Busy Road

Shands Road runs right next to the site which is always pact with fast vehicles driving through each day. Therefore, some sort of noise barrier or buffer would be a very important to mitigate the noisy road.

Alternative Route

Boundary road is another route that can be used to travel to and from the site. However, this route again is very car oriented but is mostly quiet during the day. This provides the opportunity to be a route for larger vehicles.

Resource Sharing

Surrounded by existing farms and research facilities, the layout and activities within the site according to the different carbon strategies will be based off what activities are happening in the adjacent landscapes.

Busy Roundabout

The roundabout becomes really busy at daytime which yet again causes a lot of both air and noise pollution. Therefore it is very important that the entire South-West part of the proposed site has a barrier to protect the site.

Car Orientated

This is the closest existing connection from the site to the University. But the road is poorly designed to be car dominated having only faded bikeparths that are rarely used. With this, the only logical way to get to the site is by vehicles.

Bikepaths

Springs road has clear indications between the road and bike paths. The issue being that the bike paths on the opposite side of the road from the University is rarely used as it doesn't connect to anywhere.

Bike-Friendly

Gerald street has a very bike-friendly environment and is well designed to allow cyclists to cycle safety without concerns of being hit by a vehicle. This allows opportunities to create a connection to cycle from the site.

Prebbleton - Hornby
Prebbleton - Templeton
Prebbleton - Christchurch
Rolleston
Springston
Tai Tapu
Plant and Food Research Farm
Proposed Site
Lincoln University Dairy Farm
Old Landfill
Lincoln University Dairy Farm Research
Lincoln Plant and Food Research
Agriculture Research
Lincoln University
2.6 kilometers from center of town
2.2 kilometers from center of town
Lincoln

Good Quality Soil

Average Quality Soil

Soil conditions are generally good overall as the site is currently a farm. Based on these conditions in addition with the proximity to the University, the location of student accommodation is chosen.

Context Map

The site is owned by Lincoln University and is situated approximately 200 meters away from the campus and 2 kilometers away from Lincoln town.

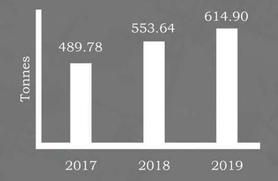
Plan Key

- Site Boundaries
- Main connection to Lincoln University
- Connections to Lincoln Town
- Potential for Resource Sharing
- Lincoln Town
- Existing Student Accommodation
- Proposed Student Accommodation

The Carbon Problem

The number of students in Lincoln University is rapidly increasing over the years, forcing the University to develop and expand. This results in the increase in the demand of energy each year. Though the University teaches sustainability and environmental care, the University ironically relies on energy from coal combustion. This results in unimaginable amounts of carbon being released into the atmosphere each year. Therefore it is important to ensure that this ongoing trend is reversed for a better environment in the future.

Carbon produced from Coal Combustion at Lincoln University per month (average)



Design Constraints

- The site is very flat and consists of minimal infrastructure other than being a farm. This makes it really hard to find grounds for a design concept.

- Power-line runs across the site having one tower present on site.

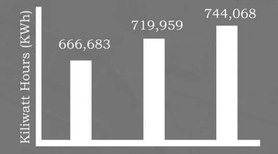
Design Opportunities

- Owned University land which is in close proximity to the University and town.

- Good soil conditions for growing crops and doing agriculture.

- Surrounded by research facilities

Electricity Usage per month for Lincoln University (average)



Design Vision

The Carbon Solution Project will be the key for Lincoln University becoming the first carbon-free University in New Zealand. The facility will be providing various research areas based on the three main strategies of sequestrating carbon. Not only will the facility improve Lincoln, but will act as a catalyst of change, demonstrating actions and coming out with solutions to problems that will lead the ultimate goal of a carbon free future.

Design Goals

One - To reduce the amount of carbon in the atmosphere through three strategies. Reduce existing carbon emissions, reduce existing carbon in the atmosphere, and to prevent carbon emissions in the first place.

Two - To provide additional study and research space for students and staff, bringing together different research professions through encouraging cross pollination between research fields.

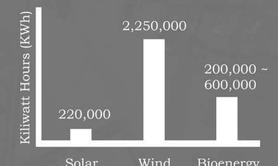
Three - To create connections between the site and the surrounding facilities including Lincoln town, in order to share resources to minimize inputs and maximize outputs.

Better Future for Lincoln University


Lincoln University's solar panel installment

Though Lincoln University attempts to thrive towards being zero carbon, it is far from impossible at this rate. Therefore the most important factor to make this a reality is to focus on converting to clean energy sources which includes sunlight, Biogas and wind.

The Carbon Solution Project energy production estimate per month (KWh)



Not only that the site produces alternative energy that will be sufficient to run the facility, but enough to also run Lincoln University if the design is fully completed.


Planting strategy of the design is capable of sequestrating 60 tonnes of carbon per month when the plants reach their matured state.

As there currently is so much carbon being released into the atmosphere due to the combustion of coal, there is so much Lincoln University would have to make up for it.

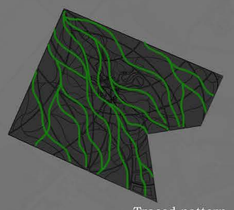
The amount of carbon sequestrated is calculated by the approximate area of the arboretum which stretches through the entire site. This is between 12,000 to 15,000 square meters.

Layout Inspiration


Image of Waimakariri River

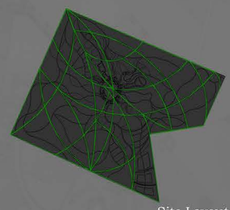
Canterbury plains used to consist of river channels running through the landscape. Traces of these patterns can be seen in some areas from satellite images. As the site is part of a University owned farm land, these patterns can clearly be seen.

Palimpsest Patterns


Traced pattern

To establish the connection between the design and the site, the patterns act as the basis of inspiration which is then developed to become a design.

Deep Forms Theory


Site Layout

Based on the traced patterns, it is then developed to establish a contemporary pattern based on the deep forms theory, formulating the spaces and layout.

N

0 200 400 600 800m

SCALE 1:10000 @ A1

DESIGN CONTEXT

TANAPOL CHITONGARTPAKDEE
STUDENT ID: 1126067
LASC 409 MAJOR DESIGN 2019

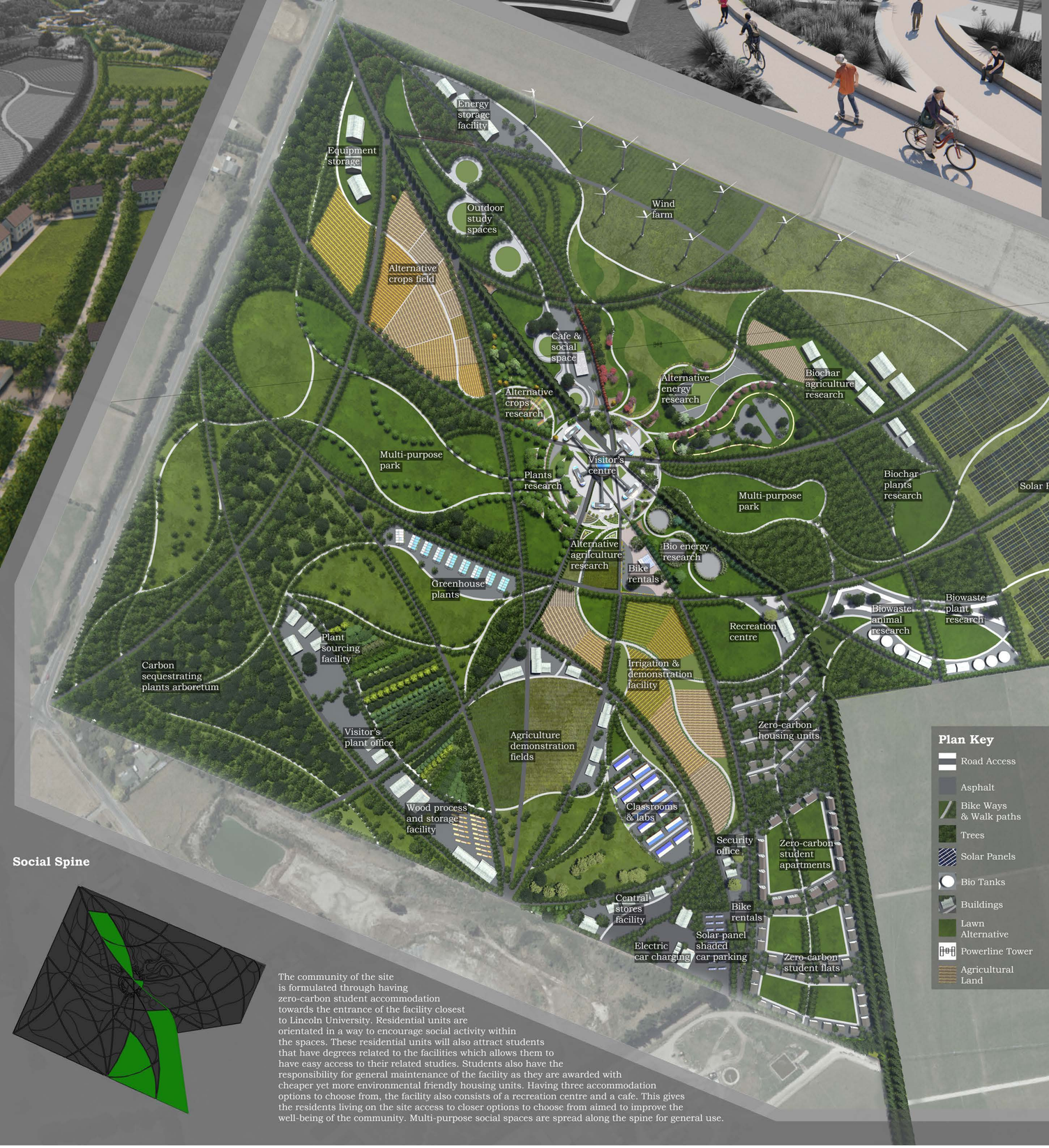
"The places that are most likely to grow trees for carbon sequestration are places where trees aren't growing now."

- Robert Jackson

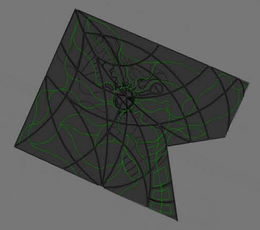
LINCOLN, CHRISTCHURCH, NEW ZEALAND

THE CARBON SOLUTION PROJECT

THE FIRST STEP TOWARDS A CARBON FREE FUTURE

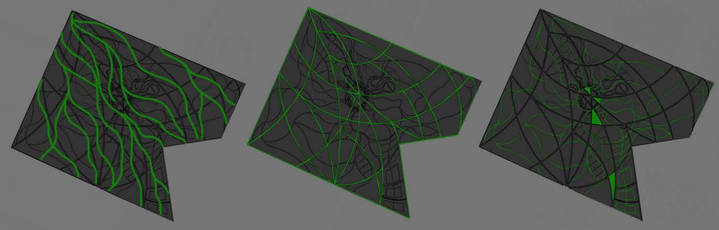


Site Circulation Strategy



The site consists of minimal car parking to discourage the use of vehicles which has high levels of carbon emissions. However, the site encourages walking and cycling providing bike paths and walk ways all around the site.

Site Layout & Design Process

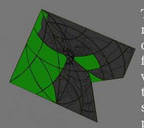


As part of the Canterbury plains, palimpsest patterns from the old river channels are still present and can clearly be seen on the satellite images. These patterns are used as a tool to connect the design to the landscape.

Utilizing the landscape patterns based on the deep forms theory, it formulates the roadways of the site through mimicking patterns, which determines the general layout of the design. This allows easy access throughout the site.

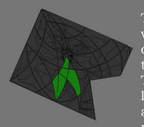
As the river patterns that run through the site determines the main roads, the activity assigned within these spaces act like stones placed in the running river, breaking and slowing down the water which formulates the bike paths and walk ways.

Strategy 1: Remove Existing Carbon

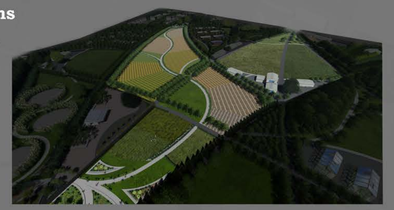


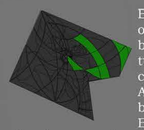
The arboretum area runs mainly along the West side of the site. Mainly this area focuses on showcasing various species of plants that are good in carbon sequestration as well as providing a multi-purpose public space for people to utilize. The arboretum stretches across the site along the internal road system formulating a solid green infrastructure.

Strategy 2: Reduce Carbon Emissions



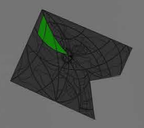
This area focuses on different ways modern agriculture can be modified and adapted to reduce carbon emissions. The area consists of farm land with different soil types and orientation which allows research to be done through experimenting different methods. The area also allows further research in water treatment and ways to filter run-offs from agricultural practice.



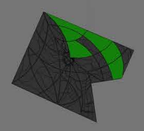


Bio energy research focuses on re-using bi-products of both plants and animals and turning them into energy we can use in the form of Biogas. As the site is surrounding by both animal and plant farms, Biowaste products from the surrounding farms can be collected and converted into energy to use on the site. The site provides the opportunity for Biochar research to be done and demonstrated on the agricultural fields of the alternative crop and agriculture areas.

Strategy 3: Prevent Carbon Emissions



By growing high protein crops on the site, it provides the opportunity to demonstrate the benefits of consuming local food. By reducing the food miles practically to almost zero, it prevents the carbon emissions produced along along the transportation process. The area also researches on the growth of different crops that can be used for sustainable food options whilst these crops are also sold to the students & staff which encourages low food miles.



The area allows study and research on alternative ways of producing energy whilst being carbon free, as well as physically producing energy to run both the facility and Lincoln University. The solar panels formulate a landscape of themselves therefore being located at the far end of the site. The wind farm consists of wind turbines with additional crop fields underneath them to maximize space use. The road system that runs along the site allows easy access to the machinery for maintenance purposes. As well as being actively producing clean energy, having research and study labs right next to these facilities allow first-hand experiences for the students. This area allows different types of clean energy production methods to be tested for a better future.

Plan Key

- Road Access
- Asphalt
- Bike Ways & Walk paths
- Trees
- Solar Panels
- Bio Tanks
- Buildings
- Lawn Alternative
- Powerline Tower
- Agricultural Land

Social Spine

The community of the site is formulated through having zero-carbon student accommodation towards the entrance of the facility closest to Lincoln University. Residential units are orientated in a way to encourage social activity within the spaces. These residential units will also attract students that have degrees related to the facilities which allows them to have easy access to their related studies. Students also have the responsibility for general maintenance of the facility as they are awarded with cheaper yet more environmental friendly housing units. Having three accommodation options to choose from, the facility also consists of a recreation centre and a cafe. This gives the residents living on the site access to closer options to choose from aimed to improve the well-being of the community. Multi-purpose social spaces are spread along the spine for general use.

N

0 50 100 150 200m

SCALE 1:2000 @ A1

MASTER PLAN

TANAPOL CHITONGARTPAKDEE
STUDENT ID: 1126067
LASC 409 MAJOR DESIGN 2019

"Now, we put out a lot of carbon dioxide every year, over 26 billion tons.. It's an average of about five tons for everyone on the planet. And, somehow, we have to make changes that will bring that down to zero."
- Bill Gates

LINCOLN, CHRISTCHURCH, NEW ZEALAND

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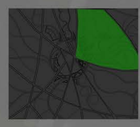
Alternative crops field
+0.55
+0.60
Cafe building
Multi-purpose motion park
Outdoor public spaces
Crop testing
+0.40
+0.20
Events space
+0.60
+0.80
Alternative crops research building
Parking
+1.00
Alternative energy research building
Outdoor energy generating gym
+1.00
+0.60
+0.95
Visitor's centre
Multi-purpose outdoor park
Plants research building
+10.00
+1.00
Bio energy research building
Multi-purpose outdoor park
Alternative agriculture research building
+1.00
Outdoor semi-private spaces
Agricultural demonstration
+0.95
Bike rentals

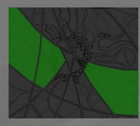
The research centres are connected together by the visitor's to encourage cross pollination between different study fields which enhances research diversity, improving research quality.

Alternative Energy Space



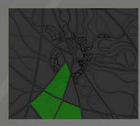
This space is designed to have an energetic vibe and overall atmosphere that reminds people within the space, of energy. The area consists of an outdoor gym that allows both staff and students to have a great workout during their lunch breaks whilst at the same time generating electricity. The area also features an events area which symbolizes constant excitement and movement on the site.

Plant Arboretum Space



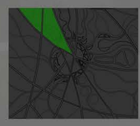
The space is designed to be spacious and showcase various species of plants and trees with capabilities of sequestrating carbon. The area features outdoor open park spaces for both students and staff to use for any purpose as well as seating areas for general study or relaxation. The space provides both shaded areas and sunny areas providing people with different preferences both options.

Alternative Agriculture Space



With various crop fields to do research, the space provides the opportunity to observe the different agricultural methods that can be implemented to reduce carbon emissions. The area also provides students a first hand experience to agriculture as the fields are close to the classrooms. This also allows further study and research in water management methods tackling run-off issues.

Alternative Crops Space



With crop fields constantly growing high protein crops, these crops can be used for demonstration and study purposes as well as food ingredients for the cafe next to the area. Not only that this promotes local food sourcing to encourage lower food miles, it allows further research on the extent local food is capable of supporting the local community. There is also an area that researches new crops.

Bio Energy Space

The area focuses on the concept of re-use & recycle which translates this into the design. The space has an outdoor semi-private multi-purpose spaces inspired by the form of Bio tanks. Miscanthus, a plant well known for having a variety of soil and nitrate fixing benefits, is used to form these spaces. Movable seating made from compressed and recycled polyester allows the space to be modified and moved around accordingly. This highlights the concept of recycling as well as providing a dynamic outdoor space.

Outdoor Cafe Space

The Cafe area provides a place for staff and students to have access to food as well as providing the opportunity to highlight the use of locally grown crops as a food source which promotes the reduction of food miles.

Electric Bicycle Rental Space

Having bike rentals promotes the transportation method with zero carbon emissions. Each bike rental building allows students to use their student ID to rent and bike which can be used to travel around the facility.

Spot Height Units in Meters

N

0 10 20 30 40m

SCALE 1:500 @ A1

INTERMEDIATE PLAN

TANAPOL CHITONGARTPAKDEE
STUDENT ID: 1126067
LASC 409 MAJOR DESIGN 2019

"Surely we have a responsibility to leave for future generations a planet that is healthy and habitable by all species."

- Sir David Attenborough

LINCOLN,
CHRISTCHURCH,
NEW ZEALAND

THE CARBON SOLUTION PROJECT

THE FIRST STEP TOWARDS A CARBON FREE FUTURE

The most important aspect of this project is in regards to energy. This is the reason why carbon emissions are gradually increasing each year. Therefore, it is important to focus on the methods of designing spaces that tackles this issue hence the reasoning behind choosing an area to focus in for the detailed design.

Shaded Seating Area
Elevated Planter box Seating
Bike Parking
Kinetic Energy Public Space
Recycled Plastic Seating
Events Space
Elevated Planter box Seating
Alternative Lawn Plantation
Elevated Planter box seating
Outdoor Energy Generating Gym
Alternative Energy Research Building
Shaded Seating Area
Main Road
Visitor's Center
Alternative Energy Research Building
Kinetic Energy Public Space
Events Space
Outdoor Energy Generating Gym
Bike path & Walkway
Jogging Track

+1.50 +1.50 +1.00 +1.20 +1.10 +1.35 +1.30 +1.00 +0.70 +1.50 +1.00 +1.15 +0.85 +1.30 +9.00 +1.40 +1.10 +1.50 +0.95 +1.00

Kinetic Energy Public Space

Compacted plastic seating allows the seats to be moved around accordingly which represents movement and motion. Elevation changes forces people use energy to access these spots, relating back to the concept of energy. In addition with the vibrant plants, the area reminds people of the idea of energy as they are in the space.

Outdoor Energy Generating Gym

Outdoor gyms particularly are designed for people to use up their energy. However, this outdoor gym is equipped with special outdoor equipment that allows that energy to be collected and stored for other uses within th facility. The space consists of a running track and is equipped with hand rowers, cycling machines, and elliptical trainers.

Events Space

The events area provides the facility with an area for different events to occur. Not only that this attracts social activity to the area, it relates to the concept of energy in the area as it encourages movement in and out of the space with the different events always going on in the space.

Spot Height Units in Meters

N

0 2 4 6 8m

SCALE 1:100 @ A1

DETAIL DESIGN

TANAPOL CHITONGARTPAKDEE
STUDENT ID: 1126067
LASC 409 MAJOR DESIGN 2019

"Climate change is not just about carbon dioxide levels and melting polar ice caps. It is about our public health and protecting our Earth for future generations."
- Mike Quigley

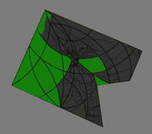
LINCOLN, CHRISTCHURCH, NEW ZEALAND

THE CARBON SOLUTION PROJECT

THE FIRST STEP TOWARDS A CARBON FREE FUTURE

STRATEGY ONE : CREATING AN ATMOSPHERE

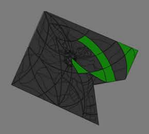
Plant Research Area



- Podocarpus totara (8m x 12m)
- Fuscospora cliffortioides (5m x 12m)
- Dacrydium cupressinum (5m x 14m)
- Carpodetus serratus (4m x 10m)
- Prumnopitys taxifolia (5m x 15m)
- Kunzea ericoides (3m x 8m)

This area consists mainly of larger trees which grow taller than 5m in its matured state to create the sense of protection and relaxation. This is achieved by the combination of the size of the canopies being tall and the amount of shadow these trees create in the area.

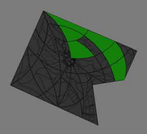
Bio Energy Research Area



- Miscanthus x giganteus (2m x 4m)
- Cordyline australis (3m x 7m)
- Leptospermum scoparium (3m x 4m)
- Hebe stricta (2m x 2m)
- Kunzea ericoides (3m x 8m)
- Alnus cordata (5m x 14m)

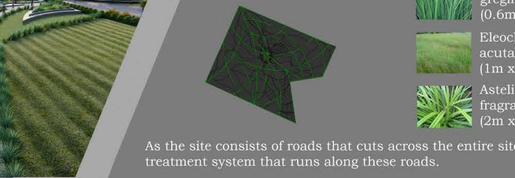
Plants in this area focuses mainly on its relationship with the concept of recycling. Plants here includes compost/nitrogen fixing species that helps with the quality of biowaste, plants with a variety of benefits to the land, to plants that are self-seeding which symbolizes the concept of recycle.

Alternative Energy Research Area

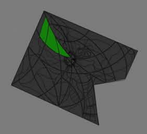


- Phormium 'Jester' (1m x 1m)
- Phormium cookianum (1.5m x 2m)
- Acer circinatum x palmatum (4m x 8m)
- Cupressus arizonica (3m x 7m)
- Acer x freemani 'Autumn Blase' (4m x 10m)
- Acacia dealbata (5m x 14m)

The area consists of both plant species with more vibrant and lively colours to create a vibrant and energetic atmosphere. As the area consists of machinery that requires maintanace, the vibrant colours would stand out which would make up to the lower number of plants compared to other areas.



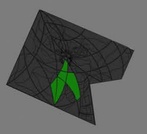
Alternative Crops Research Area



- Olearia traversii (2.5m x 5m)
- Hebe decumbens (1m x 1m)
- Carmichaelia australis (2m x 4m)
- Pittosporum tenuifolium (3m x 6m)
- Chionochloa flavicans (1.5m x 2m)
- Acacia dealbata (5m x 14m)

As the area is right next to social spine, the concept of 'attracting life' is the bases of the plants here. Plants here include fruit plants which represents the scheme of the research area as well as species that attracts birds. With birds being attracted, it creates a more lively atmosphere to the space.

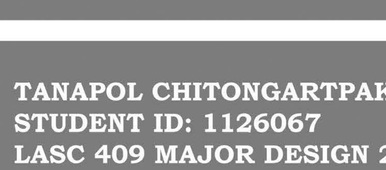
Agriculture Research Area

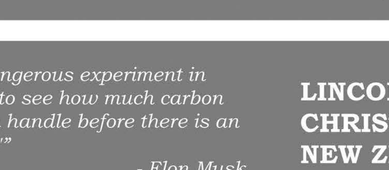


- Phormium cookianum (1.5m x 2m)
- Hebe 'Wiri Mist' (1m x 1m)
- Phormium tenax (2m x 3m)
- Austroderia richardii (2m x 2m)
- Festuca actae (0.8m x 0.5m)
- Astelia chathamica (1m x 1m)

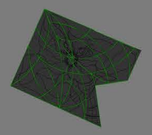
The area focuses on researching alternative agricultural methods. Plantation here is aimed to create an open atmosphere that allows people to have a wide view across the land. Therefore, plant species here would consists of lower hardy shrubs that grows well in exposed sites to meet the set character.

STRATEGY TWO : LARGE TREES FOR CARBON SEQUESTRATION





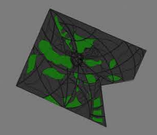
Absorbing Carbon



- Pinus radiata (7m x 15m)
- Pseudopanax arboreus (3.5m x 6m)
- Podocarpus totara (5m x 12m)
- Carpodetus serratus (4m x 10m)
- Pittosporum eugenioides (3m x 8m)
- Pittosporum tenuifolium (3m x 6m)

This planting strategy is focused on utilizing larger plant species with a height taller than 5 meters to maximize the amount of carbon absorption. Plantation runs along the main roadways which connects the whole site together. There are 5 native species which are mainly used and one exotic which has the highest amount of carbon sequestration.

Lawn Solutions

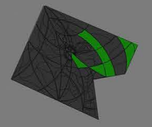


- Dichondra repens (1m x 0.1m)
- Selliera radicans (1m x 0.1m)
- Leptinella dioica (1m x 0.1m)

As the site consists of various public spaces aimed to encourage socialization, alternative lawn species are used to avoid maintenance which produces carbon. In areas with lawn, clippings are re-used for compost.

STRATEGY THREE : MULTI-PURPOSE PLANTS

Soil Fixing Plants



- Miscanthus x giganteus (2m x 4m)
- Chamaecytisus palmensis (3m x 3m)
- Leptospermum scoparium (5m x 12m)
- Alnus cordata (5m x 14m)
- Kunzea ericoides (3m x 8m)

As the area of research in this section of the site is based on converting Biowaste into energy, the process requires the compost to be kept at a good quality. These plants fixes the nitrogen in the soils which gets rid of the slimy texture compost sometimes get. Plants like Miscanthus can also improve soil conditions as well as be converted into other forms of fuel like diesel.

Self Seeding Plants (Concept of Recycle)

- Cordyline australis (3m x 7m)
- Sophora microphylla (3m x 8m)
- Pittosporum tenuifolium (3m x 6m)
- Coprosma rigida (0.5m x 0.6m)
- Hebe stricta (2m x 2m)

The concept of recycling in the area is something that is very important to represent the overall character of the research field. With these plants being self-seeding, it symbolizes this concept of self-reproduction.

STRATEGY FOUR : PLANTS FOR WATER QUALITY

Run-off Water Filtration.

- Juncus gregiflorus (0.6m x 1.2m)
- Cortaderia richardii (2m x 3m)
- Carex virgata (0.5m x 1m)
- Eleocharis acuta (1m x 1m)
- Carex secta (1.5m x 1.5m)
- Chionochloa rubra (1m x 1m)
- Astelia fragrans (2m x 2m)
- Carex solandrii (2m x 1.5m)

As the site consists of roads that cuts across the entire site in various directions, it provides the opportunity for having a water treatment system that runs along these roads.

Agricultural Run-off

- Apodasmia similis (1m x 2.5m)
- Machaerina juncea (0.8m x 0.8m)
- Phormium cookianum (1.5m x 2m)
- Cortaderia richardii (2m x 3m)
- Phormium tenax (2m x 3m)
- Carex virgata (0.5m x 1m)

As theres more space for the agriculture research area, plants species are larger.

PLANTING STRATEGY

TANAPOL CHITONGARTPAKDEE
STUDENT ID: 1126067
LASC 409 MAJOR DESIGN 2019

"We're running the most dangerous experiment in history right now, which is to see how much carbon dioxide the atmosphere can handle before there is an environmental catastrophe.'"

- Elon Musk

LINCOLN, CHRISTCHURCH, NEW ZEALAND

THE CARBON SOLUTION PROJECT

THE FIRST STEP TOWARDS A CARBON FREE FUTURE

DESIGN MATERIALS

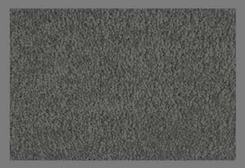
Timber Wood (Hardscape)

- Natural material that the site can always produce from processing trees from the aboretum.

-Environmental friendly and has no carbon emissions.

-Easy for maintanance purposes.

- Creates the natural character which fits the project.



Asphalt (Main Road)

- High durability.

- Easy for maintenance purposes.

- Minimal environmental impacts as they do not leach.

- Dark color provides the solid framework for the site, acting as the main roads running through the design.

Concrete (Bike path and Walkways)

- High durability.

- Easy and effective to install.

- Can be recycled and re-used.

- Low energy required in the production process which means less carbon emissions.

Glass (Visitor's Centre)

- Natural material made from sand and glass waste.

- Material can be re-used over and over again which reduces the amount of waste.

- Allows heat from the sunlight to pass-through.

- Allows visual connection between inside and outside.

Gravel (Swale and Paths)

- Cheap and quick for installation.

- Durable and effective.

- Environmental friendly as it permeable which doesn't kill the plants underneath the surface.

- Natural material fitting with design concept.

Stone Bricks (Outdoor seating)

- High durability.

- Creates the natural character for the project.

- They can be arranged into many forms making it very suitable for the curved forms present in the project.

- Easy for maintenance purposes.

Compressed Recycled Plastic

- Environmental friendly as it utilizes materials that non-biodegradable.

- Light-weighted

- Customizable to any shape and form

- Cheap (if not free) to obtain and use for the design.

Shredded Pine Mulch

- Natural material that can be obtained from the arboretum.

- Beneficial to plants species which is a very important component of the design.

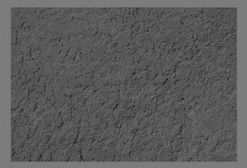
- Reduces the amount of maintenance required for the area as it controls weeds.

Biochar

- Very important for carbon sequestration as it is capable of sequestrating high amounts of carbon when added to agricultural soils and croplands.

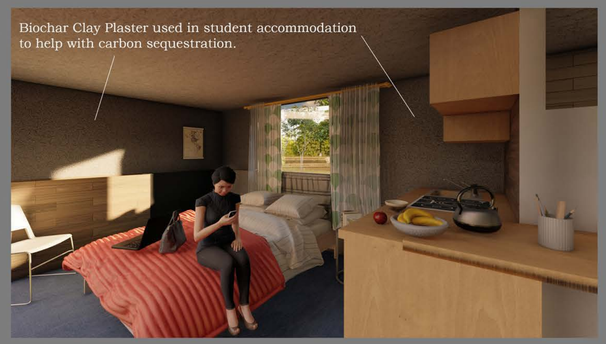
- Increases crop yield as it improves the overall soil conditions.

- Reduces cost for fertilizers.



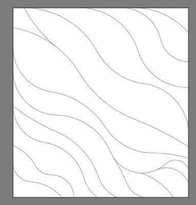
Biochar - Clay Plaster

This is a mixture between 50 percent Biochar, 30 percent sand, and 20 percent clay. This allows this material to be used as a building material. This material not only improves the air quality within the building through soaking up excessive moisture in the air, but also allows these buildings to act as carbon sinks. This material can be applied bot the inside and outside of the building being beneficial either way.



FORMS INSPIRATION

River Patterns



Activity Spaces

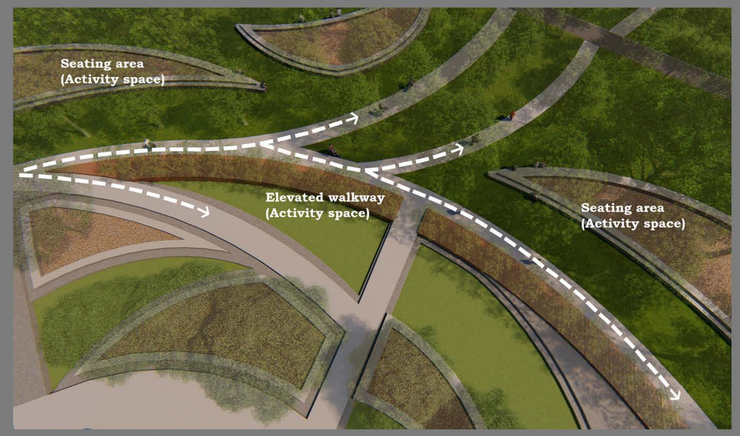
First Layer (Main Road)

The existing patterns runs through the site as a smooth river form as shown in the diagram on the left. With this, the first layer of the site is formed which acts as the main roads for the site through the deep forms theory.

Second Layer (Bike paths and Walkways)

Once the main layout of the site is established, using the same river patterns, activities within each space (shown with green circles) acts like rocks in the river, detouring the river around them. This formulates and inspires the second layer which acts as the bike paths and walkways for the site.

Curved Forms Inspired By Activity Spaces



CYCLE PATHS : CURVES VS PERPENDICULAR

Functional Fluidity

Firstly, the design of the bike paths and walkways are inspired from the natural form driven by the smooth movement of the river. The reasoning behind the entire design rarely having any perpendicular nodes or interceptions is to guide the cyclists smoothly along the landscape, rather than having them stop at a perpendicular intersection in order to make a decision to either go left or right.

Not only that this prevents the smooth flow of movement along the site, it could create circulation problems and even cause accidents in cases where students or staff were to have to make sharp 90 degree angle turns. Therefore, having little to no perpendicular nodes allows good circulation for cyclists around the site.

Smooth curves allows and encourages fluid movement along the path

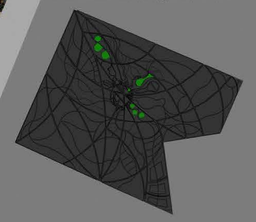
Rectilinear pathways forces cyclists to stop along the nodes.

RECYCLED MATERIALS : ADJUSTABLE SEATING AREA

Seats does not have the same orientation each day.

They are constantly moved around.

Movable Seating Locations



Reuse, Reduce & Recycle

The seating blocks are made from compressed recycled plastic which allows them to be moved around according to the space user's personal needs. As they are made from recycled materials, they can be shaped into different sizes and forms yet still are light enough to move around.

The issue modern society are having today is what to do with plastic. Solutions includes landfills, burning and disposing it into the ocean. However these solutions causes even more issues. Therefore by using these materials, it puts into use, the things people are trying to get rid of.

Transforming Social Spaces

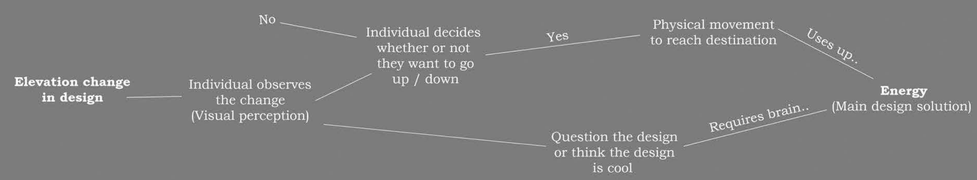
The seating areas are scattered around in different areas, mainly around the social spine in order to encourage social activity. It is certain that each day these seats would be moved around according to the user's preference. Therefore it means that if someone was to take a picture of the space every day, most likely the space would look different.

This constant movement symbolizes the idea of energy and movement. Not only does the space physically moves and changes each day, it requires energy from the people to move this which further highlights the idea of energy.

FORMS FOR ENERGY : ELEVATION CHANGE

Level Changes

The entire site is designed based on the main concept of energy. There are many layers when it comes to how the design addresses energy. This includes the producing energy, researching energy, and reducing energy use. But in this case, the design focuses on the concept of using energy. As site users are now required to use more energy to get to a higher or lower elevation point, this acts as another layer which addresses energy in this design.



FORMS AND MATERIALS STRATEGY

TANAPOL CHITONGARTPAKDEE
STUDENT ID: 1126067
LASC 409 MAJOR DESIGN 2019

"If there's one thing I would like to see, it'd be for us to be able to price the cost of carbon emissions.'

- Barack Obama

LINCOLN, CHRISTCHURCH, NEW ZEALAND

THE CARBON SOLUTION PROJECT

THE FIRST STEP TOWARDS A CARBON FREE FUTURE

THE ANSWER TO FUTURE FARMING

BACKGROUND

Rapid development in technology in modern society has lead to an increase in population due to the increase in capabilities of medical support. However with an unlimited amount of inputs (people giving birth), and a limited amount of resources, this equation is bound to eventually break. Businesses around the world focuses on low-cost investment on the production side and is focused mainly on the quantity rather than the quality as this is more beneficial on the economics of the business. Therefore with these priorities, the quality of food people receive in supermarkets and grocery stores these days is arguably poor. This makes it very difficult for people to source high-quality local products from their supermarkets as most of the time their vegetables are imported from a different country or location. (Sadik, N.D.)

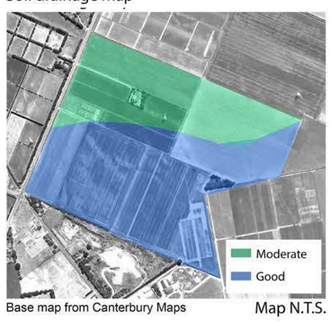
There are existing examples of systems which have already been established in modern society aimed to achieve a similar goal of providing high quality local products to those who seek them. Examples would include local food hubs and farmer's markets ran by locals where people can come and share local produces. However these systems are still very vulnerable and unfinished. Therefore this brings to the design vision of establishing this system where future agriculture can follow and be strong enough to satisfy the needs of the consumers whilst still being sustainable. (Sutton, 2018)

GOAL AND SUB-GOALS

The design an area that would act as a catalyst of change for Peri-urban farms, to support the future production of high-quality local food for adjacent urban populations.		
Provide an alternative sustainable production system.	Provide a world-class outdoor educational facility to educate future farmers.	Demonstrate alternative future farming for Canterbury plains.
1. Grow a variety of high protein crops to increase outputs.	1. Enhance the connection with Lincoln University to better accommodate future transportation.	1. Provide facilities to allow demonstration of system.
2. Minimizing inputs through utilizing existing resources from the production systems.	2. Provide facilities to support education for agricultural students	2. Utilize existing facilities to reduce inputs.
3. Enhance green infrastructure to support the new production system.	3. Encourage alternative modes of transportation through providing improving existing connection.	3. Enhance existing accessibility to the site to allow better site access.

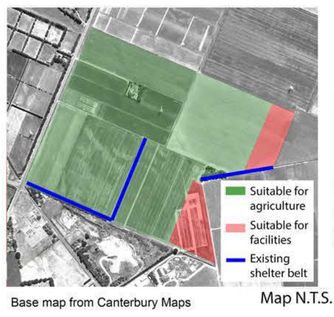
SITE CONDITIONS

Soil drainage map



Base map from Canterbury Maps Map N.T.S.

Land-use Suitability

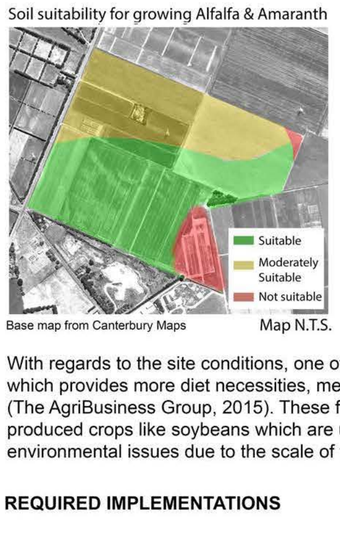


Base map from Canterbury Maps Map N.T.S.

The existing site conditions are considerably suitable for agriculture as there are a range of factors which contributes towards farming which are as follows:
- Existing irrigation system
- Good soil conditions
- Existing shelter belt
- Wide space for future development
- Good connectivity to surrounding areas

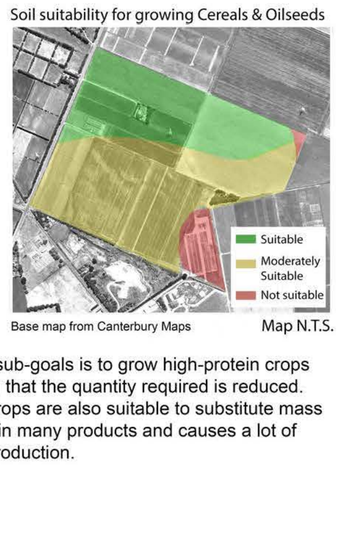
SUITABLE CROPS FOR PLANTING

Soil suitability for growing Alfalfa & Amaranth



Base map from Canterbury Maps Map N.T.S.

Soil suitability for growing Cereals & Oilseeds



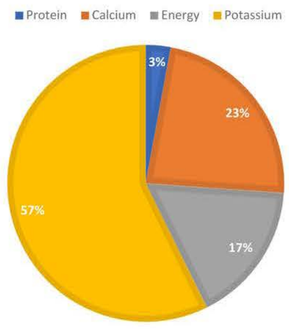
Base map from Canterbury Maps Map N.T.S.

With regards to the site conditions, one of the sub-goals is to grow high-protein crops which provides more diet necessities, meaning that the quantity required is reduced. (The AgriBusiness Group, 2015). These four crops are also suitable to substitute mass produced crops like soybeans which are used in many products and causes a lot of environmental issues due to the scale of the production.

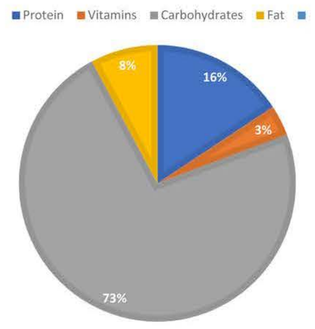
REQUIRED IMPLEMENTATIONS

What is required to produce a new system of farming alternative produces successfully?		
Minimize the inputs into the system whilst gaining more outputs.	Making society accept the new alternatives from the old ones.	Providing physical convenience for interested people to visit the site.
1. Utilizing existing resources on the site. This includes the irrigation system, shelter belt, barricades and surrounding farms.	1. Provide educational facilities for students that study agriculture as they will be the ones developing these future systems to the next level.	1. Improve the convenience for alternative methods of transportation into and from the site. Main route being from Lincoln University
2. Source good quality crop seeds in relation to price to reduce unnecessary risks of waste.	2. Further research and experiments to strengthen the knowledge of these alternatives.	2. Provide facilities to facilitate visitors of the site.
3. Research alternative methods of farming to better utilize resources.	3. Provide demonstration facilities for the public to come and learn about the new alternative.	3. Plan for the possibility of future public transportation routes for future development.

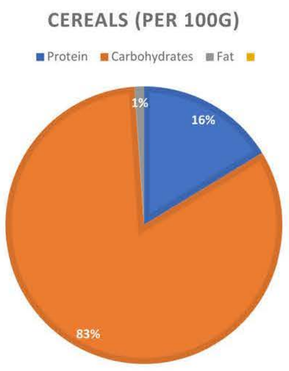
ALFALFA (PER 100G)



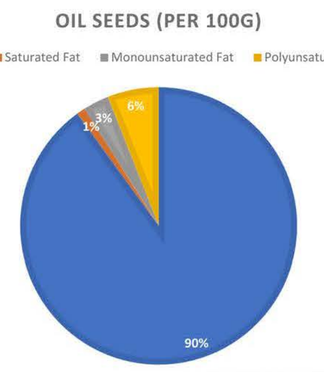
AMARANTH (PER 100G)



CEREALS (PER 100G)

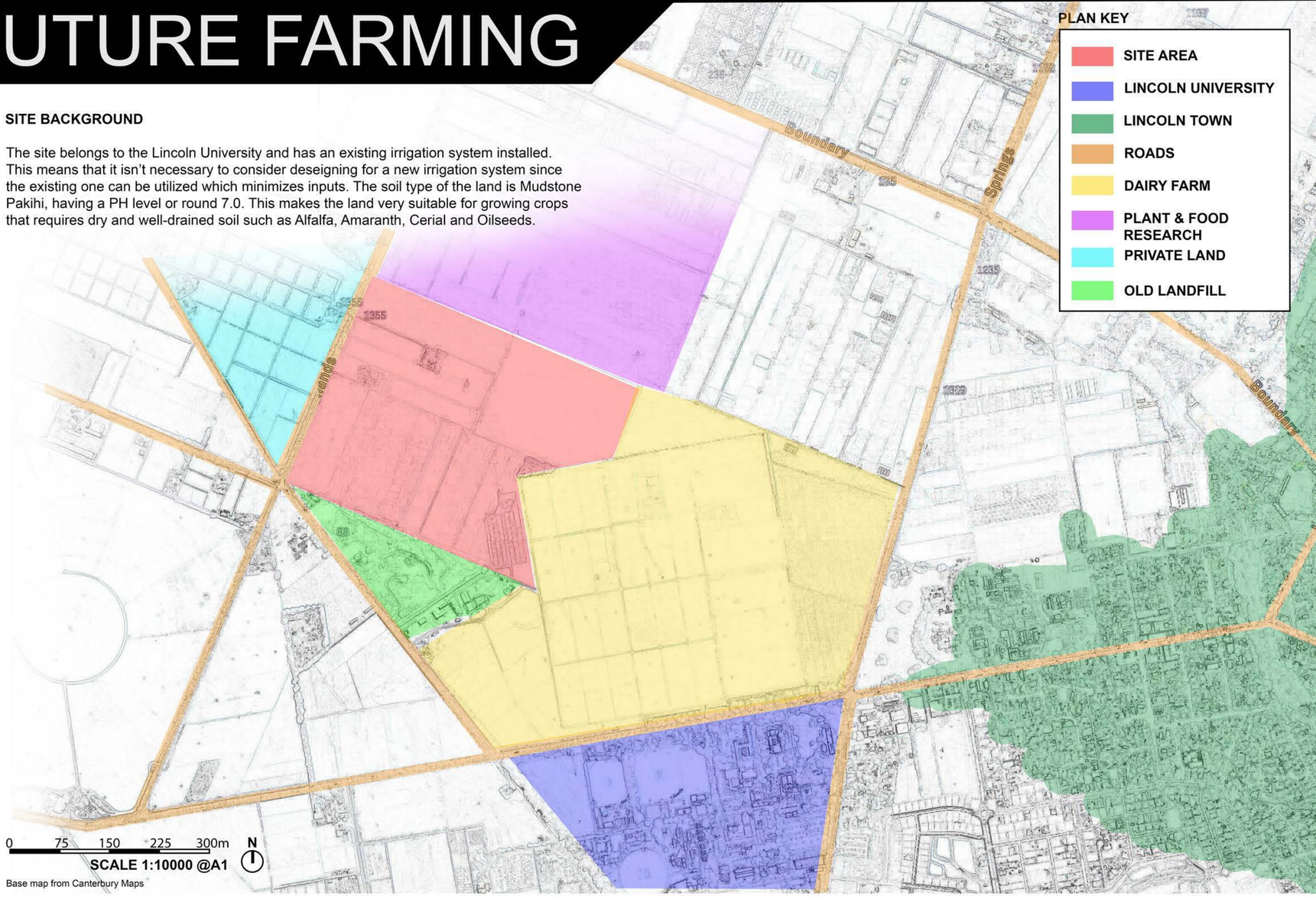


OIL SEEDS (PER 100G)



SITE BACKGROUND

The site belongs to the Lincoln University and has an existing irrigation system installed. This means that it isn't necessary to consider deseigning for a new irrigation system since the existing one can be utilized which minimizes inputs. The soil type of the land is Mudstone Pakihi, having a PH level or round 7.0. This makes the land very suitable for growing crops that requires dry and well-drained soil such as Alfalfa, Amaranth, Cerial and Oilseeds.



WHY PLANT A VARIETY OF CROPS?

Having a diverse range of sustainable crops increases the production system's resilience, both biophysically and economically. With the weather of New Zealand being sometimes unpredictable due to climate change (Kenny, 2001), it is always beneficial to have a mixed variety of crops that would physically stay fit in conditions where others won't. This same fact also apply on the economical and social sides as human demand can sometimes be unpredictable. (Shannon, 2016)

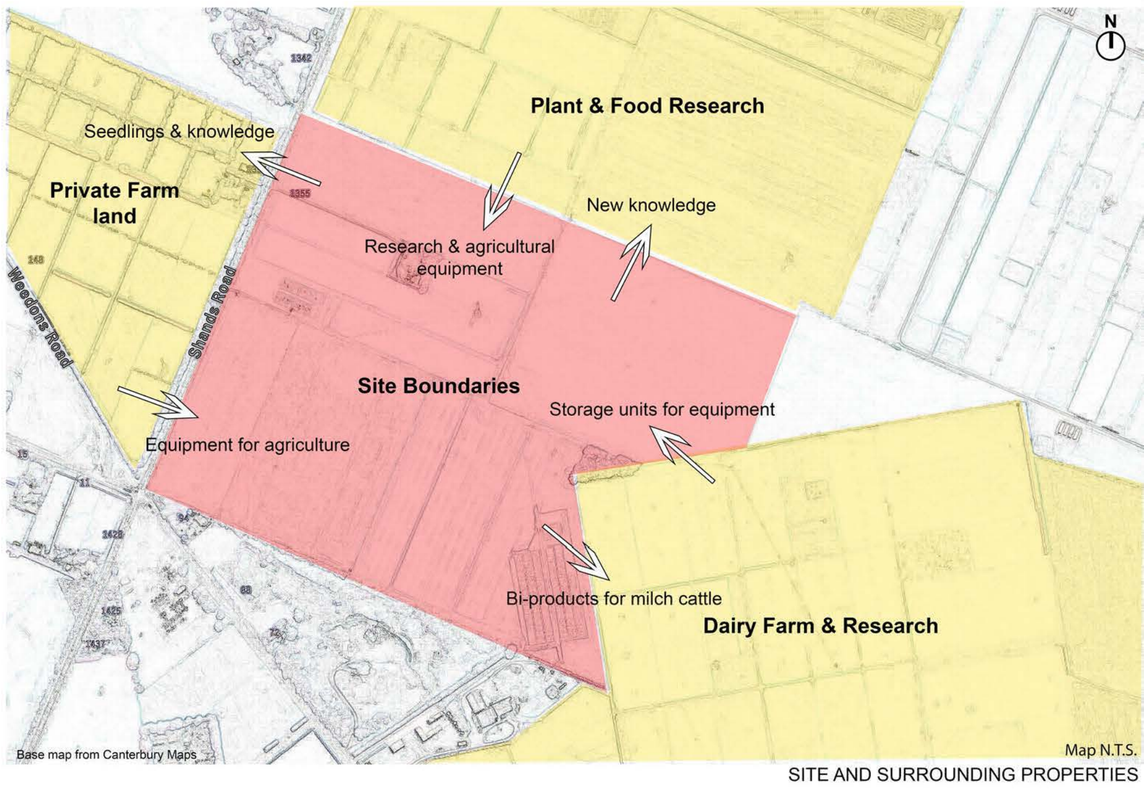
SHARING RESOURCES

As the site is surrounded by other agricultural land, equipment used for these lands would more than likely be similar. Therefore the requirements can be shared between these areas in order to reduce the inputs into the system. This includes storage areas for equipment, agricultural equipment, large machines for agriculture, and access routes into the site for convenience.

RECYCLING WASTE TO MAXIMIZE OUTPUTS

Other than the crop themselves, the bi-products produced from these crops can be beneficial for other purposes. An example would be the utilization of wheat stems as dry fodder for the milch cattle. Seed barks can also be used for fertilization of the soil at it contains certain nutrients that are beneficial for agriculture. (Kumar, 2014)

Though these bi-products does not directly benefit the main goal of this project, it can be used as a token of exchange with other farms surrounding the site. This again links back to the fact that sharing resources between farms would minimize inputs and maximize outputs for the system.



SITE AND SURROUNDING PROPERTIES

CONNECTIVITY TO OTHER TOWNS

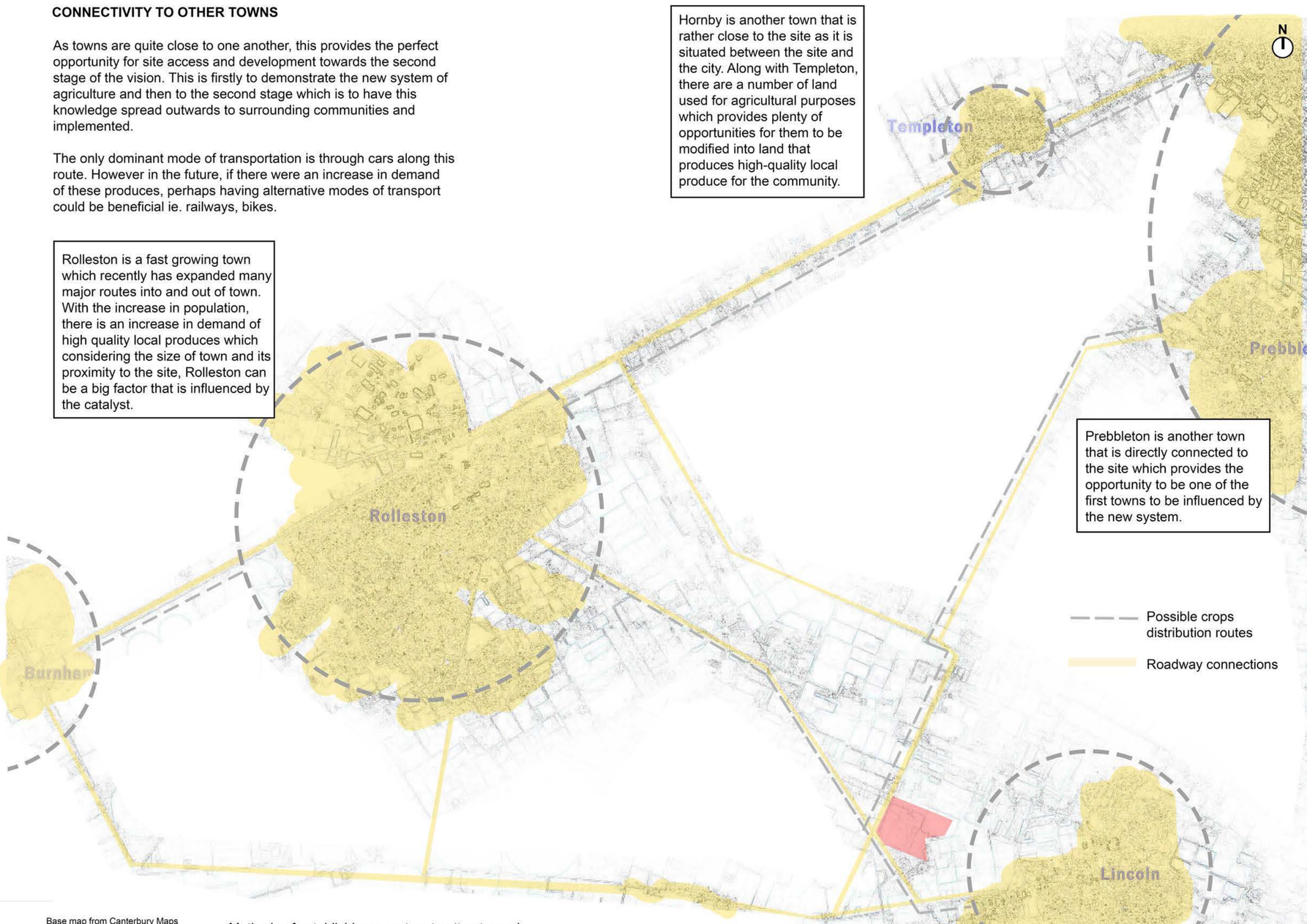
As towns are quite close to one another, this provides the perfect opportunity for site access and development towards the second stage of the vision. This is firstly to demonstrate the new system of agriculture and then to the second stage which is to have this knowledge spread outwards to surrounding communities and implemented.

The only dominant mode of transportation is through cars along this route. However in the future, if there were an increase in demand of these produces, perhaps having alternative modes of transport could be beneficial ie. railways, bikes.

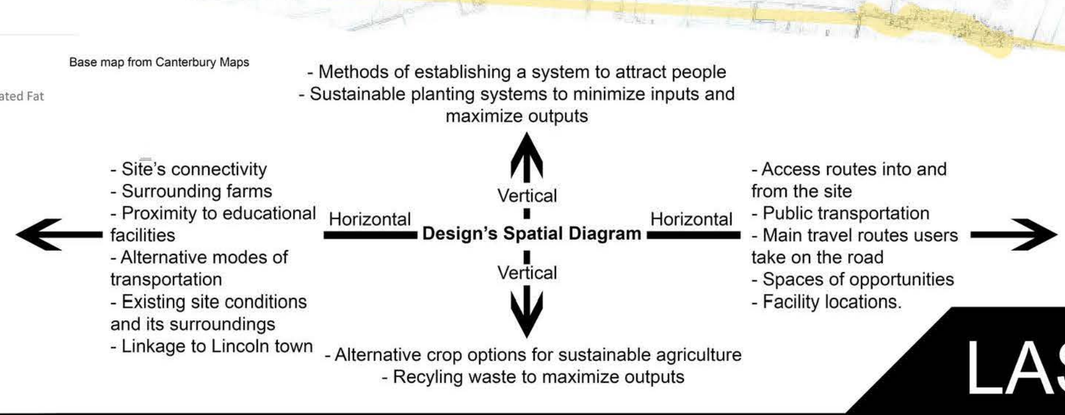
Hornby is another town that is rather close to the site as it is situated between the site and the city. Along with Templeton, there are a number of land used for agricultural purposes which provides plenty of opportunities for them to be modified into land that produces high-quality local produce for the community.

Rolleston is a fast growing town which recently has expanded many major routes into and out of town. With the increase in population, there is an increase in demand of high quality local produces which considering the size of town and its proximity to the site, Rolleston can be a big factor that is influenced by the catalyst.

Prebbleton is another town that is directly connected to the site which provides the opportunity to be one of the first towns to be influenced by the new system.



Lincoln is the first area to be influenced by the site as it is the area adjacent to the chosen location. Lincoln town, University, and the surrounding agricultural land are all connected within the proximity of the site which provides a variety of options for users to access the site through many modes of transportation. However connectivity of the road which directly connects to the site could be enhanced.



LASC 406

Tanapol Chitongartpakdee
Student ID: 1126067

TRANSPORTATION OPTIONS

How well does the route support different modes of transportation				
Mode of Transportation	**Springs Road**	**Route connecting Springs Rd. to site**	**Main intersection**	**Road adjacent to site**
Vehicle	Good	Good	Good	Good
Cycling	Good	Poor	Not present	Not present
Walking	Good	Poor	Not present	Not present
Public transport	Good	Not present	Not present	Not present

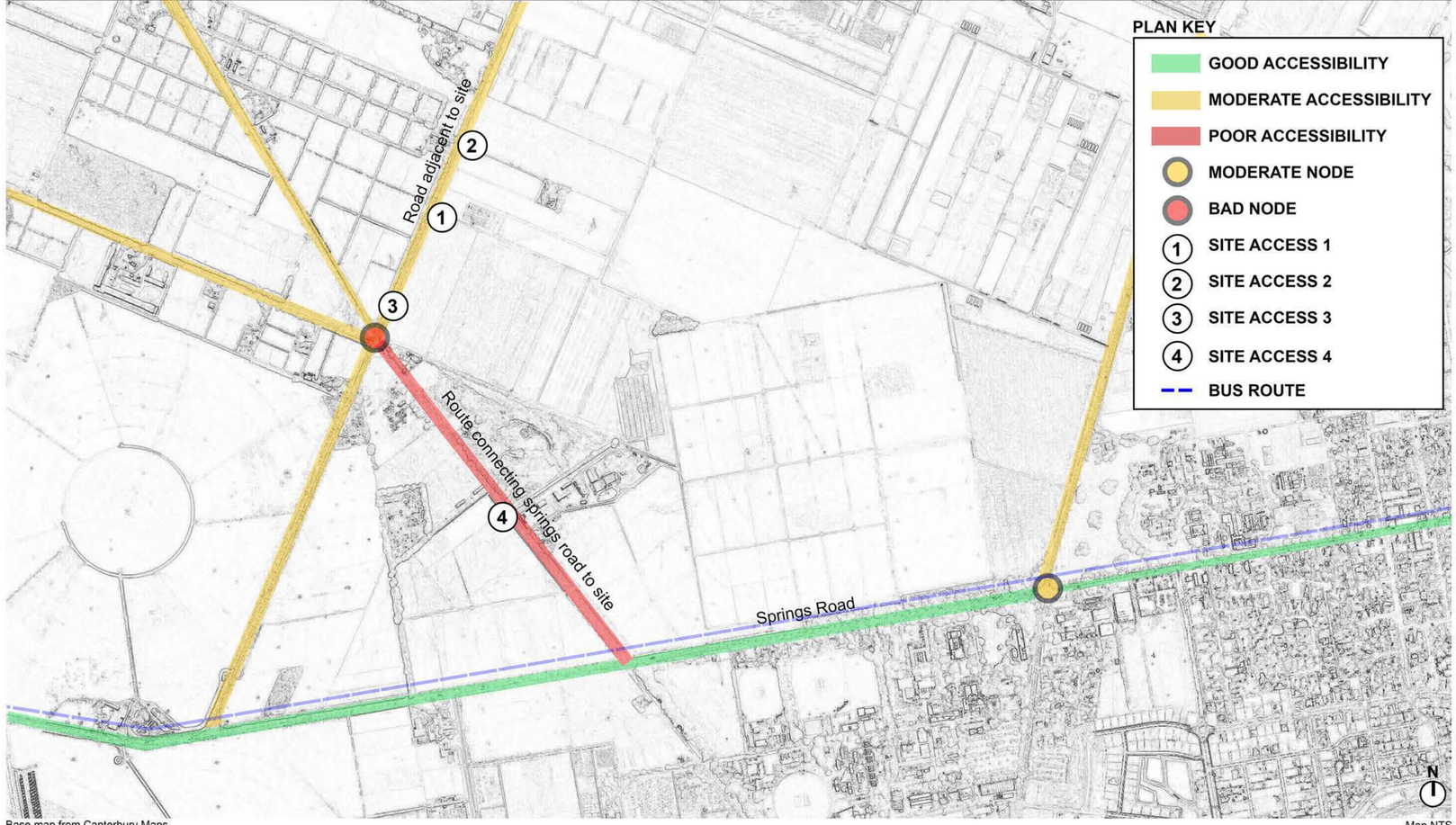
The existing transportation options are quite poor even though the site does provide good connectivity. With this in mind, this leaves opportunities to further enhance and incorporate alternative modes of transportation into these routes. This would not only provide further convenience for public users but would also support the goal to provide access to the site's facilities through attracting more people.

The plan shows the route which connects the site to the University as an area of opportunity for improvement. This can be achieved by providing more room on the existing connection or through somehow establishing an alternative route which connects into the site.

GREEN INFRASTRUCTURE

Quality of existing green infrastructure along the transportation routes			
Locations	**Protection from road**	**Aesthetics (Balance between green and gray)**	**Shelter provided for alternative modes of transportation**
Springs Road	Good	Good	Good
Route connecting Springs Road to site	Moderate	Poor	Poor
Main intersection	Poor	Poor	Poor
Road adjacent to site	Poor	Moderate	Poor

Springs road all the way to Lincoln township is a good example for a route which consist of good green infrastructure connectivity. This is due to the alignment of trees along the pathways which provides a physical barrier for the adjacent sites from the main road as well as aesthetically balancing the green and gray.



Base map from Canterbury Maps — Map NTS

SPRINGS ROAD

Springs road which stretches in front of Lincoln University support a wide range of transportation modes which includes bikes, buses, cars and pedestrian walking. Spaces are clearly defined through solid lines which makes it very clear and safe to travel on any mode of transport.

ROUTE CONNECTING SPRINGS ROAD TO SITE

Connected to Springs road, this route connects the site to the University.. This connection is quite weak even though there are two present paths which are the bike and car. However the bike path is undefined resulting in the route being dominated by cars.

MAIN INTERSECTION (NODE)

The intersection acts as the main node as it connects all the access routes into and from the site. This area is mainly dominated by cars and large vehicles as it provides no support for other modes of transport. Therefore there definitely room to improve on enhancing accessibility.

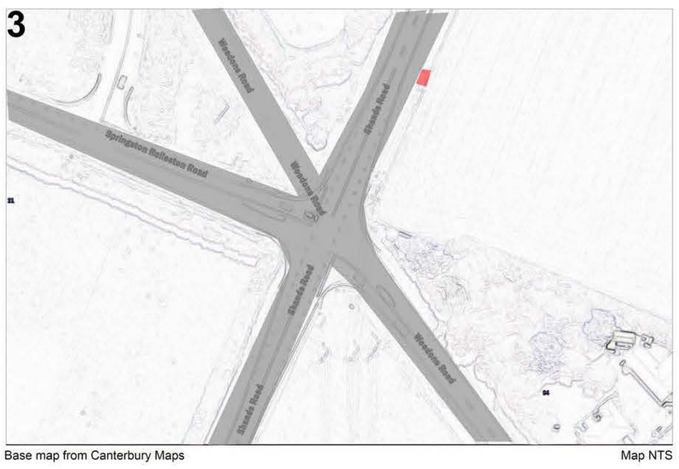
ROAD ADJACENT TO SITE

The intersection acts as the main node as it connects all the access routes into and from the site. This area is mainly dominated by cars and large vehicles as it provides no support for other modes of transport. Therefore there definitely room to improve on enhancing accessibility.

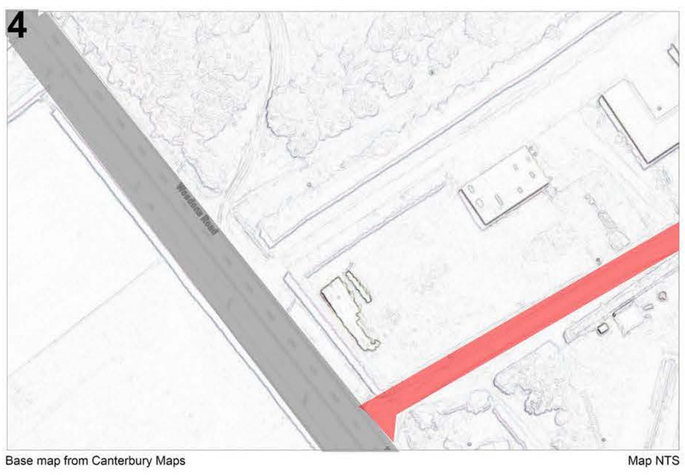
ACCESS ROUTES TO SITE

Base map from Canterbury Maps — Map NTS

Base map from Canterbury Maps — Map NTS

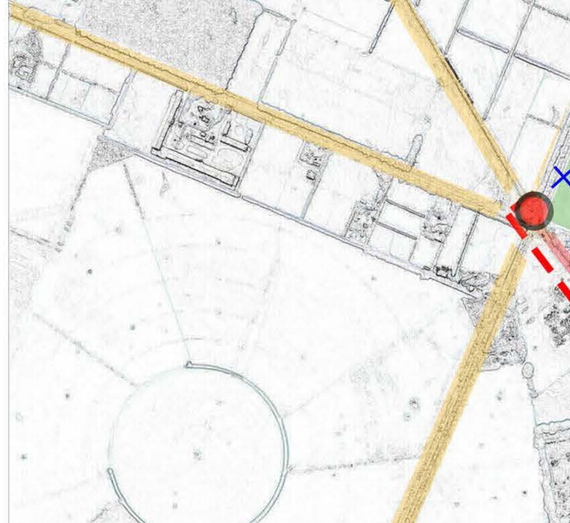


Base map from Canterbury Maps — Map NTS



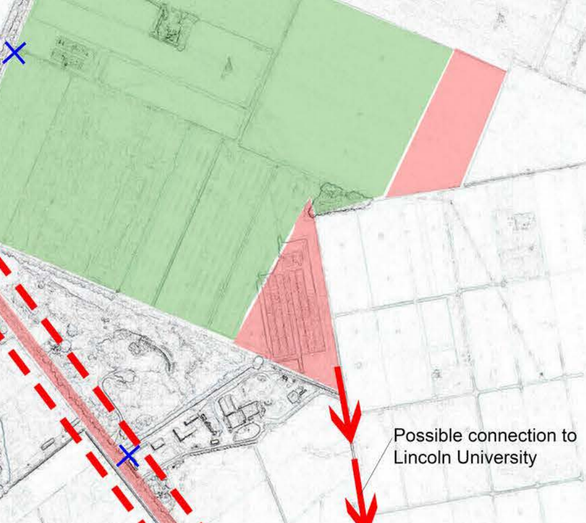
Base map from Canterbury Maps — Map NTS

LAND SUITABILITY TO ALTERNATIVE CROPS



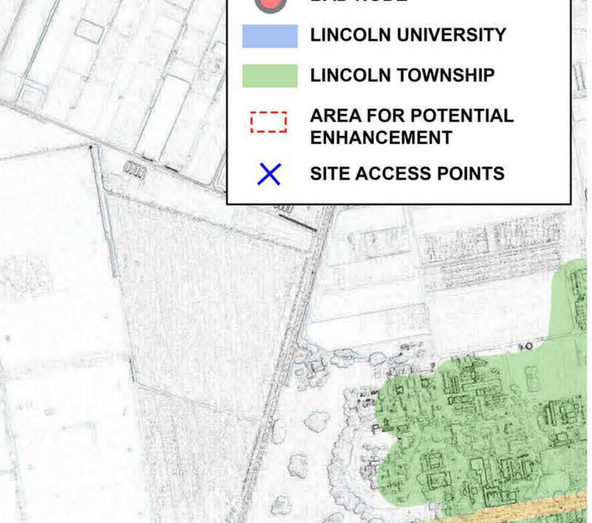
This map shows the existing land conditions and the suitability of utilizing the parcel of land for different uses. The main focus here is the capability of land which would be used for growing alternative crops.

CONNECTIVITY OF THE SITE



This map focuses on the connectivity of the site to the surrounding facilities. This includes Lincoln town, Lincoln University and existing routes which leads to the surrounding towns and cities.

ACCESSIBILITY AND TRANSPORTATION ROUTES



This map focuses on the existing transportation routes into and out of the site. This also rates and determines whether the route provides sufficient convenience for alternative modes of transportation in comparison to other routes.

The plan shows the combined diagrammatically plans for the three main goals mentioned earlier in the project. This gives a clearer visualization of the site's context in relation to all the goals and sub-goals, giving a better understanding of their relationship and how one can improve another.

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LASC 406

Tanapol Chitongartpakdee
Student ID: 1126067

Image Reference List

Page 1 – Design Context

Busy Road Photo – Taken by Tanapol Chitongartpakdee

Alternative Route Photo – Taken by Tanapol Chitongartpakdee

Resource Sharing Photo - Taken by Tanapol Chitongartpakdee

Busy Roundabout Photo - Taken by Tanapol Chitongartpakdee

Car Oriented Photo- Taken by Tanapol Chitongartpakdee

Bikepaths Photo - Taken by Tanapol Chitongartpakdee

Bike Friendly Photo - Taken by Tanapol Chitongartpakdee

Lincoln University Solar Panel Installment Photo - Taken by Tanapol Chitongartpakdee

Waimakariri River - https://teara.govt.nz/en/photograph/13049/waimakariri-river

Page 5 – Planting Strategy

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Page 6 – Forms and Materials Strategy

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Biochar Material - https://www.studentenergy.org/topics/biochar

Biochar Clay Plaster – Image Created by Tanapol Chitongartpakdee