

Angel Gosnell, Approved Laboratory Signatory

Fungal Descriptions

Alternaria sp.

Aw - 0.89. Conidia dimensions: 18-83 x 7-18 microns. A very common allergen with an IgE mediated response. It is often found in carpets, textiles and on horizontal surfaces in building interiors. Often found on window frames. Outdoors it may be isolated from samples of soil, seeds and plants. It is commonly found in outdoor samples. The large spore size, 20 - 200 microns in length and 7 - 18 microns in sizes, suggests that the spores from these fungi will be deposited in the nose, mouth and upper respiratory tract. It may be related to bakers' asthma. It has been associated with hypersensitivity pneumonitis. The species *Alternaria alternata* can produce tenuazonic acid and other toxic metabolites that may be associated with disease in humans or animals. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include edema and bronchospasms; chronic cases may develop pulmonary emphysema.

Ascospore

A spore borne in a special cell called an ascus. Spores of this type are reported to be allergenic. All ascomycetes, members of a group of fungi called Ascomycotina, have this type of spore. The minute black dots on rotting wood and leaves or the little cups on lichens are examples of ascomycetes; another is the "truffle" mushroom.

Aspergillus/Penicillium

These are two of the most commonly found allergenic fungi in problem buildings. *Aspergillus* comes in many varieties (species). Many of the varieties produce toxic substances. It may be associated with symptoms such as sinusitis, allergic bronchopulmonary aspergillosis, and other allergic symptoms. *Penicillium* is a variety of mold that is very common indoors and is found in increased numbers in problem buildings. It also has many varieties, some of which produce toxic substances. The symptoms are allergic reactions, mucous membrane irritation, headaches, vomiting, and diarrhea. Due to the morphological similarity of *Aspergillus* and *Penicillium*, they are not differentiated by microscopic analysis and are reported together.

Aspergillus sp.

Aw 0.75 - 0.82. Reported to be allergenic. Members of this genus are reported to cause ear infections. Many species produce mycotoxins that may be associated with disease in humans and other animals. Toxin production is dependent on the species or a strain within a species and on the food source for the fungus. Some of these toxins have been found to be carcinogenic in animal species. Several toxins are considered potential human carcinogens. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include edema and bronchospasms; chronic cases may develop pulmonary emphysema; may also be associated with sinusitis, allergic bronchopulmonary aspergillosis, and other allergic symptoms.

Basidiospore

Spore from basidiomycetes. Many varieties are reported to be allergenic.

Bipolaris sp.

A fungus with large spores that could be expected to be deposited in the upper respiratory tract. This fungus can produce the mycotoxin - sterigmatocystin, which has been shown to produce liver and kidney damage when ingested by laboratory animals.

Botrytis sp.

Aw 0.93. Conidia dimensions: 7-14 x 5-9 microns. It is parasitic on plants and soft fruits. Found in soil and on house plants and vegetables, it is also known as "gray mold". It causes leaf rot on grapes, strawberries, lettuce, etc. It is a well-known allergen, producing asthma type symptoms in greenhouse workers and "wine grower's lung".

Cercaspora

Common outdoors in agricultural areas, especially during harvest. Parasite of higher plants, causing leaf spot. Commonly found as parasites on higher plants.

Chaetomium sp.

large ascomycetous fungus producing perithecia. It is found on a variety of substrates containing cellulose, including paper and plant compost. It has been found on paper in sheetrock. It can produce an *Acremonium*-like state on fungal media. Varieties are considered allergenic and have been associated with peritonitis, cutaneous lesions, and system mycosis.

Cladosporium sp.

Aw 0.88; Aw 0.84. Most commonly identified outdoor fungus. The outdoor numbers are reduced in the winter. The numbers are often high in the summer. Often found indoors in numbers less than outdoor numbers. It is a common allergen. Indoor *Cladosporium* sp. may be different than the species identified outdoors. It is commonly found on the surface of fiberglass duct liners in the interior of supply ducts. A wide variety of plants are food sources for this fungus. It is found on dead plants, woody plants, food, straw, soil, paint, and textiles. Produces greater than 10 antigens. Antigens in commercial extracts are of variable quality and may degrade within weeks of preparation. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include skin lesions, eye ulceration, mycosis (including onychomycosis, an infection of the nails of the feet or hands) edema and bronchospasms; chronic cases may develop pulmonary emphysema.

Curvularia sp.

Reported to be allergenic and has been associated with allergic fungal sinusitis. It may cause corneal infections, mycetoma, and infections in immune compromised hosts.

Dreschlera sp.

Conidia dimensions: 40-120 x 17-28 microns. Found on grasses, grains and decaying food. It can occasionally cause a corneal infection of the eye.

Epicoccum sp.

Conidia dimensions: 15-25 microns. A common allergen. It is found in plants, soil, grains, textiles and paper products.

Fusarium sp.

Aw 0.90. A common soil fungus. It is found on a wide range of plants. It is often found in humidifiers. Several species in this genus can produce potent trichothecene toxins. The trichothecene (scirpene) toxin targets the following systems: circulatory, alimentary, skin, and nervous. Produces vomitoxin on grains during unusually damp growing conditions. Symptoms may occur either through ingestion of contaminated grains or possibly inhalation of spores. The genera can produce hemorrhagic syndrome in humans (alimentary toxic aleukia). This is characterized by nausea, vomiting, diarrhea, dermatitis, and extensive internal bleeding. Reported to be allergenic. Frequently involved in eye, skin, and nail infections.

Myxomycetes

Members of a group of fungi that is included in the category of "slime molds". They're occasionally found indoors, but mainly reside in forested regions on decaying logs, stumps, and dead leaves. Myxomycetes display characteristics of fungi *and* protozoans. In favorable (wet) conditions they exhibit motile, amoeba-like cells, usually bounded only by a plasma membrane, that are variable in size and form. During dry spells, they form a resting body (sclerotium) with dry, airborne spores. These fungi are not known to produce toxins but can cause hay fever and asthma.

Memnoniella

Contaminant found most often with *Stachybotrys* on wet cellulose. Forms in chains, but it are very similar to *Stachybotrys* and sometimes is considered to be in the *Stachybotrys* family. Certain species do produce toxins very similar to the ones produced by *Stachybotrys chartarum* and many consider the IAQ importance of *Memnoniella* to be on par with *Stachybotrys*. Allergenic and infectious properties are not well studied.

Nigrospora sp.

Commonly found in warm climates, this mold may be responsible for allergic reactions such as hay fever and asthma. It is found on decaying plant material and in the soil. It is not often found indoors.

Oidium sp.

The asexual phase of *Erysiphe* sp. It is a plant pathogen causing powdery mildews. It is very common on the leaf's stems, and flowers of plants. The health effects and allergenicity have not been studied. It does not grow on non-living surfaces such as wood or drywall.

Penicillium sp.

Aw 0.78 - 0.88. A wide number of organisms have been placed in this genus. Identification to species is difficult. Often found in aerosol samples. Commonly found in soil, food, cellulose and grains. It is also found in paint and compost piles. It may cause hypersensitivity pneumonitis, allergic alveolitis in susceptible individuals. It is reported to be allergenic (skin). It is commonly found in carpet, wallpaper, and in interior fiberglass duct insulation. Some species can produce mycotoxins. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include edema and bronchospasms; chronic cases may develop pulmonary emphysema. It may also cause headaches, vomiting, and diarrhea.

Periconia sp.

Periconia sp. are found in soil, blackened and dead herbaceous stems leaf spots, grasses, rushes, and sedges. Almost always associated with other fungi. Rarely found growing indoors. Reportedly associated with a rare case of mycotic keratitis.

Pithomyces sp.

A common mold found on dead leaves, plants, soil and especially grasses. Causes facial eczema in ruminants. It exhibits distinctive multi-celled brown conidia. It is not known to be a human allergen or pathogen. It is rarely found indoors, although it can grow on paper.

Rusts/Smuts

These fungi are associated with plant diseases. In the classification scheme of the fungi, the smuts have much in common with the rusts, and they are frequently discussed together. Both groups produce wind-borne, resistant teliospores that serve as the basis for their classification and their means of spread. Rusts usually attack vegetative regions (i.e., leaves and stems) of plants; smuts usually are associated with the reproductive structures (seeds). They can cause hay fever and asthma.

Spegazzinia

Spegazzinia species comprise a very small proportion of the fungal biota. This genus is somewhat related to other lobed or ornamented genera such as *Candelabrum*. No information is available regarding health effects or toxicity. Allergenicity has not been studied. Usually identified on spore trap samples where it is seen every few weeks. (Spores have very distinctive morphology.) May also be found in air by culturable (Andersen) samples if a long enough incubation period is provided so that sporulation occurs. Our laboratory has never found this organism growing on indoor environmental surfaces. Natural habitat includes soil and many kinds of trees and plants.

Stachybotrys sp.

Aw - 0.94, optimum Aw ->0.98. Several strains of this fungus (*S. atra, S. chartarum* and *S. alternans* are synonymous) may produce a trichothecene mycotoxin- Satratoxin H - which is poisonous by inhalation. The toxins are present on the fungal spores. This is a slow growing fungus on media. It does not compete well with other rapidly growing fungi. The dark colored fungus grows on building material with high cellulose content and low nitrogen content. Areas with a relative humidity above 55%, and are subject to temperature fluctuations, are ideal for toxin production. Individuals with chronic exposure to the toxin produced by this fungus reported cold and flu symptoms, sore throats, diarrhea, headaches, fatigue, dermatitis, intermittent local hair loss and generalized malaise. Other symptoms include coughs, rhinitis, nosebleed, a burning sensation in the nasal passages, throat, and lungs, and fever. The toxins produced by this fungus will suppress the immune system affecting the lymphoid tissue and the bone marrow. Animals injected with the toxin from this fungus exhibited the following symptoms: necrosis and hemorrhage within the brain, thymus, spleen, intestine, lung, heart, lymph node, liver, and kidney. Affects by absorption of the toxin in the human lung are known as pneumomycosis.

This organism is rarely found in outdoor samples. It is usually difficult to find in indoor air samples unless it is physically disturbed (or possibly -this is speculation- a drop in the relative humidity). The spores are in a gelatinous mass. Appropriate media for the growth of this organism will have high cellulose content and low nitrogen content. The spores will die readily after release. The dead spores are still allergenic and toxigenic. Percutaneous absorption has caused mild symptoms.

Stemphylium sp.

Reported to be allergenic. Isolated from dead plants and cellulose materials.

Torula sp.

Found outdoors in air, soil, on dead vegetation, wood, and grasses. Also found indoors on cellulose materials. Reported to be allergenic and may cause hay fever and asthma.

Tetraploa

Tetraploa species comprise a very small proportion of the fungal biota. This genus is somewhat related to *Triposporium* and Diplocladiella. The only reported human infections are two cases of keratitis (1970, 1980) and one case of subcutaneous infection of the knee (1990). No information is available regarding other health effects or toxicity. Allergenicity has not been studied. Usually identified on spore trap samples where it is seen every few weeks. (Spores have very distinctive morphology.) Our laboratory has never found this organism growing on indoor environmental surfaces. Natural habitat includes leaf bases and stems just above the soil on many kinds of plants and trees.

Ulocladium sp.

Aw 0.89. Isolated from dead plants and cellulose materials. Found on textiles.

Zygomycetes

Zygomycetes are one of the four major groups of fungi, the others being the Oomycetes, the Ascomycetes, and the Basidiomycetes. Zygomycetes are common, fast growing, and often overgrow and/or inhibit other fungi nearby. Rhizopus and Mucor are two of the most common Zygomycetes seen in the indoor environment. However, others are seen as well, including *Syncephalastrum*, *Circinella*, *Mortierella*, *Mycotypha*, *Cunninghamella*, and *Choanephora*. For further information, please see descriptions of these individual genera.

The following table lists mycotoxins that are produced by certain types of fungi:

Fungi	Mycotoxin
Acremonium crotocinigenum	Crotocin
Aspergillus favus	Alfatoxin B, cyclopiazonic acid
Aspergillus fumigatus	Fumagilin, gliotoxin
Aspergillus carneus	Critrinin
Aspergillus clavatus	Cytochalasin, patulin
Aspergillus Parasiticus	Alfatoxin B
Aspergillus nomius	Alfatoxin B
Aspergillus niger	Ochratoxin A, malformin, oxalicacid
Acremonium crotocinigenum	Crotocin
Aspergillus nidulans	Sterigmatocystin
Aspergillus ochraceus	Ochratoxin A, penicillic acid
Aspergillus versicolor	Sterigmatocystin, 5 ethoxysterigmatocystin
Aspergillus ustus	Ausdiol, austamide, austocystin,brevianamide
Aspergillus terreus	Citreoviridin
Alternaria	Alternariol, altertoxin, altenuene, altenusin, tenuazonic acid
Arthrinium	Nitropropionic acid
Bioploaris	Cytochalasin, sporidesmin, sterigmatocystin
Chaetomium	Chaetoglobosin A,B,C. Sterigmatocystin
Cladosporium	Cladosporic acid
Clavipes purpurea	Ergotism
Cylindrocorpon	Trichothecene
Diplodia	Diplodiatoxin
Fusarium	Trichothecene, zearalenone
Fusarium moniliforme	Fumonisins
Emericella nidulans	Sterigmatocystin
Gliocladium	Gliotoxin
Memnoniella	Griseofulvin , dechlorogriseofulvin, epi-decholorgriseofulvin, trichodermin, trichodermol
Myrothecium	Trichothecene
Paecilomyces	Patulin, viriditoxin
Penicillium aurantiocandidum	Penicillic acid
Penicillium aurantiogriseum	Penicillic acid
Penicillium brasilanum	Penicillic acid
Penicillium brevicompactum	Mycophenolic acid
Penicillium camemberti	Cyclopiazonic acid
Penicillium carneum	Mycophenolic acid, Roquefortine C
Penicillium crateriforme	Rubratoxin

Fungi	Mycotoxin
Penicillium citrinum	Citrinin
Penicillium commune	Cyclopiazonic acid
Penicillium crustosum	Roquefortine C
Penicillium chrysogenum	Roquefortine C
Penicillium discolor	Chaetoglobosin C
Penicillium expansum	Citrinin, Roquefortine C
Penicillium griseofulvum	Roquefortine C, cyclopiazonic acid, griseofulvin
Penicillium hirsutum	Roquefortine C
Penicillium hordei	Roquefortine C
Penicillium nordicum	Ochratoxin A
Penicillium paneum	Roquefortine C
Penicillium palitans	Cyclopiazonic acid
Penicillium polonicum	Penicillic acid
Penicillum roqueforti	Roquefortine C, Mycophenolic acid
Penicillium veridicatum	Penicillic acid
Penicillium verrucosum	Citrinin, ochratoxin A
Penicillium/ Aspergillus	Patulin
Penicillium/ Aspergillus/Alternaria	Glitoxin
Phomopsis	Macrocyclic trichothecenes
Phoma	Brefeldin, cytochalasin, secalonic acid, tenuazonic acid
Pithomyces	Sporidesmin
Rhizoctonia	Slaframine
Rhizopus	Rhizonin
Sclerotinia	Furanocoumarins
Stachybotrys chartarum	Iso-satratoxin F, roridin E, L-2, satratoxin G & H, trichodermin, trichodermol, trichothecene
Torula	Cytotoxins
Trichoderma	Trichodermin, trichodermol, gliotoxin
Trichothecium	Trichothecene
Wallemia	Walleminol
Zygosporium	Cytochalasin

General terms

Allergen

An allergen is a substance that elicits an IgE antibody response and is responsible for producing allergic reactions. Chemicals are released when IgE on certain cells contact an allergen. These chemicals can cause injury to surrounding tissue - the visible signs of an allergy. Only a few fungal allergens have been characterized but all fungi are thought to be potentially allergenic. Fungal allergens are proteins found in either the mycelium or spores

"Black mold"

A poorly defined term. Black mold or toxic black mold has usually been associated with the mold *Stachybotrys chartarum*. While there are only a few molds that are truly black, there are many that can appear black. Not all molds that appear to be black are *Stachybotrys*.

Fungi

Fungi are neither animals nor plants and are classified in a kingdom of their own. The Kingdom of Fungi. Fungi include a very large group of organisms, including molds, yeasts, mushrooms and puffballs. There are >100,000 accepted fungal species but current estimates range to 1.5 million species. Mycologists (people who study fungi) have grouped fungi into four large groups according to their method of reproduction.

Hidden mold

This refers to visible mold growth on building structures that is not easily seen, including the areas above drop ceilings, within a wall cavity (the space between the inner and outer structure of a wall), inside air handlers, or within the ducting of a heating/ventilation system.

Microbial Volatile Organic Compounds (MVOCs)

Fungi produce chemicals as a result of their metabolism. Some of these chemicals, MVOCs, are responsible for the characteristic moldy, musty, or earthy smell of fungi, whether mushrooms or molds. Some MVOCs are considered offensive or annoying. Specific MVOCs are thought to be characteristic of wood rot and mold growth on building materials. The human nose is very sensitive to mold odors and sometimes more so than current analytical instruments.

Mold

Molds are a group of organisms that belong to the Kingdom of Fungi (see Fungi). Even though the terms mold and fungi had been commonly referred to interchangeably, all molds are fungi, but not all fungi are molds.

Mycotoxin

Mycotoxins are compounds produced by some fungi that are toxic to humans or animals. By convention, the term? Mycotoxin. Excludes mushroom toxins. Fungi that produce mycotoxins are called "toxigenic fungi."

Spore

General term for a reproductive structure in fungi, bacteria and some plants. In fungi, the spore is the structure which may be used for dissemination and may be resistant to adverse environmental conditions.

Toxic mold

The term "toxic mold" has no scientific meaning since the mold itself is not toxic. The metabolic byproducts of some molds may be toxic (see mycotoxin).

Hypha (plural, hyphae)

An individual fungal thread or filament of connected cells; the thread that represents the individual parts of the fungal body.

Phoenix EnviroCorp

MOLD/BIOLOGICAL CONTAMINANT REMEDIATION PROTOCOL

Date: May 4, 2021

For:
Quanesha Mullins
Wilmington Housing Authority
1524 S. 16th Street
Wilmington, NC 28401

Remediation Contractor:
Rhino Demolition
1664 American Way
Little River, SC 29577

On-Site Consultant:
Phoenix EnviroCorp (PEC)
4020 Shipyard Boulevard
Wilmington, NC 28403
(910) 397-0370

Approved Signatory:

Tommie Green, CIEC
Professional Industrial Hygienist

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SECTION 1.0 REMEDIATION PROCEDURES

1.1 Project Set Up

- The owner or powers that be shall supply temporary power for remediation equipment. The existing electrical system may be utilized, with permission of the owner or powers that be. Determining specific electrical load/safety requirements, including, but not limited to, the use of a temporary GFCI electrical panel box shall be the responsibility of the abatement contractor.
- HVAC system shall be isolated.
- 6-mil polyethylene sheathing shall be erected to separate primary control areas (PCA) from remaining areas. Control areas shall be selected so that specified building materials (specified herein, in section 1.3, under primary control areas) may be removed or cleaned and dried.
- HEPA Air Filtration Devices shall be utilized for each separate control area. Critical barriers shall consist of 6-mil polyethylene so that primary control areas are isolated from remaining areas. HEPA filtration units shall be exhausted from the PCA to the outside of the building through windows/doors. Dehumidification units must be installed in the PCA to sufficiently dry components.
- A remote wash off station shall be set up to allow for employees to wash hands and faces after egress from the work area.
- Ingress/Egress to the control area(s) shall be, at minimum, sealed with a 2-way polyethylene air lock.
- Entrances to the building shall be marked as indicated in Section 7.4 of this document.

1.2 Local Exhaust System

- Once sealed, the primary control area shall be ventilated with a local HEPA air filtration device that shall ensure a minimum of four (4) air changes per hour. The air filtration device shall be placed within the containment work area.
- Local HEPA exhaust shall be utilized where cleaning of contents is required and/or in the immediate vicinity of remediation activities of building materials.
- In interior sections requiring surface area cleaning, local HEPA filtration may be exhausted within the area to scrub microbials from ambient air. This process shall only be conducted after fine cleaning has been completed.
- Negative pressure within the contained work area shall be maintained throughout the project until clearance is obtained.
- Negative air machines shall be exhausted to exterior portions of the building to adequately ensure that negative pressure is achieved.
- Negative air pressure within the work area shall be tested and recorded at initiation of the project and hourly thereafter by use of a manometer to ensure the desired pressure of -0.02 inches of water, which is comparable to four changes per hour.
- Dehumidification devices with HEPA filtration may be incorporated as filtration devices in conjunction with true HEPA filtration devices; they may not replace the true HEPA filtration devices.

Note: Formula for determination of adequate HEPA filtration:

Total feet per minute =Volume of work area (ft^3)/15 minutes
#AFD Units needed = (Total feet per minute)/Capacity of Unit (ft^3)

- At initiation of final cleaning stages, relative humidity shall be at 40% (+/-3%) and moisture content of wooden components shall be at or below 15% as determined by Delmhorst moisture meter or equivalent meter. Moisture mapping and direct read T/RH shall be recorded by the remediation contractor until the

specified levels have been achieved. Control areas shall be dehumidified during cleaning and mold remediation activities to ensure removal of surface moisture created during application of water. Drying of structural components that have been treated with encapsulating anti-microbial agents will be necessary.
- Moisture levels shall be recorded and documented by the remediation contractor upon successful completion of dehumidification.

1.3 Remediation Specifications

- Prior to commencement of mold remediation activities by the remediation contractor, the source of any water intrusions, leaks, and/or moisture/humidity problems shall be remedied by the owner. If water intrusions, leaks, and/or moisture/humidity problems exist and are not corrected, mold growth can be expected to return.
- All remediation procedures listed that involve the removal of building materials shall employ polyethylene critical barriers, negative air pressure, and HEPA filtration (i.e., primary control areas).
- The remediation contractor shall ensure that the filters are properly capped prior to switching off the air scrubbers. If the filters are not properly capped, the backflow can cause mold spores to re-release back into the control area, essentially re-contaminating an area that has already been cleaned.
- All remediation activities shall be conducted in a manner that does not allow dissemination of mold spores. Remediation procedures shall begin from the side of the control area furthest away from air filtration devices.
- Cleaning procedures shall be repeated until the area is visibly free of dust and debris.
- Engineering controls set up during the remediation process shall remain in place until remediation has been completed and acceptable post remediation sampling results have been achieved.
- **Federal and/or state regulations require that suspect asbestos containing materials in public and commercial buildings shall be inspected for asbestos prior to renovations or demolition. Based on these regulations, PEC recommends that building materials that may be disturbed during mold remediation be tested for asbestos content prior to their disturbance to prevent asbestos contamination.**
- If cleaning procedures outlined in this remediation plan outweigh the cost of replacement for selected items, the remediation contractor shall give the owner the option to clean or dispose of those items.
- Reinstallation of building materials and/or components shall only be conducted once acceptable post remediation results are obtained.
- Any chemicals used on this project shall be EPA approved and used only as directed by the manufacturer. MSDS shall be available for review upon request.

HVAC System

- The HVAC system(s) that services or run through the primary control area/affected area shall be shut down prior to remediation activities.
- The spaces that are normally climate-controlled by the HVAC system that have been shut down shall be maintained under proper humidity levels (between 30 and 60% utilizing dehumidifiers, etc.) while the system is not in operation.
- All HVAC supply/return vents within the primary control area/affected area shall be isolated with a critical barrier (i.e., plastic, etc.) to prevent air flow.
- Once the HVAC system is shut down, the system shall remain off and isolated until acceptable post remediation results are obtained.

Note: For directional purposes "front" is determined by facing Grass Lane from inside the unit, unless otherwise noted.

Primary Control Areas/Affected Areas

Critical barriers, negative air pressure, and HEPA filtration shall be established to isolate the kitchen as a Primary Control Area to perform the specified mold remediation.

Within the kitchen:

- Detach the floor mounted cabinets along the front wall (i.e., cabinets associated with the sink) and discard all water damaged components (i.e., cabinet floor, etc.) or the entire cabinet.
- Assess the walls uncovered by detaching the cabinets and remove any affected drywall (i.e., drywall with apparent water damage/suspect visible mold growth) and extend the drywall removal within a 2-foot radius of any affected areas when possible.

Throughout the unit (Negative air pressure is not required in areas where building components are not specified for removal, but HEPA filtration is required):

- Clean all surfaces, furnishings, and contents within the primary control area, as well as all areas listed in PEC's initial investigative report dated April 14, 2021 (under visual inspection) with suspect visible mold growth, and any like areas, as specified below under general specifications for primary control areas.

General Specifications for Primary Control Areas

- Open plumbing lines and drains within the control areas shall be isolated with a critical barrier consisting of 6-mil poly.
- The water line to toilets within the control areas shall be shut off and the toilets shall be isolated with a critical barrier consisting of 6-mil poly.
- Cleaning of components/materials shall consist of a method that thoroughly removes visible mold growth, settled concentrations of mold spores, and/or dust and debris (i.e., HEPA vacuuming, wet wiping, or other approved methods), followed by dehumidification/drying.
- Non-porous, semi-porous, and porous furnishings and contents shall be cleaned. If items cannot be cleaned efficiently, the abatement contractor shall consult with the owner/powers that be to determine if they shall be disposed.
- All machine washable porous cloth items shall be cleaned and dried in a household washer and dryer. Other specialty items shall be cleaned by a dry cleaner that specializes in cleaning materials affected with mold. These items shall be removed from affected area(s) and shall not be reintroduced back into the area(s) until acceptable post remediation testing is established. If porous articles cannot be cleaned efficiently, the abatement contractor shall consult with the owner/powers that be.
- Exterior surfaces of electrical appliances, electrical equipment, and light fixtures shall be cleaned, utilizing wet method and HEPA vacuuming. These items shall be disconnected from all electrical sources prior to cleaning. If these items cannot be cleaned efficiently, the abatement contractor shall consult with the owner/powers that be.
- All wall cavity insulation shall be disposed in areas that specify the removal of drywall/wallboard. The abatement contractor shall visually inspect the back side of surrounding drywall/wallboard for water damage and/or suspect mold growth and document any findings. If additional suspect mold growth or water damage is observed beyond the specified removal area, additional drywall/wallboard shall be removed until no suspect mold growth or water damage is observed.
- All penetrations within the controlled area that adjoin unaffected or non-accessible areas, including outdoor areas, crawlspaces, etc., shall be cleaned (as far as one can reach) and then sealed with 6-mil poly, extending six (6) inches on all sides.

- In areas of specified wallboard removal, all components within the wall cavities shall be cleaned. Any wooden structural components with mold stains or mold growth in pitted surfaces shall be HEPA sanded (or other approved methods) to eliminate embedded mold growth.
- All joints or sills (where the structural system meets, where the sill plate meets the floor, etc.) shall be aggressively disturbed to remove embedded mold growth and spores.
- Furnishings and contents that are specified for cleaning shall be protected with polyethylene in areas where building components are specified for removal, prior to the removal of building components to avoid cross contamination. The protective covering shall be removed, and the furnishings and contents shall be cleaned prior to post visual inspection and testing.

1.4 Removal Procedures

The contractor shall maintain surfaces of the control area free of accumulation of dust and debris. Additionally, they shall restrict the spread of dust and debris, keeping waste from being distributed over the work area. Materials shall be removed in a fashion to ensure that previously cleaned areas are not recontaminated (i.e. working from one end of the control area to the other). The contractor may be required to re-clean areas based on a visual inspection by the CIEC/CIE/IH, if the areas are not visibly clean.

Contaminated building materials that have been removed, and additional materials and debris generated during remediation, shall be bagged or wrapped with 6-mil polyethylene sheeting, sealed with duct tape, and carried to the waste container prior to visual inspection by the CIEC/CIE/IH. Materials shall be bagged and sealed directly after removal from unaffected building components.

Areas shall be allowed to dry for a period until specified RH and moisture levels have been achieved. Any remaining building products that are directly impacted by remediation shall be tested for moisture content. Wooden and cellulosic building components (e.g., wall studs, drywall, etc.) shall be tested for moisture content. If the moisture content is > 15% in wood products or > 12% in cellulosic products (utilizing a Delmhorst moisture meter), dehumidification shall be required until moisture levels are at or below said levels, and the RH level is at or below 40% +/-3% (for all interior areas). The remediation contractor shall verify water content of all wooden and cellulosic building components within the impacted areas, as well as temperature and RH prior to scheduling post remediation verification.

1.5 Cleanup Overview

The contractor shall personally review the cleaning process prior to contacting the CIEC/CIE/IH for the post remediation testing. If accumulations of debris and dust are significant, the CIEC/CIE/IH will require re-cleaning prior to post remediation verification sampling.

The CIEC/CIE/IH shall make a visual inspection and conduct post remediation sampling after the final cleaning is complete.

1.6 Post Remediation Verification Testing

Prior to conducting post remediation sampling, HEPA filtration devices shall be allowed to operate for a minimum of 48 hours (the equivalent of 192 air changes), following fine cleaning, in all areas where remediation has been conducted. The HEPA filtration devices shall be sealed at the intake and turned off approximately two hours prior to post testing and reconvene within one hour after post testing, until acceptable post remediation results are established.

Post remediation sampling shall be conducted utilizing viable and/or non-viable sample methods. Air samples shall be collected in representative areas of the control areas. Surface sampling may be conducted at the

discretion of the CIEC/CIE/IH.

Sampling shall be conducted in areas directly impacted by remediation procedures, where cleaning was conducted. The CIEC/CIE/IH shall determine acceptable post remediation status through interpretation of air sampling results, which will be based on indoor/outdoor comparisons, in combination with any surface samples collected, moisture readings, RH readings, visual observations, and any other pertinent information.

The owner/client will be responsible for post remediation testing. If air sample results indicate unacceptable airborne concentrations, the contractor shall be required to conduct a re-cleaning at the contractor's expense and absorb the cost for re-testing, until acceptable results are achieved.

SECTION 2.0 SCOPE OF WORK (Note: Section 2 and Section 1.3 are essential to the full Scope of the Contractor's Work)

2.1 Investigative Reports and Other Related Documents

Phoenix EnviroCorp investigative report dated April 14, 2021.

Phoenix EnviroCorp mold remediation cover letter report dated May 4, 2021.

Phoenix EnviroCorp Chain of Custody dated April 13, 2021.

Analytical reports dated April 14, 2021.

2.2 Project Description

The procedures covered by this program include the enclosure and drying of the said structure, the removal, handling, and disposal of building components compromised by mold/fungal growth, and the cleaning and disinfecting of existing building materials. Procedures for reconstruction are not considered in these specifications. Reconstruction of interior portions may not be conducted until procedures for remediation have been completed, the control areas have been inspected, and testing has returned acceptable post remediation results. Reconstruction of exterior portions may be conducted during the restoration to ensure that water intrusion is abated.

The objectives covered by the program include the remediation of materials shown to have surface contamination, water damage, and/or exposure to elevated airborne mold spore levels, without subjecting the workers, installation employees, and occupants to microbial contaminants. In addition, contract employees, occupants, and materials will be appropriately protected during the removal process so that present and future exposures will not occur.

This protocol is provided as a guideline. Any deviation requests from this protocol shall be addressed to the CIEC/CIE/IH for consideration. At present there are no Federal or State requirements regarding microbial remediation projects; however, OSHA General Construction Code of Federal Regulations (29 CFR 1926) shall be followed.

Remediation shall be completed as close to the date that this protocol was drafted, as the specifications outlined within represent conditions at the time the investigative services were conducted. Due to the volatility of mold, the current protocol may not reflect all necessary remediation if conditions are allowed to continue. Further, if time lapses allowing conditions to change, it will become increasingly difficult to obtain successful clearance testing results.

SECTION 3.0 AIR MONITORING

3.1 Responsibilities of the CIEC/CIE/IH

Monitoring of airborne concentrations will be performed in accordance with the requirements of this program. Prior to conducting air sampling and/or surface sampling for clearances, the CIEC/CIE/IH shall conduct a visual inspection of the area. Temperature and RH shall be recorded during the air sampling phase of clearance. All air sampling shall be conducted in such a manner as to provide a valid representation of airborne mold levels both inside and outside the work areas. If analysis of air samples indicates that airborne concentrations exceed acceptable limits, the contractor shall conduct re-cleaning at the contractor's expense.

3.2 Personal Monitoring

No personal monitoring will be conducted by the CIEC/CIE/IH unless the remediation contractor requests monitoring for OSHA compliance. Presently there are no guidelines (PELs or TLVs) for microbial contaminants. It is the remediation contractor's responsibility to determine if OSHA personal sampling may be required during application of anti-microbial agents.

3.3 Sample Integrity and Reporting

Samples shall be sealed, labeled, and a chain of custody initiated according to laboratory procedures.

Sample results shall be available within seven (7) days of the completion of collection of all samples and will include the following information:

- Site Address
- Sample Number
- Location Sampled
- Analytical Method
- Collection Date(s)
- Person Taking Sample(s)
- Additional Comments (if any)
- Analyst Signature

SECTION 4.0 MATERIAL REPLACEMENT

4.1 Material Replacement

The general contractor/replacement contractor may begin material replacement after the CIEC/CIE/IH informs all parties of acceptable post remediation sample results.

With ongoing construction activities ambient air levels are expected to be elevated over what might be normally expected. Additional testing should not be necessary after remediation procedures have been completed and successful results have been obtained. In the event of another water intrusion (i.e. broken-pipe-line, improper HVAC function, or building envelope compromise), an investigation shall be conducted within 24 to 48 hours of the event. Proper drying, if initiated within this time frame, should minimize the potential for microbial growth.

SECTION 5.0 SPILL CLEANUP REQUIREMENTS

5.1 Spills

MSDS shall be kept on site for all chemical products brought to the site by the remediation contractor. In the event of a chemical spill, the contractor shall initiate cleanup immediately. The contractor shall mop up any liquid with rags or other conventional absorbent. The spent absorbent shall be properly contained and disposed of as waste.

SECTION 6.0 WASTE CONTROL

6.1 Waste Disposal

Waste shall be disposed of at a locally selected landfill. Waste bags shall be checked for integrity and hauled in an enclosed truck/vehicle or container to ensure that transportation to the landfill does not pose a potential hazard to the environment.

SECTION 7.0 SUPPLEMENTAL INFORMATION

7.1 Applicable Publications

The publications listed below form part of this program. Written programs shall accompany all referenced CFR publications. IICRC and NYCDOH guidelines for work procedures shall be followed by the remediation contractor. A copy of the NYCDOH protocols shall be on-site, along with this design, for reference by the site supervisor. ACGIH, IAQA, and ASHRAE publications shall be utilized as guidelines for interpretation by the CIEC/CIE/IH. This design shall be reviewed by the remediation supervisor prior to initiation of set-up for the project. Any questions regarding this project may be addressed with the on-site consultant listed for Phoenix EnviroCorp.

Code of Federal Regulation (CFR Publications)

29 CFR 1910.134	Respiratory Protection
29 CFR 1910.145	Specifications for Accident Prevention, Signs and Tags
29 CFR 1926.28	Personal Protective Equipment
29 CFR 1926.59	Hazard Communication
29 CFR 1926.96	Occupational Foot Protection
29 CFR 1926.100	Head Protection
29 CFR 1926.101	Hearing Protection
29 CFR 1926.102	Eye and Face Protection
29 CFR 1926.403	Electrical General Requirements
29 CFR 1926.416	Safety General Requirements
29 CFR 1926.852	Demolition, Chutes
29 CFR 1926.1091	Record Keeping Requirements

Supplemental Guidelines

IICRC S520 2nd ed.	Standard and Reference Guide for Professional Water Damage Restoration
NYCDOH	Guidelines on Assessment and Remediation of Fungi in Indoor Environments
ACGIH	Bioaerosols: Assessment and Control
IAQA 01-2000	Recommended Guidelines for Indoor Environments
ASHRAE 62.2-2007	Ventilation for Acceptable Indoor Air Quality in Low-Rise Residential

Buildings

7.2 Definitions

Air Lock: A system that permits ingress and egress between a control area and non-control area, or other work areas, without allowing air movement between areas (e.g., three stage decon, three-way polyethylene flaps).

Air Sample: Refers to samples collected with spore trap air sample media (e.g., Micro-5, Cyclex D, or equivalent); also referred to as a non-viable air sample. May also refer to a sample collected on a disposable petri dish with Agar media by means of an Andersen Impactor (or equivalent) and sampling pump; also referred to as air culture (viable) sample. Sample media to be used in project is described under Section 1.6 (Post Remediation Verification Testing).

Area Monitoring: The sampling of airborne microbial concentrations outside the exclusion boundary, which may reach the breathing zone of the contractor or installation employees.

Asbestos Containing Materials (ACM): Refers to asbestos containing building materials that contain more than 1% asbestos by Polarized Light Microscopy (PLM) or Transmission Electron Microscopy (TEM).

Biocide: Refers to chemical agents that are specifically designed to eliminate viable microbial contamination, with a phenol equivalent efficiency (e.g., Sodium Hypochlorite, Quaternary Ammonia Compounds).

Blower Door Test: Refers to the testing of static pressure and draw of air through the HVAC in cubic feet per minute (CFM) to rate the efficiency of the system.

Clearance Monitoring: Refers to air, bulk, or swab sampling conducted as a means to demonstrate that the area specified for remediation has been completed by the contractor, left with present acceptable mold spore levels, and ready for re-construction.

Control Area: The area where microbial contaminants removal is performed, which is isolated by physical boundaries to prevent unauthorized entry of personnel, thereby preventing exposure to or the spread of microbial contaminants. Physical boundaries will be established and located such that the airborne contaminants are not allowed to escape the boundaries.

HEPA: High Efficiency Particulate Air. Refers to ventilation devices that are specifically designed to filter ambient air to an efficiency of 99.97%.

HVAC: Refers to the Heating, Ventilation, and Air Conditioning system.

Industrial Hygienist: Refers to a person who practices industrial hygiene and may act as a competent person regarding visual inspection of contaminated surfaces and clearance air and/or swab/bulk sampling. May also refer to a Certified Industrial Hygienist (CIH) as defined by the American Board of Industrial Hygiene (ABIH), a Certified Indoor Environmental Consultant as defined by the American Council for Accredited Certification (ACAC), or a Certified Indoor Environmentalist (CIE) as defined by the American Council for Accredited Certification (ACAC).

Microbial Contaminant: Refers to viable mold, fungi, pollen, bacteria, and or particulate, or their metabolites, that may be causative of epidemiological, immunotoxic, dermotoxic, neurotoxic, or enterotoxic disorders in the human population, or may be considered a pathogen or an opportunistic pathogen.

Non-Porous Materials: Refers to building materials with solid surfaces that may be successfully treated and

cleaned by means of HEPA vacuuming or other approved method. Materials include flooring, hard goods, plastic, vinyl, and some wallboard systems.

Porous Materials: Refers to building materials and household goods that may allow microscopic particles (3-20 micron) to become trapped within the material that will not allow adequate cleaning. Materials include carpet, mattresses, and clothing.

Primary Control Area (PCA): Refers to a section of a facility that has been isolated by 6-mil polyethylene barriers where specific engineering controls (e.g., HEPA filtration, negative air pressurization, dehumidification, etc.) are required. In general, it is the area where remediation of water and mold damaged building materials is to be conducted.

Refrigerant Dehumidifier: Device used to remove water content from air and materials.

Relative Humidity (RH): Refers to the ratio of water vapor in the atmosphere to the amount required to saturate it at a given temperature.

Semi-Porous Materials: Refers to materials that may be somewhat porous, yet they may still allow for adequate cleaning. Materials include wooden beams and some wallboard systems.

Swab Sample: Refers to collection of a sample onto a sterile swab for analysis of mold, fungi, and bacteria by viable and/or non-viable analysis.

Tape-Lift Sample: Refers to collection of a sample onto clear scotch tape for analysis by direct microscopic examination (non-viable).

7.3 Quality Assurance

Medical Examinations

Before potential exposure to microbial contaminants, the remediation contractor shall provide workers with a comprehensive medical examination as required by 29 CFR 1910.134 as outlined by the Medical Monitoring Program.

Medical Records

The remediation contractor shall maintain complete and accurate medical records on employees as required by OSHA and the contractor's Medical Monitoring Program. The contractor may be asked to provide a copy of all medical records for approval by the consultant's representative.

Training

Each employee working on this contract shall be trained prior to the time of initial job assignment in accordance with mold specific and chemical specific training as indicated by the OSHA General Duty Clause and the Hazard Communication Standard. Each employee shall also receive training required by Federal guidelines listed in Section 7.1 of this document and project specifications.

Hazard Communication Program

The remediation contractor has established and implemented a Hazard Communication Program as required by

29 CFR 1910.1200 and may be asked to provide a copy of this written program. Hazard Communication training must include occupational hazards as directly related to working with fungi/mold and contamination of building components by fungal contamination, specific training for chemical hazards associated with biocide usage, and site specific MSDS sheets for commercial detergents and biocides utilized on the job site.

Respiratory Protection Program

The remediation contractor has established a Respiratory Protection Program, which complies with 29 CFR 1910.134. Physical examinations and fit testing are required for use of respiratory protection greater than an N-95 dust mask. Workers removing building materials contaminated by mold growth, applying anti-microbial agents, or workers subjected to exposures to anti-microbial agents shall be required to wear, at minimum, a tight-fitting negative pressure ½ mask respirator with P-100 filters. Therefore, -he OSHA Respiratory Protection Standard applies.

Analytical Testing Laboratory

Analysis of culturable biological samples collected on this project shall be conducted by a laboratory that participates in the Environmental Microbiological Proficiency Analytical Testing Program (EMPAT) of the American Industrial Hygiene Association (AIHA) and has shown to be proficient by proficiency analytical testing (PAT) samples. Analysis of non-viable air and surface samples shall be conducted by a competent person.

7.4 Materials and Equipment

Equipment

The contractor shall make available to employees a complete set of personal protective equipment (PPE) as required by this program for entry into the controlled area. All personnel while in the control area or handling microbial contaminated waste shall wear protective clothing, respirators, and other PPE.

Respirators

Contractor shall furnish the appropriate respirator in accordance with 29 CFR 1910.134 and approved by NIOSH for protection in environments that contain microbial contaminants. The selected respirator for this project shall be a tight-fitting negative pressure ½ respirator equipped with HEPA cartridge (P-95, P-100). At minimum, an N-95 dust mask may be utilized during fine cleaning activities; however, the tight fitting ½ mask respirator shall be utilized during application of anti-microbial agents or biocides.

Special Clothing

Employees shall be provided with and required to wear: whole body disposable protective clothing, full body tyvek suits with head coverings, and latex gloves *(see table)* during all activities in the controlled area.

Chemical	Recommended Rubber Glove
Sodium Hypochlorite	Neoprene or Nitrile
Phenolic Compounds	Neoprene
Quaternary Ammonia Compounds	Polyvinyl Chloride (PVC)

Detergents	Latex

Eye Protection

The contractor shall provide chemical-resistant goggles to personnel engaged in cleaning and treatment activities and require them to be worn during application of anti-microbial agents and biocides.

Warning Signs and Labels

Standard approved warning signs shall be erected at all approaches to the control area as specified in 29 CFR 1910.145.

Anti-Microbial Agents

Anti-microbial agents utilized in interior quarters shall consist of quaternary ammonia compounds. No phenolic compounds shall be used in interior quarters with exception of Micro Ban Plus. Approval must be granted by the owner/powers that be prior to application. Anti-microbial agents shall be EPA approved. Commercial grade detergents shall be used to remove fungal contamination during cleaning phases prior to anti-microbial application, to include encapsulation.

Phoenix EnviroCorp

May 19, 2021

Quanesha Mullins
Wilmington Housing Authority
1524 S. 16th Street
Wilmington, NC 28405

RE: PEC Job # 21-121-120A-IAQ-M - 302 Grass Lane, Unit 110, Wilmington, NC - Mold Investigation/Background air sampling

Enclosed are the results of the mold investigation conducted at the above referenced unit on May 13, 2021. Phoenix EnviroCorp (PEC) was retained to conduct background air sampling to determine airborne mold spore levels and to collect surface samples of suspect visible mold growth.

Background Information: The HVAC system was operating in the cool mode, set at 69º F upon PEC's arrival and during sampling.

This is a vacant unit without furnishings or carpet.

Note: For directional purposes "front" is determined by facing Grass Lane from inside the unit, unless otherwise stated.

Visual Inspection: PEC's visual inspection noted the following (see enclosed photographic documentation):

- Suspect visible mold growth on several HVAC supply vents
- Suspect visible mold growth on the rear left bedroom closet wall
- Apparent water damage to the living room ceiling
- Apparent water damage/hole in the rear right bedroom ceiling
- Apparent water damage to the bathroom front wall baseboard

Mold Testing – Surface: Non-viable surface samples were collected from areas of suspect visible mold growth. The quantifications of fungal growth are reported as scattered spores, 21-100 fungal spores = very light (VL), 101-1,000 fungal spores = light (L), 1,001-10,000 fungal spores = moderate (M), > 10,000 fungal spores = heavy (H). The 'General Impressions' of fungal growth are reported as no fungal growth (NFG), fungal growth (FG), minimal fungal growth or growth in vicinity (MFG), and no fungal spores detected (ND). *Clear tape was utilized for the collection of surface samples. Each sample was assigned a unique ID number and shipped to a third-party laboratory for analysis.* Sampling locations and results are as follows:

Location	Result
Rear left bedroom closet right wall	**M – FG** *Penicillium/Aspergillus*
Kitchen HVAC supply vent	**VL – MFG** *Penicillium/Aspergillus*

Mold Testing – Air: Non-viable spore trap air samples were collected to determine airborne mold spore levels. Samples were collected within the rear left bedroom, the rear right bedroom, the bathroom, and the kitchen/living room. *Micro 5 sampling media was utilized for the collection of spore trap air samples. Each sample ran for five (5) minutes at a flow rate of five (5) liters per minute*

for a total volume of twenty-five (25) liters per sample. Each sample was assigned a unique ID number and shipped to a third-party laboratory for analysis. All air samples were collected from centralized locations (within their respective areas) and within the breathing zone, unless otherwise noted. Two samples were also collected outdoors for comparative purposes.

Results indicated acceptable airborne mold spore levels within all sampled locations.

The interpretation of air sample results is based on indoor/outdoor comparisons, in combination with a study by Daniel M. Baxter, entitled "A Regional Comparison of Mold Spore Concentrations Outdoors and Inside "Clean" and "Mold Contaminated" Southern California Buildings", and other industry guidelines, as well as over 20 years of experience in industrial hygiene and mold testing.

In layman terms, acceptable levels indicate that the levels are below the outdoor level and/or the baseline levels (whichever is higher) stated below. Elevated levels indicate that the levels are above the outdoor level and/or the baseline level.

Baseline levels for indoor spore trap air samples are as follows: < 900 spores/m³ for Penicillium/ Aspergillus; 0 spores/m³ for Stachybotrys and Chaetomium; and < 350 spores/m³ for other individual mold groups.

Moisture Readings: Moisture readings were collected with either a Delmhorst moisture meter or a Tramex Survey Encounter. Multiple readings were taken to represent areas and materials reported. *Readings are marked with either a D or T to denote which meter was used.* For drywall products, readings should be less than or equal to twelve percent (≤ 12%) by Delmhorst and below fifty percent (50%) by Tramex. For wood products, normal moisture content should be less than fifteen percent (<15%) for both meters.

Moisture content measurements were as follows:

<u>Living room</u>

- Drywall ceiling = ≤ 20% (T)

<u>Kitchen</u>

- Wood cabinet = ≤ 10% (D)

<u>Bathroom</u>

- Wood baseboard on the front wall = <10% (D)

<u>Rear right bedroom</u>

- Ceiling drywall = ≤ 20% (T)

Relative Humidity (RH): *Temperature and relative humidity readings were collected in the same locations as the spore trap air samples.* RH levels within the unit ranged from 42.4% – 45.6% with an outdoor reading of 39.4% (see the enclosed Chain of Custody for details). Per the American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) Standard 62-1999, relative humidity should range between 30% and 60%.

Conclusions: Air sampling did not indicate a problem with the indoor air quality regarding mold. However, surface mold growth was identified within the residence, as well as apparent water damage. Upon request, and for an additional fee, PEC can conduct additional investigative activities and provide a mold remediation protocol to address visible surface mold growth and apparent water damage/potential hidden mold growth.

Enclosed in this report are the laboratory analysis and the Chain of Custody.

Should you have any questions, please do not hesitate to call.
Thank you,

Shaenaz Mirmohamed
IH Technician

Tommie Green, CIEC
Professional Industrial Hygienist

Enclosures

Photo 1

Apparent water damage to the living room ceiling

Photo 2

Apparent water damage to the bathroom front wall baseboard

Photo 3

Apparent water damage within the kitchen sink cabinet

Photo 4

Suspect visible mold growth on the rear left bedroom closet right wall (adjacent to the water heater)

Photo 5

Apparent water damage to the ceiling/hole in the rear right bedroom

Samples collected

Phoenix EnviroCorp
4020 SHIPYARD BLVD.
WILMINGTON, NC 28403

CHAIN OF CUSTODY

LABORATORY TEST REQUEST

Seem/ Ref # 210514015 IAQ ID: 052-059

CONTACT: Shaenaz Mirmohamed	TELEPHONE (910) 397-0370 FAX (910) 313-6094	Sample date: 5/13/2021
PEC Job #: 21-21-120A-IAQ-M	SITE ADDRESS:	302 Grass Lane, Unit 110, Wilmington, NC 28405

PLEASE EMAIL RESULTS TO: KMGREEN@PHOENIXENVIROCORP.COM

SAMPLE TYPE:		TURN AROUND TIME SPECIFIED:
Spore Trap - Micro-5	6	____ Immediate ____ 24 hr ____ 48 hr __X__ Standard
Surface Samples	2	

Sample #	Sample Area	Sample Volume	Lab Analysis Requested	% Relative Humidity	Temperature °F
051321-SM-201	Rear left bedroom	25L	S001	44.9	70.6
051321-SM-202	Rear right bedroom	25L	S001	45.6	70.6
051321-SM-203	Bathroom	25L	S001	44.2	70.7
051321-SM-204	Kitchen/living room	25L	S001	42.4	70.5
051321-SM-205	Outside - Front	25L	S001	39.4	73.0
051321-SM-206	Outside - Rear	25L	S001		
050321-SM-207	Rear left bedroom closet right wall	1 cm sq	S001T	NA	NA
050321-SM-208	Kitchen HVAC supply vent	1 cm sq	S001T	NA	NA

Samples Collected By (Printed Name and Signature): Shaenaz Mirmohamed Date Signed: 5/13/2021

CHAIN OF CUSTODY RECORD

DATE:	Time:	Condition of Samples:	RELINQUISHED BY: (Printed Name and Signature)	ACCEPTED BY: (Printed Name and Signature)
5/13/2021	16:00	Intact	Shaenaz Mirmohamed AFFILIATION:	JH 5/14/21 AFFILIATION:

SEEML Reference Number:
210514015

Southeast Environmental Microbiology Laboratories
102 Edinburgh Court
Greenville, SC 29607
Phone: (864) 233-3770
FAX: (864) 233-6589

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

☒	Surface/Bulk Report	☐	Andersen Fungal Report
☒	Spore Trap Report	☐	Quantitative Fungal Report

Lab Manager Review: *Angel Gosnell* Date: 05/14/21

Thank you for using SEEML laboratories. We strive to provide superior quality and service.
SEEML laboratories are accredited through AIHA-LAP, LLC (EMLAP # 173667) for the analysis of Spore Traps and Surface/Bulk Samples.

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

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

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

Spore Trap Report

	Date Sampled: 05/13/21
Attn: ***Phoenix Enviro Corp.***	Date Received: 05/14/21
4020 Shipyard Blvd.	Date Analyzed: 05/14/21
Wilmington, NC 28403	Date Reported: 05/14/21
	Date Revised:
	Project Name: 21-21-120A-IAQ-M
	Project Address: 302 Grass Lane, Unit 110
	Project City, State, ZIP: Wilmington, NC 28405
	SEEML Reference # : 210514015

TEST METHOD: DIRECT MICROSCOPY EXAMINATION SEEML SOP 7

Client Sample ID	051321-SM-201			051321-SM-202			051321-SM-203		
Location	Rear Left Bedroom			Rear Right Bedroom			Bathroom		
Lab Sample ID	210514015-052			210514015-053			210514015-054		
Comments									
Hyphal Fragments									
Pollen									
Spore Trap Used	M5			M5			M5		
	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%
Alternaria									
Ascospores	1	40	25	1	40	25	1	40	11
Basidiospores							2	80	22
Bipolaris/Drechslera									
Chaetomium									
Cladosporium	2	80	50	3	120	75	4	160	44
Curvularia									
Epicoccum									
Cercospora									
Fusarium									
Memnoniella									
Nigrospora									
Penicillium/Aspergillus	1	40	25				2	80	22
Polythrincium									
Rusts									
Smuts/Periconia/Myxomy									
Spegazzinia									
Stachybotrys									
Stemphylium									
Tetraploa									
Torula									
Ulocladium									
Colorless/Other Brown*									
Oidium									
Zygomycetes									
Pithomyces									
Background debris (1-5)**	3			3			3		
Sample Volume(liters)	25			25			25		
TOTAL SPORES/M^3	4	**160**		4	**160**		9	**360**	

Revisions:

Spore types listed without a count or data entry were not detected during the course of the analysis for the respective sample, indicating a raw count of <1 spore.

The analytical sensitivity is the spores/m^3 divided by the raw count, expressed in spores/m^3. The limit of detection is the analytical sensitivity (in spores/m^3) multiplied by the sample volume (in liters) divided by 1000 liters.

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

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

Disclaimer: The sample results are determined by the sample volume, which is provided by the customer.

This report relates only to the samples tested as they were received.

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Greenville, SC. 29607
Phone: (864) 233-3770

Angel Gosnell

Angel Gosnell, Approved Laboratory Signatory

AIHA-LAP, LLC EMLAP #173667 Texas Lic: LAB1016

Spore Trap Report

	Date Sampled: 05/13/21
Attn: ***Phoenix Enviro Corp.***	Date Received: 05/14/21
4020 Shipyard Blvd.	Date Analyzed: 05/14/21
Wilmington, NC 28403	Date Reported: 05/14/21
	Date Revised:
	Project Name: 21-21-120A-IAQ-M
	Project Address: 302 Grass Lane, Unit 110
	Project City, State, ZIP: Wilmington, NC 28405
	SEEML Reference # : 210514015

TEST METHOD: DIRECT MICROSCOPY EXAMINATION SEEML SOP 7

Client Sample ID	051321-SM-204			051321-SM-205			051321-SM-206		
Location	Kitchen/Living Room			Outside - Front			Outside - Rear		
Lab Sample ID	210514015-055			210514015-056			210514015-057		
Comments									
Hyphal Fragments							2	80	
Pollen				3	120		6	240	
Spore Trap Used	M5			M5			M5		
	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%
Alternaria	1	40	10	3	120	3			
Ascospores	1	40	10	22	880	21	7	280	9
Basidiospores	2	80	20	20	800	19	25	1000	32
Bipolaris/Drechslera									
Chaetomium									
Cladosporium	3	120	30	59	2360	56	44	1760	56
Curvularia									
Epicoccum									
Cercospora									
Fusarium									
Memnoniella									
Nigrospora									
Penicillium/Aspergillus	2	80	20						
Polythrincium									
Rusts									
Smuts/Periconia/Myxomy	1	40	10				2	80	3
Spegazzinia				1	40	<1			
Stachybotrys									
Stemphylium									
Tetraploa									
Torula									
Ulocladium									
Colorless/Other Brown*									
Oidium									
Zygomycetes									
Pithomyces									
Background debris (1-5)**	3			3			3		
Sample Volume(liters)	25			25			25		
TOTAL SPORES/M^3	10	**400**		105	**4200**		78	**3120**	

Revisions:

Spore types listed without a count or data entry were not detected during the course of the analysis for the respective sample, indicating a raw count of <1 spore.

The analytical sensitivity is the spores/m^3 divided by the raw count, expressed in spores/m^3. The limit of detection is the analytical sensitivity (in spores/m^3) multiplied by the sample volume (in liters) divided by 1000 liters.

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

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

Disclaimer: The sample results are determined by the sample volume, which is provided by the customer.

This report relates only to the samples tested as they were received.

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Angel Gosnell

Angel Gosnell, Approved Laboratory Signatory

AIHA-LAP, LLC EMLAP #173667 Texas Lic: LAB1016

Surface and Bulk Sample Report

	Date Sampled: 05/13/21
Attn: ***Phoenix Enviro Corp.***	Date Received: 05/14/21
4020 Shipyard Blvd.	Date Analyzed: 05/14/21
Wilmington, NC 28403	Date Reported: 05/14/21
	Date Revised:
	Project Name: 21-21-120A-IAQ-M
	Project Address: 302 Grass Lane, Unit 110
	Project City, State ZIP: Wilmington, NC 28405
	SEEML Reference #: 210514015

TEST METHOD: Direct Microscopic Examination (SEEML SOP 18)

Client Sample ID	050321-SM-207	050321-SM-208		
Location	Rear Left Bedroom Closet Right Wall	Kitchen HVAC Supply Vent		
SEEML Sample ID	210514015-058	210514015-059		
Sample Type	Tape	Tape		
	Quantification*	Quantification*		
Hyphal Fragments	**Scattered**			
Pollen		**Scattered**		
General Impressions **	**FG**	**MFG**		
Fungal Spore:				
Alternaria				
Acremonium				
Ascospores				
Basidiospores				
Bipolaris/Drechslera				
Cercospora				
Chaetomium				
Cladosporium				
Curvularia				
Epicoccum				
Fusarium				
Geotrichum sp.				
Memnoniella				
Myxomycetes				
Nigrospora				
Penicillium/Aspergillus	**M**	**VL**		
Pithomyces				
Rusts/Smuts				
Stemphylium				
Tetraploa				
Ulocladium				

**** General Impressions: NFG = No Fungal Growth, FG = Fungal Growth, MFG = Minimal Fungal Growth Or Growth in vicinity**

Quantification of fungal growth is done by semi-quantitative grading using the following ranges:

Scattered Spores, 1-20 fungal spores

VL = 21-100 fungal spores **L = 101-1,000 fungal spores** **M = 1,001-10,000 fungal spores** **H = >10,000 fungal spores**

ND = No Fungal Spores Detected

Disclaimer: This report relates only to the samples tested

Respectfully submitted, SEEML

Angel Gosnell, **Approved Laboratory Signatory**

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Phone: (864) 233- 3770
Fax: (864) 233- 6589

AIHA-LAP, LLC EMLAP # 173667
Texas License: LAB1016

Fungal Descriptions

Alternaria sp.

Aw - 0.89. Conidia dimensions: 18-83 x 7-18 microns. A very common allergen with an IgE mediated response. It is often found in carpets, textiles and on horizontal surfaces in building interiors. Often found on window frames. Outdoors it may be isolated from samples of soil, seeds and plants. It is commonly found in outdoor samples. The large spore size, 20 - 200 microns in length and 7 - 18 microns in sizes, suggests that the spores from these fungi will be deposited in the nose, mouth and upper respiratory tract. It may be related to bakers' asthma. It has been associated with hypersensitivity pneumonitis. The species *Alternaria alternata* can produce tenuazonic acid and other toxic metabolites that may be associated with disease in humans or animals. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include edema and bronchospasms; chronic cases may develop pulmonary emphysema.

Ascospore

A spore borne in a special cell called an ascus. Spores of this type are reported to be allergenic. All ascomycetes, members of a group of fungi called Ascomycotina, have this type of spore. The minute black dots on rotting wood and leaves or the little cups on lichens are examples of ascomycetes; another is the "truffle" mushroom.

Aspergillus/Penicillium

These are two of the most commonly found allergenic fungi in problem buildings. *Aspergillus* comes in many varieties (species). Many of the varieties produce toxic substances. It may be associated with symptoms such as sinusitis, allergic bronchopulmonary aspergillosis, and other allergic symptoms. *Penicillium* is a variety of mold that is very common indoors and is found in increased numbers in problem buildings. It also has many varieties, some of which produce toxic substances. The symptoms are allergic reactions, mucous membrane irritation, headaches, vomiting, and diarrhea. Due to the morphological similarity of *Aspergillus* and *Penicillium*, they are not differentiated by microscopic analysis and are reported together.

Aspergillus sp.

Aw 0.75 - 0.82. Reported to be allergenic. Members of this genus are reported to cause ear infections. Many species produce mycotoxins that may be associated with disease in humans and other animals. Toxin production is dependent on the species or a strain within a species and on the food source for the fungus. Some of these toxins have been found to be carcinogenic in animal species. Several toxins are considered potential human carcinogens. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include edema and bronchospasms; chronic cases may develop pulmonary emphysema; may also be associated with sinusitis, allergic bronchopulmonary aspergillosis, and other allergic symptoms.

Basidiospore

Spore from basidiomycetes. Many varieties are reported to be allergenic.

Bipolaris sp.

A fungus with large spores that could be expected to be deposited in the upper respiratory tract. This fungus can produce the mycotoxin - sterigmatocystin, which has been shown to produce liver and kidney damage when ingested by laboratory animals.

Botrytis sp.

Aw 0.93. Conidia dimensions: 7-14 x 5-9 microns. It is parasitic on plants and soft fruits. Found in soil and on house plants and vegetables, it is also known as "gray mold". It causes leaf rot on grapes, strawberries, lettuce, etc. It is a well-known allergen, producing asthma type symptoms in greenhouse workers and "wine grower's lung".

Cercaspora

Common outdoors in agricultural areas, especially during harvest. Parasite of higher plants, causing leaf spot. Commonly found as parasites on higher plants.

Chaetomium sp.

large ascomycetous fungus producing perithecia. It is found on a variety of substrates containing cellulose, including paper and plant compost. It has been found on paper in sheetrock. It can produce an *Acremonium*-like state on fungal media. Varieties are considered allergenic and have been associated with peritonitis, cutaneous lesions, and system mycosis.

Cladosporium sp.

Aw 0.88; Aw 0.84. Most commonly identified outdoor fungus. The outdoor numbers are reduced in the winter. The numbers are often high in the summer. Often found indoors in numbers less than outdoor numbers. It is a common allergen. Indoor *Cladosporium* sp. may be different than the species identified outdoors. It is commonly found on the surface of fiberglass duct liners in the interior of supply ducts. A wide variety of plants are food sources for this fungus. It is found on dead plants, woody plants, food, straw, soil, paint, and textiles. Produces greater than 10 antigens. Antigens in commercial extracts are of variable quality and may degrade within weeks of preparation. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include skin lesions, eye ulceration, mycosis (including onychomycosis, an infection of the nails of the feet or hands) edema and bronchospasms; chronic cases may develop pulmonary emphysema.

Curvularia sp.

Reported to be allergenic and has been associated with allergic fungal sinusitis. It may cause corneal infections, mycetoma, and infections in immune compromised hosts.

Dreschlera sp.

Conidia dimensions: 40-120 x 17-28 microns. Found on grasses, grains and decaying food. It can occasionally cause a corneal infection of the eye.

Epicoccum sp.

Conidia dimensions: 15-25 microns. A common allergen. It is found in plants, soil, grains, textiles and paper products.

Fusarium sp.

Aw 0.90. A common soil fungus. It is found on a wide range of plants. It is often found in humidifiers. Several species in this genus can produce potent trichothecene toxins. The trichothecene (scirpene) toxin targets the following systems: circulatory, alimentary, skin, and nervous. Produces vomitoxin on grains during unusually damp growing conditions. Symptoms may occur either through ingestion of contaminated grains or possibly inhalation of spores. The genera can produce hemorrhagic syndrome in humans (alimentary toxic aleukia). This is characterized by nausea, vomiting, diarrhea, dermatitis, and extensive internal bleeding. Reported to be allergenic. Frequently involved in eye, skin, and nail infections.

Myxomycetes

Members of a group of fungi that is included in the category of "slime molds". They're occasionally found indoors, but mainly reside in forested regions on decaying logs, stumps, and dead leaves. Myxomycetes display characteristics of fungi *and* protozoans. In favorable (wet) conditions they exhibit motile, amoeba-like cells, usually bounded only by a plasma membrane, that are variable in size and form. During dry spells, they form a resting body (sclerotium) with dry, airborne spores. These fungi are not known to produce toxins but can cause hay fever and asthma.

Memnoniella

Contaminant found most often with *Stachybotrys* on wet cellulose. Forms in chains, but it are very similar to *Stachybotrys* and sometimes is considered to be in the *Stachybotrys* family. Certain species do produce toxins very similar to the ones produced by *Stachybotrys chartarum* and many consider the IAQ importance of *Memnoniella* to be on par with *Stachybotrys*. Allergenic and infectious properties are not well studied.

Nigrospora sp.

Commonly found in warm climates, this mold may be responsible for allergic reactions such as hay fever and asthma. It is found on decaying plant material and in the soil. It is not often found indoors.

Oidium sp.

The asexual phase of *Erysiphe* sp. It is a plant pathogen causing powdery mildews. It is very common on the leaf's stems, and flowers of plants. The health effects and allergenicity have not been studied. It does not grow on non-living surfaces such as wood or drywall.

Penicillium sp.

Aw 0.78 - 0.88. A wide number of organisms have been placed in this genus. Identification to species is difficult. Often found in aerosol samples. Commonly found in soil, food, cellulose and grains. It is also found in paint and compost piles. It may cause hypersensitivity pneumonitis, allergic alveolitis in susceptible individuals. It is reported to be allergenic (skin). It is commonly found in carpet, wallpaper, and in interior fiberglass duct insulation. Some species can produce mycotoxins. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include edema and bronchospasms; chronic cases may develop pulmonary emphysema. It may also cause headaches, vomiting, and diarrhea.

Periconia sp.

Periconia sp. are found in soil, blackened and dead herbaceous stems leaf spots, grasses, rushes, and sedges. Almost always associated with other fungi. Rarely found growing indoors. Reportedly associated with a rare case of mycotic keratitis.

Pithomyces sp.

A common mold found on dead leaves, plants, soil and especially grasses. Causes facial eczema in ruminants. It exhibits distinctive multi-celled brown conidia. It is not known to be a human allergen or pathogen. It is rarely found indoors, although it can grow on paper.

Rusts/Smuts

These fungi are associated with plant diseases. In the classification scheme of the fungi, the smuts have much in common with the rusts, and they are frequently discussed together. Both groups produce wind-borne, resistant teliospores that serve as the basis for their classification and their means of spread. Rusts usually attack vegetative regions (i.e., leaves and stems) of plants; smuts usually are associated with the reproductive structures (seeds). They can cause hay fever and asthma.

Spegazzinia

Spegazzinia species comprise a very small proportion of the fungal biota. This genus is somewhat related to other lobed or ornamented genera such as *Candelabrum*. No information is available regarding health effects or toxicity. Allergenicity has not been studied. Usually identified on spore trap samples where it is seen every few weeks. (Spores have very distinctive morphology.) May also be found in air by culturable (Andersen) samples if a long enough incubation period is provided so that sporulation occurs. Our laboratory has never found this organism growing on indoor environmental surfaces. Natural habitat includes soil and many kinds of trees and plants.

Stachybotrys sp.

Aw - 0.94, optimum Aw ->0.98. Several strains of this fungus (*S. atra, S. chartarum* and *S. alternans* are synonymous) may produce a trichothecene mycotoxin- Satratoxin H - which is poisonous by inhalation. The toxins are present on the fungal spores. This is a slow growing fungus on media. It does not compete well with other rapidly growing fungi. The dark colored fungus grows on building material with high cellulose content and low nitrogen content. Areas with a relative humidity above 55%, and are subject to temperature fluctuations, are ideal for toxin production. Individuals with chronic exposure to the toxin produced by this fungus reported cold and flu symptoms, sore throats, diarrhea, headaches, fatigue, dermatitis, intermittent local hair loss and generalized malaise. Other symptoms include coughs, rhinitis, nosebleed, a burning sensation in the nasal passages, throat, and lungs, and fever. The toxins produced by this fungus will suppress the immune system affecting the lymphoid tissue and the bone marrow. Animals injected with the toxin from this fungus exhibited the following symptoms: necrosis and hemorrhage within the brain, thymus, spleen, intestine, lung, heart, lymph node, liver, and kidney. Affects by absorption of the toxin in the human lung are known as pneumomycosis.

This organism is rarely found in outdoor samples. It is usually difficult to find in indoor air samples unless it is physically disturbed (or possibly -this is speculation- a drop in the relative humidity). The spores are in a gelatinous mass. Appropriate media for the growth of this organism will have high cellulose content and low nitrogen content. The spores will die readily after release. The dead spores are still allergenic and toxigenic. Percutaneous absorption has caused mild symptoms.

Stemphylium sp.

Reported to be allergenic. Isolated from dead plants and cellulose materials.

Torula sp.

Found outdoors in air, soil, on dead vegetation, wood, and grasses. Also found indoors on cellulose materials. Reported to be allergenic and may cause hay fever and asthma.

Tetraploa

Tetraploa species comprise a very small proportion of the fungal biota. This genus is somewhat related to *Triposporium* and Diplocladiella. The only reported human infections are two cases of keratitis (1970, 1980) and one case of subcutaneous infection of the knee (1990). No information is available regarding other health effects or toxicity. Allergenicity has not been studied. Usually identified on spore trap samples where it is seen every few weeks. (Spores have very distinctive morphology.) Our laboratory has never found this organism growing on indoor environmental surfaces. Natural habitat includes leaf bases and stems just above the soil on many kinds of plants and trees.

Ulocladium sp.

Aw 0.89. Isolated from dead plants and cellulose materials. Found on textiles.

Zygomycetes

Zygomycetes are one of the four major groups of fungi, the others being the Oomycetes, the Ascomycetes, and the Basidiomycetes. Zygomycetes are common, fast growing, and often overgrow and/or inhibit other fungi nearby. Rhizopus and Mucor are two of the most common Zygomycetes seen in the indoor environment. However, others are seen as well, including *Syncephalastrum*, *Circinella*, *Mortierella*, *Mycotypha*, *Cunninghamella*, and *Choanephora*. For further information, please see descriptions of these individual genera.

The following table lists mycotoxins that are produced by certain types of fungi:

Fungi	Mycotoxin
Acremonium crotocinigenum	Crotocin
Aspergillus favus	Alfatoxin B, cyclopiazonic acid
Aspergillus fumigatus	Fumagilin, gliotoxin
Aspergillus carneus	Critrinin
Aspergillus clavatus	Cytochalasin, patulin
Aspergillus Parasiticus	Alfatoxin B
Aspergillus nomius	Alfatoxin B
Aspergillus niger	Ochratoxin A, malformin, oxalicacid
Acremonium crotocinigenum	Crotocin
Aspergillus nidulans	Sterigmatocystin
Aspergillus ochraceus	Ochratoxin A, penicillic acid
Aspergillus versicolor	Sterigmatocystin, 5 ethoxysterigmatocystin
Aspergillus ustus	Ausdiol, austamide, austocystin,brevianamide
Aspergillus terreus	Citreoviridin
Alternaria	Alternariol, altertoxin, altenuene, altenusin, tenuazonic acid
Arthrinium	Nitropropionic acid
Bioploaris	Cytochalasin, sporidesmin, sterigmatocystin
Chaetomium	Chaetoglobosin A,B,C. Sterigmatocystin
Cladosporium	Cladosporic acid
Clavipes purpurea	Ergotism
Cylindrocorpon	Trichothecene
Diplodia	Diplodiatoxin
Fusarium	Trichothecene, zearalenone
Fusarium moniliforme	Fumonisins
Emericella nidulans	Sterigmatocystin
Gliocladium	Gliotoxin
Memnoniella	Griseofulvin , dechlorogriseofulvin, epi-decholorgriseofulvin, trichodermin, trichodermol
Myrothecium	Trichothecene
Paecilomyces	Patulin, viriditoxin
Penicillium aurantiocandidum	Penicillic acid
Penicillium aurantiogriseum	Penicillic acid
Penicillium brasilanum	Penicillic acid
Penicillium brevicompactum	Mycophenolic acid
Penicillium camemberti	Cyclopiazonic acid
Penicillium carneum	Mycophenolic acid, Roquefortine C
Penicillium crateriforme	Rubratoxin

Fungi	Mycotoxin
Penicillium citrinum	Citrinin
Penicillium commune	Cyclopiazonic acid
Penicillium crustosum	Roquefortine C
Penicillium chrysogenum	Roquefortine C
Penicillium discolor	Chaetoglobosin C
Penicillium expansum	Citrinin, Roquefortine C
Penicillium griseofulvum	Roquefortine C, cyclopiazonic acid, griseofulvin
Penicillium hirsutum	Roquefortine C
Penicillium hordei	Roquefortine C
Penicillium nordicum	Ochratoxin A
Penicillium paneum	Roquefortine C
Penicillium palitans	Cyclopiazonic acid
Penicillium polonicum	Penicillic acid
Penicillum roqueforti	Roquefortine C, Mycophenolic acid
Penicillium veridicatum	Penicillic acid
Penicillium verrucosum	Citrinin, ochratoxin A
Penicillium/ Aspergillus	Patulin
Penicillium/ Aspergillus/Alternaria	Glitoxin
Phomopsis	Macrocyclic trichothecenes
Phoma	Brefeldin, cytochalasin, secalonic acid, tenuazonic acid
Pithomyces	Sporidesmin
Rhizoctonia	Slaframine
Rhizopus	Rhizonin
Sclerotinia	Furanocoumarins
Stachybotrys chartarum	Iso-satratoxin F, roridin E, L-2, satratoxin G & H, trichodermin, trichodermol, trichothecene
Torula	Cytotoxins
Trichoderma	Trichodermin, trichodermol, gliotoxin
Trichothecium	Trichothecene
Wallemia	Walleminol
Zygosporium	Cytochalasin

General terms

Allergen

An allergen is a substance that elicits an IgE antibody response and is responsible for producing allergic reactions. Chemicals are released when IgE on certain cells contact an allergen. These chemicals can cause injury to surrounding tissue - the visible signs of an allergy. Only a few fungal allergens have been characterized but all fungi are thought to be potentially allergenic. Fungal allergens are proteins found in either the mycelium or spores

"Black mold"

A poorly defined term. Black mold or toxic black mold has usually been associated with the mold *Stachybotrys chartarum*. While there are only a few molds that are truly black, there are many that can appear black. Not all molds that appear to be black are *Stachybotrys*.

Fungi

Fungi are neither animals nor plants and are classified in a kingdom of their own. The Kingdom of Fungi. Fungi include a very large group of organisms, including molds, yeasts, mushrooms and puffballs. There are >100,000 accepted fungal species but current estimates range to 1.5 million species. Mycologists (people who study fungi) have grouped fungi into four large groups according to their method of reproduction.

Hidden mold

This refers to visible mold growth on building structures that is not easily seen, including the areas above drop ceilings, within a wall cavity (the space between the inner and outer structure of a wall), inside air handlers, or within the ducting of a heating/ventilation system.

Microbial Volatile Organic Compounds (MVOCs)

Fungi produce chemicals as a result of their metabolism. Some of these chemicals, MVOCs, are responsible for the characteristic moldy, musty, or earthy smell of fungi, whether mushrooms or molds. Some MVOCs are considered offensive or annoying. Specific MVOCs are thought to be characteristic of wood rot and mold growth on building materials. The human nose is very sensitive to mold odors and sometimes more so than current analytical instruments.

Mold

Molds are a group of organisms that belong to the Kingdom of Fungi (see Fungi). Even though the terms mold and fungi had been commonly referred to interchangeably, all molds are fungi, but not all fungi are molds.

Mycotoxin

Mycotoxins are compounds produced by some fungi that are toxic to humans or animals. By convention, the term? Mycotoxin. Excludes mushroom toxins. Fungi that produce mycotoxins are called "toxigenic fungi."

Spore

General term for a reproductive structure in fungi, bacteria and some plants. In fungi, the spore is the structure which may be used for dissemination and may be resistant to adverse environmental conditions.

Toxic mold

The term "toxic mold" has no scientific meaning since the mold itself is not toxic. The metabolic byproducts of some molds may be toxic (see mycotoxin).

Hypha (plural, hyphae)

An individual fungal thread or filament of connected cells; the thread that represents the individual parts of the fungal body.

Phoenix EnviroCorp

MOLD/BIOLOGICAL CONTAMINANT REMEDIATION PROTOCOL

Date: June 16, 2021

For: Quanesha Mullins
Wilmington Housing Authority
1524 S. 16th Street
Wilmington, NC 28401

Remediation Contractor: Not determined

On-Site Consultant: Phoenix EnviroCorp (PEC)
4020 Shipyard Boulevard
Wilmington, NC 28403
(910) 397-0370

Approved Signatory:

Shaenaz Mirmohamed
IH Technician

Tommie Green, CIEC
Professional Industrial Hygienist

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SECTION 1.0 REMEDIATION PROCEDURES

1.1 Project Set Up

- The owner or powers that be shall supply temporary power for remediation equipment. The existing electrical system may be utilized, with permission of the owner or powers that be. Determining specific electrical load/safety requirements, including, but not limited to, the use of a temporary GFCI electrical panel box shall be the responsibility of the abatement contractor.
- HVAC system shall be isolated.
- 6-mil polyethylene sheathing shall be erected to separate primary control areas (PCA) from remaining areas. Control areas shall be selected so that specified building materials (specified herein, in section 1.3, under primary control areas) may be removed or cleaned and dried.
- HEPA Air Filtration Devices shall be utilized for each separate control area. Critical barriers shall consist of 6-mil polyethylene so that primary control areas are isolated from remaining areas. HEPA filtration units shall be exhausted from the PCA to the outside of the building through windows/doors. Dehumidification units must be installed in the PCA to sufficiently dry components.
- A remote wash off station shall be set up to allow for employees to wash hands and faces after egress from the work area.
- Ingress/Egress to the control area(s) shall be, at minimum, sealed with a 2-way polyethylene air lock.
- Entrances to the building shall be marked as indicated in Section 7.4 of this document.

1.2 Local Exhaust System

- Once sealed, the primary control area shall be ventilated with a local HEPA air filtration device that shall ensure a minimum of four (4) air changes per hour. The air filtration device shall be placed within the containment work area.
- Local HEPA exhaust shall be utilized where cleaning of contents is required and/or in the immediate vicinity of remediation activities of building materials.
- In interior sections requiring surface area cleaning, local HEPA filtration may be exhausted within the area to scrub microbials from ambient air. This process shall only be conducted after fine cleaning has been completed.
- Negative pressure within the contained work area shall be maintained throughout the project until clearance is obtained.
- Negative air machines shall be exhausted to exterior portions of the building to adequately ensure that negative pressure is achieved.
- Negative air pressure within the work area shall be tested and recorded at initiation of the project and hourly thereafter by use of a manometer to ensure the desired pressure of -0.02 inches of water, which is comparable to four changes per hour.
- Dehumidification devices with HEPA filtration may be incorporated as filtration devices in conjunction with true HEPA filtration devices; they may not replace the true HEPA filtration devices.

Note: Formula for determination of adequate HEPA filtration:

Total feet per minute =Volume of work area (ft^3)/15 minutes
#AFD Units needed = (Total feet per minute)/Capacity of Unit (ft^3)

- At initiation of final cleaning stages, relative humidity shall be at 40% (+/-3%) and moisture content of wooden components shall be at or below 15% as determined by Delmhorst moisture meter or equivalent meter. Moisture mapping and direct read T/RH shall be recorded by the remediation contractor until the

specified levels have been achieved. Control areas shall be dehumidified during cleaning and mold remediation activities to ensure removal of surface moisture created during application of water. Drying of structural components that have been treated with encapsulating anti-microbial agents will be necessary.

- Moisture levels shall be recorded and documented by the remediation contractor upon successful completion of dehumidification.

1.3 Remediation Specifications

- Prior to commencement of mold remediation activities by the remediation contractor, the source of any water intrusions, leaks, and/or moisture/humidity problems shall be remedied by the owner. If water intrusions, leaks, and/or moisture/humidity problems exist and are not corrected, mold growth can be expected to return.
- All remediation procedures listed that involve the removal of building materials shall employ polyethylene critical barriers, negative air pressure, and HEPA filtration (i.e., primary control areas).
- The remediation contractor shall ensure that the filters are properly capped prior to switching off the air scrubbers. If the filters are not properly capped, the backflow can cause mold spores to re-release back into the control area, essentially re-contaminating an area that has already been cleaned.
- All remediation activities shall be conducted in a manner that does not allow dissemination of mold spores. Remediation procedures shall begin from the side of the control area furthest away from air filtration devices.
- Cleaning procedures shall be repeated until the area is visibly free of dust and debris.
- Engineering controls set up during the remediation process shall remain in place until remediation has been completed and acceptable post remediation sampling results have been achieved.
- **Federal and/or state regulations require that suspect asbestos containing materials in public and commercial buildings shall be inspected for asbestos prior to renovations or demolition. Based on these regulations, PEC recommends that building materials that may be disturbed during mold remediation be tested for asbestos content prior to their disturbance to prevent asbestos contamination.**
- If cleaning procedures outlined in this remediation plan outweigh the cost of replacement for selected items, the remediation contractor shall give the owner the option to clean or dispose of those items.
- Reinstallation of building materials and/or components shall only be conducted once acceptable post remediation results are obtained.
- Any chemicals used on this project shall be EPA approved and used only as directed by the manufacturer. MSDS shall be available for review upon request.

HVAC System

- The HVAC system(s) that services or run through the primary control area/affected area shall be shut down prior to remediation activities.
- The spaces that are normally climate-controlled by the HVAC system that have been shut down shall be maintained under proper humidity levels (between 30 and 60% utilizing dehumidifiers, etc.) while the system is not in operation.
- All HVAC supply/return vents within the primary control area/affected area shall be isolated with a critical barrier (i.e., plastic, etc.) to prevent air flow.
- Once the HVAC system is shut down, the system shall remain off and isolated until acceptable post remediation results are obtained.

Note: For directional purposes "front" is determined by facing Grass Lane from inside the residence, unless otherwise noted.

Primary Control Areas/Affected Areas

Critical barriers, negative air pressure, and HEPA filtration shall be established to isolate the following areas as Primary Control Areas to perform the specified mold remediation. **All non-stable furnishings and contents shall be removed from the containment area/primary control area prior to specified remediation to avoid cross contamination of furnishings and contents. If elected, said furnishings and contents can be precleaned (i.e., HEPA vacuum, etc.) and stored in the primary control area, but shall be protected (i.e., covered with poly, etc.) to avoid cross contamination.**

Within the kitchen:

- Detach the floor mounted cabinet from the left wall, and remove any affected drywall (i.e., drywall with apparent water damage/suspect visible mold growth) and extend the drywall removal within a 2-foot radius of the affected area when possible.
- Remove the affected drywall ceiling. The length of this removal shall be the entire length of the ceiling beginning at the front wall to the rear wall. The width of this removal shall be 4 feet beginning at the door left of the affected area and extending towards the right wall.

Within the living room:

- Remove the affected drywall ceiling. The length of this removal shall be 8 feet beginning at the left wall to the right wall. The width of this removal shall be 5 feet beginning at the rear wall and extending towards the front wall.

Within the bathroom:

- Remove the baseboard entirely from the front wall, and remove any affected drywall (i.e., drywall with apparent water damage/suspect visible mold growth) and extend the drywall removal within a 2-foot radius of the affected area when possible.

Within the rear right bedroom:

- Remove the affected ceiling drywall (i.e., drywall with apparent water damage/suspect visible mold growth) and extend the drywall removal within a 2-foot radius of the affected area when possible.

Within the rear left bedroom closet:

- Remove the affected drywall from the right wall. The height of this removal shall be 2 feet beginning at the floor and extending towards the ceiling. The width of this removal shall be 3 feet beginning at the front wall and extending towards the rear wall.

Throughout the residence (Negative air pressure is not required in areas where building components are not specified for removal, but HEPA filtration is required):

- Clean all remaining surfaces within the control area as specified herein under general specifications for primary control areas.

General Specifications for Primary Control Areas

- Open plumbing lines and drains within the control areas shall be isolated with a critical barrier consisting of 6-mil poly.
- The water line to toilets within the control areas shall be shut off and the toilets shall be isolated with a critical barrier consisting of 6-mil poly.

- Cleaning of components/materials shall consist of a method that thoroughly removes visible mold growth, settled concentrations of mold spores, and/or dust and debris (i.e., HEPA vacuuming, wet wiping, or other approved methods), followed by dehumidification/drying.
- Exterior surfaces of electrical appliances, electrical equipment, and light fixtures shall be cleaned, utilizing wet method and HEPA vacuuming. These items shall be disconnected from all electrical sources prior to cleaning. If these items cannot be cleaned efficiently, the abatement contractor shall consult with the owner/powers that be.
- All wall/ceiling cavity insulation shall be disposed in areas that specify the removal of drywall/wallboard. The abatement contractor shall visually inspect the back side of surrounding drywall/wallboard for water damage and/or suspect mold growth and document any findings. If additional suspect mold growth or water damage is observed beyond the specified removal area, additional drywall/wallboard shall be removed until no suspect mold growth or water damage is observed.
- All penetrations within the controlled area that adjoin unaffected or non-accessible areas, including outdoor areas, crawlspaces, etc., shall be cleaned (as far as one can reach) and then sealed with 6-mil poly, extending six (6) inches on all sides.
- In areas of specified wallboard removal, all components within the wall/ceiling cavities shall be cleaned. Any wooden structural components with mold stains or mold growth in pitted surfaces shall be HEPA sanded (or other approved methods) to eliminate embedded mold growth.
- All joints or sills (where the structural system meets, where the sill plate meets the floor, etc.) shall be aggressively disturbed to remove embedded mold growth and spores.

1.4 Removal Procedures

The contractor shall maintain surfaces of the control area free of accumulation of dust and debris. Additionally, they shall restrict the spread of dust and debris, keeping waste from being distributed over the work area. Materials shall be removed in a fashion to ensure that previously cleaned areas are not recontaminated (i.e. working from one end of the control area to the other). The contractor may be required to re-clean areas based on a visual inspection by the CIEC/CIE/IH, if the areas are not visibly clean.

Contaminated building materials that have been removed, and additional materials and debris generated during remediation, shall be bagged or wrapped with 6-mil polyethylene sheeting, sealed with duct tape, and carried to the waste container prior to visual inspection by the CIEC/CIE/IH. Materials shall be bagged and sealed directly after removal from unaffected building components.

Areas shall be allowed to dry for a period until specified RH and moisture levels have been achieved. Any remaining building products that are directly impacted by remediation shall be tested for moisture content. Wooden and cellulosic building components (e.g., wall studs, drywall, etc.) shall be tested for moisture content. If the moisture content is > 15% in wood products or > 12% in cellulosic products (utilizing a Delmhorst moisture meter), dehumidification shall be required until moisture levels are at or below said levels, and the RH level is at or below 40% +/-3% (for all interior areas). The remediation contractor shall verify water content of all wooden and cellulosic building components within the impacted areas, as well as temperature and RH prior to scheduling post remediation verification.

1.5 Cleanup Overview

The contractor shall personally review the cleaning process prior to contacting the CIEC/CIE/IH for the post remediation testing. If accumulations of debris and dust are significant, the CIEC/CIE/IH will require re-cleaning prior to post remediation verification sampling.

The CIEC/CIE/IH shall make a visual inspection and conduct post remediation sampling after the final cleaning is complete.

1.6 Post Remediation Verification Testing

Prior to conducting post remediation sampling, HEPA filtration devices shall be allowed to operate for a minimum of 48 hours (the equivalent of 192 air changes), following fine cleaning, in all areas where remediation has been conducted. The HEPA filtration devices shall be sealed at the intake and turned off approximately two hours prior to post testing and reconvene within one hour after post testing, until acceptable post remediation results are established.

Post remediation sampling shall be conducted utilizing viable and/or non-viable sample methods. Air samples shall be collected in representative areas of the control areas. Surface sampling may be conducted at the discretion of the CIEC/CIE/IH.

Sampling shall be conducted in areas directly impacted by remediation procedures, where cleaning was conducted. The CIEC/CIE/IH shall determine acceptable post remediation status through interpretation of air sampling results, which will be based on indoor/outdoor comparisons, in combination with any surface samples collected, moisture readings, RH readings, visual observations, and any other pertinent information.

The owner/client will be responsible for post remediation testing. If air sample results indicate unacceptable airborne concentrations, the contractor shall be required to conduct a re-cleaning at the contractor's expense and absorb the cost for re-testing, until acceptable results are achieved.

SECTION 2.0 SCOPE OF WORK (Note: Section 2 and Section 1.3 are essential to the full Scope of the Contractor's Work)

2.1 Investigative Reports and Other Related Documents

Phoenix EnviroCorp investigative report dated May 19, 2021, and June 16, 2021.

Phoenix EnviroCorp Chain of Custody dated May 13, 2021.

Analytical reports dated May 14, 2021.

2.2 Project Description

The procedures covered by this program include the enclosure and drying of the said structure, the removal, handling, and disposal of building components compromised by mold/fungal growth, and the cleaning and disinfecting of existing building materials. Procedures for reconstruction are not considered in these specifications. Reconstruction of interior portions may not be conducted until procedures for remediation have been completed, the control areas have been inspected, and testing has returned acceptable post remediation results. Reconstruction of exterior portions may be conducted during the restoration to ensure that water intrusion is abated.

The objectives covered by the program include the remediation of materials shown to have surface contamination, water damage, and/or exposure to elevated airborne mold spore levels, without subjecting the workers, installation employees, and occupants to microbial contaminants. In addition, contract employees, occupants, and materials will be appropriately protected during the removal process so that present and future exposures will not occur.

This protocol is provided as a guideline. Any deviation requests from this protocol shall be addressed to the CIEC/CIE/IH for consideration. At present there are no Federal or State requirements regarding microbial remediation projects; however, OSHA General Construction Code of Federal Regulations (29 CFR 1926) shall be followed.

Remediation shall be completed as close to the date that this protocol was drafted, as the specifications outlined within represent conditions at the time the investigative services were conducted. Due to the volatility of mold, the current protocol may not reflect all necessary remediation if conditions are allowed to continue. Further, if time lapses allowing conditions to change, it will become increasingly difficult to obtain successful clearance testing results.

SECTION 3.0 AIR MONITORING

3.1 Responsibilities of the CIEC/CIE/IH

Monitoring of airborne concentrations will be performed in accordance with the requirements of this program. Prior to conducting air sampling and/or surface sampling for clearances, the CIEC/CIE/IH shall conduct a visual inspection of the area. Temperature and RH shall be recorded during the air sampling phase of clearance. All air sampling shall be conducted in such a manner as to provide a valid representation of airborne mold levels both inside and outside the work areas. If analysis of air samples indicates that airborne concentrations exceed acceptable limits, the contractor shall conduct re-cleaning at the contractor's expense.

3.2 Personal Monitoring

No personal monitoring will be conducted by the CIEC/CIE/IH unless the remediation contractor requests monitoring for OSHA compliance. Presently there are no guidelines (PELs or TLVs) for microbial contaminants. It is the remediation contractor's responsibility to determine if OSHA personal sampling may be required during application of anti-microbial agents.

3.3 Sample Integrity and Reporting

Samples shall be sealed, labeled, and a chain of custody initiated according to laboratory procedures.

Sample results shall be available within seven (7) days of the completion of collection of all samples and will include the following information:

- Site Address
- Sample Number
- Location Sampled
- Analytical Method
- Collection Date(s)
- Person Taking Sample(s)
- Additional Comments (if any)
- Analyst Signature

SECTION 4.0 MATERIAL REPLACEMENT

4.1 Material Replacement

The general contractor/replacement contractor may begin material replacement after the CIEC/CIE/IH informs

all parties of acceptable post remediation sample results.

With ongoing construction activities ambient air levels are expected to be elevated over what might be normally expected. Additional testing should not be necessary after remediation procedures have been completed and successful results have been obtained. In the event of another water intrusion (i.e. broken-pipe-line, improper HVAC function, or building envelope compromise), an investigation shall be conducted within 24 to 48 hours of the event. Proper drying, if initiated within this time frame, should minimize the potential for microbial growth.

SECTION 5.0 SPILL CLEANUP REQUIREMENTS

5.1 Spills

MSDS shall be kept on site for all chemical products brought to the site by the remediation contractor. In the event of a chemical spill, the contractor shall initiate cleanup immediately. The contractor shall mop up any liquid with rags or other conventional absorbent. The spent absorbent shall be properly contained and disposed of as waste.

SECTION 6.0 WASTE CONTROL

6.1 Waste Disposal

Waste shall be disposed of at a locally selected landfill. Waste bags shall be checked for integrity and hauled in an enclosed truck/vehicle or container to ensure that transportation to the landfill does not pose a potential hazard to the environment.

SECTION 7.0 SUPPLEMENTAL INFORMATION

7.1 Applicable Publications

The publications listed below form part of this program. Written programs shall accompany all referenced CFR publications. IICRC and NYCDOH guidelines for work procedures shall be followed by the remediation contractor. A copy of the NYCDOH protocols shall be on-site, along with this design, for reference by the site supervisor. ACGIH, IAQA, and ASHRAE publications shall be utilized as guidelines for interpretation by the CIEC/CIE/IH. This design shall be reviewed by the remediation supervisor prior to initiation of set-up for the project. Any questions regarding this project may be addressed with the on-site consultant listed for Phoenix EnviroCorp.

Code of Federal Regulation (CFR Publications)

29 CFR 1910.134	Respiratory Protection
29 CFR 1910.145	Specifications for Accident Prevention, Signs and Tags
29 CFR 1926.28	Personal Protective Equipment
29 CFR 1926.59	Hazard Communication
29 CFR 1926.96	Occupational Foot Protection
29 CFR 1926.100	Head Protection
29 CFR 1926.101	Hearing Protection
29 CFR 1926.102	Eye and Face Protection
29 CFR 1926.403	Electrical General Requirements
29 CFR 1926.416	Safety General Requirements

29 CFR 1926.852	Demolition, Chutes
29 CFR 1926.1091	Record Keeping Requirements

Supplemental Guidelines

IICRC S520 2nd ed.	Standard and Reference Guide for Professional Water Damage Restoration
NYCDOH	Guidelines on Assessment and Remediation of Fungi in Indoor Environments
ACGIH	Bioaerosols: Assessment and Control
IAQA 01-2000	Recommended Guidelines for Indoor Environments
ASHRAE 62.2-2007	Ventilation for Acceptable Indoor Air Quality in Low-Rise Residential Buildings

7.2 Definitions

Air Lock: A system that permits ingress and egress between a control area and non-control area, or other work areas, without allowing air movement between areas (e.g., three stage decon, three-way polyethylene flaps).

Air Sample: Refers to samples collected with spore trap air sample media (e.g., Micro-5, Cyclex D, or equivalent); also referred to as a non-viable air sample. May also refer to a sample collected on a disposable petri dish with Agar media by means of an Andersen Impactor (or equivalent) and sampling pump; also referred to as air culture (viable) sample. Sample media to be used in project is described under Section 1.6 (Post Remediation Verification Testing).

Area Monitoring: The sampling of airborne microbial concentrations outside the exclusion boundary, which may reach the breathing zone of the contractor or installation employees.

Asbestos Containing Materials (ACM): Refers to asbestos containing building materials that contain more than 1% asbestos by Polarized Light Microscopy (PLM) or Transmission Electron Microscopy (TEM).

Biocide: Refers to chemical agents that are specifically designed to eliminate viable microbial contamination, with a phenol equivalent efficiency (e.g., Sodium Hypochlorite, Quaternary Ammonia Compounds).

Blower Door Test: Refers to the testing of static pressure and draw of air through the HVAC in cubic feet per minute (CFM) to rate the efficiency of the system.

Clearance Monitoring: Refers to air, bulk, or swab sampling conducted as a means to demonstrate that the area specified for remediation has been completed by the contractor, left with present acceptable mold spore levels, and ready for re-construction.

Control Area: The area where microbial contaminants removal is performed, which is isolated by physical boundaries to prevent unauthorized entry of personnel, thereby preventing exposure to or the spread of microbial contaminants. Physical boundaries will be established and located such that the airborne contaminants are not allowed to escape the boundaries.

HEPA: High Efficiency Particulate Air. Refers to ventilation devices that are specifically designed to filter ambient air to an efficiency of 99.97%.

HVAC: Refers to the Heating, Ventilation, and Air Conditioning system.

Industrial Hygienist: Refers to a person who practices industrial hygiene and may act as a competent person regarding visual inspection of contaminated surfaces and clearance air and/or swab/bulk sampling. May also refer to a Certified Industrial Hygienist (CIH) as defined by the American Board of Industrial Hygiene (ABIH), a Certified Indoor Environmental Consultant as defined by the American Council for Accredited Certification (ACAC), or a Certified Indoor Environmentalist (CIE) as defined by the American Council for Accredited Certification (ACAC).

Microbial Contaminant: Refers to viable mold, fungi, pollen, bacteria, and or particulate, or their metabolites, that may be causative of epidemiological, immunotoxic, dermotoxic, neurotoxic, or enterotoxic disorders in the human population, or may be considered a pathogen or an opportunistic pathogen.

Non-Porous Materials: Refers to building materials with solid surfaces that may be successfully treated and cleaned by means of HEPA vacuuming or other approved method. Materials include flooring, hard goods, plastic, vinyl, and some wallboard systems.

Porous Materials: Refers to building materials and household goods that may allow microscopic particles (3-20 micron) to become trapped within the material that will not allow adequate cleaning. Materials include carpet, mattresses, and clothing.

Primary Control Area (PCA): Refers to a section of a facility that has been isolated by 6-mil polyethylene barriers where specific engineering controls (e.g., HEPA filtration, negative air pressurization, dehumidification, etc.) are required. In general, it is the area where remediation of water and mold damaged building materials is to be conducted.

Refrigerant Dehumidifier: Device used to remove water content from air and materials.

Relative Humidity (RH): Refers to the ratio of water vapor in the atmosphere to the amount required to saturate it at a given temperature.

Semi-Porous Materials: Refers to materials that may be somewhat porous, yet they may still allow for adequate cleaning. Materials include wooden beams and some wallboard systems.

Swab Sample: Refers to collection of a sample onto a sterile swab for analysis of mold, fungi, and bacteria by viable and/or non-viable analysis.

Tape-Lift Sample: Refers to collection of a sample onto clear scotch tape for analysis by direct microscopic examination (non-viable).

7.3 Quality Assurance

Medical Examinations

Before potential exposure to microbial contaminants, the remediation contractor shall provide workers with a comprehensive medical examination as required by 29 CFR 1910.134 as outlined by the Medical Monitoring Program.

Medical Records

The remediation contractor shall maintain complete and accurate medical records on employees as required by

OSHA and the contractor's Medical Monitoring Program. The contractor may be asked to provide a copy of all medical records for approval by the consultant's representative.

Training

Each employee working on this contract shall be trained prior to the time of initial job assignment in accordance with mold specific and chemical specific training as indicated by the OSHA General Duty Clause and the Hazard Communication Standard. Each employee shall also receive training required by Federal guidelines listed in Section 7.1 of this document and project specifications.

Hazard Communication Program

The remediation contractor has established and implemented a Hazard Communication Program as required by 29 CFR 1910.1200 and may be asked to provide a copy of this written program. Hazard Communication training must include occupational hazards as directly related to working with fungi/mold and contamination of building components by fungal contamination, specific training for chemical hazards associated with biocide usage, and site specific MSDS sheets for commercial detergents and biocides utilized on the job site.

Respiratory Protection Program

The remediation contractor has established a Respiratory Protection Program, which complies with 29 CFR 1910.134. Physical examinations and fit testing are required for use of respiratory protection greater than an N-95 dust mask. Workers removing building materials contaminated by mold growth, applying anti-microbial agents, or workers subjected to exposures to anti-microbial agents shall be required to wear, at minimum, a tight-fitting negative pressure ½ mask respirator with P-100 filters. Therefore, -he OSHA Respiratory Protection Standard applies.

Analytical Testing Laboratory

Analysis of culturable biological samples collected on this project shall be conducted by a laboratory that participates in the Environmental Microbiological Proficiency Analytical Testing Program (EMPAT) of the American Industrial Hygiene Association (AIHA) and has shown to be proficient by proficiency analytical testing (PAT) samples. Analysis of non-viable air and surface samples shall be conducted by a competent person.

7.4 Materials and Equipment

Equipment

The contractor shall make available to employees a complete set of personal protective equipment (PPE) as required by this program for entry into the controlled area. All personnel while in the control area or handling microbial contaminated waste shall wear protective clothing, respirators, and other PPE.

Respirators

Contractor shall furnish the appropriate respirator in accordance with 29 CFR 1910.134 and approved by NIOSH for protection in environments that contain microbial contaminants. The selected respirator for this project shall be a tight-fitting negative pressure ½ respirator equipped with HEPA cartridge (P-95, P-100). At minimum, an N-95 dust mask may be utilized during fine cleaning activities; however, the tight fitting ½ mask respirator shall be utilized during application of anti-microbial agents or biocides.

Special Clothing

Employees shall be provided with and required to wear: whole body disposable protective clothing, full body tyvek suits with head coverings, and latex gloves *(see table)* during all activities in the controlled area.

Chemical	Recommended Rubber Glove
Sodium Hypochlorite	Neoprene or Nitrile
Phenolic Compounds	Neoprene
Quaternary Ammonia Compounds	Polyvinyl Chloride (PVC)
Detergents	Latex

Eye Protection

The contractor shall provide chemical-resistant goggles to personnel engaged in cleaning and treatment activities and require them to be worn during application of anti-microbial agents and biocides.

Warning Signs and Labels

Standard approved warning signs shall be erected at all approaches to the control area as specified in 29 CFR 1910.145.

Anti-Microbial Agents

Anti-microbial agents utilized in interior quarters shall consist of quaternary ammonia compounds. No phenolic compounds shall be used in interior quarters with exception of Micro Ban Plus. Approval must be granted by the owner/powers that be prior to application. Anti-microbial agents shall be EPA approved. Commercial grade detergents shall be used to remove fungal contamination during cleaning phases prior to anti-microbial application, to include encapsulation.

Phoenix EnviroCorp

June 8, 2021

Quanesha Mullins
Wilmington Housing Authority
1524 S. 16th Street
Wilmington, NC 28401

RE: PEC Job # 21-21-184-IAQ-M - 302 Grass Lane Apartment 201, Wilmington, NC - Mold Investigation/Background air sampling

Enclosed are the results of the mold investigation conducted at the above referenced unit on June 3, 2021. Phoenix EnviroCorp (PEC) was retained to conduct background air sampling to determine airborne mold spore levels and to collect surface samples of suspect visible mold growth.

Background Information: The unit is occupied and fully furnished with contents throughout.

The HVAC system was operating in the cool mode, set at 70º F upon PEC's arrival and during sampling.

Note: For directional purposes "front" is determined by facing the playground adjacent to the parking lot from inside the building, unless otherwise stated.

Visual Inspection: PEC's visual inspection noted the following (see enclosed photographic documentation):

- Apparent water damage and suspect visible mold growth in the kitchen cabinet underneath the sink.
- Apparent water damage and suspect visible mold growth in the bathroom cabinet underneath the sink.
- Apparent water damage/discoloration on the ceiling in the bathroom.
- Suspect visible mold growth on the bathtub in the bathroom.

Mold Testing – Surface: Non-viable surface samples were collected from areas of suspect visible mold growth. The quantifications of fungal growth are reported as scattered spores, 21-100 fungal spores = very light (VL), 101-1,000 fungal spores = light (L), 1,001-10,000 fungal spores = moderate (M), > 10,000 fungal spores = heavy (H). The 'General Impressions' of fungal growth are reported as no fungal growth (NFG), fungal growth (FG), minimal fungal growth or growth in vicinity (MFG), and no fungal spores detected (ND). *Clear tape was utilized for the collection of surface samples. Each sample was assigned a unique ID number and shipped to a third-party laboratory for analysis.* Sampling locations and results are as follows:

Location	Result
Bathroom cabinet underneath the sink	**M – FG** *Chaetomium* **L – FG** *Penicillium/Aspergillus*
Bathtub in the bathroom	**VL – FG** *Cladosporium*

Mold Testing – Air: Non-viable spore trap air samples were collected to determine airborne mold spore levels. Samples were collected within the kitchen/living room, the bathroom, the rear right bedroom, the rear left bedroom, and the front right bedroom. *Micro 5 sampling media was utilized for*

the collection of spore trap air samples. Each sample ran for five (5) minutes at a flow rate of five (5) liters per minute for a total volume of twenty-five (25) liters per sample. Each sample was assigned a unique ID number and shipped to a third-party laboratory for analysis. All air samples were collected from centralized locations (within their respective areas) and within the breathing zone, unless otherwise noted. Two samples were also collected outdoors for comparative purposes.

Results identified elevated airborne levels of *Chaetomium* within the rear left bedroom.

The interpretation of air sample results is based on indoor/outdoor comparisons, in combination with a study by Daniel M. Baxter, entitled "A Regional Comparison of Mold Spore Concentrations Outdoors and Inside "Clean" and "Mold Contaminated" Southern California Buildings", and other industry guidelines, as well as over 20 years of experience in industrial hygiene and mold testing.

In layman terms, acceptable levels indicate that the levels are below the outdoor level and/or the baseline levels (whichever is higher) stated below. Elevated levels indicate that the levels are above the outdoor level and/or the baseline level.

Baseline levels for indoor spore trap air samples are as follows: < 900 spores/m³ for Penicillium/ Aspergillus; 0 spores/m³ for Stachybotrys and Chaetomium; and < 350 spores/m³ for other individual mold groups.

Relative Humidity (RH): *Temperature and relative humidity readings were collected in the same locations as the spore trap air samples.* RH levels within the unit ranged from 50.0% – 53.7% with an outdoor reading of 85.0% (see the enclosed Chain of Custody for details). Per the American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) Standard 62-1999, relative humidity should range between 30% and 60%.

Conclusions: Sample results identified elevated airborne mold spore levels (*Chaetomium*) in the rear left bedroom and surface mold growth (*Chaetomium*, *Cladosporium*, and *Penicillium/Aspergillus*) within the bathroom. Upon request, and for an additional fee, PEC can provide a protocol that outlines mold remediation activities.

Enclosed in this report are the laboratory analysis and the Chain of Custody.

Should you have any questions, please do not hesitate to call.

Thank you,

Philip Green
IH Technician

Tommie Green, CIEC
Professional Industrial Hygienist

Enclosures

Photo 1

Apparent water damage/suspect visible mold growth in kitchen cabinet underneath sink

Photo 2

Apparent water damage/suspect visible mold growth in the bathroom cabinet underneath sink

Photo 3

Apparent water damage/discoloration on the bathroom ceiling

Photo 4

Suspect visible mold growth on the bathroom bathtub

Samples accepted

Phoenix EnviroCorp
4020 SHIPYARD BLVD.
WILMINGTON, NC 28403

CHAIN OF CUSTODY

LABORATORY TEST REQUEST

Seem ref# 210604076

lab ID: 099-105

CONTACT: Philip Green	TELEPHONE (910) 397-0370 FAX (910) 313-6094	6/3/2021
PEC Job #: 21-21-184-IAQ-M	SITE ADDRESS: 302 Grass Lane, Apt. 201, Wilmington, NC 28405	

PLEASE EMAIL RESULTS TO: KMGREEN@PHOENIXENVIROCORP.COM

SAMPLE TYPE:	NUMBER OF SAMPLES:	TURN AROUND TIME SPECIFIED:
Spore Trap - Micro-5	5	____ Immediate ____ 24 hr ____ 48 hr __X__ Standard
Surface Samples	2	

Sample #	Sample Area	Sample Volume	Lab Analysis Requested	% Relative Humidity	Temperature °F
060321-PG-301	Kitchen/Living Room	25L	S001	50.0	73.3
060321-PG-302	Bathroom	25L	S001	53.7	70.1
060321-PG-303	Rear Right Bedroom	25L	S001	52.4	71.4
060321-PG-304	Rear Left Bedroom	25L	S001	53.5	71.3
060321-PG-305	Front Right Bedroom	25L	S001	52.1	70.4
060321-PG-401	Black VSMG in bathroom cabinet underneath sink	1 cm sq	S001T		
060321-PG-402	Black VSMG on bathtub in bathroom	1 cm sq	S001T		

Samples Collected By (Printed Name and Signature): [signature] Date Signed: 6/3/2021

CHAIN OF CUSTODY RECORD

DATE:	Time:	Condition of Samples:	RELINQUISHED BY: (Printed Name and Signature)	ACCEPTED BY: (Printed Name and Signature)
6/3/2021	14:30:00 PM	Intact	[signature] AFFILIATION:	[signature] 6-4-21 AFFILIATION:

SEEML Reference Number: 210604026

Southeast Environmental Microbiology Laboratories
102 Edinburgh Court
Greenville, SC 29607
Phone: (864) 233-3770
FAX: (864) 233-6589

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

- ☒ Surface/Bulk Report
- ☒ Spore Trap Report
- ☐ Andersen Fungal Report
- ☐ Quantitative Fungal Report

Lab Manager Review: *Angel Gosnell* Date: 06/04/21

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Guidelines for Interpretation:
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Several organizations, including: the American Conference of Government Industrial Hygienists (ACGIH); the American Industrial Hygiene Association (AIHA); the Indoor Air Quality Association (IAQA); the United States Environmental Protection Agency (USEPA); the Centers for Disease Control (CDC), as well as the California Department of Health Services (CADHS), have all published guidelines for assessment and interpretation of mold resulting from water intrusion in buildings.

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

Spore Trap Report

	Date Sampled: 06/03/21
Attn: ***Phoenix Enviro Corp.***	Date Received: 06/04/21
4020 Shipyard Blvd.	Date Analyzed: 06/04/21
Wilmington, NC 28403	Date Reported: 06/04/21
	Date Revised:
	Project Name: 21-21-184-IAQ-M
	Project Address: 302 Grass Lane, Apt 201
	Project City, State, ZIP: Wilmington, NC 28405
	SEEML Reference # : 210604026

TEST METHOD: DIRECT MICROSCOPY EXAMINATION SEEML SOP 7

Client Sample ID	060321-PG-301			060321-PG-302			060321-PG-303		
Location	Kitchen / Living Room			Bathroom			Rear Right Bedroom		
Lab Sample ID	210604026-099			210604026-100			210604026-101		
Comments									
Hyphal Fragments									
Pollen	2	80							
Spore Trap Used	M5			M5			M5		
	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%
Alternaria									
Ascospores	2	80	10				1	40	9
Basidiospores	12	480	57	2	80	33	4	160	36
Bipolaris/Drechslera									
Chaetomium									
Cladosporium	7	280	33	2	80	33	5	200	45
Curvularia									
Epicoccum									
Cercospora									
Fusarium									
Memnoniella									
Nigrospora									
Penicillium/Aspergillus				2	80	33	1	40	9
Polythrincium									
Rusts									
Smuts/Periconia/Myxomy									
Spegazzinia									
Stachybotrys									
Stemphylium									
Tetraploa									
Torula									
Ulocladium									
Colorless/Other Brown*									
Oidium									
Zygomycetes									
Pithomyces									
Background debris (1-5)**	3			3			3		
Sample Volume(liters)	25			25			25		
TOTAL SPORES/M^3	21	**840**		6	**240**		11	**440**	

Revisions:

Spore types listed without a count or data entry were not detected during the course of the analysis for the respective sample, indicating a raw count of <1 spore.
The analytical sensitivity is the spores/m^3 divided by the raw count, expressed in spores/m^3. The limit of detection is the analytical sensitivity (in spores/m^3) multiplied by the sample volume (in liters) divided by 1000 liters.
*Colorless,other Brown are spores without a distinctive morphology on spore traps and non-viable surface samples.
**Background debris is the amount of particulate matter present on the slide and is graded from 1-5 with 1 = very light, 2= Light, 3 = Medium, 4 = Heavy, 5 = Very Heavy. The higher the rating the more likelihood spores may be underestimated. A rating of 5 should be interpreted as minimal counts and may actually be higher than reported.

Disclaimer: The sample results are determined by the sample volume, which is provided by the customer.
This report relates only to the samples tested as they were received.

Angel Gosnell
Angel Gosnell, Approved Laboratory Signatory

102 Edinburgh Court
Greenville, SC. 29607
Phone: (864) 233-3770

Spore Trap Report

	Date Sampled: 06/03/21
Attn: ***Phoenix Enviro Corp.***	Date Received: 06/04/21
4020 Shipyard Blvd.	Date Analyzed: 06/04/21
Wilmington, NC 28403	Date Reported: 06/04/21
	Date Revised:
	Project Name: 21-21-184-IAQ-M
	Project Address: 302 Grass Lane, Apt 201
	Project City, State, ZIP: Wilmington, NC 28405
	SEEML Reference # : 210604026

TEST METHOD: DIRECT MICROSCOPY EXAMINATION SEEML SOP 7

Client Sample ID	060321-PG-304			060321-PG-305					
Location	Rear Left Bedroom			Front Right Bedroom					
Lab Sample ID	210604026-102			210604026-103					
Comments									
Hyphal Fragments									
Pollen									
Spore Trap Used	M5			M5					
	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%			
Alternaria									
Ascospores									
Basidiospores	3	120	21	12	480	26			
Bipolaris/Drechslera									
Chaetomium	1	40	7						
Cladosporium	7	280	50	15	600	32			
Curvularia									
Epicoccum	1	40	7						
Cercospora									
Fusarium									
Memnoniella									
Nigrospora									
Penicillium/Aspergillus	2	80	14	20	800	43			
Polythrincium									
Rusts									
Smuts/Periconia/Myxomy									
Spegazzinia									
Stachybotrys									
Stemphylium									
Tetraploa									
Torula									
Ulocladium									
Colorless/Other Brown*									
Oidium									
Zygomycetes									
Pithomyces									
Background debris (1-5)**	3			3					
Sample Volume(liters)	25			25					
TOTAL SPORES/M^3	14	**560**		47	**1880**				

Revisions:

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Angel Gosnell

Angel Gosnell, Approved Laboratory Signatory

Surface and Bulk Sample Report

	Date Sampled: 06/03/21
Attn: ***Phoenix Enviro Corp.***	Date Received: 06/04/21
4020 Shipyard Blvd.	Date Analyzed: 06/04/21
Wilmington, NC 28403	Date Reported: 06/04/21
	Date Revised:
	Project Name: 21-21-184-IAQ-M
	Project Address: 302 Grass Lane, Apt 201
	Project City, State ZIP: Wilmington, NC 28405
	SEEML Reference #: 210604026

TEST METHOD: Direct Microscopic Examination (SEEML SOP 18)

Client Sample ID	060321-PG-401	060321-PG-402		
Location	Black VSMG in Bathroom Cabinet Underneath Sink	Black VSMG on Bathtub in Bathroom		
SEEML Sample ID	210604026-104	210604026-105		
Sample Type	Tape	Tape		
	Quantification*	Quantification*		
Hyphal Fragments	**M**	**M**		
Pollen		**Single**		
General Impressions **	**FG**	**FG**		
Fungal Spore:				
Alternaria				
Acremonium				
Ascospores				
Basidiospores				
Bipolaris/Drechslera				
Cercospora				
Chaetomium	**M**			
Cladosporium		**VL**		
Curvularia				
Epicoccum				
Fusarium				
Geotrichum sp.				
Memnoniella				
Myxomycetes				
Nigrospora				
Penicillium/Aspergillus	**L**			
Pithomyces				
Rusts/Smuts				
Stemphylium				
Tetraploa				
Ulocladium				

** General Impressions: NFG = No Fungal Growth, FG = Fungal Growth, MFG = Minimal Fungal Growth Or Growth in vicinity

Quantification of fungal growth is done by semi-quantitative grading using the following ranges:

Scattered Spores, 1-20 fungal spores

VL = 21-100 fungal spores L = 101-1,000 fungal spores M = 1,001-10,000 fungal spores H = >10,000 fungal spores

ND = No Fungal Spores Detected

Disclaimer: This report relates only to the samples tested

Respectfully submitted, SEEML

Angel Gosnell, **Approved Laboratory Signatory**

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Fax: (864) 233- 6589

AIHA-LAP, LLC EMLAP # 173667

Texas License: LAB1016

Samples Created

Phoenix EnviroCorp
4020 SHIPYARD BLVD.
WILMINGTON, NC 28403

CHAIN OF CUSTODY

LABORATORY TEST REQUEST

Seem PEC# 21060402 9 Lab ID: 118-119

CONTACT: Philip Green	TELEPHONE (910) 397-0370 FAX (910) 313-6094	6/3/2021
PEC Job #: 21-21-182,183,184,185-IAQ-M	SITE ADDRESS: 302 Grass Lane, Wilmington, NC 28405	

PLEASE EMAIL RESULTS TO: KMGREEN@PHOENIXENVIROCORP.COM

SAMPLE TYPE:	NUMBER OF SAMPLES:	TURN AROUND TIME SPECIFIED:
Spore Trap - Micro-5	2	____ Immediate ____ 24 hr ____ 48 hr __X__ Standard
Surface Samples	0	

Sample #	Sample Area	Sample Volume	Lab Analysis Requested	% Relative Humidity	Temperature °F
060321-PG-701	Outside - Front	25L	S001	85.0	83.2
060321-PG-702	Outside - Rear	25L	S001		

Samples Collected By (Printed Name and Signature): [signature] Date Signed: 6/3/2021

CHAIN OF CUSTODY RECORD

DATE:	Time:	Condition of Samples:	RELINQUISHED BY: (Printed Name and Signature)	ACCEPTED BY: (Printed Name and Signature)
6/3/2021	14:30:00 PM	Intact	[signature] AFFILIATION:	AFFILIATION: PM 0441

SEEML Reference Number: 210604029

Southeast Environmental Microbiology Laboratories
102 Edinburgh Court
Greenville, SC 29607
Phone: (864) 233-3770
FAX: (864) 233-6589

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	Project Name: 21-21-182,183,184,185-IAQ-M
	Project Address: 302 Grass Lane
	Project City, State, ZIP: Wilmington, NC 28405
	SEEML Reference # : 210604029

TEST METHOD: DIRECT MICROSCOPY EXAMINATION SEEML SOP 7

Client Sample ID	060321-PG-701			060321-PG-702					
Location	Outside - Front			Outside - Rear					
Lab Sample ID	210604029-118			210604029-119					
Comments									
Hyphal Fragments				1	40				
Pollen	4	160		2	80				
Spore Trap Used	M5			M5					
	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%			
Alternaria									
Ascospores	279	11200	73	51	2040	27			
Basidiospores	81	3240	21	27	1080	14			
Bipolaris/Drechslera									
Chaetomium									
Cladosporium	9	360	2	78	3120	41			
Curvularia									
Epicoccum									
Cercospora									
Fusarium									
Memnoniella									
Nigrospora									
Penicillium/Aspergillus	7	280	2	30	1200	16			
Polythrincium									
Rusts	9	360	2	3	120	2			
Smuts/Periconia/Myxomy									
Spegazzinia									
Stachybotrys									
Stemphylium									
Tetraploa									
Torula									
Ulocladium									
Colorless/Other Brown*									
Oidium									
Zygomycetes									
Pithomyces									
Background debris (1-5)**	3			3					
Sample Volume(liters)	25			25					
TOTAL SPORES/M^3	385	**15400**		189	**7560**				

Revisions:

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Fungal Descriptions

Alternaria sp.

Aw - 0.89. Conidia dimensions: 18-83 x 7-18 microns. A very common allergen with an IgE mediated response. It is often found in carpets, textiles and on horizontal surfaces in building interiors. Often found on window frames. Outdoors it may be isolated from samples of soil, seeds and plants. It is commonly found in outdoor samples. The large spore size, 20 - 200 microns in length and 7 - 18 microns in sizes, suggests that the spores from these fungi will be deposited in the nose, mouth and upper respiratory tract. It may be related to bakers' asthma. It has been associated with hypersensitivity pneumonitis. The species *Alternaria alternata* can produce tenuazonic acid and other toxic metabolites that may be associated with disease in humans or animals. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include edema and bronchospasms; chronic cases may develop pulmonary emphysema.

Ascospore

A spore borne in a special cell called an ascus. Spores of this type are reported to be allergenic. All ascomycetes, members of a group of fungi called Ascomycotina, have this type of spore. The minute black dots on rotting wood and leaves or the little cups on lichens are examples of ascomycetes; another is the "truffle" mushroom.

Aspergillus/Penicillium

These are two of the most commonly found allergenic fungi in problem buildings. *Aspergillus* comes in many varieties (species). Many of the varieties produce toxic substances. It may be associated with symptoms such as sinusitis, allergic bronchopulmonary aspergillosis, and other allergic symptoms. *Penicillium* is a variety of mold that is very common indoors and is found in increased numbers in problem buildings. It also has many varieties, some of which produce toxic substances. The symptoms are allergic reactions, mucous membrane irritation, headaches, vomiting, and diarrhea. Due to the morphological similarity of *Aspergillus* and *Penicillium*, they are not differentiated by microscopic analysis and are reported together.

Aspergillus sp.

Aw 0.75 - 0.82. Reported to be allergenic. Members of this genus are reported to cause ear infections. Many species produce mycotoxins that may be associated with disease in humans and other animals. Toxin production is dependent on the species or a strain within a species and on the food source for the fungus. Some of these toxins have been found to be carcinogenic in animal species. Several toxins are considered potential human carcinogens. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include edema and bronchospasms; chronic cases may develop pulmonary emphysema; may also be associated with sinusitis, allergic bronchopulmonary aspergillosis, and other allergic symptoms.

Basidiospore

Spore from basidiomycetes. Many varieties are reported to be allergenic.

Bipolaris sp.

A fungus with large spores that could be expected to be deposited in the upper respiratory tract. This fungus can produce the mycotoxin - sterigmatocystin, which has been shown to produce liver and kidney damage when ingested by laboratory animals.

Botrytis sp.

Aw 0.93. Conidia dimensions: 7-14 x 5-9 microns. It is parasitic on plants and soft fruits. Found in soil and on house plants and vegetables, it is also known as "gray mold". It causes leaf rot on grapes, strawberries, lettuce, etc. It is a well-known allergen, producing asthma type symptoms in greenhouse workers and "wine grower's lung".

Cercaspora

Common outdoors in agricultural areas, especially during harvest. Parasite of higher plants, causing leaf spot. Commonly found as parasites on higher plants.

Chaetomium sp.

large ascomycetous fungus producing perithecia. It is found on a variety of substrates containing cellulose, including paper and plant compost. It has been found on paper in sheetrock. It can produce an *Acremonium*-like state on fungal media. Varieties are considered allergenic and have been associated with peritonitis, cutaneous lesions, and system mycosis.

Cladosporium sp.

Aw 0.88; Aw 0.84. Most commonly identified outdoor fungus. The outdoor numbers are reduced in the winter. The numbers are often high in the summer. Often found indoors in numbers less than outdoor numbers. It is a common allergen. Indoor *Cladosporium* sp. may be different than the species identified outdoors. It is commonly found on the surface of fiberglass duct liners in the interior of supply ducts. A wide variety of plants are food sources for this fungus. It is found on dead plants, woody plants, food, straw, soil, paint, and textiles. Produces greater than 10 antigens. Antigens in commercial extracts are of variable quality and may degrade within weeks of preparation. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include skin lesions, eye ulceration, mycosis (including onychomycosis, an infection of the nails of the feet or hands) edema and bronchospasms; chronic cases may develop pulmonary emphysema.

Curvularia sp.

Reported to be allergenic and has been associated with allergic fungal sinusitis. It may cause corneal infections, mycetoma, and infections in immune compromised hosts.

Dreschlera sp.

Conidia dimensions: 40-120 x 17-28 microns. Found on grasses, grains and decaying food. It can occasionally cause a corneal infection of the eye.

Epicoccum sp.

Conidia dimensions: 15-25 microns. A common allergen. It is found in plants, soil, grains, textiles and paper products.

Fusarium sp.

Aw 0.90. A common soil fungus. It is found on a wide range of plants. It is often found in humidifiers. Several species in this genus can produce potent trichothecene toxins. The trichothecene (scirpene) toxin targets the following systems: circulatory, alimentary, skin, and nervous. Produces vomitoxin on grains during unusually damp growing conditions. Symptoms may occur either through ingestion of contaminated grains or possibly inhalation of spores. The genera can produce hemorrhagic syndrome in humans (alimentary toxic aleukia). This is characterized by nausea, vomiting, diarrhea, dermatitis, and extensive internal bleeding. Reported to be allergenic. Frequently involved in eye, skin, and nail infections.

Myxomycetes

Members of a group of fungi that is included in the category of "slime molds". They're occasionally found indoors, but mainly reside in forested regions on decaying logs, stumps, and dead leaves. Myxomycetes display characteristics of fungi *and* protozoans. In favorable (wet) conditions they exhibit motile, amoeba-like cells, usually bounded only by a plasma membrane, that are variable in size and form. During dry spells, they form a resting body (sclerotium) with dry, airborne spores. These fungi are not known to produce toxins but can cause hay fever and asthma.

Memnoniella

Contaminant found most often with *Stachybotrys* on wet cellulose. Forms in chains, but it are very similar to *Stachybotrys* and sometimes is considered to be in the *Stachybotrys* family. Certain species do produce toxins very similar to the ones produced by *Stachybotrys chartarum* and many consider the IAQ importance of *Memnoniella* to be on par with *Stachybotrys*. Allergenic and infectious properties are not well studied.

Nigrospora sp.

Commonly found in warm climates, this mold may be responsible for allergic reactions such as hay fever and asthma. It is found on decaying plant material and in the soil. It is not often found indoors.

Oidium sp.

The asexual phase of *Erysiphe* sp. It is a plant pathogen causing powdery mildews. It is very common on the leaf's stems, and flowers of plants. The health effects and allergenicity have not been studied. It does not grow on non-living surfaces such as wood or drywall.

Penicillium sp.

Aw 0.78 - 0.88. A wide number of organisms have been placed in this genus. Identification to species is difficult. Often found in aerosol samples. Commonly found in soil, food, cellulose and grains. It is also found in paint and compost piles. It may cause hypersensitivity pneumonitis, allergic alveolitis in susceptible individuals. It is reported to be allergenic (skin). It is commonly found in carpet, wallpaper, and in interior fiberglass duct insulation. Some species can produce mycotoxins. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include edema and bronchospasms; chronic cases may develop pulmonary emphysema. It may also cause headaches, vomiting, and diarrhea.

Periconia sp.

Periconia sp. are found in soil, blackened and dead herbaceous stems leaf spots, grasses, rushes, and sedges. Almost always associated with other fungi. Rarely found growing indoors. Reportedly associated with a rare case of mycotic keratitis.

Pithomyces sp.

A common mold found on dead leaves, plants, soil and especially grasses. Causes facial eczema in ruminants. It exhibits distinctive multi-celled brown conidia. It is not known to be a human allergen or pathogen. It is rarely found indoors, although it can grow on paper.

Rusts/Smuts

These fungi are associated with plant diseases. In the classification scheme of the fungi, the smuts have much in common with the rusts, and they are frequently discussed together. Both groups produce wind-borne, resistant teliospores that serve as the basis for their classification and their means of spread. Rusts usually attack vegetative regions (i.e., leaves and stems) of plants; smuts usually are associated with the reproductive structures (seeds). They can cause hay fever and asthma.

Spegazzinia

Spegazzinia species comprise a very small proportion of the fungal biota. This genus is somewhat related to other lobed or ornamented genera such as *Candelabrum*. No information is available regarding health effects or toxicity. Allergenicity has not been studied. Usually identified on spore trap samples where it is seen every few weeks. (Spores have very distinctive morphology.) May also be found in air by culturable (Andersen) samples if a long enough incubation period is provided so that sporulation occurs. Our laboratory has never found this organism growing on indoor environmental surfaces. Natural habitat includes soil and many kinds of trees and plants.

Stachybotrys sp.

Aw - 0.94, optimum Aw ->0.98. Several strains of this fungus (*S. atra, S. chartarum* and *S. alternans* are synonymous) may produce a trichothecene mycotoxin- Satratoxin H - which is poisonous by inhalation. The toxins are present on the fungal spores. This is a slow growing fungus on media. It does not compete well with other rapidly growing fungi. The dark colored fungus grows on building material with high cellulose content and low nitrogen content. Areas with a relative humidity above 55%, and are subject to temperature fluctuations, are ideal for toxin production. Individuals with chronic exposure to the toxin produced by this fungus reported cold and flu symptoms, sore throats, diarrhea, headaches, fatigue, dermatitis, intermittent local hair loss and generalized malaise. Other symptoms include coughs, rhinitis, nosebleed, a burning sensation in the nasal passages, throat, and lungs, and fever. The toxins produced by this fungus will suppress the immune system affecting the lymphoid tissue and the bone marrow. Animals injected with the toxin from this fungus exhibited the following symptoms: necrosis and hemorrhage within the brain, thymus, spleen, intestine, lung, heart, lymph node, liver, and kidney. Affects by absorption of the toxin in the human lung are known as pneumomycosis.

This organism is rarely found in outdoor samples. It is usually difficult to find in indoor air samples unless it is physically disturbed (or possibly -this is speculation- a drop in the relative humidity). The spores are in a gelatinous mass. Appropriate media for the growth of this organism will have high cellulose content and low nitrogen content. The spores will die readily after release. The dead spores are still allergenic and toxigenic. Percutaneous absorption has caused mild symptoms.

Stemphylium sp.

Reported to be allergenic. Isolated from dead plants and cellulose materials.

Torula sp.

Found outdoors in air, soil, on dead vegetation, wood, and grasses. Also found indoors on cellulose materials. Reported to be allergenic and may cause hay fever and asthma.

Tetraploa

Tetraploa species comprise a very small proportion of the fungal biota. This genus is somewhat related to *Triposporium* and Diplocladiella. The only reported human infections are two cases of keratitis (1970, 1980) and one case of subcutaneous infection of the knee (1990). No information is available regarding other health effects or toxicity. Allergenicity has not been studied. Usually identified on spore trap samples where it is seen every few weeks. (Spores have very distinctive morphology.) Our laboratory has never found this organism growing on indoor environmental surfaces. Natural habitat includes leaf bases and stems just above the soil on many kinds of plants and trees.

Ulocladium sp.

Aw 0.89. Isolated from dead plants and cellulose materials. Found on textiles.

Zygomycetes

Zygomycetes are one of the four major groups of fungi, the others being the Oomycetes, the Ascomycetes, and the Basidiomycetes. Zygomycetes are common, fast growing, and often overgrow and/or inhibit other fungi nearby. Rhizopus and Mucor are two of the most common Zygomycetes seen in the indoor environment. However, others are seen as well, including *Syncephalastrum*, *Circinella*, *Mortierella*, *Mycotypha*, *Cunninghamella*, and *Choanephora*. For further information, please see descriptions of these individual genera.

The following table lists mycotoxins that are produced by certain types of fungi:

Fungi	Mycotoxin
Acremonium crotocinigenum	Crotocin
Aspergillus favus	Alfatoxin B, cyclopiazonic acid
Aspergillus fumigatus	Fumagilin, gliotoxin
Aspergillus carneus	Critrinin
Aspergillus clavatus	Cytochalasin, patulin
Aspergillus Parasiticus	Alfatoxin B
Aspergillus nomius	Alfatoxin B
Aspergillus niger	Ochratoxin A, malformin, oxalicacid
Acremonium crotocinigenum	Crotocin
Aspergillus nidulans	Sterigmatocystin
Aspergillus ochraceus	Ochratoxin A, penicillic acid
Aspergillus versicolor	Sterigmatocystin, 5 ethoxysterigmatocystin
Aspergillus ustus	Ausdiol, austamide, austocystin,brevianamide
Aspergillus terreus	Citreoviridin
Alternaria	Alternariol, altertoxin, altenuene, altenusin, tenuazonic acid
Arthrinium	Nitropropionic acid
Bioploaris	Cytochalasin, sporidesmin, sterigmatocystin
Chaetomium	Chaetoglobosin A,B,C. Sterigmatocystin
Cladosporium	Cladosporic acid
Clavipes purpurea	Ergotism
Cylindrocorpon	Trichothecene
Diplodia	Diplodiatoxin
Fusarium	Trichothecene, zearalenone
Fusarium moniliforme	Fumonisins
Emericella nidulans	Sterigmatocystin
Gliocladium	Gliotoxin
Memnoniella	Griseofulvin , dechlorogriseofulvin, epi-decholorgriseofulvin, trichodermin, trichodermol
Myrothecium	Trichothecene
Paecilomyces	Patulin, viriditoxin
Penicillium aurantiocandidum	Penicillic acid
Penicillium aurantiogriseum	Penicillic acid
Penicillium brasilanum	Penicillic acid
Penicillium brevicompactum	Mycophenolic acid
Penicillium camemberti	Cyclopiazonic acid
Penicillium carneum	Mycophenolic acid, Roquefortine C
Penicillium crateriforme	Rubratoxin

Fungi	Mycotoxin
Penicillium citrinum	Citrinin
Penicillium commune	Cyclopiazonic acid
Penicillium crustosum	Roquefortine C
Penicillium chrysogenum	Roquefortine C
Penicillium discolor	Chaetoglobosin C
Penicillium expansum	Citrinin, Roquefortine C
Penicillium griseofulvum	Roquefortine C, cyclopiazonic acid, griseofulvin
Penicillium hirsutum	Roquefortine C
Penicillium hordei	Roquefortine C
Penicillium nordicum	Ochratoxin A
Penicillium paneum	Roquefortine C
Penicillium palitans	Cyclopiazonic acid
Penicillium polonicum	Penicillic acid
Penicillum roqueforti	Roquefortine C, Mycophenolic acid
Penicillium veridicatum	Penicillic acid
Penicillium verrucosum	Citrinin, ochratoxin A
Penicillium/ Aspergillus	Patulin
Penicillium/ Aspergillus/Alternaria	Glitoxin
Phomopsis	Macrocyclic trichothecenes
Phoma	Brefeldin, cytochalasin, secalonic acid, tenuazonic acid
Pithomyces	Sporidesmin
Rhizoctonia	Slaframine
Rhizopus	Rhizonin
Sclerotinia	Furanocoumarins
Stachybotrys chartarum	Iso-satratoxin F, roridin E, L-2, satratoxin G & H, trichodermin, trichodermol, trichothecene
Torula	Cytotoxins
Trichoderma	Trichodermin, trichodermol, gliotoxin
Trichothecium	Trichothecene
Wallemia	Walleminol
Zygosporium	Cytochalasin

General terms

Allergen

An allergen is a substance that elicits an IgE antibody response and is responsible for producing allergic reactions. Chemicals are released when IgE on certain cells contact an allergen. These chemicals can cause injury to surrounding tissue - the visible signs of an allergy. Only a few fungal allergens have been characterized but all fungi are thought to be potentially allergenic. Fungal allergens are proteins found in either the mycelium or spores

"Black mold"

A poorly defined term. Black mold or toxic black mold has usually been associated with the mold *Stachybotrys chartarum*. While there are only a few molds that are truly black, there are many that can appear black. Not all molds that appear to be black are *Stachybotrys*.

Fungi

Fungi are neither animals nor plants and are classified in a kingdom of their own. The Kingdom of Fungi. Fungi include a very large group of organisms, including molds, yeasts, mushrooms and puffballs. There are >100,000 accepted fungal species but current estimates range to 1.5 million species. Mycologists (people who study fungi) have grouped fungi into four large groups according to their method of reproduction.

Hidden mold

This refers to visible mold growth on building structures that is not easily seen, including the areas above drop ceilings, within a wall cavity (the space between the inner and outer structure of a wall), inside air handlers, or within the ducting of a heating/ventilation system.

Microbial Volatile Organic Compounds (MVOCs)

Fungi produce chemicals as a result of their metabolism. Some of these chemicals, MVOCs, are responsible for the characteristic moldy, musty, or earthy smell of fungi, whether mushrooms or molds. Some MVOCs are considered offensive or annoying. Specific MVOCs are thought to be characteristic of wood rot and mold growth on building materials. The human nose is very sensitive to mold odors and sometimes more so than current analytical instruments.

Mold

Molds are a group of organisms that belong to the Kingdom of Fungi (see Fungi). Even though the terms mold and fungi had been commonly referred to interchangeably, all molds are fungi, but not all fungi are molds.

Mycotoxin

Mycotoxins are compounds produced by some fungi that are toxic to humans or animals. By convention, the term? Mycotoxin. Excludes mushroom toxins. Fungi that produce mycotoxins are called "toxigenic fungi."

Spore

General term for a reproductive structure in fungi, bacteria and some plants. In fungi, the spore is the structure which may be used for dissemination and may be resistant to adverse environmental conditions.

Toxic mold

The term "toxic mold" has no scientific meaning since the mold itself is not toxic. The metabolic byproducts of some molds may be toxic (see mycotoxin).

Hypha (plural, hyphae)

An individual fungal thread or filament of connected cells; the thread that represents the individual parts of the fungal body.

Phoenix EnviroCorp

MOLD/BIOLOGICAL CONTAMINANT REMEDIATION PROTOCOL

Date: July 8, 2021

For: Quanesha Mullins
Wilmington Housing Authority
1524 S. 16th Street
Wilmington, NC 28401

Remediation Contractor: Not determined

On-Site Consultant: Phoenix EnviroCorp (PEC)
4020 Shipyard Boulevard
Wilmington, NC 28403
(910) 397-0370

Approved Signatory:

Tommie Green, CIEC
Professional Industrial Hygienist

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SECTION 1.0 REMEDIATION PROCEDURES

1.1 Project Set Up

- The owner or powers that be shall supply temporary power for remediation equipment. The existing electrical system may be utilized, with permission of the owner or powers that be. Determining specific electrical load/safety requirements, including, but not limited to, the use of a temporary GFCI electrical panel box shall be the responsibility of the abatement contractor.
- HVAC system shall be isolated.
- 6-mil polyethylene sheathing shall be erected to separate primary control areas (PCA) from remaining areas. Control areas shall be selected so that specified building materials (specified herein, in section 1.3, under primary control areas) may be removed or cleaned and dried.
- HEPA Air Filtration Devices shall be utilized for each separate control area. Critical barriers shall consist of 6-mil polyethylene so that primary control areas are isolated from remaining areas. HEPA filtration units shall be exhausted from the PCA to the outside of the building through windows/doors. Dehumidification units must be installed in the PCA to sufficiently dry components.
- A remote wash off station shall be set up to allow for employees to wash hands and faces after egress from the work area.
- Ingress/Egress to the control area(s) shall be, at minimum, sealed with a 2-way polyethylene air lock.
- Entrances to the building shall be marked as indicated in Section 7.4 of this document.

1.2 Local Exhaust System

- Once sealed, the primary control area shall be ventilated with a local HEPA air filtration device that shall ensure a minimum of four (4) air changes per hour. The air filtration device shall be placed within the containment work area.
- Local HEPA exhaust shall be utilized where cleaning of contents is required and/or in the immediate vicinity of remediation activities of building materials.
- In interior sections requiring surface area cleaning, local HEPA filtration may be exhausted within the area to scrub microbials from ambient air. This process shall only be conducted after fine cleaning has been completed.
- Negative pressure within the contained work area shall be maintained throughout the project until clearance is obtained.
- Negative air machines shall be exhausted to exterior portions of the building to adequately ensure that negative pressure is achieved.
- Negative air pressure within the work area shall be tested and recorded at initiation of the project and hourly thereafter by use of a manometer to ensure the desired pressure of -0.02 inches of water, which is comparable to four changes per hour.
- Dehumidification devices with HEPA filtration may be incorporated as filtration devices in conjunction with true HEPA filtration devices; they may not replace the true HEPA filtration devices.

Note: Formula for determination of adequate HEPA filtration:

Total feet per minute =Volume of work area (ft^3)/15 minutes
#AFD Units needed = (Total feet per minute)/Capacity of Unit (ft^3)

- At initiation of final cleaning stages, relative humidity shall be at 40% (+/-3%) and moisture content of wooden components shall be at or below 15% as determined by Delmhorst moisture meter or equivalent meter. Moisture mapping and direct read T/RH shall be recorded by the remediation contractor until the

specified levels have been achieved. Control areas shall be dehumidified during cleaning and mold remediation activities to ensure removal of surface moisture created during application of water. Drying of structural components that have been treated with encapsulating anti-microbial agents will be necessary.

- Moisture levels shall be recorded and documented by the remediation contractor upon successful completion of dehumidification.

1.3 Remediation Specifications

- Prior to commencement of mold remediation activities by the remediation contractor, the source of any water intrusions, leaks, and/or moisture/humidity problems shall be remedied by the owner. If water intrusions, leaks, and/or moisture/humidity problems exist and are not corrected, mold growth can be expected to return.
- All remediation procedures listed that involve the removal of building materials shall employ polyethylene critical barriers, negative air pressure, and HEPA filtration (i.e., primary control areas).
- The remediation contractor shall ensure that the filters are properly capped prior to switching off the air scrubbers. If the filters are not properly capped, the backflow can cause mold spores to re-release back into the control area, essentially re-contaminating an area that has already been cleaned.
- All remediation activities shall be conducted in a manner that does not allow dissemination of mold spores. Remediation procedures shall begin from the side of the control area furthest away from air filtration devices.
- Cleaning procedures shall be repeated until the area is visibly free of dust and debris.
- Engineering controls set up during the remediation process shall remain in place until remediation has been completed and acceptable post remediation sampling results have been achieved.
- **Federal and/or state regulations require that suspect asbestos containing materials in public and commercial buildings shall be inspected for asbestos prior to renovations or demolition. Based on these regulations, PEC recommends that building materials that may be disturbed during mold remediation be tested for asbestos content prior to their disturbance to prevent asbestos contamination.**
- If cleaning procedures outlined in this remediation plan outweigh the cost of replacement for selected items, the remediation contractor shall give the owner the option to clean or dispose of those items.
- Reinstallation of building materials and/or components shall only be conducted once acceptable post remediation results are obtained.
- Any chemicals used on this project shall be EPA approved and used only as directed by the manufacturer. MSDS shall be available for review upon request.

HVAC System

- The HVAC system(s) that services or run through the primary control area/affected area shall be shut down prior to remediation activities.
- The spaces that are normally climate-controlled by the HVAC system that have been shut down shall be maintained under proper humidity levels (between 30 and 60% utilizing dehumidifiers, etc.) while the system is not in operation.
- All HVAC supply/return vents within the primary control area/affected area shall be isolated with a critical barrier (i.e., plastic, etc.) to prevent air flow. Prior to isolating the vents, the register covers (diffusers) shall be removed, and the supply shall be isolated at the metal boot. Once isolated, the registers and surrounding building materials shall be cleaned.
- The interior of the air handler, rigid duct system, intake box, etc. shall be thoroughly cleaned by an HVAC professional experienced in mold remediation. The interior can be cleaned with mechanical methods that aggressively disturb all interior surfaces and filter the disturbed airborne particulates.

- Cleaning of components shall consist of a method that thoroughly removes visible mold growth, settled concentrations of mold spores, and/or dust and debris.
- PEC recommends the removal and disposal of the flex ducts when feasible, as well as any interior duct board where cleaning will damage the duct board. Once removed, the remediation contractor shall isolate the connection point where the flex duct and/or duct board was detached with a critical barrier (such as plastic, etc.) to prevent air flow.
- Once the HVAC system components are cleaned or replaced anew, the system shall remain off and isolated until acceptable post remediation results are obtained.
- A written document shall be obtained from the remediation contractor verifying that the HVAC system has been cleaned by an HVAC cleaning company with mold experience. This document shall include the property address and date of services and shall be filed with other mold remediation documents.

Note: For directional purposes "front" is determined by facing the playground from inside the unit, unless otherwise noted.

Primary Control Areas/Affected Areas

Critical barriers, negative air pressure, and HEPA filtration shall be established to isolate the following areas as Primary Control Areas to perform the specified mold remediation.

Within the bathroom:
- Remove the entire drywall ceiling.
- Remove and discard the floor mounted cabinet (with sink) along the front wall.
- Remove an approximately 5-foot by 3-foot section of drywall from the front wall beginning at the right wall and extending to the bathtub (approximately 5 feet); and beginning at the floor and extending up 3 feet.
- Remove an approximately 2.5 foot by 3-foot section of drywall from the right wall, beginning at the front wall and extending to the door (approximately 2.5 feet); and beginning at the floor and extending 3 feet up. Also, remove the trim board from the front side of the door.
- Remove any loose floor tiles.

Within the kitchen:
- Remove and discard the floor mounted cabinets associated with the sink along the front wall.
- Remove all baseboards from the front wall.
- Assess the drywall uncovered by the removal of the specified cabinet and baseboards and remove any affected drywall (i.e., drywall with apparent water damage/suspect visible mold growth) and extend the drywall removal within a 2-foot radius of any affected areas when possible.
- Remove any loose floor tiles.

Within the bathroom, the kitchen, and the rear left bedroom:
- Preclean (i.e., HEPA vacuum, etc.) and remove all non-stabled furnishing and contents from the primary control areas, prior to commencement of other specified remediation.
- Clean all remaining surfaces as specified below under general specifications for primary control areas.

General Specifications for Primary Control Areas

- Open plumbing lines and drains within the control areas shall be isolated with a critical barrier consisting of 6-mil poly.
- The water line to toilets within the control areas shall be shut off and the toilets shall be isolated with a critical barrier consisting of 6-mil poly.

- Cleaning of components/materials shall consist of a method that thoroughly removes visible mold growth, settled concentrations of mold spores, and/or dust and debris (i.e., HEPA vacuuming, wet wiping, or other approved methods), followed by dehumidification/drying.
- Exterior surfaces of electrical appliances, electrical equipment, and light fixtures shall be cleaned, utilizing wet method and HEPA vacuuming. These items shall be disconnected from all electrical sources prior to cleaning. If these items cannot be cleaned efficiently, the abatement contractor shall consult with the owner/powers that be.
- All wall/ceiling cavity insulation shall be disposed in areas that specify the removal of drywall/wallboard. The abatement contractor shall visually inspect the back side of surrounding drywall/wallboard for water damage and/or suspect mold growth and document any findings. If additional suspect mold growth or water damage is observed beyond the specified removal area, additional drywall/wallboard shall be removed until no suspect mold growth or water damage is observed.
- All penetrations within the controlled area that adjoin unaffected or non-accessible areas, including outdoor areas, crawlspaces, etc., shall be cleaned (as far as one can reach) and then sealed with 6-mil poly, extending six (6) inches on all sides.
- In areas of specified wallboard removal, all components within the wall/ceiling cavities shall be cleaned. Any wooden structural components with mold stains or mold growth in pitted surfaces shall be HEPA sanded (or other approved methods) to eliminate embedded mold growth.
- All joints or sills (where the structural system meets, where the sill plate meets the floor, etc.) shall be aggressively disturbed to remove embedded mold growth and spores.

1.4 Removal Procedures

The contractor shall maintain surfaces of the control area free of accumulation of dust and debris. Additionally, they shall restrict the spread of dust and debris, keeping waste from being distributed over the work area. Materials shall be removed in a fashion to ensure that previously cleaned areas are not recontaminated (i.e. working from one end of the control area to the other). The contractor may be required to re-clean areas based on a visual inspection by the CIEC/CIE/IH, if the areas are not visibly clean.

Contaminated building materials that have been removed, and additional materials and debris generated during remediation, shall be bagged or wrapped with 6-mil polyethylene sheeting, sealed with duct tape, and carried to the waste container prior to visual inspection by the CIEC/CIE/IH. Materials shall be bagged and sealed directly after removal from unaffected building components.

Areas shall be allowed to dry for a period until specified RH and moisture levels have been achieved. Any remaining building products that are directly impacted by remediation shall be tested for moisture content. Wooden and cellulosic building components (e.g., wall studs, drywall, etc.) shall be tested for moisture content. If the moisture content is > 15% in wood products or > 12% in cellulosic products (utilizing a Delmhorst moisture meter), dehumidification shall be required until moisture levels are at or below said levels, and the RH level is at or below 40% +/-3% (for all interior areas). The remediation contractor shall verify water content of all wooden and cellulosic building components within the impacted areas, as well as temperature and RH prior to scheduling post remediation verification.

1.5 Cleanup Overview

The contractor shall personally review the cleaning process prior to contacting the CIEC/CIE/IH for the post remediation testing. If accumulations of debris and dust are significant, the CIEC/CIE/IH will require re-cleaning prior to post remediation verification sampling.

The CIEC/CIE/IH shall make a visual inspection and conduct post remediation sampling after the final cleaning is complete.

1.6 Post Remediation Verification Testing

Prior to conducting post remediation sampling, HEPA filtration devices shall be allowed to operate for a minimum of 48 hours (the equivalent of 192 air changes), following fine cleaning, in all areas where remediation has been conducted. The HEPA filtration devices shall be sealed at the intake and turned off approximately two hours prior to post testing and reconvene within one hour after post testing, until acceptable post remediation results are established.

Post remediation sampling shall be conducted utilizing viable and/or non-viable sample methods. Air samples shall be collected in representative areas of the control areas. Surface sampling may be conducted at the discretion of the CIEC/CIE/IH.

Sampling shall be conducted in areas directly impacted by remediation procedures, where cleaning was conducted. The CIEC/CIE/IH shall determine acceptable post remediation status through interpretation of air sampling results, which will be based on indoor/outdoor comparisons, in combination with any surface samples collected, moisture readings, RH readings, visual observations, and any other pertinent information.

The owner/client will be responsible for post remediation testing. If air sample results indicate unacceptable airborne concentrations, the contractor shall be required to conduct a re-cleaning at the contractor's expense and absorb the cost for re-testing, until acceptable results are achieved.

SECTION 2.0 SCOPE OF WORK (Note: Section 2 and Section 1.3 are essential to the full Scope of the Contractor's Work)

2.1 Investigative Reports and Other Related Documents

Phoenix EnviroCorp initial investigative report dated June 8, 2021.

Phoenix EnviroCorp investigative report dated July 8, 2021.

Phoenix EnviroCorp Chain of Custody dated June 3, 2021.

Analytical reports dated June 4, 2021.

2.2 Project Description

The procedures covered by this program include the enclosure and drying of the said structure, the removal, handling, and disposal of building components compromised by mold/fungal growth, and the cleaning and disinfecting of existing building materials. Procedures for reconstruction are not considered in these specifications. Reconstruction of interior portions may not be conducted until procedures for remediation have been completed, the control areas have been inspected, and testing has returned acceptable post remediation results. Reconstruction of exterior portions may be conducted during the restoration to ensure that water intrusion is abated.

The objectives covered by the program include the remediation of materials shown to have surface contamination, water damage, and/or exposure to elevated airborne mold spore levels, without subjecting the workers, installation employees, and occupants to microbial contaminants. In addition, contract employees, occupants, and materials will be appropriately protected during the removal process so that present and future

exposures will not occur.

This protocol is provided as a guideline. Any deviation requests from this protocol shall be addressed to the CIEC/CIE/IH for consideration. At present there are no Federal or State requirements regarding microbial remediation projects; however, OSHA General Construction Code of Federal Regulations (29 CFR 1926) shall be followed.

Remediation shall be completed as close to the date that this protocol was drafted, as the specifications outlined within represent conditions at the time the investigative services were conducted. Due to the volatility of mold, the current protocol may not reflect all necessary remediation if conditions are allowed to continue. Further, if time lapses allowing conditions to change, it will become increasingly difficult to obtain successful clearance testing results.

SECTION 3.0 AIR MONITORING

3.1 Responsibilities of the CIEC/CIE/IH

Monitoring of airborne concentrations will be performed in accordance with the requirements of this program. Prior to conducting air sampling and/or surface sampling for clearances, the CIEC/CIE/IH shall conduct a visual inspection of the area. Temperature and RH shall be recorded during the air sampling phase of clearance. All air sampling shall be conducted in such a manner as to provide a valid representation of airborne mold levels both inside and outside the work areas. If analysis of air samples indicates that airborne concentrations exceed acceptable limits, the contractor shall conduct re-cleaning at the contractor's expense.

3.2 Personal Monitoring

No personal monitoring will be conducted by the CIEC/CIE/IH unless the remediation contractor requests monitoring for OSHA compliance. Presently there are no guidelines (PELs or TLVs) for microbial contaminants. It is the remediation contractor's responsibility to determine if OSHA personal sampling may be required during application of anti-microbial agents.

3.3 Sample Integrity and Reporting

Samples shall be sealed, labeled, and a chain of custody initiated according to laboratory procedures.

Sample results shall be available within seven (7) days of the completion of collection of all samples and will include the following information:

- Site Address
- Sample Number
- Location Sampled
- Analytical Method
- Collection Date(s)
- Person Taking Sample(s)
- Additional Comments (if any)
- Analyst Signature

SECTION 4.0 MATERIAL REPLACEMENT

4.1 Material Replacement

The general contractor/replacement contractor may begin material replacement after the CIEC/CIE/IH informs all parties of acceptable post remediation sample results.

With ongoing construction activities ambient air levels are expected to be elevated over what might be normally expected. Additional testing should not be necessary after remediation procedures have been completed and successful results have been obtained. In the event of another water intrusion (i.e. broken-pipe-line, improper HVAC function, or building envelope compromise), an investigation shall be conducted within 24 to 48 hours of the event. Proper drying, if initiated within this time frame, should minimize the potential for microbial growth.

SECTION 5.0 SPILL CLEANUP REQUIREMENTS

5.1 Spills

MSDS shall be kept on site for all chemical products brought to the site by the remediation contractor. In the event of a chemical spill, the contractor shall initiate cleanup immediately. The contractor shall mop up any liquid with rags or other conventional absorbent. The spent absorbent shall be properly contained and disposed of as waste.

SECTION 6.0 WASTE CONTROL

6.1 Waste Disposal

Waste shall be disposed of at a locally selected landfill. Waste bags shall be checked for integrity and hauled in an enclosed truck/vehicle or container to ensure that transportation to the landfill does not pose a potential hazard to the environment.

SECTION 7.0 SUPPLEMENTAL INFORMATION

7.1 Applicable Publications

The publications listed below form part of this program. Written programs shall accompany all referenced CFR publications. IICRC and NYCDOH guidelines for work procedures shall be followed by the remediation contractor. A copy of the NYCDOH protocols shall be on-site, along with this design, for reference by the site supervisor. ACGIH, IAQA, and ASHRAE publications shall be utilized as guidelines for interpretation by the CIEC/CIE/IH. This design shall be reviewed by the remediation supervisor prior to initiation of set-up for the project. Any questions regarding this project may be addressed with the on-site consultant listed for Phoenix EnviroCorp.

Code of Federal Regulation (CFR Publications)

29 CFR 1910.134	Respiratory Protection
29 CFR 1910.145	Specifications for Accident Prevention, Signs and Tags
29 CFR 1926.28	Personal Protective Equipment
29 CFR 1926.59	Hazard Communication
29 CFR 1926.96	Occupational Foot Protection
29 CFR 1926.100	Head Protection
29 CFR 1926.101	Hearing Protection
29 CFR 1926.102	Eye and Face Protection

29 CFR 1926.403	Electrical General Requirements
29 CFR 1926.416	Safety General Requirements
29 CFR 1926.852	Demolition, Chutes
29 CFR 1926.1091	Record Keeping Requirements

Supplemental Guidelines

IICRC S520 2nd ed.	Standard and Reference Guide for Professional Water Damage Restoration
NYCDOH	Guidelines on Assessment and Remediation of Fungi in Indoor Environments
ACGIH	Bioaerosols: Assessment and Control
IAQA 01-2000	Recommended Guidelines for Indoor Environments
ASHRAE 62.2-2007	Ventilation for Acceptable Indoor Air Quality in Low-Rise Residential Buildings

7.2 Definitions

Air Lock: A system that permits ingress and egress between a control area and non-control area, or other work areas, without allowing air movement between areas (e.g., three stage decon, three-way polyethylene flaps).

Air Sample: Refers to samples collected with spore trap air sample media (e.g., Micro-5, Cyclex D, or equivalent); also referred to as a non-viable air sample. May also refer to a sample collected on a disposable petri dish with Agar media by means of an Andersen Impactor (or equivalent) and sampling pump; also referred to as air culture (viable) sample. Sample media to be used in project is described under Section 1.6 (Post Remediation Verification Testing).

Area Monitoring: The sampling of airborne microbial concentrations outside the exclusion boundary, which may reach the breathing zone of the contractor or installation employees.

Asbestos Containing Materials (ACM): Refers to asbestos containing building materials that contain more than 1% asbestos by Polarized Light Microscopy (PLM) or Transmission Electron Microscopy (TEM).

Biocide: Refers to chemical agents that are specifically designed to eliminate viable microbial contamination, with a phenol equivalent efficiency (e.g., Sodium Hypochlorite, Quaternary Ammonia Compounds).

Blower Door Test: Refers to the testing of static pressure and draw of air through the HVAC in cubic feet per minute (CFM) to rate the efficiency of the system.

Clearance Monitoring: Refers to air, bulk, or swab sampling conducted as a means to demonstrate that the area specified for remediation has been completed by the contractor, left with present acceptable mold spore levels, and ready for re-construction.

Control Area: The area where microbial contaminants removal is performed, which is isolated by physical boundaries to prevent unauthorized entry of personnel, thereby preventing exposure to or the spread of microbial contaminants. Physical boundaries will be established and located such that the airborne contaminants are not allowed to escape the boundaries.

HEPA: High Efficiency Particulate Air. Refers to ventilation devices that are specifically designed to filter ambient air to an efficiency of 99.97%.

HVAC: Refers to the Heating, Ventilation, and Air Conditioning system.

Industrial Hygienist: Refers to a person who practices industrial hygiene and may act as a competent person regarding visual inspection of contaminated surfaces and clearance air and/or swab/bulk sampling. May also refer to a Certified Industrial Hygienist (CIH) as defined by the American Board of Industrial Hygiene (ABIH), a Certified Indoor Environmental Consultant as defined by the American Council for Accredited Certification (ACAC), or a Certified Indoor Environmentalist (CIE) as defined by the American Council for Accredited Certification (ACAC).

Microbial Contaminant: Refers to viable mold, fungi, pollen, bacteria, and or particulate, or their metabolites, that may be causative of epidemiological, immunotoxic, dermotoxic, neurotoxic, or enterotoxic disorders in the human population, or may be considered a pathogen or an opportunistic pathogen.

Non-Porous Materials: Refers to building materials with solid surfaces that may be successfully treated and cleaned by means of HEPA vacuuming or other approved method. Materials include flooring, hard goods, plastic, vinyl, and some wallboard systems.

Porous Materials: Refers to building materials and household goods that may allow microscopic particles (3-20 micron) to become trapped within the material that will not allow adequate cleaning. Materials include carpet, mattresses, and clothing.

Primary Control Area (PCA): Refers to a section of a facility that has been isolated by 6-mil polyethylene barriers where specific engineering controls (e.g., HEPA filtration, negative air pressurization, dehumidification, etc.) are required. In general, it is the area where remediation of water and mold damaged building materials is to be conducted.

Refrigerant Dehumidifier: Device used to remove water content from air and materials.

Relative Humidity (RH): Refers to the ratio of water vapor in the atmosphere to the amount required to saturate it at a given temperature.

Semi-Porous Materials: Refers to materials that may be somewhat porous, yet they may still allow for adequate cleaning. Materials include wooden beams and some wallboard systems.

Swab Sample: Refers to collection of a sample onto a sterile swab for analysis of mold, fungi, and bacteria by viable and/or non-viable analysis.

Tape-Lift Sample: Refers to collection of a sample onto clear scotch tape for analysis by direct microscopic examination (non-viable).

7.3 Quality Assurance

Medical Examinations

Before potential exposure to microbial contaminants, the remediation contractor shall provide workers with a comprehensive medical examination as required by 29 CFR 1910.134 as outlined by the Medical Monitoring Program.

Medical Records

The remediation contractor shall maintain complete and accurate medical records on employees as required by

OSHA and the contractor's Medical Monitoring Program. The contractor may be asked to provide a copy of all medical records for approval by the consultant's representative.

Training

Each employee working on this contract shall be trained prior to the time of initial job assignment in accordance with mold specific and chemical specific training as indicated by the OSHA General Duty Clause and the Hazard Communication Standard. Each employee shall also receive training required by Federal guidelines listed in Section 7.1 of this document and project specifications.

Hazard Communication Program

The remediation contractor has established and implemented a Hazard Communication Program as required by 29 CFR 1910.1200 and may be asked to provide a copy of this written program. Hazard Communication training must include occupational hazards as directly related to working with fungi/mold and contamination of building components by fungal contamination, specific training for chemical hazards associated with biocide usage, and site specific MSDS sheets for commercial detergents and biocides utilized on the job site.

Respiratory Protection Program

The remediation contractor has established a Respiratory Protection Program, which complies with 29 CFR 1910.134. Physical examinations and fit testing are required for use of respiratory protection greater than an N-95 dust mask. Workers removing building materials contaminated by mold growth, applying anti-microbial agents, or workers subjected to exposures to anti-microbial agents shall be required to wear, at minimum, a tight-fitting negative pressure ½ mask respirator with P-100 filters. Therefore, -he OSHA Respiratory Protection Standard applies.

Analytical Testing Laboratory

Analysis of culturable biological samples collected on this project shall be conducted by a laboratory that participates in the Environmental Microbiological Proficiency Analytical Testing Program (EMPAT) of the American Industrial Hygiene Association (AIHA) and has shown to be proficient by proficiency analytical testing (PAT) samples. Analysis of non-viable air and surface samples shall be conducted by a competent person.

7.4 Materials and Equipment

Equipment

The contractor shall make available to employees a complete set of personal protective equipment (PPE) as required by this program for entry into the controlled area. All personnel while in the control area or handling microbial contaminated waste shall wear protective clothing, respirators, and other PPE.

Respirators

Contractor shall furnish the appropriate respirator in accordance with 29 CFR 1910.134 and approved by NIOSH for protection in environments that contain microbial contaminants. The selected respirator for this project shall be a tight-fitting negative pressure ½ respirator equipped with HEPA cartridge (P-95, P-100). At minimum, an N-95 dust mask may be utilized during fine cleaning activities; however, the tight fitting ½ mask respirator shall be utilized during application of anti-microbial agents or biocides.

Special Clothing

Employees shall be provided with and required to wear: whole body disposable protective clothing, full body tyvek suits with head coverings, and latex gloves *(see table)* during all activities in the controlled area.

Chemical	Recommended Rubber Glove
Sodium Hypochlorite	Neoprene or Nitrile
Phenolic Compounds	Neoprene
Quaternary Ammonia Compounds	Polyvinyl Chloride (PVC)
Detergents	Latex

Eye Protection

The contractor shall provide chemical-resistant goggles to personnel engaged in cleaning and treatment activities and require them to be worn during application of anti-microbial agents and biocides.

Warning Signs and Labels

Standard approved warning signs shall be erected at all approaches to the control area as specified in 29 CFR 1910.145.

Anti-Microbial Agents

Anti-microbial agents utilized in interior quarters shall consist of quaternary ammonia compounds. No phenolic compounds shall be used in interior quarters with exception of Micro Ban Plus. Approval must be granted by the owner/powers that be prior to application. Anti-microbial agents shall be EPA approved. Commercial grade detergents shall be used to remove fungal contamination during cleaning phases prior to anti-microbial application, to include encapsulation.

Phoenix EnviroCorp

June 8, 2021

Quanesha Mullins
Wilmington Housing Authority
1524 S. 16th Street
Wilmington, NC 28401

RE: PEC Job # 21-21-185-IAQ-M - 302 Grass Lane, Apartment 202, Wilmington, NC - Mold Investigation/Background air sampling

Enclosed are the results of the mold investigation conducted at the above referenced residence on June 3, 2021. Phoenix EnviroCorp (PEC) was retained to conduct background air sampling to determine airborne mold spore levels and to collect surface samples of suspect visible mold growth.

Background Information: The resident reported a leak in the past in the kitchen.

The unit was occupied and fully furnished with contents throughout.

The HVAC system was operating in the cool mode, set at 70º F upon PEC's arrival and during sampling.

Note: For directional purposes "front" is determined by facing the playground adjacent to the parking lot from inside the building, unless otherwise stated.

Visual Inspection: PEC's visual inspection noted the following (see enclosed photographic documentation):

- Apparent water damage and suspect visible mold growth in kitchen cabinet underneath the sink

Mold Testing – Surface: Non-viable surface samples were collected from areas of suspect visible mold growth. The quantifications of fungal growth are reported as scattered spores, 21-100 fungal spores = very light (VL), 101-1,000 fungal spores = light (L), 1,001-10,000 fungal spores = moderate (M), > 10,000 fungal spores = heavy (H). The 'General Impressions' of fungal growth are reported as no fungal growth (NFG), fungal growth (FG), minimal fungal growth or growth in vicinity (MFG), and no fungal spores detected (ND). *Clear tape was utilized for the collection of surface samples. Each sample was assigned a unique ID number and shipped to a third-party laboratory for analysis.* Sampling locations and results are as follows:

Location	Result
Kitchen cabinet underneath sink	**M – FG** *Chaetomium*

Mold Testing – Air: Non-viable spore trap air samples were collected to determine airborne mold spore levels. Samples were collected within the kitchen/living room, the bathroom, the rear right bedroom, and the rear left bedroom. *Micro 5 sampling media was utilized for the collection of spore trap air samples. Each sample ran for five (5) minutes at a flow rate of five (5) liters per minute for a total volume of twenty-five (25) liters per sample. Each sample was assigned a unique ID number and shipped to a third-party laboratory for analysis. All air samples were collected from centralized locations (within their respective areas) and within the breathing zone, unless otherwise noted.* Two samples were also collected outdoors for comparative purposes.

Results identified elevated airborne levels of *Chaetomium* within the bathroom.

The interpretation of air sample results is based on indoor/outdoor comparisons, in combination with a study by Daniel M. Baxter, entitled "A Regional Comparison of Mold Spore Concentrations Outdoors and Inside "Clean" and "Mold Contaminated" Southern California Buildings", and other industry guidelines, as well as over 20 years of experience in industrial hygiene and mold testing.

In layman terms, acceptable levels indicate that the levels are below the outdoor level and/or the baseline levels (whichever is higher) stated below. Elevated levels indicate that the levels are above the outdoor level and/or the baseline level.

Baseline levels for indoor spore trap air samples are as follows: < 900 spores/m³ for Penicillium/ Aspergillus; 0 spores/m³ for Stachybotrys and Chaetomium; and < 350 spores/m³ for other individual mold groups.

Relative Humidity (RH): *Temperature and relative humidity readings were collected in the same locations as the spore trap air samples.* RH levels within the unit ranged from 54.5% – 56.5% with an outdoor reading of 85.0% (see the enclosed Chain of Custody for details). Per the American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) Standard 62-1999, relative humidity should range between 30% and 60%.

Conclusions: Sample results identified elevated airborne mold spore levels of *Chaetomium* within the bathroom and surface mold growth of *Chaetomium* within the kitchen cabinet underneath the sink. Upon request, and for an additional fee, PEC can provide a protocol that outlines mold remediation activities.

Enclosed in this report are the laboratory analysis and the Chain of Custody.

Should you have any questions, please do not hesitate to call.

Thank you,

Philip Green
IH Technician

Tommie Green, CIEC
Professional Industrial Hygienist

Enclosures

Photo 1

Apparent water damage and suspect visible mold growth in kitchen cabinet underneath sink

Samples accepted

Phoenix EnviroCorp
4020 SHIPYARD BLVD.
WILMINGTON, NC 28403

CHAIN OF CUSTODY

LABORATORY TEST REQUEST

Semi BSA 21060427 Lab ID: 106-110

CONTACT: Philip Green	TELEPHONE (910) 397-0370 FAX (910) 313-6094	6/3/2021
PEC Job #: 21-21-185-IAQ-M	SITE ADDRESS: 302 Grass Lane, Apt. 202, Wilmington, NC 28405	

PLEASE EMAIL RESULTS TO: KMGREEN@PHOENIXENVIROCORP.COM

SAMPLE TYPE:	NUMBER OF SAMPLES:	TURN AROUND TIME SPECIFIED:
Spore Trap - Micro-5	4	____ Immediate ____ 24 hr ____ 48 hr __X__ Standard
Surface Samples	1	

Sample #	Sample Area	Sample Volume	Lab Analysis Requested	% Relative Humidity	Temperature °F
060321-PG-501	Kitchen/Living Room	25L	S001	54.5	71.0
060321-PG-502	Bathroom	25L	S001	56.5	67.7
060321-PG-503	Rear Right Bedroom	25L	S001	55.2	71.0
060321-PG-504	Rear Left Bedroom	25L	S001	55.6	71.3
060321-PG-601	Black VSMG in kitchen cabinet underneath sink	1 cm sq	S001T		

Samples Collected By (Printed Name and Signature): [signature] Date Signed: 6/3/2021

CHAIN OF CUSTODY RECORD

DATE:	Time:	Condition of Samples:	RELINQUISHED BY: (Printed Name and Signature)	ACCEPTED BY: (Printed Name and Signature)
6/3/2021	14:30:00 PM	Intact	[signature] AFFILIATION:	[signature] AFFILIATION:

SEEML Reference Number: 210604027

Southeast Environmental Microbiology Laboratories
102 Edinburgh Court
Greenville, SC 29607
Phone: (864) 233-3770
FAX: (864) 233-6589

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

- ☒ Surface/Bulk Report
- ☒ Spore Trap Report
- ☐ Andersen Fungal Report
- ☐ Quantitative Fungal Report

Lab Manager Review: *Angel Gosnell* Date: 06/04/21

Thank you for using SEEML laboratories. We strive to provide superior quality and service.
SEEML laboratories are accredited through AIHA-LAP, LLC (EMLAP # 173667) for the analysis of Spore Traps and Surface/Bulk Samples.

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

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

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

Spore Trap Report

Attn: ***Phoenix Enviro Corp.***	Date Sampled: 06/03/21
4020 Shipyard Blvd.	Date Received: 06/04/21
Wilmington, NC 28403	Date Analyzed: 06/04/21
	Date Reported: 06/04/21
	Date Revised:
	Project Name: 21-21-185-IAQ-M
	Project Address: 302 Grass Lane, Apt. 202
	Project City, State, ZIP: Wilmington, NC 28405
	SEEML Reference # : 210604027

TEST METHOD: DIRECT MICROSCOPY EXAMINATION SEEML SOP 7

Client Sample ID	060321-PG-501			060321-PG-502			060321-PG-503		
Location	Kitchen / Living Room			Bathroom			Rear Right Bedroom		
Lab Sample ID	210604027-106			210604027-107			210604027-108		
Comments									
Hyphal Fragments									
Pollen									
Spore Trap Used	M5			M5			M5		
	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%
Alternaria	1	40	7						
Ascospores	2	80	13	1	40	17	1	40	25
Basidiospores	2	80	13						
Bipolaris/Drechslera									
Chaetomium				2	80	33			
Cladosporium	1	40	7	1	40	17	1	40	25
Curvularia									
Epicoccum									
Cercospora									
Fusarium									
Memnoniella									
Nigrospora									
Penicillium/Aspergillus	9	360	60	2	80	33	2	80	50
Polythrincium									
Rusts									
Smuts/Periconia/Myxomy									
Spegazzinia									
Stachybotrys									
Stemphylium									
Tetraploa									
Torula									
Ulocladium									
Colorless/Other Brown*									
Oidium									
Zygomycetes									
Pithomyces									
Background debris (1-5)**	3			3			3		
Sample Volume(liters)	25			25			25		
TOTAL SPORES/M^3	15	**600**		6	**240**		4	**160**	

Revisions:

Spore types listed without a count or data entry were not detected during the course of the analysis for the respective sample, indicating a raw count of <1 spore.
The analytical sensitivity is the spores/m^3 divided by the raw count, expressed in spores/m^3. The limit of detection is the analytical sensitivity (in spores/m^3) multiplied by the sample volume (in liters) divided by 1000 liters.
*Colorless,other Brown are spores without a distinctive morphology on spore traps and non-viable surface samples.
**Background debris is the amount of particulate matter present on the slide and is graded from 1-5 with 1 = very light, 2= Light, 3 = Medium, 4 = Heavy, 5 = Very Heavy. The higher the rating the more likelihood spores may be underestimated. A rating of 5 should be interpreted as minimal counts and may actually be higher than reported.

Disclaimer: The sample results are determined by the sample volume, which is provided by the customer.
This report relates only to the samples tested as they were received.

Angel Gosnell
Angel Gosnell, Approved Laboratory Signatory

102 Edinburgh Court
Greenville, SC. 29607
Phone: (864) 233-3770

Spore Trap Report

Attn: ***Phoenix Enviro Corp.***	Date Sampled: 06/03/21
4020 Shipyard Blvd.	Date Received: 06/04/21
Wilmington, NC 28403	Date Analyzed: 06/04/21
	Date Reported: 06/04/21
	Date Revised:
	Project Name: 21-21-185-IAQ-M
	Project Address: 302 Grass Lane, Apt. 202
	Project City, State, ZIP: Wilmington, NC 28405
	SEEML Reference # : 210604027

TEST METHOD: DIRECT MICROSCOPY EXAMINATION SEEML SOP 7

Client Sample ID	060321-PG-504		
Location	Rear Left Bedroom		
Lab Sample ID	210604027-109		
Comments			
Hyphal Fragments			
Pollen			
Spore Trap Used	M5		
	raw ct.	spores/m^3	%
Alternaria			
Ascospores	3	120	30
Basidiospores	4	160	40
Bipolaris/Drechslera			
Chaetomium			
Cladosporium	1	40	10
Curvularia			
Epicoccum			
Cercospora			
Fusarium			
Memnoniella			
Nigrospora			
Penicillium/Aspergillus	2	80	20
Polythrincium			
Rusts			
Smuts/Periconia/Myxomy			
Spegazzinia			
Stachybotrys			
Stemphylium			
Tetraploa			
Torula			
Ulocladium			
Colorless/Other Brown*			
Oidium			
Zygomycetes			
Pithomyces			
Background debris (1-5)**	3		
Sample Volume(liters)	25		
TOTAL SPORES/M^3	10	**400**	

Revisions:

Spore types listed without a count or data entry were not detected during the course of the analysis for the respective sample, indicating a raw count of <1 spore.
The analytical sensitivity is the spores/m^3 divided by the raw count, expressed in spores/m^3. The limit of detection is the analytical sensitivity (in spores/m^3) multiplied by the sample volume (in liters) divided by 1000 liters.
*Colorless,other Brown are spores without a distinctive morphology on spore traps and non-viable surface samples.
**Background debris is the amount of particulate matter present on the slide and is graded from 1-5 with 1 = very light, 2= Light, 3 = Medium, 4 = Heavy, 5 = Very Heavy. The higher the rating the more likelihood spores may be underestimated. A rating of 5 should be interpreted as minimal counts and may actually be higher than reported.

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Angel Gosnell
Angel Gosnell, Approved Laboratory Signatory

102 Edinburgh Court
Greenville, SC. 29607
Phone: (864) 233-3770

Surface and Bulk Sample Report

	Date Sampled: 06/03/21
Attn: ***Phoenix Enviro Corp.***	Date Received: 06/04/21
4020 Shipyard Blvd.	Date Analyzed: 06/04/21
Wilmington, NC 28403	Date Reported: 06/04/21
	Date Revised:
	Project Name: 21-21-185-IAQ-M
	Project Address: 302 Grass Lane, Apt. 202
	Project City, State ZIP: Wilmington, NC 28405
	SEEML Reference #: 210604027

TEST METHOD: Direct Microscopic Examination (SEEML SOP 18)

Client Sample ID	060321-PG-601			
Location	Black VSMG In Kitchen Cabinet Underneath Sink			
SEEML Sample ID	210604027-110			
Sample Type	Tape			
	Quantification*			
Hyphal Fragments	**M**			
Pollen				
General Impressions **	**FG**			
Fungal Spore:				
Alternaria				
Acremonium				
Ascospores				
Basidiospores				
Bipolaris/Drechslera				
Cercospora				
Chaetomium	**M**			
Cladosporium				
Curvularia				
Epicoccum				
Fusarium				
Geotrichum sp.				
Memnoniella				
Myxomycetes				
Nigrospora				
Penicillium/Aspergillus				
Pithomyces				
Rusts/Smuts				
Stemphylium				
Tetraploa				
Ulocladium				

** General Impressions: NFG = No Fungal Growth, FG = Fungal Growth, MFG = Minimal Fungal Growth Or Growth in vicinity

Quantification of fungal growth is done by semi-quantitative grading using the following ranges:

Scattered Spores, 1-20 fungal spores

VL = 21-100 fungal spores L = 101-1,000 fungal spores M = 1,001-10,000 fungal spores H = >10,000 fungal spores

ND = No Fungal Spores Detected

Disclaimer: This report relates only to the samples tested

Respectfully submitted, SEEML

Angel Gosnell, **Approved Laboratory Signatory**

102 Edinburgh Court
Greenville, SC 29607
Phone: (864) 233- 3770
Fax: (864) 233- 6589

AIHA-LAP, LLC EMLAP # 173667

Texas License: LAB1016

Samples Created

Phoenix EnviroCorp
4020 SHIPYARD BLVD.
WILMINGTON, NC 28403

CHAIN OF CUSTODY

LABORATORY TEST REQUEST

Seem PEC# 21060402 9 Lab ID: 118-119

CONTACT: Philip Green	TELEPHONE (910) 397-0370 FAX (910) 313-6094	6/3/2021
PEC Job #: 21-21-182,183,184,185-IAQ-M	SITE ADDRESS: 302 Grass Lane, Wilmington, NC 28405	

PLEASE EMAIL RESULTS TO: KMGREEN@PHOENIXENVIROCORP.COM

SAMPLE TYPE:	NUMBER OF SAMPLES:	TURN AROUND TIME SPECIFIED:
Spore Trap - Micro-5	2	____ Immediate ____ 24 hr ____ 48 hr __X__ Standard
Surface Samples	0	

Sample #	Sample Area	Sample Volume	Lab Analysis Requested	% Relative Humidity	Temperature °F
060321-PG-701	Outside - Front	25L	S001	85.0	83.2
060321-PG-702	Outside - Rear	25L	S001		

Samples Collected By (Printed Name and Signature): [signature] Date Signed: 6/3/2021

CHAIN OF CUSTODY RECORD

DATE:	Time:	Condition of Samples:	RELINQUISHED BY: (Printed Name and Signature)	ACCEPTED BY: (Printed Name and Signature)
6/3/2021	14:30:00 PM	Intact	[signature] AFFILIATION:	AFFILIATION: PM 0441

SEEML Reference Number: 210604029

Southeast Environmental Microbiology Laboratories
102 Edinburgh Court
Greenville, SC 29607
Phone: (864) 233-3770
FAX: (864) 233-6589

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

- ☐ Surface/Bulk Report
- ☒ Spore Trap Report
- ☐ Andersen Fungal Report
- ☐ Quantitative Fungal Report

Lab Manager Review: *Angel Gosnell* Date: 06/04/21

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

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

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

Spore Trap Report

	Date Sampled: 06/03/21
Attn: ***Phoenix Enviro Corp.***	Date Received: 06/04/21
4020 Shipyard Blvd.	Date Analyzed: 06/04/21
Wilmington, NC 28403	Date Reported: 06/04/21
	Date Revised:
	Project Name: 21-21-182,183,184,185-IAQ-M
	Project Address: 302 Grass Lane
	Project City, State, ZIP: Wilmington, NC 28405
	SEEML Reference # : 210604029

TEST METHOD: DIRECT MICROSCOPY EXAMINATION SEEML SOP 7

Client Sample ID	060321-PG-701			060321-PG-702					
Location	Outside - Front			Outside - Rear					
Lab Sample ID	210604029-118			210604029-119					
Comments									
Hyphal Fragments				1	40				
Pollen	4	160		2	80				
Spore Trap Used	M5			M5					
	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%			
Alternaria									
Ascospores	279	11200	73	51	2040	27			
Basidiospores	81	3240	21	27	1080	14			
Bipolaris/Drechslera									
Chaetomium									
Cladosporium	9	360	2	78	3120	41			
Curvularia									
Epicoccum									
Cercospora									
Fusarium									
Memnoniella									
Nigrospora									
Penicillium/Aspergillus	7	280	2	30	1200	16			
Polythrincium									
Rusts	9	360	2	3	120	2			
Smuts/Periconia/Myxomy									
Spegazzinia									
Stachybotrys									
Stemphylium									
Tetraploa									
Torula									
Ulocladium									
Colorless/Other Brown*									
Oidium									
Zygomycetes									
Pithomyces									
Background debris (1-5)**	3			3					
Sample Volume(liters)	25			25					
TOTAL SPORES/M^3	385	**15400**		189	**7560**				

Revisions:

Spore types listed without a count or data entry were not detected during the course of the analysis for the respective sample, indicating a raw count of <1 spore.

The analytical sensitivity is the spores/m^3 divided by the raw count, expressed in spores/m^3. The limit of detection is the analytical sensitivity (in spores/m^3) multiplied by the sample volume (in liters) divided by 1000 liters.

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

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

Disclaimer: The sample results are determined by the sample volume, which is provided by the customer.
This report relates only to the samples tested as they were received.

102 Edinburgh Court
Greenville, SC. 29607
Phone: (864) 233-3770

Angel Gosnell

Angel Gosnell, Approved Laboratory Signatory

Fungal Descriptions

Alternaria sp.

Aw - 0.89. Conidia dimensions: 18-83 x 7-18 microns. A very common allergen with an IgE mediated response. It is often found in carpets, textiles and on horizontal surfaces in building interiors. Often found on window frames. Outdoors it may be isolated from samples of soil, seeds and plants. It is commonly found in outdoor samples. The large spore size, 20 - 200 microns in length and 7 - 18 microns in sizes, suggests that the spores from these fungi will be deposited in the nose, mouth and upper respiratory tract. It may be related to bakers' asthma. It has been associated with hypersensitivity pneumonitis. The species *Alternaria alternata* can produce tenuazonic acid and other toxic metabolites that may be associated with disease in humans or animals. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include edema and bronchospasms; chronic cases may develop pulmonary emphysema.

Ascospore

A spore borne in a special cell called an ascus. Spores of this type are reported to be allergenic. All ascomycetes, members of a group of fungi called Ascomycotina, have this type of spore. The minute black dots on rotting wood and leaves or the little cups on lichens are examples of ascomycetes; another is the "truffle" mushroom.

Aspergillus/Penicillium

These are two of the most commonly found allergenic fungi in problem buildings. *Aspergillus* comes in many varieties (species). Many of the varieties produce toxic substances. It may be associated with symptoms such as sinusitis, allergic bronchopulmonary aspergillosis, and other allergic symptoms. *Penicillium* is a variety of mold that is very common indoors and is found in increased numbers in problem buildings. It also has many varieties, some of which produce toxic substances. The symptoms are allergic reactions, mucous membrane irritation, headaches, vomiting, and diarrhea. Due to the morphological similarity of *Aspergillus* and *Penicillium*, they are not differentiated by microscopic analysis and are reported together.

Aspergillus sp.

Aw 0.75 - 0.82. Reported to be allergenic. Members of this genus are reported to cause ear infections. Many species produce mycotoxins that may be associated with disease in humans and other animals. Toxin production is dependent on the species or a strain within a species and on the food source for the fungus. Some of these toxins have been found to be carcinogenic in animal species. Several toxins are considered potential human carcinogens. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include edema and bronchospasms; chronic cases may develop pulmonary emphysema; may also be associated with sinusitis, allergic bronchopulmonary aspergillosis, and other allergic symptoms.

Basidiospore

Spore from basidiomycetes. Many varieties are reported to be allergenic.

Bipolaris sp.

A fungus with large spores that could be expected to be deposited in the upper respiratory tract. This fungus can produce the mycotoxin - sterigmatocystin, which has been shown to produce liver and kidney damage when ingested by laboratory animals.

Botrytis sp.

Aw 0.93. Conidia dimensions: 7-14 x 5-9 microns. It is parasitic on plants and soft fruits. Found in soil and on house plants and vegetables, it is also known as "gray mold". It causes leaf rot on grapes, strawberries, lettuce, etc. It is a well-known allergen, producing asthma type symptoms in greenhouse workers and "wine grower's lung".

Cercaspora

Common outdoors in agricultural areas, especially during harvest. Parasite of higher plants, causing leaf spot. Commonly found as parasites on higher plants.

Chaetomium sp.

large ascomycetous fungus producing perithecia. It is found on a variety of substrates containing cellulose, including paper and plant compost. It has been found on paper in sheetrock. It can produce an *Acremonium*-like state on fungal media. Varieties are considered allergenic and have been associated with peritonitis, cutaneous lesions, and system mycosis.

Cladosporium sp.

Aw 0.88; Aw 0.84. Most commonly identified outdoor fungus. The outdoor numbers are reduced in the winter. The numbers are often high in the summer. Often found indoors in numbers less than outdoor numbers. It is a common allergen. Indoor *Cladosporium* sp. may be different than the species identified outdoors. It is commonly found on the surface of fiberglass duct liners in the interior of supply ducts. A wide variety of plants are food sources for this fungus. It is found on dead plants, woody plants, food, straw, soil, paint, and textiles. Produces greater than 10 antigens. Antigens in commercial extracts are of variable quality and may degrade within weeks of preparation. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include skin lesions, eye ulceration, mycosis (including onychomycosis, an infection of the nails of the feet or hands) edema and bronchospasms; chronic cases may develop pulmonary emphysema.

Curvularia sp.

Reported to be allergenic and has been associated with allergic fungal sinusitis. It may cause corneal infections, mycetoma, and infections in immune compromised hosts.

Dreschlera sp.

Conidia dimensions: 40-120 x 17-28 microns. Found on grasses, grains and decaying food. It can occasionally cause a corneal infection of the eye.

Epicoccum sp.

Conidia dimensions: 15-25 microns. A common allergen. It is found in plants, soil, grains, textiles and paper products.

Fusarium sp.

Aw 0.90. A common soil fungus. It is found on a wide range of plants. It is often found in humidifiers. Several species in this genus can produce potent trichothecene toxins. The trichothecene (scirpene) toxin targets the following systems: circulatory, alimentary, skin, and nervous. Produces vomitoxin on grains during unusually damp growing conditions. Symptoms may occur either through ingestion of contaminated grains or possibly inhalation of spores. The genera can produce hemorrhagic syndrome in humans (alimentary toxic aleukia). This is characterized by nausea, vomiting, diarrhea, dermatitis, and extensive internal bleeding. Reported to be allergenic. Frequently involved in eye, skin, and nail infections.

Myxomycetes

Members of a group of fungi that is included in the category of "slime molds". They're occasionally found indoors, but mainly reside in forested regions on decaying logs, stumps, and dead leaves. Myxomycetes display characteristics of fungi *and* protozoans. In favorable (wet) conditions they exhibit motile, amoeba-like cells, usually bounded only by a plasma membrane, that are variable in size and form. During dry spells, they form a resting body (sclerotium) with dry, airborne spores. These fungi are not known to produce toxins but can cause hay fever and asthma.

Memnoniella

Contaminant found most often with *Stachybotrys* on wet cellulose. Forms in chains, but it are very similar to *Stachybotrys* and sometimes is considered to be in the *Stachybotrys* family. Certain species do produce toxins very similar to the ones produced by *Stachybotrys chartarum* and many consider the IAQ importance of *Memnoniella* to be on par with *Stachybotrys*. Allergenic and infectious properties are not well studied.

Nigrospora sp.

Commonly found in warm climates, this mold may be responsible for allergic reactions such as hay fever and asthma. It is found on decaying plant material and in the soil. It is not often found indoors.

Oidium sp.

The asexual phase of *Erysiphe* sp. It is a plant pathogen causing powdery mildews. It is very common on the leaf's stems, and flowers of plants. The health effects and allergenicity have not been studied. It does not grow on non-living surfaces such as wood or drywall.

Penicillium sp.

Aw 0.78 - 0.88. A wide number of organisms have been placed in this genus. Identification to species is difficult. Often found in aerosol samples. Commonly found in soil, food, cellulose and grains. It is also found in paint and compost piles. It may cause hypersensitivity pneumonitis, allergic alveolitis in susceptible individuals. It is reported to be allergenic (skin). It is commonly found in carpet, wallpaper, and in interior fiberglass duct insulation. Some species can produce mycotoxins. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include edema and bronchospasms; chronic cases may develop pulmonary emphysema. It may also cause headaches, vomiting, and diarrhea.

Periconia sp.

Periconia sp. are found in soil, blackened and dead herbaceous stems leaf spots, grasses, rushes, and sedges. Almost always associated with other fungi. Rarely found growing indoors. Reportedly associated with a rare case of mycotic keratitis.

Pithomyces sp.

A common mold found on dead leaves, plants, soil and especially grasses. Causes facial eczema in ruminants. It exhibits distinctive multi-celled brown conidia. It is not known to be a human allergen or pathogen. It is rarely found indoors, although it can grow on paper.

Rusts/Smuts

These fungi are associated with plant diseases. In the classification scheme of the fungi, the smuts have much in common with the rusts, and they are frequently discussed together. Both groups produce wind-borne, resistant teliospores that serve as the basis for their classification and their means of spread. Rusts usually attack vegetative regions (i.e., leaves and stems) of plants; smuts usually are associated with the reproductive structures (seeds). They can cause hay fever and asthma.

Spegazzinia

Spegazzinia species comprise a very small proportion of the fungal biota. This genus is somewhat related to other lobed or ornamented genera such as *Candelabrum*. No information is available regarding health effects or toxicity. Allergenicity has not been studied. Usually identified on spore trap samples where it is seen every few weeks. (Spores have very distinctive morphology.) May also be found in air by culturable (Andersen) samples if a long enough incubation period is provided so that sporulation occurs. Our laboratory has never found this organism growing on indoor environmental surfaces. Natural habitat includes soil and many kinds of trees and plants.

Stachybotrys sp.

Aw - 0.94, optimum Aw ->0.98. Several strains of this fungus (*S. atra, S. chartarum* and *S. alternans* are synonymous) may produce a trichothecene mycotoxin- Satratoxin H - which is poisonous by inhalation. The toxins are present on the fungal spores. This is a slow growing fungus on media. It does not compete well with other rapidly growing fungi. The dark colored fungus grows on building material with high cellulose content and low nitrogen content. Areas with a relative humidity above 55%, and are subject to temperature fluctuations, are ideal for toxin production. Individuals with chronic exposure to the toxin produced by this fungus reported cold and flu symptoms, sore throats, diarrhea, headaches, fatigue, dermatitis, intermittent local hair loss and generalized malaise. Other symptoms include coughs, rhinitis, nosebleed, a burning sensation in the nasal passages, throat, and lungs, and fever. The toxins produced by this fungus will suppress the immune system affecting the lymphoid tissue and the bone marrow. Animals injected with the toxin from this fungus exhibited the following symptoms: necrosis and hemorrhage within the brain, thymus, spleen, intestine, lung, heart, lymph node, liver, and kidney. Affects by absorption of the toxin in the human lung are known as pneumomycosis.

This organism is rarely found in outdoor samples. It is usually difficult to find in indoor air samples unless it is physically disturbed (or possibly -this is speculation- a drop in the relative humidity). The spores are in a gelatinous mass. Appropriate media for the growth of this organism will have high cellulose content and low nitrogen content. The spores will die readily after release. The dead spores are still allergenic and toxigenic. Percutaneous absorption has caused mild symptoms.

Stemphylium sp.

Reported to be allergenic. Isolated from dead plants and cellulose materials.

Torula sp.

Found outdoors in air, soil, on dead vegetation, wood, and grasses. Also found indoors on cellulose materials. Reported to be allergenic and may cause hay fever and asthma.

Tetraploa

Tetraploa species comprise a very small proportion of the fungal biota. This genus is somewhat related to *Triposporium* and Diplocladiella. The only reported human infections are two cases of keratitis (1970, 1980) and one case of subcutaneous infection of the knee (1990). No information is available regarding other health effects or toxicity. Allergenicity has not been studied. Usually identified on spore trap samples where it is seen every few weeks. (Spores have very distinctive morphology.) Our laboratory has never found this organism growing on indoor environmental surfaces. Natural habitat includes leaf bases and stems just above the soil on many kinds of plants and trees.

Ulocladium sp.

Aw 0.89. Isolated from dead plants and cellulose materials. Found on textiles.

Zygomycetes

Zygomycetes are one of the four major groups of fungi, the others being the Oomycetes, the Ascomycetes, and the Basidiomycetes. Zygomycetes are common, fast growing, and often overgrow and/or inhibit other fungi nearby. Rhizopus and Mucor are two of the most common Zygomycetes seen in the indoor environment. However, others are seen as well, including *Syncephalastrum*, *Circinella*, *Mortierella*, *Mycotypha*, *Cunninghamella*, and *Choanephora*. For further information, please see descriptions of these individual genera.

The following table lists mycotoxins that are produced by certain types of fungi:

Fungi	Mycotoxin
Acremonium crotocinigenum	Crotocin
Aspergillus favus	Alfatoxin B, cyclopiazonic acid
Aspergillus fumigatus	Fumagilin, gliotoxin
Aspergillus carneus	Critrinin
Aspergillus clavatus	Cytochalasin, patulin
Aspergillus Parasiticus	Alfatoxin B
Aspergillus nomius	Alfatoxin B
Aspergillus niger	Ochratoxin A, malformin, oxalicacid
Acremonium crotocinigenum	Crotocin
Aspergillus nidulans	Sterigmatocystin
Aspergillus ochraceus	Ochratoxin A, penicillic acid
Aspergillus versicolor	Sterigmatocystin, 5 ethoxysterigmatocystin
Aspergillus ustus	Ausdiol, austamide, austocystin,brevianamide
Aspergillus terreus	Citreoviridin
Alternaria	Alternariol, altertoxin, altenuene, altenusin, tenuazonic acid
Arthrinium	Nitropropionic acid
Bioploaris	Cytochalasin, sporidesmin, sterigmatocystin
Chaetomium	Chaetoglobosin A,B,C. Sterigmatocystin
Cladosporium	Cladosporic acid
Clavipes purpurea	Ergotism
Cylindrocorpon	Trichothecene
Diplodia	Diplodiatoxin
Fusarium	Trichothecene, zearalenone
Fusarium moniliforme	Fumonisins
Emericella nidulans	Sterigmatocystin
Gliocladium	Gliotoxin
Memnoniella	Griseofulvin , dechlorogriseofulvin, epi-decholorgriseofulvin, trichodermin, trichodermol
Myrothecium	Trichothecene
Paecilomyces	Patulin, viriditoxin
Penicillium aurantiocandidum	Penicillic acid
Penicillium aurantiogriseum	Penicillic acid
Penicillium brasilanum	Penicillic acid
Penicillium brevicompactum	Mycophenolic acid
Penicillium camemberti	Cyclopiazonic acid
Penicillium carneum	Mycophenolic acid, Roquefortine C
Penicillium crateriforme	Rubratoxin

Fungi	Mycotoxin
Penicillium citrinum	Citrinin
Penicillium commune	Cyclopiazonic acid
Penicillium crustosum	Roquefortine C
Penicillium chrysogenum	Roquefortine C
Penicillium discolor	Chaetoglobosin C
Penicillium expansum	Citrinin, Roquefortine C
Penicillium griseofulvum	Roquefortine C, cyclopiazonic acid, griseofulvin
Penicillium hirsutum	Roquefortine C
Penicillium hordei	Roquefortine C
Penicillium nordicum	Ochratoxin A
Penicillium paneum	Roquefortine C
Penicillium palitans	Cyclopiazonic acid
Penicillium polonicum	Penicillic acid
Penicillum roqueforti	Roquefortine C, Mycophenolic acid
Penicillium veridicatum	Penicillic acid
Penicillium verrucosum	Citrinin, ochratoxin A
Penicillium/ Aspergillus	Patulin
Penicillium/ Aspergillus/Alternaria	Glitoxin
Phomopsis	Macrocyclic trichothecenes
Phoma	Brefeldin, cytochalasin, secalonic acid, tenuazonic acid
Pithomyces	Sporidesmin
Rhizoctonia	Slaframine
Rhizopus	Rhizonin
Sclerotinia	Furanocoumarins
Stachybotrys chartarum	Iso-satratoxin F, roridin E, L-2, satratoxin G & H, trichodermin, trichodermol, trichothecene
Torula	Cytotoxins
Trichoderma	Trichodermin, trichodermol, gliotoxin
Trichothecium	Trichothecene
Wallemia	Walleminol
Zygosporium	Cytochalasin

General terms

Allergen

An allergen is a substance that elicits an IgE antibody response and is responsible for producing allergic reactions. Chemicals are released when IgE on certain cells contact an allergen. These chemicals can cause injury to surrounding tissue - the visible signs of an allergy. Only a few fungal allergens have been characterized but all fungi are thought to be potentially allergenic. Fungal allergens are proteins found in either the mycelium or spores

"Black mold"

A poorly defined term. Black mold or toxic black mold has usually been associated with the mold *Stachybotrys chartarum*. While there are only a few molds that are truly black, there are many that can appear black. Not all molds that appear to be black are *Stachybotrys*.

Fungi

Fungi are neither animals nor plants and are classified in a kingdom of their own. The Kingdom of Fungi. Fungi include a very large group of organisms, including molds, yeasts, mushrooms and puffballs. There are >100,000 accepted fungal species but current estimates range to 1.5 million species. Mycologists (people who study fungi) have grouped fungi into four large groups according to their method of reproduction.

Hidden mold

This refers to visible mold growth on building structures that is not easily seen, including the areas above drop ceilings, within a wall cavity (the space between the inner and outer structure of a wall), inside air handlers, or within the ducting of a heating/ventilation system.

Microbial Volatile Organic Compounds (MVOCs)

Fungi produce chemicals as a result of their metabolism. Some of these chemicals, MVOCs, are responsible for the characteristic moldy, musty, or earthy smell of fungi, whether mushrooms or molds. Some MVOCs are considered offensive or annoying. Specific MVOCs are thought to be characteristic of wood rot and mold growth on building materials. The human nose is very sensitive to mold odors and sometimes more so than current analytical instruments.

Mold

Molds are a group of organisms that belong to the Kingdom of Fungi (see Fungi). Even though the terms mold and fungi had been commonly referred to interchangeably, all molds are fungi, but not all fungi are molds.

Mycotoxin

Mycotoxins are compounds produced by some fungi that are toxic to humans or animals. By convention, the term? Mycotoxin. Excludes mushroom toxins. Fungi that produce mycotoxins are called "toxigenic fungi."

Spore

General term for a reproductive structure in fungi, bacteria and some plants. In fungi, the spore is the structure which may be used for dissemination and may be resistant to adverse environmental conditions.

Toxic mold

The term "toxic mold" has no scientific meaning since the mold itself is not toxic. The metabolic byproducts of some molds may be toxic (see mycotoxin).

Hypha (plural, hyphae)

An individual fungal thread or filament of connected cells; the thread that represents the individual parts of the fungal body.

Phoenix EnviroCorp

MOLD/BIOLOGICAL CONTAMINANT REMEDIATION PROTOCOL

Date: June 30, 2021

For: Quanesha Mullins
Wilmington Housing Authority
1524 S. 16th Street
Wilmington, NC 28401

Remediation Contractor: Not determined

On-Site Consultant: Phoenix EnviroCorp (PEC)
4020 Shipyard Boulevard
Wilmington, NC 28403
(910) 397-0370

Approved Signatory:

Tommie Green, CIEC
Professional Industrial Hygienist

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SECTION 1.0 REMEDIATION PROCEDURES

1.1 Project Set Up

- The owner or powers that be shall supply temporary power for remediation equipment. The existing electrical system may be utilized, with permission of the owner or powers that be. Determining specific electrical load/safety requirements, including, but not limited to, the use of a temporary GFCI electrical panel box shall be the responsibility of the abatement contractor.
- HVAC system shall be isolated.
- 6-mil polyethylene sheathing shall be erected to separate primary control areas (PCA) from remaining areas. Control areas shall be selected so that specified building materials (specified herein, in section 1.3, under primary control areas) may be removed or cleaned and dried.
- HEPA Air Filtration Devices shall be utilized for each separate control area. Critical barriers shall consist of 6-mil polyethylene so that primary control areas are isolated from remaining areas. HEPA filtration units shall be exhausted from the PCA to the outside of the building through windows/doors. Dehumidification units must be installed in the PCA to sufficiently dry components.
- A remote wash off station shall be set up to allow for employees to wash hands and faces after egress from the work area.
- Ingress/Egress to the control area(s) shall be, at minimum, sealed with a 2-way polyethylene air lock.
- Entrances to the building shall be marked as indicated in Section 7.4 of this document.

1.2 Local Exhaust System

- Once sealed, the primary control area shall be ventilated with a local HEPA air filtration device that shall ensure a minimum of four (4) air changes per hour. The air filtration device shall be placed within the containment work area.
- Local HEPA exhaust shall be utilized where cleaning of contents is required and/or in the immediate vicinity of remediation activities of building materials.
- In interior sections requiring surface area cleaning, local HEPA filtration may be exhausted within the area to scrub microbials from ambient air. This process shall only be conducted after fine cleaning has been completed.
- Negative pressure within the contained work area shall be maintained throughout the project until clearance is obtained.
- Negative air machines shall be exhausted to exterior portions of the building to adequately ensure that negative pressure is achieved.
- Negative air pressure within the work area shall be tested and recorded at initiation of the project and hourly thereafter by use of a manometer to ensure the desired pressure of -0.02 inches of water, which is comparable to four changes per hour.
- Dehumidification devices with HEPA filtration may be incorporated as filtration devices in conjunction with true HEPA filtration devices; they may not replace the true HEPA filtration devices.

Note: Formula for determination of adequate HEPA filtration:

Total feet per minute =Volume of work area (ft^3)/15 minutes
#AFD Units needed = (Total feet per minute)/Capacity of Unit (ft^3)

- At initiation of final cleaning stages, relative humidity shall be at 40% (+/-3%) and moisture content of wooden components shall be at or below 15% as determined by Delmhorst moisture meter or equivalent meter. Moisture mapping and direct read T/RH shall be recorded by the remediation contractor until the

specified levels have been achieved. Control areas shall be dehumidified during cleaning and mold remediation activities to ensure removal of surface moisture created during application of water. Drying of structural components that have been treated with encapsulating anti-microbial agents will be necessary.

- Moisture levels shall be recorded and documented by the remediation contractor upon successful completion of dehumidification.

1.3 Remediation Specifications

- Prior to commencement of mold remediation activities by the remediation contractor, the source of any water intrusions, leaks, and/or moisture/humidity problems shall be remedied by the owner. If water intrusions, leaks, and/or moisture/humidity problems exist and are not corrected, mold growth can be expected to return.
- All remediation procedures listed that involve the removal of building materials shall employ polyethylene critical barriers, negative air pressure, and HEPA filtration (i.e., primary control areas).
- The remediation contractor shall ensure that the filters are properly capped prior to switching off the air scrubbers. If the filters are not properly capped, the backflow can cause mold spores to re-release back into the control area, essentially re-contaminating an area that has already been cleaned.
- All remediation activities shall be conducted in a manner that does not allow dissemination of mold spores. Remediation procedures shall begin from the side of the control area furthest away from air filtration devices.
- Cleaning procedures shall be repeated until the area is visibly free of dust and debris.
- Engineering controls set up during the remediation process shall remain in place until remediation has been completed and acceptable post remediation sampling results have been achieved.
- **Federal and/or state regulations require that suspect asbestos containing materials in public and commercial buildings shall be inspected for asbestos prior to renovations or demolition. Based on these regulations, PEC recommends that building materials that may be disturbed during mold remediation be tested for asbestos content prior to their disturbance to prevent asbestos contamination.**
- If cleaning procedures outlined in this remediation plan outweigh the cost of replacement for selected items, the remediation contractor shall give the owner the option to clean or dispose of those items.
- Reinstallation of building materials and/or components shall only be conducted once acceptable post remediation results are obtained.
- Any chemicals used on this project shall be EPA approved and used only as directed by the manufacturer. MSDS shall be available for review upon request.

HVAC System

- The HVAC system(s) that services or run through the primary control area/affected area shall be shut down prior to remediation activities.
- The spaces that are normally climate-controlled by the HVAC system that have been shut down shall be maintained under proper humidity levels (between 30 and 60% utilizing dehumidifiers, etc.) while the system is not in operation.
- All HVAC supply/return vents within the primary control area/affected area shall be isolated with a critical barrier (i.e., plastic, etc.) to prevent air flow. Prior to isolating the vents, the register covers (diffusers) shall be removed, and the supply shall be isolated at the metal boot. Once isolated, the registers and surrounding building materials shall be cleaned.
- The interior of the air handler, rigid duct system, intake box, etc. shall be thoroughly cleaned by an HVAC professional experienced in mold remediation. The interior can be cleaned with mechanical methods that aggressively disturb all interior surfaces and filter the disturbed airborne particulates.

- Cleaning of components shall consist of a method that thoroughly removes visible mold growth, settled concentrations of mold spores, and/or dust and debris.
- PEC recommends the removal and disposal of the flex ducts when feasible, as well as any interior duct board where cleaning will damage the duct board. Once removed, the remediation contractor shall isolate the connection point where the flex duct and/or duct board was detached with a critical barrier (such as plastic, etc.) to prevent air flow.
- Once the HVAC system components are cleaned or replaced anew, the system shall remain off and isolated until acceptable post remediation results are obtained.
- A written document shall be obtained from the remediation contractor verifying that the HVAC system has been cleaned by an HVAC cleaning company with mold experience. This document shall include the property address and date of services and shall be filed with other mold remediation documents.

Note: For directional purposes "front" is determined by facing the playground from inside the unit, unless otherwise noted.

Primary Control Areas/Affected Areas

Critical barriers, negative air pressure, and HEPA filtration shall be established to isolate the following areas as Primary Control Areas to perform the specified mold remediation.

Within the bathroom:

- Detach the floor mounted cabinet (with sink) from the front wall, and discard water damaged components (i.e., cabinet floor, etc.).
- Remove all baseboards from the front and left walls (approximately 4 feet total).
- Assess the drywall uncovered by the removal of specified cabinet and baseboards, and remove any affected drywall (i.e., drywall with apparent water damage/suspect visible mold growth) and extend the drywall removal within a 2-foot radius of any affected areas when possible.
- Remove any loose floor tiles.

Within the kitchen:

- Detach the floor mounted cabinets along the left wall associated with the sink, and discard water damaged components (i.e., cabinet floor, etc.).
- Assess the drywall uncovered by the removal of specified cabinet and remove any affected drywall (i.e., drywall with suspect visible mold growth/apparent water damage) and extend the drywall removal within a 2-foot radius of any affected areas when possible.
- Clean the interior and exterior of the refrigerator.
- Remove any loose floor tiles.

Throughout the unit (Negative air pressure is not required in areas where building components are not specified for removal, but HEPA filtration is required):

- Preclean (i.e., HEPA vacuum, etc.) all exposed surfaces of contents and remove all contents from the containment area prior to commencement of other specified remediation. If elected, the contents can be precleaned and stored in the containment, but shall be protected (i.e., covered with poly, etc.) to avoid cross contamination of contents.
- Clean all remaining surfaces throughout the unit as specified below under general specifications for primary control areas; paying special attention to horizontal areas where dust/mold spores can settle (i.e., floors, baseboards, tops of trim boards, etc.).

General Specifications for Primary Control Areas

- Open plumbing lines and drains within the control areas shall be isolated with a critical barrier consisting of 6-mil poly.
- The water line to toilets within the control areas shall be shut off and the toilets shall be isolated with a critical barrier consisting of 6-mil poly.
- Cleaning of components/materials shall consist of a method that thoroughly removes visible mold growth, settled concentrations of mold spores, and/or dust and debris (i.e., HEPA vacuuming, wet wiping, or other approved methods), followed by dehumidification/drying.
- Exterior surfaces of electrical appliances, electrical equipment, and light fixtures shall be cleaned, utilizing wet method and HEPA vacuuming. These items shall be disconnected from all electrical sources prior to cleaning. If these items cannot be cleaned efficiently, the abatement contractor shall consult with the owner/powers that be.
- All wall cavity insulation shall be disposed in areas that specify the removal of drywall/wallboard. The abatement contractor shall visually inspect the back side of surrounding drywall/wallboard for water damage and/or suspect mold growth and document any findings. If additional suspect mold growth or water damage is observed beyond the specified removal area, additional drywall/wallboard shall be removed until no suspect mold growth or water damage is observed.
- All penetrations within the controlled area that adjoin unaffected or non-accessible areas, including outdoor areas, crawlspaces, etc., shall be cleaned (as far as one can reach) and then sealed with 6-mil poly, extending six (6) inches on all sides.
- In areas of specified wallboard removal, all components within the wall cavities shall be cleaned. Any wooden structural components with mold stains or mold growth in pitted surfaces shall be HEPA sanded (or other approved methods) to eliminate embedded mold growth.
- All joints or sills (where the structural system meets, where the sill plate meets the floor, etc.) shall be aggressively disturbed to remove embedded mold growth and spores.

1.4 Removal Procedures

The contractor shall maintain surfaces of the control area free of accumulation of dust and debris. Additionally, they shall restrict the spread of dust and debris, keeping waste from being distributed over the work area. Materials shall be removed in a fashion to ensure that previously cleaned areas are not recontaminated (i.e. working from one end of the control area to the other). The contractor may be required to re-clean areas based on a visual inspection by the CIEC/CIE/IH, if the areas are not visibly clean.

Contaminated building materials that have been removed, and additional materials and debris generated during remediation, shall be bagged or wrapped with 6-mil polyethylene sheeting, sealed with duct tape, and carried to the waste container prior to visual inspection by the CIEC/CIE/IH. Materials shall be bagged and sealed directly after removal from unaffected building components.

Areas shall be allowed to dry for a period until specified RH and moisture levels have been achieved. Any remaining building products that are directly impacted by remediation shall be tested for moisture content. Wooden and cellulosic building components (e.g., wall studs, drywall, etc.) shall be tested for moisture content. If the moisture content is > 15% in wood products or > 12% in cellulosic products (utilizing a Delmhorst moisture meter), dehumidification shall be required until moisture levels are at or below said levels, and the RH level is at or below 40% +/-3% (for all interior areas). The remediation contractor shall verify water content of all wooden and cellulosic building components within the impacted areas, as well as temperature and RH prior to scheduling post remediation verification.

1.5 Cleanup Overview

The contractor shall personally review the cleaning process prior to contacting the CIEC/CIE/IH for the post remediation testing. If accumulations of debris and dust are significant, the CIEC/CIE/IH will require re-

cleaning prior to post remediation verification sampling.

The CIEC/CIE/IH shall make a visual inspection and conduct post remediation sampling after the final cleaning is complete.

1.6 Post Remediation Verification Testing

Prior to conducting post remediation sampling, HEPA filtration devices shall be allowed to operate for a minimum of 48 hours (the equivalent of 192 air changes), following fine cleaning, in all areas where remediation has been conducted. The HEPA filtration devices shall be sealed at the intake and turned off approximately two hours prior to post testing and reconvene within one hour after post testing, until acceptable post remediation results are established.

Post remediation sampling shall be conducted utilizing viable and/or non-viable sample methods. Air samples shall be collected in representative areas of the control areas. Surface sampling may be conducted at the discretion of the CIEC/CIE/IH.

Sampling shall be conducted in areas directly impacted by remediation procedures, where cleaning was conducted. The CIEC/CIE/IH shall determine acceptable post remediation status through interpretation of air sampling results, which will be based on indoor/outdoor comparisons, in combination with any surface samples collected, moisture readings, RH readings, visual observations, and any other pertinent information.

The owner/client will be responsible for post remediation testing. If air sample results indicate unacceptable airborne concentrations, the contractor shall be required to conduct a re-cleaning at the contractor's expense and absorb the cost for re-testing, until acceptable results are achieved.

SECTION 2.0 SCOPE OF WORK (Note: Section 2 and Section 1.3 are essential to the full Scope of the Contractor's Work)

2.1 Investigative Reports and Other Related Documents

Phoenix EnviroCorp investigative report dated June 8, 2021, and June 30, 2021.

Phoenix EnviroCorp Chain of Custody dated June 3, 2021.

Analytical reports dated June 4, 2021.

2.2 Project Description

The procedures covered by this program include the enclosure and drying of the said structure, the removal, handling, and disposal of building components compromised by mold/fungal growth, and the cleaning and disinfecting of existing building materials. Procedures for reconstruction are not considered in these specifications. Reconstruction of interior portions may not be conducted until procedures for remediation have been completed, the control areas have been inspected, and testing has returned acceptable post remediation results. Reconstruction of exterior portions may be conducted during the restoration to ensure that water intrusion is abated.

The objectives covered by the program include the remediation of materials shown to have surface contamination, water damage, and/or exposure to elevated airborne mold spore levels, without subjecting the workers, installation employees, and occupants to microbial contaminants. In addition, contract employees, occupants, and materials will be appropriately protected during the removal process so that present and future

exposures will not occur.

This protocol is provided as a guideline. Any deviation requests from this protocol shall be addressed to the CIEC/CIE/IH for consideration. At present there are no Federal or State requirements regarding microbial remediation projects; however, OSHA General Construction Code of Federal Regulations (29 CFR 1926) shall be followed.

Remediation shall be completed as close to the date that this protocol was drafted, as the specifications outlined within represent conditions at the time the investigative services were conducted. Due to the volatility of mold, the current protocol may not reflect all necessary remediation if conditions are allowed to continue. Further, if time lapses allowing conditions to change, it will become increasingly difficult to obtain successful clearance testing results.

SECTION 3.0 AIR MONITORING

3.1 Responsibilities of the CIEC/CIE/IH

Monitoring of airborne concentrations will be performed in accordance with the requirements of this program. Prior to conducting air sampling and/or surface sampling for clearances, the CIEC/CIE/IH shall conduct a visual inspection of the area. Temperature and RH shall be recorded during the air sampling phase of clearance. All air sampling shall be conducted in such a manner as to provide a valid representation of airborne mold levels both inside and outside the work areas. If analysis of air samples indicates that airborne concentrations exceed acceptable limits, the contractor shall conduct re-cleaning at the contractor's expense.

3.2 Personal Monitoring

No personal monitoring will be conducted by the CIEC/CIE/IH unless the remediation contractor requests monitoring for OSHA compliance. Presently there are no guidelines (PELs or TLVs) for microbial contaminants. It is the remediation contractor's responsibility to determine if OSHA personal sampling may be required during application of anti-microbial agents.

3.3 Sample Integrity and Reporting

Samples shall be sealed, labeled, and a chain of custody initiated according to laboratory procedures.

Sample results shall be available within seven (7) days of the completion of collection of all samples and will include the following information:

- Site Address
- Sample Number
- Location Sampled
- Analytical Method
- Collection Date(s)
- Person Taking Sample(s)
- Additional Comments (if any)
- Analyst Signature

SECTION 4.0 MATERIAL REPLACEMENT

4.1 Material Replacement

The general contractor/replacement contractor may begin material replacement after the CIEC/CIE/IH informs all parties of acceptable post remediation sample results.

With ongoing construction activities ambient air levels are expected to be elevated over what might be normally expected. Additional testing should not be necessary after remediation procedures have been completed and successful results have been obtained. In the event of another water intrusion (i.e. broken-pipe-line, improper HVAC function, or building envelope compromise), an investigation shall be conducted within 24 to 48 hours of the event. Proper drying, if initiated within this time frame, should minimize the potential for microbial growth.

SECTION 5.0 SPILL CLEANUP REQUIREMENTS

5.1 Spills

MSDS shall be kept on site for all chemical products brought to the site by the remediation contractor. In the event of a chemical spill, the contractor shall initiate cleanup immediately. The contractor shall mop up any liquid with rags or other conventional absorbent. The spent absorbent shall be properly contained and disposed of as waste.

SECTION 6.0 WASTE CONTROL

6.1 Waste Disposal

Waste shall be disposed of at a locally selected landfill. Waste bags shall be checked for integrity and hauled in an enclosed truck/vehicle or container to ensure that transportation to the landfill does not pose a potential hazard to the environment.

SECTION 7.0 SUPPLEMENTAL INFORMATION

7.1 Applicable Publications

The publications listed below form part of this program. Written programs shall accompany all referenced CFR publications. IICRC and NYCDOH guidelines for work procedures shall be followed by the remediation contractor. A copy of the NYCDOH protocols shall be on-site, along with this design, for reference by the site supervisor. ACGIH, IAQA, and ASHRAE publications shall be utilized as guidelines for interpretation by the CIEC/CIE/IH. This design shall be reviewed by the remediation supervisor prior to initiation of set-up for the project. Any questions regarding this project may be addressed with the on-site consultant listed for Phoenix EnviroCorp.

Code of Federal Regulation (CFR Publications)

29 CFR 1910.134	Respiratory Protection
29 CFR 1910.145	Specifications for Accident Prevention, Signs and Tags
29 CFR 1926.28	Personal Protective Equipment
29 CFR 1926.59	Hazard Communication
29 CFR 1926.96	Occupational Foot Protection
29 CFR 1926.100	Head Protection
29 CFR 1926.101	Hearing Protection
29 CFR 1926.102	Eye and Face Protection

29 CFR 1926.403	Electrical General Requirements
29 CFR 1926.416	Safety General Requirements
29 CFR 1926.852	Demolition, Chutes
29 CFR 1926.1091	Record Keeping Requirements

Supplemental Guidelines

IICRC S520 2nd ed.	Standard and Reference Guide for Professional Water Damage Restoration
NYCDOH	Guidelines on Assessment and Remediation of Fungi in Indoor Environments
ACGIH	Bioaerosols: Assessment and Control
IAQA 01-2000	Recommended Guidelines for Indoor Environments
ASHRAE 62.2-2007	Ventilation for Acceptable Indoor Air Quality in Low-Rise Residential Buildings

7.2 Definitions

Air Lock: A system that permits ingress and egress between a control area and non-control area, or other work areas, without allowing air movement between areas (e.g., three stage decon, three-way polyethylene flaps).

Air Sample: Refers to samples collected with spore trap air sample media (e.g., Micro-5, Cyclex D, or equivalent); also referred to as a non-viable air sample. May also refer to a sample collected on a disposable petri dish with Agar media by means of an Andersen Impactor (or equivalent) and sampling pump; also referred to as air culture (viable) sample. Sample media to be used in project is described under Section 1.6 (Post Remediation Verification Testing).

Area Monitoring: The sampling of airborne microbial concentrations outside the exclusion boundary, which may reach the breathing zone of the contractor or installation employees.

Asbestos Containing Materials (ACM): Refers to asbestos containing building materials that contain more than 1% asbestos by Polarized Light Microscopy (PLM) or Transmission Electron Microscopy (TEM).

Biocide: Refers to chemical agents that are specifically designed to eliminate viable microbial contamination, with a phenol equivalent efficiency (e.g., Sodium Hypochlorite, Quaternary Ammonia Compounds).

Blower Door Test: Refers to the testing of static pressure and draw of air through the HVAC in cubic feet per minute (CFM) to rate the efficiency of the system.

Clearance Monitoring: Refers to air, bulk, or swab sampling conducted as a means to demonstrate that the area specified for remediation has been completed by the contractor, left with present acceptable mold spore levels, and ready for re-construction.

Control Area: The area where microbial contaminants removal is performed, which is isolated by physical boundaries to prevent unauthorized entry of personnel, thereby preventing exposure to or the spread of microbial contaminants. Physical boundaries will be established and located such that the airborne contaminants are not allowed to escape the boundaries.

HEPA: High Efficiency Particulate Air. Refers to ventilation devices that are specifically designed to filter ambient air to an efficiency of 99.97%.

HVAC: Refers to the Heating, Ventilation, and Air Conditioning system.

Industrial Hygienist: Refers to a person who practices industrial hygiene and may act as a competent person regarding visual inspection of contaminated surfaces and clearance air and/or swab/bulk sampling. May also refer to a Certified Industrial Hygienist (CIH) as defined by the American Board of Industrial Hygiene (ABIH), a Certified Indoor Environmental Consultant as defined by the American Council for Accredited Certification (ACAC), or a Certified Indoor Environmentalist (CIE) as defined by the American Council for Accredited Certification (ACAC).

Microbial Contaminant: Refers to viable mold, fungi, pollen, bacteria, and or particulate, or their metabolites, that may be causative of epidemiological, immunotoxic, dermotoxic, neurotoxic, or enterotoxic disorders in the human population, or may be considered a pathogen or an opportunistic pathogen.

Non-Porous Materials: Refers to building materials with solid surfaces that may be successfully treated and cleaned by means of HEPA vacuuming or other approved method. Materials include flooring, hard goods, plastic, vinyl, and some wallboard systems.

Porous Materials: Refers to building materials and household goods that may allow microscopic particles (3-20 micron) to become trapped within the material that will not allow adequate cleaning. Materials include carpet, mattresses, and clothing.

Primary Control Area (PCA): Refers to a section of a facility that has been isolated by 6-mil polyethylene barriers where specific engineering controls (e.g., HEPA filtration, negative air pressurization, dehumidification, etc.) are required. In general, it is the area where remediation of water and mold damaged building materials is to be conducted.

Refrigerant Dehumidifier: Device used to remove water content from air and materials.

Relative Humidity (RH): Refers to the ratio of water vapor in the atmosphere to the amount required to saturate it at a given temperature.

Semi-Porous Materials: Refers to materials that may be somewhat porous, yet they may still allow for adequate cleaning. Materials include wooden beams and some wallboard systems.

Swab Sample: Refers to collection of a sample onto a sterile swab for analysis of mold, fungi, and bacteria by viable and/or non-viable analysis.

Tape-Lift Sample: Refers to collection of a sample onto clear scotch tape for analysis by direct microscopic examination (non-viable).

7.3 Quality Assurance

Medical Examinations

Before potential exposure to microbial contaminants, the remediation contractor shall provide workers with a comprehensive medical examination as required by 29 CFR 1910.134 as outlined by the Medical Monitoring Program.

Medical Records

The remediation contractor shall maintain complete and accurate medical records on employees as required by

OSHA and the contractor's Medical Monitoring Program. The contractor may be asked to provide a copy of all medical records for approval by the consultant's representative.

Training

Each employee working on this contract shall be trained prior to the time of initial job assignment in accordance with mold specific and chemical specific training as indicated by the OSHA General Duty Clause and the Hazard Communication Standard. Each employee shall also receive training required by Federal guidelines listed in Section 7.1 of this document and project specifications.

Hazard Communication Program

The remediation contractor has established and implemented a Hazard Communication Program as required by 29 CFR 1910.1200 and may be asked to provide a copy of this written program. Hazard Communication training must include occupational hazards as directly related to working with fungi/mold and contamination of building components by fungal contamination, specific training for chemical hazards associated with biocide usage, and site specific MSDS sheets for commercial detergents and biocides utilized on the job site.

Respiratory Protection Program

The remediation contractor has established a Respiratory Protection Program, which complies with 29 CFR 1910.134. Physical examinations and fit testing are required for use of respiratory protection greater than an N-95 dust mask. Workers removing building materials contaminated by mold growth, applying anti-microbial agents, or workers subjected to exposures to anti-microbial agents shall be required to wear, at minimum, a tight-fitting negative pressure ½ mask respirator with P-100 filters. Therefore, -he OSHA Respiratory Protection Standard applies.

Analytical Testing Laboratory

Analysis of culturable biological samples collected on this project shall be conducted by a laboratory that participates in the Environmental Microbiological Proficiency Analytical Testing Program (EMPAT) of the American Industrial Hygiene Association (AIHA) and has shown to be proficient by proficiency analytical testing (PAT) samples. Analysis of non-viable air and surface samples shall be conducted by a competent person.

7.4 Materials and Equipment

Equipment

The contractor shall make available to employees a complete set of personal protective equipment (PPE) as required by this program for entry into the controlled area. All personnel while in the control area or handling microbial contaminated waste shall wear protective clothing, respirators, and other PPE.

Respirators

Contractor shall furnish the appropriate respirator in accordance with 29 CFR 1910.134 and approved by NIOSH for protection in environments that contain microbial contaminants. The selected respirator for this project shall be a tight-fitting negative pressure ½ respirator equipped with HEPA cartridge (P-95, P-100). At minimum, an N-95 dust mask may be utilized during fine cleaning activities; however, the tight fitting ½ mask respirator shall be utilized during application of anti-microbial agents or biocides.

Special Clothing

Employees shall be provided with and required to wear: whole body disposable protective clothing, full body tyvek suits with head coverings, and latex gloves *(see table)* during all activities in the controlled area.

Chemical	Recommended Rubber Glove
Sodium Hypochlorite	Neoprene or Nitrile
Phenolic Compounds	Neoprene
Quaternary Ammonia Compounds	Polyvinyl Chloride (PVC)
Detergents	Latex

Eye Protection

The contractor shall provide chemical-resistant goggles to personnel engaged in cleaning and treatment activities and require them to be worn during application of anti-microbial agents and biocides.

Warning Signs and Labels

Standard approved warning signs shall be erected at all approaches to the control area as specified in 29 CFR 1910.145.

Anti-Microbial Agents

Anti-microbial agents utilized in interior quarters shall consist of quaternary ammonia compounds. No phenolic compounds shall be used in interior quarters with exception of Micro Ban Plus. Approval must be granted by the owner/powers that be prior to application. Anti-microbial agents shall be EPA approved. Commercial grade detergents shall be used to remove fungal contamination during cleaning phases prior to anti-microbial application, to include encapsulation.

April 30, 2021

Quanesha Mullins
Wilmington Housing Authority
1524 S. 16th Street
Wilmington, NC 28401

RE: PEC Job # 21-21-132-IAQ-M; 302 Grass Lane, Unit 203, Wilmington, NC 28401 – Mold Investigation

Enclosed are the results of the mold investigation conducted at the above referenced unit on April 23, 2021. Phoenix EnviroCorp (PEC) was retained to conduct a mold investigation and provide a mold remediation protocol.

Background Information: The tenant reported mold growth in the bathroom according to the on-site representative during PEC's visit.

This is a one-story unit located on the 2nd floor of a two-story apartment building built on a slab. This unit is fully furnished and without carpet.

The HVAC system was operating in the cool mode set at 70º F upon PEC's arrival and during sampling.

Note: For directional purposes, "front" is determined by facing Grass Lane from inside the unit, unless otherwise stated.

Visual Inspection: PEC's visual inspection noted the following (see enclosed photographic documentation):

- Apparent water damage and suspect visible mold growth within the bathroom cabinet on the front wall

Mold Testing – Surface: A non-viable surface sample was collected from an area of suspect visible mold growth. The quantifications of fungal growth are reported as scattered spores, 21-100 fungal spores = very light (VL), 101-1,000 fungal spores = light (L), 1,001-10,000 fungal spores = moderate (M), > 10,000 fungal spores = heavy (H). The 'General Impressions' of fungal growth are reported as no fungal growth (NFG), fungal growth (FG), minimal fungal growth or growth in vicinity (MFG), and no fungal spores detected (ND). *Clear tape was utilized for the collection of surface samples. Each sample was assigned a unique ID number and shipped to a third-party laboratory for analysis.* Sampling locations and results are as follows:

Location	Result
Within the bathroom cabinet	**M – FG** *Chaetomium*

Mold Testing – Air: Non-viable spore trap air samples were collected to determine airborne mold spore levels. Samples were collected within the kitchen/living room, the bathroom, the rear left bedroom, and the rear right bedroom. *Micro 5 sampling media was utilized for the collection of spore trap air samples. Each sample ran for five (5) minutes at a flow rate of five (5) liters per minute for a*

total volume of twenty-five (25) liters per sample. Each sample was assigned a unique ID number and shipped to a third-party laboratory for analysis. All air samples were collected from centralized locations (within their respective areas) and within the breathing zone, unless otherwise noted. Two samples were also collected outdoors for comparative purposes.

Results indicated acceptable levels of airborne mold spores in all sampled locations.

The interpretation of air sample results is based on indoor/outdoor comparisons, in combination with a study by Daniel M. Baxter, entitled "A Regional Comparison of Mold Spore Concentrations Outdoors and Inside "Clean" and "Mold Contaminated" Southern California Buildings", and other industry guidelines, as well as over 20 years of experience in industrial hygiene and mold testing.

In layman terms, acceptable levels indicate that the levels are below the outdoor level and/or the baseline levels (whichever is higher) stated below. Elevated levels indicate that the levels are above the outdoor level and/or the baseline level.

Baseline levels for indoor spore trap air samples are as follows: < 900 spores/m³ for Penicillium/ Aspergillus; 0 spores/m³ for Stachybotrys and Chaetomium; and < 350 spores/m³ for other individual mold groups.

Moisture Readings: Moisture readings were collected with a Delmhorst moisture meter. Multiple readings were taken to represent areas and materials reported. For wood products, normal moisture content should be less than fifteen percent (<15%).

Moisture content measurements were as follows:
Bathroom

- Wood cabinet and components = ≤ 10%

Relative Humidity (RH): *Temperature and relative humidity readings were collected in the same locations as the spore trap air samples.* RH levels within the residence ranged from 45.0% - 45.6% with an outdoor RH level of 33.0% (see the enclosed Chain of Custody for details). Per the American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) Standard 62-1999, relative humidity should range between 30% and 60%.

Conclusions: Air sampling within the tested areas did not indicate a problem with the indoor air quality regarding mold. However, surface mold growth (*Chaetomium)* was identified within the bathroom cabinet.

A mold remediation protocol that outlines remediation activities is attached.

Prior to commencement of mold remediation, the source of any water intrusions, leaks, and/or moisture/humidity issues shall be remedied. If water intrusions/moisture issues exist and are not remedied, mold can be expected to return.

After remediation activities are completed, but before put-back of removed components, post remediation verification shall be conducted. Upon notice, and for an additional fee, PEC can conduct post remediation verification testing.

Enclosed in this report are the laboratory analysis and the Chain of Custody.

Should you have any questions, please do not hesitate to call.

Thank you,

Shaenaz Mirmohamed
IH Technician

Tommie Green, CIEC
Professional Industrial Hygienist

Enclosures

Photo 1

Apparent water damage and suspect visible mold growth within the bathroom cabinet

Phoenix EnviroCorp
4020 SHIPYARD BLVD.
WILMINGTON, NC 28403

CHAIN OF CUSTODY

LABORATORY TEST REQUEST

Seem1 Ref #2104247015
Lab ID: 054-060

CONTACT: Shaenaz Mirmohamed	TELEPHONE (910) 397-0370 FAX (910) 313-6094	Sample date: 4/23/2021
PEC Job #: 21-21-132-IAQ-M	SITE ADDRESS: 302 Grass Lane, Unit 203, Wilmington, NC 28401	

PLEASE EMAIL RESULTS TO: KMGREEN@PHOENIXENVIROCORP.COM

SAMPLE TYPE:	NUMBER OF SAMPLES:	TURN AROUND TIME SPECIFIED:
Spore Trap - Micro-5	6	____ Immediate ____ 24 hr ____ 48 hr __X__ Standard
Surface Samples	1	

Sample #	Sample Area	Sample Volume	Lab Analysis Requested	% Relative Humidity	Temperature °F
042321-SM-101	Kitchen/living room	25L	S001	45.0	72.2
042321-SM-102	Bathroom	25L	S001	45.2	73.4
042321-SM-103	Rear left bedroom	25L	S001	456.0	72.4
042321-SM-104	Rear right bedroom	25L	S001	45.6	72.5
042321-SM-105	Outside - Front	25L	S001	33.0	71.1
042321-SM-106	Outside - Rear	25L	S001		
042321-SM-107	Within the bathroom sink cabinet	1 cm sq	S001T	NA	NA
	Samples accepted				

Samples Collected By (Printed Name and Signature): Shaenaz Mirmohamed Date Signed: 4/23/2021

CHAIN OF CUSTODY RECORD

DATE:	Time:	Condition of Samples:	RELINQUISHED BY: (Printed Name and Signature)	ACCEPTED BY: (Printed Name and Signature)
4/23/2021	15:30	Intact	Shaenaz Mirmohamed AFFILIATION:	Nelsy AFFILIATION: 4.27.21

SEEML Reference Number: 210427015

Southeast Environmental Microbiology Laboratories
102 Edinburgh Court
Greenville, SC 29607
Phone: (864) 233-3770
FAX: (864) 233-6589

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

- ☒ Surface/Bulk Report
- ☒ Spore Trap Report
- ☐ Andersen Fungal Report
- ☐ Quantitative Fungal Report

Lab Manager Review: *Angel Gosnell* Date: 04/27/21

Thank you for using SEEML laboratories. We strive to provide superior quality and service.
SEEML laboratories are accredited through AIHA-LAP, LLC (EMLAP # 173667) for the analysis of Spore Traps and Surface/Bulk Samples.

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

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

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

Spore Trap Report

	Date Sampled: 04/23/21
Attn: ***Phoenix Enviro Corp.***	Date Received: 04/27/21
4020 Shipyard Blvd.	Date Analyzed: 04/27/21
Wilmington, NC 28403	Date Reported: 04/27/21
	Date Revised:
	Project Name: 21-21-132-IAQ-M
	Project Address: 302 Grass Lane, Unit 203
	Project City, State, ZIP: Wilmington, NC 28401
	SEEML Reference # : 210427015

TEST METHOD: DIRECT MICROSCOPY EXAMINATION SEEML SOP 7

Client Sample ID	042321-SM-101			042321-SM-102			042321-SM-103		
Location	Kitchen / Living Room			Bathroom			Rear Left Bedroom		
Lab Sample ID	210427015-054			210427015-055			210427015-056		
Comments									
Hyphal Fragments	2	80		1	40				
Pollen									
Spore Trap Used	M5			M5			M5		
	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%
Alternaria									
Ascospores	4	160	50	3	120	21	2	80	22
Basidiospores	2	80	25	3	120	21	1	40	11
Bipolaris/Drechslera									
Chaetomium									
Cladosporium	1	40	13	3	120	21	1	40	11
Curvularia				4	160	29	2	80	22
Epicoccum				1	40	7			
Cercospora									
Fusarium									
Memnoniella									
Nigrospora									
Penicillium/Aspergillus	1	40	13				2	80	22
Polythrincium									
Rusts									
Smuts/Periconia/Myxomy									
Spegazzinia									
Stachybotrys									
Stemphylium									
Tetraploa									
Torula							1	40	11
Ulocladium									
Colorless/Other Brown*									
Oidium									
Zygomycetes									
Pithomyces									
Background debris (1-5)**	3			3			3		
Sample Volume(liters)	25			25			25		
TOTAL SPORES/M^3	8	**320**		14	**560**		9	**360**	

Revisions:

Spore types listed without a count or data entry were not detected during the course of the analysis for the respective sample, indicating a raw count of <1 spore.

The analytical sensitivity is the spores/m^3 divided by the raw count, expressed in spores/m^3. The limit of detection is the analytical sensitivity (in spores/m^3) multiplied by the sample volume (in liters) divided by 1000 liters.

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

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

Disclaimer: The sample results are determined by the sample volume, which is provided by the customer.
This report relates only to the samples tested as they were received.

102 Edinburgh Court
Greenville, SC. 29607
Phone: (864) 233-3770

Angel Gosnell

Angel Gosnell, Approved Laboratory Signatory

Spore Trap Report

	Date Sampled: 04/23/21
Attn: ***Phoenix Enviro Corp.***	Date Received: 04/27/21
4020 Shipyard Blvd.	Date Analyzed: 04/27/21
Wilmington, NC 28403	Date Reported: 04/27/21
	Date Revised:
	Project Name: 21-21-132-IAQ-M
	Project Address: 302 Grass Lane, Unit 203
	Project City, State, ZIP: Wilmington, NC 28401
	SEEML Reference # : 210427015

TEST METHOD: DIRECT MICROSCOPY EXAMINATION SEEML SOP 7

Client Sample ID	042321-SM-104			042321-SM-105			042321-SM-106		
Location	Rear Right Bedroom			Outside - Front			Outside - Rear		
Lab Sample ID	210427015-057			210427015-058			210427015-059		
Comments									
Hyphal Fragments	3	120					1	40	
Pollen				5	200		6	240	
Spore Trap Used	M5			M5			M5		
	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%
Alternaria									
Ascospores				30	1200	49	16	640	52
Basidiospores				4	160	7	8	320	26
Bipolaris/Drechslera									
Chaetomium									
Cladosporium	2	80	22	22	880	36	7	280	23
Curvularia									
Epicoccum									
Cercospora									
Fusarium									
Memnoniella									
Nigrospora									
Penicillium/Aspergillus	7	280	78	3	120	5			
Polythrincium									
Rusts									
Smuts/Periconia/Myxomy				2	80	3			
Spegazzinia									
Stachybotrys									
Stemphylium									
Tetraploa									
Torula									
Ulocladium									
Colorless/Other Brown*									
Oidium									
Zygomycetes									
Pithomyces									
Background debris (1-5)**	3			3			3		
Sample Volume(liters)	25			25			25		
TOTAL SPORES/M^3	9	**360**		61	**2440**		31	**1240**	

Revisions:

Spore types listed without a count or data entry were not detected during the course of the analysis for the respective sample, indicating a raw count of <1 spore.

The analytical sensitivity is the spores/m^3 divided by the raw count, expressed in spores/m^3. The limit of detection is the analytical sensitivity (in spores/m^3) multiplied by the sample volume (in liters) divided by 1000 liters.

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

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

Disclaimer: The sample results are determined by the sample volume, which is provided by the customer.
This report relates only to the samples tested as they were received.

102 Edinburgh Court
Greenville, SC. 29607
Phone: (864) 233-3770

Angel Gosnell

Angel Gosnell, Approved Laboratory Signatory

AIHA-LAP, LLC EMLAP #173667 Texas Lic: LAB1016

Surface and Bulk Sample Report

	Date Sampled: 04/23/21
Attn: ***Phoenix Enviro Corp.***	Date Received: 04/27/21
4020 Shipyard Blvd.	Date Analyzed: 04/27/21
Wilmington, NC 28403	Date Reported: 04/27/21
	Date Revised:
	Project Name: 21-21-132-IAQ-M
	Project Address: 302 Grass Lane, Unit 203
	Project City, State ZIP: Wilmington, NC 28401
	SEEML Reference #: 210427015

TEST METHOD: Direct Microscopic Examination (SEEML SOP 18)

Client Sample ID	042321-SM-107			
Location	Within The Bathroom Sink Cabinet			
SEEML Sample ID	210427015-060			
Sample Type	Tape			
	Quantification*			
Hyphal Fragments	**M**			
Pollen				
General Impressions **	**FG**			
Fungal Spore:				
Alternaria				
Acremonium				
Ascospores				
Basidiospores				
Bipolaris/Drechslera				
Cercospora				
Chaetomium	**M**			
Cladosporium				
Curvularia				
Epicoccum				
Fusarium				
Geotrichum sp.				
Memnoniella				
Myxomycetes				
Nigrospora				
Penicillium/Aspergillus				
Pithomyces				
Rusts/Smuts				
Stemphylium				
Tetraploa				
Ulocladium				

**** General Impressions: NFG = No Fungal Growth, FG = Fungal Growth, MFG = Minimal Fungal Growth Or Growth in vicinity**

Quantification of fungal growth is done by semi-quantitative grading using the following ranges:

Scattered Spores, 1-20 fungal spores

VL = 21-100 fungal spores **L = 101-1,000 fungal spores** **M = 1,001-10,000 fungal spores** **H = >10,000 fungal spores**

ND = No Fungal Spores Detected

Disclaimer: This report relates only to the samples tested

Respectfully submitted, SEEML

Angel Gosnell, **Approved Laboratory Signatory**

102 Edinburgh Court
Greenville, SC 29607
Phone: (864) 233- 3770
Fax: (864) 233- 6589

AIHA-LAP, LLC EMLAP # 173667

Texas License: LAB1016

Fungal Descriptions

Alternaria sp.

Aw - 0.89. Conidia dimensions: 18-83 x 7-18 microns. A very common allergen with an IgE mediated response. It is often found in carpets, textiles and on horizontal surfaces in building interiors. Often found on window frames. Outdoors it may be isolated from samples of soil, seeds and plants. It is commonly found in outdoor samples. The large spore size, 20 - 200 microns in length and 7 - 18 microns in sizes, suggests that the spores from these fungi will be deposited in the nose, mouth and upper respiratory tract. It may be related to bakers' asthma. It has been associated with hypersensitivity pneumonitis. The species *Alternaria alternata* can produce tenuazonic acid and other toxic metabolites that may be associated with disease in humans or animals. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include edema and bronchospasms; chronic cases may develop pulmonary emphysema.

Ascospore

A spore borne in a special cell called an ascus. Spores of this type are reported to be allergenic. All ascomycetes, members of a group of fungi called Ascomycotina, have this type of spore. The minute black dots on rotting wood and leaves or the little cups on lichens are examples of ascomycetes; another is the "truffle" mushroom.

Aspergillus/Penicillium

These are two of the most commonly found allergenic fungi in problem buildings. *Aspergillus* comes in many varieties (species). Many of the varieties produce toxic substances. It may be associated with symptoms such as sinusitis, allergic bronchopulmonary aspergillosis, and other allergic symptoms. *Penicillium* is a variety of mold that is very common indoors and is found in increased numbers in problem buildings. It also has many varieties, some of which produce toxic substances. The symptoms are allergic reactions, mucous membrane irritation, headaches, vomiting, and diarrhea. Due to the morphological similarity of *Aspergillus* and *Penicillium*, they are not differentiated by microscopic analysis and are reported together.

Aspergillus sp.

Aw 0.75 - 0.82. Reported to be allergenic. Members of this genus are reported to cause ear infections. Many species produce mycotoxins that may be associated with disease in humans and other animals. Toxin production is dependent on the species or a strain within a species and on the food source for the fungus. Some of these toxins have been found to be carcinogenic in animal species. Several toxins are considered potential human carcinogens. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include edema and bronchospasms; chronic cases may develop pulmonary emphysema; may also be associated with sinusitis, allergic bronchopulmonary aspergillosis, and other allergic symptoms.

Basidiospore

Spore from basidiomycetes. Many varieties are reported to be allergenic.

Bipolaris sp.

A fungus with large spores that could be expected to be deposited in the upper respiratory tract. This fungus can produce the mycotoxin - sterigmatocystin, which has been shown to produce liver and kidney damage when ingested by laboratory animals.

Botrytis sp.

Aw 0.93. Conidia dimensions: 7-14 x 5-9 microns. It is parasitic on plants and soft fruits. Found in soil and on house plants and vegetables, it is also known as "gray mold". It causes leaf rot on grapes, strawberries, lettuce, etc. It is a well-known allergen, producing asthma type symptoms in greenhouse workers and "wine grower's lung".

Cercaspora

Common outdoors in agricultural areas, especially during harvest. Parasite of higher plants, causing leaf spot. Commonly found as parasites on higher plants.

Chaetomium sp.

large ascomycetous fungus producing perithecia. It is found on a variety of substrates containing cellulose, including paper and plant compost. It has been found on paper in sheetrock. It can produce an *Acremonium*-like state on fungal media. Varieties are considered allergenic and have been associated with peritonitis, cutaneous lesions, and system mycosis.

Cladosporium sp.

Aw 0.88; Aw 0.84. Most commonly identified outdoor fungus. The outdoor numbers are reduced in the winter. The numbers are often high in the summer. Often found indoors in numbers less than outdoor numbers. It is a common allergen. Indoor *Cladosporium* sp. may be different than the species identified outdoors. It is commonly found on the surface of fiberglass duct liners in the interior of supply ducts. A wide variety of plants are food sources for this fungus. It is found on dead plants, woody plants, food, straw, soil, paint, and textiles. Produces greater than 10 antigens. Antigens in commercial extracts are of variable quality and may degrade within weeks of preparation. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include skin lesions, eye ulceration, mycosis (including onychomycosis, an infection of the nails of the feet or hands) edema and bronchospasms; chronic cases may develop pulmonary emphysema.

Curvularia sp.

Reported to be allergenic and has been associated with allergic fungal sinusitis. It may cause corneal infections, mycetoma, and infections in immune compromised hosts.

Dreschlera sp.

Conidia dimensions: 40-120 x 17-28 microns. Found on grasses, grains and decaying food. It can occasionally cause a corneal infection of the eye.

Epicoccum sp.

Conidia dimensions: 15-25 microns. A common allergen. It is found in plants, soil, grains, textiles and paper products.

Fusarium sp.

Aw 0.90. A common soil fungus. It is found on a wide range of plants. It is often found in humidifiers. Several species in this genus can produce potent trichothecene toxins. The trichothecene (scirpene) toxin targets the following systems: circulatory, alimentary, skin, and nervous. Produces vomitoxin on grains during unusually damp growing conditions. Symptoms may occur either through ingestion of contaminated grains or possibly inhalation of spores. The genera can produce hemorrhagic syndrome in humans (alimentary toxic aleukia). This is characterized by nausea, vomiting, diarrhea, dermatitis, and extensive internal bleeding. Reported to be allergenic. Frequently involved in eye, skin, and nail infections.

Myxomycetes

Members of a group of fungi that is included in the category of "slime molds". They're occasionally found indoors, but mainly reside in forested regions on decaying logs, stumps, and dead leaves. Myxomycetes display characteristics of fungi *and* protozoans. In favorable (wet) conditions they exhibit motile, amoeba-like cells, usually bounded only by a plasma membrane, that are variable in size and form. During dry spells, they form a resting body (sclerotium) with dry, airborne spores. These fungi are not known to produce toxins but can cause hay fever and asthma.

Memnoniella

Contaminant found most often with *Stachybotrys* on wet cellulose. Forms in chains, but it are very similar to *Stachybotrys* and sometimes is considered to be in the *Stachybotrys* family. Certain species do produce toxins very similar to the ones produced by *Stachybotrys chartarum* and many consider the IAQ importance of *Memnoniella* to be on par with *Stachybotrys*. Allergenic and infectious properties are not well studied.

Nigrospora sp.

Commonly found in warm climates, this mold may be responsible for allergic reactions such as hay fever and asthma. It is found on decaying plant material and in the soil. It is not often found indoors.

Oidium sp.

The asexual phase of *Erysiphe* sp. It is a plant pathogen causing powdery mildews. It is very common on the leaf's stems, and flowers of plants. The health effects and allergenicity have not been studied. It does not grow on non-living surfaces such as wood or drywall.

Penicillium sp.

Aw 0.78 - 0.88. A wide number of organisms have been placed in this genus. Identification to species is difficult. Often found in aerosol samples. Commonly found in soil, food, cellulose and grains. It is also found in paint and compost piles. It may cause hypersensitivity pneumonitis, allergic alveolitis in susceptible individuals. It is reported to be allergenic (skin). It is commonly found in carpet, wallpaper, and in interior fiberglass duct insulation. Some species can produce mycotoxins. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include edema and bronchospasms; chronic cases may develop pulmonary emphysema. It may also cause headaches, vomiting, and diarrhea.

Periconia sp.

Periconia sp. are found in soil, blackened and dead herbaceous stems leaf spots, grasses, rushes, and sedges. Almost always associated with other fungi. Rarely found growing indoors. Reportedly associated with a rare case of mycotic keratitis.

Pithomyces sp.

A common mold found on dead leaves, plants, soil and especially grasses. Causes facial eczema in ruminants. It exhibits distinctive multi-celled brown conidia. It is not known to be a human allergen or pathogen. It is rarely found indoors, although it can grow on paper.

Rusts/Smuts

These fungi are associated with plant diseases. In the classification scheme of the fungi, the smuts have much in common with the rusts, and they are frequently discussed together. Both groups produce wind-borne, resistant teliospores that serve as the basis for their classification and their means of spread. Rusts usually attack vegetative regions (i.e., leaves and stems) of plants; smuts usually are associated with the reproductive structures (seeds). They can cause hay fever and asthma.

Spegazzinia

Spegazzinia species comprise a very small proportion of the fungal biota. This genus is somewhat related to other lobed or ornamented genera such as *Candelabrum*. No information is available regarding health effects or toxicity. Allergenicity has not been studied. Usually identified on spore trap samples where it is seen every few weeks. (Spores have very distinctive morphology.) May also be found in air by culturable (Andersen) samples if a long enough incubation period is provided so that sporulation occurs. Our laboratory has never found this organism growing on indoor environmental surfaces. Natural habitat includes soil and many kinds of trees and plants.

Stachybotrys sp.

Aw - 0.94, optimum Aw ->0.98. Several strains of this fungus (*S. atra, S. chartarum* and *S. alternans* are synonymous) may produce a trichothecene mycotoxin- Satratoxin H - which is poisonous by inhalation. The toxins are present on the fungal spores. This is a slow growing fungus on media. It does not compete well with other rapidly growing fungi. The dark colored fungus grows on building material with high cellulose content and low nitrogen content. Areas with a relative humidity above 55%, and are subject to temperature fluctuations, are ideal for toxin production. Individuals with chronic exposure to the toxin produced by this fungus reported cold and flu symptoms, sore throats, diarrhea, headaches, fatigue, dermatitis, intermittent local hair loss and generalized malaise. Other symptoms include coughs, rhinitis, nosebleed, a burning sensation in the nasal passages, throat, and lungs, and fever. The toxins produced by this fungus will suppress the immune system affecting the lymphoid tissue and the bone marrow. Animals injected with the toxin from this fungus exhibited the following symptoms: necrosis and hemorrhage within the brain, thymus, spleen, intestine, lung, heart, lymph node, liver, and kidney. Affects by absorption of the toxin in the human lung are known as pneumomycosis.

This organism is rarely found in outdoor samples. It is usually difficult to find in indoor air samples unless it is physically disturbed (or possibly -this is speculation- a drop in the relative humidity). The spores are in a gelatinous mass. Appropriate media for the growth of this organism will have high cellulose content and low nitrogen content. The spores will die readily after release. The dead spores are still allergenic and toxigenic. Percutaneous absorption has caused mild symptoms.

Stemphylium sp.

Reported to be allergenic. Isolated from dead plants and cellulose materials.

Torula sp.

Found outdoors in air, soil, on dead vegetation, wood, and grasses. Also found indoors on cellulose materials. Reported to be allergenic and may cause hay fever and asthma.

Tetraploa

Tetraploa species comprise a very small proportion of the fungal biota. This genus is somewhat related to *Triposporium* and Diplocladiella. The only reported human infections are two cases of keratitis (1970, 1980) and one case of subcutaneous infection of the knee (1990). No information is available regarding other health effects or toxicity. Allergenicity has not been studied. Usually identified on spore trap samples where it is seen every few weeks. (Spores have very distinctive morphology.) Our laboratory has never found this organism growing on indoor environmental surfaces. Natural habitat includes leaf bases and stems just above the soil on many kinds of plants and trees.

Ulocladium sp.

Aw 0.89. Isolated from dead plants and cellulose materials. Found on textiles.

Zygomycetes

Zygomycetes are one of the four major groups of fungi, the others being the Oomycetes, the Ascomycetes, and the Basidiomycetes. Zygomycetes are common, fast growing, and often overgrow and/or inhibit other fungi nearby. Rhizopus and Mucor are two of the most common Zygomycetes seen in the indoor environment. However, others are seen as well, including *Syncephalastrum*, *Circinella*, *Mortierella*, *Mycotypha*, *Cunninghamella*, and *Choanephora*. For further information, please see descriptions of these individual genera.

The following table lists mycotoxins that are produced by certain types of fungi:

Fungi	Mycotoxin
Acremonium crotocinigenum	Crotocin
Aspergillus favus	Alfatoxin B, cyclopiazonic acid
Aspergillus fumigatus	Fumagilin, gliotoxin
Aspergillus carneus	Critrinin
Aspergillus clavatus	Cytochalasin, patulin
Aspergillus Parasiticus	Alfatoxin B
Aspergillus nomius	Alfatoxin B
Aspergillus niger	Ochratoxin A, malformin, oxalicacid
Acremonium crotocinigenum	Crotocin
Aspergillus nidulans	Sterigmatocystin
Aspergillus ochraceus	Ochratoxin A, penicillic acid
Aspergillus versicolor	Sterigmatocystin, 5 ethoxysterigmatocystin
Aspergillus ustus	Ausdiol, austamide, austocystin,brevianamide
Aspergillus terreus	Citreoviridin
Alternaria	Alternariol, altertoxin, altenuene, altenusin, tenuazonic acid
Arthrinium	Nitropropionic acid
Bioploaris	Cytochalasin, sporidesmin, sterigmatocystin
Chaetomium	Chaetoglobosin A,B,C. Sterigmatocystin
Cladosporium	Cladosporic acid
Clavipes purpurea	Ergotism
Cylindrocorpon	Trichothecene
Diplodia	Diplodiatoxin
Fusarium	Trichothecene, zearalenone
Fusarium moniliforme	Fumonisins
Emericella nidulans	Sterigmatocystin
Gliocladium	Gliotoxin
Memnoniella	Griseofulvin , dechlorogriseofulvin, epi-decholorgriseofulvin, trichodermin, trichodermol
Myrothecium	Trichothecene
Paecilomyces	Patulin, viriditoxin
Penicillium aurantiocandidum	Penicillic acid
Penicillium aurantiogriseum	Penicillic acid
Penicillium brasilanum	Penicillic acid
Penicillium brevicompactum	Mycophenolic acid
Penicillium camemberti	Cyclopiazonic acid
Penicillium carneum	Mycophenolic acid, Roquefortine C
Penicillium crateriforme	Rubratoxin

Fungi	Mycotoxin
Penicillium citrinum	Citrinin
Penicillium commune	Cyclopiazonic acid
Penicillium crustosum	Roquefortine C
Penicillium chrysogenum	Roquefortine C
Penicillium discolor	Chaetoglobosin C
Penicillium expansum	Citrinin, Roquefortine C
Penicillium griseofulvum	Roquefortine C, cyclopiazonic acid, griseofulvin
Penicillium hirsutum	Roquefortine C
Penicillium hordei	Roquefortine C
Penicillium nordicum	Ochratoxin A
Penicillium paneum	Roquefortine C
Penicillium palitans	Cyclopiazonic acid
Penicillium polonicum	Penicillic acid
Penicillum roqueforti	Roquefortine C, Mycophenolic acid
Penicillium veridicatum	Penicillic acid
Penicillium verrucosum	Citrinin, ochratoxin A
Penicillium/ Aspergillus	Patulin
Penicillium/ Aspergillus/Alternaria	Glitoxin
Phomopsis	Macrocyclic trichothecenes
Phoma	Brefeldin, cytochalasin, secalonic acid, tenuazonic acid
Pithomyces	Sporidesmin
Rhizoctonia	Slaframine
Rhizopus	Rhizonin
Sclerotinia	Furanocoumarins
Stachybotrys chartarum	Iso-satratoxin F, roridin E, L-2, satratoxin G & H, trichodermin, trichodermol, trichothecene
Torula	Cytotoxins
Trichoderma	Trichodermin, trichodermol, gliotoxin
Trichothecium	Trichothecene
Wallemia	Walleminol
Zygosporium	Cytochalasin

General terms

Allergen

An allergen is a substance that elicits an IgE antibody response and is responsible for producing allergic reactions. Chemicals are released when IgE on certain cells contact an allergen. These chemicals can cause injury to surrounding tissue - the visible signs of an allergy. Only a few fungal allergens have been characterized but all fungi are thought to be potentially allergenic. Fungal allergens are proteins found in either the mycelium or spores

"Black mold"

A poorly defined term. Black mold or toxic black mold has usually been associated with the mold *Stachybotrys chartarum*. While there are only a few molds that are truly black, there are many that can appear black. Not all molds that appear to be black are *Stachybotrys*.

Fungi

Fungi are neither animals nor plants and are classified in a kingdom of their own. The Kingdom of Fungi. Fungi include a very large group of organisms, including molds, yeasts, mushrooms and puffballs. There are >100,000 accepted fungal species but current estimates range to 1.5 million species. Mycologists (people who study fungi) have grouped fungi into four large groups according to their method of reproduction.

Hidden mold

This refers to visible mold growth on building structures that is not easily seen, including the areas above drop ceilings, within a wall cavity (the space between the inner and outer structure of a wall), inside air handlers, or within the ducting of a heating/ventilation system.

Microbial Volatile Organic Compounds (MVOCs)

Fungi produce chemicals as a result of their metabolism. Some of these chemicals, MVOCs, are responsible for the characteristic moldy, musty, or earthy smell of fungi, whether mushrooms or molds. Some MVOCs are considered offensive or annoying. Specific MVOCs are thought to be characteristic of wood rot and mold growth on building materials. The human nose is very sensitive to mold odors and sometimes more so than current analytical instruments.

Mold

Molds are a group of organisms that belong to the Kingdom of Fungi (see Fungi). Even though the terms mold and fungi had been commonly referred to interchangeably, all molds are fungi, but not all fungi are molds.

Mycotoxin

Mycotoxins are compounds produced by some fungi that are toxic to humans or animals. By convention, the term? Mycotoxin. Excludes mushroom toxins. Fungi that produce mycotoxins are called "toxigenic fungi."

Spore

General term for a reproductive structure in fungi, bacteria and some plants. In fungi, the spore is the structure which may be used for dissemination and may be resistant to adverse environmental conditions.

Toxic mold

The term "toxic mold" has no scientific meaning since the mold itself is not toxic. The metabolic byproducts of some molds may be toxic (see mycotoxin).

Hypha (plural, hyphae)

An individual fungal thread or filament of connected cells; the thread that represents the individual parts of the fungal body.

MOLD/BIOLOGICAL CONTAMINANT REMEDIATION PROTOCOL

Date: April 30, 201

For:
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SECTION 1.0 REMEDIATION PROCEDURES

1.1 Project Set Up

- The owner or powers that be shall supply temporary power for remediation equipment. The existing electrical system may be utilized, with permission of the owner or powers that be. Determining specific electrical load/safety requirements, including, but not limited to, the use of a temporary GFCI electrical panel box shall be the responsibility of the abatement contractor.
- HVAC system shall be isolated.
- 6-mil polyethylene sheathing shall be erected to separate primary control areas (PCA) from remaining areas. Control areas shall be selected so that specified building materials (specified herein, in section 1.3, under primary control areas) may be removed or cleaned and dried.
- HEPA Air Filtration Devices shall be utilized for each separate control area. Critical barriers shall consist of 6-mil polyethylene so that primary control areas are isolated from remaining areas. HEPA filtration units shall be exhausted from the PCA to the outside of the building through windows/doors. Dehumidification units must be installed in the PCA to sufficiently dry components.
- A remote wash off station shall be set up to allow for employees to wash hands and faces after egress from the work area.
- Ingress/Egress to the control area(s) shall be, at minimum, sealed with a 2-way polyethylene air lock.
- Entrances to the building shall be marked as indicated in Section 7.4 of this document.

1.2 Local Exhaust System

- Once sealed, the primary control area shall be ventilated with a local HEPA air filtration device that shall ensure a minimum of four (4) air changes per hour. The air filtration device shall be placed within the containment work area.
- Local HEPA exhaust shall be utilized where cleaning of contents is required and/or in the immediate vicinity of remediation activities of building materials.
- In interior sections requiring surface area cleaning, local HEPA filtration may be exhausted within the area to scrub microbials from ambient air. This process shall only be conducted after fine cleaning has been completed.
- Negative pressure within the contained work area shall be maintained throughout the project until clearance is obtained.
- Negative air machines shall be exhausted to exterior portions of the building to adequately ensure that negative pressure is achieved.
- Negative air pressure within the work area shall be tested and recorded at initiation of the project and hourly thereafter by use of a manometer to ensure the desired pressure of -0.02 inches of water, which is comparable to four changes per hour.
- Dehumidification devices with HEPA filtration may be incorporated as filtration devices in conjunction with true HEPA filtration devices; they may not replace the true HEPA filtration devices.

Note: Formula for determination of adequate HEPA filtration:

Total feet per minute =Volume of work area (ft^3)/15 minutes
#AFD Units needed = (Total feet per minute)/Capacity of Unit (ft^3)

- At initiation of final cleaning stages, relative humidity shall be at 40% (+/-3%) and moisture content of wooden components shall be at or below 15% as determined by Delmhorst moisture meter or equivalent meter. Moisture mapping and direct read T/RH shall be recorded by the remediation contractor until the

specified levels have been achieved. Control areas shall be dehumidified during cleaning and mold remediation activities to ensure removal of surface moisture created during application of water. Drying of structural components that have been treated with encapsulating anti-microbial agents will be necessary.

- Moisture levels shall be recorded and documented by the remediation contractor upon successful completion of dehumidification.

1.3 Remediation Specifications

- Prior to commencement of mold remediation activities by the remediation contractor, the source of any water intrusions, leaks, and/or moisture/humidity problems shall be remedied by the owner. If water intrusions, leaks, and/or moisture/humidity problems exist and are not corrected, mold growth can be expected to return.
- All remediation procedures listed that involve the removal of building materials shall employ polyethylene critical barriers, negative air pressure, and HEPA filtration (i.e., primary control areas).
- The remediation contractor shall ensure that the filters are properly capped prior to switching off the air scrubbers. If the filters are not properly capped, the backflow can cause mold spores to re-release back into the control area, essentially re-contaminating an area that has already been cleaned.
- All remediation activities shall be conducted in a manner that does not allow dissemination of mold spores. Remediation procedures shall begin from the side of the control area furthest away from air filtration devices.
- Cleaning procedures shall be repeated until the area is visibly free of dust and debris.
- Engineering controls set up during the remediation process shall remain in place until remediation has been completed and acceptable post remediation sampling results have been achieved.
- **Federal and/or state regulations require that suspect asbestos containing materials in public and commercial buildings shall be inspected for asbestos prior to renovations or demolition. Based on these regulations, PEC recommends that building materials that may be disturbed during mold remediation be tested for asbestos content prior to their disturbance to prevent asbestos contamination.**
- If cleaning procedures outlined in this remediation plan outweigh the cost of replacement for selected items, the remediation contractor shall give the owner the option to clean or dispose of those items.
- Reinstallation of building materials and/or components shall only be conducted once acceptable post remediation results are obtained.
- Any chemicals used on this project shall be EPA approved and used only as directed by the manufacturer. MSDS shall be available for review upon request.

HVAC System

- The HVAC system(s) that services or run through the primary control area/affected area shall be shut down prior to remediation activities.
- The spaces that are normally climate-controlled by the HVAC system that have been shut down shall be maintained under proper humidity levels (between 30 and 60% utilizing dehumidifiers, etc.) while the system is not in operation.
- All HVAC supply/return vents within the primary control area/affected area shall be isolated with a critical barrier (i.e., plastic, etc.) to prevent air flow.
- Once the HVAC system is shut down, the system shall remain off and isolated until acceptable post remediation results are obtained.

Note: For directional purposes "front" is determined by facing Grass Lane from inside the unit, unless otherwise noted.

Primary Control Areas/Affected Areas

Critical barriers, negative air pressure, and HEPA filtration shall be established to isolate the following areas as Primary Control Areas to perform the specified mold remediation.

Within the bathroom:

- Detach the floor mounted cabinet from the front wall, and remove any affected drywall (i.e., drywall with apparent water damage/suspect visible mold growth) and extend the drywall removal within a 2- foot radius of the affected area when possible.
- Clean all surfaces, furnishings and contents as specified herein under general specifications for primary control areas.

General Specifications for Primary Control Areas

- Open plumbing lines and drains within the control areas shall be isolated with a critical barrier consisting of 6-mil poly.
- The water line to toilets within the control areas shall be shut off and the toilets shall be isolated with a critical barrier consisting of 6-mil poly.
- Cleaning of components/materials shall consist of a method that thoroughly removes visible mold growth, settled concentrations of mold spores, and/or dust and debris (i.e., HEPA vacuuming, wet wiping, or other approved methods), followed by dehumidification/drying.
- Non-porous, semi-porous, and porous furnishings and contents shall be cleaned. If items cannot be cleaned efficiently, the abatement contractor shall consult with the owner/powers that be to determine if they shall be disposed.
- All machine washable porous cloth items shall be cleaned and dried in a household washer and dryer. Other specialty items shall be cleaned by a dry cleaner that specializes in cleaning materials affected with mold. These items shall be removed from affected area(s) and shall not be reintroduced back into the area(s) until acceptable post remediation testing is established. If porous articles cannot be cleaned efficiently, the abatement contractor shall consult with the owner/powers that be.
- Exterior surfaces of electrical appliances, electrical equipment, and light fixtures shall be cleaned, utilizing wet method and HEPA vacuuming. These items shall be disconnected from all electrical sources prior to cleaning. If these items cannot be cleaned efficiently, the abatement contractor shall consult with the owner/powers that be.
- All wall/ceiling cavity insulation shall be disposed in areas that specify the removal of drywall/wallboard. The abatement contractor shall visually inspect the back side of surrounding drywall/wallboard for water damage and/or suspect mold growth and document any findings. If additional suspect mold growth or water damage is observed beyond the specified removal area, additional drywall/wallboard shall be removed until no suspect mold growth or water damage is observed.
- All penetrations within the controlled area that adjoin unaffected or non-accessible areas, including outdoor areas, crawlspaces, etc., shall be cleaned (as far as one can reach) and then sealed with 6-mil poly, extending six (6) inches on all sides.
- In areas of specified wallboard removal, all components within the wall/ceiling cavities shall be cleaned. Any wooden structural components with mold stains or mold growth in pitted surfaces shall be HEPA sanded (or other approved methods) to eliminate embedded mold growth.
- All joints or sills (where the structural system meets, where the sill plate meets the floor, etc.) shall be aggressively disturbed to remove embedded mold growth and spores.

1.4 Removal Procedures

The contractor shall maintain surfaces of the control area free of accumulation of dust and debris. Additionally, they shall restrict the spread of dust and debris, keeping waste from being distributed over the work area. Materials shall be removed in a fashion to ensure that previously cleaned areas are not re-contaminated (i.e., working from one end of the control area to the other). The contractor may be required to re-clean areas based on a visual inspection by the CIEC/CIE/IH, if the areas are not visibly clean.

Contaminated building materials that have been removed, and additional materials and debris generated during remediation, shall be bagged or wrapped with 6-mil polyethylene sheeting, sealed with duct tape, and carried to the waste container prior to visual inspection by the CIEC/CIE/IH. Materials shall be bagged and sealed directly after removal from unaffected building components.

Areas shall be allowed to dry for a period until specified RH and moisture levels have been achieved. Any remaining building products that are directly impacted by remediation shall be tested for moisture content. Wooden and cellulosic building components (e.g., wall studs, drywall, etc.) shall be tested for moisture content. If the moisture content is > 15% in wood products or > 12% in cellulosic products (utilizing a Delmhorst moisture meter), dehumidification shall be required until moisture levels are at or below said levels, and the RH level is at or below 40% +/-3% (for all interior areas). The remediation contractor shall verify water content of all wooden and cellulosic building components within the impacted areas, as well as temperature and RH prior to scheduling post remediation verification.

1.5 Cleanup Overview

The contractor shall personally review the cleaning process prior to contacting the CIEC/CIE/IH for the post remediation testing. If accumulations of debris and dust are significant, the CIEC/CIE/IH will require re-cleaning prior to post remediation verification sampling.

The CIEC/CIE/IH shall make a visual inspection and conduct post remediation sampling after the final cleaning is complete.

1.6 Post Remediation Verification Testing

Prior to conducting post remediation sampling, HEPA filtration devices shall be allowed to operate for a minimum of 48 hours (the equivalent of 192 air changes), following fine cleaning, in all areas where remediation has been conducted. The HEPA filtration devices shall be sealed at the intake and turned off approximately two hours prior to post testing and reconvene within one hour after post testing, until acceptable post remediation results are established.

Post remediation sampling shall be conducted utilizing viable and/or non-viable sample methods. Air samples shall be collected in representative areas of the control areas. Surface sampling may be conducted at the discretion of the CIEC/CIE/IH.

Sampling shall be conducted in areas directly impacted by remediation procedures, where cleaning was conducted. The CIEC/CIE/IH shall determine acceptable post remediation status through interpretation of air sampling results, which will be based on indoor/outdoor comparisons, in combination with any surface samples collected, moisture readings, RH readings, visual observations, and any other pertinent information.

The owner/client will be responsible for post remediation testing. If air sample results indicate unacceptable airborne concentrations, the contractor shall be required to conduct a re-cleaning at the contractor's expense and absorb the cost for re-testing, until acceptable results are achieved.

SECTION 2.0 SCOPE OF WORK (Note: Section 2 and Section 1.3 are essential to the full Scope of the Contractor's Work)

2.1 Investigative Reports and Other Related Documents

Phoenix EnviroCorp investigative report dated April 30, 2021.

Phoenix EnviroCorp Chain of Custody dated April 23, 2021.

Analytical report dated April 27, 2021.

2.2 Project Description

The procedures covered by this program include the enclosure and drying of the said structure, the removal, handling, and disposal of building components compromised by mold/fungal growth, and the cleaning and disinfecting of existing building materials. Procedures for reconstruction are not considered in these specifications. Reconstruction of interior portions may not be conducted until procedures for remediation have been completed, the control areas have been inspected, and testing has returned acceptable post remediation results. Reconstruction of exterior portions may be conducted during the restoration to ensure that water intrusion is abated.

The objectives covered by the program include the remediation of materials shown to have surface contamination, water damage, and/or exposure to elevated airborne mold spore levels, without subjecting the workers, installation employees, and occupants to microbial contaminants. In addition, contract employees, occupants, and materials will be appropriately protected during the removal process so that present and future exposures will not occur.

This protocol is provided as a guideline. Any deviation requests from this protocol shall be addressed to the CIEC/CIE/IH for consideration. At present there are no Federal or State requirements regarding microbial remediation projects; however, OSHA General Construction Code of Federal Regulations (29 CFR 1926) shall be followed.

Remediation shall be completed as close to the date that this protocol was drafted, as the specifications outlined within represent conditions at the time the investigative services were conducted. Due to the volatility of mold, the current protocol may not reflect all necessary remediation if conditions are allowed to continue. Further, if time lapses allowing conditions to change, it will become increasingly difficult to obtain successful clearance testing results.

SECTION 3.0 AIR MONITORING

3.1 Responsibilities of the CIEC/CIE/IH

Monitoring of airborne concentrations will be performed in accordance with the requirements of this program. Prior to conducting air sampling and/or surface sampling for clearances, the CIEC/CIE/IH shall conduct a visual inspection of the area. Temperature and RH shall be recorded during the air sampling phase of clearance. All air sampling shall be conducted in such a manner as to provide a valid representation of airborne mold levels both inside and outside the work areas. If analysis of air samples indicates that airborne

concentrations exceed acceptable limits, the contractor shall conduct re-cleaning at the contractor's expense.

3.2 Personal Monitoring

No personal monitoring will be conducted by the CIEC/CIE/IH unless the remediation contractor requests monitoring for OSHA compliance. Presently there are no guidelines (PELs or TLVs) for microbial contaminants. It is the remediation contractor's responsibility to determine if OSHA personal sampling may be required during application of anti-microbial agents.

3.3 Sample Integrity and Reporting

Samples shall be sealed, labeled, and a chain of custody initiated according to laboratory procedures.

Sample results shall be available within seven (7) days of the completion of collection of all samples and will include the following information:

- Site Address
- Sample Number
- Location Sampled
- Analytical Method
- Collection Date(s)
- Person Taking Sample(s)
- Additional Comments (if any)
- Analyst Signature

SECTION 4.0 MATERIAL REPLACEMENT

4.1 Material Replacement

The general contractor/replacement contractor may begin material replacement after the CIEC/CIE/IH informs all parties of acceptable post remediation sample results.

With ongoing construction activities ambient air levels are expected to be elevated over what might be normally expected. Additional testing should not be necessary after remediation procedures have been completed and successful results have been obtained. In the event of another water intrusion (i.e. broken-pipe-line, improper HVAC function, or building envelope compromise), an investigation shall be conducted within 24 to 48 hours of the event. Proper drying, if initiated within this time frame, should minimize the potential for microbial growth.

SECTION 5.0 SPILL CLEANUP REQUIREMENTS

5.1 Spills

MSDS shall be kept on site for all chemical products brought to the site by the remediation contractor. In the event of a chemical spill, the contractor shall initiate cleanup immediately. The contractor shall mop up any liquid with rags or other conventional absorbent. The spent absorbent shall be properly contained and disposed of as waste.

SECTION 6.0 WASTE CONTROL

6.1 Waste Disposal

Waste shall be disposed of at a locally selected landfill. Waste bags shall be checked for integrity and hauled in an enclosed truck/vehicle or container to ensure that transportation to the landfill does not pose a potential hazard to the environment.

SECTION 7.0 SUPPLEMENTAL INFORMATION

7.1 Applicable Publications

The publications listed below form part of this program. Written programs shall accompany all referenced CFR publications. IICRC and NYCDOH guidelines for work procedures shall be followed by the remediation contractor. A copy of the NYCDOH protocols shall be on-site, along with this design, for reference by the site supervisor. ACGIH, IAQA, and ASHRAE publications shall be utilized as guidelines for interpretation by the CIEC/CIE/IH. This design shall be reviewed by the remediation supervisor prior to initiation of set-up for the project. Any questions regarding this project may be addressed with the on-site consultant listed for Phoenix EnviroCorp.

Code of Federal Regulation (CFR Publications)

29 CFR 1910.134	Respiratory Protection
29 CFR 1910.145	Specifications for Accident Prevention, Signs and Tags
29 CFR 1926.28	Personal Protective Equipment
29 CFR 1926.59	Hazard Communication
29 CFR 1926.96	Occupational Foot Protection
29 CFR 1926.100	Head Protection
29 CFR 1926.101	Hearing Protection
29 CFR 1926.102	Eye and Face Protection
29 CFR 1926.403	Electrical General Requirements
29 CFR 1926.416	Safety General Requirements
29 CFR 1926.852	Demolition, Chutes
29 CFR 1926.1091	Record Keeping Requirements

Supplemental Guidelines

IICRC S520 2nd ed.	Standard and Reference Guide for Professional Water Damage Restoration
NYCDOH	Guidelines on Assessment and Remediation of Fungi in Indoor Environments
ACGIH	Bioaerosols: Assessment and Control
IAQA 01-2000	Recommended Guidelines for Indoor Environments
ASHRAE 62.2-2007	Ventilation for Acceptable Indoor Air Quality in Low-Rise Residential Buildings

7.2 Definitions

Air Lock: A system that permits ingress and egress between a control area and non-control area, or other work areas, without allowing air movement between areas (e.g., three stage decon, three-way polyethylene flaps).

Air Sample: Refers to samples collected with spore trap air sample media (e.g., Micro-5, Cyclex D, or

equivalent); also referred to as a non-viable air sample. May also refer to a sample collected on a disposable petri dish with Agar media by means of an Andersen Impactor (or equivalent) and sampling pump; also referred to as air culture (viable) sample. Sample media to be used in project is described under Section 1.6 (Post Remediation Verification Testing).

Area Monitoring: The sampling of airborne microbial concentrations outside the exclusion boundary, which may reach the breathing zone of the contractor or installation employees.

Asbestos Containing Materials (ACM): Refers to asbestos containing building materials that contain more than 1% asbestos by Polarized Light Microscopy (PLM) or Transmission Electron Microscopy (TEM).

Biocide: Refers to chemical agents that are specifically designed to eliminate viable microbial contamination, with a phenol equivalent efficiency (e.g., Sodium Hypochlorite, Quaternary Ammonia Compounds).

Blower Door Test: Refers to the testing of static pressure and draw of air through the HVAC in cubic feet per minute (CFM) to rate the efficiency of the system.

Clearance Monitoring: Refers to air, bulk, or swab sampling conducted as a means to demonstrate that the area specified for remediation has been completed by the contractor, left with present acceptable mold spore levels, and ready for re-construction.

Control Area: The area where microbial contaminants removal is performed, which is isolated by physical boundaries to prevent unauthorized entry of personnel, thereby preventing exposure to or the spread of microbial contaminants. Physical boundaries will be established and located such that the airborne contaminants are not allowed to escape the boundaries.

HEPA: High Efficiency Particulate Air. Refers to ventilation devices that are specifically designed to filter ambient air to an efficiency of 99.97%.

HVAC: Refers to the Heating, Ventilation, and Air Conditioning system.

Industrial Hygienist: Refers to a person who practices industrial hygiene and may act as a competent person regarding visual inspection of contaminated surfaces and clearance air and/or swab/bulk sampling. May also refer to a Certified Industrial Hygienist (CIH) as defined by the American Board of Industrial Hygiene (ABIH), a Certified Indoor Environmental Consultant as defined by the American Council for Accredited Certification (ACAC), or a Certified Indoor Environmentalist (CIE) as defined by the American Council for Accredited Certification (ACAC).

Microbial Contaminant: Refers to viable mold, fungi, pollen, bacteria, and or particulate, or their metabolites, that may be causative of epidemiological, immunotoxic, dermotoxic, neurotoxic, or enterotoxic disorders in the human population, or may be considered a pathogen or an opportunistic pathogen.

Non-Porous Materials: Refers to building materials with solid surfaces that may be successfully treated and cleaned by means of HEPA vacuuming or other approved method. Materials include flooring, hard goods, plastic, vinyl, and some wallboard systems.

Porous Materials: Refers to building materials and household goods that may allow microscopic particles (3-20 micron) to become trapped within the material that will not allow adequate cleaning. Materials include carpet, mattresses, and clothing.

Primary Control Area (PCA): Refers to a section of a facility that has been isolated by 6-mil polyethylene barriers where specific engineering controls (e.g., HEPA filtration, negative air pressurization, dehumidification, etc.) are required. In general, it is the area where remediation of water and mold damaged building materials is to be conducted.

Refrigerant Dehumidifier: Device used to remove water content from air and materials.

Relative Humidity (RH): Refers to the ratio of water vapor in the atmosphere to the amount required to saturate it at a given temperature.

Semi-Porous Materials: Refers to materials that may be somewhat porous, yet they may still allow for adequate cleaning. Materials include wooden beams and some wallboard systems.

Swab Sample: Refers to collection of a sample onto a sterile swab for analysis of mold, fungi, and bacteria by viable and/or non-viable analysis.

Tape-Lift Sample: Refers to collection of a sample onto clear scotch tape for analysis by direct microscopic examination (non-viable).

7.3 Quality Assurance

Medical Examinations

Before potential exposure to microbial contaminants, the remediation contractor shall provide workers with a comprehensive medical examination as required by 29 CFR 1910.134 as outlined by the Medical Monitoring Program.

Medical Records

The remediation contractor shall maintain complete and accurate medical records on employees as required by OSHA and the contractor's Medical Monitoring Program. The contractor may be asked to provide a copy of all medical records for approval by the consultant's representative.

Training

Each employee working on this contract shall be trained prior to the time of initial job assignment in accordance with mold specific and chemical specific training as indicated by the OSHA General Duty Clause and the Hazard Communication Standard. Each employee shall also receive training required by Federal guidelines listed in Section 7.1 of this document and project specifications.

Hazard Communication Program

The remediation contractor has established and implemented a Hazard Communication Program as required by 29 CFR 1910.1200 and may be asked to provide a copy of this written program. Hazard Communication training must include occupational hazards as directly related to working with fungi/mold and contamination of building components by fungal contamination, specific training for chemical hazards associated with biocide usage, and site specific MSDS sheets for commercial detergents and biocides utilized on the job site.

Respiratory Protection Program

The remediation contractor has established a Respiratory Protection Program, which complies with 29 CFR 1910.134. Physical examinations and fit testing are required for use of respiratory protection greater than an N-95 dust mask. Workers removing building materials contaminated by mold growth, applying anti-microbial agents, or workers subjected to exposures to anti-microbial agents shall be required to wear, at minimum, a tight-fitting negative pressure ½ mask respirator with P-100 filters. Therefore, -he OSHA Respiratory Protection Standard applies.

Analytical Testing Laboratory

Analysis of culturable biological samples collected on this project shall be conducted by a laboratory that participates in the Environmental Microbiological Proficiency Analytical Testing Program (EMPAT) of the American Industrial Hygiene Association (AIHA) and has shown to be proficient by proficiency analytical testing (PAT) samples. Analysis of non-viable air and surface samples shall be conducted by a competent person.

7.4 Materials and Equipment

Equipment

The contractor shall make available to employees a complete set of personal protective equipment (PPE) as required by this program for entry into the controlled area. All personnel while in the control area or handling microbial contaminated waste shall wear protective clothing, respirators, and other PPE.

Respirators

Contractor shall furnish the appropriate respirator in accordance with 29 CFR 1910.134 and approved by NIOSH for protection in environments that contain microbial contaminants. The selected respirator for this project shall be a tight-fitting negative pressure ½ respirator equipped with HEPA cartridge (P-95, P-100). At minimum, an N-95 dust mask may be utilized during fine cleaning activities; however, the tight fitting ½ mask respirator shall be utilized during application of anti-microbial agents or biocides.

Special Clothing

Employees shall be provided with and required to wear: whole body disposable protective clothing, full body tyvek suits with head coverings, and latex gloves *(see table)* during all activities in the controlled area.

Chemical	Recommended Rubber Glove
Sodium Hypochlorite	Neoprene or Nitrile
Phenolic Compounds	Neoprene
Quaternary Ammonia Compounds	Polyvinyl Chloride (PVC)
Detergents	Latex

Eye Protection

The contractor shall provide chemical-resistant goggles to personnel engaged in cleaning and treatment activities and require them to be worn during application of anti-microbial agents and biocides.

Warning Signs and Labels

Standard approved warning signs shall be erected at all approaches to the control area as specified in 29 CFR 1910.145.

Anti-Microbial Agents

Anti-microbial agents utilized in interior quarters shall consist of quaternary ammonia compounds. No phenolic compounds shall be used in interior quarters with exception of Micro Ban Plus. Approval must be granted by the owner/powers that be prior to application. Anti-microbial agents shall be EPA approved. Commercial grade detergents shall be used to remove fungal contamination during cleaning phases prior to anti-microbial application, to include encapsulation.

Phoenix EnviroCorp

June 15, 2021

Quanesha Mullins
Wilmington Housing Authority
1524 S. 16th Street
Wilmington, NC 28401

RE: PEC Job # 21-21-186-IAQ-M - 302 Grass Lane, Apartment 204, Wilmington, NC - Mold Investigation/Background air sampling

Enclosed are the results of the mold investigation conducted at the above referenced unit on June 8, 2021. Phoenix EnviroCorp (PEC) was retained to conduct background air sampling to determine airborne mold spore levels and to collect surface samples of suspect visible mold growth.

Background Information: The unit is occupied and fully furnished with content throughout.

The HVAC system was operating in the cool mode set at 74º F upon PEC's arrival and during sampling.

Note: For directional purposes "front" is determined by facing the grass area adjacent to the playground and the parking lot from inside the unit, unless otherwise stated.

Visual Inspection: PEC's visual inspection noted the following (see enclosed photographic documentation):

- Apparent water damage within the kitchen cabinet underneath the sink
- Apparent water damage and suspect visible mold growth within the bathroom cabinet underneath the sink

Mold Testing – Surface: A non-viable surface sample was collected from an area of suspect visible mold growth. The quantifications of fungal growth are reported as scattered spores, 21-100 fungal spores = very light (VL), 101-1,000 fungal spores = light (L), 1,001-10,000 fungal spores = moderate (M), > 10,000 fungal spores = heavy (H). The 'General Impressions' of fungal growth are reported as no fungal growth (NFG), fungal growth (FG), minimal fungal growth or growth in vicinity (MFG), and no fungal spores detected (ND). *Clear tape was utilized for the collection of surface samples. Each sample was assigned a unique ID number and shipped to a third-party laboratory for analysis.* Sampling locations and results are as follows:

Location	Result
Bathroom cabinet underneath the sink	**M – FG** *Penicillium/Aspergillus*

Mold Testing – Air: Non-viable spore trap air samples were collected to determine airborne mold spore levels. Samples were collected within the kitchen/living room, the bathroom, the rear right bedroom, the rear left bedroom, and the front left bedroom. *Micro 5 sampling media was utilized for the collection of spore trap air samples. Each sample ran for five (5) minutes at a flow rate of five (5) liters per minute for a total volume of twenty-five (25) liters per sample. Each sample was assigned a unique ID number and shipped to a third-party laboratory for analysis. All air samples were collected from centralized locations (within their respective areas) and within the breathing zone, unless otherwise noted.* Two samples were also collected outdoors for comparative purposes.

Results identified elevated airborne levels of *Penicillium/Aspergillus* within all sampled locations.

The interpretation of air sample results is based on indoor/outdoor comparisons, in combination with a study by Daniel M. Baxter, entitled "A Regional Comparison of Mold Spore Concentrations Outdoors and Inside "Clean" and "Mold Contaminated" Southern California Buildings", and other industry guidelines, as well as over 20 years of experience in industrial hygiene and mold testing.

In layman terms, acceptable levels indicate that the levels are below the outdoor level and/or the baseline levels (whichever is higher) stated below. Elevated levels indicate that the levels are above the outdoor level and/or the baseline level.

Baseline levels for indoor spore trap air samples are as follows: < 900 spores/m³ for Penicillium/ Aspergillus; 0 spores/m³ for Stachybotrys and Chaetomium; and < 350 spores/m³ for other individual mold groups.

Relative Humidity (RH): *Temperature and relative humidity readings were collected in the same locations as the spore trap air samples.* RH levels within the unit ranged from 59.8% – 65.9% with an outdoor reading of 77.3% (see the enclosed Chain of Custody for details). Per the American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) Standard 62-1999, relative humidity should range between 30% and 60%. **Consistent RH levels above 60% is conducive to mold growth.**

Conclusions: Sample results identified elevated airborne mold spore levels of *Penicillium/Aspergillus* within all sampled locations, as well as surface mold growth and apparent water damage within the unit. Upon request, and for an additional fee, PEC can provide a protocol that outlines mold remediation activities.

Enclosed in this report are the laboratory analysis and the Chain of Custody.

Should you have any questions, please do not hesitate to call.

Thank you,

Philip Green
IH Technician

Tommie Green, CIEC
Professional Industrial Hygienist

Enclosures

Photo 1

Apparent water damage in the kitchen cabinet underneath the sink

Photo 2

Apparent water damage and suspect visible mold growth in the bathroom cabinet under the sink

Phoenix EnviroCorp
4020 SHIPYARD BLVD.
WILMINGTON, NC 28403

CHAIN OF CUSTODY

LABORATORY TEST REQUEST Seem| Ref #2106090 24 25

Lab ID: 077 - 082

6.9.21 VM

CONTACT: Philip Green	TELEPHONE (910) 397-0370	FAX (910) 313-6094	6/8/2021
PEC Job #: 21-21-186-IAQ-M	SITE ADDRESS:	302 Grass Lane, Apt. 204, Wilmington, NC 28405	

PLEASE EMAIL RESULTS TO: KMGREEN@PHOENIXENVIROCORP.COM

SAMPLE TYPE:	NUMBER OF SAMPLES:	TURN AROUND TIME SPECIFIED:
Spore Trap - Micro-5	5	____ Immediate ____ 24 hr ____ 48 hr __X__ Standard
Surface Samples	1	

Sample #	Sample Area	Sample Volume	Lab Analysis Requested	% Relative Humidity	Temperature °F
060821-PG-01	Kitchen/Living Room	25L	S001	59.8	77.2
060821-PG-02	Bathroom	25L	S001	61.2	76.4
060821-PG-03	Rear Right Bedroom	25L	S001	63.7	75.7
060821-PG-04	Rear Left Bedroom	25L	S001	64.4	75.0
060821-PG-05	Front Left Bedroom	25L	S001	65.9	75.0
060821-PG-101	Green/Brown VSMG in bathroom cabinet underneath sink	1 cm sq	S001		
	Samples accepted				

Samples Collected By (Printed Name and Signature): [signature] Date Signed: 6/8/2021

CHAIN OF CUSTODY RECORD

DATE:	Time:	Condition of Samples:	RELINQUISHED BY: (Printed Name and Signature)	ACCEPTED BY: (Printed Name and Signature)
6/8/2021	14:00 PM	Intact	[signature] AFFILIATION:	[signature] AFFILIATION: 6.9.21

SEEML Reference Number: 210609024

Southeast Environmental Microbiology Laboratories
102 Edinburgh Court
Greenville, SC 29607
Phone: (864) 233-3770
FAX: (864) 233-6589

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

- ☒ Surface/Bulk Report
- ☒ Spore Trap Report
- ☐ Andersen Fungal Report
- ☐ Quantitative Fungal Report

Lab Manager Review: *Angel Gosnell* Date: 06/09/21

Thank you for using SEEML laboratories. We strive to provide superior quality and service.
SEEML laboratories are accredited through AIHA-LAP, LLC (EMLAP # 173667) for the analysis of Spore Traps and Surface/Bulk Samples.

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

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

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

Spore Trap Report

Attn: ***Phoenix Enviro Corp.***	Date Sampled: 06/08/21
4020 Shipyard Blvd.	Date Received: 06/09/21
Wilmington, NC 28403	Date Analyzed: 06/09/21
	Date Reported: 06/09/21
	Date Revised:
	Project Name: 21-21-186-IAQ-M
	Project Address: 302 Grass Lane, Apt 204
	Project City, State, ZIP: Wilmington, NC 28405
	SEEML Reference # : 210609024

TEST METHOD: DIRECT MICROSCOPY EXAMINATION SEEML SOP 7

Client Sample ID	060821-PG-01			060821-PG-02			060821-PG-03		
Location	Kitchen / Living Room			Bathroom			Rear Right Bedroom		
Lab Sample ID	210609024-077			210609024-078			210609024-079		
Comments									
Hyphal Fragments									
Pollen	1	40							
Spore Trap Used	M5			M5			M5		
	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%
Alternaria									
Ascospores									
Basidiospores	1	40	1	1	40	1	2	80	7
Bipolaris/Drechslera									
Chaetomium									
Cladosporium	1	40	1	1	40	1	1	40	3
Curvularia									
Epicoccum									
Cercospora									
Fusarium									
Memnoniella									
Nigrospora									
Penicillium/Aspergillus	87	3480	96	79	3160	98	26	1040	90
Polythrincium									
Rusts									
Smuts/Periconia/Myxomy	1	40	1						
Spegazzinia									
Stachybotrys									
Stemphylium									
Tetraploa	1	40	1						
Torula									
Ulocladium									
Colorless/Other Brown*									
Oidium									
Zygomycetes									
Pithomyces									
Background debris (1-5)**	3			3			3		
Sample Volume(liters)	25			25			25		
TOTAL SPORES/M^3	91	**3640**		81	**3240**		29	**1160**	

Revisions:

Spore types listed without a count or data entry were not detected during the course of the analysis for the respective sample, indicating a raw count of <1 spore.
The analytical sensitivity is the spores/m^3 divided by the raw count, expressed in spores/m^3. The limit of detection is the analytical sensitivity (in spores/m^3) multiplied by the sample volume (in liters) divided by 1000 liters.
*Colorless,other Brown are spores without a distinctive morphology on spore traps and non-viable surface samples.
**Background debris is the amount of particulate matter present on the slide and is graded from 1-5 with 1 = very light, 2= Light, 3 = Medium, 4 = Heavy, 5 = Very Heavy. The higher the rating the more likelihood spores may be underestimated. A rating of 5 should be interpreted as minimal counts and may actually be higher than reported.

Disclaimer: The sample results are determined by the sample volume, which is provided by the customer.
This report relates only to the samples tested as they were received.

Angel Gosnell
Angel Gosnell, Approved Laboratory Signatory

102 Edinburgh Court
Greenville, SC. 29607
Phone: (864) 233-3770

Spore Trap Report

	Date Sampled: 06/08/21
Attn: ***Phoenix Enviro Corp.***	Date Received: 06/09/21
4020 Shipyard Blvd.	Date Analyzed: 06/09/21
Wilmington, NC 28403	Date Reported: 06/09/21
	Date Revised:
	Project Name: 21-21-186-IAQ-M
	Project Address: 302 Grass Lane, Apt 204
	Project City, State, ZIP: Wilmington, NC 28405
	SEEML Reference # : 210609024

TEST METHOD: DIRECT MICROSCOPY EXAMINATION SEEML SOP 7

Client Sample ID	060821-PG-04			060821-PG-05					
Location	Rear Left Bedroom			Front Left Bedroom					
Lab Sample ID	210609024-080			210609024-081					
Comments									
Hyphal Fragments									
Pollen									
Spore Trap Used	M5			M5					
	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%			
Alternaria									
Ascospores									
Basidiospores									
Bipolaris/Drechslera									
Chaetomium									
Cladosporium	1	40	3	1	40	3			
Curvularia	1	40	3						
Epicoccum									
Cercospora									
Fusarium									
Memnoniella									
Nigrospora									
Penicillium/Aspergillus	34	1360	94	31	1240	97			
Polythrincium									
Rusts									
Smuts/Periconia/Myxomy									
Spegazzinia									
Stachybotrys									
Stemphylium									
Tetraploa									
Torula									
Ulocladium									
Colorless/Other Brown*									
Oidium									
Zygomycetes									
Pithomyces									
Background debris (1-5)**	3			3					
Sample Volume(liters)	25			25					
TOTAL SPORES/M^3	36	**1440**		32	**1280**				

Revisions:

Spore types listed without a count or data entry were not detected during the course of the analysis for the respective sample, indicating a raw count of <1 spore.
The analytical sensitivity is the spores/m^3 divided by the raw count, expressed in spores/m^3. The limit of detection is the analytical sensitivity (in spores/m^3) multiplied by the sample volume (in liters) divided by 1000 liters.
*Colorless,other Brown are spores without a distinctive morphology on spore traps and non-viable surface samples.
**Background debris is the amount of particulate matter present on the slide and is graded from 1-5 with 1 = very light, 2= Light, 3 = Medium, 4 = Heavy, 5 = Very Heavy. The higher the rating the more likelihood spores may be underestimated. A rating of 5 should be interpreted as minimal counts and may actually be higher than reported.

Disclaimer: The sample results are determined by the sample volume, which is provided by the customer.
This report relates only to the samples tested as they were received.

Angel Gosnell
Angel Gosnell, Approved Laboratory Signatory

102 Edinburgh Court
Greenville, SC. 29607
Phone: (864) 233-3770

Surface and Bulk Sample Report

	Date Sampled: 06/08/21
Attn: ***Phoenix Enviro Corp.***	Date Received: 06/09/21
4020 Shipyard Blvd.	Date Analyzed: 06/09/21
Wilmington, NC 28403	Date Reported: 06/09/21
	Date Revised:
	Project Name: 21-21-186-IAQ-M
	Project Address: 302 Grass lane, Apt 204
	Project City, State ZIP: Wilmington, NC 28405
	SEEML Reference #: 210609024

TEST METHOD: Direct Microscopic Examination (SEEML SOP 18)

Client Sample ID	060821-PG-101			
Location	Green / Brown VSMG in Bathroom Cabinet Underneath Sink			
SEEML Sample ID	210609024-082			
Sample Type	Tape			
	Quantification*			
Hyphal Fragments	**Scattered**			
Pollen				
General Impressions **	**FG**			
Fungal Spore:				
Alternaria				
Acremonium				
Ascospores				
Basidiospores				
Bipolaris/Drechslera				
Cercospora				
Chaetomium				
Cladosporium				
Curvularia				
Epicoccum				
Fusarium				
Geotrichum sp.				
Memnoniella				
Myxomycetes				
Nigrospora				
Penicillium/Aspergillus	**M**			
Pithomyces				
Rusts/Smuts				
Stemphylium				
Tetraploa				
Ulocladium				

** General Impressions: NFG = No Fungal Growth, FG = Fungal Growth, MFG = Minimal Fungal Growth Or Growth in vicinity

Quantification of fungal growth is done by semi-quantitative grading using the following ranges:

Scattered Spores, 1-20 fungal spores

VL = 21-100 fungal spores L = 101-1,000 fungal spores M = 1,001-10,000 fungal spores H = >10,000 fungal spores

ND = No Fungal Spores Detected

Disclaimer: This report relates only to the samples tested

Respectfully submitted, SEEML

Angel Gosnell, **Approved Laboratory Signatory**

102 Edinburgh Court
Greenville, SC 29607
Phone: (864) 233- 3770
Fax: (864) 233- 6589

AIHA-LAP, LLC EMLAP # 173667

Texas License: LAB1016

Phoenix EnviroCorp
4020 SHIPYARD BLVD.
WILMINGTON, NC 28403

CHAIN OF CUSTODY

LABORATORY TEST REQUEST See ml Ref # 210609028
Lab ID : 099 - 100

CONTACT: Philip Green	TELEPHONE (910) 397-0370 FAX (910) 313-6094	6/8/2021
PEC Job #: 21-21-186,188,189,190-IAQ-M	SITE ADDRESS: 302 Grass Lane, Wilmington, NC 28405	

PLEASE EMAIL RESULTS TO: KMGREEN@PHOENIXENVIROCORP.COM

SAMPLE TYPE:	NUMBER OF SAMPLES:	TURN AROUND TIME SPECIFIED:
Spore Trap - Micro-5	2	_____ Immediate _____ 24 hr _____ 48 hr __X__ Standard
Surface Samples	0	

Sample #	Sample Area	Sample Volume	Lab Analysis Requested	% Relative Humidity	Temperature °F
060821-PG-801	Outside - Front	25L	S001	77.3	81.1
060821-PG-802	Outside - Rear	25L	S001		
	Samples accepted				

Samples Collected By (Printed Name and Signature): [signature] Date Signed: 6/8/2021

CHAIN OF CUSTODY RECORD

DATE:	Time:	Condition of Samples:	RELINQUISHED BY: (Printed Name and Signature)	ACCEPTED BY: (Printed Name and Signature)
6/8/2021	14:00 PM	Intact	[signature] AFFILIATION:	[signature] AFFILIATION: 6-9-21

SEEML Reference Number: 210609028

Southeast Environmental Microbiology Laboratories
102 Edinburgh Court
Greenville, SC 29607
Phone: (864) 233-3770
FAX: (864) 233-6589

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

- ☐ Surface/Bulk Report
- ☒ Spore Trap Report
- ☐ Andersen Fungal Report
- ☐ Quantitative Fungal Report

Lab Manager Review: *Angel Gosnell* Date: 06/09/21

Thank you for using SEEML laboratories. We strive to provide superior quality and service.
SEEML laboratories are accredited through AIHA-LAP, LLC (EMLAP # 173667) for the analysis of Spore Traps and Surface/Bulk Samples.

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

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

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

Spore Trap Report

	Date Sampled: 06/08/21
Attn: ***Phoenix Enviro Corp.***	Date Received: 06/09/21
4020 Shipyard Blvd.	Date Analyzed: 06/09/21
Wilmington, NC 28403	Date Reported: 06/09/21
	Date Revised:
	Project Name: 21-21-186, 188,189,190-IAQ-M
	Project Address: 302 Grass Lane
	Project City, State, ZIP: Wilmington, NC 28405
	SEEML Reference # : 210609028

TEST METHOD: DIRECT MICROSCOPY EXAMINATION SEEML SOP 7

Client Sample ID	060821-PG-801			060821-PG-802					
Location	Outside- Front			Outside- Rear					
Lab Sample ID	210609028-099			210609028-100					
Comments									
Hyphal Fragments									
Pollen				3	120				
Spore Trap Used	M5			M5					
	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%			
Alternaria	2	80	<1						
Ascospores	453	18100	36	120	4800	20			
Basidiospores	615	24600	49	213	8520	36			
Bipolaris/Drechslera	1	40	<1						
Chaetomium									
Cladosporium	177	7080	14	222	8880	37			
Curvularia									
Epicoccum									
Cercospora	2	80	<1						
Fusarium									
Memnoniella									
Nigrospora									
Penicillium/Aspergillus				46	1840	8			
Polythrincium									
Rusts									
Smuts/Periconia/Myxomy	1	40	<1						
Spegazzinia									
Stachybotrys									
Stemphylium									
Tetraploa									
Torula									
Ulocladium									
Colorless/Other Brown*									
Oidium									
Zygomycetes									
Pithomyces									
Background debris (1-5)**	3			3					
Sample Volume(liters)	25			25					
TOTAL SPORES/M^3	1251	**50000**		601	**24000**				

Revisions:

Spore types listed without a count or data entry were not detected during the course of the analysis for the respective sample, indicating a raw count of <1 spore.

The analytical sensitivity is the spores/m^3 divided by the raw count, expressed in spores/m^3. The limit of detection is the analytical sensitivity (in spores/m^3) multiplied by the sample volume (in liters) divided by 1000 liters.

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

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

Disclaimer: The sample results are determined by the sample volume, which is provided by the customer.
This report relates only to the samples tested as they were received.

102 Edinburgh Court
Greenville, SC. 29607
Phone: (864) 233-3770

Angel Gosnell

Angel Gosnell, Approved Laboratory Signatory

Fungal Descriptions

Alternaria sp.

Aw - 0.89. Conidia dimensions: 18-83 x 7-18 microns. A very common allergen with an IgE mediated response. It is often found in carpets, textiles and on horizontal surfaces in building interiors. Often found on window frames. Outdoors it may be isolated from samples of soil, seeds and plants. It is commonly found in outdoor samples. The large spore size, 20 - 200 microns in length and 7 - 18 microns in sizes, suggests that the spores from these fungi will be deposited in the nose, mouth and upper respiratory tract. It may be related to bakers' asthma. It has been associated with hypersensitivity pneumonitis. The species *Alternaria alternata* can produce tenuazonic acid and other toxic metabolites that may be associated with disease in humans or animals. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include edema and bronchospasms; chronic cases may develop pulmonary emphysema.

Ascospore

A spore borne in a special cell called an ascus. Spores of this type are reported to be allergenic. All ascomycetes, members of a group of fungi called Ascomycotina, have this type of spore. The minute black dots on rotting wood and leaves or the little cups on lichens are examples of ascomycetes; another is the "truffle" mushroom.

Aspergillus/Penicillium

These are two of the most commonly found allergenic fungi in problem buildings. *Aspergillus* comes in many varieties (species). Many of the varieties produce toxic substances. It may be associated with symptoms such as sinusitis, allergic bronchopulmonary aspergillosis, and other allergic symptoms. *Penicillium* is a variety of mold that is very common indoors and is found in increased numbers in problem buildings. It also has many varieties, some of which produce toxic substances. The symptoms are allergic reactions, mucous membrane irritation, headaches, vomiting, and diarrhea. Due to the morphological similarity of *Aspergillus* and *Penicillium*, they are not differentiated by microscopic analysis and are reported together.

Aspergillus sp.

Aw 0.75 - 0.82. Reported to be allergenic. Members of this genus are reported to cause ear infections. Many species produce mycotoxins that may be associated with disease in humans and other animals. Toxin production is dependent on the species or a strain within a species and on the food source for the fungus. Some of these toxins have been found to be carcinogenic in animal species. Several toxins are considered potential human carcinogens. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include edema and bronchospasms; chronic cases may develop pulmonary emphysema; may also be associated with sinusitis, allergic bronchopulmonary aspergillosis, and other allergic symptoms.

Basidiospore

Spore from basidiomycetes. Many varieties are reported to be allergenic.

Bipolaris sp.

A fungus with large spores that could be expected to be deposited in the upper respiratory tract. This fungus can produce the mycotoxin - sterigmatocystin, which has been shown to produce liver and kidney damage when ingested by laboratory animals.

Botrytis sp.

Aw 0.93. Conidia dimensions: 7-14 x 5-9 microns. It is parasitic on plants and soft fruits. Found in soil and on house plants and vegetables, it is also known as "gray mold". It causes leaf rot on grapes, strawberries, lettuce, etc. It is a well-known allergen, producing asthma type symptoms in greenhouse workers and "wine grower's lung".

Cercaspora

Common outdoors in agricultural areas, especially during harvest. Parasite of higher plants, causing leaf spot. Commonly found as parasites on higher plants.

Chaetomium sp.

large ascomycetous fungus producing perithecia. It is found on a variety of substrates containing cellulose, including paper and plant compost. It has been found on paper in sheetrock. It can produce an *Acremonium*-like state on fungal media. Varieties are considered allergenic and have been associated with peritonitis, cutaneous lesions, and system mycosis.

Cladosporium sp.

Aw 0.88; Aw 0.84. Most commonly identified outdoor fungus. The outdoor numbers are reduced in the winter. The numbers are often high in the summer. Often found indoors in numbers less than outdoor numbers. It is a common allergen. Indoor *Cladosporium* sp. may be different than the species identified outdoors. It is commonly found on the surface of fiberglass duct liners in the interior of supply ducts. A wide variety of plants are food sources for this fungus. It is found on dead plants, woody plants, food, straw, soil, paint, and textiles. Produces greater than 10 antigens. Antigens in commercial extracts are of variable quality and may degrade within weeks of preparation. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include skin lesions, eye ulceration, mycosis (including onychomycosis, an infection of the nails of the feet or hands) edema and bronchospasms; chronic cases may develop pulmonary emphysema.

Curvularia sp.

Reported to be allergenic and has been associated with allergic fungal sinusitis. It may cause corneal infections, mycetoma, and infections in immune compromised hosts.

Dreschlera sp.

Conidia dimensions: 40-120 x 17-28 microns. Found on grasses, grains and decaying food. It can occasionally cause a corneal infection of the eye.

Epicoccum sp.

Conidia dimensions: 15-25 microns. A common allergen. It is found in plants, soil, grains, textiles and paper products.

Fusarium sp.

Aw 0.90. A common soil fungus. It is found on a wide range of plants. It is often found in humidifiers. Several species in this genus can produce potent trichothecene toxins. The trichothecene (scirpene) toxin targets the following systems: circulatory, alimentary, skin, and nervous. Produces vomitoxin on grains during unusually damp growing conditions. Symptoms may occur either through ingestion of contaminated grains or possibly inhalation of spores. The genera can produce hemorrhagic syndrome in humans (alimentary toxic aleukia). This is characterized by nausea, vomiting, diarrhea, dermatitis, and extensive internal bleeding. Reported to be allergenic. Frequently involved in eye, skin, and nail infections.

Myxomycetes

Members of a group of fungi that is included in the category of "slime molds". They're occasionally found indoors, but mainly reside in forested regions on decaying logs, stumps, and dead leaves. Myxomycetes display characteristics of fungi *and* protozoans. In favorable (wet) conditions they exhibit motile, amoeba-like cells, usually bounded only by a plasma membrane, that are variable in size and form. During dry spells, they form a resting body (sclerotium) with dry, airborne spores. These fungi are not known to produce toxins but can cause hay fever and asthma.

Memnoniella

Contaminant found most often with *Stachybotrys* on wet cellulose. Forms in chains, but it are very similar to *Stachybotrys* and sometimes is considered to be in the *Stachybotrys* family. Certain species do produce toxins very similar to the ones produced by *Stachybotrys chartarum* and many consider the IAQ importance of *Memnoniella* to be on par with *Stachybotrys*. Allergenic and infectious properties are not well studied.

Nigrospora sp.

Commonly found in warm climates, this mold may be responsible for allergic reactions such as hay fever and asthma. It is found on decaying plant material and in the soil. It is not often found indoors.

Oidium sp.

The asexual phase of *Erysiphe* sp. It is a plant pathogen causing powdery mildews. It is very common on the leaf's stems, and flowers of plants. The health effects and allergenicity have not been studied. It does not grow on non-living surfaces such as wood or drywall.

Penicillium sp.

Aw 0.78 - 0.88. A wide number of organisms have been placed in this genus. Identification to species is difficult. Often found in aerosol samples. Commonly found in soil, food, cellulose and grains. It is also found in paint and compost piles. It may cause hypersensitivity pneumonitis, allergic alveolitis in susceptible individuals. It is reported to be allergenic (skin). It is commonly found in carpet, wallpaper, and in interior fiberglass duct insulation. Some species can produce mycotoxins. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include edema and bronchospasms; chronic cases may develop pulmonary emphysema. It may also cause headaches, vomiting, and diarrhea.

Periconia sp.

Periconia sp. are found in soil, blackened and dead herbaceous stems leaf spots, grasses, rushes, and sedges. Almost always associated with other fungi. Rarely found growing indoors. Reportedly associated with a rare case of mycotic keratitis.

Pithomyces sp.

A common mold found on dead leaves, plants, soil and especially grasses. Causes facial eczema in ruminants. It exhibits distinctive multi-celled brown conidia. It is not known to be a human allergen or pathogen. It is rarely found indoors, although it can grow on paper.

Rusts/Smuts

These fungi are associated with plant diseases. In the classification scheme of the fungi, the smuts have much in common with the rusts, and they are frequently discussed together. Both groups produce wind-borne, resistant teliospores that serve as the basis for their classification and their means of spread. Rusts usually attack vegetative regions (i.e., leaves and stems) of plants; smuts usually are associated with the reproductive structures (seeds). They can cause hay fever and asthma.

Spegazzinia

Spegazzinia species comprise a very small proportion of the fungal biota. This genus is somewhat related to other lobed or ornamented genera such as *Candelabrum*. No information is available regarding health effects or toxicity. Allergenicity has not been studied. Usually identified on spore trap samples where it is seen every few weeks. (Spores have very distinctive morphology.) May also be found in air by culturable (Andersen) samples if a long enough incubation period is provided so that sporulation occurs. Our laboratory has never found this organism growing on indoor environmental surfaces. Natural habitat includes soil and many kinds of trees and plants.

Stachybotrys sp.

Aw - 0.94, optimum Aw ->0.98. Several strains of this fungus (*S. atra, S. chartarum* and *S. alternans* are synonymous) may produce a trichothecene mycotoxin- Satratoxin H - which is poisonous by inhalation. The toxins are present on the fungal spores. This is a slow growing fungus on media. It does not compete well with other rapidly growing fungi. The dark colored fungus grows on building material with high cellulose content and low nitrogen content. Areas with a relative humidity above 55%, and are subject to temperature fluctuations, are ideal for toxin production. Individuals with chronic exposure to the toxin produced by this fungus reported cold and flu symptoms, sore throats, diarrhea, headaches, fatigue, dermatitis, intermittent local hair loss and generalized malaise. Other symptoms include coughs, rhinitis, nosebleed, a burning sensation in the nasal passages, throat, and lungs, and fever. The toxins produced by this fungus will suppress the immune system affecting the lymphoid tissue and the bone marrow. Animals injected with the toxin from this fungus exhibited the following symptoms: necrosis and hemorrhage within the brain, thymus, spleen, intestine, lung, heart, lymph node, liver, and kidney. Affects by absorption of the toxin in the human lung are known as pneumomycosis.

This organism is rarely found in outdoor samples. It is usually difficult to find in indoor air samples unless it is physically disturbed (or possibly -this is speculation- a drop in the relative humidity). The spores are in a gelatinous mass. Appropriate media for the growth of this organism will have high cellulose content and low nitrogen content. The spores will die readily after release. The dead spores are still allergenic and toxigenic. Percutaneous absorption has caused mild symptoms.

Stemphylium sp.

Reported to be allergenic. Isolated from dead plants and cellulose materials.

Torula sp.

Found outdoors in air, soil, on dead vegetation, wood, and grasses. Also found indoors on cellulose materials. Reported to be allergenic and may cause hay fever and asthma.

Tetraploa

Tetraploa species comprise a very small proportion of the fungal biota. This genus is somewhat related to *Triposporium* and Diplocladiella. The only reported human infections are two cases of keratitis (1970, 1980) and one case of subcutaneous infection of the knee (1990). No information is available regarding other health effects or toxicity. Allergenicity has not been studied. Usually identified on spore trap samples where it is seen every few weeks. (Spores have very distinctive morphology.) Our laboratory has never found this organism growing on indoor environmental surfaces. Natural habitat includes leaf bases and stems just above the soil on many kinds of plants and trees.

Ulocladium sp.

Aw 0.89. Isolated from dead plants and cellulose materials. Found on textiles.

Zygomycetes

Zygomycetes are one of the four major groups of fungi, the others being the Oomycetes, the Ascomycetes, and the Basidiomycetes. Zygomycetes are common, fast growing, and often overgrow and/or inhibit other fungi nearby. Rhizopus and Mucor are two of the most common Zygomycetes seen in the indoor environment. However, others are seen as well, including *Syncephalastrum*, *Circinella*, *Mortierella*, *Mycotypha*, *Cunninghamella*, and *Choanephora*. For further information, please see descriptions of these individual genera.

The following table lists mycotoxins that are produced by certain types of fungi:

Fungi	Mycotoxin
Acremonium crotocinigenum	Crotocin
Aspergillus favus	Alfatoxin B, cyclopiazonic acid
Aspergillus fumigatus	Fumagilin, gliotoxin
Aspergillus carneus	Critrinin
Aspergillus clavatus	Cytochalasin, patulin
Aspergillus Parasiticus	Alfatoxin B
Aspergillus nomius	Alfatoxin B
Aspergillus niger	Ochratoxin A, malformin, oxalicacid
Acremonium crotocinigenum	Crotocin
Aspergillus nidulans	Sterigmatocystin
Aspergillus ochraceus	Ochratoxin A, penicillic acid
Aspergillus versicolor	Sterigmatocystin, 5 ethoxysterigmatocystin
Aspergillus ustus	Ausdiol, austamide, austocystin,brevianamide
Aspergillus terreus	Citreoviridin
Alternaria	Alternariol, altertoxin, altenuene, altenusin, tenuazonic acid
Arthrinium	Nitropropionic acid
Bioploaris	Cytochalasin, sporidesmin, sterigmatocystin
Chaetomium	Chaetoglobosin A,B,C. Sterigmatocystin
Cladosporium	Cladosporic acid
Clavipes purpurea	Ergotism
Cylindrocorpon	Trichothecene
Diplodia	Diplodiatoxin
Fusarium	Trichothecene, zearalenone
Fusarium moniliforme	Fumonisins
Emericella nidulans	Sterigmatocystin
Gliocladium	Gliotoxin
Memnoniella	Griseofulvin , dechlorogriseofulvin, epi-decholorgriseofulvin, trichodermin, trichodermol
Myrothecium	Trichothecene
Paecilomyces	Patulin, viriditoxin
Penicillium aurantiocandidum	Penicillic acid
Penicillium aurantiogriseum	Penicillic acid
Penicillium brasilanum	Penicillic acid
Penicillium brevicompactum	Mycophenolic acid
Penicillium camemberti	Cyclopiazonic acid
Penicillium carneum	Mycophenolic acid, Roquefortine C
Penicillium crateriforme	Rubratoxin

Fungi	**Mycotoxin**
Penicillium citrinum	Citrinin
Penicillium commune	Cyclopiazonic acid
Penicillium crustosum	Roquefortine C
Penicillium chrysogenum	Roquefortine C
Penicillium discolor	Chaetoglobosin C
Penicillium expansum	Citrinin, Roquefortine C
Penicillium griseofulvum	Roquefortine C, cyclopiazonic acid, griseofulvin
Penicillium hirsutum	Roquefortine C
Penicillium hordei	Roquefortine C
Penicillium nordicum	Ochratoxin A
Penicillium paneum	Roquefortine C
Penicillium palitans	Cyclopiazonic acid
Penicillium polonicum	Penicillic acid
Penicillum roqueforti	Roquefortine C, Mycophenolic acid
Penicillium veridicatum	Penicillic acid
Penicillium verrucosum	Citrinin, ochratoxin A
Penicillium/ Aspergillus	Patulin
Penicillium/ Aspergillus/Alternaria	Glitoxin
Phomopsis	Macrocyclic trichothecenes
Phoma	Brefeldin, cytochalasin, secalonic acid, tenuazonic acid
Pithomyces	Sporidesmin
Rhizoctonia	Slaframine
Rhizopus	Rhizonin
Sclerotinia	Furanocoumarins
Stachybotrys chartarum	Iso-satratoxin F, roridin E, L-2, satratoxin G & H, trichodermin, trichodermol, trichothecene
Torula	Cytotoxins
Trichoderma	Trichodermin, trichodermol, gliotoxin
Trichothecium	Trichothecene
Wallemia	Walleminol
Zygosporium	Cytochalasin

General terms

Allergen

An allergen is a substance that elicits an IgE antibody response and is responsible for producing allergic reactions. Chemicals are released when IgE on certain cells contact an allergen. These chemicals can cause injury to surrounding tissue - the visible signs of an allergy. Only a few fungal allergens have been characterized but all fungi are thought to be potentially allergenic. Fungal allergens are proteins found in either the mycelium or spores

"Black mold"

A poorly defined term. Black mold or toxic black mold has usually been associated with the mold *Stachybotrys chartarum*. While there are only a few molds that are truly black, there are many that can appear black. Not all molds that appear to be black are *Stachybotrys*.

Fungi

Fungi are neither animals nor plants and are classified in a kingdom of their own. The Kingdom of Fungi. Fungi include a very large group of organisms, including molds, yeasts, mushrooms and puffballs. There are >100,000 accepted fungal species but current estimates range to 1.5 million species. Mycologists (people who study fungi) have grouped fungi into four large groups according to their method of reproduction.

Hidden mold

This refers to visible mold growth on building structures that is not easily seen, including the areas above drop ceilings, within a wall cavity (the space between the inner and outer structure of a wall), inside air handlers, or within the ducting of a heating/ventilation system.

Microbial Volatile Organic Compounds (MVOCs)

Fungi produce chemicals as a result of their metabolism. Some of these chemicals, MVOCs, are responsible for the characteristic moldy, musty, or earthy smell of fungi, whether mushrooms or molds. Some MVOCs are considered offensive or annoying. Specific MVOCs are thought to be characteristic of wood rot and mold growth on building materials. The human nose is very sensitive to mold odors and sometimes more so than current analytical instruments.

Mold

Molds are a group of organisms that belong to the Kingdom of Fungi (see Fungi). Even though the terms mold and fungi had been commonly referred to interchangeably, all molds are fungi, but not all fungi are molds.

Mycotoxin

Mycotoxins are compounds produced by some fungi that are toxic to humans or animals. By convention, the term? Mycotoxin. Excludes mushroom toxins. Fungi that produce mycotoxins are called "toxigenic fungi."

Spore

General term for a reproductive structure in fungi, bacteria and some plants. In fungi, the spore is the structure which may be used for dissemination and may be resistant to adverse environmental conditions.

Toxic mold

The term "toxic mold" has no scientific meaning since the mold itself is not toxic. The metabolic byproducts of some molds may be toxic (see mycotoxin).

Hypha (plural, hyphae)

An individual fungal thread or filament of connected cells; the thread that represents the individual parts of the fungal body.

Phoenix EnviroCorp

MOLD/BIOLOGICAL CONTAMINANT REMEDIATION PROTOCOL

Date: July 2, 2021

For: Quanesha Mullins
Wilmington Housing Authority
1524 S. 16th Street
Wilmington, NC 28401

Remediation Contractor: Not determined

On-Site Consultant: Phoenix EnviroCorp (PEC)
4020 Shipyard Boulevard
Wilmington, NC 28403
(910) 397-0370

Approved Signatory:

Tommie Green, CIEC
Professional Industrial Hygienist

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SECTION 1.0 REMEDIATION PROCEDURES

1.1 Project Set Up

- The owner or powers that be shall supply temporary power for remediation equipment. The existing electrical system may be utilized, with permission of the owner or powers that be. Determining specific electrical load/safety requirements, including, but not limited to, the use of a temporary GFCI electrical panel box shall be the responsibility of the abatement contractor.
- HVAC system shall be isolated.
- 6-mil polyethylene sheathing shall be erected to separate primary control areas (PCA) from remaining areas. Control areas shall be selected so that specified building materials (specified herein, in section 1.3, under primary control areas) may be removed or cleaned and dried.
- HEPA Air Filtration Devices shall be utilized for each separate control area. Critical barriers shall consist of 6-mil polyethylene so that primary control areas are isolated from remaining areas. HEPA filtration units shall be exhausted from the PCA to the outside of the building through windows/doors. Dehumidification units must be installed in the PCA to sufficiently dry components.
- A remote wash off station shall be set up to allow for employees to wash hands and faces after egress from the work area.
- Ingress/Egress to the control area(s) shall be, at minimum, sealed with a 2-way polyethylene air lock.
- Entrances to the building shall be marked as indicated in Section 7.4 of this document.

1.2 Local Exhaust System

- Once sealed, the primary control area shall be ventilated with a local HEPA air filtration device that shall ensure a minimum of four (4) air changes per hour. The air filtration device shall be placed within the containment work area.
- Local HEPA exhaust shall be utilized where cleaning of contents is required and/or in the immediate vicinity of remediation activities of building materials.
- In interior sections requiring surface area cleaning, local HEPA filtration may be exhausted within the area to scrub microbials from ambient air. This process shall only be conducted after fine cleaning has been completed.
- Negative pressure within the contained work area shall be maintained throughout the project until clearance is obtained.
- Negative air machines shall be exhausted to exterior portions of the building to adequately ensure that negative pressure is achieved.
- Negative air pressure within the work area shall be tested and recorded at initiation of the project and hourly thereafter by use of a manometer to ensure the desired pressure of -0.02 inches of water, which is comparable to four changes per hour.
- Dehumidification devices with HEPA filtration may be incorporated as filtration devices in conjunction with true HEPA filtration devices; they may not replace the true HEPA filtration devices.

Note: Formula for determination of adequate HEPA filtration:

Total feet per minute =Volume of work area (ft^3)/15 minutes
#AFD Units needed = (Total feet per minute)/Capacity of Unit (ft^3)

- At initiation of final cleaning stages, relative humidity shall be at 40% (+/-3%) and moisture content of wooden components shall be at or below 15% as determined by Delmhorst moisture meter or equivalent meter. Moisture mapping and direct read T/RH shall be recorded by the remediation contractor until the

specified levels have been achieved. Control areas shall be dehumidified during cleaning and mold remediation activities to ensure removal of surface moisture created during application of water. Drying of structural components that have been treated with encapsulating anti-microbial agents will be necessary.

- Moisture levels shall be recorded and documented by the remediation contractor upon successful completion of dehumidification.

1.3 Remediation Specifications

- Prior to commencement of mold remediation activities by the remediation contractor, the source of any water intrusions, leaks, and/or moisture/humidity problems shall be remedied by the owner. If water intrusions, leaks, and/or moisture/humidity problems exist and are not corrected, mold growth can be expected to return.
- All remediation procedures listed that involve the removal of building materials shall employ polyethylene critical barriers, negative air pressure, and HEPA filtration (i.e., primary control areas).
- The remediation contractor shall ensure that the filters are properly capped prior to switching off the air scrubbers. If the filters are not properly capped, the backflow can cause mold spores to re-release back into the control area, essentially re-contaminating an area that has already been cleaned.
- All remediation activities shall be conducted in a manner that does not allow dissemination of mold spores. Remediation procedures shall begin from the side of the control area furthest away from air filtration devices.
- Cleaning procedures shall be repeated until the area is visibly free of dust and debris.
- Engineering controls set up during the remediation process shall remain in place until remediation has been completed and acceptable post remediation sampling results have been achieved.
- **Federal and/or state regulations require that suspect asbestos containing materials in public and commercial buildings shall be inspected for asbestos prior to renovations or demolition. Based on these regulations, PEC recommends that building materials that may be disturbed during mold remediation be tested for asbestos content prior to their disturbance to prevent asbestos contamination.**
- If cleaning procedures outlined in this remediation plan outweigh the cost of replacement for selected items, the remediation contractor shall give the owner the option to clean or dispose of those items.
- Reinstallation of building materials and/or components shall only be conducted once acceptable post remediation results are obtained.
- Any chemicals used on this project shall be EPA approved and used only as directed by the manufacturer. MSDS shall be available for review upon request.

HVAC System

- The HVAC system(s) that services or run through the primary control area/affected area shall be shut down prior to remediation activities.
- The spaces that are normally climate-controlled by the HVAC system that have been shut down shall be maintained under proper humidity levels (between 30 and 60% utilizing dehumidifiers, etc.) while the system is not in operation.
- All HVAC supply/return vents within the primary control area/affected area shall be isolated with a critical barrier (i.e., plastic, etc.) to prevent air flow. Prior to isolating the vents, the register covers (diffusers) shall be removed, and the supply shall be isolated at the metal boot. Once isolated, the registers and surrounding building materials shall be cleaned.
- The interior of the air handler, rigid duct system, intake box, etc. shall be thoroughly cleaned by an HVAC professional experienced in mold remediation. The interior can be cleaned with mechanical methods that aggressively disturb all interior surfaces and filter the disturbed airborne particulates.

- Cleaning of components shall consist of a method that thoroughly removes visible mold growth, settled concentrations of mold spores, and/or dust and debris.
- PEC recommends the removal and disposal of the flex ducts when feasible, as well as any interior duct board where cleaning will damage the duct board. Once removed, the remediation contractor shall isolate the connection point where the flex duct and/or duct board was detached with a critical barrier (such as plastic, etc.) to prevent air flow.
- Once the HVAC system components are cleaned or replaced anew, the system shall remain off and isolated until acceptable post remediation results are obtained.
- A written document shall be obtained from the remediation contractor verifying that the HVAC system has been cleaned by an HVAC cleaning company with mold experience. This document shall include the property address and date of services and shall be filed with other mold remediation documents.

Note: For directional purposes "front" is determined by facing the playground/grassy area from inside the unit, unless otherwise noted.

Primary Control Areas/Affected Areas

Critical barriers, negative air pressure, and HEPA filtration shall be established to isolate the following areas as Primary Control Areas to perform the specified mold remediation.

Within the kitchen:

- Detach the floor mounted cabinets (with sink) from the front wall and discard water damaged components (i.e., cabinet floor, etc.).
- Remove all baseboards from the front wall.
- Assess the drywall uncovered by the removal of the specified cabinet and baseboards and remove any affected drywall (i.e., drywall with apparent water damage/suspect visible mold growth) and extend the drywall removal within a 2-foot radius of any affected areas when possible.
- Remove any loose flooring.

Within the bathroom:

- Remove and discard the floor mounted cabinet along the front wall.
- Remove all baseboards from the front and left walls.
- Assess the drywall uncovered by the removal of the specified cabinet and baseboards and remove any affected drywall (i.e., drywall with apparent water damage/suspect visible mold growth) and extend the drywall removal within a 2-foot radius of any affected areas when possible.
- Remove all loose floor tiles.

Throughout the unit (Negative air pressure is not required in areas where building components are not specified for removal, but HEPA filtration is required):

- Clean all surfaces, furnishings and contents as specified below under general specifications for primary control areas.

General Specifications for Primary Control Areas

- Open plumbing lines and drains within the control areas shall be isolated with a critical barrier consisting of 6-mil poly.
- The water line to toilets within the control areas shall be shut off and the toilets shall be isolated with a critical barrier consisting of 6-mil poly.
- Cleaning of components/materials shall consist of a method that thoroughly removes visible mold growth, settled concentrations of mold spores, and/or dust and debris (i.e., HEPA vacuuming, wet wiping, or other approved methods), followed by dehumidification/drying.

- Non-porous, semi-porous, and porous furnishings and contents shall be cleaned. If items cannot be cleaned efficiently, the abatement contractor shall consult with the owner/powers that be to determine if they shall be disposed.
- All machine washable porous cloth items shall be cleaned and dried in a household washer and dryer. Other specialty items shall be cleaned by a dry cleaner that specializes in cleaning materials affected with mold. These items shall be removed from affected area(s) and shall not be reintroduced back into the area(s) until acceptable post remediation testing is established. If porous articles cannot be cleaned efficiently, the abatement contractor shall consult with the owner/powers that be.
- Mattresses shall be cleaned utilizing HEPA vacuuming, NOT by pressure extraction or wet methods. If suspect visible mold growth is on the mattress or if the mattress cannot be cleaned efficiently, the abatement contractor shall consult with the owner/powers that be prior to disposal.
- Exterior surfaces of electrical appliances, electrical equipment, and light fixtures shall be cleaned, utilizing wet method and HEPA vacuuming. These items shall be disconnected from all electrical sources prior to cleaning. If these items cannot be cleaned efficiently, the abatement contractor shall consult with the owner/powers that be.
- All wall cavity insulation shall be disposed in areas that specify the removal of drywall/wallboard. The abatement contractor shall visually inspect the back side of surrounding drywall/wallboard for water damage and/or suspect mold growth and document any findings. If additional suspect mold growth or water damage is observed beyond the specified removal area, additional drywall/wallboard shall be removed until no suspect mold growth or water damage is observed.
- All penetrations within the controlled area that adjoin unaffected or non-accessible areas, including outdoor areas, crawlspaces, etc., shall be cleaned (as far as one can reach) and then sealed with 6-mil poly, extending six (6) inches on all sides.
- In areas of specified wallboard removal, all components within the wall cavities shall be cleaned. Any wooden structural components with mold stains or mold growth in pitted surfaces shall be HEPA sanded (or other approved methods) to eliminate embedded mold growth.
- All joints or sills (where the structural system meets, where the sill plate meets the floor, etc.) shall be aggressively disturbed to remove embedded mold growth and spores.
- Furnishings and contents that are specified for cleaning shall be protected with polyethylene in areas where building components are specified for removal, prior to the removal of building components to avoid cross contamination. The protective covering shall be removed, and the furnishings and contents shall be cleaned prior to post visual inspection and testing.

1.4 Removal Procedures

The contractor shall maintain surfaces of the control area free of accumulation of dust and debris. Additionally, they shall restrict the spread of dust and debris, keeping waste from being distributed over the work area. Materials shall be removed in a fashion to ensure that previously cleaned areas are not re-contaminated (i.e., working from one end of the control area to the other). The contractor may be required to re-clean areas based on a visual inspection by the CIEC/CIE/IH, if the areas are not visibly clean.

Contaminated building materials that have been removed, and additional materials and debris generated during remediation, shall be bagged or wrapped with 6-mil polyethylene sheeting, sealed with duct tape, and carried to the waste container prior to visual inspection by the CIEC/CIE/IH. Materials shall be bagged and sealed directly after removal from unaffected building components.

Areas shall be allowed to dry for a period until specified RH and moisture levels have been achieved. Any remaining building products that are directly impacted by remediation shall be tested for moisture content. Wooden and cellulosic building components (e.g., wall studs, drywall, etc.) shall be tested for moisture content. If the moisture content is > 15% in wood products or > 12% in cellulosic products (utilizing a Delmhorst moisture meter), dehumidification shall be required until moisture levels are at or below said levels,

and the RH level is at or below 40% +/-3% (for all interior areas). The remediation contractor shall verify water content of all wooden and cellulosic building components within the impacted areas, as well as temperature and RH prior to scheduling post remediation verification.

1.5 Cleanup Overview

The contractor shall personally review the cleaning process prior to contacting the CIEC/CIE/IH for the post remediation testing. If accumulations of debris and dust are significant, the CIEC/CIE/IH will require re-cleaning prior to post remediation verification sampling.

The CIEC/CIE/IH shall make a visual inspection and conduct post remediation sampling after the final cleaning is complete.

1.6 Post Remediation Verification Testing

Prior to conducting post remediation sampling, HEPA filtration devices shall be allowed to operate for a minimum of 48 hours (the equivalent of 192 air changes), following fine cleaning, in all areas where remediation has been conducted. The HEPA filtration devices shall be sealed at the intake and turned off approximately two hours prior to post testing and reconvene within one hour after post testing, until acceptable post remediation results are established.

Post remediation sampling shall be conducted utilizing viable and/or non-viable sample methods. Air samples shall be collected in representative areas of the control areas. Surface sampling may be conducted at the discretion of the CIEC/CIE/IH.

Sampling shall be conducted in areas directly impacted by remediation procedures, where cleaning was conducted. The CIEC/CIE/IH shall determine acceptable post remediation status through interpretation of air sampling results, which will be based on indoor/outdoor comparisons, in combination with any surface samples collected, moisture readings, RH readings, visual observations, and any other pertinent information.

The owner/client will be responsible for post remediation testing. If air sample results indicate unacceptable airborne concentrations, the contractor shall be required to conduct a re-cleaning at the contractor's expense and absorb the cost for re-testing, until acceptable results are achieved.

SECTION 2.0 SCOPE OF WORK (Note: Section 2 and Section 1.3 are essential to the full Scope of the Contractor's Work)

2.1 Investigative Reports and Other Related Documents

Phoenix EnviroCorp investigative report dated June 15, 2021, and July 2, 2021.

Phoenix EnviroCorp Chain of Custody dated June 8, 2021.

Analytical reports dated June 9, 2021.

2.2 Project Description

The procedures covered by this program include the enclosure and drying of the said structure, the removal, handling, and disposal of building components compromised by mold/fungal growth, and the cleaning and disinfecting of existing building materials. Procedures for reconstruction are not considered in these specifications. Reconstruction of interior portions may not be conducted until procedures for remediation have

been completed, the control areas have been inspected, and testing has returned acceptable post remediation results. Reconstruction of exterior portions may be conducted during the restoration to ensure that water intrusion is abated.

The objectives covered by the program include the remediation of materials shown to have surface contamination, water damage, and/or exposure to elevated airborne mold spore levels, without subjecting the workers, installation employees, and occupants to microbial contaminants. In addition, contract employees, occupants, and materials will be appropriately protected during the removal process so that present and future exposures will not occur.

This protocol is provided as a guideline. Any deviation requests from this protocol shall be addressed to the CIEC/CIE/IH for consideration. At present there are no Federal or State requirements regarding microbial remediation projects; however, OSHA General Construction Code of Federal Regulations (29 CFR 1926) shall be followed.

Remediation shall be completed as close to the date that this protocol was drafted, as the specifications outlined within represent conditions at the time the investigative services were conducted. Due to the volatility of mold, the current protocol may not reflect all necessary remediation if conditions are allowed to continue. Further, if time lapses allowing conditions to change, it will become increasingly difficult to obtain successful clearance testing results.

SECTION 3.0 AIR MONITORING

3.1 Responsibilities of the CIEC/CIE/IH

Monitoring of airborne concentrations will be performed in accordance with the requirements of this program. Prior to conducting air sampling and/or surface sampling for clearances, the CIEC/CIE/IH shall conduct a visual inspection of the area. Temperature and RH shall be recorded during the air sampling phase of clearance. All air sampling shall be conducted in such a manner as to provide a valid representation of airborne mold levels both inside and outside the work areas. If analysis of air samples indicates that airborne concentrations exceed acceptable limits, the contractor shall conduct re-cleaning at the contractor's expense.

3.2 Personal Monitoring

No personal monitoring will be conducted by the CIEC/CIE/IH unless the remediation contractor requests monitoring for OSHA compliance. Presently there are no guidelines (PELs or TLVs) for microbial contaminants. It is the remediation contractor's responsibility to determine if OSHA personal sampling may be required during application of anti-microbial agents.

3.3 Sample Integrity and Reporting

Samples shall be sealed, labeled, and a chain of custody initiated according to laboratory procedures.

Sample results shall be available within seven (7) days of the completion of collection of all samples and will include the following information:

- Site Address
- Sample Number
- Location Sampled
- Analytical Method

- Collection Date(s)
- Person Taking Sample(s)
- Additional Comments (if any)
- Analyst Signature

SECTION 4.0 MATERIAL REPLACEMENT

4.1 Material Replacement

The general contractor/replacement contractor may begin material replacement after the CIEC/CIE/IH informs all parties of acceptable post remediation sample results.

With ongoing construction activities ambient air levels are expected to be elevated over what might be normally expected. Additional testing should not be necessary after remediation procedures have been completed and successful results have been obtained. In the event of another water intrusion (i.e., broken-pipe-line, improper HVAC function, or building envelope compromise), an investigation shall be conducted within 24 to 48 hours of the event. Proper drying, if initiated within this time frame, should minimize the potential for microbial growth.

SECTION 5.0 SPILL CLEANUP REQUIREMENTS

5.1 Spills

MSDS shall be kept on site for all chemical products brought to the site by the remediation contractor. In the event of a chemical spill, the contractor shall initiate cleanup immediately. The contractor shall mop up any liquid with rags or other conventional absorbent. The spent absorbent shall be properly contained and disposed of as waste.

SECTION 6.0 WASTE CONTROL

6.1 Waste Disposal

Waste shall be disposed of at a locally selected landfill. Waste bags shall be checked for integrity and hauled in an enclosed truck/vehicle or container to ensure that transportation to the landfill does not pose a potential hazard to the environment.

SECTION 7.0 SUPPLEMENTAL INFORMATION

7.1 Applicable Publications

The publications listed below form part of this program. Written programs shall accompany all referenced CFR publications. IICRC and NYCDOH guidelines for work procedures shall be followed by the remediation contractor. A copy of the NYCDOH protocols shall be on-site, along with this design, for reference by the site supervisor. ACGIH, IAQA, and ASHRAE publications shall be utilized as guidelines for interpretation by the CIEC/CIE/IH. This design shall be reviewed by the remediation supervisor prior to initiation of set-up for the project. Any questions regarding this project may be addressed with the on-site consultant listed for Phoenix EnviroCorp.

Code of Federal Regulation (CFR Publications)

29 CFR 1910.134	Respiratory Protection
29 CFR 1910.145	Specifications for Accident Prevention, Signs and Tags
29 CFR 1926.28	Personal Protective Equipment
29 CFR 1926.59	Hazard Communication
29 CFR 1926.96	Occupational Foot Protection
29 CFR 1926.100	Head Protection
29 CFR 1926.101	Hearing Protection
29 CFR 1926.102	Eye and Face Protection
29 CFR 1926.403	Electrical General Requirements
29 CFR 1926.416	Safety General Requirements
29 CFR 1926.852	Demolition, Chutes
29 CFR 1926.1091	Record Keeping Requirements

Supplemental Guidelines

IICRC S520 2nd ed.	Standard and Reference Guide for Professional Water Damage Restoration
NYCDOH	Guidelines on Assessment and Remediation of Fungi in Indoor Environments
ACGIH	Bioaerosols: Assessment and Control
IAQA 01-2000	Recommended Guidelines for Indoor Environments
ASHRAE 62.2-2007	Ventilation for Acceptable Indoor Air Quality in Low-Rise Residential Buildings

7.2 Definitions

Air Lock: A system that permits ingress and egress between a control area and non-control area, or other work areas, without allowing air movement between areas (e.g., three stage decon, three-way polyethylene flaps).

Air Sample: Refers to samples collected with spore trap air sample media (e.g., Micro-5, Cyclex D, or equivalent); also referred to as a non-viable air sample. May also refer to a sample collected on a disposable petri dish with Agar media by means of an Andersen Impactor (or equivalent) and sampling pump; also referred to as air culture (viable) sample. Sample media to be used in project is described under Section 1.6 (Post Remediation Verification Testing).

Area Monitoring: The sampling of airborne microbial concentrations outside the exclusion boundary, which may reach the breathing zone of the contractor or installation employees.

Asbestos Containing Materials (ACM): Refers to asbestos containing building materials that contain more than 1% asbestos by Polarized Light Microscopy (PLM) or Transmission Electron Microscopy (TEM).

Biocide: Refers to chemical agents that are specifically designed to eliminate viable microbial contamination, with a phenol equivalent efficiency (e.g., Sodium Hypochlorite, Quaternary Ammonia Compounds).

Blower Door Test: Refers to the testing of static pressure and draw of air through the HVAC in cubic feet per minute (CFM) to rate the efficiency of the system.

Clearance Monitoring: Refers to air, bulk, or swab sampling conducted as a means to demonstrate that the area specified for remediation has been completed by the contractor, left with present acceptable mold spore levels, and ready for re-construction.

Control Area: The area where microbial contaminants removal is performed, which is isolated by physical

boundaries to prevent unauthorized entry of personnel, thereby preventing exposure to or the spread of microbial contaminants. Physical boundaries will be established and located such that the airborne contaminants are not allowed to escape the boundaries.

HEPA: High Efficiency Particulate Air. Refers to ventilation devices that are specifically designed to filter ambient air to an efficiency of 99.97%.

HVAC: Refers to the Heating, Ventilation, and Air Conditioning system.

Industrial Hygienist: Refers to a person who practices industrial hygiene and may act as a competent person regarding visual inspection of contaminated surfaces and clearance air and/or swab/bulk sampling. May also refer to a Certified Industrial Hygienist (CIH) as defined by the American Board of Industrial Hygiene (ABIH), a Certified Indoor Environmental Consultant as defined by the American Council for Accredited Certification (ACAC), or a Certified Indoor Environmentalist (CIE) as defined by the American Council for Accredited Certification (ACAC).

Microbial Contaminant: Refers to viable mold, fungi, pollen, bacteria, and or particulate, or their metabolites, that may be causative of epidemiological, immunotoxic, dermotoxic, neurotoxic, or enterotoxic disorders in the human population, or may be considered a pathogen or an opportunistic pathogen.

Non-Porous Materials: Refers to building materials with solid surfaces that may be successfully treated and cleaned by means of HEPA vacuuming or other approved method. Materials include flooring, hard goods, plastic, vinyl, and some wallboard systems.

Porous Materials: Refers to building materials and household goods that may allow microscopic particles (3-20 micron) to become trapped within the material that will not allow adequate cleaning. Materials include carpet, mattresses, and clothing.

Primary Control Area (PCA): Refers to a section of a facility that has been isolated by 6-mil polyethylene barriers where specific engineering controls (e.g., HEPA filtration, negative air pressurization, dehumidification, etc.) are required. In general, it is the area where remediation of water and mold damaged building materials is to be conducted.

Refrigerant Dehumidifier: Device used to remove water content from air and materials.

Relative Humidity (RH): Refers to the ratio of water vapor in the atmosphere to the amount required to saturate it at a given temperature.

Semi-Porous Materials: Refers to materials that may be somewhat porous, yet they may still allow for adequate cleaning. Materials include wooden beams and some wallboard systems.

Swab Sample: Refers to collection of a sample onto a sterile swab for analysis of mold, fungi, and bacteria by viable and/or non-viable analysis.

Tape-Lift Sample: Refers to collection of a sample onto clear scotch tape for analysis by direct microscopic examination (non-viable).

7.3 Quality Assurance

Medical Examinations

Before potential exposure to microbial contaminants, the remediation contractor shall provide workers with a comprehensive medical examination as required by 29 CFR 1910.134 as outlined by the Medical Monitoring Program.

Medical Records

The remediation contractor shall maintain complete and accurate medical records on employees as required by OSHA and the contractor's Medical Monitoring Program. The contractor may be asked to provide a copy of all medical records for approval by the consultant's representative.

Training

Each employee working on this contract shall be trained prior to the time of initial job assignment in accordance with mold specific and chemical specific training as indicated by the OSHA General Duty Clause and the Hazard Communication Standard. Each employee shall also receive training required by Federal guidelines listed in Section 7.1 of this document and project specifications.

Hazard Communication Program

The remediation contractor has established and implemented a Hazard Communication Program as required by 29 CFR 1910.1200 and may be asked to provide a copy of this written program. Hazard Communication training must include occupational hazards as directly related to working with fungi/mold and contamination of building components by fungal contamination, specific training for chemical hazards associated with biocide usage, and site specific MSDS sheets for commercial detergents and biocides utilized on the job site.

Respiratory Protection Program

The remediation contractor has established a Respiratory Protection Program, which complies with 29 CFR 1910.134. Physical examinations and fit testing are required for use of respiratory protection greater than an N-95 dust mask. Workers removing building materials contaminated by mold growth, applying anti-microbial agents, or workers subjected to exposures to anti-microbial agents shall be required to wear, at minimum, a tight-fitting negative pressure ½ mask respirator with P-100 filters. Therefore, -he OSHA Respiratory Protection Standard applies.

Analytical Testing Laboratory

Analysis of culturable biological samples collected on this project shall be conducted by a laboratory that participates in the Environmental Microbiological Proficiency Analytical Testing Program (EMPAT) of the American Industrial Hygiene Association (AIHA) and has shown to be proficient by proficiency analytical testing (PAT) samples. Analysis of non-viable air and surface samples shall be conducted by a competent person.

7.4 Materials and Equipment

Equipment

The contractor shall make available to employees a complete set of personal protective equipment (PPE) as required by this program for entry into the controlled area. All personnel while in the control area or handling microbial contaminated waste shall wear protective clothing, respirators, and other PPE.

Respirators

Contractor shall furnish the appropriate respirator in accordance with 29 CFR 1910.134 and approved by NIOSH for protection in environments that contain microbial contaminants. The selected respirator for this project shall be a tight-fitting negative pressure ½ respirator equipped with HEPA cartridge (P-95, P-100). At minimum, an N-95 dust mask may be utilized during fine cleaning activities; however, the tight fitting ½ mask respirator shall be utilized during application of anti-microbial agents or biocides.

Special Clothing

Employees shall be provided with and required to wear: whole body disposable protective clothing, full body tyvek suits with head coverings, and latex gloves *(see table)* during all activities in the controlled area.

Chemical	Recommended Rubber Glove
Sodium Hypochlorite	Neoprene or Nitrile
Phenolic Compounds	Neoprene
Quaternary Ammonia Compounds	Polyvinyl Chloride (PVC)
Detergents	Latex

Eye Protection

The contractor shall provide chemical-resistant goggles to personnel engaged in cleaning and treatment activities and require them to be worn during application of anti-microbial agents and biocides.

Warning Signs and Labels

Standard approved warning signs shall be erected at all approaches to the control area as specified in 29 CFR 1910.145.

Anti-Microbial Agents

Anti-microbial agents utilized in interior quarters shall consist of quaternary ammonia compounds. No phenolic compounds shall be used in interior quarters with exception of Micro Ban Plus. Approval must be granted by the owner/powers that be prior to application. Anti-microbial agents shall be EPA approved. Commercial grade detergents shall be used to remove fungal contamination during cleaning phases prior to anti-microbial application, to include encapsulation.

Phoenix EnviroCorp

June 22, 2021

Quanesha Mullins
Wilmington Housing Authority
1524 S. 16th Street
Wilmington, NC 28401

RE: PEC Job # 21-21-187-IAQ-M – 302 Grass Lane, Apartment 205, Wilmington, NC - Mold Investigation/Background air sampling

Enclosed are the results of the mold investigation conducted at the above referenced unit on June 17, 2021. Phoenix EnviroCorp (PEC) was retained to conduct background air sampling to determine airborne mold spore levels and to collect surface samples of suspect visible mold growth.

Background Information: The HVAC system was operating in the cool mode set at 66º F upon PEC's arrival and during sampling.

The unit is occupied and fully furnished with contents throughout.

Note: For directional purposes "front" is determined by facing the parking lot off Grass Lane from inside the unit, unless otherwise stated.

Visual Inspection: PEC's visual inspection noted the following (see enclosed photographic documentation):

- Apparent water damage and suspect visible mold growth in the kitchen cabinet underneath the sink
- Apparent water damage in the bathroom cabinet underneath sink
- Suspect visible mold growth on the HVAC supply vent in the rear left bedroom
- Suspect visible mold growth on the HVAC supply vent in the rear right bedroom
- Apparent water damage on the popcorn ceiling in the rear right bedroom

Mold Testing – Surface: Non-viable surface samples were collected from areas of suspect visible mold growth. The quantifications of fungal growth are reported as scattered spores, 21-100 fungal spores = very light (VL), 101-1,000 fungal spores = light (L), 1,001-10,000 fungal spores = moderate (M), > 10,000 fungal spores = heavy (H). The 'General Impressions' of fungal growth are reported as no fungal growth (NFG), fungal growth (FG), minimal fungal growth or growth in vicinity (MFG), and no fungal spores detected (ND). *Clear tape was utilized for the collection of surface samples. Each sample was assigned a unique ID number and shipped to a third-party laboratory for analysis.* Sampling locations and results are as follows:

Location	Result
Kitchen cabinet underneath the sink	**M – FG** *Chaetomium*
HVAC supply vent in the rear left bedroom	**L – FG** *Cladosporium*

Mold Testing – Air: Non-viable spore trap air samples were collected to determine airborne mold spore levels. Samples were collected within the kitchen/living room, the bathroom, the rear right bedroom, the rear left bedroom, and the front left room. *Micro 5 sampling media was utilized for the collection of spore trap air samples. Each sample ran for five (5) minutes at a flow rate of five (5)*

liters per minute for a total volume of twenty-five (25) liters per sample. Each sample was assigned a unique ID number and shipped to a third-party laboratory for analysis. All air samples were collected from centralized locations (within their respective areas) and within the breathing zone, unless otherwise noted. Two samples were also collected outdoors for comparative purposes.

Results indicated acceptable levels of airborne mold spores in all sampled locations.

The interpretation of air sample results is based on indoor/outdoor comparisons, in combination with a study by Daniel M. Baxter, entitled "A Regional Comparison of Mold Spore Concentrations Outdoors and Inside "Clean" and "Mold Contaminated" Southern California Buildings", and other industry guidelines, as well as over 20 years of experience in industrial hygiene and mold testing.

In layman terms, acceptable levels indicate that the levels are below the outdoor level and/or the baseline levels (whichever is higher) stated below. Elevated levels indicate that the levels are above the outdoor level and/or the baseline level.

Baseline levels for indoor spore trap air samples are as follows: < 900 spores/m³ for Penicillium/ Aspergillus; 0 spores/m³ for Stachybotrys and Chaetomium; and < 350 spores/m³ for other individual mold groups.

Moisture Readings: Moisture readings were collected with a Tramex Survey Encounter. Multiple readings were taken to represent areas and materials reported. For drywall products, readings should be below fifty percent (50%). For wood products, normal moisture content should be less than fifteen percent (<15%).

Moisture content measurements were as follows:
Rear right bedroom

- Popcorn ceiling = 14%

Relative Humidity (RH): *Temperature and relative humidity readings were collected in the same locations as the spore trap air samples.* RH levels within the unit ranged from 41.8% – 54.4% with an outdoor reading of 40.2% (see the enclosed Chain of Custody for details). Per the American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) Standard 62-1999, relative humidity should range between 30% and 60%.

Conclusions: Air sampling within the tested areas did not indicate a problem with the indoor air quality regarding mold. However, apparent water damage and surface mold growth, to include *Chaetomium* was identified within unit. Upon request, and for an additional fee, PEC can provide a protocol that outlines mold remediation activities.

Enclosed in this report are the laboratory analysis and the Chain of Custody.

Should you have any questions, please do not hesitate to call.

Thank you,

Philip Green
IH Technician

Tommie Green, CIEC
Professional Industrial Hygienist

Enclosures

Photo 1

Apparent water damage/suspect visible mold growth in the kitchen cabinet underneath the sink

Photo 2

Apparent water damage in the bathroom cabinet underneath the sink

Photo 3

Suspect visible mold growth on the HVAC supply vent in the rear left bedroom

Photo 4

Suspect visible mold growth on the HVAC supply vent in the rear right bedroom

Photo 5

Apparent water damage to the popcorn ceilin in the rear right bedroom

Phoenix EnviroCorp
4020 SHIPYARD BLVD.
WILMINGTON, NC 28403

CHAIN OF CUSTODY

LABORATORY TEST REQUEST

SEEML Ref #: 210618020 Lab ID: 049-057

CONTACT: Philip Green	TELEPHONE (910) 397-0370 FAX (910) 313-6094	6/17/2021
PEC Job #: 21-21-187-IAQ-M	SITE ADDRESS: 302 Grass Lane, Apt. 205, Wilmington, NC 28405	

PLEASE EMAIL RESULTS TO: KMGREEN@PHOENIXENVIROCORP.COM

SAMPLE TYPE:	NUMBER OF SAMPLES:	TURN AROUND TIME SPECIFIED:
Spore Trap - Micro-5	7	____ Immediate ____ 24 hr ____ 48 hr __X__ Standard
Surface Samples	2	

Sample #	Sample Area	Sample Volume	Lab Analysis Requested	% Relative Humidity	Temperature °F
061721-PG-01	Kitchen/Living Room	25L	S001	41.8	70.9
061721-PG-02	Bathroom	25L	S001	52.9	69.0
061721-PG-03	Rear Right Bedroom	25L	S001	53.3	66.4
061721-PG-04	Rear Left Bedroom	25L	S001	54.4	67.6
061721-PG-05	Front Left Room	25L	S001	52.7	64.5
061721-PG-06	Outside - Front	25L	S001	40.2	90.8
061721-PG-07	Outside - Rear	25L	S001		
061721-PG-101	Black SVMG in kitchen cabinet underneath the sink	1 cm sq	S001T		
061721-PG-102	Black SVMG on HVAC supply vent in rear left bedroom	1 cm sq	S001T		
		Samples accepted			

Samples Collected By (Printed Name and Signature): [signature] Date Signed: 6/17/2021

CHAIN OF CUSTODY RECORD

DATE:	Time:	Condition of Samples:	RELINQUISHED BY: (Printed Name and Signature)	ACCEPTED BY: (Printed Name and Signature)
6/17/2021	13:30:00 PM	Intact	[signature] AFFILIATION:	[signature] AFFILIATION: 6/18/21

SEEML Reference Number: 210618020

Southeast Environmental Microbiology Laboratories
102 Edinburgh Court
Greenville, SC 29607
Phone: (864) 233-3770
FAX: (864) 233-6589

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

- ☒ Surface/Bulk Report
- ☒ Spore Trap Report
- ☐ Andersen Fungal Report
- ☐ Quantitative Fungal Report

Lab Manager Review: *Angel Gosnell* Date: 06/18/21

Thank you for using SEEML laboratories. We strive to provide superior quality and service.
SEEML laboratories are accredited through AIHA-LAP, LLC (EMLAP # 173667) for the analysis of Spore Traps and Surface/Bulk Samples.

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

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

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

Spore Trap Report

	Date Sampled: 06/17/21
Attn: ***Phoenix Enviro Corp.***	Date Received: 06/18/21
4020 Shipyard Blvd.	Date Analyzed: 06/18/21
Wilmington, NC 28403	Date Reported: 06/18/21
	Date Revised:
	Project Name: 21-21-187-IAQ-M
	Project Address: 302 Grass Lane, Apt 205
	Project City, State, ZIP: Wilmington, NC 28405
	SEEML Reference # : 210618020

TEST METHOD: DIRECT MICROSCOPY EXAMINATION SEEML SOP 7

Client Sample ID	061721-PG-01			061721-PG-02			061721-PG-03		
Location	Kitchen / Living Room			Bathroom			Rear Right Bedroom		
Lab Sample ID	210618020-049			210618020-050			210618020-051		
Comments									
Hyphal Fragments									
Pollen									
Spore Trap Used	M5			M5			M5		
	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%
Alternaria				1	40	20			
Ascospores							1	40	13
Basidiospores	6	240	55	2	80	40	2	80	25
Bipolaris/Drechslera									
Chaetomium									
Cladosporium	2	80	18	1	40	20	1	40	13
Curvularia									
Epicoccum									
Cercospora									
Fusarium									
Memnoniella									
Nigrospora									
Penicillium/Aspergillus	3	120	27	1	40	20	4	160	50
Polythrincium									
Rusts									
Smuts/Periconia/Myxomy									
Spegazzinia									
Stachybotrys									
Stemphylium									
Tetraploa									
Torula									
Ulocladium									
Colorless/Other Brown*									
Oidium									
Zygomycetes									
Pithomyces									
Background debris (1-5)**	3			3			3		
Sample Volume(liters)	25			25			25		
TOTAL SPORES/M^3	11	**440**		5	**200**		8	**320**	

Revisions:

Spore types listed without a count or data entry were not detected during the course of the analysis for the respective sample, indicating a raw count of <1 spore.

The analytical sensitivity is the spores/m^3 divided by the raw count, expressed in spores/m^3. The limit of detection is the analytical sensitivity (in spores/m^3) multiplied by the sample volume (in liters) divided by 1000 liters.

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

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

Disclaimer: The sample results are determined by the sample volume, which is provided by the customer.
This report relates only to the samples tested as they were received.

102 Edinburgh Court
Greenville, SC. 29607
Phone: (864) 233-3770

Angel Gosnell

Angel Gosnell, Approved Laboratory Signatory

Spore Trap Report

	Date Sampled: 06/17/21
Attn: ***Phoenix Enviro Corp.***	Date Received: 06/18/21
4020 Shipyard Blvd.	Date Analyzed: 06/18/21
Wilmington, NC 28403	Date Reported: 06/18/21
	Date Revised:
	Project Name: 21-21-187-IAQ-M
	Project Address: 302 Grass Lane, Apt 205
	Project City, State, ZIP: Wilmington, NC 28405
	SEEML Reference # : 210618020

TEST METHOD: DIRECT MICROSCOPY EXAMINATION SEEML SOP 7

Client Sample ID	061721-PG-04			061721-PG-05			061721-PG-06		
Location	Rear Left Bedroom			Front Left Room			Outside - Front		
Lab Sample ID	210618020-052			210618020-053			210618020-054		
Comments									
Hyphal Fragments				1	40		7	280	
Pollen									
Spore Trap Used	M5			M5			M5		
	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%
Alternaria							7	280	4
Ascospores	1	40	7				8	320	4
Basidiospores	9	360	64	4	160	67	131	5240	70
Bipolaris/Drechslera									
Chaetomium									
Cladosporium	3	120	21	1	40	17	22	880	12
Curvularia									
Epicoccum							2	80	1
Cercospora									
Fusarium									
Memnoniella									
Nigrospora									
Penicillium/Aspergillus	1	40	7	1	40	17	13	520	7
Polythrincium									
Rusts									
Smuts/Periconia/Myxomy							4	160	2
Spegazzinia									
Stachybotrys									
Stemphylium									
Tetraploa									
Torula									
Ulocladium									
Colorless/Other Brown*									
Oidium									
Zygomycetes									
Pithomyces									
Background debris (1-5)**	3			3			3		
Sample Volume(liters)	25			25			25		
TOTAL SPORES/M^3	14	**560**		6	**240**		187	**7480**	

Revisions:

Spore types listed without a count or data entry were not detected during the course of the analysis for the respective sample, indicating a raw count of <1 spore.

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

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

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Spore Trap Report

	Date Sampled: 06/17/21
Attn: ***Phoenix Enviro Corp.***	Date Received: 06/18/21
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Wilmington, NC 28403	Date Reported: 06/18/21
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	Project Name: 21-21-187-IAQ-M
	Project Address: 302 Grass Lane, Apt 205
	Project City, State, ZIP: Wilmington, NC 28405
	SEEML Reference # : 210618020

TEST METHOD: DIRECT MICROSCOPY EXAMINATION SEEML SOP 7

Client Sample ID	061721-PG-07								
Location	Outside - Rear								
Lab Sample ID	210618020-055								
Comments									
Hyphal Fragments	6	240							
Pollen									
Spore Trap Used	M5								
	raw ct.	spores/m^3	%						
Alternaria	4	160	3						
Ascospores	10	400	7						
Basidiospores	78	3120	56						
Bipolaris/Drechslera									
Chaetomium									
Cladosporium	40	1600	29						
Curvularia									
Epicoccum	1	40	<1						
Cercospora									
Fusarium									
Memnoniella									
Nigrospora									
Penicillium/Aspergillus									
Polythrincium									
Rusts									
Smuts/Periconia/Myxomy	6	240	4						
Spegazzinia									
Stachybotrys									
Stemphylium									
Tetraploa									
Torula									
Ulocladium									
Colorless/Other Brown*									
Oidium									
Zygomycetes									
Pithomyces									
Background debris (1-5)**	3								
Sample Volume(liters)	25								
TOTAL SPORES/M^3	139	**5560**							

Revisions:

Spore types listed without a count or data entry were not detected during the course of the analysis for the respective sample, indicating a raw count of <1 spore.

The analytical sensitivity is the spores/m^3 divided by the raw count, expressed in spores/m^3. The limit of detection is the analytical sensitivity (in spores/m^3) multiplied by the sample volume (in liters) divided by 1000 liters.

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

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

Disclaimer: The sample results are determined by the sample volume, which is provided by the customer.
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Angel Gosnell

Angel Gosnell, Approved Laboratory Signatory

AIHA-LAP, LLC EMLAP #173667 Texas Lic: LAB1016

Surface and Bulk Sample Report

	Date Sampled: 06/17/21
Attn: ***Phoenix Enviro Corp.***	Date Received: 06/18/21
4020 Shipyard Blvd.	Date Analyzed: 06/18/21
Wilmington, NC 28403	Date Reported: 06/18/21
	Date Revised:
	Project Name: 21-21-187-IAQ-M
	Project Address: 302 Grass Lane, Apt 205
	Project City, State ZIP: Wilmington, NC 28405
	SEEML Reference #: 210618020

TEST METHOD: Direct Microscopic Examination (SEEML SOP 18)

Client Sample ID	061721-PG-101	061721-PG-102		
Location	Black SVMG In Kitchen Cabinet Underneath The Sink	Black SVMG ON HVAC Supply Vent In Rear Left Bedroom		
SEEML Sample ID	210618020-056	210618020-057		
Sample Type	Tape	Tape		
	Quantification*	Quantification*		
Hyphal Fragments	**M**	**M**		
Pollen				
General Impressions **	**FG**	**FG**		
Fungal Spore:				
Alternaria				
Acremonium				
Ascospores				
Basidiospores				
Bipolaris/Drechslera				
Cercospora				
Chaetomium	**M**			
Cladosporium		**L**		
Curvularia				
Epicoccum				
Fusarium				
Geotrichum sp.				
Memnoniella				
Myxomycetes				
Nigrospora				
Penicillium/Aspergillus				
Pithomyces				
Rusts/Smuts				
Stemphylium				
Tetraploa				
Ulocladium				

**** General Impressions: NFG = No Fungal Growth, FG = Fungal Growth, MFG = Minimal Fungal Growth Or Growth in vicinity**

Quantification of fungal growth is done by semi-quantitative grading using the following ranges:

Scattered Spores, 1-20 fungal spores

VL = 21-100 fungal spores **L = 101-1,000 fungal spores** **M = 1,001-10,000 fungal spores** **H = >10,000 fungal spores**

ND = No Fungal Spores Detected

Disclaimer: This report relates only to the samples tested

Respectfully submitted, SEEML

Angel Gosnell, **Approved Laboratory Signatory**

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AIHA-LAP, LLC EMLAP # 173667

Texas License: LAB1016

Fungal Descriptions

Alternaria sp.

Aw - 0.89. Conidia dimensions: 18-83 x 7-18 microns. A very common allergen with an IgE mediated response. It is often found in carpets, textiles and on horizontal surfaces in building interiors. Often found on window frames. Outdoors it may be isolated from samples of soil, seeds and plants. It is commonly found in outdoor samples. The large spore size, 20 - 200 microns in length and 7 - 18 microns in sizes, suggests that the spores from these fungi will be deposited in the nose, mouth and upper respiratory tract. It may be related to bakers' asthma. It has been associated with hypersensitivity pneumonitis. The species *Alternaria alternata* can produce tenuazonic acid and other toxic metabolites that may be associated with disease in humans or animals. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include edema and bronchospasms; chronic cases may develop pulmonary emphysema.

Ascospore

A spore borne in a special cell called an ascus. Spores of this type are reported to be allergenic. All ascomycetes, members of a group of fungi called Ascomycotina, have this type of spore. The minute black dots on rotting wood and leaves or the little cups on lichens are examples of ascomycetes; another is the "truffle" mushroom.

Aspergillus/Penicillium

These are two of the most commonly found allergenic fungi in problem buildings. *Aspergillus* comes in many varieties (species). Many of the varieties produce toxic substances. It may be associated with symptoms such as sinusitis, allergic bronchopulmonary aspergillosis, and other allergic symptoms. *Penicillium* is a variety of mold that is very common indoors and is found in increased numbers in problem buildings. It also has many varieties, some of which produce toxic substances. The symptoms are allergic reactions, mucous membrane irritation, headaches, vomiting, and diarrhea. Due to the morphological similarity of *Aspergillus* and *Penicillium*, they are not differentiated by microscopic analysis and are reported together.

Aspergillus sp.

Aw 0.75 - 0.82. Reported to be allergenic. Members of this genus are reported to cause ear infections. Many species produce mycotoxins that may be associated with disease in humans and other animals. Toxin production is dependent on the species or a strain within a species and on the food source for the fungus. Some of these toxins have been found to be carcinogenic in animal species. Several toxins are considered potential human carcinogens. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include edema and bronchospasms; chronic cases may develop pulmonary emphysema; may also be associated with sinusitis, allergic bronchopulmonary aspergillosis, and other allergic symptoms.

Basidiospore

Spore from basidiomycetes. Many varieties are reported to be allergenic.

Bipolaris sp.

A fungus with large spores that could be expected to be deposited in the upper respiratory tract. This fungus can produce the mycotoxin - sterigmatocystin, which has been shown to produce liver and kidney damage when ingested by laboratory animals.

Botrytis sp.

Aw 0.93. Conidia dimensions: 7-14 x 5-9 microns. It is parasitic on plants and soft fruits. Found in soil and on house plants and vegetables, it is also known as "gray mold". It causes leaf rot on grapes, strawberries, lettuce, etc. It is a well-known allergen, producing asthma type symptoms in greenhouse workers and "wine grower's lung".

Cercaspora

Common outdoors in agricultural areas, especially during harvest. Parasite of higher plants, causing leaf spot. Commonly found as parasites on higher plants.

Chaetomium sp.

large ascomycetous fungus producing perithecia. It is found on a variety of substrates containing cellulose, including paper and plant compost. It has been found on paper in sheetrock. It can produce an *Acremonium*-like state on fungal media. Varieties are considered allergenic and have been associated with peritonitis, cutaneous lesions, and system mycosis.

Cladosporium sp.

Aw 0.88; Aw 0.84. Most commonly identified outdoor fungus. The outdoor numbers are reduced in the winter. The numbers are often high in the summer. Often found indoors in numbers less than outdoor numbers. It is a common allergen. Indoor *Cladosporium* sp. may be different than the species identified outdoors. It is commonly found on the surface of fiberglass duct liners in the interior of supply ducts. A wide variety of plants are food sources for this fungus. It is found on dead plants, woody plants, food, straw, soil, paint, and textiles. Produces greater than 10 antigens. Antigens in commercial extracts are of variable quality and may degrade within weeks of preparation. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include skin lesions, eye ulceration, mycosis (including onychomycosis, an infection of the nails of the feet or hands) edema and bronchospasms; chronic cases may develop pulmonary emphysema.

Curvularia sp.

Reported to be allergenic and has been associated with allergic fungal sinusitis. It may cause corneal infections, mycetoma, and infections in immune compromised hosts.

Dreschlera sp.

Conidia dimensions: 40-120 x 17-28 microns. Found on grasses, grains and decaying food. It can occasionally cause a corneal infection of the eye.

Epicoccum sp.

Conidia dimensions: 15-25 microns. A common allergen. It is found in plants, soil, grains, textiles and paper products.

Fusarium sp.

Aw 0.90. A common soil fungus. It is found on a wide range of plants. It is often found in humidifiers. Several species in this genus can produce potent trichothecene toxins. The trichothecene (scirpene) toxin targets the following systems: circulatory, alimentary, skin, and nervous. Produces vomitoxin on grains during unusually damp growing conditions. Symptoms may occur either through ingestion of contaminated grains or possibly inhalation of spores. The genera can produce hemorrhagic syndrome in humans (alimentary toxic aleukia). This is characterized by nausea, vomiting, diarrhea, dermatitis, and extensive internal bleeding. Reported to be allergenic. Frequently involved in eye, skin, and nail infections.

Myxomycetes

Members of a group of fungi that is included in the category of "slime molds". They're occasionally found indoors, but mainly reside in forested regions on decaying logs, stumps, and dead leaves. Myxomycetes display characteristics of fungi *and* protozoans. In favorable (wet) conditions they exhibit motile, amoeba-like cells, usually bounded only by a plasma membrane, that are variable in size and form. During dry spells, they form a resting body (sclerotium) with dry, airborne spores. These fungi are not known to produce toxins but can cause hay fever and asthma.

Memnoniella

Contaminant found most often with *Stachybotrys* on wet cellulose. Forms in chains, but it are very similar to *Stachybotrys* and sometimes is considered to be in the *Stachybotrys* family. Certain species do produce toxins very similar to the ones produced by *Stachybotrys chartarum* and many consider the IAQ importance of *Memnoniella* to be on par with *Stachybotrys*. Allergenic and infectious properties are not well studied.

Nigrospora sp.

Commonly found in warm climates, this mold may be responsible for allergic reactions such as hay fever and asthma. It is found on decaying plant material and in the soil. It is not often found indoors.

Oidium sp.

The asexual phase of *Erysiphe* sp. It is a plant pathogen causing powdery mildews. It is very common on the leaf's stems, and flowers of plants. The health effects and allergenicity have not been studied. It does not grow on non-living surfaces such as wood or drywall.

Penicillium sp.

Aw 0.78 - 0.88. A wide number of organisms have been placed in this genus. Identification to species is difficult. Often found in aerosol samples. Commonly found in soil, food, cellulose and grains. It is also found in paint and compost piles. It may cause hypersensitivity pneumonitis, allergic alveolitis in susceptible individuals. It is reported to be allergenic (skin). It is commonly found in carpet, wallpaper, and in interior fiberglass duct insulation. Some species can produce mycotoxins. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include edema and bronchospasms; chronic cases may develop pulmonary emphysema. It may also cause headaches, vomiting, and diarrhea.

Periconia sp.

Periconia sp. are found in soil, blackened and dead herbaceous stems leaf spots, grasses, rushes, and sedges. Almost always associated with other fungi. Rarely found growing indoors. Reportedly associated with a rare case of mycotic keratitis.

Pithomyces sp.

A common mold found on dead leaves, plants, soil and especially grasses. Causes facial eczema in ruminants. It exhibits distinctive multi-celled brown conidia. It is not known to be a human allergen or pathogen. It is rarely found indoors, although it can grow on paper.

Rusts/Smuts

These fungi are associated with plant diseases. In the classification scheme of the fungi, the smuts have much in common with the rusts, and they are frequently discussed together. Both groups produce wind-borne, resistant teliospores that serve as the basis for their classification and their means of spread. Rusts usually attack vegetative regions (i.e., leaves and stems) of plants; smuts usually are associated with the reproductive structures (seeds). They can cause hay fever and asthma.

Spegazzinia

Spegazzinia species comprise a very small proportion of the fungal biota. This genus is somewhat related to other lobed or ornamented genera such as *Candelabrum*. No information is available regarding health effects or toxicity. Allergenicity has not been studied. Usually identified on spore trap samples where it is seen every few weeks. (Spores have very distinctive morphology.) May also be found in air by culturable (Andersen) samples if a long enough incubation period is provided so that sporulation occurs. Our laboratory has never found this organism growing on indoor environmental surfaces. Natural habitat includes soil and many kinds of trees and plants.

Stachybotrys sp.

Aw - 0.94, optimum Aw ->0.98. Several strains of this fungus (*S. atra, S. chartarum* and *S. alternans* are synonymous) may produce a trichothecene mycotoxin- Satratoxin H - which is poisonous by inhalation. The toxins are present on the fungal spores. This is a slow growing fungus on media. It does not compete well with other rapidly growing fungi. The dark colored fungus grows on building material with high cellulose content and low nitrogen content. Areas with a relative humidity above 55%, and are subject to temperature fluctuations, are ideal for toxin production. Individuals with chronic exposure to the toxin produced by this fungus reported cold and flu symptoms, sore throats, diarrhea, headaches, fatigue, dermatitis, intermittent local hair loss and generalized malaise. Other symptoms include coughs, rhinitis, nosebleed, a burning sensation in the nasal passages, throat, and lungs, and fever. The toxins produced by this fungus will suppress the immune system affecting the lymphoid tissue and the bone marrow. Animals injected with the toxin from this fungus exhibited the following symptoms: necrosis and hemorrhage within the brain, thymus, spleen, intestine, lung, heart, lymph node, liver, and kidney. Affects by absorption of the toxin in the human lung are known as pneumomycosis.

This organism is rarely found in outdoor samples. It is usually difficult to find in indoor air samples unless it is physically disturbed (or possibly -this is speculation- a drop in the relative humidity). The spores are in a gelatinous mass. Appropriate media for the growth of this organism will have high cellulose content and low nitrogen content. The spores will die readily after release. The dead spores are still allergenic and toxigenic. Percutaneous absorption has caused mild symptoms.

Stemphylium sp.

Reported to be allergenic. Isolated from dead plants and cellulose materials.

Torula sp.

Found outdoors in air, soil, on dead vegetation, wood, and grasses. Also found indoors on cellulose materials. Reported to be allergenic and may cause hay fever and asthma.

Tetraploa

Tetraploa species comprise a very small proportion of the fungal biota. This genus is somewhat related to *Triposporium* and Diplocladiella. The only reported human infections are two cases of keratitis (1970, 1980) and one case of subcutaneous infection of the knee (1990). No information is available regarding other health effects or toxicity. Allergenicity has not been studied. Usually identified on spore trap samples where it is seen every few weeks. (Spores have very distinctive morphology.) Our laboratory has never found this organism growing on indoor environmental surfaces. Natural habitat includes leaf bases and stems just above the soil on many kinds of plants and trees.

Ulocladium sp.

Aw 0.89. Isolated from dead plants and cellulose materials. Found on textiles.

Zygomycetes

Zygomycetes are one of the four major groups of fungi, the others being the Oomycetes, the Ascomycetes, and the Basidiomycetes. Zygomycetes are common, fast growing, and often overgrow and/or inhibit other fungi nearby. Rhizopus and Mucor are two of the most common Zygomycetes seen in the indoor environment. However, others are seen as well, including *Syncephalastrum*, *Circinella*, *Mortierella*, *Mycotypha*, *Cunninghamella*, and *Choanephora*. For further information, please see descriptions of these individual genera.

The following table lists mycotoxins that are produced by certain types of fungi:

Fungi	Mycotoxin
Acremonium crotocinigenum	Crotocin
Aspergillus favus	Alfatoxin B, cyclopiazonic acid
Aspergillus fumigatus	Fumagilin, gliotoxin
Aspergillus carneus	Critrinin
Aspergillus clavatus	Cytochalasin, patulin
Aspergillus Parasiticus	Alfatoxin B
Aspergillus nomius	Alfatoxin B
Aspergillus niger	Ochratoxin A, malformin, oxalicacid
Acremonium crotocinigenum	Crotocin
Aspergillus nidulans	Sterigmatocystin
Aspergillus ochraceus	Ochratoxin A, penicillic acid
Aspergillus versicolor	Sterigmatocystin, 5 ethoxysterigmatocystin
Aspergillus ustus	Ausdiol, austamide, austocystin,brevianamide
Aspergillus terreus	Citreoviridin
Alternaria	Alternariol, altertoxin, altenuene, altenusin, tenuazonic acid
Arthrinium	Nitropropionic acid
Bioploaris	Cytochalasin, sporidesmin, sterigmatocystin
Chaetomium	Chaetoglobosin A,B,C. Sterigmatocystin
Cladosporium	Cladosporic acid
Clavipes purpurea	Ergotism
Cylindrocorpon	Trichothecene
Diplodia	Diplodiatoxin
Fusarium	Trichothecene, zearalenone
Fusarium moniliforme	Fumonisins
Emericella nidulans	Sterigmatocystin
Gliocladium	Gliotoxin
Memnoniella	Griseofulvin , dechlorogriseofulvin, epi-decholorgriseofulvin, trichodermin, trichodermol
Myrothecium	Trichothecene
Paecilomyces	Patulin, viriditoxin
Penicillium aurantiocandidum	Penicillic acid
Penicillium aurantiogriseum	Penicillic acid
Penicillium brasilanum	Penicillic acid
Penicillium brevicompactum	Mycophenolic acid
Penicillium camemberti	Cyclopiazonic acid
Penicillium carneum	Mycophenolic acid, Roquefortine C
Penicillium crateriforme	Rubratoxin

Fungi	Mycotoxin
Penicillium citrinum	Citrinin
Penicillium commune	Cyclopiazonic acid
Penicillium crustosum	Roquefortine C
Penicillium chrysogenum	Roquefortine C
Penicillium discolor	Chaetoglobosin C
Penicillium expansum	Citrinin, Roquefortine C
Penicillium griseofulvum	Roquefortine C, cyclopiazonic acid, griseofulvin
Penicillium hirsutum	Roquefortine C
Penicillium hordei	Roquefortine C
Penicillium nordicum	Ochratoxin A
Penicillium paneum	Roquefortine C
Penicillium palitans	Cyclopiazonic acid
Penicillium polonicum	Penicillic acid
Penicillum roqueforti	Roquefortine C, Mycophenolic acid
Penicillium veridicatum	Penicillic acid
Penicillium verrucosum	Citrinin, ochratoxin A
Penicillium/ Aspergillus	Patulin
Penicillium/ Aspergillus/Alternaria	Glitoxin
Phomopsis	Macrocyclic trichothecenes
Phoma	Brefeldin, cytochalasin, secalonic acid, tenuazonic acid
Pithomyces	Sporidesmin
Rhizoctonia	Slaframine
Rhizopus	Rhizonin
Sclerotinia	Furanocoumarins
Stachybotrys chartarum	Iso-satratoxin F, roridin E, L-2, satratoxin G & H, trichodermin, trichodermol, trichothecene
Torula	Cytotoxins
Trichoderma	Trichodermin, trichodermol, gliotoxin
Trichothecium	Trichothecene
Wallemia	Walleminol
Zygosporium	Cytochalasin

General terms

Allergen

An allergen is a substance that elicits an IgE antibody response and is responsible for producing allergic reactions. Chemicals are released when IgE on certain cells contact an allergen. These chemicals can cause injury to surrounding tissue - the visible signs of an allergy. Only a few fungal allergens have been characterized but all fungi are thought to be potentially allergenic. Fungal allergens are proteins found in either the mycelium or spores

"Black mold"

A poorly defined term. Black mold or toxic black mold has usually been associated with the mold *Stachybotrys chartarum*. While there are only a few molds that are truly black, there are many that can appear black. Not all molds that appear to be black are *Stachybotrys*.

Fungi

Fungi are neither animals nor plants and are classified in a kingdom of their own. The Kingdom of Fungi. Fungi include a very large group of organisms, including molds, yeasts, mushrooms and puffballs. There are >100,000 accepted fungal species but current estimates range to 1.5 million species. Mycologists (people who study fungi) have grouped fungi into four large groups according to their method of reproduction.

Hidden mold

This refers to visible mold growth on building structures that is not easily seen, including the areas above drop ceilings, within a wall cavity (the space between the inner and outer structure of a wall), inside air handlers, or within the ducting of a heating/ventilation system.

Microbial Volatile Organic Compounds (MVOCs)

Fungi produce chemicals as a result of their metabolism. Some of these chemicals, MVOCs, are responsible for the characteristic moldy, musty, or earthy smell of fungi, whether mushrooms or molds. Some MVOCs are considered offensive or annoying. Specific MVOCs are thought to be characteristic of wood rot and mold growth on building materials. The human nose is very sensitive to mold odors and sometimes more so than current analytical instruments.

Mold

Molds are a group of organisms that belong to the Kingdom of Fungi (see Fungi). Even though the terms mold and fungi had been commonly referred to interchangeably, all molds are fungi, but not all fungi are molds.

Mycotoxin

Mycotoxins are compounds produced by some fungi that are toxic to humans or animals. By convention, the term? Mycotoxin. Excludes mushroom toxins. Fungi that produce mycotoxins are called "toxigenic fungi."

Spore

General term for a reproductive structure in fungi, bacteria and some plants. In fungi, the spore is the structure which may be used for dissemination and may be resistant to adverse environmental conditions.

Toxic mold

The term "toxic mold" has no scientific meaning since the mold itself is not toxic. The metabolic byproducts of some molds may be toxic (see mycotoxin).

Hypha (plural, hyphae)

An individual fungal thread or filament of connected cells; the thread that represents the individual parts of the fungal body.

Phoenix EnviroCorp

MOLD/BIOLOGICAL CONTAMINANT REMEDIATION PROTOCOL

Date: July 23, 2021

For: Quanesha Mullins
Wilmington Housing Authority
1524 S. 16th Street
Wilmington, NC 28405

Remediation Contractor: Not determined

On-Site Consultant: Phoenix EnviroCorp (PEC)
4020 Shipyard Boulevard
Wilmington, NC 28403
(910) 397-0370

Approved Signatory:

Shaenaz Mirmohamed
IH Technician

Tommie Green, CIEC
Professional Industrial Hygienist

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SECTION 1.0 REMEDIATION PROCEDURES

1.1 Project Set Up

- The owner or powers that be shall supply temporary power for remediation equipment. The existing electrical system may be utilized, with permission of the owner or powers that be. Determining specific electrical load/safety requirements, including, but not limited to, the use of a temporary GFCI electrical panel box shall be the responsibility of the abatement contractor.
- HVAC system shall be isolated.
- 6-mil polyethylene sheathing shall be erected to separate primary control areas (PCA) from remaining areas. Control areas shall be selected so that specified building materials (specified herein, in section 1.3, under primary control areas) may be removed or cleaned and dried.
- HEPA Air Filtration Devices shall be utilized for each separate control area. Critical barriers shall consist of 6-mil polyethylene so that primary control areas are isolated from remaining areas. HEPA filtration units shall be exhausted from the PCA to the outside of the building through windows/doors. Dehumidification units must be installed in the PCA to sufficiently dry components.
- A remote wash off station shall be set up to allow for employees to wash hands and faces after egress from the work area.
- Ingress/Egress to the control area(s) shall be, at minimum, sealed with a 2-way polyethylene air lock.
- Entrances to the building shall be marked as indicated in Section 7.4 of this document.

1.2 Local Exhaust System

- Once sealed, the primary control area shall be ventilated with a local HEPA air filtration device that shall ensure a minimum of four (4) air changes per hour. The air filtration device shall be placed within the containment work area.
- Local HEPA exhaust shall be utilized where cleaning of contents is required and/or in the immediate vicinity of remediation activities of building materials.
- In interior sections requiring surface area cleaning, local HEPA filtration may be exhausted within the area to scrub microbials from ambient air. This process shall only be conducted after fine cleaning has been completed.
- Negative pressure within the contained work area shall be maintained throughout the project until clearance is obtained.
- Negative air machines shall be exhausted to exterior portions of the building to adequately ensure that negative pressure is achieved.
- Negative air pressure within the work area shall be tested and recorded at initiation of the project and hourly thereafter by use of a manometer to ensure the desired pressure of -0.02 inches of water, which is comparable to four changes per hour.
- Dehumidification devices with HEPA filtration may be incorporated as filtration devices in conjunction with true HEPA filtration devices; they may not replace the true HEPA filtration devices.

Note: Formula for determination of adequate HEPA filtration:

Total feet per minute =Volume of work area (ft^3)/15 minutes
#AFD Units needed = (Total feet per minute)/Capacity of Unit (ft^3)

- At initiation of final cleaning stages, relative humidity shall be at 40% (+/-3%) and moisture content of wooden components shall be at or below 15% as determined by Delmhorst moisture meter or equivalent meter. Moisture mapping and direct read T/RH shall be recorded by the remediation contractor until the

specified levels have been achieved. Control areas shall be dehumidified during cleaning and mold remediation activities to ensure removal of surface moisture created during application of water. Drying of structural components that have been treated with encapsulating anti-microbial agents will be necessary.

- Moisture levels shall be recorded and documented by the remediation contractor upon successful completion of dehumidification.

1.3 Remediation Specifications

- Prior to commencement of mold remediation activities by the remediation contractor, the source of any water intrusions, leaks, and/or moisture/humidity problems shall be remedied by the owner. If water intrusions, leaks, and/or moisture/humidity problems exist and are not corrected, mold growth can be expected to return.
- All remediation procedures listed that involve the removal of building materials shall employ polyethylene critical barriers, negative air pressure, and HEPA filtration (i.e., primary control areas).
- The remediation contractor shall ensure that the filters are properly capped prior to switching off the air scrubbers. If the filters are not properly capped, the backflow can cause mold spores to re-release back into the control area, essentially re-contaminating an area that has already been cleaned.
- All remediation activities shall be conducted in a manner that does not allow dissemination of mold spores. Remediation procedures shall begin from the side of the control area furthest away from air filtration devices.
- Cleaning procedures shall be repeated until the area is visibly free of dust and debris.
- Engineering controls set up during the remediation process shall remain in place until remediation has been completed and acceptable post remediation sampling results have been achieved.
- **Federal and/or state regulations require that suspect asbestos containing materials in public and commercial buildings shall be inspected for asbestos prior to renovations or demolition. Based on these regulations, PEC recommends that building materials that may be disturbed during mold remediation be tested for asbestos content prior to their disturbance to prevent asbestos contamination.**
- If cleaning procedures outlined in this remediation plan outweigh the cost of replacement for selected items, the remediation contractor shall give the owner the option to clean or dispose of those items.
- Reinstallation of building materials and/or components shall only be conducted once acceptable post remediation results are obtained.
- Any chemicals used on this project shall be EPA approved and used only as directed by the manufacturer. MSDS shall be available for review upon request.

HVAC System

- The HVAC system(s) that services or run through the primary control area/affected area shall be shut down prior to remediation activities.
- The spaces that are normally climate-controlled by the HVAC system that have been shut down shall be maintained under proper humidity levels (between 30 and 60% utilizing dehumidifiers, etc.) while the system is not in operation.
- All HVAC supply/return vents within the primary control area/affected area shall be isolated with a critical barrier (i.e., plastic, etc.) to prevent air flow.
- Once the HVAC system is shut down, the system shall remain off and isolated until acceptable post remediation results are obtained.

Note: For directional purposes "front" is determined by facing Grass Lane from inside the unit, unless otherwise noted.

Primary Control Areas/Affected Areas

Critical barriers, negative air pressure, and HEPA filtration shall be established to isolate the following areas as Primary Control Areas to perform the specified mold remediation. **All non-stable furnishings and contents shall be removed from the containment area/primary control area prior to specified remediation to avoid cross contamination of furnishings and contents. If elected, said furnishings and contents can be precleaned (i.e., HEPA vacuum, etc.) and stored in the primary control area, but shall be protected (i.e., covered with poly, etc.) to avoid cross contamination.**

Within the kitchen:

- Detach the floor mounted cabinet from the front and rear walls, and remove any affected drywall (i.e., drywall with apparent water damage/suspect visible mold growth) and extend the drywall removal within a 2- foot radius of the affected area when possible.
- Clean all remaining surfaces as specified herein under general specifications for primary control areas.

Within the bathroom:

- Detach the floor mounted cabinet from the front wall, and remove any affected drywall (i.e., drywall with apparent water damage/suspect visible mold growth) and extend the drywall removal within a 2- foot radius of the affected area when possible.
- Due to the reported leak in the front wall, remove the baseboard from the front wall to allowing access to thoroughly inspect the wall for apparent water damage/suspect visible mold growth and remove any affected drywall and extend the drywall removal within a 2- foot radius of the affected area when possible.
- Clean all remaining surfaces as specified herein under general specifications for primary control areas.

Within the rear right bedroom, and the rear left bedroom (Negative air pressure is not required in areas where building components are not specified for removal, but HEPA filtration is required):

- Clean suspect visible mold growth (identified as Cladosporium in the rear left bedroom in PEC's report dated June 22, 2021) on and around the HVAC supply vents.

General Specifications for Primary Control Areas

- Open plumbing lines and drains within the control areas shall be isolated with a critical barrier consisting of 6-mil poly.
- The water line to toilets within the control areas shall be shut off and the toilets shall be isolated with a critical barrier consisting of 6-mil poly.
- Cleaning of components/materials shall consist of a method that thoroughly removes visible mold growth, settled concentrations of mold spores, and/or dust and debris (i.e., HEPA vacuuming, wet wiping, or other approved methods), followed by dehumidification/drying.
- Exterior surfaces of electrical appliances, electrical equipment, and light fixtures shall be cleaned, utilizing wet method and HEPA vacuuming. These items shall be disconnected from all electrical sources prior to cleaning. If these items cannot be cleaned efficiently, the abatement contractor shall consult with the owner/powers that be.
- In areas where drywall removal is specified around windows and doors, remove trim boards. The door casing(s) shall also be assessed to determine if they have sustained mold/water damage. If so, they shall be cleaned, or removed.
- All wall/ceiling cavity insulation shall be disposed in areas that specify the removal of drywall/wallboard. The abatement contractor shall visually inspect the back side of surrounding drywall/wallboard for water

damage and/or suspect mold growth and document any findings. If additional suspect mold growth or water damage is observed beyond the specified removal area, additional drywall/wallboard shall be removed until no suspect mold growth or water damage is observed.

- All penetrations within the controlled area that adjoin unaffected or non-accessible areas, including outdoor areas, crawlspaces, etc., shall be cleaned (as far as one can reach) and then sealed with 6-mil poly, extending six (6) inches on all sides.
- In areas of specified wallboard removal, all components within the wall/ceiling cavities shall be cleaned. Any wooden structural components with mold stains or mold growth in pitted surfaces shall be HEPA sanded (or other approved methods) to eliminate embedded mold growth.
- All joints or sills (where the structural system meets, where the sill plate meets the floor, etc.) shall be aggressively disturbed to remove embedded mold growth and spores.

1.4 Removal Procedures

The contractor shall maintain surfaces of the control area free of accumulation of dust and debris. Additionally, they shall restrict the spread of dust and debris, keeping waste from being distributed over the work area. Materials shall be removed in a fashion to ensure that previously cleaned areas are not recontaminated (i.e., working from one end of the control area to the other). The contractor may be required to re-clean areas based on a visual inspection by the CIEC/CIE/IH, if the areas are not visibly clean.

Contaminated building materials that have been removed, and additional materials and debris generated during remediation, shall be bagged or wrapped with 6-mil polyethylene sheeting, sealed with duct tape, and carried to the waste container prior to visual inspection by the CIEC/CIE/IH. Materials shall be bagged and sealed directly after removal from unaffected building components.

Areas shall be allowed to dry for a period until specified RH and moisture levels have been achieved. Any remaining building products that are directly impacted by remediation shall be tested for moisture content. Wooden and cellulosic building components (e.g., wall studs, drywall, etc.) shall be tested for moisture content. If the moisture content is > 15% in wood products or > 12% in cellulosic products (utilizing a Delmhorst moisture meter), dehumidification shall be required until moisture levels are at or below said levels, and the RH level is at or below 40% +/-3% (for all interior areas). The remediation contractor shall verify water content of all wooden and cellulosic building components within the impacted areas, as well as temperature and RH prior to scheduling post remediation verification.

1.5 Cleanup Overview

The contractor shall personally review the cleaning process prior to contacting the CIEC/CIE/IH for the post remediation testing. If accumulations of debris and dust are significant, the CIEC/CIE/IH will require re-cleaning prior to post remediation verification sampling.

The CIEC/CIE/IH shall make a visual inspection and conduct post remediation sampling after the final cleaning is complete.

1.6 Post Remediation Verification Testing

Prior to conducting post remediation sampling, HEPA filtration devices shall be allowed to operate for a minimum of 48 hours (the equivalent of 192 air changes), following fine cleaning, in all areas where remediation has been conducted. The HEPA filtration devices shall be sealed at the intake and turned off approximately two hours prior to post testing and reconvene within one hour after post testing, until acceptable post remediation results are established.

Post remediation sampling shall be conducted utilizing viable and/or non-viable sample methods. Air samples shall be collected in representative areas of the control areas. Surface sampling may be conducted at the discretion of the CIEC/CIE/IH.

Sampling shall be conducted in areas directly impacted by remediation procedures, where cleaning was conducted. The CIEC/CIE/IH shall determine acceptable post remediation status through interpretation of air sampling results, which will be based on indoor/outdoor comparisons, in combination with any surface samples collected, moisture readings, RH readings, visual observations, and any other pertinent information.

The owner/client will be responsible for post remediation testing. If air sample results indicate unacceptable airborne concentrations, the contractor shall be required to conduct a re-cleaning at the contractor's expense and absorb the cost for re-testing, until acceptable results are achieved.

SECTION 2.0 SCOPE OF WORK (Note: Section 2 and Section 1.3 are essential to the full Scope of the Contractor's Work)

2.1 Investigative Reports and Other Related Documents

Phoenix EnviroCorp initial investigative report dated June 22, 2021.

Phoenix EnviroCorp investigative report dated July 23, 2021.

Phoenix EnviroCorp Chain of Custody dated June 17, 2021, and July 15, 2021.

Analytical reports dated June 18, 2021, and July 16, 2021.

2.2 Project Description

The procedures covered by this program include the enclosure and drying of the said structure, the removal, handling, and disposal of building components compromised by mold/fungal growth, and the cleaning and disinfecting of existing building materials. Procedures for reconstruction are not considered in these specifications. Reconstruction of interior portions may not be conducted until procedures for remediation have been completed, the control areas have been inspected, and testing has returned acceptable post remediation results. Reconstruction of exterior portions may be conducted during the restoration to ensure that water intrusion is abated.

The objectives covered by the program include the remediation of materials shown to have surface contamination, water damage, and/or exposure to elevated airborne mold spore levels, without subjecting the workers, installation employees, and occupants to microbial contaminants. In addition, contract employees, occupants, and materials will be appropriately protected during the removal process so that present and future exposures will not occur.

This protocol is provided as a guideline. Any deviation requests from this protocol shall be addressed to the CIEC/CIE/IH for consideration. At present there are no Federal or State requirements regarding microbial remediation projects; however, OSHA General Construction Code of Federal Regulations (29 CFR 1926) shall be followed.

Remediation shall be completed as close to the date that this protocol was drafted, as the specifications outlined within represent conditions at the time the investigative services were conducted. Due to the volatility of mold, the current protocol may not reflect all necessary remediation if conditions are allowed to continue.

Further, if time lapses allowing conditions to change, it will become increasingly difficult to obtain successful clearance testing results.

SECTION 3.0 AIR MONITORING

3.1 Responsibilities of the CIEC/CIE/IH

Monitoring of airborne concentrations will be performed in accordance with the requirements of this program. Prior to conducting air sampling and/or surface sampling for clearances, the CIEC/CIE/IH shall conduct a visual inspection of the area. Temperature and RH shall be recorded during the air sampling phase of clearance. All air sampling shall be conducted in such a manner as to provide a valid representation of airborne mold levels both inside and outside the work areas. If analysis of air samples indicates that airborne concentrations exceed acceptable limits, the contractor shall conduct re-cleaning at the contractor's expense.

3.2 Personal Monitoring

No personal monitoring will be conducted by the CIEC/CIE/IH unless the remediation contractor requests monitoring for OSHA compliance. Presently there are no guidelines (PELs or TLVs) for microbial contaminants. It is the remediation contractor's responsibility to determine if OSHA personal sampling may be required during application of anti-microbial agents.

3.3 Sample Integrity and Reporting

Samples shall be sealed, labeled, and a chain of custody initiated according to laboratory procedures.

Sample results shall be available within seven (7) days of the completion of collection of all samples and will include the following information:

- Site Address
- Sample Number
- Location Sampled
- Analytical Method
- Collection Date(s)
- Person Taking Sample(s)
- Additional Comments (if any)
- Analyst Signature

SECTION 4.0 MATERIAL REPLACEMENT

4.1 Material Replacement

The general contractor/replacement contractor may begin material replacement after the CIEC/CIE/IH informs all parties of acceptable post remediation sample results.

With ongoing construction activities ambient air levels are expected to be elevated over what might be normally expected. Additional testing should not be necessary after remediation procedures have been completed and successful results have been obtained. In the event of another water intrusion (i.e. broken-pipe-line, improper HVAC function, or building envelope compromise), an investigation shall be conducted within 24 to 48 hours of the event. Proper drying, if initiated within this time frame, should minimize the potential for microbial growth.

SECTION 5.0 SPILL CLEANUP REQUIREMENTS

5.1 Spills

MSDS shall be kept on site for all chemical products brought to the site by the remediation contractor. In the event of a chemical spill, the contractor shall initiate cleanup immediately. The contractor shall mop up any liquid with rags or other conventional absorbent. The spent absorbent shall be properly contained and disposed of as waste.

SECTION 6.0 WASTE CONTROL

6.1 Waste Disposal

Waste shall be disposed of at a locally selected landfill. Waste bags shall be checked for integrity and hauled in an enclosed truck/vehicle or container to ensure that transportation to the landfill does not pose a potential hazard to the environment.

SECTION 7.0 SUPPLEMENTAL INFORMATION

7.1 Applicable Publications

The publications listed below form part of this program. Written programs shall accompany all referenced CFR publications. IICRC and NYCDOH guidelines for work procedures shall be followed by the remediation contractor. A copy of the NYCDOH protocols shall be on-site, along with this design, for reference by the site supervisor. ACGIH, IAQA, and ASHRAE publications shall be utilized as guidelines for interpretation by the CIEC/CIE/IH. This design shall be reviewed by the remediation supervisor prior to initiation of set-up for the project. Any questions regarding this project may be addressed with the on-site consultant listed for Phoenix EnviroCorp.

Code of Federal Regulation (CFR Publications)

29 CFR 1910.134	Respiratory Protection
29 CFR 1910.145	Specifications for Accident Prevention, Signs and Tags
29 CFR 1926.28	Personal Protective Equipment
29 CFR 1926.59	Hazard Communication
29 CFR 1926.96	Occupational Foot Protection
29 CFR 1926.100	Head Protection
29 CFR 1926.101	Hearing Protection
29 CFR 1926.102	Eye and Face Protection
29 CFR 1926.403	Electrical General Requirements
29 CFR 1926.416	Safety General Requirements
29 CFR 1926.852	Demolition, Chutes
29 CFR 1926.1091	Record Keeping Requirements

Supplemental Guidelines

IICRC S520 2nd ed.	Standard and Reference Guide for Professional Water Damage Restoration
NYCDOH	Guidelines on Assessment and Remediation of Fungi in Indoor Environments

ACGIH	Bioaerosols: Assessment and Control
IAQA 01-2000	Recommended Guidelines for Indoor Environments
ASHRAE 62.2-2007	Ventilation for Acceptable Indoor Air Quality in Low-Rise Residential Buildings

7.2 Definitions

Air Lock: A system that permits ingress and egress between a control area and non-control area, or other work areas, without allowing air movement between areas (e.g., three stage decon, three-way polyethylene flaps).

Air Sample: Refers to samples collected with spore trap air sample media (e.g., Micro-5, Cyclex D, or equivalent); also referred to as a non-viable air sample. May also refer to a sample collected on a disposable petri dish with Agar media by means of an Andersen Impactor (or equivalent) and sampling pump; also referred to as air culture (viable) sample. Sample media to be used in project is described under Section 1.6 (Post Remediation Verification Testing).

Area Monitoring: The sampling of airborne microbial concentrations outside the exclusion boundary, which may reach the breathing zone of the contractor or installation employees.

Asbestos Containing Materials (ACM): Refers to asbestos containing building materials that contain more than 1% asbestos by Polarized Light Microscopy (PLM) or Transmission Electron Microscopy (TEM).

Biocide: Refers to chemical agents that are specifically designed to eliminate viable microbial contamination, with a phenol equivalent efficiency (e.g., Sodium Hypochlorite, Quaternary Ammonia Compounds).

Blower Door Test: Refers to the testing of static pressure and draw of air through the HVAC in cubic feet per minute (CFM) to rate the efficiency of the system.

Clearance Monitoring: Refers to air, bulk, or swab sampling conducted as a means to demonstrate that the area specified for remediation has been completed by the contractor, left with present acceptable mold spore levels, and ready for re-construction.

Control Area: The area where microbial contaminants removal is performed, which is isolated by physical boundaries to prevent unauthorized entry of personnel, thereby preventing exposure to or the spread of microbial contaminants. Physical boundaries will be established and located such that the airborne contaminants are not allowed to escape the boundaries.

HEPA: High Efficiency Particulate Air. Refers to ventilation devices that are specifically designed to filter ambient air to an efficiency of 99.97%.

HVAC: Refers to the Heating, Ventilation, and Air Conditioning system.

Industrial Hygienist: Refers to a person who practices industrial hygiene and may act as a competent person regarding visual inspection of contaminated surfaces and clearance air and/or swab/bulk sampling. May also refer to a Certified Industrial Hygienist (CIH) as defined by the American Board of Industrial Hygiene (ABIH), a Certified Indoor Environmental Consultant as defined by the American Council for Accredited Certification (ACAC), or a Certified Indoor Environmentalist (CIE) as defined by the American Council for Accredited Certification (ACAC).

Microbial Contaminant: Refers to viable mold, fungi, pollen, bacteria, and or particulate, or their metabolites, that may be causative of epidemiological, immunotoxic, dermotoxic, neurotoxic, or enterotoxic

disorders in the human population, or may be considered a pathogen or an opportunistic pathogen.

Non-Porous Materials: Refers to building materials with solid surfaces that may be successfully treated and cleaned by means of HEPA vacuuming or other approved method. Materials include flooring, hard goods, plastic, vinyl, and some wallboard systems.

Porous Materials: Refers to building materials and household goods that may allow microscopic particles (3-20 micron) to become trapped within the material that will not allow adequate cleaning. Materials include carpet, mattresses, and clothing.

Primary Control Area (PCA): Refers to a section of a facility that has been isolated by 6-mil polyethylene barriers where specific engineering controls (e.g., HEPA filtration, negative air pressurization, dehumidification, etc.) are required. In general, it is the area where remediation of water and mold damaged building materials is to be conducted.

Refrigerant Dehumidifier: Device used to remove water content from air and materials.

Relative Humidity (RH): Refers to the ratio of water vapor in the atmosphere to the amount required to saturate it at a given temperature.

Semi-Porous Materials: Refers to materials that may be somewhat porous, yet they may still allow for adequate cleaning. Materials include wooden beams and some wallboard systems.

Swab Sample: Refers to collection of a sample onto a sterile swab for analysis of mold, fungi, and bacteria by viable and/or non-viable analysis.

Tape-Lift Sample: Refers to collection of a sample onto clear scotch tape for analysis by direct microscopic examination (non-viable).

7.3 Quality Assurance

Medical Examinations

Before potential exposure to microbial contaminants, the remediation contractor shall provide workers with a comprehensive medical examination as required by 29 CFR 1910.134 as outlined by the Medical Monitoring Program.

Medical Records

The remediation contractor shall maintain complete and accurate medical records on employees as required by OSHA and the contractor's Medical Monitoring Program. The contractor may be asked to provide a copy of all medical records for approval by the consultant's representative.

Training

Each employee working on this contract shall be trained prior to the time of initial job assignment in accordance with mold specific and chemical specific training as indicated by the OSHA General Duty Clause and the Hazard Communication Standard. Each employee shall also receive training required by Federal guidelines listed in Section 7.1 of this document and project specifications.

Hazard Communication Program

The remediation contractor has established and implemented a Hazard Communication Program as required by 29 CFR 1910.1200 and may be asked to provide a copy of this written program. Hazard Communication training must include occupational hazards as directly related to working with fungi/mold and contamination of building components by fungal contamination, specific training for chemical hazards associated with biocide usage, and site specific MSDS sheets for commercial detergents and biocides utilized on the job site.

Respiratory Protection Program

The remediation contractor has established a Respiratory Protection Program, which complies with 29 CFR 1910.134. Physical examinations and fit testing are required for use of respiratory protection greater than an N-95 dust mask. Workers removing building materials contaminated by mold growth, applying anti-microbial agents, or workers subjected to exposures to anti-microbial agents shall be required to wear, at minimum, a tight-fitting negative pressure ½ mask respirator with P-100 filters. Therefore, -he OSHA Respiratory Protection Standard applies.

Analytical Testing Laboratory

Analysis of culturable biological samples collected on this project shall be conducted by a laboratory that participates in the Environmental Microbiological Proficiency Analytical Testing Program (EMPAT) of the American Industrial Hygiene Association (AIHA) and has shown to be proficient by proficiency analytical testing (PAT) samples. Analysis of non-viable air and surface samples shall be conducted by a competent person.

7.4 Materials and Equipment

Equipment

The contractor shall make available to employees a complete set of personal protective equipment (PPE) as required by this program for entry into the controlled area. All personnel while in the control area or handling microbial contaminated waste shall wear protective clothing, respirators, and other PPE.

Respirators

Contractor shall furnish the appropriate respirator in accordance with 29 CFR 1910.134 and approved by NIOSH for protection in environments that contain microbial contaminants. The selected respirator for this project shall be a tight-fitting negative pressure ½ respirator equipped with HEPA cartridge (P-95, P-100). At minimum, an N-95 dust mask may be utilized during fine cleaning activities; however, the tight fitting ½ mask respirator shall be utilized during application of anti-microbial agents or biocides.

Special Clothing

Employees shall be provided with and required to wear: whole body disposable protective clothing, full body tyvek suits with head coverings, and latex gloves *(see table)* during all activities in the controlled area.

Chemical	Recommended Rubber Glove
Sodium Hypochlorite	Neoprene or Nitrile

Phenolic Compounds	Neoprene
Quaternary Ammonia Compounds	Polyvinyl Chloride (PVC)
Detergents	Latex

Eye Protection

The contractor shall provide chemical-resistant goggles to personnel engaged in cleaning and treatment activities and require them to be worn during application of anti-microbial agents and biocides.

Warning Signs and Labels

Standard approved warning signs shall be erected at all approaches to the control area as specified in 29 CFR 1910.145.

Anti-Microbial Agents

Anti-microbial agents utilized in interior quarters shall consist of quaternary ammonia compounds. No phenolic compounds shall be used in interior quarters with exception of Micro Ban Plus. Approval must be granted by the owner/powers that be prior to application. Anti-microbial agents shall be EPA approved. Commercial grade detergents shall be used to remove fungal contamination during cleaning phases prior to anti-microbial application, to include encapsulation.

Phoenix EnviroCorp

June 15, 2021

Quanesha Mullins
Wilmington Housing Authority
1524 S. 16th Street
Wilmington, NC 28401

RE: PEC Job # 21-21-189-IAQ-M - 302 Grass Lane, Apartment 207, Wilmington, NC - Mold Investigation/Background air sampling

Enclosed are the results of the mold investigation conducted at the above referenced unit on June 8, 2021. Phoenix EnviroCorp (PEC) was retained to conduct background air sampling to determine airborne mold spore levels and to collect surface samples of suspect visible mold growth.

Background Information: The resident reported a leak in the bathroom, hot water room, and in the kitchen.

The unit is occupied, fully furnished with contents throughout.

The HVAC system was operating in the cool mode, set at 72º F upon PEC's arrival and during sampling.

Note: For directional purposes "front" is determined by facing the parking lot off Grass Lane from inside the unit, unless otherwise stated.

Visual Inspection: PEC's visual inspection noted the following (see enclosed photographic documentation):

- Apparent water damage within the bathroom cabinet underneath the sink
- Apparent water damage on the floor in the bathroom near the bathtub
- Apparent water damage within the kitchen cabinet underneath the sink
- Suspect visible mold growth and rust on the HVAC supply vent in the bathroom

Mold Testing – Surface: A non-viable surface sample was collected from an area of suspect visible mold growth. The quantifications of fungal growth are reported as scattered spores, 21-100 fungal spores = very light (VL), 101-1,000 fungal spores = light (L), 1,001-10,000 fungal spores = moderate (M), > 10,000 fungal spores = heavy (H). The 'General Impressions' of fungal growth are reported as no fungal growth (NFG), fungal growth (FG), minimal fungal growth or growth in vicinity (MFG), and no fungal spores detected (ND). *Clear tape was utilized for the collection of surface samples. Each sample was assigned a unique ID number and shipped to a third-party laboratory for analysis.* Sampling locations and results are as follows:

Location	Result
HVAC supply vent in the bathroom	**VL – MFG** *Basidiospores* **Scattered Spores –** *Bipolaris/Drechslera* **VL – MFG** *Cladosporium* **Scattered Spores –** *Epicoccum*

Mold Testing – Air: Non-viable spore trap air samples were collected to determine airborne mold spore levels. Samples were collected within the kitchen/living room, the bathroom, the rear right bedroom, and the rear left bedroom. *Micro 5 sampling media was utilized for the collection of spore trap air samples. Each sample ran for five (5) minutes at a flow rate of five (5) liters per minute for a total volume of twenty-five (25) liters per sample. Each sample was assigned a unique ID number and shipped to a third-party laboratory for analysis. All air samples were collected from centralized locations (within their respective areas) and within the breathing zone, unless otherwise noted.* Two samples were also collected outdoors for comparative purposes.

Results indicated acceptable levels of airborne mold spores in all sampled locations.

The interpretation of air sample results is based on indoor/outdoor comparisons, in combination with a study by Daniel M. Baxter, entitled "A Regional Comparison of Mold Spore Concentrations Outdoors and Inside "Clean" and "Mold Contaminated" Southern California Buildings", and other industry guidelines, as well as over 20 years of experience in industrial hygiene and mold testing.

In layman terms, acceptable levels indicate that the levels are below the outdoor level and/or the baseline levels (whichever is higher) stated below. Elevated levels indicate that the levels are above the outdoor level and/or the baseline level.

Baseline levels for indoor spore trap air samples are as follows: < 900 spores/m³ for Penicillium/ Aspergillus; 0 spores/m³ for Stachybotrys and Chaetomium; and < 350 spores/m³ for other individual mold groups.

Relative Humidity (RH): *Temperature and relative humidity readings were collected in the same locations as the spore trap air samples.* RH levels within the residence ranged from 49.7% - 51.7% with an outdoor RH level of 77.3% (see the enclosed Chain of Custody for details). Per the American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) Standard 62-1999, relative humidity should range between 30% and 60%.

Conclusions: Air sampling within the tested areas did not indicate a problem with the indoor air quality regarding mold, however, minimal surface mold growth (*Basidiospores,* and *Cladosporium) w*as identified, in addition to apparent water damage.

Upon request and for an additional fee, PEC can conduct additional investigative activities and provide a mold remediation protocol if needed.

Enclosed in this report are the laboratory analysis and the Chain of Custody.

Should you have any questions, please do not hesitate to call.

Thank you,

Philip Green
IH Technician

Tommie Green, CIEC
Professional Industrial Hygienist

Enclosures

Photo 1

Apparent water damage in the bathroom cabinet underneath the sink

Photo 2

Apparent water damge on the floor in the bathroom near the bathtub

Photo 3

Apparent water damage in the kitchen cabinet underneath the sink

Photo 4

Suspect visible mold growth and rust on the HVAC supply vent in the bathroom

Phoenix EnviroCorp
4020 SHIPYARD BLVD.
WILMINGTON, NC 28403

CHAIN OF CUSTODY

LABORATORY TEST REQUEST

~~Seem Ref # 210609~~m 6.9.21

Seem Ref # 21060902e

Lab ID: 088-~~00~~092

CONTACT: Philip Green	TELEPHONE (910) 397-0370 FAX (910) 313-6094	6/8/2021
PEC Job #: 21-21-189-IAQ-M	SITE ADDRESS:	302 Grass Lane, Apt. 207, Wilmington, NC 28405

PLEASE EMAIL RESULTS TO: KMGREEN@PHOENIXENVIROCORP.COM

SAMPLE TYPE:	NUMBER OF SAMPLES:	TURN AROUND TIME SPECIFIED:
Spore Trap - Micro-5	4	____ Immediate ____ 24 hr ____ 48 hr _X_ Standard
Surface Samples	1	

Sample #	Sample Area	Sample Volume	Lab Analysis Requested	% Relative Humidity	Temperature °F
060821-PG-401	Kitchen/Living Room	25L	S001	49.7	75.4
060821-PG-402	Bathroom	25L	S001	51.4	74.7
060821-PG-403	Rear Right Bedroom	25L	S001	51.7	73.7
060821-PG-404	Rear Left Bedroom	25L	S001	50.6	74.0
060821-PG-501	Black VSMG/Rust on HVAC supply vent in bathroom	1 cm sq	S001		
	samples accepted				

Samples Collected By (Printed Name and Signature): [signature] Date Signed: 6/8/2021

CHAIN OF CUSTODY RECORD

DATE:	Time:	Condition of Samples:	RELINQUISHED BY: (Printed Name and Signature)	ACCEPTED BY: (Printed Name and Signature)
6/8/2021	14:00 PM	Intact	[signature] AFFILIATION:	[signature] 6.9.21 AFFILIATION:

SEEML Reference Number: 210609026

Southeast Environmental Microbiology Laboratories
102 Edinburgh Court
Greenville, SC 29607
Phone: (864) 233-3770
FAX: (864) 233-6589

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

- ☒ Surface/Bulk Report
- ☒ Spore Trap Report
- ☐ Andersen Fungal Report
- ☐ Quantitative Fungal Report

Lab Manager Review: *Angel Gosnell* Date: 06/09/21

Thank you for using SEEML laboratories. We strive to provide superior quality and service.
SEEML laboratories are accredited through AIHA-LAP, LLC (EMLAP # 173667) for the analysis of Spore Traps and Surface/Bulk Samples.

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

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

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

Spore Trap Report

	Date Sampled: 06/08/21
Attn: ***Phoenix Enviro Corp.***	Date Received: 06/09/21
4020 Shipyard Blvd.	Date Analyzed: 06/09/21
Wilmington, NC 28403	Date Reported: 06/09/21
	Date Revised:
	Project Name: 21-21-189-IAQ-M
	Project Address: 302 Grass Lane, Apt 207
	Project City, State, ZIP: Wilmington, NC 28405
	SEEML Reference # : 210609026

TEST METHOD: DIRECT MICROSCOPY EXAMINATION SEEML SOP 7

Client Sample ID	060821-PG-401			060821-PG-402			060821-PG-403		
Location	Kitchen / Living Room			Bathroom			Rear Right Bedroom		
Lab Sample ID	210609026-088			210609026-089			210609026-090		
Comments									
Hyphal Fragments							1	40	
Pollen	1	40							
Spore Trap Used	M5			M5			M5		
	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%
Alternaria	1	40	<1						
Ascospores	6	240	6	2	80	12	3	120	7
Basidiospores	21	840	19	4	160	24	19	760	42
Bipolaris/Drechslera	1	40	<1						
Chaetomium									
Cladosporium	67	2680	61	8	320	47	20	800	44
Curvularia	2	80	2						
Epicoccum									
Cercospora									
Fusarium									
Memnoniella									
Nigrospora									
Penicillium/Aspergillus	11	440	10	3	120	18	3	120	7
Polythrincium									
Rusts									
Smuts/Periconia/Myxomy									
Spegazzinia									
Stachybotrys									
Stemphylium									
Tetraploa									
Torula									
Ulocladium									
Colorless/Other Brown*									
Oidium									
Zygomycetes									
Pithomyces									
Background debris (1-5)**	3			3			3		
Sample Volume(liters)	25			25			25		
TOTAL SPORES/M^3	109	**4360**		17	**680**		45	**1800**	

Revisions:

Spore types listed without a count or data entry were not detected during the course of the analysis for the respective sample, indicating a raw count of <1 spore.
The analytical sensitivity is the spores/m^3 divided by the raw count, expressed in spores/m^3. The limit of detection is the analytical sensitivity (in spores/m^3) multiplied by the sample volume (in liters) divided by 1000 liters.
*Colorless,other Brown are spores without a distinctive morphology on spore traps and non-viable surface samples.
**Background debris is the amount of particulate matter present on the slide and is graded from 1-5 with 1 = very light, 2= Light, 3 = Medium, 4 = Heavy, 5 = Very Heavy. The higher the rating the more likelihood spores may be underestimated. A rating of 5 should be interpreted as minimal counts and may actually be higher than reported.

Disclaimer: The sample results are determined by the sample volume, which is provided by the customer.
This report relates only to the samples tested as they were received.

Angel Gosnell
Angel Gosnell, Approved Laboratory Signatory

102 Edinburgh Court
Greenville, SC. 29607
Phone: (864) 233-3770

Spore Trap Report

	Date Sampled: 06/08/21
Attn: ***Phoenix Enviro Corp.***	Date Received: 06/09/21
4020 Shipyard Blvd.	Date Analyzed: 06/09/21
Wilmington, NC 28403	Date Reported: 06/09/21
	Date Revised:
	Project Name: 21-21-189-IAQ-M
	Project Address: 302 Grass Lane, Apt 207
	Project City, State, ZIP: Wilmington, NC 28405
	SEEML Reference # : 210609026

TEST METHOD: DIRECT MICROSCOPY EXAMINATION SEEML SOP 7

Client Sample ID	060821-PG-404		
Location	Rear Left Bedroom		
Lab Sample ID	210609026-091		
Comments			
Hyphal Fragments			
Pollen			
Spore Trap Used	M5		
	raw ct.	spores/m^3	%
Alternaria			
Ascospores	2	80	9
Basidiospores	6	240	27
Bipolaris/Drechslera			
Chaetomium			
Cladosporium	13	520	59
Curvularia			
Epicoccum			
Cercospora			
Fusarium			
Memnoniella			
Nigrospora			
Penicillium/Aspergillus	1	40	5
Polythrincium			
Rusts			
Smuts/Periconia/Myxomy			
Spegazzinia			
Stachybotrys			
Stemphylium			
Tetraploa			
Torula			
Ulocladium			
Colorless/Other Brown*			
Oidium			
Zygomycetes			
Pithomyces			
Background debris (1-5)**	3		
Sample Volume(liters)	25		
TOTAL SPORES/M^3	22	**880**	

Revisions:

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The analytical sensitivity is the spores/m^3 divided by the raw count, expressed in spores/m^3. The limit of detection is the analytical sensitivity (in spores/m^3) multiplied by the sample volume (in liters) divided by 1000 liters.
*Colorless,other Brown are spores without a distinctive morphology on spore traps and non-viable surface samples.
**Background debris is the amount of particulate matter present on the slide and is graded from 1-5 with 1 = very light, 2= Light, 3 = Medium, 4 = Heavy, 5 = Very Heavy. The higher the rating the more likelihood spores may be underestimated. A rating of 5 should be interpreted as minimal counts and may actually be higher than reported.

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Angel Gosnell
Angel Gosnell, Approved Laboratory Signatory

102 Edinburgh Court
Greenville, SC. 29607
Phone: (864) 233-3770

Surface and Bulk Sample Report

	Date Sampled: 06/08/21
Attn: ***Phoenix Enviro Corp.***	Date Received: 06/09/21
4020 Shipyard Blvd.	Date Analyzed: 06/09/21
Wilmington, NC 28403	Date Reported: 06/09/21
	Date Revised:
	Project Name: 21-21-189-IAQ-M
	Project Address: 302 Grass Lane, Apt 207
	Project City, State ZIP: Wilmington, NC 28405
	SEEML Reference #: 210609026

TEST METHOD: Direct Microscopic Examination (SEEML SOP 18)

Client Sample ID	060821-PG-501			
Location	Black VSMG/ Rust on HVAC Supply Vent in Bathroom			
SEEML Sample ID	210609026-092			
Sample Type	Tape			
	Quantification*			
Hyphal Fragments	**Scattered**			
Pollen	**Scattered**			
General Impressions **	**MFG**			
Fungal Spore:				
Alternaria				
Acremonium				
Ascospores				
Basidiospores	**VL**			
Bipolaris/Drechslera	**Scattered Spores**			
Cercospora				
Chaetomium				
Cladosporium	**VL**			
Curvularia				
Epicoccum	**Scattered Spores**			
Fusarium				
Geotrichum sp.				
Memnoniella				
Myxomycetes				
Nigrospora				
Penicillium/Aspergillus				
Pithomyces				
Rusts/Smuts				
Stemphylium				
Tetraploa				
Ulocladium				

** General Impressions: NFG = No Fungal Growth, FG = Fungal Growth, MFG = Minimal Fungal Growth Or Growth in vicinity

Quantification of fungal growth is done by semi-quantitative grading using the following ranges:

Scattered Spores, 1-20 fungal spores

VL = 21-100 fungal spores L = 101-1,000 fungal spores M = 1,001-10,000 fungal spores H = >10,000 fungal spores

ND = No Fungal Spores Detected

Disclaimer: This report relates only to the samples tested

Respectfully submitted, SEEML

Angel Gosnell, **Approved Laboratory Signatory**

102 Edinburgh Court
Greenville, SC 29607
Phone: (864) 233- 3770
Fax: (864) 233- 6589

AIHA-LAP, LLC EMLAP # 173667

Texas License: LAB1016

Phoenix EnviroCorp
4020 SHIPYARD BLVD.
WILMINGTON, NC 28403

CHAIN OF CUSTODY

LABORATORY TEST REQUEST See ml Ref # 210609028
Lab ID : 099 - 100

CONTACT: Philip Green	TELEPHONE (910) 397-0370 FAX (910) 313-6094	6/8/2021
PEC Job #: 21-21-186,188,189,190-IAQ-M	SITE ADDRESS: 302 Grass Lane, Wilmington, NC 28405	

PLEASE EMAIL RESULTS TO: KMGREEN@PHOENIXENVIROCORP.COM

SAMPLE TYPE:	NUMBER OF SAMPLES:	TURN AROUND TIME SPECIFIED:
Spore Trap - Micro-5	2	_____ Immediate _____ 24 hr _____ 48 hr __X__ Standard
Surface Samples	0	

Sample #	Sample Area	Sample Volume	Lab Analysis Requested	% Relative Humidity	Temperature °F
060821-PG-801	Outside - Front	25L	S001	77.3	81.1
060821-PG-802	Outside - Rear	25L	S001		
	Samples accepted				

Samples Collected By (Printed Name and Signature): [signature] Date Signed: 6/8/2021

CHAIN OF CUSTODY RECORD

DATE:	Time:	Condition of Samples:	RELINQUISHED BY: (Printed Name and Signature)	ACCEPTED BY: (Printed Name and Signature)
6/8/2021	14:00 PM	Intact	[signature] AFFILIATION:	[signature] AFFILIATION: 6-9-21

SEEML Reference Number: 210609028

Southeast Environmental Microbiology Laboratories
102 Edinburgh Court
Greenville, SC 29607
Phone: (864) 233-3770
FAX: (864) 233-6589

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

- ☐ Surface/Bulk Report
- ☒ Spore Trap Report
- ☐ Andersen Fungal Report
- ☐ Quantitative Fungal Report

Lab Manager Review: *Angel Gosnell* Date: 06/09/21

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

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

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

Spore Trap Report

	Date Sampled: 06/08/21
Attn: ***Phoenix Enviro Corp.***	Date Received: 06/09/21
4020 Shipyard Blvd.	Date Analyzed: 06/09/21
Wilmington, NC 28403	Date Reported: 06/09/21
	Date Revised:
	Project Name: 21-21-186, 188,189,190-IAQ-M
	Project Address: 302 Grass Lane
	Project City, State, ZIP: Wilmington, NC 28405
	SEEML Reference # : 210609028

TEST METHOD: DIRECT MICROSCOPY EXAMINATION SEEML SOP 7

Client Sample ID	060821-PG-801			060821-PG-802					
Location	Outside- Front			Outside- Rear					
Lab Sample ID	210609028-099			210609028-100					
Comments									
Hyphal Fragments									
Pollen				3	120				
Spore Trap Used	M5			M5					
	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%			
Alternaria	2	80	<1						
Ascospores	453	18100	36	120	4800	20			
Basidiospores	615	24600	49	213	8520	36			
Bipolaris/Drechslera	1	40	<1						
Chaetomium									
Cladosporium	177	7080	14	222	8880	37			
Curvularia									
Epicoccum									
Cercospora	2	80	<1						
Fusarium									
Memnoniella									
Nigrospora									
Penicillium/Aspergillus				46	1840	8			
Polythrincium									
Rusts									
Smuts/Periconia/Myxomy	1	40	<1						
Spegazzinia									
Stachybotrys									
Stemphylium									
Tetraploa									
Torula									
Ulocladium									
Colorless/Other Brown*									
Oidium									
Zygomycetes									
Pithomyces									
Background debris (1-5)**	3			3					
Sample Volume(liters)	25			25					
TOTAL SPORES/M^3	1251	**50000**		601	**24000**				

Revisions:

Spore types listed without a count or data entry were not detected during the course of the analysis for the respective sample, indicating a raw count of <1 spore.

The analytical sensitivity is the spores/m^3 divided by the raw count, expressed in spores/m^3. The limit of detection is the analytical sensitivity (in spores/m^3) multiplied by the sample volume (in liters) divided by 1000 liters.

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

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

Disclaimer: The sample results are determined by the sample volume, which is provided by the customer.
This report relates only to the samples tested as they were received.

102 Edinburgh Court
Greenville, SC. 29607
Phone: (864) 233-3770

Angel Gosnell

Angel Gosnell, Approved Laboratory Signatory

Fungal Descriptions

Alternaria sp.

Aw - 0.89. Conidia dimensions: 18-83 x 7-18 microns. A very common allergen with an IgE mediated response. It is often found in carpets, textiles and on horizontal surfaces in building interiors. Often found on window frames. Outdoors it may be isolated from samples of soil, seeds and plants. It is commonly found in outdoor samples. The large spore size, 20 - 200 microns in length and 7 - 18 microns in sizes, suggests that the spores from these fungi will be deposited in the nose, mouth and upper respiratory tract. It may be related to bakers' asthma. It has been associated with hypersensitivity pneumonitis. The species *Alternaria alternata* can produce tenuazonic acid and other toxic metabolites that may be associated with disease in humans or animals. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include edema and bronchospasms; chronic cases may develop pulmonary emphysema.

Ascospore

A spore borne in a special cell called an ascus. Spores of this type are reported to be allergenic. All ascomycetes, members of a group of fungi called Ascomycotina, have this type of spore. The minute black dots on rotting wood and leaves or the little cups on lichens are examples of ascomycetes; another is the "truffle" mushroom.

Aspergillus/Penicillium

These are two of the most commonly found allergenic fungi in problem buildings. *Aspergillus* comes in many varieties (species). Many of the varieties produce toxic substances. It may be associated with symptoms such as sinusitis, allergic bronchopulmonary aspergillosis, and other allergic symptoms. *Penicillium* is a variety of mold that is very common indoors and is found in increased numbers in problem buildings. It also has many varieties, some of which produce toxic substances. The symptoms are allergic reactions, mucous membrane irritation, headaches, vomiting, and diarrhea. Due to the morphological similarity of *Aspergillus* and *Penicillium*, they are not differentiated by microscopic analysis and are reported together.

Aspergillus sp.

Aw 0.75 - 0.82. Reported to be allergenic. Members of this genus are reported to cause ear infections. Many species produce mycotoxins that may be associated with disease in humans and other animals. Toxin production is dependent on the species or a strain within a species and on the food source for the fungus. Some of these toxins have been found to be carcinogenic in animal species. Several toxins are considered potential human carcinogens. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include edema and bronchospasms; chronic cases may develop pulmonary emphysema; may also be associated with sinusitis, allergic bronchopulmonary aspergillosis, and other allergic symptoms.

Basidiospore

Spore from basidiomycetes. Many varieties are reported to be allergenic.

Bipolaris sp.

A fungus with large spores that could be expected to be deposited in the upper respiratory tract. This fungus can produce the mycotoxin - sterigmatocystin, which has been shown to produce liver and kidney damage when ingested by laboratory animals.

Botrytis sp.

Aw 0.93. Conidia dimensions: 7-14 x 5-9 microns. It is parasitic on plants and soft fruits. Found in soil and on house plants and vegetables, it is also known as "gray mold". It causes leaf rot on grapes, strawberries, lettuce, etc. It is a well-known allergen, producing asthma type symptoms in greenhouse workers and "wine grower's lung".

Cercaspora

Common outdoors in agricultural areas, especially during harvest. Parasite of higher plants, causing leaf spot. Commonly found as parasites on higher plants.

Chaetomium sp.

large ascomycetous fungus producing perithecia. It is found on a variety of substrates containing cellulose, including paper and plant compost. It has been found on paper in sheetrock. It can produce an *Acremonium*-like state on fungal media. Varieties are considered allergenic and have been associated with peritonitis, cutaneous lesions, and system mycosis.

Cladosporium sp.

Aw 0.88; Aw 0.84. Most commonly identified outdoor fungus. The outdoor numbers are reduced in the winter. The numbers are often high in the summer. Often found indoors in numbers less than outdoor numbers. It is a common allergen. Indoor *Cladosporium* sp. may be different than the species identified outdoors. It is commonly found on the surface of fiberglass duct liners in the interior of supply ducts. A wide variety of plants are food sources for this fungus. It is found on dead plants, woody plants, food, straw, soil, paint, and textiles. Produces greater than 10 antigens. Antigens in commercial extracts are of variable quality and may degrade within weeks of preparation. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include skin lesions, eye ulceration, mycosis (including onychomycosis, an infection of the nails of the feet or hands) edema and bronchospasms; chronic cases may develop pulmonary emphysema.

Curvularia sp.

Reported to be allergenic and has been associated with allergic fungal sinusitis. It may cause corneal infections, mycetoma, and infections in immune compromised hosts.

Dreschlera sp.

Conidia dimensions: 40-120 x 17-28 microns. Found on grasses, grains and decaying food. It can occasionally cause a corneal infection of the eye.

Epicoccum sp.

Conidia dimensions: 15-25 microns. A common allergen. It is found in plants, soil, grains, textiles and paper products.

Fusarium sp.

Aw 0.90. A common soil fungus. It is found on a wide range of plants. It is often found in humidifiers. Several species in this genus can produce potent trichothecene toxins. The trichothecene (scirpene) toxin targets the following systems: circulatory, alimentary, skin, and nervous. Produces vomitoxin on grains during unusually damp growing conditions. Symptoms may occur either through ingestion of contaminated grains or possibly inhalation of spores. The genera can produce hemorrhagic syndrome in humans (alimentary toxic aleukia). This is characterized by nausea, vomiting, diarrhea, dermatitis, and extensive internal bleeding. Reported to be allergenic. Frequently involved in eye, skin, and nail infections.

Myxomycetes

Members of a group of fungi that is included in the category of "slime molds". They're occasionally found indoors, but mainly reside in forested regions on decaying logs, stumps, and dead leaves. Myxomycetes display characteristics of fungi *and* protozoans. In favorable (wet) conditions they exhibit motile, amoeba-like cells, usually bounded only by a plasma membrane, that are variable in size and form. During dry spells, they form a resting body (sclerotium) with dry, airborne spores. These fungi are not known to produce toxins but can cause hay fever and asthma.

Memnoniella

Contaminant found most often with *Stachybotrys* on wet cellulose. Forms in chains, but it are very similar to *Stachybotrys* and sometimes is considered to be in the *Stachybotrys* family. Certain species do produce toxins very similar to the ones produced by *Stachybotrys chartarum* and many consider the IAQ importance of *Memnoniella* to be on par with *Stachybotrys*. Allergenic and infectious properties are not well studied.

Nigrospora sp.

Commonly found in warm climates, this mold may be responsible for allergic reactions such as hay fever and asthma. It is found on decaying plant material and in the soil. It is not often found indoors.

Oidium sp.

The asexual phase of *Erysiphe* sp. It is a plant pathogen causing powdery mildews. It is very common on the leaf's stems, and flowers of plants. The health effects and allergenicity have not been studied. It does not grow on non-living surfaces such as wood or drywall.

Penicillium sp.

Aw 0.78 - 0.88. A wide number of organisms have been placed in this genus. Identification to species is difficult. Often found in aerosol samples. Commonly found in soil, food, cellulose and grains. It is also found in paint and compost piles. It may cause hypersensitivity pneumonitis, allergic alveolitis in susceptible individuals. It is reported to be allergenic (skin). It is commonly found in carpet, wallpaper, and in interior fiberglass duct insulation. Some species can produce mycotoxins. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include edema and bronchospasms; chronic cases may develop pulmonary emphysema. It may also cause headaches, vomiting, and diarrhea.

Periconia sp.

Periconia sp. are found in soil, blackened and dead herbaceous stems leaf spots, grasses, rushes, and sedges. Almost always associated with other fungi. Rarely found growing indoors. Reportedly associated with a rare case of mycotic keratitis.

Pithomyces sp.

A common mold found on dead leaves, plants, soil and especially grasses. Causes facial eczema in ruminants. It exhibits distinctive multi-celled brown conidia. It is not known to be a human allergen or pathogen. It is rarely found indoors, although it can grow on paper.

Rusts/Smuts

These fungi are associated with plant diseases. In the classification scheme of the fungi, the smuts have much in common with the rusts, and they are frequently discussed together. Both groups produce wind-borne, resistant teliospores that serve as the basis for their classification and their means of spread. Rusts usually attack vegetative regions (i.e., leaves and stems) of plants; smuts usually are associated with the reproductive structures (seeds). They can cause hay fever and asthma.

Spegazzinia

Spegazzinia species comprise a very small proportion of the fungal biota. This genus is somewhat related to other lobed or ornamented genera such as *Candelabrum*. No information is available regarding health effects or toxicity. Allergenicity has not been studied. Usually identified on spore trap samples where it is seen every few weeks. (Spores have very distinctive morphology.) May also be found in air by culturable (Andersen) samples if a long enough incubation period is provided so that sporulation occurs. Our laboratory has never found this organism growing on indoor environmental surfaces. Natural habitat includes soil and many kinds of trees and plants.

Stachybotrys sp.

Aw - 0.94, optimum Aw ->0.98. Several strains of this fungus (*S. atra, S. chartarum* and *S. alternans* are synonymous) may produce a trichothecene mycotoxin- Satratoxin H - which is poisonous by inhalation. The toxins are present on the fungal spores. This is a slow growing fungus on media. It does not compete well with other rapidly growing fungi. The dark colored fungus grows on building material with high cellulose content and low nitrogen content. Areas with a relative humidity above 55%, and are subject to temperature fluctuations, are ideal for toxin production. Individuals with chronic exposure to the toxin produced by this fungus reported cold and flu symptoms, sore throats, diarrhea, headaches, fatigue, dermatitis, intermittent local hair loss and generalized malaise. Other symptoms include coughs, rhinitis, nosebleed, a burning sensation in the nasal passages, throat, and lungs, and fever. The toxins produced by this fungus will suppress the immune system affecting the lymphoid tissue and the bone marrow. Animals injected with the toxin from this fungus exhibited the following symptoms: necrosis and hemorrhage within the brain, thymus, spleen, intestine, lung, heart, lymph node, liver, and kidney. Affects by absorption of the toxin in the human lung are known as pneumomycosis.

This organism is rarely found in outdoor samples. It is usually difficult to find in indoor air samples unless it is physically disturbed (or possibly -this is speculation- a drop in the relative humidity). The spores are in a gelatinous mass. Appropriate media for the growth of this organism will have high cellulose content and low nitrogen content. The spores will die readily after release. The dead spores are still allergenic and toxigenic. Percutaneous absorption has caused mild symptoms.

Stemphylium sp.

Reported to be allergenic. Isolated from dead plants and cellulose materials.

Torula sp.

Found outdoors in air, soil, on dead vegetation, wood, and grasses. Also found indoors on cellulose materials. Reported to be allergenic and may cause hay fever and asthma.

Tetraploa

Tetraploa species comprise a very small proportion of the fungal biota. This genus is somewhat related to *Triposporium* and Diplocladiella. The only reported human infections are two cases of keratitis (1970, 1980) and one case of subcutaneous infection of the knee (1990). No information is available regarding other health effects or toxicity. Allergenicity has not been studied. Usually identified on spore trap samples where it is seen every few weeks. (Spores have very distinctive morphology.) Our laboratory has never found this organism growing on indoor environmental surfaces. Natural habitat includes leaf bases and stems just above the soil on many kinds of plants and trees.

Ulocladium sp.

Aw 0.89. Isolated from dead plants and cellulose materials. Found on textiles.

Zygomycetes

Zygomycetes are one of the four major groups of fungi, the others being the Oomycetes, the Ascomycetes, and the Basidiomycetes. Zygomycetes are common, fast growing, and often overgrow and/or inhibit other fungi nearby. Rhizopus and Mucor are two of the most common Zygomycetes seen in the indoor environment. However, others are seen as well, including *Syncephalastrum*, *Circinella*, *Mortierella*, *Mycotypha*, *Cunninghamella*, and *Choanephora*. For further information, please see descriptions of these individual genera.

The following table lists mycotoxins that are produced by certain types of fungi:

Fungi	Mycotoxin
Acremonium crotocinigenum	Crotocin
Aspergillus favus	Alfatoxin B, cyclopiazonic acid
Aspergillus fumigatus	Fumagilin, gliotoxin
Aspergillus carneus	Critrinin
Aspergillus clavatus	Cytochalasin, patulin
Aspergillus Parasiticus	Alfatoxin B
Aspergillus nomius	Alfatoxin B
Aspergillus niger	Ochratoxin A, malformin, oxalicacid
Acremonium crotocinigenum	Crotocin
Aspergillus nidulans	Sterigmatocystin
Aspergillus ochraceus	Ochratoxin A, penicillic acid
Aspergillus versicolor	Sterigmatocystin, 5 ethoxysterigmatocystin
Aspergillus ustus	Ausdiol, austamide, austocystin,brevianamide
Aspergillus terreus	Citreoviridin
Alternaria	Alternariol, altertoxin, altenuene, altenusin, tenuazonic acid
Arthrinium	Nitropropionic acid
Bioploaris	Cytochalasin, sporidesmin, sterigmatocystin
Chaetomium	Chaetoglobosin A,B,C. Sterigmatocystin
Cladosporium	Cladosporic acid
Clavipes purpurea	Ergotism
Cylindrocorpon	Trichothecene
Diplodia	Diplodiatoxin
Fusarium	Trichothecene, zearalenone
Fusarium moniliforme	Fumonisins
Emericella nidulans	Sterigmatocystin
Gliocladium	Gliotoxin
Memnoniella	Griseofulvin , dechlorogriseofulvin, epi-decholorgriseofulvin, trichodermin, trichodermol
Myrothecium	Trichothecene
Paecilomyces	Patulin, viriditoxin
Penicillium aurantiocandidum	Penicillic acid
Penicillium aurantiogriseum	Penicillic acid
Penicillium brasilanum	Penicillic acid
Penicillium brevicompactum	Mycophenolic acid
Penicillium camemberti	Cyclopiazonic acid
Penicillium carneum	Mycophenolic acid, Roquefortine C
Penicillium crateriforme	Rubratoxin

Fungi	**Mycotoxin**
Penicillium citrinum	Citrinin
Penicillium commune	Cyclopiazonic acid
Penicillium crustosum	Roquefortine C
Penicillium chrysogenum	Roquefortine C
Penicillium discolor	Chaetoglobosin C
Penicillium expansum	Citrinin, Roquefortine C
Penicillium griseofulvum	Roquefortine C, cyclopiazonic acid, griseofulvin
Penicillium hirsutum	Roquefortine C
Penicillium hordei	Roquefortine C
Penicillium nordicum	Ochratoxin A
Penicillium paneum	Roquefortine C
Penicillium palitans	Cyclopiazonic acid
Penicillium polonicum	Penicillic acid
Penicillum roqueforti	Roquefortine C, Mycophenolic acid
Penicillium veridicatum	Penicillic acid
Penicillium verrucosum	Citrinin, ochratoxin A
Penicillium/ Aspergillus	Patulin
Penicillium/ Aspergillus/Alternaria	Glitoxin
Phomopsis	Macrocyclic trichothecenes
Phoma	Brefeldin, cytochalasin, secalonic acid, tenuazonic acid
Pithomyces	Sporidesmin
Rhizoctonia	Slaframine
Rhizopus	Rhizonin
Sclerotinia	Furanocoumarins
Stachybotrys chartarum	Iso-satratoxin F, roridin E, L-2, satratoxin G & H, trichodermin, trichodermol, trichothecene
Torula	Cytotoxins
Trichoderma	Trichodermin, trichodermol, gliotoxin
Trichothecium	Trichothecene
Wallemia	Walleminol
Zygosporium	Cytochalasin

General terms

Allergen

An allergen is a substance that elicits an IgE antibody response and is responsible for producing allergic reactions. Chemicals are released when IgE on certain cells contact an allergen. These chemicals can cause injury to surrounding tissue - the visible signs of an allergy. Only a few fungal allergens have been characterized but all fungi are thought to be potentially allergenic. Fungal allergens are proteins found in either the mycelium or spores

"Black mold"

A poorly defined term. Black mold or toxic black mold has usually been associated with the mold *Stachybotrys chartarum*. While there are only a few molds that are truly black, there are many that can appear black. Not all molds that appear to be black are *Stachybotrys*.

Fungi

Fungi are neither animals nor plants and are classified in a kingdom of their own. The Kingdom of Fungi. Fungi include a very large group of organisms, including molds, yeasts, mushrooms and puffballs. There are >100,000 accepted fungal species but current estimates range to 1.5 million species. Mycologists (people who study fungi) have grouped fungi into four large groups according to their method of reproduction.

Hidden mold

This refers to visible mold growth on building structures that is not easily seen, including the areas above drop ceilings, within a wall cavity (the space between the inner and outer structure of a wall), inside air handlers, or within the ducting of a heating/ventilation system.

Microbial Volatile Organic Compounds (MVOCs)

Fungi produce chemicals as a result of their metabolism. Some of these chemicals, MVOCs, are responsible for the characteristic moldy, musty, or earthy smell of fungi, whether mushrooms or molds. Some MVOCs are considered offensive or annoying. Specific MVOCs are thought to be characteristic of wood rot and mold growth on building materials. The human nose is very sensitive to mold odors and sometimes more so than current analytical instruments.

Mold

Molds are a group of organisms that belong to the Kingdom of Fungi (see Fungi). Even though the terms mold and fungi had been commonly referred to interchangeably, all molds are fungi, but not all fungi are molds.

Mycotoxin

Mycotoxins are compounds produced by some fungi that are toxic to humans or animals. By convention, the term? Mycotoxin. Excludes mushroom toxins. Fungi that produce mycotoxins are called "toxigenic fungi."

Spore

General term for a reproductive structure in fungi, bacteria and some plants. In fungi, the spore is the structure which may be used for dissemination and may be resistant to adverse environmental conditions.

Toxic mold

The term "toxic mold" has no scientific meaning since the mold itself is not toxic. The metabolic byproducts of some molds may be toxic (see mycotoxin).

Hypha (plural, hyphae)

An individual fungal thread or filament of connected cells; the thread that represents the individual parts of the fungal body.

Phoenix EnviroCorp

MOLD/BIOLOGICAL CONTAMINANT REMEDIATION PROTOCOL

Date: July 21, 2021

For: Quanesha Mullins
Wilmington Housing Authority
1524 S. 16th Street
Wilmington, NC 28405

Remediation Contractor: Not determined

On-Site Consultant: Phoenix EnviroCorp (PEC)
4020 Shipyard Boulevard
Wilmington, NC 28403
(910) 397-0370

Approved Signatory:

Shaenaz Mirmohamed
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SECTION 1.0 REMEDIATION PROCEDURES

1.1 Project Set Up

- The owner or powers that be shall supply temporary power for remediation equipment. The existing electrical system may be utilized, with permission of the owner or powers that be. Determining specific electrical load/safety requirements, including, but not limited to, the use of a temporary GFCI electrical panel box shall be the responsibility of the abatement contractor.
- HVAC system shall be isolated.
- 6-mil polyethylene sheathing shall be erected to separate primary control areas (PCA) from remaining areas. Control areas shall be selected so that specified building materials (specified herein, in section 1.3, under primary control areas) may be removed or cleaned and dried.
- HEPA Air Filtration Devices shall be utilized for each separate control area. Critical barriers shall consist of 6-mil polyethylene so that primary control areas are isolated from remaining areas. HEPA filtration units shall be exhausted from the PCA to the outside of the building through windows/doors. Dehumidification units must be installed in the PCA to sufficiently dry components.
- A remote wash off station shall be set up to allow for employees to wash hands and faces after egress from the work area.
- Ingress/Egress to the control area(s) shall be, at minimum, sealed with a 2-way polyethylene air lock.
- Entrances to the building shall be marked as indicated in Section 7.4 of this document.

1.2 Local Exhaust System

- Once sealed, the primary control area shall be ventilated with a local HEPA air filtration device that shall ensure a minimum of four (4) air changes per hour. The air filtration device shall be placed within the containment work area.
- Local HEPA exhaust shall be utilized where cleaning of contents is required and/or in the immediate vicinity of remediation activities of building materials.
- In interior sections requiring surface area cleaning, local HEPA filtration may be exhausted within the area to scrub microbials from ambient air. This process shall only be conducted after fine cleaning has been completed.
- Negative pressure within the contained work area shall be maintained throughout the project until clearance is obtained.
- Negative air machines shall be exhausted to exterior portions of the building to adequately ensure that negative pressure is achieved.
- Negative air pressure within the work area shall be tested and recorded at initiation of the project and hourly thereafter by use of a manometer to ensure the desired pressure of -0.02 inches of water, which is comparable to four changes per hour.
- Dehumidification devices with HEPA filtration may be incorporated as filtration devices in conjunction with true HEPA filtration devices; they may not replace the true HEPA filtration devices.

Note: Formula for determination of adequate HEPA filtration:

Total feet per minute =Volume of work area (ft^3)/15 minutes
#AFD Units needed = (Total feet per minute)/Capacity of Unit (ft^3)

- At initiation of final cleaning stages, relative humidity shall be at 40% (+/-3%) and moisture content of wooden components shall be at or below 15% as determined by Delmhorst moisture meter or equivalent meter. Moisture mapping and direct read T/RH shall be recorded by the remediation contractor until the

specified levels have been achieved. Control areas shall be dehumidified during cleaning and mold remediation activities to ensure removal of surface moisture created during application of water. Drying of structural components that have been treated with encapsulating anti-microbial agents will be necessary.

- Moisture levels shall be recorded and documented by the remediation contractor upon successful completion of dehumidification.

1.3 Remediation Specifications

- Prior to commencement of mold remediation activities by the remediation contractor, the source of any water intrusions, leaks, and/or moisture/humidity problems shall be remedied by the owner. If water intrusions, leaks, and/or moisture/humidity problems exist and are not corrected, mold growth can be expected to return.
- All remediation procedures listed that involve the removal of building materials shall employ polyethylene critical barriers, negative air pressure, and HEPA filtration (i.e., primary control areas).
- The remediation contractor shall ensure that the filters are properly capped prior to switching off the air scrubbers. If the filters are not properly capped, the backflow can cause mold spores to re-release back into the control area, essentially re-contaminating an area that has already been cleaned.
- All remediation activities shall be conducted in a manner that does not allow dissemination of mold spores. Remediation procedures shall begin from the side of the control area furthest away from air filtration devices.
- Cleaning procedures shall be repeated until the area is visibly free of dust and debris.
- Engineering controls set up during the remediation process shall remain in place until remediation has been completed and acceptable post remediation sampling results have been achieved.
- **Federal and/or state regulations require that suspect asbestos containing materials in public and commercial buildings shall be inspected for asbestos prior to renovations or demolition. Based on these regulations, PEC recommends that building materials that may be disturbed during mold remediation be tested for asbestos content prior to their disturbance to prevent asbestos contamination.**
- If cleaning procedures outlined in this remediation plan outweigh the cost of replacement for selected items, the remediation contractor shall give the owner the option to clean or dispose of those items.
- Reinstallation of building materials and/or components shall only be conducted once acceptable post remediation results are obtained.
- Any chemicals used on this project shall be EPA approved and used only as directed by the manufacturer. MSDS shall be available for review upon request.

HVAC System

- The HVAC system(s) that services or run through the primary control area/affected area shall be shut down prior to remediation activities.
- The spaces that are normally climate-controlled by the HVAC system that have been shut down shall be maintained under proper humidity levels (between 30 and 60% utilizing dehumidifiers, etc.) while the system is not in operation.
- All HVAC supply/return vents within the primary control area/affected area shall be isolated with a critical barrier (i.e., plastic, etc.) to prevent air flow.
- Once the HVAC system is shut down, the system shall remain off and isolated until acceptable post remediation results are obtained.

Note: For directional purposes "front" is determined by facing Grass Lane from inside the unit, unless otherwise noted.

Primary Control Areas/Affected Areas

Critical barriers, negative air pressure, and HEPA filtration shall be established to isolate the following areas as Primary Control Areas to perform the specified mold remediation. **All non-stable furnishings and contents shall be removed from the containment area/primary control area prior to specified remediation to avoid cross contamination of furnishings and contents. If elected, said furnishings and contents can be precleaned (i.e., HEPA vacuum, etc.) and stored in the primary control area, but shall be protected (i.e., covered with poly, etc.) to avoid cross contamination.**

Within the bathroom:

- Due to the reported leak, etc., detach the cabinet from the front wall to allow access to all walls, to thoroughly inspect the walls for apparent water damage/suspect visible mold growth and clean or remove any affected drywall accordingly (i.e., drywall with apparent water damage/suspect visible mold growth) and extend the drywall removal within a 2-foot radius of the affected area when possible.
- Remove the vinyl flooring entirely, assess the wood floorboards for apparent water damage/suspect visible mold growth and remove or clean any affected floorboard accordingly (i.e., floorboard with apparent water damage/suspect visible mold growth).

Within the kitchen:

- Due to the reported leak, etc., detach the cabinet from the right wall and remove any affected drywall (i.e., drywall with apparent water damage/suspect visible mold growth) and extend the drywall removal within a 2-foot radius of the affected area when possible.

Within the kitchen, the bathroom, and the water heater closet (Negative air pressure is not required in areas where building components are not specified for removal, but HEPA filtration is required):

- Clean all remaining surfaces as specified herein under general specifications for primary control areas.
- **Areas of specified subflooring removal shall be sealed with poly (i.e., critical barrier) after cleaning, but before HEPA air scrubbing after cleaning, to prevent air flow from areas outside the containment area. An access door (i.e., poly flap taped in place, zipper, etc.) shall be installed in the critical barrier for easy access to conduct a visual inspection of the building materials behind the critical barrier.**

General Specifications for Primary Control Areas

- Open plumbing lines and drains within the control areas shall be isolated with a critical barrier consisting of 6-mil poly.
- The water line to toilets within the control areas shall be shut off and the toilets shall be isolated with a critical barrier consisting of 6-mil poly.
- Cleaning of components/materials shall consist of a method that thoroughly removes visible mold growth, settled concentrations of mold spores, and/or dust and debris (i.e., HEPA vacuuming, wet wiping, or other approved methods), followed by dehumidification/drying.
- Exterior surfaces of electrical appliances, electrical equipment, and light fixtures shall be cleaned, utilizing wet method and HEPA vacuuming. These items shall be disconnected from all electrical sources prior to cleaning. If these items cannot be cleaned efficiently, the abatement contractor shall consult with the owner/powers that be.
- All wall/ceiling cavity insulation shall be disposed in areas that specify the removal of drywall/wallboard. The abatement contractor shall visually inspect the back side of surrounding drywall/wallboard for water

damage and/or suspect mold growth and document any findings. If additional suspect mold growth or water damage is observed beyond the specified removal area, additional drywall/wallboard shall be removed until no suspect mold growth or water damage is observed.

- All penetrations within the controlled area that adjoin unaffected or non-accessible areas, including outdoor areas, crawlspaces, etc., shall be cleaned (as far as one can reach) and then sealed with 6-mil poly, extending six (6) inches on all sides.
- In areas of specified wallboard removal, all components within the wall/ceiling cavities shall be cleaned. Any wooden structural components with mold stains or mold growth in pitted surfaces shall be HEPA sanded (or other approved methods) to eliminate embedded mold growth.
- All joints or sills (where the structural system meets, where the sill plate meets the floor, etc.) shall be aggressively disturbed to remove embedded mold growth and spores.

1.4 Removal Procedures

The contractor shall maintain surfaces of the control area free of accumulation of dust and debris. Additionally, they shall restrict the spread of dust and debris, keeping waste from being distributed over the work area. Materials shall be removed in a fashion to ensure that previously cleaned areas are not recontaminated (i.e. working from one end of the control area to the other). The contractor may be required to re-clean areas based on a visual inspection by the CIEC/CIE/IH, if the areas are not visibly clean.

Contaminated building materials that have been removed, and additional materials and debris generated during remediation, shall be bagged or wrapped with 6-mil polyethylene sheeting, sealed with duct tape, and carried to the waste container prior to visual inspection by the CIEC/CIE/IH. Materials shall be bagged and sealed directly after removal from unaffected building components.

Areas shall be allowed to dry for a period until specified RH and moisture levels have been achieved. Any remaining building products that are directly impacted by remediation shall be tested for moisture content. Wooden and cellulosic building components (e.g., wall studs, drywall, etc.) shall be tested for moisture content. If the moisture content is > 15% in wood products or > 12% in cellulosic products (utilizing a Delmhorst moisture meter), dehumidification shall be required until moisture levels are at or below said levels, and the RH level is at or below 40% +/-3% (for all interior areas). The remediation contractor shall verify water content of all wooden and cellulosic building components within the impacted areas, as well as temperature and RH prior to scheduling post remediation verification.

1.5 Cleanup Overview

The contractor shall personally review the cleaning process prior to contacting the CIEC/CIE/IH for the post remediation testing. If accumulations of debris and dust are significant, the CIEC/CIE/IH will require re-cleaning prior to post remediation verification sampling.

The CIEC/CIE/IH shall make a visual inspection and conduct post remediation sampling after the final cleaning is complete.

1.6 Post Remediation Verification Testing

Prior to conducting post remediation sampling, HEPA filtration devices shall be allowed to operate for a minimum of 48 hours (the equivalent of 192 air changes), following fine cleaning, in all areas where remediation has been conducted. The HEPA filtration devices shall be sealed at the intake and turned off approximately two hours prior to post testing and reconvene within one hour after post testing, until acceptable post remediation results are established.

Post remediation sampling shall be conducted utilizing viable and/or non-viable sample methods. Air samples shall be collected in representative areas of the control areas. Surface sampling may be conducted at the discretion of the CIEC/CIE/IH.

Sampling shall be conducted in areas directly impacted by remediation procedures, where cleaning was conducted. The CIEC/CIE/IH shall determine acceptable post remediation status through interpretation of air sampling results, which will be based on indoor/outdoor comparisons, in combination with any surface samples collected, moisture readings, RH readings, visual observations, and any other pertinent information.

The owner/client will be responsible for post remediation testing. If air sample results indicate unacceptable airborne concentrations, the contractor shall be required to conduct a re-cleaning at the contractor's expense and absorb the cost for re-testing, until acceptable results are achieved.

SECTION 2.0 SCOPE OF WORK (Note: Section 2 and Section 1.3 are essential to the full Scope of the Contractor's Work)

2.1 Investigative Reports and Other Related Documents

Phoenix EnviroCorp initial investigative report dated June 15, 2021.

Phoenix EnviroCorp investigative report dated July 21, 2021.

Phoenix EnviroCorp Chain of Custody dated June 8, 2021, July 9, 2021.

Analytical reports dated June 9, 2021, and July 12, 2021.

2.2 Project Description

The procedures covered by this program include the enclosure and drying of the said structure, the removal, handling, and disposal of building components compromised by mold/fungal growth, and the cleaning and disinfecting of existing building materials. Procedures for reconstruction are not considered in these specifications. Reconstruction of interior portions may not be conducted until procedures for remediation have been completed, the control areas have been inspected, and testing has returned acceptable post remediation results. Reconstruction of exterior portions may be conducted during the restoration to ensure that water intrusion is abated.

The objectives covered by the program include the remediation of materials shown to have surface contamination, water damage, and/or exposure to elevated airborne mold spore levels, without subjecting the workers, installation employees, and occupants to microbial contaminants. In addition, contract employees, occupants, and materials will be appropriately protected during the removal process so that present and future exposures will not occur.

This protocol is provided as a guideline. Any deviation requests from this protocol shall be addressed to the CIEC/CIE/IH for consideration. At present there are no Federal or State requirements regarding microbial remediation projects; however, OSHA General Construction Code of Federal Regulations (29 CFR 1926) shall be followed.

Remediation shall be completed as close to the date that this protocol was drafted, as the specifications outlined within represent conditions at the time the investigative services were conducted. Due to the volatility of mold, the current protocol may not reflect all necessary remediation if conditions are allowed to continue.

Further, if time lapses allowing conditions to change, it will become increasingly difficult to obtain successful clearance testing results.

SECTION 3.0 AIR MONITORING

3.1 Responsibilities of the CIEC/CIE/IH

Monitoring of airborne concentrations will be performed in accordance with the requirements of this program. Prior to conducting air sampling and/or surface sampling for clearances, the CIEC/CIE/IH shall conduct a visual inspection of the area. Temperature and RH shall be recorded during the air sampling phase of clearance. All air sampling shall be conducted in such a manner as to provide a valid representation of airborne mold levels both inside and outside the work areas. If analysis of air samples indicates that airborne concentrations exceed acceptable limits, the contractor shall conduct re-cleaning at the contractor's expense.

3.2 Personal Monitoring

No personal monitoring will be conducted by the CIEC/CIE/IH unless the remediation contractor requests monitoring for OSHA compliance. Presently there are no guidelines (PELs or TLVs) for microbial contaminants. It is the remediation contractor's responsibility to determine if OSHA personal sampling may be required during application of anti-microbial agents.

3.3 Sample Integrity and Reporting

Samples shall be sealed, labeled, and a chain of custody initiated according to laboratory procedures.

Sample results shall be available within seven (7) days of the completion of collection of all samples and will include the following information:

- Site Address
- Sample Number
- Location Sampled
- Analytical Method
- Collection Date(s)
- Person Taking Sample(s)
- Additional Comments (if any)
- Analyst Signature

SECTION 4.0 MATERIAL REPLACEMENT

4.1 Material Replacement

The general contractor/replacement contractor may begin material replacement after the CIEC/CIE/IH informs all parties of acceptable post remediation sample results.

With ongoing construction activities ambient air levels are expected to be elevated over what might be normally expected. Additional testing should not be necessary after remediation procedures have been completed and successful results have been obtained. In the event of another water intrusion (i.e. broken-pipe-line, improper HVAC function, or building envelope compromise), an investigation shall be conducted within 24 to 48 hours of the event. Proper drying, if initiated within this time frame, should minimize the potential for microbial growth.

SECTION 5.0 SPILL CLEANUP REQUIREMENTS

5.1 Spills

MSDS shall be kept on site for all chemical products brought to the site by the remediation contractor. In the event of a chemical spill, the contractor shall initiate cleanup immediately. The contractor shall mop up any liquid with rags or other conventional absorbent. The spent absorbent shall be properly contained and disposed of as waste.

SECTION 6.0 WASTE CONTROL

6.1 Waste Disposal

Waste shall be disposed of at a locally selected landfill. Waste bags shall be checked for integrity and hauled in an enclosed truck/vehicle or container to ensure that transportation to the landfill does not pose a potential hazard to the environment.

SECTION 7.0 SUPPLEMENTAL INFORMATION

7.1 Applicable Publications

The publications listed below form part of this program. Written programs shall accompany all referenced CFR publications. IICRC and NYCDOH guidelines for work procedures shall be followed by the remediation contractor. A copy of the NYCDOH protocols shall be on-site, along with this design, for reference by the site supervisor. ACGIH, IAQA, and ASHRAE publications shall be utilized as guidelines for interpretation by the CIEC/CIE/IH. This design shall be reviewed by the remediation supervisor prior to initiation of set-up for the project. Any questions regarding this project may be addressed with the on-site consultant listed for Phoenix EnviroCorp.

Code of Federal Regulation (CFR Publications)

29 CFR 1910.134	Respiratory Protection
29 CFR 1910.145	Specifications for Accident Prevention, Signs and Tags
29 CFR 1926.28	Personal Protective Equipment
29 CFR 1926.59	Hazard Communication
29 CFR 1926.96	Occupational Foot Protection
29 CFR 1926.100	Head Protection
29 CFR 1926.101	Hearing Protection
29 CFR 1926.102	Eye and Face Protection
29 CFR 1926.403	Electrical General Requirements
29 CFR 1926.416	Safety General Requirements
29 CFR 1926.852	Demolition, Chutes
29 CFR 1926.1091	Record Keeping Requirements

Supplemental Guidelines

IICRC S520 2nd ed.	Standard and Reference Guide for Professional Water Damage Restoration
NYCDOH	Guidelines on Assessment and Remediation of Fungi in Indoor Environments

ACGIH	Bioaerosols: Assessment and Control
IAQA 01-2000	Recommended Guidelines for Indoor Environments
ASHRAE 62.2-2007	Ventilation for Acceptable Indoor Air Quality in Low-Rise Residential Buildings

7.2 Definitions

Air Lock: A system that permits ingress and egress between a control area and non-control area, or other work areas, without allowing air movement between areas (e.g., three stage decon, three-way polyethylene flaps).

Air Sample: Refers to samples collected with spore trap air sample media (e.g., Micro-5, Cyclex D, or equivalent); also referred to as a non-viable air sample. May also refer to a sample collected on a disposable petri dish with Agar media by means of an Andersen Impactor (or equivalent) and sampling pump; also referred to as air culture (viable) sample. Sample media to be used in project is described under Section 1.6 (Post Remediation Verification Testing).

Area Monitoring: The sampling of airborne microbial concentrations outside the exclusion boundary, which may reach the breathing zone of the contractor or installation employees.

Asbestos Containing Materials (ACM): Refers to asbestos containing building materials that contain more than 1% asbestos by Polarized Light Microscopy (PLM) or Transmission Electron Microscopy (TEM).

Biocide: Refers to chemical agents that are specifically designed to eliminate viable microbial contamination, with a phenol equivalent efficiency (e.g., Sodium Hypochlorite, Quaternary Ammonia Compounds).

Blower Door Test: Refers to the testing of static pressure and draw of air through the HVAC in cubic feet per minute (CFM) to rate the efficiency of the system.

Clearance Monitoring: Refers to air, bulk, or swab sampling conducted as a means to demonstrate that the area specified for remediation has been completed by the contractor, left with present acceptable mold spore levels, and ready for re-construction.

Control Area: The area where microbial contaminants removal is performed, which is isolated by physical boundaries to prevent unauthorized entry of personnel, thereby preventing exposure to or the spread of microbial contaminants. Physical boundaries will be established and located such that the airborne contaminants are not allowed to escape the boundaries.

HEPA: High Efficiency Particulate Air. Refers to ventilation devices that are specifically designed to filter ambient air to an efficiency of 99.97%.

HVAC: Refers to the Heating, Ventilation, and Air Conditioning system.

Industrial Hygienist: Refers to a person who practices industrial hygiene and may act as a competent person regarding visual inspection of contaminated surfaces and clearance air and/or swab/bulk sampling. May also refer to a Certified Industrial Hygienist (CIH) as defined by the American Board of Industrial Hygiene (ABIH), a Certified Indoor Environmental Consultant as defined by the American Council for Accredited Certification (ACAC), or a Certified Indoor Environmentalist (CIE) as defined by the American Council for Accredited Certification (ACAC).

Microbial Contaminant: Refers to viable mold, fungi, pollen, bacteria, and or particulate, or their metabolites, that may be causative of epidemiological, immunotoxic, dermotoxic, neurotoxic, or enterotoxic

disorders in the human population, or may be considered a pathogen or an opportunistic pathogen.

Non-Porous Materials: Refers to building materials with solid surfaces that may be successfully treated and cleaned by means of HEPA vacuuming or other approved method. Materials include flooring, hard goods, plastic, vinyl, and some wallboard systems.

Porous Materials: Refers to building materials and household goods that may allow microscopic particles (3-20 micron) to become trapped within the material that will not allow adequate cleaning. Materials include carpet, mattresses, and clothing.

Primary Control Area (PCA): Refers to a section of a facility that has been isolated by 6-mil polyethylene barriers where specific engineering controls (e.g., HEPA filtration, negative air pressurization, dehumidification, etc.) are required. In general, it is the area where remediation of water and mold damaged building materials is to be conducted.

Refrigerant Dehumidifier: Device used to remove water content from air and materials.

Relative Humidity (RH): Refers to the ratio of water vapor in the atmosphere to the amount required to saturate it at a given temperature.

Semi-Porous Materials: Refers to materials that may be somewhat porous, yet they may still allow for adequate cleaning. Materials include wooden beams and some wallboard systems.

Swab Sample: Refers to collection of a sample onto a sterile swab for analysis of mold, fungi, and bacteria by viable and/or non-viable analysis.

Tape-Lift Sample: Refers to collection of a sample onto clear scotch tape for analysis by direct microscopic examination (non-viable).

7.3 Quality Assurance

Medical Examinations

Before potential exposure to microbial contaminants, the remediation contractor shall provide workers with a comprehensive medical examination as required by 29 CFR 1910.134 as outlined by the Medical Monitoring Program.

Medical Records

The remediation contractor shall maintain complete and accurate medical records on employees as required by OSHA and the contractor's Medical Monitoring Program. The contractor may be asked to provide a copy of all medical records for approval by the consultant's representative.

Training

Each employee working on this contract shall be trained prior to the time of initial job assignment in accordance with mold specific and chemical specific training as indicated by the OSHA General Duty Clause and the Hazard Communication Standard. Each employee shall also receive training required by Federal guidelines listed in Section 7.1 of this document and project specifications.

Hazard Communication Program

The remediation contractor has established and implemented a Hazard Communication Program as required by 29 CFR 1910.1200 and may be asked to provide a copy of this written program. Hazard Communication training must include occupational hazards as directly related to working with fungi/mold and contamination of building components by fungal contamination, specific training for chemical hazards associated with biocide usage, and site specific MSDS sheets for commercial detergents and biocides utilized on the job site.

Respiratory Protection Program

The remediation contractor has established a Respiratory Protection Program, which complies with 29 CFR 1910.134. Physical examinations and fit testing are required for use of respiratory protection greater than an N-95 dust mask. Workers removing building materials contaminated by mold growth, applying anti-microbial agents, or workers subjected to exposures to anti-microbial agents shall be required to wear, at minimum, a tight-fitting negative pressure ½ mask respirator with P-100 filters. Therefore, -he OSHA Respiratory Protection Standard applies.

Analytical Testing Laboratory

Analysis of culturable biological samples collected on this project shall be conducted by a laboratory that participates in the Environmental Microbiological Proficiency Analytical Testing Program (EMPAT) of the American Industrial Hygiene Association (AIHA) and has shown to be proficient by proficiency analytical testing (PAT) samples. Analysis of non-viable air and surface samples shall be conducted by a competent person.

7.4 Materials and Equipment

Equipment

The contractor shall make available to employees a complete set of personal protective equipment (PPE) as required by this program for entry into the controlled area. All personnel while in the control area or handling microbial contaminated waste shall wear protective clothing, respirators, and other PPE.

Respirators

Contractor shall furnish the appropriate respirator in accordance with 29 CFR 1910.134 and approved by NIOSH for protection in environments that contain microbial contaminants. The selected respirator for this project shall be a tight-fitting negative pressure ½ respirator equipped with HEPA cartridge (P-95, P-100). At minimum, an N-95 dust mask may be utilized during fine cleaning activities; however, the tight fitting ½ mask respirator shall be utilized during application of anti-microbial agents or biocides.

Special Clothing

Employees shall be provided with and required to wear: whole body disposable protective clothing, full body tyvek suits with head coverings, and latex gloves *(see table)* during all activities in the controlled area.

Chemical	Recommended Rubber Glove
Sodium Hypochlorite	Neoprene or Nitrile

Phenolic Compounds	Neoprene
Quaternary Ammonia Compounds	Polyvinyl Chloride (PVC)
Detergents	Latex

Eye Protection

The contractor shall provide chemical-resistant goggles to personnel engaged in cleaning and treatment activities and require them to be worn during application of anti-microbial agents and biocides.

Warning Signs and Labels

Standard approved warning signs shall be erected at all approaches to the control area as specified in 29 CFR 1910.145.

Anti-Microbial Agents

Anti-microbial agents utilized in interior quarters shall consist of quaternary ammonia compounds. No phenolic compounds shall be used in interior quarters with exception of Micro Ban Plus. Approval must be granted by the owner/powers that be prior to application. Anti-microbial agents shall be EPA approved. Commercial grade detergents shall be used to remove fungal contamination during cleaning phases prior to anti-microbial application, to include encapsulation.

Phoenix EnviroCorp

May 5, 2021

Quanesha Mullins
Wilmington Housing Authority
1524 S. 16th Street
Wilmington, NC 28401

RE: PEC Job # 21-21-146-IAQ-M; 302 Grass Lane, Unit 209, Wilmington, NC – Mold Investigation/Background air sampling

Enclosed are the results of the mold investigation conducted at the above referenced unit on May 3, 2021. Phoenix EnviroCorp (PEC) was retained to conduct background air sampling to determine airborne mold spore levels and to collect surface samples of suspect visible mold growth.

Background Information: The client reported that a year ago there was a leak from the washing machine.

The HVAC system was off upon PEC's arrival and during sampling.

Note: For directional purposes, "front" is determined by facing Grass Lane from inside the unit, unless otherwise stated.

Visual Inspection: PEC's visual inspection noted the following (see enclosed photographic documentation):

- No suspect visible mold growth observed

Mold Testing – Air: Non-viable spore trap air samples were collected to determine airborne mold spore levels. Samples were collected within the rear left bedroom, the rear right bedroom, the bathroom, the kitchen/living room, and the front bedroom. *Micro 5 sampling media was utilized for the collection of spore trap air samples. Each sample ran for five (5) minutes at a flow rate of five (5) liters per minute for a total volume of twenty-five (25) liters per sample. Each sample was assigned a unique ID number and shipped to a third-party laboratory for analysis. All air samples were collected from centralized locations (within their respective areas) and within the breathing zone, unless otherwise noted.* Two samples were also collected outdoors for comparative purposes.

Results indicated acceptable levels of airborne mold spores in all sampled locations.

The interpretation of air sample results is based on indoor/outdoor comparisons, in combination with a study by Daniel M. Baxter, entitled "A Regional Comparison of Mold Spore Concentrations Outdoors and Inside "Clean" and "Mold Contaminated" Southern California Buildings", and other industry guidelines, as well as over 20 years of experience in industrial hygiene and mold testing.

In layman terms, acceptable levels indicate that the levels are below the outdoor level and/or the baseline levels (whichever is higher) stated below. Elevated levels indicate that the levels are above the outdoor level and/or the baseline level.

Baseline levels for indoor spore trap air samples are as follows: < 900 spores/m³ for Penicillium/

Aspergillus; 0 spores/m³ for Stachybotrys and Chaetomium; and < 350 spores/m³ for other individual mold groups.

Relative Humidity (RH): *Temperature and relative humidity readings were collected in the same locations as the spore trap air samples.* RH levels within the residence ranged from 60.9% - 64.6% with an outdoor RH level of 66.5% (see the enclosed Chain of Custody for details). Per the American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) Standard 62-1999, relative humidity should range between 30% and 60%. **Consistent RH levels above 60% is conducive to mold growth.**

Conclusions: Air sampling within the tested areas did not indicate a problem with the indoor air quality regarding mold, and there was no suspect visible mold growth observed.

Enclosed in this report are the laboratory analysis and the Chain of Custody.

Should you have any questions, please do not hesitate to call.

Thank you,

Shaenaz Mirmohamed
IH Technician

Tommie Green, CIEC
Professional Industrial Hygienist

Enclosures

Phoenix EnviroCorp
4020 SHIPYARD BLVD.
WILMINGTON, NC 28403

CHAIN OF CUSTODY

LABORATORY TEST REQUEST

SEEML Ref #: 2105041008 Lab ID's: 021-025

CONTACT: Shaenaz Mirmohamed	TELEPHONE (910) 397-0370 FAX (910) 313-6094	Sample date: 5/3/2021
PEC Job #: 21-21-146-IAQ-M	SITE ADDRESS: 302 Grass Lane, Unit 209, Wilmington, NC 28405	

PLEASE EMAIL RESULTS TO: KMGREEN@PHOENIXENVIROCORP.COM

SAMPLE TYPE:	NUMBER OF SAMPLES:	TURN AROUND TIME SPECIFIED:
Spore Trap - Micro-5 Surface Samples	5	____ Immediate ____ 24 hr ____ 48 hr _X_ Standard

Sample #	Sample Area	Sample Volume	Lab Analysis Requested	% Relative Humidity	Temperature °F
050321-SM-201	Rear left bedroom	25L	S001	60.9	80.5
050321-SM-202	Rear right bedroom	25L	S001	62.6	80.5
050321-SM-203	Bathroom	25L	S001	63.5	80.6
050321-SM-204	Kitchen/living room	25L	S001	64.6	80.5
050321-SM-205	Front bedroom	25L	S001	61.5	80.1
		Samples accepted			

Samples Collected By (Printed Name and Signature): Shaenaz Mirmohamed Date Signed: 5/3/2021

CHAIN OF CUSTODY RECORD

DATE:	Time:	Condition of Samples:	RELINQUISHED BY: (Printed Name and Signature)	ACCEPTED BY: (Printed Name and Signature)
5/3/2021	15:00	Intact	Shaenaz Mirmohamed AFFILIATION:	AFFILIATION: 5/4/21

SEEML Reference Number:
210504008

Southeast Environmental Microbiology Laboratories

102 Edinburgh Court
Greenville, SC 29607
Phone: (864) 233-3770
FAX: (864) 233-6589

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

- ☐ Surface/Bulk Report
- ☒ Spore Trap Report
- ☐ Andersen Fungal Report
- ☐ Quantitative Fungal Report

Lab Manager Review: *Angel Gosnell* Date: 05/04/21

Thank you for using SEEML laboratories. We strive to provide superior quality and service.
SEEML laboratories are accredited through AIHA-LAP, LLC (EMLAP # 173667) for the analysis of Spore Traps and Surface/Bulk Samples.

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

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

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

Spore Trap Report

	Date Sampled: 05/03/21
Attn: ***Phoenix Enviro Corp.***	Date Received: 05/04/21
4020 Shipyard Blvd.	Date Analyzed: 05/04/21
Wilmington, NC 28403	Date Reported: 05/04/21
	Date Revised:
	Project Name: 21-21-146-IAQ-M
	Project Address: 302 Grass Lane Unit 209
	Project City, State, ZIP: Wilmington, NC 28405
	SEEML Reference # : 210504008

TEST METHOD: DIRECT MICROSCOPY EXAMINATION SEEML SOP 7

Client Sample ID	050321-SM-201			050321-SM-202			050321-SM-203		
Location	Rear Left Bedroom			Rear Right Bedroom			Bathroom		
Lab Sample ID	210504008-021			210504008-022			210504008-023		
Comments									
Hyphal Fragments									
Pollen									
Spore Trap Used	M5			M5			M5		
	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%
Alternaria									
Ascospores				3	120	27	1	40	20
Basidiospores	6	240	29	2	80	18	1	40	20
Bipolaris/Drechslera									
Chaetomium									
Cladosporium	6	240	29	2	80	18	3	120	60
Curvularia									
Epicoccum									
Cercospora									
Fusarium									
Memnoniella									
Nigrospora									
Penicillium/Aspergillus	9	360	43	3	120	27			
Polythrincium									
Rusts									
Smuts/Periconia/Myxomy				1	40	9			
Spegazzinia									
Stachybotrys									
Stemphylium									
Tetraploa									
Torula									
Ulocladium									
Colorless/Other Brown*									
Oidium									
Zygomycetes									
Pithomyces									
Background debris (1-5)**	3			3			3		
Sample Volume(liters)	25			25			25		
TOTAL SPORES/M^3	21	**840**		11	**440**		5	**200**	

Revisions:

Spore types listed without a count or data entry were not detected during the course of the analysis for the respective sample, indicating a raw count of <1 spore.
The analytical sensitivity is the spores/m^3 divided by the raw count, expressed in spores/m^3. The limit of detection is the analytical sensitivity (in spores/m^3) multiplied by the sample volume (in liters) divided by 1000 liters.
*Colorless,other Brown are spores without a distinctive morphology on spore traps and non-viable surface samples.
**Background debris is the amount of particulate matter present on the slide and is graded from 1-5 with 1 = very light, 2= Light, 3 = Medium, 4 = Heavy, 5 = Very Heavy. The higher the rating the more likelihood spores may be underestimated. A rating of 5 should be interpreted as minimal counts and may actually be higher than reported.

Disclaimer: The sample results are determined by the sample volume, which is provided by the customer.
This report relates only to the samples tested as they were received.

Angel Gosnell
Angel Gosnell, Approved Laboratory Signatory

102 Edinburgh Court
Greenville, SC. 29607
Phone: (864) 233-3770

Spore Trap Report

	Date Sampled: 05/03/21
Attn: ***Phoenix Enviro Corp.***	Date Received: 05/04/21
4020 Shipyard Blvd.	Date Analyzed: 05/04/21
Wilmington, NC 28403	Date Reported: 05/04/21
	Date Revised:
	Project Name: 21-21-146-IAQ-M
	Project Address: 302 Grass Lane Unit 209
	Project City, State, ZIP: Wilmington, NC 28405
	SEEML Reference # : 210504008

TEST METHOD: DIRECT MICROSCOPY EXAMINATION SEEML SOP 7

Client Sample ID	050321-SM-204			050321-SM-205					
Location	Kitchen / Living Room			Front Bedroom					
Lab Sample ID	210504008-024			210504008-025					
Comments									
Hyphal Fragments									
Pollen									
Spore Trap Used	M5			M5					
	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%			
Alternaria									
Ascospores				1	40	20			
Basidiospores				2	80	40			
Bipolaris/Drechslera									
Chaetomium									
Cladosporium	6	240	60	1	40	20			
Curvularia									
Epicoccum									
Cercospora									
Fusarium									
Memnoniella									
Nigrospora									
Penicillium/Aspergillus	4	160	40	1	40	20			
Polythrincium									
Rusts									
Smuts/Periconia/Myxomy									
Spegazzinia									
Stachybotrys									
Stemphylium									
Tetraploa									
Torula									
Ulocladium									
Colorless/Other Brown*									
Oidium									
Zygomycetes									
Pithomyces									
Background debris (1-5)**	3			3					
Sample Volume(liters)	25			25					
TOTAL SPORES/M^3	10	**400**		5	**200**				

Revisions:

Spore types listed without a count or data entry were not detected during the course of the analysis for the respective sample, indicating a raw count of <1 spore.
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This report relates only to the samples tested as they were received.

Angel Gosnell
Angel Gosnell, Approved Laboratory Signatory

102 Edinburgh Court
Greenville, SC. 29607
Phone: (864) 233-3770

Phoenix EnviroCorp
4020 SHIPYARD BLVD
WILMINGTON, NC 28403

CHAIN OF CUSTODY

LABORATORY TEST REQUEST

SEHLRR #: 210504007 Lab ID: 019-020

CONTACT: Shaenaz Mirmohamed	TELEPHONE (910) 397-0370 FAX (910) 313-6094	Sample date: 5/3/2021
PEC Job #: 21-21-146&147-IAQ-M	SITE ADDRESS: 302 Grass Lane, Wilmington, NC 28405	

PLEASE EMAIL RESULTS TO: KMGREEN@PHOENIXENVIROCORP.COM

SAMPLE TYPE:	NUMBER OF SAMPLES:	TURN AROUND TIME SPECIFIED:
Spore Trap - Micro-5 Surface Samples	2	____ Immediate ____ 24 hr ____ 48 hr __X__ Standard

Sample #	Sample Area	Sample Volume	Lab Analysis Requested	% Relative Humidity	Temperature °F
050321-SM-301	Outside - Front - 1st floor	25L	S001	66.5	78.
050321-SM-302	Outside - Front - 2nd floor	25L	S001		
		Samples accepted			

Samples Collected By (Printed Name and Signature): Shaenaz Mirmohamed Date Signed: 5/3/2021

CHAIN OF CUSTODY RECORD

DATE:	Time:	Condition of Samples:	RELINQUISHED BY: (Printed Name and Signature)	ACCEPTED BY: (Printed Name and Signature)
5/3/2021	15:00	Intact	Shaenaz Mirmohamed AFFILIATION:	AFFILIATION: 5-4-21

SEEML Reference Number:
210504007

Southeast Environmental Microbiology Laboratories
102 Edinburgh Court
Greenville, SC 29607
Phone: (864) 233-3770
FAX: (864) 233-6589

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

☐	Surface/Bulk Report	☐	Andersen Fungal Report
☒	Spore Trap Report	☐	Quantitative Fungal Report

Lab Manager Review: *Angel Gosnell* Date: 05/04/21

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

Spore Trap Report

	Date Sampled: 05/03/21
Attn: ***Phoenix Enviro Corp.***	Date Received: 05/04/21
4020 Shipyard Blvd.	Date Analyzed: 05/04/21
Wilmington, NC 28403	Date Reported: 05/04/21
	Date Revised:
	Project Name: 21-21-146&147-IAQ-M
	Project Address: 302 Grass Lane
	Project City, State, ZIP: Wilmington, NC 28405
	SEEML Reference # : 210504007

TEST METHOD: DIRECT MICROSCOPY EXAMINATION SEEML SOP 7

Client Sample ID	050321-SM-301			050321-SM-302					
Location	Outside - Front - 1st Floor			Outside - Front - 2nd Floor					
Lab Sample ID	210504007-019			210504007-020					
Comments									
Hyphal Fragments									
Pollen				5	200				
Spore Trap Used	M5			M5					
	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%			
Alternaria									
Ascospores	5	200	25	3	120	14			
Basidiospores	2	80	10	2	80	9			
Bipolaris/Drechslera									
Chaetomium									
Cladosporium	10	400	50	12	480	55			
Curvularia									
Epicoccum									
Cercospora									
Fusarium									
Memnoniella									
Nigrospora									
Penicillium/Aspergillus	1	40	5						
Polythrincium									
Rusts				1	40	5			
Smuts/Periconia/Myxomy				4	160	18			
Spegazzinia									
Stachybotrys									
Stemphylium									
Tetraploa									
Torula									
Ulocladium									
Colorless/Other Brown*									
Oidium	2	80	10						
Zygomycetes									
Pithomyces									
Background debris (1-5)**	3			3					
Sample Volume(liters)	25			25					
TOTAL SPORES/M^3	20	**800**		22	**880**				

Revisions:

Spore types listed without a count or data entry were not detected during the course of the analysis for the respective sample, indicating a raw count of <1 spore.

The analytical sensitivity is the spores/m^3 divided by the raw count, expressed in spores/m^3. The limit of detection is the analytical sensitivity (in spores/m^3) multiplied by the sample volume (in liters) divided by 1000 liters.

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

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

Disclaimer: The sample results are determined by the sample volume, which is provided by the customer.
This report relates only to the samples tested as they were received.

102 Edinburgh Court
Greenville, SC. 29607
Phone: (864) 233-3770

Angel Gosnell

Angel Gosnell, Approved Laboratory Signatory

Fungal Descriptions

Alternaria sp.

Aw - 0.89. Conidia dimensions: 18-83 x 7-18 microns. A very common allergen with an IgE mediated response. It is often found in carpets, textiles and on horizontal surfaces in building interiors. Often found on window frames. Outdoors it may be isolated from samples of soil, seeds and plants. It is commonly found in outdoor samples. The large spore size, 20 - 200 microns in length and 7 - 18 microns in sizes, suggests that the spores from these fungi will be deposited in the nose, mouth and upper respiratory tract. It may be related to bakers' asthma. It has been associated with hypersensitivity pneumonitis. The species *Alternaria alternata* can produce tenuazonic acid and other toxic metabolites that may be associated with disease in humans or animals. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include edema and bronchospasms; chronic cases may develop pulmonary emphysema.

Ascospore

A spore borne in a special cell called an ascus. Spores of this type are reported to be allergenic. All ascomycetes, members of a group of fungi called Ascomycotina, have this type of spore. The minute black dots on rotting wood and leaves or the little cups on lichens are examples of ascomycetes; another is the "truffle" mushroom.

Aspergillus/Penicillium

These are two of the most commonly found allergenic fungi in problem buildings. *Aspergillus* comes in many varieties (species). Many of the varieties produce toxic substances. It may be associated with symptoms such as sinusitis, allergic bronchopulmonary aspergillosis, and other allergic symptoms. *Penicillium* is a variety of mold that is very common indoors and is found in increased numbers in problem buildings. It also has many varieties, some of which produce toxic substances. The symptoms are allergic reactions, mucous membrane irritation, headaches, vomiting, and diarrhea. Due to the morphological similarity of *Aspergillus* and *Penicillium*, they are not differentiated by microscopic analysis and are reported together.

Aspergillus sp.

Aw 0.75 - 0.82. Reported to be allergenic. Members of this genus are reported to cause ear infections. Many species produce mycotoxins that may be associated with disease in humans and other animals. Toxin production is dependent on the species or a strain within a species and on the food source for the fungus. Some of these toxins have been found to be carcinogenic in animal species. Several toxins are considered potential human carcinogens. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include edema and bronchospasms; chronic cases may develop pulmonary emphysema; may also be associated with sinusitis, allergic bronchopulmonary aspergillosis, and other allergic symptoms.

Basidiospore

Spore from basidiomycetes. Many varieties are reported to be allergenic.

Bipolaris sp.

A fungus with large spores that could be expected to be deposited in the upper respiratory tract. This fungus can produce the mycotoxin - sterigmatocystin, which has been shown to produce liver and kidney damage when ingested by laboratory animals.

Botrytis sp.

Aw 0.93. Conidia dimensions: 7-14 x 5-9 microns. It is parasitic on plants and soft fruits. Found in soil and on house plants and vegetables, it is also known as "gray mold". It causes leaf rot on grapes, strawberries, lettuce, etc. It is a well-known allergen, producing asthma type symptoms in greenhouse workers and "wine grower's lung".

Cercaspora

Common outdoors in agricultural areas, especially during harvest. Parasite of higher plants, causing leaf spot. Commonly found as parasites on higher plants.

Chaetomium sp.

large ascomycetous fungus producing perithecia. It is found on a variety of substrates containing cellulose, including paper and plant compost. It has been found on paper in sheetrock. It can produce an *Acremonium*-like state on fungal media. Varieties are considered allergenic and have been associated with peritonitis, cutaneous lesions, and system mycosis.

Cladosporium sp.

Aw 0.88; Aw 0.84. Most commonly identified outdoor fungus. The outdoor numbers are reduced in the winter. The numbers are often high in the summer. Often found indoors in numbers less than outdoor numbers. It is a common allergen. Indoor *Cladosporium* sp. may be different than the species identified outdoors. It is commonly found on the surface of fiberglass duct liners in the interior of supply ducts. A wide variety of plants are food sources for this fungus. It is found on dead plants, woody plants, food, straw, soil, paint, and textiles. Produces greater than 10 antigens. Antigens in commercial extracts are of variable quality and may degrade within weeks of preparation. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include skin lesions, eye ulceration, mycosis (including onychomycosis, an infection of the nails of the feet or hands) edema and bronchospasms; chronic cases may develop pulmonary emphysema.

Curvularia sp.

Reported to be allergenic and has been associated with allergic fungal sinusitis. It may cause corneal infections, mycetoma, and infections in immune compromised hosts.

Dreschlera sp.

Conidia dimensions: 40-120 x 17-28 microns. Found on grasses, grains and decaying food. It can occasionally cause a corneal infection of the eye.

Epicoccum sp.

Conidia dimensions: 15-25 microns. A common allergen. It is found in plants, soil, grains, textiles and paper products.

Fusarium sp.

Aw 0.90. A common soil fungus. It is found on a wide range of plants. It is often found in humidifiers. Several species in this genus can produce potent trichothecene toxins. The trichothecene (scirpene) toxin targets the following systems: circulatory, alimentary, skin, and nervous. Produces vomitoxin on grains during unusually damp growing conditions. Symptoms may occur either through ingestion of contaminated grains or possibly inhalation of spores. The genera can produce hemorrhagic syndrome in humans (alimentary toxic aleukia). This is characterized by nausea, vomiting, diarrhea, dermatitis, and extensive internal bleeding. Reported to be allergenic. Frequently involved in eye, skin, and nail infections.

Myxomycetes

Members of a group of fungi that is included in the category of "slime molds". They're occasionally found indoors, but mainly reside in forested regions on decaying logs, stumps, and dead leaves. Myxomycetes display characteristics of fungi *and* protozoans. In favorable (wet) conditions they exhibit motile, amoeba-like cells, usually bounded only by a plasma membrane, that are variable in size and form. During dry spells, they form a resting body (sclerotium) with dry, airborne spores. These fungi are not known to produce toxins but can cause hay fever and asthma.

Memnoniella

Contaminant found most often with *Stachybotrys* on wet cellulose. Forms in chains, but it are very similar to *Stachybotrys* and sometimes is considered to be in the *Stachybotrys* family. Certain species do produce toxins very similar to the ones produced by *Stachybotrys chartarum* and many consider the IAQ importance of *Memnoniella* to be on par with *Stachybotrys*. Allergenic and infectious properties are not well studied.

Nigrospora sp.

Commonly found in warm climates, this mold may be responsible for allergic reactions such as hay fever and asthma. It is found on decaying plant material and in the soil. It is not often found indoors.

Oidium sp.

The asexual phase of *Erysiphe* sp. It is a plant pathogen causing powdery mildews. It is very common on the leaf's stems, and flowers of plants. The health effects and allergenicity have not been studied. It does not grow on non-living surfaces such as wood or drywall.

Penicillium sp.

Aw 0.78 - 0.88. A wide number of organisms have been placed in this genus. Identification to species is difficult. Often found in aerosol samples. Commonly found in soil, food, cellulose and grains. It is also found in paint and compost piles. It may cause hypersensitivity pneumonitis, allergic alveolitis in susceptible individuals. It is reported to be allergenic (skin). It is commonly found in carpet, wallpaper, and in interior fiberglass duct insulation. Some species can produce mycotoxins. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include edema and bronchospasms; chronic cases may develop pulmonary emphysema. It may also cause headaches, vomiting, and diarrhea.

Periconia sp.

Periconia sp. are found in soil, blackened and dead herbaceous stems leaf spots, grasses, rushes, and sedges. Almost always associated with other fungi. Rarely found growing indoors. Reportedly associated with a rare case of mycotic keratitis.

Pithomyces sp.

A common mold found on dead leaves, plants, soil and especially grasses. Causes facial eczema in ruminants. It exhibits distinctive multi-celled brown conidia. It is not known to be a human allergen or pathogen. It is rarely found indoors, although it can grow on paper.

Rusts/Smuts

These fungi are associated with plant diseases. In the classification scheme of the fungi, the smuts have much in common with the rusts, and they are frequently discussed together. Both groups produce wind-borne, resistant teliospores that serve as the basis for their classification and their means of spread. Rusts usually attack vegetative regions (i.e., leaves and stems) of plants; smuts usually are associated with the reproductive structures (seeds). They can cause hay fever and asthma.

Spegazzinia

Spegazzinia species comprise a very small proportion of the fungal biota. This genus is somewhat related to other lobed or ornamented genera such as *Candelabrum*. No information is available regarding health effects or toxicity. Allergenicity has not been studied. Usually identified on spore trap samples where it is seen every few weeks. (Spores have very distinctive morphology.) May also be found in air by culturable (Andersen) samples if a long enough incubation period is provided so that sporulation occurs. Our laboratory has never found this organism growing on indoor environmental surfaces. Natural habitat includes soil and many kinds of trees and plants.

Stachybotrys sp.

Aw - 0.94, optimum Aw ->0.98. Several strains of this fungus (*S. atra, S. chartarum* and *S. alternans* are synonymous) may produce a trichothecene mycotoxin- Satratoxin H - which is poisonous by inhalation. The toxins are present on the fungal spores. This is a slow growing fungus on media. It does not compete well with other rapidly growing fungi. The dark colored fungus grows on building material with high cellulose content and low nitrogen content. Areas with a relative humidity above 55%, and are subject to temperature fluctuations, are ideal for toxin production. Individuals with chronic exposure to the toxin produced by this fungus reported cold and flu symptoms, sore throats, diarrhea, headaches, fatigue, dermatitis, intermittent local hair loss and generalized malaise. Other symptoms include coughs, rhinitis, nosebleed, a burning sensation in the nasal passages, throat, and lungs, and fever. The toxins produced by this fungus will suppress the immune system affecting the lymphoid tissue and the bone marrow. Animals injected with the toxin from this fungus exhibited the following symptoms: necrosis and hemorrhage within the brain, thymus, spleen, intestine, lung, heart, lymph node, liver, and kidney. Affects by absorption of the toxin in the human lung are known as pneumomycosis.

This organism is rarely found in outdoor samples. It is usually difficult to find in indoor air samples unless it is physically disturbed (or possibly -this is speculation- a drop in the relative humidity). The spores are in a gelatinous mass. Appropriate media for the growth of this organism will have high cellulose content and low nitrogen content. The spores will die readily after release. The dead spores are still allergenic and toxigenic. Percutaneous absorption has caused mild symptoms.

Stemphylium sp.

Reported to be allergenic. Isolated from dead plants and cellulose materials.

Torula sp.

Found outdoors in air, soil, on dead vegetation, wood, and grasses. Also found indoors on cellulose materials. Reported to be allergenic and may cause hay fever and asthma.

Tetraploa

Tetraploa species comprise a very small proportion of the fungal biota. This genus is somewhat related to *Triposporium* and Diplocladiella. The only reported human infections are two cases of keratitis (1970, 1980) and one case of subcutaneous infection of the knee (1990). No information is available regarding other health effects or toxicity. Allergenicity has not been studied. Usually identified on spore trap samples where it is seen every few weeks. (Spores have very distinctive morphology.) Our laboratory has never found this organism growing on indoor environmental surfaces. Natural habitat includes leaf bases and stems just above the soil on many kinds of plants and trees.

Ulocladium sp.

Aw 0.89. Isolated from dead plants and cellulose materials. Found on textiles.

Zygomycetes

Zygomycetes are one of the four major groups of fungi, the others being the Oomycetes, the Ascomycetes, and the Basidiomycetes. Zygomycetes are common, fast growing, and often overgrow and/or inhibit other fungi nearby. Rhizopus and Mucor are two of the most common Zygomycetes seen in the indoor environment. However, others are seen as well, including *Syncephalastrum*, *Circinella*, *Mortierella*, *Mycotypha*, *Cunninghamella*, and *Choanephora*. For further information, please see descriptions of these individual genera.

The following table lists mycotoxins that are produced by certain types of fungi:

Fungi	Mycotoxin
Acremonium crotocinigenum	Crotocin
Aspergillus favus	Alfatoxin B, cyclopiazonic acid
Aspergillus fumigatus	Fumagilin, gliotoxin
Aspergillus carneus	Critrinin
Aspergillus clavatus	Cytochalasin, patulin
Aspergillus Parasiticus	Alfatoxin B
Aspergillus nomius	Alfatoxin B
Aspergillus niger	Ochratoxin A, malformin, oxalicacid
Acremonium crotocinigenum	Crotocin
Aspergillus nidulans	Sterigmatocystin
Aspergillus ochraceus	Ochratoxin A, penicillic acid
Aspergillus versicolor	Sterigmatocystin, 5 ethoxysterigmatocystin
Aspergillus ustus	Ausdiol, austamide, austocystin,brevianamide
Aspergillus terreus	Citreoviridin
Alternaria	Alternariol, altertoxin, altenuene, altenusin, tenuazonic acid
Arthrinium	Nitropropionic acid
Bioploaris	Cytochalasin, sporidesmin, sterigmatocystin
Chaetomium	Chaetoglobosin A,B,C. Sterigmatocystin
Cladosporium	Cladosporic acid
Clavipes purpurea	Ergotism
Cylindrocorpon	Trichothecene
Diplodia	Diplodiatoxin
Fusarium	Trichothecene, zearalenone
Fusarium moniliforme	Fumonisins
Emericella nidulans	Sterigmatocystin
Gliocladium	Gliotoxin
Memnoniella	Griseofulvin , dechlorogriseofulvin, epi-decholorgriseofulvin, trichodermin, trichodermol
Myrothecium	Trichothecene
Paecilomyces	Patulin, viriditoxin
Penicillium aurantiocandidum	Penicillic acid
Penicillium aurantiogriseum	Penicillic acid
Penicillium brasilanum	Penicillic acid
Penicillium brevicompactum	Mycophenolic acid
Penicillium camemberti	Cyclopiazonic acid
Penicillium carneum	Mycophenolic acid, Roquefortine C
Penicillium crateriforme	Rubratoxin

Fungi	Mycotoxin
Penicillium citrinum	Citrinin
Penicillium commune	Cyclopiazonic acid
Penicillium crustosum	Roquefortine C
Penicillium chrysogenum	Roquefortine C
Penicillium discolor	Chaetoglobosin C
Penicillium expansum	Citrinin, Roquefortine C
Penicillium griseofulvum	Roquefortine C, cyclopiazonic acid, griseofulvin
Penicillium hirsutum	Roquefortine C
Penicillium hordei	Roquefortine C
Penicillium nordicum	Ochratoxin A
Penicillium paneum	Roquefortine C
Penicillium palitans	Cyclopiazonic acid
Penicillium polonicum	Penicillic acid
Penicillum roqueforti	Roquefortine C, Mycophenolic acid
Penicillium veridicatum	Penicillic acid
Penicillium verrucosum	Citrinin, ochratoxin A
Penicillium/ Aspergillus	Patulin
Penicillium/ Aspergillus/Alternaria	Glitoxin
Phomopsis	Macrocyclic trichothecenes
Phoma	Brefeldin, cytochalasin, secalonic acid, tenuazonic acid
Pithomyces	Sporidesmin
Rhizoctonia	Slaframine
Rhizopus	Rhizonin
Sclerotinia	Furanocoumarins
Stachybotrys chartarum	Iso-satratoxin F, roridin E, L-2, satratoxin G & H, trichodermin, trichodermol, trichothecene
Torula	Cytotoxins
Trichoderma	Trichodermin, trichodermol, gliotoxin
Trichothecium	Trichothecene
Wallemia	Walleminol
Zygosporium	Cytochalasin

General terms

Allergen

An allergen is a substance that elicits an IgE antibody response and is responsible for producing allergic reactions. Chemicals are released when IgE on certain cells contact an allergen. These chemicals can cause injury to surrounding tissue - the visible signs of an allergy. Only a few fungal allergens have been characterized but all fungi are thought to be potentially allergenic. Fungal allergens are proteins found in either the mycelium or spores

"Black mold"

A poorly defined term. Black mold or toxic black mold has usually been associated with the mold *Stachybotrys chartarum*. While there are only a few molds that are truly black, there are many that can appear black. Not all molds that appear to be black are *Stachybotrys*.

Fungi

Fungi are neither animals nor plants and are classified in a kingdom of their own. The Kingdom of Fungi. Fungi include a very large group of organisms, including molds, yeasts, mushrooms and puffballs. There are >100,000 accepted fungal species but current estimates range to 1.5 million species. Mycologists (people who study fungi) have grouped fungi into four large groups according to their method of reproduction.

Hidden mold

This refers to visible mold growth on building structures that is not easily seen, including the areas above drop ceilings, within a wall cavity (the space between the inner and outer structure of a wall), inside air handlers, or within the ducting of a heating/ventilation system.

Microbial Volatile Organic Compounds (MVOCs)

Fungi produce chemicals as a result of their metabolism. Some of these chemicals, MVOCs, are responsible for the characteristic moldy, musty, or earthy smell of fungi, whether mushrooms or molds. Some MVOCs are considered offensive or annoying. Specific MVOCs are thought to be characteristic of wood rot and mold growth on building materials. The human nose is very sensitive to mold odors and sometimes more so than current analytical instruments.

Mold

Molds are a group of organisms that belong to the Kingdom of Fungi (see Fungi). Even though the terms mold and fungi had been commonly referred to interchangeably, all molds are fungi, but not all fungi are molds.

Mycotoxin

Mycotoxins are compounds produced by some fungi that are toxic to humans or animals. By convention, the term? Mycotoxin. Excludes mushroom toxins. Fungi that produce mycotoxins are called "toxigenic fungi."

Spore

General term for a reproductive structure in fungi, bacteria and some plants. In fungi, the spore is the structure which may be used for dissemination and may be resistant to adverse environmental conditions.

Toxic mold

The term "toxic mold" has no scientific meaning since the mold itself is not toxic. The metabolic byproducts of some molds may be toxic (see mycotoxin).

Hypha (plural, hyphae)

An individual fungal thread or filament of connected cells; the thread that represents the individual parts of the fungal body.

Phoenix EnviroCorp

MOLD/BIOLOGICAL CONTAMINANT REMEDIATION PROTOCOL

Date: June 16, 2021

For: Quanesha Mullins
Wilmington Housing Authority
1524 S. 16th Street
Wilmington, NC 28401

Remediation Contractor: Not determined

On-Site Consultant: Phoenix EnviroCorp (PEC)
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Wilmington, NC 28403
(910) 397-0370

Approved Signatory:

Shaenaz Mirmohamed
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SECTION 1.0 REMEDIATION PROCEDURES

1.1 Project Set Up

- The owner or powers that be shall supply temporary power for remediation equipment. The existing electrical system may be utilized, with permission of the owner or powers that be. Determining specific electrical load/safety requirements, including, but not limited to, the use of a temporary GFCI electrical panel box shall be the responsibility of the abatement contractor.
- HVAC system shall be isolated.
- 6-mil polyethylene sheathing shall be erected to separate primary control areas (PCA) from remaining areas. Control areas shall be selected so that specified building materials (specified herein, in section 1.3, under primary control areas) may be removed or cleaned and dried.
- HEPA Air Filtration Devices shall be utilized for each separate control area. Critical barriers shall consist of 6-mil polyethylene so that primary control areas are isolated from remaining areas. HEPA filtration units shall be exhausted from the PCA to the outside of the building through windows/doors. Dehumidification units must be installed in the PCA to sufficiently dry components.
- A remote wash off station shall be set up to allow for employees to wash hands and faces after egress from the work area.
- Ingress/Egress to the control area(s) shall be, at minimum, sealed with a 2-way polyethylene air lock.
- Entrances to the building shall be marked as indicated in Section 7.4 of this document.

1.2 Local Exhaust System

- Once sealed, the primary control area shall be ventilated with a local HEPA air filtration device that shall ensure a minimum of four (4) air changes per hour. The air filtration device shall be placed within the containment work area.
- Local HEPA exhaust shall be utilized where cleaning of contents is required and/or in the immediate vicinity of remediation activities of building materials.
- In interior sections requiring surface area cleaning, local HEPA filtration may be exhausted within the area to scrub microbials from ambient air. This process shall only be conducted after fine cleaning has been completed.
- Negative pressure within the contained work area shall be maintained throughout the project until clearance is obtained.
- Negative air machines shall be exhausted to exterior portions of the building to adequately ensure that negative pressure is achieved.
- Negative air pressure within the work area shall be tested and recorded at initiation of the project and hourly thereafter by use of a manometer to ensure the desired pressure of -0.02 inches of water, which is comparable to four changes per hour.
- Dehumidification devices with HEPA filtration may be incorporated as filtration devices in conjunction with true HEPA filtration devices; they may not replace the true HEPA filtration devices.

Note: Formula for determination of adequate HEPA filtration:

Total feet per minute =Volume of work area (ft^3)/15 minutes
#AFD Units needed = (Total feet per minute)/Capacity of Unit (ft^3)

- At initiation of final cleaning stages, relative humidity shall be at 40% (+/-3%) and moisture content of wooden components shall be at or below 15% as determined by Delmhorst moisture meter or equivalent meter. Moisture mapping and direct read T/RH shall be recorded by the remediation contractor until the

specified levels have been achieved. Control areas shall be dehumidified during cleaning and mold remediation activities to ensure removal of surface moisture created during application of water. Drying of structural components that have been treated with encapsulating anti-microbial agents will be necessary.

- Moisture levels shall be recorded and documented by the remediation contractor upon successful completion of dehumidification.

1.3 Remediation Specifications

- Prior to commencement of mold remediation activities by the remediation contractor, the source of any water intrusions, leaks, and/or moisture/humidity problems shall be remedied by the owner. If water intrusions, leaks, and/or moisture/humidity problems exist and are not corrected, mold growth can be expected to return.
- All remediation procedures listed that involve the removal of building materials shall employ polyethylene critical barriers, negative air pressure, and HEPA filtration (i.e., primary control areas).
- The remediation contractor shall ensure that the filters are properly capped prior to switching off the air scrubbers. If the filters are not properly capped, the backflow can cause mold spores to re-release back into the control area, essentially re-contaminating an area that has already been cleaned.
- All remediation activities shall be conducted in a manner that does not allow dissemination of mold spores. Remediation procedures shall begin from the side of the control area furthest away from air filtration devices.
- Cleaning procedures shall be repeated until the area is visibly free of dust and debris.
- Engineering controls set up during the remediation process shall remain in place until remediation has been completed and acceptable post remediation sampling results have been achieved.
- **Federal and/or state regulations require that suspect asbestos containing materials in public and commercial buildings shall be inspected for asbestos prior to renovations or demolition. Based on these regulations, PEC recommends that building materials that may be disturbed during mold remediation be tested for asbestos content prior to their disturbance to prevent asbestos contamination.**
- If cleaning procedures outlined in this remediation plan outweigh the cost of replacement for selected items, the remediation contractor shall give the owner the option to clean or dispose of those items.
- Reinstallation of building materials and/or components shall only be conducted once acceptable post remediation results are obtained.
- Any chemicals used on this project shall be EPA approved and used only as directed by the manufacturer. MSDS shall be available for review upon request.

HVAC System

- The HVAC system(s) that services or run through the primary control area/affected area shall be shut down prior to remediation activities.
- The spaces that are normally climate-controlled by the HVAC system that have been shut down shall be maintained under proper humidity levels (between 30 and 60% utilizing dehumidifiers, etc.) while the system is not in operation.
- All HVAC supply/return vents within the primary control area/affected area shall be isolated with a critical barrier (i.e., plastic, etc.) to prevent air flow.
- Once the HVAC system is shut down, the system shall remain off and isolated until acceptable post remediation results are obtained.

Note: For directional purposes "front" is determined by facing Grass Lane from inside the residence, unless otherwise noted.

Primary Control Areas/Affected Areas

Critical barriers, negative air pressure, and HEPA filtration shall be established to isolate the following areas as Primary Control Areas to perform the specified mold remediation. **All non-stable furnishings and contents shall be removed from the containment area/primary control area prior to specified remediation to avoid cross contamination of furnishings and contents. If elected, said furnishings and contents can be precleaned (i.e., HEPA vacuum, etc.) and stored in the primary control area, but shall be protected (i.e., covered with poly, etc.) to avoid cross contamination.**

Within the bathroom:

- Detach the floor mounted cabinet from the front wall, and remove any affected drywall (i.e., drywall with apparent water damage/suspect visible mold growth) and extend the drywall removal within a 2-foot radius of the affected area when possible.
- Remove baseboards entirely from the front, rear, and right walls, and remove any affected drywall (i.e., drywall with apparent water damage/suspect visible mold growth) and extend the drywall removal within a 2-foot radius of the affected area when possible.
- Remove any loose floor tiles.
- Clean all remaining surfaces within the control area as specified herein under general specifications for primary control areas.

General Specifications for Primary Control Areas

- Open plumbing lines and drains within the control areas shall be isolated with a critical barrier consisting of 6-mil poly.
- The water line to toilets within the control areas shall be shut off and the toilets shall be isolated with a critical barrier consisting of 6-mil poly.
- Cleaning of components/materials shall consist of a method that thoroughly removes visible mold growth, settled concentrations of mold spores, and/or dust and debris (i.e., HEPA vacuuming, wet wiping, or other approved methods), followed by dehumidification/drying.
- Exterior surfaces of electrical appliances, electrical equipment, and light fixtures shall be cleaned, utilizing wet method and HEPA vacuuming. These items shall be disconnected from all electrical sources prior to cleaning. If these items cannot be cleaned efficiently, the abatement contractor shall consult with the owner/powers that be.
- All wall/ceiling cavity insulation shall be disposed in areas that specify the removal of drywall/wallboard. The abatement contractor shall visually inspect the back side of surrounding drywall/wallboard for water damage and/or suspect mold growth and document any findings. If additional suspect mold growth or water damage is observed beyond the specified removal area, additional drywall/wallboard shall be removed until no suspect mold growth or water damage is observed.
- All penetrations within the controlled area that adjoin unaffected or non-accessible areas, including outdoor areas, crawlspaces, etc., shall be cleaned (as far as one can reach) and then sealed with 6-mil poly, extending six (6) inches on all sides.
- In areas of specified wallboard removal, all components within the wall/ceiling cavities shall be cleaned. Any wooden structural components with mold stains or mold growth in pitted surfaces shall be HEPA sanded (or other approved methods) to eliminate embedded mold growth.
- All joints or sills (where the structural system meets, where the sill plate meets the floor, etc.) shall be aggressively disturbed to remove embedded mold growth and spores.

1.4 Removal Procedures

The contractor shall maintain surfaces of the control area free of accumulation of dust and debris. Additionally, they shall restrict the spread of dust and debris, keeping waste from being distributed over the work area. Materials shall be removed in a fashion to ensure that previously cleaned areas are not recontaminated (i.e. working from one end of the control area to the other). The contractor may be required to re-clean areas based on a visual inspection by the CIEC/CIE/IH, if the areas are not visibly clean.

Contaminated building materials that have been removed, and additional materials and debris generated during remediation, shall be bagged or wrapped with 6-mil polyethylene sheeting, sealed with duct tape, and carried to the waste container prior to visual inspection by the CIEC/CIE/IH. Materials shall be bagged and sealed directly after removal from unaffected building components.

Areas shall be allowed to dry for a period until specified RH and moisture levels have been achieved. Any remaining building products that are directly impacted by remediation shall be tested for moisture content. Wooden and cellulosic building components (e.g., wall studs, drywall, etc.) shall be tested for moisture content. If the moisture content is > 15% in wood products or > 12% in cellulosic products (utilizing a Delmhorst moisture meter), dehumidification shall be required until moisture levels are at or below said levels, and the RH level is at or below 40% +/-3% (for all interior areas). The remediation contractor shall verify water content of all wooden and cellulosic building components within the impacted areas, as well as temperature and RH prior to scheduling post remediation verification.

1.5 Cleanup Overview

The contractor shall personally review the cleaning process prior to contacting the CIEC/CIE/IH for the post remediation testing. If accumulations of debris and dust are significant, the CIEC/CIE/IH will require re-cleaning prior to post remediation verification sampling.

The CIEC/CIE/IH shall make a visual inspection and conduct post remediation sampling after the final cleaning is complete.

1.6 Post Remediation Verification Testing

Prior to conducting post remediation sampling, HEPA filtration devices shall be allowed to operate for a minimum of 25 hours (the equivalent of 100 air changes), following fine cleaning, in all areas where remediation has been conducted. The HEPA filtration devices shall be sealed at the intake and turned off approximately two hours prior to post testing and reconvene within one hour after post testing, until acceptable post remediation results are established.

Post remediation sampling shall be conducted utilizing viable and/or non-viable sample methods. Air samples shall be collected in representative areas of the control areas. Surface sampling may be conducted at the discretion of the CIEC/CIE/IH.

Sampling shall be conducted in areas directly impacted by remediation procedures, where cleaning was conducted. The CIEC/CIE/IH shall determine acceptable post remediation status through interpretation of air sampling results, which will be based on indoor/outdoor comparisons, in combination with any surface samples collected, moisture readings, RH readings, visual observations, and any other pertinent information.

The owner/client will be responsible for post remediation testing. If air sample results indicate unacceptable airborne concentrations, the contractor shall be required to conduct a re-cleaning at the contractor's expense and absorb the cost for re-testing, until acceptable results are achieved.

SECTION 2.0 SCOPE OF WORK (Note: Section 2 and Section 1.3 are essential to the full Scope of the Contractor's Work)

2.1 Investigative Reports and Other Related Documents

Phoenix EnviroCorp investigative report dated May 5, 2021, and June 16, 2021.

Phoenix EnviroCorp Chain of Custody dated May 3, 2021, and June 7, 2021.

Analytical reports dated May 4, 2021, and June 8, 2021.

2.2 Project Description

The procedures covered by this program include the enclosure and drying of the said structure, the removal, handling, and disposal of building components compromised by mold/fungal growth, and the cleaning and disinfecting of existing building materials. Procedures for reconstruction are not considered in these specifications. Reconstruction of interior portions may not be conducted until procedures for remediation have been completed, the control areas have been inspected, and testing has returned acceptable post remediation results. Reconstruction of exterior portions may be conducted during the restoration to ensure that water intrusion is abated.

The objectives covered by the program include the remediation of materials shown to have surface contamination, water damage, and/or exposure to elevated airborne mold spore levels, without subjecting the workers, installation employees, and occupants to microbial contaminants. In addition, contract employees, occupants, and materials will be appropriately protected during the removal process so that present and future exposures will not occur.

This protocol is provided as a guideline. Any deviation requests from this protocol shall be addressed to the CIEC/CIE/IH for consideration. At present there are no Federal or State requirements regarding microbial remediation projects; however, OSHA General Construction Code of Federal Regulations (29 CFR 1926) shall be followed.

Remediation shall be completed as close to the date that this protocol was drafted, as the specifications outlined within represent conditions at the time the investigative services were conducted. Due to the volatility of mold, the current protocol may not reflect all necessary remediation if conditions are allowed to continue. Further, if time lapses allowing conditions to change, it will become increasingly difficult to obtain successful clearance testing results.

SECTION 3.0 AIR MONITORING

3.1 Responsibilities of the CIEC/CIE/IH

Monitoring of airborne concentrations will be performed in accordance with the requirements of this program. Prior to conducting air sampling and/or surface sampling for clearances, the CIEC/CIE/IH shall conduct a visual inspection of the area. Temperature and RH shall be recorded during the air sampling phase of clearance. All air sampling shall be conducted in such a manner as to provide a valid representation of airborne mold levels both inside and outside the work areas. If analysis of air samples indicates that airborne concentrations exceed acceptable limits, the contractor shall conduct re-cleaning at the contractor's expense.

3.2 Personal Monitoring

No personal monitoring will be conducted by the CIEC/CIE/IH unless the remediation contractor requests monitoring for OSHA compliance. Presently there are no guidelines (PELs or TLVs) for microbial contaminants. It is the remediation contractor's responsibility to determine if OSHA personal sampling may be required during application of anti-microbial agents.

3.3 Sample Integrity and Reporting

Samples shall be sealed, labeled, and a chain of custody initiated according to laboratory procedures.

Sample results shall be available within seven (7) days of the completion of collection of all samples and will include the following information:

- Site Address
- Sample Number
- Location Sampled
- Analytical Method
- Collection Date(s)
- Person Taking Sample(s)
- Additional Comments (if any)
- Analyst Signature

SECTION 4.0 MATERIAL REPLACEMENT

4.1 Material Replacement

The general contractor/replacement contractor may begin material replacement after the CIEC/CIE/IH informs all parties of acceptable post remediation sample results.

With ongoing construction activities ambient air levels are expected to be elevated over what might be normally expected. Additional testing should not be necessary after remediation procedures have been completed and successful results have been obtained. In the event of another water intrusion (i.e. broken-pipe-line, improper HVAC function, or building envelope compromise), an investigation shall be conducted within 24 to 48 hours of the event. Proper drying, if initiated within this time frame, should minimize the potential for microbial growth.

SECTION 5.0 SPILL CLEANUP REQUIREMENTS

5.1 Spills

MSDS shall be kept on site for all chemical products brought to the site by the remediation contractor. In the event of a chemical spill, the contractor shall initiate cleanup immediately. The contractor shall mop up any liquid with rags or other conventional absorbent. The spent absorbent shall be properly contained and disposed of as waste.

SECTION 6.0 WASTE CONTROL

6.1 Waste Disposal

Waste shall be disposed of at a locally selected landfill. Waste bags shall be checked for integrity and hauled

in an enclosed truck/vehicle or container to ensure that transportation to the landfill does not pose a potential hazard to the environment.

SECTION 7.0 SUPPLEMENTAL INFORMATION

7.1 Applicable Publications

The publications listed below form part of this program. Written programs shall accompany all referenced CFR publications. IICRC and NYCDOH guidelines for work procedures shall be followed by the remediation contractor. A copy of the NYCDOH protocols shall be on-site, along with this design, for reference by the site supervisor. ACGIH, IAQA, and ASHRAE publications shall be utilized as guidelines for interpretation by the CIEC/CIE/IH. This design shall be reviewed by the remediation supervisor prior to initiation of set-up for the project. Any questions regarding this project may be addressed with the on-site consultant listed for Phoenix EnviroCorp.

Code of Federal Regulation (CFR Publications)

29 CFR 1910.134	Respiratory Protection
29 CFR 1910.145	Specifications for Accident Prevention, Signs and Tags
29 CFR 1926.28	Personal Protective Equipment
29 CFR 1926.59	Hazard Communication
29 CFR 1926.96	Occupational Foot Protection
29 CFR 1926.100	Head Protection
29 CFR 1926.101	Hearing Protection
29 CFR 1926.102	Eye and Face Protection
29 CFR 1926.403	Electrical General Requirements
29 CFR 1926.416	Safety General Requirements
29 CFR 1926.852	Demolition, Chutes
29 CFR 1926.1091	Record Keeping Requirements

Supplemental Guidelines

IICRC S520 2nd ed.	Standard and Reference Guide for Professional Water Damage Restoration
NYCDOH	Guidelines on Assessment and Remediation of Fungi in Indoor Environments
ACGIH	Bioaerosols: Assessment and Control
IAQA 01-2000	Recommended Guidelines for Indoor Environments
ASHRAE 62.2-2007	Ventilation for Acceptable Indoor Air Quality in Low-Rise Residential Buildings

7.2 Definitions

Air Lock: A system that permits ingress and egress between a control area and non-control area, or other work areas, without allowing air movement between areas (e.g., three stage decon, three-way polyethylene flaps).

Air Sample: Refers to samples collected with spore trap air sample media (e.g., Micro-5, Cyclex D, or equivalent); also referred to as a non-viable air sample. May also refer to a sample collected on a disposable petri dish with Agar media by means of an Andersen Impactor (or equivalent) and sampling pump; also referred to as air culture (viable) sample. Sample media to be used in project is described under Section 1.6 (Post Remediation Verification Testing).

Area Monitoring: The sampling of airborne microbial concentrations outside the exclusion boundary, which may reach the breathing zone of the contractor or installation employees.

Asbestos Containing Materials (ACM): Refers to asbestos containing building materials that contain more than 1% asbestos by Polarized Light Microscopy (PLM) or Transmission Electron Microscopy (TEM).

Biocide: Refers to chemical agents that are specifically designed to eliminate viable microbial contamination, with a phenol equivalent efficiency (e.g., Sodium Hypochlorite, Quaternary Ammonia Compounds).

Blower Door Test: Refers to the testing of static pressure and draw of air through the HVAC in cubic feet per minute (CFM) to rate the efficiency of the system.

Clearance Monitoring: Refers to air, bulk, or swab sampling conducted as a means to demonstrate that the area specified for remediation has been completed by the contractor, left with present acceptable mold spore levels, and ready for re-construction.

Control Area: The area where microbial contaminants removal is performed, which is isolated by physical boundaries to prevent unauthorized entry of personnel, thereby preventing exposure to or the spread of microbial contaminants. Physical boundaries will be established and located such that the airborne contaminants are not allowed to escape the boundaries.

HEPA: High Efficiency Particulate Air. Refers to ventilation devices that are specifically designed to filter ambient air to an efficiency of 99.97%.

HVAC: Refers to the Heating, Ventilation, and Air Conditioning system.

Industrial Hygienist: Refers to a person who practices industrial hygiene and may act as a competent person regarding visual inspection of contaminated surfaces and clearance air and/or swab/bulk sampling. May also refer to a Certified Industrial Hygienist (CIH) as defined by the American Board of Industrial Hygiene (ABIH), a Certified Indoor Environmental Consultant as defined by the American Council for Accredited Certification (ACAC), or a Certified Indoor Environmentalist (CIE) as defined by the American Council for Accredited Certification (ACAC).

Microbial Contaminant: Refers to viable mold, fungi, pollen, bacteria, and or particulate, or their metabolites, that may be causative of epidemiological, immunotoxic, dermotoxic, neurotoxic, or enterotoxic disorders in the human population, or may be considered a pathogen or an opportunistic pathogen.

Non-Porous Materials: Refers to building materials with solid surfaces that may be successfully treated and cleaned by means of HEPA vacuuming or other approved method. Materials include flooring, hard goods, plastic, vinyl, and some wallboard systems.

Porous Materials: Refers to building materials and household goods that may allow microscopic particles (3-20 micron) to become trapped within the material that will not allow adequate cleaning. Materials include carpet, mattresses, and clothing.

Primary Control Area (PCA): Refers to a section of a facility that has been isolated by 6-mil polyethylene barriers where specific engineering controls (e.g., HEPA filtration, negative air pressurization, dehumidification, etc.) are required. In general, it is the area where remediation of water and mold damaged building materials is to be conducted.

Refrigerant Dehumidifier: Device used to remove water content from air and materials.

Relative Humidity (RH): Refers to the ratio of water vapor in the atmosphere to the amount required to saturate it at a given temperature.

Semi-Porous Materials: Refers to materials that may be somewhat porous, yet they may still allow for adequate cleaning. Materials include wooden beams and some wallboard systems.

Swab Sample: Refers to collection of a sample onto a sterile swab for analysis of mold, fungi, and bacteria by viable and/or non-viable analysis.

Tape-Lift Sample: Refers to collection of a sample onto clear scotch tape for analysis by direct microscopic examination (non-viable).

7.3 Quality Assurance

Medical Examinations

Before potential exposure to microbial contaminants, the remediation contractor shall provide workers with a comprehensive medical examination as required by 29 CFR 1910.134 as outlined by the Medical Monitoring Program.

Medical Records

The remediation contractor shall maintain complete and accurate medical records on employees as required by OSHA and the contractor's Medical Monitoring Program. The contractor may be asked to provide a copy of all medical records for approval by the consultant's representative.

Training

Each employee working on this contract shall be trained prior to the time of initial job assignment in accordance with mold specific and chemical specific training as indicated by the OSHA General Duty Clause and the Hazard Communication Standard. Each employee shall also receive training required by Federal guidelines listed in Section 7.1 of this document and project specifications.

Hazard Communication Program

The remediation contractor has established and implemented a Hazard Communication Program as required by 29 CFR 1910.1200 and may be asked to provide a copy of this written program. Hazard Communication training must include occupational hazards as directly related to working with fungi/mold and contamination of building components by fungal contamination, specific training for chemical hazards associated with biocide usage, and site specific MSDS sheets for commercial detergents and biocides utilized on the job site.

Respiratory Protection Program

The remediation contractor has established a Respiratory Protection Program, which complies with 29 CFR 1910.134. Physical examinations and fit testing are required for use of respiratory protection greater than an N-95 dust mask. Workers removing building materials contaminated by mold growth, applying anti-microbial agents, or workers subjected to exposures to anti-microbial agents shall be required to wear, at minimum, a tight-fitting negative pressure ½ mask respirator with P-100 filters. Therefore, -he OSHA Respiratory

Protection Standard applies.

Analytical Testing Laboratory

Analysis of culturable biological samples collected on this project shall be conducted by a laboratory that participates in the Environmental Microbiological Proficiency Analytical Testing Program (EMPAT) of the American Industrial Hygiene Association (AIHA) and has shown to be proficient by proficiency analytical testing (PAT) samples. Analysis of non-viable air and surface samples shall be conducted by a competent person.

7.4 Materials and Equipment

Equipment

The contractor shall make available to employees a complete set of personal protective equipment (PPE) as required by this program for entry into the controlled area. All personnel while in the control area or handling microbial contaminated waste shall wear protective clothing, respirators, and other PPE.

Respirators

Contractor shall furnish the appropriate respirator in accordance with 29 CFR 1910.134 and approved by NIOSH for protection in environments that contain microbial contaminants. The selected respirator for this project shall be a tight-fitting negative pressure ½ respirator equipped with HEPA cartridge (P-95, P-100). At minimum, an N-95 dust mask may be utilized during fine cleaning activities; however, the tight fitting ½ mask respirator shall be utilized during application of anti-microbial agents or biocides.

Special Clothing

Employees shall be provided with and required to wear: whole body disposable protective clothing, full body tyvek suits with head coverings, and latex gloves *(see table)* during all activities in the controlled area.

Chemical	Recommended Rubber Glove
Sodium Hypochlorite	Neoprene or Nitrile
Phenolic Compounds	Neoprene
Quaternary Ammonia Compounds	Polyvinyl Chloride (PVC)
Detergents	Latex

Eye Protection

The contractor shall provide chemical-resistant goggles to personnel engaged in cleaning and treatment activities and require them to be worn during application of anti-microbial agents and biocides.

Warning Signs and Labels

Standard approved warning signs shall be erected at all approaches to the control area as specified in 29 CFR 1910.145.

Anti-Microbial Agents

Anti-microbial agents utilized in interior quarters shall consist of quaternary ammonia compounds. No phenolic compounds shall be used in interior quarters with exception of Micro Ban Plus. Approval must be granted by the owner/powers that be prior to application. Anti-microbial agents shall be EPA approved. Commercial grade detergents shall be used to remove fungal contamination during cleaning phases prior to anti-microbial application, to include encapsulation.

Phoenix EnviroCorp

April 15, 2021

Quanesha Mullins
Wilmington Housing Authority
1524 S. 16th Street
Wilmington, NC 28401

RE: PEC Job # 21-21-114-IAQ-M; 302 Grass Lane, Unit 210, Wilmington, NC – Mold Investigation/Background air sampling

Enclosed are the results of the mold investigation conducted at the above referenced unit on April 13, 2021. Phoenix EnviroCorp (PEC) was retained to conduct background air sampling and to collect surface samples of suspect visible mold growth.

Background Information: The tenant reported mold growth on the HVAC supply vents.

The HVAC system was operating in the cool mode, set at 68º F upon PEC's arrival and during sampling.

Note: For directional purposes, "front" is determined by facing Grass Lane from inside the unit, unless otherwise stated.

Visual Inspection: PEC's visual inspection noted the following (see enclosed photographic documentation):

- Suspect visible mold growth on several HVAC supply vents

Mold Testing – Surface: A non-viable surface sample was collected from an area of suspect visible mold growth. The quantifications of fungal growth are reported as scattered spores, 21-100 fungal spores = very light (VL), 101-1,000 fungal spores = light (L), 1,001-10,000 fungal spores = moderate (M), > 10,000 fungal spores = heavy (H). The 'General Impressions' of fungal growth are reported as no fungal growth (NFG), fungal growth (FG), minimal fungal growth or growth in vicinity (MFG), and no fungal spores detected (ND). *Clear tape was utilized for the collection of surface samples. Each sample was assigned a unique ID number and shipped to a third-party laboratory for analysis.* Sampling locations and results are as follows:

Location	Result
Living room HVAC supply vent	**M – FG** *Cladosporium* **L – FG** *Penicillium/Aspergillus* **L – FG** *Ulocladium*

Mold Testing – Air: Non-viable spore trap air samples were collected to determine airborne mold spore levels. Samples were collected within the kitchen/living room, the rear right bedroom, the rear left bedroom, and the bathroom. *Micro 5 sampling media was utilized for the collection of spore trap air samples. Each sample ran for five (5) minutes at a flow rate of five (5) liters per minute for a total volume of twenty-five (25) liters per sample. Each sample was assigned a unique ID number and shipped to a third-party laboratory for analysis. All air samples were collected from centralized*

locations (within their respective areas) and within the breathing zone, unless otherwise noted. Two samples were also collected outdoors for comparative purposes.

Results indicated acceptable levels of airborne mold spores in all sampled locations.

The interpretation of air sample results is based on indoor/outdoor comparisons, in combination with a study by Daniel M. Baxter, entitled "A Regional Comparison of Mold Spore Concentrations Outdoors and Inside "Clean" and "Mold Contaminated" Southern California Buildings", and other industry guidelines, as well as over 20 years of experience in industrial hygiene and mold testing.

In layman terms, acceptable levels indicate that the levels are below the outdoor level and/or the baseline levels (whichever is higher) stated below. Elevated levels indicate that the levels are above the outdoor level and/or the baseline level.

Baseline levels for indoor spore trap air samples are as follows: < 900 spores/m³ for Penicillium/ Aspergillus; 0 spores/m³ for Stachybotrys and Chaetomium; and < 350 spores/m³ for other individual mold groups.

Relative Humidity (RH): *Temperature and relative humidity readings were collected in the same locations as the spore trap air samples.* RH levels within the residence ranged from 47.1% - 51.6% with an outdoor RH level of 49.3% (see the enclosed Chain of Custody for details). Per the American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) Standard 62-1999, relative humidity should range between 30% and 60%.

Conclusions: Air sampling within the tested areas did not indicate a problem with the indoor air quality regarding mold; however, surface mold growth (*Cladosporium, Penicillium/Aspergillus, and Ulocladium*) was identified on the living room HVAC supply vent.

PEC recommends cleaning the identified mold growth and any like areas with an over-the-counter product designed specifically for cleaning mold growth. Such a product can be purchased at most hardware stores, and the manufacturer's instructions shall be followed.

Enclosed in this report are the laboratory analysis and the Chain of Custody.

Should you have any questions, please do not hesitate to call.

Thank you,

Shaenaz Mirmohamed
IH Technician

Tommie Green, CIEC
Professional Industrial Hygienist

Enclosures

Photo 1

Suspect visible mold growth on the living room HVAC supply vent

Photo 2

Suspect visible mold growth on the kitchen HVAC supply vent

Samples accepted

Phoenix EnviroCorp
4020 SHIPYARD BLVD.
WILMINGTON, NC 28403

CHAIN OF CUSTODY

LABORATORY TEST REQUEST

Seem Ref # 2104 14020 lab ID: 060-064

CONTACT: Shaenaz Mirmohamed	TELEPHONE (910) 397-0370 FAX (910) 313-6094	Sample date: 4/13/2021
PEC Job #: 21-21-114-IAQ-M	SITE ADDRESS: 302 Grass Lane, Unit 210, Wilmington, NC 28401	

PLEASE EMAIL RESULTS TO: KMGREEN@PHOENIXENVIROCORP.COM

SAMPLE TYPE:	NUMBER OF SAMPLES:	TURN AROUND TIME SPECIFIED:
Spore Trap - Micro-5	4	____ Immediate ____ 24 hr ____ 48 hr __X__ Standard
Surface Samples	1	

Sample #	Sample Area	Sample Volume	Lab Analysis Requested	% Relative Humidity
041321-SM-01	Kitchen/living room	25L	S001	47.5
041321-SM-02	Rear right bedoom	25L	S001	48.
041321-SM-03	Rear left bedroom	25L	S001	47.
041321-SM-04	Bathroom	25L	S001	51.
041321-SM-05	Living room HVAC supply vent	1 cm sq	S001T	NA

Samples Collected By (Printed Name and Signature): Shaenaz Mirmohamed Date Signed: 4/13/2021

CHAIN OF CUSTODY RECORD

DATE:	Time:	Condition of Samples:	RELINQUISHED BY: (Printed Name and Signature)	ACCEPTED BY: (Printed Name and Signature)
4/13/2021	14:00	Intact	Shaenaz Mirmohamed	4-14-

SEEML Reference Number: 210414020

Southeast Environmental Microbiology Laboratories
102 Edinburgh Court
Greenville, SC 29607
Phone: (864) 233-3770
FAX: (864) 233-6589

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

- ☒ Surface/Bulk Report
- ☒ Spore Trap Report
- ☐ Andersen Fungal Report
- ☐ Quantitative Fungal Report

Lab Manager Review: *Angel Gosnell* Date: 04/14/21

Thank you for using SEEML laboratories. We strive to provide superior quality and service.
SEEML laboratories are accredited through AIHA-LAP, LLC (EMLAP # 173667) for the analysis of Spore Traps and Surface/Bulk Samples.

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

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

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

Spore Trap Report

	Date Sampled: 04/13/21
Attn: ***Phoenix Enviro Corp.***	Date Received: 04/14/21
4020 Shipyard Blvd.	Date Analyzed: 04/14/21
Wilmington, NC 28403	Date Reported: 04/14/21
	Date Revised:
	Project Name: 21-21-114-IAQ-M
	Project Address: 302 Grass Lane, Unit 210
	Project City, State, ZIP: Wilmington, NC 28401
	SEEML Reference # : 210414020

TEST METHOD: DIRECT MICROSCOPY EXAMINATION SEEML SOP 7

Client Sample ID	041321-SM-01			041321-SM-02			041321-SM-03		
Location	Kitchen / Living Room			Rear Right bedroom			Rear Left Bedroom		
Lab Sample ID	210414020-060			210414020-061			210414020-062		
Comments									
Hyphal Fragments									
Pollen									
Spore Trap Used	M5			M5			M5		
	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%
Alternaria									
Ascospores	6	240	11	6	240	19	7	280	11
Basidiospores	21	840	40	12	480	38	11	440	18
Bipolaris/Drechslera									
Chaetomium									
Cladosporium	25	1000	47	10	400	31	31	1240	50
Curvularia									
Epicoccum									
Cercospora									
Fusarium									
Memnoniella									
Nigrospora									
Penicillium/Aspergillus	1	40	2	4	160	13	12	480	19
Polythrincium									
Rusts									
Smuts/Periconia/Myxomy									
Spegazzinia									
Stachybotrys									
Stemphylium									
Tetraploa									
Torula									
Ulocladium									
Colorless/Other Brown*									
Oidium							1	40	2
Zygomycetes									
Pithomyces									
Background debris (1-5)**	3			3			3		
Sample Volume(liters)	25			25			25		
TOTAL SPORES/M^3	53	**2120**		32	**1280**		62	**2480**	

Revisions:

Spore types listed without a count or data entry were not detected during the course of the analysis for the respective sample, indicating a raw count of <1 spore.

The analytical sensitivity is the spores/m^3 divided by the raw count, expressed in spores/m^3. The limit of detection is the analytical sensitivity (in spores/m^3) multiplied by the sample volume (in liters) divided by 1000 liters.

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

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

Disclaimer: The sample results are determined by the sample volume, which is provided by the customer.

This report relates only to the samples tested as they were received.

102 Edinburgh Court
Greenville, SC. 29607
Phone: (864) 233-3770

Angel Gosnell

Angel Gosnell, Approved Laboratory Signatory

Spore Trap Report

	Date Sampled: 04/13/21
Attn: ***Phoenix Enviro Corp.***	Date Received: 04/14/21
4020 Shipyard Blvd.	Date Analyzed: 04/14/21
Wilmington, NC 28403	Date Reported: 04/14/21
	Date Revised:
	Project Name: 21-21-114-IAQ-M
	Project Address: 302 Grass Lane, Unit 210
	Project City, State, ZIP: Wilmington, NC 28401
	SEEML Reference # : 210414020

TEST METHOD: DIRECT MICROSCOPY EXAMINATION SEEML SOP 7

Client Sample ID	041321-SM-04		
Location	Bathroom		
Lab Sample ID	210414020-063		
Comments			
Hyphal Fragments			
Pollen	2	80	
Spore Trap Used	M5		
	raw ct.	spores/m^3	%
Alternaria			
Ascospores	2	80	5
Basidiospores	9	360	22
Bipolaris/Drechslera			
Chaetomium			
Cladosporium	24	960	59
Curvularia			
Epicoccum			
Cercospora			
Fusarium			
Memnoniella			
Nigrospora			
Penicillium/Aspergillus	6	240	15
Polythrincium			
Rusts			
Smuts/Periconia/Myxomy			
Spegazzinia			
Stachybotrys			
Stemphylium			
Tetraploa			
Torula			
Ulocladium			
Colorless/Other Brown*			
Oidium			
Zygomycetes			
Pithomyces			
Background debris (1-5)**	3		
Sample Volume(liters)	25		
TOTAL SPORES/M^3	41	**1640**	

Revisions:

Spore types listed without a count or data entry were not detected during the course of the analysis for the respective sample, indicating a raw count of <1 spore.
The analytical sensitivity is the spores/m^3 divided by the raw count, expressed in spores/m^3. The limit of detection is the analytical sensitivity (in spores/m^3) multiplied by the sample volume (in liters) divided by 1000 liters.
*Colorless,other Brown are spores without a distinctive morphology on spore traps and non-viable surface samples.
**Background debris is the amount of particulate matter present on the slide and is graded from 1-5 with 1 = very light, 2= Light, 3 = Medium, 4 = Heavy, 5 = Very Heavy. The higher the rating the more likelihood spores may be underestimated. A rating of 5 should be interpreted as minimal counts and may actually be higher than reported.

Disclaimer: The sample results are determined by the sample volume, which is provided by the customer.
This report relates only to the samples tested as they were received.

102 Edinburgh Court
Greenville, SC. 29607
Phone: (864) 233-3770

Angel Gosnell
Angel Gosnell, Approved Laboratory Signatory

Surface and Bulk Sample Report

	Date Sampled: 04/13/21
Attn: ***Phoenix Enviro Corp.***	Date Received: 04/14/21
4020 Shipyard Blvd.	Date Analyzed: 04/14/21
Wilmington, NC 28403	Date Reported: 04/14/21
	Date Revised:
	Project Name: 21-21-114-IAQ-M
	Project Address: 302 Grass Lane, Unit 210
	Project City, State ZIP: Wilmington, NC 28401
	SEEML Reference #: 210414020

TEST METHOD: Direct Microscopic Examination (SEEML SOP 18)

Client Sample ID	041321-SM-05			
Location	Living Room HVAC Supply Vent			
SEEML Sample ID	210414020-064			
Sample Type	Tape			
	Quantification*			
Hyphal Fragments	M			
Pollen				
General Impressions **	FG			
Fungal Spore:				
Alternaria				
Acremonium				
Ascospores				
Basidiospores				
Bipolaris/Drechslera				
Cercospora				
Chaetomium				
Cladosporium	M			
Curvularia				
Epicoccum				
Fusarium				
Geotrichum sp.				
Memnoniella				
Myxomycetes				
Nigrospora				
Penicillium/Aspergillus	L			
Pithomyces				
Rusts/Smuts				
Stemphylium				
Tetraploa				
Ulocladium	L			

** General Impressions: NFG = No Fungal Growth, FG = Fungal Growth, MFG = Minimal Fungal Growth Or Growth in vicinity

Quantification of fungal growth is done by semi-quantitative grading using the following ranges:

Scattered Spores, 1-20 fungal spores

VL = 21-100 fungal spores L = 101-1,000 fungal spores M = 1,001-10,000 fungal spores H = >10,000 fungal spores

ND = No Fungal Spores Detected

Disclaimer: This report relates only to the samples tested

Respectfully submitted, SEEML

Angel Gosnell, **Approved Laboratory Signatory**

102 Edinburgh Court
Greenville, SC 29607
Phone: (864) 233- 3770
Fax: (864) 233- 6589

AIHA-LAP, LLC EMLAP # 173667
Texas License: LAB1016

Samples aliented

Phoenix EnviroCorp
4020 SHIPYARD BLVD.
WILMINGTON, NC 28403

CHAIN OF CUSTODY

LABORATORY TEST REQUEST

Seemi Rs#2104140 18

lab ID: 051-052

CONTACT: Shaenaz Mirmohamed	TELEPHONE (910) 397-0370 FAX (910) 313-6094	Sample date: 4/13/2021
PEC Job #: 21-21-113, 114, &116-IAQ-M	SITE ADDRESS:	302 Grass Lane, Units 210, 211, & 108, Wilmington, NC 28401

PLEASE EMAIL RESULTS TO: KMGREEN@PHOENIXENVIROCORP.COM

SAMPLE TYPE:	NUMBER OF SAMPLES:	TURN AROUND TIME SPECIFIED:
Spore Trap - Micro-5 Surface Samples	2	____ Immediate ____ 24 hr ____ 48 hr __X__ Standard

Sample #	Sample Area	Sample Volume	Lab Analysis Requested	% Relative Humidity	Temperature °F
041321-SM-301	Outside - Front - 2nd floor	25L	S001	49.3	70.5
041321-SM-302	Outside - Front - 1st floor	25L	S001		

Samples Collected By (Printed Name and Signature): Shaenaz Mirmohamed Date Signed: 4/13/2021

CHAIN OF CUSTODY RECORD

DATE:	Time:	Condition of Samples:	RELINQUISHED BY: (Printed Name and Signature)	ACCEPTED BY: (Printed Name and Signature)
4/13/2021	14:00	Intact	Shaenaz Mirmohamed AFFILIATION:	JM 4-14-21 AFFILIATION:

SEEML Reference Number: 210414018

Southeast Environmental Microbiology Laboratories
102 Edinburgh Court
Greenville, SC 29607
Phone: (864) 233-3770
FAX: (864) 233-6589

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- ☐ Surface/Bulk Report
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- ☐ Quantitative Fungal Report

Lab Manager Review: *Angel Gosnell* Date: 04/14/21

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

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

Spore Trap Report

	Date Sampled: 04/13/21
Attn: ***Phoenix Enviro Corp.***	Date Received: 04/14/21
4020 Shipyard Blvd.	Date Analyzed: 04/14/21
Wilmington, NC 28403	Date Reported: 04/14/21
	Date Revised:
	Project Name: 21-21-113, 114, & 116-IAQ-M
	Project Address: 302 Grass Lane, Units 210,211, & 108
	Project City, State, ZIP: Wilmington, NC 28401
	SEEML Reference # : 210414018

TEST METHOD: DIRECT MICROSCOPY EXAMINATION SEEML SOP 7

Client Sample ID	041321-SM-301			041321-SM-302					
Location	Outside - Front - 2nd Floor			Outside - Front - 1st Floor					
Lab Sample ID	210414018-051			210414018-052					
Comments									
Hyphal Fragments	4	160							
Pollen	29	1160							
Spore Trap Used	M5			M5					
	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%			
Alternaria									
Ascospores	122	4880	31	10	400	17			
Basidiospores	142	5680	36	19	760	32			
Bipolaris/Drechslera									
Chaetomium									
Cladosporium	125	5000	32	30	1200	50			
Curvularia									
Epicoccum									
Cercospora									
Fusarium									
Memnoniella									
Nigrospora									
Penicillium/Aspergillus				1	40	2			
Polythrincium	1	40	<1						
Rusts									
Smuts/Periconia/Myxomy									
Spegazzinia									
Stachybotrys									
Stemphylium									
Tetraploa									
Torula									
Ulocladium									
Colorless/Other Brown*									
Oidium									
Zygomycetes									
Pithomyces									
Background debris (1-5)**	3			3					
Sample Volume(liters)	25			25					
TOTAL SPORES/M^3	390	**15600**		60	**2400**				

Revisions:

Spore types listed without a count or data entry were not detected during the course of the analysis for the respective sample, indicating a raw count of <1 spore.

The analytical sensitivity is the spores/m^3 divided by the raw count, expressed in spores/m^3. The limit of detection is the analytical sensitivity (in spores/m^3) multiplied by the sample volume (in liters) divided by 1000 liters.

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

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

Disclaimer: The sample results are determined by the sample volume, which is provided by the customer.
This report relates only to the samples tested as they were received.

102 Edinburgh Court
Greenville, SC. 29607
Phone: (864) 233-3770

Angel Gosnell

Angel Gosnell, Approved Laboratory Signatory

Fungal Descriptions

Alternaria sp.

Aw - 0.89. Conidia dimensions: 18-83 x 7-18 microns. A very common allergen with an IgE mediated response. It is often found in carpets, textiles and on horizontal surfaces in building interiors. Often found on window frames. Outdoors it may be isolated from samples of soil, seeds and plants. It is commonly found in outdoor samples. The large spore size, 20 - 200 microns in length and 7 - 18 microns in sizes, suggests that the spores from these fungi will be deposited in the nose, mouth and upper respiratory tract. It may be related to bakers' asthma. It has been associated with hypersensitivity pneumonitis. The species *Alternaria alternata* can produce tenuazonic acid and other toxic metabolites that may be associated with disease in humans or animals. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include edema and bronchospasms; chronic cases may develop pulmonary emphysema.

Ascospore

A spore borne in a special cell called an ascus. Spores of this type are reported to be allergenic. All ascomycetes, members of a group of fungi called Ascomycotina, have this type of spore. The minute black dots on rotting wood and leaves or the little cups on lichens are examples of ascomycetes; another is the "truffle" mushroom.

Aspergillus/Penicillium

These are two of the most commonly found allergenic fungi in problem buildings. *Aspergillus* comes in many varieties (species). Many of the varieties produce toxic substances. It may be associated with symptoms such as sinusitis, allergic bronchopulmonary aspergillosis, and other allergic symptoms. *Penicillium* is a variety of mold that is very common indoors and is found in increased numbers in problem buildings. It also has many varieties, some of which produce toxic substances. The symptoms are allergic reactions, mucous membrane irritation, headaches, vomiting, and diarrhea. Due to the morphological similarity of *Aspergillus* and *Penicillium*, they are not differentiated by microscopic analysis and are reported together.

Aspergillus sp.

Aw 0.75 - 0.82. Reported to be allergenic. Members of this genus are reported to cause ear infections. Many species produce mycotoxins that may be associated with disease in humans and other animals. Toxin production is dependent on the species or a strain within a species and on the food source for the fungus. Some of these toxins have been found to be carcinogenic in animal species. Several toxins are considered potential human carcinogens. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include edema and bronchospasms; chronic cases may develop pulmonary emphysema; may also be associated with sinusitis, allergic bronchopulmonary aspergillosis, and other allergic symptoms.

Basidiospore

Spore from basidiomycetes. Many varieties are reported to be allergenic.

Bipolaris sp.

A fungus with large spores that could be expected to be deposited in the upper respiratory tract. This fungus can produce the mycotoxin - sterigmatocystin, which has been shown to produce liver and kidney damage when ingested by laboratory animals.

Botrytis sp.

Aw 0.93. Conidia dimensions: 7-14 x 5-9 microns. It is parasitic on plants and soft fruits. Found in soil and on house plants and vegetables, it is also known as "gray mold". It causes leaf rot on grapes, strawberries, lettuce, etc. It is a well-known allergen, producing asthma type symptoms in greenhouse workers and "wine grower's lung".

Cercaspora

Common outdoors in agricultural areas, especially during harvest. Parasite of higher plants, causing leaf spot. Commonly found as parasites on higher plants.

Chaetomium sp.

large ascomycetous fungus producing perithecia. It is found on a variety of substrates containing cellulose, including paper and plant compost. It has been found on paper in sheetrock. It can produce an *Acremonium*-like state on fungal media. Varieties are considered allergenic and have been associated with peritonitis, cutaneous lesions, and system mycosis.

Cladosporium sp.

Aw 0.88; Aw 0.84. Most commonly identified outdoor fungus. The outdoor numbers are reduced in the winter. The numbers are often high in the summer. Often found indoors in numbers less than outdoor numbers. It is a common allergen. Indoor *Cladosporium* sp. may be different than the species identified outdoors. It is commonly found on the surface of fiberglass duct liners in the interior of supply ducts. A wide variety of plants are food sources for this fungus. It is found on dead plants, woody plants, food, straw, soil, paint, and textiles. Produces greater than 10 antigens. Antigens in commercial extracts are of variable quality and may degrade within weeks of preparation. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include skin lesions, eye ulceration, mycosis (including onychomycosis, an infection of the nails of the feet or hands) edema and bronchospasms; chronic cases may develop pulmonary emphysema.

Curvularia sp.

Reported to be allergenic and has been associated with allergic fungal sinusitis. It may cause corneal infections, mycetoma, and infections in immune compromised hosts.

Dreschlera sp.

Conidia dimensions: 40-120 x 17-28 microns. Found on grasses, grains and decaying food. It can occasionally cause a corneal infection of the eye.

Epicoccum sp.

Conidia dimensions: 15-25 microns. A common allergen. It is found in plants, soil, grains, textiles and paper products.

Fusarium sp.

Aw 0.90. A common soil fungus. It is found on a wide range of plants. It is often found in humidifiers. Several species in this genus can produce potent trichothecene toxins. The trichothecene (scirpene) toxin targets the following systems: circulatory, alimentary, skin, and nervous. Produces vomitoxin on grains during unusually damp growing conditions. Symptoms may occur either through ingestion of contaminated grains or possibly inhalation of spores. The genera can produce hemorrhagic syndrome in humans (alimentary toxic aleukia). This is characterized by nausea, vomiting, diarrhea, dermatitis, and extensive internal bleeding. Reported to be allergenic. Frequently involved in eye, skin, and nail infections.

Myxomycetes

Members of a group of fungi that is included in the category of "slime molds". They're occasionally found indoors, but mainly reside in forested regions on decaying logs, stumps, and dead leaves. Myxomycetes display characteristics of fungi *and* protozoans. In favorable (wet) conditions they exhibit motile, amoeba-like cells, usually bounded only by a plasma membrane, that are variable in size and form. During dry spells, they form a resting body (sclerotium) with dry, airborne spores. These fungi are not known to produce toxins but can cause hay fever and asthma.

Memnoniella

Contaminant found most often with *Stachybotrys* on wet cellulose. Forms in chains, but it are very similar to *Stachybotrys* and sometimes is considered to be in the *Stachybotrys* family. Certain species do produce toxins very similar to the ones produced by *Stachybotrys chartarum* and many consider the IAQ importance of *Memnoniella* to be on par with *Stachybotrys*. Allergenic and infectious properties are not well studied.

Nigrospora sp.

Commonly found in warm climates, this mold may be responsible for allergic reactions such as hay fever and asthma. It is found on decaying plant material and in the soil. It is not often found indoors.

Oidium sp.

The asexual phase of *Erysiphe* sp. It is a plant pathogen causing powdery mildews. It is very common on the leaf's stems, and flowers of plants. The health effects and allergenicity have not been studied. It does not grow on non-living surfaces such as wood or drywall.

Penicillium sp.

Aw 0.78 - 0.88. A wide number of organisms have been placed in this genus. Identification to species is difficult. Often found in aerosol samples. Commonly found in soil, food, cellulose and grains. It is also found in paint and compost piles. It may cause hypersensitivity pneumonitis, allergic alveolitis in susceptible individuals. It is reported to be allergenic (skin). It is commonly found in carpet, wallpaper, and in interior fiberglass duct insulation. Some species can produce mycotoxins. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include edema and bronchospasms; chronic cases may develop pulmonary emphysema. It may also cause headaches, vomiting, and diarrhea.

Periconia sp.

Periconia sp. are found in soil, blackened and dead herbaceous stems leaf spots, grasses, rushes, and sedges. Almost always associated with other fungi. Rarely found growing indoors. Reportedly associated with a rare case of mycotic keratitis.

Pithomyces sp.

A common mold found on dead leaves, plants, soil and especially grasses. Causes facial eczema in ruminants. It exhibits distinctive multi-celled brown conidia. It is not known to be a human allergen or pathogen. It is rarely found indoors, although it can grow on paper.

Rusts/Smuts

These fungi are associated with plant diseases. In the classification scheme of the fungi, the smuts have much in common with the rusts, and they are frequently discussed together. Both groups produce wind-borne, resistant teliospores that serve as the basis for their classification and their means of spread. Rusts usually attack vegetative regions (i.e., leaves and stems) of plants; smuts usually are associated with the reproductive structures (seeds). They can cause hay fever and asthma.

Spegazzinia

Spegazzinia species comprise a very small proportion of the fungal biota. This genus is somewhat related to other lobed or ornamented genera such as *Candelabrum*. No information is available regarding health effects or toxicity. Allergenicity has not been studied. Usually identified on spore trap samples where it is seen every few weeks. (Spores have very distinctive morphology.) May also be found in air by culturable (Andersen) samples if a long enough incubation period is provided so that sporulation occurs. Our laboratory has never found this organism growing on indoor environmental surfaces. Natural habitat includes soil and many kinds of trees and plants.

Stachybotrys sp.

Aw - 0.94, optimum Aw ->0.98. Several strains of this fungus (*S. atra, S. chartarum* and *S. alternans* are synonymous) may produce a trichothecene mycotoxin- Satratoxin H - which is poisonous by inhalation. The toxins are present on the fungal spores. This is a slow growing fungus on media. It does not compete well with other rapidly growing fungi. The dark colored fungus grows on building material with high cellulose content and low nitrogen content. Areas with a relative humidity above 55%, and are subject to temperature fluctuations, are ideal for toxin production. Individuals with chronic exposure to the toxin produced by this fungus reported cold and flu symptoms, sore throats, diarrhea, headaches, fatigue, dermatitis, intermittent local hair loss and generalized malaise. Other symptoms include coughs, rhinitis, nosebleed, a burning sensation in the nasal passages, throat, and lungs, and fever. The toxins produced by this fungus will suppress the immune system affecting the lymphoid tissue and the bone marrow. Animals injected with the toxin from this fungus exhibited the following symptoms: necrosis and hemorrhage within the brain, thymus, spleen, intestine, lung, heart, lymph node, liver, and kidney. Affects by absorption of the toxin in the human lung are known as pneumomycosis.

This organism is rarely found in outdoor samples. It is usually difficult to find in indoor air samples unless it is physically disturbed (or possibly -this is speculation- a drop in the relative humidity). The spores are in a gelatinous mass. Appropriate media for the growth of this organism will have high cellulose content and low nitrogen content. The spores will die readily after release. The dead spores are still allergenic and toxigenic. Percutaneous absorption has caused mild symptoms.

Stemphylium sp.

Reported to be allergenic. Isolated from dead plants and cellulose materials.

Torula sp.

Found outdoors in air, soil, on dead vegetation, wood, and grasses. Also found indoors on cellulose materials. Reported to be allergenic and may cause hay fever and asthma.

Tetraploa

Tetraploa species comprise a very small proportion of the fungal biota. This genus is somewhat related to *Triposporium* and Diplocladiella. The only reported human infections are two cases of keratitis (1970, 1980) and one case of subcutaneous infection of the knee (1990). No information is available regarding other health effects or toxicity. Allergenicity has not been studied. Usually identified on spore trap samples where it is seen every few weeks. (Spores have very distinctive morphology.) Our laboratory has never found this organism growing on indoor environmental surfaces. Natural habitat includes leaf bases and stems just above the soil on many kinds of plants and trees.

Ulocladium sp.

Aw 0.89. Isolated from dead plants and cellulose materials. Found on textiles.

Zygomycetes

Zygomycetes are one of the four major groups of fungi, the others being the Oomycetes, the Ascomycetes, and the Basidiomycetes. Zygomycetes are common, fast growing, and often overgrow and/or inhibit other fungi nearby. Rhizopus and Mucor are two of the most common Zygomycetes seen in the indoor environment. However, others are seen as well, including *Syncephalastrum*, *Circinella*, *Mortierella*, *Mycotypha*, *Cunninghamella*, and *Choanephora*. For further information, please see descriptions of these individual genera.

The following table lists mycotoxins that are produced by certain types of fungi:

Fungi	Mycotoxin
Acremonium crotocinigenum	Crotocin
Aspergillus favus	Alfatoxin B, cyclopiazonic acid
Aspergillus fumigatus	Fumagilin, gliotoxin
Aspergillus carneus	Critrinin
Aspergillus clavatus	Cytochalasin, patulin
Aspergillus Parasiticus	Alfatoxin B
Aspergillus nomius	Alfatoxin B
Aspergillus niger	Ochratoxin A, malformin, oxalicacid
Acremonium crotocinigenum	Crotocin
Aspergillus nidulans	Sterigmatocystin
Aspergillus ochraceus	Ochratoxin A, penicillic acid
Aspergillus versicolor	Sterigmatocystin, 5 ethoxysterigmatocystin
Aspergillus ustus	Ausdiol, austamide, austocystin,brevianamide
Aspergillus terreus	Citreoviridin
Alternaria	Alternariol, altertoxin, altenuene, altenusin, tenuazonic acid
Arthrinium	Nitropropionic acid
Bioploaris	Cytochalasin, sporidesmin, sterigmatocystin
Chaetomium	Chaetoglobosin A,B,C. Sterigmatocystin
Cladosporium	Cladosporic acid
Clavipes purpurea	Ergotism
Cylindrocorpon	Trichothecene
Diplodia	Diplodiatoxin
Fusarium	Trichothecene, zearalenone
Fusarium moniliforme	Fumonisins
Emericella nidulans	Sterigmatocystin
Gliocladium	Gliotoxin
Memnoniella	Griseofulvin , dechlorogriseofulvin, epi-decholorgriseofulvin, trichodermin, trichodermol
Myrothecium	Trichothecene
Paecilomyces	Patulin, viriditoxin
Penicillium aurantiocandidum	Penicillic acid
Penicillium aurantiogriseum	Penicillic acid
Penicillium brasilanum	Penicillic acid
Penicillium brevicompactum	Mycophenolic acid
Penicillium camemberti	Cyclopiazonic acid
Penicillium carneum	Mycophenolic acid, Roquefortine C
Penicillium crateriforme	Rubratoxin

Fungi	Mycotoxin
Penicillium citrinum	Citrinin
Penicillium commune	Cyclopiazonic acid
Penicillium crustosum	Roquefortine C
Penicillium chrysogenum	Roquefortine C
Penicillium discolor	Chaetoglobosin C
Penicillium expansum	Citrinin, Roquefortine C
Penicillium griseofulvum	Roquefortine C, cyclopiazonic acid, griseofulvin
Penicillium hirsutum	Roquefortine C
Penicillium hordei	Roquefortine C
Penicillium nordicum	Ochratoxin A
Penicillium paneum	Roquefortine C
Penicillium palitans	Cyclopiazonic acid
Penicillium polonicum	Penicillic acid
Penicillum roqueforti	Roquefortine C, Mycophenolic acid
Penicillium veridicatum	Penicillic acid
Penicillium verrucosum	Citrinin, ochratoxin A
Penicillium/ Aspergillus	Patulin
Penicillium/ Aspergillus/Alternaria	Glitoxin
Phomopsis	Macrocyclic trichothecenes
Phoma	Brefeldin, cytochalasin, secalonic acid, tenuazonic acid
Pithomyces	Sporidesmin
Rhizoctonia	Slaframine
Rhizopus	Rhizonin
Sclerotinia	Furanocoumarins
Stachybotrys chartarum	Iso-satratoxin F, roridin E, L-2, satratoxin G & H, trichodermin, trichodermol, trichothecene
Torula	Cytotoxins
Trichoderma	Trichodermin, trichodermol, gliotoxin
Trichothecium	Trichothecene
Wallemia	Walleminol
Zygosporium	Cytochalasin

General terms

Allergen

An allergen is a substance that elicits an IgE antibody response and is responsible for producing allergic reactions. Chemicals are released when IgE on certain cells contact an allergen. These chemicals can cause injury to surrounding tissue - the visible signs of an allergy. Only a few fungal allergens have been characterized but all fungi are thought to be potentially allergenic. Fungal allergens are proteins found in either the mycelium or spores

"Black mold"

A poorly defined term. Black mold or toxic black mold has usually been associated with the mold *Stachybotrys chartarum*. While there are only a few molds that are truly black, there are many that can appear black. Not all molds that appear to be black are *Stachybotrys*.

Fungi

Fungi are neither animals nor plants and are classified in a kingdom of their own. The Kingdom of Fungi. Fungi include a very large group of organisms, including molds, yeasts, mushrooms and puffballs. There are >100,000 accepted fungal species but current estimates range to 1.5 million species. Mycologists (people who study fungi) have grouped fungi into four large groups according to their method of reproduction.

Hidden mold

This refers to visible mold growth on building structures that is not easily seen, including the areas above drop ceilings, within a wall cavity (the space between the inner and outer structure of a wall), inside air handlers, or within the ducting of a heating/ventilation system.

Microbial Volatile Organic Compounds (MVOCs)

Fungi produce chemicals as a result of their metabolism. Some of these chemicals, MVOCs, are responsible for the characteristic moldy, musty, or earthy smell of fungi, whether mushrooms or molds. Some MVOCs are considered offensive or annoying. Specific MVOCs are thought to be characteristic of wood rot and mold growth on building materials. The human nose is very sensitive to mold odors and sometimes more so than current analytical instruments.

Mold

Molds are a group of organisms that belong to the Kingdom of Fungi (see Fungi). Even though the terms mold and fungi had been commonly referred to interchangeably, all molds are fungi, but not all fungi are molds.

Mycotoxin

Mycotoxins are compounds produced by some fungi that are toxic to humans or animals. By convention, the term? Mycotoxin. Excludes mushroom toxins. Fungi that produce mycotoxins are called "toxigenic fungi."

Spore

General term for a reproductive structure in fungi, bacteria and some plants. In fungi, the spore is the structure which may be used for dissemination and may be resistant to adverse environmental conditions.

Toxic mold

The term "toxic mold" has no scientific meaning since the mold itself is not toxic. The metabolic byproducts of some molds may be toxic (see mycotoxin).

Hypha (plural, hyphae)

An individual fungal thread or filament of connected cells; the thread that represents the individual parts of the fungal body.

Phoenix EnviroCorp

MOLD/BIOLOGICAL CONTAMINANT REMEDIATION PROTOCOL

Date: June 9, 2021

For: Quanesha Mullins
Wilmington Housing Authority
1524 S. 16th Street
Wilmington, NC 28401

Remediation Contractor: Not determined

On-Site Consultant: Phoenix EnviroCorp (PEC)
4020 Shipyard Boulevard
Wilmington, NC 28403
(910) 397-0370

Approved Signatory:

Shaenaz Mirmohamed
IH Technician

Tommie Green, CIEC
Professional Industrial Hygienist

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SECTION 1.0 REMEDIATION PROCEDURES

1.1 Project Set Up

- The owner or powers that be shall supply temporary power for remediation equipment. The existing electrical system may be utilized, with permission of the owner or powers that be. Determining specific electrical load/safety requirements, including, but not limited to, the use of a temporary GFCI electrical panel box shall be the responsibility of the abatement contractor.
- HVAC system shall be isolated.
- 6-mil polyethylene sheathing shall be erected to separate primary control areas (PCA) from remaining areas. Control areas shall be selected so that specified building materials (specified herein, in section 1.3, under primary control areas) may be removed or cleaned and dried.
- HEPA Air Filtration Devices shall be utilized for each separate control area. Critical barriers shall consist of 6-mil polyethylene so that primary control areas are isolated from remaining areas. HEPA filtration units shall be exhausted from the PCA to the outside of the building through windows/doors. Dehumidification units must be installed in the PCA to sufficiently dry components.
- A remote wash off station shall be set up to allow for employees to wash hands and faces after egress from the work area.
- Ingress/Egress to the control area(s) shall be, at minimum, sealed with a 2-way polyethylene air lock.
- Entrances to the building shall be marked as indicated in Section 7.4 of this document.

1.2 Local Exhaust System

- Once sealed, the primary control area shall be ventilated with a local HEPA air filtration device that shall ensure a minimum of four (4) air changes per hour. The air filtration device shall be placed within the containment work area.
- Local HEPA exhaust shall be utilized where cleaning of contents is required and/or in the immediate vicinity of remediation activities of building materials.
- In interior sections requiring surface area cleaning, local HEPA filtration may be exhausted within the area to scrub microbials from ambient air. This process shall only be conducted after fine cleaning has been completed.
- Negative pressure within the contained work area shall be maintained throughout the project until clearance is obtained.
- Negative air machines shall be exhausted to exterior portions of the building to adequately ensure that negative pressure is achieved.
- Negative air pressure within the work area shall be tested and recorded at initiation of the project and hourly thereafter by use of a manometer to ensure the desired pressure of -0.02 inches of water, which is comparable to four changes per hour.
- Dehumidification devices with HEPA filtration may be incorporated as filtration devices in conjunction with true HEPA filtration devices; they may not replace the true HEPA filtration devices.

Note: Formula for determination of adequate HEPA filtration:

Total feet per minute =Volume of work area (ft^3)/15 minutes
#AFD Units needed = (Total feet per minute)/Capacity of Unit (ft^3)

- At initiation of final cleaning stages, relative humidity shall be at 40% (+/-3%) and moisture content of wooden components shall be at or below 15% as determined by Delmhorst moisture meter or equivalent meter. Moisture mapping and direct read T/RH shall be recorded by the remediation contractor until the

specified levels have been achieved. Control areas shall be dehumidified during cleaning and mold remediation activities to ensure removal of surface moisture created during application of water. Drying of structural components that have been treated with encapsulating anti-microbial agents will be necessary.

- Moisture levels shall be recorded and documented by the remediation contractor upon successful completion of dehumidification.

1.3 Remediation Specifications

- Prior to commencement of mold remediation activities by the remediation contractor, the source of any water intrusions, leaks, and/or moisture/humidity problems shall be remedied by the owner. If water intrusions, leaks, and/or moisture/humidity problems exist and are not corrected, mold growth can be expected to return.
- All remediation procedures listed that involve the removal of building materials shall employ polyethylene critical barriers, negative air pressure, and HEPA filtration (i.e., primary control areas).
- The remediation contractor shall ensure that the filters are properly capped prior to switching off the air scrubbers. If the filters are not properly capped, the backflow can cause mold spores to re-release back into the control area, essentially re-contaminating an area that has already been cleaned.
- All remediation activities shall be conducted in a manner that does not allow dissemination of mold spores. Remediation procedures shall begin from the side of the control area furthest away from air filtration devices.
- Cleaning procedures shall be repeated until the area is visibly free of dust and debris.
- Engineering controls set up during the remediation process shall remain in place until remediation has been completed and acceptable post remediation sampling results have been achieved.
- **Federal and/or state regulations require that suspect asbestos containing materials in public and commercial buildings shall be inspected for asbestos prior to renovations or demolition. Based on these regulations, PEC recommends that building materials that may be disturbed during mold remediation be tested for asbestos content prior to their disturbance to prevent asbestos contamination.**
- If cleaning procedures outlined in this remediation plan outweigh the cost of replacement for selected items, the remediation contractor shall give the owner the option to clean or dispose of those items.
- Reinstallation of building materials and/or components shall only be conducted once acceptable post remediation results are obtained.
- Any chemicals used on this project shall be EPA approved and used only as directed by the manufacturer. MSDS shall be available for review upon request.

HVAC System

- The HVAC system(s) that services or run through the primary control area/affected area shall be shut down prior to remediation activities.
- The spaces that are normally climate-controlled by the HVAC system that have been shut down shall be maintained under proper humidity levels (between 30 and 60% utilizing dehumidifiers, etc.) while the system is not in operation.
- All HVAC supply/return vents within the primary control area/affected area shall be isolated with a critical barrier (i.e., plastic, etc.) to prevent air flow. Prior to isolating the vents, the register covers (diffusers) shall be removed and the supply shall be isolated at the metal boot. Once isolated, the registers and surrounding building materials shall be cleaned.
- The interior of the air handler and rigid duct system shall be thoroughly cleaned by an HVAC professional experienced in mold remediation. The interior can be cleaned with mechanical methods that aggressively disturb all interior surfaces and filter the disturbed airborne particulates.

- Cleaning of components shall consist of a method that thoroughly removes visible mold growth, settled concentrations of mold spores, and/or dust and debris.
- PEC recommends the removal and disposal of the flex ducts when feasible, as well as any interior duct board where cleaning will damage the duct board. Once removed, the remediation contractor shall isolate the connection point where the flex duct and/or duct board was detached with a critical barrier (such as plastic, etc.) to prevent air flow.
- Once the HVAC system components are cleaned or replaced anew, the system shall remain off and isolated until acceptable post remediation results are obtained.
- A written document shall be obtained from the remediation contractor verifying that the HVAC system has been cleaned by an HVAC cleaning company with mold experience. This document shall include the property address and date of services and shall be filed with other mold remediation documents.

Note: For directional purposes "front" is determined by facing Grass Lane from inside the unit, unless otherwise noted.

Primary Control Areas/Affected Areas

Critical barriers, negative air pressure, and HEPA filtration shall be established to isolate the following areas as Primary Control Areas to perform the specified mold remediation.

Within the rear bedroom closet:

- Remove the baseboards entirely from the front and right walls, and remove any affected drywall (i.e., drywall with apparent water damage/suspect visible mold growth) and extend the drywall removal within a 2-foot radius of the affected area when possible.

Within the bathroom:

- Detach and dispose of the floor mounted cabinet from the front wall, and remove any affected drywall (i.e., drywall with apparent water damage/suspect visible mold growth) and extend the drywall removal within a 2-foot radius of the affected area when possible.

Within the kitchen:

- Detach the floor mounted cabinet from the left wall, and remove any affected drywall (i.e., drywall with apparent water damage/suspect visible mold growth) and extend the drywall removal within a 2-foot radius of the affected area when possible.

Within the laundry area:

- Due to the reported washing machine leak; remove the baseboards entirely from the front, rear, and left walls to assess the exposed drywall and remove any affected drywall (i.e., drywall with apparent water damage/suspect visible mold growth) and extend the drywall removal within a 2-foot radius of the affected area when possible.

Within the kitchen/living room, the rear left bedroom closet, the laundry area and the bathroom (Negative air pressure is not required in areas where building components are not specified for removal, but HEPA filtration is required):

- Clean all surfaces as specified herein under general specifications for primary control areas.

General Specifications for Primary Control Areas

- Open plumbing lines and drains within the control areas shall be isolated with a critical barrier consisting of 6-mil poly.

- The water line to toilets within the control areas shall be shut off and the toilets shall be isolated with a critical barrier consisting of 6-mil poly.
- Cleaning of components/materials shall consist of a method that thoroughly removes visible mold growth, settled concentrations of mold spores, and/or dust and debris (i.e., HEPA vacuuming, wet wiping, or other approved methods), followed by dehumidification/drying.
- Exterior surfaces of electrical appliances, electrical equipment, and light fixtures shall be cleaned, utilizing wet method and HEPA vacuuming. These items shall be disconnected from all electrical sources prior to cleaning. If these items cannot be cleaned efficiently, the abatement contractor shall consult with the owner/powers that be.
- In areas where drywall removal is specified around windows and doors, remove trim boards. The door casing(s) shall also be assessed to determine if they have sustained mold/water damage. If so, they shall be cleaned, or removed.
- All wall/ceiling cavity insulation shall be disposed in areas that specify the removal of drywall/wallboard. The abatement contractor shall visually inspect the back side of surrounding drywall/wallboard for water damage and/or suspect mold growth and document any findings. If additional suspect mold growth or water damage is observed beyond the specified removal area, additional drywall/wallboard shall be removed until no suspect mold growth or water damage is observed.
- All penetrations within the controlled area that adjoin unaffected or non-accessible areas, including outdoor areas, crawlspaces, etc., shall be cleaned (as far as one can reach) and then sealed with 6-mil poly, extending six (6) inches on all sides.
- In areas of specified wallboard removal, all components within the wall/ceiling cavities shall be cleaned. Any wooden structural components with mold stains or mold growth in pitted surfaces shall be HEPA sanded (or other approved methods) to eliminate embedded mold growth.
- All joints or sills (where the structural system meets, where the sill plate meets the floor, etc.) shall be aggressively disturbed to remove embedded mold growth and spores.

1.4 Removal Procedures

The contractor shall maintain surfaces of the control area free of accumulation of dust and debris. Additionally, they shall restrict the spread of dust and debris, keeping waste from being distributed over the work area. Materials shall be removed in a fashion to ensure that previously cleaned areas are not recontaminated (i.e. working from one end of the control area to the other). The contractor may be required to re-clean areas based on a visual inspection by the CIEC/CIE/IH, if the areas are not visibly clean.

Contaminated building materials that have been removed, and additional materials and debris generated during remediation, shall be bagged or wrapped with 6-mil polyethylene sheeting, sealed with duct tape, and carried to the waste container prior to visual inspection by the CIEC/CIE/IH. Materials shall be bagged and sealed directly after removal from unaffected building components.

Areas shall be allowed to dry for a period until specified RH and moisture levels have been achieved. Any remaining building products that are directly impacted by remediation shall be tested for moisture content. Wooden and cellulosic building components (e.g., wall studs, drywall, etc.) shall be tested for moisture content. If the moisture content is > 15% in wood products or > 12% in cellulosic products (utilizing a Delmhorst moisture meter), dehumidification shall be required until moisture levels are at or below said levels, and the RH level is at or below 40% +/-3% (for all interior areas). The remediation contractor shall verify water content of all wooden and cellulosic building components within the impacted areas, as well as temperature and RH prior to scheduling post remediation verification.

1.5 Cleanup Overview

The contractor shall personally review the cleaning process prior to contacting the CIEC/CIE/IH for the post

remediation testing. If accumulations of debris and dust are significant, the CIEC/CIE/IH will require re-cleaning prior to post remediation verification sampling.

The CIEC/CIE/IH shall make a visual inspection and conduct post remediation sampling after the final cleaning is complete.

1.6 Post Remediation Verification Testing

Prior to conducting post remediation sampling, HEPA filtration devices shall be allowed to operate for a minimum of 48 hours (the equivalent of 192 air changes), following fine cleaning, in all areas where remediation has been conducted. The HEPA filtration devices shall be sealed at the intake and turned off approximately two hours prior to post testing and reconvene within one hour after post testing, until acceptable post remediation results are established.

Post remediation sampling shall be conducted utilizing viable and/or non-viable sample methods. Air samples shall be collected in representative areas of the control areas. Surface sampling may be conducted at the discretion of the CIEC/CIE/IH.

Sampling shall be conducted in areas directly impacted by remediation procedures, where cleaning was conducted. The CIEC/CIE/IH shall determine acceptable post remediation status through interpretation of air sampling results, which will be based on indoor/outdoor comparisons, in combination with any surface samples collected, moisture readings, RH readings, visual observations, and any other pertinent information.

The owner/client will be responsible for post remediation testing. If air sample results indicate unacceptable airborne concentrations, the contractor shall be required to conduct a re-cleaning at the contractor's expense and absorb the cost for re-testing, until acceptable results are achieved.

SECTION 2.0 SCOPE OF WORK (Note: Section 2 and Section 1.3 are essential to the full Scope of the Contractor's Work)

2.1 Investigative Reports and Other Related Documents

Phoenix EnviroCorp initial investigative report dated April 15, 2021.

Phoenix EnviroCorp investigative report dated May 12, 2021, and June 9, 2021.

Phoenix EnviroCorp Chain of Custody dated April 13, 2021, and May 7, 2021

Analytical reports dated April 14, 2021, and May 10, 2021.

2.2 Project Description

The procedures covered by this program include the enclosure and drying of the said structure, the removal, handling, and disposal of building components compromised by mold/fungal growth, and the cleaning and disinfecting of existing building materials. Procedures for reconstruction are not considered in these specifications. Reconstruction of interior portions may not be conducted until procedures for remediation have been completed, the control areas have been inspected, and testing has returned acceptable post remediation results. Reconstruction of exterior portions may be conducted during the restoration to ensure that water intrusion is abated.

The objectives covered by the program include the remediation of materials shown to have surface

contamination, water damage, and/or exposure to elevated airborne mold spore levels, without subjecting the workers, installation employees, and occupants to microbial contaminants. In addition, contract employees, occupants, and materials will be appropriately protected during the removal process so that present and future exposures will not occur.

This protocol is provided as a guideline. Any deviation requests from this protocol shall be addressed to the CIEC/CIE/IH for consideration. At present there are no Federal or State requirements regarding microbial remediation projects; however, OSHA General Construction Code of Federal Regulations (29 CFR 1926) shall be followed.

Remediation shall be completed as close to the date that this protocol was drafted, as the specifications outlined within represent conditions at the time the investigative services were conducted. Due to the volatility of mold, the current protocol may not reflect all necessary remediation if conditions are allowed to continue. Further, if time lapses allowing conditions to change, it will become increasingly difficult to obtain successful clearance testing results.

SECTION 3.0 AIR MONITORING

3.1 Responsibilities of the CIEC/CIE/IH

Monitoring of airborne concentrations will be performed in accordance with the requirements of this program. Prior to conducting air sampling and/or surface sampling for clearances, the CIEC/CIE/IH shall conduct a visual inspection of the area. Temperature and RH shall be recorded during the air sampling phase of clearance. All air sampling shall be conducted in such a manner as to provide a valid representation of airborne mold levels both inside and outside the work areas. If analysis of air samples indicates that airborne concentrations exceed acceptable limits, the contractor shall conduct re-cleaning at the contractor's expense.

3.2 Personal Monitoring

No personal monitoring will be conducted by the CIEC/CIE/IH unless the remediation contractor requests monitoring for OSHA compliance. Presently there are no guidelines (PELs or TLVs) for microbial contaminants. It is the remediation contractor's responsibility to determine if OSHA personal sampling may be required during application of anti-microbial agents.

3.3 Sample Integrity and Reporting

Samples shall be sealed, labeled, and a chain of custody initiated according to laboratory procedures.

Sample results shall be available within seven (7) days of the completion of collection of all samples and will include the following information:

- Site Address
- Sample Number
- Location Sampled
- Analytical Method
- Collection Date(s)
- Person Taking Sample(s)
- Additional Comments (if any)
- Analyst Signature

SECTION 4.0 MATERIAL REPLACEMENT

4.1 Material Replacement

The general contractor/replacement contractor may begin material replacement after the CIEC/CIE/IH informs all parties of acceptable post remediation sample results.

With ongoing construction activities ambient air levels are expected to be elevated over what might be normally expected. Additional testing should not be necessary after remediation procedures have been completed and successful results have been obtained. In the event of another water intrusion (i.e. broken-pipe-line, improper HVAC function, or building envelope compromise), an investigation shall be conducted within 24 to 48 hours of the event. Proper drying, if initiated within this time frame, should minimize the potential for microbial growth.

SECTION 5.0 SPILL CLEANUP REQUIREMENTS

5.1 Spills

MSDS shall be kept on site for all chemical products brought to the site by the remediation contractor. In the event of a chemical spill, the contractor shall initiate cleanup immediately. The contractor shall mop up any liquid with rags or other conventional absorbent. The spent absorbent shall be properly contained and disposed of as waste.

SECTION 6.0 WASTE CONTROL

6.1 Waste Disposal

Waste shall be disposed of at a locally selected landfill. Waste bags shall be checked for integrity and hauled in an enclosed truck/vehicle or container to ensure that transportation to the landfill does not pose a potential hazard to the environment.

SECTION 7.0 SUPPLEMENTAL INFORMATION

7.1 Applicable Publications

The publications listed below form part of this program. Written programs shall accompany all referenced CFR publications. IICRC and NYCDOH guidelines for work procedures shall be followed by the remediation contractor. A copy of the NYCDOH protocols shall be on-site, along with this design, for reference by the site supervisor. ACGIH, IAQA, and ASHRAE publications shall be utilized as guidelines for interpretation by the CIEC/CIE/IH. This design shall be reviewed by the remediation supervisor prior to initiation of set-up for the project. Any questions regarding this project may be addressed with the on-site consultant listed for Phoenix EnviroCorp.

Code of Federal Regulation (CFR Publications)

29 CFR 1910.134	Respiratory Protection
29 CFR 1910.145	Specifications for Accident Prevention, Signs and Tags
29 CFR 1926.28	Personal Protective Equipment

29 CFR 1926.59	Hazard Communication
29 CFR 1926.96	Occupational Foot Protection
29 CFR 1926.100	Head Protection
29 CFR 1926.101	Hearing Protection
29 CFR 1926.102	Eye and Face Protection
29 CFR 1926.403	Electrical General Requirements
29 CFR 1926.416	Safety General Requirements
29 CFR 1926.852	Demolition, Chutes
29 CFR 1926.1091	Record Keeping Requirements

Supplemental Guidelines

IICRC S520 2nd ed.	Standard and Reference Guide for Professional Water Damage Restoration
NYCDOH	Guidelines on Assessment and Remediation of Fungi in Indoor Environments
ACGIH	Bioaerosols: Assessment and Control
IAQA 01-2000	Recommended Guidelines for Indoor Environments
ASHRAE 62.2-2007	Ventilation for Acceptable Indoor Air Quality in Low-Rise Residential Buildings

7.2 Definitions

Air Lock: A system that permits ingress and egress between a control area and non-control area, or other work areas, without allowing air movement between areas (e.g., three stage decon, three-way polyethylene flaps).

Air Sample: Refers to samples collected with spore trap air sample media (e.g., Micro-5, Cyclex D, or equivalent); also referred to as a non-viable air sample. May also refer to a sample collected on a disposable petri dish with Agar media by means of an Andersen Impactor (or equivalent) and sampling pump; also referred to as air culture (viable) sample. Sample media to be used in project is described under Section 1.6 (Post Remediation Verification Testing).

Area Monitoring: The sampling of airborne microbial concentrations outside the exclusion boundary, which may reach the breathing zone of the contractor or installation employees.

Asbestos Containing Materials (ACM): Refers to asbestos containing building materials that contain more than 1% asbestos by Polarized Light Microscopy (PLM) or Transmission Electron Microscopy (TEM).

Biocide: Refers to chemical agents that are specifically designed to eliminate viable microbial contamination, with a phenol equivalent efficiency (e.g., Sodium Hypochlorite, Quaternary Ammonia Compounds).

Blower Door Test: Refers to the testing of static pressure and draw of air through the HVAC in cubic feet per minute (CFM) to rate the efficiency of the system.

Clearance Monitoring: Refers to air, bulk, or swab sampling conducted as a means to demonstrate that the area specified for remediation has been completed by the contractor, left with present acceptable mold spore levels, and ready for re-construction.

Control Area: The area where microbial contaminants removal is performed, which is isolated by physical boundaries to prevent unauthorized entry of personnel, thereby preventing exposure to or the spread of microbial contaminants. Physical boundaries will be established and located such that the airborne contaminants are not allowed to escape the boundaries.

HEPA: High Efficiency Particulate Air. Refers to ventilation devices that are specifically designed to filter ambient air to an efficiency of 99.97%.

HVAC: Refers to the Heating, Ventilation, and Air Conditioning system.

Industrial Hygienist: Refers to a person who practices industrial hygiene and may act as a competent person regarding visual inspection of contaminated surfaces and clearance air and/or swab/bulk sampling. May also refer to a Certified Industrial Hygienist (CIH) as defined by the American Board of Industrial Hygiene (ABIH), a Certified Indoor Environmental Consultant as defined by the American Council for Accredited Certification (ACAC), or a Certified Indoor Environmentalist (CIE) as defined by the American Council for Accredited Certification (ACAC).

Microbial Contaminant: Refers to viable mold, fungi, pollen, bacteria, and or particulate, or their metabolites, that may be causative of epidemiological, immunotoxic, dermotoxic, neurotoxic, or enterotoxic disorders in the human population, or may be considered a pathogen or an opportunistic pathogen.

Non-Porous Materials: Refers to building materials with solid surfaces that may be successfully treated and cleaned by means of HEPA vacuuming or other approved method. Materials include flooring, hard goods, plastic, vinyl, and some wallboard systems.

Porous Materials: Refers to building materials and household goods that may allow microscopic particles (3-20 micron) to become trapped within the material that will not allow adequate cleaning. Materials include carpet, mattresses, and clothing.

Primary Control Area (PCA): Refers to a section of a facility that has been isolated by 6-mil polyethylene barriers where specific engineering controls (e.g., HEPA filtration, negative air pressurization, dehumidification, etc.) are required. In general, it is the area where remediation of water and mold damaged building materials is to be conducted.

Refrigerant Dehumidifier: Device used to remove water content from air and materials.

Relative Humidity (RH): Refers to the ratio of water vapor in the atmosphere to the amount required to saturate it at a given temperature.

Semi-Porous Materials: Refers to materials that may be somewhat porous, yet they may still allow for adequate cleaning. Materials include wooden beams and some wallboard systems.

Swab Sample: Refers to collection of a sample onto a sterile swab for analysis of mold, fungi, and bacteria by viable and/or non-viable analysis.

Tape-Lift Sample: Refers to collection of a sample onto clear scotch tape for analysis by direct microscopic examination (non-viable).

7.3 Quality Assurance

Medical Examinations

Before potential exposure to microbial contaminants, the remediation contractor shall provide workers with a comprehensive medical examination as required by 29 CFR 1910.134 as outlined by the Medical Monitoring

Program.

Medical Records

The remediation contractor shall maintain complete and accurate medical records on employees as required by OSHA and the contractor's Medical Monitoring Program. The contractor may be asked to provide a copy of all medical records for approval by the consultant's representative.

Training

Each employee working on this contract shall be trained prior to the time of initial job assignment in accordance with mold specific and chemical specific training as indicated by the OSHA General Duty Clause and the Hazard Communication Standard. Each employee shall also receive training required by Federal guidelines listed in Section 7.1 of this document and project specifications.

Hazard Communication Program

The remediation contractor has established and implemented a Hazard Communication Program as required by 29 CFR 1910.1200 and may be asked to provide a copy of this written program. Hazard Communication training must include occupational hazards as directly related to working with fungi/mold and contamination of building components by fungal contamination, specific training for chemical hazards associated with biocide usage, and site specific MSDS sheets for commercial detergents and biocides utilized on the job site.

Respiratory Protection Program

The remediation contractor has established a Respiratory Protection Program, which complies with 29 CFR 1910.134. Physical examinations and fit testing are required for use of respiratory protection greater than an N-95 dust mask. Workers removing building materials contaminated by mold growth, applying anti-microbial agents, or workers subjected to exposures to anti-microbial agents shall be required to wear, at minimum, a tight-fitting negative pressure ½ mask respirator with P-100 filters. Therefore, -he OSHA Respiratory Protection Standard applies.

Analytical Testing Laboratory

Analysis of culturable biological samples collected on this project shall be conducted by a laboratory that participates in the Environmental Microbiological Proficiency Analytical Testing Program (EMPAT) of the American Industrial Hygiene Association (AIHA) and has shown to be proficient by proficiency analytical testing (PAT) samples. Analysis of non-viable air and surface samples shall be conducted by a competent person.

7.4 Materials and Equipment

Equipment

The contractor shall make available to employees a complete set of personal protective equipment (PPE) as required by this program for entry into the controlled area. All personnel while in the control area or handling microbial contaminated waste shall wear protective clothing, respirators, and other PPE.

Respirators

Contractor shall furnish the appropriate respirator in accordance with 29 CFR 1910.134 and approved by NIOSH for protection in environments that contain microbial contaminants. The selected respirator for this project shall be a tight-fitting negative pressure ½ respirator equipped with HEPA cartridge (P-95, P-100). At minimum, an N-95 dust mask may be utilized during fine cleaning activities; however, the tight fitting ½ mask respirator shall be utilized during application of anti-microbial agents or biocides.

Special Clothing

Employees shall be provided with and required to wear: whole body disposable protective clothing, full body tyvek suits with head coverings, and latex gloves *(see table)* during all activities in the controlled area.

Chemical	Recommended Rubber Glove
Sodium Hypochlorite	Neoprene or Nitrile
Phenolic Compounds	Neoprene
Quaternary Ammonia Compounds	Polyvinyl Chloride (PVC)
Detergents	Latex

Eye Protection

The contractor shall provide chemical-resistant goggles to personnel engaged in cleaning and treatment activities and require them to be worn during application of anti-microbial agents and biocides.

Warning Signs and Labels

Standard approved warning signs shall be erected at all approaches to the control area as specified in 29 CFR 1910.145.

Anti-Microbial Agents

Anti-microbial agents utilized in interior quarters shall consist of quaternary ammonia compounds. No phenolic compounds shall be used in interior quarters with exception of Micro Ban Plus. Approval must be granted by the owner/powers that be prior to application. Anti-microbial agents shall be EPA approved. Commercial grade detergents shall be used to remove fungal contamination during cleaning phases prior to anti-microbial application, to include encapsulation.

Phoenix EnviroCorp

April 14, 2021

Quanesha Mullins
Wilmington Housing Authority
1524 S. 16th Street
Wilmington, NC 28401

RE: PEC Job # 21-21-116-IAQ-M; 302 Grass Lane, Unit 211, Wilmington, NC – Mold Investigation/Background air sampling

Enclosed are the results of the mold investigation conducted at the above referenced unit on April 13, 2021. Phoenix EnviroCorp (PEC) was retained to conduct background air sampling to determine airborne mold spore levels and to collect surface samples of suspect visible mold growth.

Background Information: The tenant reported that they have not seen mold in their unit, but there was mold in the unit beneath them.

The HVAC system was operating in the cool mode, set at 76º F upon PEC's arrival and during sampling.

Note: For directional purposes, "front" is determined by facing Grass Lane from inside the unit, unless otherwise stated.

Visual Inspection: PEC's visual inspection noted the following:

- No suspect visible mold growth observed

Mold Testing – Air: Non-viable spore trap air samples were collected to determine airborne mold spore levels. Samples were collected within the kitchen/living room, the rear right bedroom, the rear left bedroom, and the bathroom. *Micro 5 sampling media was utilized for the collection of spore trap air samples. Each sample ran for five (5) minutes at a flow rate of five (5) liters per minute for a total volume of twenty-five (25) liters per sample. Each sample was assigned a unique ID number and shipped to a third-party laboratory for analysis. All air samples were collected from centralized locations (within their respective areas) and within the breathing zone, unless otherwise noted.* Two samples were also collected outdoors for comparative purposes.

Results indicated acceptable levels of airborne mold spores in all sampled locations.

The interpretation of air sample results is based on indoor/outdoor comparisons, in combination with a study by Daniel M. Baxter, entitled "A Regional Comparison of Mold Spore Concentrations Outdoors and Inside "Clean" and "Mold Contaminated" Southern California Buildings", and other industry guidelines, as well as over 20 years of experience in industrial hygiene and mold testing.

In layman terms, acceptable levels indicate that the levels are below the outdoor level and/or the baseline levels (whichever is higher) stated below. Elevated levels indicate that the levels are above the outdoor level and/or the baseline level.

Baseline levels for indoor spore trap air samples are as follows: < 900 spores/m³ for Penicillium/

Aspergillus; 0 spores/m³ for Stachybotrys and Chaetomium; and < 350 spores/m³ for other individual mold groups.

Relative Humidity (RH): *Temperature and relative humidity readings were collected in the same locations as the spore trap air samples.* RH levels within the unit ranged from 53.9% - 59.1% with an outdoor RH level of 49.3% (see the enclosed Chain of Custody for details). Per the American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) Standard 62-1999, relative humidity should range between 30% and 60%. Consistent RH levels above 60% are conducive to mold growth.

Conclusions: Air sampling within the tested areas did not indicate a problem with the indoor air quality regarding mold, and there was no suspect visible mold growth observed.

Enclosed in this report are the laboratory analysis and the Chain of Custody.

Should you have any questions, please do not hesitate to call.

Thank you,

Shaenaz Mirmohamed
IH Technician

Tommie Green, CIEC
Professional Industrial Hygienist

Enclosures

Samples accepted

Phoenix EnviroCorp
4020 SHIPYARD BLVD.
WILMINGTON, NC 28403

CHAIN OF CUSTODY

LABORATORY TEST REQUEST

Seemi Ref # 21041402l

LAB ID: 065-068

CONTACT: Shaenaz Mirmohamed	TELEPHONE (910) 397-0370 FAX (910) 313-6094	Sample date: 4/13/2021
PEC Job #: 21-21-116-IAQ-M	SITE ADDRESS: 302 Grass Lane, Unit 211, Wilmington, NC 28401	

PLEASE EMAIL RESULTS TO: KMGREEN@PHOENIXENVIROCORP.COM

SAMPLE TYPE:	NUMBER OF SAMPLES:	TURN AROUND TIME SPECIFIED:
Spore Trap - Micro-5 Surface Samples	4	____ Immediate _____ 24 hr _____ 48 hr __X__ Standard

Sample #	Sample Area	Sample Volume	Lab Analysis Requested	% Relative Humidity	Temperature °F
041321-SM-101	Kitchen/living room	25L	S001	59.1	75.4
041321-SM-102	Rear right bedoom	25L	S001	54.3	74.6
041321-SM-103	Rear left bedroom	25L	S001	54.4	74.6
041321-SM-104	Bathroom	25L	S001	53.9	74.6

Samples Collected By (Printed Name and Signature): Shaenaz Mirmohamed Date Signed: 4/13/2021

CHAIN OF CUSTODY RECORD

DATE:	Time:	Condition of Samples:	RELINQUISHED BY: (Printed Name and Signature)	ACCEPTED BY: (Printed Name and Signature)
4/13/2021	14:00	Intact	Shaenaz Mirmohamed AFFILIATION:	JM 4-14-21 AFFILIATION:

SEEML Reference Number:
210414021

Southeast Environmental Microbiology Laboratories
102 Edinburgh Court
Greenville, SC 29607
Phone: (864) 233-3770
FAX: (864) 233-6589

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

- ☐ Surface/Bulk Report
- ☒ Spore Trap Report
- ☐ Andersen Fungal Report
- ☐ Quantitative Fungal Report

Lab Manager Review: *Angel Gosnell* Date: 04/14/21

Thank you for using SEEML laboratories. We strive to provide superior quality and service.
SEEML laboratories are accredited through AIHA-LAP, LLC (EMLAP # 173667) for the analysis of Spore Traps and Surface/Bulk Samples.

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

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

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

Spore Trap Report

	Date Sampled: 04/13/21
Attn: ***Phoenix Enviro Corp.***	Date Received: 04/14/21
4020 Shipyard Blvd.	Date Analyzed: 04/14/21
Wilmington, NC 28403	Date Reported: 04/14/21
	Date Revised:
	Project Name: 21-21-116-IAQ-M
	Project Address: 302 Grass Lane, Unit 211
	Project City, State, ZIP: Wilmington, NC 28401
	SEEML Reference # : 210414021

TEST METHOD: DIRECT MICROSCOPY EXAMINATION SEEML SOP 7

Client Sample ID	041321-SM-101			041321-SM-102			041321-SM-103		
Location	Kitchen / Living Room			Rear Right Bedroom			Rear Left Bedroom		
Lab Sample ID	210414021-065			210414021-066			210414021-067		
Comments									
Hyphal Fragments	1	40							
Pollen									
Spore Trap Used	M5			M5			M5		
	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%
Alternaria									
Ascospores									
Basidiospores	2	80	25						
Bipolaris/Drechslera									
Chaetomium									
Cladosporium	1	40	13	None			1	40	33
Curvularia				Detected					
Epicoccum									
Cercospora									
Fusarium									
Memnoniella									
Nigrospora									
Penicillium/Aspergillus	5	200	63				2	80	67
Polythrincium									
Rusts									
Smuts/Periconia/Myxomy									
Spegazzinia									
Stachybotrys									
Stemphylium									
Tetraploa									
Torula									
Ulocladium									
Colorless/Other Brown*									
Oidium									
Zygomycetes									
Pithomyces									
Background debris (1-5)**	3			4			3		
Sample Volume(liters)	25			25			25		
TOTAL SPORES/M^3	8	**320**		0			3	**120**	

Revisions:

Spore types listed without a count or data entry were not detected during the course of the analysis for the respective sample, indicating a raw count of <1 spore.

The analytical sensitivity is the spores/m^3 divided by the raw count, expressed in spores/m^3. The limit of detection is the analytical sensitivity (in spores/m^3) multiplied by the sample volume (in liters) divided by 1000 liters.

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

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

Disclaimer: The sample results are determined by the sample volume, which is provided by the customer.
This report relates only to the samples tested as they were received.

102 Edinburgh Court
Greenville, SC. 29607
Phone: (864) 233-3770

Angel Gosnell

Angel Gosnell, Approved Laboratory Signatory

Spore Trap Report

	Date Sampled: 04/13/21
Attn: ***Phoenix Enviro Corp.***	Date Received: 04/14/21
4020 Shipyard Blvd.	Date Analyzed: 04/14/21
Wilmington, NC 28403	Date Reported: 04/14/21
	Date Revised:
	Project Name: 21-21-116-IAQ-M
	Project Address: 302 Grass Lane, Unit 211
	Project City, State, ZIP: Wilmington, NC 28401
	SEEML Reference # : 210414021

TEST METHOD: DIRECT MICROSCOPY EXAMINATION SEEML SOP 7

Client Sample ID	041321-SM-104		
Location	Bathroom		
Lab Sample ID	210414021-068		
Comments			
Hyphal Fragments			
Pollen			
Spore Trap Used	M5		
	raw ct.	spores/m^3	%
Alternaria			
Ascospores			
Basidiospores	5	200	36
Bipolaris/Drechslera			
Chaetomium			
Cladosporium	5	200	36
Curvularia			
Epicoccum			
Cercospora			
Fusarium			
Memnoniella			
Nigrospora			
Penicillium/Aspergillus	4	160	29
Polythrincium			
Rusts			
Smuts/Periconia/Myxomy			
Spegazzinia			
Stachybotrys			
Stemphylium			
Tetraploa			
Torula			
Ulocladium			
Colorless/Other Brown*			
Oidium			
Zygomycetes			
Pithomyces			
Background debris (1-5)**	3		
Sample Volume(liters)	25		
TOTAL SPORES/M^3	14	**560**	

Revisions:

Spore types listed without a count or data entry were not detected during the course of the analysis for the respective sample, indicating a raw count of <1 spore.
The analytical sensitivity is the spores/m^3 divided by the raw count, expressed in spores/m^3. The limit of detection is the analytical sensitivity (in spores/m^3) multiplied by the sample volume (in liters) divided by 1000 liters.
*Colorless,other Brown are spores without a distinctive morphology on spore traps and non-viable surface samples.
**Background debris is the amount of particulate matter present on the slide and is graded from 1-5 with 1 = very light, 2= Light, 3 = Medium, 4 = Heavy, 5 = Very Heavy. The higher the rating the more likelihood spores may be underestimated. A rating of 5 should be interpreted as minimal counts and may actually be higher than reported.

Disclaimer: The sample results are determined by the sample volume, which is provided by the customer.
This report relates only to the samples tested as they were received.

102 Edinburgh Court
Greenville, SC. 29607
Phone: (864) 233-3770

Angel Gosnell
Angel Gosnell, Approved Laboratory Signatory

Samples aliented

Phoenix EnviroCorp
4020 SHIPYARD BLVD.
WILMINGTON, NC 28403

CHAIN OF CUSTODY

LABORATORY TEST REQUEST

Seemi Rs#2104140 18

lab ID: 051-052

CONTACT: Shaenaz Mirmohamed	TELEPHONE (910) 397-0370 FAX (910) 313-6094	Sample date: 4/13/2021
PEC Job #: 21-21-113, 114, &116-IAQ-M	SITE ADDRESS:	302 Grass Lane, Units 210, 211, & 108, Wilmington, NC 28401

PLEASE EMAIL RESULTS TO: KMGREEN@PHOENIXENVIROCORP.COM

SAMPLE TYPE:	NUMBER OF SAMPLES:	TURN AROUND TIME SPECIFIED:
Spore Trap - Micro-5 Surface Samples	2	____ Immediate ____ 24 hr ____ 48 hr __X__ Standard

Sample #	Sample Area	Sample Volume	Lab Analysis Requested	% Relative Humidity	Temperature °F
041321-SM-301	Outside - Front - 2nd floor	25L	S001	49.3	70.5
041321-SM-302	Outside - Front - 1st floor	25L	S001		

Samples Collected By (Printed Name and Signature): Shaenaz Mirmohamed Date Signed: 4/13/2021

CHAIN OF CUSTODY RECORD

DATE:	Time:	Condition of Samples:	RELINQUISHED BY: (Printed Name and Signature)	ACCEPTED BY: (Printed Name and Signature)
4/13/2021	14:00	Intact	Shaenaz Mirmohamed AFFILIATION:	JM 4-14-21 AFFILIATION:

SEEML Reference Number: 210414018

Southeast Environmental Microbiology Laboratories
102 Edinburgh Court
Greenville, SC 29607
Phone: (864) 233-3770
FAX: (864) 233-6589

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

- ☐ Surface/Bulk Report
- ☒ Spore Trap Report
- ☐ Andersen Fungal Report
- ☐ Quantitative Fungal Report

Lab Manager Review: *Angel Gosnell* Date: 04/14/21

Thank you for using SEEML laboratories. We strive to provide superior quality and service.
SEEML laboratories are accredited through AIHA-LAP, LLC (EMLAP # 173667) for the analysis of Spore Traps and Surface/Bulk Samples.

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

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

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

Spore Trap Report

	Date Sampled: 04/13/21
Attn: ***Phoenix Enviro Corp.***	Date Received: 04/14/21
4020 Shipyard Blvd.	Date Analyzed: 04/14/21
Wilmington, NC 28403	Date Reported: 04/14/21
	Date Revised:
	Project Name: 21-21-113, 114, & 116-IAQ-M
	Project Address: 302 Grass Lane, Units 210,211, & 108
	Project City, State, ZIP: Wilmington, NC 28401
	SEEML Reference # : 210414018

TEST METHOD: DIRECT MICROSCOPY EXAMINATION SEEML SOP 7

Client Sample ID	041321-SM-301			041321-SM-302					
Location	Outside - Front - 2nd Floor			Outside - Front - 1st Floor					
Lab Sample ID	210414018-051			210414018-052					
Comments									
Hyphal Fragments	4	160							
Pollen	29	1160							
Spore Trap Used	M5			M5					
	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%			
Alternaria									
Ascospores	122	4880	31	10	400	17			
Basidiospores	142	5680	36	19	760	32			
Bipolaris/Drechslera									
Chaetomium									
Cladosporium	125	5000	32	30	1200	50			
Curvularia									
Epicoccum									
Cercospora									
Fusarium									
Memnoniella									
Nigrospora									
Penicillium/Aspergillus				1	40	2			
Polythrincium	1	40	<1						
Rusts									
Smuts/Periconia/Myxomy									
Spegazzinia									
Stachybotrys									
Stemphylium									
Tetraploa									
Torula									
Ulocladium									
Colorless/Other Brown*									
Oidium									
Zygomycetes									
Pithomyces									
Background debris (1-5)**	3			3					
Sample Volume(liters)	25			25					
TOTAL SPORES/M^3	390	**15600**		60	**2400**				

Revisions:

Spore types listed without a count or data entry were not detected during the course of the analysis for the respective sample, indicating a raw count of <1 spore.

The analytical sensitivity is the spores/m^3 divided by the raw count, expressed in spores/m^3. The limit of detection is the analytical sensitivity (in spores/m^3) multiplied by the sample volume (in liters) divided by 1000 liters.

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

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

Disclaimer: The sample results are determined by the sample volume, which is provided by the customer.
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Angel Gosnell

Angel Gosnell, Approved Laboratory Signatory

Fungal Descriptions

Alternaria sp.

Aw - 0.89. Conidia dimensions: 18-83 x 7-18 microns. A very common allergen with an IgE mediated response. It is often found in carpets, textiles and on horizontal surfaces in building interiors. Often found on window frames. Outdoors it may be isolated from samples of soil, seeds and plants. It is commonly found in outdoor samples. The large spore size, 20 - 200 microns in length and 7 - 18 microns in sizes, suggests that the spores from these fungi will be deposited in the nose, mouth and upper respiratory tract. It may be related to bakers' asthma. It has been associated with hypersensitivity pneumonitis. The species *Alternaria alternata* can produce tenuazonic acid and other toxic metabolites that may be associated with disease in humans or animals. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include edema and bronchospasms; chronic cases may develop pulmonary emphysema.

Ascospore

A spore borne in a special cell called an ascus. Spores of this type are reported to be allergenic. All ascomycetes, members of a group of fungi called Ascomycotina, have this type of spore. The minute black dots on rotting wood and leaves or the little cups on lichens are examples of ascomycetes; another is the "truffle" mushroom.

Aspergillus/Penicillium

These are two of the most commonly found allergenic fungi in problem buildings. *Aspergillus* comes in many varieties (species). Many of the varieties produce toxic substances. It may be associated with symptoms such as sinusitis, allergic bronchopulmonary aspergillosis, and other allergic symptoms. *Penicillium* is a variety of mold that is very common indoors and is found in increased numbers in problem buildings. It also has many varieties, some of which produce toxic substances. The symptoms are allergic reactions, mucous membrane irritation, headaches, vomiting, and diarrhea. Due to the morphological similarity of *Aspergillus* and *Penicillium*, they are not differentiated by microscopic analysis and are reported together.

Aspergillus sp.

Aw 0.75 - 0.82. Reported to be allergenic. Members of this genus are reported to cause ear infections. Many species produce mycotoxins that may be associated with disease in humans and other animals. Toxin production is dependent on the species or a strain within a species and on the food source for the fungus. Some of these toxins have been found to be carcinogenic in animal species. Several toxins are considered potential human carcinogens. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include edema and bronchospasms; chronic cases may develop pulmonary emphysema; may also be associated with sinusitis, allergic bronchopulmonary aspergillosis, and other allergic symptoms.

Basidiospore

Spore from basidiomycetes. Many varieties are reported to be allergenic.

Bipolaris sp.

A fungus with large spores that could be expected to be deposited in the upper respiratory tract. This fungus can produce the mycotoxin - sterigmatocystin, which has been shown to produce liver and kidney damage when ingested by laboratory animals.

Botrytis sp.

Aw 0.93. Conidia dimensions: 7-14 x 5-9 microns. It is parasitic on plants and soft fruits. Found in soil and on house plants and vegetables, it is also known as "gray mold". It causes leaf rot on grapes, strawberries, lettuce, etc. It is a well-known allergen, producing asthma type symptoms in greenhouse workers and "wine grower's lung".

Cercaspora

Common outdoors in agricultural areas, especially during harvest. Parasite of higher plants, causing leaf spot. Commonly found as parasites on higher plants.

Chaetomium sp.

large ascomycetous fungus producing perithecia. It is found on a variety of substrates containing cellulose, including paper and plant compost. It has been found on paper in sheetrock. It can produce an *Acremonium*-like state on fungal media. Varieties are considered allergenic and have been associated with peritonitis, cutaneous lesions, and system mycosis.

Cladosporium sp.

Aw 0.88; Aw 0.84. Most commonly identified outdoor fungus. The outdoor numbers are reduced in the winter. The numbers are often high in the summer. Often found indoors in numbers less than outdoor numbers. It is a common allergen. Indoor *Cladosporium* sp. may be different than the species identified outdoors. It is commonly found on the surface of fiberglass duct liners in the interior of supply ducts. A wide variety of plants are food sources for this fungus. It is found on dead plants, woody plants, food, straw, soil, paint, and textiles. Produces greater than 10 antigens. Antigens in commercial extracts are of variable quality and may degrade within weeks of preparation. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include skin lesions, eye ulceration, mycosis (including onychomycosis, an infection of the nails of the feet or hands) edema and bronchospasms; chronic cases may develop pulmonary emphysema.

Curvularia sp.

Reported to be allergenic and has been associated with allergic fungal sinusitis. It may cause corneal infections, mycetoma, and infections in immune compromised hosts.

Dreschlera sp.

Conidia dimensions: 40-120 x 17-28 microns. Found on grasses, grains and decaying food. It can occasionally cause a corneal infection of the eye.

Epicoccum sp.

Conidia dimensions: 15-25 microns. A common allergen. It is found in plants, soil, grains, textiles and paper products.

Fusarium sp.

Aw 0.90. A common soil fungus. It is found on a wide range of plants. It is often found in humidifiers. Several species in this genus can produce potent trichothecene toxins. The trichothecene (scirpene) toxin targets the following systems: circulatory, alimentary, skin, and nervous. Produces vomitoxin on grains during unusually damp growing conditions. Symptoms may occur either through ingestion of contaminated grains or possibly inhalation of spores. The genera can produce hemorrhagic syndrome in humans (alimentary toxic aleukia). This is characterized by nausea, vomiting, diarrhea, dermatitis, and extensive internal bleeding. Reported to be allergenic. Frequently involved in eye, skin, and nail infections.

Myxomycetes

Members of a group of fungi that is included in the category of "slime molds". They're occasionally found indoors, but mainly reside in forested regions on decaying logs, stumps, and dead leaves. Myxomycetes display characteristics of fungi *and* protozoans. In favorable (wet) conditions they exhibit motile, amoeba-like cells, usually bounded only by a plasma membrane, that are variable in size and form. During dry spells, they form a resting body (sclerotium) with dry, airborne spores. These fungi are not known to produce toxins but can cause hay fever and asthma.

Memnoniella

Contaminant found most often with *Stachybotrys* on wet cellulose. Forms in chains, but it are very similar to *Stachybotrys* and sometimes is considered to be in the *Stachybotrys* family. Certain species do produce toxins very similar to the ones produced by *Stachybotrys chartarum* and many consider the IAQ importance of *Memnoniella* to be on par with *Stachybotrys*. Allergenic and infectious properties are not well studied.

Nigrospora sp.

Commonly found in warm climates, this mold may be responsible for allergic reactions such as hay fever and asthma. It is found on decaying plant material and in the soil. It is not often found indoors.

Oidium sp.

The asexual phase of *Erysiphe* sp. It is a plant pathogen causing powdery mildews. It is very common on the leaf's stems, and flowers of plants. The health effects and allergenicity have not been studied. It does not grow on non-living surfaces such as wood or drywall.

Penicillium sp.

Aw 0.78 - 0.88. A wide number of organisms have been placed in this genus. Identification to species is difficult. Often found in aerosol samples. Commonly found in soil, food, cellulose and grains. It is also found in paint and compost piles. It may cause hypersensitivity pneumonitis, allergic alveolitis in susceptible individuals. It is reported to be allergenic (skin). It is commonly found in carpet, wallpaper, and in interior fiberglass duct insulation. Some species can produce mycotoxins. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include edema and bronchospasms; chronic cases may develop pulmonary emphysema. It may also cause headaches, vomiting, and diarrhea.

Periconia sp.

Periconia sp. are found in soil, blackened and dead herbaceous stems leaf spots, grasses, rushes, and sedges. Almost always associated with other fungi. Rarely found growing indoors. Reportedly associated with a rare case of mycotic keratitis.

Pithomyces sp.

A common mold found on dead leaves, plants, soil and especially grasses. Causes facial eczema in ruminants. It exhibits distinctive multi-celled brown conidia. It is not known to be a human allergen or pathogen. It is rarely found indoors, although it can grow on paper.

Rusts/Smuts

These fungi are associated with plant diseases. In the classification scheme of the fungi, the smuts have much in common with the rusts, and they are frequently discussed together. Both groups produce wind-borne, resistant teliospores that serve as the basis for their classification and their means of spread. Rusts usually attack vegetative regions (i.e., leaves and stems) of plants; smuts usually are associated with the reproductive structures (seeds). They can cause hay fever and asthma.

Spegazzinia

Spegazzinia species comprise a very small proportion of the fungal biota. This genus is somewhat related to other lobed or ornamented genera such as *Candelabrum*. No information is available regarding health effects or toxicity. Allergenicity has not been studied. Usually identified on spore trap samples where it is seen every few weeks. (Spores have very distinctive morphology.) May also be found in air by culturable (Andersen) samples if a long enough incubation period is provided so that sporulation occurs. Our laboratory has never found this organism growing on indoor environmental surfaces. Natural habitat includes soil and many kinds of trees and plants.

Stachybotrys sp.

Aw - 0.94, optimum Aw ->0.98. Several strains of this fungus (*S. atra, S. chartarum* and *S. alternans* are synonymous) may produce a trichothecene mycotoxin- Satratoxin H - which is poisonous by inhalation. The toxins are present on the fungal spores. This is a slow growing fungus on media. It does not compete well with other rapidly growing fungi. The dark colored fungus grows on building material with high cellulose content and low nitrogen content. Areas with a relative humidity above 55%, and are subject to temperature fluctuations, are ideal for toxin production. Individuals with chronic exposure to the toxin produced by this fungus reported cold and flu symptoms, sore throats, diarrhea, headaches, fatigue, dermatitis, intermittent local hair loss and generalized malaise. Other symptoms include coughs, rhinitis, nosebleed, a burning sensation in the nasal passages, throat, and lungs, and fever. The toxins produced by this fungus will suppress the immune system affecting the lymphoid tissue and the bone marrow. Animals injected with the toxin from this fungus exhibited the following symptoms: necrosis and hemorrhage within the brain, thymus, spleen, intestine, lung, heart, lymph node, liver, and kidney. Affects by absorption of the toxin in the human lung are known as pneumomycosis.

This organism is rarely found in outdoor samples. It is usually difficult to find in indoor air samples unless it is physically disturbed (or possibly -this is speculation- a drop in the relative humidity). The spores are in a gelatinous mass. Appropriate media for the growth of this organism will have high cellulose content and low nitrogen content. The spores will die readily after release. The dead spores are still allergenic and toxigenic. Percutaneous absorption has caused mild symptoms.

Stemphylium sp.

Reported to be allergenic. Isolated from dead plants and cellulose materials.

Torula sp.

Found outdoors in air, soil, on dead vegetation, wood, and grasses. Also found indoors on cellulose materials. Reported to be allergenic and may cause hay fever and asthma.

Tetraploa

Tetraploa species comprise a very small proportion of the fungal biota. This genus is somewhat related to *Triposporium* and Diplocladiella. The only reported human infections are two cases of keratitis (1970, 1980) and one case of subcutaneous infection of the knee (1990). No information is available regarding other health effects or toxicity. Allergenicity has not been studied. Usually identified on spore trap samples where it is seen every few weeks. (Spores have very distinctive morphology.) Our laboratory has never found this organism growing on indoor environmental surfaces. Natural habitat includes leaf bases and stems just above the soil on many kinds of plants and trees.

Ulocladium sp.

Aw 0.89. Isolated from dead plants and cellulose materials. Found on textiles.

Zygomycetes

Zygomycetes are one of the four major groups of fungi, the others being the Oomycetes, the Ascomycetes, and the Basidiomycetes. Zygomycetes are common, fast growing, and often overgrow and/or inhibit other fungi nearby. Rhizopus and Mucor are two of the most common Zygomycetes seen in the indoor environment. However, others are seen as well, including *Syncephalastrum*, *Circinella*, *Mortierella*, *Mycotypha*, *Cunninghamella*, and *Choanephora*. For further information, please see descriptions of these individual genera.

The following table lists mycotoxins that are produced by certain types of fungi:

Fungi	Mycotoxin
Acremonium crotocinigenum	Crotocin
Aspergillus favus	Alfatoxin B, cyclopiazonic acid
Aspergillus fumigatus	Fumagilin, gliotoxin
Aspergillus carneus	Critrinin
Aspergillus clavatus	Cytochalasin, patulin
Aspergillus Parasiticus	Alfatoxin B
Aspergillus nomius	Alfatoxin B
Aspergillus niger	Ochratoxin A, malformin, oxalicacid
Acremonium crotocinigenum	Crotocin
Aspergillus nidulans	Sterigmatocystin
Aspergillus ochraceus	Ochratoxin A, penicillic acid
Aspergillus versicolor	Sterigmatocystin, 5 ethoxysterigmatocystin
Aspergillus ustus	Ausdiol, austamide, austocystin,brevianamide
Aspergillus terreus	Citreoviridin
Alternaria	Alternariol, altertoxin, altenuene, altenusin, tenuazonic acid
Arthrinium	Nitropropionic acid
Bioploaris	Cytochalasin, sporidesmin, sterigmatocystin
Chaetomium	Chaetoglobosin A,B,C. Sterigmatocystin
Cladosporium	Cladosporic acid
Clavipes purpurea	Ergotism
Cylindrocorpon	Trichothecene
Diplodia	Diplodiatoxin
Fusarium	Trichothecene, zearalenone
Fusarium moniliforme	Fumonisins
Emericella nidulans	Sterigmatocystin
Gliocladium	Gliotoxin
Memnoniella	Griseofulvin , dechlorogriseofulvin, epi-decholorgriseofulvin, trichodermin, trichodermol
Myrothecium	Trichothecene
Paecilomyces	Patulin, viriditoxin
Penicillium aurantiocandidum	Penicillic acid
Penicillium aurantiogriseum	Penicillic acid
Penicillium brasilanum	Penicillic acid
Penicillium brevicompactum	Mycophenolic acid
Penicillium camemberti	Cyclopiazonic acid
Penicillium carneum	Mycophenolic acid, Roquefortine C
Penicillium crateriforme	Rubratoxin

Fungi	Mycotoxin
Penicillium citrinum	Citrinin
Penicillium commune	Cyclopiazonic acid
Penicillium crustosum	Roquefortine C
Penicillium chrysogenum	Roquefortine C
Penicillium discolor	Chaetoglobosin C
Penicillium expansum	Citrinin, Roquefortine C
Penicillium griseofulvum	Roquefortine C, cyclopiazonic acid, griseofulvin
Penicillium hirsutum	Roquefortine C
Penicillium hordei	Roquefortine C
Penicillium nordicum	Ochratoxin A
Penicillium paneum	Roquefortine C
Penicillium palitans	Cyclopiazonic acid
Penicillium polonicum	Penicillic acid
Penicillum roqueforti	Roquefortine C, Mycophenolic acid
Penicillium veridicatum	Penicillic acid
Penicillium verrucosum	Citrinin, ochratoxin A
Penicillium/ Aspergillus	Patulin
Penicillium/ Aspergillus/Alternaria	Glitoxin
Phomopsis	Macrocyclic trichothecenes
Phoma	Brefeldin, cytochalasin, secalonic acid, tenuazonic acid
Pithomyces	Sporidesmin
Rhizoctonia	Slaframine
Rhizopus	Rhizonin
Sclerotinia	Furanocoumarins
Stachybotrys chartarum	Iso-satratoxin F, roridin E, L-2, satratoxin G & H, trichodermin, trichodermol, trichothecene
Torula	Cytotoxins
Trichoderma	Trichodermin, trichodermol, gliotoxin
Trichothecium	Trichothecene
Wallemia	Walleminol
Zygosporium	Cytochalasin

General terms

Allergen

An allergen is a substance that elicits an IgE antibody response and is responsible for producing allergic reactions. Chemicals are released when IgE on certain cells contact an allergen. These chemicals can cause injury to surrounding tissue - the visible signs of an allergy. Only a few fungal allergens have been characterized but all fungi are thought to be potentially allergenic. Fungal allergens are proteins found in either the mycelium or spores

"Black mold"

A poorly defined term. Black mold or toxic black mold has usually been associated with the mold *Stachybotrys chartarum*. While there are only a few molds that are truly black, there are many that can appear black. Not all molds that appear to be black are *Stachybotrys*.

Fungi

Fungi are neither animals nor plants and are classified in a kingdom of their own. The Kingdom of Fungi. Fungi include a very large group of organisms, including molds, yeasts, mushrooms and puffballs. There are >100,000 accepted fungal species but current estimates range to 1.5 million species. Mycologists (people who study fungi) have grouped fungi into four large groups according to their method of reproduction.

Hidden mold

This refers to visible mold growth on building structures that is not easily seen, including the areas above drop ceilings, within a wall cavity (the space between the inner and outer structure of a wall), inside air handlers, or within the ducting of a heating/ventilation system.

Microbial Volatile Organic Compounds (MVOCs)

Fungi produce chemicals as a result of their metabolism. Some of these chemicals, MVOCs, are responsible for the characteristic moldy, musty, or earthy smell of fungi, whether mushrooms or molds. Some MVOCs are considered offensive or annoying. Specific MVOCs are thought to be characteristic of wood rot and mold growth on building materials. The human nose is very sensitive to mold odors and sometimes more so than current analytical instruments.

Mold

Molds are a group of organisms that belong to the Kingdom of Fungi (see Fungi). Even though the terms mold and fungi had been commonly referred to interchangeably, all molds are fungi, but not all fungi are molds.

Mycotoxin

Mycotoxins are compounds produced by some fungi that are toxic to humans or animals. By convention, the term? Mycotoxin. Excludes mushroom toxins. Fungi that produce mycotoxins are called "toxigenic fungi."

Spore

General term for a reproductive structure in fungi, bacteria and some plants. In fungi, the spore is the structure which may be used for dissemination and may be resistant to adverse environmental conditions.

Toxic mold

The term "toxic mold" has no scientific meaning since the mold itself is not toxic. The metabolic byproducts of some molds may be toxic (see mycotoxin).

Hypha (plural, hyphae)

An individual fungal thread or filament of connected cells; the thread that represents the individual parts of the fungal body.

MOLD/BIOLOGICAL CONTAMINANT REMEDIATION PROTOCOL

Date: January 18, 2022

For: Quanesha Mullins
Wilmington Housing Authority
1524 S. 16th Street
Wilmington, NC 28401

Remediation Contractor: Not determined

On-Site Consultant: Phoenix EnviroCorp (PEC)
4020 Shipyard Boulevard
Wilmington, NC 28403
(910) 397-0370

Approved Signatory:

Shaenaz Mirmohamed
IH Technician

Tommie Green, CIEC
Professional Industrial Hygienist

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SECTION 1.0 REMEDIATION PROCEDURES

1.1 Project Set Up

- The owner or powers that be shall supply temporary power for remediation equipment. The existing electrical system may be utilized, with permission of the owner or powers that be. Determining specific electrical load/safety requirements, including, but not limited to, the use of a temporary GFCI electrical panel box shall be the responsibility of the abatement contractor.
- HVAC system shall be isolated.
- 6-mil polyethylene sheathing shall be erected to separate primary control areas (PCA) from remaining areas. Control areas shall be selected so that specified building materials (specified herein, in section 1.3, under primary control areas) may be removed or cleaned and dried.
- HEPA Air Filtration Devices shall be utilized for each separate control area. Critical barriers shall consist of 6-mil polyethylene so that primary control areas are isolated from remaining areas. HEPA filtration units shall be exhausted from the PCA to the outside of the building through windows/doors. Dehumidification units must be installed in the PCA to sufficiently dry components.
- A remote wash off station shall be set up to allow for employees to wash hands and faces after egress from the work area.
- Ingress/Egress to the control area(s) shall be, at minimum, sealed with a 2-way polyethylene air lock.
- Entrances to the building shall be marked as indicated in Section 7.4 of this document.

1.2 Local Exhaust System

- Once sealed, the primary control area shall be ventilated with a local HEPA air filtration device that shall ensure a minimum of four (4) air changes per hour. The air filtration device shall be placed within the containment work area.
- Local HEPA exhaust shall be utilized where cleaning of contents is required and/or in the immediate vicinity of remediation activities of building materials.
- In interior sections requiring surface area cleaning, local HEPA filtration may be exhausted within the area to scrub microbials from ambient air. This process shall only be conducted after fine cleaning has been completed.
- Negative pressure within the contained work area shall be maintained throughout the project until clearance is obtained.
- Negative air machines shall be exhausted to exterior portions of the building to adequately ensure that negative pressure is achieved.
- Dehumidification devices with HEPA filtration may be incorporated as filtration devices in conjunction with true HEPA filtration devices; they may not replace the true HEPA filtration devices.

Note: Formula for determination of adequate HEPA filtration:

Total feet per minute =Volume of work area (ft^3)/15 minutes
#AFD Units needed = (Total feet per minute)/Capacity of Unit (ft^3)

- At initiation of final cleaning stages, relative humidity shall be at 40% (+/-3%) and moisture content of wooden components shall be at or below 15% as determined by Delmhorst moisture meter or equivalent meter. Moisture mapping and direct read T/RH shall be recorded by the remediation contractor until the specified levels have been achieved. Control areas shall be dehumidified during cleaning and mold remediation activities to ensure removal of surface moisture created during application of water. Drying of structural components that have been treated with encapsulating anti-microbial agents will be necessary.

- Moisture levels shall be recorded and documented by the remediation contractor upon successful completion of dehumidification.

1.3 Remediation Specifications

- Prior to commencement of mold remediation activities by the remediation contractor, the source of any water intrusions, leaks, and/or moisture/humidity problems shall be remedied by the owner. If water intrusions, leaks, and/or moisture/humidity problems exist and are not corrected, mold growth can be expected to return.
- All remediation procedures listed that involve the removal of building materials shall employ polyethylene critical barriers, negative air pressure, and HEPA filtration (i.e., primary control areas).
- The remediation contractor shall ensure that the filters are properly capped prior to switching off the air scrubbers. If the filters are not properly capped, the backflow can cause mold spores to re-release back into the control area, essentially re-contaminating an area that has already been cleaned.
- All remediation activities shall be conducted in a manner that does not allow dissemination of mold spores. Remediation procedures shall begin from the side of the control area furthest away from air filtration devices.
- Cleaning procedures shall be repeated until the area is visibly free of dust and debris.
- Engineering controls set up during the remediation process shall remain in place until remediation has been completed and acceptable post remediation sampling results have been achieved.
- **Federal and/or state regulations require that suspect asbestos containing materials in public and commercial buildings shall be inspected for asbestos prior to renovations or demolition. Based on these regulations, PEC recommends that building materials that may be disturbed during mold remediation be tested for asbestos content prior to their disturbance to prevent asbestos contamination.**
- If cleaning procedures outlined in this remediation plan outweigh the cost of replacement for selected items, the remediation contractor shall give the owner the option to clean or dispose of those items.
- Reinstallation of building materials and/or components shall only be conducted once acceptable post remediation results are obtained.
- Any chemicals used on this project shall be EPA approved and used only as directed by the manufacturer. MSDS shall be available for review upon request.

HVAC System

- The HVAC system(s) that services or run through the primary control area/affected area shall be shut down prior to remediation activities.
- The spaces that are normally climate-controlled by the HVAC system that have been shut down shall be maintained under proper humidity levels (between 30 and 60% utilizing dehumidifiers, etc.) while the system is not in operation.
- All HVAC supply/return vents within the primary control area/affected area shall be isolated with a critical barrier (i.e., plastic, etc.) to prevent air flow. Prior to isolating the vents, the register covers (diffusers) shall be removed, and the supply shall be isolated at the metal boot. Once isolated, the registers and surrounding building materials shall be cleaned.
- The interior of the air handler, rigid duct system, intake box, etc. shall be thoroughly cleaned by an HVAC professional experienced in mold remediation. The interior shall be cleaned with mechanical methods that aggressively disturb all interior surfaces and filter the disturbed airborne particulates to avoid cross contamination, or other equivalent methods.
- Cleaning of components shall consist of a method that thoroughly removes visible mold growth, settled concentrations of mold spores, and/or dust and debris.

- PEC recommends the removal and disposal of any fibrous or porous materials (i.e., insulation, etc.) from the interior of the HVAC system, to include but not limited to the air handler and rigid ductwork system. PEC also recommends that an HVAC professional design the re-insulation of the HVAC system without the use of porous interior insulation when possible.
- PEC recommends the removal and disposal of the flex ducts when feasible, as well as any interior duct board where cleaning will damage the duct board. Once removed, the remediation contractor shall isolate the connection point where the flex duct and/or duct board was detached with a critical barrier (such as plastic, etc.) to prevent air flow.
- The remediation contractor shall be responsible for coordinating the cleaning of the HVAC system and other specified remediation to avoid cross contamination.
- Once the HVAC system components are cleaned or replaced anew, the system shall remain off and isolated until acceptable post remediation results are obtained.
- A written document shall be obtained from the remediation contractor verifying that the HVAC system has been cleaned by an HVAC cleaning company with mold experience. This document shall include the property address and date of services and shall be filed with other mold remediation documents.

Note: For directional purposes "front" is determined by facing Grass Lane from inside the unit, unless otherwise noted.

Primary Control Areas/Affected Areas

Critical barriers, negative air pressure, and HEPA filtration shall be established to isolate the following areas as Primary Control Areas to perform the specified mold remediation.

Within the kitchen:

- Detach the floor mounted cabinet from the right wall, and remove any affected drywall (i.e., drywall with apparent water damage/suspect visible mold growth) and extend the drywall removal within a 2- foot radius of the affected area when possible.

Within the rear left bedroom:

- Remove the affected ceiling drywall around the HVAC supply vent (i.e., drywall with apparent water damage/suspect visible mold growth) and extend the drywall removal within a 2- foot radius of the affected area when possible.

Within the bathroom:

- Remove the drywall from the front wall. The heigh of this removal shall be approximately 4 feet beginning at the floor and extending towards the ceiling. The width of this removal shall be approximately 5 feet beginning at the right wall and extending towards the left wall.
- Remove the drywall from the right wall. The height of this removal shall be 4 feet beginning at the floor and extending towards the ceiling. The width of this removal shall be 2.5 feet beginning at the front wall and extending towards the rear wall.

Throughout the Residence (Negative air pressure is not required in areas where building components are not specified for removal, but HEPA filtration is required):

- Clean all surfaces as specified herein under general specifications for primary control areas.
- **Areas of specified ceiling removal shall be sealed with poly (i.e., critical barrier) after cleaning, but before HEPA air scrubbing after cleaning, to prevent air flow from areas outside the containment area. An access door (i.e., poly flap taped in place, zipper, etc.) shall be installed in the critical barrier for easy access to conduct a visual inspection of the building materials behind the critical barrier.**

General Specifications for Primary Control Areas

- Open plumbing lines and drains within the control areas shall be isolated with a critical barrier consisting of 6-mil poly.
- The water line to toilets within the control areas shall be shut off and the toilets shall be isolated with a critical barrier consisting of 6-mil poly.
- Cleaning of components/materials shall consist of a method that thoroughly removes visible mold growth, settled concentrations of mold spores, and/or dust and debris (i.e., HEPA vacuuming, wet wiping, or other approved methods), followed by dehumidification/drying.
- Exterior surfaces of electrical appliances, electrical equipment, and light fixtures shall be cleaned, utilizing wet method and HEPA vacuuming. These items shall be disconnected from all electrical sources prior to cleaning. If these items cannot be cleaned efficiently, the abatement contractor shall consult with the owner/powers that be.
- In areas where drywall removal is specified around windows and doors, remove trim boards. The door casing(s) shall also be assessed to determine if they have sustained mold/water damage. If so, they shall be cleaned, or removed.
- All wall/ceiling cavity insulation shall be disposed in areas that specify the removal of drywall/wallboard. The abatement contractor shall visually inspect the back side of surrounding drywall/wallboard for water damage and/or suspect mold growth and document any findings. If additional suspect mold growth or water damage is observed beyond the specified removal area, additional drywall/wallboard shall be removed until no suspect mold growth or water damage is observed.
- All penetrations within the controlled area that adjoin unaffected or non-accessible areas, including outdoor areas, crawlspaces, etc., shall be cleaned (as far as one can reach) and then sealed with 6-mil poly, extending six (6) inches on all sides.
- In areas of specified wallboard removal, all components within the wall/ceiling cavities shall be cleaned. Any wooden structural components with mold stains or mold growth in pitted surfaces shall be HEPA sanded (or other approved methods) to eliminate embedded mold growth.
- All joints or sills (where the structural system meets, where the sill plate meets the floor, etc.) shall be aggressively disturbed to remove embedded mold growth and spores.
- The remediation contractor shall document any drywall/wallboard that requires removal, in addition to the specified amount, prior to removal (i.e., drywall that is specified to be assessed by the remediation contractor, etc.). Documentation shall include photos and specific location at a minimum.

1.4 Removal Procedures

The contractor shall maintain surfaces of the control area free of accumulation of dust and debris. Additionally, they shall restrict the spread of dust and debris, keeping waste from being distributed over the work area. Materials shall be removed in a fashion to ensure that previously cleaned areas are not re-contaminated (i.e., working from one end of the control area to the other). The contractor may be required to re-clean areas based on a visual inspection by the CIEC/CIE/IH, if the areas are not visibly clean.

Contaminated building materials that have been removed, and additional materials and debris generated during remediation, shall be placed in an enclosed container prior to transporting the material through the building and to the waste container, and prior to visual inspection by the CIEC/CIE/IH.

Areas shall be allowed to dry for a period until RH and moisture levels specified below have been achieved. Any remaining building products that are directly impacted by remediation shall be tested for moisture content. Wooden and cellulosic building components (e.g., wall studs, drywall, etc.) shall be tested for moisture content. If the moisture content is > 15% in wood products or > 12% in cellulosic products (utilizing a

Delmhorst moisture meter or equivalent), dehumidification shall be required until moisture levels are at or below said levels, and the RH level is at or below 40% +/-3% (for all interior areas). The remediation contractor shall verify moisture content of all wooden and cellulosic building components within the impacted areas, as well as RH levels prior to scheduling post remediation verification.

1.5 Cleanup Overview

The contractor shall personally review the cleaning process prior to contacting the CIEC/CIE/IH for the post remediation testing. If accumulations of debris and dust are significant, the CIEC/CIE/IH will require re-cleaning prior to post remediation verification sampling.

The CIEC/CIE/IH shall make a visual inspection and conduct post remediation sampling after the final cleaning is complete.

1.6 Post Remediation Verification Testing

Prior to conducting post remediation sampling, HEPA filtration devices shall be allowed to operate for a minimum of 48 hours (the equivalent of 192 air changes), following fine cleaning, in all areas where remediation has been conducted. The HEPA filtration devices shall be sealed at the intake and turned off approximately two hours prior to post testing and reconvene within one hour after post testing, until acceptable post remediation results are established.

Post remediation sampling shall be conducted utilizing viable and/or non-viable sample methods. Air samples shall be collected in representative areas of the control areas. Surface sampling may be conducted at the discretion of the CIEC/CIE/IH.

Sampling shall be conducted in areas directly impacted by remediation procedures, where cleaning was conducted. The CIEC/CIE/IH shall determine acceptable post remediation status through interpretation of air sampling results, which will be based on indoor/outdoor comparisons, in combination with any surface samples collected, moisture readings, RH readings, visual observations, and any other pertinent information.

The owner/client will be responsible for post remediation testing. If air sample results indicate unacceptable airborne concentrations, the contractor shall be required to conduct a re-cleaning at the contractor's expense and absorb the cost for re-testing, until acceptable results are achieved.

Criteria for post remediation air sampling can be viewed in PEC's investigative report(s) listed in Section 2.1 below. This information can be found within the air sampling section of said report(s).

SECTION 2.0 SCOPE OF WORK (Note: Section 2.1 and Section 1.3 are essential to the full Scope of the Contractor's Work)

2.1 Investigative Reports and Other Related Documents

Phoenix EnviroCorp initial investigative report dated December 6, 2021.

Phoenix EnviroCorp investigative report dated January 18, 2022.

Phoenix EnviroCorp Chain of Custody dated December 2, 2021.

Analytical reports dated December 3, 2021.

2.2 Project Description

The procedures covered by this program/protocol include the enclosure and drying of the said structure, the removal, handling, and disposal of building components compromised by mold/fungal growth, and the cleaning and disinfecting of existing building materials. Procedures for reconstruction are not considered in these specifications. Reconstruction of interior portions may not be conducted until procedures for remediation have been completed, the control areas have been inspected, and testing has returned acceptable post remediation results. Reconstruction of exterior portions may be conducted during the restoration to ensure that water intrusion is abated.

The objectives covered by this program/protocol include the remediation of materials shown to have surface contamination, water damage, and/or exposure to elevated airborne mold spore levels, without subjecting the workers, installation employees, and occupants to microbial contaminants. In addition, contract employees, occupants, and materials shall be appropriately protected during the removal process to avoid exposure.

This program/protocol is provided as a guideline. Any deviation requests from this protocol shall be addressed to the CIEC/CIE/IH for consideration. At present there are no Federal or State requirements regarding microbial remediation projects; however, OSHA General Construction Code of Federal Regulations (29 CFR 1926) shall be followed.

Remediation shall be completed as close as possible to the date that this protocol was drafted, as the specifications outlined within represent conditions at the time the investigative services were conducted. Due to the volatility of mold, the current protocol may not reflect all necessary remediation if conditions are allowed to continue. Further, if time lapses allowing conditions to change, it may become increasingly difficult to obtain successful clearance testing results.

SECTION 3.0 AIR MONITORING

3.1 Responsibilities of the CIEC/CIE/IH

Monitoring of airborne concentrations will be performed in accordance with the requirements of this program. Prior to conducting air sampling and/or surface sampling for clearances, the CIEC/CIE/IH shall conduct a visual inspection of the area. Temperature and RH shall be recorded during the air sampling phase of clearance. All air sampling shall be conducted in such a manner as to provide a valid representation of airborne mold levels both inside and outside the work areas. If analysis of air samples indicates that airborne concentrations exceed acceptable limits, the contractor shall conduct re-cleaning at the contractor’s expense.

3.2 Personal Monitoring

No personal monitoring will be conducted by the CIEC/CIE/IH unless the remediation contractor requests monitoring for OSHA compliance. Presently there are no PELs or TLVs for microbial contaminants. It is the remediation contractor’s responsibility to determine if OSHA personal sampling may be required during application of anti-microbial agents.

3.3 Sample Integrity and Reporting

Samples shall be sealed, labeled, and a chain of custody initiated according to laboratory procedures.

Post remediation sample results shall be available within seven (7) business days of the completion of collection and will include the following information:

- Site Address
- Sample Number
- Location Sampled
- Collection Date(s)
- Person Taking Sample(s)
- Additional Comments (if any)
- Analyst Signature

SECTION 4.0 MATERIAL REPLACEMENT

4.1 Material Replacement

The general contractor/replacement contractor may begin material replacement after the CIEC/CIE/IH informs all parties of acceptable post remediation sample results.

With ongoing construction activities ambient air levels are expected to be elevated over what might be normally expected. Additional testing should not be necessary after remediation procedures have been completed and successful results have been obtained. In the event of another water intrusion (i.e., broken-pipeline, improper HVAC function, or building envelope compromise), an investigation shall be conducted within 24 to 48 hours of the event. Proper drying, if initiated within this time frame, should minimize the potential for microbial growth.

SECTION 5.0 SPILL CLEANUP REQUIREMENTS

5.1 Spills

MSDS shall be kept on site for all chemical products brought to the site by the remediation contractor. In the event of a chemical spill, the contractor shall initiate cleanup immediately. The contractor shall mop up any liquid with rags or other conventional absorbent. The spent absorbent shall be properly contained and disposed of as waste.

SECTION 6.0 WASTE CONTROL

6.1 Waste Disposal

Waste shall be disposed of at a locally selected landfill. Waste shall be transported to the landfill in such a way to ensure that it does not pose a potential hazard to the environment.

SECTION 7.0 SUPPLEMENTAL INFORMATION

7.1 Applicable Publications

The publications listed below form part of this program. This protocol shall be reviewed by the remediation contractor prior to initiation of set-up for the project. Any questions regarding this protocol shall be addressed with the generator or appropriate Phoenix EnviroCorp personnel.

Code of Federal Regulation (CFR Publications)

29 CFR 1910.134 Respiratory Protection

29 CFR 1910.145	Specifications for Accident Prevention, Signs and Tags
29 CFR 1926.28	Personal Protective Equipment
29 CFR 1926.59	Hazard Communication
29 CFR 1926.96	Occupational Foot Protection
29 CFR 1926.100	Head Protection
29 CFR 1926.101	Hearing Protection
29 CFR 1926.102	Eye and Face Protection
29 CFR 1926.403	Electrical General Requirements
29 CFR 1926.416	Safety General Requirements
29 CFR 1926.852	Demolition, Chutes
29 CFR 1926.1091	Record Keeping Requirements

Supplemental Guidelines

IICRC S520 2nd ed.	Standard and Reference Guide for Professional Water Damage Restoration
NYCDOH	Guidelines on Assessment and Remediation of Fungi in Indoor Environments
ACGIH	Bioaerosols: Assessment and Control
IAQA 01-2000	Recommended Guidelines for Indoor Environments
ASHRAE 62.2-2007	Ventilation for Acceptable Indoor Air Quality in Low-Rise Residential Buildings

7.2 Definitions

Air Lock: A system that permits ingress and egress between a control area and non-control area, or other work areas, without allowing air movement between areas (e.g., three stage decon, three-way polyethylene flaps).

Air Sample: Refers to samples collected with spore trap air sample media (e.g., Micro-5, Cyclex D, or equivalent); also referred to as a non-viable air sample. May also refer to a sample collected on a disposable petri dish with Agar media by means of an Andersen Impactor (or equivalent) and sampling pump; also referred to as air culture (viable) sample. Sample media to be used in project is described under Section 1.6 (Post Remediation Verification Testing).

Area Monitoring: The sampling of airborne microbial concentrations outside the exclusion boundary, which may reach the breathing zone of the contractor or installation employees.

Asbestos Containing Materials (ACM): Refers to asbestos containing building materials that contain more than 1% asbestos by Polarized Light Microscopy (PLM) or Transmission Electron Microscopy (TEM).

Biocide: Refers to chemical agents that are specifically designed to eliminate viable microbial contamination, with a phenol equivalent efficiency (e.g., Sodium Hypochlorite, Quaternary Ammonia Compounds).

Blower Door Test: Refers to the testing of static pressure and draw of air through the HVAC in cubic feet per minute (CFM) to rate the efficiency of the system.

Clearance Monitoring: Refers to air, bulk, or swab sampling conducted as a means to demonstrate that the area specified for remediation has been completed by the contractor, left with present acceptable mold spore levels, and ready for re-construction.

Control Area: The area where microbial contaminants removal is performed, which is isolated by physical boundaries to prevent unauthorized entry of personnel, thereby preventing exposure to or the spread of

microbial contaminants. Physical boundaries will be established and located such that the airborne contaminants are not allowed to escape the boundaries.

HEPA: High Efficiency Particulate Air. Refers to ventilation devices that are specifically designed to filter ambient air to an efficiency of 99.97%.

HVAC: Refers to the Heating, Ventilation, and Air Conditioning system.

Industrial Hygienist: Refers to a person who practices industrial hygiene and may act as a competent person regarding visual inspection of contaminated surfaces and clearance air and/or swab/bulk sampling. May also refer to a Certified Industrial Hygienist (CIH) as defined by the American Board of Industrial Hygiene (ABIH), a Certified Indoor Environmental Consultant as defined by the American Council for Accredited Certification (ACAC), or a Certified Indoor Environmentalist (CIE) as defined by the American Council for Accredited Certification (ACAC).

Microbial Contaminant: Refers to viable mold, fungi, pollen, bacteria, and or particulate, or their metabolites, which may be causative of epidemiological, immunotoxic, dermotoxic, neurotoxic, or enterotoxic disorders in the human population, or may be considered a pathogen or an opportunistic pathogen.

Non-Porous Materials: Refers to building materials with solid surfaces that may be successfully treated and cleaned by means of HEPA vacuuming or other approved method. Materials include flooring, hard goods, plastic, vinyl, and some wallboard systems.

Porous Materials: Refers to building materials and household goods that may allow microscopic particles (3-20 micron) to become trapped within the material that will not allow adequate cleaning. Materials include carpet, mattresses, and clothing.

Primary Control Area (PCA): Refers to a section of a facility that has been isolated by 6-mil polyethylene barriers where specific engineering controls (e.g., HEPA filtration, negative air pressurization, dehumidification, etc.) are required. In general, it is the area where remediation of water and mold damaged building materials is to be conducted.

Refrigerant Dehumidifier: Device used to remove water content from air and materials.

Relative Humidity (RH): Refers to the ratio of water vapor in the atmosphere to the amount required to saturate it at a given temperature.

Semi-Porous Materials: Refers to materials that may be somewhat porous, yet they may still allow for adequate cleaning. Materials include wooden beams and some wallboard systems.

Swab Sample: Refers to collection of a sample onto a sterile swab for analysis of mold, fungi, and bacteria by viable and/or non-viable analysis.

Tape-Lift Sample: Refers to collection of a sample onto clear scotch tape for analysis by direct microscopic examination (non-viable).

7.3 Quality Assurance

Medical Examinations

Before potential exposure to microbial contaminants, the remediation contractor shall provide workers with a comprehensive medical examination as required by 29 CFR 1910.134 as outlined by the Medical Monitoring Program.

Medical Records

The remediation contractor shall maintain complete and accurate medical records on employees as required by OSHA and the contractor's Medical Monitoring Program. The contractor may be asked to provide a copy of all medical records for approval by the consultant's representative.

Training

Each employee working on this contract shall be trained prior to the time of initial job assignment in accordance with mold specific and chemical specific training as indicated by the OSHA General Duty Clause and the Hazard Communication Standard. Each employee shall also receive training required by Federal guidelines listed in Section 7.1 of this document and project specifications.

Hazard Communication Program

The remediation contractor has established and implemented a Hazard Communication Program as required by 29 CFR 1910.1200 and may be asked to provide a copy of this written program. Hazard Communication training must include occupational hazards as directly related to working with fungi/mold and contamination of building components by fungal contamination, specific training for chemical hazards associated with biocide usage, and site specific MSDS sheets for commercial detergents and biocides utilized on the job site.

Respiratory Protection Program

The remediation contractor has established a Respiratory Protection Program, which complies with 29 CFR 1910.134. Physical examinations and fit testing are required for use of respiratory protection greater than an N-95 dust mask. Workers removing building materials contaminated by mold growth, applying anti-microbial agents, or workers subjected to exposures to anti-microbial agents shall be required to wear, at minimum, a tight-fitting negative pressure ½ mask respirator with P-100 filters. Therefore, -he OSHA Respiratory Protection Standard applies.

Analytical Testing Laboratory

Analysis of culturable biological samples collected on this project shall be conducted by a laboratory that participates in the Environmental Microbiological Proficiency Analytical Testing Program (EMPAT) of the American Industrial Hygiene Association (AIHA) and has shown to be proficient by proficiency analytical testing (PAT) samples. Analysis of non-viable air and surface samples shall be conducted by a competent person.

7.4 Materials and Equipment

Equipment

The contractor shall make available to employees a complete set of personal protective equipment (PPE) as required by this program for entry into the controlled area. All personnel while in the control area or handling microbial contaminated waste shall wear protective clothing, respirators, and other PPE.

Respirators

The contractor shall furnish the appropriate respirator in accordance with 29 CFR 1910.134. At a minimum, an N-95 dust mask shall be utilized.

Special Clothing

Employees shall be provided with and required to wear: whole body disposable protective clothing, full body tyvek suits with head coverings, and latex gloves *(see table)* during all activities in the controlled area.

Chemical	Recommended Rubber Glove
Sodium Hypochlorite	Neoprene or Nitrile
Phenolic Compounds	Neoprene
Quaternary Ammonia Compounds	Polyvinyl Chloride (PVC)
Detergents	Latex

Eye Protection

The contractor shall provide chemical-resistant goggles to personnel engaged in cleaning and treatment activities and require them to be worn during application of anti-microbial agents and biocides.

Warning Signs and Labels

Standard approved warning signs shall be erected at all approaches to the control area as specified in 29 CFR 1910.145.

Anti-Microbial Agents

Anti-microbial agents utilized in interior quarters shall consist of quaternary ammonia compounds. No phenolic compounds shall be used in interior quarters with exception of Micro Ban Plus. Approval must be granted by the owner/powers that be prior to application. Anti-microbial agents shall be EPA approved. Commercial grade detergents shall be used to remove fungal contamination during cleaning phases prior to anti-microbial application, to include encapsulation.

July 28, 2021

Quanesha Mullins
Wilmington Housing Authority
1524 S. 16th Street,
Wilmington, NC 28401

RE: PEC Job # 21-21-112A-IAQ-M – 302 Grass Lane, Unit 212, Wilmington, NC - Mold Investigation

Enclosed are the results of the mold investigation conducted at the above referenced unit on July 16, 2021. Phoenix EnviroCorp (PEC) was retained to conduct a mold investigation and provide a mold remediation protocol if needed.

Background Information: PEC conducted a mold investigation on April 12, 2021, identifying surface mold growth (*Cladosporium*) on the bathroom ceiling. The investigative report included recommendations for cleaning. The client has since requested additional investigative activities to include a mold remediation protocol if needed.

This is a two-story building on a slab. The subject unit is on the 2nd floor, is vacant, and without carpet.

The HVAC system was off upon PEC's arrival and during sampling.

Related Documents:
- PEC initial investigation report dated April 14, 2021

Note: For directional purposes "front" is determined by facing Grass Lane from inside the unit, unless otherwise stated.

Visual Inspection: PEC's visual inspection noted the following (see enclosed photographic documentation):
Bathroom
- Apparent water damage in the cabinet
- Apparent water damage on the front wall baseboard
- Suspect visible mold growth on the walls
- Suspect visible mold growth on the HVAC supply vent

Kitchen
- Apparent water damage and suspect visible mold in the front floor mounted cabinet

Living room
- Suspect visible mold growth on the HVAC supply vent

Mold Testing – Surface: Non-viable surface samples were collected from areas of suspect visible mold growth. The quantifications of fungal growth are reported as scattered spores, 21-100 fungal spores = very light (VL), 101-1,000 fungal spores = light (L), 1,001-10,000 fungal spores = moderate (M), > 10,000 fungal spores = heavy (H). The 'General Impressions' of fungal growth are reported as

no fungal growth (NFG), fungal growth (FG), minimal fungal growth or growth in vicinity (MFG), and no fungal spores detected (ND). *Clear tape was utilized for the collection of surface samples. Each sample was assigned a unique ID number and shipped to a third-party laboratory for analysis.* Sampling locations and results are as follows:

Location	Result
Kitchen front wall cabinet	**Scattered Spores–** *Basidiospores*
Bathroom HVAC supply vent	**M – FG** *Cladosporium*
Bathroom left wall	**L – FG** *Cladosporium*

Mold Testing – Air: Non-viable spore trap air samples were collected to determine airborne mold spore levels. Samples were collected within the bathroom, the rear right bedroom, the rear left bedroom, the kitchen/living room, and the front left bedroom. *Micro 5 sampling media was utilized for the collection of spore trap air samples. Each sample ran for five (5) minutes at a flow rate of five (5) liters per minute for a total volume of twenty-five (25) liters per sample. Each sample was assigned a unique ID number and shipped to a third-party laboratory for analysis. All air samples were collected from centralized locations (within their respective areas) and within the breathing zone, unless otherwise noted.* Two samples were also collected outdoors for comparative purposes.

Results identified elevated airborne levels of *Penicillium/Aspergillus* within the kitchen/living room and the front left bedroom, and elevated airborne levels of *Cladosporium* within the rear left bedroom.

The interpretation of air sample results is based on indoor/outdoor comparisons, in combination with a study by Daniel M. Baxter, entitled "A Regional Comparison of Mold Spore Concentrations Outdoors and Inside "Clean" and "Mold Contaminated" Southern California Buildings", and other industry guidelines, as well as over 20 years of experience in industrial hygiene and mold testing.

In layman terms, acceptable levels indicate that the levels are below the outdoor level and/or the baseline levels (whichever is higher) stated below. Elevated levels indicate that the levels are above the outdoor level and/or the baseline level.

Baseline levels for indoor spore trap air samples are as follows: < 900 spores/m³ for Penicillium/ Aspergillus; 0 spores/m³ for Stachybotrys and Chaetomium; and < 350 spores/m³ for other individual mold groups.

Moisture Readings: Moisture readings were collected with either a Delmhorst moisture meter or a Tramex Survey Encounter. Multiple readings were taken to represent areas and materials reported. *Readings are marked with either a D or T to denote which meter was used.* For drywall products, readings should be less than or equal to twelve percent (≤ 12%) by Delmhorst and below fifty percent (50%) by Tramex. For wood products, normal moisture content should be less than fifteen percent (<15%) for both meters.

Moisture content measurements were as follows:

Bathroom

- Wood cabinet = ≤ 10% (D)
- Wood baseboards = ≤ 15% (D)
- Ceiling drywall = ≤ 10% (T)
- Drywall walls = < 15% (T)

Kitchen

- Wood cabinets = ≤ 10% (D)

Relative Humidity (RH): *Temperature and relative humidity readings were collected in the same locations as the spore trap air samples.* RH levels within the unit ranged from 49.5% – 52.1% with an outdoor reading of 74.2% (see the enclosed Chain of Custody for details). Per the American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) Standard 62-1999, relative humidity should range between 30% and 60%.

Conclusions: Sample results identified elevated airborne mold spore levels of *Penicillium/Aspergillus* within the kitchen/living room and the front left bedroom, and elevated airborne mold spore levels of *Cladosporium* within the rear left bedroom, in addition to potentially problematic airborne mold spore levels of *Penicillium/Aspergillus* within all other sampled locations based on outdoor levels and the levels/percentages identified indoors. Surface mold growth (*Cladosporium*) was also identified within the bathroom; and apparent water damage was observed on building materials within the unit. A mold remediation protocol that outlines remediation activities is attached.

Prior to commencement of mold remediation, the source of any water intrusions, leaks, and/or moisture/humidity issues shall be remedied. If water intrusions/moisture issues exist and are not remedied, mold can be expected to return.

After remediation activities are completed, but before put-back of removed components, post remediation verification shall be conducted. Upon notice, and for an additional fee, PEC can conduct post remediation verification testing.

Enclosed in this report are the laboratory analysis and the Chain of Custody.

Should you have any questions, please do not hesitate to call.

Thank you,

Shaenaz Mirmohamed
IH Technician

Tommie Green, CIEC
Professional Industrial Hygienist

Enclosures

Photo 1

Apparent water damage and buckling in the bathroom cabinet

Photo 2

Suspect visible mold growth on the walls and the HVAC supply vent in the bathroom

Photo 3

Apparent water damage on the bathroom front wall baseboard

Photo 4

Apparent water damage and Suspect visible mold growth in the kitchen front floor mounted cabinet

Photo 5

Suspect visible mold growth on the HVAC supply vent in the living room

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4020 SHIPYARD BLVD.
WILMINGTON, NC 28403

CHAIN OF CUSTODY

LABORATORY TEST REQUEST Scem| Ref# 21071032

Lab ID: 093-102

CONTACT:	Shaenaz Mirmohamed	TELEPHONE (910) 397-0370 FAX (910) 313-6094	Sample date:	7/16/2021
PEC Job #:	21-21-112A-IAQ-M	SITE ADDRESS:	302 Grass Lane, Unit 212, Wilmington, NC 28405	

PLEASE EMAIL RESULTS TO: KMGREEN@PHOENIXENVIROCORP.COM

SAMPLE TYPE:	NUMBER OF SAMPLES:	TURN AROUND TIME SPECIFIED:
Spore Trap - Micro-5 Surface Samples	1	____ Immediate ____ 24 hr ____ 48 hr __X__ Standard

Sample #	Sample	Sample Volume	Lab Analysis Requested	% Relative Humidity	Temperature °F
071621-SM-01	Bathroom	25L	S001	51.6	77.9
071621-SM-02	Rear right bedroom	25L	S001	51.7	78.0
071621-SM-03	Rear left bedroom	25L	S001	49.5	78.5
071621-SM-04	Kitchen/Living room	25L	S001	51.0	80.0
071621-SM-05	Front left bedroom	25L	S001	52.1	79.1
071621-SM-06	Outside - Front	25L	S001	74.2	83.4
071621-SM-07	Outside - Rear	25L	S001		
071621-SM-08	Kitchen cabinet on front wall	1 cm sq	S001T	NA	NA
071621-SM-09	Bathroom HVAC supply vent	1 cm sq	S001T	NA	NA
071621-SM-10	Bathroom left wall	1 cm sq	S001T	NA	NA
	Samples accepted				

Samples Collected By (Printed Name and Signature): Shaenaz Mirmohamed Date Signed: 7/16/2021

CHAIN OF CUSTODY RECORD

DATE:	Time:	Condition of Samples:	RELINQUISHED BY: (Printed Name and Signature)	ACCEPTED BY: (Printed Name and Signature)
7/16/2021	15:30	Intact	Shaenaz Mirmohamed AFFILIATION:	AFFILIATION: Uelsym 7.19.21

SEEML Reference Number: 210719032

Southeast Environmental Microbiology Laboratories
102 Edinburgh Court
Greenville, SC 29607
Phone: (864) 233-3770
FAX: (864) 233-6589

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

- ☒ Surface/Bulk Report
- ☒ Spore Trap Report
- ☐ Andersen Fungal Report
- ☐ Quantitative Fungal Report

Lab Manager Review: *Angel Gosnell* Date: 07/19/21

Thank you for using SEEML laboratories. We strive to provide superior quality and service.
SEEML laboratories are accredited through AIHA-LAP, LLC (EMLAP # 173667) for the analysis of Spore Traps and Surface/Bulk Samples.

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

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

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

Spore Trap Report

	Date Sampled: 07/16/21
Attn: ***Phoenix Enviro Corp.***	Date Received: 07/19/21
4020 Shipyard Blvd.	Date Analyzed: 07/19/21
Wilmington, NC 28403	Date Reported: 07/19/21
	Date Revised:
	Project Name: 21-21-112A-IAQ-M
	Project Address: 302 Grass Ln. Unit 212
	Project City, State, ZIP: Wilmington, NC 28405
	SEEML Reference # : 210719032

TEST METHOD: DIRECT MICROSCOPY EXAMINATION SEEML SOP 7

Client Sample ID	071621-SM-01			071621-SM-02			071621-SM-03		
Location	Bathroom			Rear Right Bedroom			Rear Left Bedroom		
Lab Sample ID	210719032-093			210719032-094			210719032-095		
Comments									
Hyphal Fragments									
Pollen									
Spore Trap Used	M5			M5			M5		
	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%
Alternaria									
Ascospores	5	200	24						
Basidiospores	2	80	10	2	80	11	5	200	17
Bipolaris/Drechslera									
Chaetomium									
Cladosporium	1	40	5	2	80	11	14	560	48
Curvularia							1	40	3
Epicoccum									
Cercospora									
Fusarium									
Memnoniella									
Nigrospora									
Penicillium/Aspergillus	13	520	62	15	600	79	9	360	31
Polythrincium									
Rusts									
Smuts/Periconia/Myxomy									
Spegazzinia									
Stachybotrys									
Stemphylium									
Tetraploa									
Torula									
Ulocladium									
Colorless/Other Brown*									
Oidium									
Zygomycetes									
Pithomyces									
Background debris (1-5)**	3			3			3		
Sample Volume(liters)	25			25			25		
TOTAL SPORES/M^3	21	**840**		19	**760**		29	**1160**	

Revisions:

Spore types listed without a count or data entry were not detected during the course of the analysis for the respective sample, indicating a raw count of <1 spore.

The analytical sensitivity is the spores/m^3 divided by the raw count, expressed in spores/m^3. The limit of detection is the analytical sensitivity (in spores/m^3) multiplied by the sample volume (in liters) divided by 1000 liters.

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

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

Disclaimer: The sample results are determined by the sample volume, which is provided by the customer.
This report relates only to the samples tested as they were received.

102 Edinburgh Court
Greenville, SC. 29607
Phone: (864) 233-3770

Angel Gosnell

Angel Gosnell, Approved Laboratory Signatory

Spore Trap Report

	Date Sampled: 07/16/21
Attn: ***Phoenix Enviro Corp.***	Date Received: 07/19/21
4020 Shipyard Blvd.	Date Analyzed: 07/19/21
Wilmington, NC 28403	Date Reported: 07/19/21
	Date Revised:
	Project Name: 21-21-112A-IAQ-M
	Project Address: 302 Grass Ln. Unit 212
	Project City, State, ZIP: Wilmington, NC 28405
	SEEML Reference # : 210719032

TEST METHOD: DIRECT MICROSCOPY EXAMINATION SEEML SOP 7

Client Sample ID	071621-SM-04			071621-SM-05			071621-SM-06		
Location	Kitchen / Living Room			Front Left Bedroom			Outside- Front		
Lab Sample ID	210719032-096			210719032-097			210719032-098		
Comments									
Hyphal Fragments							2	80	
Pollen									
Spore Trap Used	M5			M5			M5		
	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%
Alternaria									
Ascospores							5	200	8
Basidiospores	1	40	<1	1	40	<1	22	880	36
Bipolaris/Drechslera									
Chaetomium									
Cladosporium	8	320	3	1	40	<1	13	520	21
Curvularia							3	120	5
Epicoccum	1	40	<1				1	40	2
Cercospora									
Fusarium									
Memnoniella									
Nigrospora									
Penicillium/Aspergillus	278	11100	97	134	5360	99	1	40	2
Polythrincium									
Rusts									
Smuts/Periconia/Myxomy							15	600	25
Spegazzinia									
Stachybotrys									
Stemphylium									
Tetraploa									
Torula									
Ulocladium									
Colorless/Other Brown*									
Oidium									
Zygomycetes									
Pithomyces							1	40	2
Background debris (1-5)**	3			3			3		
Sample Volume(liters)	25			25			25		
TOTAL SPORES/M^3	288	**11500**		136	**5440**		61	**2440**	

Revisions:

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*Colorless,other Brown are spores without a distinctive morphology on spore traps and non-viable surface samples.
**Background debris is the amount of particulate matter present on the slide and is graded from 1-5 with 1 = very light, 2= Light, 3 = Medium, 4 = Heavy, 5 = Very Heavy. The higher the rating the more likelihood spores may be underestimated. A rating of 5 should be interpreted as minimal counts and may actually be higher than reported.

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Angel Gosnell

Angel Gosnell, Approved Laboratory Signatory

Spore Trap Report

	Date Sampled: 07/16/21
Attn: ***Phoenix Enviro Corp.***	Date Received: 07/19/21
4020 Shipyard Blvd.	Date Analyzed: 07/19/21
Wilmington, NC 28403	Date Reported: 07/19/21
	Date Revised:
	Project Name: 21-21-112A-IAQ-M
	Project Address: 302 Grass Ln. Unit 212
	Project City, State, ZIP: Wilmington, NC 28405
	SEEML Reference # : 210719032

TEST METHOD: DIRECT MICROSCOPY EXAMINATION SEEML SOP 7

Client Sample ID	071621-SM-07								
Location	Outside- Rear								
Lab Sample ID	210719032-099								
Comments									
Hyphal Fragments	1	40							
Pollen									
Spore Trap Used	M5								
	raw ct.	spores/m^3	%						
Alternaria									
Ascospores	7	280	12						
Basidiospores	21	840	36						
Bipolaris/Drechslera									
Chaetomium									
Cladosporium	12	480	21						
Curvularia									
Epicoccum									
Cercospora									
Fusarium									
Memnoniella									
Nigrospora	2	80	3						
Penicillium/Aspergillus									
Polythrincium									
Rusts									
Smuts/Periconia/Myxomy	16	640	28						
Spegazzinia									
Stachybotrys									
Stemphylium									
Tetraploa									
Torula									
Ulocladium									
Colorless/Other Brown*									
Oidium									
Zygomycetes									
Pithomyces									
Background debris (1-5)**	3								
Sample Volume(liters)	25								
TOTAL SPORES/M^3	58	**2320**							

Revisions:

Spore types listed without a count or data entry were not detected during the course of the analysis for the respective sample, indicating a raw count of <1 spore.

The analytical sensitivity is the spores/m^3 divided by the raw count, expressed in spores/m^3. The limit of detection is the analytical sensitivity (in spores/m^3) multiplied by the sample volume (in liters) divided by 1000 liters.

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

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

Disclaimer: The sample results are determined by the sample volume, which is provided by the customer.
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Angel Gosnell

Angel Gosnell, Approved Laboratory Signatory

Surface and Bulk Sample Report

	Date Sampled: 07/16/21
Attn: ***Phoenix Enviro Corp.***	Date Received: 07/19/21
4020 Shipyard Blvd.	Date Analyzed: 07/19/21
Wilmington, NC 28403	Date Reported: 07/19/21
	Date Revised:
	Project Name: 21-21-112A-IAQ-M
	Project Address: 302 Grass Lane, Unit 212
	Project City, State ZIP: Wilmington, NC 28405
	SEEML Reference #: 210719032

TEST METHOD: Direct Microscopic Examination (SEEML SOP 18)

Client Sample ID	071521-SM-08	071521-SM-09	071521-SM-10	
Location	Kitchen Cabinet on Front Wall	Bathroom HVAC Supply Vent	Bathroom Left Wall	
SEEML Sample ID	210719032-100	210719032-101	210719032-102	
Sample Type	Tape	Tape	Tape	
	Quantification*	Quantification*	Quantification*	
Hyphal Fragments		**Scattered**	**Scattered**	
Pollen				
General Impressions **	**NFG**	**FG**	**FG**	
Fungal Spore:				
Alternaria				
Acremonium				
Ascospores				
Basidiospores	**Scattered Spores**			
Bipolaris/Drechslera				
Cercospora				
Chaetomium				
Cladosporium		**M**	**L**	
Curvularia				
Epicoccum				
Fusarium				
Geotrichum sp.				
Memnoniella				
Myxomycetes				
Nigrospora				
Penicillium/Aspergillus				
Pithomyces				
Rusts/Smuts				
Stemphylium				
Tetraploa				
Ulocladium				

**** General Impressions: NFG = No Fungal Growth, FG = Fungal Growth, MFG = Minimal Fungal Growth Or Growth in vicinity**

Quantification of fungal growth is done by semi-quantitative grading using the following ranges:

Scattered Spores, 1-20 fungal spores

VL = 21-100 fungal spores **L = 101-1,000 fungal spores** **M = 1,001-10,000 fungal spores** **H = >10,000 fungal spores**

ND = No Fungal Spores Detected

Disclaimer: This report relates only to the samples tested

Respectfully submitted, SEEML

Angel Gosnell, **Approved Laboratory Signatory**

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AIHA-LAP, LLC EMLAP # 173667

Texas License: LAB1016

Fungal Descriptions

Alternaria sp.

Aw - 0.89. Conidia dimensions: 18-83 x 7-18 microns. A very common allergen with an IgE mediated response. It is often found in carpets, textiles and on horizontal surfaces in building interiors. Often found on window frames. Outdoors it may be isolated from samples of soil, seeds and plants. It is commonly found in outdoor samples. The large spore size, 20 - 200 microns in length and 7 - 18 microns in sizes, suggests that the spores from these fungi will be deposited in the nose, mouth and upper respiratory tract. It may be related to bakers' asthma. It has been associated with hypersensitivity pneumonitis. The species *Alternaria alternata* can produce tenuazonic acid and other toxic metabolites that may be associated with disease in humans or animals. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include edema and bronchospasms; chronic cases may develop pulmonary emphysema.

Ascospore

A spore borne in a special cell called an ascus. Spores of this type are reported to be allergenic. All ascomycetes, members of a group of fungi called Ascomycotina, have this type of spore. The minute black dots on rotting wood and leaves or the little cups on lichens are examples of ascomycetes; another is the "truffle" mushroom.

Aspergillus/Penicillium

These are two of the most commonly found allergenic fungi in problem buildings. *Aspergillus* comes in many varieties (species). Many of the varieties produce toxic substances. It may be associated with symptoms such as sinusitis, allergic bronchopulmonary aspergillosis, and other allergic symptoms. *Penicillium* is a variety of mold that is very common indoors and is found in increased numbers in problem buildings. It also has many varieties, some of which produce toxic substances. The symptoms are allergic reactions, mucous membrane irritation, headaches, vomiting, and diarrhea. Due to the morphological similarity of *Aspergillus* and *Penicillium*, they are not differentiated by microscopic analysis and are reported together.

Aspergillus sp.

Aw 0.75 - 0.82. Reported to be allergenic. Members of this genus are reported to cause ear infections. Many species produce mycotoxins that may be associated with disease in humans and other animals. Toxin production is dependent on the species or a strain within a species and on the food source for the fungus. Some of these toxins have been found to be carcinogenic in animal species. Several toxins are considered potential human carcinogens. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include edema and bronchospasms; chronic cases may develop pulmonary emphysema; may also be associated with sinusitis, allergic bronchopulmonary aspergillosis, and other allergic symptoms.

Basidiospore

Spore from basidiomycetes. Many varieties are reported to be allergenic.

Bipolaris sp.

A fungus with large spores that could be expected to be deposited in the upper respiratory tract. This fungus can produce the mycotoxin - sterigmatocystin, which has been shown to produce liver and kidney damage when ingested by laboratory animals.

Botrytis sp.

Aw 0.93. Conidia dimensions: 7-14 x 5-9 microns. It is parasitic on plants and soft fruits. Found in soil and on house plants and vegetables, it is also known as "gray mold". It causes leaf rot on grapes, strawberries, lettuce, etc. It is a well-known allergen, producing asthma type symptoms in greenhouse workers and "wine grower's lung".

Cercaspora

Common outdoors in agricultural areas, especially during harvest. Parasite of higher plants, causing leaf spot. Commonly found as parasites on higher plants.

Chaetomium sp.

large ascomycetous fungus producing perithecia. It is found on a variety of substrates containing cellulose, including paper and plant compost. It has been found on paper in sheetrock. It can produce an *Acremonium*-like state on fungal media. Varieties are considered allergenic and have been associated with peritonitis, cutaneous lesions, and system mycosis.

Cladosporium sp.

Aw 0.88; Aw 0.84. Most commonly identified outdoor fungus. The outdoor numbers are reduced in the winter. The numbers are often high in the summer. Often found indoors in numbers less than outdoor numbers. It is a common allergen. Indoor *Cladosporium* sp. may be different than the species identified outdoors. It is commonly found on the surface of fiberglass duct liners in the interior of supply ducts. A wide variety of plants are food sources for this fungus. It is found on dead plants, woody plants, food, straw, soil, paint, and textiles. Produces greater than 10 antigens. Antigens in commercial extracts are of variable quality and may degrade within weeks of preparation. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include skin lesions, eye ulceration, mycosis (including onychomycosis, an infection of the nails of the feet or hands) edema and bronchospasms; chronic cases may develop pulmonary emphysema.

Curvularia sp.

Reported to be allergenic and has been associated with allergic fungal sinusitis. It may cause corneal infections, mycetoma, and infections in immune compromised hosts.

Dreschlera sp.

Conidia dimensions: 40-120 x 17-28 microns. Found on grasses, grains and decaying food. It can occasionally cause a corneal infection of the eye.

Epicoccum sp.

Conidia dimensions: 15-25 microns. A common allergen. It is found in plants, soil, grains, textiles and paper products.

Fusarium sp.

Aw 0.90. A common soil fungus. It is found on a wide range of plants. It is often found in humidifiers. Several species in this genus can produce potent trichothecene toxins. The trichothecene (scirpene) toxin targets the following systems: circulatory, alimentary, skin, and nervous. Produces vomitoxin on grains during unusually damp growing conditions. Symptoms may occur either through ingestion of contaminated grains or possibly inhalation of spores. The genera can produce hemorrhagic syndrome in humans (alimentary toxic aleukia). This is characterized by nausea, vomiting, diarrhea, dermatitis, and extensive internal bleeding. Reported to be allergenic. Frequently involved in eye, skin, and nail infections.

Myxomycetes

Members of a group of fungi that is included in the category of "slime molds". They're occasionally found indoors, but mainly reside in forested regions on decaying logs, stumps, and dead leaves. Myxomycetes display characteristics of fungi *and* protozoans. In favorable (wet) conditions they exhibit motile, amoeba-like cells, usually bounded only by a plasma membrane, that are variable in size and form. During dry spells, they form a resting body (sclerotium) with dry, airborne spores. These fungi are not known to produce toxins but can cause hay fever and asthma.

Memnoniella

Contaminant found most often with *Stachybotrys* on wet cellulose. Forms in chains, but it are very similar to *Stachybotrys* and sometimes is considered to be in the *Stachybotrys* family. Certain species do produce toxins very similar to the ones produced by *Stachybotrys chartarum* and many consider the IAQ importance of *Memnoniella* to be on par with *Stachybotrys*. Allergenic and infectious properties are not well studied.

Nigrospora sp.

Commonly found in warm climates, this mold may be responsible for allergic reactions such as hay fever and asthma. It is found on decaying plant material and in the soil. It is not often found indoors.

Oidium sp.

The asexual phase of *Erysiphe* sp. It is a plant pathogen causing powdery mildews. It is very common on the leaf's stems, and flowers of plants. The health effects and allergenicity have not been studied. It does not grow on non-living surfaces such as wood or drywall.

Penicillium sp.

Aw 0.78 - 0.88. A wide number of organisms have been placed in this genus. Identification to species is difficult. Often found in aerosol samples. Commonly found in soil, food, cellulose and grains. It is also found in paint and compost piles. It may cause hypersensitivity pneumonitis, allergic alveolitis in susceptible individuals. It is reported to be allergenic (skin). It is commonly found in carpet, wallpaper, and in interior fiberglass duct insulation. Some species can produce mycotoxins. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include edema and bronchospasms; chronic cases may develop pulmonary emphysema. It may also cause headaches, vomiting, and diarrhea.

Periconia sp.

Periconia sp. are found in soil, blackened and dead herbaceous stems leaf spots, grasses, rushes, and sedges. Almost always associated with other fungi. Rarely found growing indoors. Reportedly associated with a rare case of mycotic keratitis.

Pithomyces sp.

A common mold found on dead leaves, plants, soil and especially grasses. Causes facial eczema in ruminants. It exhibits distinctive multi-celled brown conidia. It is not known to be a human allergen or pathogen. It is rarely found indoors, although it can grow on paper.

Rusts/Smuts

These fungi are associated with plant diseases. In the classification scheme of the fungi, the smuts have much in common with the rusts, and they are frequently discussed together. Both groups produce wind-borne, resistant teliospores that serve as the basis for their classification and their means of spread. Rusts usually attack vegetative regions (i.e., leaves and stems) of plants; smuts usually are associated with the reproductive structures (seeds). They can cause hay fever and asthma.

Spegazzinia

Spegazzinia species comprise a very small proportion of the fungal biota. This genus is somewhat related to other lobed or ornamented genera such as *Candelabrum*. No information is available regarding health effects or toxicity. Allergenicity has not been studied. Usually identified on spore trap samples where it is seen every few weeks. (Spores have very distinctive morphology.) May also be found in air by culturable (Andersen) samples if a long enough incubation period is provided so that sporulation occurs. Our laboratory has never found this organism growing on indoor environmental surfaces. Natural habitat includes soil and many kinds of trees and plants.

Stachybotrys sp.

Aw - 0.94, optimum Aw ->0.98. Several strains of this fungus (*S. atra, S. chartarum* and *S. alternans* are synonymous) may produce a trichothecene mycotoxin- Satratoxin H - which is poisonous by inhalation. The toxins are present on the fungal spores. This is a slow growing fungus on media. It does not compete well with other rapidly growing fungi. The dark colored fungus grows on building material with high cellulose content and low nitrogen content. Areas with a relative humidity above 55%, and are subject to temperature fluctuations, are ideal for toxin production. Individuals with chronic exposure to the toxin produced by this fungus reported cold and flu symptoms, sore throats, diarrhea, headaches, fatigue, dermatitis, intermittent local hair loss and generalized malaise. Other symptoms include coughs, rhinitis, nosebleed, a burning sensation in the nasal passages, throat, and lungs, and fever. The toxins produced by this fungus will suppress the immune system affecting the lymphoid tissue and the bone marrow. Animals injected with the toxin from this fungus exhibited the following symptoms: necrosis and hemorrhage within the brain, thymus, spleen, intestine, lung, heart, lymph node, liver, and kidney. Affects by absorption of the toxin in the human lung are known as pneumomycosis.

This organism is rarely found in outdoor samples. It is usually difficult to find in indoor air samples unless it is physically disturbed (or possibly -this is speculation- a drop in the relative humidity). The spores are in a gelatinous mass. Appropriate media for the growth of this organism will have high cellulose content and low nitrogen content. The spores will die readily after release. The dead spores are still allergenic and toxigenic. Percutaneous absorption has caused mild symptoms.

Stemphylium sp.

Reported to be allergenic. Isolated from dead plants and cellulose materials.

Torula sp.

Found outdoors in air, soil, on dead vegetation, wood, and grasses. Also found indoors on cellulose materials. Reported to be allergenic and may cause hay fever and asthma.

Tetraploa

Tetraploa species comprise a very small proportion of the fungal biota. This genus is somewhat related to *Triposporium* and Diplocladiella. The only reported human infections are two cases of keratitis (1970, 1980) and one case of subcutaneous infection of the knee (1990). No information is available regarding other health effects or toxicity. Allergenicity has not been studied. Usually identified on spore trap samples where it is seen every few weeks. (Spores have very distinctive morphology.) Our laboratory has never found this organism growing on indoor environmental surfaces. Natural habitat includes leaf bases and stems just above the soil on many kinds of plants and trees.

Ulocladium sp.

Aw 0.89. Isolated from dead plants and cellulose materials. Found on textiles.

Zygomycetes

Zygomycetes are one of the four major groups of fungi, the others being the Oomycetes, the Ascomycetes, and the Basidiomycetes. Zygomycetes are common, fast growing, and often overgrow and/or inhibit other fungi nearby. Rhizopus and Mucor are two of the most common Zygomycetes seen in the indoor environment. However, others are seen as well, including *Syncephalastrum*, *Circinella*, *Mortierella*, *Mycotypha*, *Cunninghamella*, and *Choanephora*. For further information, please see descriptions of these individual genera.

The following table lists mycotoxins that are produced by certain types of fungi:

Fungi	Mycotoxin
Acremonium crotocinigenum	Crotocin
Aspergillus favus	Alfatoxin B, cyclopiazonic acid
Aspergillus fumigatus	Fumagilin, gliotoxin
Aspergillus carneus	Critrinin
Aspergillus clavatus	Cytochalasin, patulin
Aspergillus Parasiticus	Alfatoxin B
Aspergillus nomius	Alfatoxin B
Aspergillus niger	Ochratoxin A, malformin, oxalicacid
Acremonium crotocinigenum	Crotocin
Aspergillus nidulans	Sterigmatocystin
Aspergillus ochraceus	Ochratoxin A, penicillic acid
Aspergillus versicolor	Sterigmatocystin, 5 ethoxysterigmatocystin
Aspergillus ustus	Ausdiol, austamide, austocystin,brevianamide
Aspergillus terreus	Citreoviridin
Alternaria	Alternariol, altertoxin, altenuene, altenusin, tenuazonic acid
Arthrinium	Nitropropionic acid
Bioploaris	Cytochalasin, sporidesmin, sterigmatocystin
Chaetomium	Chaetoglobosin A,B,C. Sterigmatocystin
Cladosporium	Cladosporic acid
Clavipes purpurea	Ergotism
Cylindrocorpon	Trichothecene
Diplodia	Diplodiatoxin
Fusarium	Trichothecene, zearalenone
Fusarium moniliforme	Fumonisins
Emericella nidulans	Sterigmatocystin
Gliocladium	Gliotoxin
Memnoniella	Griseofulvin , dechlorogriseofulvin, epi-decholorgriseofulvin, trichodermin, trichodermol
Myrothecium	Trichothecene
Paecilomyces	Patulin, viriditoxin
Penicillium aurantiocandidum	Penicillic acid
Penicillium aurantiogriseum	Penicillic acid
Penicillium brasilanum	Penicillic acid
Penicillium brevicompactum	Mycophenolic acid
Penicillium camemberti	Cyclopiazonic acid
Penicillium carneum	Mycophenolic acid, Roquefortine C
Penicillium crateriforme	Rubratoxin

Fungi	**Mycotoxin**
Penicillium citrinum	Citrinin
Penicillium commune	Cyclopiazonic acid
Penicillium crustosum	Roquefortine C
Penicillium chrysogenum	Roquefortine C
Penicillium discolor	Chaetoglobosin C
Penicillium expansum	Citrinin, Roquefortine C
Penicillium griseofulvum	Roquefortine C, cyclopiazonic acid, griseofulvin
Penicillium hirsutum	Roquefortine C
Penicillium hordei	Roquefortine C
Penicillium nordicum	Ochratoxin A
Penicillium paneum	Roquefortine C
Penicillium palitans	Cyclopiazonic acid
Penicillium polonicum	Penicillic acid
Penicillum roqueforti	Roquefortine C, Mycophenolic acid
Penicillium veridicatum	Penicillic acid
Penicillium verrucosum	Citrinin, ochratoxin A
Penicillium/ Aspergillus	Patulin
Penicillium/ Aspergillus/Alternaria	Glitoxin
Phomopsis	Macrocyclic trichothecenes
Phoma	Brefeldin, cytochalasin, secalonic acid, tenuazonic acid
Pithomyces	Sporidesmin
Rhizoctonia	Slaframine
Rhizopus	Rhizonin
Sclerotinia	Furanocoumarins
Stachybotrys chartarum	Iso-satratoxin F, roridin E, L-2, satratoxin G & H, trichodermin, trichodermol, trichothecene
Torula	Cytotoxins
Trichoderma	Trichodermin, trichodermol, gliotoxin
Trichothecium	Trichothecene
Wallemia	Walleminol
Zygosporium	Cytochalasin

General terms

Allergen

An allergen is a substance that elicits an IgE antibody response and is responsible for producing allergic reactions. Chemicals are released when IgE on certain cells contact an allergen. These chemicals can cause injury to surrounding tissue - the visible signs of an allergy. Only a few fungal allergens have been characterized but all fungi are thought to be potentially allergenic. Fungal allergens are proteins found in either the mycelium or spores

"Black mold"

A poorly defined term. Black mold or toxic black mold has usually been associated with the mold *Stachybotrys chartarum*. While there are only a few molds that are truly black, there are many that can appear black. Not all molds that appear to be black are *Stachybotrys*.

Fungi

Fungi are neither animals nor plants and are classified in a kingdom of their own. The Kingdom of Fungi. Fungi include a very large group of organisms, including molds, yeasts, mushrooms and puffballs. There are >100,000 accepted fungal species but current estimates range to 1.5 million species. Mycologists (people who study fungi) have grouped fungi into four large groups according to their method of reproduction.

Hidden mold

This refers to visible mold growth on building structures that is not easily seen, including the areas above drop ceilings, within a wall cavity (the space between the inner and outer structure of a wall), inside air handlers, or within the ducting of a heating/ventilation system.

Microbial Volatile Organic Compounds (MVOCs)

Fungi produce chemicals as a result of their metabolism. Some of these chemicals, MVOCs, are responsible for the characteristic moldy, musty, or earthy smell of fungi, whether mushrooms or molds. Some MVOCs are considered offensive or annoying. Specific MVOCs are thought to be characteristic of wood rot and mold growth on building materials. The human nose is very sensitive to mold odors and sometimes more so than current analytical instruments.

Mold

Molds are a group of organisms that belong to the Kingdom of Fungi (see Fungi). Even though the terms mold and fungi had been commonly referred to interchangeably, all molds are fungi, but not all fungi are molds.

Mycotoxin

Mycotoxins are compounds produced by some fungi that are toxic to humans or animals. By convention, the term? Mycotoxin. Excludes mushroom toxins. Fungi that produce mycotoxins are called "toxigenic fungi."

Spore

General term for a reproductive structure in fungi, bacteria and some plants. In fungi, the spore is the structure which may be used for dissemination and may be resistant to adverse environmental conditions.

Toxic mold

The term "toxic mold" has no scientific meaning since the mold itself is not toxic. The metabolic byproducts of some molds may be toxic (see mycotoxin).

Hypha (plural, hyphae)

An individual fungal thread or filament of connected cells; the thread that represents the individual parts of the fungal body.

Phoenix EnviroCorp

MOLD/BIOLOGICAL CONTAMINANT REMEDIATION PROTOCOL

Date: July 16, 2021

For: Quanesha Mullins
Wilmington Housing Authority
1524 S. 16th Street,
Wilmington, NC 28401

Remediation Contractor: Not determined

On-Site Consultant: Phoenix EnviroCorp (PEC)
4020 Shipyard Boulevard
Wilmington, NC 28403
(910) 397-0370

Approved Signatory:

Shaenaz Mirmohamed
IH Technician

Tommie Green, CIEC
Professional Industrial Hygienist

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SECTION 1.0 REMEDIATION PROCEDURES

1.1 Project Set Up

- The owner or powers that be shall supply temporary power for remediation equipment. The existing electrical system may be utilized, with permission of the owner or powers that be. Determining specific electrical load/safety requirements, including, but not limited to, the use of a temporary GFCI electrical panel box shall be the responsibility of the abatement contractor.
- HVAC system shall be isolated.
- 6-mil polyethylene sheathing shall be erected to separate primary control areas (PCA) from remaining areas. Control areas shall be selected so that specified building materials (specified herein, in section 1.3, under primary control areas) may be removed or cleaned and dried.
- HEPA Air Filtration Devices shall be utilized for each separate control area. Critical barriers shall consist of 6-mil polyethylene so that primary control areas are isolated from remaining areas. HEPA filtration units shall be exhausted from the PCA to the outside of the building through windows/doors. Dehumidification units must be installed in the PCA to sufficiently dry components.
- A remote wash off station shall be set up to allow for employees to wash hands and faces after egress from the work area.
- Ingress/Egress to the control area(s) shall be, at minimum, sealed with a 2-way polyethylene air lock.
- Entrances to the building shall be marked as indicated in Section 7.4 of this document.

1.2 Local Exhaust System

- Once sealed, the primary control area shall be ventilated with a local HEPA air filtration device that shall ensure a minimum of four (4) air changes per hour. The air filtration device shall be placed within the containment work area.
- Local HEPA exhaust shall be utilized where cleaning of contents is required and/or in the immediate vicinity of remediation activities of building materials.
- In interior sections requiring surface area cleaning, local HEPA filtration may be exhausted within the area to scrub microbials from ambient air. This process shall only be conducted after fine cleaning has been completed.
- Negative pressure within the contained work area shall be maintained throughout the project until clearance is obtained.
- Negative air machines shall be exhausted to exterior portions of the building to adequately ensure that negative pressure is achieved.
- Negative air pressure within the work area shall be tested and recorded at initiation of the project and hourly thereafter by use of a manometer to ensure the desired pressure of -0.02 inches of water, which is comparable to four changes per hour.
- Dehumidification devices with HEPA filtration may be incorporated as filtration devices in conjunction with true HEPA filtration devices; they may not replace the true HEPA filtration devices.

Note: Formula for determination of adequate HEPA filtration:

Total feet per minute =Volume of work area (ft^3)/15 minutes
#AFD Units needed = (Total feet per minute)/Capacity of Unit (ft^3)

- At initiation of final cleaning stages, relative humidity shall be at 40% (+/-3%) and moisture content of wooden components shall be at or below 15% as determined by Delmhorst moisture meter or equivalent meter. Moisture mapping and direct read T/RH shall be recorded by the remediation contractor until the

specified levels have been achieved. Control areas shall be dehumidified during cleaning and mold remediation activities to ensure removal of surface moisture created during application of water. Drying of structural components that have been treated with encapsulating anti-microbial agents will be necessary.

- Moisture levels shall be recorded and documented by the remediation contractor upon successful completion of dehumidification.

1.3 Remediation Specifications

- Prior to commencement of mold remediation activities by the remediation contractor, the source of any water intrusions, leaks, and/or moisture/humidity problems shall be remedied by the owner. If water intrusions, leaks, and/or moisture/humidity problems exist and are not corrected, mold growth can be expected to return.
- All remediation procedures listed that involve the removal of building materials shall employ polyethylene critical barriers, negative air pressure, and HEPA filtration (i.e., primary control areas).
- The remediation contractor shall ensure that the filters are properly capped prior to switching off the air scrubbers. If the filters are not properly capped, the backflow can cause mold spores to re-release back into the control area, essentially re-contaminating an area that has already been cleaned.
- All remediation activities shall be conducted in a manner that does not allow dissemination of mold spores. Remediation procedures shall begin from the side of the control area furthest away from air filtration devices.
- Cleaning procedures shall be repeated until the area is visibly free of dust and debris.
- Engineering controls set up during the remediation process shall remain in place until remediation has been completed and acceptable post remediation sampling results have been achieved.
- **Federal and/or state regulations require that suspect asbestos containing materials in public and commercial buildings shall be inspected for asbestos prior to renovations or demolition. Based on these regulations, PEC recommends that building materials that may be disturbed during mold remediation be tested for asbestos content prior to their disturbance to prevent asbestos contamination.**
- If cleaning procedures outlined in this remediation plan outweigh the cost of replacement for selected items, the remediation contractor shall give the owner the option to clean or dispose of those items.
- Reinstallation of building materials and/or components shall only be conducted once acceptable post remediation results are obtained.
- Any chemicals used on this project shall be EPA approved and used only as directed by the manufacturer. MSDS shall be available for review upon request.

HVAC System

- The HVAC system(s) that services or run through the primary control area/affected area shall be shut down prior to remediation activities.
- The spaces that are normally climate-controlled by the HVAC system that have been shut down shall be maintained under proper humidity levels (between 30 and 60% utilizing dehumidifiers, etc.) while the system is not in operation.
- All HVAC supply/return vents within the primary control area/affected area shall be isolated with a critical barrier (i.e., plastic, etc.) to prevent air flow. Prior to isolating the vents, the register covers (diffusers) shall be removed, and the supply shall be isolated at the metal boot. Once isolated, the registers and surrounding building materials shall be cleaned.
- The interior of the air handler, rigid duct system, intake box, etc. shall be thoroughly cleaned by an HVAC professional experienced in mold remediation. The interior can be cleaned with mechanical methods that aggressively disturb all interior surfaces and filter the disturbed airborne particulates.

- Cleaning of components shall consist of a method that thoroughly removes visible mold growth, settled concentrations of mold spores, and/or dust and debris.
- PEC recommends the removal and disposal of the flex ducts when feasible, as well as any interior duct board where cleaning will damage the duct board. Once removed, the remediation contractor shall isolate the connection point where the flex duct and/or duct board was detached with a critical barrier (such as plastic, etc.) to prevent air flow.
- Once the HVAC system components are cleaned or replaced anew, the system shall remain off and isolated until acceptable post remediation results are obtained.
- A written document shall be obtained from the remediation contractor verifying that the HVAC system has been cleaned by an HVAC cleaning company with mold experience. This document shall include the property address and date of services and shall be filed with other mold remediation documents.

Note: For directional purposes "front" is determined by facing Grass Lane from inside the unit, unless otherwise noted.

Primary Control Areas/Affected Areas

Critical barriers, negative air pressure, and HEPA filtration shall be established to isolate the following areas as Primary Control Areas to perform the specified mold remediation.

Within the bathroom:

- Detach the floor mounted cabinet from the front wall, and remove any affected drywall (i.e., drywall with apparent water damage/suspect visible mold growth) and extend the drywall removal within a 2-foot radius of the affected area when possible.
- Remove the baseboard entirely from the front wall, thoroughly inspect the wall, and remove any affected drywall (i.e., drywall with apparent water damage/suspect visible mold growth) and extend the drywall removal within a 2-foot radius of the affected area when possible.

Within the kitchen:

- Detach the floor mounted cabinet from the front wall, and remove any affected drywall (i.e., drywall with apparent water damage/suspect visible mold growth) and extend the drywall removal within a 2-foot radius of the affected area when possible.

Throughout the unit (Negative air pressure is not required in areas where building components are not specified for removal, but HEPA filtration is required):

- Clean all surfaces, furnishings and contents as specified herein under general specifications for primary control areas.

General Specifications for Primary Control Areas

- Open plumbing lines and drains within the control areas shall be isolated with a critical barrier consisting of 6-mil poly.
- The water line to toilets within the control areas shall be shut off and the toilets shall be isolated with a critical barrier consisting of 6-mil poly.
- Cleaning of components/materials shall consist of a method that thoroughly removes visible mold growth, settled concentrations of mold spores, and/or dust and debris (i.e., HEPA vacuuming, wet wiping, or other approved methods), followed by dehumidification/drying.
- Non-porous, semi-porous, and porous furnishings and contents shall be cleaned. If items cannot be cleaned efficiently, the abatement contractor shall consult with the owner/powers that be to determine if they shall be disposed.

- All machine washable porous cloth items shall be cleaned and dried in a household washer and dryer. Other specialty items shall be cleaned by a dry cleaner that specializes in cleaning materials affected with mold. These items shall be removed from affected area(s) and shall not be reintroduced back into the area(s) until acceptable post remediation testing is established. If porous articles cannot be cleaned efficiently, the abatement contractor shall consult with the owner/powers that be.
- Mattresses shall be cleaned utilizing HEPA vacuuming, NOT by pressure extraction or wet methods. If suspect visible mold growth is on the mattress or if the mattress cannot be cleaned efficiently, the abatement contractor shall consult with the owner/powers that be prior to disposal.
- Exterior surfaces of electrical appliances, electrical equipment, and light fixtures shall be cleaned, utilizing wet method and HEPA vacuuming. These items shall be disconnected from all electrical sources prior to cleaning. If these items cannot be cleaned efficiently, the abatement contractor shall consult with the owner/powers that be.
- In areas where drywall removal is specified around windows and doors, remove trim boards. The door casing(s) shall also be assessed to determine if they have sustained mold/water damage. If so, they shall be cleaned, or removed.
- All wall/ceiling cavity insulation shall be disposed in areas that specify the removal of drywall/wallboard. The abatement contractor shall visually inspect the back side of surrounding drywall/wallboard for water damage and/or suspect mold growth and document any findings. If additional suspect mold growth or water damage is observed beyond the specified removal area, additional drywall/wallboard shall be removed until no suspect mold growth or water damage is observed.
- All penetrations within the controlled area that adjoin unaffected or non-accessible areas, including outdoor areas, crawlspaces, etc., shall be cleaned (as far as one can reach) and then sealed with 6-mil poly, extending six (6) inches on all sides.
- In areas of specified wallboard removal, all components within the wall/ceiling cavities shall be cleaned. Any wooden structural components with mold stains or mold growth in pitted surfaces shall be HEPA sanded (or other approved methods) to eliminate embedded mold growth.
- All joints or sills (where the structural system meets, where the sill plate meets the floor, etc.) shall be aggressively disturbed to remove embedded mold growth and spores.
- Furnishings and contents that are specified for cleaning shall be protected with polyethylene in areas where building components are specified for removal, prior to the removal of building components to avoid cross contamination. The protective covering shall be removed, and the furnishings and contents shall be cleaned prior to post visual inspection and testing.

1.4 Removal Procedures

The contractor shall maintain surfaces of the control area free of accumulation of dust and debris. Additionally, they shall restrict the spread of dust and debris, keeping waste from being distributed over the work area. Materials shall be removed in a fashion to ensure that previously cleaned areas are not recontaminated (i.e. working from one end of the control area to the other). The contractor may be required to re-clean areas based on a visual inspection by the CIEC/CIE/IH, if the areas are not visibly clean.

Contaminated building materials that have been removed, and additional materials and debris generated during remediation, shall be bagged or wrapped with 6-mil polyethylene sheeting, sealed with duct tape, and carried to the waste container prior to visual inspection by the CIEC/CIE/IH. Materials shall be bagged and sealed directly after removal from unaffected building components.

Areas shall be allowed to dry for a period until specified RH and moisture levels have been achieved. Any remaining building products that are directly impacted by remediation shall be tested for moisture content. Wooden and cellulosic building components (e.g., wall studs, drywall, etc.) shall be tested for moisture content. If the moisture content is > 15% in wood products or > 12% in cellulosic products (utilizing a Delmhorst moisture meter), dehumidification shall be required until moisture levels are at or below said levels,

and the RH level is at or below 40% +/-3% (for all interior areas). The remediation contractor shall verify water content of all wooden and cellulosic building components within the impacted areas, as well as temperature and RH prior to scheduling post remediation verification.

1.5 Cleanup Overview

The contractor shall personally review the cleaning process prior to contacting the CIEC/CIE/IH for the post remediation testing. If accumulations of debris and dust are significant, the CIEC/CIE/IH will require re-cleaning prior to post remediation verification sampling.

The CIEC/CIE/IH shall make a visual inspection and conduct post remediation sampling after the final cleaning is complete.

1.6 Post Remediation Verification Testing

Prior to conducting post remediation sampling, HEPA filtration devices shall be allowed to operate for a minimum of 48 hours (the equivalent of 192 air changes), following fine cleaning, in all areas where remediation has been conducted. The HEPA filtration devices shall be sealed at the intake and turned off approximately two hours prior to post testing and reconvene within one hour after post testing, until acceptable post remediation results are established.

Post remediation sampling shall be conducted utilizing viable and/or non-viable sample methods. Air samples shall be collected in representative areas of the control areas. Surface sampling may be conducted at the discretion of the CIEC/CIE/IH.

Sampling shall be conducted in areas directly impacted by remediation procedures, where cleaning was conducted. The CIEC/CIE/IH shall determine acceptable post remediation status through interpretation of air sampling results, which will be based on indoor/outdoor comparisons, in combination with any surface samples collected, moisture readings, RH readings, visual observations, and any other pertinent information.

The owner/client will be responsible for post remediation testing. If air sample results indicate unacceptable airborne concentrations, the contractor shall be required to conduct a re-cleaning at the contractor's expense and absorb the cost for re-testing, until acceptable results are achieved.

SECTION 2.0 SCOPE OF WORK (Note: Section 2 and Section 1.3 are essential to the full Scope of the Contractor's Work)

2.1 Investigative Reports and Other Related Documents

Phoenix EnviroCorp initial investigative report dated April 14, 2021.

Phoenix EnviroCorp investigative report dated July 28, 2021.

Phoenix EnviroCorp Chain of Custody dated April 12, 2021, and July 16, 2021.

Analytical reports dated April 13, 2021, and July 19, 2021.

2.2 Project Description

The procedures covered by this program include the enclosure and drying of the said structure, the removal, handling, and disposal of building components compromised by mold/fungal growth, and the cleaning and

disinfecting of existing building materials. Procedures for reconstruction are not considered in these specifications. Reconstruction of interior portions may not be conducted until procedures for remediation have been completed, the control areas have been inspected, and testing has returned acceptable post remediation results. Reconstruction of exterior portions may be conducted during the restoration to ensure that water intrusion is abated.

The objectives covered by the program include the remediation of materials shown to have surface contamination, water damage, and/or exposure to elevated airborne mold spore levels, without subjecting the workers, installation employees, and occupants to microbial contaminants. In addition, contract employees, occupants, and materials will be appropriately protected during the removal process so that present and future exposures will not occur.

This protocol is provided as a guideline. Any deviation requests from this protocol shall be addressed to the CIEC/CIE/IH for consideration. At present there are no Federal or State requirements regarding microbial remediation projects; however, OSHA General Construction Code of Federal Regulations (29 CFR 1926) shall be followed.

Remediation shall be completed as close to the date that this protocol was drafted, as the specifications outlined within represent conditions at the time the investigative services were conducted. Due to the volatility of mold, the current protocol may not reflect all necessary remediation if conditions are allowed to continue. Further, if time lapses allowing conditions to change, it will become increasingly difficult to obtain successful clearance testing results.

SECTION 3.0 AIR MONITORING

3.1 Responsibilities of the CIEC/CIE/IH

Monitoring of airborne concentrations will be performed in accordance with the requirements of this program. Prior to conducting air sampling and/or surface sampling for clearances, the CIEC/CIE/IH shall conduct a visual inspection of the area. Temperature and RH shall be recorded during the air sampling phase of clearance. All air sampling shall be conducted in such a manner as to provide a valid representation of airborne mold levels both inside and outside the work areas. If analysis of air samples indicates that airborne concentrations exceed acceptable limits, the contractor shall conduct re-cleaning at the contractor's expense.

3.2 Personal Monitoring

No personal monitoring will be conducted by the CIEC/CIE/IH unless the remediation contractor requests monitoring for OSHA compliance. Presently there are no guidelines (PELs or TLVs) for microbial contaminants. It is the remediation contractor's responsibility to determine if OSHA personal sampling may be required during application of anti-microbial agents.

3.3 Sample Integrity and Reporting

Samples shall be sealed, labeled, and a chain of custody initiated according to laboratory procedures.

Sample results shall be available within seven (7) days of the completion of collection of all samples and will include the following information:

- Site Address
- Sample Number

- Location Sampled
- Analytical Method
- Collection Date(s)
- Person Taking Sample(s)
- Additional Comments (if any)
- Analyst Signature

SECTION 4.0 MATERIAL REPLACEMENT

4.1 Material Replacement

The general contractor/replacement contractor may begin material replacement after the CIEC/CIE/IH informs all parties of acceptable post remediation sample results.

With ongoing construction activities ambient air levels are expected to be elevated over what might be normally expected. Additional testing should not be necessary after remediation procedures have been completed and successful results have been obtained. In the event of another water intrusion (i.e. broken-pipe-line, improper HVAC function, or building envelope compromise), an investigation shall be conducted within 24 to 48 hours of the event. Proper drying, if initiated within this time frame, should minimize the potential for microbial growth.

SECTION 5.0 SPILL CLEANUP REQUIREMENTS

5.1 Spills

MSDS shall be kept on site for all chemical products brought to the site by the remediation contractor. In the event of a chemical spill, the contractor shall initiate cleanup immediately. The contractor shall mop up any liquid with rags or other conventional absorbent. The spent absorbent shall be properly contained and disposed of as waste.

SECTION 6.0 WASTE CONTROL

6.1 Waste Disposal

Waste shall be disposed of at a locally selected landfill. Waste bags shall be checked for integrity and hauled in an enclosed truck/vehicle or container to ensure that transportation to the landfill does not pose a potential hazard to the environment.

SECTION 7.0 SUPPLEMENTAL INFORMATION

7.1 Applicable Publications

The publications listed below form part of this program. Written programs shall accompany all referenced CFR publications. IICRC and NYCDOH guidelines for work procedures shall be followed by the remediation contractor. A copy of the NYCDOH protocols shall be on-site, along with this design, for reference by the site supervisor. ACGIH, IAQA, and ASHRAE publications shall be utilized as guidelines for interpretation by the CIEC/CIE/IH. This design shall be reviewed by the remediation supervisor prior to initiation of set-up for the project. Any questions regarding this project may be addressed with the on-site consultant listed for Phoenix EnviroCorp.

Code of Federal Regulation (CFR Publications)

29 CFR 1910.134	Respiratory Protection
29 CFR 1910.145	Specifications for Accident Prevention, Signs and Tags
29 CFR 1926.28	Personal Protective Equipment
29 CFR 1926.59	Hazard Communication
29 CFR 1926.96	Occupational Foot Protection
29 CFR 1926.100	Head Protection
29 CFR 1926.101	Hearing Protection
29 CFR 1926.102	Eye and Face Protection
29 CFR 1926.403	Electrical General Requirements
29 CFR 1926.416	Safety General Requirements
29 CFR 1926.852	Demolition, Chutes
29 CFR 1926.1091	Record Keeping Requirements

Supplemental Guidelines

IICRC S520 2nd ed.	Standard and Reference Guide for Professional Water Damage Restoration
NYCDOH	Guidelines on Assessment and Remediation of Fungi in Indoor Environments
ACGIH	Bioaerosols: Assessment and Control
IAQA 01-2000	Recommended Guidelines for Indoor Environments
ASHRAE 62.2-2007	Ventilation for Acceptable Indoor Air Quality in Low-Rise Residential Buildings

7.2 Definitions

Air Lock: A system that permits ingress and egress between a control area and non-control area, or other work areas, without allowing air movement between areas (e.g., three stage decon, three-way polyethylene flaps).

Air Sample: Refers to samples collected with spore trap air sample media (e.g., Micro-5, Cyclex D, or equivalent); also referred to as a non-viable air sample. May also refer to a sample collected on a disposable petri dish with Agar media by means of an Andersen Impactor (or equivalent) and sampling pump; also referred to as air culture (viable) sample. Sample media to be used in project is described under Section 1.6 (Post Remediation Verification Testing).

Area Monitoring: The sampling of airborne microbial concentrations outside the exclusion boundary, which may reach the breathing zone of the contractor or installation employees.

Asbestos Containing Materials (ACM): Refers to asbestos containing building materials that contain more than 1% asbestos by Polarized Light Microscopy (PLM) or Transmission Electron Microscopy (TEM).

Biocide: Refers to chemical agents that are specifically designed to eliminate viable microbial contamination, with a phenol equivalent efficiency (e.g., Sodium Hypochlorite, Quaternary Ammonia Compounds).

Blower Door Test: Refers to the testing of static pressure and draw of air through the HVAC in cubic feet per minute (CFM) to rate the efficiency of the system.

Clearance Monitoring: Refers to air, bulk, or swab sampling conducted as a means to demonstrate that the area specified for remediation has been completed by the contractor, left with present acceptable mold spore levels, and ready for re-construction.

Control Area: The area where microbial contaminants removal is performed, which is isolated by physical boundaries to prevent unauthorized entry of personnel, thereby preventing exposure to or the spread of microbial contaminants. Physical boundaries will be established and located such that the airborne contaminants are not allowed to escape the boundaries.

HEPA: High Efficiency Particulate Air. Refers to ventilation devices that are specifically designed to filter ambient air to an efficiency of 99.97%.

HVAC: Refers to the Heating, Ventilation, and Air Conditioning system.

Industrial Hygienist: Refers to a person who practices industrial hygiene and may act as a competent person regarding visual inspection of contaminated surfaces and clearance air and/or swab/bulk sampling. May also refer to a Certified Industrial Hygienist (CIH) as defined by the American Board of Industrial Hygiene (ABIH), a Certified Indoor Environmental Consultant as defined by the American Council for Accredited Certification (ACAC), or a Certified Indoor Environmentalist (CIE) as defined by the American Council for Accredited Certification (ACAC).

Microbial Contaminant: Refers to viable mold, fungi, pollen, bacteria, and or particulate, or their metabolites, that may be causative of epidemiological, immunotoxic, dermotoxic, neurotoxic, or enterotoxic disorders in the human population, or may be considered a pathogen or an opportunistic pathogen.

Non-Porous Materials: Refers to building materials with solid surfaces that may be successfully treated and cleaned by means of HEPA vacuuming or other approved method. Materials include flooring, hard goods, plastic, vinyl, and some wallboard systems.

Porous Materials: Refers to building materials and household goods that may allow microscopic particles (3-20 micron) to become trapped within the material that will not allow adequate cleaning. Materials include carpet, mattresses, and clothing.

Primary Control Area (PCA): Refers to a section of a facility that has been isolated by 6-mil polyethylene barriers where specific engineering controls (e.g., HEPA filtration, negative air pressurization, dehumidification, etc.) are required. In general, it is the area where remediation of water and mold damaged building materials is to be conducted.

Refrigerant Dehumidifier: Device used to remove water content from air and materials.

Relative Humidity (RH): Refers to the ratio of water vapor in the atmosphere to the amount required to saturate it at a given temperature.

Semi-Porous Materials: Refers to materials that may be somewhat porous, yet they may still allow for adequate cleaning. Materials include wooden beams and some wallboard systems.

Swab Sample: Refers to collection of a sample onto a sterile swab for analysis of mold, fungi, and bacteria by viable and/or non-viable analysis.

Tape-Lift Sample: Refers to collection of a sample onto clear scotch tape for analysis by direct microscopic examination (non-viable).

7.3 Quality Assurance

Medical Examinations

Before potential exposure to microbial contaminants, the remediation contractor shall provide workers with a comprehensive medical examination as required by 29 CFR 1910.134 as outlined by the Medical Monitoring Program.

Medical Records

The remediation contractor shall maintain complete and accurate medical records on employees as required by OSHA and the contractor's Medical Monitoring Program. The contractor may be asked to provide a copy of all medical records for approval by the consultant's representative.

Training

Each employee working on this contract shall be trained prior to the time of initial job assignment in accordance with mold specific and chemical specific training as indicated by the OSHA General Duty Clause and the Hazard Communication Standard. Each employee shall also receive training required by Federal guidelines listed in Section 7.1 of this document and project specifications.

Hazard Communication Program

The remediation contractor has established and implemented a Hazard Communication Program as required by 29 CFR 1910.1200 and may be asked to provide a copy of this written program. Hazard Communication training must include occupational hazards as directly related to working with fungi/mold and contamination of building components by fungal contamination, specific training for chemical hazards associated with biocide usage, and site specific MSDS sheets for commercial detergents and biocides utilized on the job site.

Respiratory Protection Program

The remediation contractor has established a Respiratory Protection Program, which complies with 29 CFR 1910.134. Physical examinations and fit testing are required for use of respiratory protection greater than an N-95 dust mask. Workers removing building materials contaminated by mold growth, applying anti-microbial agents, or workers subjected to exposures to anti-microbial agents shall be required to wear, at minimum, a tight-fitting negative pressure ½ mask respirator with P-100 filters. Therefore, -he OSHA Respiratory Protection Standard applies.

Analytical Testing Laboratory

Analysis of culturable biological samples collected on this project shall be conducted by a laboratory that participates in the Environmental Microbiological Proficiency Analytical Testing Program (EMPAT) of the American Industrial Hygiene Association (AIHA) and has shown to be proficient by proficiency analytical testing (PAT) samples. Analysis of non-viable air and surface samples shall be conducted by a competent person.

7.4 Materials and Equipment

Equipment

The contractor shall make available to employees a complete set of personal protective equipment (PPE) as

required by this program for entry into the controlled area. All personnel while in the control area or handling microbial contaminated waste shall wear protective clothing, respirators, and other PPE.

Respirators

Contractor shall furnish the appropriate respirator in accordance with 29 CFR 1910.134 and approved by NIOSH for protection in environments that contain microbial contaminants. The selected respirator for this project shall be a tight-fitting negative pressure ½ respirator equipped with HEPA cartridge (P-95, P-100). At minimum, an N-95 dust mask may be utilized during fine cleaning activities; however, the tight fitting ½ mask respirator shall be utilized during application of anti-microbial agents or biocides.

Special Clothing

Employees shall be provided with and required to wear: whole body disposable protective clothing, full body tyvek suits with head coverings, and latex gloves *(see table)* during all activities in the controlled area.

Chemical	Recommended Rubber Glove
Sodium Hypochlorite	Neoprene or Nitrile
Phenolic Compounds	Neoprene
Quaternary Ammonia Compounds	Polyvinyl Chloride (PVC)
Detergents	Latex

Eye Protection

The contractor shall provide chemical-resistant goggles to personnel engaged in cleaning and treatment activities and require them to be worn during application of anti-microbial agents and biocides.

Warning Signs and Labels

Standard approved warning signs shall be erected at all approaches to the control area as specified in 29 CFR 1910.145.

Anti-Microbial Agents

Anti-microbial agents utilized in interior quarters shall consist of quaternary ammonia compounds. No phenolic compounds shall be used in interior quarters with exception of Micro Ban Plus. Approval must be granted by the owner/powers that be prior to application. Anti-microbial agents shall be EPA approved. Commercial grade detergents shall be used to remove fungal contamination during cleaning phases prior to anti-microbial application, to include encapsulation.

Creekwood (14 Units) at
602, 712, 804, 805, 809 & 1008 N. 30th St.,
617, 701, 707, 708, 902, 915 & 922 Emory St.,
and 2905 Clayton Place, Wilmington, NC
28405

Phoenix EnviroCorp

November 18, 2022

Pamela Baldwin
Wilmington Housing Authority
1524 S. 16th Street
Wilmington, NC 28401

RE: PEC Job # 21-21-305B-IAQ-M – 602 N. 30th Street, Wilmington, NC - Mold Investigation

Enclosed are the results of the mold investigation conducted at the above referenced unit on November 9, 2022. Phoenix EnviroCorp (PEC) was retained to conduct additional investigative activities and provide a mold remediation protocol.

Background Information: PEC conducted a mold investigation (i.e., background air sampling and surface sampling) at the above referenced unit on October 7, 2021, identifying elevated airborne mold spore levels (*Cladosporium* within the 2nd floor left bedroom) and surface mold growth within the 2nd floor bathroom, on the ceiling, to include *Stachybotrys*. Additionally, apparent water damage was noted in the kitchen.

During the October 7, 2021 investigation, the tenant reported water intrusion in the 2nd floor bathroom and the kitchen which occurred during Hurricane Florence.

This is a 2-story apartment building, built on a slab. The subject unit is on both floors and is fully furnished with contents throughout, and there is no carpet installed in the unit.

The 1st floor HVAC system was operating in the cool mode set at 67º F with the fan on auto, and the 2nd floor systems was operating in the heat mode with the fan in the on position.

Related Documents:
- PEC mold investigation report dated October 12, 2021

Note: For directional purposes "front" is determined by facing N. 30th Street from inside the unit, unless otherwise stated.

Visual Inspection: PEC's visual inspection noted the following (see enclosed photographic documentation as well as photos from PEC's report dated October 12, 2021):
2nd floor bathroom
- Apparent water damage/suspect visible mold growth on the drywall ceiling/rear wall above the toilet. *A surface sample collected during the October 7, 2021 investigation identified Stachybotrys in this area*
- Apparent water damage to the baseboards along the rear wall

Kitchen
- Apparent water damage to the drywall ceiling along the rear wall. *This area is directly below the bathroom*
- Apparent water damage within the floor mounted cabinet with sink, along the rear wall
- No apparent water damage around the wall mounted cabinets along the rear wall

Throughout the unit

- Dust/suspect visible mold growth on HVAC supply vents in various locations throughout
- Excessive contents in various locations throughout the unit obstructing the visual inspection

Moisture Readings: Moisture readings were collected with a Tramex Survey Encounter meter. Multiple readings were taken to represent areas and materials reported. For drywall products, readings should be below fifty percent (50%). For wood products, normal moisture content should be less than fifteen percent (<15%).

Moisture content measurements were as follows:

- 1st floor hallway rear drywall wall associated with the HVAC closet = ≤ 10%

2nd floor bathroom

- Drywall walls and ceiling = ≤ 40%

Kitchen

- Drywall walls and ceiling = ≤ 30%

Conclusions: Sample results from PEC's October 7, 2021 visit identified elevated airborne mold spore levels of *Cladosporium* within the 2nd floor bathroom, and surface mold growth to include *Stachybotrys* within the unit. A mold remediation protocol that outlines remediation activities is attached.

Prior to commencement of mold remediation, the source of any water intrusions, leaks, and/or moisture/humidity issues shall be remedied. If water intrusions/moisture issues exist and are not remedied, mold can be expected to return.

After remediation activities are completed, but before put-back of removed components, post remediation verification shall be conducted. Upon notice, and for an additional fee, PEC can conduct post remediation verification testing.

Enclosed in this report are the laboratory analysis and the Chain of Custody.

Should you have any questions, please do not hesitate to call.

Thank you,

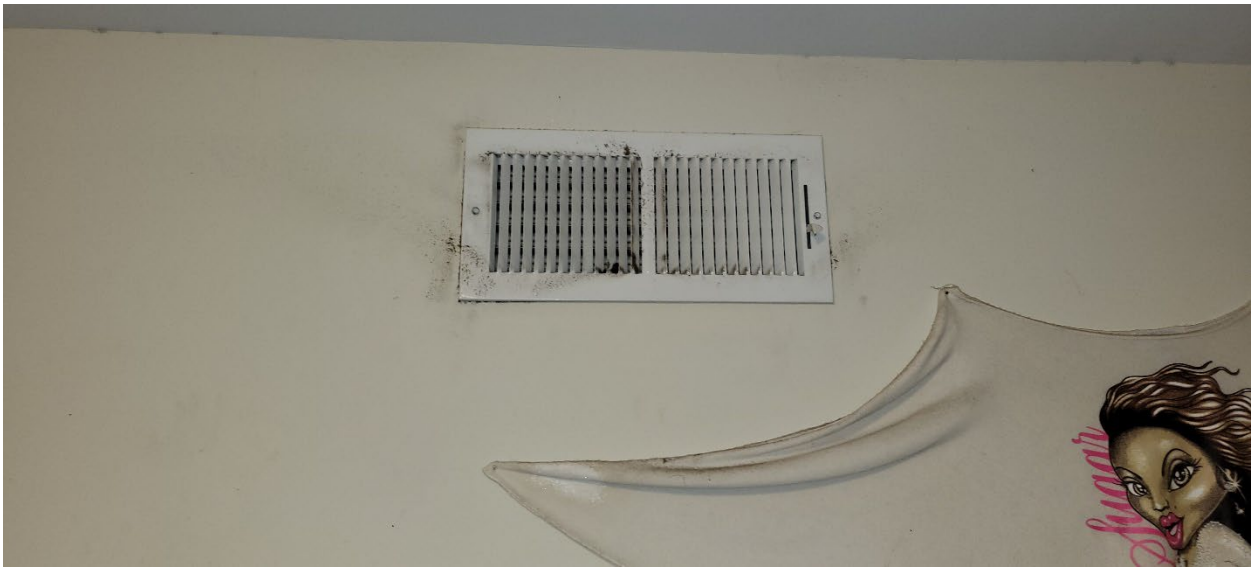
Tommie Green, CIEC
Professional Industrial Hygienist

Enclosures

Photo 1

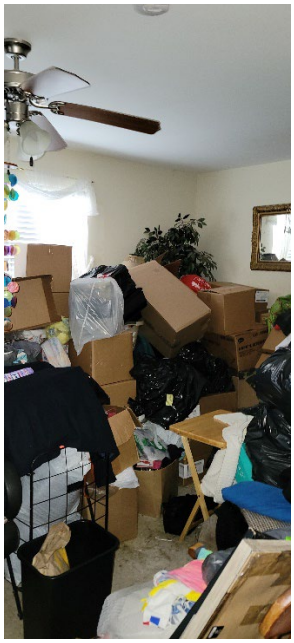
Apparent water damage to the baseboards along the rear wall of the 2nd floor bathroom

Photo 2



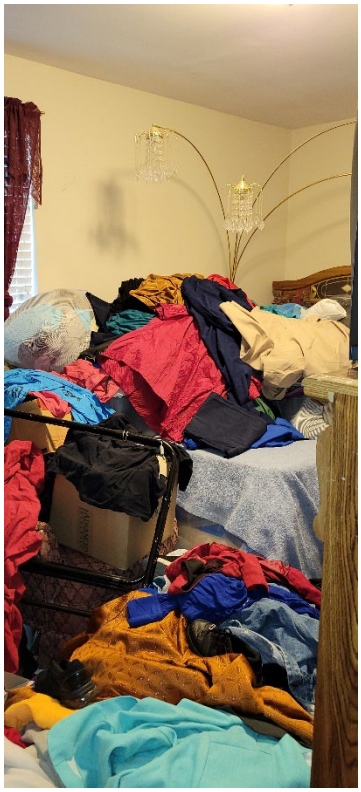
Dust/suspect visible mold growth on HVAC supply vents in various locations throughout. *Note: Photo taken in the 2nd floor front right bedroom*

Photo 3



Excessive contents in various locations throughout the unit obstructing the visual inspection

Photo 4



Excessive contents in various locations throughout the unit obstructing the visual inspection

Phoenix EnviroCorp

MOLD/BIOLOGICAL CONTAMINANT REMEDIATION PROTOCOL

Date: November 18, 2022

For: Pamela Baldwin
Wilmington Housing Authority
1524 S. 16th Street
Wilmington, NC 28401

Remediation Contractor: Not determined

On-Site Consultant: Phoenix EnviroCorp (PEC)
4020 Shipyard Boulevard
Wilmington, NC 28403
(910) 397-0370

Approved Signatory:

Tommie Green, CIEC
Professional Industrial Hygienist

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SECTION 1.0 REMEDIATION PROCEDURES

1.1 Project Set Up

- The owner or powers that be shall supply temporary power for remediation equipment. The existing electrical system may be utilized, with permission of the owner or powers that be. Determining specific electrical load/safety requirements, including, but not limited to, the use of a temporary GFCI electrical panel box shall be the responsibility of the abatement contractor.
- HVAC system shall be isolated.
- 6-mil polyethylene sheathing shall be erected to separate primary control areas (PCA) from remaining areas. Control areas shall be selected so that specified building materials (specified herein, in section 1.3, under primary control areas) may be removed or cleaned and dried.
- HEPA Air Filtration Devices shall be utilized for each separate control area. Critical barriers shall consist of 6-mil polyethylene so that primary control areas are isolated from remaining areas. HEPA filtration units shall be exhausted from the PCA to the outside of the building through windows/doors. Dehumidification units must be installed in the PCA to sufficiently dry components.
- A remote wash off station shall be set up to allow for employees to wash hands and faces after egress from the work area.
- Ingress/Egress to the control area(s) shall be, at minimum, sealed with a 2-way polyethylene air lock.
- Entrances to the building shall be marked as indicated in Section 7.4 of this document.

1.2 Local Exhaust System

- Once sealed, the primary control area shall be ventilated with a local HEPA air filtration device that shall ensure a minimum of four (4) air changes per hour. The air filtration device shall be placed within the containment work area.
- Local HEPA exhaust shall be utilized where cleaning of contents is required and/or in the immediate vicinity of remediation activities of building materials.
- In interior sections requiring surface area cleaning, local HEPA filtration may be exhausted within the area to scrub microbials from ambient air. This process shall only be conducted after fine cleaning has been completed.
- Negative pressure within the contained work area shall be maintained throughout the project until clearance is obtained.
- Negative air machines shall be exhausted to exterior portions of the building to adequately ensure that negative pressure is achieved.
- Dehumidification devices with HEPA filtration may be incorporated as filtration devices in conjunction with true HEPA filtration devices; they may not replace the true HEPA filtration devices.

Note: Formula for determination of adequate HEPA filtration:

Total feet per minute =Volume of work area (ft^3)/15 minutes
#AFD Units needed = (Total feet per minute)/Capacity of Unit (ft^3)

- At initiation of final cleaning stages, relative humidity shall be at 40% (+/-3%) and moisture content of wooden components shall be at or below 15% as determined by Delmhorst moisture meter or equivalent meter. Moisture mapping and direct read T/RH shall be recorded by the remediation contractor until the specified levels have been achieved. Control areas shall be dehumidified during cleaning and mold remediation activities to ensure removal of surface moisture created during application of water. Drying of structural components that have been treated with encapsulating anti-microbial agents will be necessary.

- Moisture levels shall be recorded and documented by the remediation contractor upon successful completion of dehumidification.

1.3 Remediation Specifications

- Prior to commencement of mold remediation activities by the remediation contractor, the source of any water intrusions, leaks, and/or moisture/humidity problems shall be remedied by the owner. If water intrusions, leaks, and/or moisture/humidity problems exist and are not corrected, mold growth can be expected to return.
- All remediation procedures listed that involve the removal of building materials shall employ polyethylene critical barriers, negative air pressure, and HEPA filtration (i.e., primary control areas).
- The remediation contractor shall ensure that the filters are properly capped prior to switching off the air scrubbers. If the filters are not properly capped, the backflow can cause mold spores to re-release back into the control area, essentially re-contaminating an area that has already been cleaned.
- All remediation activities shall be conducted in a manner that does not allow dissemination of mold spores. Remediation procedures shall begin from the side of the control area furthest away from air filtration devices.
- Cleaning procedures shall be repeated until the area is visibly free of dust and debris.
- Engineering controls set up during the remediation process shall remain in place until remediation has been completed and acceptable post remediation sampling results have been achieved.
- **Federal and/or state regulations require that suspect asbestos containing materials in public and commercial buildings shall be inspected for asbestos prior to renovations or demolition. Based on these regulations, PEC recommends that building materials that may be disturbed during mold remediation be tested for asbestos content prior to their disturbance to prevent asbestos contamination.**
- If cleaning procedures outlined in this remediation plan outweigh the cost of replacement for selected items, the remediation contractor shall give the owner the option to clean or dispose of those items.
- Reinstallation of building materials and/or components shall only be conducted once acceptable post remediation results are obtained.
- Any chemicals used on this project shall be EPA approved and used only as directed by the manufacturer. MSDS shall be available for review upon request.

HVAC System

- The HVAC system(s) that services or run through the primary control area/affected area shall be shut down prior to remediation activities.
- The spaces that are normally climate-controlled by the HVAC system that have been shut down shall be maintained under proper humidity levels (between 30 and 60% utilizing dehumidifiers, etc.) while the system is not in operation.
- All HVAC supply/return vents within the primary control area/affected area shall be isolated with a critical barrier (i.e., plastic, etc.) to prevent air flow. Prior to isolating the vents, the register covers (diffusers) shall be removed, and the supply shall be isolated at the metal boot. Once isolated, the registers and surrounding building materials shall be cleaned.
- The interior of the air handler, rigid duct system, intake box, etc. shall be thoroughly cleaned by an HVAC professional experienced in mold remediation. The interior shall be cleaned with mechanical methods that aggressively disturb all interior surfaces and filter the disturbed airborne particulates to avoid cross contamination, or other equivalent methods.
- Cleaning of components shall consist of a method that thoroughly removes visible mold growth, settled concentrations of mold spores, and/or dust and debris.

- PEC recommends the removal and disposal of the flex ducts when feasible, as well as any interior duct board where cleaning will damage the duct board. Once removed, the remediation contractor shall isolate the connection point where the flex duct and/or duct board was detached with a critical barrier (such as plastic, etc.) to prevent air flow.
- The remediation contractor shall be responsible for coordinating the cleaning of the HVAC system and other specified remediation to avoid cross contamination.
- Once the HVAC system components are cleaned or replaced anew, the system shall remain off and isolated until acceptable post remediation results are obtained.
- A written document shall be obtained from the remediation contractor verifying that the HVAC system has been cleaned by an HVAC cleaning company with mold experience. This document shall include the property address and date of services and shall be filed with other mold remediation documents.

Note: For directional purposes "front" is determined by facing N. 30th Street from inside the unit, unless otherwise noted.

Primary Control Areas/Affected Areas

Critical barriers, negative air pressure, and HEPA filtration shall be established to isolate the following areas as Primary Control Areas to perform the specified mold remediation.

Within the 2nd floor bathroom:
- Remove the entire drywall ceiling (approximately 6-feet by 8-feet).
- Detach the toilet and floor mounted cabinet to allow access to the walls and floor obstructed by the toilet and cabinet.
- Remove all baseboards and the sheet flooring.
- Remove the entire shower surround.
- Remove the entire rear drywall wall (approximately 8-feet by 8-feet).
- Remove any subflooring that cannot be properly cleaned (i.e., wood rot, etc.).
- Assess the drywall uncovered by the removal of specified baseboards/shower surround and remove any additional affected drywall (i.e., drywall with suspect visible mold growth/apparent water damage) and extend the drywall removal within a 2-foot radius of any affected areas when possible.

Within the kitchen:
- Remove the entire drywall ceiling (approximately 7-feet by 11-feet). Note: The apparent water damaged area begins at the rear wall and extends approximately 3-feet toward the front of the room.
- Detach the floor mounted cabinets along the rear wall.
- Remove an 11-foot by 3-foot section of drywall from the rear wall beginning at the left wall and extending 11-feet toward the right; and beginning at the floor and extending up 3-feet.

Throughout the Unit (Negative air pressure is not required in areas where building components are not specified for removal, but HEPA filtration is required):
- Move all contents to allow access and viewing of all walls and floors.
- Clean all surfaces, furnishings and contents as specified below under general specifications for primary control areas. (Note: Elevated airborne mold spore levels and surface mold growth, to include Stachybotrys was identified within the unit in October 2021, per PEC's report dated October 12, 2021.
- **Areas of specified subflooring or ceiling removal shall be sealed with poly (i.e., critical barrier) after cleaning, but before HEPA air scrubbing after cleaning, to prevent air flow from areas outside the containment area. An access door (i.e., poly flap taped in place, zipper, etc.) shall be installed in the critical barrier for easy access to conduct a visual inspection of the building materials behind the critical barrier.**

General Specifications for Primary Control Areas

- Open plumbing lines and drains within the control areas shall be isolated with a critical barrier consisting of 6-mil poly.
- The water line to toilets within the control areas shall be shut off and the toilets shall be isolated with a critical barrier consisting of 6-mil poly.
- Cleaning of components/materials shall consist of a method that thoroughly removes visible mold growth, settled concentrations of mold spores, and/or dust and debris (i.e., HEPA vacuuming, wet wiping, or other approved methods), followed by dehumidification/drying.
- Non-porous, semi-porous, and porous furnishings and contents shall be cleaned. If items cannot be cleaned efficiently, the abatement contractor shall consult with the owner/powers that be to determine if they shall be disposed.
- All machine washable porous cloth items shall be cleaned and dried in a household washer and dryer. Other specialty items shall be cleaned by a dry cleaner that specializes in cleaning materials affected with mold. These items shall be removed from affected area(s) and shall not be reintroduced back into the area(s) until acceptable post remediation testing is established. If porous articles cannot be cleaned efficiently, the abatement contractor shall consult with the owner/powers that be.
- Mattresses shall be cleaned utilizing HEPA vacuuming, NOT by pressure extraction or wet methods. If suspect visible mold growth is on the mattress or if the mattress cannot be cleaned efficiently, the abatement contractor shall consult with the owner/powers that be prior to disposal.
- Exterior surfaces of electrical appliances, electrical equipment, and light fixtures shall be cleaned, utilizing wet method and HEPA vacuuming. These items shall be disconnected from all electrical sources prior to cleaning. If these items cannot be cleaned efficiently, the abatement contractor shall consult with the owner/powers that be.
- All wall/ceiling cavity insulation shall be disposed in areas that specify the removal of drywall/wallboard. The abatement contractor shall visually inspect the back side of surrounding drywall/wallboard for water damage and/or suspect mold growth and document any findings. If additional suspect mold growth or water damage is observed beyond the specified removal area, additional drywall/wallboard shall be removed until no suspect visible mold growth or water damage is observed.
- All penetrations within the controlled area that adjoin unaffected or non-accessible areas, including outdoor areas, crawlspaces, etc., shall be cleaned (as far as one can reach) and then sealed with 6-mil poly, extending six (6) inches on all sides.
- In areas of specified wallboard removal, all components within the wall/ceiling cavities shall be cleaned. Any wooden structural components with mold stains or mold growth in pitted surfaces shall be HEPA sanded (or other approved methods) to eliminate embedded mold growth.
- All joints or sills (where the structural system meets, where the sill plate meets the floor, etc.) shall be aggressively disturbed to remove embedded mold growth and spores.
- Furnishings and contents that are specified for cleaning shall be protected with polyethylene in areas where building components are specified for removal, prior to the removal of building components to avoid cross contamination. The protective covering shall be removed, and the furnishings and contents shall be cleaned prior to post visual inspection and testing.
- The remediation contractor shall document any drywall/wallboard that requires removal, in addition to the specified amount, prior to removal (i.e., drywall that is specified to be assessed by the remediation contractor, etc.). Documentation shall include photos and specific location at a minimum.

1.4 Removal Procedures

The contractor shall maintain surfaces of the control area free of accumulation of dust and debris. Additionally, they shall restrict the spread of dust and debris, keeping waste from being distributed over the work area.

Materials shall be removed in a fashion to ensure that previously cleaned areas are not re-contaminated (i.e., working from one end of the control area to the other). The contractor may be required to re-clean areas based on a visual inspection by the CIEC/CIE/IH, if the areas are not visibly clean.

Contaminated building materials that have been removed, and additional materials and debris generated during remediation, shall be placed in an enclosed container prior to transporting the material through the building and to the waste container, and prior to visual inspection by the CIEC/CIE/IH.

Areas shall be allowed to dry for a period until RH and moisture levels specified below have been achieved. Any remaining building products that are directly impacted by remediation shall be tested for moisture content. Wooden and cellulosic building components (e.g., wall studs, drywall, etc.) shall be tested for moisture content. If the moisture content is > 15% in wood products or > 12% in cellulosic products (utilizing a Delmhorst moisture meter or equivalent), dehumidification shall be required until moisture levels are at or below said levels, and the RH level is at or below 40% +/-3% (for all interior areas). The remediation contractor shall verify moisture content of all wooden and cellulosic building components within the impacted areas, as well as RH levels prior to scheduling post remediation verification.

1.5 Cleanup Overview

The contractor shall personally review the cleaning process prior to contacting the CIEC/CIE/IH for the post remediation testing. If accumulations of debris and dust are significant, the CIEC/CIE/IH will require re-cleaning prior to post remediation verification sampling.

The CIEC/CIE/IH shall make a visual inspection and conduct post remediation sampling after the final cleaning is complete.

1.6 Post Remediation Verification Testing

Prior to conducting post remediation sampling, HEPA filtration devices shall be allowed to operate for a minimum of 48 hours (the equivalent of 192 air changes), following fine cleaning, in all areas where remediation has been conducted. The HEPA filtration devices shall be sealed at the intake and turned off approximately two hours prior to post testing and reconvene within one hour after post testing, until acceptable post remediation results are established.

Post remediation sampling shall be conducted utilizing viable and/or non-viable sample methods. Air samples shall be collected in representative areas of the control areas. Surface sampling may be conducted at the discretion of the CIEC/CIE/IH.

Sampling shall be conducted in areas directly impacted by remediation procedures, where cleaning was conducted. The CIEC/CIE/IH shall determine acceptable post remediation status through interpretation of air sampling results, which will be based on indoor/outdoor comparisons, in combination with any surface samples collected, moisture readings, RH readings, visual observations, and any other pertinent information.

The owner/client will be responsible for post remediation testing. If air sample results indicate unacceptable airborne concentrations, the contractor shall be required to conduct a re-cleaning at the contractor's expense and absorb the cost for re-testing, until acceptable results are achieved.

Criteria for post remediation air sampling can be viewed in PEC's investigative report(s) listed in Section 2.1 below. This information can be found within the air sampling section of said report(s).

SECTION 2.0 SCOPE OF WORK (Note: Section 2.1 and Section 1.3 are essential to the full Scope of the Contractor's Work)

2.1 Investigative Reports and Other Related Documents

Phoenix EnviroCorp investigative reports dated October 12, 2021, and November 18, 2022.

Phoenix EnviroCorp Chain of Custody dated October 7, 2021.

Analytical reports dated October 8, 2021.

2.2 Project Description

The procedures covered by this program/protocol include the enclosure and drying of the said structure, the removal, handling, and disposal of building components compromised by mold/fungal growth, and the cleaning and disinfecting of existing building materials. Procedures for reconstruction are not considered in these specifications. Reconstruction of interior portions may not be conducted until procedures for remediation have been completed, the control areas have been inspected, and testing has returned acceptable post remediation results. Reconstruction of exterior portions may be conducted during the restoration to ensure that water intrusion is abated.

The objectives covered by this program/protocol include the remediation of materials shown to have surface contamination, water damage, and/or exposure to elevated airborne mold spore levels, without subjecting the workers, installation employees, and occupants to microbial contaminants. In addition, contract employees, occupants, and materials shall be appropriately protected during the removal process to avoid exposure.

This program/protocol is provided as a guideline. Any deviation requests from this protocol shall be addressed to the CIEC/CIE/IH for consideration. At present there are no Federal or State requirements regarding microbial remediation projects; however, OSHA General Construction Code of Federal Regulations (29 CFR 1926) shall be followed.

Remediation shall be completed as close as possible to the date that this protocol was drafted, as the specifications outlined within represent conditions at the time the investigative services were conducted. Due to the volatility of mold, the current protocol may not reflect all necessary remediation if conditions are allowed to continue. Further, if time lapses allowing conditions to change, it may become increasingly difficult to obtain successful clearance testing results.

SECTION 3.0 AIR MONITORING

3.1 Responsibilities of the CIEC/CIE/IH

Monitoring of airborne concentrations will be performed in accordance with the requirements of this program. Prior to conducting air sampling and/or surface sampling for clearances, the CIEC/CIE/IH shall conduct a visual inspection of the area. Temperature and RH shall be recorded during the air sampling phase of clearance. All air sampling shall be conducted in such a manner as to provide a valid representation of airborne mold levels both inside and outside the work areas. If analysis of air samples indicates that airborne concentrations exceed acceptable limits, the contractor shall conduct re-cleaning at the contractor's expense.

3.2 Personal Monitoring

No personal monitoring will be conducted by the CIEC/CIE/IH unless the remediation contractor requests monitoring for OSHA compliance. Presently there are no PELs or TLVs for microbial contaminants. It is the remediation contractor's responsibility to determine if OSHA personal sampling may be required during application of anti-microbial agents.

3.3 Sample Integrity and Reporting

Samples shall be sealed, labeled, and a chain of custody initiated according to laboratory procedures.

Post remediation sample results shall be available within seven (7) business days of the completion of collection and will include the following information:

- Site Address
- Sample Number
- Location Sampled
- Collection Date(s)
- Person Taking Sample(s)
- Additional Comments (if any)
- Analyst Signature

SECTION 4.0 MATERIAL REPLACEMENT

4.1 Material Replacement

The general contractor/replacement contractor may begin material replacement after the CIEC/CIE/IH informs all parties of acceptable post remediation sample results.

With ongoing construction activities ambient air levels are expected to be elevated over what might be normally expected. Additional testing should not be necessary after remediation procedures have been completed and successful results have been obtained. In the event of another water intrusion (i.e., broken-pipeline, improper HVAC function, or building envelope compromise), an investigation shall be conducted within 24 to 48 hours of the event. Proper drying, if initiated within this time frame, should minimize the potential for microbial growth.

SECTION 5.0 SPILL CLEANUP REQUIREMENTS

5.1 Spills

MSDS shall be kept on site for all chemical products brought to the site by the remediation contractor. In the event of a chemical spill, the contractor shall initiate cleanup immediately. The contractor shall mop up any liquid with rags or other conventional absorbent. The spent absorbent shall be properly contained and disposed of as waste.

SECTION 6.0 WASTE CONTROL

6.1 Waste Disposal

Waste shall be disposed of at a locally selected landfill. Waste shall be transported to the landfill in such a way to ensure that it does not pose a potential hazard to the environment.

SECTION 7.0 SUPPLEMENTAL INFORMATION

7.1 Applicable Publications

The publications listed below form part of this program. This protocol shall be reviewed by the remediation contractor prior to initiation of set-up for the project. Any questions regarding this protocol shall be addressed with the generator or appropriate Phoenix EnviroCorp personnel.

Code of Federal Regulation (CFR Publications)

29 CFR 1910.134	Respiratory Protection
29 CFR 1910.145	Specifications for Accident Prevention, Signs and Tags
29 CFR 1926.28	Personal Protective Equipment
29 CFR 1926.59	Hazard Communication
29 CFR 1926.96	Occupational Foot Protection
29 CFR 1926.100	Head Protection
29 CFR 1926.101	Hearing Protection
29 CFR 1926.102	Eye and Face Protection
29 CFR 1926.403	Electrical General Requirements
29 CFR 1926.416	Safety General Requirements
29 CFR 1926.852	Demolition, Chutes
29 CFR 1926.1091	Record Keeping Requirements

Supplemental Guidelines

IICRC S520 2nd ed.	Standard and Reference Guide for Professional Water Damage Restoration
NYCDOH	Guidelines on Assessment and Remediation of Fungi in Indoor Environments
ACGIH	Bioaerosols: Assessment and Control
IAQA 01-2000	Recommended Guidelines for Indoor Environments
ASHRAE 62.2-2007	Ventilation for Acceptable Indoor Air Quality in Low-Rise Residential Buildings

7.2 Definitions

Air Lock: A system that permits ingress and egress between a control area and non-control area, or other work areas, without allowing air movement between areas (e.g., three stage decon, three-way polyethylene flaps).

Air Sample: Refers to samples collected with spore trap air sample media (e.g., Micro-5, Cyclex D, or equivalent); also referred to as a non-viable air sample. May also refer to a sample collected on a disposable petri dish with Agar media by means of an Andersen Impactor (or equivalent) and sampling pump; also referred to as air culture (viable) sample. Sample media to be used in project is described under Section 1.6 (Post Remediation Verification Testing).

Area Monitoring: The sampling of airborne microbial concentrations outside the exclusion boundary, which may reach the breathing zone of the contractor or installation employees.

Asbestos Containing Materials (ACM): Refers to asbestos containing building materials that contain more than 1% asbestos by Polarized Light Microscopy (PLM) or Transmission Electron Microscopy (TEM).

Biocide: Refers to chemical agents that are specifically designed to eliminate viable microbial contamination,

with a phenol equivalent efficiency (e.g., Sodium Hypochlorite, Quaternary Ammonia Compounds).

Blower Door Test: Refers to the testing of static pressure and draw of air through the HVAC in cubic feet per minute (CFM) to rate the efficiency of the system.

Clearance Monitoring: Refers to air, bulk, or swab sampling conducted to demonstrate that the area specified for remediation has been completed by the contractor, left with present acceptable mold spore levels, and ready for re-construction.

Control Area: The area where microbial contaminants removal is performed, which is isolated by physical boundaries to prevent unauthorized entry of personnel, thereby preventing exposure to or the spread of microbial contaminants. Physical boundaries will be established and located such that the airborne contaminants are not allowed to escape the boundaries.

HEPA: High Efficiency Particulate Air. Refers to ventilation devices that are specifically designed to filter ambient air to an efficiency of 99.97%.

HVAC: Refers to the Heating, Ventilation, and Air Conditioning system.

Industrial Hygienist: Refers to a person who practices industrial hygiene and may act as a competent person regarding visual inspection of contaminated surfaces and clearance air and/or swab/bulk sampling. May also refer to a Certified Industrial Hygienist (CIH) as defined by the American Board of Industrial Hygiene (ABIH), a Certified Indoor Environmental Consultant as defined by the American Council for Accredited Certification (ACAC), or a Certified Indoor Environmentalist (CIE) as defined by the American Council for Accredited Certification (ACAC).

Microbial Contaminant: Refers to viable mold, fungi, pollen, bacteria, and or particulate, or their metabolites, which may be causative of epidemiological, immunotoxic, dermotoxic, neurotoxic, or enterotoxic disorders in the human population, or may be considered a pathogen or an opportunistic pathogen.

Non-Porous Materials: Refers to building materials with solid surfaces that may be successfully treated and cleaned by means of HEPA vacuuming or other approved method. Materials include flooring, hard goods, plastic, vinyl, and some wallboard systems.

Porous Materials: Refers to building materials and household goods that may allow microscopic particles (3-20 micron) to become trapped within the material that will not allow adequate cleaning. Materials include carpet, mattresses, and clothing.

Primary Control Area (PCA): Refers to a section of a facility that has been isolated by 6-mil polyethylene barriers where specific engineering controls (e.g., HEPA filtration, negative air pressurization, dehumidification, etc.) are required. In general, it is the area where remediation of water and mold damaged building materials is to be conducted.

Refrigerant Dehumidifier: Device used to remove water content from air and materials.

Relative Humidity (RH): Refers to the ratio of water vapor in the atmosphere to the amount required to saturate it at a given temperature.

Semi-Porous Materials: Refers to materials that may be somewhat porous, yet they may still allow for adequate cleaning. Materials include wooden beams and some wallboard systems.

Swab Sample: Refers to collection of a sample onto a sterile swab for analysis of mold, fungi, and bacteria by viable and/or non-viable analysis.

Tape-Lift Sample: Refers to collection of a sample onto clear scotch tape for analysis by direct microscopic examination (non-viable).

7.3 Quality Assurance

Medical Examinations

Before potential exposure to microbial contaminants, the remediation contractor shall provide workers with a comprehensive medical examination as required by 29 CFR 1910.134 as outlined by the Medical Monitoring Program.

Medical Records

The remediation contractor shall maintain complete and accurate medical records on employees as required by OSHA and the contractor's Medical Monitoring Program. The contractor may be asked to provide a copy of all medical records for approval by the consultant's representative.

Training

Each employee working on this contract shall be trained prior to the time of initial job assignment in accordance with mold specific and chemical specific training as indicated by the OSHA General Duty Clause and the Hazard Communication Standard. Each employee shall also receive training required by Federal guidelines listed in Section 7.1 of this document and project specifications.

Hazard Communication Program

The remediation contractor has established and implemented a Hazard Communication Program as required by 29 CFR 1910.1200 and may be asked to provide a copy of this written program. Hazard Communication training must include occupational hazards as directly related to working with fungi/mold and contamination of building components by fungal contamination, specific training for chemical hazards associated with biocide usage, and site specific MSDS sheets for commercial detergents and biocides utilized on the job site.

Respiratory Protection Program

The remediation contractor has established a Respiratory Protection Program, which complies with 29 CFR 1910.134. Physical examinations and fit testing are required for use of respiratory protection greater than an N-95 dust mask. Workers removing building materials contaminated by mold growth, applying anti-microbial agents, or workers subjected to exposures to anti-microbial agents shall be required to wear, at minimum, a tight-fitting negative pressure ½ mask respirator with P-100 filters. Therefore, -he OSHA Respiratory Protection Standard applies.

Analytical Testing Laboratory

Analysis of culturable biological samples collected on this project shall be conducted by a laboratory that participates in the Environmental Microbiological Proficiency Analytical Testing Program (EMPAT) of the American Industrial Hygiene Association (AIHA) and has shown to be proficient by proficiency analytical

testing (PAT) samples. Analysis of non-viable air and surface samples shall be conducted by a competent person.

7.4 Materials and Equipment

Equipment

The contractor shall make available to employees a complete set of personal protective equipment (PPE) as required by this program for entry into the controlled area. All personnel while in the control area or handling microbial contaminated waste shall wear protective clothing, respirators, and other PPE.

Respirators

The contractor shall furnish the appropriate respirator in accordance with 29 CFR 1910.134. At a minimum, an N-95 dust mask shall be utilized.

Special Clothing

Employees shall be provided with and required to wear: whole body disposable protective clothing, full body tyvek suits with head coverings, and latex gloves *(see table)* during all activities in the controlled area.

Chemical	Recommended Rubber Glove
Sodium Hypochlorite	Neoprene or Nitrile
Phenolic Compounds	Neoprene
Quaternary Ammonia Compounds	Polyvinyl Chloride (PVC)
Detergents	Latex

Eye Protection

The contractor shall provide chemical-resistant goggles to personnel engaged in cleaning and treatment activities and require them to be worn during application of anti-microbial agents and biocides.

Warning Signs and Labels

Standard approved warning signs shall be erected at all approaches to the control area as specified in 29 CFR 1910.145.

Anti-Microbial Agents

Anti-microbial agents utilized in interior quarters shall consist of quaternary ammonia compounds. No phenolic compounds shall be used in interior quarters with exception of Micro Ban Plus. Approval must be granted by the owner/powers that be prior to application. Anti-microbial agents shall be EPA approved. Commercial grade detergents shall be used to remove fungal contamination during cleaning phases prior to anti-microbial application, to include encapsulation.

PRECISION ENVIRONMENTAL INC.

3802 Cherry Avenue
Wilmington, NC 28403
Tel: 910-763-3445 Fax: 910-763-3415
www.precision-enviro.com

June 24, 2022

Wilmington Housing Authority
Attn: Chauntrell Burns
714 Emory St. - Creekwood
Wilmington, NC 28405

Re: Mold Contamination Assessment at:
712 N. 30th St.
Wilmington, NC 28405
Precision Project No.: 5241-22-0001-1IAQ

At the request of the Wilmington Housing Authority, Precision Environmental, Inc. (Precision) performed a mold contamination assessment within the above referenced residence.

This mold contamination assessment included a visual assessment of accessible areas, the collection of non-viable mold spore trap air samples, the collection of a single mold spore surface sample, moisture mapping and the collection of temperature/relative humidity readings.

Directional reference: Front is determined from within the residence facing N. 30th St.

Spore trap air samples were collected in the following areas:

- Kitchen
- Right hallway

In addition, a single exterior sample was collected for comparative purposes.

A non-viable surface sample was collected in the following area:

- Rear right room. HVAC supply flex duct

During Precision's site visit on June 13, 2022, the following were found/observed:

Kitchen
- The spore trap air sample collected within this area indicated no significantly elevated levels of mold growth as compared to the sample collected at the exterior of the residence.
- The relative humidity within the area was 59.9% which is within the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) guidelines for occupant's comfort of 30% to 60%.

Rear right room
- The surface sample collected within the HVAC supply flex duct revealed <1+ *Cladosporium* species indicating minimal mold growth within the duct. (The lab noted very few insect parts detected).

Right hallway
- The spore trap air sample collected within this area indicated no significantly elevated levels of mold growth as compared to the sample collected at the exterior of the residence.
- The relative humidity within the area was 61.1% which is above the ASHRAE guidelines for occupant's comfort of 30% to 60%.

Bathroom
- It was noted that water damage was observed along the lower left wall of the space.
- Condensation was noted on the HVAC supply diffuser within the bathroom.
- Moisture readings collected within the area via GE Protimeter Surveymaster in WME (measure mode) indicated the following:

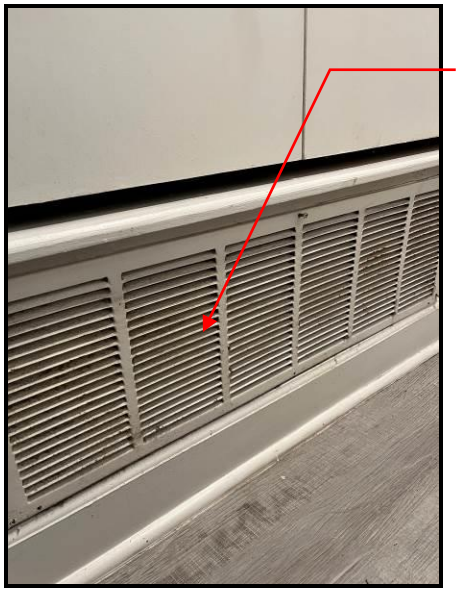
- Lower left wall:
  - Wall: 93.8 (Wet)
  - Wall: 78.5 (Wet)

Water damage noted along the lower left wall of the space.

Condensation on the HVAC supply diffuser.

HVAC system

- Dust and debris were noted on the HVAC return vent.
- Dust and debris were noted within the HVAC return plenum. Additionally, it was noted that a filter was not installed.



Dust and debris noted on the HVAC return vent.

Dust and debris noted within the return plenum.

Moisture measurements were collected using a GE Protimeter *Surveymaster*. Collected moisture measurements were evaluated based upon the following manufacturer's instructions:

%WME (measure mode) measurement of approximately:
Green zone readings (Between 0% and 15 %) indicates that the material examined is "Dry";
Yellow zone readings (Above 15% but less than 20%) indicates that the material examined is "borderline condition";
Red zone readings (Above 20%) indicates that the material examined is "wet" or in "damp condition"

%WME (measure mode) = WME is the moisture level that would be attained by a piece of wood in equilibrium with the material being tested. As the critical moisture levels for wood are known, WME measurements enable the moisture meter user to establish if materials are in a safe air dry, borderline or damp condition.

Air samples for non-culturable fungal spores were collected using Zefon Air-O-Cell cassettes and High-Volume Sampling Pump for 10 minutes at a flow rate of 15 liters per minute as recommended by the manufacturer.

Surface samples were collected via clear tape collection adhered to laboratory supplied bio tape.

Quantities of mold found on surface samples are graded 1+ to 4+ with 4+ denoting the highest quantities.

Temperature/Relative humidity readings were collected utilizing a Fluke 971 Temperature Humidity Meter

Based on the investigation conducted within the residence, Precision has found evidence of surface mold within the HVAC ducts associated with the residence as well as water damage associated with the left bathroom wall.

The relative humidity level within the hall was above the acceptable range at the time of the assessment. The relative humidity level within the kitchen was within the acceptable range at the time of the assessment.

The relative humidity level at the exterior of the structure at the time of the investigation was 72.9%.

Recommendations
Precision recommends the following based on the limited mold investigation conducted on June 13, 2022:

All remediation activities should be conducted by mold remediation contractors with experience conducting mold remediation projects and all work should be conducted in accordance with standard industry practices.

If not previously addressed, any water leak present within the bathroom, which is likely the cause of the damage to the lower left wall, should be repaired to prevent further water damage to building components within the bathroom and adjacent areas.

An HVAC engineer or contractor shall assess the HVAC system servicing the residence in order to determine the cause of the elevated humidity level within the right hall area of the residence, which is the likely contributing factor for the formation of condensation within the bathroom.

General recommendations

A. The HVAC system(s) serving work areas within residence shall be shut down prior to the start of all work. HVAC supply and return vents within work areas shall be sealed with critical barriers.
B. Air scrubbers or negative air machines equipped with HEPA filters shall be installed within the work areas and shall remain operational/in place during remediation activities and for a minimum of twenty-four (24) hours following completion of remediation activities.
C. All insulation exposed by the removal of walls shall be removed and disposed.
D. All structural components exposed by the removal of walls shall be dried and decontaminated.
E. Decontamination shall consist of wet wiping the material with a microbial agent as well as HEPA vacuuming affected components. Spraying areas with visible mold or suspect visible mold without physically removing the mold is unacceptable.
F. If, following removal of walls described below, additional moisture or mold issues are noted, removal shall continue until an area one foot beyond noted issues are reached.
G. Dehumidifiers shall be installed within the work areas and shall remain in place until components are dry.
H. Following completion of remediation activities, the air scrubbers shall run for a minimum of 24 hours. Following the 24-hour air scrubbing period the machines shall be shut down and immediately sealed (both intake and exhaust).

I. Following shut down of the air scrubbers, a clearance inspection may be conducted at the owner's discretion. The inspection should be conducted prior to the replacement of removed materials. Engineering controls (poly barriers, poly sheeting containment, air scrubbers, etc.) shall remain in place until receipt of acceptable final clearance visual/air monitoring results. If the owner chooses not to conduct the clearance inspection, the work area may be dismantled following the 24-hour air scrubbing period.

J. If final visual/clearance sample analysis indicates elevated levels of non-viable mold spores (surface and/or air) within any of the work areas, the failed space and all of its surfaces shall be recleaned at no additional expense to the owner.

Area specific – Bathroom

A. The bathroom shall be incorporated into a single work area and shall be enclosed within a single containment. The containment shall be constructed of poly sheeting and shall seal all penetrations leading out of the work area. Access to the work area shall be through a zippered entry.
B. The HVAC supply diffuser shall be removed, decontaminated and stored for reinstallation at the conclusion of remediation activities.
C. The wood base along the entire left wall shall be removed.
D. The lower two (2) feet of the entire left wall shall be removed and disposed.
E. The exposed wood components shall be assessed for moisture and deterioration and corrected/replaced as needed.
F. All exposed components shall be dried and decontaminated.

Area specific – HVAC system

A. Due to the missing HVAC return air filter, and the condition noted within the HVAC return plenum, it is presumed that the interior of the air handling unit is contaminated. Therefore the interior of the air handling unit (evaporator coils, blower/fan, etc.) shall be decontaminated.
B. All surfaces within the return plenum shall be decontaminated.
C. The remaining HVAC supply diffusers shall be removed, decontaminated and stored for reinstallation at the conclusion of remediation activities.
D. The HVAC ducts shall be decontaminated by a contractor with experience decontaminating mold from within duct work without contaminating the residence.

Limitations

This report has been prepared to assist the Wilmington Housing Authority in evaluating the microbiological impact within the above referenced residence. Precision provided these services consistent with the level and skill customarily exercised by members of the profession currently practicing under similar conditions. This report is intended for the sole use of the Wilmington Housing Authority.

Additionally, the passage of time may result in a change in the environmental characteristics at this site. This report does not warrant against future operations or conditions that could affect the recommendations made. The results, findings, conclusions, and recommendations expressed in this report are based only on conditions that were observed during Precision's inspection.

If you need further information, please contact me at 910-763-3445.

Sincerely,

Precision Environmental, Inc.

Reggie Romero

Attachments:
Laboratory Analysis/Chain of Custody
Laboratory accreditation

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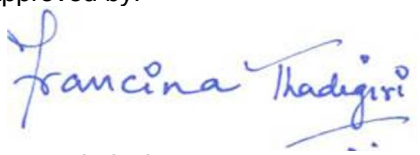
Report for:

Mr. Jonathan Guetta
Precision Environmental, Inc.
3802 Cherry Ave.
Wilmington, NC 28403

Regarding: Project: PEI Job # 5241-22-0001-1IAQ; 712 N 30th St. Wilmington, NC
EML ID: 2953563

Approved by:



Technical Manager
Francina Thadigiri

Dates of Analysis:
Spore trap analysis: 06-17-2022

Service SOPs: Spore trap analysis (EM-MY-S-1038)
AIHA-LAP, LLC accredited service, Lab ID #179623

All samples were received in acceptable condition unless noted in the Report Comments portion in the body of the report. Due to the nature of the analyses performed, field blank correction of results is not applied. The results relate only to the samples as received and tested. Information supplied by the client which can affect the validity of results: sample air volume.

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Eurofins EMLab P&K
3929 Old Lee Highway, Suite 91C, Fairfax, VA 22030
(866) 871-1984 Fax (856) 334-1040 www.emlab.com

Client: Precision Environmental, Inc.
C/O: Mr. Jonathan Guetta
Re: PEI Job # 5241-22-0001-1IAQ; 712 N 30th St. Wilmington, NC

Date of Sampling: 06-13-2022
Date of Receipt: 06-16-2022
Date of Report: 06-20-2022

SPORE TRAP REPORT: NON-VIABLE METHODOLOGY

Location:	061322-712-01: Kitchen			061322-712-02: Right hallway		
Comments (see below)	None			None		
Lab ID-Version‡:	14197733-1			14197734-1		
Analysis Date:	06/17/2022			06/17/2022		
	raw ct.	% read	spores/m3	raw ct.	% read	spores/m3
Alternaria	1	100	7	1	100	7
Ascospores	1/8	25/100	80	1	25	27
Basidiospores	5	25	130	8	25	210
Cercospora						
Chaetomium						
Choanephora				1	100	7
Cladosporium	4	25	110	4	25	110
Curvularia				1	100	7
Epicoccum						
Nigrospora						
Other brown						
Penicillium/Aspergillus types†	1	25	27	1	25	27
Pithomyces						
Rusts						
Smuts, Periconia, Myxomycetes	11	100	73	3	100	20
Stachybotrys						
Stemphylium						
Torula						
Ulocladium						
Zygomycetes						
Background debris (1-4+)††	2+			2+		
Hyphal fragments/m3	13			7		
Pollen/m3	7			13		
Skin cells (1-4+)	1+			1+		
Sample volume (liters)	150			150		
§ TOTAL SPORES/m3			430			410

Comments:

Spore types listed without a count or data entry were not detected during the course of the analysis for the respective sample, indicating a raw count of <1 spore.
† The spores of *Aspergillus* and *Penicillium* (and others such as *Acremonium, Paecilomyces*) are small and round with very few distinguishing characteristics. They cannot be differentiated by non-viable sampling methods. Also, some species with very small spores are easily missed, and may be undercounted.
††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/m^3 divided by the raw count, expressed in spores/m^3. The limit of detection is the analytical sensitivity (in spores/m^3) multiplied by the sample volume (in liters) divided by 1000 liters.

For more information regarding analytical sensitivity, please contact QA by calling the laboratory.
‡ 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 Spores/m3 has been rounded to two significant figures to reflect analytical precision.

Eurofins EMLab P&K
3929 Old Lee Highway, Suite 91C, Fairfax, VA 22030
(866) 871-1984 Fax (856) 334-1040 www.emlab.com

Client: Precision Environmental, Inc.
C/O: Mr. Jonathan Guetta
Re: PEI Job # 5241-22-0001-1IAQ; 712 N 30th St. Wilmington, NC

Date of Sampling: 06-13-2022
Date of Receipt: 06-16-2022
Date of Report: 06-20-2022

SPORE TRAP REPORT: NON-VIABLE METHODOLOGY

Location:	061322-712-03: Outside		
Comments (see below)	A		
Lab ID-Version‡:	14197735-1		
Analysis Date:	06/17/2022		
	raw ct.	% read	spores/m3
Alternaria	12	100	80
Ascospores	71	25	1,900
Basidiospores	210	25	5,600
Cercospora	4	100	27
Chaetomium			
Choanephora			
Cladosporium	11/33	25/100	510
Curvularia	1	100	7
Epicoccum	1	100	7
Nigrospora	2	100	13
Other brown	1	100	7
Penicillium/Aspergillus types†			
Pithomyces			
Rusts			
Smuts, Periconia, Myxomycetes	3	100	20
Stachybotrys			
Stemphylium			
Torula			
Ulocladium			
Zygomycetes			
Background debris (1-4+)††	2+		
Hyphal fragments/m3	13		
Pollen/m3	13		
Skin cells (1-4+)	< 1+		
Sample volume (liters)	150		
§ TOTAL SPORES/m3			8,200

Comments: A) 33 of the raw count *Cladosporium* spores were present as a single clump.

Spore types listed without a count or data entry were not detected during the course of the analysis for the respective sample, indicating a raw count of <1 spore.
† The spores of *Aspergillus* and *Penicillium* (and others such as *Acremonium, Paecilomyces*) are small and round with very few distinguishing characteristics. They cannot be differentiated by non-viable sampling methods. Also, some species with very small spores are easily missed, and may be undercounted.
††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/m^3 divided by the raw count, expressed in spores/m^3. The limit of detection is the analytical sensitivity (in spores/m^3) multiplied by the sample volume (in liters) divided by 1000 liters.

For more information regarding analytical sensitivity, please contact QA by calling the laboratory.
‡ 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 Spores/m3 has been rounded to two significant figures to reflect analytical precision.

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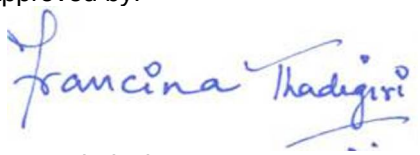
Report for:

Mr. Jonathan Guetta
Precision Environmental, Inc.
3802 Cherry Ave.
Wilmington, NC 28403

Regarding: Project: PEI Job # 5241-22-0001-1IAQ; 712 N 30th St. Wilmington, NC
EML ID: 2953563

Approved by:



Technical Manager
Francina Thadigiri

Dates of Analysis:
Direct microscopic exam (Qualitative): 06-17-2022

Service SOPs: Direct microscopic exam (Qualitative) (EM-MY-S-1039)
AIHA-LAP, LLC accredited service, Lab ID #179623

Eurofins EMLab P&K
3929 Old Lee Highway, Suite 91C, Fairfax, VA 22030
(866) 871-1984 Fax (856) 334-1040 www.emlab.com

Client: Precision Environmental, Inc.
C/O: Mr. Jonathan Guetta
Re: PEI Job # 5241-22-0001-1IAQ; 712 N 30th St. Wilmington, NC

Date of Sampling: 06-13-2022
Date of Receipt: 06-16-2022
Date of Report: 06-20-2022

DIRECT MICROSCOPIC EXAMINATION REPORT

Background Debris and/or Description	Miscellaneous Spores Present*	MOLD GROWTH: Molds seen with underlying mycelial and/or sporulating structures†	Other Comments††	General Impression
Lab ID-Version‡: 14197732-1, Analysis Date: 06/17/2022: Tape sample 061322-712-04: Rear right room. HVAC supply flex duct				
Heavy	Few	< 1+ *Cladosporium* species (spores, hyphal fragments)	Very few insect parts detected.	Minimal mold growth

* Indicative of normal conditions, i.e. seen on surfaces everywhere. Includes basidiospores (mushroom spores), myxomycetes, plant pathogens such as ascospores, rusts and smuts, and a mix of saprophytic genera with no particular spore type predominating. Distribution of spore types seen mirrors that usually seen outdoors.

† Quantities of molds seen growing are listed in the MOLD GROWTH column and are graded <1+ to 4+, with 4+ denoting the highest numbers.

†† Some comments may refer to the following: Most surfaces collect a mix of spores which are normally present in the outdoor environment. At times it is possible to note a skewing of the distribution of spore types, and also to note "marker" genera which may indicate indoor mold growth. Marker genera are those spore types which are present normally in very small numbers, but which multiply indoors when conditions are favorable for growth.

‡ 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".
The limit of detection is < 1+ when mold growth is detected.

For additional information necessary for the interpretation of the results, all readers are advised to refer to the document "Direct Exam Details Page" which is available on our website at:
www.emlab.com/services/mold-testing/direct-microscopic-exam-qualitative/

CHAIN OF CUSTODY

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www.EMLabPK.com

Cherry Hill, NJ: 1936 Olney Avenue, Cherry Hill, NJ 08003 * **(866) 871-1984**
Phoenix, AZ: 1501 West Knudsen Drive, Phoenix, AZ 85027 * **(800) 651-4802**
San Bruno, CA: 1150 Bayhill Drive, #100, San Bruno, CA 94066 * **(866) 888-6653**
San Diego, CA: 5473 Kearny Villa Road, #130, San Diego, CA 92123 * **(866) 465-6653**

WEATHER		Fog	Rain	Snow	Wind	Clear
LEVEL	None	x	x	x	x	
	Light					
	Moderate					
	Heavy					

CONTACT INFORMATION

Company: Precision Environmental Inc
Contact: Jonathan Guetta
Phone: 910-763-3445
Address: 3802 Cherry Ave., Wilmington, NC 28403
Special Instructions: Email results to: jguetta@precision-enviro.com

PROJECT INFORMATION

Project ID: PEI Job # 5241-22-0001-1IAQ
Project Desc.: 712 N 30th St. Wilmington, NC
Project Zip Code: 28405
Sampling Date & Time: 06/13/22 11:20
PO Number:

TURN AROUND TIME CODES - (TAT)

STD - Standard (DEFAULT)
ND - Next Business Day
SD - Same Business Day Rush
WH - Weekend/Holiday

Rushes received after 2pm or on weekends, will be considered received the next business day. Please alert us in advance of weekend analysis needs.

REQUESTED SERVICES (✔ Boxes)

SAMPLE ID	DESCRIPTION	Sample Type (Below)	TAT (Above)	Total Volume/Area (as applicable)	NOTES (Time of day, Temp, RH, etc.)	Fungi - Spore Trap Analysis	Spore Trap Analysis - Other particles	Direct Microscopic Exam (Qualitative)	Quantitative Spore Count Direct Exam	1-Media Surface Fungi (Genus ID + Asp. spp.)	2-Media Surface Fungi (Genus ID + Asp. spp.)	3-Media Surface Fungi (Genus ID + Asp. spp.)	Culturable Air Fungi (Genus ID + Asp. spp.)	Gram Stain and Counts (Culturable Air and Surface Bacteria)	*Legionella* culture	Total Coliform, *E.coli* (Presence/Absence)	Membrane Filtration (Please specify organism	MPN Bacteria (Please specify organism)	QuantiTray - Sewage Screen	Asbestos Analysis - PCM Airborne Fiber Count	Asbestos Analysis - PLM (EPA method 600/R-9	PCR (please specify test)
061322-712-01	Kitchen	ST	STD	150 Liters	67.5/59.9% RH	✓																
061322-712-02	Right hallway	ST	STD	150 Liters	66.5/61.1% RH	✓																
061322-712-03	Outside	ST	STD	150 Liters	89.4/72.9% RH	✓																
061322-712-04	Rear right room. HVAC supply flex duct	T	STD	N/A	N/A			✓														

Non-Culturable: Spore Trap; Tape Swab Bulk
Culturable: BioCassette™ Andersen, SAS, Swab, Water, Bulk, Dust, Soil, Contact Plate
Other Requests

2953563

SAMPLE TYPE CODES

BC - BioCassette™	**CP** - Contact Plate	**T** - Tape	**D** - Dust
A1S - Andersen	**ST** - Spore Trap: Zefon, Allergenco, Burkard...	**SW** - Swab	**W** - Water
SAS - Surface Air Sampler		**B** - Bulk	**SO** - Soil
O - Other:			

RELINQUISHED BY	DATE & TIME
Reggie Romero	06/15/22

RECEIVED BY	DATE & TIME
VF	6/16/22 9:50

AIHA Laboratory Accreditation Programs, LLC

acknowledges that

Eurofins EMLab P&K

3929 Old Lee Highway, Unit 91 C, Fairfax, VA 22030

Laboratory ID: LAP-179623

along with all premises from which key activities are performed, as listed above, has fulfilled the requirements of the AIHA Laboratory Accreditation Programs (AIHA-LAP), LLC accreditation to the ISO/IEC 17025:2017 international standard, General Requirements for the Competence of Testing and Calibration Laboratories in the following:

LABORATORY ACCREDITATION PROGRAMS

☐	**INDUSTRIAL HYGIENE**	Accreditation Expires:
☐	**ENVIRONMENTAL LEAD**	Accreditation Expires:
☑	**ENVIRONMENTAL MICROBIOLOGY**	Accreditation Expires: January 01, 2023
☐	**FOOD**	Accreditation Expires:
☐	**UNIQUE SCOPES**	Accreditation Expires:

Specific Field(s) of Testing (FoT)/Method(s) within each Accreditation Program for which the above named laboratory maintains accreditation is outlined on the attached Scope of Accreditation. Continued accreditation is contingent upon successful on-going compliance with ISO/IEC 17025:2017 and AIHA-LAP, LLC requirements. This certificate is not valid without the attached Scope of Accreditation. Please review the AIHA-LAP, LLC website (www.aihaaccreditedlabs.org) for the most current Scope.

Cheryl O Morton
Managing Director, AIHA Laboratory Accreditation Programs, LLC

Revision19: 09/01/2020

Date Issued: 12/31/2020

AIHA Laboratory Accreditation Programs, LLC

SCOPE OF ACCREDITATION

Eurofins EMLab P&K
3929 Old Lee Highway, Unit 91 C, Fairfax, VA 22030

Laboratory ID: LAP-179623
Issue Date: 12/31/2020

The laboratory is approved for those specific field(s) of testing/methods listed in the table below. Clients are urged to verify the laboratory's current accreditation status for the particular field(s) of testing/Methods, since these can change due to proficiency status, suspension and/or withdrawal of accreditation.

Environmental Microbiology Laboratory Accreditation Program (EMLAP)

Initial Accreditation Date: 12/01/2005

EMLAP Scope Category	Field of Testing (FOT)	Component, parameter or characteristic tested	Method	Method Description *(for internal methods only)*
Fungal	Air - Culturable	Viable Impaction Samples	EM-MY-S-1043	Preparation and Analysis of Air Samples for Culturable Fungi
Fungal	Air - Direct Examination	Spore Trap Air Samples	EM-MY-S-1038	Preparation and Analysis of Spore Trap (Air) Samples for Fungal Spores, Other Biological and Non-Biological Particles
Fungal	Bulk - Culturable	Dust, Swab, Bulk, Water/Liquids, Wipes	EM-MY-S-1040	Preparation of Bulk, Dust/ Soil, Swab/Wipe and Water/Liquid Samples for Quantitative Fungal and /or Bacterial Analysis
Fungal	Bulk - Culturable	Dust, Swab, Bulk, Water/Liquids, Wipes, Contact Plates	EM-MY-S-2584	Analysis of Dust, Swab, Water, and Bulk Samples for Culturable Fungi
Fungal	Bulk - Direct Examination	Tape, Swab, Wipe, Bulk, Dust, Soil	EM-MY-S-1039	Preparation and Analysis of Tape, Swab, Wipe, Bulk and Dust - Soil Samples for Qualitative Direct Microscopic Examination
Fungal	Bulk - Direct Examination	Tape, Swab, Wipe, Bulk, Dust, Soil	EM-MY-S-1041	Preparation and Analysis of Tape, Swab, Wipe, Bulk and Dust - Soil Samples for Quantitative Direct Microscopic Examination
Fungal	Surface - Culturable	Dust, Swab, Bulk, Water/Liquids, Wipes	EM-MY-S-1040	Preparation of Bulk, Dust/ Soil, Swab/Wipe and Water/Liquid Samples for Quantitative Fungal and /or Bacterial Analysis
Fungal	Surface - Culturable	Dust, Swab, Bulk, Water/Liquids, Wipes, Contact Plates	EM-MY-S-2584	Analysis of Dust, Swab, Water, and Bulk Samples for Culturable Fungi

EMLAP Scope Category	Field of Testing (FOT)	Component, parameter or characteristic tested	Method	Method Description *(for internal methods only)*
Fungal	Surface - Direct Examination	Tape, Swab, Wipe, Bulk, Dust, Soil	EM-MY-S-1039	Preparation and Analysis of Tape, Swab, Wipe, Bulk and Dust - Soil Samples for Qualitative Direct Microscopic Examination
Fungal	Surface - Direct Examination	Tape, Swab, Wipe, Bulk, Dust, Soil	EM-MY-S-1041	Preparation and Analysis of Tape, Swab, Wipe, Bulk and Dust - Soil Samples for Quantitative Direct Microscopic Examination

A complete listing of currently accredited EMLAP laboratories is available on the AIHA-LAP, LLC website at: *http://www.aihaaccreditedlabs.org*

Advanced Air Solutions

INVOICE	#14457
SERVICE DATE	Aug 12, 2022
INVOICE DATE	Oct 10, 2022
DUE	Upon receipt
AMOUNT DUE	**$0.00**

Wilmington Housing Authority
Wilmington Housing Authority
1524 S 16th St
Wilmington, NC 28401

(910) 660-9080
smoon@wha.net

SERVICE ADDRESS

712 N 30th St
Wilmington, NC 28405

CONTACT US

5208 Carolina Beach Rd, 100
Wilmington, NC 28412

(910) 791-7888
jreinholt@advancedairsolutions.org

Service completed by: Matthew Pleasant, John Sweeley

INVOICE

Services	qty	unit price	amount
Duct Cleaning - Air Ducts	1.0	$0.00	$0.00

Central heating and air conditioning systems transfer air throughout your house via air ducts.

Debris can build up in your ducts that needs to be removed to ensure proper operation. Cleaning includes the use of a brush in each register and air duct.

Subtotal	$0.00
Total Tax	$0.00
Our Coverage Area (7%)	$0.00
Total	**$0.00**

Thank you for choosing Advanced Air Solutions for your Indoor Air Quality needs.

Phoenix EnviroCorp

December 21, 2021

Monique Washington
Wilmington Housing Authority
1524 S. 16th Street
Wilmington, NC 28401

RE: PEC Job # 21-21-405A-IAQ-M – 712 N. 30th Street, Wilmington, NC - Mold Investigation/Background air sampling

Enclosed are the results of the mold investigation conducted at the above referenced unit on December 10, 2021. Phoenix EnviroCorp (PEC) was retained to conduct background air sampling following cleaning of surface mold growth by Wilmington Housing Authority's maintenance department.

Background Information: PEC conducted an investigation on November 15th, 2021, identifying suspect visible mold growth; however, no fungal growth was identified from surface samples.

The HVAC system was operating in the cool mode, set at 73º F upon PEC's arrival and during sampling.

Related Documents:
- PEC initial investigation report dated November 17, 2021

Note: For directional purposes "front" is determined by facing N. 30th Street from inside the unit, unless otherwise stated.

Mold Testing – Air: Non-viable spore trap air samples were collected to determine airborne mold spore levels. Samples were collected within the kitchen/living room, the bathroom, the front bedroom, and the rear bedroom. *Micro 5 sampling media was utilized for the collection of spore trap air samples. Each sample ran for five (5) minutes at a flow rate of five (5) liters per minute for a total volume of twenty-five (25) liters per sample. Each sample was assigned a unique ID number and shipped to a third-party laboratory for analysis. All air samples were collected from centralized locations (within their respective areas) and within the breathing zone, unless otherwise noted.* Two samples were also collected outdoors for comparative purposes.

Results identified elevated airborne levels of *Cladosporium* within the kitchen/living room.

The interpretation of air sample results is based on indoor/outdoor comparisons, in combination with a study by Daniel M. Baxter, entitled "A Regional Comparison of Mold Spore Concentrations Outdoors and Inside "Clean" and "Mold Contaminated" Southern California Buildings", and other industry guidelines, as well as over 20 years of experience in industrial hygiene and mold testing.

In layman terms, acceptable levels indicate that the levels are below the outdoor level and/or the baseline levels (whichever is higher) stated below. Elevated levels indicate that the levels are above the outdoor level and/or the baseline level.

Baseline levels for indoor spore trap air samples are as follows: < 900 spores/m³ for Penicillium/Aspergillus; 0 spores/m³ for Stachybotrys and Chaetomium; and < 350 spores/m³ for other individual mold groups.

Relative Humidity (RH): *Temperature and relative humidity readings were collected in the same locations as the spore trap air samples.* RH levels within the unit ranged from 52.2% – 58.6% with an outdoor reading of 78.1% (see the enclosed Chain of Custody for details). Per the American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) Standard 62-1999, relative humidity should range between 30% and 60%.

Conclusions: Sample results identified slightly elevated airborne mold spore levels (880 spores/m,^{3} of *Cladosporium*) within the kitchen/living room. Based on *Cladosporium* levels outdoors (i.e., 600 and 720 spores/m^3) during this investigation, coupled with the initial investigation (i.e., acceptable airborne mold spore levels and no surface mold growth identified) no further actions are recommended at this time. However, if conditions change (i.e., additional suspect visible mold growth, tenant complaints, etc.), PEC recommends additional investigative activities (i.e., air sampling at a minimum).

Enclosed in this report are the laboratory analysis and the Chain of Custody.

Should you have any questions, please do not hesitate to call.

Thank you,

Philip Green
IH Technician

Tommie Green, CIEC
Professional Industrial Hygienist

Enclosures

Phoenix EnviroCorp
4020 SHIPYARD BLVD.
WILMINGTON, NC 28403

CHAIN OF CUSTODY

LABORATORY TEST REQUEST

R-Q #: 211214033 Lab ID: 099 - 104

CONTACT: Philip Green	TELEPHONE (910) 397-0370 FAX (910) 313-6094	12/10/2021
PEC Job #: 21-21-405A-IAQ-M	SITE ADDRESS: 712 N. 30th Street, Wilmington, NC 28405	

PLEASE EMAIL RESULTS TO: KMGREEN@PHOENIXENVIROCORP.COM

SAMPLE TYPE:	NUMBER OF SAMPLES:	TURN AROUND TIME SPECIFIED:
Spore Trap - Micro-5	6	____ Immediate ____ 24 hr ____ 48 hr __X__ Standard
Surface Samples	0	

Sample #	Sample Area	Sample Volume	Lab Analysis Requested	% Relative Humidity	Temperature °F
121021-PG-201	Kitchen/Living Room	25L	S001	58.6	72.9
121021-PG-202	Bathroom	25L	S001	52.2	74.1
121021-PG-203	Front Bedroom	25L	S001	56.3	72.1
121021-PG-204	Rear Bedroom	25L	S001	57.2	74.0
121021-PG-205	Outside - Right	25L	S001	78.1	70.1
121021-PG-206	Outside - Left	25L	S001		

Samples Collected By (Printed Name and Signature): [signature] Date Signed: 12/10/2021

CHAIN OF CUSTODY RECORD

DATE:	Time:	Condition of Samples:	RELINQUISHED BY: (Printed Name and Signature)	ACCEPTED BY: (Printed Name and Signature)
12/10/2021	16:00	Intact	[signature] AFFILIATION:	AFFILIATION: 12-14-21

SEEML Reference Number:
211214033

Southeast Environmental Microbiology Laboratories
102 Edinburgh Court
Greenville, SC 29607
Phone: (864) 233-3770
FAX: (864) 233-6589

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

☐	Surface/Bulk Report	☐	Andersen Fungal Report
☒	Spore Trap Report	☐	Quantitative Fungal Report

Lab Manager Review: *Angel Gosnell* Date: 12/14/21

Thank you for using SEEML laboratories. We strive to provide superior quality and service.
SEEML laboratories are accredited through AIHA-LAP, LLC (EMLAP # 173667) for the analysis of Spore Traps and Surface/Bulk Samples.

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

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

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

Spore Trap Report

	Date Sampled: 12/10/21
Attn: ***Phoenix Enviro Corp.***	Date Received: 12/14/21
4020 Shipyard Blvd.	Date Analyzed: 12/14/21
Wilmington, NC 28403	Date Reported: 12/14/21
	Date Revised:
	Project Name: 21-21-405A-IAQ-M
	Project Address: 712 N. 30th Street
	Project City, State, ZIP: Wilmington, NC 28405
	SEEML Reference # : 211214033

TEST METHOD: DIRECT MICROSCOPY EXAMINATION SEEML SOP 7

Client Sample ID	121021-PG-201			121021-PG-202			121021-PG-203		
Location	Kitchen/Living Room			Bathroom			Front Bedroom		
Lab Sample ID	211214033-099			211214033-100			211214033-101		
Comments									
Hyphal Fragments									
Pollen									
Spore Trap Used	M5			M5			M5		
	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%
Alternaria									
Ascospores				2	80	13			
Basidiospores				2	80	13	8	320	62
Bipolaris/Drechslera									
Chaetomium									
Cladosporium	22	880	96	12	480	75			
Curvularia									
Epicoccum									
Cercospora									
Fusarium									
Memnoniella									
Nigrospora									
Penicillium/Aspergillus	1	40	4				5	200	38
Polythrincium									
Rusts									
Smuts/Periconia/Myxomy									
Spegazzinia									
Stachybotrys									
Stemphylium									
Tetraploa									
Torula									
Ulocladium									
Colorless/Other Brown*									
Oidium									
Zygomycetes									
Pithomyces									
Background debris (1-5)**	3			3			3		
Sample Volume(liters)	25			25			25		
TOTAL SPORES/M^3	23	**920**		16	**640**		13	**520**	

Revisions:

Spore types listed without a count or data entry were not detected during the course of the analysis for the respective sample, indicating a raw count of <1 spore.

The analytical sensitivity is the spores/m^3 divided by the raw count, expressed in spores/m^3. The limit of detection is the analytical sensitivity (in spores/m^3) multiplied by the sample volume (in liters) divided by 1000 liters.

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

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

Disclaimer: The sample results are determined by the sample volume, which is provided by the customer.
This report relates only to the samples tested as they were received.

102 Edinburgh Court
Greenville, SC. 29607
Phone: (864) 233-3770

Angel Gosnell

Angel Gosnell, Approved Laboratory Signatory

Spore Trap Report

	Date Sampled: 12/10/21
Attn: ***Phoenix Enviro Corp.***	Date Received: 12/14/21
4020 Shipyard Blvd.	Date Analyzed: 12/14/21
Wilmington, NC 28403	Date Reported: 12/14/21
	Date Revised:
	Project Name: 21-21-405A-IAQ-M
	Project Address: 712 N. 30th Street
	Project City, State, ZIP: Wilmington, NC 28405
	SEEML Reference # : 211214033

TEST METHOD: DIRECT MICROSCOPY EXAMINATION SEEML SOP 7

Client Sample ID	121021-PG-204			121021-PG-205			121021-PG-206		
Location	Rear Bedroom			Outside-Right			Outside-Left		
Lab Sample ID	211214033-102			211214033-103			211214033-104		
Comments									
Hyphal Fragments							1	40	
Pollen									
Spore Trap Used	M5			M5			M5		
	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%
Alternaria									
Ascospores	1	40	14						
Basidiospores	1	40	14	8	320	32	5	200	22
Bipolaris/Drechslera									
Chaetomium									
Cladosporium	1	40	14	15	600	60	18	720	78
Curvularia									
Epicoccum				1	40	4			
Cercospora									
Fusarium									
Memnoniella									
Nigrospora									
Penicillium/Aspergillus	2	80	29	1	40	4			
Polythrincium									
Rusts									
Smuts/Periconia/Myxomy	2	80	29						
Spegazzinia									
Stachybotrys									
Stemphylium									
Tetraploa									
Torula									
Ulocladium									
Colorless/Other Brown*									
Oidium									
Zygomycetes									
Pithomyces									
Background debris (1-5)**	3			3			3		
Sample Volume(liters)	25			25			25		
TOTAL SPORES/M^3	7	**280**		25	**1000**		23	**920**	

Revisions:

Spore types listed without a count or data entry were not detected during the course of the analysis for the respective sample, indicating a raw count of <1 spore.

The analytical sensitivity is the spores/m^3 divided by the raw count, expressed in spores/m^3. The limit of detection is the analytical sensitivity (in spores/m^3) multiplied by the sample volume (in liters) divided by 1000 liters.

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

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

Disclaimer: The sample results are determined by the sample volume, which is provided by the customer.
This report relates only to the samples tested as they were received.

102 Edinburgh Court
Greenville, SC. 29607
Phone: (864) 233-3770

Angel Gosnell

Angel Gosnell, Approved Laboratory Signatory

AIHA-LAP, LLC EMLAP #173667 Texas Lic: LAB1016

Fungal Descriptions

Alternaria sp.

Aw - 0.89. Conidia dimensions: 18-83 x 7-18 microns. A very common allergen with an IgE mediated response. It is often found in carpets, textiles and on horizontal surfaces in building interiors. Often found on window frames. Outdoors it may be isolated from samples of soil, seeds and plants. It is commonly found in outdoor samples. The large spore size, 20 - 200 microns in length and 7 - 18 microns in sizes, suggests that the spores from these fungi will be deposited in the nose, mouth and upper respiratory tract. It may be related to bakers' asthma. It has been associated with hypersensitivity pneumonitis. The species *Alternaria alternata* can produce tenuazonic acid and other toxic metabolites that may be associated with disease in humans or animals. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include edema and bronchospasms; chronic cases may develop pulmonary emphysema.

Ascospore

A spore borne in a special cell called an ascus. Spores of this type are reported to be allergenic. All ascomycetes, members of a group of fungi called Ascomycotina, have this type of spore. The minute black dots on rotting wood and leaves or the little cups on lichens are examples of ascomycetes; another is the "truffle" mushroom.

Aspergillus/Penicillium

These are two of the most commonly found allergenic fungi in problem buildings. *Aspergillus* comes in many varieties (species). Many of the varieties produce toxic substances. It may be associated with symptoms such as sinusitis, allergic bronchopulmonary aspergillosis, and other allergic symptoms. *Penicillium* is a variety of mold that is very common indoors and is found in increased numbers in problem buildings. It also has many varieties, some of which produce toxic substances. The symptoms are allergic reactions, mucous membrane irritation, headaches, vomiting, and diarrhea. Due to the morphological similarity of *Aspergillus* and *Penicillium*, they are not differentiated by microscopic analysis and are reported together.

Aspergillus sp.

Aw 0.75 - 0.82. Reported to be allergenic. Members of this genus are reported to cause ear infections. Many species produce mycotoxins that may be associated with disease in humans and other animals. Toxin production is dependent on the species or a strain within a species and on the food source for the fungus. Some of these toxins have been found to be carcinogenic in animal species. Several toxins are considered potential human carcinogens. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include edema and bronchospasms; chronic cases may develop pulmonary emphysema; may also be associated with sinusitis, allergic bronchopulmonary aspergillosis, and other allergic symptoms.

Basidiospore

Spore from basidiomycetes. Many varieties are reported to be allergenic.

Bipolaris sp.

A fungus with large spores that could be expected to be deposited in the upper respiratory tract. This fungus can produce the mycotoxin - sterigmatocystin, which has been shown to produce liver and kidney damage when ingested by laboratory animals.

Botrytis sp.

Aw 0.93. Conidia dimensions: 7-14 x 5-9 microns. It is parasitic on plants and soft fruits. Found in soil and on house plants and vegetables, it is also known as "gray mold". It causes leaf rot on grapes, strawberries, lettuce, etc. It is a well-known allergen, producing asthma type symptoms in greenhouse workers and "wine grower's lung".

Cercaspora

Common outdoors in agricultural areas, especially during harvest. Parasite of higher plants, causing leaf spot. Commonly found as parasites on higher plants.

Chaetomium sp.

large ascomycetous fungus producing perithecia. It is found on a variety of substrates containing cellulose, including paper and plant compost. It has been found on paper in sheetrock. It can produce an *Acremonium*-like state on fungal media. Varieties are considered allergenic and have been associated with peritonitis, cutaneous lesions, and system mycosis.

Cladosporium sp.

Aw 0.88; Aw 0.84. Most commonly identified outdoor fungus. The outdoor numbers are reduced in the winter. The numbers are often high in the summer. Often found indoors in numbers less than outdoor numbers. It is a common allergen. Indoor *Cladosporium* sp. may be different than the species identified outdoors. It is commonly found on the surface of fiberglass duct liners in the interior of supply ducts. A wide variety of plants are food sources for this fungus. It is found on dead plants, woody plants, food, straw, soil, paint, and textiles. Produces greater than 10 antigens. Antigens in commercial extracts are of variable quality and may degrade within weeks of preparation. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include skin lesions, eye ulceration, mycosis (including onychomycosis, an infection of the nails of the feet or hands) edema and bronchospasms; chronic cases may develop pulmonary emphysema.

Curvularia sp.

Reported to be allergenic and has been associated with allergic fungal sinusitis. It may cause corneal infections, mycetoma, and infections in immune compromised hosts.

Dreschlera sp.

Conidia dimensions: 40-120 x 17-28 microns. Found on grasses, grains and decaying food. It can occasionally cause a corneal infection of the eye.

Epicoccum sp.

Conidia dimensions: 15-25 microns. A common allergen. It is found in plants, soil, grains, textiles and paper products.

Fusarium sp.

Aw 0.90. A common soil fungus. It is found on a wide range of plants. It is often found in humidifiers. Several species in this genus can produce potent trichothecene toxins. The trichothecene (scirpene) toxin targets the following systems: circulatory, alimentary, skin, and nervous. Produces vomitoxin on grains during unusually damp growing conditions. Symptoms may occur either through ingestion of contaminated grains or possibly inhalation of spores. The genera can produce hemorrhagic syndrome in humans (alimentary toxic aleukia). This is characterized by nausea, vomiting, diarrhea, dermatitis, and extensive internal bleeding. Reported to be allergenic. Frequently involved in eye, skin, and nail infections.

Myxomycetes

Members of a group of fungi that is included in the category of "slime molds". They're occasionally found indoors, but mainly reside in forested regions on decaying logs, stumps, and dead leaves. Myxomycetes display characteristics of fungi *and* protozoans. In favorable (wet) conditions they exhibit motile, amoeba-like cells, usually bounded only by a plasma membrane, that are variable in size and form. During dry spells, they form a resting body (sclerotium) with dry, airborne spores. These fungi are not known to produce toxins but can cause hay fever and asthma.

Memnoniella

Contaminant found most often with *Stachybotrys* on wet cellulose. Forms in chains, but it are very similar to *Stachybotrys* and sometimes is considered to be in the *Stachybotrys* family. Certain species do produce toxins very similar to the ones produced by *Stachybotrys chartarum* and many consider the IAQ importance of *Memnoniella* to be on par with *Stachybotrys*. Allergenic and infectious properties are not well studied.

Nigrospora sp.

Commonly found in warm climates, this mold may be responsible for allergic reactions such as hay fever and asthma. It is found on decaying plant material and in the soil. It is not often found indoors.

Oidium sp.

The asexual phase of *Erysiphe* sp. It is a plant pathogen causing powdery mildews. It is very common on the leaf's stems, and flowers of plants. The health effects and allergenicity have not been studied. It does not grow on non-living surfaces such as wood or drywall.

Penicillium sp.

Aw 0.78 - 0.88. A wide number of organisms have been placed in this genus. Identification to species is difficult. Often found in aerosol samples. Commonly found in soil, food, cellulose and grains. It is also found in paint and compost piles. It may cause hypersensitivity pneumonitis, allergic alveolitis in susceptible individuals. It is reported to be allergenic (skin). It is commonly found in carpet, wallpaper, and in interior fiberglass duct insulation. Some species can produce mycotoxins. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include edema and bronchospasms; chronic cases may develop pulmonary emphysema. It may also cause headaches, vomiting, and diarrhea.

Periconia sp.

Periconia sp. are found in soil, blackened and dead herbaceous stems leaf spots, grasses, rushes, and sedges. Almost always associated with other fungi. Rarely found growing indoors. Reportedly associated with a rare case of mycotic keratitis.

Pithomyces sp.

A common mold found on dead leaves, plants, soil and especially grasses. Causes facial eczema in ruminants. It exhibits distinctive multi-celled brown conidia. It is not known to be a human allergen or pathogen. It is rarely found indoors, although it can grow on paper.

Rusts/Smuts

These fungi are associated with plant diseases. In the classification scheme of the fungi, the smuts have much in common with the rusts, and they are frequently discussed together. Both groups produce wind-borne, resistant teliospores that serve as the basis for their classification and their means of spread. Rusts usually attack vegetative regions (i.e., leaves and stems) of plants; smuts usually are associated with the reproductive structures (seeds). They can cause hay fever and asthma.

Spegazzinia

Spegazzinia species comprise a very small proportion of the fungal biota. This genus is somewhat related to other lobed or ornamented genera such as *Candelabrum*. No information is available regarding health effects or toxicity. Allergenicity has not been studied. Usually identified on spore trap samples where it is seen every few weeks. (Spores have very distinctive morphology.) May also be found in air by culturable (Andersen) samples if a long enough incubation period is provided so that sporulation occurs. Our laboratory has never found this organism growing on indoor environmental surfaces. Natural habitat includes soil and many kinds of trees and plants.

Stachybotrys sp.

Aw - 0.94, optimum Aw ->0.98. Several strains of this fungus (*S. atra, S. chartarum* and *S. alternans* are synonymous) may produce a trichothecene mycotoxin- Satratoxin H - which is poisonous by inhalation. The toxins are present on the fungal spores. This is a slow growing fungus on media. It does not compete well with other rapidly growing fungi. The dark colored fungus grows on building material with high cellulose content and low nitrogen content. Areas with a relative humidity above 55%, and are subject to temperature fluctuations, are ideal for toxin production. Individuals with chronic exposure to the toxin produced by this fungus reported cold and flu symptoms, sore throats, diarrhea, headaches, fatigue, dermatitis, intermittent local hair loss and generalized malaise. Other symptoms include coughs, rhinitis, nosebleed, a burning sensation in the nasal passages, throat, and lungs, and fever. The toxins produced by this fungus will suppress the immune system affecting the lymphoid tissue and the bone marrow. Animals injected with the toxin from this fungus exhibited the following symptoms: necrosis and hemorrhage within the brain, thymus, spleen, intestine, lung, heart, lymph node, liver, and kidney. Affects by absorption of the toxin in the human lung are known as pneumomycosis.

This organism is rarely found in outdoor samples. It is usually difficult to find in indoor air samples unless it is physically disturbed (or possibly -this is speculation- a drop in the relative humidity). The spores are in a gelatinous mass. Appropriate media for the growth of this organism will have high cellulose content and low nitrogen content. The spores will die readily after release. The dead spores are still allergenic and toxigenic. Percutaneous absorption has caused mild symptoms.

Stemphylium sp.

Reported to be allergenic. Isolated from dead plants and cellulose materials.

Torula sp.

Found outdoors in air, soil, on dead vegetation, wood, and grasses. Also found indoors on cellulose materials. Reported to be allergenic and may cause hay fever and asthma.

Tetraploa

Tetraploa species comprise a very small proportion of the fungal biota. This genus is somewhat related to *Triposporium* and Diplocladiella. The only reported human infections are two cases of keratitis (1970, 1980) and one case of subcutaneous infection of the knee (1990). No information is available regarding other health effects or toxicity. Allergenicity has not been studied. Usually identified on spore trap samples where it is seen every few weeks. (Spores have very distinctive morphology.) Our laboratory has never found this organism growing on indoor environmental surfaces. Natural habitat includes leaf bases and stems just above the soil on many kinds of plants and trees.

Ulocladium sp.

Aw 0.89. Isolated from dead plants and cellulose materials. Found on textiles.

Zygomycetes

Zygomycetes are one of the four major groups of fungi, the others being the Oomycetes, the Ascomycetes, and the Basidiomycetes. Zygomycetes are common, fast growing, and often overgrow and/or inhibit other fungi nearby. Rhizopus and Mucor are two of the most common Zygomycetes seen in the indoor environment. However, others are seen as well, including *Syncephalastrum*, *Circinella*, *Mortierella*, *Mycotypha*, *Cunninghamella*, and *Choanephora*. For further information, please see descriptions of these individual genera.

The following table lists mycotoxins that are produced by certain types of fungi:

Fungi	Mycotoxin
Acremonium crotocinigenum	Crotocin
Aspergillus favus	Alfatoxin B, cyclopiazonic acid
Aspergillus fumigatus	Fumagilin, gliotoxin
Aspergillus carneus	Critrinin
Aspergillus clavatus	Cytochalasin, patulin
Aspergillus Parasiticus	Alfatoxin B
Aspergillus nomius	Alfatoxin B
Aspergillus niger	Ochratoxin A, malformin, oxalicacid
Acremonium crotocinigenum	Crotocin
Aspergillus nidulans	Sterigmatocystin
Aspergillus ochraceus	Ochratoxin A, penicillic acid
Aspergillus versicolor	Sterigmatocystin, 5 ethoxysterigmatocystin
Aspergillus ustus	Ausdiol, austamide, austocystin,brevianamide
Aspergillus terreus	Citreoviridin
Alternaria	Alternariol, altertoxin, altenuene, altenusin, tenuazonic acid
Arthrinium	Nitropropionic acid
Bioploaris	Cytochalasin, sporidesmin, sterigmatocystin
Chaetomium	Chaetoglobosin A,B,C. Sterigmatocystin
Cladosporium	Cladosporic acid
Clavipes purpurea	Ergotism
Cylindrocorpon	Trichothecene
Diplodia	Diplodiatoxin
Fusarium	Trichothecene, zearalenone
Fusarium moniliforme	Fumonisins
Emericella nidulans	Sterigmatocystin
Gliocladium	Gliotoxin
Memnoniella	Griseofulvin , dechlorogriseofulvin, epi-decholorgriseofulvin, trichodermin, trichodermol
Myrothecium	Trichothecene
Paecilomyces	Patulin, viriditoxin
Penicillium aurantiocandidum	Penicillic acid
Penicillium aurantiogriseum	Penicillic acid
Penicillium brasilanum	Penicillic acid
Penicillium brevicompactum	Mycophenolic acid
Penicillium camemberti	Cyclopiazonic acid
Penicillium carneum	Mycophenolic acid, Roquefortine C
Penicillium crateriforme	Rubratoxin

Fungi	Mycotoxin
Penicillium citrinum	Citrinin
Penicillium commune	Cyclopiazonic acid
Penicillium crustosum	Roquefortine C
Penicillium chrysogenum	Roquefortine C
Penicillium discolor	Chaetoglobosin C
Penicillium expansum	Citrinin, Roquefortine C
Penicillium griseofulvum	Roquefortine C, cyclopiazonic acid, griseofulvin
Penicillium hirsutum	Roquefortine C
Penicillium hordei	Roquefortine C
Penicillium nordicum	Ochratoxin A
Penicillium paneum	Roquefortine C
Penicillium palitans	Cyclopiazonic acid
Penicillium polonicum	Penicillic acid
Penicillum roqueforti	Roquefortine C, Mycophenolic acid
Penicillium veridicatum	Penicillic acid
Penicillium verrucosum	Citrinin, ochratoxin A
Penicillium/ Aspergillus	Patulin
Penicillium/ Aspergillus/Alternaria	Glitoxin
Phomopsis	Macrocyclic trichothecenes
Phoma	Brefeldin, cytochalasin, secalonic acid, tenuazonic acid
Pithomyces	Sporidesmin
Rhizoctonia	Slaframine
Rhizopus	Rhizonin
Sclerotinia	Furanocoumarins
Stachybotrys chartarum	Iso-satratoxin F, roridin E, L-2, satratoxin G & H, trichodermin, trichodermol, trichothecene
Torula	Cytotoxins
Trichoderma	Trichodermin, trichodermol, gliotoxin
Trichothecium	Trichothecene
Wallemia	Walleminol
Zygosporium	Cytochalasin

General terms

Allergen

An allergen is a substance that elicits an IgE antibody response and is responsible for producing allergic reactions. Chemicals are released when IgE on certain cells contact an allergen. These chemicals can cause injury to surrounding tissue - the visible signs of an allergy. Only a few fungal allergens have been characterized but all fungi are thought to be potentially allergenic. Fungal allergens are proteins found in either the mycelium or spores

"Black mold"

A poorly defined term. Black mold or toxic black mold has usually been associated with the mold *Stachybotrys chartarum*. While there are only a few molds that are truly black, there are many that can appear black. Not all molds that appear to be black are *Stachybotrys*.

Fungi

Fungi are neither animals nor plants and are classified in a kingdom of their own. The Kingdom of Fungi. Fungi include a very large group of organisms, including molds, yeasts, mushrooms and puffballs. There are >100,000 accepted fungal species but current estimates range to 1.5 million species. Mycologists (people who study fungi) have grouped fungi into four large groups according to their method of reproduction.

Hidden mold

This refers to visible mold growth on building structures that is not easily seen, including the areas above drop ceilings, within a wall cavity (the space between the inner and outer structure of a wall), inside air handlers, or within the ducting of a heating/ventilation system.

Microbial Volatile Organic Compounds (MVOCs)

Fungi produce chemicals as a result of their metabolism. Some of these chemicals, MVOCs, are responsible for the characteristic moldy, musty, or earthy smell of fungi, whether mushrooms or molds. Some MVOCs are considered offensive or annoying. Specific MVOCs are thought to be characteristic of wood rot and mold growth on building materials. The human nose is very sensitive to mold odors and sometimes more so than current analytical instruments.

Mold

Molds are a group of organisms that belong to the Kingdom of Fungi (see Fungi). Even though the terms mold and fungi had been commonly referred to interchangeably, all molds are fungi, but not all fungi are molds.

Mycotoxin

Mycotoxins are compounds produced by some fungi that are toxic to humans or animals. By convention, the term? Mycotoxin. Excludes mushroom toxins. Fungi that produce mycotoxins are called "toxigenic fungi."

Spore

General term for a reproductive structure in fungi, bacteria and some plants. In fungi, the spore is the structure which may be used for dissemination and may be resistant to adverse environmental conditions.

Toxic mold

The term "toxic mold" has no scientific meaning since the mold itself is not toxic. The metabolic byproducts of some molds may be toxic (see mycotoxin).

Hypha (plural, hyphae)

An individual fungal thread or filament of connected cells; the thread that represents the individual parts of the fungal body.

Phoenix EnviroCorp

May 9, 2022

James Hayes
Wilmington Housing Authority
1524 S. 16th Street
Wilmington, NC 28401

RE: PEC Job # 21-20-237A-IAQ-M – 809 N. 30th Street, Wilmington, NC - Mold Investigation/Background air sampling

Enclosed are the results of the mold investigation conducted at the above referenced unit on April 29, 2022. Phoenix EnviroCorp (PEC) was retained to conduct background air sampling to determine airborne mold spore levels and to collect surface samples of suspect visible mold growth.

Background Information: This is a two-story apartment building built on a slab. The subject unit is fully furnished with contents throughout, and no carpet installed within.

The first floor HVAC system was operating in the cool mode with the fan on auto set at 68º F, and the second floor HVAC system was operating in the cool mode with the fan on auto set at 69º F upon PEC's arrival and during sampling.

Note: For directional purposes, "front" is determined by facing N. 30th Street from inside the unit, unless otherwise stated.

Visual Inspection: PEC's visual inspection noted the following:

- Excessive contents in closets in various locations throughout the unit obstructing the visual inspection
- No suspect visible mold growth observed

Mold Testing – Air: Non-viable spore trap air samples were collected to determine airborne mold spore levels. Samples were collected within the kitchen, the living room, the bathroom, the 1st floor bedroom, the 2nd floor front right bedroom, the 2nd floor rear right bedroom, the 2nd floor rear left bedroom, and the 2nd floor bathroom. *Micro 5 sampling media was utilized for the collection of spore trap air samples. Each sample ran for five (5) minutes at a flow rate of five (5) liters per minute for a total volume of twenty-five (25) liters per sample. Each sample was assigned a unique ID number and shipped to a third-party laboratory for analysis. All air samples were collected from centralized locations (within their respective areas) and within the breathing zone, unless otherwise noted.* Two samples were also collected outdoors for comparative purposes.

Results indicated acceptable levels of airborne mold spores in all sampled locations.

The interpretation of air sample results is based on indoor/outdoor comparisons, in combination with a study by Daniel M. Baxter, entitled "A Regional Comparison of Mold Spore Concentrations Outdoors and Inside "Clean" and "Mold Contaminated" Southern California Buildings", and other industry guidelines, as well as over 20 years of experience in industrial hygiene and mold testing.

In layman terms, acceptable levels indicate that the levels are below the outdoor level and/or the baseline levels (whichever is higher) stated below. Elevated levels indicate that the levels are above the outdoor level and/or the baseline level.

Baseline levels for indoor spore trap air samples are as follows: < 900 spores/m³ for Penicillium/Aspergillus; 0 spores/m³ for Stachybotrys and Chaetomium; and < 350 spores/m³ for other individual mold groups.

Relative Humidity (RH): *Temperature and relative humidity readings were collected in the same locations as the spore trap air samples.* RH levels within the unit ranged from 46.2% - 48.6% with an outdoor RH level of 50.5% (see the enclosed Chain of Custody for details). Per the American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) Standard 62-1999, relative humidity should range between 30% and 60%.

Conclusions: Air sampling within the tested areas did not indicate a problem with the indoor air quality regarding mold and there was no suspect visible mold growth or apparent water damage observed.

Enclosed in this report are the laboratory analysis and the Chain of Custody.

Should you have any questions, please do not hesitate to call.

Thank you,

Leon J. Henry, III
IH Technician

Tommie Green, CIEC
Professional Industrial Hygienist

Enclosures

Phoenix EnviroCorp
4020 SHIPYARD BLVD.
WILMINGTON, NC 28403

CHAIN OF CUSTODY

LABORATORY TEST REQUEST

Seem Ref #220503047 Lab ID: 147-156

CONTACT: Leon Henry	TELEPHONE (910) 397-0370 FAX (910) 313-6094	Date of Service: 4/29/2022
PEC Job #: 21-20-237A-IAQ-M	SITE ADDRESS: 809 N. 30th St, Wilmington NC 28405	

PLEASE EMAIL RESULTS TO: KMGREEN@PHOENIXENVIROCORP.COM

SAMPLE TYPE:	NUMBER OF SAMPLES:	TURN AROUND TIME SPECIFIED:
Spore Trap - Micro-5	10	____ Immediate ____ 24 hr ____ 48 hr __X__ Standard
Surface Samples	0	

Sample #	Sample Area	Sample Volume	Lab Analysis Requested	% Relative Humidity	Temperature °F
042922-LH-01	Kitchen	25L	S001	46.2	69.6
042922-LH-02	Living Room	25L	S001	48.2	68.7
042922-LH-03	Bathroom	25L	S001	48.2	68.6
042922-LH-04	Bedroom	25L	S001	47.7	68.7
042922-LH-05	Front Right Bedroom 2nd Floor	25L	S001	46.9	70.2
042922-LH-06	Rear Right Bedroom 2nd Floor	25L	S001	46.8	69.5
042922-LH-07	Rear Left Bedroom 2nd Floor	25L	S001	46.7	68.6
042922-LH-08	2nd Floor Bathroom	25L	S001	48.6	70.0
042922-LH-09	Outside Front	25L	S001	50.5	74.0
042922-LH-10	Outside Rear	25L	S001	N/A	N/A
	samples are acceptable				

Samples Collected By (Printed Name and Signature): Leon J Henry III Date Signed: 4/29/2022

CHAIN OF CUSTODY RECORD

DATE:	Time:	Condition of Samples:	RELINQUISHED BY: (Printed Name and Signature)	ACCEPTED BY: (Printed Name and Signature)
4/29/2022	18:00	Intact	AFFILIATION: Leon J Henry III	AFFILIATION: 5.3-22

SEEML Reference Number: 220503047

Southeast Environmental Microbiology Laboratories
102 Edinburgh Court
Greenville, SC 29607
Phone: (864) 233-3770
FAX: (864) 233-6589

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

- ☐ Surface/Bulk Report
- ☒ Spore Trap Report
- ☐ Andersen Fungal Report
- ☐ Quantitative Fungal Report

Lab Manager Review: *Blake Robinson* Date: 05/03/22

Thank you for using SEEML laboratories. We strive to provide superior quality and service.
SEEML laboratories are accredited through AIHA-LAP, LLC (EMLAP # 173667) for the analysis of Spore Traps and Surface/Bulk Samples.

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

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

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

Spore Trap Report

	Date Sampled: 04/29/22
Attn: ***Phoenix Enviro Corp.***	Date Received: 05/03/22
4020 Shipyard Blvd.	Date Analyzed: 05/03/22
Wilmington, NC 28403	Date Reported: 05/03/22
	Date Revised:
	Project Name: 21-20-237A-IAQ-M
	Project Address: 809 N. 30th St.
	Project City, State, ZIP: Wilmington, NC 28405
	SEEML Reference # : 220503047

TEST METHOD: DIRECT MICROSCOPY EXAMINATION SEEML SOP 7

Client Sample ID	042922-LH-01			042922-LH-02			042922-LH-03		
Location	Kitchen			Living Room			Bathroom		
Lab Sample ID	220503047-147			220503047-148			220503047-149		
Comments									
Hyphal Fragments	1	40					3	120	
Pollen				1	40				
Spore Trap Used	M5			M5			M5		
	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%
Alternaria				1	40	6	1	40	6
Ascospores							3	120	18
Basidiospores	1	40	25	2	80	13			
Bipolaris/Drechslera									
Chaetomium									
Cladosporium	2	80	50	4	160	25	11	440	65
Curvularia									
Epicoccum									
Cercospora									
Fusarium									
Memnoniella									
Nigrospora									
Penicillium/Aspergillus	1	40	25	9	360	56	1	40	6
Polythrincium							1	40	6
Rusts									
Smuts/Periconia/Myxomy									
Spegazzinia									
Stachybotrys									
Stemphylium									
Tetraploa									
Torula									
Ulocladium									
Colorless/Other Brown*									
Oidium									
Zygomycetes									
Pithomyces									
Background debris (1-5)**	3			3			3		
Sample Volume(liters)	25			25			25		
TOTAL SPORES/M^3	4	**160**		16	**640**		17	**680**	

Revisions:

Spore types listed without a count or data entry were not detected during the course of the analysis for the respective sample, indicating a raw count of <1 spore.

The analytical sensitivity is the spores/m^3 divided by the raw count, expressed in spores/m^3. The limit of detection is the analytical sensitivity (in spores/m^3) multiplied by the sample volume (in liters) divided by 1000 liters.

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

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

Disclaimer: The sample results are determined by the sample volume, which is provided by the customer.
This report relates only to the samples tested as they were received.

102 Edinburgh Court
Greenville, SC. 29607
Phone: (864) 233-3770

Blake Robinson

Blake Robinson, Approved Laboratory Signatory

Spore Trap Report

	Date Sampled: 04/29/22
Attn: ***Phoenix Enviro Corp.***	Date Received: 05/03/22
4020 Shipyard Blvd.	Date Analyzed: 05/03/22
Wilmington, NC 28403	Date Reported: 05/03/22
	Date Revised:
	Project Name: 21-20-237A-IAQ-M
	Project Address: 809 N. 30th St.
	Project City, State, ZIP: Wilmington, NC 28405
	SEEML Reference # : 220503047

TEST METHOD: DIRECT MICROSCOPY EXAMINATION SEEML SOP 7

Client Sample ID	042922-LH-04			042922-LH-05			042922-LH-06		
Location	Bedroom			Front Right Bedroom 2nd Floor			Rear Right Bedroom 2nd Floor		
Lab Sample ID	220503047-150			220503047-151			220503047-152		
Comments									
Hyphal Fragments									
Pollen									
Spore Trap Used	M5			M5			M5		
	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%
Alternaria							1	40	10
Ascospores	1	40	25						
Basidiospores				3	120	25	1	40	10
Bipolaris/Drechslera									
Chaetomium									
Cladosporium	2	80	50	4	160	33	1	40	10
Curvularia							1	40	10
Epicoccum									
Cercospora									
Fusarium									
Memnoniella									
Nigrospora									
Penicillium/Aspergillus	1	40	25	5	200	42	6	240	60
Polythrincium									
Rusts									
Smuts/Periconia/Myxomy									
Spegazzinia									
Stachybotrys									
Stemphylium									
Tetraploa									
Torula									
Ulocladium									
Colorless/Other Brown*									
Oidium									
Zygomycetes									
Pithomyces									
Background debris (1-5)**	3			3			3		
Sample Volume(liters)	25			25			25		
TOTAL SPORES/M^3	4	**160**		12	**480**		10	**400**	

Revisions:

Spore types listed without a count or data entry were not detected during the course of the analysis for the respective sample, indicating a raw count of <1 spore.

The analytical sensitivity is the spores/m^3 divided by the raw count, expressed in spores/m^3. The limit of detection is the analytical sensitivity (in spores/m^3) multiplied by the sample volume (in liters) divided by 1000 liters.

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

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

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102 Edinburgh Court
Greenville, SC. 29607
Phone: (864) 233-3770

Blake Robinson

Blake Robinson, Approved Laboratory Signatory

Spore Trap Report

	Date Sampled: 04/29/22
Attn: ***Phoenix Enviro Corp.***	Date Received: 05/03/22
4020 Shipyard Blvd.	Date Analyzed: 05/03/22
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	Project Name: 21-20-237A-IAQ-M
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	Project City, State, ZIP: Wilmington, NC 28405
	SEEML Reference # : 220503047

TEST METHOD: DIRECT MICROSCOPY EXAMINATION SEEML SOP 7

Client Sample ID	042922-LH-07			042922-LH-08			042922-LH-09		
Location	Rear Left Bedroom 2nd Floor			2nd Floor Bathroom			Outside Front		
Lab Sample ID	220503047-153			220503047-154			220503047-155		
Comments									
Hyphal Fragments	2	80		1	40		10	400	
Pollen							2	80	
Spore Trap Used	M5			M5			M5		
	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%
Alternaria	1	40	11	2	80	11	8	320	8
Ascospores	1	40	11				2	80	2
Basidiospores				1	40	5	1	40	<1
Bipolaris/Drechslera				1	40	5	1	40	<1
Chaetomium									
Cladosporium	2	80	22	12	480	63	72	2880	71
Curvularia	1	40	11						
Epicoccum							5	200	5
Cercospora									
Fusarium									
Memnoniella									
Nigrospora									
Penicillium/Aspergillus	3	120	33	3	120	16			
Polythrincium							2	80	2
Rusts							6	240	6
Smuts/Periconia/Myxomy							3	120	3
Spegazzinia									
Stachybotrys									
Stemphylium									
Tetraploa							1	40	<1
Torula									
Ulocladium									
Colorless/Other Brown*									
Oidium	1	40	11						
Zygomycetes							1	40	<1
Pithomyces									
Background debris (1-5)**	3			3			3		
Sample Volume(liters)	25			25			25		
TOTAL SPORES/M^3	9	**360**		19	**760**		102	**4080**	

Revisions:

Spore types listed without a count or data entry were not detected during the course of the analysis for the respective sample, indicating a raw count of <1 spore.

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102 Edinburgh Court
Greenville, SC. 29607
Phone: (864) 233-3770

Blake Robinson

Blake Robinson, Approved Laboratory Signatory

Spore Trap Report

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	Project Name: 21-20-237A-IAQ-M
	Project Address: 809 N. 30th St.
	Project City, State, ZIP: Wilmington, NC 28405
	SEEML Reference # : 220503047

TEST METHOD: DIRECT MICROSCOPY EXAMINATION SEEML SOP 7

Client Sample ID	042922-LH-10								
Location	Outside Rear								
Lab Sample ID	220503047-156								
Comments									
Hyphal Fragments	12	480							
Pollen	5	200							
Spore Trap Used	M5								
	raw ct.	spores/m^3	%						
Alternaria	9	360	5						
Ascospores	2	80	1						
Basidiospores	3	120	2						
Bipolaris/Drechslera	1	40	<1						
Chaetomium									
Cladosporium	140	5600	85						
Curvularia									
Epicoccum									
Cercospora									
Fusarium									
Memnoniella									
Nigrospora									
Penicillium/Aspergillus									
Polythrincium									
Rusts	7	280	4						
Smuts/Periconia/Myxomy	2	80	1						
Spegazzinia									
Stachybotrys									
Stemphylium									
Tetraploa									
Torula									
Ulocladium									
Colorless/Other Brown*									
Oidium									
Zygomycetes									
Pithomyces									
Background debris (1-5)**	3								
Sample Volume(liters)	25								
TOTAL SPORES/M^3	164	**6560**							

Revisions:

Spore types listed without a count or data entry were not detected during the course of the analysis for the respective sample, indicating a raw count of <1 spore.

The analytical sensitivity is the spores/m^3 divided by the raw count, expressed in spores/m^3. The limit of detection is the analytical sensitivity (in spores/m^3) multiplied by the sample volume (in liters) divided by 1000 liters.

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

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

Disclaimer: The sample results are determined by the sample volume, which is provided by the customer.
This report relates only to the samples tested as they were received.

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Fungal Descriptions

Alternaria sp.

Aw - 0.89. Conidia dimensions: 18-83 x 7-18 microns. A very common allergen with an IgE mediated response. It is often found in carpets, textiles and on horizontal surfaces in building interiors. Often found on window frames. Outdoors it may be isolated from samples of soil, seeds and plants. It is commonly found in outdoor samples. The large spore size, 20 - 200 microns in length and 7 - 18 microns in sizes, suggests that the spores from these fungi will be deposited in the nose, mouth and upper respiratory tract. It may be related to bakers' asthma. It has been associated with hypersensitivity pneumonitis. The species *Alternaria alternata* can produce tenuazonic acid and other toxic metabolites that may be associated with disease in humans or animals. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include edema and bronchospasms; chronic cases may develop pulmonary emphysema.

Ascospore

A spore borne in a special cell called an ascus. Spores of this type are reported to be allergenic. All ascomycetes, members of a group of fungi called Ascomycotina, have this type of spore. The minute black dots on rotting wood and leaves or the little cups on lichens are examples of ascomycetes; another is the "truffle" mushroom.

Aspergillus/Penicillium

These are two of the most commonly found allergenic fungi in problem buildings. *Aspergillus* comes in many varieties (species). Many of the varieties produce toxic substances. It may be associated with symptoms such as sinusitis, allergic bronchopulmonary aspergillosis, and other allergic symptoms. *Penicillium* is a variety of mold that is very common indoors and is found in increased numbers in problem buildings. It also has many varieties, some of which produce toxic substances. The symptoms are allergic reactions, mucous membrane irritation, headaches, vomiting, and diarrhea. Due to the morphological similarity of *Aspergillus* and *Penicillium*, they are not differentiated by microscopic analysis and are reported together.

Aspergillus sp.

Aw 0.75 - 0.82. Reported to be allergenic. Members of this genus are reported to cause ear infections. Many species produce mycotoxins that may be associated with disease in humans and other animals. Toxin production is dependent on the species or a strain within a species and on the food source for the fungus. Some of these toxins have been found to be carcinogenic in animal species. Several toxins are considered potential human carcinogens. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include edema and bronchospasms; chronic cases may develop pulmonary emphysema; may also be associated with sinusitis, allergic bronchopulmonary aspergillosis, and other allergic symptoms.

Basidiospore

Spore from basidiomycetes. Many varieties are reported to be allergenic.

Bipolaris sp.

A fungus with large spores that could be expected to be deposited in the upper respiratory tract. This fungus can produce the mycotoxin - sterigmatocystin, which has been shown to produce liver and kidney damage when ingested by laboratory animals.

Botrytis sp.

Aw 0.93. Conidia dimensions: 7-14 x 5-9 microns. It is parasitic on plants and soft fruits. Found in soil and on house plants and vegetables, it is also known as "gray mold". It causes leaf rot on grapes, strawberries, lettuce, etc. It is a well-known allergen, producing asthma type symptoms in greenhouse workers and "wine grower's lung".

Cercaspora

Common outdoors in agricultural areas, especially during harvest. Parasite of higher plants, causing leaf spot. Commonly found as parasites on higher plants.

Chaetomium sp.

large ascomycetous fungus producing perithecia. It is found on a variety of substrates containing cellulose, including paper and plant compost. It has been found on paper in sheetrock. It can produce an *Acremonium*-like state on fungal media. Varieties are considered allergenic and have been associated with peritonitis, cutaneous lesions, and system mycosis.

Cladosporium sp.

Aw 0.88; Aw 0.84. Most commonly identified outdoor fungus. The outdoor numbers are reduced in the winter. The numbers are often high in the summer. Often found indoors in numbers less than outdoor numbers. It is a common allergen. Indoor *Cladosporium* sp. may be different than the species identified outdoors. It is commonly found on the surface of fiberglass duct liners in the interior of supply ducts. A wide variety of plants are food sources for this fungus. It is found on dead plants, woody plants, food, straw, soil, paint, and textiles. Produces greater than 10 antigens. Antigens in commercial extracts are of variable quality and may degrade within weeks of preparation. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include skin lesions, eye ulceration, mycosis (including onychomycosis, an infection of the nails of the feet or hands) edema and bronchospasms; chronic cases may develop pulmonary emphysema.

Curvularia sp.

Reported to be allergenic and has been associated with allergic fungal sinusitis. It may cause corneal infections, mycetoma, and infections in immune compromised hosts.

Dreschlera sp.

Conidia dimensions: 40-120 x 17-28 microns. Found on grasses, grains and decaying food. It can occasionally cause a corneal infection of the eye.

Epicoccum sp.

Conidia dimensions: 15-25 microns. A common allergen. It is found in plants, soil, grains, textiles and paper products.

Fusarium sp.

Aw 0.90. A common soil fungus. It is found on a wide range of plants. It is often found in humidifiers. Several species in this genus can produce potent trichothecene toxins. The trichothecene (scirpene) toxin targets the following systems: circulatory, alimentary, skin, and nervous. Produces vomitoxin on grains during unusually damp growing conditions. Symptoms may occur either through ingestion of contaminated grains or possibly inhalation of spores. The genera can produce hemorrhagic syndrome in humans (alimentary toxic aleukia). This is characterized by nausea, vomiting, diarrhea, dermatitis, and extensive internal bleeding. Reported to be allergenic. Frequently involved in eye, skin, and nail infections.

Myxomycetes

Members of a group of fungi that is included in the category of "slime molds". They're occasionally found indoors, but mainly reside in forested regions on decaying logs, stumps, and dead leaves. Myxomycetes display characteristics of fungi *and* protozoans. In favorable (wet) conditions they exhibit motile, amoeba-like cells, usually bounded only by a plasma membrane, that are variable in size and form. During dry spells, they form a resting body (sclerotium) with dry, airborne spores. These fungi are not known to produce toxins but can cause hay fever and asthma.

Memnoniella

Contaminant found most often with *Stachybotrys* on wet cellulose. Forms in chains, but it are very similar to *Stachybotrys* and sometimes is considered to be in the *Stachybotrys* family. Certain species do produce toxins very similar to the ones produced by *Stachybotrys chartarum* and many consider the IAQ importance of *Memnoniella* to be on par with *Stachybotrys*. Allergenic and infectious properties are not well studied.

Nigrospora sp.

Commonly found in warm climates, this mold may be responsible for allergic reactions such as hay fever and asthma. It is found on decaying plant material and in the soil. It is not often found indoors.

Oidium sp.

The asexual phase of *Erysiphe* sp. It is a plant pathogen causing powdery mildews. It is very common on the leaf's stems, and flowers of plants. The health effects and allergenicity have not been studied. It does not grow on non-living surfaces such as wood or drywall.

Penicillium sp.

Aw 0.78 - 0.88. A wide number of organisms have been placed in this genus. Identification to species is difficult. Often found in aerosol samples. Commonly found in soil, food, cellulose and grains. It is also found in paint and compost piles. It may cause hypersensitivity pneumonitis, allergic alveolitis in susceptible individuals. It is reported to be allergenic (skin). It is commonly found in carpet, wallpaper, and in interior fiberglass duct insulation. Some species can produce mycotoxins. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include edema and bronchospasms; chronic cases may develop pulmonary emphysema. It may also cause headaches, vomiting, and diarrhea.

Periconia sp.

Periconia sp. are found in soil, blackened and dead herbaceous stems leaf spots, grasses, rushes, and sedges. Almost always associated with other fungi. Rarely found growing indoors. Reportedly associated with a rare case of mycotic keratitis.

Pithomyces sp.

A common mold found on dead leaves, plants, soil and especially grasses. Causes facial eczema in ruminants. It exhibits distinctive multi-celled brown conidia. It is not known to be a human allergen or pathogen. It is rarely found indoors, although it can grow on paper.

Rusts/Smuts

These fungi are associated with plant diseases. In the classification scheme of the fungi, the smuts have much in common with the rusts, and they are frequently discussed together. Both groups produce wind-borne, resistant teliospores that serve as the basis for their classification and their means of spread. Rusts usually attack vegetative regions (i.e., leaves and stems) of plants; smuts usually are associated with the reproductive structures (seeds). They can cause hay fever and asthma.

Spegazzinia

Spegazzinia species comprise a very small proportion of the fungal biota. This genus is somewhat related to other lobed or ornamented genera such as *Candelabrum*. No information is available regarding health effects or toxicity. Allergenicity has not been studied. Usually identified on spore trap samples where it is seen every few weeks. (Spores have very distinctive morphology.) May also be found in air by culturable (Andersen) samples if a long enough incubation period is provided so that sporulation occurs. Our laboratory has never found this organism growing on indoor environmental surfaces. Natural habitat includes soil and many kinds of trees and plants.

Stachybotrys sp.

Aw - 0.94, optimum Aw ->0.98. Several strains of this fungus (*S. atra, S. chartarum* and *S. alternans* are synonymous) may produce a trichothecene mycotoxin- Satratoxin H - which is poisonous by inhalation. The toxins are present on the fungal spores. This is a slow growing fungus on media. It does not compete well with other rapidly growing fungi. The dark colored fungus grows on building material with high cellulose content and low nitrogen content. Areas with a relative humidity above 55%, and are subject to temperature fluctuations, are ideal for toxin production. Individuals with chronic exposure to the toxin produced by this fungus reported cold and flu symptoms, sore throats, diarrhea, headaches, fatigue, dermatitis, intermittent local hair loss and generalized malaise. Other symptoms include coughs, rhinitis, nosebleed, a burning sensation in the nasal passages, throat, and lungs, and fever. The toxins produced by this fungus will suppress the immune system affecting the lymphoid tissue and the bone marrow. Animals injected with the toxin from this fungus exhibited the following symptoms: necrosis and hemorrhage within the brain, thymus, spleen, intestine, lung, heart, lymph node, liver, and kidney. Affects by absorption of the toxin in the human lung are known as pneumomycosis.

This organism is rarely found in outdoor samples. It is usually difficult to find in indoor air samples unless it is physically disturbed (or possibly -this is speculation- a drop in the relative humidity). The spores are in a gelatinous mass. Appropriate media for the growth of this organism will have high cellulose content and low nitrogen content. The spores will die readily after release. The dead spores are still allergenic and toxigenic. Percutaneous absorption has caused mild symptoms.

Stemphylium sp.

Reported to be allergenic. Isolated from dead plants and cellulose materials.

Torula sp.

Found outdoors in air, soil, on dead vegetation, wood, and grasses. Also found indoors on cellulose materials. Reported to be allergenic and may cause hay fever and asthma.

Tetraploa

Tetraploa species comprise a very small proportion of the fungal biota. This genus is somewhat related to *Triposporium* and Diplocladiella. The only reported human infections are two cases of keratitis (1970, 1980) and one case of subcutaneous infection of the knee (1990). No information is available regarding other health effects or toxicity. Allergenicity has not been studied. Usually identified on spore trap samples where it is seen every few weeks. (Spores have very distinctive morphology.) Our laboratory has never found this organism growing on indoor environmental surfaces. Natural habitat includes leaf bases and stems just above the soil on many kinds of plants and trees.

Ulocladium sp.

Aw 0.89. Isolated from dead plants and cellulose materials. Found on textiles.

Zygomycetes

Zygomycetes are one of the four major groups of fungi, the others being the Oomycetes, the Ascomycetes, and the Basidiomycetes. Zygomycetes are common, fast growing, and often overgrow and/or inhibit other fungi nearby. Rhizopus and Mucor are two of the most common Zygomycetes seen in the indoor environment. However, others are seen as well, including *Syncephalastrum*, *Circinella*, *Mortierella*, *Mycotypha*, *Cunninghamella*, and *Choanephora*. For further information, please see descriptions of these individual genera.