



# H O V E Y ENVIRONMENTAL

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## RESIDENTIAL MOLD ASSESSMENT

### Final Report

*Your Address Here*

September 1, 2003

**Prepared for:**

*Your Name Here*

**Prepared by:**

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## STATEMENT OF LIMITATIONS

The following mold assessment is based on findings of the physical inspection and testing. Findings are current and accurate for the date and time they were found, but do not reflect expected or predictable mold growth and infestation on and within the property. This report addresses only those areas physically inspected and sampled. The Inspector is not responsible or liable for the non-discovery of any water damage, water problems, mold contamination, or other conditions of the Subject Property which may occur or may become evident after the inspection and testing time and date. Inspector is neither an insurer nor guarantor against water problems, mold problems or other defects in the Subject Property and improvements, systems or components inspected. Inspector makes no warranty, expressed or implied as to the fitness for use of condition of the systems or components inspected. Inspector assumes no responsibility for the cost of repairing any water problems, mold problems or any other defects or conditions. Inspector is not responsible or liable for any future water problems, mold problems or any other future failures or repairs. Remediation recommendations are suggested guidelines, not a detailed remediation protocol. More or less actions may be necessary and will be determined by the remediation company chosen by the property owners or other responsible party. Please see Appendix C: copy of Mold Inspection and Testing Agreement for more details.

## ASSESSMENT AND TESTING PROTOCOL

Mold assessment and testing has been performed by a trained and experienced inspector. The following assessment methods and testing protocol represent the most current industry standards and practices. All practices conform to the guidelines of the Environmental Assessment Association and the Certified Mold Inspectors and Contractors Institute.

The following diagnostic tools were used in the physical investigation:

- thermo-hygrometer: records ambient temperature and relative humidity of each room, closet, and area to establish above normal (greater than 60%) moisture content within ambient air
- Protimeter moisture meter scans: indicates relative moisture of building materials up to one inch deep; used along walls, floors, ceilings, and other building materials
  - Less than 15% moisture indicates normal moisture levels
  - Between 15% and 25% warrant further investigation
  - Greater than 25% indicates excessive moisture
- Protimeter moisture meter point measurements: indicates actual percent moisture at the surface of building materials; three readings were taken and the average percent moisture calculated in areas of concern, windowsills, and walls with plumbing
- Boroscope fiber optic device: used to visually assess hard to reach areas or within wall cavities

Seven samples were collected at the subject property. The Air-o-Cell sampling pump was calibrated to 15 L/min on-site before samples were collected. All samples were delivered to Environmental Microbiology Laboratory for analysis. Table 1 provides descriptions of each sample, including location and sampling time.

Table 1. Location and description of samples collected.

<b>Sample Location</b>	<b>Description</b>	<b>Sample Time</b>
Outside	Ambient Air	10 minutes
Bathroom	Ambient Air	5 minutes
Bedroom Closet	Wall check	2 minutes
Child's Bedroom	Ceiling check	2 minutes
Laundry Room	Wall check	2 minutes
Dining Room	Wall check	2 minutes
Family Room	Wall check	2 minutes

## PROJECT LOCATION AND BACKGROUND

Mold Assessment and testing was performed on July 1, 2003 by Caroline Hovey, Principal Environmental Specialist, of Hovey Environmental. The subject property is located at *Your Address* in San Diego, California. The assessment was requested by *You*.

The subject property is a three bedroom, three bath single family residence. The assessment was requested due concerns of moisture intrusion and suspected mold growth within the home. Several water stains and evidence of water damage had been noted by the owner. Mold growth was also noted on walls in the home.

<b>FINDINGS</b>
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Temperature and relative humidity levels were recorded outside and throughout the home. The readings are provided in Table 2. The Occupational Safety and Health Administration recommends maintaining relative humidity levels below 60% for healthy indoor environments. Although relative humidity recorded throughout the home was slightly higher than the recommended level, this is likely a reflection of the ambient humidity level outside of the home. Most rooms were well ventilated with open windows.

Table 2. Ambient temperature and relative humidity in each area of the home.

	Temperature (°F)	Relative Humidity (%)
Outside	79	65
Garage	78	68
Kitchen	79	66
Laundry Room	80	65
Dining Room	78	67
Family Room	78	67
Master Bedroom	77	69
Master Bathroom	78	67
Closet	77	69
Northwest Bedroom	79	63
Closet	75	68
Northwest Bathroom	79	63
Hall Bathroom	80	63
Southwest Bedroom	79	65
Closet	79	67

Relative and actual moisture levels were recorded in various places throughout the assessment area. In addition to specific areas of concern, windows and walls with plumbing (e.g. toilets, showers, etc.) were scanned and point readings recorded. Point readings are given as the average of a minimum of three readings from each area evaluated. Moisture data is provided in Table 3.

Table 3. Moisture level of building materials tested throughout the home.

Room	Area	Comments	Moisture Level	
			Relative (scan)	Surface Reading (%)
Kitchen	Window		Low	13%
	Below Sink		Low	13%
	Laundry room wall	where pipe goes into wall	Mid	25%
Garage	Water Heater		Low	15%
Dining Room	Wall above French Door		Mid	20%
	Wall left of French Door		Mid	23%
Family Room	South Window		Low	
	East Window		Low	
	Ceiling southwest corner		Low	
	Left of Fireplace		High	47%
	Right of Fireplace		High	40%
Master Bedroom / Bathroom	Ceiling center of room	chipped paint	Low	
	Wall common to shower	dry wall removed at base; visible mold	High	28%
	Northeast Window		Low	15%
	Northwest Window	suspected moisture damage	Low	15%
	Bathroom Window		Low	12%
Northwest Bedroom / Bathroom	Ceiling – NW corner	water stain	Low	10%
	Ceiling – NE corner	paint bubbling	Low	13%
	Window		High	37%
	Closet Wall	common to master bath shower	High	26%
Hall / Bathroom	Bottom of Hall Wall	common to shower of NW bathroom	High	28%
	Top of Hall Wall	water stain	Low	13%
	Window		Low	12%
	Walls surrounding tub		Low	12%
Southwest Bedroom	Ceiling – SW corner	water stain	Mid	23%
	West Window		Low	11%
	South Window		Mid	18%

Several areas of elevated moisture and suspected mold growth were noted in the home. Most of these were surrounding plumbing areas, windows, or ceiling corners. In the laundry room, high

moisture levels were detected on the wall in the area the pipes go into the wall. A wall check sample was collected from this area (Figure 1).



Figure 1. Digital image of laundry room wall, showing sample location.

In the dining room, mid-level moisture was noted to the left and above the French doors. A wall check sample was taken to the left of the doors to determine if mold growth is associated with this moisture intrusion (Figure 2).



Figure 2. Digital image of sample taken left of French doors in dining room.

In the family room high moisture levels were detected at the lower part of the walls on either side of the fireplace. A sample was taken from the wall to the left of the fireplace. An image is not available for this sample.

In the master bedroom, an area of drywall was removed from the wall common to the shower (Figure 3). Mold growth was noted on the lower boards of the wall cavity. Because mold growth was confirmed visually, a sample was not deemed necessary in this area. The relative moisture level of wood and dry wall in and above this area was high.



Figure 3. Digital image of area of removed drywall in master bedroom.

In the northwest bedroom, suspected water damage and stains were noted in the northwest and northeast corners of the room. Both of these areas showed low relative moisture levels. Additional moisture damage was noted around the window of the north wall. The relative moisture level of the drywall surrounding both bottom corners was high. High relative moisture levels were also detected in the closet. This wall is common to the master bathroom shower. A sample was taken from this area to determine if active mold growth is occurring behind the shower (Figure 4).



Figure 4. Digital image of wall check sample taken from closet of northwest bedroom.

The bathroom adjoining the northwest bedroom has undergone some demolition. The tile surround in the shower had been removed from the shower floor and bottom foot of shower wall. High moisture levels were detected on the area of the hallway wall which is common to this shower. An ambient air sample was taken from this area to determine if mold is actively growing within the exposed wall cavities (Figure 5).



Figure 5. Digital image of sample taken in northwest bathroom.

In the southwest bedroom (currently used as a child's room), a water stain was noted on the southwest corner of the ceiling. Relative moisture levels were slightly elevated in this area, and a sample was taken from the ceiling (Figure 6). In addition, mid-level relative moisture was detected around the south window.

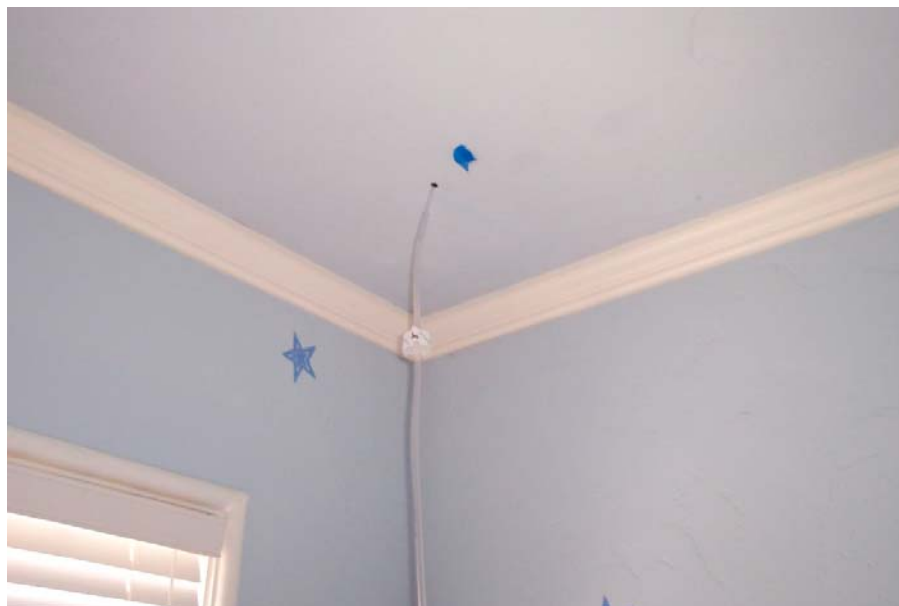


Figure 6. Digital image of sample taken in southwest bedroom.

<b>SAMPLE RESULTS</b>
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Results of samples taken at the subject property are provided in Appendix A. Air samples were taken to establish the concentration of spores in ambient air. Because different time intervals were used for different sample types and locations, the concentration (spores/m<sup>3</sup>) is evaluated to determine trends in mold growth. Under normal conditions, the concentration of spores inside should be approximately equivalent to or lower than the concentration of spores captured outside. The total concentration of mold spores per cubic meter of air from each sample is given in Table 4.

Table 4. Total concentration of mold spores in air samples.

Sample	Concentration (spores/m <sup>3</sup> )
Outside	3,715
Laundry Room Wall	466
Dining Room Wall	1,367
Family Room Wall	8,769
Northwest Bedroom Closet Wall	2,499
Northwest Bathroom	1,414
Southwest Bedroom Ceiling	666

The concentration of individual mold types from each sample is given in Figure 7. In order to determine areas of elevated mold growth the concentration of individual mold types in each sample can be directly compared to the concentration of the same mold type in outdoor samples. In order to simplify the figure, mold types captured at low levels that are not significant in the analysis of active mold growth have been removed. The scale of Figure 7 was cut off at 2,000 spores/m<sup>3</sup> in order to show all trends in mold spore concentrations. The actual value of Penicillium/Aspergillus captured in the family room sample exceeded this level, therefore the value is provided on the graph.

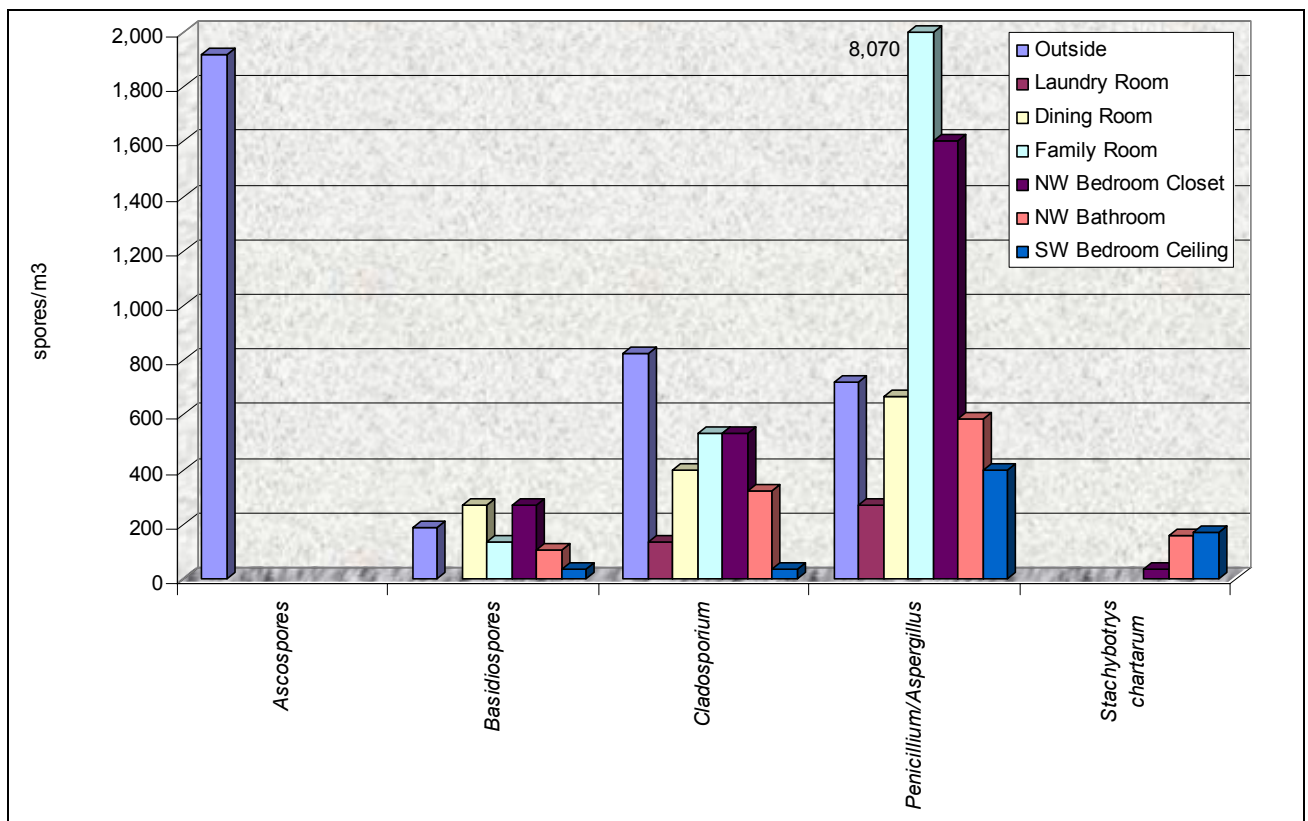


Figure 7. Concentration of mold types in air samples.

Figure 7 shows a very high concentration of *Ascospores* captured in the outdoor sample. Because this value is so high compared to other mold types, the total concentrations provided in Table 4 cannot be relied upon to determine active mold growth. Further evaluation of each mold type is necessary. *Basidiospores* and *Cladosporium* were captured at inside at concentrations approximately equivalent to or lower than the outside sample. Active growth of these mold types is not occurring at the subject property. *Penicillium/Aspergillus* mold spores were captured at elevated concentrations in the samples taken from the wall of the family room and the wall of the Northwest bedroom closet. *Stachybotrys chartarum* was found in the wall of the northwest bedroom closet, the northwest bathroom, and the southwest bedroom ceiling. Active growth in the following areas has been confirmed by the concentrations of *Penicillium/Aspergillus* and *Stachybotrys chartarum*:

- Family room wall
- Northwest bedroom closet wall
- Northwest bathroom
- Southwest bedroom ceiling

Appendix B provides a MoldStat report prepared by Environmental Microbiology Laboratories. This report provides an additional method of analysis for the samples collected at the subject property. Samples are evaluated based on their similarity to the outside sample. Samples are given a MoldSCORE on a scale of 100 to 300. Low MoldSCOREs indicate the mold types and concentrations are similar to that captured outside. Medium to High MoldSCOREs indicate the mold types and concentrations are not similar to that captured outside and may require remediation. The following samples had medium to high MoldSCOREs:

- Family room
- Northwest bedroom closet
- Northwest bathroom
- Southwest bedroom

## CHARACTERISTICS OF MOLD GROWTH AND BEHAVIOR

Mold spores have been shown to produce allergic reactions in people susceptible to them. Spores may affect the respiratory system, producing sinusitis, Type I allergies (hay fever, asthma) and/or Type III hypersensitivity pneumonitis. Topical reactions may include rashes, irritation, and dermatitis. Species associated with the production of mycotoxins are specifically noted below.

Although most species of mold require high moisture levels for active growth, the reduction of moisture levels will not kill mold. Most species will go dormant at low moisture levels. There are some species that can continue active growth and spore production even at low moisture levels, particularly certain species of *Aspergillus*. Following is a description of mold types captured at the subject property.

***Basidiospores*** are a group of spores produced by over 1200 different types of fungi, including many mushrooms. They are common in cosmopolitan areas, and often associated with gardens and forests. In indoor environments, *Basidiospores* are typically found on wood or cellulosic material. Certain species of *Basidiospores* have been attributed to wood rot. The presence of *Basidiospores* in this sample does not prove the existence of these species. Additional testing would be necessary to determine if the species which produce wood rot are present at the subject property.

***Cladosporium*** is common in indoor environments. This group of molds is the most common worldwide and is found naturally throughout Southern California. In outdoor environments, *Cladosporium* is associated with many types of soil, plant litter, and plant pathogens. In indoor environments, *Cladosporium* is typically found on moist windowsills, textiles, and wood.

***Penicillium*** and ***Aspergillus*** are included as one group due to similarities in the appearance of their spores and growth patterns. They are often associated with house dust, but may also be found growing on cellulosic materials, such as sheet rock, and wood. This group of mold is often the first to colonize an area and is marked by rapid spore production and colony growth. This group of molds was captured at elevated levels in the wall of the family room and wall of the northwest bedroom closet.

*Stachybotrys chartarum* is found on very moist cellulosic materials, such as gypsum board, paint, wallboard, etc. This species requires prolonged exposure to elevated moisture levels for growth. Although it is typically not the first species to colonize an area and does not grow as rapidly as molds such as *Penicillium*, *Stachybotrys chartarum* may become dominant given enough time. This species is associated with the production of mycotoxins that are potentially harmful to human health. *Stachybotrys chartarum* was captured in the wall of the northwest bedroom closet, northwest bathroom, and ceiling of the southwest bedroom.

## OPINIONS AND REMEDIATION RECOMMENDATIONS

The New York Department of Health has established “Guidelines for the assessment and remediation of fungi in indoor environments.” This guideline dictates the type of practices necessary to deal with mold infestations. In isolated areas and those areas less than 10 ft<sup>2</sup>, remediation can be handled by regular maintenance personnel. Areas of mold infestation over 10 ft<sup>2</sup> should be remediated by a professional remediation company with training and experience dealing with mold. Proper remediation protocol may include the following, though additional measures may be necessary and will be determined by the remediation company chosen.

- contain the affected area
- Remove and discard linoleum, dry wall, particle board, carpet, and other porous materials in the affected areas as well as an additional 2 feet in each direction.
- Visually inspect studs within walls; wood with indications of rot should be removed
- Treat studs, hard woods, and other non-porous materials with a biocide
- Where practical, cover the affected area(s) with Killz or other anti-fungal paint
- Dry and hepa-vac the area
- Have tests run by a company independent to the remediator to ensure mold levels are within normal or expected levels

Based on the physical investigation and sample results, several areas of concern were noted at the subject property. Moisture intrusion is originating from several different sources. Water stains and areas of past water damage were noted on the ceiling. This is likely the result of deficiencies in the roof. Two areas sampled confirmed mold growth from this source: the family room and southwest bedroom. These areas exhibited high relative moisture levels and elevated spore concentrations within wall or ceiling cavities. The roof should be evaluated by a professional to determine all deficiencies and recommendations for fixing them. Mold remediation should proceed as outlined above in the family room and southwest bedroom. Because high moisture levels were found on both sides of the fireplace, both areas should be treated during remediation. In addition to the areas sampled, several other areas were identified as having past moisture intrusion from the roof. These areas may also have active mold growth. Further testing would be necessary to determine this, and is recommended for the following areas:

- Family room: southwest corner
- Master bedroom: northeast corner
- Master bedroom: center
- Northwest bedroom: northwest corner of the ceiling
- Northwest bedroom: northeast corner of the ceiling
- Hallway: top of wall/ceiling above entry to bathroom

Active mold growth was confirmed around the showers in both the master bathroom and northwest bathroom. The source of moisture intrusion may be a deficiency in the shower pan, plumbing leak, or deficiencies in the grout of the tile surround. Mold remediation should proceed by removing the tile surround in both bathrooms in order to access all affected areas.

The drywall surrounding several windows at the subject property showed signs of moisture intrusion. These areas were not tested at the time of this assessment, though there may be active mold occurring. These areas include:

- Master bedroom: west window
- Northwest bedroom: north window
- Family room: window

SIGNATURE OF INSPECTOR
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I certify that the above findings, opinions, and recommendations are true and accurate to the best of my knowledge, and represent the most current knowledge of mold assessment and remediation methods.

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Caroline Hovey, CEI, CES, CTMI, CMR  
Principal Environmental Specialist  
Hovey Environmental

APPENDIX A

Environmental Microbiology Laboratory

Test Results

APPENDIX B

Environmental Microbiology Laboratory

MoldStat Report

APPENDIX B

Signed Copy of

Mold Inspection and Testing