SOUTH FEATHERSTON HOMESTEAD

Contents

Part 1: Site Analysis

Property Description

The Home

The home has a traditional bungalow style appearance from the street in keeping with the age and type of house (1948 bungalow) with three bedrooms, one bathroom. There is an open plan living room, kitchen and dining room on the northern side of the building.

Front yard

The existing front yard contains several shade trees (one ornamental cherry and two silver birches) planted in a front yard consisting of lawn. There is an existing flower garden along the front of the house that has been planted up with flowers such as roses, hydrangeas, Calla lily (Zantedescia) and several varieties of annuals. These were planted by the land owners (except for one un-named variety of rose) which was there when they bought the section four months earlier.

Analysis:

The front yard faces east so it will receive early morning sun and afternoon shade. Any plantings in the front yard will need to be able to handle the strong northerly and north westly winds that are funnelled between the house and the house on the northern neighbour's section.

The ornamental cherry and two silver birches in the front yard will require regular pruning during winter to ensure that the branches do not impede the overhead electricity and telephone lines coming into the house.

Northern side of the section

On the northern side of the section is a grassed area that includes several citrus trees planted by the previous owner. The citrus trees include: dwarf navel orange (fruited for the first time in 2017), Tahitian Lime and grapefruit (neither have yet fruited). Against the original chimney of the house is a “San Pedro” cactus which is over two metres tall

Issues with the northern side of the property are: excessive heat radiating into the house from the northern wall during summer, strong north-westerly winds coming down from the Remutaka Range, and the northern side of the yard being a wasted space with a lack of aesthetic appeal (apart from citrus trees).

Analysis:

This northern side of the house would form a useful microclimate for the growth of warmth loving plants as the side of the house acts as a heat sink during the day releasing warmth during the cooler nights.

The planting of deciduous trees along that side of the property would also provide shade and cool that side of the house during summer, while allowing in light and warmth during the winter months.

Southern side of the section

The southern side of the section is a narrow strip containing a drive way (two concrete strips through grass) down to the garage at the rear of the section, and the original garage built in 1948.

Analysis:

Any planting in this area needs to factor in:

- ensuring any planting does not shade out or impact on the amenity of the neighbour next door (any planting would be on the northern side of the neighbour’s section), and
- allows the clients and visitors to be able to get in and out of their cars.

The space between the house and the concrete strips of the driveway is in permanent shade being on the southern side of the house.

Backyard

The backyard of the section is enclosed in a dog proof fence, with the fence on the northern side being a 1.5 metre solid ply fence to help protect from the north-westerly winds. Down either side of the backyard is a row of ornamental cherry trees which flower beautifully in spring. In the centre of the yard (facing west) is a section of lawn running from the house down to the rear fence. This grass allows the landowners to enjoy the view of the paddocks beyond the fence-line and the Remutaka Range in the background.

At the rear of the garage is the woodshed and the vegetable garden. This area (9 metres X 6 metres pictured when the clients moved in) has since been set-up and established for annual vegetable production.

The house still has the original septic pit located in the backyard towards the middle of the section. There is also a lemon tree in the backyard that is in its second year of fruiting.

Many pasture species can be found growing in the backyard lawn due to the proximity of the grazing paddocks at the rear of the section. Species found growing in the backyard include: white clover, yarrow, parsley dropwort, broad-leaved plantain, dandelion, purslane, daisy, pennyroyal and mallow.

Analysis:

The views of the farmland and the Remutaka Range in the west limits what plantings can be made in the backyard. Plantings on the northern side of the backyard will need to include deciduous species to maximise sunlight into the section during the winter months, while wind breaks (to protect from the strong northerly and north-westerly winds) will need to be planted to have a minimal impact on the views.

The limited size of the homestead will have an impact on the varieties of fruit trees that can be fitted into the section. By approaching the neighbours on either side of the homestead to identify what fruit varieties they are already growing on their sections, we will be able to maximise opportunities for pollination and fruit production in the homestead.

Location

Latitude: 41.1353^{o} South Longitude: 175.35211^{o} East

South Featherston is a small rural farming community located on the South-East tip of the North Island. The small community consists of sixteen houses and a small primary school surrounded by dairy farms and lifestyle blocks. The sixteen houses that make up this community are on sections ranging in size from 800 square metres through to 4000 square metres.

The community is centred around the intersection of South Featherston Road and State Highway 53 (Featherston-Martinborough Road) with the first sub-divisions and houses originally being built in 1948 to provide accommodation for the workers at a local dairy foods factory which has since been closed and demolished.

The South Featherston community is located between the town of Featherston, in the foothills of the Remutaka Range, and the Tauherenikau River. It is situated 5km southeast of the town centre of Featherston, which has the local railway station that provides commuter access to the city of Wellington.

South Featherston is located on State Highway 53 (Featherston-Martinborough Road) also known as part of the Classic New Zealand Wine Trail which spans three of New Zealand's top wine growing regions - Hawke's Bay, the Wairarapa and Martinborough.

Wairarapa Maps

January 24, 2018

1:50,000

0 550 1,100 2,200 Metres

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Map for the local area with the town of Featherston (A), South Featherston (B) and the Tauherenikau River (C) identified.

The location of the South Featherston homestead is marked ★ below.

Wairarapa Maps

January 24, 2018

Masterton Contours

0

1

Carterton Contours

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South Wairarapa Contours

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1:4,000

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Climate

South Featherston has a temperate climate with warm, dry summers, and cool winters with regular frosts. Strong dry north-westerly 'foehn' winds occur in spring and summer gathering strength as they come down off the Remutaka Range, while heavy rains coming from the south and east can cause localised flooding due to the flat nature of the surrounding farmland as well as flooding of the nearby Tauherenikau River.

The Gardenate website (https://www.gardenate.com/zones/#zone-NZ) describes the climate as Cool/Mountain Temperate. With the PlantMaps website (http://www.plantmaps.com) identifying Featherston as having a USDA Plant Hardiness zone of 10A.

Precipitation

Featherston has an altitude of 40 metres (being in the foothills of the Remutaka Range), while the community of South Featherston, 2.6 kilometres east, has an altitude of 23 metres. Both towns experience significant rainfall due to their proximity to the Remutaka Range, with an annual rainfall of 1228mm.

Precipitation is lowest in February with an average rainfall of 64mm, while the wettest month is July with an average rainfall of 136mm. The most rainfall occurs during the months of May to September.

Average monthly rainfall is recorded below (Source: https://en.climate-data.org/location/32608/)

Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
86mm	64mm	96mm	97mm	115mm	125mm	136mm	125mm	102mm	94mm	92mm	96mm

Temperature

The average annual temperature for Featherston is 13 degrees Celsius. Throughout the year the temperatures vary by 9.2° Celsius. January and February are the hottest months of the year with average temperatures of 17.6° Celsius. The coldest month of the year is July with an average temperature of 8.4° Celsius.

Average maximum and minimum temperatures are recorded below

(Source: https://en.climate-data.org/location/32608/)

	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Av.	17.6°c	17.6°c	16.2°c	13.8°c	11.2°c	9.2°c	8.4°c	9.0°c	10.7°c	12.3°c	14.1°c	16.1°c
Min.	12.7°c	12.6°c	11.6°c	9.5°c	7.2°c	5.3°c	4.6°c	5.1°c	6.7°c	8.1°c	9.6°c	11.5°c
Max.	22.5°c	22.6°c	20.9°c	18.2°c	15.3°c	13.1°c	12.3°c	13.0°c	14.8°c	16.6°c	18.6°c	20.7°c

Growing season (Hours of daylight and expected frost dates)

(Source: http://www.featherston.climatemps.com/sunlight.php)

During the year the sun varies in altitude in the sky from 25.5 degrees, in June, to 72.3 degrees in December.

The average annual number of daylight hours is 12.0 hours per day, with the longest day being in December (15hours 05minutes of daylight), and the shortest day being in June (9hours and 16minutes of daylight).

Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
14h 46m	13h 46m	12h 28m	11h 03m	9h 52m	9h 16m	9h 32m	10h 33m	11h 55m	13h 19m	14h 30m	15h 05m

According to *"An Air Frost Chronology for New Zealand", New Zealand Meteorological Service, 1981"*, the South Wairarapa region (weather station data from Greytown, was used in the study) can, on average, expect the first extreme frost around 3 May, and the last extreme frost around 6 October. This gives an expected growing season of 208 days, which does not factor in the use of polytunnels, glasshouses and starting off seedlings inside to expand the growing season.

Wind direction

The South Wairarapa includes the areas around Featherston (including South Featherston), Martinborough, Greytown and Carterton.

The average wind direction (in degrees) per month over the last five years has been averaged as follows:

	Jan.	Feb.	March	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
2013	234°	306°	236°	236°	-	220°	214°	289°	325°	240°	315°	221°
2014	312°	305°	306°	222°	320°	314°	302°	300°	225°	303°	-	248°
2015	307°	237°	-	290°	229°	356°	321°	252°	342°	308°	291°	-
2016	-	308°	225°	220°	312°	318°	234°	219°	210°	289°	296°	226°
2017	292°	182°	236°	318°	292°	227°	304°	-	320°	319°	300°	313°
Average direction (in degrees)	286.25°	267.6°	250.75°	257.2°	288.25°	287°	275°	265°	284.4°	291.8°	300.5°	252°
Direction	West	West	West	West	West	West	West	West	West	NW	NW	West

Data collated from New Zealand's National Climate Database (Source: https://cliflo.niwa.co.nz/) for period from 2013-2018.

Winds coming from the South West usually bring mild warm weather, while winds from the East or South East usually bring excessive rainfall as the cloud hits the Remutaka Range. Winds coming from the west are usually blustering and gusty. In winter these winds bring extreme cold down off the Remutakas, whereas in late Spring and Summer the north westerly 'foehn' winds off the Remutakas bring extremely warm, drying winds.

Sunrise and sunset times and degrees

(Source: https://www.timeanddate.com/sun/new-zealand/wellington)

	Autumn equinox March 20, 2017		Winter equinox June 21, 2017		Spring equinox September 23, 2017		Summer equinox December 22, 2017	
Sunrise	07:23am	91°	07:46am	59°	06:09am	91°	05:44am	123°
Sunset	19:32pm	269°	16:58pm	301°	18:18pm	269°	20:54pm	237°

Soil

To determine the type of soil on the property five test holes were dug across the length of the property. In each test hole the first 5cm of soil containing grass roots etc. was removed and then the soil dug to a depth of 12-15cm. A sample of this soil was then tested.

The soils from all five test holes were very similar which is not surprising in a section that is relatively flat and only 800 square metres in size.

Physical description

The soil at South Featherston Homestead was a light grey colour suggesting that it will have a low level of organic matter. Much of the soil samples were fine particles of loam with larger aggregates of the same. Each soil sample also contained small rounded pebbles which is not surprising considering the geological history of the area (alluvial plain and glacial outwash). Pebbles found in the soil samples were in the 6-12mm size range with occasional pebbles found ranging in size up to 24mm in diameter.

Soil sample from a depth of 12-15cm.

A float test was first used to determine the mineral composition of the soil.

The float test involved removing the top soil (top 5cm) and taking a sample of soil from a depth of 12-15cm.

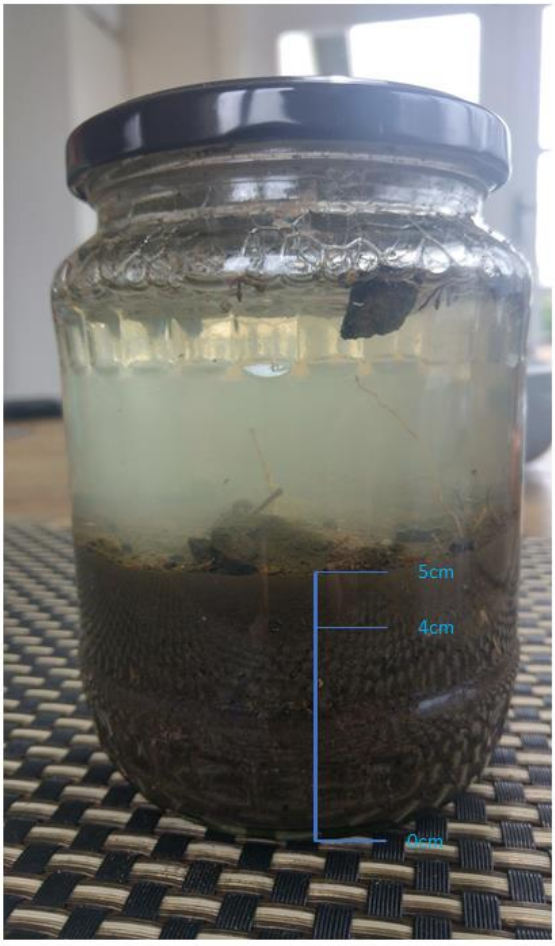
This soil was put into a glass jar (filling it about one third or 5cm) and then adding water and a squeeze of detergent.

After one hour a photograph was taken to show the initial layering of soil types, and then again after 24 hours to give time for any finely suspended particles in the water to form a layer.

Any of the larger pebbles found in the soil samples were removed before the float test was conducted.

Float test results

Float test pics after 1 hr (top) and 24 hrs (bottom)



Float test results

Depth of sample in jar: 5cm

Depth of clay in sample: 0.8cm +/- 0.2cm

Percentage of clay in sample: 20% approx.

Depth of silt in sample: 4.0cm +/- 0.2cm

Percentage of silt in sample: 84% approx.

Depth of sand in sample: 0.2 +/- 0.1cm

Percentage of sand in sample: 4% approx.

As the pictures reveal, the soil at the site is almost completely silt with a percentage of clay, with minimal sand present. The samples also contained some organic matter as can be seen floating on the surface during the float test. Analysis would suggest probably 10-15% clay (shown by the thin dark layer on top of the soil) with 80-85% silt and 0-5% sand meaning the soil would best be described as **silty loam**.

Observations of the soil while the samples were being dug suggest that while the soil is primarily silty with some clay, fine gravel and stones.

Each sample hole was then filled with water (approximately 4litres per hole) to determine the soil's ability to absorb moisture. Testing at the soil sample test spots revealed the same results in each of the soil sample holes. Each hole was filled with water and left to drain away. The soil at the bottom of the hole was then dug to see how far the moisture penetrated the soil.

The water was observed to only soak into the top 10-15mm of the soil surface with soil below that still being dry.

After 4litres of water was poured into this hole only the top 10-15mm of soil had absorbed any of the moisture. The soil underneath was still dry.

Chemical Properties

The soil pH was tested using a Soil pH Testing Kit (Gardener's Mate brand) which revealed a soil pH of 6.0 which is acidic. This is at the acidic end of the growing range for many plants and will begin interfering with their uptake of nutrients such as phosphorus, calcium, molybdenum and magnesium.

A more accurate report on the condition of the soil would be provided with a professional soil test. This would more accurately report on the soil acidity level, cation-exchange capacity, and the nutrient and levels of specific minerals in the soil. For example, a soil test by Bio Services, Paeroa, would be able to conduct a REAMS Soil Test Report which would also identify the amount of nutrients in the soil that are available for plants to use, the key nutrient ratios and humus levels.

Topography

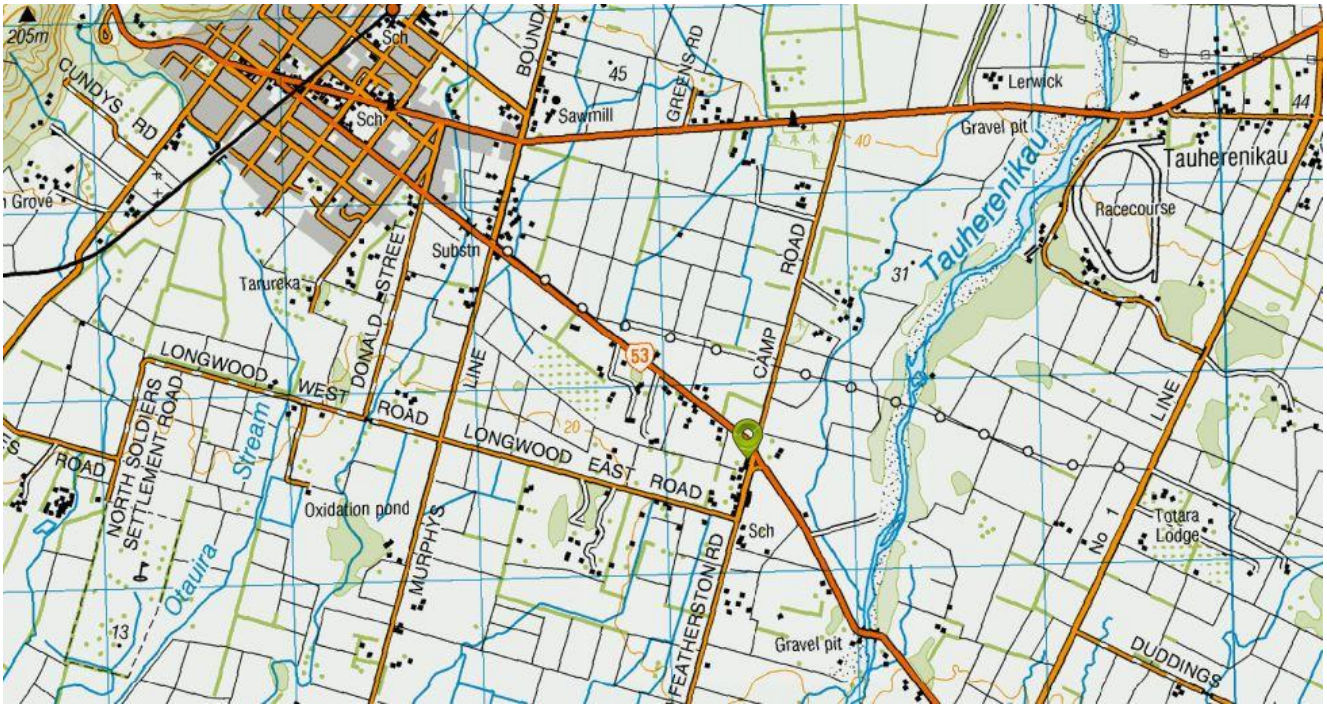
South Featherston is located between two major topographical features, the Remutaka range which is 5km to the west and the Tauherenikau River which is 2.9km to the east. South Featherston is situated on flat grazing land between the Tauherenikau flood plain and the foothills of the Remutakas. ★Location of the South Featherston homestead.

Tauherenikau flood plain contours mapped by the South Wairarapa District Council. The light blue line running north-south dotted blue shows a water race and the edge of the floodplain.

Slope

The South Featherston homestead is situated on the western side of South Featherston road with the section sloping from east to west away from the road. In the front half of the property (front yard and house) the fall away from South Featherston Road is 13:1000 (130mm over 10metres), whereas in the rear of the section the fall away from the house is 19:1000 (190mm over 10metres).

The gradient changes within the South Featherston Homestead site are too small to feature on the contour maps for the local area, or on Google Earth with a Contours close data set.



Source: https://www.topomap.co.nz/NZTopoMap/nz43334/Featherston/Wellington

Part 2: User Requirements

Introduction

The clients are a professional couple who are nearing retirement age. One of them has taken early retirement and has an interest in permaculture, organic gardening, self-sufficiency and homesteading. The other member of the couple is studying at university, with an interest in cooking and traditional gardening.

Client Vision/ Goal statement

Our section will be a fully productive homestead with annual and perennial vegetables, berries and fruit trees, perennial flowers and bulbs, herbs, annual flowers and livestock, from which we will produce most of the food we eat all year round. Native plantings as well as exotic species will attract bees and beneficial insects into the garden across all the seasons.

Our homestead will allow us the opportunity to develop new skills in self-reliance and self-sufficiency, which we can then share with others in our local community.

Our section will be connected to the local area with its views of the surrounding farm land and the Remutaka Ranges, while having some protection from the strong north-westerly winds, and the heat from the summer sun.

Client requirements

- Privacy from road on eastern side of section
- Blocking or reducing the heat the northern side of the house during summer
- Protection from strong winds (often gale strength) coming from the northwest
- Production from fruit trees and berry plants spread out across the year
- Water storage
- Vegetable garden and small orchard
- Opportunity to be able to expand production to include sales of produce, seedlings and potted plants
- Woodland style plantings with deciduous trees underplanted with shrubs/ flowers/ herbs/ bulbs
- Retain views of the Remutaka Ranges and surrounding farmland
- Livestock to include chickens
- Improve aesthetic appeal of backyard while catering for physiological needs of livestock and two small house dogs which are the family pets

Client Style

- Classic traditional with a mix of modern furniture and artworks
- Mix of formal and informal areas for entertaining
- Mix of productive and ornamental gardens

Resources – time, money and expertise

One of the clients has taken early retirement (early 50s) and is able to do the implementation and ongoing maintenance of the design. That client is currently the primary gardener being responsible for establishing and maintaining the garden (including the vegetable garden) He has the knowledge and skills required to establish a garden and the work involved (eg. propagating, weeding, pruning and composting) and is planting on learning grafting. This client has also done several weekend permaculture courses so is aware of what may be suggested in a permaculture design.
The other client is studying full-time at university while enjoying gardening and cooking in their free time.

The clients intend to implement the permaculture design themselves and are willing to implement the design over a longer period without a definite finishing date. They would prefer to propagate the plants from seeds and cuttings themselves, rather than purchasing all the plantings as established, more mature plants.

Landscaping features such as garden paths and infrastructure will be purchased, or constructed, by the land owners themselves as time and money allow.

Part 3: Site Maps

Topography

The South Featherston homestead is situated on the western side of South Featherston road with the section sloping from east to west away from the road. At the front half of the property (front yard and house) the fall away from South Featherston Road is 13:1000 (130mm over 10metres), whereas in the rear of the section the fall away from the house is 19:1000 (190mm over 10metres).

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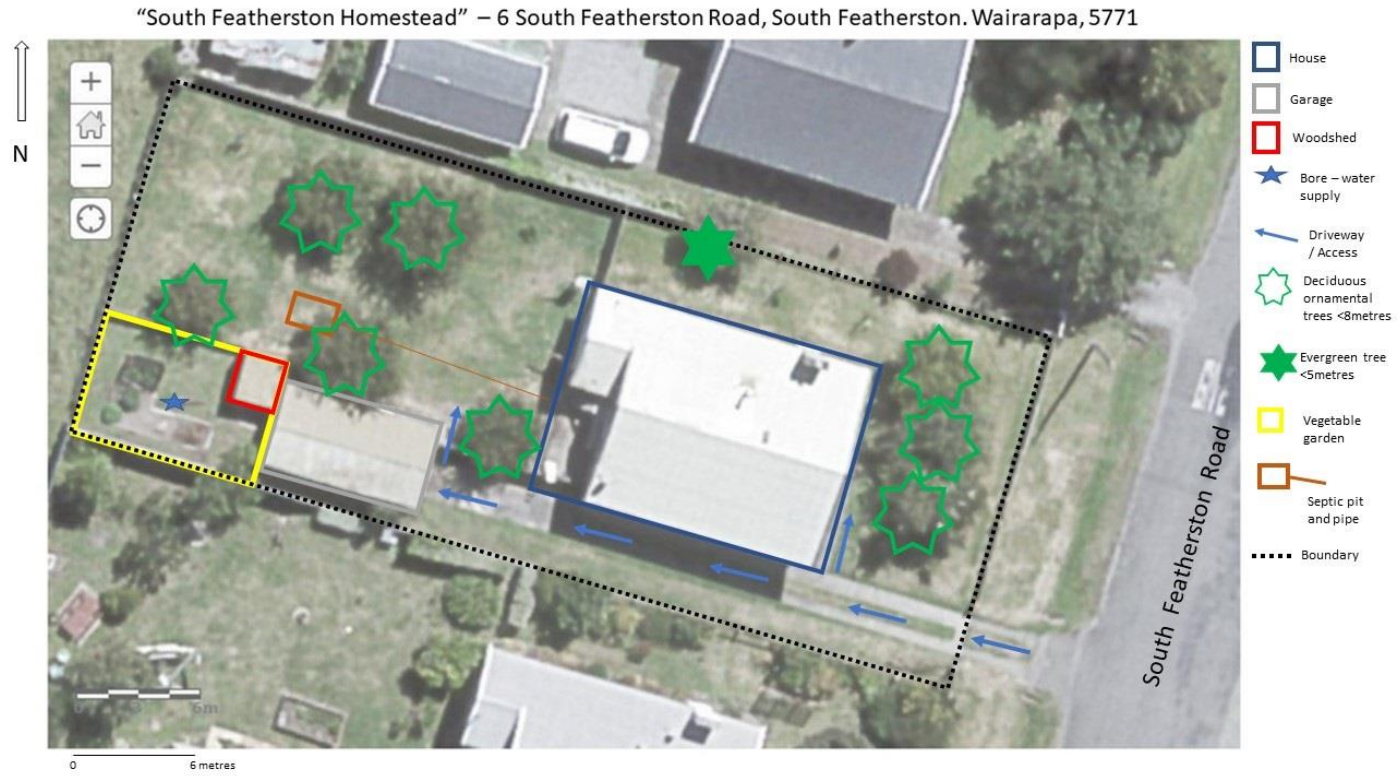
Existing features

The base map below shows the permanent structures found at the South Featherston Homestead site.

Area: 819 square metres

Road frontage: 20metres Section length: 40.95metres

This includes: permanent buildings (including the house, garage and woodshed), access routes, infrastructure (such as the bore, septic pit and pipes) and the location of trees and permanent garden beds on the site.



The aerial map (following page) shows existing plantings in the site as well as several microclimates found within the section.

The deciduous ornamental trees are all less than 8metres tall and are of two different species. They have been coded: 'C' for the ornamental cherries (Prunus spp.), and 'S' for Silver birches (Betula Pendula). The only evergreen tree on the site is a variety of callistemon (Australian bottlebrush) which is growing inside the neighbour's property and is less than 5metres tall. The callistemon is shown on the map with the letter 'B'.

The annual vegetable garden at the rear of the section is 48 square metres in size (marked in yellow), and the two flower gardens at the front of the house (in blue) are marked on the map as well.

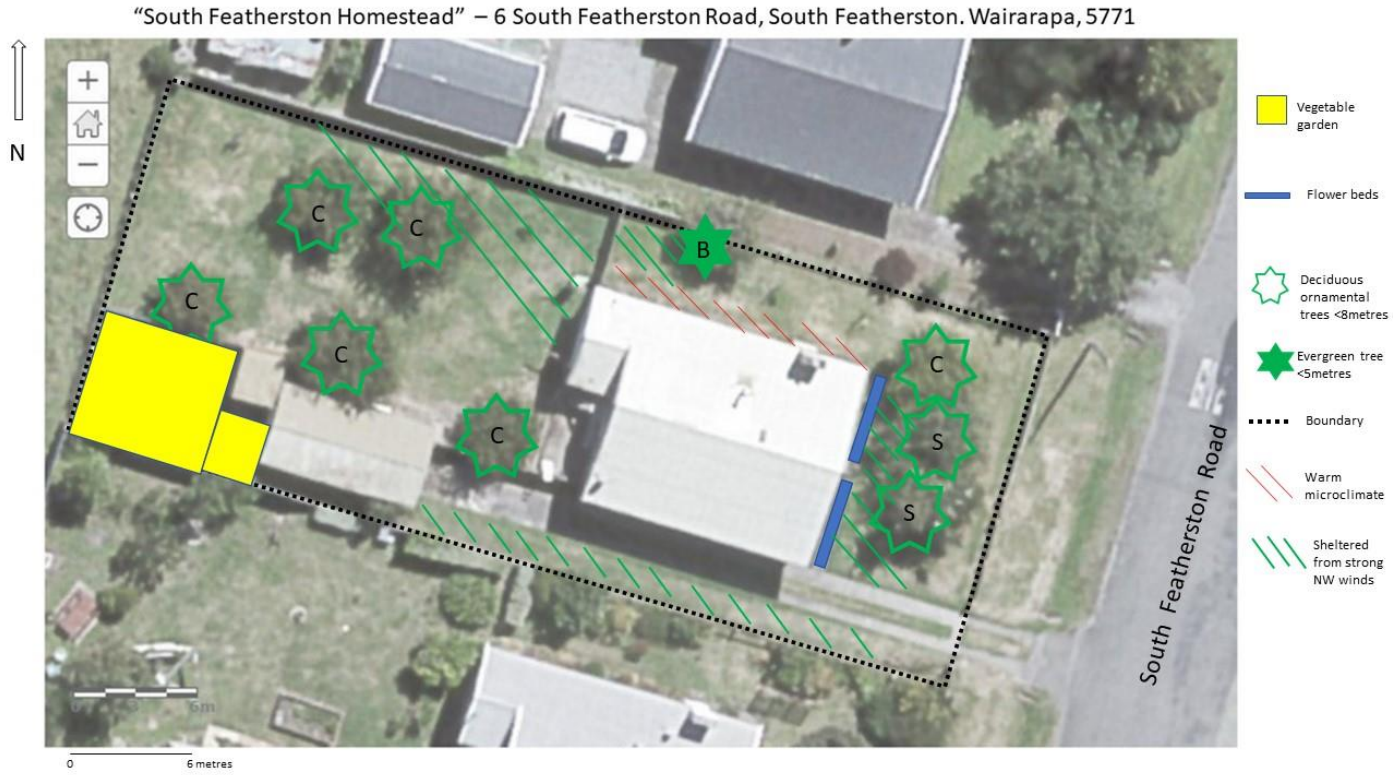
Micro-climates

Several micro-climates can be found within the site.

The area in front of the northern exterior wall of the house creates a micro-climate that absorbs heat from the sun during the day and releases it during cool winter nights creating a warm micro-climate. During Summer this exterior wall of the house absorbs the summer heat heating the interior of the house on the northern side.

The green shaded areas on the map below show areas in the site that are protected by from the wind. This protection comes from the solid ply fence along part of the northern boundary, the location of permanent structures such as the house and garage, and the deciduous trees within the property.

Each of the shaded spots are protect from the westerly and north-westerly winds which blow down from the Remutaka Ranges. During winter these winds are strong and blustery, and bitterly cold, whereas in late spring and summer they are the dry warm 'foehn' winds that dry out the soil and quickly raise the atmospheric temperature. micro-climates which are protected from the winds, are ideal for fragile, tender plants that need some wind protection for crop production.



Water dynamics

Water movement across the section

The map below shows the way water moves across the property during a rain event.

There is no kerbing in South Featherston. Any run-off from the road flows into a culvert which runs parallel to the road (as shown by the yellow arrow).

The red arrow just inside the fence at the front of the section shows a low-lying area which runs along the entire front of the section and collects run-off. Some of the water that is collected is absorbed into the soil while the excess then flows out and onto the driveway and down toward the garage.

The blue arrows show the flow of water across the property. Excess run-off then flows through into the paddocks at the rear of the section. Any run-off from this paddock then flows into a water race on the western side of the paddock.

The red “L”, at the rear of the section, shows a low-lying point where some of the water flowing across the section tends to pool.

Water movement in the surrounding area

The water race (dotted blue line shown on the next aerial image) runs along the back of the sections at South Featherston, then south out through the surrounding dairy farms.

Water storage

Even though the house and garage both have guttering there are no water storage facilities on the block. The guttering on both buildings is in poor condition, being the original painted tin guttering from the construction of the house in 1948. The guttering and downpipes are painted tin and end with the downpipes leading into soakage pits.

Water bore and septic tank

Water is supplied to the section via a shallow bore. The section has no town water or sewerage provided.

At the rear of the property, are located the shallow bore (in the south western corner) and the septic pit. The septic pit is the original septic pit for the property (originally servicing both properties on either side of the section as well) with the original clay pipes running from the house to the septic pit. The septic pit is located in the middle of the back yard of the property. *Bore* **B** *and Septic pit,* **S** *marked on aerial image.*

The local plumber has identified the bores in the local area produce slightly alkaline water with many dissolved minerals, in particular, iron and copper. Water from the bore is filtered with a 20micron filter before being pumped into the header tank located in the ceiling of the house.

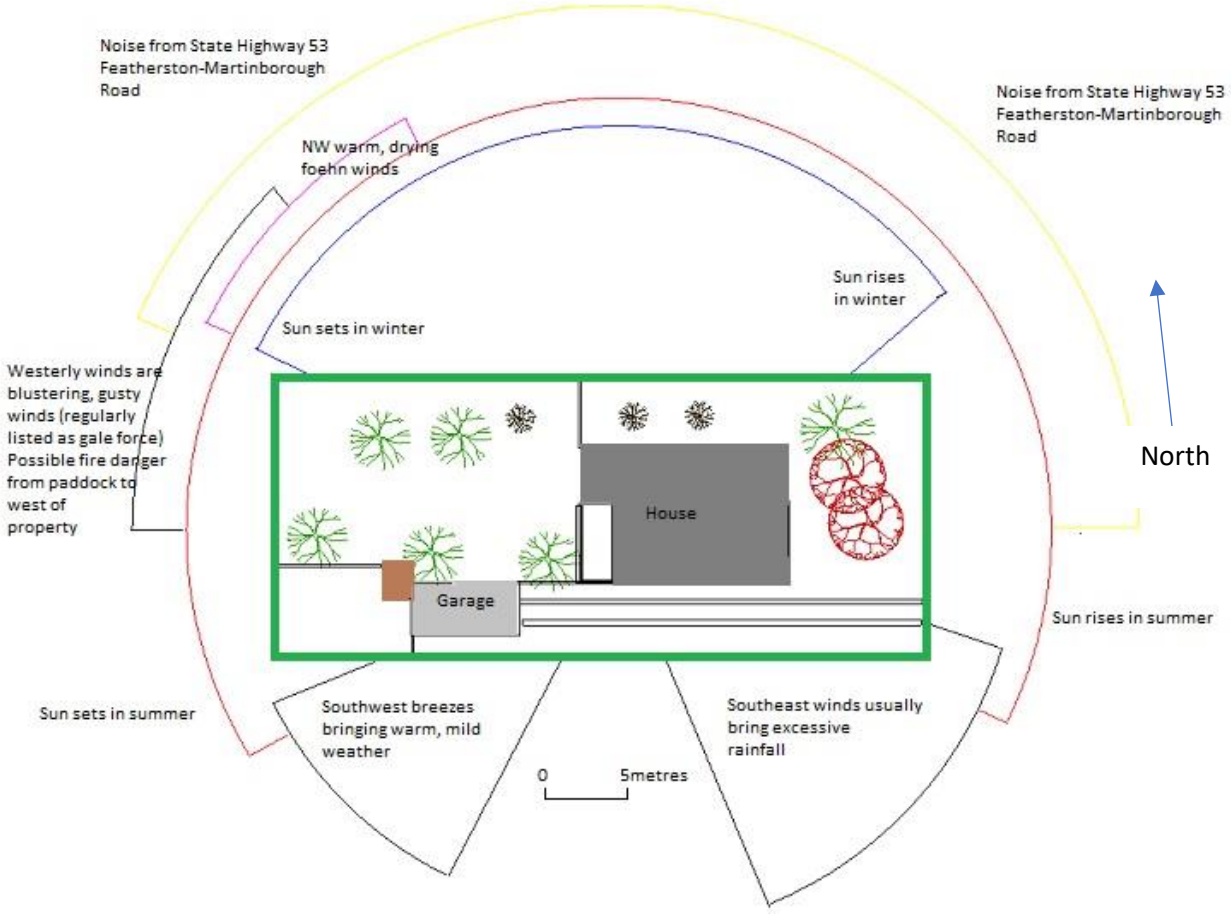
Future water storage options could be investigated including the storage and capture of run-off water, as well as the repair of guttering and installation of rain water tanks on the permanent buildings.

Grey water and waste from the house goes into a septic pit located to the rear of the section. Due to the size of the section, and the location of both a septic pit and a shallow bore at the rear of the section, it would be recommended that the water from the bore be tested to ensure suitability for both household and irrigation purposes.

Sector Analysis

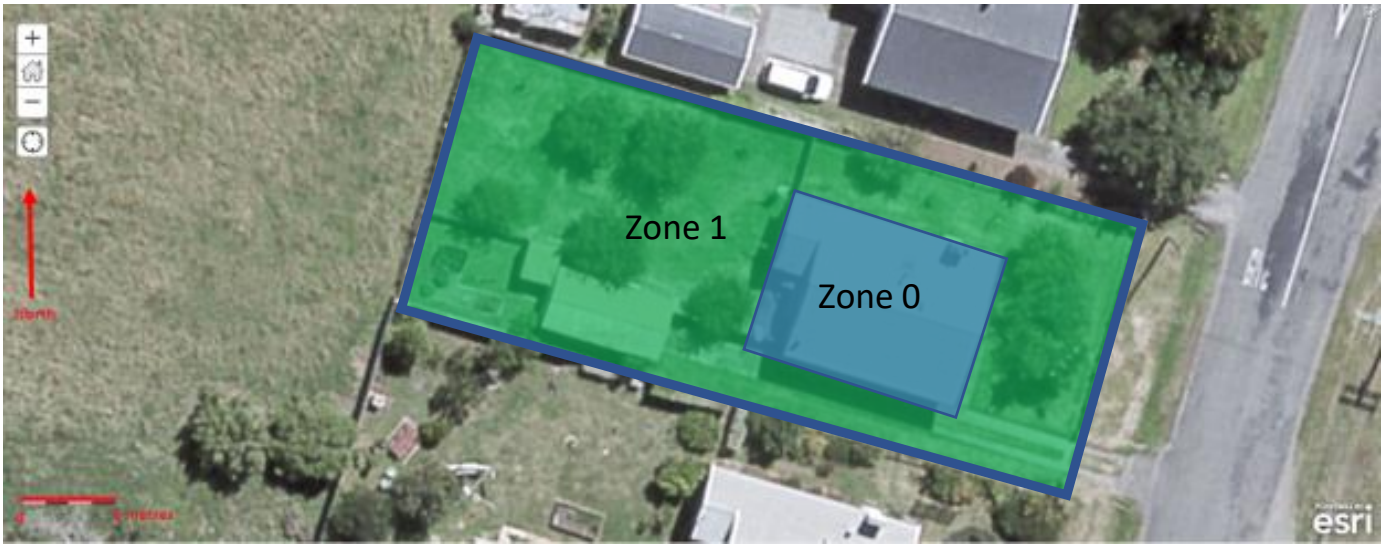
The sector analysis below shows:

- Seasonal wind direction
- Direction excessive rain comes from
- Summer sunrise and sunset
- Winter sunrise and sunset
- Impact from noise
- Directions of fire risk



Zones of Production

Due to the limited size of this section (a small house block of 819 square metres) the zones of production are limited to Zone 0 (the house) and Zone 1 (the driveway, front and back yards, and the vegetable garden behind the garage), however components of other zones such Zone 2 (fruit tree guilds and food forest), Zone 3 (silvopasture with rotational grazing for livestock) and Zone 4 (woodlot and windbreak plantings) can still be incorporated into the permaculture design on such as small section.

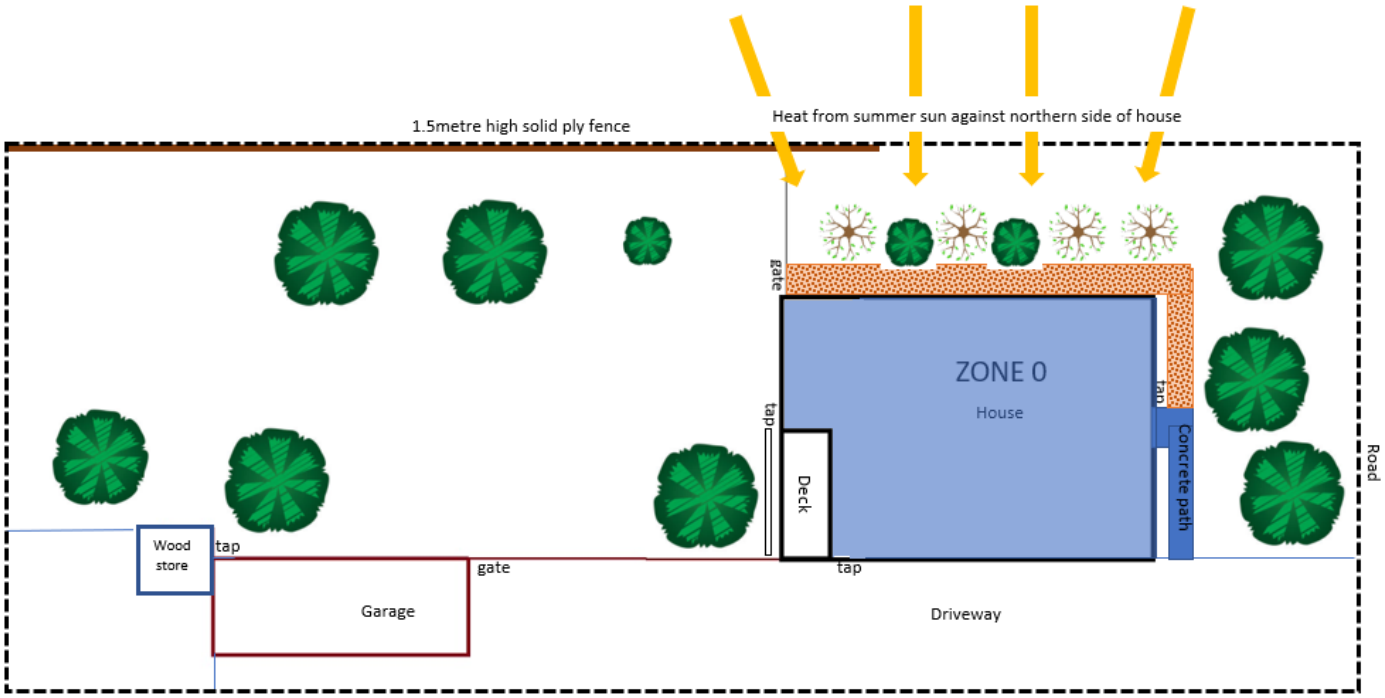


Part 4: Concept Sketches

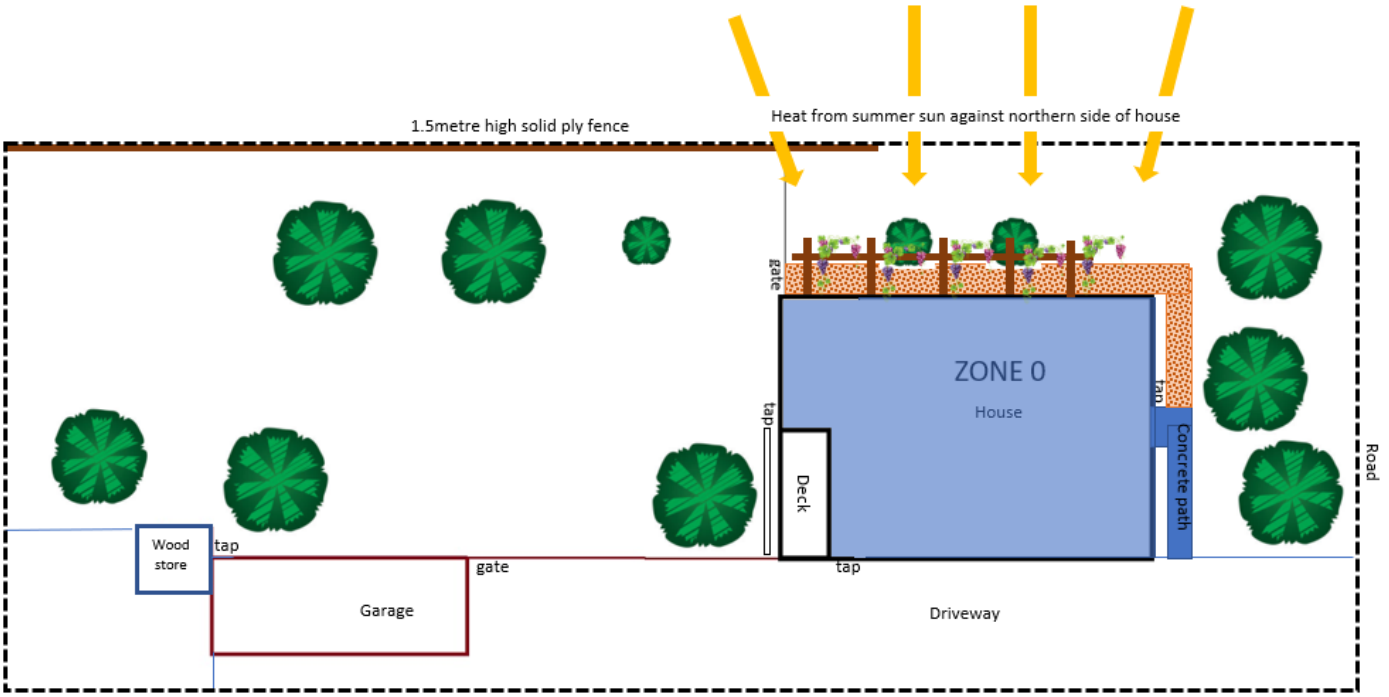
Zone 0 Concept sketches

A major issue in Zone 0 (the house) is the excessive heat radiating into the house from the northern wall during the summer months. The concept sketches below provide three alternatives to solve this issue while taking into account that the northern side of the house forms a useful microclimate for the growth of warmth loving plants with the exterior northern side of the house acting as a heat sink during the day and releasing that warmth during the cooler nights.

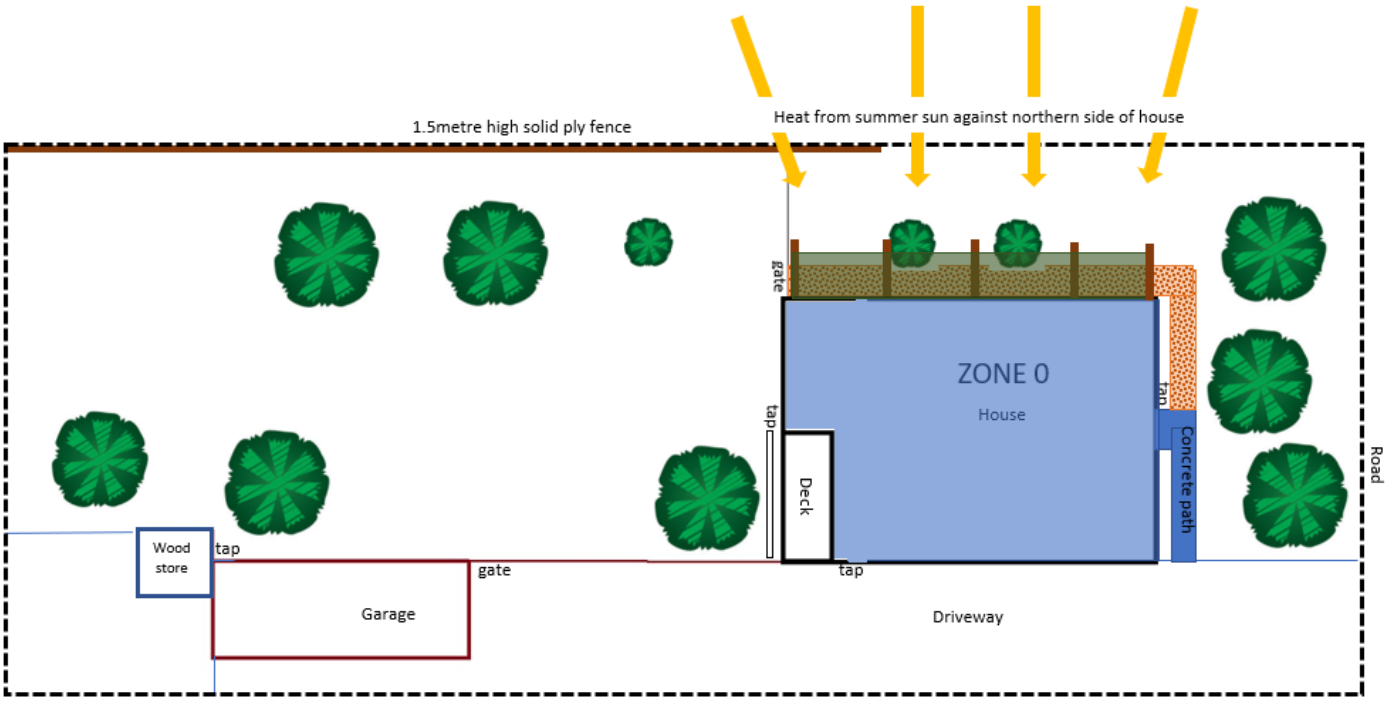
Zone 0 Option 1	Description	Benefits	Concerns
Deciduous trees	A row of deciduous trees planted along the northern side of the house.	Shade northern side of house in summer while allowing light and heat through in winter. Deciduous fruit trees would provide an edible crop. Warmth loving plants could still be grown along the side of house, or in pots, to take advantage of micro-climate.	Maintain access to the side gate via a path along side of house Trees planted far enough away from house to ensure minimal root damage to foundation.



Zone 0 Option 2	Description	Benefits	Concerns
Pergola	A pergola with deciduous vines built along northern side of the house.	Shade northern side of house in summer while allowing light and heat through in winter. Deciduous vines (eg. grape vines) would provide an edible crop. Warmth loving plants could still be grown along the side of house, or in pots, to take advantage of micro-climate. Could be used as an additional entertainment area.	Maintain access to the side gate via a path along side of house. Pergola would need to be built independently of the house to reduce damage to exterior (roughcast) walls.



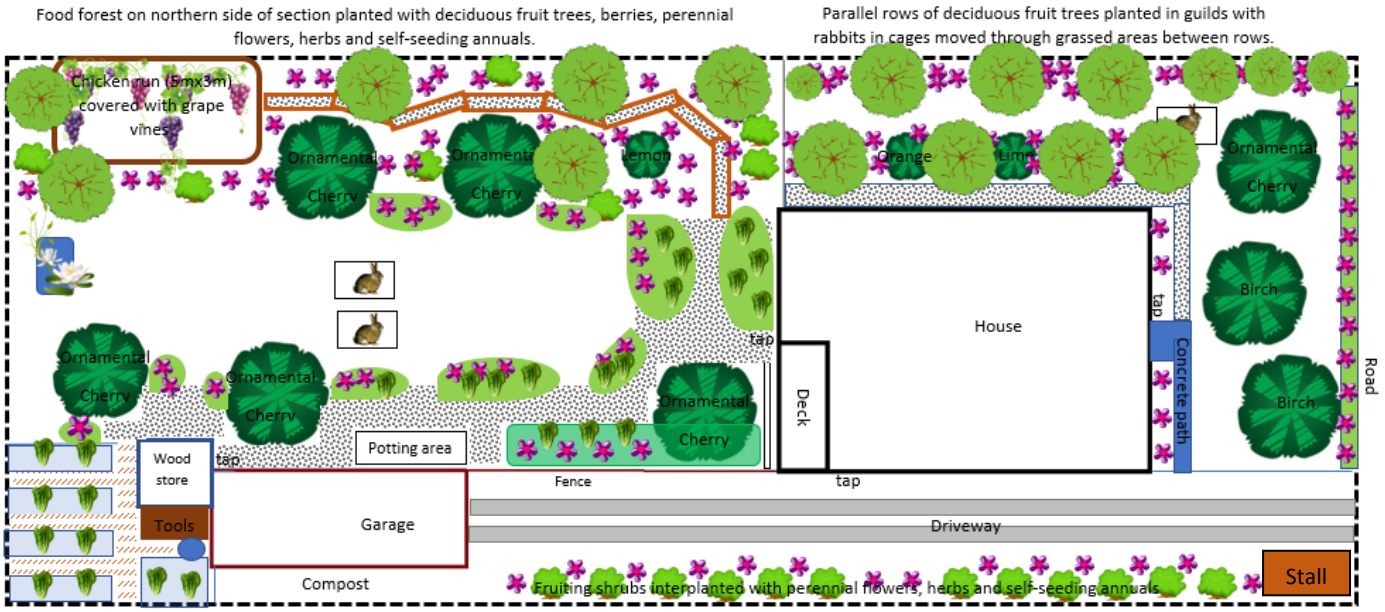
Zone 0 Option 3	Description	Benefits	Concerns
Glasshouse/ grow tunnel	A glasshouse or grow tunnel built along the northern side of the house.	Shade northern side of house in summer while allowing light and heat through in winter. Beneficial micro-climate for fruit and vegetable production – extending growing season and protecting from winds, cold temperatures, etc. Expands varieties of crops able to be grown on the site (eg. sub-tropical and tropical varieties that normally couldn't be grown in this climate).	Maintain access to the side gate via a path along side of house. Glasshouse/grow tunnel would need to be built independently of the house to reduce damage to exterior (roughcast) walls. Would need a good ventilation system to combat summer heat temperatures. Would need to be rated to handle the extreme wind conditions of the site.



Zone 1 Concept sketches

Concept Sketch One – Homestead selling excess fruit and vegetable produce, and products online (or via a roadside stall)

This concept design focuses on the homestead producing a significant amount of its food requirements and having the flexibility to be able to sell excess produce, or products made from that excess, either online or via a simple roadside stall. The major benefit of this model is that the landowners would only be advertising produce when they have an excess to sell.



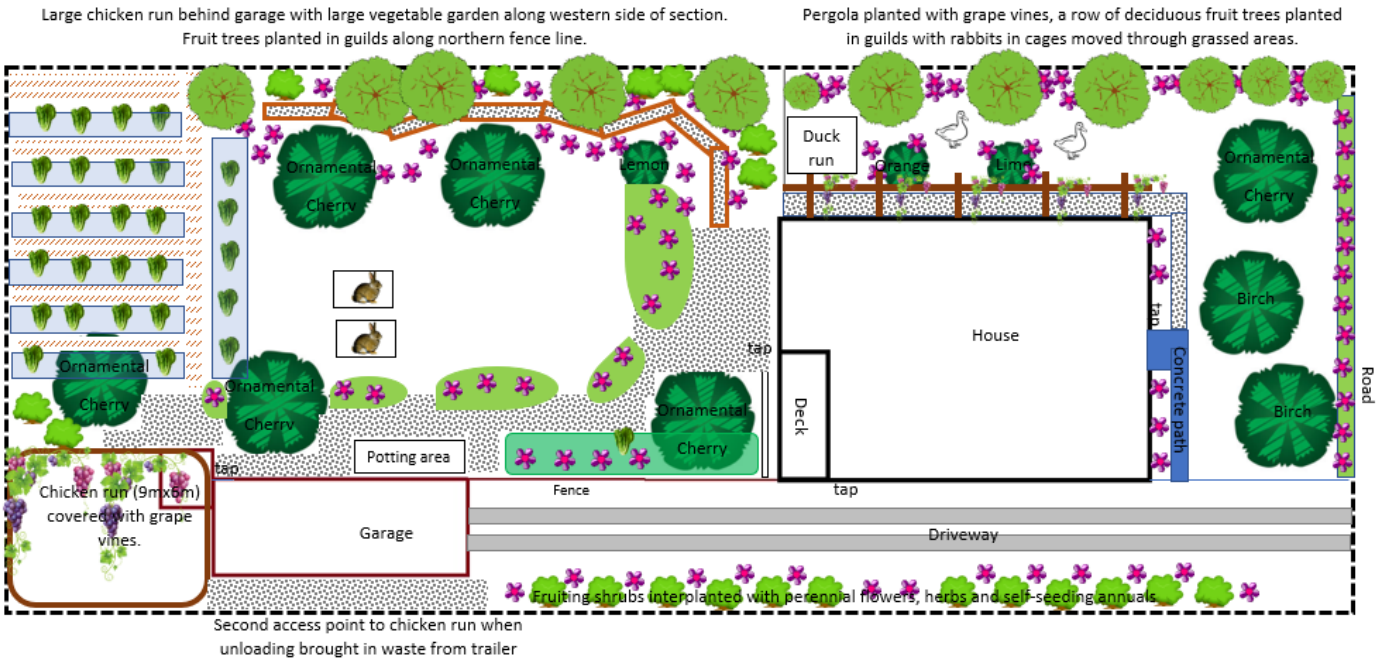
Option 1 components	Description	Benefits	Concerns
Food forest and deciduous fruit tree guilds planted on northern side of section	Parallel rows of deciduous fruit trees planted in guilds with beneficial herbs, nitrogen fixers and flowering perennials	Deciduous trees will shade northern side of house in summer while allowing light and heat through in winter. More effective use of space with more diverse crops per area ("stacking" of fruiting plants) Increased productivity with plants in guild helping each other. Improving the soil through nitrogen fixers and nutrient accumulators. Minimises potential pest problems through encouraging beneficial insects. Wind protection for guild plants from trees and proximity with other plants. Warmth loving plants can be grown along the side of house, or in pots, to take advantage of micro-climate. Will act as a windbreak for northerly and north-westerly winds.	Deciduous fruit trees will need to be on dwarf/semi-dwarf rootstock so they don't grow too large. Space available limits number of species and varieties that can be incorporated. Trees need to be planted far enough away from house to ensure minimal root damage to the foundation. Ensure plants used in guild are not poisonous to livestock. Electric netting with solar charger will be needed to limit areas chickens can access.

Option 1 components	Description	Benefits	Concerns
Food forest and deciduous fruit tree guilds planted on northern side of section	Food forest planted on northern side of section in back yard (incorporating a chicken run covered by grape vines)	Layers of different plants provide protection from the northerly and north-westerly winds. More effective use of space with more diverse crops per area ("stacking" of fruiting plants) and more forest edges providing more opportunities for different species. Deciduous fruit trees (and grape vines over chicken run) provide protection from summer sun and allow in light and warmth during winter months. Improving the soil through nitrogen fixers, nutrient accumulators ("chop and drop") and retaining moisture in the soil. Minimise potential pest problems through encouraging beneficial insects. Development of fungi-based microbial networks within soil. Chickens disturb and aerate soil, eat fallen produce, pest insects and weed seeds, fertilise the soil and provide eggs and meat. Will act as a windbreak for northerly and north-westerly winds.	Electric netting with solar charger will be needed to limit areas chickens can access. The canopy layer will need to be small/deciduous trees so that the grassed areas in the middle of the section get enough sunlight. Fruit trees to be on dwarf/semi-dwarf rootstock to fit them in available space. Ensure plants used in guild are not poisonous to livestock.
Rotational grazing with rabbits	Rabbits in cages/"tractors" moved around grassed areas	Rabbits droppings (high in nitrogen and phosphorus) fertilise soil as they are moved around (or can be raked up and used on garden beds). Eating grass, herbs and weeds found in lawn minimises feed costs. Vegetable waste can be fed to rabbits (converting waste into meat). Rabbits provide both meat and pelts. Possible secondary income stream selling rabbits as pets. Ideal source of meat in built up areas - quiet, doesn't need a lot of space, short breeding cycle and economical to feed.	Rabbit cages/"tractors" need to be secure to protect from predators (including household pets).

Option 1 components	Description	Benefits	Concerns
Hedge of fruiting shrubs	Fruiting shrubs interplanted with perennials along southern fence line	Effective use of space to get a crop from a small narrow area. Increased fruit crop due to better pollination rates. Minimise potential pest problems through encouraging beneficial insects.	Height is an issue so that the shrubs do not impact on amenity of neighbour.

Concept Sketch Two – Homestead selling excess produce online

This concept design focuses on the homestead producing regular, high value crops for selling locally online (or perhaps, at farmer's markets on a semi-regular basis). This design includes the homestead creating much of the compost that it uses from its own waste as well as bringing in waste from other sources (local businesses).



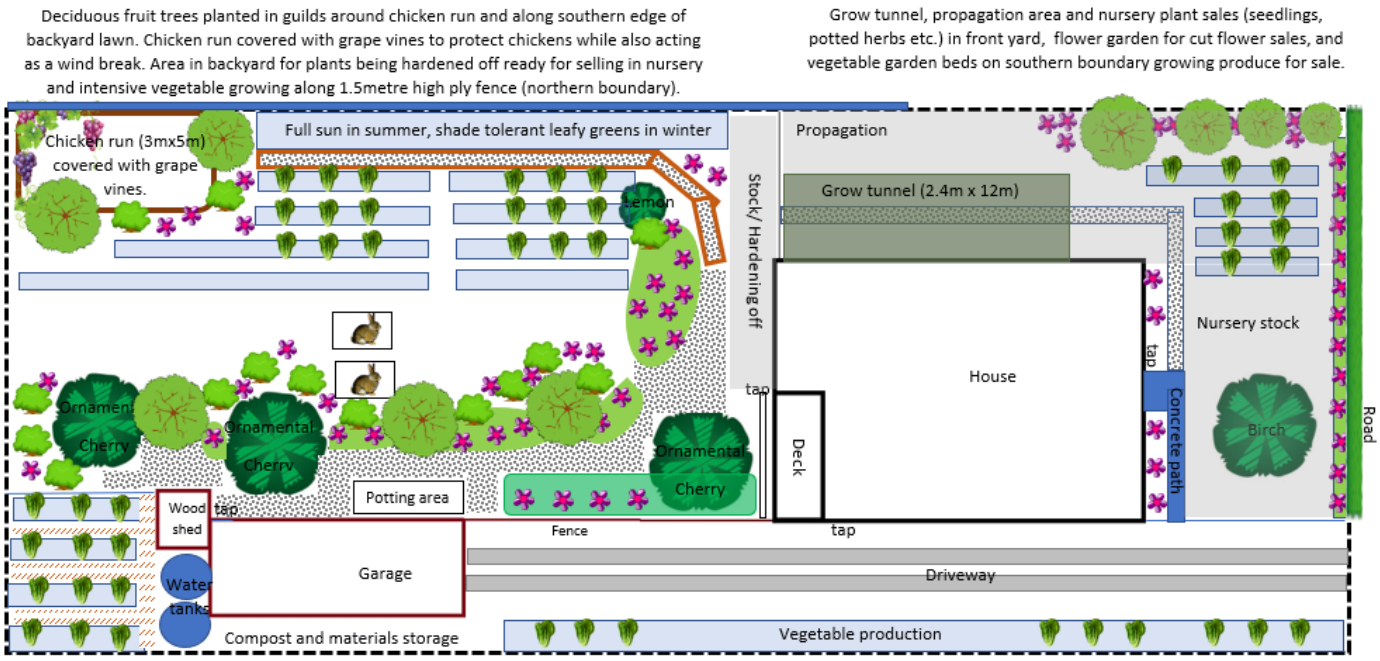
Option 2 components	Description	Benefits	Concerns
Chicken run used to produce compost from garden waste, food scraps, and waste from local businesses	Chicken run is located behind garage (9m x 6m) with two entry points to allow easy access when bringing in garden waste, food scraps and waste from both the homestead and local businesses.	Chickens disturb and aerate waste products, eat pest insects and weed seeds, fertilise the compost while providing eggs and meat. Waste products brought into chicken run are turned into compost which is then used in the vegetable gardens. Existing woodshed can easily be converted into a chicken house (roosting space) Deciduous fruit trees (and grape vines over chicken run) provide protection from summer sun and allow in light and warmth during winter months.	Manual turning to ensure compost is well aerated and not too moist (doesn't begin to smell). Would need ongoing vermin control (rats and mice). Wouldn't be able to let chickens out into the back yard as they would damage vegetable crops.
Pergola	A pergola with deciduous vines built along northern side of the house.	Shade northern side of house in summer while allowing light and heat through in winter. Deciduous vines (eg. grape vines) would provide an edible crop. Warmth loving plants could still be grown along the side of house, or in pots, to take advantage of micro-climate. Could be used as an additional entertainment area.	Pergola would need to be built independently of the house to reduce damage to exterior (roughcast) walls.

Option 2 components	Description	Benefits	Concerns
Fruit tree guilds planted on northern side of section	Fruit trees planted in guilds with beneficial herbs, nitrogen fixers and flowering perennials	More effective use of space with more diverse crops per area ("stacking" of fruiting plants) Increased productivity with plants in guild helping each other. Improving the soil through nitrogen fixers and nutrient accumulators. Minimises potential pest problems through encouraging beneficial insects. Wind protection from northerly and north-westerly winds for guild plants and property.	Fruit trees will need to be on dwarf/semi-dwarf rootstock so they don't grow too large. Space available limits number of species and varieties that can be incorporated. Ensure plants used in guild are not poisonous to livestock.
Extensive vegetable gardens in back yard	Vegetable gardens along western side of the section	Intensive plantings maximise yield. Beds can easily be covered with row covers to protect produce from frost and wind. Located beside chicken run so waste from garden doesn't need to be transported a long distance. Compost is created in chicken run beside vegetable gardens where it is then used.	Due to space limitations high value crops will need to be identified and grown. Need for plenty of plants that attract beneficial insects to be planted among fruit tree guilds to maximise beneficial insect population all year round.
Rotational grazing with rabbits, and silvopasture grazing with ducks	Rabbits in cages/"tractors" moved around back yard, and, ducks in the front yard among fruit trees (with night time run)	Rabbits droppings (high in nitrogen and phosphorus) fertilise soil as they are moved around (or can be raked up and used on garden beds). Rabbits and ducks will eat grass, herbs and weeds found in lawn to minimise feed costs. Vegetable waste can be fed to rabbits (converting waste into meat). Rabbits provide both meat and pelts, while ducks will provide eggs and meat. Possible secondary income stream selling rabbits and ducklings. Ducks can be used for insect control. Rabbits are an ideal source of meat in built up areas - quiet, doesn't need a lot of space, short breeding cycle and economical to feed.	Rabbit cages/"tractors", and duck night time run needs to be secure to protect from predators (including household pets). Possible noise issue from ducks (Muscovy ducks are quieter) Ensure plants used are not poisonous to livestock.

Option 2 components	Description	Benefits	Concerns
Hedge of fruiting shrubs/ berries	Fruiting shrubs/ berries interplanted with perennials along southern fence line	Effective use of space to get a crop from a small narrow area. Increased fruit crop due to better pollination rates. Minimise potential pest problems through encouraging beneficial insects.	Height is an issue so that the shrubs do not impact on amenity of neighbour. Garden edging needed to ensure plants stay within garden bed (don't spread into neighbouring property).

Concept Sketch Three – Homestead nursery selling potted herbs, fruiting plants, seedlings, and excess produce at farmer's markets

This design focuses on the homestead having a regular stall at the local farmer's market and selling potted herbs, seedlings and fruiting plants (propagated from plant stocks in the homestead) as well as excess produce and products. This design would require the removal of some of the existing deciduous trees on the section to make room for a nursery space and more intensive vegetable garden beds to maximise the number of vegetable garden beds for production.



Option 3 components	Description	Benefits	Concerns
Homestead nursery	Home nursery selling potted herbs, fruiting plants, seedlings and excess produce at farmer's markets	Propagation materials can come from existing plants grown on homestead. Value adding by growing out cuttings etc. and selling as established plants. Seedlings can be produced from seeds saved on the homestead. Grow tunnel ensures seedlings and plants can be started early so able to be sold at best prices. Grow tunnel provides conditions for varieties of plants not normally grown in the local area (tropical and sub-tropical varieties)	Ensure no-one at farmer's markets are currently selling similar products. Exclusion nets needed to ensure seed purity (reduce cross pollination of varieties) when selling seedlings. Need to ensure adequate water supply (water tanks behind garage)

Option 3 components	Description	Benefits	Concerns
Extensive vegetable gardens	Vegetable gardens in back yard, front yard and along southern boundary	Intensive plantings maximise yield. Beds can easily be covered with row covers to protect produce from frost and wind. Most gardens located near chicken run so waste from garden doesn't need to be transported a long distance. Compost is created in chicken run beside vegetable gardens where it is then used.	Due to space limitations high value crops will need to be identified and grown. Need for plenty of plants that attract beneficial insects to be planted among fruit tree guilds to maximise beneficial insect population all year round.
Chicken run used to produce compost from garden waste, food scraps, and waste from local businesses	Chicken run located in north west corner of property near vegetable gardens.	Chickens disturb and aerate waste products, eat pest insects and weed seeds, fertilise the compost while providing eggs and meat. Waste products from garden brought into chicken run are turned into compost which is then used in the vegetable gardens. Deciduous fruit trees (and grape vines over chicken run) provide protection from summer sun and allow in light and warmth during winter months. Will act as a windbreak for northerly and north-westerly winds.	Manual turning to ensure compost is well aerated and not too moist (doesn't begin to smell). Would need ongoing vermin control (rats and mice). Wouldn't be able to let chickens out into the back yard as they would damage vegetable crops.
Fruit tree guilds planted on southern side of back yard lawn	Fruit trees planted in guilds with beneficial herbs, nitrogen fixers and flowering perennials	More effective use of space with more diverse crops per area ("stacking" of fruiting plants) Increased productivity with plants in guild helping each other. Improving the soil through nitrogen fixers and nutrient accumulators. Minimises potential pest problems through encouraging beneficial insects. Maximum light due to lawn being on northern side of plantings. Waste can go into nearby chicken run. Can be used to supply cuttings and scions for grafting.	Fruit trees will need to be on dwarf/semi-dwarf rootstock so they don't grow too large. Space available limits number of species and varieties that can be incorporated. Fruit tree guilds won't provide wind protection to section. Ensure plants used in guild are not poisonous to livestock.

Option 3 components	Description	Benefits	Concerns
Rotational grazing with rabbits	Rabbits in cages/"tractors" moved around back yard	Rabbits droppings (high in nitrogen and phosphorus) fertilise soil as they are moved around (or can be raked up and used on garden beds). Rabbits will eat grass, herbs and weeds found in lawn to minimise feed costs. Vegetable waste can be fed to rabbits (converting waste into meat). Rabbits provide both meat and pelts. Possible secondary income stream selling rabbits as pets. Rabbits are an ideal source of meat in built up areas - quiet, doesn't need a lot of space, short breeding cycle and economical to feed.	Rabbit cages/"tractors" need to be secure to protect from predators (including household pets).

Market factors

The closest farmer's market to the homestead is at Featherston. This market occurs each Saturday morning with a limited number of stalls. A fruit and vegetable stall selling fresh produce brought over from Wellington, a stall selling knitted crafts, a stall selling native plants, and one selling baked goods. Occasionally there will be a person selling bags of local produce e.g. watercress out of the back of their car. This is usually only limited to one or more types of vegetable or fruit. The Featherston markets are typically visited by locals to the area.

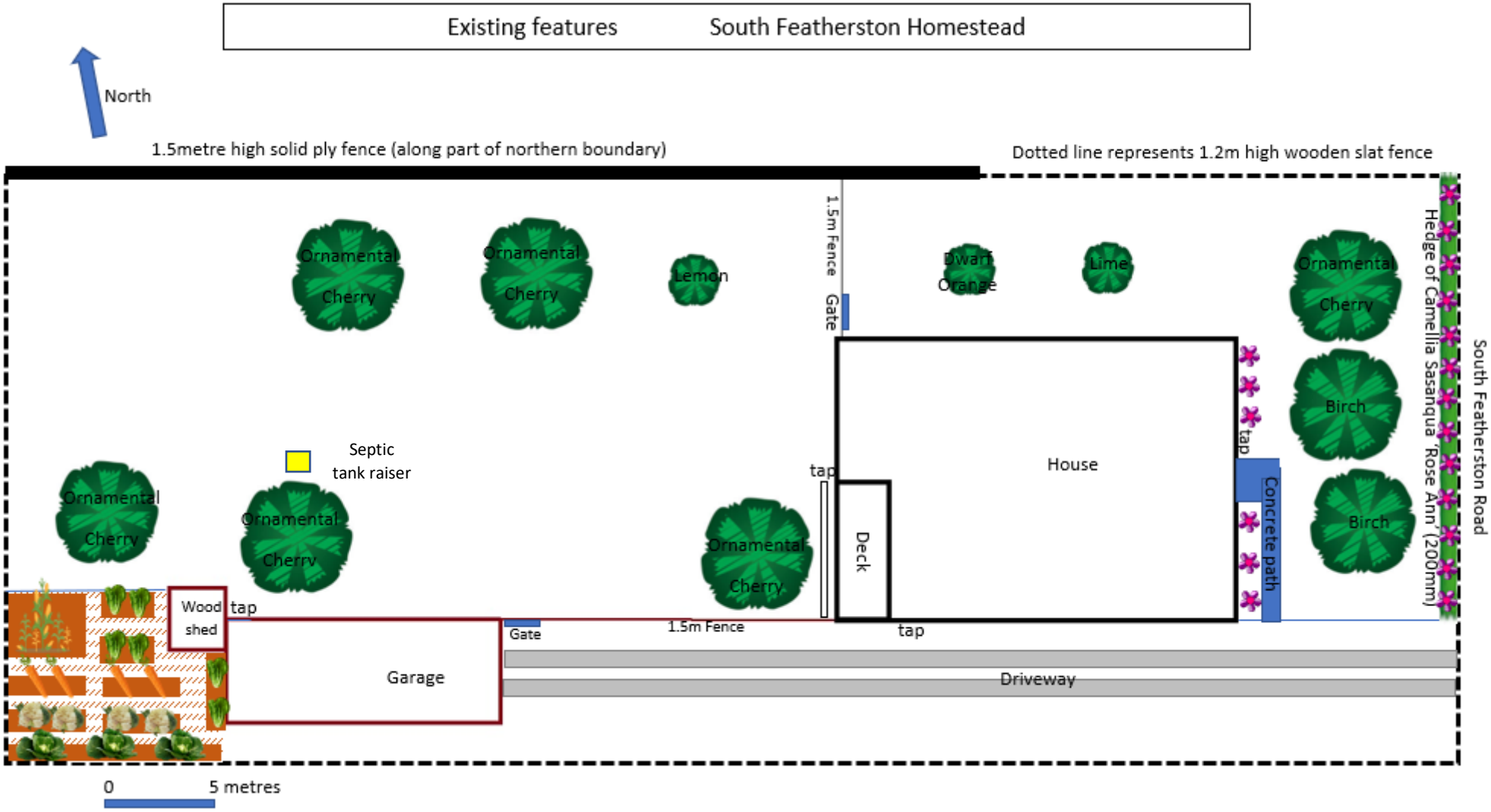
At Martinborough the farmer's market (on the first Sunday of the month) contains more stalls with stallholders selling artisan produce (preserves, artisan breads, cured meats) and stalls selling craft products (soaps, candles, essential oils, etc). The Martinborough markets have a much greater turnout with both locals, and many tourists attending while on a day trip to the Wairarapa region from Wellington.

The markets at Greytown and Carterton contain similar types of stalls as Martinborough, though with less stalls overall. There are also some stalls at these markets that sell fresh produce from local orchards and farms.

There is a definite opportunity for the sale of products made from local produce at the Featherston markets (jams and preserves, rabbit pelts, seedlings and fruit trees and berries). The Wairarapa region also has an active Buy and Sell facebook page where excess produce could be sold. As well there is a Livestock Buy and Sell page, or online on TradeMe, where purebred chickens, fertile hatching eggs, rabbits for pets, and breeding stock could be sold.

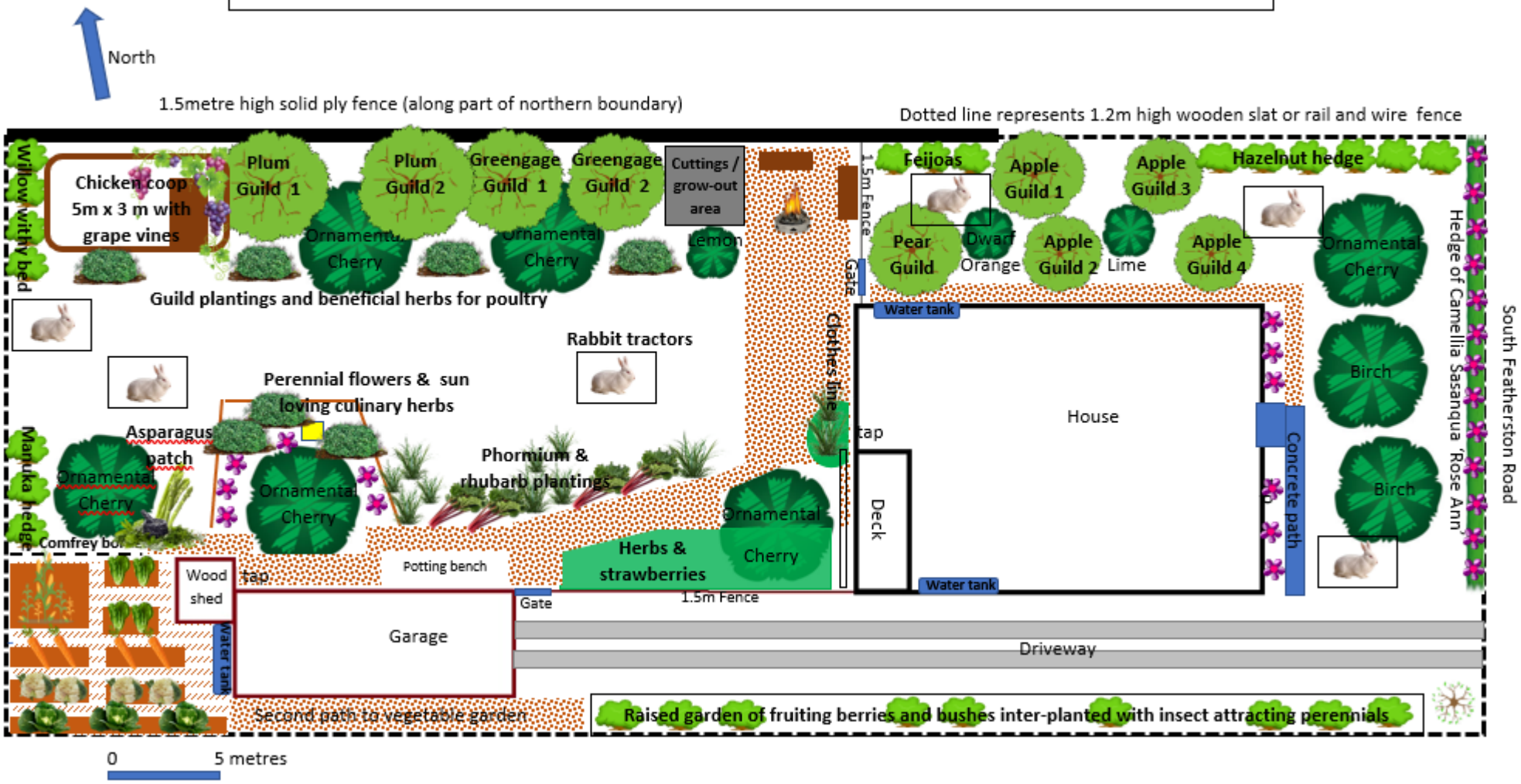
At Martinborough a stall aimed at the permaculture market selling heritage variety seedlings, willow crafts and baskets, and plants for using within a permaculture design (fruiting plants and support plants such as tagasaste) may be an option.

Part 5: Final Design Plan



Note: The South Featherston homestead is situated on the western side of South Featherston road with the section sloping from east to west away from the road. At the front half of the property (front yard and house) the fall away from South Featherston Road is 13:1000 (130mm over 10metres), whereas in the rear of the section falls away from the road at 19:1000 (190mm over 10metres).

Design Plan South Featherston Homestead



Gravel paths (Lime chip 15mm)

Arborist mix paths

Rabbit tractor (one meat rabbit per tractor) tractor size 150mmX60mm

Chicken coop – run 5mX3m with chicken shed 1.2mX2.4m covered with a Wairarapa Pink grape growing over top to provide summer shade and allow winter warmth. Garden and household waste is converted into compost within chicken run with chickens providing fertiliser from their droppings, aeration through scratching and pest control (weeds and insects).

Part 6: Management Plan

Systems in the design and how they work together

Annual vegetable garden (48 square metres)	The annual vegetable garden is located behind the garage and woodshed. Surrounded by a 1.2metre high slated wood fence covered with wind protection fabric the vegetables receive some wind protection. Located in the middle of this garden area is the bore. The garden contains a mixture of in-ground and raised beds (raised beds for root crops as the soil is quite gravelly) All of the paths between the beds are arborist wood chip which is topped up annually. The wood chip slows water runoff, mulches and protects the soil, allows better water absorption and soil improvement through the development of mycorrhizal networks. Compost for the vegetable garden will come from the chicken coop where garden and household wastes are converted into compost.
Chop and Drop mulching	Any stems and woody waste from the homestead that is too large for composting will be chopped into smaller pieces and left around the base of the fruit trees to feed the soil. This decomposition will help create nutrient-dense soil. Dynamic accumulators such as comfrey, borage, chickweed, dandelion, alfalfa, clovers and vetch will be mulched in this way to mine the minerals and nutrients their roots have brought up from deep in the soil. While chop and drop of nitrogen fixing plants such as tagasaste, vetch and clover will not only provide nutrients through decomposition, but also release nitrogen from root nodules into the soil for nearby plants to use.
Chicken compost system	Much of the garden waste and lawn clippings, as well as household food scraps, will be dumped into the chicken coop to be turned into compost which will then be removed and used back in the vegetable gardens and around the fruit trees. Sprouted grain will be scattered among the garden waste each day so that the chickens scratch and turn over the materials aerating the compost, fertilising it with their droppings and eating any insects and weed seeds that are present. Depending on the amount of garden waste in the coop, it may be necessary to manually turn over the materials with a garden fork once a week to ensure that the materials are well aerated, not too moist and beginning to smell. Besides eggs and meat from the flock there is the opportunity for the homestead to be able to sell purebred chicks and eggs for hatching. Hatching eggs from a good quality purebred flock can be sold for higher prices than plain eggs from a mixed flock for eating. Grapes over the chicken coop provide summer shade and allow winter warmth.
Cuttings / plant propagation and growing out area	In a sheltered corner near the outdoor entertaining area will be situated an area of landscape fabric where cuttings and potted fruits can be grown out for sale, or for use in other areas of the homestead. The propagation material will come from existing varieties already being grown on the homestead which will either be struck in potting mix/sand or grafted onto rootstock. These plants are sheltered from the winds and shaded from the summer heat by the deciduous greengages and ornamental cherries

Fruit tree guild	Each fruit tree guild will feature a fruit tree surrounded by support species that are either dynamic accumulators, nitrogen fixing, insect attractors for beneficial insects or pollinators, or that have a role in improving the health of the soil, the fruit tree itself or the health of nearby livestock. The existing citrus trees in the homestead will be incorporated into the surrounding fruit tree guilds as understorey plants. Feijoas will also be included in the fruit tree guilds on the northern side of the front yard where there is some wind protection for them. Several plant species normally included in fruit tree guilds were not included in this design as the plants are considered poisonous to rabbits (such as daffodils, lupins, and foxgloves) which will be grazing around the fruit tree guilds in their rabbit tractors. Using electric netting and a solar energizer, chickens will be run among the fruit tree guilds eating any fallen fruit, foraging for bugs and garden pests, manuring and aerating the soil. The side gate on the northern side of the house will allow the chickens to access the fruit tree guilds in the front yard on the northern side of the property. As a result, many additional varieties of herbs that are beneficial and/or medicinal to chickens will be grown among the fruit tree guilds to ensure optimal health and vitality.
Fruiting berries hedge	On the fence on the southern side of the section will be a hedge of fruiting berries and bushes in a raised garden to reduce risk of runners spreading into the neighbouring property. The fence will act as a trellis with the house providing shelter from strong winds. The fruiting berries and bushes will be inter-planted with flowers and herbs that attract pollinators and beneficial insects to maximise fruit yield and to deter insect pests. Plantings should be less than 1.8metres tall to reduce the impact on the neighbouring property.
Hazelnut hedge	The hazelnut hedge in the north-east corner of the section will provide some protection from winds gusting around the nearby buildings. These hazelnut varieties are large, deciduous shrubs which also provide pollen for insects, an edible nut crop and oil, shelter for wildlife, and wood for kindling and garden structures.
Kindling	Larger stems and branches from the fruit trees, ornamental trees/shrubs, and willows will be chopped into lengths and dried for kindling. This kindling will be used in both the fire pit and in the fireplace inside the house. Suitable lengths will also be kept for garden stakes and for the construction of garden structures (example: woven willow walls, tipis).
Grassed areas	The existing grassed areas will be under-sown with herbal ley seed mix to produce a diverse variety of pasture plants on which to graze the meat rabbits, improving soil quality, and providing a food source for beneficial insects and pollinators. The rabbits will be grazed in rabbit tractors being moved to a new location each day (rotational grazing). The herbal seed blend will contain varieties such as Alfalfa, Dill, Dandelion, Caraway, Chicory, Burnet, Poppy, Red Clover, Parsley, Fennel, and Sorrel. Some grassed areas will be kept as lawn with regular mowing but in out of the way corners and around the fruit tree guilds the herbal ley will be allowed to reach full growth.
Manuka hedge	A manuka hedge will be planted to help provide some wind protection to the vegetable garden from the north-west direction while also attracting beneficial insects, medicinal oil, habitat and shelter for wildlife, and a sheltered micro-climate for nearby plants such as the asparagus patch which could be damaged by extreme winds.
Perennial flowers & herbs	A central perennial flower and herb garden is located towards the middle of the backyard. Besides providing cut flowers and herbs (for culinary and medicinal uses) these plants will also attract beneficial insects and pollinators, mulch the soil, provide health benefits for livestock, and propagation material (seeds and cuttings) for plant sales.

Rabbits	Two breeds of meat rabbits will be used on the homestead: New Zealand Whites and Californians, with a recommendation that the homesteaders buy an unrelated trio of each. The rabbits will be grazed in rabbit tractors being moved to a new location each day. Besides converting the lawn, pasture and waste vegetables into meat and pelts, the rabbit manure will also enrich the soil. Rabbit manure can be used immediately in the garden, it doesn't require aging like chicken and cow manure. Excess rabbits may also be sold as pets, and to other homesteaders for use as breeding stock, and for meat.
Water conservation	Slimline water tanks will be installed under the eaves of the house and garage to store runoff from the buildings (annual rainfall of 1228mm per annum). Replacement of existing guttering is also part of this long-term job. The bore will continue to supply water to the house and homestead gardens with the tanks as back-up. Gravel paths have been used in high traffic areas to protect the soil, to slow runoff during rain events, to minimise erosion and allow maximum water absorption into the soil. All gardens and fruit tree guilds will be thickly mulched with compost and arborist wood chip for the same reason.
Willow withy (willow bed)	Four different varieties of basket willow will be grown in the homestead to test which best suit the homesteaders' needs. These will be planted in the north-west corner of the section to act as part of the wind break. Basket willows which grow to a height of 3-4 metres are also used for: forage for the rabbits, natural shade for the chicken coop, a nectar source (for bees, insects and birds), to prevent soil erosion and capture sediment, habitat, basketry and craft materials, and to supply kindling to the homestead. Annual coppicing will provide a steady stream of stems for willow crafts such as basket making, and woody materials which can also be used for the creation of woven walls and garden stakes, while the location of the willow withy bed between the chicken coop and the neighbouring paddock will capture sediment and remove nutrients from the runoff before flowing off the property. Willow varieties that do not grow well or do not meet the homesteaders' needs will be replaced with others in the test planting that are better suited to their needs.

How the design reflects permaculture principles

Permaculture principle	This design provides opportunities to:
Observe and interact	• observe and interact with the livestock, chickens producing eggs and meat, while fertilising the soil, aerating the soil while scratching for pets (both insect and weeds), rabbits eating grass and herbs while being rotationally grazed around the fruit tree guilds, and on the lawns in both the front and back parts of the section, • observe on daily basis how the vegetables, fruit trees, herbs and flowers are growing, which insect pests have appeared and whether the predatory insects and animals that feed on them have also arrived, • whether the wind breaks are succeeding at reducing the damage from the north-westerly winds, and • observe the improvement in the soil through chop and drop of branches and the composting of garden and household waste through the chicken run to produce nutrient dense soil that in turn produces nutrient dense food.
Catch and store energy	• catch and store carbon in plant form, whether it is in the fruit trees and berry plants, perennial herbs, flowers and vegetables, or self-seeding annuals, • catch and store minerals through chop and drop of materials from dynamic accumulator plants and nitrogen fixers, or the creation of nutrient rich compost in the chicken run, • creating beneficial micro climates that retain heat and are protected from strong north-westerly winds allowing optimal plant growth, and • plantings of deciduous trees which provide shade and shelter from the heat in the summer months, while also allowing in warmth and sunlight during the winter months.
Obtain a yield	• make use of the limited space available to grow crops of fruits and vegetables, herbs and flowers, and provide eggs and meat for the homestead, • use larger branches of the trees and stems from the willow bed to produce kindling and construction materials for use in the garden, • convert lawn into meat and pelts by grazing rabbits on the grasses and herbs growing in these areas, and • install water tanks to capture the runoff from buildings to supplement the water available from the bore.
Apply self regulation and apply feedback	• connect on an intimate level with the food being grown, from observing when plants have issues and applying non-chemical solutions, to deciding when a crop should be harvested for optimal quality, through to when the crop is finished and needs to be converted into compost, • rotational grazing for short periods of time with rabbits being moved to fresh grass each day before they damage the grass, through to chickens being moved under fruit trees when fallen fruit or pests need to be cleaned up, and • trial various varieties of the same fruit and vegetables to determine which is best suited to the growing environment and has the best taste, to then be propagated and grown for future crops, or for sale.

Permaculture principle	• **This design provides opportunities to:**
Use and value renewable resources and services	• reduce impact on the local environment through seed saving favourite annuals (vegetables, herbs and flowers) through to cuttings and grafting of favourite varieties of fruits and vegetables, • coppice willow for kindling and garden construction materials such as garden stakes, • use waste materials from the homestead and local community (such as garden and household waste) to create compost which then can be used to improve the soil, and • make use of local waste products (arborist mix of garden waste and wood chips) on paths in the vegetable garden to feed the mycorrhizal fungi in the soil.
Produce no waste	• recycle all household and garden waste from the homestead through either the chicken run where it is turned into compost, through chop and drop to feed the plants and soil, or through using branches and willow stems for kindling and garden construction materials, • make use of the excess chickens and rabbits as meat, and • focus on growing and propagating plants that have either edible, medicinal, plant nurturing or soil building qualities.
Design from patterns to details	• turn a tradition front and back yard into a highly productive homestead that goes a long way to meeting the nutritional needs of its inhabitants, • create guilds of plants that support each other and grow together collaboratively, • make use of edges in the homestead to maximise production (fruit tree guild edges, paths and garden beds, curved areas of lawn), • stack food crops within forest-type systems, and • focus on feeding the soil through layers of compost and woody materials rather than tilling, turning and disturbing the soil.
Integrate rather than segregate	• develop relationships between the various components of the design so that it strengthens the design as a whole, • converting garden and household waste into compost using the chickens to fertilise, aerate and remove pests, • using stems and leaves from dynamic accumulators and nitrogen fixers to bring minerals up to the surface of the soil where the plants can access them, • converting larger branches and willow stems into materials that can be used in garden construction and for kindling, and • integrate chickens and rabbits into the system where they become vital tools in maintaining production.
Use small and slow solutions	• trial varieties of fruiting plants to determine which ones are best suited to local growing conditions for propagation and planting for future crops, • save seeds from favourite varieties of vegetables so that over time they become better suited local growing conditions, • grow species in the windbreaks which also produce wood for garden construction and kindling, and • begin building the soil through compost, chop and drop, and strengthening mycorrhizal fungi networks.

Permaculture principle	• **This design provides opportunities to:**
Use and value diversity	• plant a diverse variety of food crops to build resilience into the homestead, • encourage wildlife into the homestead to feed on pests and pollinate crops, • develop new skills such as willow basket weaving, breeding purebred chickens and selling eggs, or preserving pelts of rabbits to add diverse income streams to the homestead, and • plant varieties of the same vegetable and fruit to see which best suit the growing conditions of the homestead and can be propagated for future crops.
Use edges and value the marginal	• grow a diverse range of edible plants making use of the micro climates and edges between the fruit tree guilds and lawns to maximise production, and • transform a small section into a highly productive and regenerative (soil-building) homestead which not only produces food crops but also propagates plants suited to local growing conditions for members of the community to buy and plant themselves.
Creatively use and respond to change	• choose to eat home-grown produce that is nutrient dense and as fresh as possible when it is consumed, • take home-grown produce and preserve it so that there is also food in storage, • change the local growing conditions through use of micro-climates, fruit tree guilds and wind breaks to maximise crop diversity, and • grow and propagate the best producing plants each year for plants that are best adapted to the local growing conditions and most adapted to changes in those conditions.

How the plan meets the needs of the client

Client Vision/ Goal statement

Our section will be a fully productive homestead with annual and perennial vegetables, berries and fruit trees, perennial flowers and bulbs, herbs, annual flowers and livestock, from which we will produce most of the food we eat all year round. Native plantings as well as exotic species will attract bees and beneficial insects into the garden across all the seasons.

Our homestead will allow us the opportunity to develop new skills in self-reliance and self-sufficiency, which we can then share with others in our local community.

Our section will be connected to the local area with its views of the surrounding farm land and the Remutaka Ranges, while having some protection from the harsh north-westerly winds, and the heat from the summer sun.

This design plan meets the clients goal of having a productive homestead through the incorporation of:

- the existing annual vegetable garden,
- fruit tree guilds with supporting species to enrich the soil and promote growth of the fruit trees,
- hedges of hazelnuts and berry plants,
- herbs and, both perennial and annual flowers.

This design incorporates chickens and rabbits into the system with chickens converting the garden and household waste into compost which will enrich the soil in the vegetable gardens and around the fruit trees. The rabbits will graze on the lawn areas and in corners where herbal ley has been seeded to produce a diversity of grasses and herbs for better grazing quality. Chickens will produce eggs and meat for the homestead, while the rabbits will produce both meat and pelts.

Native plantings in this design are initially limited to a manuka hedge and phormium (NZ flax) being used to shelter and protect perennial vegetables from the north-westerly winds, and be a source of food for native wildlife, however, flexibility has been planned into the design with garden beds set aside so that the clients can select their favourite exotic and native flowering plants for inclusion into the design.

This design gives the clients the opportunity to develop new skills in self-reliance and self-sufficiency including: plant propagation and seed saving, preserving home-grown produce, willow working and basketry, animal husbandry (including breeding chickens and rabbits), harvesting chickens and rabbits for meat, tanning rabbit pelts, and making compost. As they develop skills in these areas the opportunity arises for the clients to then teach others those skills.

An important part of the client vision was that they wanted their homestead to remain connected to the local area with its views of the local farm land and Remutaka Ranges. The design allows for the views of the farm land at the back of the section with the Remutaka Range to still be seen from the back yard and dining room windows. Some windbreaks were included in the design to reduce the impact of the westerly and north-westerly winds and plantings of deciduous fruit tree guilds along the northern side of the section will allow for shade and cooling during the summer months, while allowing in warmth and sunlight in the winter.

An important feature of this design is that the clients can take it as far as they feel comfortable. They may choose to simply grow enough food for their own needs and to propagate their favourite varieties for future production, or, they may decide to sell their excess either online or at the local farmer's market.

Options to bring in additional income from the homestead include:

- Selling rare or heritage purebred chickens, point of lay pullets, or fertile purebred eggs
- Breeding meat rabbits for meat and pelts while selling excess as pets, as breeding stock for other homesteaders, or selling the rabbit pelts
- Selling harvested willow stems to basket makers, or selling willow baskets and products
- Selling excess produce (vegetable and fruit) when an excess is produced
- Producing herbal products and oils from herbs grown on the homestead
- Collecting seeds and selling seedlings (especially rarer heirloom varieties)
- Selling plants propagated from plant stock on the homestead.

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How the management practices will improve soil health

The entire design for this homestead revolves around building and enriching the soil on the homestead.

Fruit tree guilds are planted with dynamic accumulators and nitrogen fixers which as they are chop and dropped release minerals to the plants and the soil. Small branches and stems are chop and dropped and laid among the guild plants where they break down and feed the fungi in the soil. Larger branches and stems from the willows can be used for kindling or garden construction where they will need to be replaced every couple of years as they become weathered and break down.

Garden and household waste will be turned into compost in the chicken run where the chickens will fertilise it with their droppings, turn and aerate the compost while scratching in it, and remove insect pests and weed seeds. This compost will then be used in the garden beds and fruit tree guilds to further enrich the soil and produce better harvests.

Lime chip paths in high traffic areas will protect the soil and maximise water absorption and reduce erosion. Arborist wood chip will feed the mycorrhizal fungi in the soil when it is used on the garden beds and on the paths in the vegetable garden.

The diversity of plants being grown, and wildlife that will be encouraged to visit the garden, will all add to the soil health and the productivity of the homestead.

Part 7: Implementation strategy

Timeline

August/ September 2018

- Plant fruit trees and hazelnuts
- Plant willow wands in 3 rows to form a diamond pattern (wands 45cm apart to create windbreak)
- Construct gravel paths through high traffic areas and chicken coop
- Top up paths in vegetable garden with arborist mix, fertilise garden beds ready for new growing season
- Construction of garden beds, including raised garden bed along southern side for berry crops and fruiting bushes
- Set up propagation area for seedlings, cuttings and plant pots
- Purchase and plant out manuka plants and phormiums to provide wind protection to the site

October/ November 2018

- Start off seedlings of vegetables, guild plants, beneficial herbs around chicken coop, and annual flowers
- Purchase perennial flowers and vegetables as seedlings
- Purchase berry plants and fruiting bushes to plant in raised garden bed on southern side of section (look at starting with one of each variety to trial and see which grow and taste the best)
- Under-sow grassed areas with herbal ley mix

2019

- Begin creating compost in chicken run using garden and household waste
- Purchase electric netting and solar charger to run chickens among established fruit tree guilds
- Begin propagating from seed, cuttings and grafting of favourite vegetables, herbs, flowers and fruit trees
- Build rabbit tractors and purchasing meat rabbit breeding stock
- Begin chop and drop in fruit tree guilds
- First coppicing of willow (Winter 2019)
- Quotes for replacing guttering on house and garage
- Installation of slimline water tanks

See following pages for more details on implementation of the design plan.

Implementation of components

Area of implementation	Requirements	Notes
Annual vegetable garden (48 square metres)	Annual vegetable garden is already established Annual mulching of paths (1/2 cubic metre of arborist mix ($30 at Wairarapa Landscape Supplies) Begin seed saving of favourite varieties to develop plants better suited to growing conditions.	Investigate local arborists who may be able to supply wood chips at cheaper rate. Investigate local source of manure for use in fertilising garden beds.
Chop and Drop mulching	Purchase of necessary garden equipment – secateurs, lopper, pruning saw, hedge shears	
Chicken compost system	Chicken coop with enclosed run where garden and household waste converted into compost – design to be determined by landowner Beneficial herbs for chickens planted in guilds around chicken coop for browsing or picking and feeding to chickens: garlic (cloves in drinking water), wormwood, tansy, comfrey, nasturtium, rosemary, feverfew, lemongrass, calendula (fed as fresh pick, also dried and sprinkled in dust bath and nesting boxes. **Seed packs (approx. $4 per pack from Kings Seeds)**	Turn over compost weekly with a fork to ensure aeration, moisture levels are not too high and compost is not developing a smell. Electric netting (25metres $260.00 from Appletons) and solar energizer ($160.00 from Farming Pro NZ) Further information on beneficial herbs for chicken health can be found in "Backyard Poultry – Naturally" by Alanna Moore
Cuttings / plant propagation and growing out area	Creation of growing out area (3metres X 3 metres): 10 metres x 90mm weedmat ($8.98 Mitre10 Mega) and weedmat pegs (Pkt 25 $12.90 Mitre10 Mega) Planter bags PB28 (available in packs of 10 for $5 Egmont Seeds) Potting mix and sand as required Rootstock as required	Investigate best times to take cuttings for individual plant species. Investigate most cost effective sources of propagation materials – planter bags, potting mix and sand supplies, suitable rootstock. Wairarapa Landscape Supplies sells ½ cubic metre loads of compost for $50 and a Value Mix (sandy loam and compost mix) for $47.50.
Fruit tree guild	**Fruit trees (approx. $38 each Clareville Nursery)** Four varieties of apple trees – Cox's Orange Pippin (MM106 rootstock), Peasgood Nonsuch (MM106), Pacific Rose (MM106), Monty's Surprise (MM106) Two varieties of plums – Omega and Santa Rosa Two varieties of greengages – English Greengage and Reine Claude de Bavay One dual grafted pear - Doyenne du Comice/ Beuerre Bosc	**Apples** Cox's Orange Pippin - early to mid-season eating variety pollinated by Peasgood Nonsuch and Monty's Surprise Peasgood Nonsuch – mid-season to late dessert and cooking apple pollinated by Cox's Orange and Monty's Surprise Pacific Rose – mid-season eating variety pollinated by Peasgood Nonsuch and Monty's Surprise Monty's Surprise – late eating and cooking variety pollinated by Peasgood Nonsuch

	Nitrogen fixers planted in guilds Tagasaste, vetch and clover **Dynamic accumulators in guilds** Comfrey, borage, chickweed, dandelion, alfalfa, clovers and vetch **Plants to encourage beneficial insects and pollinators** Nasturtiums, fennel and garlic chives, borage, echinacea, alyssum, parsley, marigolds, lavender, thyme and rosemary **Seed packs (approx. $4 per pack from Kings Seeds)**	**Plums** Santa Rosa – early to mid-season, self-fertile Omega – late variety pollinated by Santa Rosa **Greengages** English Greengage – mid to late season pollinated by Reine Claude de Bavay Reine Claude de Bavay – late season, self-fertile **Pear** – dual grafted to pollinate each other Doyenne du Comice – mid to late season variety Beuerre Bosc – mid season variety
Fruiting berries hedge	**Berry plants (approx. $20-22 each from Clareville Nursery)** **Blackberries** Black Satin and Navaho blackberry **Boysenberries** Mapua and Tasman boysenberry **Currents** Magnus black currant Gloria de Versailles red currant **Gooseberries** Invicta and Pax **Raspberry** Heritage, Tulameen & Waiau **Plants to encourage beneficial insects and pollinators** Nasturtiums, fennel and garlic chives, borage, echinacea, alyssum, bergamot (bee balm) and marigolds **Seed packs (approx. $4 per pack from Kings Seeds)**	Black Satin blackberry – ripens in February, thornless variety Navaho blackberry – ripens in December, thornless variety Mapua boysenberry – ripens December to January Tasman boysenberry - ripens December to January Magnus black currant – ripens late December to February Gloria de Versailles – ripens late December to February Invicta gooseberry – ripens December-January Pax gooseberry – red gooseberry ripening December to January Heritage raspberry – ripens February through to May Tulameen raspberry – ripens February, almost thornless Waiau raspberry – ripens December and January
Hazelnut hedge	**Hazelnuts (approx. $22 each from Clareville Nursery)** Two seedlings of Barcelona and two seedlings of Merveille de Bollwillier One Butler and one Alexandra seedlings (pollinators)	Remove suckers as they appear and use for chop and drop, or kindling
Kindling	Drying stand for storage of kindling off ground	To be built using second hand materials
Grassed areas	Under sow grass with Herbal ley mix ($22 for 250g pack Kings Seeds)	Concentrate sowing herbal ley on bare earth patches, in corners of section, and around fruit tree guilds
Manuka hedge to protect asparagus patch and vegetable garden	Potted manuka available for sale $5 each in Greytown Asparagus crowns 5 for $20 on TradeMe	

Perennial flowers & herbs (centre of back yard near septic riser)	Choice of varieties as clients' interest and personal taste dictates **Seed packs (approx. $4 per pack from Kings Seeds)**	
Phormium (NZ flax) and rhubarb plantings	Rhubarb crowns – potted (approx. $17 each from Kings Plant Barn) Phormium – dwarf varieties (approx. $18 each from Clareville Nursery) buy larger established plants in pots for faster protection of rhubarb from wind	Phormium dwarf varieties - Phormium Black Rage (black & chocolate 80cm), Phormium Evening Glow (red & green 75cm), Phormium Dark Delight (black 1.5m)
Rabbits	New Zealand Whites and Californians (approx. $30 each from purebred breeders) Rabbit tractor materials – cage and base $50, plastic crate shelter $20, wire mesh 5 metres for approx. $20, other materials $10 (wire clips etc)	An alternative to having meat breeds is to buy purebred lops or another breed of 'pet' rabbit
Water conservation	Slimline water tanks – 5000litres 2950mm length xX2170mm height X880mm width approx. $3000.00 from ThinTanks.co.nz Gravel for high traffic paths - 4 cubic metres of Lime chip 15mm ($66 per cubic metre from Wairarapa Landscaping supplies + $70 delivery)	Long term job due to possible plumbing costs to replace guttering on house and garage, and to redirect down pipes into water tanks? Establishing gravel paths should be done as soon as possible to reduce damage to soil surface (erosion, muddy paths, water runoff)
Willow withy (willow bed)	Purchase basket willow varieties as 30cm cuttings ($1 each from "Go Willow (Golden Bay, Nelson)" and plant 45-60cm apart in three rows in a diamond pattern. Varieties: Salix purpurea 'Green Dicks', Salix Alba Vitellina x Fragilis 'Red Flanders', Salix triandra 'Noire de Villaine', Salix viminalis (Common osier, Basket willow) Annual coppicing of 'Viminalis' to keep size down, coppice alternate rows of other varieties each year	Coppice alternate rows annually in late winter and keep well mulched to protect from weeds and grass. "Green Dicks" - slender green stems used to make fine baskets (up to 2metres tall) "Red Flanders" – red stems produce rods for basket weaving (up to 3metres tall) "Noire de Villaine" – dark maroon stems used for basketry garden sculptures and woven willow walls (up to 2.5metres tall) "Viminalis" – greyish-green slightly thicker stems used for baskets, garden stakes and woven walls (needs annual coppicing or will grow 4+metres)

Short and long-term food and income sources

Short-term food sources on the homestead are based on the annual vegetable garden which is already planted out and producing harvests. A monthly planting schedule (planning seeds for vegetables and herbs which are expected to be harvested in three months) means that crops are ready for harvest on a regular basis.

Fruit trees planted now will not expected to be producing fruit for three or more years, however, strawberries and berries planted now will likely to be producing a harvest in summer 2018/19.

The design plan allows for the following options to bring in additional income from the homestead:

- Selling rare or heritage purebred chickens, point of lay pullets, or fertile purebred eggs
- Breeding meat rabbits for meat and pelts while selling excess as pets, as breeding stock for other homesteaders, or selling the rabbit pelts
- Selling harvested willow stems to basket makers, or selling willow baskets and products
- Selling excess produce (vegetable and fruit) when an excess is produced
- Producing herbal products and oils from herbs grown on the homestead
- Collecting seeds and selling seedlings (especially rarer heirloom varieties)
- Selling plants propagated from plant stock on the homestead.

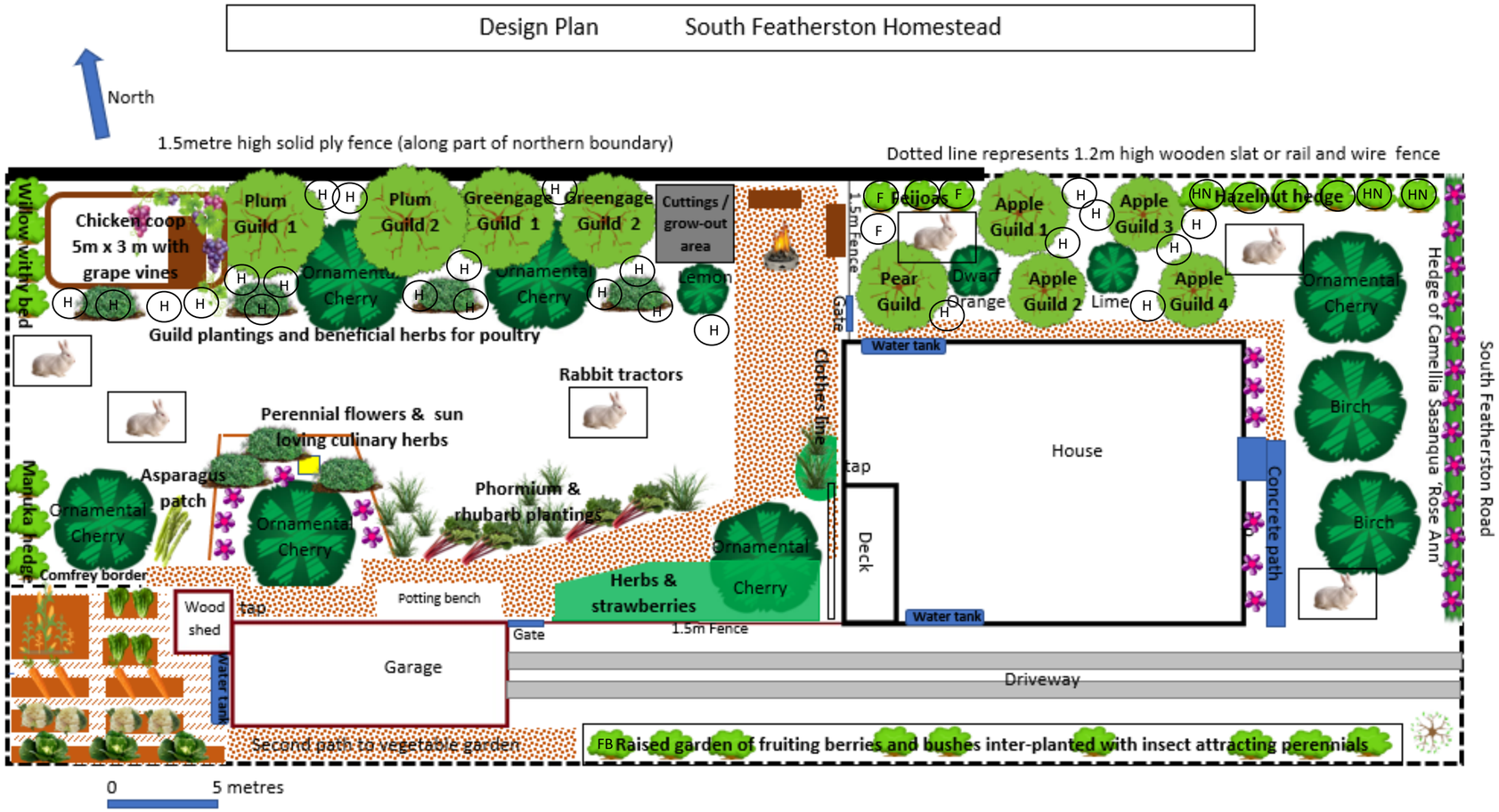
These options all rely on taking time to get the homestead established, for plants to reach harvesting stage, and be producing crops for sale, or, for the clients to have developed and mastered skills needed to be able to create and sell quality crafts or products.

Even when the homestead is established and in full production, the small size of the homestead will limit the amount of income it will be able to generate, meaning that it will probably always be necessary for some external employment to provide additional income.

One long term opportunity that exists for generating income could be through education. Through the development of the homestead the clients will develop a range of skills that could then be taught to others through workshops and online courses. This could be supported by the development of an online presence to include a website, blog, social media accounts, writing digital books, and the publishing of videos on a facebook channel.

Providing educational services on the homestead would provide a valuable income stream in the future, but, is still be dependent on the clients taking time to develop and master those skills which could then be taught to others.

Final Design Plan for South Featherston Homestead



FB

Beneficial herbs and plants for chickens planted around fruit tree guilds:

(H) Planted in clumps around guilds and through northern half of backyard and around chicken run - garlic, wormwood, tansy, comfrey, nasturtium, rosemary, feverfew, lemongrass, calendula.

Wairarapa Pink grape planted over chicken run to provide shade in summer and allow in winter warmth and light in winter.

Hedge plant lists:

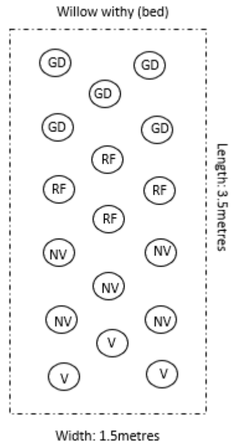
(F) Feijoas – Apollo, Mammoth, Triumph, Unique

(HN) Hazelnuts – Alexandra, Barcelona. Butler, Merveille de Bollwillier

(FB) Southern boundary (fruiting berries and bushes) – Black Satin blackberry, Navaho blackberry, Mapua boysenberry, Tasman boysenberry, Magnus black currant, Gloria de Versailles red currant, Invicta gooseberry, Pax gooseberry, Heritage raspberry, Tulameen raspberry, and Waiau raspberry

(B) Inter-planted with nasturtiums, fennel and garlic chives, borage, echinacea, alyssum, bergamot (bee balm) and marigolds

- See Southern boundary garden plan below



Willow withy:

Willows planted in 3 rows with spacing of 45cm –

(GD) Salix purpurea 'Green Dicks',

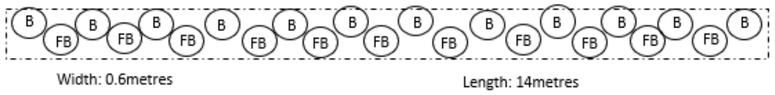
(RF) Salix Alba Vitellina x Fragilis 'Red Flanders',

(ND) Salix triandra 'Noire de Villaine',

(V) Salix viminalis (Common osier, Basket willow)

Southern boundary garden plan

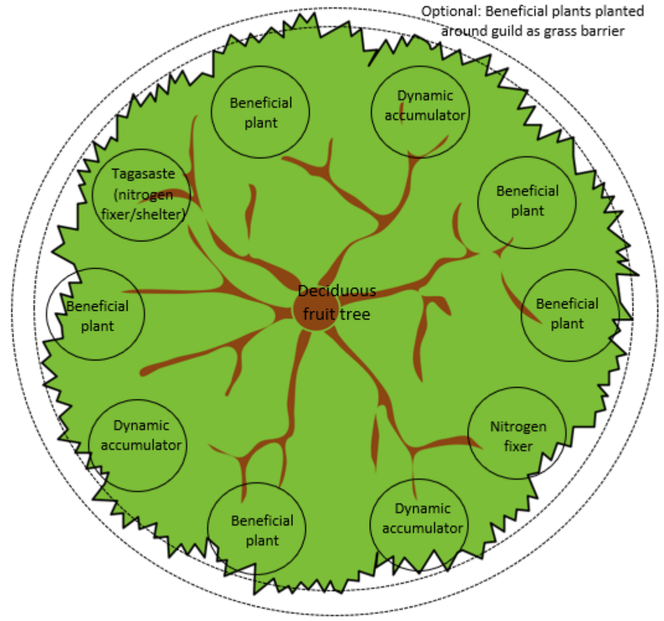
(FB) Southern boundary (fruiting berries and bushes) – Black Satin blackberry, Navaho blackberry, Mapua boysenberry, Tasman boysenberry, Magnus black currant, Gloria de Versailles red currant, Invicta gooseberry, Pax gooseberry, Heritage raspberry, Tulameen raspberry, and Waiau raspberry



(B) Beneficial plants inter-planted with nasturtiums, fennel and garlic chives, borage, echinacea, alyssum, bergamot (bee balm) and marigolds

Fruit guild planting plan:

Guilds based around:
Four varieties of apple trees – Cox's Orange Pippin (MM106 rootstock), Peasgood Nonsuch (MM106), Pacific Rose (MM106), Monty's Surprise (MM106)
Two varieties of plums – Omega and Santa Rosa
Two varieties of greengages – English Greengage and Reine Claude de Bavay
One dual grafted pear - Doyenne du Comice/ Beuerre Bosc



Support species for fruit tree guilds are selected from below:

Nitrogen fixers planted in guilds: tagasaste, vetch and clover

Dynamic accumulators in guilds: Comfrey, borage, chickweed, dandelion, alfalfa, clovers, tagasaste and vetch

Plants to encourage beneficial insects and pollinators: Nasturtiums, fennel and garlic chives, borage, echinacea, alyssum, parsley, marigolds, lavender, thyme and rosemary

Phormium (NZ flax) and rhubarb planting: Dwarf phormium varieties acting as a wind break to protect rhubarb from North-westerly winds.

(PH) Dwarf phormium

(R) Rhubarb

North-westerly winds