

# Sanctuary

MODERN GREEN HOMES

ISSUE  
56

SUSTAINABLE HOUSE  
DAY SPECIAL

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Building materials | Climate resilient design

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### PROJECT TYPE

New build

### LOCATION

Goolwa, SA

### PROPOSED HOUSE SIZE

Main house 125m<sup>2</sup>

Bunkhouse 75m<sup>2</sup>

### LAND SIZE

580m<sup>2</sup>

### BUDGET

\$500,000

### THE BRIEF

- An affordable, Passive House-certified family retreat
- Flexibility to accommodate extended family without wasting energy on unused sections of the house
- Take advantage of the waterside location and views to the south
- North-facing glazing for passive solar gains



← Matt and his partner have a large blended family.

**Matt Sinnett-Jones wants to build a family retreat that can comfortably accommodate any number from two to a dozen on his waterfront block in Goolwa, South Australia. Adelaide-based sustainable designer and energy-efficient homes expert Geraldine Petit of SUHO gives him some advice on pairing maximum flexibility with minimal energy use.**

Matt Sinnett-Jones and his family have been visiting Goolwa for a decade, enjoying the river and sea in this laid-back part of South Australia. Now he wants to build an environmentally conscious retreat for his family to enjoy for generations.

Having looked for several years for the perfect house to accommodate their active lifestyle, “I came to the conclusion we’d need to build what we wanted,” Matt says. When a block of land with a private jetty came up for sale, he didn’t hesitate. “The jetty was such an amazing feature, I couldn’t pass it up.”

Matt is planning to build a barn-style main house with a bunkhouse behind, and a small cabin on the jetty to double as a private retreat and storage. “My partner and I have a blended family with six kids, so we need a bunkhouse,” he explains. “My parents are elderly and need easily accessible rooms on the ground floor, while my sister who lives in Singapore has

a growing family. Fitting everyone in is a priority, but we don’t want to waste energy heating or cooling large spaces when only a few people are staying.”

The river views are to the south, so a major challenge for the design will be to make the most of the outlook without compromising thermal performance. Matt has asked for advice on passive solar heating, taking advantage of the property’s natural features, and creating maximum flexibility with minimum waste. He plans to build with rammed earth walls, hempcrete, and polished concrete floors, and incorporate solar PV and rainwater collection.

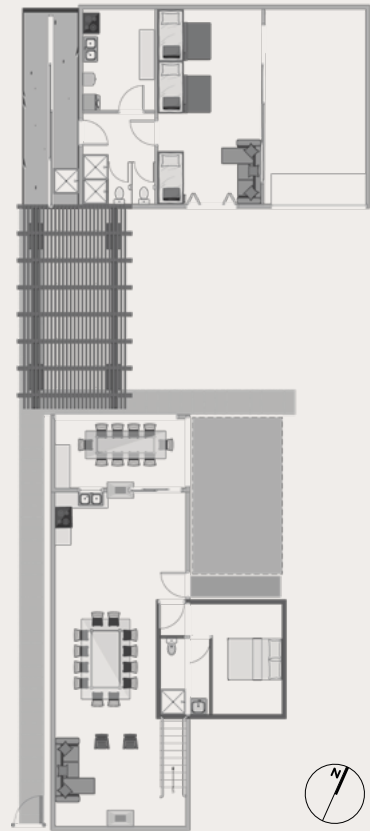
“I want to create a house inspired by the ‘bach’ getaways of New Zealand, built to Passive House standards, that fully utilises the views and feels like a holiday retreat no matter the size of the group staying,” says Matt. “I would like it to be enjoyed by my children and theirs.”





↑  
Right on the water near the mouth of the Murray river, Matt's block – the upper yellow outline – comes with its own private jetty.

## MATT'S PROPOSED DESIGN



↑  
Matt's design features a large open-plan living space and an accessible bedroom downstairs, with a main bedroom suite (not shown on plan) upstairs extending over the driveway. At the rear of the property is a bunkhouse, bathroom, laundry and garage.

## GERALDINE'S RESPONSE

In the briefing process with a client, we try to start with a good understanding of the client's own definition of sustainability and their priorities so we can set tangible targets. Matt's ideas for creating flexibility and compartmentalising spaces make a lot of sense and can serve as a good base for a sustainable project.

Passive House certification requires high levels of insulation and good control of the airtightness of the envelope. One important aspect of achieving this performance is minimising the surface area of the envelope (walls, roofs and floors) in relation to the volume. Therefore, I'd recommend the design be as compact as possible to optimise

both performance and affordability.

In my proposed alternative design (see p.84), the structure and the envelope remain quite simple. The shape will express the barn style Matt is looking for and create opportunities for openings in the north-east and north-west elevations. The footprint of the main building is only around 100 square metres, but there are two large spaces upstairs (a main bedroom and a second living area). The habitable floor area will be close to 170 square metres. Creating a second bedroom downstairs for the children will allow more flexibility in the future as they grow up and will permit more potential scenarios of occupancy.

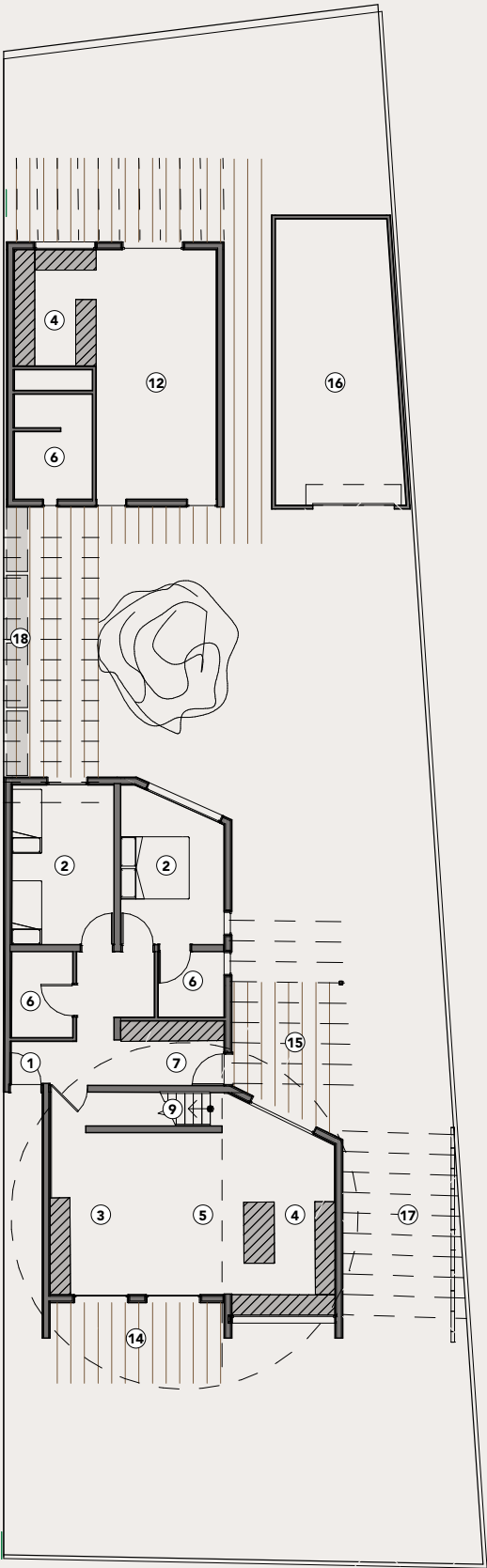
The living room offers transparency from the central garden area through

to the river view; this will also support natural ventilation. The location of the laundry/mudroom allows access from both the back of the building and the front garden, for a progressive transition from outdoor recreational areas to indoor spaces. On the upper floor, the second living room will offer a beautiful view of the river and could be converted to extra sleeping space. The main bedroom, designed with a walk-in robe and an ensuite, will benefit from northern light. Both spaces are granted a balcony.

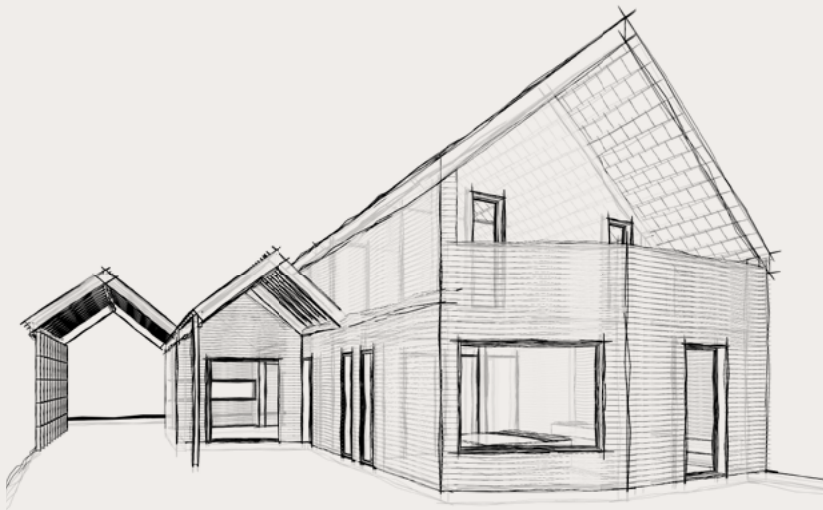
Installing well-sealed doors between living areas, bedrooms and service areas will allow control of the temperature room by room: in my design a pivot door separates the open living area from the ground floor bedrooms and service areas.

GERALDINE'S ALTERNATIVE DESIGN

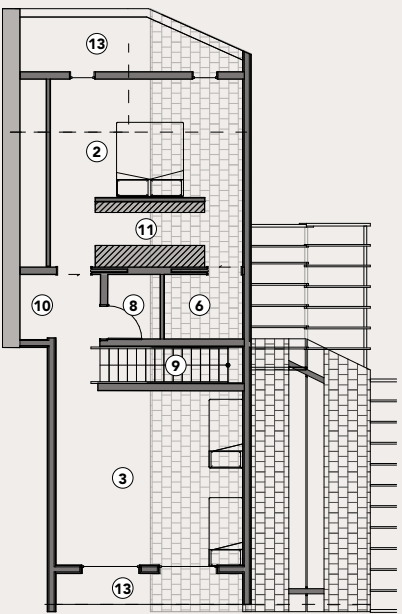
GROUND FLOOR PLAN



ELEVATION SKETCH



FIRST FLOOR PLAN



LEGEND

- ① Entry
- ② Bedroom
- ③ Living
- ④ Kitchen
- ⑤ Dining
- ⑥ Bathroom
- ⑦ Laundry/mudroom
- ⑧ Toilet
- ⑨ Stairs
- ⑩ Study nook
- ⑪ Walk-in robe
- ⑫ Bunkhouse
- ⑬ Balcony
- ⑭ Summer terrace
- ⑮ Winter terrace
- ⑯ Garage
- ⑰ Carport
- ⑱ Water tanks

Geraldine's design keeps the form of the main house simple, making it easier to achieve Passive House standard for construction detailing and expressing the barn-style aesthetic Matt is looking for.

In terms of passive solar design, the low south-west and south-east summer sun can be hard to control and is typically responsible for a lot of overheating in summer. Glazing on the south side would also create heat loss in winter. Ideally, I would recommend avoiding openings on the south elevation as much as possible; however in this case the view of the river is worth the compromise. In this situation, it is particularly important to specify a high-performing window system with a U-value and a solar heat gain coefficient as low as possible.

The good news is that the block is not quite oriented north-south, which will be very beneficial to the project if the living area is placed on the north-eastern side of the building. I suggest a strategy where service areas are placed against the south-western boundary with minimum openings. On the other side of the building, the living spaces and main bedrooms will benefit from a northern orientation. In order to maximise daylight penetration, I propose to angle the walls in the main bedroom and living space to face due north.

I completely support the use of Passive House certification criteria as a benchmark for construction: it should drastically increase the energy efficiency of the house. Aiming for this quality of construction will require Matt to work with experts. The knowledge to build what I call 'smart walls' is still kept by only a few in this part of the world.

Smart walls are designed to control thermal performance and maintain a good level of oxygen in the building as well as preventing potential mould growth. By using building technology knowledge and simulation tools such as WUFI (which provides heat and moisture calculations for multi-layer building components), we can make scientifically supported choices of construction materials and their combinations, in order to guarantee the long-term integrity of the building.

The use of hempcrete blocks will give a good level of insulation – Matt will need to use a block at least 300 millimetres

thick to achieve an R-value of around 4. I would recommend a timber structure for the roof, installing a minimum of R8 insulation between the rafters, and dense walls inside the building. Rammed earth walls on both sides of the staircase would create a nice feature in the living area, as well as providing thermal mass. In winter those exposed walls will store heat and slowly release it during the night.

Matt can then focus on creating an airtight envelope by choosing appropriately sealed doors and windows with thermally-broken double-glazed frames. To minimise glazing cost, it is important to carefully consider the location and type of openings as fixed glazing is generally less expensive. In such an airtight building a mechanical ventilation system with heat recovery (MVHR) will be needed to ensure a good supply of fresh air.

As some parts of the building won't be permanently occupied, in order to keep the budget under control I'd recommend Matt focus on the main building achieving a Passive House level of performance. The bunkhouse building at the rear, used less of the time, will still work perfectly well with a passive solar design and natural ventilation with louvres.

It would be great to take the opportunity of the driveway space along the north-east side of the house to create a carport structure. The building will benefit from the extra shading in summer if deciduous plants are established, and its shape and greening will enhance the architectural language.

I'd suggest the rainwater tanks be located along the western boundary between the two buildings, to reduce the length of pipes and facilitate access for watering the garden. The tanks will collect water from all the roofs and can be plumbed to the laundry and toilets as well.

In terms of energy production, we recommend all our clients go fully electric with solar panels and battery storage. The choice of energy-efficient appliances as well as a good hot water system (a heat pump unit would make sense for this

project) could allow Matt's family to cover their energy consumption with solar generation. The proposed ventilation system with its heat recovery function will support this strategy, reducing the need for active cooling and heating and using only a small amount of electricity.

Overall, I believe the orientation of Matt's land offers great possibilities for passive solar design, and he should be able to achieve a good energy rating. I believe all certifications have their strengths, so aiming for a good passive solar design and a high Star rating as well as Passive House certification will maximise the chances of achieving a sustainable, comfortable and energy-efficient building.

I hope Matt and his beautiful family enjoy this truly special location, and I'm grateful to hear from people like them who are setting a new benchmark of quality for tomorrow's construction. ⑤



Geraldine Petit is Lead Construction Design Specialist at SUHO in Adelaide. With a decade of experience delivering high-performance housing in Europe and Australia, she has an excellent understanding of the collaborative approach required to build to international standards. She is directing her career towards bridging the gap between design and construction, as she sees it as part of the journey to transition to a better and more sustainable built environment. [www.suho.com.au](http://www.suho.com.au)