

**INDOOR ENVIRONMENTAL QUALITY EVALUATION
FOLLOWUP INVESTIGATION**

**O'CAMPO RESIDENCE
402 PRECIOUS, VILLAS AT FORTUNA
SAN ANTONIO, TEXAS**

Prepared for

**SAN ANTONIO HOUSING AUTHORITY
SAN ANTONIO, TEXAS**

by

ETC INFORMATION SERVICES, LLC

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Project No. 7A-020
June 1, 2007

Mr. Timothy Alcott
San Antonio Housing Authority
1315 N. Elmendorf
San Antonio, Texas 78207

**Re: Indoor Environmental Quality Evaluation – Follow-up Investigation
O’Campo Residence, 402 Precious, San Antonio, Texas**

Dear Mr. Alcott:

A copy of the report for the follow-up investigation of the referenced property is being forwarded to you for your information and necessary action. This report is for the additional investigation that was recommended in the first report for this property. The previous report should be consulted for the original conclusions and recommendations. Remediation and cleaning recommendations are included in the report.

We will be happy to answer any questions concerning this report. It has been a pleasure working with you on this important assignment. We look forward to being of continuing service to you.

Sincerely,

ETC INFORMATION SERVICES, LLC

Donald J. Schaezler, Ph.D., P.E., CIH
President

1.0 INTRODUCTION AND BACKGROUND

1.1 Purpose of the Evaluation

The subject residence was investigated for indoor environmental quality conditions May 8, 2007. The purposes of the investigation were as follows:

- To collect additional indoor air samples for identification and enumeration of airborne fungal spores and culturable fungi
- To collect indoor air samples for identification and enumeration of general types of culturable bacteria
- To collect additional indoor air samples for enumeration of fiber glass and other mineral fibers, pollen, skin cell fragments, and other particles
- To measure indoor air quality with respect to common chemical and physical parameters
- To evaluate further apparent sources of water damage and visible mold in the residence
- To investigate conditions in the Attic that might affect indoor environmental quality conditions
- To document areas with excess moisture content in building materials
- To inspect and sample the return and supply sides of the air handler unit (AHU) and ductwork
- To sample representative areas of carpeting in the house
- To have potential source samples analyzed for general types of bacteria in addition to fungal spores and culturable fungi
- If necessary, to recommend remediation, including preparation of a Mold Remediation Protocol

The investigation was performed to obtain more detailed information on the condition of the residence with respect to water damage and microbial contamination.

The investigation was conducted by Donald J. Schaezler, Ph.D., P.E., CIH, with assistance from other ETC staff. Dr. Schaezler is a licensed Mold Assessment Consultant (MAC), a licensed professional engineer (P.E.), and a Certified Industrial Hygienist (CIH).

1.2 Subject Residence

The subject residence was in the Villas at Fortuna subdivision. The residence was apparently built by KB Homes in about 2000. It has been leased to Mr. O’Campo but is owned by SAHA. Over the past several years, the residents in this and similar homes had complained to SAHA and KB about a variety of structural and indoor environmental

issues. These complaints have triggered investigations by several consultants, including this report.

2.0 FIELD OPERATIONS

2.1 Description of Residence

The subject residence is approximately seven years old and is a single-family dwelling located in west San Antonio, between West Commerce and Culebra Road, near St. Mary’s University. It appears to have a reinforced concrete foundation, Hardiplank® siding external wall finish, conventional wood framing, and a complex hip and gable roof with composition shingles. It is a one-story structure with three bedrooms, two bathrooms, Kitchen, Breakfast Room, Living Room, Utility Room, and an attached one-car Garage. The layout of the subject residence is shown schematically in Figure 1.

The residence had carpeting in bedrooms, the Living Room, and hallways. It had vinyl flooring in the Entry, Kitchen, Breakfast Room, bathrooms, and the Utility Room. Interior finishes were typically textured and painted gypsum board.

There is a single, central HVAC system of split design. The condenser unit (CU) is outside on a concrete pad. The air handler unit (AHU) is in a hallway closet. Return air is routed through a grille in the lower closet door and up through a supporting platform to the AHU. The AHU has a return air filter, evaporator coil, blower, and electric heating unit. Supply air is routed up to the Attic through a ductboard plenum. Flexible runouts are attached to that plenum. The return air plenum is shared by a low profile hot water heater. The ceiling penetration in the HVAC Closet is sealed with aluminum foil duct tape. There were large openings to a chase behind the AHU and, probably, to the attic behind the supply air plenum.

The Utility Room included connections for a washer and a dryer. The dryer exhausted through the right wall.

For simplicity of discussion in this report, Precious Street is assumed to run north-south. Directional references, such as front, right, rear, and left will refer to an observer facing the front of the house from the street. Back door refers to the side door to a side yard rather than to the rear of the house.

2.2 Observations

1. There was a noticeable odor upon entering the residence. The odor was stale and somewhat musty. It was reminiscent of damp pet odors and/or damp organic surfaces.
2. The HVAC system was off. The blower was turned on before air samples were collected.
3. Minor mold and/or water staining was observed at many of the window sills.
4. Elevated moisture content was found at several window sills, including the Living Room and Bedroom 3. The elevated moisture was dramatic and was not consistent with recent rainfall or with conditions found or considered previously in this house. Window sills were dry during the previous investigation.
5. Elevated moisture content was found in tackboards and/or base trim under the Living Room window, the rear window in the Master Bedroom, and the Master Bedroom window on the right wall. The elevated moisture was dramatic and was not consistent with recent rainfall or with conditions found or considered previously in this house. Those tackboards that were investigated previously were dry.
6. Minor water damage, previously observed, was again observed on the base trim at the back door.
7. The base trim and lower sheetrock walls at the back door had elevated moisture content for several feet in both directions from the door. This elevated moisture was also dramatic and was not consistent with recent rainfall or with conditions found or considered previously. The base trim and lower sheetrock had normal moisture content during the previous investigation.
8. Mold growth was apparent on the baseboard at the rear wall of the Master Bedroom, including below the right window on that wall and between the window and the right rear corner. The moisture content of the tackboard was elevated. This mold growth was not present during the previous investigation. The mold growth and the elevated moisture were not consistent with recent rainfall or with conditions found or considered previously for this area.
9. There was similar looking material, apparently mold growth, along the baseboard at the right wall of the Master closet, near the juncture with the carpet. The moisture content of the baseboard was somewhat elevated, and the moisture content in the tackboard was definitely elevated. This mold growth was not present during the previous investigation. Moisture contents were not measured in the closet previously. The mold growth and the elevated moisture were not consistent with recent rainfall or with conditions found or considered previously for this area.
10. The tackboard under the window in the Living Room was darkly but not uniformly stained and was saturated with an aqueous liquid. The surfaces had an odd chemical or biochemical odor.

11. The tackboard in the left front corner of the Master Closet was stained similarly to that in the Living Room. The moisture content in the tackboard was slightly elevated.
12. The tackboard at the right wall of the Master Closet had only minor stains, but the moisture content was somewhat high.
13. The tackboard under the rear corner of the window in the right wall of the Master Bedroom was slightly stained. It had elevated moisture content.
14. As noted previously, the home had a minor amount of dust in the return air plenum, including at the entrance to the air handler unit (AHU).
15. As noted previously, the home was using a low efficiency return air filter.
16. As noted previously, the evaporator coil was fairly clean, except at the edges, where some dried scum was apparent. The coil fins have been bent in many places. This damage appears to have been caused by attempts to clean the coils.
17. The supply air plenum was fairly clean and had no unusual accumulations of dirt and debris. There was no obvious mold contamination of the surfaces of the ductboard.
18. Mr. O’Campo again reported a history of sewage backups and overflows into the house. However, he noted that the sewage only affected the bathrooms. It did not reach carpeted rooms, and the walls of the bathrooms were not significantly impacted. The next day he called with corrections, stating that sewage had reached carpeting adjacent to both bathrooms.
19. As reported previously, the Utility Room had a work station for soldering or brazing. Metal working equipment and chemicals were noted there and in several other areas of the house. What appeared to be metal dust particles had accumulated on some equipment.
20. Chemicals noted included ammonia solution, charcoal lighter, denatured alcohol, and bleach solution.
21. Outside there were several large ant mounds. Some of these mounds covered the lower edge of the siding. The presence of the ant mounds may be indicative of elevated moisture. They are also a source of dirt being brought into the house. The edge of the house had been sodded, and the sod reached the lower edge of the siding at the right and right-rear of the residence. This condition may be conducive to introduction of moisture into the slab.

Areas with water damage and mold growth are summarized in Table 2, along with other characterizations of investigation results.

2.3 Field Measurements

2.3.1 Moisture Content

Moisture measurements were made for wood, sheetrock, and concrete surfaces in areas with visible or potential water damage with Delmhorst and Tramex moisture instruments. Measurements were also taken in background areas for comparison.

Contrary to the previous investigation, several locations had moist or wet conditions. These were noted in section 2.2 and are summarized in Table 2.

2.3.2 Air Quality

During the survey, the indoor area was investigated by measuring general indoor air quality parameters to determine the potential for chemical and physical problems. Temperature, relative humidity, carbon dioxide, and carbon monoxide were measured using a Vulcain Safety Palm field instrument. Results are summarized in Table 3. Key points are discussed below. The house was not occupied at the time of the survey and had apparently not been occupied for several days. The HVAC system was off.

1. The indoor relative humidity and dew point were unsatisfactory.
2. Carbon dioxide values were satisfactory due to lack of occupancy.
3. Carbon monoxide values were zero.

2.4 Sampling

The emphasis of the sampling program was to reevaluate indoor air quality, to evaluate potential source areas, and to collect samples for bacterial analyses as well as fungal analyses.

Air samples were collected from two locations, at the return air grille with the blower in the AHU on and in the Master Bedroom near the Master Bathroom.

The supply air plenum, evaporator coils, carpeting, Master Bedroom baseboard, and Living Room tackboard were sampled as potential source areas for microbial contamination.

The Attic insulation, return air plenum dust, and carpet fibers were collected for evaluation of fiber types.

2.5 Photographs

Photographs of the subject residence are available for review.

3.0 RESULTS AND DISCUSSION

All sample results are included in appendix. The results are summarized in the tables and are discussed in this section for comparison purposes.

3.1 Sample Locations and Procedures

3.1.1 Fungi and Bacteria in Air

Two sets of indoor air samples and two outdoor air samples were collected for the house. One set of indoor air samples was collected from near the return air grille, and one set was collected from the Master Bedroom. Indoor air samples were collected for indirect evidence of water damage and mold amplification and to evaluate potential exposures to occupants of the house.

Outdoor air samples from the neighborhood were used for two houses investigated May 8, 2007. One sample was from the O’Campo front yard, and one sample was from the De Los Santos front yard.

Samples were collected for total bioaerosols, using Allergenco D cassettes, which are slit impaction samplers. Sampling was at 15 liters per minute for five minutes. The slides in the cassettes were interpreted microscopically by Aerotech and were analyzed for total bioaerosols. Results of analyses are summarized in Table 5.

Samples were also collected for culturable fungi, using a single stage Anderson-type impactor with potato dextrose agar plates. Sampling was at 28.3 liters per minute for three minutes. The plates were then reassembled, sealed with tape, and shipped to Aerotech for incubation and interpretation. Results of analyses are summarized in Table 6.

Samples were also collected for culturable bacteria, using the same Anderson-type impactor with blood agar plates. Sampling and sample handling were as described for culturable fungi. Results of analyses are summarized in Table 7.

3.1.2 Swab, Bulk, and Dust (Source) Samples

Surface samples were taken with sterile swabs, and bulk samples were collected by selecting a representative portion of a material and placing it in a sample bag using clean instruments. Dust samples were collected by vacuuming surfaces at about 30 lpm through a ¼-inch diameter tube and collecting dust on filters. These samples were analyzed by microscopic examination and by culturing for fungi and bacteria. Results of analyses are summarized in Tables 8, 9, and 10

3.2 Fungal Contamination

3.2.1 Fungi in Air

1. Outdoor air had high levels of total fungal spores, dominated by Basidiospores and *Cladosporium* and with a low level of *Aspergillus/Penicillium*-like spores.
2. Indoor air had relatively low levels of total fungal spores, dominated by *Cladosporium* and *Aspergillus/Penicillium*-like spores.
3. The results are consistent with sources of *Aspergillus/Penicillium*-like spores in the indoor environment that disperse those spores into the indoor air. Sources of *Aspergillus/Penicillium*-like spores were found in the Master Bedroom.
4. Outdoor air had typical levels of culturable fungi, dominated by *Cladosporium*. Low levels of *Fusarium* and *Sporotrichum* and a trace level of *Penicillium* species were present.
5. Both indoor air samples had slightly higher levels of culturable fungi than outdoor air. The diversity of fungi in the air at the return air grille was very similar to that in outdoor air, and the results do not indicate indoor sources of fungi.
6. However, the indoor air in the Master Bedroom had low but significant levels of *Aspergillus* species Variant 1 and *Penicillium* species Variant 1.
7. These results are consistent with sources of both *Aspergillus* and *Penicillium* species in the indoor environment that disperse propagules of those fungi into the indoor air. The sources and impacted air were found in the Master Bedroom.

3.2.2 Source Sampling

3.2.2.1 HVAC-Related Samples

3.2.2.1.1 Return Side

1. The dust in the return air plenum had high levels of total fungal spores, dominated by *Cladosporium* and *Aspergillus/Penicillium*-like spores. The results indicate that *Cladosporium* and *Aspergillus/Penicillium*-like spores may have been dominant in indoor air over an extended period of time.
2. The dust in the return air plenum had very low levels of culturable fungi. *Aspergillus* species Variant 1 and *Penicillium* species Variant 1 were not present.
3. The results for the return air plenum are consistent with the air samples and indicate that *Aspergillus/Penicillium*-like spores have been present at significant levels in indoor air over an extended period of time.

4. The evaporator coils had low levels of total fungal spores, dominated by *Cladosporium*.
5. The coils had very high levels of culturable fungi, but they were almost all yeast, which like the wet conditions inevitably present on evaporator coils. *Aspergillus* species Variant 1 and *Penicillium* species Variant 1 were not present.

3.2.2.1.2 Supply Side

1. The supply air plenum had very high levels of total fungal spores, dominated by *Cladosporium* and *Aspergillus/Penicillium*-like spores. There were no detectable culturable fungi.
2. The results indicate that the supply air ductwork may be a source and/or a route for distribution of *Cladosporium* and *Aspergillus/Penicillium*-like spores in the indoor environment.
3. The results also indicate that the spores present in the plenum are not viable and are probably the result of an old condition in the AHU system. The supply air plenum is probably not a source of culturable *Aspergillus* and *Penicillium* species in the indoor environment.

3.2.2.2 Other Source Samples

1. The tackboard under the Living Room window had only a trace level of total fungal spores and mycelial fragments.
2. The tackboard also had only a trace level of culturable fungi.
3. It is likely that the tackboard was recently wetted and has not had a history of wet conditions.
4. The Master Bedroom baseboard, where visible mold growth was occurring, had high levels of total fungal spores, all of which were *Aspergillus/Penicillium*-like spores.
5. The baseboard had a high level of culturable fungi, all of which were *Aspergillus* species Variant 1.
6. The results indicate that the baseboard in the Master Bedroom is an active amplification source of *Aspergillus/Penicillium*-like spores and culturable *Aspergillus* species in the indoor environment.
7. There was a high level of dust recovered from the Master Bedroom carpet.
8. The dust from the Master Bedroom carpet had very high levels of total fungal spores, all of which were *Aspergillus/Penicillium*-like spores.
9. The dust had very high levels of culturable fungi, dominated by *Penicillium* species Variant 1 and with a significant proportion of *Aspergillus* species Variant 1.

10. The results indicate that the fungal particles in the carpet are highly viable and probably the result of recent or ongoing wetting processes.
11. The results indicate that the carpeting in the Master Bedroom suite may be a source of the elevated *Aspergillus/Penicillium*-like spores and the elevated culturable *Aspergillus* and *Penicillium* species found in the indoor air.

3.3 Bacterial Contamination

3.3.1 Bacteria in Air

1. Outdoor air had moderate levels of culturable bacteria, dominated by *Bacillus* species, Gram-negative bacilli, and Gram-positive bacilli.
2. Indoor air at the return air grille had low levels of culturable bacteria with the same types of bacilli but also with Gram positive cocci.
3. Indoor air in the Master Bedroom had significantly higher levels of bacteria with a similar distribution.
4. The results indicate typical patterns for airborne bacteria. It is normal for Gram-positive cocci to be present in indoor air, because they are shed from the skin of human occupants and may be associated with the skin cell fragments found in indoor air and in dust inventories in the house.
5. The results do not necessarily indicate an impact from reservoirs of Gram-negative bacilli. However, many more Gram-negative bacilli were found in the Master Bedroom air than at the return air grille, and high concentrations of Gram-negative bacilli were found in the carpet in that room.

3.3.2 Source Sampling

3.3.2.1 HVAC-Related Samples

3.3.2.1.1 Return Side

1. The dust in the return air plenum had moderate levels of culturable bacteria, all of which were *Bacillus* species.
2. These results indicate that Gram-negative bacteria are not significant in the dust that collects in the return air plenum and thus are probably not significant in indoor air. That is reasonably consistent with air results.
3. The evaporator coils had very high levels of culturable bacteria, dominated by Gram-negative bacilli.
4. The results indicate that Gram-negative bacilli may be growing in the AHU at the evaporator coils.

3.3.2.1.2 Supply Side

1. The supply air plenum had no detectable bacteria.
2. The results indicate that Gram-negative bacteria may be growing on the evaporator coils, but they are not surviving in the supply air ductwork. The AHU and ductwork are probably not a significant source of Gram-negative bacteria in the indoor environment.

3.3.2.2 Other Source Samples

1. The dust from the Master Bedroom carpet had high levels of culturable bacteria, dominated by Gram-negative bacilli and *Bacillus* species.
2. The results indicate that the carpeting may be a source of Gram-negative bacilli in the indoor environment.
3. The baseboard in the Master Bedroom had high levels of culturable bacteria, all of which were Gram-positive and most of which were Gram-positive bacilli.
4. The results indicate that normal indoor bacteria, shed from the skin of occupants, are thriving in the moist environment of the baseboards, but that Gram-negative bacteria are not present.
5. The tackboard in the Living Room had very low levels of culturable bacteria.

3.4 Fibers and Other Particles in Air Samples

The Allergenco D slides were evaluated by Aerotech for the presence of fibers and particles of potential interest other than fungal spores and mycelial fragments. The fibers found were compared specifically to attic insulation. The results are summarized in Table 5. Compared to samples collected from other houses, there were moderate concentrations of fibers, skin fragments, and fiberglass in one or both of the two indoor air samples.

The fibers reported were found not to be from the attic insulation. The fibers were also not fiberglass.

3.5 Sources of Water Damage

Based on field observations and measurements, apparent sources of water causing damages at the subject residence include the following:

1. Condensation at windows
2. Rain water intrusion at the back door
3. History of sewage backups into the house

In addition, several areas were wet from undetermined, possibly recent causes.

The Living Room tackboard under the front corner of the window on the left wall was saturated. The window sill was moist but not wet. There had been no significant rain since April 30. However, the water event that caused the elevated moisture contents must have been recent, because there was no significant mold or bacterial growth in the area. Therefore, the high moisture levels were not consistent with recent rainfall or with conditions found or considered previously in the house.

The lower walls and base trim were wet for several feet in both directions from the back door. This was not the case on March 29, when the home was originally investigated, even though there had been significant rain three days earlier on March 26. Therefore, the wet conditions were not consistent with recent rainfall or with conditions found or considered previously in the house.

The Master Bedroom rear window sill, base trim, and tackboard had moist areas, but the wall was dry. In this case the moisture had been present long enough to cause mold growth on the tackboards, the base trim, and the carpet. The carpet also had heavy bacterial growth. The elevated moisture content and the visible mold growth were consistent with prolonged wet conditions. But prolonged wet conditions are not consistent with the dry conditions and lack of mold growth found previously in the house.

4.0 CONCLUSIONS

1. The residence had high relative humidity and dew points during the investigation. These conditions are conducive to mold growth, dust mite proliferation, and other indoor environmental problems. The HVAC system was turned off.
2. The house had inadequate filtration within the air handler unit (AHU). This condition will contribute to problems with excess dust in the house.
3. The residence had some slight water damage and mold growth at several window sills. This damage is consistent with condensation that would occur during cold weather. However, two window sills were wet at corners, conditions that were not consistent with recent rainfall events or with conditions found or considered previously at the residence. These wet areas will require remediation.
4. The residence had some water damage at the base trim near the back door. This damage is consistent with rain water intrusion. The lower walls and trim were wet for several feet from the door. These conditions were not consistent with recent rainfall events or with conditions found or considered previously at the residence. The wet areas will require remediation.
5. The cleanliness of the AHU system was unsatisfactory. The evaporator coils had excess debris and high concentrations of fungi and bacteria. The AHU condition requires cleaning.
6. There has been some damage to the evaporator coil fins. The coil fins have been bent in many places. This damage appears to have been caused by attempts to clean the coils.
7. There were low to moderate levels of total fungal spores and culturable fungi in the indoor air. There were elevated proportions of *Aspergillus/Penicillium*-like spores and culturable *Aspergillus* and *Penicillium* in the indoor air samples.
8. Amplification sources of fungi are creating reservoirs of fungi, and the fungi are being dispersed into the indoor air and are then being distributed by the AHU and ductwork.
9. Amplification sources of fungi include the Master Bedroom carpeting, the Master Bedroom and closet baseboards (where visible growth was noted), the circulating dust that had collected in the return air plenum, and the supply air plenum (an old source with spores but not culturable fungi). These areas will require remediation.
10. Hidden sources of amplification may exist, such as at wall cavities under windows, next to the back door, or next to the bathtubs.

11. Exposure to the high levels of Gram-negative bacilli in the carpets represents the major concern with respect to bacteria.
12. There were relatively high concentrations of fibers, skin fragments, and fiberglass in one or both of the two indoor air samples. The particles identified as “fibers” were not from the attic insulation and not fiberglass.
13. Because of the visible water damage and mold growth, the wet areas at and under windows and at the back door, and the elevated levels of fungi in the indoor air and on the evaporator coils, the O’Campo residence should be remediated. Remediation will require that the residents move from the house for a period of time. Following remediation, including post-remediation verification (clearance), the residents should be able to reoccupy the home.
14. Mold contamination affects areas with more than 25 contiguous square feet of mold contamination. Therefore, the mold remediation work must follow the Texas Mold Assessment and Remediation Rules (TMARR).

5.0 RECOMMENDATIONS

1. A technically competent HVAC contractor should evaluate the O’Campo residence for the size of the HVAC equipment, the capacity of the blower, the size of the plenums, the size and orientation of the ductwork, the size of the registers, the connections of all supply air components, the sealing of the HVAC Closet and return air plenum, the cleanliness of the system and the need for cleaning, the thermal performance of the system, the balance of the supply air system, the operation of the thermostat, the level of refrigerant in the system, and other aspects of the design and operation of the system. All deficiencies should be corrected.
2. The O’Campo residence should use high performance pleated return air filters, rated as MERV 8 or better.
3. The amplification sources and reservoirs of fungal and bacterial contamination should be remediated.
4. Structural remediation should include the carpeting, the AHU and ductwork, and the areas with wet or moist baseboards or other materials.
5. Remediation should include correction of deficiencies in installation of doors and windows. All windows with visible damage, and the back door, should be remediated from the inside and repaired from the outside as necessary.
6. Remediation of damaged areas near the heads of the tubs and at the top of the shower-surrounds should be performed at the same time.
7. The remediation work affects areas with more than 25 contiguous square feet of mold contamination. Therefore, the mold assessment and the remediation

work must follow the Texas Mold Assessment and Remediation Rules (TMARR). A Mold Remediation Protocol will be prepared as a separate document for the work recommended above.

8. During the evaluation of the HVAC system and investigation of door and window installations, the Mold Assessment Consultant should evaluate the condition of the system with respect to mold contamination.
9. The evaporator coils, return air plenum, and other AHU surfaces should be thoroughly cleaned, and the AHU should be operated to minimize deposits of debris on the coils.
10. All penetrations of the ceilings (such as peripheral edges of supply air ducts and vents and exhaust fans) and chases (such as at the HVAC closet) should be sealed.
11. As part of the remediation procedures, the residence should be thoroughly cleaned. This will include HEPA-vacuuuming of all surfaces and HEPA-vacuuuming plus hot water extraction of upholstery and carpeting by the licensed mold remediation company. Badly soiled carpet should be discarded. Together with use of high performance return air filters, this should help to correct the dust problems in the future.

TABLE 1 – SUMMARY OF RESIDENCE CHARACTERISTICS

No.	Street	Resident	Owner	Yr. Built	SF	Stories	Garage	Neighborhood	Subdivision	Date Investigated
402	Precious	O’Campo	SAHA	2000	1283	One	1-car	Rosedale Park	Villas at Fortuna	3/29/07

TABLE 2 – SUMMARY OF MOLD GROWTH, WATER DAMAGE AND MOISTURE CONTENT

No.	Street	Resident	Visible Mold Growth	Visible Water Damage	High Moisture Content
402	Precious	O’Campo	Master Bedroom - baseboard on rear wall Master Closet – baseboard on right wall	Window sills (slight) Trim at back door (slight) Tackboards in Living Room (at window) Tackboards in Master Closet (left front corner, right wall) Tackboards in Master Bedroom (at window on right wall, at window on rear wall)	Window sill in Living Room Tackboard in Living Room under window (saturated) Window sill in Bedroom 3 Tackboard and baseboard at rear wall of Master Bedroom Tackboard at right wall of Master Bedroom, under window Tackboard at right wall of Master Closet Tackboard at left front corner of Master Closet (slight)

Yellow-highlighted boxes indicate conditions that may be significant in evaluation of indoor environmental issues.

Table 3
Summary of Air Quality Measurements

Location	Temp °F	RH %	CO ₂ Ppmv	CO Ppmv	Dew Point °F
May 8, 2007					
Outside Air	86.6	54	434	0	67
O’Campo at return air grille	81.3	67	573	0	68.5
O’Campo in Kitchen	83.2	66	586	0	69.5

Yellow-highlighted boxes indicate conditions that may be significant in evaluation of indoor environmental issues.

TABLE 4 – SUMMARY OF HVAC SYSTEM OPERATION AND SPECIAL CONDITIONS

No.	Street	Occupant	AC Operation	AHU Cleanliness	Dew Point	IAQ CO ₂ /CO	No. Occupants	Pets	Comments
402	Precious	O’Campo	The system was turned off	Fair to poor	69.5	586/0	None; previously 1	Previously 1 dog	Sewer backups and overflows; soldering or brazing operations in Utility Room, metal dust, chemicals, lack of HVAC operation

Yellow-highlighted boxes indicate conditions that may be significant in evaluation of indoor environmental issues.

TABLE 5 – SUMMARY OF AIRBORNE AND AHU PARTICLES

No.	Street	Occupant	Sample Location	Total Fungal Spores	Unusual Spore Counts	Mycelial Fragments	Fiber Count	Skin Cell Fragments	Fiber-glass	Pollen	AHU
5/08/07											
Outdoor Air Samples – Villas at Fortuna											
506	Precious	De Los Santos	Outside Air	10,480	Bas>Asc, Cl	40	<13	53	<13	53	NA
402	Precious	O’Campo	Outside Air	23,613	Bas>Cl	520	53	667	<13	813	NA
Indoor Air Samples – Villas at Fortuna											
402	Precious	O’Campo	Return Air	2,453	Cl>As/Pn 307 Cts/M ³ (13%) As/Pn	333	760	3,613	40	147	Very high As/Pn and Cl in return air plenum dust and supply air plenum
402	Precious	O’Campo	MBR	1,267	Cl>As/Pn>Bi 347 Cts/M ³ (27%) As/Pn 133 Cts/M ³ (11%) Bi	293	<13	2,973	947	120	NA

Yellow-highlighted boxes indicate conditions that may be significant in evaluation of indoor environmental issues.

Other fungal spore results of note: Very high concentrations of Aspergillus/Penicillium-like spores on the Master Bedroom baseboard. High concentration of Aspergillus/Penicillium-like spores in the Master Bedroom carpet.

Indoor Environmental Evaluation – Follow-up Investigation – O’Campo Residence – 402 Precious

Alt denotes *Alternaria*. As/Pn denotes *Aspergillus/Penicillium*-like spores. Asc denotes Ascospores. Bas denotes Basidiospores. Bi denotes *Bipolaris/Drechslera*. Cl denotes *Cladosporium*.
 A>B, C denotes that type A is more numerous than type B, which in turn has the same numbers as type C.

TABLE 6 – SUMMARY OF AIRBORNE CULTURABLE FUNGI AND AHU SAMPLES

No.	Street	Occupant	Sample Location	Total Fungi	Unusual Counts	Return Air Filter	Supply Air Plenum
May 8, 2007							
Outdoor Samples – Villas at Fortuna							
506	Precious	De Los Santos	Outdoor Air	788	Cl>> <i>Fusarium</i>	NA	NA
402	Precious	O’Campo	Outside Air	694	Cl>>StH, <i>Sporotrichum</i>	NA	NA
Indoor Samples – Villas at Fortuna							
402	Precious	O’Campo	Return Air	976	Cl>>StH	Low fungi	No fungi
402	Precious	O’Campo	MBR	906	Cl>> <i>Rhinoctadiella</i> , StH, Pn, As 59 Cts/M ³ (6%) As 71 Cts/M ³ (8%) Pn	NA	NA

Yellow-highlighted boxes indicate conditions that may be significant in evaluation of indoor environmental issues.
 Other culturable fungi results of note: High concentrations of fungi on the evaporator coils. High concentrations of *Aspergillus* on the Master Bedroom baseboard. High concentration of *Penicillium* in the carpet.

As denotes *Aspergillus*. Pn denotes *Penicillium*. Cl denotes *Cladosporium*. StH denotes sterile Hyphae.
 A>B, C denotes that type A is more numerous than type B, which in turn has the same numbers as type C

TABLE 7 – SUMMARY OF AIRBORNE CULTURABLE BACTERIA AND AHU SAMPLES

No.	Street	Occupant	Sample Location	Total Bact.	Act	Bac	G- Bac	G+ Bac	G+ Cocci	Return Air Filter	Supply Air Plenum
May 8, 2007											
Outdoor Samples – Villas at Fortuna											
506	Precious	De Los Santos	Outdoor Air	1,153	115	231	346	346	115	NA	NA
402	Precious	O’Campo	Outside Air	518	52	259	104	104	<12	NA	NA
Indoor Samples – Villas at Fortuna											
402	Precious	O’Campo	Return Air	176	<12	71	18	35	53	Moderate <i>Bacillus</i>	No bacteria
402	Precious	O’Campo	MBR	871	<12	261	174	261	174	NA	NA

Bact denotes bacteria. Act denotes *Actinomyces*. Bac denotes *Bacillus*. G- denotes Gram-negative. G+ denotes Gram-positive.

Other bacterial results of note: Very high concentrations of bacteria on the evaporator coil, dominated by Gram-negative bacilli. High levels of bacteria on the Master Bedroom tackboard, dominated by Gram-positive cocci. High concentrations of bacteria in the carpet, dominated by Gram-negative bacilli.

Indoor Environmental Evaluation – Follow-up Investigation – O’Campo Residence – 402
Precious



