Biotopia Environmental Assessment Pty Ltd

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Biotopia Environmental Assessment

ENVIRONMENTAL ASSESSMENT REPORT

Biotopia Report ID:	200514-1 Alphington
Address:	[redacted], Alphington VIC
Occupant:	Unoccupied
Date of Attendance:	14 May 2020
Date of Report:	25 May 2020
Previous Report ID:	N/A

EXECUTIVE SUMMARY

Extremely mouldy, rotten and at total-loss condition.

Requires complete strip-out.

Safety concerns regarding remaining ceilings downstairs, the chipboard floors upstairs, and the MDF stairs themselves.

INSTRUCTIONS

Prior to assessment of this property, Biotopia was requested to investigate and provide a report on the following / Interpreted thus:

1. Is there a significant mould or moisture ingress problem?

2. If there is a problem, what may be causing it?

3. Suggest a strategy for the remediation of the above issues.

BACKGROUND

From information given verbally by the owner/representative and from initial general visual impressions:

- The structure is an approx. mid-1990's townhouse (by dead-reckoning); brick-veneer; duplex/semi-detached with garage to left side and adjoining townhouse to right (set slightly forward); cluster of similar townhouses in an estate; terracotta tile roof or similar; slab floor (ground), chipboard floor (upstairs); small garden at rear.
- Unoccupied at time of assessment; some contents items present in boxes in the ground floor living room.
- I was not informed as to the exact nature of the claimed pipe-burst event or when it occurred prior to arrival. From visual assessment it was evident that a significant water ingress event had occurred upstairs over some time (weeks-months), and some time ago (at least several months) based on the truly amazing amount of visible mould growth and water damage over a very wide area.
- Essentially no surface was free of mould downstairs, and most upstairs. Significant sections of ceilings downstairs had collapsed likely due to water flowing from above.
- Based on the state of dust, cobwebs, garden, it could be this house has been left as-is for a year or so without early mitigation nor other remediation works.
- I declare that none of the claimants, owners, former occupants nor similar representatives are known to me aside from this sole professional interaction to the best of my knowledge, and that I have no conflicts of interest nor vested interest, and that I have an agreement for the payment of all my professional fees in advance regardless of the outcome of this report. I do not operate nor have financial interests in any remediation or similar cleaning or repair business. I am guided by the published best-practise standards and guidelines for physically testing mould/fungi and moisture. This is therefore a true and accurate report to the best of my knowledge.

OBSERVATIONS

1. MOULD: see Tables	Extreme
2. TEMPERATURE & HUMIDITY	Really damp and humid throughout, well above minimum for most mould types growth
3. MOISTURE by meter	Wet throughout
4. SIGNS OF MOISTURE	Extreme
5. CONTENTS	CONDITION 2/3 (via testing boxes of items in living room)
6. VENTILATION	N/A
7. HEPA-FILTERED AIR FLOW IN CONTAINED AREA >4 chg/hr	N/A
8. AIR FLOW TO SUBFLOOR adequate (≥6000 mm^2/m)	N/A
9. ODOUR	Extremely mouldy
10. THERMOGRAPHY	N/A
11. DAMAGE TO STRUCTURE, CONTENTS FROM MOULD, MOISTURE	Significant untreated damage seen
12. CHEMICALS AND OTHER HAZARDS	The MDF stairs and upstairs yellowtongue flooring are spongy and weak: possible danger of collapse. Some plasterboard ceilings have collapsed likely due to water pooling above, but other sections could possibly collapse. Consider wearing helmets.

CONCLUSIONS

1. Is there a significant problem?

Yes.

This is one of the worst affected buildings I have ever witnessed.

In a nutshell, every conceivable surface and internal material is in some way mouldy with visible active growth of spectacular colours, or less-visible active growth hazes of pale colours matching paintwork, or likely embedded within damp materials such as MDF and growing out of it, or at very least coated with settled spores including horizontal, vertical and inverted surfaces.

This is truly a sight to behold.

It is also impossible that all wall and ceiling cavities have somehow escaped either being wet from direct water flows, and/or humid/damp to nigh saturation due to the vast amounts of vapour rising up through the structure vs the evidently minimal ventilation.

That is, it is guaranteed that the roofspace is also wet and mouldy as vapour rises up then condenses and drips back down.

This building must be entirely stripped out, including all plasterboard wall panels, ceilings, cabinets, insulation, chipboard flooring, architraves/doors, the MDF staircase, bathtub, shower tiles/base, etc., in order to access the cavities to physically remove mould and timber rots, and to likely repair rotten, weakened timber frames (and corroded metal elements, if any).

Removal of wiring and electrical systems are similarly warranted as these tend to become waterlogged and/or corroded.

Similarly, HVAC / ducted heater unit and all ductwork.

Most window frames have also suffered from condensation running down the panes causing rot/mould.

This building is at total-loss condition, and doing any less than total-strip-out will result in failures in PRV assessment, further costs/time and repeated efforts.

It is even unclear if the structure is sound, and assessment by a suitably qualified structural engineer and a timber grader is recommended, ideally after key panels have been removed to allow inspection of the structural load-bearing members.

Was unable to open the garage and it may have had water ingress to the wall adjoining the house. If it is lined with plasterboard or similar, this ought to be included in the strip-out/remediation.

It is also unclear what construction the party-wall is between the two adjoining townhouses, such as single-brick or plaster shaft-liner, and whether water had flowed into the adjoining property and/or damaged the party-wall.

Some soffits may have been affected, too.

2. If there is a problem, what may be causing it?

Difficult to say, but consistent with long-term / large-volume flow of water from the upstairs area at or around the toilet (likely cistern), but can't rule out flooding from overflowing bathtub, shower, vanity sink. Cold water given lack of 'snakeskin' paint damage downstairs.

Does not appear to have flowed from above the upstairs ceiling, nor from within upstairs wall cavities under pressure. Water has then soaked all carpets upstairs, into wall cavities, then down the stairs and through the flooring into the downstairs ceiling cavities, causing them to fill and collapse over the kitchen. Water has then penetrated all wall cavities downstairs either from flows from above, or pooled water flowing over the slab and contacting skirtings and bases of walls. Kitchen cabinetry has been exposed to water from above, and water flowing underneath causing delamination, swelling, rot, etc. Water may have flowed out the rear door into the small enclosed back yard.

3. Suggested strategy for remediation of above issues based on Results.

A brief, suggested basic outline to assist the safe remediation of the property of mould and moisture as per IICRC s500 / s520 standards by a qualified practitioner, and additional builders as appropriate, may include the points below, but must be negotiated between all materially interested parties.

3.1. Strict containment protocols as per standard, including: **warning signs** (ideally with date and contact name/mobile phone number); appropriate **full-face PPE** with documentation of respirator filters being in-date; keeping health and site **access/visitor logs**; **prohibition** of any non-remediation personnel entering during remediation works; later in remediation / after strip-out, **use multiple containment cells** via sealed plastic sheets, zip-doors, air pressurisation / flow balancing, HEPA filtration, etc. **Isolate all domestic power circuits** and run temporary power cables for lights, equipment. **Helmets** may be required at least in the early phases as it is unclear if the ceilings and upstairs flooring are stable. Shut off water mains.

3.2. In this instance: **ALL AREAS OF HOUSE INCLUDING ROOFSPACE** and possibly garage.

3.3. Identify and repair the source/s of moisture ingress if not already so done.

3.4. Check the structural integrity / safety / load-bearing capacity of the MDF stairs and upstairs yellowtongue flooring, and consider pulling down the ceilings downstairs before they fall down unexpectedly.

3.5. Discard all contents items not able to be run through a dishwasher, or of extreme sentimental / monetary value. Do not re-use the cardboard boxes. Ensure mini-skips are covered and very mouldy items are wrapped/bagged to prevent escape of contaminated dusts into local area where there are several residents nearby.

3.6. Remove and discard all wall and ceiling panels entirely, and HVAC ductwork, vents, louvers, registers, electrical appliances (ovens, fans, etc.), fixtures/fittings (inc. lights, power-points, switches, ports, conduits), architraves, moldings, doors, damaged window frames, bathtub, shower, vanity, kitchen cabinets, floor coverings / vinyl / tiles

3.7. Discard any fibrous insulation. Check any sarking membranes on both sides for staining/damage/possible mould growth. This includes the roofspace, and the battens/stringers and other roof frame timbers as they're likely mouldy/rotten from high humidity and condensation.

Note: humid air rises up within the house and all cavities and thus mould often grows high within the cavities, but is usually not visible as is normal for most moulds.

3.8. Replace rotten baseplates, bases of studs within cavities, roofing members, etc., cleaning/remediating underneath each if possible. Seek advice from a suitable engineer/builder re. structural load-bearing elements.

3.9. Remove stairs and upstairs flooring to better access the salvageable timber members. May need to put down temporary duck-boards and steps/ladder.

3.10. Consider setting up some containment cells in the hope it will capture some of the contaminated dusts from grinding, blasting works, or at least limit the amount of dust egress outdoors towards the other occupied homes nearby.

3.11. Garnet blasting may be warranted to scrub multiple surfaces quickly, such as timber frames, battens, flooring timbers, etc., but is to be used with caution and the understanding that this will blow contaminated dusts everywhere, and will damage sarking membranes. Dry ice tends to be more expensive/difficult to source daily, and soda tends to clump up. Sand-blasting is not permissible by WorkSafe due to silicosis concerns. Clean up what you can. May be more trouble than it is worth. Uncertain if there's a plaster shaft-liner party wall, which can be damaged by blasting / scrubbing.

3.12. Set up containment cells, suitable HEPA-air scrubbers with 'draft-tube/sausages' at least 3 m long, etc., to facilitate cleaning efforts by limiting back-contamination of newly cleaned areas while cleaning/scrubbing others, and to keep warmed/dried air circulating at damp materials especially the slab. May need to keep whole house under negative pressure to help limit dust contamination of local area where others are living, especially when personnel enter/exit front door. May need an airlock.

3.13. "Micro-detail" clean, remediate, scrub, HEPA vacuum, wet-wash, power-mop/shampoo, etc., all exposed surfaces including walls, windowsills/panes, slab/floors AND all remediation equipment (dehums, air movers, HEPA units, and all plastic sheeting/zip-doors, draft-tubes, etc.)

3.14. Continue to dry the remaining materials, timbers, slab and walls completely

Note: watch for the two-phase drying profile and long 'tail-end' of drying typical of masonry, thick timbers. Air movement and many dehums helps 'wet' phase, but only heat helps 'damp' phase, and fewer dehums / air-movers are required. Monitor the air temp and humidity.

3.15. After 48-72 hrs, repeat micro-detail clean described above, then allow at least 24 hrs before clearance sampling by IEP

NOTE: even a **hand-sized patch** of active mould growth or settled spores (even on a vertical or inverted surface) can be more than enough to re-contaminate a whole house if blown around, and **PRV will fail**.

3.16. Have an independent IEP collect samples and perform a ***post-remediation verification*** (PRV) get a valid **PRV certificate** (as per IICRC s520 sections 12.2.1, 12.2.2, 15, 16; s500, 12.5.9, etc.) Do not attempt to collect samples or perform PRV yourself as this could be deemed a 'conflict of interest.'

3.17. Only after receipt of the valid PRV certificate should containment be taken down and site control formally passed to the Builder for rebuilding works.

OTHER NOTES

Methods used in the preparation of this report may have included but is not limited to, and in accordance with common practice in monitoring environmental surfaces in industry:

- Use of 'sterile technique', disinfection of hands, equipment before and after use, and due diligence to avoid cross-contamination. 400-hole plate was cleaned by warm ultrasonic bath in RO water with detergent every two weeks, and cleaned onsite with single-use alcohol-based lens cleaning wipes to avoid residue build-up.

- Viable surface samples: Sterile cotton fibre tipped swabs, 10 cm^2 area, immediately inoculated onto agar media onsite. For transport or storage prior to inoculation, dry sterile cotton tipped swabs in their own sterile tubes were used dry and kept dry and cool (or no more than room temperature) and away from radiant heat / light.

- Total surface samples: Where possible, as per ASTM D7658-17. Zefon 'Bio-Tape.' Total sample area 25.4 mm x 16 mm = 4.1 cm^2. Total counted area at 400x was **0.119 cm^2** (approx. 3% of total sample area), by 'no-overlap' method (63 discrete non-overlapping adjacent FoV, being 31.5 FoV/row x 2 rows; rows were typically separated by some distance and not adjacent) hence raw numbers of particles counted from inner red lines on Bio-Tape were converted to 'per cm^2' by **x8.42**

- Viable airborne fungal particles: A calibrated SKC 'QuickTake30' unit with an Andersen single-stage 400-hole impactor at 30 L/min, 5 min hence 150 L of air (= 0.15 m^3). Calculation of raw-count viable airborne fungal numbers were (via pre-prepared lookup table) pre-factored for use of plastic Petri dishes (1.25x). as per Andersen, J Bacteriol. 1958 November; 76(5): 471–484, then Andersen Table 1 was applied, then expressed as 'per m^3' by **/0.15** and rounding to nearest integer.

- Total airborne particle sample collection as per ASTM D7788-14: A calibrated SKC 'QuickTake30' unit at 30 L/min, 5 min hence 150 L of air (= 0.15 m^3), and a fresh Zefon 'Air-O-Cell' cassette unit that was then re-sealed. Analysis as per ASTM D7391-17: examined microscopically at 400x, counting 100% of the sample as per 12.3.8.1c, and thus converting from raw numbers per sample to 'per m^3 ' by **/0.15**

- Agar media: "SabGC" agar media in plastic Petri dishes were used and cultured for 3 days at 27°C with periodic examination and photography if practicable. Raw counts were converted from 10 cm^2 sampled to 100 cm^2 by **x10**

- Microscopy: Radical RXLr-3 at 40x/100x/400x/1000x with Lacto-Glycerol-CottonBlue / proprietary epifluorescence, and/or phase-contrast, bright-field, oil-immersion, Gram-stain techniques as required. Calibrated periodically (**490** μm diameter FoV at 400x). Images shown are not the complete FoV for technical limitation reasons, and are used for illustrative/confirmation purposes rather than exhaustive.

- Thermography: Testo 875-2 thermographic camera with SuperResolution module active.

- Moisture, temperature, humidity: Testo 606-2 two-prong moisture/humidity meter.

- References include: CDC, USA guidelines (2003); US ACOEM 2002; Australian NHMRC EH32, others; Aust. EPA guidelines; WHO Guidelines for IAQ – Dampness and Mould, 2009, ISBN 978 92 890 4168 3; Australian Standards, Building code of Australia, ISO and other relevant recognised guidelines wherever possible including ASTM D7391-17, D7788-14, D7789-12, D7440-08, D7338-14, D7910-14, D7658-17, and peer-reviewed publications in scientific journals. See http://www.biotopia.com.au

N.B.: Mould will only grow in response to moisture on a suitable food source, producing a great number of live / viable spores. These spores can then spread like dust in small air currents and movement of people and contaminated items, being viable for a number of months but not growing unless a suitable damp food source is settled upon. People can inhale these spores and other mould-associated particles and become increasingly allergic over time, especially if the spores are viable and the person is susceptible to allergies. If a person is significantly immunocompromised or otherwise unwell, there is a risk of infection by some types of moulds that may or may not be present in any particular house. Other organisms such as house dust-mites, however, may also grow to significant numbers and elicit significant allergies under similar conditions.

Yours faithfully,

Dr Wesley D. Black

BSc (Melb), Grad Dip Biotech (Melb), Grad Dip Ed (RMIT), PhD (Melb),
Member of the Australian Society of Building Consultants (ASBC), Australian Society for Microbiology (MASM), Building Dispute Practitioners' Society (BDPS), Metrology Society of Australia (MSA), Australian Mycology Society (AMS), International Society of Indoor Air Quality and Climate (ISIAQ), Indoor Air Quality Association, Australia (IAQAA, Secretary 2019).

Dr Black is proficient in environmental assessments and is a qualified, recognised microbiologist with a PhD in that field. This report is intended to be used in conjunction with civil engineering consultant and other building professional reports as deemed suitable by the insurer and legal bodies.

Biotopia maintains the integrity of its reports but cannot be held responsible for inaccuracies or omissions due to inability to access all areas at the time of assessment, or subsequent actions by other parties that may have interfered with physical parameters, such as the opening up of formerly inaccessible enclosed areas that were damp, mouldy, rotten, or otherwise contaminated. Without prejudice.

APPENDIX 1 - TABLES

1) VIABLE Airborne and Surface fungal counts by culture

Location	Colony Forming Units (CFU)		Identified fungi (CFU)											
			1. Alternaria \ 11. Ulocladium	2. ascomycete (undiff.)	3. Aspergillus	3. Penicillium	4. basidiomycete (undiff.)	6. Cladosporium	7. Curvularia	X. Trichoderma	X. Chrysonilia	X.Plant. phyllo/Phoma	X: yeasts,	X.Zygomycetes Rhyz/Muc.
AIRBORNE AV	**/samp -le**	**/m³**												
01 Control: outdoors, upwind prior to entry	N/A													
02 entry / gnd living area	> 400 ****	> 17520	+	+	?	~400 ****								++
SURFACE SV	**/samp -le**	**/100 cm²**												
01 entry / gnd living area, top of box #1 with contents	>500 *****	> 5000				> 500 *****								

NOTE: Not useful for detection of some moulds such as Chaetomium and Stachybotrys.

2) TOTAL Airborne and Surface fungal counts by direct microscopy

Location	Sum fungal structures		Identified particles (Units or coverage)												
			1. Alternaria / 11. Ulocladium	2. ascospores (undiff.)	3. Pen. / Asp 6. Cladosporium	4. basidiospores	5. Chaetomium	8. Drech. Bipol. 7. Curvularia	9. smut Myxo Periconia	10. Stachybotrys	Pollen	Mineral grit	Vegetable fibre, wood, textile	Hair, fur, dander	Other comments
AIRBORNE AT	**/sample**	**/m³**													
01 Control: outdoors, upwind prior to entry	N/A														
02 Entry area / living room	> 1000	> 5000		++	TNC ****	~ 50	+++		+			+			
SURFACE ST	**/sample**	**/cm²**													
01 box of contents in living room	> 3000	> 5000		+	TNC ****					TNC *****					

TNC: too numerous to count

KEY Table 1 – VIABLE AIRBORNE FUNGAL PARTICLE COUNT relative to Outdoor Air Abundance (OA) and (generally recognised numbers and conditions)

Rating	CFU/m³	Load category *1	Comments
Not Detected			May indicate lack of growth on media, lack of detection cf. actual absence
(Low)		+	Only practically possible with HEPA filtration, >7 air-changes/hr and positive pressure
Normal	<OA (<500)	++	Slightly less than outdoor air, with range of organisms, no dominant species
Elevated	≤2OA (≤1000)	+++	Esp. if a species is dominant, or small numbers of species of similar xerophelicity. Check spore viability and materials moisture. Respirators recommended in addition to appropriate PPE if airborne over a substantial area. A preponderance of similar spores, thus of an aberrant ecology but normal or low number may be considered 'Elevated'
High	>2OA (>1000)	++++	As above. The source of mould and moisture should be identified and addressed. Containment and full PPE recommended if airborne over a substantial area. Clean tools, equipment, exposed items when leaving site. A preponderance of similar spores, thus of an aberrant ecology but 'Elevated' number may be considered 'High'
Very High	>2OA (>5000) (+AE)	+++++	As above. If airborne over a substantial area, remove occupants and workers without PPE, especially with predisposing respiratory and/or immunocompromisory conditions, chemotherapy, asthma, severe allergies, etc. Monitor for infection with known pathogenic species such as *Aspergillus fumigatus*. Log eye, nose, throat, lung, skin conditions and seek medical attention as appropriate. A preponderance of similar spores, thus of an aberrant ecology but 'High' number may be considered 'Very High'

AE = Aberrant Ecology score from 0 AE – 5 AE, being a preponderance of similar spores, especially if likely to be clonal, and/or different types of organisms of similar water-activity (Aw) requirements, and thus likely to be from the same active growth area *en masse.* A normal ecology has a range of various organisms in relatively balanced numbers, whereas an aberrant ecology may have a reduced range of organisms with one or more 'dominant' mould types, which may be 'moisture loving' (high Aw requirements) and/or prefers consuming other moulds (e.g., Trichoderma), and/or potentially infectious and/or mycotoxogenic. Noted aberrant ecology may be deemed a higher designation.

OA = Outdoor Abundance / Air control/s;

Adapted from and/or as per Kemp & Neumeister-Kemp, "The Mould Worker's Handbook" (2010, 2nd ed.) and "The Australian Mould Guide" (2010, 2nd ed.) With acknowledgement of the lack of conclusively established and widely / formally recognised limits linked to health effects.

*1: As adapted from ASTM 7658-17 and D7391-17 (total count) as a general representation of relative abundance / surface area coverage. ASTM does not appear to have a standard for laboratory analysis of viable air or surface fungi.

"s" : spot sample, primarily to ID an organism in a restricted area or visible patch, not indicative of the general area.
"g" : general sample, likely indicative of the general environment / broad area / room.
"sg": indicative of a restricted area, e.g., under carpet, in cupboard.

KEY Table 2 – TOTAL AIRBORNE PARTICLE COUNT, relative to Outdoor Abundance (OA) and (generally recognised numbers)

Rating	TC /m³	Load category *1	Comments
Not Detected			May indicate lack of detection cf. actual absence
Low	<*OA/2* (<100)	+	Only practically possible with HEPA filtration, >7 air-changes/hr and positive pressure
Normal	<OA (<500)	++	Slightly less than outdoor air, with range of organisms, no dominant species / no aberrant ecology evident
Elevated	≤2OA (≤1000)	+++	Esp. if a species is dominant, or small numbers of species of similar xerophelicity. Check spore viability and materials moisture. Respirators recommended in addition to appropriate PPE if airborne over a substantial area.
High	>2OA (>1000)	++++	As above. The source of mould and moisture should be identified and addressed. Containment and full PPE recommended if airborne over a substantial area. Clean tools, equipment, exposed items when leaving site.
Very High	>2OA (>5000) (+High AE)	+++++	As above. If airborne over a substantial area, remove occupants and workers without PPE, especially with predisposing respiratory and/or immunocompromisory conditions, chemotherapy, asthma, severe allergies, etc. Monitor for infection with known pathogenic species such as *Aspergillus fumigatus*. Log eye, nose, throat, lung, skin conditions and seek medical attention as appropriate

TC = Total Count via microscopy; all identifiable fungal structures including spores, hyphae, conidiophores. Chains or clusters of small spores (Penicillium, Aspergillus, etc.), and/or aberrant numbers of large heavy spores (Chaetomium, Stachybotrys, etc.) shall be regarded as indication of nearby active growth

AE = Aberrant Ecology score from 0 AE – 5 AE, being a preponderance of similar spores, especially if likely to be clonal, and/or different types of organisms of similar water-activity (Aw) requirements, and thus likely to be from the same active growth area *en masse.* A normal ecology has a range of various organisms in relatively balanced numbers, whereas an aberrant ecology may have a reduced range of organisms with one or more 'dominant' mould types, which may be 'moisture loving' (high Aw requirements) and/or prefers consuming other moulds (e.g., Trichoderma), and/or potentially infectious and/or mycotoxogenic.

OA = Outdoor Air control/s;

DS = Dust Score from 0 DS – 5 DS; particles including pollen, textile and mineral insulation fibres, dander, skin, grit (non-fungal, non-insect)

IS = Insect Score from 0 IS – 5 IS; particles including wings, wing-scales, body parts, hairs, carpet beetle larval hairs (non-fungal, non-dust)

*1: ASTM 7658-17 12.2.10.1 Fungal Loading Categories and 12.2.10.2 Non-Fungal Particle Loading Categories, each being 0 – 5.

Category designations are subject to interpretation with reference to the control sample/s and other observations of aberrant ecology, mould types, surface area coverage. Noted aberrant ecology may be deemed a higher designation.

Adapted from and/or as per Kemp & Neumeister-Kemp, "The Mould Worker's Handbook" (2010, 2nd ed.) and "The Australian Mould Guide" (2010, 2nd ed.) at 15 L/min. It is understood that in general 28.3 L/min is slightly more efficient at oil droplet capture but variously efficient for some species of fungi due to bounce-off [Trunov M, et al., 2001], but likely far less effect than general uncertainty, random variation due to small bursts of particles from occupant/assessor activity, breezes, etc., but more precise due to greater air volume sampled. With acknowledgement of the lack of conclusively established and widely / formally recognised limits linked to health effects.

*1: ASTM 7658-17 12.2.10.2 Non-Fungal Particle Loading Categories -, +, ++, +++, ++++, +++++, respectively. Category designations are subject to interpretation with reference to the control sample/s and other observations of aberrant ecology, mould types, surface area coverage. Symbols rather than numbers are used in order to avoid confusion with numbers of particles.

"s" : spot sample, primarily to ID an organism in a restricted area or visible patch, not indicative of the general area.
"g" : general sample, likely indicative of the general environment / broad area / room. Default assumption unless otherwise indicated.
"sg": indicative of a restricted area, e.g., under carpet, in cupboard.

‘Other Spores”: includes undifferentiated Ascospores, Basidiospores, Curvularia, Myxomycetes, Periconia, similar looking smuts, Memnoniella as per ASTM D7658-17

KEY Table 3 – VIABLE SURFACE FUNGAL COUNTS; 10 cm^2 area via swab on 90 mm diameter Petri dish

Rating	CFU/100 cm^2 *2	Load category *1	Comments
(Not Detected)		0	May indicate lack of growth on media, lack of detection cf. actual absence
Low	<100	1	Surface may have recently been wiped or washed
Normal	<500	2	Typically with a range of common outdoor organisms, no dominant species / aberrant ecology
Elevated	<1000	3	Respirators recommended in addition to appropriate PPE. Avoid stirring dusts up including use of HEPA air movers. Ideally use wet-washing techniques. A preponderance of similar spores, thus of an aberrant ecology but normal or low number may be considered 'Elevated'
High	<2500	4	As above. Containment and full PPE recommended if over a substantial area. Clean all tools, equipment, exposed items, skin when leaving site. A preponderance of similar spores, thus of an aberrant ecology but 'Elevated' number may be considered 'High'
Very High	≥2500	5	As above. If airborne over a substantial area, remove occupants and workers without PPE, especially with predisposing respiratory and/or immunocompromisory conditions, chemotherapy, asthma, severe allergies, etc. Monitor for infection with known pathogenic species such as *Aspergillus fumigatus*. Log eye, nose, throat, lung, skin conditions and seek medical attention as appropriate. A preponderance of similar spores, thus of an aberrant ecology but 'High' number may be considered 'Very High'

CFU = Colony Forming Units via culture

AE = Aberrant Ecology score from 0 AE – 5 AE, being a preponderance of similar spores, especially if likely to be clonal, and/or different types of organisms of similar water-activity (Aw) requirements, and thus likely to be from the same active growth area *en masse.* A normal ecology has a range of various organisms in relatively balanced numbers, whereas an aberrant ecology may have a reduced range of organisms with one or more 'dominant' mould types, which may be 'moisture loving' (high Aw requirements) and/or prefers consuming other moulds (e.g., Trichoderma), and/or potentially infectious and/or mycotoxogenic. Noted aberrant ecology may be deemed a higher designation.

*1: As adapted from ASTM 7658-17 and D7391-17 as a general representation of relative abundance. Category designations are subject to interpretation with reference to the control sample/s and other observations of aberrant ecology, mould types, surface area coverage. ASTM does not appear to have a standard for analysis of viable air or surface fungi.

*2: Adapted from and/or as per Kemp & Neumeister-Kemp, "The Mould Worker's Handbook" (2010, 2nd ed.) and "The Australian Mould Guide" (2010, 2nd ed.) with acknowledgement of the lack of conclusively established and widely / formally recognised limits linked to health effects. Further adaptation of swab methods by Dr WD Black based on development and validation studies (in preparation for publication) and ATSM D7789-12.

KEY Table 4 – TOTAL SURFACE PARTICLE COUNT by lift-tape and direct microscopy

Rating	TC /cm²	Load category *1	Comments
Not Detected			May indicate lack of detection cf. actual absence
Low	<50	+	Surface may have recently been wiped or washed, especially if DS is low
Normal	<500 (≥3DS)	++	Typically with a range of common outdoor organisms; not aberrant ecology, especially if DS is high
Elevated	≤1000	+++	Esp. if . Check spore viability and materials moisture. Respirators recommended in addition to appropriate PPE if present over a substantial area.
Contaminated	>1000	++ ++	As above. The source of mould and moisture should be identified and addressed. Containment and full PPE recommended if present over a substantial area. Clean all tools, equipment, exposed items and skin when leaving site.
Extremely High	>5000 (especia lly >3AE <3DS)	+++ ++	As above. If airborne over a substantial area, remove occupants and workers without PPE, especially with predisposing respiratory and/or immunocompromisory conditions, chemotherapy, asthma, severe allergies, etc. Monitor for infection with known pathogenic species such as *Aspergillus fumigatus*. Log eye, nose, throat, lung, skin conditions and seek medical attention as appropriate

TC = Total Count via microscopy; all identifiable fungal structures including spores, hyphae, conidiophores. Chains or clusters of small spores (Penicillium, Aspergillus, etc.), and/or aberrant numbers of large heavy spores (Chaetomium, Stachybotrys, etc.) shall be regarded as indication of nearby active growth

AE = Aberrant Ecology score from 0 AE – 5 AE, being a preponderance of similar spores, especially if likely to be clonal, and/or different types of organisms of similar water-activity (Aw) requirements, and thus likely to be from the same active growth area *en masse.* A normal ecology has a range of various organisms in relatively balanced numbers, whereas an aberrant ecology may have a reduced range of organisms with one or more 'dominant' mould types, which may be 'moisture loving' (high Aw requirements) and/or prefers consuming other moulds (e.g., Trichoderma), and/or potentially infectious and/or mycotoxogenic. Noted aberrant ecology may be deemed a higher designation.

OA = Outdoor Air control/s;

DS = Dust Score from 0 DS – 5 DS; particles including pollen, textile and mineral insulation fibres, dander, skin, grit (non-fungal, non-insect)

IS = Insect Score from 0 IS – 5 IS; particles including wings, wing-scales, body parts, hairs, carpet beetle larval hairs (non-fungal, non-dust)

Adapted from and/or as per Kemp & Neumeister-Kemp, "The Mould Worker's Handbook" (2010, 2nd ed.) and "The Australian Mould Guide" (2010, 2nd ed.) with acknowledgement of the lack of conclusively established and widely / formally recognised limits linked to health effects.

*1: ASTM 7658-17 12.2.10.1 Fungal Loading Categories and 12.2.10.2 Non-Fungal Particle Loading Categories

Category designations are subject to interpretation with reference to the control sample/s and other observations of aberrant ecology, mould types, surface area coverage

APPENDIX 2 – IMAGES

1. The front of the house. Garage to left, adjoining townhouse to right.

2. The front door, staircase and entry area.

3. The detail of the entry area walls: some mould evident. Mainly *Penicillium* spp. and *Aspergillus niger* at this location. Note hole in wall, likely from some item knocking it but typical of weakness of cardboard backing within the wall cavity due to even greater mould activity and dampness.

4. The living room: boxes of contents items, as sampled.

5. The plastic on the living room slab: condensation noted underneath indicating slab dampness.

6. The living room area / front bay windows. Noted rot of window frames from condensation. Wall to adjoining property is to left.


FRAGILE
Move
FRAGILE

7. The living room ceiling: heating ducts, downlights. Visible mould patches.

8. The kitchen. Some mould may be visible. Note missing ceiling.

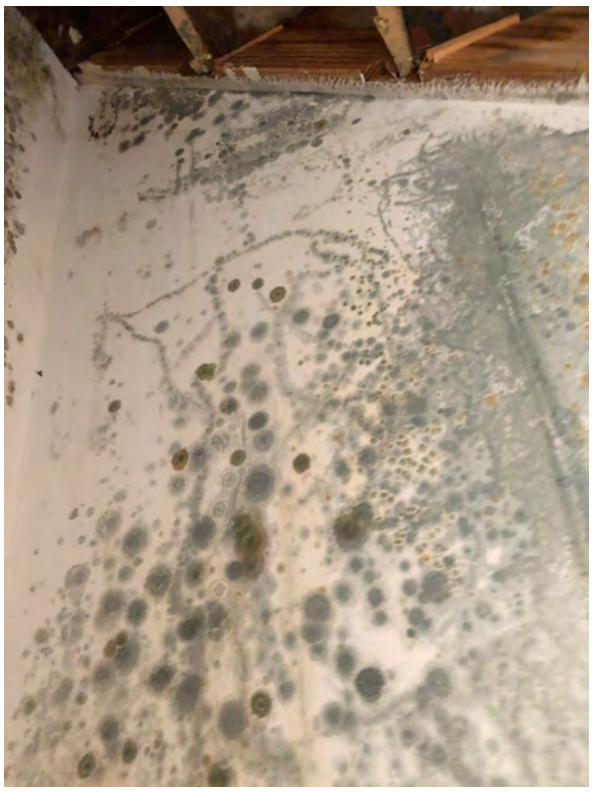
9. The kitchen cabinets: seen better days.




10. The downstairs toilet.

11. The laundry

12. The stairs.



13. The upstairs landing. Chipboard squishy.

14. The upstairs landing looking rearwards / towards bathroom.

15. The upstairs bathroom.

16. The upstairs bedrooms.

17. The chipboard was soggy, spongy and wet, with visible mould growth and rot.