LATROBE VALLEY
ASBESTOS TASKFORCE

ESTIMATING THE VOLUME OF RESIDENTIAL ASBESTOS REMAINING IN THE LATROBE VALLEY

A MODEL

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Executive Summary

Australia's asbestos consumption was so great in the 20th century, it is thought to have had the highest per capita consumption in the world, peaking in the 1970s. As a result, more than 4,000 people die each year in Australia from asbestos-related disease.

A large volume of asbestos remains in the built environment and much of the material is reaching the end of its useful life. Without concentrated efforts to increase community understanding of the potential dire health risks associated with asbestos exposure, more people will succumb to asbestos-related disease.

The Latrobe Valley Asbestos Taskforce initiated this project to determine if a model could be developed to estimate the volume of legacy asbestos remaining in the residential built environment that would provide region-specific results. The purpose was to deliver an informed assessment of the volume of legacy asbestos and the corresponding health risks to the wider Latrobe Valley community. This report presents the results of this undertaking.

Information to support this project was primarily sourced from the Australian Bureau of Statistics Census of Population and Housing. This was complemented by quantitative and qualitative data and studies referenced in various reports commissioned by the Australian Asbestos Safety and Eradication Agency, as well as Geographic Information Systems (GIS)[1] mapping, asbestos audit reports, and wide-ranging consultations with industry professionals, building surveyors and contractors, historians and others.

In contrast to the national average of one in three Australian homes containing asbestos, it was found to be much higher in the regional municipalities investigated, with nearly three in four likely to contain asbestos.

The findings reveal a total of 3,119,599m² of asbestos-containing materials (ACMs) across the Shire of Baw Baw (674,880m²), the City of Latrobe (1,472,407m²) and the Shire of Wellington (972,312m²). The amount of ACMs remaining in the residential built environment is estimated at 18m² per capita, with 74% homes containing asbestos, as shown in Figure 1 below.

In developing the model to estimate the volume of legacy asbestos, it must be noted that the findings present a conservative estimation. A large number of asbestos products were not included in the totals as there was no data available to inform calculations.

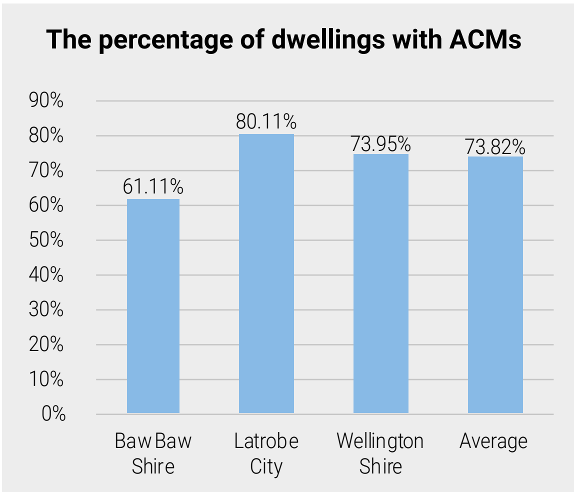


Figure 1. Percentage of dwellings with asbestos-containing materials in Baw Baw Shire, Latrobe City and Wellington Shire

[1] Geographic Information System (GIS) is a framework for gathering, managing and analysing spatial data.

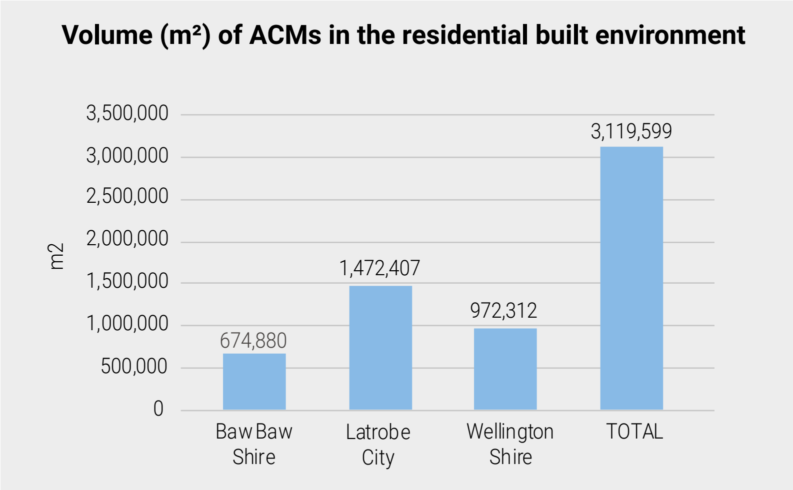


Figure 2. Total Volume (m²) of legacy asbestos-containing materials remaining in the residential built environment in Baw Baw Shire, Latrobe City and Wellington Shire.

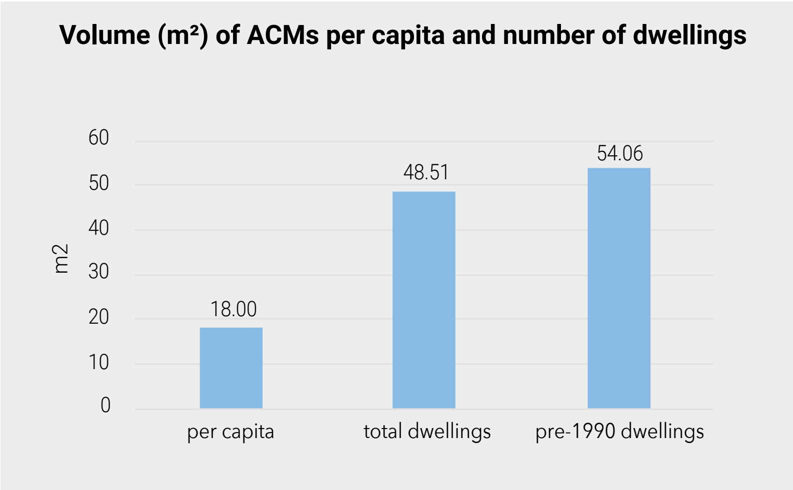


Figure 3. Volume (m²) of asbestos-containing materials by Population, Number of total dwellings, and Number of pre-1990 dwellings

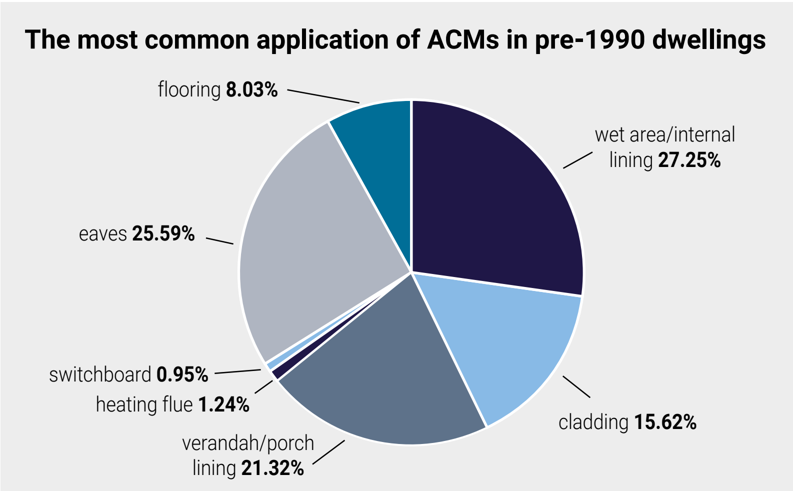


Figure 4. Most common applications of asbestos-containing materials in pre-1990 dwellings

About the Latrobe Valley Asbestos Taskforce

The Latrobe Valley as an industrial region has a long history of asbestos-related issues and the community has a strong awareness of, and concern about, the management and disposal of asbestos waste.

The Latrobe Valley Asbestos Taskforce ("the Taskforce") was commissioned by the Victorian Government in 2019 to undertake a review into how asbestos is managed in the Latrobe Valley, including the safe identification, handling and disposal of asbestos across industrial, commercial and residential sites and locations.

The Taskforce brings together a diverse range of stakeholders including state agencies, local government, workers' representatives and community groups. It aims to bring about consistency, collaboration and improved community engagement and awareness for the management of asbestos.

As detailed in the Terms of Reference[2], the four key functions of the Taskforce are to:

1. Enquire into and report to Government on current asbestos waste handling processes and safety practices within the public and private sector.
2. Design a plan for the management, demolition, transportation and disposal of asbestos for all Latrobe Valley sites and locations.
3. Make recommendations to Government on the way asbestos waste material will be dealt with in a formal and consistent manner.
4. Engage with and inform the community and industry in the Latrobe Valley on the work and progress of the Taskforce.

The Taskforce has a four-year duration and will culminate in March 2023. The Independent Chair of the Taskforce is the Latrobe Health Advocate, Jane Anderson. The Taskforce member organisations are:

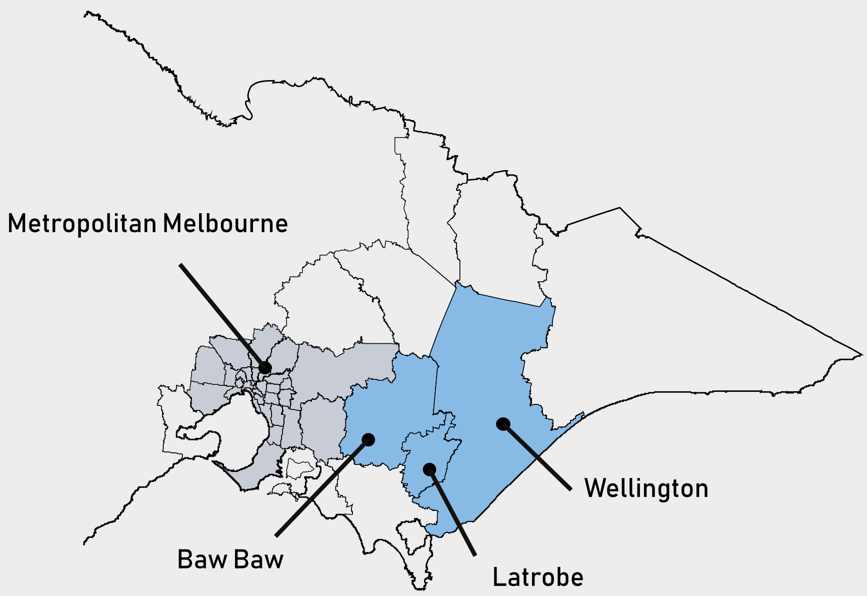
- Department of Environment, Land, Water and Planning
- WorkSafe Victoria
- Environment Protection Authority
- Department of Health and Human Services
- Sustainability Victoria
- Latrobe City Council
- Wellington Shire Council
- Baw Baw Shire Council
- Resource Recovery Gippsland
- Latrobe Valley Authority
- Latrobe Health Assembly
- Asbestos Council of Victoria/Gippsland Asbestos Related Disease Support Group (GARDS)
- Australian Manufacturing Workers Union
- Construction, Forestry, Mining and Energy Union
- Electrical Trades Union
- Australian Workers Union
- Australian Services Union.

[2] Latrobe Valley Asbestos Taskforce Terms of Reference available at https://www.asbestostaskforce.net/terms-of-reference/

Asbestos-related disease

THE THREE “WAVES” OF EXPOSURE

1. Involved in the mining, manufacturing and transportation of asbestos and asbestos products
2. Building and construction workers using products containing asbestos
3. Environmental exposure in workplaces, homes and other buildings (esp. DIY renovators)



The local government areas of Baw Baw, Latrobe City and Wellington in Gippsland, Victoria

Introduction and aims

Understanding the actual volume of legacy asbestos across the broader Latrobe Valley is central to one of the functions specified in the Latrobe Valley Asbestos Taskforce Terms of Reference:

> *Identify the gaps in knowledge of where asbestos is and how it is managed in the Latrobe Valley across all jurisdictions.*

The popularity of asbestos prior to 1990 is well understood, due to its durability, ability to support rapid construction, fire-retardant properties and affordability. Australia was the highest per capita consumer of asbestos-containing materials (ACMs) in the world, with the identified peak occurring in 1975.[3] It was used in more than 3,000 products, many of which remain in the environment today.

The residential sector was identified by the Taskforce as the area with the greatest asbestos legacy knowledge gap. This research project developed from initial enquiries to determine if there was a straightforward way to estimate the ages of residential buildings and the likely usage of ACMs. There wasn't. It is complex, and this was identified by the Asbestos Safety and Eradication Agency (ASEA) in the 2017 National Asbestos Profile as:

> *"Recommendation 1: There is an identified need for more research to gain a better understanding of the amount and location of ACMs in the residential sector."*[4]

It is more important now than ever to understand how much of this dangerous substance is left to deal with in the residential built environment.

In recent years, it has emerged that there is a "third wave"[5] of asbestos victims, who are mostly do-it-yourself (DIY) home renovators.

This is supported by the most recent report from the Australian Institute of Health and Welfare, *Mesothelioma in Australia 2019*, which found that 82% of study participants 'were assessed as having possible or probable exposure in non-occupational contexts', with more than half (51%) undertaking home renovations and 39% living in a home during renovations.[6]

As ACMs are reaching the end of their product lifespan, the old adage "it's fine if you don't touch it" is no longer true. There is a real need for the community to better understand the health dangers of asbestos exposure, for local government to be able to assess the relative risk to residents' health and well-being, and for state governments to understand the magnitude of potential exposure, and measure the relative cost to implement initiatives and programs.

This project aims to identify the likely locations and estimate the quantities of asbestos contained within residential properties across the three local government areas (LGAs) encompassing the broader Latrobe Valley region: Baw Baw, Latrobe City and Wellington (hereafter "the three LGAs"). A secondary purpose is to demonstrate a methodology and produce a set of guidelines that can be transferred to other jurisdictions to produce comparable results in other regions. The developed methodologies can be adapted to suit available data or may even be enhanced by improved methods as more data is obtained and further analysis takes place.

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3 Asbestos Safety and Eradication Agency. (2017). *National Asbestos Profile for Australia.* Australian Government.

4 ibid

5 Finity Consulting. (2016). *The Third Wave – Australian Mesothelioma Analysis & Projection*. Asbestos Safety and Eradication Agency.

6 Australian Institute of Health and Welfare. (2020). *Mesothelioma in Australia 2019*. Australian Government.

Methodology

A desktop assessment of the extent of residential asbestos in Australia yielded some fundamental statistics, which were then employed as the benchmark for this study. These were readily available from a large variety of sources. Such statistics included that one in three Australian homes today contain asbestos in some form,[7] that 25% of new dwellings built before 1960 were clad with asbestos 'fibro-cement',[8] and that 20% of domestic roofs installed before 1976 were asbestos.[9]

The widely-cited British Geological Survey[10] shows minimal asbestos consumption in Australia (apparent consumption = production – exports + imports) from 1990 until the ban came into effect on 1 January 2004. Based on this data, it is reasonable to assume that any residential property constructed post-1990 is free from asbestos-containing materials (ACMs). Due to remaining stocks of ACMs being available after production ceased in 1987, it is also a reasonable expectation that ACMs were used in the construction of residential properties for some years afterwards. Therefore, the validity of using 1990 as the end date for ACM use in residential properties appears sound.

Hence, this study has not conducted any research beyond the year 1990, and the modelling is based on the assumption that the use of ACMs in the building of residential properties ceased in the late 1980s.

Methods included mapping in GIS using historic aerial photographs, analysis of the Australian Bureau of Statistics (ABS) Census of Population and Housing data from 1948 to 1991, and the annual ABS Victorian Year Book from 1940 - 1990 for information on numbers and value of commercial and residential buildings erected. A range of other information was also used from both federal and state government agency websites gained via web searches, location surveys of relevant townships, conversations with licensed asbestos removalists, builders and building surveyors, and asbestos audits of Gippsland properties built prior to 1990 undertaken in the last decade.

This granular (bottom-up + local + field-based) approach is in contrast to the top-down approaches in previous studies that have used aggregated national and international statistics to develop models that are applied more generally.

Census data

From 1948 until 1981 the ABS Census of Population and Housing recorded the primary cladding material of residential buildings in each local government area across Australia. This information made it possible to enumerate the growth of asbestos-clad houses across the three LGAs until 1981. To complete the information gap from 1981 to 1991, a linear projection was taken using the final two data points in the dataset for each LGA.

Donovan and Pickin[11] calculated that 90% of asbestos products in Australia were cement products, with 32% being asbestos cement (AC) sheeting products used in residential buildings, 22% AC sheeting products used in commercial buildings and 36% in cement water pipes. To drill down further

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[7] Asbestos Safety and Eradication Agency. (2017). *National Asbestos Profile for Australia.* Australian Government.

[8] Leigh, J. and Driscoll, T. (2002). Malignant Mesothelioma in Australia, 1945–2002. *International Journal of Occupational and Environmental Health,* 9(3), 206-217.

[9] Finity Consulting. (2016). *The Third Wave – Australian Mesothelioma Analysis & Projection.* Asbestos Safety and Eradication Agency.

[10] British Geological Survey. (2015). World mineral statistics archive. [Dataset].

[11] Donovan, S. and Pickin, J. (2016). *An Australian stocks and flows model for asbestos.* Waste Management & Research, p.6.

to obtain estimates on the volume of AC sheeting used in the residential sector across the three LGAs, the ABS Victorian Year Book was consulted for information on building activity value in Victoria, which from 1940 – 1954 was recorded as "Value of Building permits issued" and from 1955 onwards is recorded as "Total Value of Buildings completed." Dwellings above businesses were counted in the Commercial and Public buildings section. Each ABS Victorian Year Book also provides information on the location of buildings, delineating between the metropolitan area or the "remainder of the state." This enables a regional consumption breakdown. Figure 5 below shows the amount of asbestos consumed in each product group in Victoria.

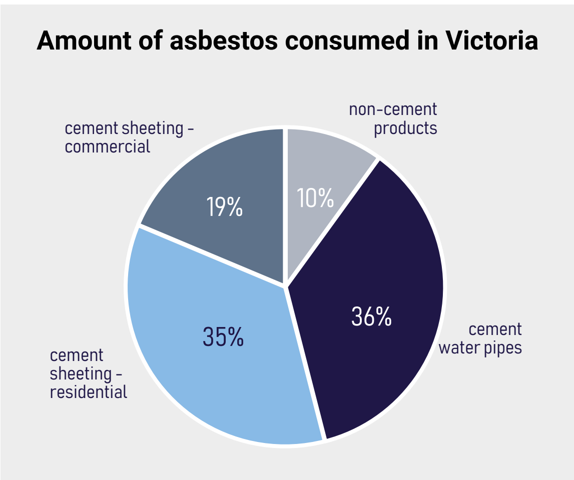

Figure 5. Amount of asbestos consumed in each product group in the State of Victoria until 1990

Geographical Information Systems (GIS) mapping

GIS mapping was undertaken to obtain a spatial representation of where properties likely to contain asbestos are situated in townships. The mapping was used to corroborate other data such as that provided in the ABS Census of Population and Housing, and to help determine the areas in which location surveys would be undertaken.

The GIS mapping was conducted in QGIS[12] using each councils' own current property boundary cadastre and historic township aerial photographs. It is acknowledged that in rural municipalities, more than two thirds of dwellings are situated in the major townships. Due to limitations in funding and time, the scope of the interrogation was rationalised to focus solely on the townships to the geographical extent covered by historic aerial photographs. As a result, 70% of dwellings across the Latrobe Valley region were captured.

Given that historically, aerial photographs were not taken regularly for all townships, the images used were the ones available closest chronologically to 1990. Where there was a significant time lapse in the aerial photographs either side of 1990, the newer aerial photograph has been used to err on the side of caution and provide a slight overestimation of asbestos quantities.

Within the GIS system, a layer was created entitled "Property Likely Asbestos" (PLA) and properties were selected from the current cadastre and added to this layer if they were present in the respective aerial photograph. Properties were not added if they were known to be a current commercial premise. The results returned an overestimate, as it assumed that every property contained ACMs and did not account for the removal of ACMs due to demolition/rebuilding and renovations. Location surveys were then undertaken to determine the likely presence or removal of ACMs to yield more accurate results.

[12] "Quantum GIS": a free, open-source GIS development software package

Location surveys

In order to moderate the results returned by the mapping, visual location surveys of selected townships were conducted via vehicle through the areas identified in the mapping process. Maps of the relevant regions were printed and, as the drive-through was conducted, properties in the PLA layer were highlighted if the dwelling fit any of the following criteria:

1. The old house had been demolished and a new one built.
2. An extensive rebuild had occurred.
3. The house had clearly been built post-1990.

Indicators of the age of the house included style, construction materials, usage of aluminium window frames and similarity of the roofline to that shown in available aerial photographs.

These properties were later electronically removed from the PLA layer. Whilst conducting the visual inspection, the number of properties that appeared to have asbestos cladding, fencing and roofs was noted. Cladding was noted as it is one of the most significant contributors to overall quantity of ACMs used in residential properties. Corrugated asbestos roofing and fencing was noted as it is easy to identify and gives a good indication of the age of the dwelling and the likelihood of other ACMs being present. Admittedly, this process did not account for asbestos tiled roofs as these are more difficult to identify from a distance, nor the presence of internal sources such as floor coverings.

It is important to note that this was a quick-fire way to account for the removal of housing stock posing no risk due to the age of the dwelling and certainly did not constitute an asbestos audit, nor would it have identified every residential building that had undergone either partial or complete ACM removal. The aim was to achieve a rapid, cost-effective cross-reference between the field inspections and the desktop research.

Consultations with industry professionals and others

Members of the Latrobe Valley Asbestos Taskforce, as well as historical societies within each LGA, were consulted to discuss the growth of the region, including the main industries and drivers of growth, and to locate appropriate resources/records that could be useful in the study.

Significant anecdotal evidence was obtained as many of those consulted had lived in the same region for 40-plus years. There was much discussion about their own experiences with asbestos, including memories of where they and their own parents encountered and dealt with it, as well as local lore and resources including maps.

Building surveyors from the era and licensed asbestos removalists operating within the Gippsland region were consulted regarding period construction techniques and the popularity and incidence of asbestos in different areas of the house; said one “it was just everywhere.”

Below is a photograph of a typical prefabricated house shipped from England for Victorian Railway workers. Similar houses, which contained large amounts of asbestos, were constructed across the Latrobe Valley by the State Electricity Commission, Australian Paper Mills, and the Housing Commission throughout the 1940s, ‘50s and ‘60s.

Pre-1990 dwelling asbestos audits

A review of 134 asbestos audits of dwellings built prior to 1990 conducted between August 2018 and January 2020 across the Gippsland region was undertaken. Of these, 45 identified no ACMs and it was later confirmed using aerial imagery that 34 of these were built post-1988 and nine between 1970 and 2002. Of the remaining two, one could not be found on any imagery and the other appeared to have been built between 1955 and 1970.

Of the 89 audits where ACMs were identified, these corroborated and supported information provided by building surveyors, licensed asbestos removalists and members of local historical societies regarding the quantity and location of ACMs in residential properties from different periods.

A model house for each decade

To produce the most accurate results to estimate the volume of legacy asbestos in the Latrobe Valley region, it was an important part of this process to gather as much data as possible on all types of ACM usage in residential buildings.

To formulate a method for calculating the volume of legacy asbestos, it was necessary to develop a model house to produce best estimates of commonly used ACMs in each part of the home. Flats, apartments, units etc. were excluded in the development of the model house because they account for less than 7% of all dwellings across the three LGAs over the period to 1990. In a metropolitan region with much higher proportions of such housing types, it could be beneficial to create individual models for each type of residential building. However, as they count as dwellings, they are included in the totals. This is because, according to consultations with licensed asbestos removalists, there was negligible difference in usage patterns of ACMs between the various types of residential buildings.

The model house differs in each decade due to housing trends; from smaller rooms to larger rooms within the home, an increase in the number of rooms within the home, and the rise in popularity of the second bathroom/ensuite.

There was no accessible ABS data that provided information on the average size of houses in Victoria. McMullan and Fuller, in their article *Spatial growth in Australian homes (1960 – 2010)*[13] identify that in the 1960s, the average sized home in the regional Victorian town of Highton, a suburb of Geelong, was 113m², and two decades later it was 170m². However, the area of each house in McMullan and Fuller's study did not include "porches, verandahs, carports, garages, sun rooms or sheds", which were popular areas for the usage of ACMs. It was therefore necessary to develop another model for the Latrobe Valley region.

To develop a bona fide model, a number of data sources were analysed to create the model house constructed in each decade. This included ABS housing data for each local government area, asbestos audit reports on homes built prior to 1990, and the examination of roof lines using aerial photographs. It was determined that the best way to sort the data was to align each decade as closely as possible to the corresponding census years. As a result, a pre-1947 model house was developed, then a 1950s model for the post-war period from 1948 – 1961, followed by a 1960s, 1970s and 1980s model house.

[13] McMullan, M. and Fuller, R.. (2015). Spatial growth in Australian homes (1960–2010), *Australian Planner*, 52:4, 314-325.

Using various available data sets, the vast majority of ACMs in the residential environment were found in 10 prevailing locations:

1. Exterior cladding
2. Heating flues
3. Internal wall and roof linings, especially wet areas
4. Eaves linings (including soffits[14])
5. Verandah and/or porch linings
6. Switchboard backings
7. Flooring (vinyl tiles, backing materials, carpet underlay and AC sheet)
8. Wall and roofing material of outbuildings
9. Cement sheet fencing
10. Cement sheet and tile (including 'decromastic') roofing.

Field surveys and consultations with builders and licensed asbestos removalists identified that the quantities of fencing and ACM roofing were negligible within the study area (less than 0.1% of the total) compared to the other areas. Therefore, these areas were omitted from further analysis.

The area of exterior cladding was based on the calculated surface area of the walls of the model house, less the void area of windows and doors. External doors were taken as a standard 1.67m² area. The number of doors was based on floor plans of median houses from each decade as depicted in McMullan and Fuller.[15] The window area was calculated based on the area of a standard 1.8m x 2.1m window, common in houses from the 1980s, then taking an average of field measurements of window areas for pre-1947 houses (0.9m x 1.6m) and applying a linear growth rate to obtain window sizes for the interim decades. The number of windows was the sum of main rooms in the model house (bedrooms, kitchen, living areas, study) plus one to account for the smaller and/or lack of windows in bathrooms, toilets and laundries. External wall height was averaged at 2.5m for all models.

Heating flues had an average length of 3m, and prevalence ranged from 60% of dwellings with ACM heating flues in the 1950s/60s to 5% in the 1980s.

Internal asbestos cement (AC) sheeting used as wall linings was split into six categories:

1. Bathroom
2. Toilet
3. Laundry
4. Kitchen
5. Heater infills
6. Other.

Within each period, each of the six categories were averaged individually and then added together. The "Other" category was difficult to calculate. Builders and licensed asbestos removalists recalled houses where the entire interior lining was AC sheet, and others with none at all. This was also reflected in the asbestos audits, which revealed three different dwellings with large areas of AC wall lining in the bedroom ceiling, lounge walls and dining room walls.

Acknowledging the difficulty in determining a reliable average from such a small sample, estimates from licensed asbestos removalists were applied instead; these estimated a constant 4m² of ACM internal lining in the "Other" category over all periods, with the proportion of houses varying from 0% in the pre-1947 model house to 70% in the 1960s model house and 20% in the 1980s model. Porch areas averaged to the

[14] The underside of any exposed architectural elements such as an arch, balcony, beam or overhanging eaves.

[15] McMullan, M. and Fuller, R.. (2015). Spatial growth in Australian homes (1960–2010), *Australian Planner*, 52:4, 314-325.

equivalent of a porch running along one side of the building. Thus, the eaves complete the other three sides of the building. The average width of a porch was 1.2m for the pre-1947 house and 1.8m for all other models. Eaves were 0.3m wide for the pre-1947 model house and 0.45m for all other models (i.e. standard eave widths).

According to builders and licensed asbestos removalists, ACMs in switchboard backings were nearly ubiquitous, with some submitting that 100% of switchboards installed prior to 1990 would have contained ACMs. The asbestos audits returned a much-lower-than-expected figure of 17% of residential buildings with asbestos in the switchboard. The average of amounts provided by licensed asbestos removalists, builders, building surveyors and asbestos audits was used to the effect that switchboards with ACMs were taken to be in 80% of dwellings built pre-1947, in 100% of dwellings built from 1948 until 1981 and 50% of dwellings built from 1982 until 1991. Switchboard size averaged at a constant 0.5m² across all models.

Very little data was available regarding the quantities and prevalence of ACMs in flooring products. Investigating this segment was also difficult because of the large variety of ACM flooring products available (carpet underlays, vinyl tiles, tile glues and mastics, cement sheeting etc.) and the high likelihood of these products being covered by a new flooring layer during renovations as opposed to being removed. This means that they are often not detected during asbestos audits. Only two of the sighted asbestos audits recorded detection of ACM flooring products. Estimates from builders and licensed asbestos removalists suggested an area range between 10-15m² per dwelling, and approximate application in 40% of dwellings between 1948 and 1971 and 20% of dwellings in other periods. In the absence of available data, these figures were used in calculations.

The illustrations on the following pages show a typical home for each decade, and include the key areas where ACMs were used and the average amount (measured in m²) of these products or ACMs.

The pre-1947 model house

Avg. floor area	90.0m²
Bathroom	4.5m²
Laundry	2.0m²
Verandah/porch	11.4m²
Eaves	8.5m²
Doors	3.34m²
Windows	5.76m²

The average house from the 1940s was typically in the style of the 'Californian bungalow', and has five rooms, including a living area, two bedrooms, a kitchen, one bathroom, and a laundry attached to the back of the house.

The 1950s post-war model house (1948 – 1961)

Avg. floor area	100.0m²
Bathroom	5.0m²
Laundry	3.0m²
Verandah/porch	15.0m²
Eaves	13.5m²
Doors	5.01m²
Windows	10.76m²

The 1950s model house has six rooms including a living area, kitchen, three bedrooms, one bathroom, an inside toilet and an internal laundry.

The 1960s model house

Avg. floor area	113.0m²
Bathroom	5.0m²
Laundry	5.0m²
Verandah/porch	219.1m²
Eaves	14.35m²
Doors	6.68m²
Windows	16.58m²

The 1960s model house has nine rooms including a living area, dining area, kitchen, three bedrooms, one bathroom and an internal laundry.

The 1970s model house

This decade saw the rise in popularity of the second bathroom/ensuite and the inclusion of a rumpus room. The 1970s model house has 10 rooms including two living areas, a kitchen, four bedrooms, and one combined toilet/bathroom.

Avg. floor area	*154m²*
Bathroom	*7.5m²*
Laundry	*8.0m²*
Verandah/porch	*22.34m²*
Eaves	*16.75m²*
Doors	*6.68m²*
Windows	*26.17m²*

The 1980s model house

The 1980s model house has 12 rooms including two living areas, a kitchen, a study, a dining area, four bedrooms, a main bathroom, an ensuite bathroom, a separate toilet and a laundry.

Avg. floor area	*170.0m²*
Bathroom	*8.0m²*
Laundry	*6.0m²*
Verandah/porch	*23.47m²*
Eaves	*17.6m²*
Doors	*6.68m²*
Windows	*34.02m²*

Outbuildings

Since information on ACM usage in outbuildings was not available by the decade, this segment was considered on its own over the entire period to 1990 for the three LGAs.

Within each LGA, a selection of residential properties considered to be typical were selected for analysis. In Latrobe, a sample of 74 properties from Morwell and 46 from Moe were analysed; in Baw Baw two samples from different areas of Warragul of 49 and 57 properties, and in Wellington one sample of 59 from Maffra and another of 52 from Sale. Using aerial imagery, the average number and area of sheds, outhouses, carports and any other structure that was not the primary dwelling on the property was calculated. The area measurement tool in the GIS program was used to make area measurements.

In order to determine the proportion of outbuildings constructed using ACMs, a set of maps produced by the Traralgon Water Authority currently in the possession of the local historical society proved useful. These maps, although originally published circa 1962, detail the construction material of every building within the contemporary bounds of Traralgon, making it possible to calculate the percentage (20%) of outbuildings constructed using ACMs. In the absence of other data, this percentage was applied to all three LGAs.

To account for open sheds and carports, and for outbuildings not entirely clad with ACMs, outbuildings were considered to have two walls 7 feet (2.13m) high as well as a flat roof.

Limitations

Unfortunately, it is not possible to account for all asbestos used in the residential built environment. In some circumstances, the testament of industry professionals and others has been used to inform estimates where no recorded data was available. While there is some data available broadly on a national scale, it is apparent that there is a vast amount of geographical/spatial variability in asbestos usage in Australia.

Due to a lack of available data or minimal instances of use in the residential environment, the following items have been excluded from the volume calculations in this study:

- Asbestos cement utility water pipes
- Asbestos cement fencing
- Asbestos roof tiles
- Asbestos guttering/downpipes
- Asbestos insulation
- Asbestos lagging (also known as asbestos rope)
- Corrugated asbestos cement roofing.

ACM roofing, including asbestos-containing cement tiles, corrugated cement sheeting and 'decromastic' roofing was an exclusion of some note. While AC tiles were not uncommon, building surveyors and licensed asbestos removalists did not report encountering decromastic roofing and there was no reference to this product in any of the asbestos audits reviewed.

Decromastic roofing is a pressed, galvanised sheet product with a bituminous (and sometimes asbestos-containing) mastic on the outward facing side that offers a tiled appearance. Only one licensed asbestos removalist mentioned this product and said it was not common. It is possible that due to the similarity in appearance to tiled roofs, the use of asbestos-containing decromastic roofing is not well known. It is also worth noting that decromastic roofing, whether asbestos-containing or not, was sometimes used to cover corrugated asbestos cement roofing. Further research into this area could enhance the accuracy of results and would increase the estimated volume of total ACMs.

Two major discrepancies in the data were noted. Firstly, data from the asbestos audits revealed only 16% of dwellings built before 1990 have asbestos-containing flues, whereas overwhelming evidence from builders and removalists placed this value closer to 50%.

Secondly, the asbestos audits data reported the proportion of ACMs in switchboards to be 17%, in contrast to builders and licensed asbestos removalists who consistently submitted that this number is between 75% and 100%. It is possible that a large proportion of switchboards have been upgraded since their original installation, particularly with the introduction of smart meters and solar installations that require changes to the switchboard itself and may have prompted the removal of ACM backings. On the balance of probability, and the basis that it is better to overestimate rather than underestimate quantities of ACMs, the values used in the calculations were at the upper margins of the ranges.

Further, the "Other" internal linings is difficult to quantify because of the immense variability from dwelling to dwelling. Analysis of a much greater number of asbestos audits may provide more precise data.

The most common forms of asbestos-containing materials are taken from the list published on the Asbestos Victoria website[16] and can be found in the Appendix.

[16] www.asbestos.vic.gov.au

Residential asbestos in the Shire of Baw Baw

The Shire of Baw Baw today has a population of 53,396, and its major towns are Drouin and Warragul. Other large townships are Trafalgar, Longwarry and Yarragon. The Shire of Baw Baw was formed in 1994 as a result of the amalgamation of the Shires of Buln Buln and Narracan, the Rural City of Warragul and parts of the Shire of Upper Yarra.

The shire covers an area of 4,025 km², bounded by the municipalities of Cardinia Shire to the west, South Gippsland Shire to the south, Latrobe City to the east and Wellington Shire to the north-east. The Mansfield and Yarra Ranges Shires are to the north via the heavily forested and little inhabited northern half of the Baw Baw Shire, which sits in the foothills of the Great Dividing Range and comprises mostly state and national parks with some managed logging and farming.

The major industries are – and for much of the area's history have been – forestry, beef and dairy farming, and intensive potato farming in the south around the township of Thorpdale. In recent years, the major towns have expanded rapidly, and ease of access to Baw Baw Shire from Melbourne has encouraged a growing tourism trade; the region is highly regarded for its gourmet food scene.

Due to the growth experienced after WWII leading into the 1960s, the Housing Commission built several estates in the larger townships across Baw Baw Shire. The largest of these was in Warragul, with a little over 500 dwellings built between the end of WWII and 1990. ACM use was high in these houses due to affordability.

Asbestos cladding was also popular in bushfire-prone areas such as Noojee, where it was considered to be effectively fireproof. Companies such as James Hardie targeted advertising campaigns based on this selling point from as early as the 1920s. Furthermore,

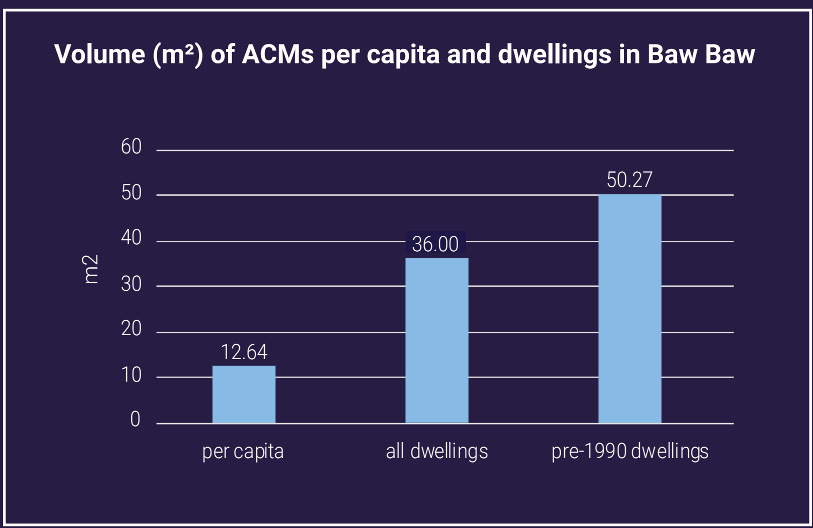

Figure 6. Volume (m²) of asbestos-containing materials in the Shire of Baw Baw by Population, Total number of dwellings, and Number of pre-1990 dwellings

after the devastating fires of 1939, which burnt two million hectares through the Strzelecki Ranges, the Yarra Ranges and the Australian Alps and razed several towns including the townships of Noojee, Hill-End and Nayook West in the study area and the townships of Matlock, Omeo and Woods Point in surrounding regions, planning schemes were generally amended so that dwellings constructed in bushfire-prone areas were required to have outer walls constructed from fire-resistant material. As a result, some townships exhibit unusually high proportions of asbestos-clad houses. In the case of Noojee, this is approximately 50% of houses built before 1990.

Adapted methodology

GIS analysis considered the 12 largest townships covered by aerial imagery from around 1990. The townships considered were Buln Buln, Darnum, Drouin, Erica/Rawson, Longwarry, Neerim South, Noojee, Trafalgar, Walhalla, Warragul, Willow Grove and Yarragon. These townships accounted for 51% of the population and 52% of dwellings in the shire as at 1991.

Aerial photographs used for different townships were from the years 1988, 1990, 1991, 1998, 2001 and 2002. Use of the later aerials was justified using ABS Census data from 1991[17] and 2001[18] which showed minimal growth in the shire (less than nine houses per month) over that decade.

Location surveys were conducted in all towns considered in the GIS analysis with the exception of Drouin.

[17] Australian Bureau of Statistics (1991). Census of Population and Housing; Census Counts for Small Areas (ABS Publication 2101.0). Australian Government.

[18] Australian Bureau of Statistics. (2001). Census Community Profiles Baw Baw Shire (S). Australian Government.

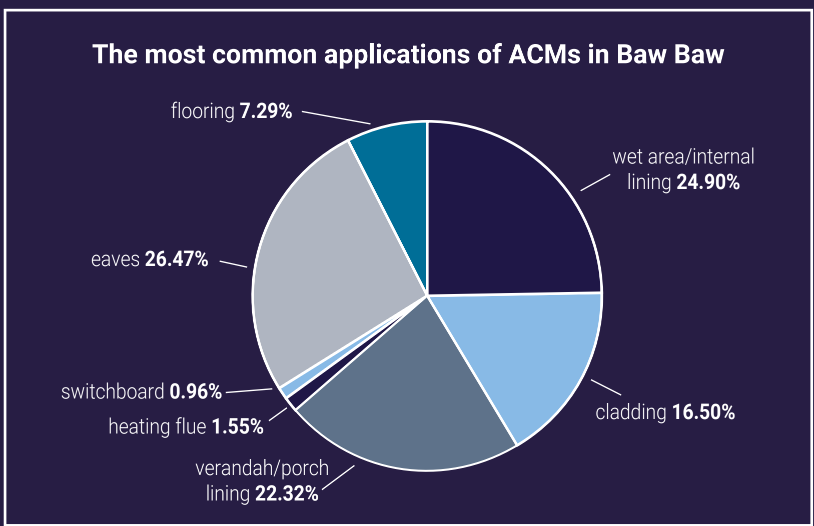

Figure 7. Most common applications of asbestos-containing materials in pre-1990 dwellings in the Shire of Baw Baw

Results

ABS data from the 1991 census postulated 13,424 dwellings existing in Baw Baw Shire at that time. This number includes rural dwellings which were not captured in the mapping. The GIS analysis rendered 10,040 dwellings, and while this number only accounts for townships, it ought to be noted that due to the use of post-1990 aerial photographs in the absence of 1990 aerial photographs, it is an overestimate of ACM-containing dwellings within those townships. This mapping exercise also gave a spatial representation of the distribution of likely ACM-containing houses in the major townships. It was found that 77% of PLA was in the three largest townships of Drouin, Warragul and Trafalgar.

In contrast to the national estimate that 25% of houses built before 1960 are asbestos-clad,[19] in Baw Baw Shire the figure is 20.4% (Latrobe City 15.9%, Wellington Shire 39%). This is likely due to proximity to timber resources.

Location surveys

After conducting location surveys, it became apparent that data based on national averages was heavily skewed regionally - for instance, the statistic that 20% of roofs installed before 1976 were asbestos.[20] It was observed in the field that the vast majority of older roofs in the Shire of Baw Baw were corrugated iron. In fact, in a drive-through of nine minor townships[21] only five corrugated asbestos roofs were counted.

Anecdotal evidence from local historical societies purported that ACM roofs were not considered desirable and that houses were generally only built with ACM roofs when supply of other roofing products could not meet demand. It was claimed that ACM roofs that were installed were quickly replaced with other products as soon as budget and/or supply permitted.

The location surveys also revealed that in fire-prone areas such as the township of Noojee, approximately 50% of dwellings built before 1990 were constructed using asbestos fibre-cement cladding. As these remote areas have seen little in the way of development, many of these ACMs remain in place.

Volume of asbestos-containing materials and the most common applications

The results for Baw Baw returned the least amount of asbestos by every metric: in absolute terms, and relative to the other LGAs as measured by ACMs per capita, per dwelling and per dwelling built prior to 1990.

Calculation yielded a total of 674,880m² of ACMs in the residential built environment in the Shire of Baw Baw.

Baw Baw Shire has always had the smallest population and amount of housing stock of the three LGAs. The small quantity per capita and per dwelling as shown in Figure 6 is the result of the huge growth experienced in the Shire since 1990, which has seen the population nearly double in 30 years. The small amount of ACM per dwelling built prior to 1990 is due to Baw Baw Shire not experiencing the kind of explosive growth that can be seen in Latrobe and Wellington between the end of WWII and 1960. This was when ACMs were at

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[19] Leigh, J. and Driscoll, T. (2002). Malignant Mesothelioma in Australia, 1945–2002. *International Journal of Occupational and Environmental Health,* 9(3), 206-217.

[20] ibid

[21] Townships included Yarragon, Darnum, Erica, Rawson, Willow Grove, Longwarry, Noojee, Neerim South and Buln Buln.

their most popular in residential applications such as in the lining of entire laundries and toilets.

Eaves accounted for the greatest usage of ACMs in Baw Baw Shire, accounting for 26% of usage, followed closely by wet areas/internal linings at 24%, then verandah/porch linings at 22%. Cladding accounted for 17% of ACM use, and flooring 7%. Switchboard backings and heating flues accounted for a combined 3.0%. The overall split of applications was similar to that seen in Latrobe and Wellington, although Latrobe exhibited less use in outbuildings with a greater proportion in wet areas, internal linings and eaves.

Figure 7 on page 19 shows the most common application of ACM products in pre-1990 dwellings in the Shire of Baw Baw.

ACMs in outbuildings in Baw Baw Shire accounted for 25% of total ACM usage in the shire. The calculated quantity was 171,633m². This accounted for 6% of total ACM use and 27% of ACMs in outbuildings across the three LGAs.

Figure 8 below shows the average number of outbuildings per residential property and the volume of ACMs in Baw Baw Shire.

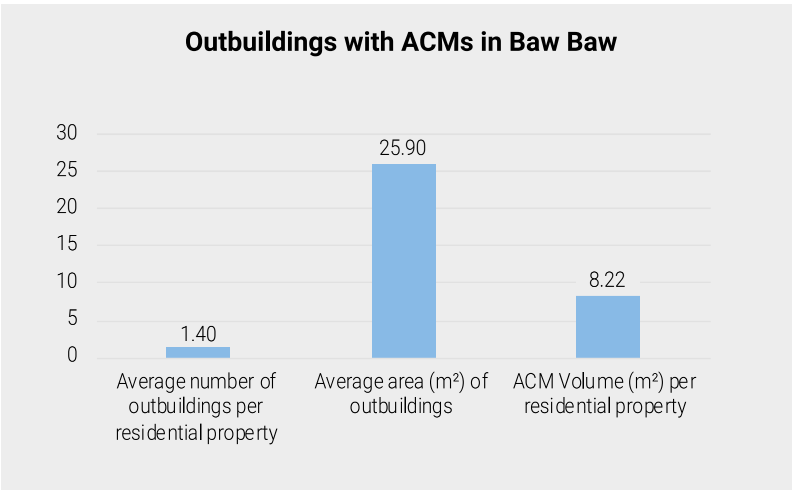

Figure 8. Average number of outbuildings and the Volume of asbestos-containing materials in outbuildings in the Shire of Baw Baw

Residential asbestos in the City of Latrobe

The City of Latrobe today has a population of 75,561 and its major towns are Traralgon, Moe, Newborough and Morwell. Other large townships include Churchill and Yallourn North. Latrobe City was formed in 1994 from the amalgamation of the Cities of Moe, Morwell, and Traralgon, the Shire of Traralgon, and parts of the Shires of Rosedale and Narracan. The municipality covers an area of 1,422 km², bounded by Wellington Shire to the north and east, South Gippsland Shire to the south and Baw Baw Shire to the west.

The majority of the population (78%) lives in the major towns along the freeway transport corridor and train line. These townships are heavily industrialised and support the Maryvale Papermill and the various Latrobe Valley power stations, which have heavily influenced much of the growth and development of the Latrobe Valley. Other industries within the area include forestry, beef and dairy farming, tertiary education and government administration. Historically, population growth in the region exploded between 1920 and 1960, followed by slower but nonetheless rapid growth to the early 1990s. This huge growth was mainly associated with the activity of the State Electricity Commission (SEC) and the Australian Paper Mill (APM), now known as Australian Paper. Deposits of brown coal led to the construction of power stations, which at their peak provided 80% of Victoria's power supply for more than 90 years. APM developed the Maryvale site to take advantage of cheap power, wood and water supplies, access to transportation routes and a ready availability of workers. Both the SEC and APM were active in providing housing for workers, the vast majority of which still stands. Victorian Railways also built housing for rail workers in the main towns, close to the depots and stations.

In 1946 the Housing Commission took over responsibility for meeting housing demand, leading to the construction of large Housing Commission estates

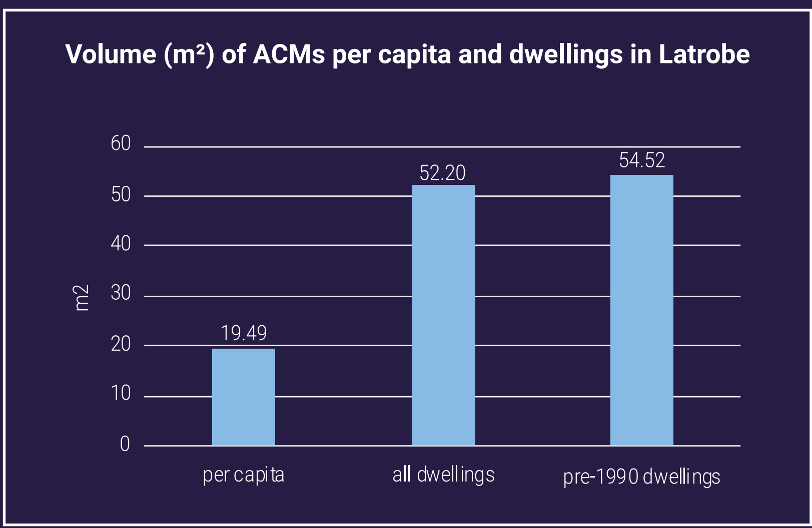

Figure 9. Volume (m²) of asbestos-containing materials in the City of Latrobe by Population, Total number of dwellings, and Number of pre-1990 dwellings

in many townships. In Latrobe, between 1947 and 1982 this totalled nearly 5600 dwellings, which equates to 34% of housing built in that period. The vast majority of these were built in Moe, Newborough, Morwell, Traralgon and Churchill; in fact, Churchill was entirely planned and built by the Housing Commission to be a dormitory suburb for SEC workers. In some areas, entire neighbourhoods of 1950s and 1960s commission homes can be found clad entirely with brightly coloured AC 'Shadowline' sheet.

APM built homes for plantation and papermill workers, with nearly 3000 houses built in Traralgon between 1930 and 1961 and several hundred more in Morwell, including 200 temporary "bachelor huts" to meet housing demands.

ACM construction was also popular in the heavily wooded and bushfire-prone southern and northern reaches of the shire. An example is the township of Toongabbie, where approximately 25% of dwellings built prior to 1996 are asbestos-clad.

Although timber was the most popular residential building material, followed by brick veneer, Latrobe had the most ACMs of the three LGAs due to the sheer volume of housing built, particularly in the period from 1947 to 1961. This was when asbestos was still generally considered to be a wonder product and thus was abundant in its many forms in the residential built environment.

Adapted methodology

GIS analysis considered the 12 largest townships covered by aerial imagery from around the 1990 era. The townships considered were Boolarra, Churchill, Glengarry, Moe, Newborough, Morwell, Toongabbie, Traralgon, Traralgon South, Tyers, Yallourn North and Yinnar. These townships accounted for 80% of the population and 84% of dwellings in the LGA as at 1991.

Aerial photographs used for different townships were from the years 1987, 1988, 1995 and 1996.

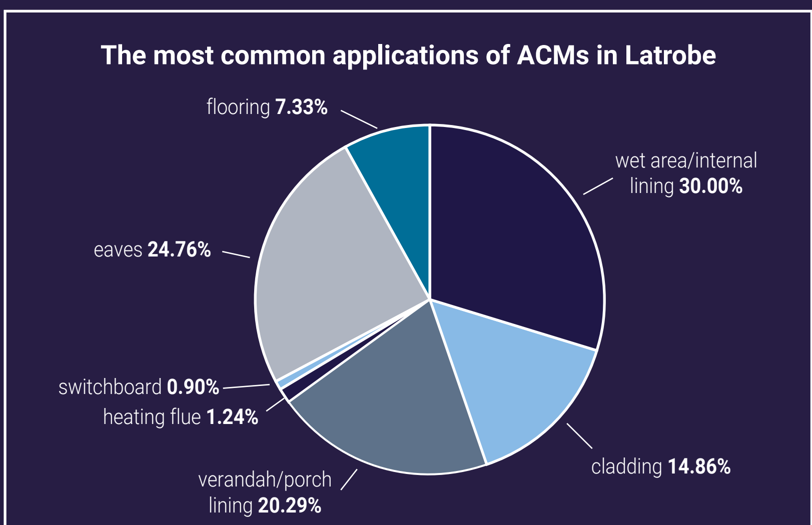

Figure 10. Most common applications of asbestos-containing materials in pre-1990 dwellings in the City of Latrobe

Use of the later aerials was justified using ABS Census data from 1991[22] and 2001[23] which showed minimal growth in the region (less than 15 houses per month across the LGA) over that decade.

Results

As at 1990 there were 27,008 dwellings in Latrobe City, which also includes rural dwellings that were not captured in the mapping. As there was no aerial imagery taken in 1990 for a number of towns,[24] aerial photographs from 1995 and 1996 were used. The GIS analysis accounted for 27,500 dwellings in the PLA layer using this approach. This higher than expected number highlights the importance of moderating any overestimates through "on the ground" location surveys to more accurately inform the analysis. The mapping exercise also gave a spatial representation of the distribution of dwellings with likely ACMs in the major townships. It was found that 95% of PLA was in the five largest townships of Moe, Newborough, Morwell, Traralgon and Churchill.

Latrobe City returned the lowest percentage of houses built before 1960 with ACM outer walls across the three LGAs. At 15.9% it is well below the national estimate of 25% of all houses built pre-1960 being asbestos-clad (Baw Baw 20.4%, Wellington 39%). This ratio is low despite it having the largest consumption, seemingly due to ease of access to – and scale of – local timber resources. This led to a majority of houses being of timber construction.

Location surveys

Location surveys were conducted in Moe, Newborough, Morwell, Traralgon, Toongabbie and Glengarry, with similar observations made to those in the Baw Baw Shire regarding the prevalence of ACM roofing and fencing. According to a local historical society, the reason for it being so minimal was that ACM roofs were not considered desirable. Another local source brought attention to decromastic asbestos roofs that replaced 'Super 6' asbestos roofs on SEC housing in Moe-Newborough in the 1970s. The identification of decromastic roofs was not counted in the location surveys, as the potential presence of this roofing item was not known at the time.

Much like in Noojee, it was noted that in fire-prone townships such as Toongabbie, asbestos cladding was very popular with approximately 25% of dwellings built using ACMs as the primary cladding material. Note that 1996 is the threshold for Toongabbie, as this was the age of the available aerial imagery for the township. However, given that the production of ACMs ended in 1987, it is thought unlikely that any dwellings post-1990 were built with asbestos cladding.

Volume of asbestos-containing materials and the most common applications

Since the period immediately following WWII, Latrobe City has maintained the largest population and the largest residential property stock of the three LGAs, which correlates with the large quantity

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[22] Australian Bureau of Statistics (1991). *Census of Population and Housing; Census Counts for Small Areas* (ABS Publication 2101.0). Australian Government.

[23] Australian Bureau of Statistics. (2001). Census Community Profiles Latrobe City (C). Australian Government.

[24] Boolarra, Churchill, Glengarry, Toongabbie, Tyers, Yallourn North and Yinnar.

of ACMs remaining in residential buildings in the Shire. The high proportion of ACMs per capita and per dwelling are the result of the slow population growth in the 30 years since 1990. The large quantity of ACMs per dwelling constructed prior to 1990 is largely due to the coincidence of explosive peak growth in the LGA and the peak popularity of ACMs as a building product throughout the 1950s and 1960s. In contrast to the other LGAs, the majority of ACM consumption is in these decades. This also means that, on the whole, asbestos stocks in Latrobe City's residential properties are older than in the other two LGAs.

Latrobe City displayed the most asbestos overall, with a total of 1,472,407m² of ACMs in the residential built environment. However, in terms of quantities per capita, per dwelling and per dwelling built prior to 1990, Latrobe sits between the shires of Wellington and Baw Baw. Population growth since 1990 slower than that in Baw Baw Shire, but faster than that in Wellington Shire, has no doubt contributed to this.

The most common application of ACMs in Latrobe City were found in wet areas/internal linings at 30%, followed by eaves at 25% as shown in Figure 10 on page 23. This was driven to a large extent by wet area linings in toilets and laundries, which were especially common throughout the 1950s and 1960s; exactly when Latrobe was experiencing its largest growth period.

Otherwise, the split of ACMs between different applications followed a similar pattern to Baw Baw and Wellington, with cladding representing 15%, flooring representing 7% and switchboard backings and heating flues a combined 2%.

ACMs in outbuildings in Latrobe City accounted for 13% of total ACM usage in the City. The calculated quantity was 196,926m². This accounted for 6% of total ACM use and 31% of ACMs in outbuildings across the three LGAs.

Figure 11 below shows the average number of outbuildings and the volume of ACMs in outbuildings in Latrobe City.

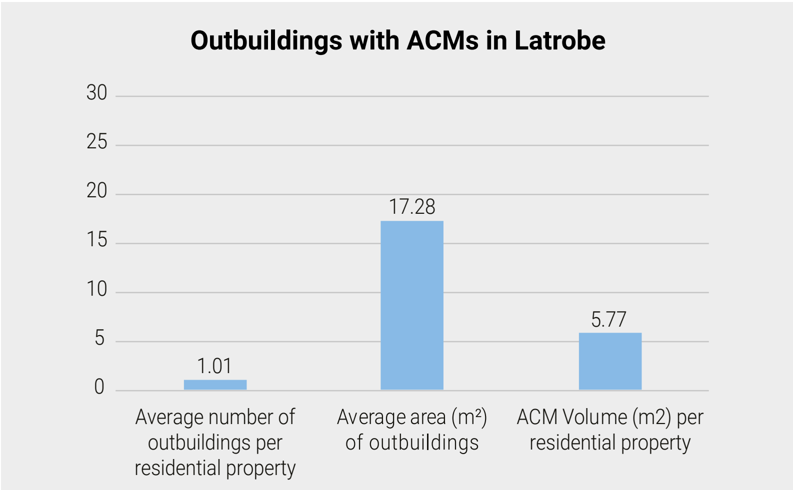

Figure 11. Average number of outbuildings and the Volume of asbestos-containing materials in outbuildings in the City of Latrobe

Residential asbestos in the Shire of Wellington

The Shire of Wellington today has a population of 44,380 and its major population centre is Sale. Larger townships include Maffra, Yarram, Stratford, Heyfield and Loch Sport. Wellington Shire was formed in 1994 as the result of an amalgamation of the shires of Alberton, Avon, Maffra, the City of Sale and parts of the Shire of Rosedale.

Wellington Shire covers an area of 10,811 km², bounded by the municipalities of South Gippsland Shire, Latrobe City, Baw Baw Shire and Mansfield Shire to the west, Alpine Shire to the north and East Gippsland Shire to the east. The northern half of the shire reaches into the Great Dividing Range and comprises mostly state and national parks with a large amount of managed logging.

The major industries are – and for much of the area's history have been – forestry and agriculture especially beef and dairy farming. Oil and gas have generated much economic growth since the 1960s, dropping off since the 1990s. The larger population centres have developed as commercial and service providers for the surrounding agricultural operations. Tourism to the alpine regions in the north and to the coastal regions in the south and east is also significant.

Due to the growth experienced after WWII leading into the 1960s, the Housing Commission built several estates in the larger townships across Wellington Shire. The largest of these was in Sale, with just over 850 dwellings built between the end of WWII and 1990. ACM use was high in these houses for reasons of affordability.

As occurred in the Shire of Baw Baw after the 1939 fires devastated the region, planning schemes were amended so that properties constructed in bushfire-prone areas were required to have outer walls constructed from fire-resistant material. This is why asbestos cladding was so popular in the heavily forested northern half of Wellington Shire, where it was considered to be effectively fireproof. As a result, townships

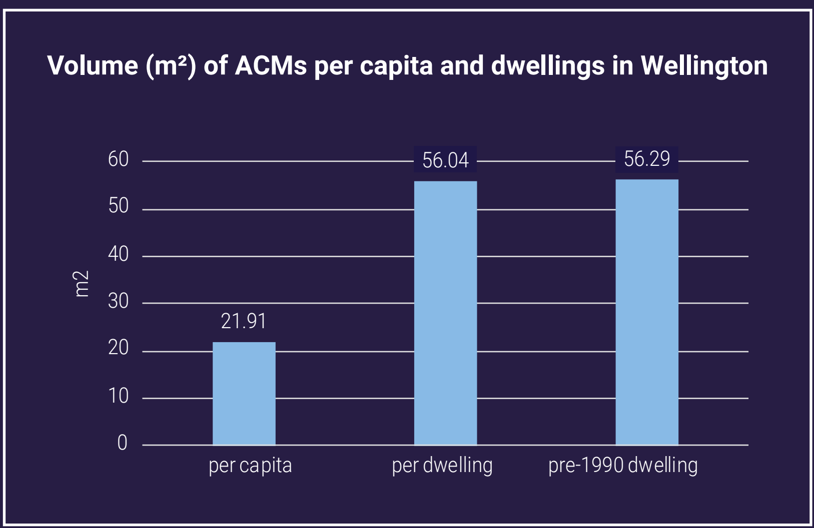

Figure 12. Volume (m²) of asbestos-containing materials in the Shire of Wellington by Population, Total number of dwellings, and Number of pre-1990 dwellings

such as Coongulla exhibit high proportions of asbestos-clad houses (20% - 40%), as reported by locals and verified via a virtual Google Earth drive-through.

From the 1950s onwards, hundreds of holiday homes were built along the Ninety Mile Beach in townships such as Seaspray and Loch Sport. These holiday homes were built as simply and cheaply as possible, meaning that asbestos cladding was extremely common.

The 1966 Census of Population and Housing exhibits an extremely high incidence of houses in the (then separate) shires of Avon, Alberton and Maffra with ACM outer walls. These covered the southern coastal and northern forested regions of the shire, further supporting that ACM usage was driven by its low cost and fire-retardant properties.

Adapted methodology

GIS analysis considered the 10 largest townships covered by aerial imagery from around 1990. The townships considered were Heyfield, Loch Sport, Maffra, Briagolong, Port Albert, Rosedale, Sale, Seaspray, Stratford and Yarram. These townships accounted for 66% of the population and 61% of dwellings in the LGA as at 1991.

Aerial photographs used for different townships were from the years 1975, 1979, 1983, 1987, 1988, 1991 and 1999. Use of the later aerials was justified using ABS Census data from 1991[25] and 2001[26] which showed minimal growth in the region (less than 7 houses per month) over that decade.

[25] Australian Bureau of Statistics (1991). *Census of Population and Housing; Census Counts for Small Areas* (ABS Publication 2101.0). Australian Government.

[26] Australian Bureau of Statistics. (2001). Census Community Profiles Wellington Shire (S). Australian Government.

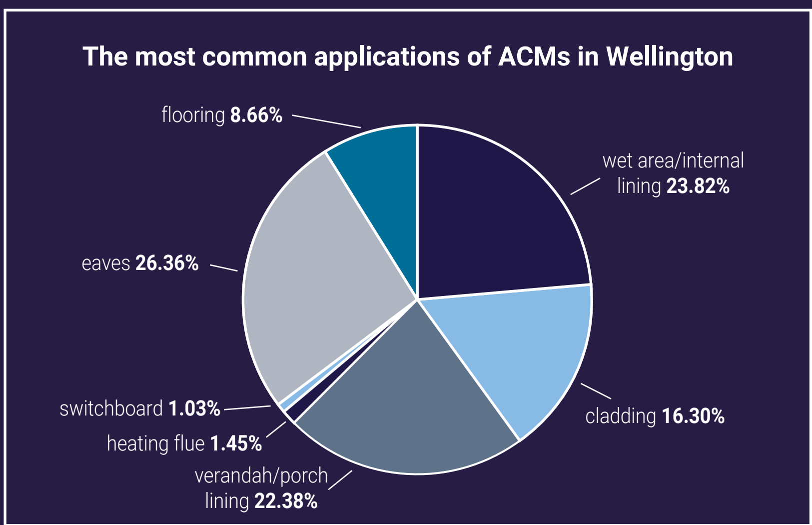

Figure 13. Most common applications of asbestos-containing materials in pre-1990 dwellings in the Shire of Wellington

Results

ABS Census data postulated 17,274 residential dwellings existing in Wellington Shire at that time. This number includes rural dwellings which were not captured in the mapping. The GIS analysis rendered 11,053 dwellings in the PLA layer. This mapping exercise also gave a spatial representation of the distribution of dwellings likely to have ACMs in the major townships. It was found that 89% of PLA was in the six largest townships of Sale, Loch Sport, Maffra, Yarram, Stratford and Heyfield.

Wellington was the only shire to exceed the national average of 25% of all houses built pre-1960 being asbestos-clad. It was well above, with 39% of houses built pre-1960 with AC cladding. There is a high incidence of AC cladding in the bushfire-prone northern reaches (historically the Shires of Maffra and Avon) and the coastal holiday areas (in the former Shire of Alberton), which were in a peak-growth period at that time.

Location surveys

Location surveys were conducted in Heyfield, Loch Sport, Maffra, Paradise/Golden Beach, Port Albert, Rosedale, Sale, Seaspray, Stratford and Yarram.

Much the same as the other two LGAs, location surveys provided minimal evidence of ACM usage in fencing and as a roofing material in residential properties throughout the shire.

Surveys in the coastal regions revealed the uniquely high prevalence of ACM as a cladding product in coastal townships such as Loch Sport, Seaspray and Paradise Beach. High incidences of asbestos cladding were observed in the townships of Stratford, Maffra and Heyfield, especially in distinctive Housing Commission properties and loggers' houses.

Volume of asbestos-containing materials and the most common applications

Wellington Shire was calculated to have the second largest stock of ACMs in the residential built environment, with a total of 972,312m² of ACMs. This was the second largest quantity of the three LGAs, but is the largest relative to population size, number of dwellings and dwellings built prior to 1990.

As shown in Figure 12 on page 26, the large amount per capita and dwellings is caused by the very slow growth in housing stock in the shire over the last 30 years. In terms of proportion of existing dwellings that were built before 1990, Wellington has the largest percentage of housing stock built before 1990 of all three LGAs. The large quantity per dwelling built prior to 1990 is mainly due to the prevalence of outbuildings in the shire as well as the high incidence of asbestos cladding compared to Baw Baw and Latrobe.

Wellington displayed a very similar apportioning of ACM applications to that observed in the Baw Baw Shire. As shown in Figure 13 on page 27, eaves accounted for the largest percentage at 26% followed by wet areas and other internal linings at 24%, then verandah/porch linings at 22%. Flooring accounted for 9% and switchboard backings and heating flues accounted for a combined 2%, as seen in the other LGAs. The similarity to Baw Baw is due to the similarities in the growth profiles of the two LGAs up until 1990.

ACMs in outbuildings in Wellington Shire accounted for 28% of total ACM usage in the shire. The calculated quantity was 267,894m². This accounted for 9% of total ACM use and 42% of ACMs in outbuildings across the three LGAs.

Figure 14 below shows that in Wellington, the volume of ACMs in outbuildings averages to 12.07m² per residential property, which is higher than both Latrobe and Baw Baw, at 5.77m² and 8.22m² respectively.

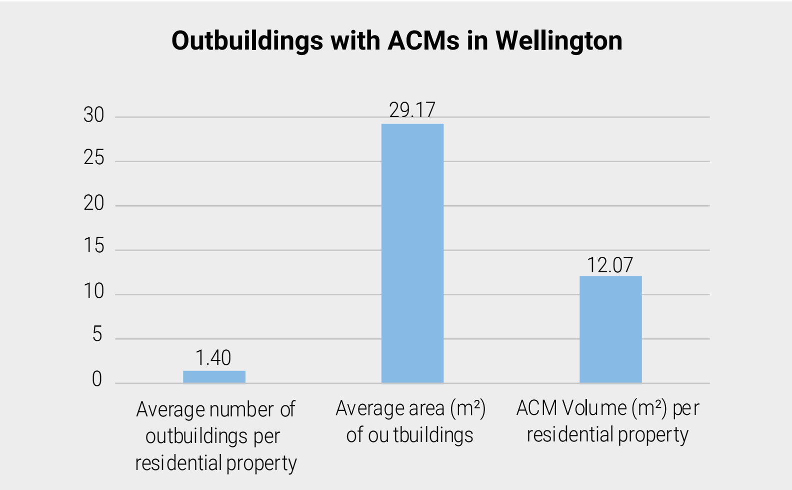

Figure 14. Average number of outbuildings and the Volume of asbestos-containing materials in outbuildings in the Shire of Wellington

Comparison charts: Baw Baw, Latrobe and Wellington

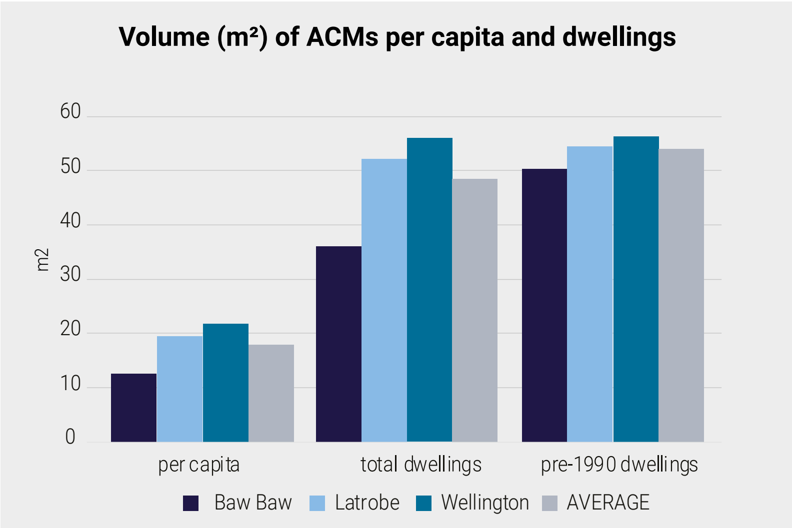

Figure 15. Volume (m²) of asbestos-containing materials by Population, Number of total dwellings and Number of pre-1990 dwellings in Baw Baw Shire, Latrobe City and Wellington Shire.

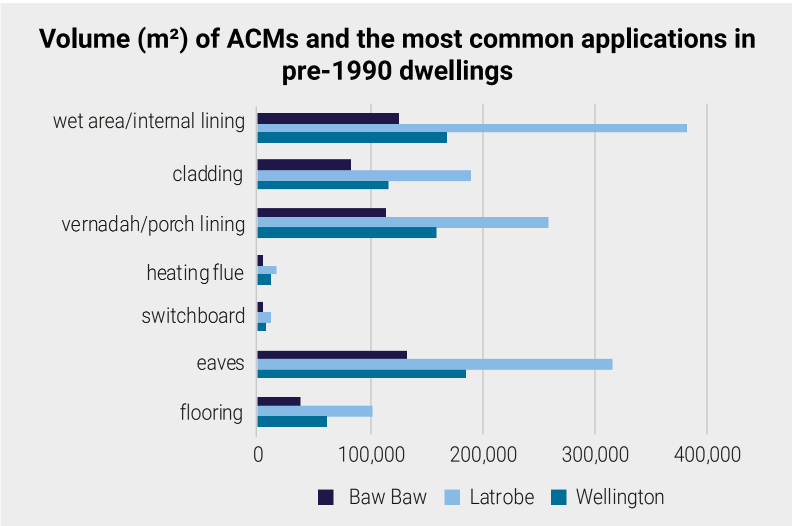

Figure 16. Volume (m²) of asbestos-containing materials and the most common applications in pre-1990 dwellings in Baw Baw Shire, Latrobe City and Wellington Shire

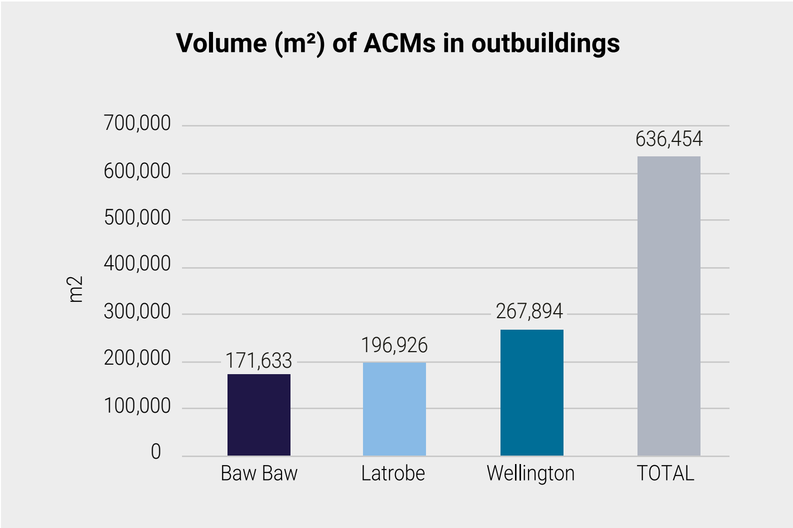

Figure 17. Volume (m²) of asbestos-containing materials in outbuildings in Baw Baw Shire, Latrobe City and Wellington Shire

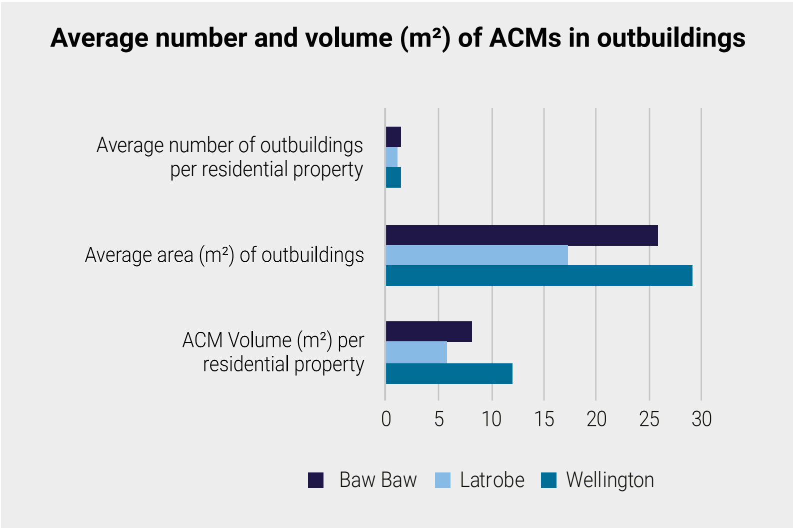

Figure 18. Average number of outbuildings and Volume (m²) of asbestos-containing materials in outbuildings in Baw Baw Shire, Latrobe City and Wellington Shire

Conclusion

This study developed a model to calculate the volume of legacy asbestos remaining in the residential built environment across Baw Baw Shire, Latrobe City and Wellington Shire.

Despite sharing common boundaries and major transport routes, the analysis revealed that there were marked differences in the volumes of the various types of asbestos-containing materials found across the three municipalities investigated.

Common findings identified a much higher incidence of asbestos-containing materials (ACMs) than the national average in all municipalities. This was expected in the City of Latrobe due to the presence of industrial power stations and the housing built to accommodate workers. However the findings relating to a much higher incidence of asbestos per capita in Wellington Shire than the other two municipalities were not expected.

The results reveal the magnitude of risk based on the prevalence of asbestos-containing materials in residential properties, and permit the further understanding of the activities likely to subject communities to asbestos exposure. By providing a more granular assessment by municipality or even township, a local perspective may be applied to engagement with homeowners and the building profession. This also enables the development of more suitable awareness raising campaigns that are focused on the common locations and types of asbestos found in the home.

Coastal areas with holiday homes are likely to have a very high incidence of ACMs, and so too areas that suffered devastating fires in the first half of the 20th century, after which the building of asbestos-clad houses was very popular. It also follows that areas with low to moderate population growth have a higher percentage of residential properties with ACMs than areas experiencing high population growth since the 1990s.

While conclusions may be drawn and applied to regional Victorian municipalities, such as a higher incidence than the national average of one in three homes containing asbestos, there are specific differences within each municipality that decision-makers will need to understand to be aware of the risks to their communities.

Calculations based on available information estimated ACMs in wet areas and internal linings to be on a par with eaves, as the most common application of ACMs in dwellings built prior to 1990. However due to the limitations on available methods to establish the volume of ACMs installed and then removed from wet areas and internal linings through minor home renovations, it is suggested that the majority of ACMs today are in the eaves of the home. The next-most common application of ACMs was found in verandah and porch linings. These are very common areas for home improvement activities, with many do-it-yourself (DIY) home renovators active in sanding and painting, or demolition leading to the refurbishment of kitchens and bathrooms. The simple sanding of eaves would pose a very grave risk of asbestos exposure to those unaware of the likely presence of asbestos.

By understanding where ACMs are most commonly found in the residential built environment, targeted education and communication campaigns can be developed to advise the community of the need for caution when dealing with asbestos. Further, by understanding the volume of legacy asbestos remaining in the residential built environment, governments and local governments will be able to accurately plan for asbestos disposal into the future.

Future studies are recommended to build upon the research and findings from this project. Further work may refine the accuracy and precision of results through reconciling local data across many municipalities using the same (or similar) methodology applied in this study for comparison with existing national and state data.

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Appendix: Examples of asbestos-containing materials

From the "A-Z of asbestos-containing materials" published on the Asbestos Victoria website at www.asbestos.vic.gov.au. This is not an exhaustive list.

A

Air-conditioning ducts: exterior or interior acoustic and thermal insulation

Arc shields in lift motor rooms or large electrical cabinets

Asbestos-based plastics products - as electrical insulates and acid-resistant compositions or aircraft seats

Asbestos ceiling tiles

Asbestos cement conduit

Asbestos cement electrical fuse boards

Asbestos cement external roofs and walls

Asbestos cement in the use of form work when pouring concrete

Asbestos cement internal flues and downpipes

Asbestos cement moulded products such as gutters, ridge cappings, gas meter covers, cable troughs and covers

Asbestos cement pieces for packing spaces between floor joists and piers

Asbestos cement underground pits, as used for traffic control wiring, telecommunications cabling

Asbestos cement render, plaster, mortar and coursework

Asbestos cement sheet

Asbestos cement sheet behind ceramic tiles

Asbestos cement sheet internal over exhaust canopies such as ovens, fume cupboards

Asbestos cement sheet internal walls and ceilings

Asbestos cement sheet underlays for vinyl

Asbestos cement storm drainpipes

Asbestos cement water pipes (usually underground)

Asbestos-containing laminates (such as F ormica) used where heat resistance is required (such as ships)

Asbestos-containing pegboard

Asbestos felts

Asbestos marine board (such as marinate)

Asbestos mattresses used for covering hot equipment in power stations

Asbestos paper used variously for insulation, filtering and production of fire resistant laminates

Asbestos roof tiles

Asbestos textiles

Asbestos textile gussets in air-conditioning ducting systems

Asbestos yarn

Autoclave/steriliser insulation

B

Bitumen-based water proofing such as malthoid (typically on roofs and floors but also in brickwork)

Bituminous adhesives and sealants

Boiler gaskets

Boiler insulation, slabs and wet mix

Brake disc pads

Brake linings

C

Cable penetration insulation bags

Calorifier insulation

Car body filters (not common)

Caulking compounds, sealant and adhesives

Cement render

Chrysotile wicks in kerosene heaters

Clutch faces

Compressed asbestos cement panels for flooring, typically verandas, bathrooms and steps for demountable buildings

Compressed asbestos fibres (CAF) used in brakes and gaskets for plant and automobiles

D

Door seals on ovens

E

Electric heat banks - block insulation

Electric hot water services (normally not asbestos but some millboard could be present)

Electric light fittings, high wattage, insulation around fitting (and bituminised)

Electrical switchboards (see pitch-based)

Exhausts on vehicles

F

Filler in acetylene gas cylinders

Filters — beverage, wine filtration

Fire blankets

Fire curtains

Fire door insulation

Fire-rated wall rendering containing asbestos with mortar

Fire-resistant plaster board, typically on ships

Fire-retardant material on steel work supporting reactors on columns in refineries in the chemical industry

Flexible hoses

Floor vinyl sheets

Floor vinyl tiles

Fuse blankets and ceramic fuses in switchboards

G

Galbestos™ roofing materials (decorative coating on metal roof for sound proofing)

Gaskets — chemicals, refineries

Gaskets — general

Gauze mats in laboratories / chemical refineries

Gloves — for insulation against heat

H

Hairdryers — insulation around heating elements

Header (manifold) insulation

I

Insulation blocks

Insulation in electric reheat units for air-conditioner systems

L

Laboratory bench tops

Laboratory fume cupboard panels

Laboratory ovens — wall insulation

Lagged exhaust pipes on emergency power generators

Lagging in penetrations in fireproof walls

Lifts shafts — asbestos cement panels lining the shaft at the opening of each floor and asbestos packing around penetrations

Limpet asbestos spray insulation

Locomotives (steam) lagging on boilers, steam lines, steam dome and gaskets

M

Mastics

Millboard between heating unit and wall

Millboard lining of switchboxes

Mortar

P

Packing materials for gauges, valves (square packing, rope or loose fibre)

Packing material on window anchorage points in high rise buildings

Paint (typically industrial epoxy paints)

Penetrations through concrete slabs in high-rise buildings

Pipe insulation including moulded sections, water-mix type, rope braid and sheet

Pitch-based (e.g. Zelemite, Ausbestos, Lebah) electrical switchboard

Plaster and plaster cornice adhesives

Pump insulation

R

Refractory linings

Refractory tiles

Rubber articles (extent of usage unknown)

S

Sealant between floor slab and wall, usually in boiler rooms, risers or lift shafts

Sealant or mastik on windows

Sealants and mastics in air-conditioning ducting joints

Spackle or plasterboard wall-jointing compounds

Sprayed insulation — acoustic wall and ceilin

Sprayed insulation — beams and ceiling slabs

Sprayed insulation — fire retardant sprayed on nut internally, for bolts holding external building wall panels

Stoves — old domestic type; wall insulation

T

Tape and rope — lagging and jointing

Tapered ends of pipe lagging (where lagging is not necessarily asbestos)

Tilux sheeting in place of ceramic tiles in bathrooms

Trailing cable under lift cabins

Trains, guards vans, millboard between heater and wall

Trains — Harris cars (sprayed asbestos between steel shell and laminex)

V

Valve insulation

W

Welding rods

Woven asbestos cable sheath

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