

2015

Permaculture Design



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Goals and Ethics

Ethics

- To work with nature
- Reduce our 'ecological footprint'
- Increase the sustainability elements at Brewongle EEC
- Foster and value a connection to nature in staff, visiting adults and all students
- Respect all life forms
- Produce no waste
- Practice what we preach

Goals

- To create a sustainable permaculture design as an education tool
- To create permaculture elements that enhance the visual, practical, edible and teaching focus of Brewongle EEC.
- To foster a love of nature and growing food
- To link to curriculum and provide a quality teaching element
- To manage and retain water in the landscape
- To create gardens that are self-sustaining and require as little maintenance as possible.

To quote Bill Mollison, one of the Australian founders of permaculture:

“Permaculture is a design system for creating sustainable human environments”.

Permaculture aims to produce ecologically sound systems for living, producing food, avoiding pollution and producing no waste. Permaculture uses observations of the natural world, including non-living components like soil, water, climate; built environments and living things to create abundance and self-sufficiency in a landscape.

Permaculture Design Principals

- Work with nature, not against it. Observe and interact.
- The problem is the solution – cooperation not competition
- Make least change for greatest effect – minimise maintenance
- Yield is unlimited
- Everything gardens – the garden ecosystem can help reduce workload.
- Multiple functions for each element
- Aim for long term sustainability
- Avoid waste.

Brewongle EEC is well placed to begin using permaculture design elements to showcase how sustainability can be used in our schools, homes and workplaces. Situated on 6 acres of partly forested ridge top land above the Hawkesbury River, Brewongle includes an old school house and numerous buildings, gardens and outdoor teaching elements.

This permaculture design will include the following ‘zones’:

Zone 0 – the old schoolhouse and surrounding buildings – traditionally the ‘house’ in urban permaculture design.

Zone 1 – This will include the current vegetable garden and future gardens in an intensively cultivated area in the ‘backyard’ of the schoolhouse. This area is close to zone 0 for staff to maintain.

Zone 2 – This area will contain the food forest elements. It will be closely planted with many layers, with meandering paths. It will include an orchard, bushtucker garden, other fruit and shade trees. Swales for water retention and a self-sustaining focus are the keys to this zone.

Zones 3 & 4 – These zones are usually for larger scale agriculture and animals as well as producing firewood, timber for sustainable building. There is no scope for these zones at Brewongle EEC

Zone 5 – This is the natural, indigenous forest areas. Permaculture seeks to conserve and enhance our native bushland. Brewongle EEC is surrounded by Shale Sandstone Transition Forest (an Ecologically Endangered Plant Community), and Grey Myrtle Dry Rainforest. Brewongle is already engaged in Landcare and will continue to manage weeds and native vegetation in zone 5.

Element 1 – Zone 0 – rainwater management

Brewongle EEC is reliant on rainwater for all water needs. Due to the high volume of students (5000-7000 per year) passing through the centre, rainwater catchment from buildings is crucial. Currently Brewongle spends over \$1000 dollars a year to buy water and truck it to the site. This is wasted money and wastes energy, resources and creates greenhouse pollution in the trucking process.

Currently less than half of the schoolhouse and very few of the other surrounding buildings catch and store rainwater. This plan outlines the need to install rainwater tanks and ensure all water is either diverted into existing tanks or falls into new tank systems.

Element 2 – Zone 2 – stormwater management

Currently, all stormwater is diverted via drains and pipes to flow away from the centres buildings. Some of these outlets create erosion problems on the southern hillside. Standing water in holding pits creates mosquito breeding grounds. Much rooftop water is also ending up in the stormwater system. Gutters are often blocked and some retain water and encourage mosquitos.

This plan will provide solutions to retain this water in the landscape, provide water for food forests and reduce erosion.

Element 3 – Zone 1 Herb garden and shade trees.

Existing garden beds close to the rear verandah of the house are well shaded and could provide ideal herb growing beds. A shade tree (deciduous) needs to be planted near existing vege beds to provide shade from extreme summer sun in the afternoon.

Element 4 – Zone 2 Food forests

This will utilise previously grassed areas and an existing garden bed to the east, south and west of the school house. Meandering paths will lead students between orchard fruit trees, a bushtucker garden and nut trees. Swales will be incorporated into the landscape to retain water.

Element 5 – Zone 2 Banana Circle

A banana circle, mango and avocado trees will be planted in the area that receives the most sun and water runoff. This is an existing garden bed to the northeast of the house.

Element 6 – Chickens

The existing free standing solar panels can provide a perfect covered area for chickens. By enclosing this area with mesh, providing nest boxes and perches, collecting water off the roof of the solar panels – a sustainable chicken house can be created. Chickens can complement the food forests by foraging for bugs, turning the soil and fertilising. Eggs provided will feed camp programs and chickens can help dispose of camp organic rubbish.

Site and Sector Analysis



Slope



Stormwater
and erosion



Soil Sample



Potential rainwater
catchment

Sun Arc

SunCalc for Sackville North NSW 2756, on 08 Apr, 2015 now



A sun arc allows us to see the path of the sun all year round. The area shown in Yellow is the arc of the sun with the upper limit being the winter arc and the lower limit summer.

Climate

Rainfall

The following table for mean rainfall in mm is from the Bureau of Meteorology – data collected at Sackville from 2001-2011

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean	47.3	100.8	68.7	45.2	46.3	57.8	25.8	21.8	33.1	71.8	63.5	59.4	627.9

As can be seen the wettest months are February and March and driest months are July, August & September. There is a need retain water in the landscape for the drier months and to catch as much rainwater as possible.

Temperature

Average minimum temperature (1994-2014) (Richmond)

Statistic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean	17.6	17.7	15.6	11.5	7.5	5.1	3.6	4.4	8.0	10.9	14.1	16.0	11.0


Average maximum temperature (1994-2014)

Statistic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean	30.0	29.0	26.8	23.9	20.7	17.9	17.6	19.8	22.8	25.2	26.9	28.5	24.1

Future Climate

From CSIRO 'Climate Analogues Explorer' - <http://www.climatechangeinaustralia.gov.au/en/climate-projections/climate-analogues/analogues-explorer/>

Richmond



Configure Data

TEMPERATURE CHANGE: 1 °C

RAINFALL CHANGE: -1 %

Preset Scenarios

CLUSTER	East Coast	TIME PERIOD	2030
EMISSIONS SCENARIO	RCP 4.5	DESCRIPTION	Maximum Consensus

ANALOGUE TOWNS

Warwick, Kingaroy, Yanchep Beach, Cessnock, Quirindi, Nanango, Singleton, Tamworth, Perth,

The data on the previous page shows that a future climate for Richmond will be 1 degree warmer with little change in rainfall. Towns with a similar current climate are listed under 'Analogue Towns'. This future climate will need to be considered when choosing appropriate species for planting.

Soil

Brewongle is located on a sandstone ridge 90m above sea level adjacent to the Hawkesbury River. Soils were tested around the house in zone 2 close to possible food forest locations (see map). Soil pH was 8 at all sites. Soil is loamy sand with a low organic component. Soil will need to be built up with organic matter and manure. Soil has good drainage around the house.

Fire

Brewongle is surrounded by forest, including myrtle dry rainforest to the southwest, and dry sclerophyll to the east and north. Current fuel loads are estimated at 10 tonnes per hectare. The main threat of fire will be from the southwest aspect up the slope from the Hawkesbury River. Plantings near buildings will need to consider the use of plants with low flammability.

Wind

Due to the surrounding forest, the main areas for growing food have good natural wind barriers already in place. No extra plantings would be needed for wind protection.

Map of Permaculture Elements.



Rainwater Tank



Swale



Divert rainwater to existing tank

Recommendations

Zone 0

The major focus for zone 0 (house) will be to manage rainwater collection. As can be seen from the site and sector analysis, much rainwater is lost from roof spaces. It is recommended to install rainwater tanks in the locations listed on the Elements map. Most of these tanks can water nearby garden beds via gravity feed to drip lines or similar. A pump may need to be purchased to water the food forest of citrus, tropical and nut trees on eastern side of house. 5000L slimline poly tanks and round 20,000L retail for approx. \$1500 each. Colorbond metal tanks may help keep the visual heritage look of the homestead. DEC Assets to assess and finance?

Zone 1

The backyard and existing vegetable beds. Small alterations are planned for this area. A deciduous shade tree is needed to provide some protection for growing vegetables during extreme heat days in summer – possible native species are; white or red cedar, or a flame tree. Shade loving herbs can be planted in garden beds adjacent to verandah. Space is needed for student groups to move a round in and for visual amenity of the rear of the sandstone schoolhouse.

Zone 2

Stormwater management: Swales will be the main tool to divert stormwater and reduce erosion occurring on the southern hillside. A swale is a planted mound constructed along contour lines to reduce the velocity of water flow and channel it towards plants. The water can collect in the low point above the mound construction and filter slowly for plant use. This low point is often filled with mulch and makes a good access path. See map for swale placements.

Existing driveway stormwater problems: Some water will be diverted to ponds via a swale. Water from drains could be diverted into existing gardens around big tree via new piping, instead of current run off down southern hillside causing erosion. Water could be diverted to a new underground tank in the construction of proposed Covered Outdoor Learning Area (COLA)

Bushtucker garden: The aim of this garden is to be a teaching element showcasing native bush foods. It can be incorporated into our existing bush resource walk as an example of cultivated bush tucker plants. Plants could be a combination of local and non-local native species.

Food Forests: (see below)

All food gardens will be made up of as many layers as possible. Composting could occur via bottomless buckets under trees – kitchen scraps dropped in here with some worms. Buckets removed and rotated periodically. A chop and drop approach could be used for pruning and providing mulch.

Bushtucker Garden Plant list

Ground covers:

Plant name	Use	Height	Fruiting/flowering time	Notes
Warrigul spinach - Tetragonia tetragonoides	Edible leaves – raw or cooked	Groundcover	NA	Likes moist free draining soil, part shade can become weedy
Native violet – Viola hederacea	flowers edible in salads	groundcover	All year, dense in spring	Likes moist and part shade
Native raspberry - Rubus parvifolius	Edible berries, leaves make tea.	Groundcover	Dec-April	Full sun, well drained soil.
Blue Flax lily – Dianella longifolia	Berries edible	Tufting grass	Spring/summer	Well drained soils.

Shrubs/small trees

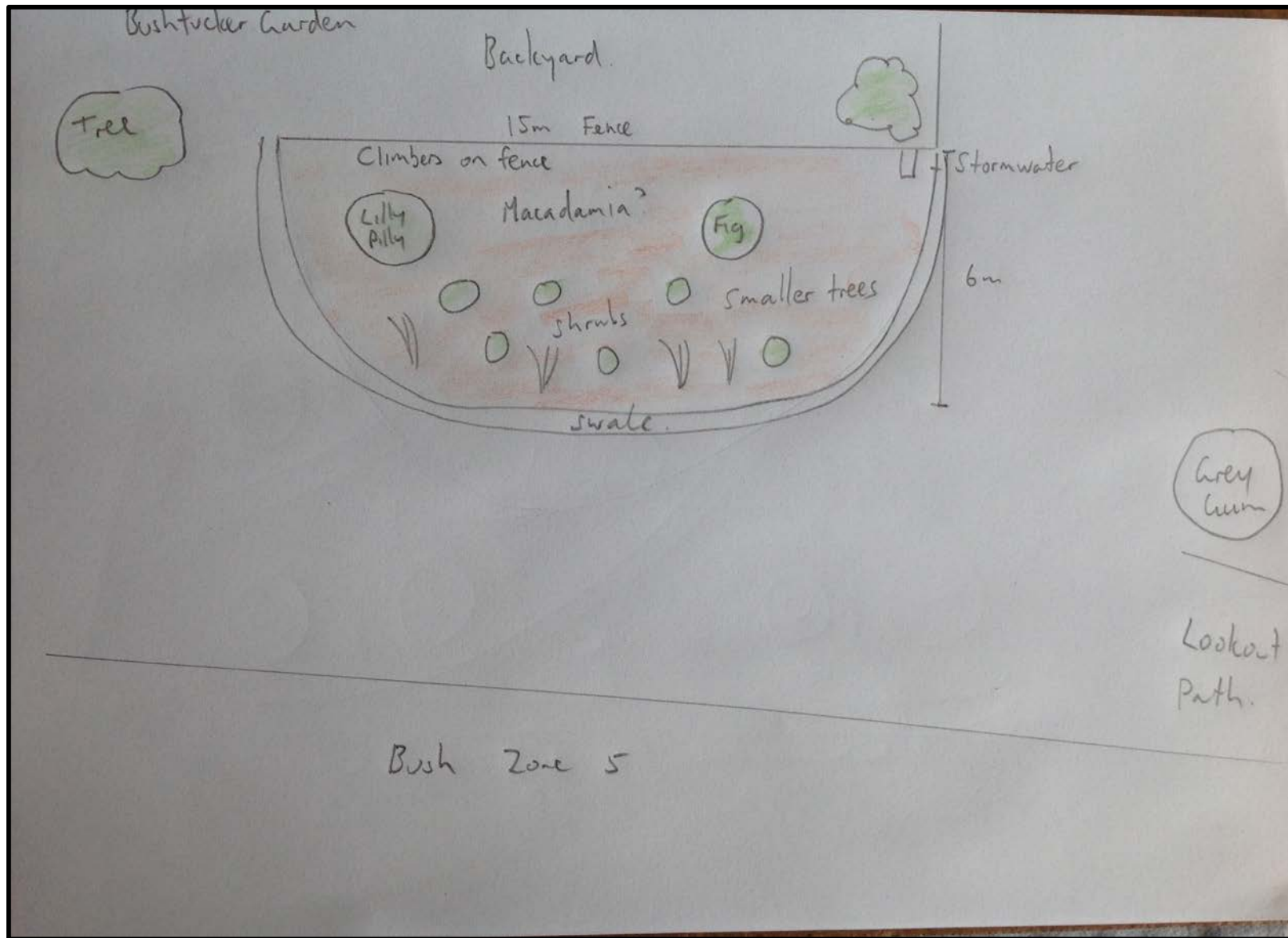
Plant name	Use	Height	Fruiting time	Notes
Lemon myrtle – Backhousia citriodora	Teas, lemongrass substitute, cheesecakes	3-8m		Full sun-part shade
Midgen berry - Austromyrtus dulcis	Edible white berries	2m spreading shrub		Moist well drained soils
Native rosella – Hibiscus heterophyllus	Buds cooked, jam, raw, petals in salads	3-8m shrub	November /dec	Moist well drained partial shade
Finger Lime – Microcitrus australasica	Limes edible in jams chutneys, sauces and drinks	Up to 10m	Summer	Rainforest plant

Climbers

Plant name	Use	Height	Fruiting time	Notes
Apple Berry – <i>Billaderia scandens</i>	Fruits edible	Grows well under large trees	Summer	Tolerates range of soils
Wombat berry – <i>Eustrephus latifolias</i>	Fruits and roots edible	Climber	Summer?	Local species
<i>Hardenbergia violacea</i>	Bird and bee attractor	Climber	Spring?	
Water Vine				

Trees

Plant name	Use	Height	Fruiting time	Notes
Bunya Pine???	Nuts eaten raw or cooked	Huge – 30-40m	Late January/feb not every year	Potential hazard from falling cones
Lilly Pilly – <i>Syzigium smitthii</i>	Fruit eaten raw or cooked in jam	Up to 20m	Autumn/winter	Rainforest tree
Port Jackson Fig – <i>Ficus rubiginosa</i>	Figs edible	Up 20m	Feb-july	Slow growing
Macadamia nut	Edible nuts	12-15m		Grafted varieties best.



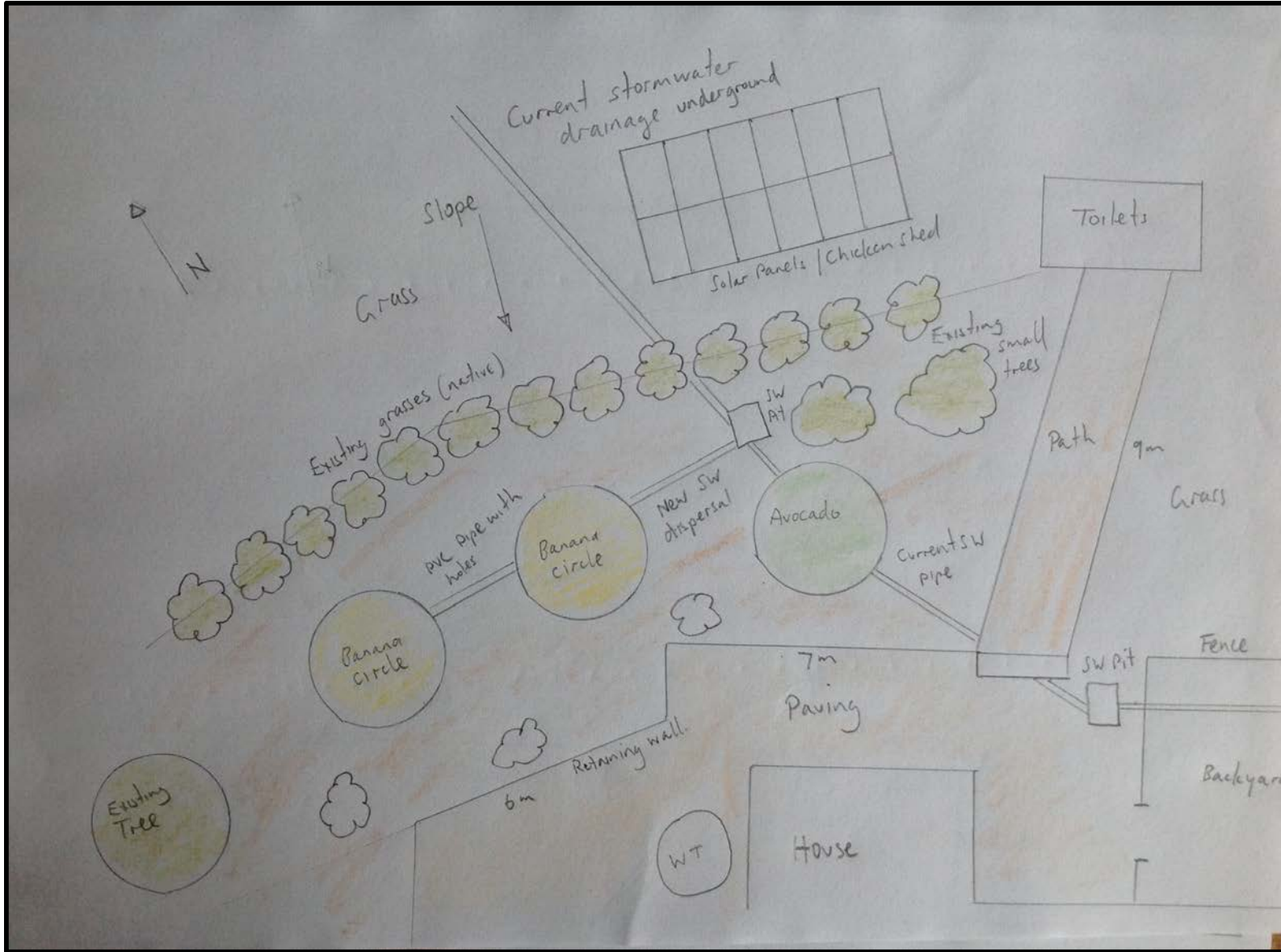
NE food forest (in existing garden bed)

All food forests will utilise plant guilds – an assembly of harmonious plants that assist each other in health, buffering environmental effects and pest management.

This plant guild will utilise the existing elements of plenty of sun and good water retention and existing water tanks and pump access nearby.

Banana Circle – plant in a circular swale about 2-3m diameter with plenty of sun and good soil. Lots of compost! May need nurse plants to create frost/wind free microclimate.

Plant name	Use	Height	Fruiting/flowering time	Notes
Banana	Edible fruit, leaves for wrapping and serving food	Dwarf varieties easier picking - Cavendish	About 9 months after planting	http://www.tropicalpermaculture.com/growing-bananas.html Plenty of water, rich soil, protection from wind, frost and cold.
Paw Paw/Papaya	Fruit edible	Small tree – 5m?	All year	As for bananas. Plant seeds from ripe fruit.
Sweet potato	Tuber and leaves edible	Trailing vine	Harvest tubers late autumn after dieback	http://greenharvest.com.au/Plants/Information/SweetPotato.html Plant in spring – when warmer.
Pepino - Solanum muricatum	Crunchy melon like fruit	Up to 1 metre sprawling	Fruits over warmer months.	http://www.deeplivingproject.com.au/plants/pepinos/ Sun and plenty of water.
Avocado Tree	Edible fruits	Can be pruned	Summer	May need two plants for pollination.



Eastern Side Fruit and Nut Food Forest.

There is plenty of space here for meandering paths and all the layers in a food forest. At least one or two swales will help retain water on the slope, and a stormwater drain from below the Solar Panels could be redirected here.

The focus of this garden is Citrus and Nut trees with climbers along the fence

Trees.

Plant name	Use	Height	Fruiting/flowering time	Notes
Orange – Valencia or Navel	Fruit	4m	Sept – April	Soil will need improving mulching compost. Use grafted varieties
Mandarin – Imperial or emperor	Fruit	2-3m		
Lemon – Meyer, Eureka				
Fig – black or genoa	Fruit	2-3m or medium tree if not pruned.	Summer fruit	
Macadamia, Pecan or other nut tree		10-20m		

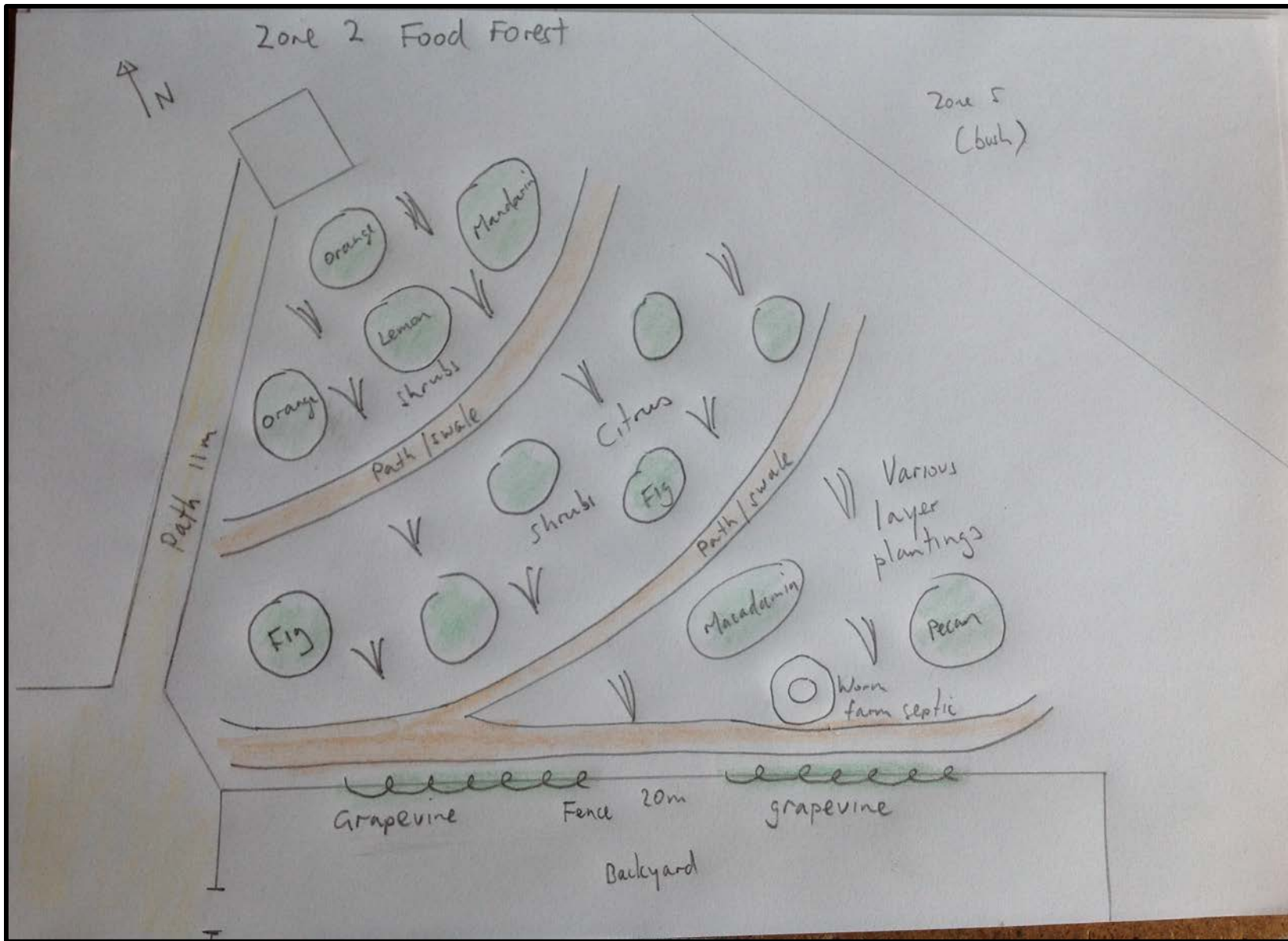
Shrubs

Plant name	Use	Height	Fruiting/flowering time	Notes
Borage	Attracts pollinators edible flowers good for chooks	Half metre	Spring	
Comfrey	Nitrogen fixer and compost accelerator chooks health	Half metre		
Lavender	Attracts pollinators	Small shrub		
Fruit salad sage	Edible flowers pollinator			

Eternal Spinach	Perrenial herb			
Artichoke – globe				
Daikon				
Rocket				
Rhubarb				

Climbers and ground covers

Plant name	Use	Height	Fruiting/flowering time	Notes
Grape vine on fence	Edible fruit	Climber	Summer	
Native raspberry - Rubus parvifolius	Edible berries, leaves make tea.	Groundcover	Dec-April	Full sun, well drained soil.



Deciduous Shade trees

These will provide shade for vegetable beds in the harsh summer heat and shade for students eating on outdoor tables during summer. These would preferably be fast growing and native – Red Cedar?

Chicken Shed

Chickens are a possible addition to this permaculture garden and would be included at the very end, when gardens are well established. Using the Solar Panels as a roof for the shed means that little infrastructure will need to be constructed. Water for the chickens could be collected into a small tank via runoff from the panels themselves. Timber roosts, nesting boxes, mesh enclosing and a door would all need to be constructed. Issues with chickens would be care during holidays, destructive nature around gardens and feeding. Benefits are eggs, compost and pest control in gardens.

Implementation

The works proposed could be carried out in several ways. A school/schools could be enlisted to help us complete elements via a 'permablitz' day. Mt Druitt Tutorial School students and staff may be perfect for this and they could have ongoing ownership of the garden and help with maintenance. They are regular visitors already for bush regeneration.

Another option would be for a community 'permablitz' day or weekend. We could enlist the help of Sydney West Permaculture members or local residents to help with earthworks and planting. The locals could then have access to the produce from the garden as a way of thanking them!

Priority 1

Water management should be the first priority for implementation. The installation of rainwater tanks and diversions of stormwater should be completed first as adequate water will be a necessity for the establishment of new garden beds. Funding for tanks could come partly from the Primezone grant money and DEC Assets may help out? Diversion of stormwater will require some digging and re-routing of pipes in both the driveway and eastern side of house areas. Timeline – terms 2-3 2015

Priority 2

Earthworks. The building of swales will work in with priority 1 to manage and retain water in the landscape. This could also include the enriching of soil with compost (we may need to purchase this) and mulching of paths. These works will need to be completed before planting. Term 3 2015.

Priority 3

Planting of all tree species. Term 3 2015. The end of winter would be a good time for planting as it is not too hot on workers and will give trees time to establish before the summer heat. This is the driest time at Brewongle and adequate water would need to be available to water in the plants. If there has not been enough rainfall to fill new tanks, then we may need to buy some water initially.

Priority 4

Planting of all ground covers, shrubs and climbers to make up the remainder of the food forest. Term 4 2015. The ideal time for this would be early term 4 2015. Spring planting will allow help establishment and give staff time to monitor progress before the summer holidays.

Priority 5

Construction of Chicken Shed and addition of chickens. 2016. This is a low priority and subject to discussion with staff.