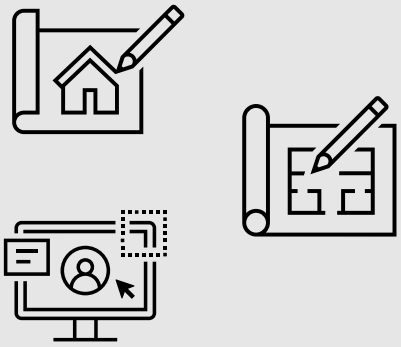
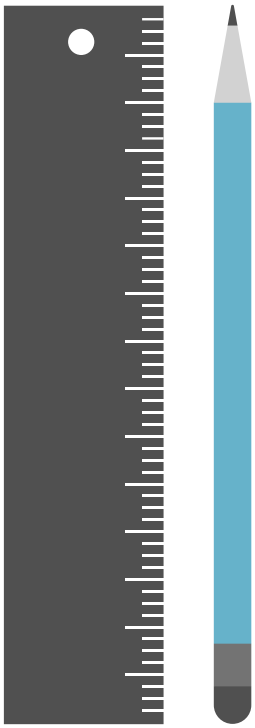
Design Project Folio:

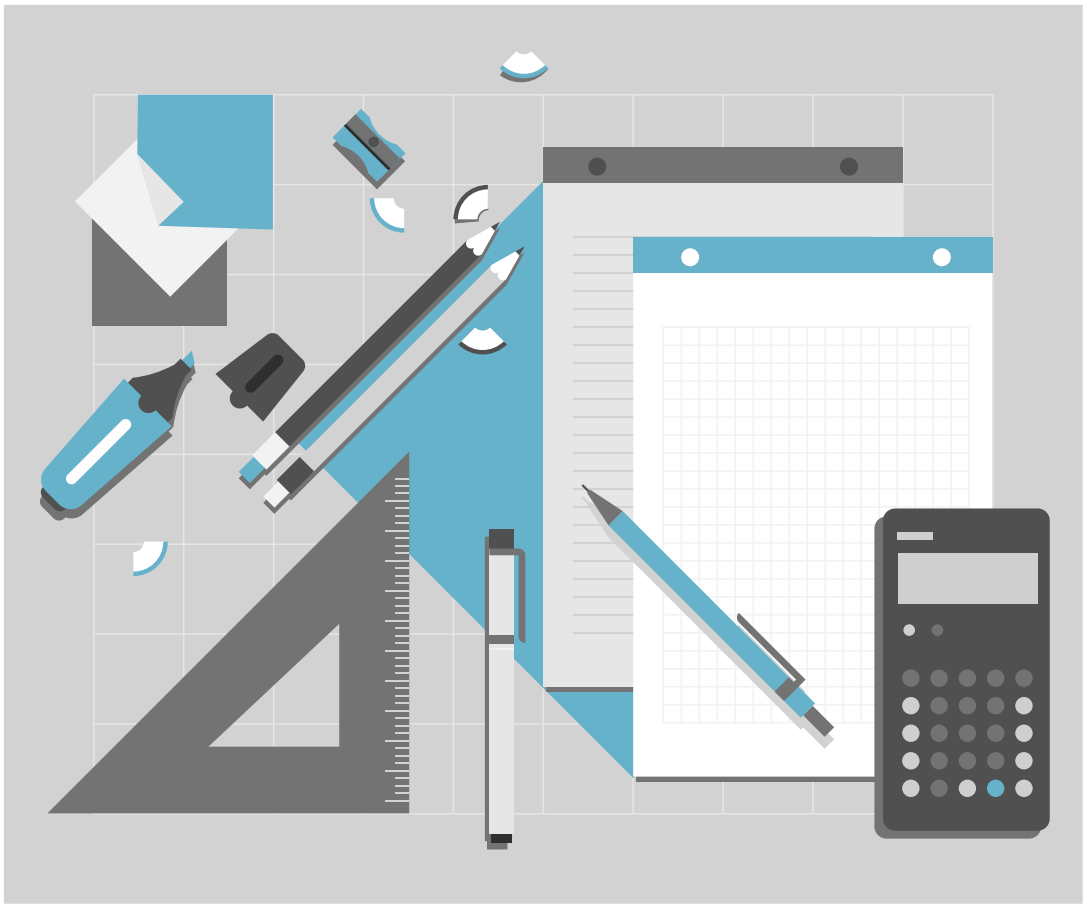


Fire Resistant Cabin

Architectural Design | 2021

Natalie Hardy



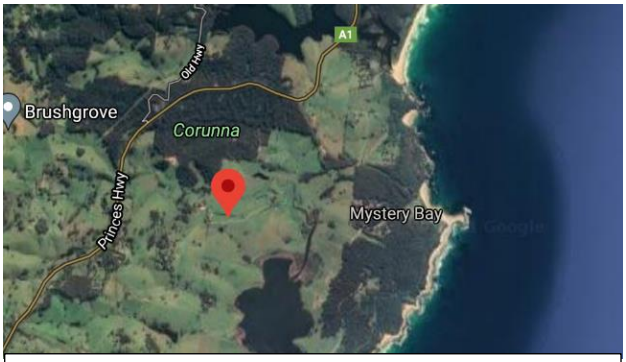


Contents:

Project Brief:

General Information:

Designer's Name:	Natalie Hardy
Name of project:	Fire Resistant Cabin
Clients (Fictional):	Mr. and Mrs. Bruce and Mathilda Lamington
Geographic location (Located on the south coast, NSW):	14 Sunnyside Road, Central Tilba, NSW 2546, 36.2908° S, 150.0606° E.
Client profile 1: Mathilda	**Work:** English teacher working at a primary school. **Hobbies and interests:** writing a blog and reading. **Style:** Neat and monochromatic coloring.
Client Profile 2: Bruce	**Work:** Environmental scientist. **Hobbies and interests:** Gardening and spending time outside in nature. **Style:** Potted plants/ greenery.



Satellite image of the Fire-resistant cabin's location (Google Maps, 2021).

Geographic location of the Fire-resistant cabin (Google Maps, 2021).

Design Brief:

The outcome for this design is to construct a fire-resistant cabin located on the NSW south coast for a specific client. The design must provide the clients with a chance to escape the business of their everyday life and be able to withstand being left vacant for long periods of time. The design must also include aspects which the client enjoys in-order to become a successful design.

Constraints:

When designing this cabin, aspects need to be included to ensure the design is successful and completes the design brief:

- **The cabin must contain:**
    - An entry
    - 1 bedroom
    - Bathroom/ Laundry
    - Kitchen
    - Sitting area

The outdoor area must contain:

- Deck or outdoor entertaining area on the northern side

Fire resistant aspects:

- Fire Bunker (external)
- Fire-resistant water tanks.

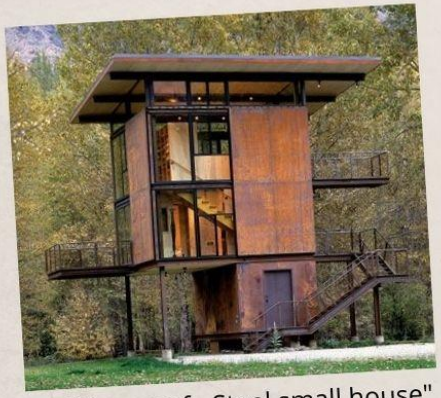
External site landscaping:

- BBQ/ firepit area
- Paths and a road leading to the cabin
- Garden and trees
- Plunge pool

- Be able to survive a bushfire without the owner present.
- Have an area no larger than 85m².
- Be 600mm off the ground (for fire, flood and building regulations)
- Must be an open plan, with large windows (lots of light), entertaining areas, storage and easy to maintain facilities.
- Must be located on a coastal property in NSW.

Mood-Board | Part 1:

This image shows a building that is elevated from the ground. Metal was used to create the building however was colored brown to apply aesthetics.



"Fireproof - Steel small house" (Pinterest, 2021)

This image shows a rounded building form. Overall the building provides further protection against fires due to this shape.

"Bush fire resistant house" (Edigital, 2020)

This image shows the entire building being rounded. Instead of just one side.

"Bush fire resistant house" (THE Q CABIN KITS, 2018)

This image shows a building built inside the ground with grass running over the top.

"Bushfire proof house" (Pinterest, 2021)

"Gauge Steel Home" (THE Q CABIN KITS, 2018)

"Bush fire resistant house" (Paul Deffenbaugh, 2018)

This image also has the entire roof curved. However, is smaller than the other images.

This colour scheme shows monochromatic colours which resembles nature

This image also shows a rounded building form. however, the building is larger and there is less curve.

Mood-Board | Part 2:

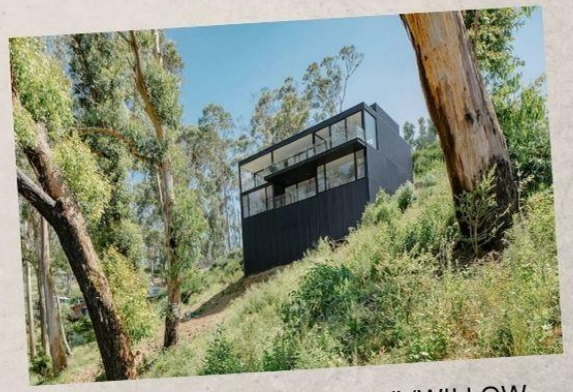
This design shows a bush-fire-proof house being on stilts to prevent the inside from burning.

I Like how this design caters to the height of fires in the area (the fires in the area may not reach past a specific height.
This image is **directing my design** to include tall stilts onto the house structure to ensure if a fire approaches the contents of the house are safer than if it was positioned directly onto the ground.

"Bushfire Management Overlay" (Modscape, 2021)

"Bushfire proof house" (Pinterest, 2021)

This design shows a house that is positioned on a hill to prevent destruction. Even though fires tend to cause more destruction up hills, the house will be protected because it is situated in the middle of the hill.



"Bushfire proof house" (WILLOW ALIENTO, 2019)

This image is **directing my design** to work with my site and use its surroundings to my advantage.

This house design has been engraved into the ground to protect it against bush fires. The design has also been aesthetically designed to suit the environment.

Overall this image is **directing my design** to incorporate a rounded structure to ensure a more fireproof design. Also to create an aesthetic design

Mood-Board Reflection:

Majority of the fireproof houses in the above mood-boards are in a rounded form to protect the house from bushfires. Because of this rounded shape, the fire will move over the top of the house without damaging any aspects. Overall, this rounded element will be included in my final design to ensure more protection is equipped to the cabin. The other images located on the mood-board are seen to be on high stilts or located halfway up a hill. This is to ensure the fire will not heat the ground and damage the contents of the house. Due to this safety aspect, my cabin design will also be located on stilts to prevent extreme damage to the contents of the house.

Individual Image Reflections:

"Fireproof – Steel small house (Pinterest, 2021)": This image will direct my design into including a hierarchy aspect into the final cabin. This can be done using stilts etc. This design also inspires my design to include aesthetics in my cabin and overall create a house that the clients will appreciate. This appreciation will also be formed due to its functionality and ergonomics.

"Bush fire resistant house (Edigital, 2021)": Overall, this house will direct my design into incorporating a curved roof to further protect the cabin from fire dangers. This is because the fire is more likely to flow over the rounded roof than a flat roof. Fires also move faster up hills, and with this slopped roof, the fire will surpass away from the house quicker.

"Bushfire proof house (Pinterest, 2021)": This house design, just like the previous image, incorporates a rounded roof. However also appears slightly underground with grass growing over the top of the roofs. These aspects will direct my design into using the sites nature to create more protection for the house and inspire my bunker design.

"Gauge Steel Home (THE Q CABIN KITS, 2018)": This house design as slope that elevates quickly and stops after reaching the top of the houses roof. Overall, this will guide my design to incorporate a steep incline for fires to flow over the house (to do this I need to make the roof higher than an average home).

"Bushfire resistant house (THE Q CABIN KITS)": This house design will direct my fireproof cabin with the slopped roof and position of a hill. This house will inspire my design to incorporate different fire safe aspects into one design to double the changes of its survival in hazardous fires.

"Bushfire resistant house (Paul Deffenbaugh, 2018)": This fire-resistant house will direct my design to incorporate height in the designs roof to ensure the contents are safe from catching fire. This height is created by both the slope in the roof and the straight walls to create a steeper incline.

Sustainable Design Feature Research:

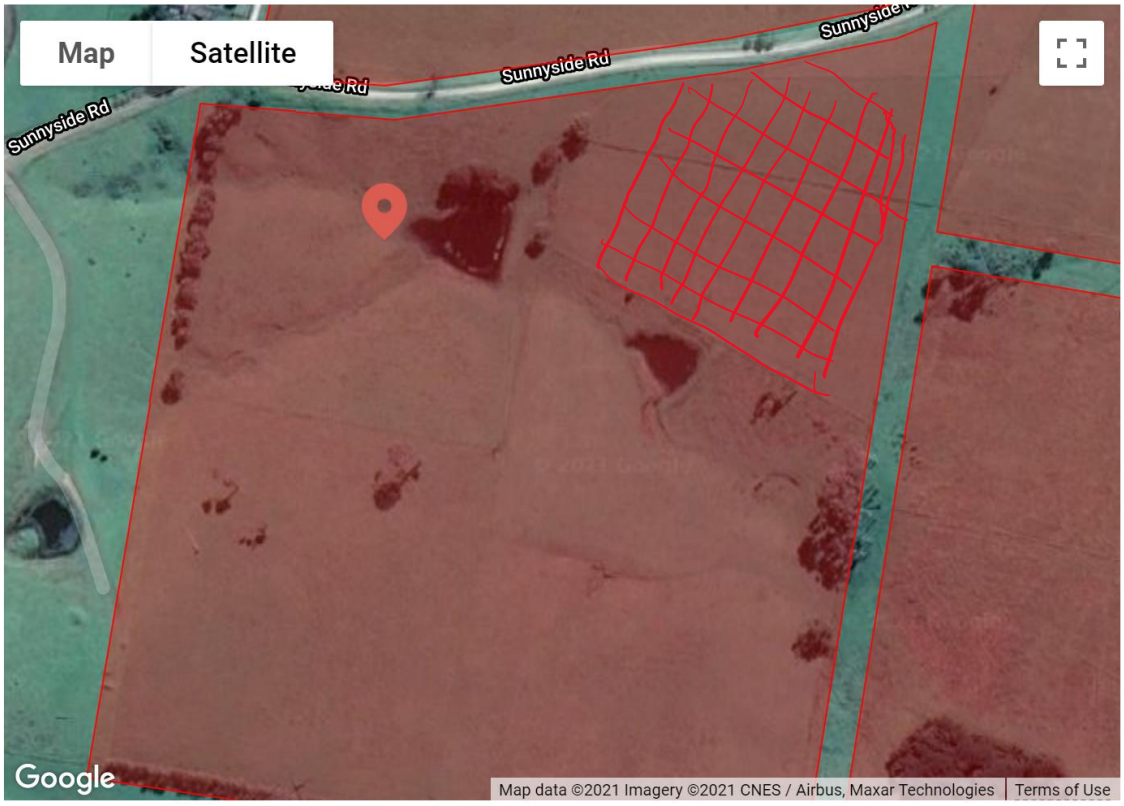
To create a successful design that completes the details and requirements outlined in the design brief, the cabin must be sustainable as well as protect itself in a bushfire circumstance. Stainless steel bushfire mesh is installed on buildings to protect against embers from entering through gaps and can be applied on windows, doors, or roofs. According to an Australian Wire Mesh Supplier's website, this design feature is important for houses in bushfire prone areas because 80% of house loss is due to embers entering the home and lighting on fire prone/ combustible objects located inside the house (Stainless Steel Wire Mesh Supplies in Australia, 2020). However, the bushfire mesh can have openings no larger than 2mm and should be made of corrosion-resistant steels, i.e. stainless steel. These metals are sustainable for houses because they last a long time and ensure the house does not burn down and let off hazardous chemicals such as volatile organic compounds (VOC).

Bushfire mesh on a gable roof (Infodec Communications, 2019).

Site Evaluation:

Basic information:

- The site is 500 meters away from bush on the Northern side and 1.5km away from bush on the south-east side.
- Slope of the land is 5-10 degrees.
- The site is in a bush fire prone zone.



Your search result

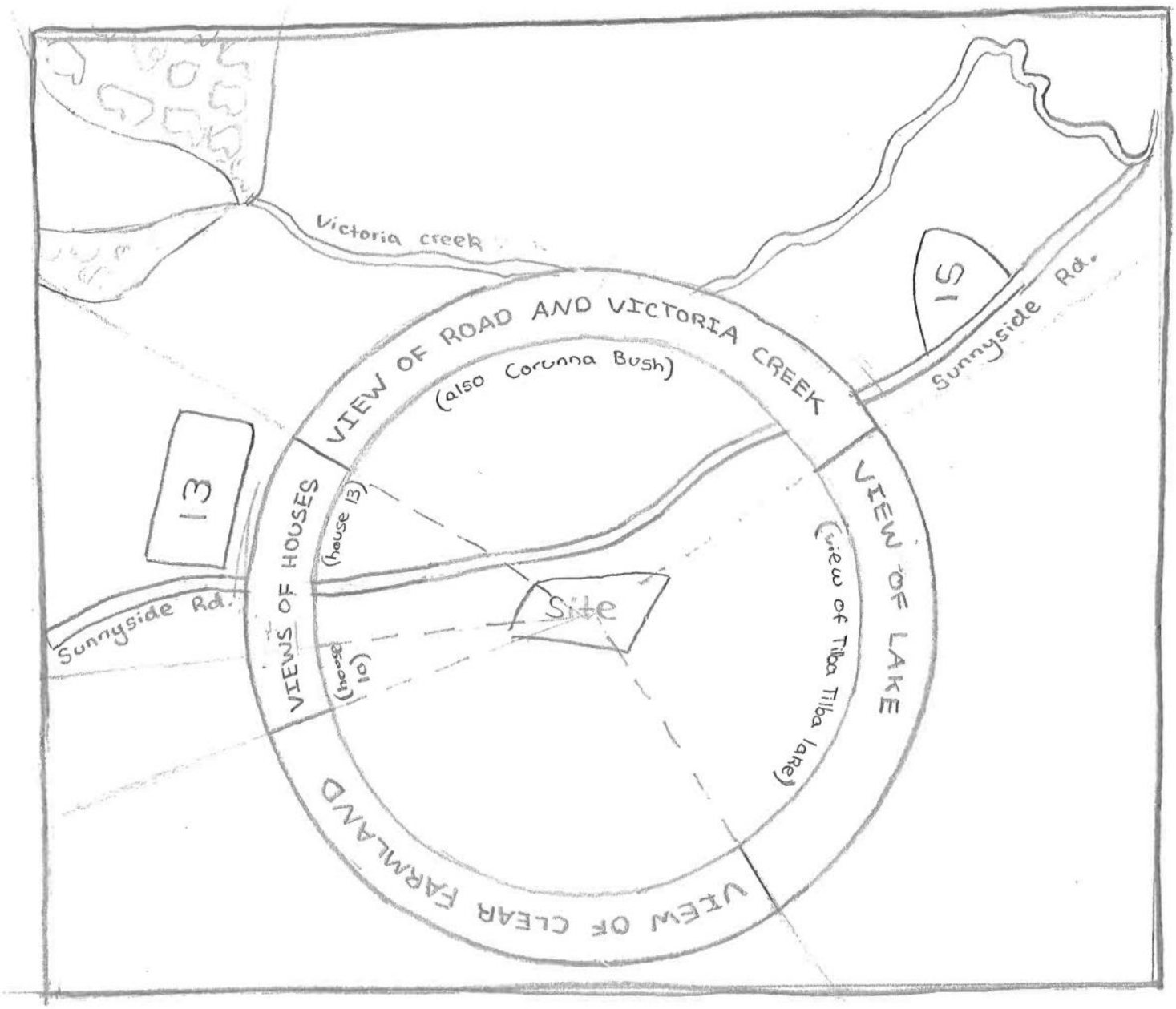
You have conducted a search of the online bush fire prone land tool for the land in the map above. This search result is valid for the date the search was conducted. If you have any questions about the Bush Fire Prone Land Tool please contact bushfireprone.mapping@rfs.nsw.gov.au

The parcel of land you have selected is within a designated bush fire prone area.

This image shows how the site is in a bushfire prone area on the NSW government website.

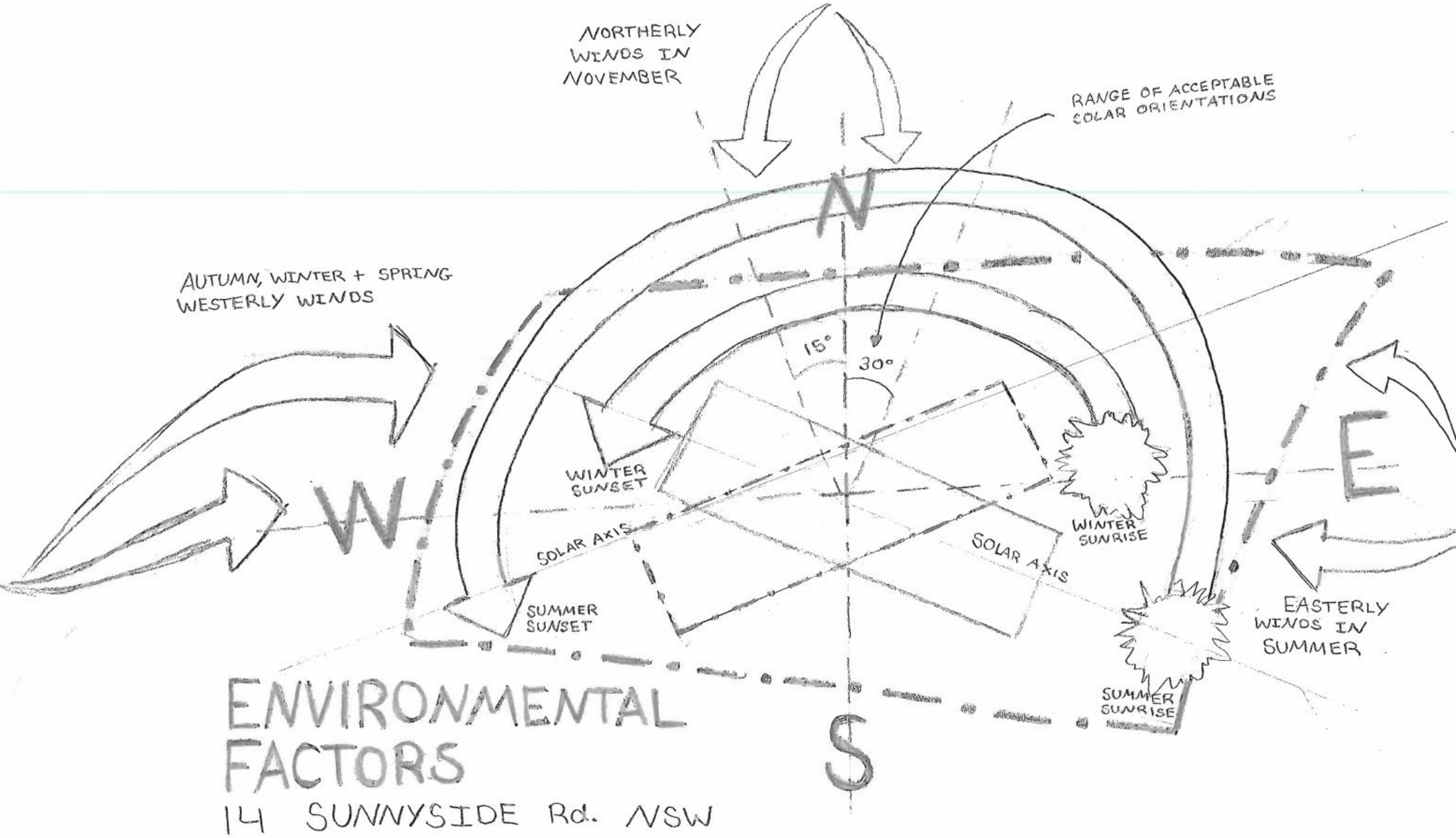
NSW Government 2021, Check if you're in bush fire prone land, viewed 7 May 2021, <https://www.rfs.nsw.gov.au/plan-and-prepare/building-in-a-bush-fire-area/planning-for-bush-fire-protection/bush-fire-prone-land/check-bfpl>.

View analysis:

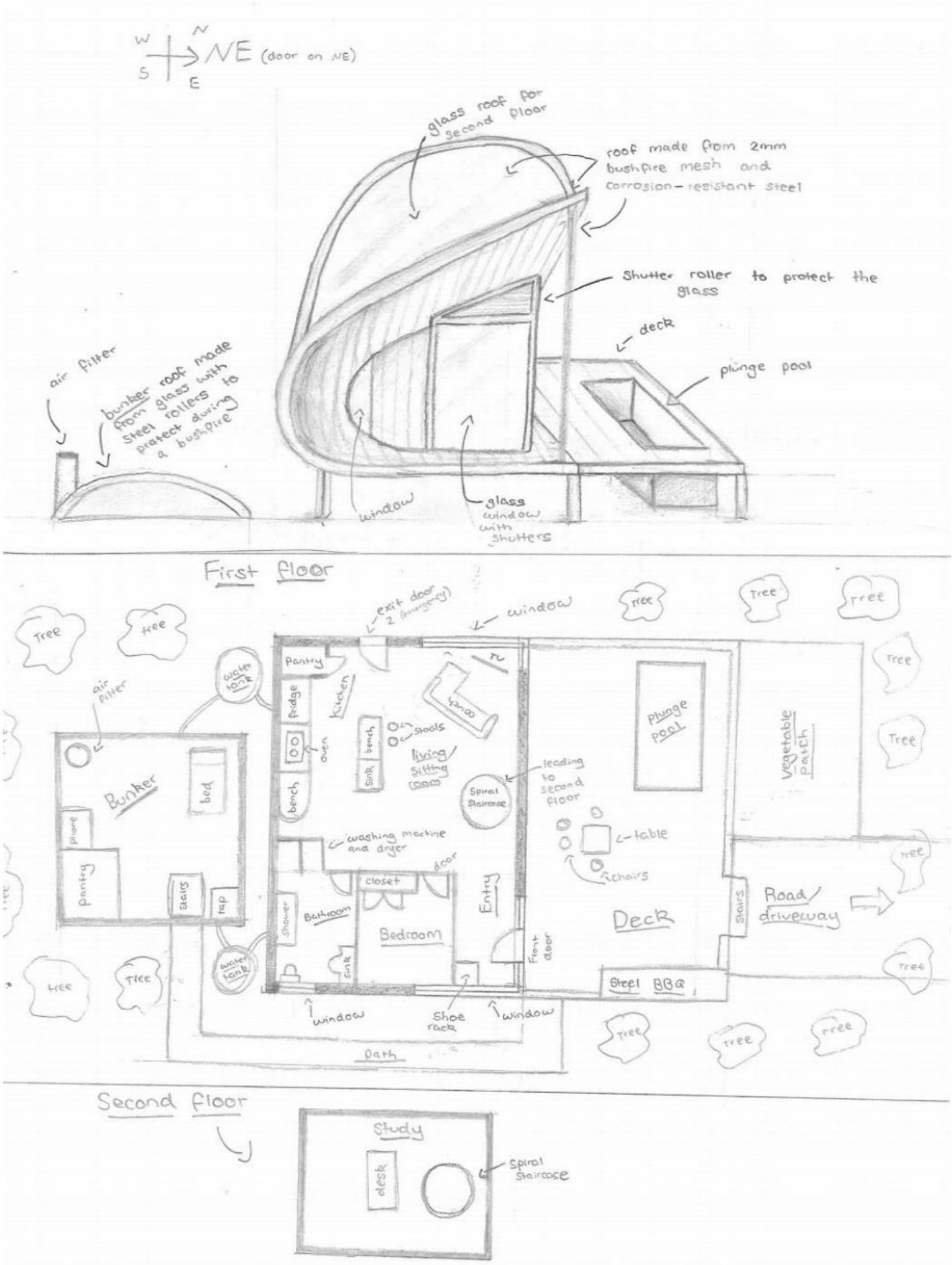


The best views are from the North, East and South. This is because there is majority bushland and caters to the clients' hobbies (environmental scientist who enjoys the outdoors).

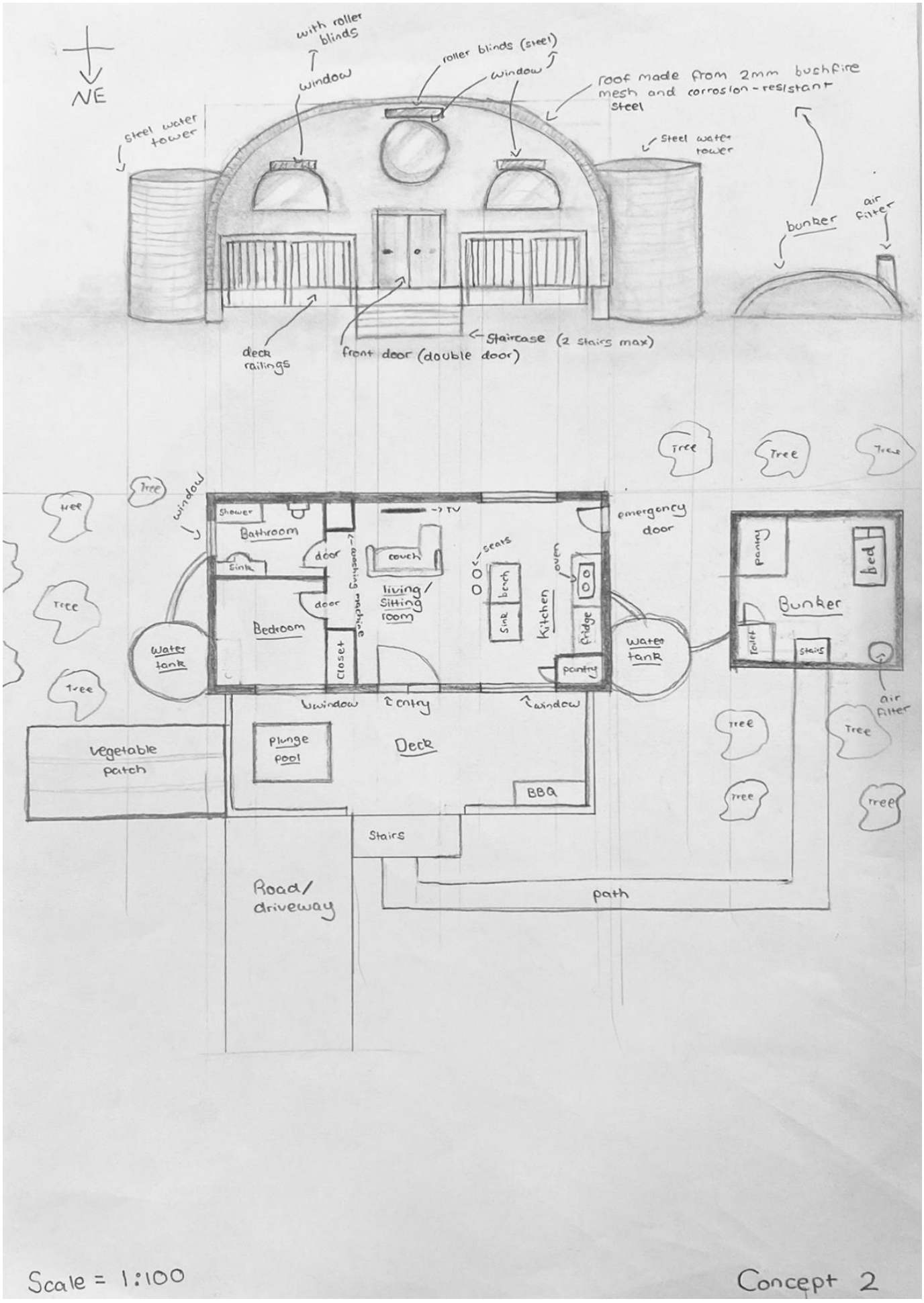
Environmental Factors:



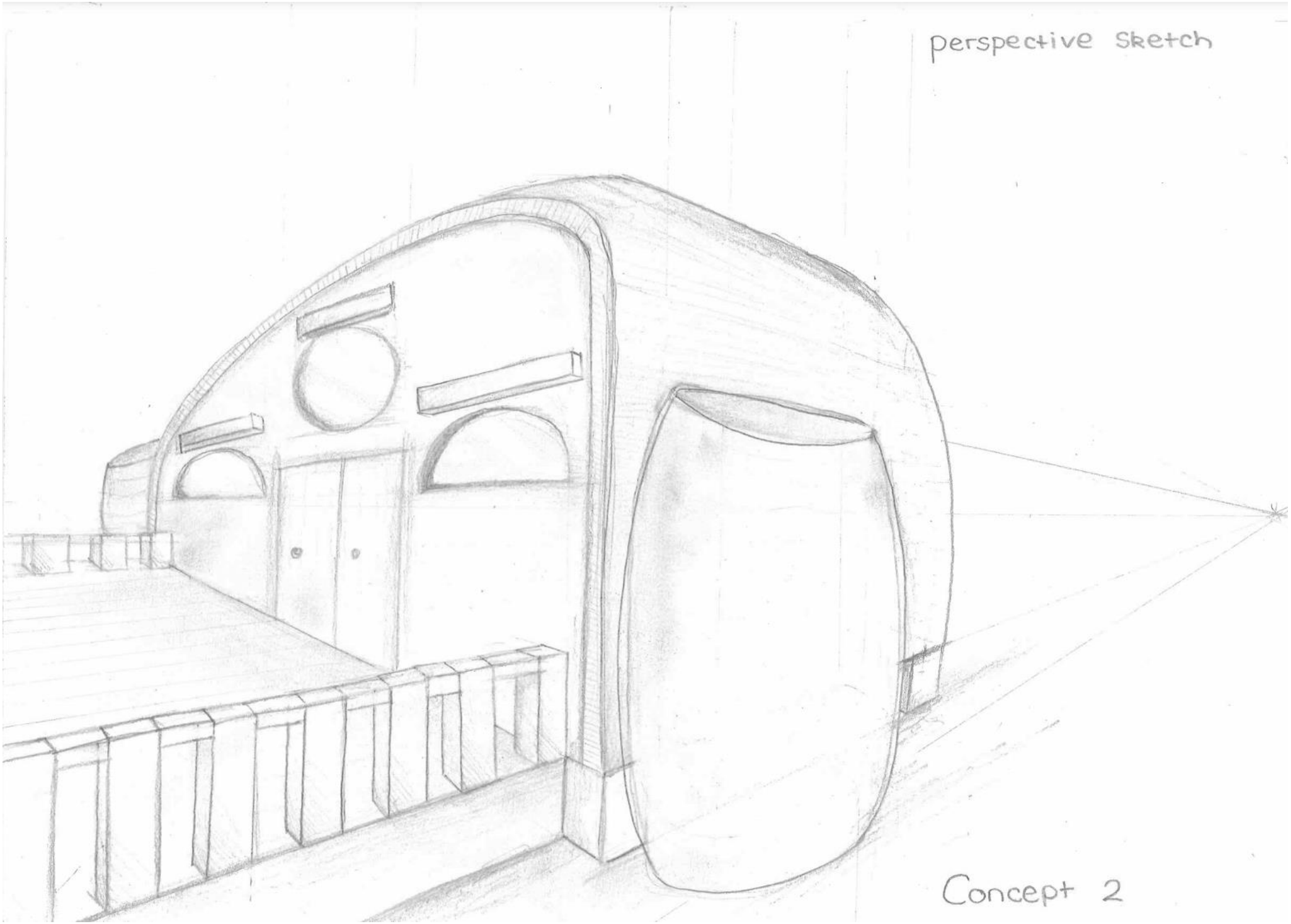
Concept Sketch 1:



Concept Sketch 2:



Perspective Sketch on Concept 2:



“Concept Sketch 1” Description:

This concept sketch shows a two leveled house composed of rounded roofs. These rounded roofs intend to make the design more resistant when fires occur because the rounded structure allows fires to move quicker past the house and cause less damage. Overall, I found that this design is aesthetically pleasing due to the hierarchy involved in its composition. However, only one of the sides is rounded meaning that if the fire moves towards the Southwest, the house will have less protection because the rounded roof is not located on this side.

I also found that it will be difficult to create this design because of the size restrictions, and when the roof is edited to measure 3 meters high, the designs aesthetics becomes unbalanced.

“Concept Sketch 2” Description:

This concept sketch shows a single leveled cabin design where both the cabin and bunker have the same roof design. This therefore makes the design aesthetically pleasing while being able to protect the contents of the house from bush fires. The house is more protected against fires due to the added bushfire mesh and corrosion resistant steel.

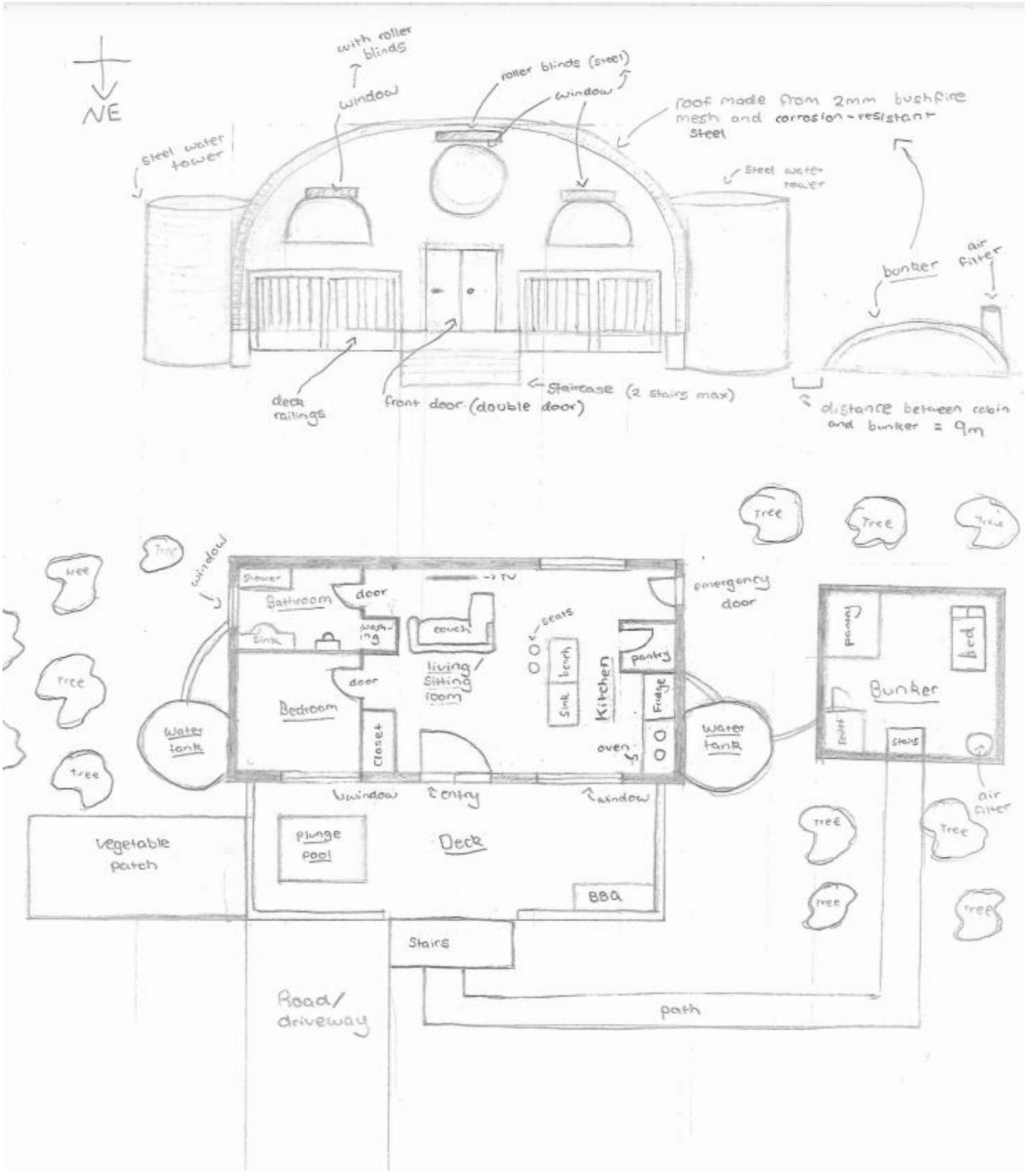
The overall floor plan of this design is simple and smaller than the previous design, however, still completes the design briefs specifications because of the open floor plan with large windows. The house and bunker will also be more protected against fires due to this smaller design (less surface area for the fire to burn making the bunker safer and less prone to being fully consumed/ destroyed by flames).

“Perspective on Concept 2” Description:

This perspective was created to form an idea on how the second concept sketch will look like in three-dimensional view/ realistic view. The drawing has been rendered using a 2B pencil and an eraser to create the allusion of highlights/ sun direction.

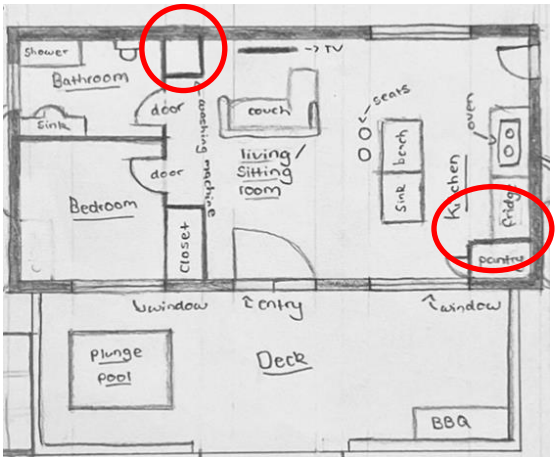
Overall, I found that this perspective drawing was successful however could have been positioned in the center of the page to show areas of the deck (the drawing was positioned too far on the left of the page).

Design Development - Final Concept:

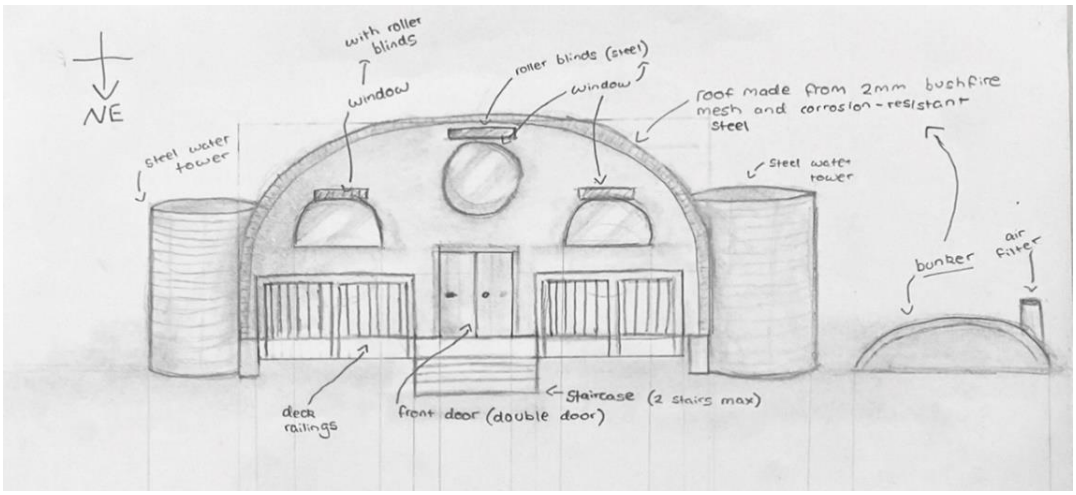


As seen in the images located on the right, the floor plan has been slightly edited to ensure there is more privacy between the bedroom and bathroom (there is now a wall blocking view from the bedroom door to the bathroom door). The position of the pantry has also changed to allow wider window access.

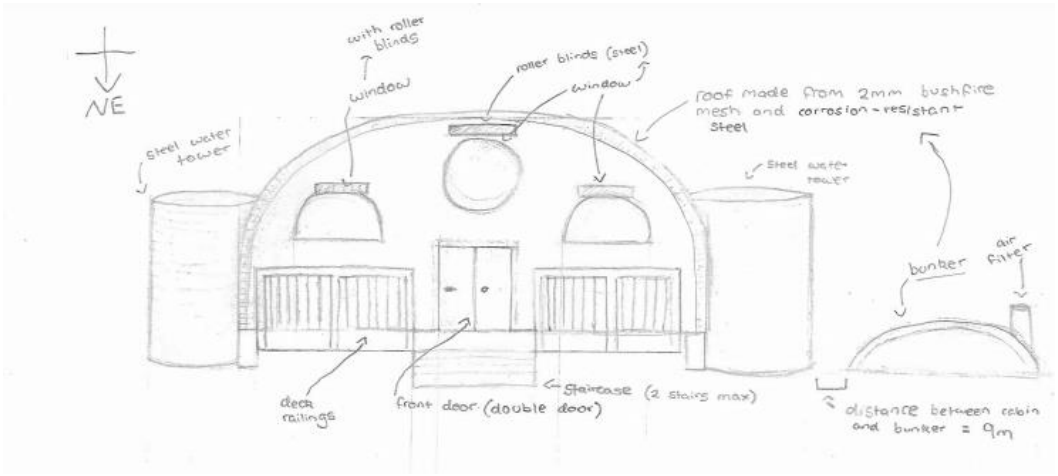
Edited concept:



Original concept:



Original concept:

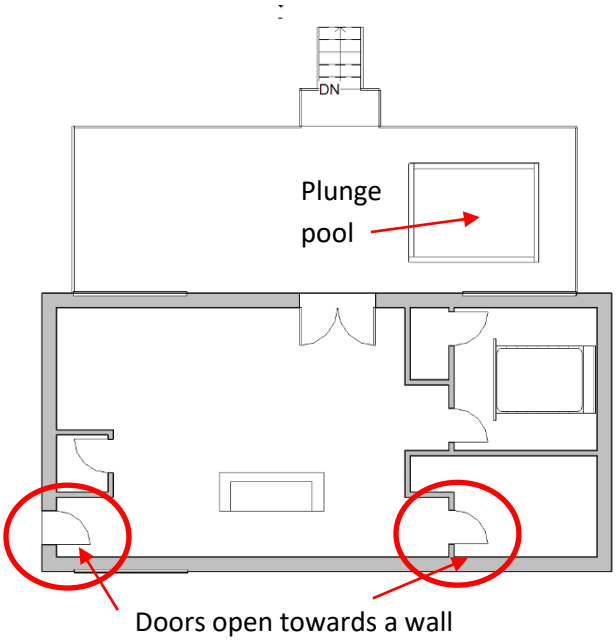


Edited concept:

Overall, the direction of north has been changed to compensate with the Revit program (where the front of the house is facing North). However, this means the cabin has more protection from the common westerly and easterly winds.

Another aspect which was developed in this design was the distance between the bunker and the house. This change was from the original 1-meter cap to a 9-meter gap. This allows further protection for the bunker if (on a rare circumstance) the house catches on fire and makes a larger scaled fire danger.

Revit Process:

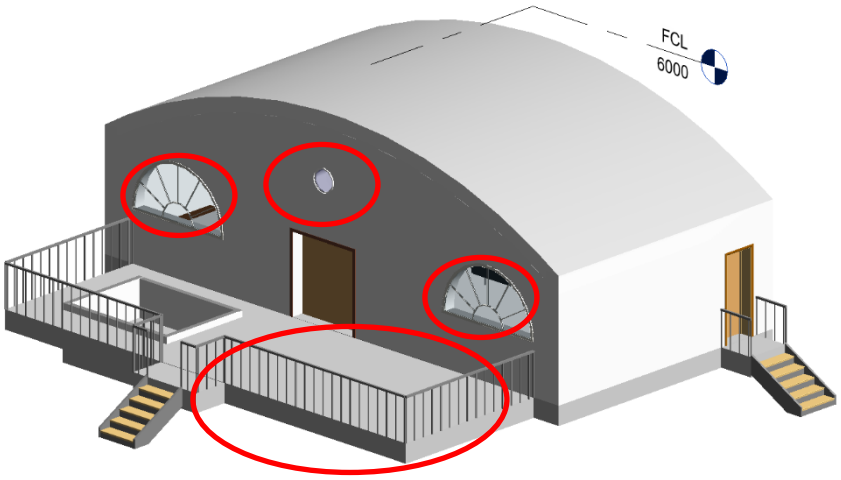


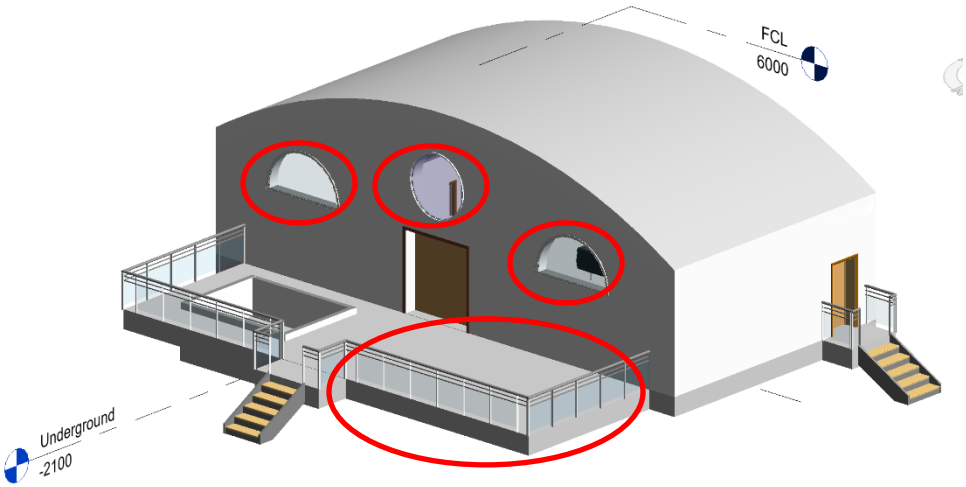
Floor Plan:

This image reflects the stage in Revit where the floor plan was created. Overall, the doors that were used are standard in height and width and always open towards a wall (highlighted in red).
The size of the plunge pool has also been edited from the original concept. This is because the wall thickness needed to be calculated when designing the plan.

Cabin:

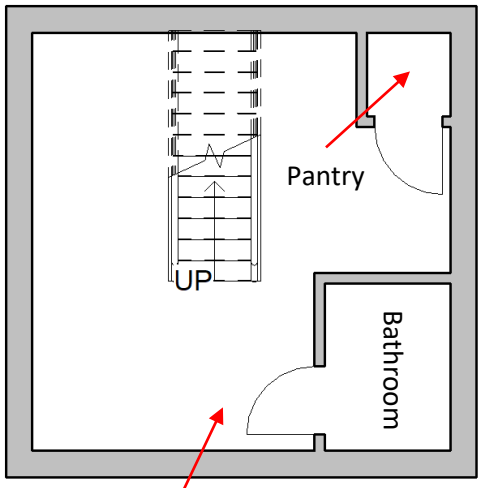
When first designing the cabin's overall shape, the windows had mullions or were too small (as seen in the circle window) and overall made the design appear unbalanced and unsymmetric. The decks vertical railings were also making the design appear less modern and not suit the clients required taste.



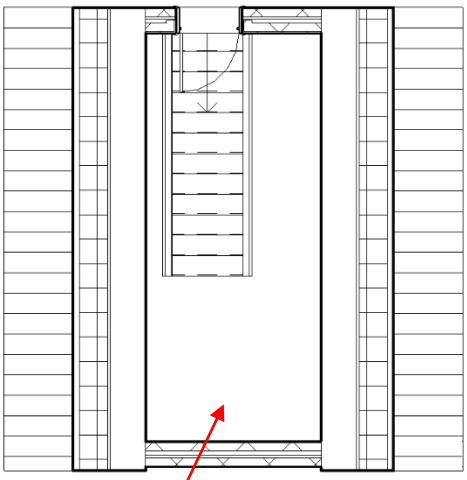


Cabin:

Overall, this image shows the changes that were added to the design suggested by the first Revit prototype/ concept. The circular window was enlarged to balance the design and the windows mullions were removed. Glass railings also replaced the vertical pipe railings and create balance with the large windows (balance the amount of glass).



Floor plan:



Ceiling plan:

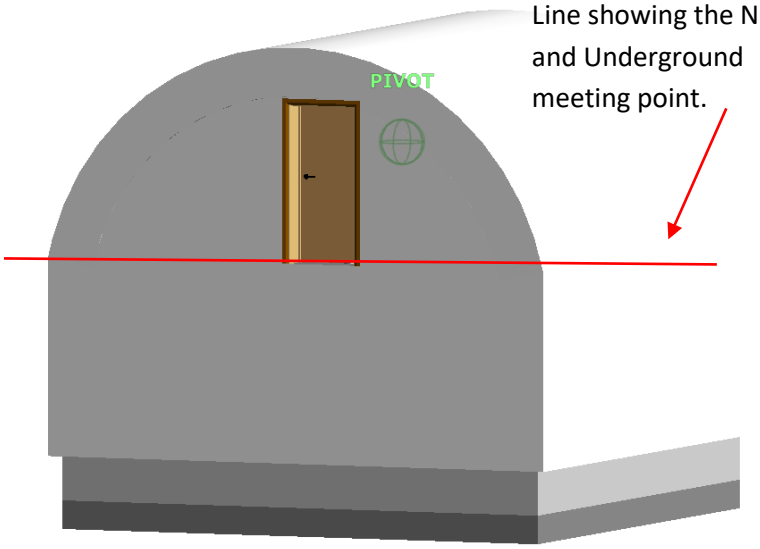
Bunker Floor Plan:

These two images (located on the left) show the floor plans of the Bunker without added furniture. Overall, I had to add walls for the bathroom in the bunker (which was not drawn in the concepts) to provide privacy for the clients. I also had to move the stairs slightly more towards the left of the bunker to provide enough walking space between the stairs and pantry.

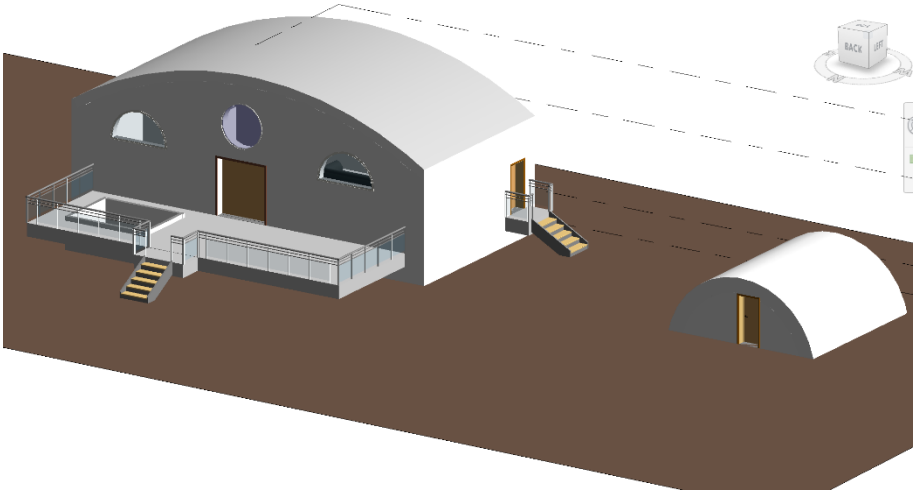
Bunker:

Overall, the shape of this design intends to reflect an army bunker and therefore create more protection for the clients when a fire occurs (Army bunkers were created to protect against bombs, explosions etc.)

The roof of the bunker is composed of bushfire resistant mesh and corrosion resistant steel to protect the roof from burning. However, this design is yet to include an air filter.



Line showing the NGL and Underground meeting point.



Overall Design Layout:

The image located on the left shows the rough layout for the final overall design. The distance between the bunker and house measures 9 meters and the NGL has been coloured to show a view of what the bunker would look like from ground level.

However, the water tanks, paths and air filter still need to be added to the design for the final presentation.

NATALIE HARDY

Fire Resistant Cabin Design

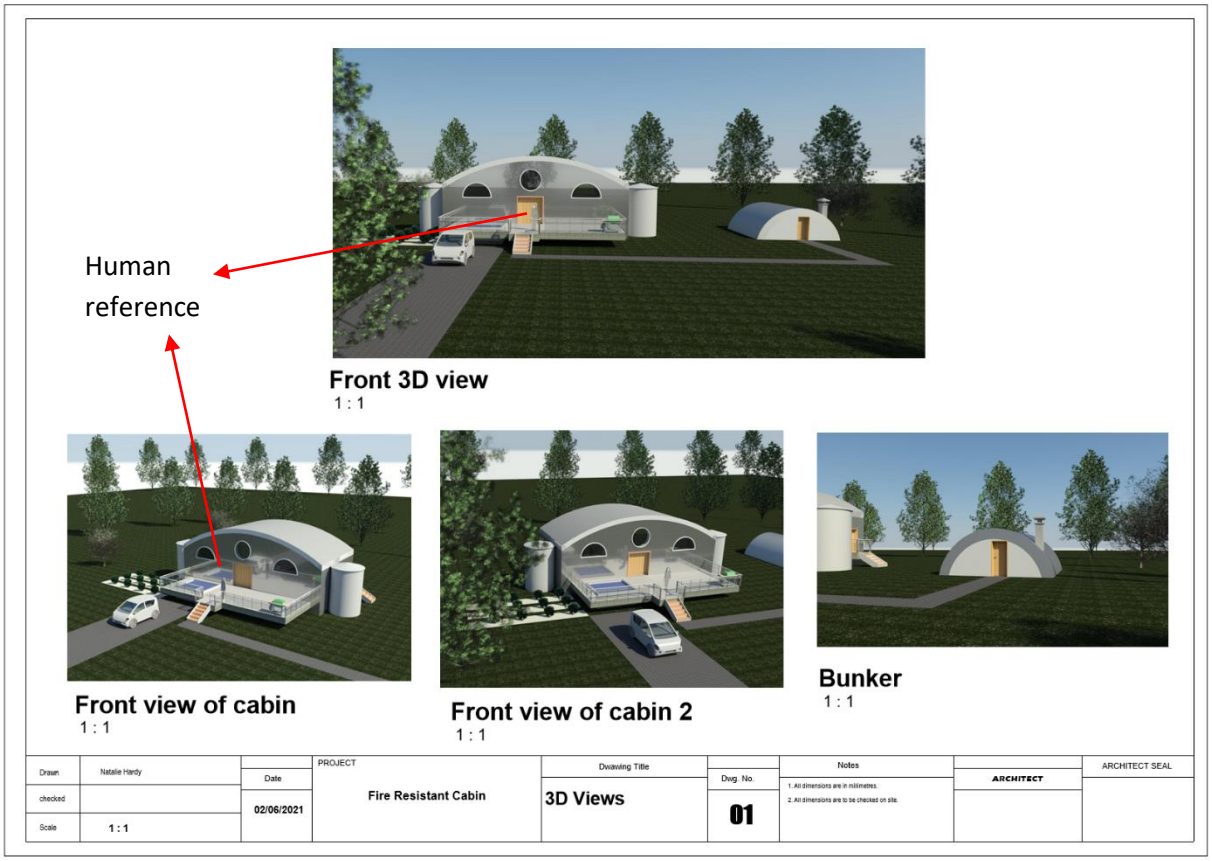
Architect's Statement | 02/06/2021:

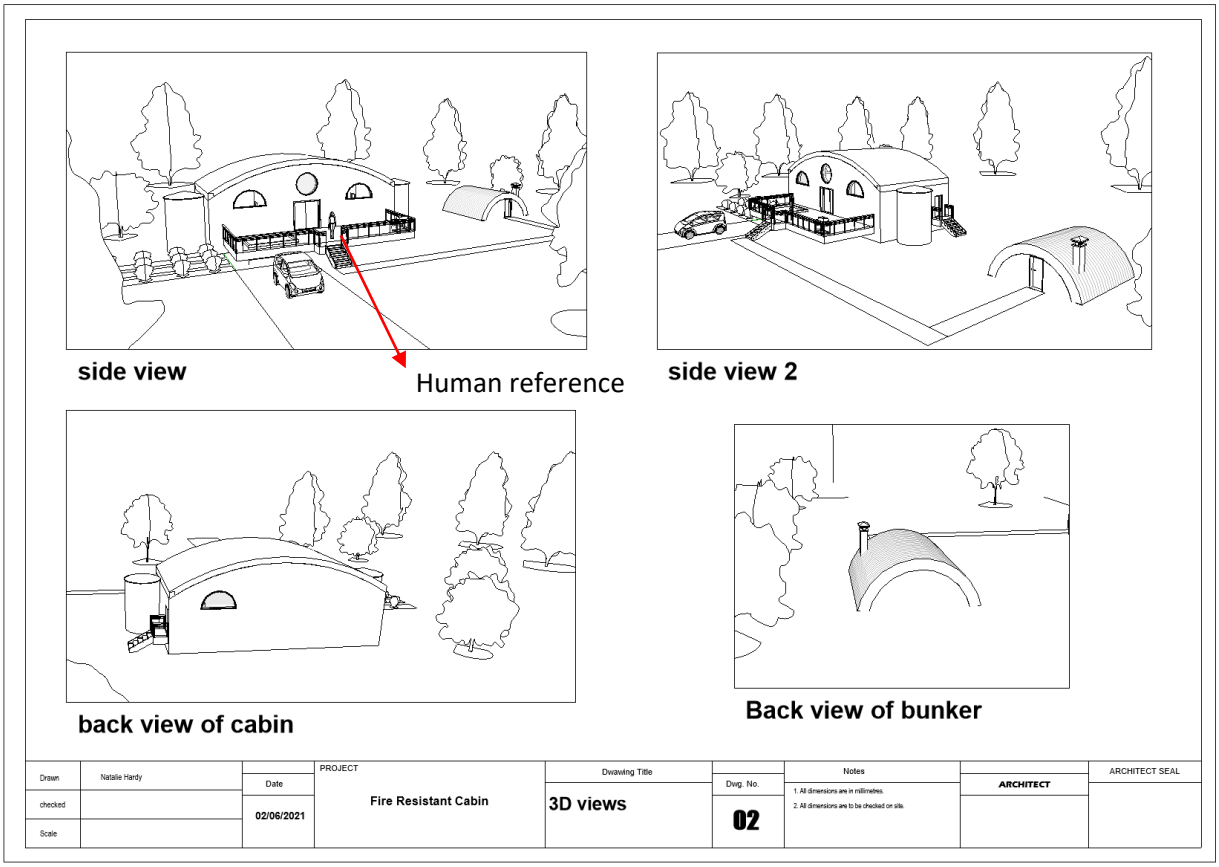
The criteria's described in the design brief were successfully completed with the designs fire-resistant features and ability to connect with the clients. Bruce and Mathilda Lamington desired a house with a monochromatic and modern colour palette with aspects of greenery. By incorporating a monochromatic colour palette with contrasting brightly coloured stairs and doors emphasize the rounded modern shape of the design and meet Mrs. Lamington's needs. A vegetable patch and large site area satisfies the needs of Mr. Lamington and allows the client to express their interests in a secluded destination. The designs rounded roof structures and added 3mm bushfire resistant mesh with corrosion-resistant steel form a design that allows fires to travel past the house quicker and cause less damage.

To form a design that further meets the design briefs specifications, a larger floor plan can be created to encourage the clients to host guests and escape their busy working lives.

3D views:

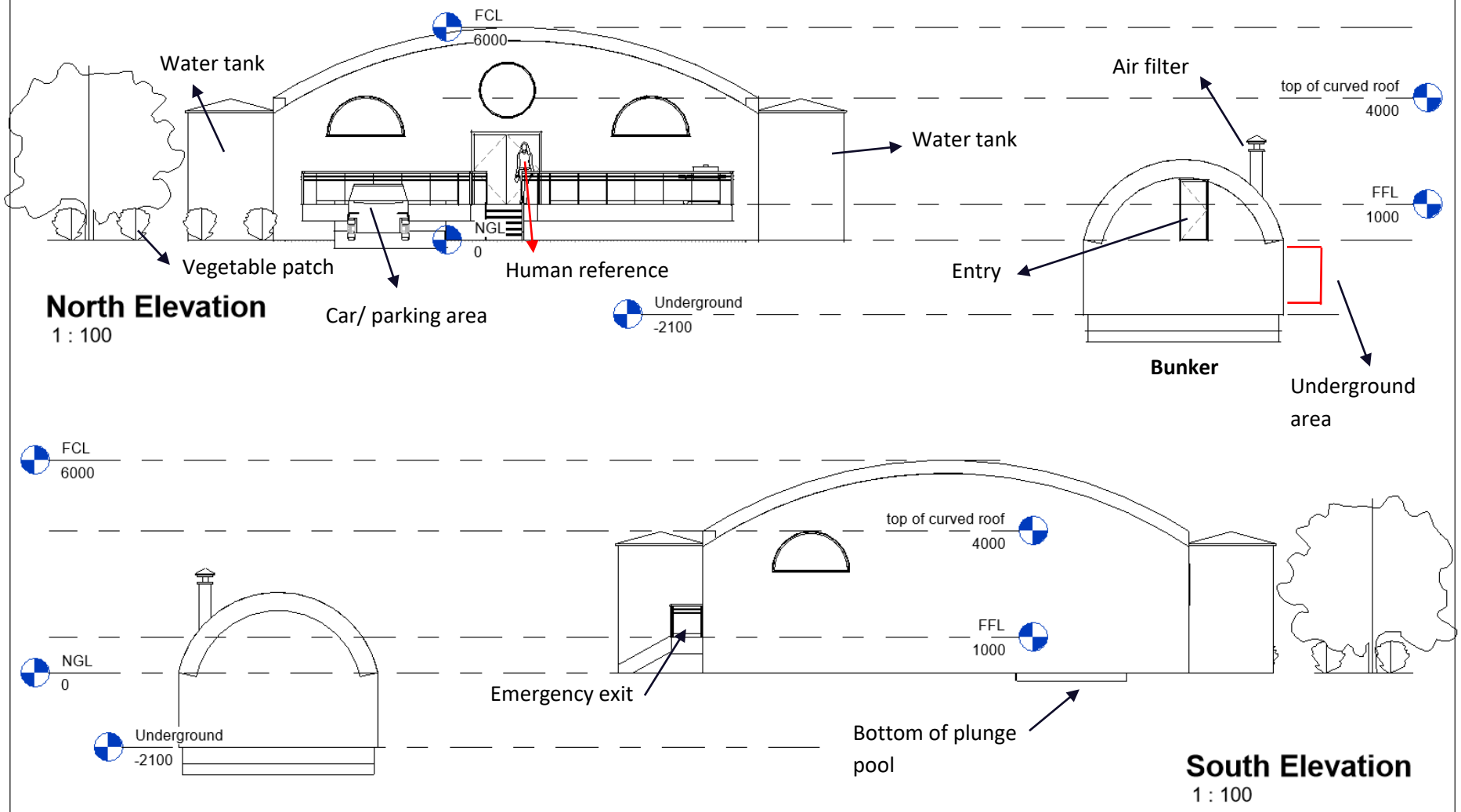
These images show four three dimensional views of the final rendered cabin design. These views intend to provide the clients with a better understanding of the cabin's proportions and colouring in a realistic manner.
Key features seen in these images are the monochromatic colour scheme and the contrasting bright coloured stairs and doors (these views show these colours).





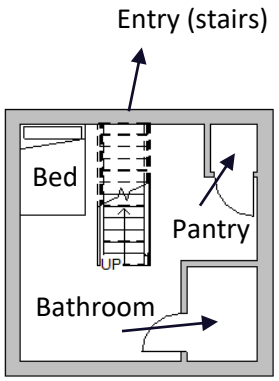
These images show the un-rendered three dimensional views of the cabin design. Overall, they describe a key feature of shape. The designs overall rounded shape is emphasized because the colour does not distract the eye, and the clients are able to understand the functionality behind the design and how this was used to create aesthetics. Therefore, forming a successful design.

Elevations:

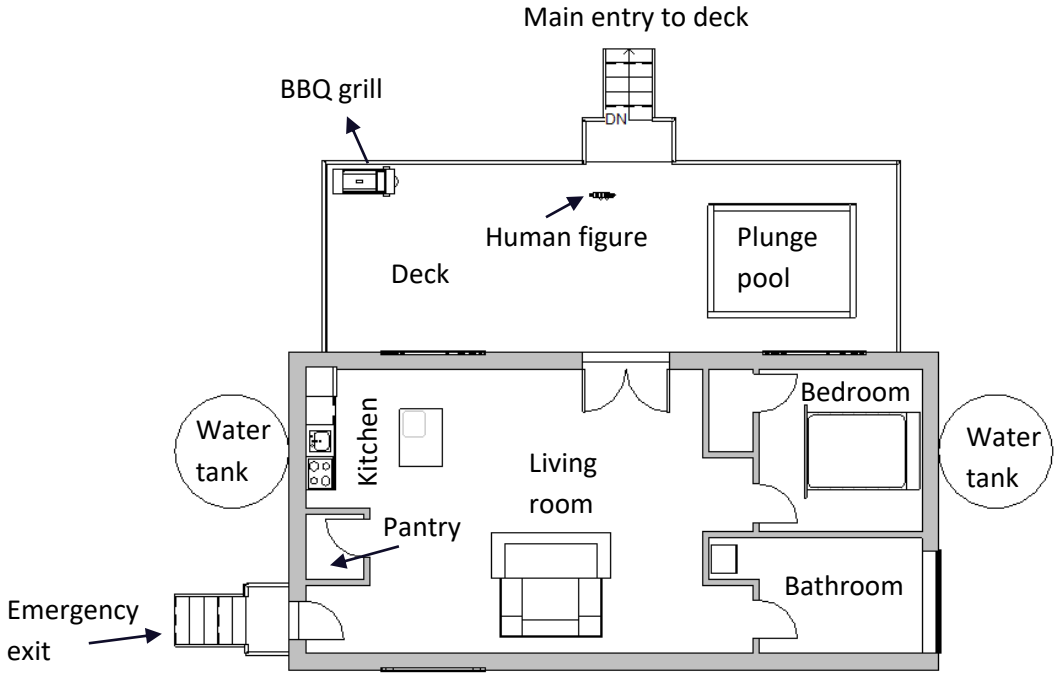


Drawn	Natalie Hardy	Date	PROJECT	Dwawing Title	Dwg. No.	Notes	ARCHITECT SEAL
checked		02/06/2021	Fire Resistant Cabin	Elevations	03	1. All dimensions are in millimetres. 2. All dimensions are to be checked on site.	ARCHITECT
Scale	1 : 100						

Floor Plans:



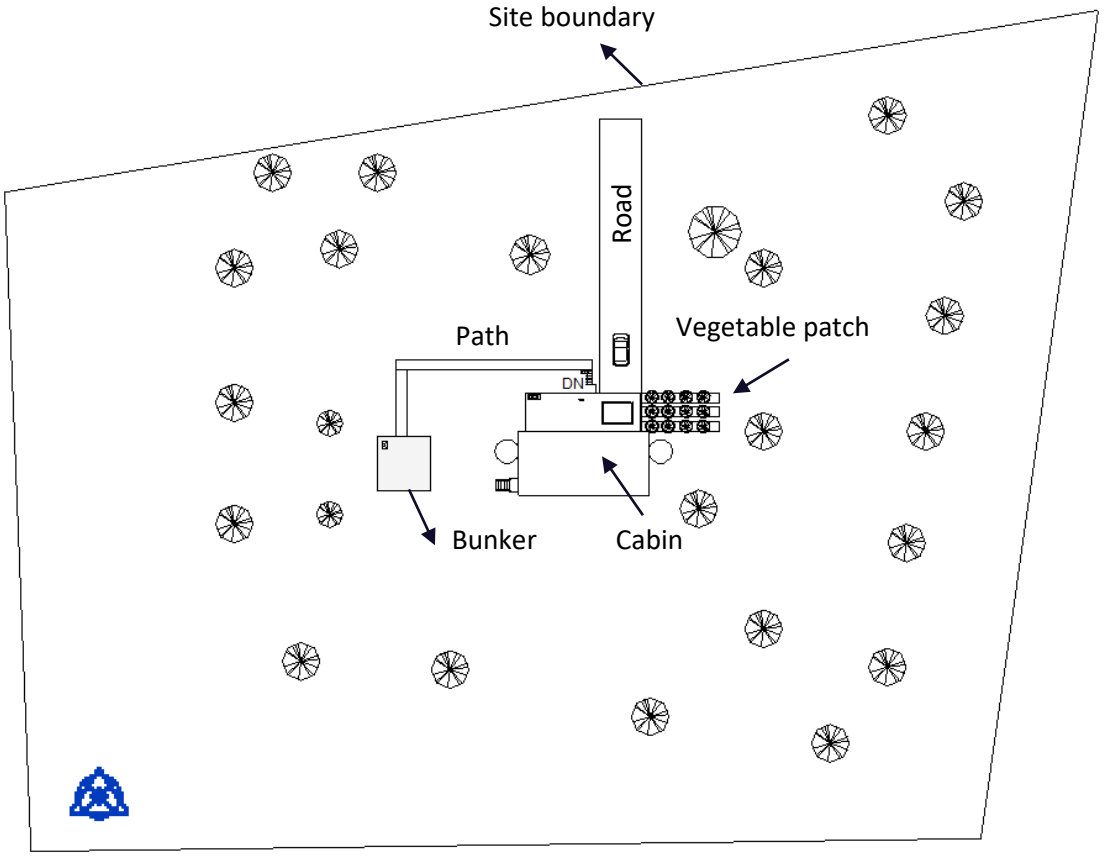
Bunker
1 : 100



First Floor Level
1 : 100

Drawn	Natalie Hardy		PROJECT	Dwawing Title		Notes	ARCHITECT SEAL
checked		Date	Fire Resistant Cabin	Floor Plans	Dwg. No.	1. All dimensions are in millimetres. 2. All dimensions are to be checked on site.	ARCHITECT
Scale	1 : 100	02/06/2021			04		

Site Plan:



Site view
1 : 500

Key:

= Trees

= Car/ parking

= Water tanks

Drawn	Natalie Hardy	Date	PROJECT	Dwawing Title	Dwg. No.	Notes	ARCHITECT SEAL
checked		02/06/2021	Fire Resistant Cabin	Site Plan	05	1. All dimensions are in millimetres. 2. All dimensions are to be checked on site.	ARCHITECT
Scale	1 : 500						

Walk Through:

Living room

Living room

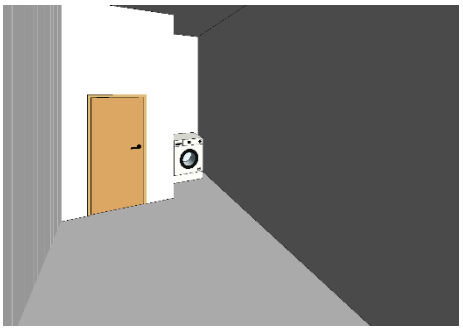
kitchen

Drawn	Natalie Hardy	Date	PROJECT	Dwawing Title	Dwg. No.	Notes	ARCHITECT	ARCHITECT SEAL
checked		02/06/2021	Fire Resistant Cabin	Walk Through	06	1. All dimensions are in millimetres. 2. All dimensions are to be checked on site.		
Scale								

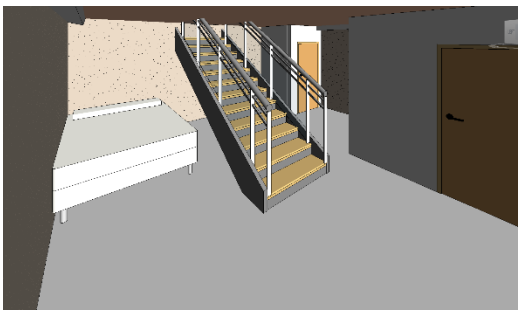
These images show what the house looks like when inside. The kitchen and the living room have been placed in an open area to express feelings of peacefulness (because of the space was crowded it would remind the clients of their busy lives). The placement of the living room also gives clients a chance to re-arrange the space to their desire and allows the clients to have a say in their house design.

These images show specific rooms located in the cabin and bunker. The two images on the top of the sheet show the bedroom and bathroom. These spaces have been left empty to allow clients to design the contents of the house and express their individual ideas (they are able to involve themselves in the design). The bottom image on this sheet shows the bunkers contents and the location of the stairs. This provides clients with an understanding of the space.

bedroom



bathroom



bunker

Drawn	Natalie Hardy	Date	PROJECT	Dwawing Title	Dwg. No.	Notes	ARCHITECT	ARCHITECT SEAL
checked		02/06/2021	Fire Resistant Cabin	Walk Through	07	1. All dimensions are in millimetres. 2. All dimensions are to be checked on site.		
Scale								

Hero Shot:

The walls of this design have reflective material to show how it is composed of metal material and explain to the clients how the house design will be protected from fires. However, in the final house design this material will be less reflective with more vertical grids visible. The vegetable patch seen in this final rendered Revit design is composed of sand, however, will be composed of soil in the final design. However, by using sand in this concept provides clients with a possibility for experimenting with what plants will grow in sand in this specific location (the client can express their gardening hobby in more detail).

Revit Sheet Reflections:

Elevations:

These elevation images consist of a North view and South view of the cabin/ bunker design. Overall, these images show the clients what the design looks like as a whole from an isometric point of view. They are then able to see the technical details of the design and understand how the house will be protected from fires and how functionality is linked with aesthetics (the shape of the curved roof is both aesthetically pleasing and fire resistant).

Floor Plans:

The number of stairs for the bunker was calculated using this formula: $\frac{\boldsymbol{NGL\ to\ Underground}}{\boldsymbol{Riser}} = \frac{\mathbf{2100}}{\mathbf{150}} = \boldsymbol{14\ stairs}$. Because of this, a larger area had to be left to allow these stairs to be placed. The location of the pantry and bathroom have also switched positions in this final concept to provide the bathroom with more space.

The final floor plan for the cabin design has little furniture, and this is to provide clients with an opportunity to design their houses layout and feel involved in the design's creation/ concept process.

Site Plan:

This site plan image shows the surrounding area of the cabin and bunker design. There are trees located around the house to act as a protective barrier for the design if a fire occurs. Trees can stop the spread of fires because they are less likely to catch on fire if embers spread from a fire occurring far from the house (Jim's Mowing, 2021). This is because of the moisture in the leaves (to survive trees store water in the leaves and make them slightly moist).

The vegetable patch is seen to be located next to the house. This is to ensure it gets protected if a fire occurs due to it being surrounded by the house and trees. Not only does this protect the area from fires but allows the client to enjoy their hobby without traveling a far distance form the house. Overall, making the design more enjoyable for the client and meeting the design briefs specifications.

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