UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

The Lyttelton Edible School Walking Route

Enhancing the space between home and school

Neal Johnston, Carrie Hodges, Phoebe Evans, Campbell Ross & Esther Pickering

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1. Executive Summary

Research Question

- How can the Lyttelton community create an edible and engaging school walking route?

Context

- The Ministry of Education is to merge Lyttelton schools into a centrally located site
- This most severely impacts those attending Lyttelton West School
- Project Lyttelton has requested a report on an edible and engaging school walking route

Methods

- Consultation and interviews with key contacts used to gather suitable plants
- Survey of parents and wider community
- Workshop activities with children
- Route analysis considering variables tree shade, slope and busy roads
- Site analysis considering variables solar radiation exposure, location and distance

Key Findings

- The route proposed is the current path used to commute to fortnightly joint assemblies
- Survey results suggested significant community support, with many indicating interest
- Popular attractions en route include fruit, vegetables, educational activities and artwork
- Games, informal play, nature, and socialising were highlighted in child responses
- Six sites within 1km of the school were selected as recommended stations involving educational activities, informal play, art, planter boxes and vegetable gardens

Limitations

- The survey was conducted by convenience rather than proper random sampling
- Survey respondent numbers were low
- Analysis error and accuracy
- Geotagging and Global Positioning System inaccuracies

Future Research

- Expansion to other areas, utilising the analysis to achieve results for alternative paths

2. Introduction

With the increasing modernisation of cities, world trends have shown a decline in active transport to school, and decreases in environments that promote walking with a sense of excitement (Larsen, Gilliland, Hess, Tucker, Irwin, & He, 2009). Therefore Project Lyttelton (PL), a community based group, has requested a report on creating a successful interactive and engaging walking school route, with focus on food resilience and sustainability. This comes from the post-earthquake Ministry of Education's decision to merge Lyttelton's primary schools to one centrally located site as of July 2015. Consequently those attending Lyttelton West School are severely impacted. As a response, Project Lyttelton have requested a report on how they can successfully design an interactive and engaging school walking route in the west, with focus on food resilience and sustainability.

There are many facets to consider when implementing a route of this nature for children in any community. More specifically in Lyttelton, there is a need to enhance school routes to include more interactive and self-learning processes, while also combining elements of an edible landscape. An edible landscape is one that encourages the community to use and grow edible plants within public spaces (Bohn & Viljoen, 2011). These aspects provide an engaging alternative to the conventional school walk, allowing children to interact with their environment in an enjoyable and educational way. The success of this project will require the inclusion of creative ideas, community support and careful consideration of any limitations.

This report will first provide a background that describes the town of Lyttelton, its local community and their views on enhancing local sustainability. Following this will be current relevant literature regarding what may be limiting active transport among children traveling to school and their perceptions of the environment in this space. The interaction of children in nature and similar projects will also be discussed, followed by the methodology and findings. An overall discussion will then draw together findings and concepts, ending with recommendations and conclusions.

3. Background of Lyttelton

Lyttelton is the historic port town south-east of Christchurch. The community has developed a distinctive culture that blends themes of sustainability, environmental consciousness, and self-reliance (Project Lyttelton, 2014). They aim to locally source services and food, minimise waste, increase energy resilience, and strengthen the community through a variety of projects run by PL; a community-based not-for-profit organisation (Project Lyttelton, 2014). Currently there are two public food growing sites within Lyttelton that the community maintains and uses. These include the forest garden which provides fruit trees and herbs, and the community gardens providing fruit, vegetables and herbs. These are both located in the east of Lyttelton, situated on the hill above the new school site.

The community consists of about 3000 residents, with Statistics New Zealand (2013) estimating about 19% of that represents children under the ages of fifteen. Figure 1 details the spatial distribution of children aged between five and fourteen using 2013 Census data. It shows a significant proportion of children in the study area located to the west, shown in Figure 2.

Distribution of Children Aged 5-14

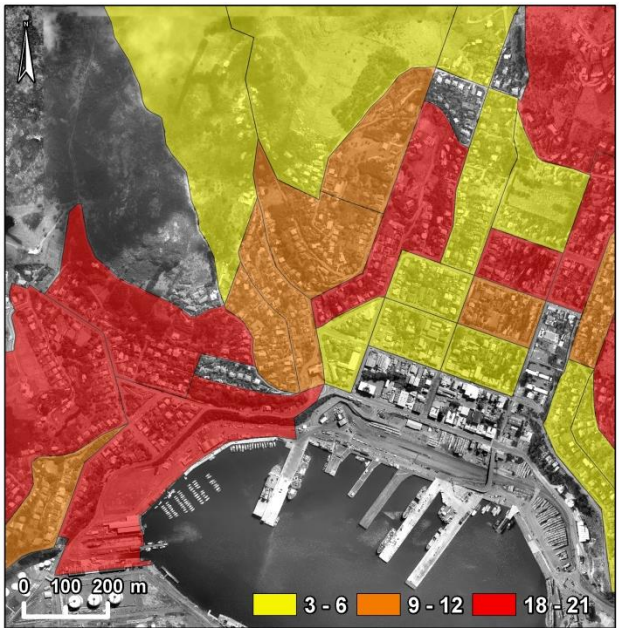

Figure 1: *Spatial distribution of children ages 5-14 years old in Lyttelton* (Statistics New Zaland, 2013)

School Sites and Study Area

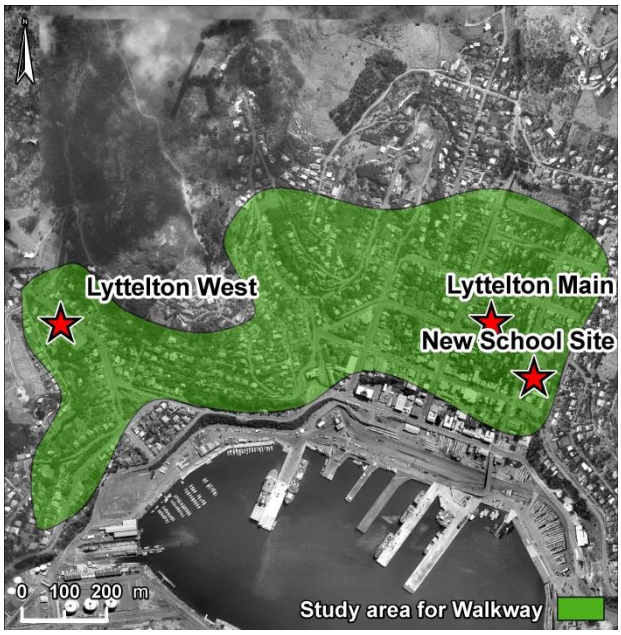

Figure 2: Current and future school sites, shown with the project study area

Lyttelton is currently going through several infrastructural changes, with a proposed port redevelopment, transport upgrades and rebuilding (Port Lyttelton, 2014). The redevelopment of Lyttelton is important to acknowledge, in order to identify suitable and relevant locations for the recommended edible walkway and sites in the future.

4. Theoretical Framework

There are not many existing edible and interactive school route projects, however there are projects and theories that encompass the same principles that this walkway represents.

4.1. Factors Influencing Children's transport modes

In order to ensure the route is used, it is important to recognise what factors influence children's transport modes. Various academic papers have shown that safety and walkability are main factors, and that parent perception of these factors often determine the outcome of a child's transport mode (Kerr, 2006; Mitchell, et.al., 2007). Kerr (2006) further suggest that traffic density, distance, mixed land use, topography, shading street trees and population density are variables that also influence the factors of safety and walkability.

Due to the increasing modernisation of cities, there has been a decrease in walkable communities, which has in turn increased the amount of children being driven to school. This has had a number of negative impacts on children's health as well as their environmental and social consciousness (Mitchell, et.al., 2007). Studies in New Zealand have shown that active transport is important for children to socialise, play, and act independently (Mitchell, H., et al., 2007).

4.2. Research with children

In order to conduct effective and ethical research with children, there are a number of guiding principles which are critical to success. According to Greig et. al (2013), there are five key ethical principles which must be adhered to These are with the first being autonomy. This implies that children can consent through their own free will, without worrying about possible ramifications if they do not consent. The second is non-maleficence, meaning the utmost must be done to avoid pain, suffering, embarrassment, or offense. Third is beneficence, where the

research must at all times be for a positive cause, with the positives always outweighing the negatives. The fourth key principle is justice, requiring that the treatment of all subjects is fair, appropriate and equal. Lastly is confidence, where the children must always remain anonymous.

Barker & Weller (2003) describe the concept of researching with children rather than on children as another guiding research principle. They argue that it gives children the opportunity to express the themes that are important for them, rather than researchers deciding the importance. Additionally, children's responses are vulnerable to social pressures and suggestibility, so the status of the task leader as well as social pressures within the classroom have to be taken into account (Hemming, 2007). Within the context of this project, the teachers have agreed to lead designed and approved workshops, as they have authority and are known to the children.

4.3. Similar projects

Internationally, there are a number of examples where projects with similar themes have been undertaken, mainly addressing the edible aspects. These examples provided some context and show how edible landscapes have been presented in real communities.

Wilmore, Kansas (UNC Charlotte Urban Institute, 2014)

The town of Wilmore has planned an edible walkway to be connected to the current community garden. The project has not yet begun but a grant of US$2,500 has been secured to implement it. Fruit trees and berry bushes will be planted along the route that local children usually take to the store to buy unhealthy food.

Incredible Edible Todmorden (The Ecologist, 2014)

The town of Todmorden is very prominent in sustainable living. Edible plants have been planted in public places and in planter boxes along sidewalks. The edible spaces exist in conjunction with school gardens and cooking lessons for children, these ties in with the emphasis the town places on learning how to grow food, cook, and live sustainably.

The edible landscape project (The Edible Landscape Project, 2013)

An edible landscape project in Ireland follows the course of a railway line about 44km long and includes several different communities. Much consideration has been placed on community collaboration and the regeneration of native plants of the Western Seaboard Region. The project has also been consciously linked to broader concepts such as climate change, food resilience and sustainability.

Open Orchards (Nelson City Council, 2014)

More locally the Nelson City Council in the South Island has established open orchards, where pedestrians are welcomed to pick ripe fruit along the walk. There are currently four edible walks, providing links to the areas orchard heritage as well as the opportunity for foraging. The areas are well documented with maps accompanied by lists of the edible plants which are freely available on the council website to encourage usage and physical activity by the users.

5. Methods

Since the project itself is a combination of many physical, environmental and social aspects, the methods used to obtain the information utilised a variety of different research techniques. As Figure 3 illustrates, the methods included interviews with key community contacts, workshops with the children and surveys. All other methods and data included the investigation of spatial data and was analysed within a Geographic Information System (GIS).

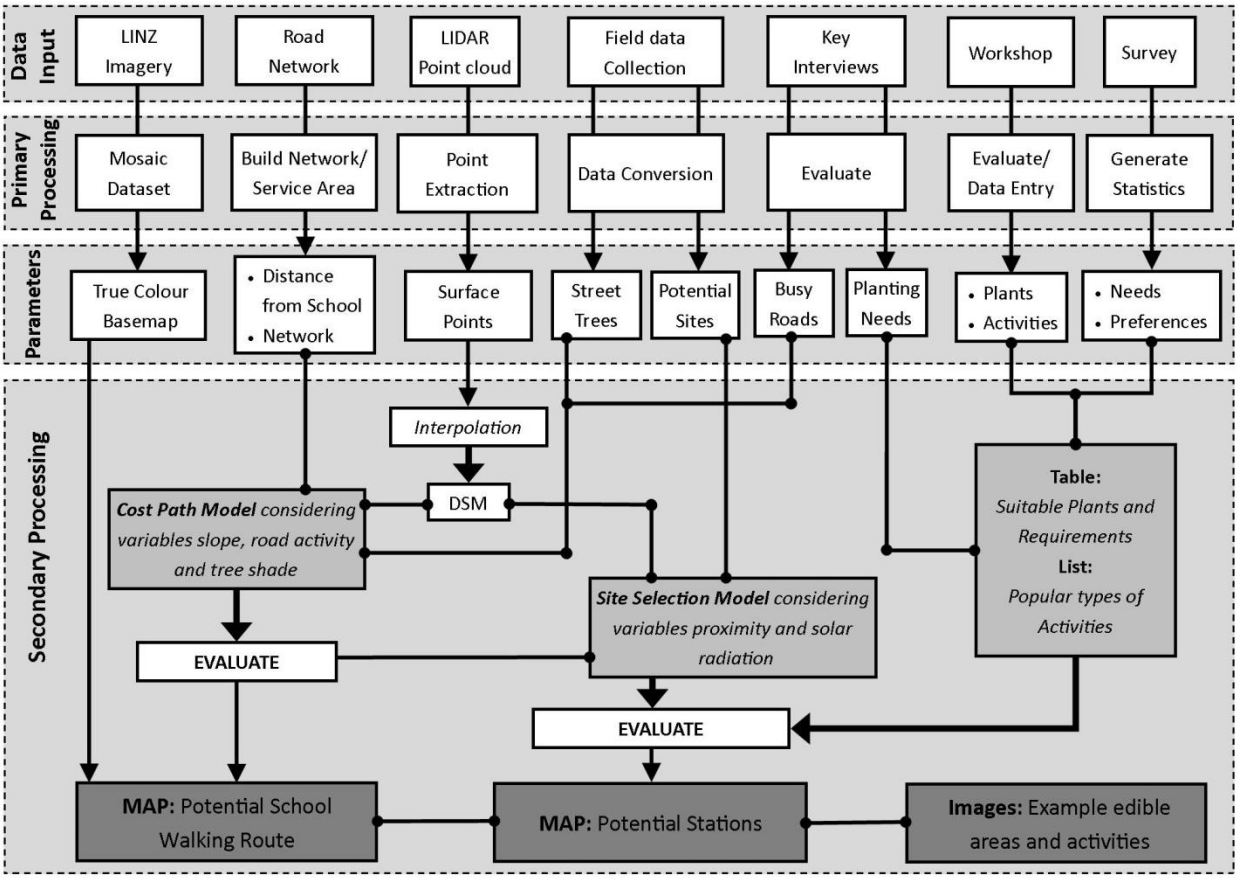

Figure 3: *Conceptual model for the data acquisition and analysis*

5.1. Community Contact

To determine potential road safety issues, school walking route plans, plant maintenance concerns and perspectives on active transport, meetings were arranged with the local Christchurch City Council (CCC) where these matters were all addressed. Council resources were also utilised when identifying ownership of potential station locations through council service centres.

Additionally, interviews with the local community gardener were carried out which provided a local perspective on specific edible vegetation that could be successfully grown within the Lyttelton area.

To engage and inform the community of progress, two articles were placed in the local newspaper, *The Akaroa Mail* (see Appendix A-B). These detailed our progress and objectives followed by a update and request for participation in our focus group. Unfortunately there was no response for a focus group, so this option was abandoned in favour of a survey. As this paper is only published monthly, just key general information was provided because the ability to give regular updates or requests was limited.

To establish how interaction with the children could be facilitated, there was additional consultation with the Principal of all Lyttelton Primary Schools which provided a unique opportunity for data collection with the children.

All the information gathered from contacts was then collated and utilised when evaluating potential sites for stations, as illustrated in Figure 3.

5.2. Classroom Workshop

With cooperation from the Principal, an activity for the children of the west campus was undertaken within class time and facilitated by teachers. As a result, key issues were raised around ensuring that the edible aspects of the route were presented safely. Additional points included enabling an interactive journey without distracting from the task of walking to school, and utilizing current routes as used during the fortnightly walk between campuses.

The classroom workshop consisted of two parts, with the first part asking children to circle their favourite foods from a list of images on a page provided in Appendix C. The second part was a question: “Draw or write about what you like to do outside”, for children up to 9 years old, and “Draw or write about what you like to do on your journey to school”, for children from 10 to 13 years old. The multi-method approach was used as literature suggests that different children communicate in different ways so there can be a variety of abilities across the ages (Hemming, 2007). Furthermore, Greig et.al. (2013) recommends inclusion of drawing alternatives as it does not require a level of literacy while still allowing them to express what

they think is important in an unconstrained way. The activities and workshop outline was given to consenting teachers of Lyttelton West and Lyttelton Main Primary School, who then presented it to the children during class time. No child's individual information was recorded at any stage during the process.

As Figure 3 shows, the data collected from the children was then analysed to determine the preferences for fruit, vegetables and outdoor activities.

5.3. Survey

Based on background research, the survey was designed to target parents more specifically, while still allowing feedback from the wider Lyttelton community. Appendix D shows the survey comprising of ten questions, beginning with an initial outline and consent agreement. The questions targeted at parents asked ages of their children, their most regular mode of school transport and the reasons behind this choice. All participants however, were asked their opinions on foraging and how this could be clearly marked, as well as how regularly they would be willing to help maintain the areas if located near their residence.

The survey was distributed online to community contacts and social media pages of local community groups. This was accompanied by leaflets distributed around Lyttelton in letterboxes with the online link to complete the survey. Additional to this residents were directly surveyed at the Lyttelton Farmer's Market on two consecutive Saturdays in September. To gain a better representation of parent's perceptions, surveys were also taken to the waiting parents near to the end of the school day.

5.4. GIS Analysis

The GIS analysis was split in three tasks, the acquisition, the route analysis and the site analysis. All analysis however, was executed using ArcDesktop 10.2 software (ESRI, 2014), and visualised with a mosaicked 0.1m Aerial Imagery from Land Information New Zealand (2011).

5.4.1. Field data acquisition

Global Positioning System (GPS) field data was collected from the Lyttelton area using a mapping grade Garman GPS60 unit and two Android OS 4.2 Samsung tablets. As Figure 3

suggests, the GPS unit was used to record shading street trees over footpaths, whereas the Android tablet was used to record photographs of potential sites while geotagging each image. Geotagging is attaching coordinates to images, where Welsh, France, Whalley, & Park (2012) suggest this is efficient when collecting imagery data.

5.4.2. Route Analysis

Regarding the route, a shortest path would not be sufficient since the interest lay in the effect that slope, tree shading and busy roads would have. A cost path model was developed which would detail the shortest and least costly path from point A to B based on a designed weighted cost surface. To make the surface needed for the cost path model suggested in Figure X, a service area network analysis was then performed, eliminating areas further than 1.2km from the school site. Once clipped by the service area, the network was buffered at 10m to force the model to follow the network. Due to the high level of detail needed, the road network data itself was acquired through Open Street Maps (OSM, 2014), which is a crowdsourcing project where public users contribute to an ever growing detailed geodatabase.

As described in Figure 3, using Lidar point clouds (NZIM, 2011) gathered from the University of Canterbury (UC) database, a Digital Surface Model (DSM) detailing surface elevations was created using a combination of software including LAStools (Isenburg, 2014) and FUSION (McGaughey, 2014). From there, a slope surface was calculated. To simulate shade, a 5m buffer was also generated around the shading street trees. All this data was clipped to the network buffer and converted into raster format. This was reclassified, making reduced slope, tree shade and quiet roads more attractive with higher values or weightings. As suggested in Figure 3, these were combined to create a cost surface input into the first stage of the cost path model, the cost distance. The cost distance describes the distance from each pixel to its neighbour based on weightings. Once run, the outputs became the inputs for the cost path, which created the shortest, most shaded, least steep and taxing route.

5.4.3. Site Analysis

Regarding the site selection and as indicated in Figure 3, using the DSM an area solar radiation accumulation model was run covering the period 31st October 2014 to 31st October

2015. This calculated the total sunshine accumulation of any given pixel with relation to the surrounding elevations of neighbouring pixels. Although just estimation, the DSM should provide the most accurate estimation possible, as Smith, Goodchild & Longley (2007) suggest this process performs best when the spatial resolution is high and detailed.

Following this, a 2m buffer was then generated for the GPS points collected in the field, to simulate the area of the site. Statistics for these zones were calculated, determining the average solar accumulation for each given potential site area. Only those sites that fell within 10m of the cost path route were then selected for evaluation with overall findings with an attempt on an even distribution along the journey.

As Figure 3 suggests, all the GIS analysis was then combined and evaluated with all other methods to determine end results and recommendations.

6. Results

6.1. Community Contact

6.1.1. The Christchurch City Council

Transport safety and plant maintenance standards were addressed by the CCC in regard to the edible walkway idea. They highlighted that the school site is not a high traffic area, so engineered safety options such as pedestrian crossings were not being considered at this time. However, alternative engineered solutions may still be an option to improve pedestrian safety in the future.

Furthermore, the CCC requires any vegetation that is grown on council land to be maintained to a horticultural standard. A volunteer agreement would need to be signed that outlines the time and intensity of effort towards maintenance, ensuring adequate upkeep.

6.1.2. Lyttelton Community Gardener

The community gardener in Lyttelton provided a list of fruit, vegetables, and other edible plants suitable for the local climate. This combined with CCC information is shown in Table 1, detailing maintenance, lighting requirements and edible seasons.

Table 1: *A list of suitable plants and their requirements. Underlined are those selected for the workshop*

Name	Type	Maintenance*	Lighting	Season
Silverbeet	Leaf vegetable	Low	Partial Shade	All Year
Kale	**Leaf vegetable**	**Low**	**Full Sun/Partial Shade**	**All Year**
Mints	**Herb**	**Low**	**Full sun/partial shade**	**All year**
Lemon Balm	Herb	Low	Full Sun/Partial Shade	All Year
Rosemary	Herb	Low	Full Sun	All year
Sages	Herb	Med	Full Sun	All Year
Lavender	Herb	Med	Full Sun	All Year
Cranberry	Fruit plant	Low	Full Sun/Partial Shade	March-April
Feijoa	**Fruit tree**	**Low**	**Full sun/partial shade**	**March-June**
Mandarin	**Fruit tree**	**Low**	**Full sun**	**April- Oct**
Asian Greens	Leaf vegetable	Low	Full Sun	May-Aug
Spinach	Leaf vegetable	Low	Full Sun	May-Nov
Broad bean	Vegetable plant	Med	Full Sun	May-Dec
Strawberry	**Fruit plant**	**Low**	**Full sun/partial shade**	**Sept-Feb**
Carrot	**Root vegetable**	**Med**	**Full Sun**	**Sept-May**
Nasturtiums	**Edible flower**	**Low**	**Full Sun/Partial Shade**	**Sept-June**
Lettuce	Leaf vegetable	Low	Sun/Partial Shade	Sept-June
Tomato	**Fruit plant**	**High**	**Full sun**	**Oct-March**
Viola	Edible Flower	Low	Partial Shade	Oct-April
Blackcurrant	Fruit plant	Medium	Partial Shade	Nov-Dec
Coriander	Herb	Low	Partial Shade	Nov-Jan
Sunflower	**Edible Seeds**	**Med**	**Full Sun**	**Nov-Feb**
Boysenberry	Fruit plant	Medium	Full Sun	Dec-Feb
Passionfruit	**Fruit vine**	**Med**	**Full sun**	**Dec-Feb**
Zucchini	**Vegetable plant**	**Low**	**Full Sun/Partial Shade**	**Dec-March**
Basil	Herb	Low	Full Sun	Dec-March
Peas	**Vegetable plant**	**High**	**Full Sun/Partial Shade**	**Dec-April**

** Maintenance categories are defined by the amount of attention needed. Those requiring just watering and weeding are defined as low. Medium and high represent the frequency and intensity of upkeep such as pruning, thinning and fertilising. The more of these are needed, the higher the level of maintenance.*

In addition to providing plant options, the community gardeners also raised issues such as how adequate moisture levels would be maintained, especially in the planter boxes which are liable to lose moisture far more easily than a traditional garden.

6.2. Classroom Workshop

Part 1 of the workshop received 76 responses. As illustrated in Figure 4, the most frequently chosen item was strawberries (*n=64*), followed by mandarins (*n=50*), feijoas (*n=49*), and then carrots (*n=40*). Kale and Zucchini were the least chosen items.

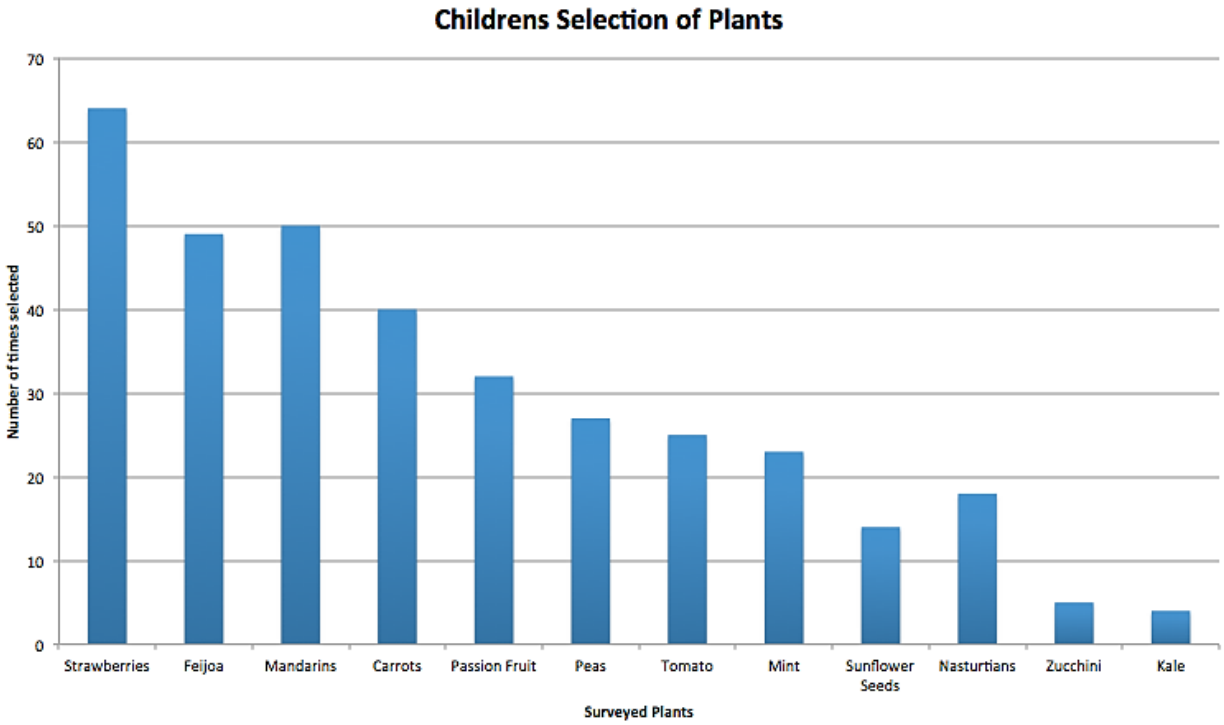

Figure 4: *A list of suitable plants and their requirements. Those selected for the workshop are underlined*

Part 2 of the workshop received 12 picture and 40 written responses. The responses were then gathered and assessed by identifying major themes, as identified in Figure 5. These included art, nature, socialising, driving, informal play, relaxing and thinking, sport and education.

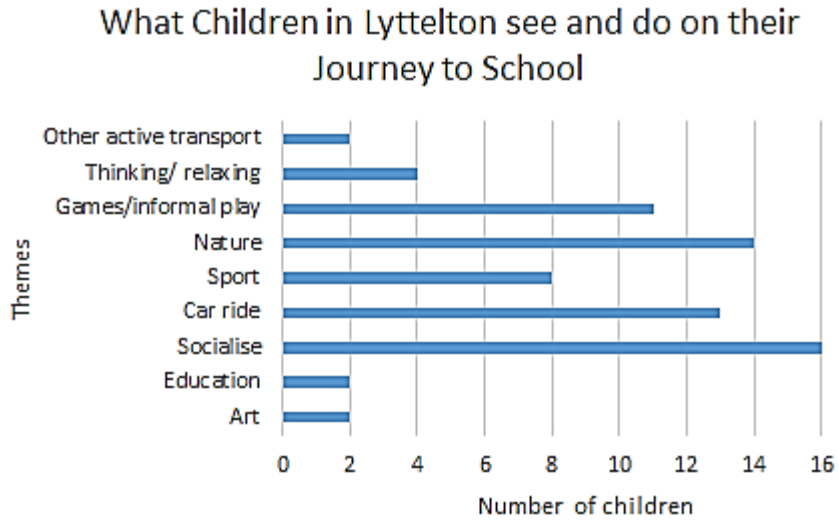

Figure 5: *Themes identified in children's stories and drawings in response to Part 2 of the workshop*

Natural features (*n=14*) and socializing (*n=16*) are the two most important elements of walking to school. The most common form of social interaction was talking to and playing with friends. Nature was represented predominantly through trees. Additional representations of nature were listening to the birds and picking flowers. A small number described eating while walking, finding food on the way and eating lunch. Imaginative games and informal play such as kicking stones were also popular responses.

6.3. Survey

Out of 59 Lyttelton residents who participated, 47% (*n=28*) were parents with children attending school in Lyttelton and 53% (*n=31*) either did not have children, or their children did not attend Lyttelton schools.

The age groups of those children attending were broken into two groups; 5-8 years and 9-13 years, with equal spread between the two. As Figure 6 shows many of them walked or used active transport as a means of getting to school. Furthermore, it describes the reasoning behind each transport method, where enjoyment, distance and convenience are indicated as reasons for choosing active transport options.

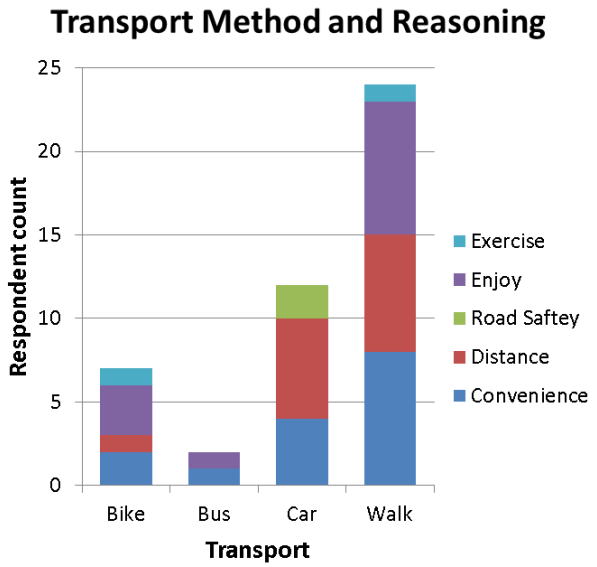

Figure 6: *Children's mode of transport separated by reason they use this*

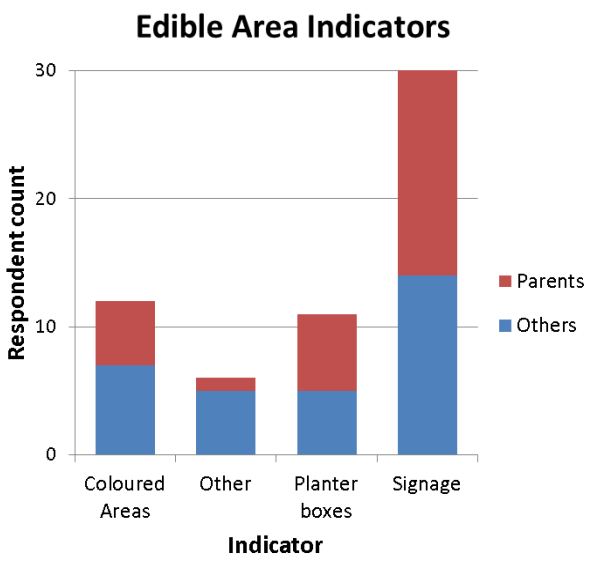

Figure 7: *Indicators for edible areas by parent respondents and other members of the community*

Shown in Figure 7, the majority of respondents (*n=30*) felt signage was the best indicator of edible areas marked for foraging, additionally coloured areas (*n=12*) and planter boxes or pots (*n=11*) were popular options.

In terms of participants attitude towards children foraging, the majority of parents (*n=27*) would allow their child to forage if clearly marked. Most of these parents (*n=16*) would allow their child to forage alone in the areas anytime.

With respect to maintenance, the majority of respondents agree to help in some way to maintain portions of the edible garden located near them (*n=53*). Shown in Figure 8 is the frequency of maintenance offered, with 49% (*n=29*) willing to help at least once a month, 19% at least once a week (*n=11*) and 22% (*n=13*) less frequently.

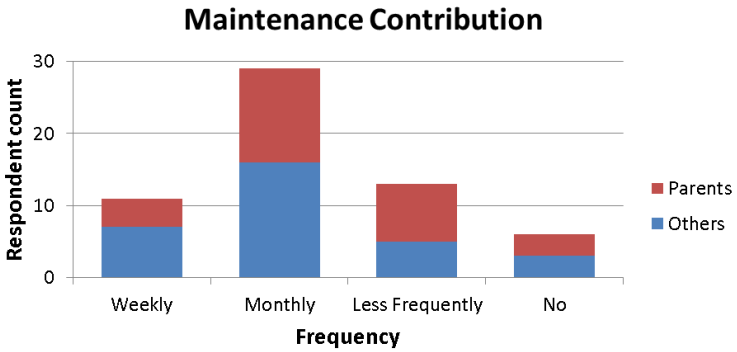

Figure 8: *The frequency of maintenance contribution that respondents would be willing to make*

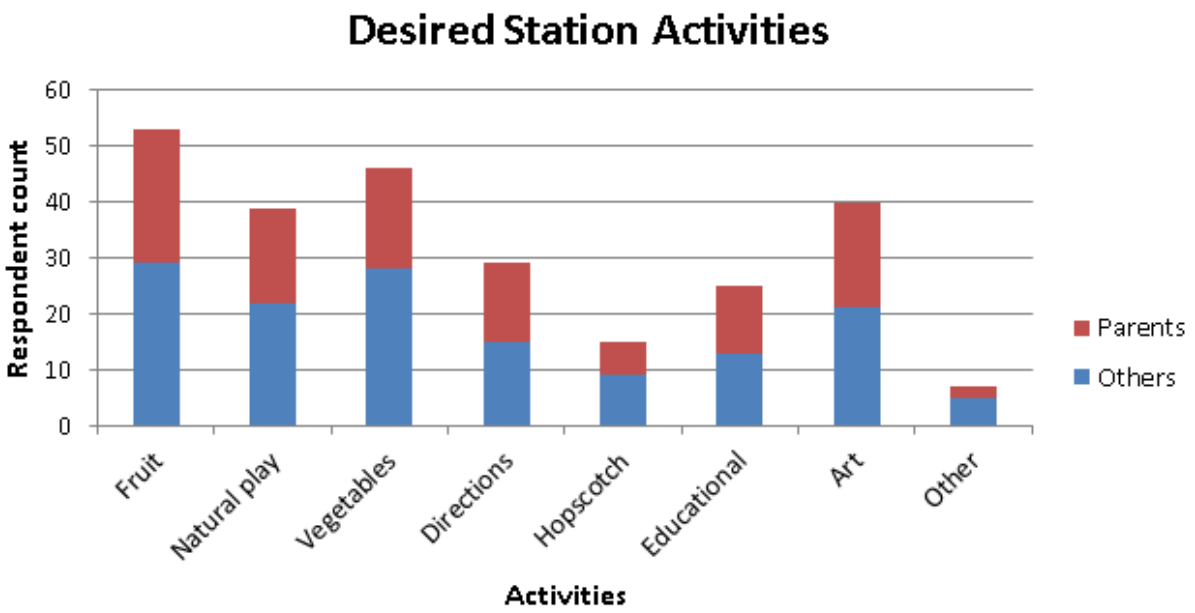

Figure 9: *Preferences for potential station activities along route by parents and other community members*

The respondents were also asked what they would like to see along the edible walkway and as Figure 9 shows, the most popular responses were fruit plants (*n=53*), vegetable gardens (*n=46*) and artwork (*n=40*). Additional responses included natural playgrounds (*n=39)* and signage for directions (*n=29)* with educational activities and hopscotch following. Other suggested ideas included having linkages to Mahinga Kai, positive quotes, playground equipment and incorporating benches.

6.4. GIS Analysis

The findings show the shortest route as shown in Figure 10. The route is about 1km long and avoids steep slopes as well as maximising shade from nearby trees. Land use also changes from residential to business, while still interacting with small green spaces along the way.

The Optimal Route

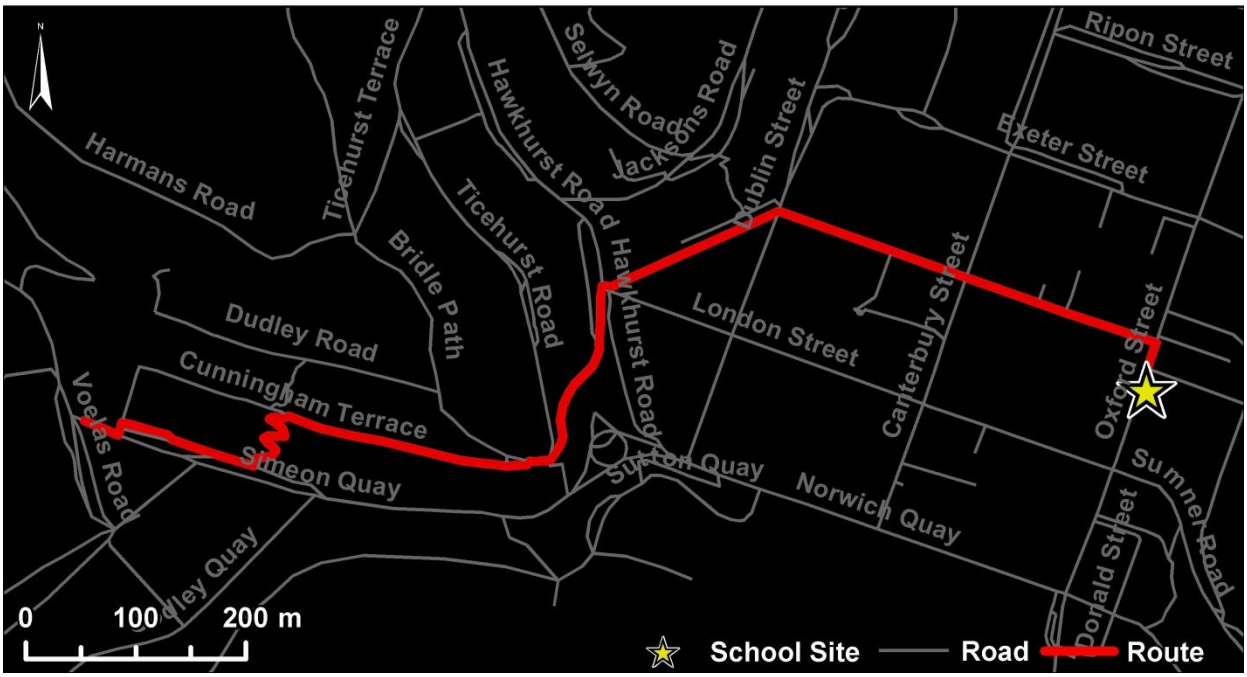

Figure 10: *The optimal route found. Also the route currently used by the children once a fortnight*

Out of the many sites identified, six were chosen. Each site is unique, as shown in Figure 11 where the annual solar radiation varies greatly between sites, favouring sites three to five. Site two although low in sunshine, contains pre-existing local artwork supported by the CCC, as illustrated in Figure 12. Site one is an isolated track under a canopy of various trees, whereas site six is placed near the town centre on a large safe footpath. All the sites were selected in a way that roughly distributes them 200m apart, as Figure 12 shows.

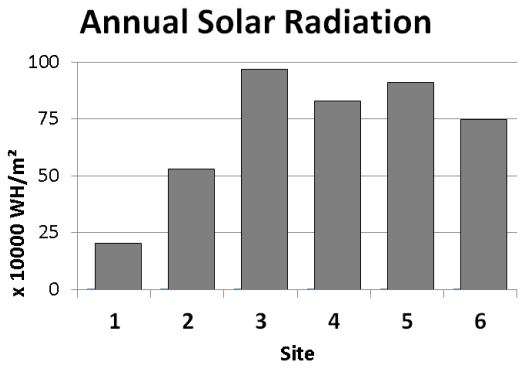

Figure 11: *Solar Radiation annual estimation for each site*

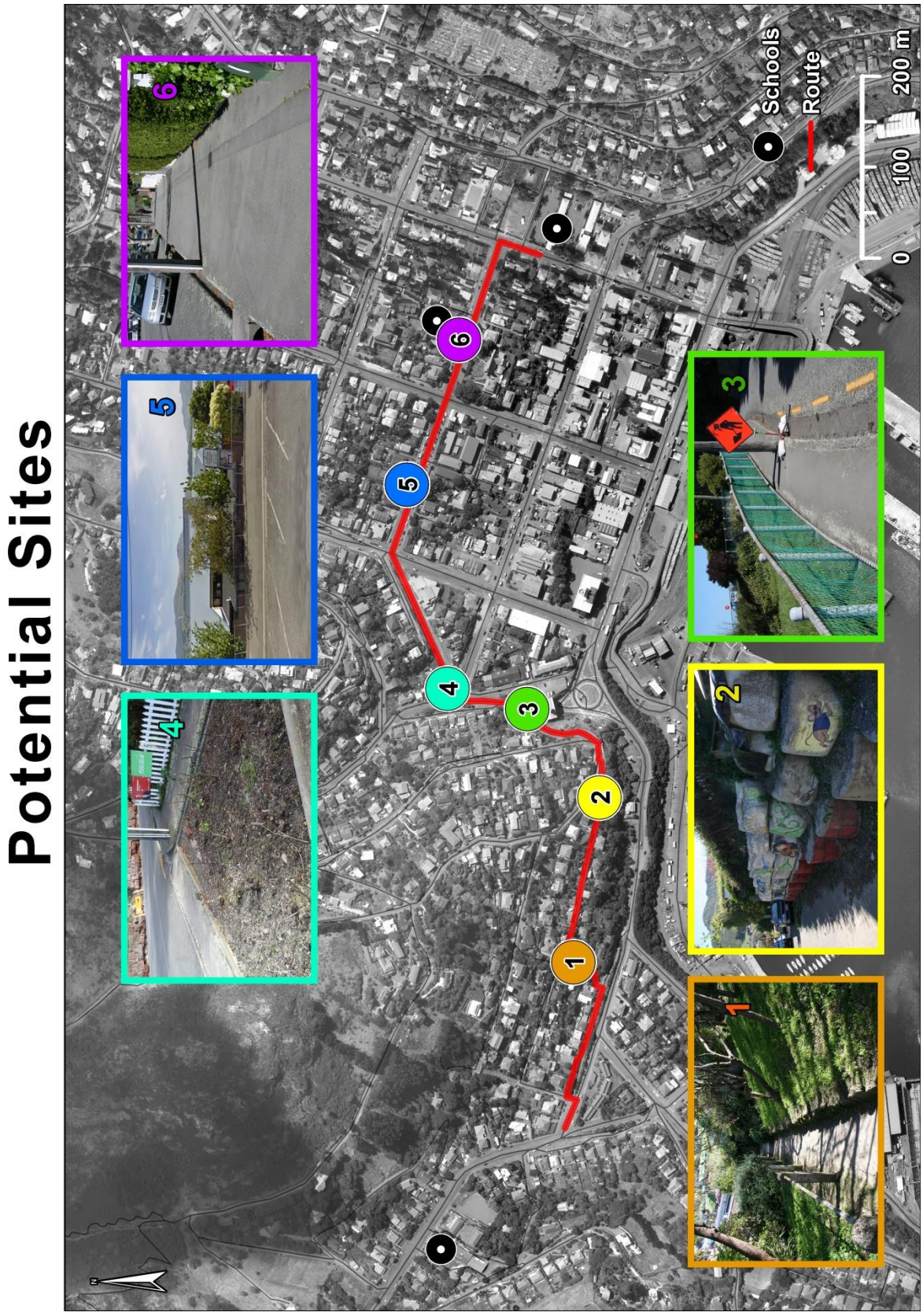

Figure 12: *Potential Station site locations for activities and edible gardening*

7. Recommendations

7.1. The Route

The results of the parent responses to the survey indicated that most of their children walk to school due to convenience, distance and enjoyment. The relatively even split between surveyed age groups is likely to change upon the merging of the two schools, as children on the east side of Lyttelton will be much further away, increasing travel time, and exposing them to more hazards such as road intersections and traffic. It is expected that younger children who live further away will be more frequently driven to school unless parents feel confident that their children will be able to safely walk. Therefore it was important to identify a safe and efficient route from the west to the east of Lyttelton.

The selected route shown in Figure 12, is currently the route taken by the children in their once a fortnight joint school assembly in Lyttelton Main School, which suggests that it is easier to navigate as the children are familiar with it. Additionally, the route makes use of shading street trees that cover the footpaths, providing shelter from the weather. The students will also remain off the main roads during their entire trip. This route was designed to find the path with the least slope within the shortest distance, so the journey itself is suggested to be the least taxing on the children.

7.2. The Stations

In order to provide engaging stations, the results of the GIS analysis, key contacts, surveys and children's workshops were all used to establish the example station content. These lead to stations that incorporated education, art, natural play, fruits and vegetables. All edible areas will be clearly marked with signage as conceptualised in Appendix E

Figure 13 shows station one and five which focus on education, which includes signage with information on native birds and maps with main geologic or geographic features identified.

Station six addresses the desire for social interaction during the walk, with painted concrete games such as the hot lava game. Refer to Appendix F for instructions.

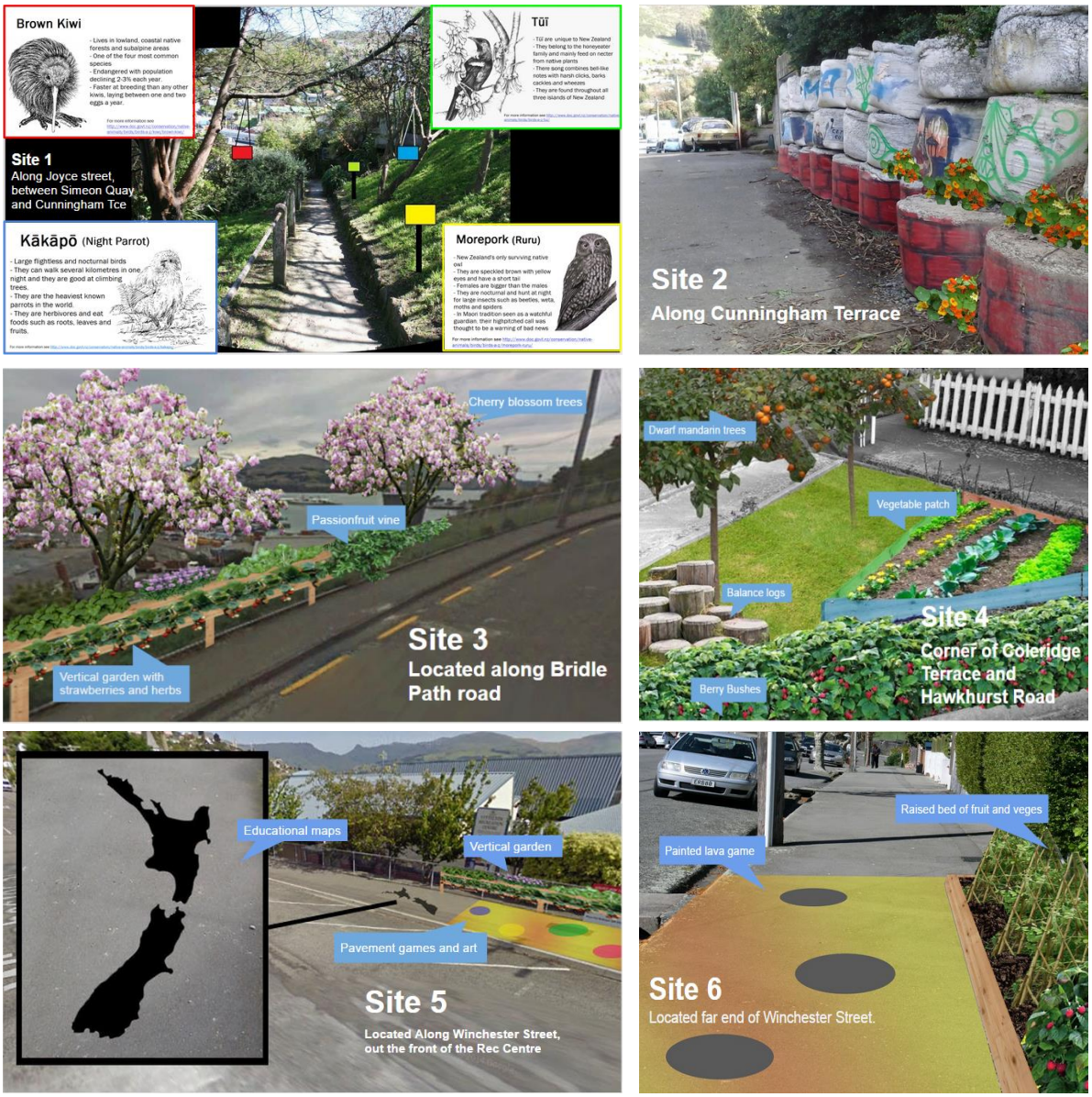

Figure 13: *From left to right; top to bottom. Example station sites 1-6, including activities and edible gardening*

Stations three and four were selected for planting due to their levels of sun exposure. There is space to add additional vertical gardens at site five. Sites one and two can also be planted with mint or nasturtiums. Art was an important feature to those surveyed, so murals could be painted on existing and future retaining walls.

7.3. Maintenance and Contributors

Findings show there are varying maintenance contribution frequencies, which could be organised via rosters overseen by Project Lyttelton or others. Working with pre-existing groups such as the Time Bank, Community Garden and Grow Harbour Kids would have a more all-inclusive community approach.

Use of vertical gardens seen in Appendix G will reduce maintenance requirements and save space. Figure 14 illustrates a low cost and simple watering option that can be easily installed by the community.

Material goods for the project could be sourced through a flyer drop closer to the development stage, with lists of required goods that the community could donate. This same technique can be utilised to find contributors for maintenance based on their proximity to a station.

Figure 14: Low cost and convenient watering solution
(Provident Living, 2012)

8. Discussion

This project has links to wider issues of food resilience and sustainability as well as the benefits of active transport and natural play for children, of which awareness is growing around the world. Sage (2014) speaks of a natural movement globally towards local sustainable food production in current times of economic and ecological uncertainty. The Lyttelton community places high importance on this, particularly post-earthquake with the possibility of isolation after disaster. For the school this has meant incorporating placing awareness into the curriculum in order for children to learn more about where they are living, and who has lived there in the past as well as what may be happening in the future.

8.1. Limitations

There were some recorded limitations with regard to GPS, where Zavorotny & Voronovich (2002) state that often GPS has large error or inaccuracies can be caused by scattering signals from the ocean and winds. Regarding the geotagging, Welsh, France, Whalley, & Park (2012) discuss limitations in terms of accuracy, describing signal and reception as problematic, which became apparent, as many images did not geotag. There are also limitations within the GIS analysis, where cell size and accuracy of data limited the overall accuracy of the results, however the spatial resolution of the data was in most cases maximised.

It was also initially planned to run a focus group of 6-10 people, providing in depth information with regards to parent perceptions. Unfortunately due to lack of respondents, this could not be conducted. There was suggestion of the community being 'focus grouped out,' particularly post-earthquake, so the survey was chosen as a preferred, less committing method. Regarding the survey, since it was conducted at the market, school and homes in the area, this became a sample of convenience rather than a true random sample. Additionally, there were small parent sample size (*n=28), so a*ssumptions cannot be made utilising the central limit theorem as the data does not follow a normal distribution due. Therefore caution must be taken when inferring these statistics to the larger population. This may not be a full reflection

of the community as a whole, however it can be an indication of the perceptions among the active community members.

8.2. Future Possibilities

If the recommended project is successfully implemented, it will provide a template for expansion of the concept throughout Lyttelton. For successful adaptation of the established school routes, children living in the east should be further considered. Initially future research could focus on mapping routes used in the east and determining the users in this area.

This could also be useful to establish a network between the current community garden, school garden and the edible route. Bohn & Viljoen (2011) describe benefits such as community involvement and belonging when there is a successful arrangement of networks that connect edible landscapes. Providing this in Lyttelton would utilize existing networks within the community and would seek to include additional community members to be involved in the edible walking route concept.

Incorporation of bigger projects such as the CCC transport redevelopments and Port redevelopment could also be a possibility for further expansion. With the different the groups within Lyttelton working together with the same intentions to improve the resilience and sustainability of the community, the success of projects such as the school walking route could have a great impact. Additionally, future research into CCC traffic management plans involving the safety of the route could help to increase the security for children travelling from West Lyttelton to the new school site.

9. Conclusion

The final route model, along with the station locations, plant types, and activities, were identified according to the best fit of physical data, consultation with key informants, as well as the needs and preferences of parents, children and the wider community. As changes take place in Lyttelton, there is possibility for further expansion to service all children around Lyttelton, with opportunities to work with the City Council and developers to include the edible walkway idea into their plans.

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Lyttelton Community

Children of Lyttelton

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12. Appendices

12.1. Appendix A: Newspaper (August Edition)

Interactive School Walking Routes in Lyttelton

Due to the planned merger of the two local primary schools, the children of Lyttelton face big changes to their current surroundings. With the new central location of the school, the children's daily walking routes will change. For this reason, Project Lyttelton has enlisted the help of the University of Canterbury to design a fun, educational and engaging walking school route, with a focus on food resilience and sustainability.

We are a group of third year geography students working to lay the foundations for the route. Currently, we are looking into similar examples, both locally and internationally. Soon we will be reaching out to ask the community of Lyttelton to participate in this project through surveys or focus groups. To ensure the route will succeed within the community, we encourage you to get involved to share your opinions and ideas about this exciting project. We believe it is important that the children feel comfortable and excited about the new school route, enhancing their sense of belonging to the community.

Over the coming weeks we will be looking to engage with the community and contact stakeholders. In the interim, if you have any questions or comments, feel free to contact us at ucwalklyttelton@gmail.com.

12.2. Appendix B: Newspaper (September Edition)

Engaging and Edible School Walking Route

The school merger that is to take place next year in Lyttelton has an impact on all the children that attend schools in the area. This provides a unique opportunity to improve how the children to interact with the community and its surroundings through the engaging and edible school walking route proposed by Project Lyttelton and refined by UC Geography students.

The ide a behind the project is to encourage children to walk to school using fun, educational and exciting activities along a safe route, helping them learn and exercise on the way to school. Christchurch City Council (CCC) has been developing a safe school walking route for some time; our aim is to combine the edible walking route concept with the proposed CCC route by identifying suitable locations along this route for activities, planting fruit or vegetables and other enhancements. Our progress to date has involved collecting information about Lyttelton, you may have seen us walking the streets, recording locations of shading trees over the footpaths and potential areas for plant growing or activities. This information, along with satellite and census data, will be used to analyse the Lyttelton area for information such as the slope of the road, sun exposure and distance to the new school site in Oxford Street. This information will help us to select suitable sites for planting as well as exercises such as hopscotch, artwork and nature or science activities.

We are also researching suitable plants and safe activities to accompany this information. Assisted by Lyttelton Primary School and Lyttelton Time Bank, we are currently seeking volunteers for a focus group of 5-10 parents whose children attend school in the area. This will take place on the 16th of September, and provide us with further information regarding safety and how best to encourage walking. The end result of the project will provide the community with a map of suggested stations where activities or particular plants can be established to best suit the children. We also hope to understand the reasons for not walking to school and provide ways to overcome these. Finally, we wish to define a list of possible contributors from the community who would be interested in helping to establish and maintain these areas.

If you, would like to contribute to establishing the route, participate in the focus group, or if you have any questions or comments please contact us at ucwalklyttelton@gmail.com.

12.3. Appendix C: Classroom Workshop

For the children's activity we have a couple of questions for them to answer, which will hopefully not take up too much time. We think it would be important for the teacher(s) to introduce the project to the class, and then after the activity give the option for the children to keep their work if they do not want to participate. If the older children could title their work with 'My journey to school', that will help us to differentiate between the older and younger age groups.

Aim of Project:

Canterbury University students are helping Lyttelton to make a safe and fun walking route. By answering these questions you are helping them to work out what fruit, veges, and activities to include along a walking route to your school.

1) Edible food preferences:

A. Circle your favourite fruit and vegetables out of those that can be grown easily in Lyttelton. (Refer to following page)

2) What children like to do outside/on their journey to school:

A. Write about or draw your favourite things to do outside. (Ages up to 9 years old)

B. Write about or draw what you like to do on your journey to school. (10-12 years old)

Circle your favourite foods:

Passion fruit

Strawberries

Feijoa

Peas

Mandarins

Nasturtians
(Edible flower)

Carrots

Zucchini

Mint

Tomato

Sunflower
seeds

Kale

12.4. Appendix D: Survey

Lyttelton School Walking Route

UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

In partnership with Project Lyttelton a group of Geography students from the University of Canterbury are researching possible options for an edible and interactive school walking route in Lyttelton. In particular finding out what members of the Lyttelton community would like to be implemented and what perceptions they have about allowing their children to walk to school.

By completing this survey you are helping to give an indication of what you would personally like to see happen with this walking route, and (if relevant) what encourages you to let your children walk to school. This can be incorporated into our research to help make the most effective suggestions that best represent the Lyttelton community.

What does taking part involve?

You are invited to complete this survey, which is comprised of 7 questions and will take approximately 5 minutes.
Completing this survey is voluntary and you have the right to withdraw at any stage without penalty. If you withdraw, we will do our best to remove any information relating to you, provided this remains practically achievable.

What will happen with the information I provide?

The information from the survey will be used to inform decisions made by the group from the University of Canterbury and Project Lyttelton. In addition, a map will be produced that identifies key ideas as suggested by local residents and parents. All responses will be confidential and you will not be individually identified in any of the results.

The project data will be securely stored in a locked room and on a password protected computer system at the University. Anonymised versions of the data (names and contact details will be removed) may be made available to students as part of practical exercises within Geography classes. The university copy of your information will be destroyed after ten years.

A report will be produced on the results and will be sent to Project Lyttelton, and may be accessed by members of the local community from there. These results will not identify any individuals.

For those who complete the survey we will assume that you are willing for any information or opinions provided to contribute towards our research in a confidential manner.

If you have any further questions you can contact us at ucwalklyttelton@gmail.com.

By signing below I accept these conditions

Participant signature:_____ Date: _____

University of Canterbury Private Bag 4800, Christchurch 8140, New Zealand. **www.canterbury.ac.nz**

Lyttelton School Walking Route Survey

UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

1. Do you have Children that attend a school in Lyttelton? *(If no proceed to question 6)*

☐ Yes
☐ No

2. How old is your child(ren)? *(Tick all that apply)*

☐ 5-8 Years old
☐ 9-13 Years old

3. How does your child(ren) most regularly travel to school?

☐ Walk
☐ Bike
☐ Car
☐ Other *(Please specify)*: _____

_____

4. Why do they use this transport method? *(Tick all that apply)*

☐ Convenience
☐ Distance
☐ Road Safety
☐ General Safety
☐ They enjoy it!
☐ Other *(Please specify)*: _____

_____

5. If edible areas were clearly marked, would you give permission for your child(ren) to forage through the fruits and vegetables?

☐ Yes, anytime
☐ Yes, if I could investigate it beforehand
☐ Yes, if supervised
☐ No, never

6. Do you have any comments about the possibilty of children foraging on route to school?

_____

_____

7. What do you think will most clearly indicate that an area is safe for foraging?

☐ Signage
☐ Planter boxes/pots
☐ Coloured areas
☐ Other *(Please specify):* _____

_____

8. What would you like to see along this edible walkway? *(Tick all that apply)*

☐ Fruit Plants
☐ Natural Playgrounds
☐ Vegetable Gardens
☐ Signage for directions
☐ Hopscotch
☐ Educational Activities
☐ Art
☐ Other *(Please specify)*:

9. If there was an edible garden located near your home, would you help maintain it?

☐ Yes, at least once a week
☐ Yes, at least once a month
☐ Yes, less frequently
☐ No

10. Do you have any other comments regarding the edible school walking route ?

_____

_____

12.5. Appendix E: Conceptual Signage Format

12.6. Appendix F: Game instructions for 'Hot Lava'

Hot lava (or **the floor is lava** or Pirates) is a game, usually played by children, in which the players imagine that the floor or ground is made of lava (or any other lethal substance, such as acid or quicksand), and thus avoid touching the ground lest they get burned or otherwise injured. The players stay off of the unpainted footpath and are only able to move between the painted shapes. Participants generally may not remain still, and are required to move from one shape to the next. The game can be played with a group or alone for self-amusement. There may even be a goal, to which the players must race. Different coloured shapes can be used to represent differing levels depending on the players ability.

Source: http://en.wikipedia.org/wiki/Hot_lava_(game)

12.7. Appendix G: Vertical Garden Example and Explanation

Vertical gardens can be created utilising low cost materials, such as gutters or untreated wood. As shown in the picture below, these options could be attached onto wire fences along the walk, care would need to be ensured as not to overburden the fence with too much weight.

Source: http://www.homegue.com/2011/04/hanging-gutter-outdoor-vertical-garden/hanging_gutter_outdoor_garden_03/