

**Grey Stations:  
New Strategies for Senior Housing in Vancouver, BC**

by

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## **ABSTRACT**

This thesis proposes a strategy to capitalize on the abundance of derelict service stations in Vancouver, BC, as a means to address the current crisis of seniors' housing and services. Vancouver's glut of vacant service stations reflects a widespread trend of service station closures across North America. As former service stations, these sites are commonly contaminated and have to undergo remediation before they can be rezoned for other uses. However, this network of sites has great potential for long term development.

The goal is to create an alternative to the homogeneous seniors' homes currently available and establish a network of 'Community Stations' spread throughout the city. These sites will act as nodes to provide housing and services for seniors in the local community. The design is a phased development which will allow time for the site to remediate as well as, through community involvement, establish value and ownership.

## **ACKNOWLEDGEMENTS**

I would like to thank my supervisor, Sarah Bonnemaïson, for her encouragement and guidance during this process. To my advisor, Steve Parcell, as always, thank you for your clear and insightful critiques.

I would like to thank my classmates. Your work was constantly inspiring and your friendship always invaluable. Thank you.

To Bianca, my mum, my dad, and my sister, thank you for your unwavering support and understanding. I could not have done this without you.

## CHAPTER 1: INTRODUCTION

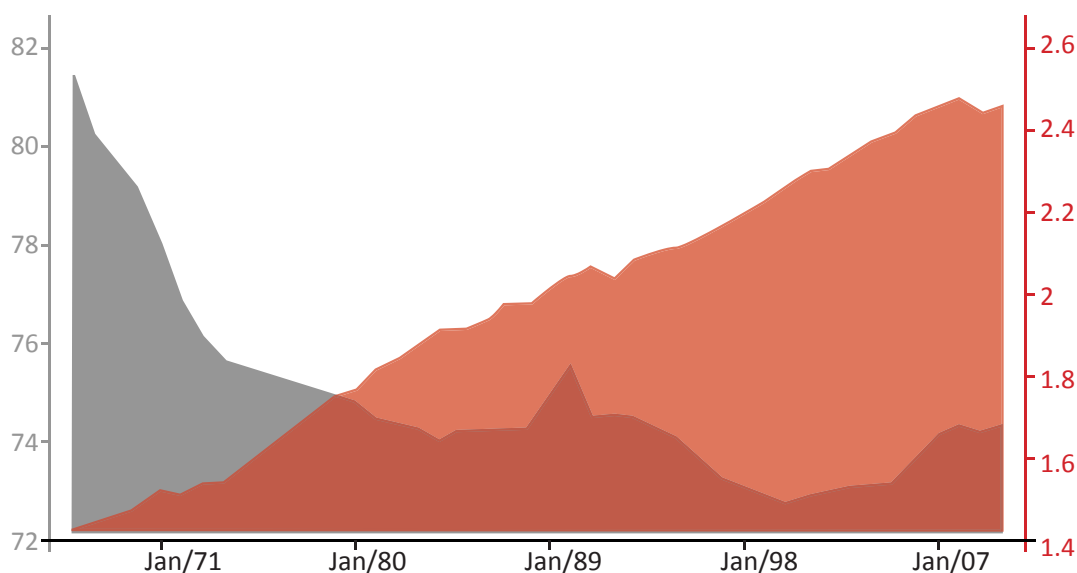
### Context

#### Global

With one in nine persons in the world aged 60 years or over, projected to increase to one in five by 2050, population ageing is a phenomenon that can no longer be ignored.<sup>1</sup>

In the next few decades there will be significant demographic shifts across the world. In many 'developed' countries this will be partly due to the "baby boom" generation reaching old age but that is just part of a larger population trend evident in both 'developed' and 'developing' countries.

In the West this shift is due to declining birth rates and longer life expectancies. The cumulative effect of these two factors over the next 40 years will be unprecedented: by the year 2050, seniors over the age of 60 will outnumber children under the age of 15 for the first time in history.<sup>2</sup> This impending wave of older adults has been dubbed the "Silver Tsunami" and amongst those countries hardest hit will be Canada.



*Birthrate vs Life Expectancy in Canada: 1969 to 2011*

1 *Ageing in the Twenty-First Century: A Celebration and a Challenge* (New York: United Nations Population Fund, 2012), 11.

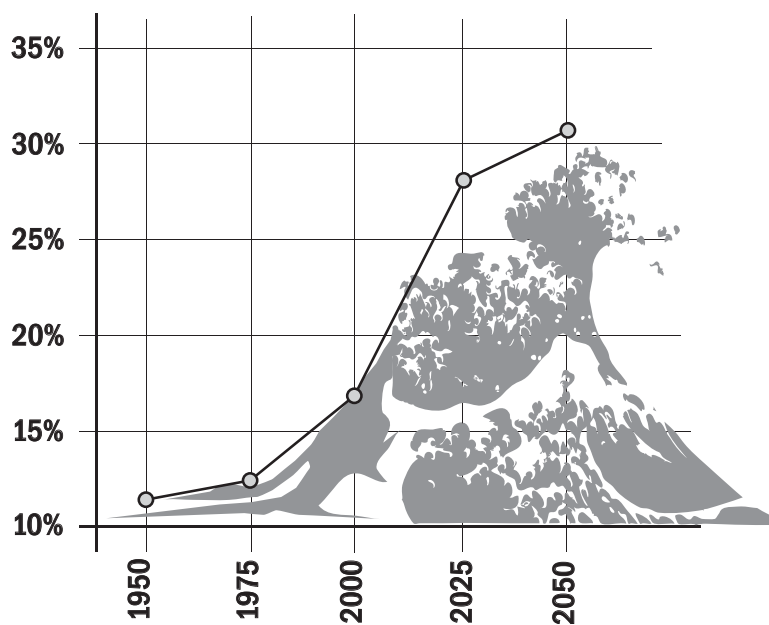
2 *Ibid.*, 20.

## Canada

In 2011, an estimated 7.2 million Canadians were 60 years of age or older, a number that is expected to double in the next 25 years.<sup>3</sup>

By 2050 the ratio of seniors in Canada will grow from one in five Canadians to one in three.<sup>4</sup> And most relevant to architects, seniors are one of the fastest growing homeless populations in Canada, with the stock of affordable housing adapted to seniors failing to meet this climbing demand.<sup>5</sup>

Seniors need different types of facilities to serve their needs as they progress into old age. Amongst those is the need for appropriate housing and at-home-services to enable them to stay in their homes for longer. This thesis is an attempt to investigate possible architectural solutions to this growing housing demand and ways in which new attitudes towards the role seniors play in society could harness the experience and skills of this demographic trend presently only seen as consumers.



*Canada's Silver Tsunami*  
Percentage of population over the age of 60

3 Ibid., 176.

4 Ibid., 168.

5 Stephanie Kelly, "A Wave of Poor Seniors About to Hit Vancouver as Boomers Age," *The Thunderbird*, October 17, 2012, <http://thethunderbird.ca/2012/10/17/a-wave-of-poor-seniors-about-to-hit-vancouver-as-boomers-age/>.

## Vancouver

For Old People's homes, locations in residential areas can be advantageous in order to be near one's relatives.<sup>6</sup>

I initially chose Vancouver as a test site not only because of my familiarity with it but because BC currently has one of the highest percentage of people over the age of 65 amongst Canadian provinces.<sup>7</sup> However, due to a rising cost of living and longer life expectancies, the current real estate market is forcing many seniors out of their communities in search of more affordable housing.



### *Site location*

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6 Eckhard Feddersen and Lüdtké Insa, *A Design Manual: Living for the Elderly* (Boston: Birkhauser, 2009), 74.

7 Martin Turcotte and Grant Schellenberg, *A Portrait of Seniors in Canada*. Catalogue no. 89-519-XIE. Ottawa, Ontario. Ministry of Industry, 2007, <http://www.statcan.gc.ca/pub/89-519-x/89-519-x2006001-eng.pdf>.

## The Decline of the Gas Station

The number of Gas Stations in Canada has decreased by 37% since 1989.<sup>8</sup>

While searching for a site for my thesis I noticed the prevalence of vacant lots of former gas stations around the city. As I mapped out the locations, I noticed a pattern in their distribution. By comparing this pattern against the placement of existing gas stations I realized that the economic forces which led to gas retailers choosing specific locations to open their businesses resulted in a similarly ordered vacancy pattern when they began to close. The result of this vacancy pattern was a network of empty lots on main circulation arteries in communities across the city. I will later return to this issue of networks when discussing its value in relation to senior care.

This trend of gas station closures is not only occurring at the same scale across Canada as a whole, but to an even larger degree across the border in the US. In Canada there are currently 1400 vacant and contaminated service stations while the US has over 200,000.<sup>9</sup> As a result of tight profit margins, rising land prices and changes in driving habits and technology, gas stations are closing down all across North America. In their place, cavities in the urban fabric; empty lots contaminated with petroleum leachate, sit idly behind chain link fences.



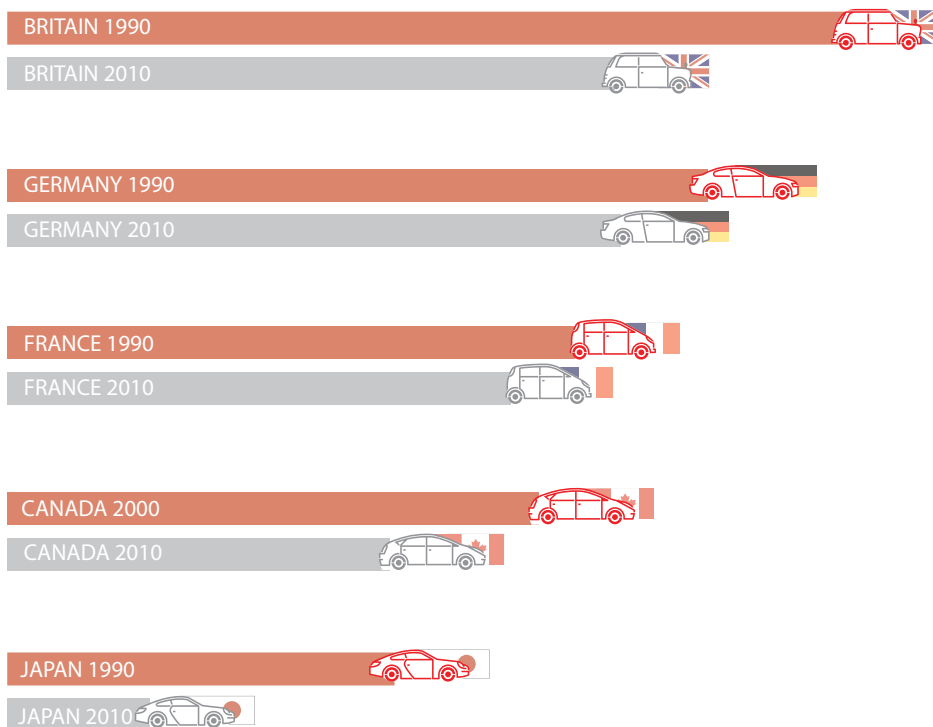
*Vacant lot at 41st and Cambie*

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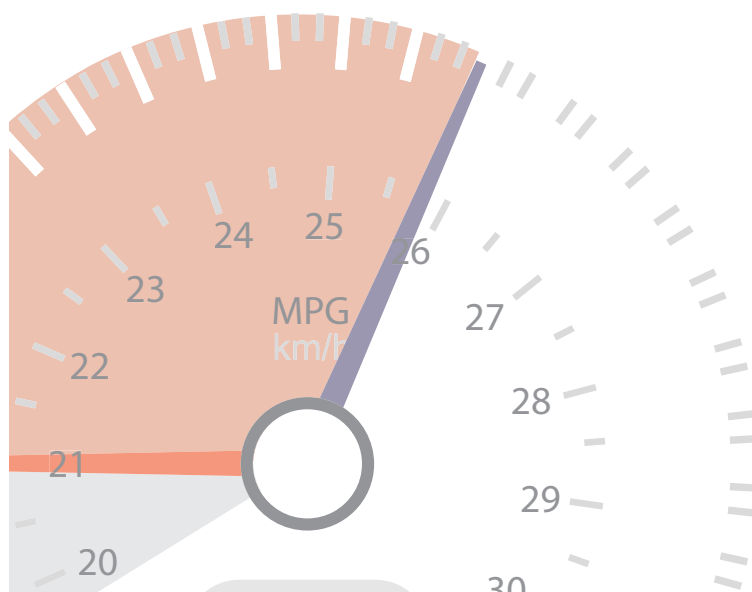
8 Ashleigh Patterson, "Canadian Retail Gas Stations in Decline, Report Says," *Reuters*, May 7, 2009, <http://www.reuters.com/article/2009/05/07/canada-gasstations-idUSN0736332720090507>.

9 Brian Hutchinson, "How the Gas Station was Priced Out of Canadian Cities", *National Post*, Aug 3, 2012, <http://fullcomment.nationalpost.com/2012/03/08/brian-hutchinson-how-the-gas-station-was-priced-out-of-canadas-downtowns/>.





Average Kilometres per Car, (1990 vs 2010)

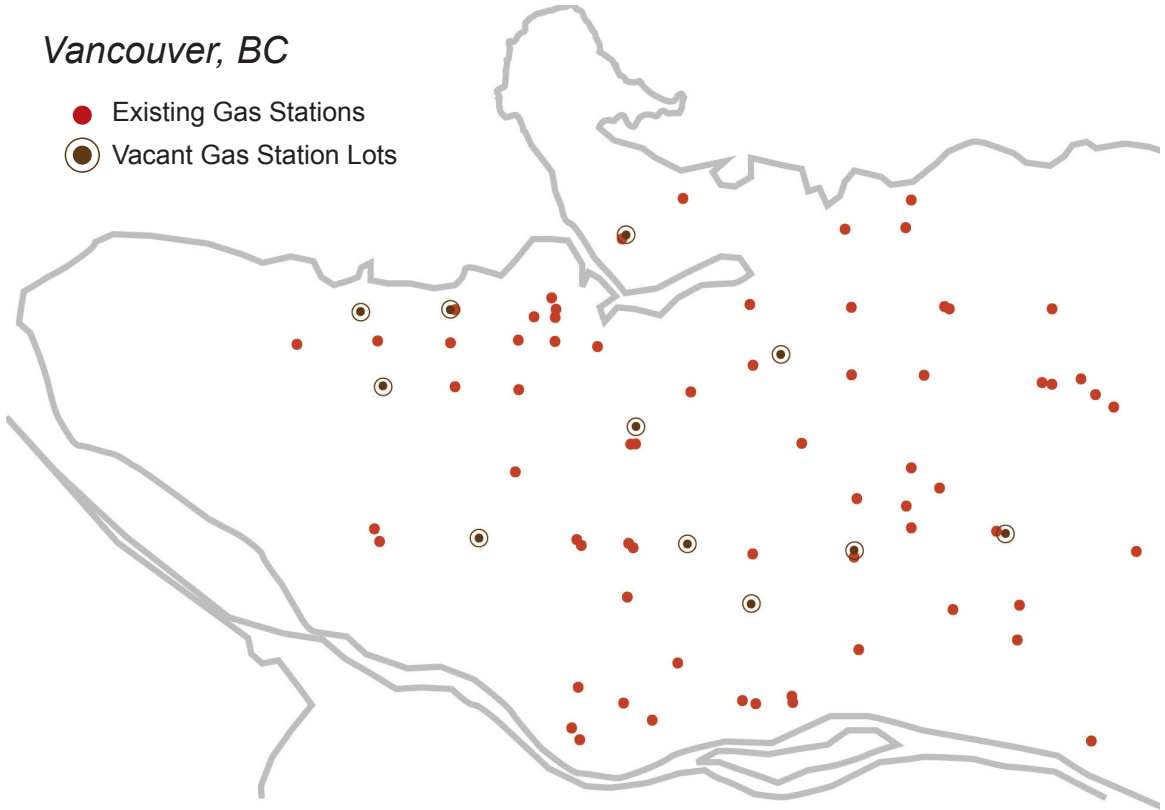


Average Light-Duty Automotive MPG (1980 vs 2012)

Amongst other factors, changing driving habits, technology and tight profit margins have forced many gasoline retailers to close down.

### Vancouver, BC

- Existing Gas Stations
- Vacant Gas Station Lots



*Existing service stations vs vacant lots*



*Stations located on main transportation arteries*



*Pattern of development creates network of sites*

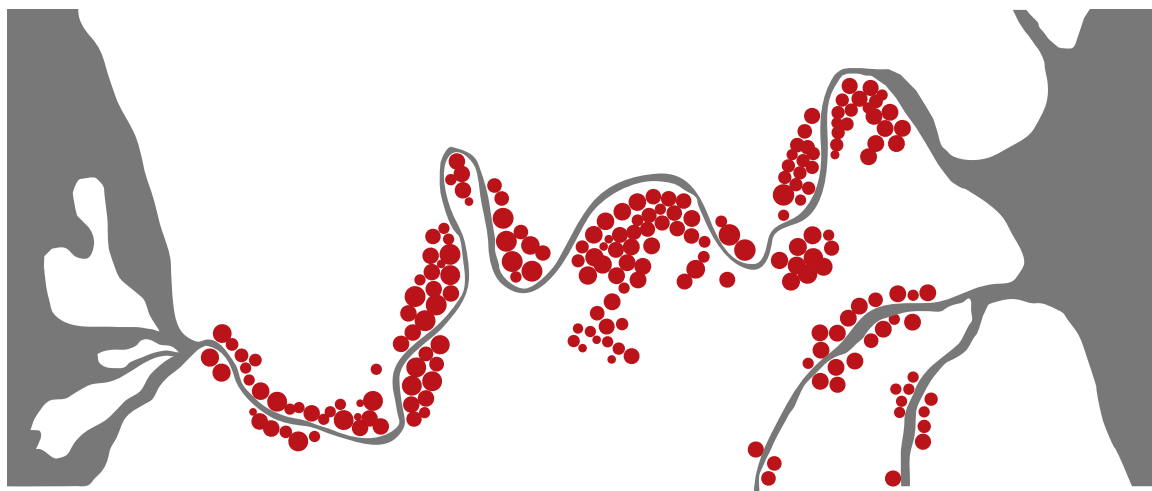


*Vacancy pattern reflects the development pattern*

## The Proposal

The majority of these old service stations have been contaminated by LUSTs (Leaking Underground Storage Tanks). Installed in the early 1980s, over time the steel tanks used to store gasoline underground began to rust and leak petroleum into the surrounding soil. In Canada, up to one third of all underground storage tanks installed before 1990 are leaking or will do so before they are removed.<sup>10</sup>

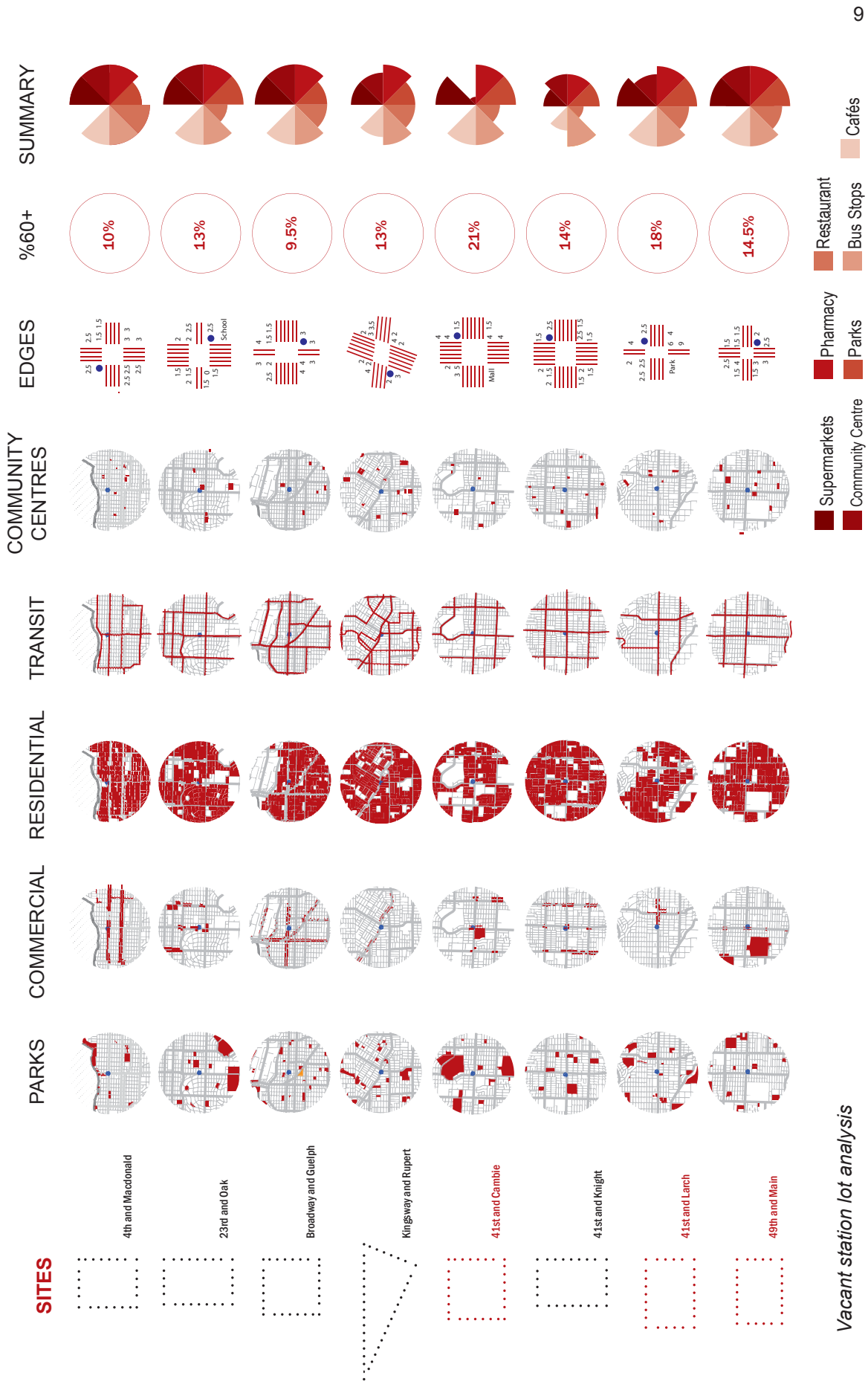
At first blush, seniors' housing on old gas station sites may seem unusual, but a thorough analysis of these sites reveals they are ideal locations to provide for the needs of aging Canadians. As gas stations rely on vehicular traffic, all of the empty lots are situated on busy streets, often at intersections. For the same reasons that gas stations are attracted to these sites, these intersections support a plethora of other businesses. As a result, these sites are typically located within walking distance of cafés, restaurants, grocery stores, community centres, parks and transit stops used by seniors. As people age and their mobility decreases, having amenities within a short walking distance is important to maintain accessibility, a sense of independence, and encourage physical activity.



*Irrigation fields in South Africa show clustering around a central resource*

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<sup>10</sup> "Petroleum Storage Tanks," Alberta Environment and Sustainable Resource Development, last modified February 14, 2014, <http://esrd.alberta.ca/lands-forests/land-industrial/education/chemical-land-quality/petroleum-storage-tanks.aspx>.



Vacant station lot analysis

- Supermarkets
- Community Centre
- Pharmacy
- Parks
- Restaurant
- Bus Stops
- Cafés

### WHAT IS A 'SENIOR'?



"GO-GOs" (60-75yrs)



"SLOW-GOs" (75-85yrs)



"NO-GOs" (85+yrs)

#### SITE PREFERENCE



[Access to city amenities]

#### SITE PREFERENCE



[Access to local amenities]

#### SITE PREFERENCE



[Proximity to family]

#### SITE FEATURES



[Transit hubs]

#### SITE FEATURES



[Commercial edge]

#### SITE FEATURES



[Residential edge]

#### VOLUNTEER ROLES



[Mentoring]

#### VOLUNTEER ROLES



[Tutoring]

#### VOLUNTEER ROLES



[Childcare]

*An analysis of the senior demographic based on the three transitional phases of aging from Herrad Schenk's essay "The Adventure of Growing Old: On Growing Old and Staying Young".*

## Remediation

In adapting former gas stations for seniors' housing and services it is necessary to choose a remediation technique that suits the needs of both the future program and environment. Although the sites appear to be inactive, they are in fact in the process of a very slow remediation. The owners of these sites have elected for a strategy of "natural attenuation" to clean the soil. This is a low risk but lengthy process that leaves the soil to slowly breakdown the contaminants over a 10 to 20+ year period. While an industry accepted practice, it fails to address the repercussions to the community that these vacant lots present. In evaluating remediation processes I prioritized techniques that required a low initial investment and low upkeep while providing an opportunity to engage and educate the surrounding community. For this project to be successful it is critical to involve the community in the sequence of site regeneration. For these reasons I chose "Phytoremediation": the use of plants to naturally breakdown and filter contaminants in soil and groundwater.

## Phytoremediation


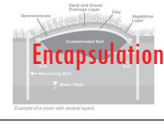

In my research on phytoremediation I found a growing scientific support for the use of hybrid poplar trees to remediate soil contaminated by petroleum products.<sup>11</sup> The Black Cottonwood is a poplar native to BC and is one of the species of poplar that makes up this specialized species. It is important that it is a local tree type because of the need for the trees to thrive on site.

Hybrid poplars are well suited to phytoremediation because they are 'phreatophytes', that is, they sprout deep roots which draw moisture from the water table. This, coupled with their ability to process up to 200 litres of water a day, makes them ideal for filtering contaminated groundwater. Able to grow from cuttings or felled stumps, Hybrid poplars also mature very quickly typically growing 1-2.5 metres a year with roots that can reach lengths of over 5 metres.<sup>12</sup> As the trees grow they become symbols of the regeneration that is happening below the surface and, as a park, an important means to engage with the community in the early phase of development.

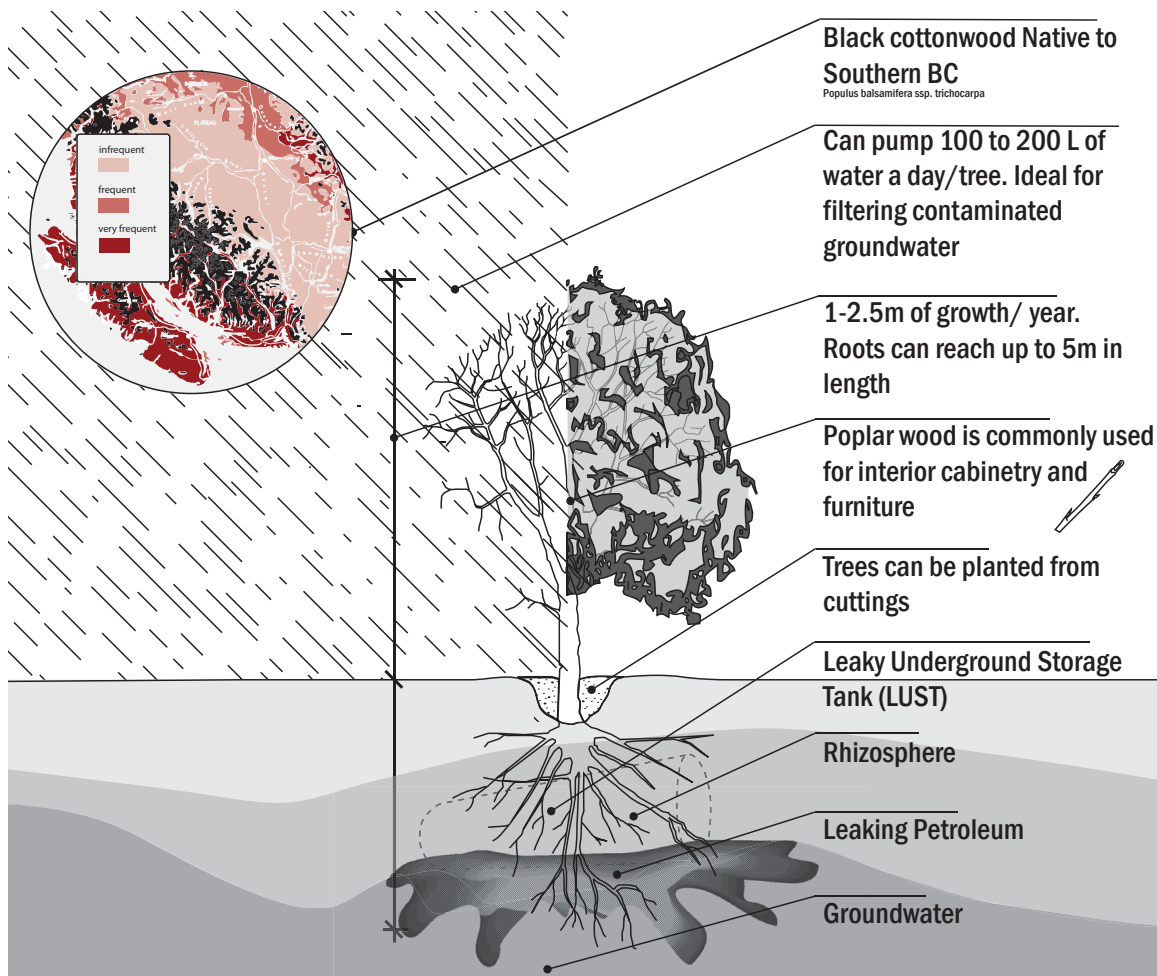
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11 Rafael Duhalt and Rodolfo Ramirez, "Petroleum Biotechnology: Developments and Perspectives." *Petroleum Biotechnology*, Volume 151: *Developments and Perspectives*. (Burlington: Elsevier, 2004), 462.

12 Ibid.

Remediation Options	Contaminants	Soil Type	Costs	Efficiency	Duration
 <p><b>Phytoremediation</b></p>	<b>A-F</b>				
 <p><b>Encapsulation</b></p>	<b>C-F</b>				
 <p><b>Solidification</b></p>	<b>C,E-F</b>				

Excerpt from remediation strategy evaluation table



Poplar phytoremediation



## Development Strategy

As one cannot expect to cover the increasing demand for care and support through paid services alone it is necessary to encourage and promote networks based on mutual assistance.<sup>13</sup>

Much like the remediation process that gradually restores the ground beneath the site, the program above will grow to engage the community and revitalize the area. Conceived of as a 10 year plan, the development strategy involves three phases with three scales and types of program at each phase. The first phase is a park program, the second is a community hub, and lastly, housing. The specific nature of the program at each phase is shaped by the community context and the preceding program phases.

I have selected three typical sites to represent various urban conditions and show how the program strategy adapts to each. Additionally, although these examples will look at the three main phases, each phase is the result of gradual changes that occur between phases. An example of these “micro-phases” that might occur between ‘Empty Lot’ and ‘Park’ is illustrated at the end of this chapter.

### Scenario 1: 41st and Cambie

In 2008/2009, 34% of Canadians aged 65 or older (more than 4.1 million) were at nutritional risk.<sup>14</sup>

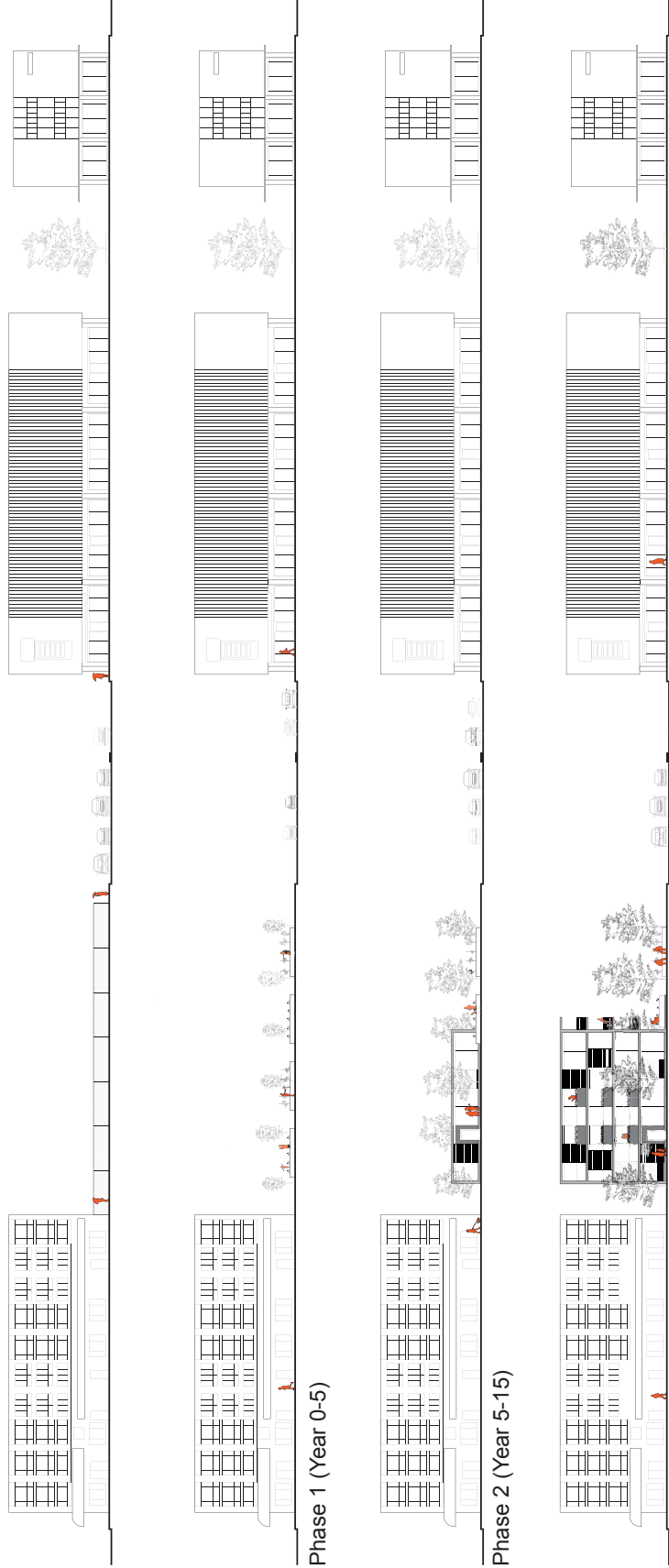
This site at Cambie St and 41st Ave is defined by mid-rise apartments and office buildings. In evaluating an appropriate park program for this site I took into account the site’s proximity to a large city park located a few blocks away and the lack of growing space that condo apartments afford. In this situation a vegetable garden would establish a park program that would provide a needed amenity without being redundant.

In the second phase, a community kitchen is introduced to reinforce and strengthen the existing program. The community kitchen could host cooking classes for all ages and through volunteer efforts make nutritious meals to deliver to local seniors that may be struggling with healthy eating habits.

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13 Feddersen, *A Design Manual: Living for the Elderly*, 24.

14 Pamela L. Ramage-Morin and Didier Garriguet, *Nutritional Risk Among Older Canadians*. Catalogue no. 82-003-x. Ottawa, Ontario, Health Analysis Division, 2013, <http://www.statcan.gc.ca/pub/82-003-x/2013003/article/11773-eng.htm>.



Phase 1 (Year 0-5)

Phase 2 (Year 5-15)

Phase 3 (Year 15+)

*41st and Cambie site development*

The beginning of the last phase marks the completion of the remediation of the site. At this point the site can be rezoned for residential use. In this case, the housing program is in the form of a mid-rise apartment with access to a vegetable garden and community kitchen on the ground floor. Although primarily a mix of market priced and subsidized assisted living apartments, the complex would also offer a portion of the apartments to the general public to facilitate a mix of ages.

### **Scenario 2: 49th and Main**

For older adults in particular, dancing can help prevent the loss of muscle strength and bone density. These effects combined with improvements in balance reduce the risk of falls.<sup>15</sup>

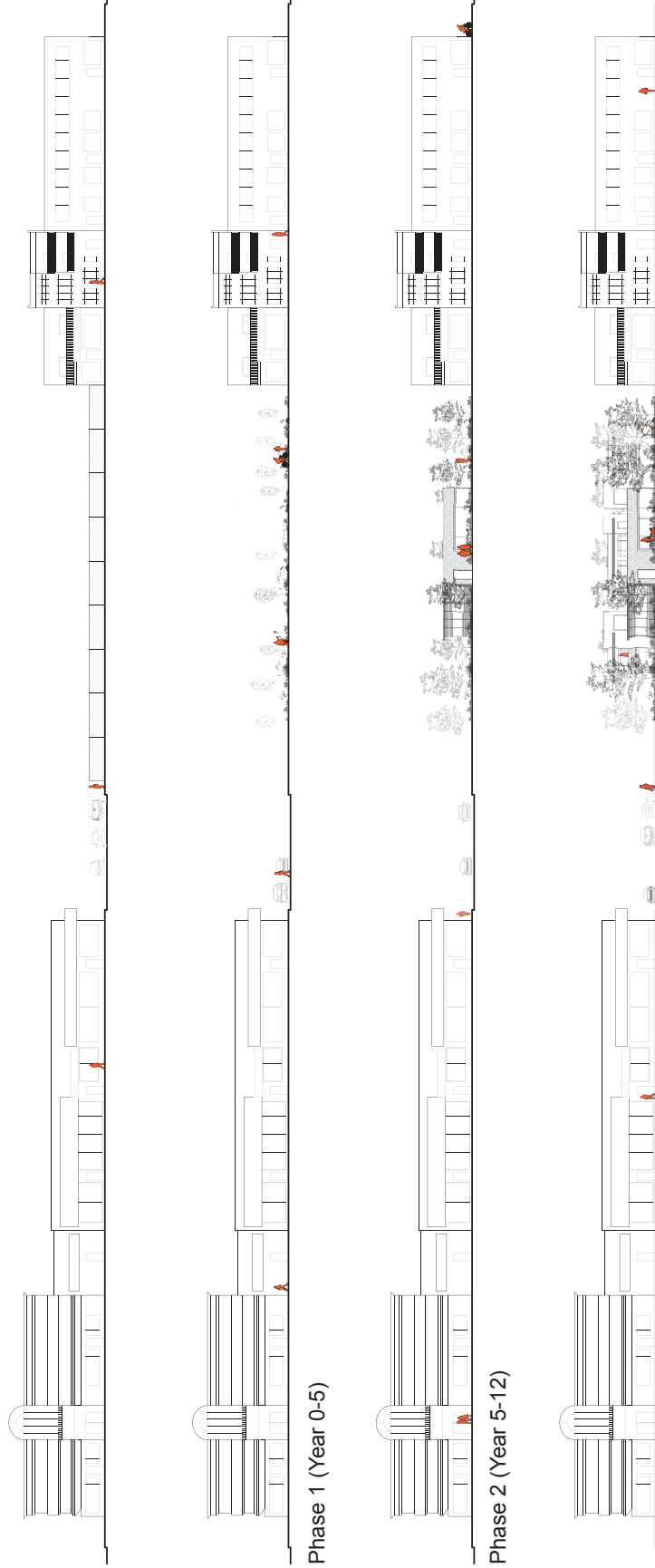
In this second scenario the site is located in Vancouver's "Little India" on 49th Ave and Main St. This program strategy takes into account the nearby parks and the current struggles of this area to attract pedestrian traffic. The first stage proposes a wildflower garden. This program will help to encourage casual foot traffic into the area and give people a place to enjoy the authentic Punjabi snacks on offer in the nearby shops.

The next phase of development is the building of a Bhangra dance studio on the site. A traditional Punjab dance, Bhangra has seen renewed interest in Vancouver in last few years. As a colourful and expressive dance style, a Bhangra studio on this corner would attract local residents as well as tourists and provide a space to showcase Punjab culture as well as encourage physical activity in local seniors. The surrounding garden would provide an informal venue to watch rehearsals or outdoor performances.

In the final phase, small two storey buildings would provide scale sensitive mixed-age housing with a proportion reserved for subsidized and market priced supportive senior housing.

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15 Lily Sarafan, "What the Cha-Cha Can Do For Your Health," *Huffington Post*, Nov. 16, 2012, [http://www.huffingtonpost.ca/lily-sarafan/dance-benefits-for-seniors\\_b\\_2139339.html](http://www.huffingtonpost.ca/lily-sarafan/dance-benefits-for-seniors_b_2139339.html).



Phase 1 (Year 0-5)

Phase 2 (Year 5-12)

Phase 3 (Year 12+)

*49th and Main site development*

### Scenario 3: 41st and Larch

When children are ill, working parents often struggle to find caregivers. Under the Danish voluntary Reserve Grandparent Scheme, retired older people stepped in to care for sick children.<sup>16</sup>

In this last example the immediate site context is defined by a residential/commercial edge and a nearby sports field. Based on those factors, a children's playground could supplement and help strengthen the existing sports field by providing spaces for a younger demographic.

The second phase would build off of the playground program by establishing a neighbourhood daycare on site. Daycares are in great demand in Vancouver as there is a significant lack of affordable options available.<sup>17</sup> Having local seniors volunteer at the daycare will provide the community with a welcome service while giving the seniors a valuable way to remain active members in the community.

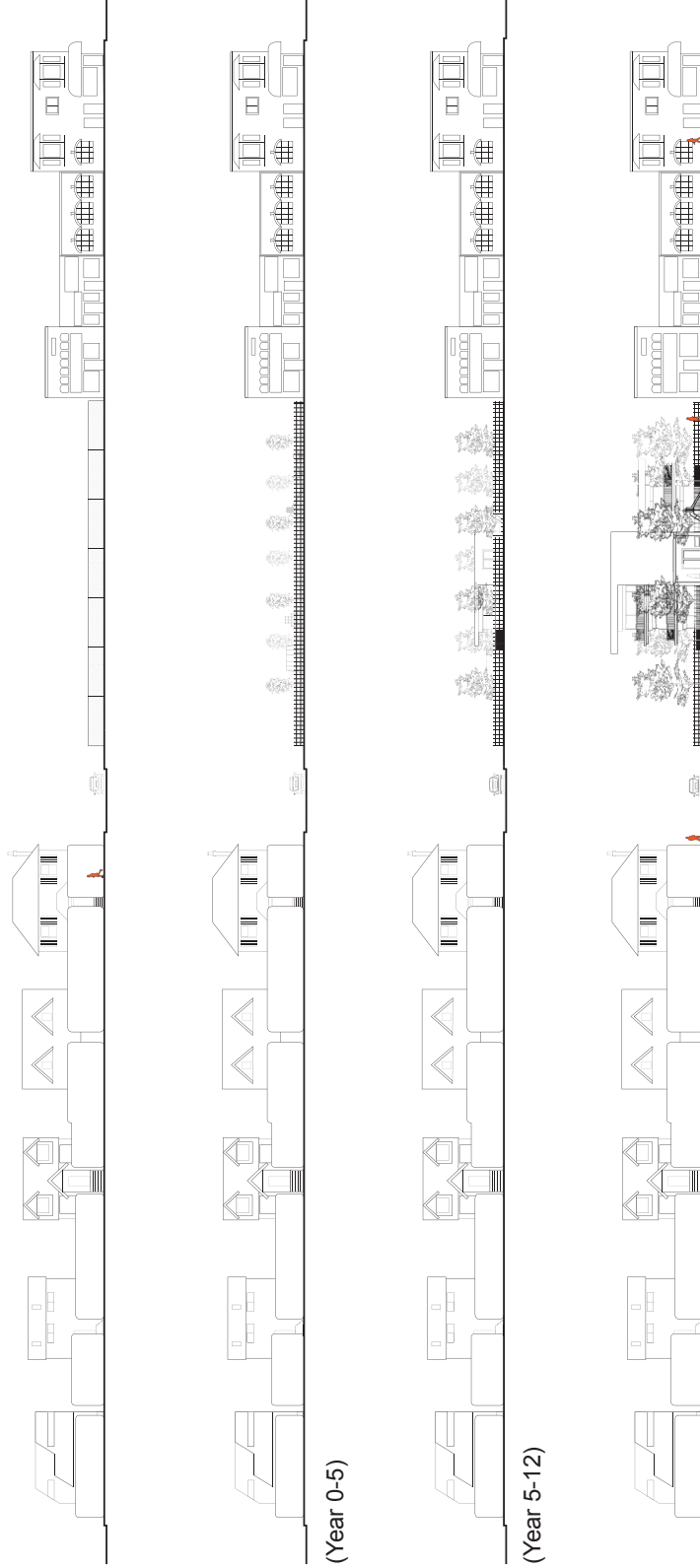
The third and final phase is the introduction of housing on site. In this case, the housing is a three storey apartment complex which incorporates the existing playground and daycare facilities. As in the previous examples the apartments would be weighted towards affordable seniors' housing with some units offered at market price.

I have decided to use this site to test my thesis design as it is a fairly typical site. It is located on a corner lot, it is in close proximity to both commercial amenities and a residential neighborhood, and has nearby access to public transit lines. The 3-4 storey urban fabric surrounding the site is also a nice starting point to investigate appropriate density for these Community Stations.

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<sup>16</sup> *Ageing in the Twenty-First Century*, 36.

<sup>17</sup> M. Friendly, S. Halfon, J. Beach and B. Forer, *Early Childhood Education and Care in Canada 2012* (Toronto: Childcare Resource and Research Unit, 2013), 43.



Phase 1 (Year 0-5)

Phase 2 (Year 5-12)

Phase 3 (Year 12+)

*41st and Larch site development*

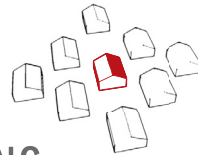


## Community Station Development

My proposal occurs over three phases during the period of site remediation.



**1. PICK A PARK** The first phase is a park. A park is a low investment way to transform the derelict sites while providing opportunities for community involvement.



**2. PICK A HUB** The second phase introduces a community hub program. This further establishes the site as a community focal point.



**3. CHOOSE HOUSING** In the final phase seniors' housing is incorporated onto the site. The type and degree of care is informed by density and community context.



**Parks**  
Years 1-4

- Vegetable Garden
- Playground
- Off Leash Area
- Flower Garden
- Sports Field



**Community Hub**  
Years 5-10

- Dance Studio
- Community Kitchen
- Daycare
- Gymnasium
- Theatre



**Housing: "Campus of Care"**  
Years 10+

**Seniors' Housing**

choice of:

- Assisted Living
- Supportive Living
- Complex Care
- Palliative Care

**Outpatient Care**

includes:

- Personal Grooming
- Bathing
- Shopping
- Meals
- Transportation

**Complimentary Program**

choice of:

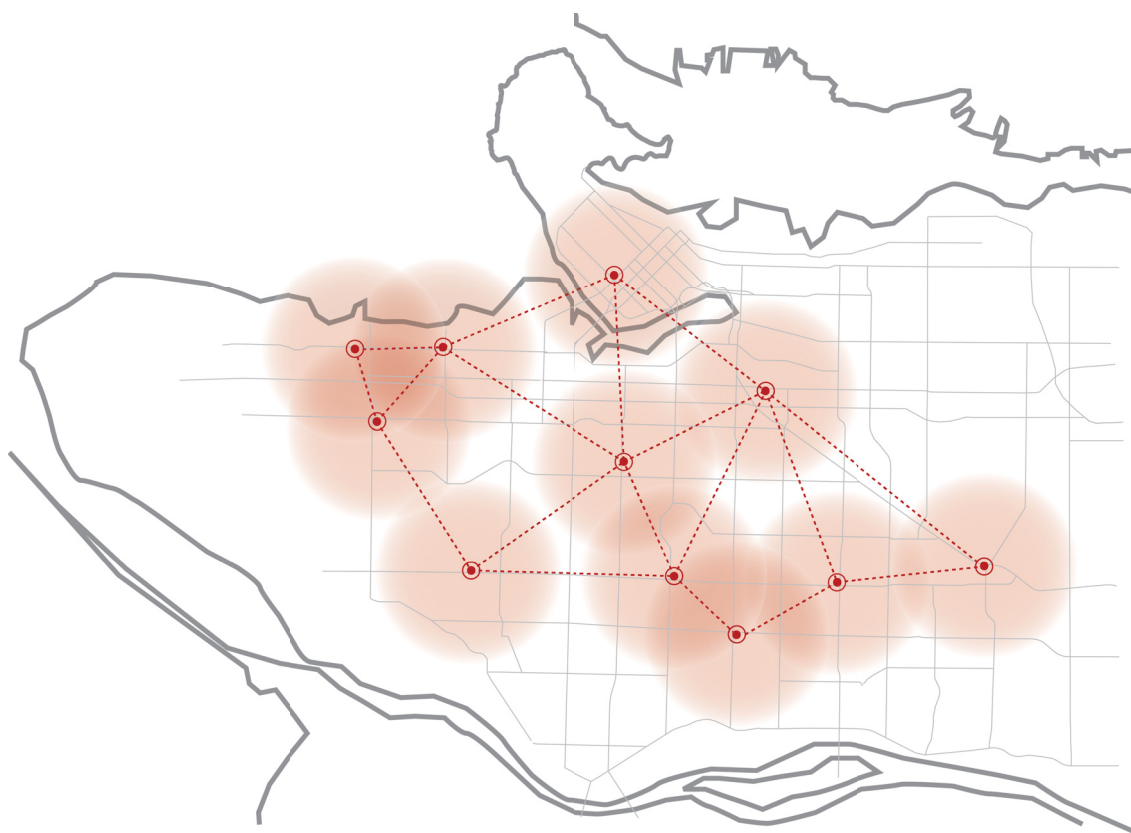
- Community Postal Boxes
- Walk in Clinic
- Pharmacy
- Library
- Pharmacy

Diagram of the proposed development process

## Network Approach

Approximately 85% of older Canadians would prefer to age in place, and most will be living in urban areas. They will require supports and housing options to allow them to live independently in their own homes for as long as possible.<sup>18</sup>

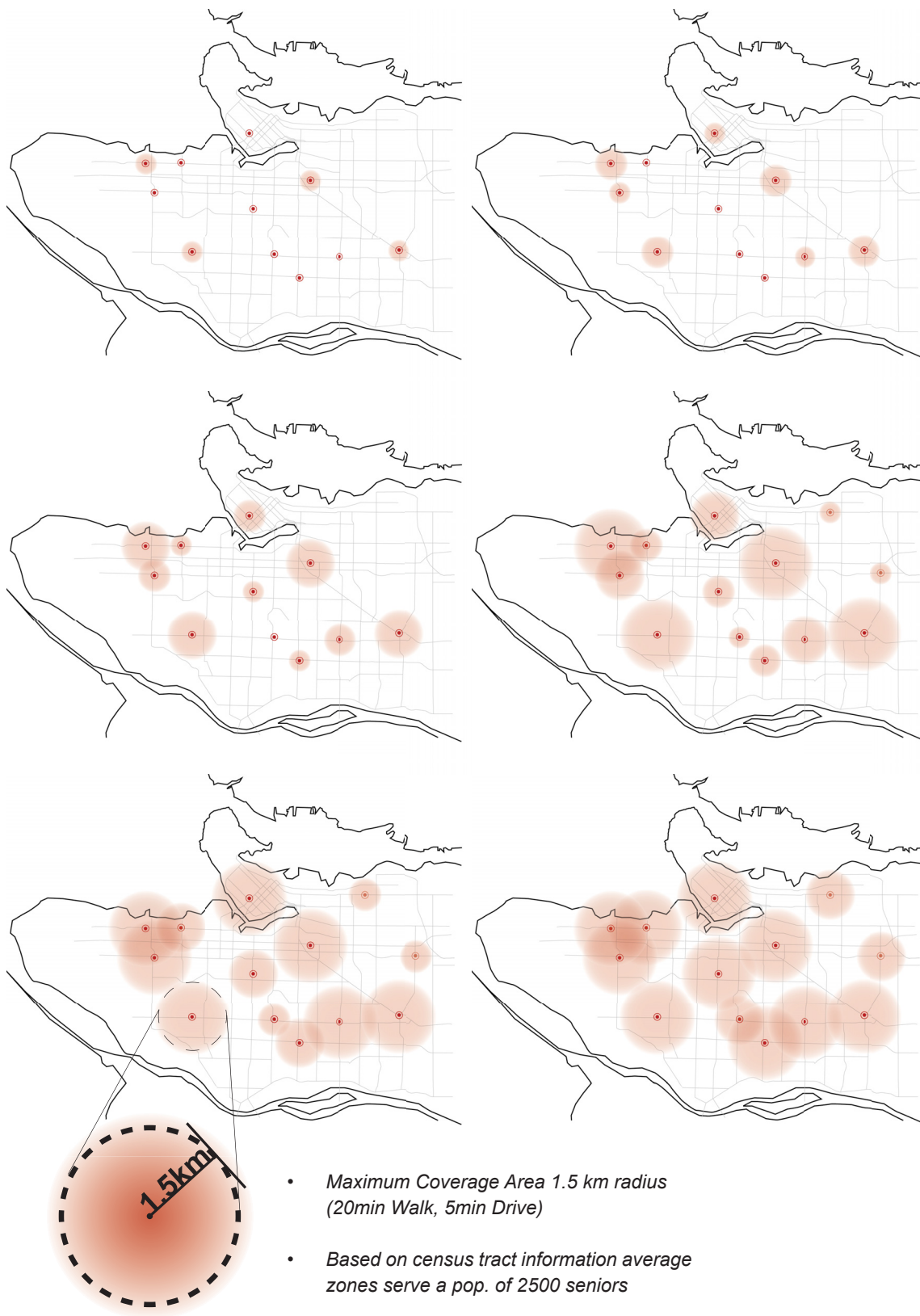
The spaced distribution of sites throughout the city lends themselves to a network approach to seniors' care. These sites would function like telecommunication towers: as new Community Stations are gradually erected, the coverage zone increases. As more and more old gas station sites get developed, age-in-place services would increase to cover the city. Progressively seniors across the city would have access to local age-in-place services to help them to continue to live at home. By reducing the need for seniors to move out of their current homes this approach will alleviate some of the strain on the existing senior housing stock while enabling seniors to stay in their homes longer.



*Nodes can serve surrounding community*

18 Canada Mortgage and Housing Corporation. "Housing For Older Canadians: The Definitive Guide to the Over-55 Market," 2012, accessed Sept. 28, <http://www.cmhc-schl.gc.ca/odpub/pdf/67514.pdf>.





*Illustration of growth of the age-in-place service area*

## Sustainable Development

As a method of deciding on a minimum density requirement for the site I looked at the surrounding neighborhood's economic conditions as well as the rental apartment market in Vancouver. The full report can be found in the appendix but the final conclusions are as follows: the median income for a senior in Vancouver Metro is \$23,270. Based on a 30% shelter-to-cost-income-ratio (STIR) this demographic's maximum rent is \$582/month. Keeping a 50:50 mix of market-priced to affordable housing, 10 units is a rough minimum required density for the development to be sustainable.

In consideration of the neighborhood scale, I am proposing a 12 unit development. Four of the units would be supportive housing apartments and eight would provide assisted living services. Seniors in the supportive housing would be more mobile with only the need for occasional assistance with some household tasks. The assisted living apartments would provide more comprehensive care to older or less mobile residents.

Although typically these Community Stations should be able to meet their break-even density, if a development needs to run for a time at a small loss because of contextual factors, the network approach to this proposal should be able to mitigate losses through profits at other branches. Moreover, the mix of programs in these developments could help support each other; the restaurant and café on site could have contracts to provide meals for residents, and the residents could volunteer their time downstairs at the daycare.

My thesis proposes that these sites are incrementally bought by the provincial government and leased to a non-profit housing organization. The sites would have to be bought while still contaminated, which currently is a legal obstacle but may not be for long.<sup>19</sup> The companies which own the land are typically large petroleum companies. Assuming they are risk-averse, the petroleum companies may be eager to sell these lots and distance themselves from any of the reliability of owning them.

Once purchased, the increase in property tax from the surrounding neighborhood during the remediation years could contribute towards their economic feasibility.<sup>20</sup>

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19 *Antorisa Investments Ltd. v. 172965 Canada, Ltd.*, [2006] O.J. No. 3427 (Aug. 28, 2006)

20 The Province of British Columbia, *The Basics of Brownfield Redevelopment*, 2008, [http://www.brownfieldrenewal.gov.bc.ca/Documents/BrownfieldsBooklet\\_LowRes.pdf](http://www.brownfieldrenewal.gov.bc.ca/Documents/BrownfieldsBooklet_LowRes.pdf)



Existing Site



Summer Year 1



Summer Year 2



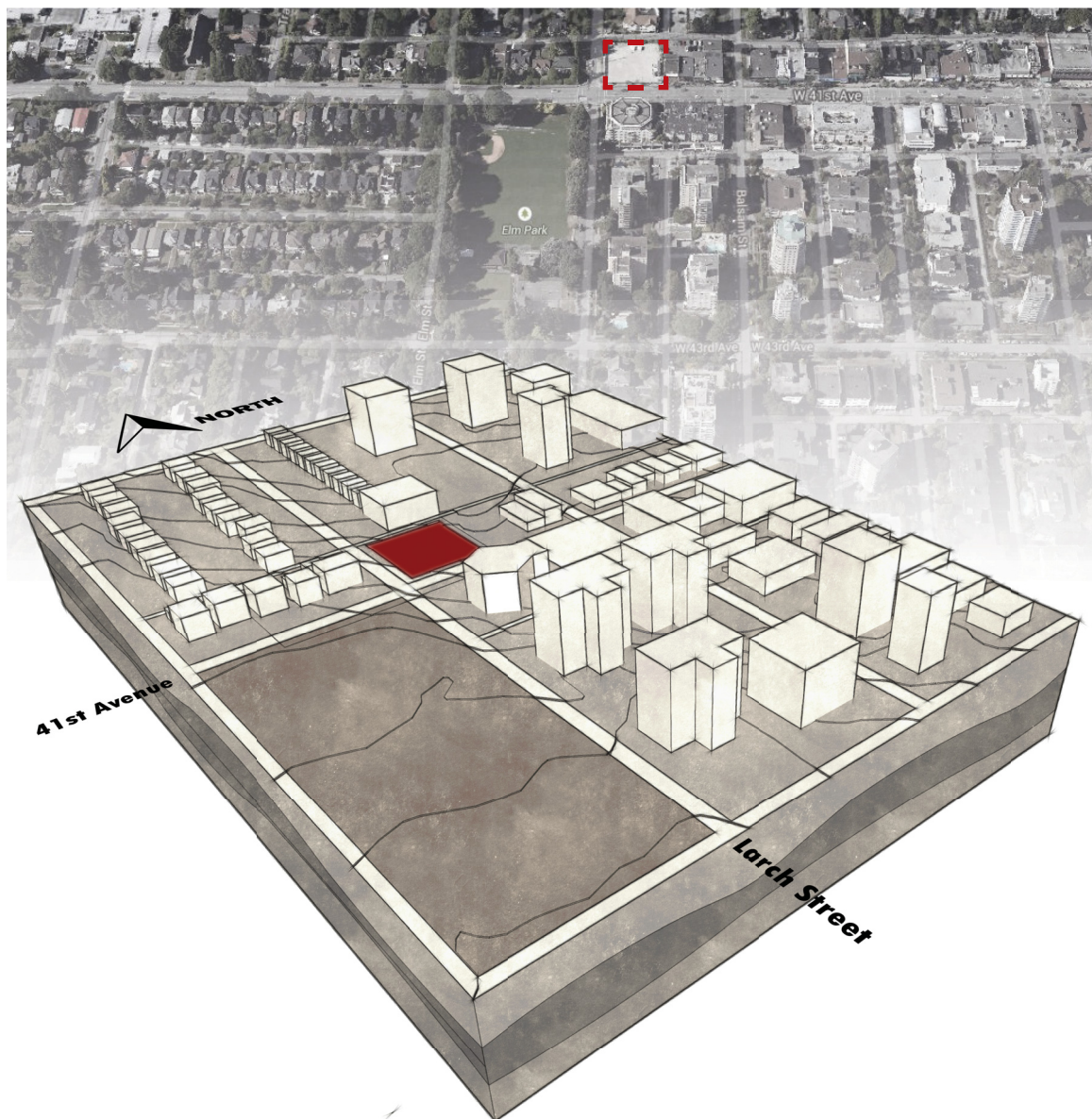
Summer Year 3

*Example of the gradual growth from vacant lot to park*

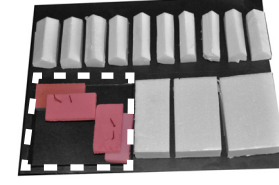
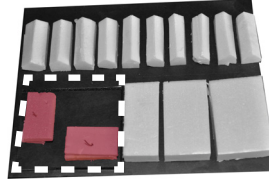
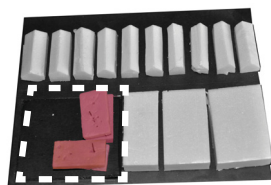
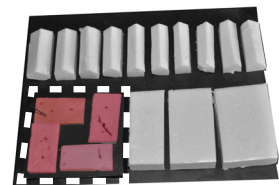
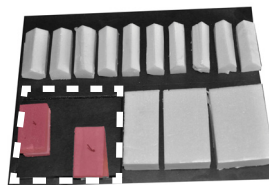
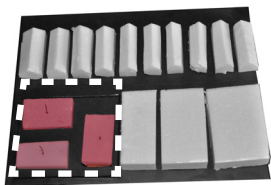
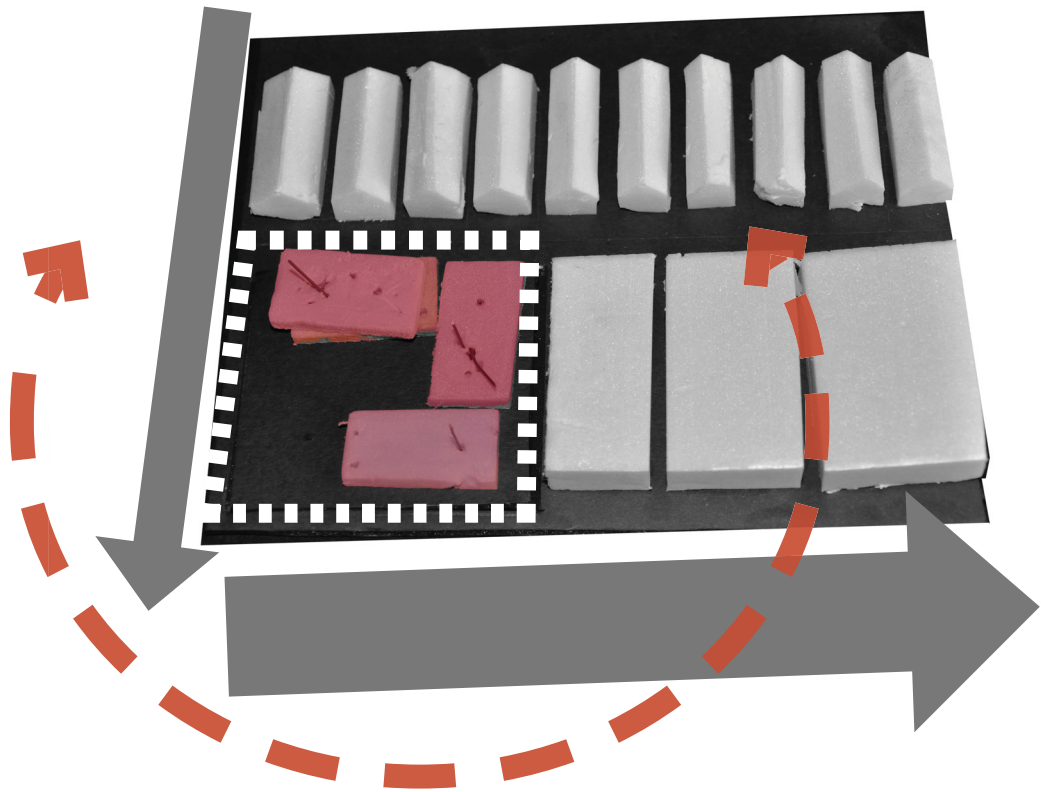
## CHAPTER 2: DESIGN

### Site

The site is located on a corner lot at Larch Street and 41st Avenue in Vancouver, BC. It features a large sports field across the street and marks a threshold from residential housing into a busy commercial strip along 41st Avenue. The neighborhood around the site is called 'Kerrisdale', and at 18%, has a high percentage of senior residents in the area.



*Site with immediate context*



*Massing study exploring ways to create protected public spaces, maximize sunlight penetration and address the bordering busy streets.*

## Program

The label of “Senior” incorporates a wide demographic spectrum. While a similar demographic categorization such as “Teenagers”, spans a decade, “Seniors” spans 40+ years with care services typically increasing with age. Although these Community Stations could be tailored towards any level of care they would most likely work providing assisted or supportive care services as opposed to complex care because of the restrictions and infrastructure investment required.

Supportive Living

*Occasionally* one of:

-  Grooming
-  Bathing
-  Transport
-  Help with Medication

Assisted Living

*Commonly* most of:

-  Supportive Services
- +
-  Meals
-  Housekeeping
-  Laundry
-  Social Activities
-  Emergency Response System

Complex Care

*Consistently* most of:

-  Supportive Services
- +
-  Assisted Living Services
- +
-  Dressing
-  Feeding



Programmatic sketch model

### Housing Types



Assisted Living



Supportive Living

### Complimentary Public Program



Community mailboxes



Walk-in clinic



Pharmacy



Age-in-place offices



Daycare



Playground

### Retail Program



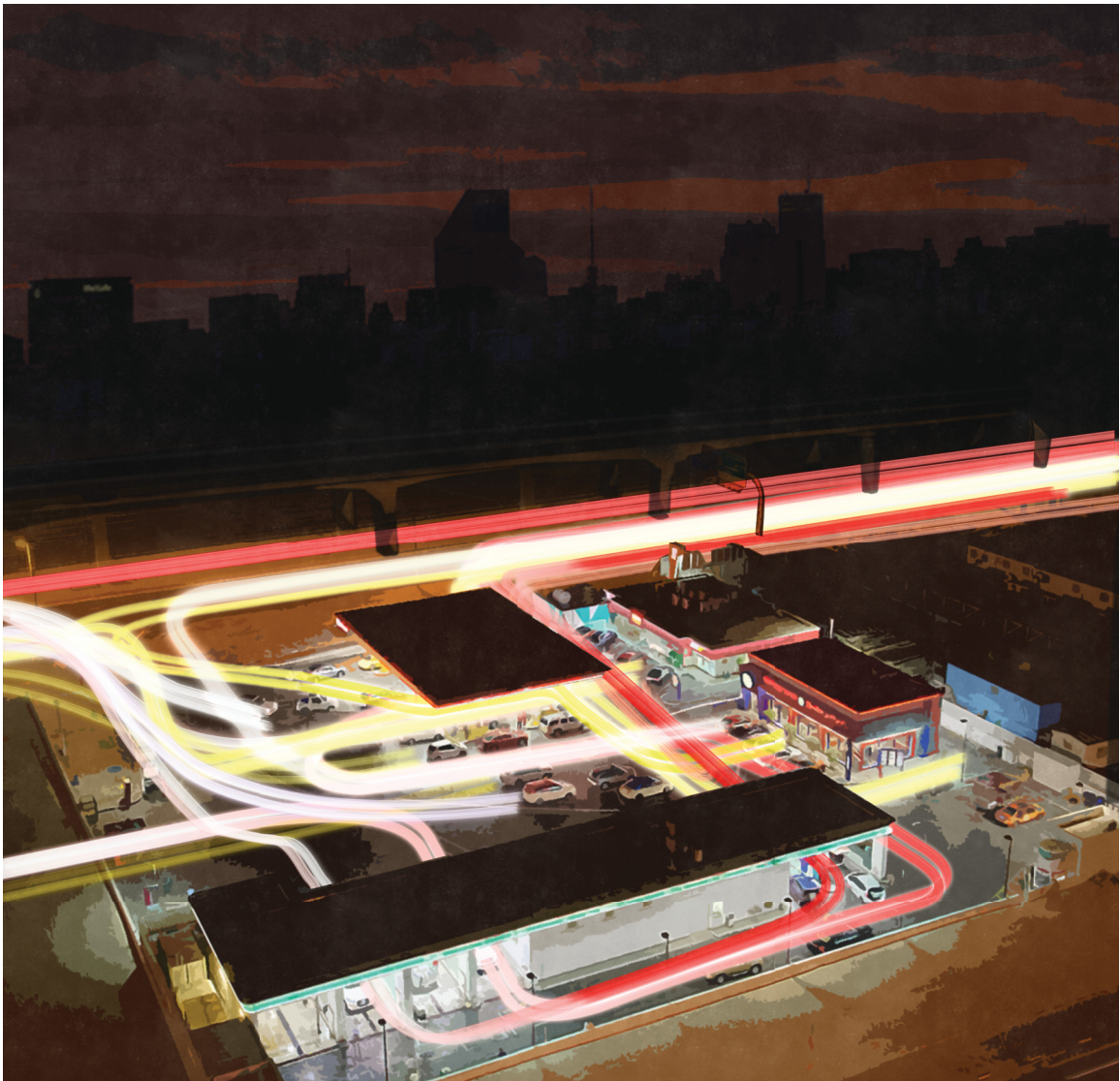
Café



Restaurant

## Node: The Community Station as a Physical Focal Point

Gas stations have always been incidental interaction points; places where diverse demographics come together as part of a daily routine. Using the same principles, these Community Stations will bring people together but at a slower pace



*Physical Focal Point*



## Landmark: The Community Station as a Visual Focal Point

The Service Station typology is marked by strong visuals. Big signs and bright night lighting establish a visual presence in its surroundings. By embracing that spirit, the stations have the potential to become visual landmarks in their communities and provide a sense of place in their neighborhood and by extension the city, contributing to what noted urban planner Kevin Lynch defined as a city's "imageability".<sup>21</sup>



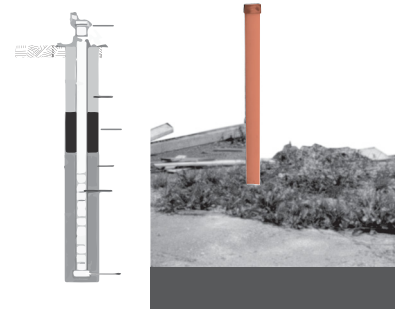
*Visual Focal Point*

<sup>21</sup> Kevin Lynch, *The Image of the City* (Cambridge: M.I.T. Press, 1964), 48.

## Design Study: Remediation Infrastructure



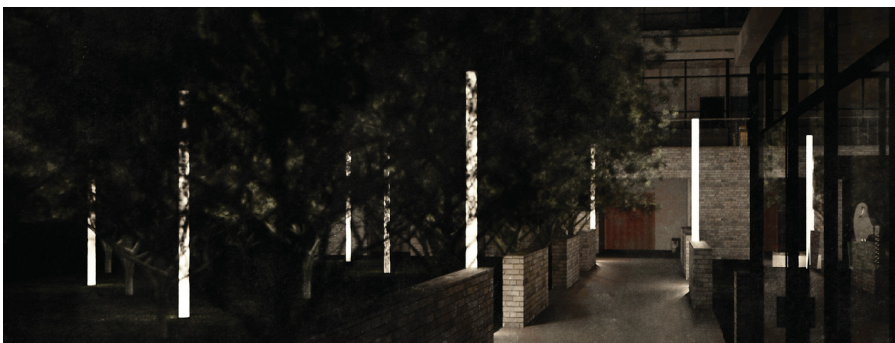
Feature



Groundwater Monitoring Tubes



Model Study



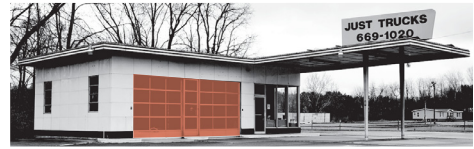
*Tubes used to sample ground water as part of environmental impact monitoring will be lit to provide night lighting and a means to promote community engagement*

Design Concept

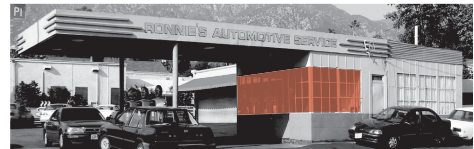
# Design Study: Service Station Architecture



*Flying Canopy*

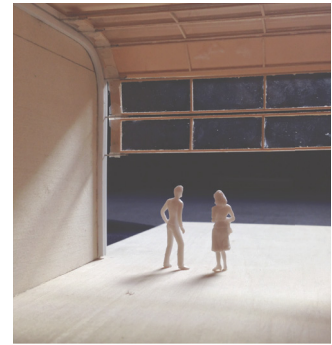
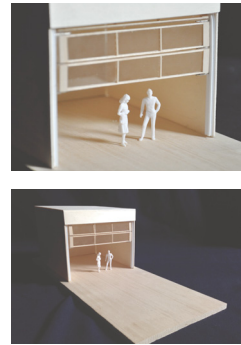


*Garage Door*

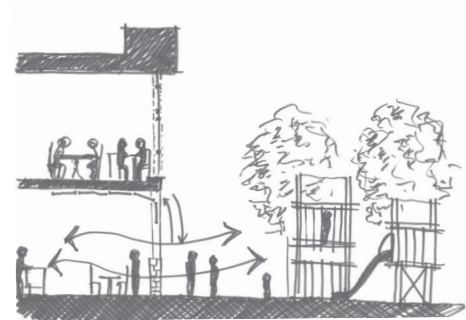
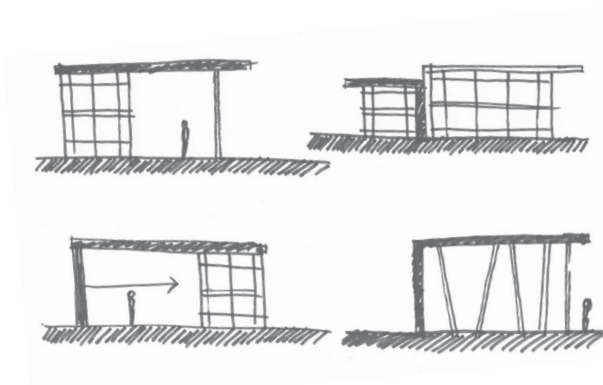


*Fenestration Style*

## Feature

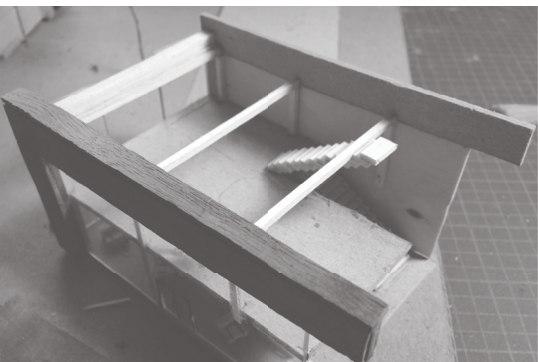
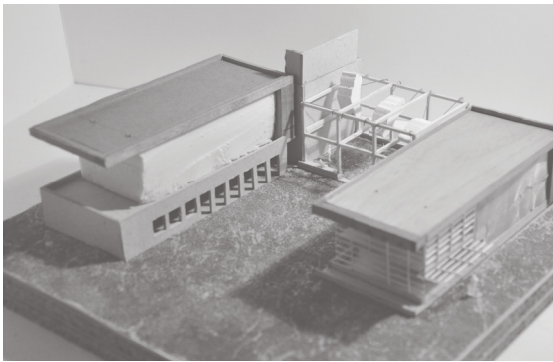
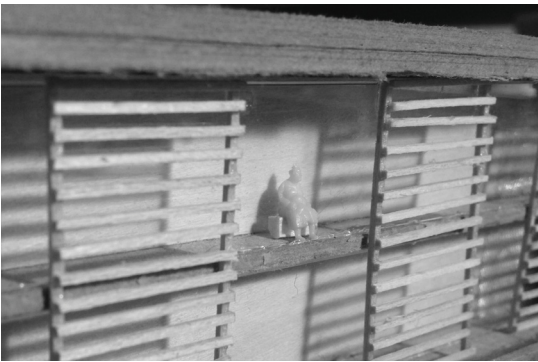
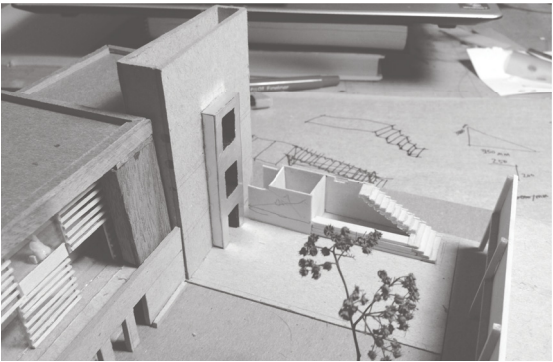
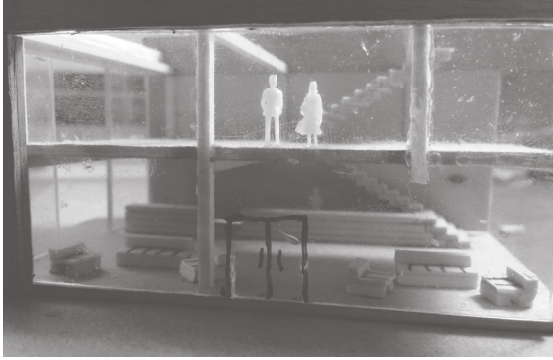


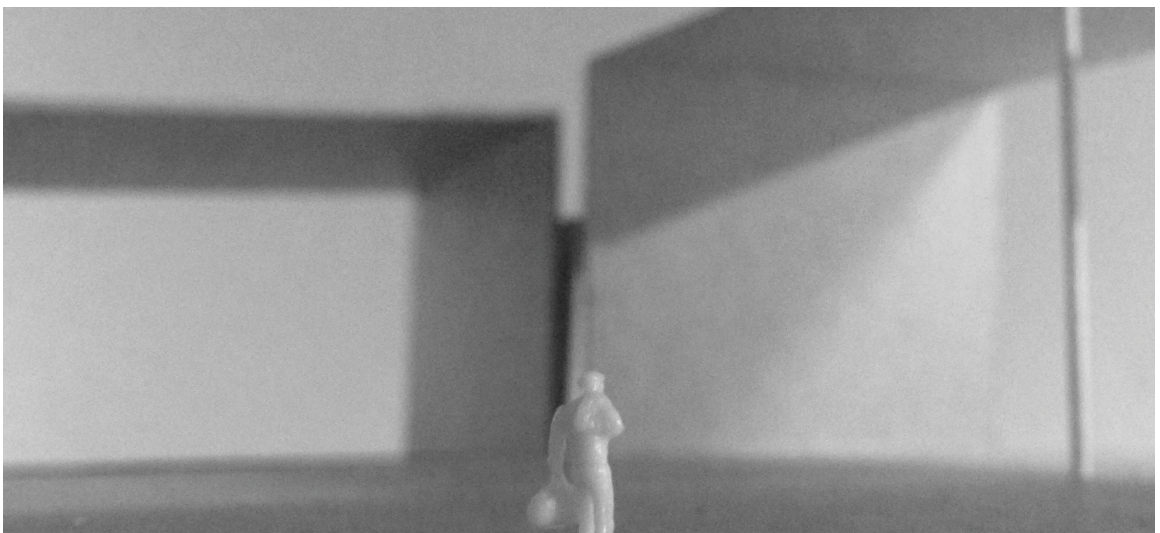
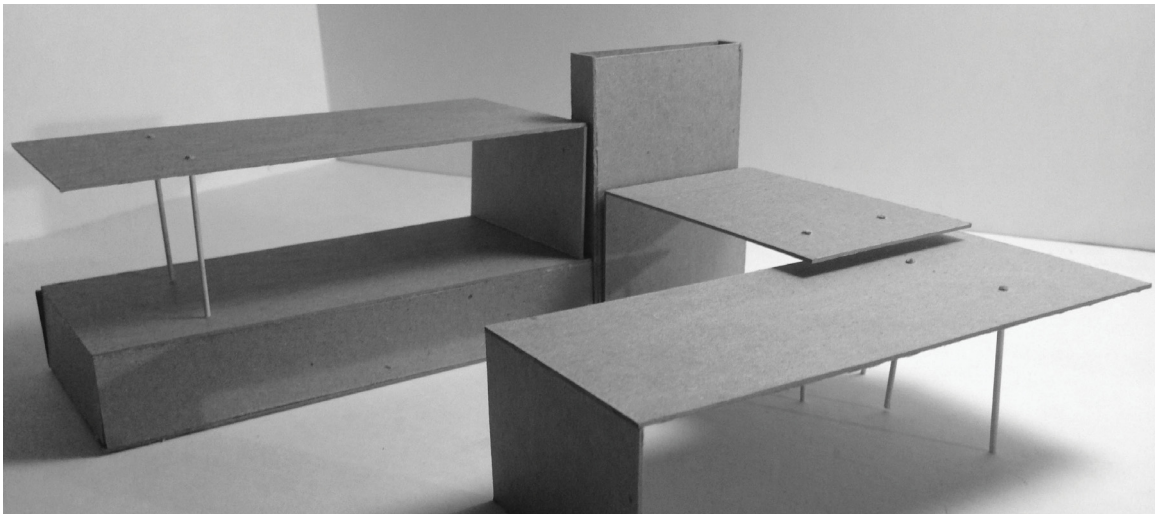
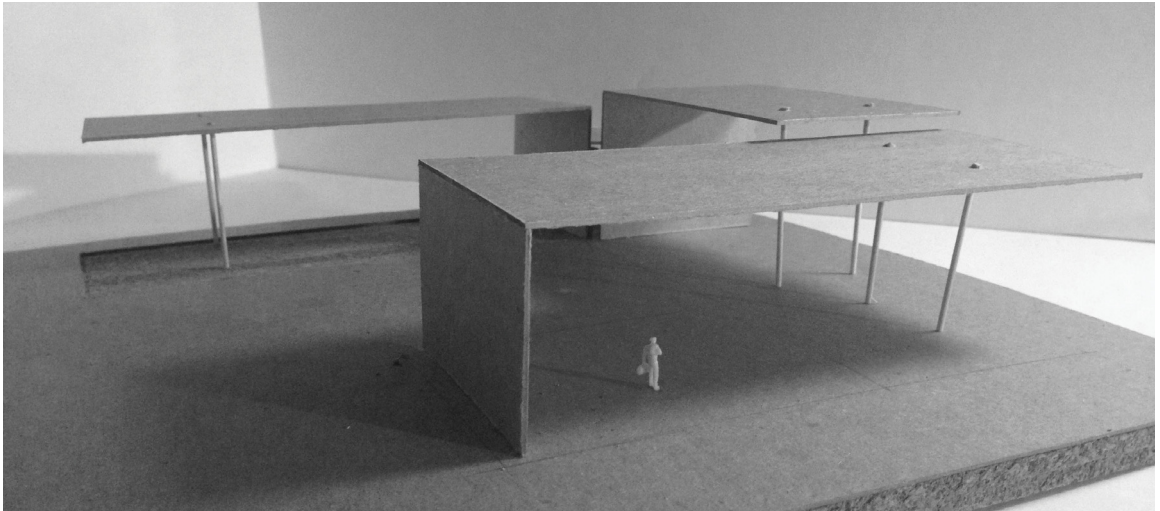
## Model Study



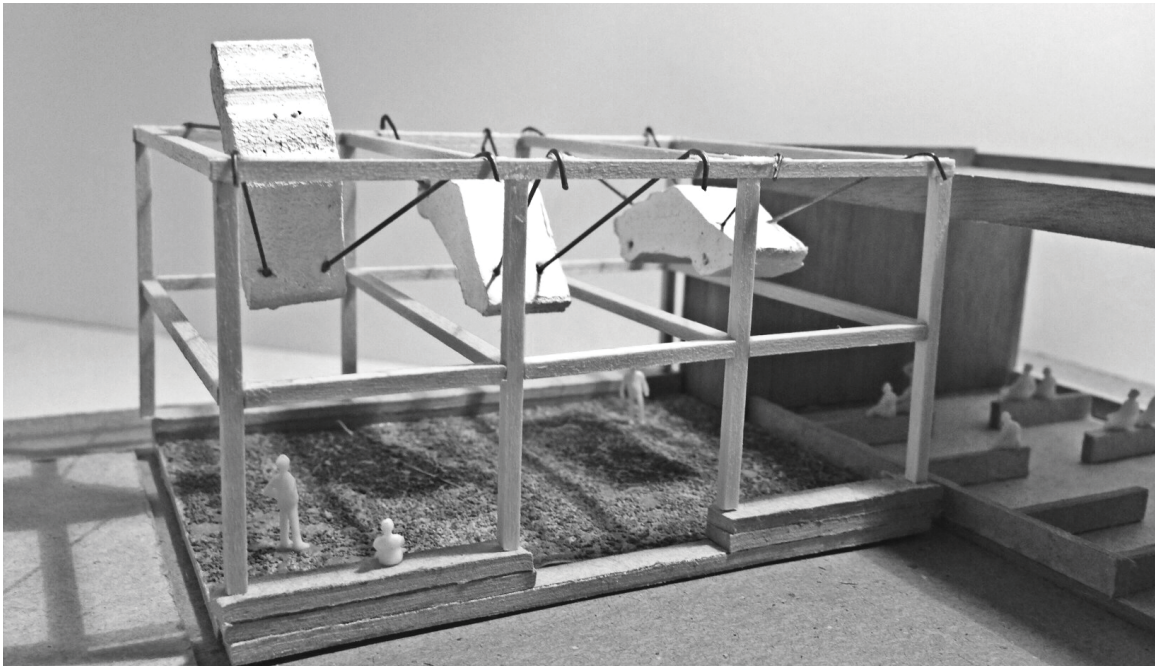
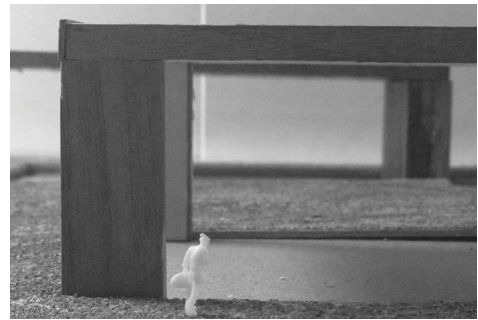
## Design Concept

# Schematic Design

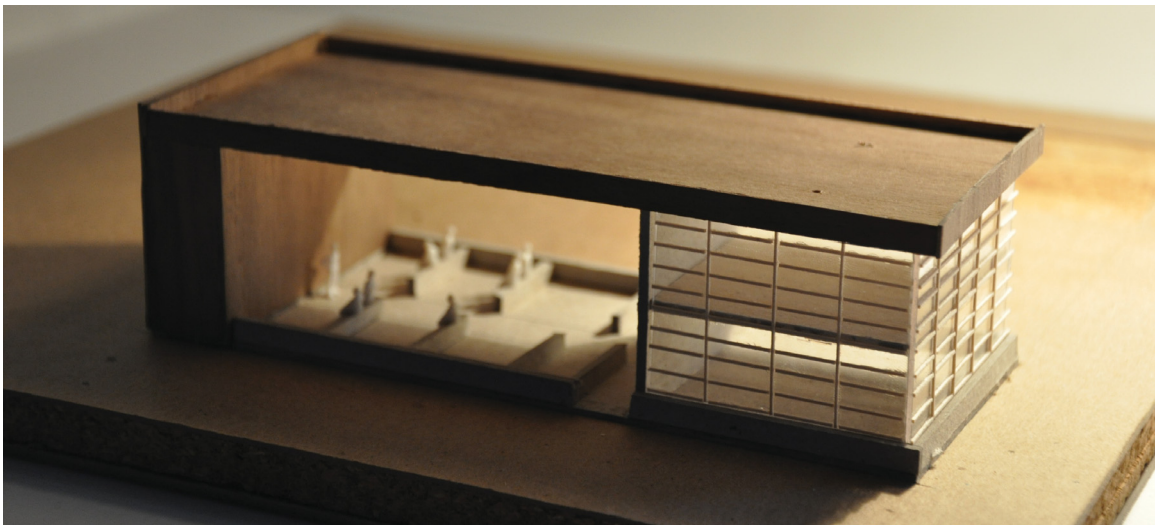
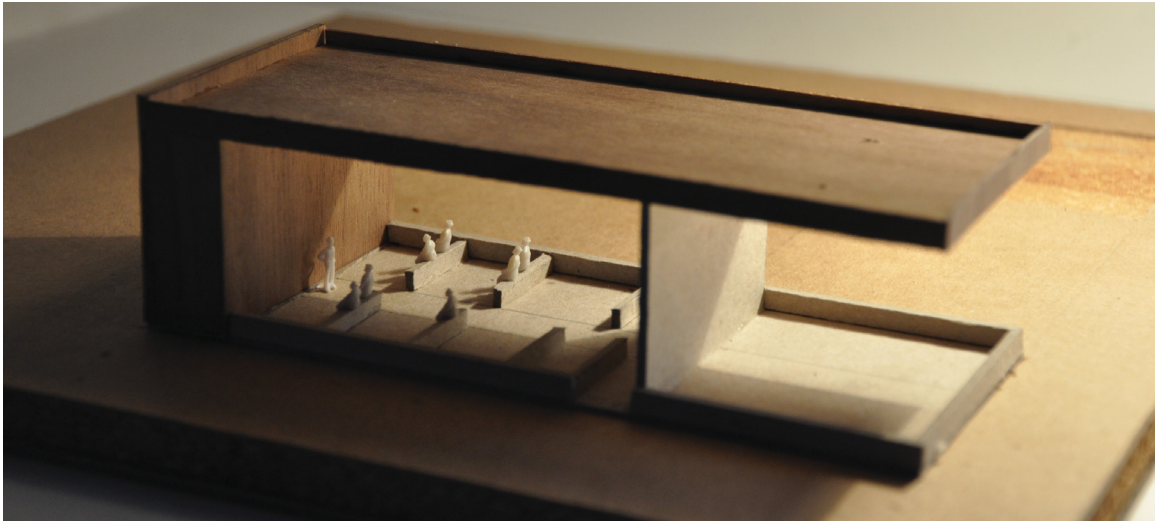




*Form-making with abstracted elements taken from the service station study*

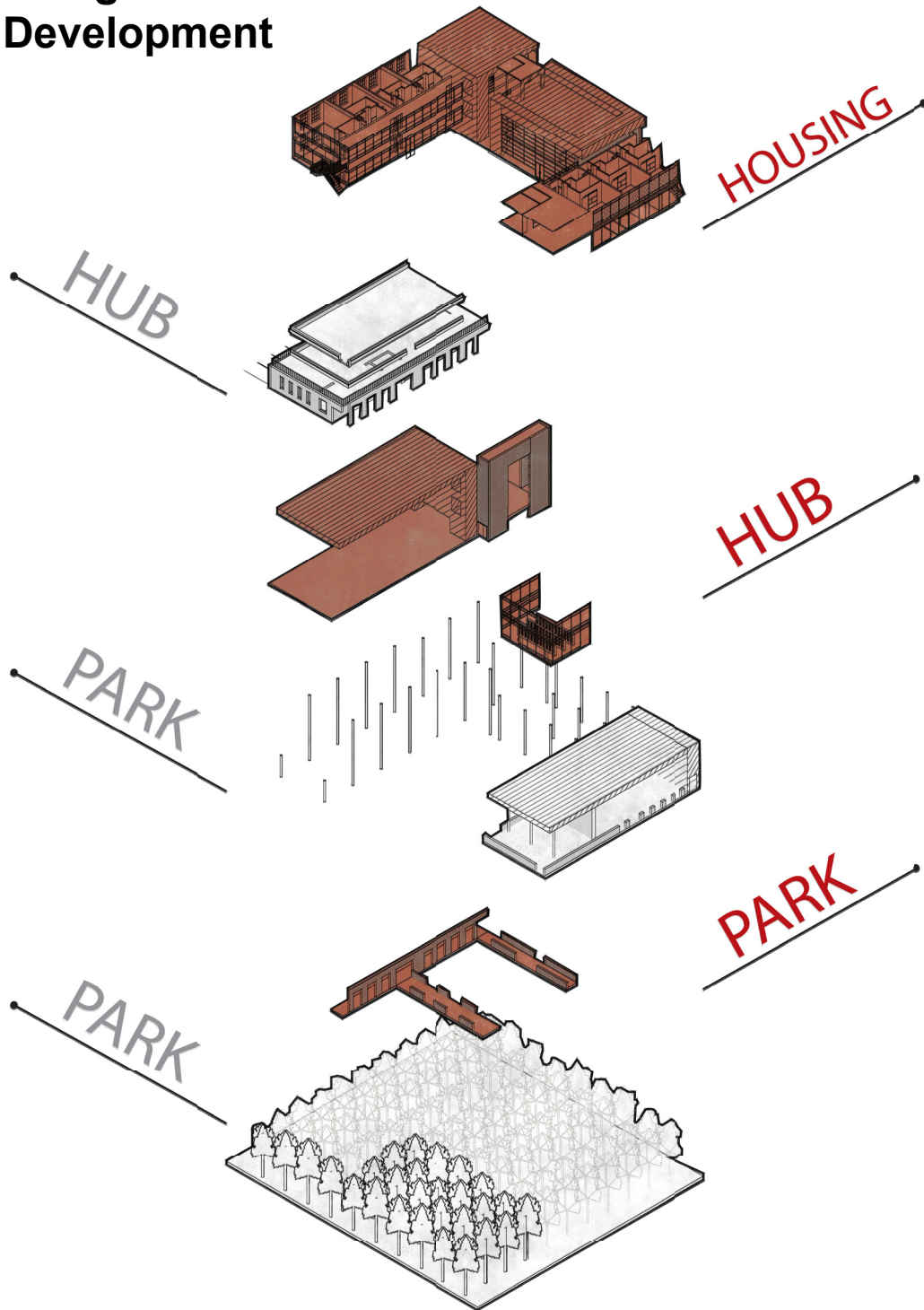


*Transitional Spaces: examples of stages of development and how program can adapt to the growth of the site. In this illustration the steel frame of the restaurant building is used as part of a community art installation.*



*Study of the phased development of the South wing*

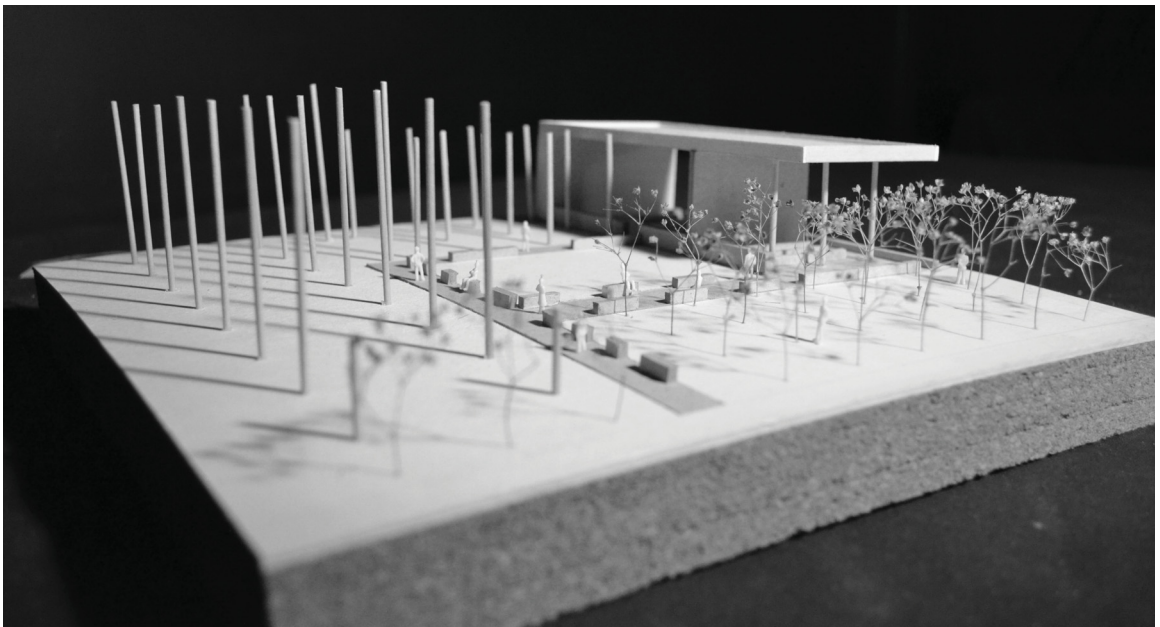
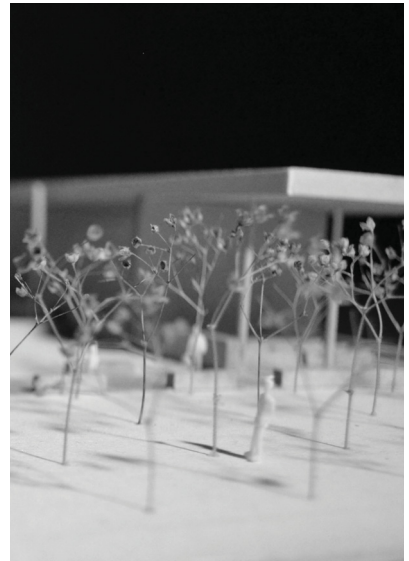
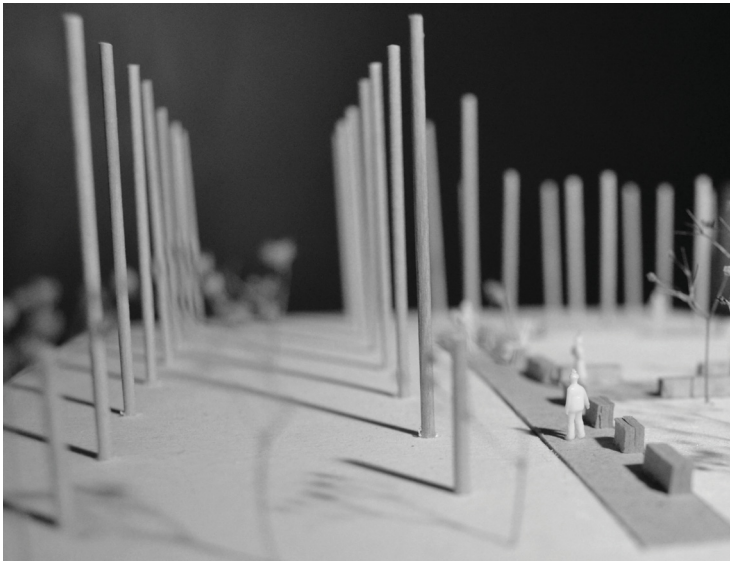
# Design Development



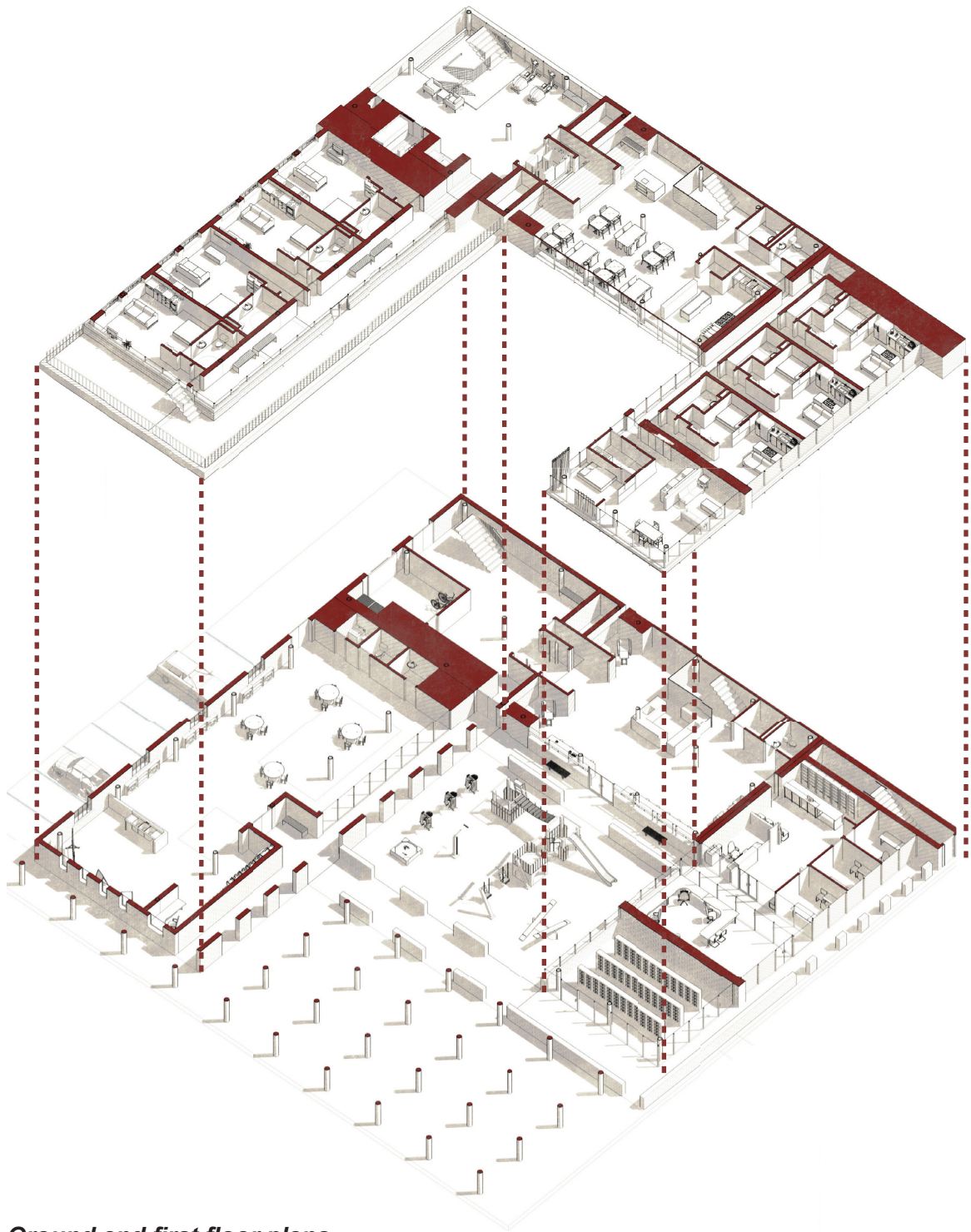
## ***Exploded phased axonometric***

*Diagram showing building elements and the phase in which they were introduced.*





*Stages from the 'Park' phase*



### **Ground and first floor plans**

*The ground floor is made up of large open spaces for mixing people and activities. The first floor features a restaurant located between two residential wings.*

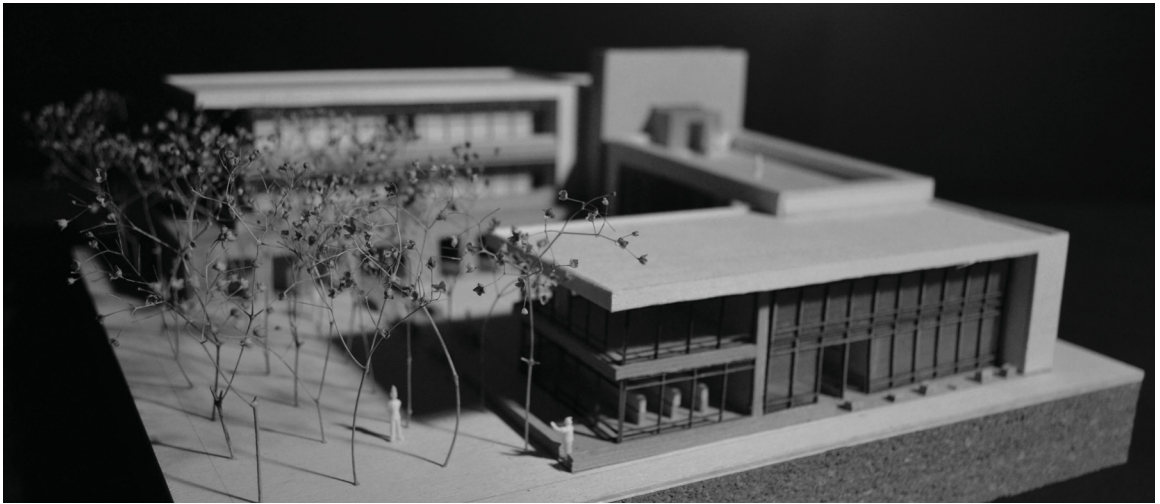
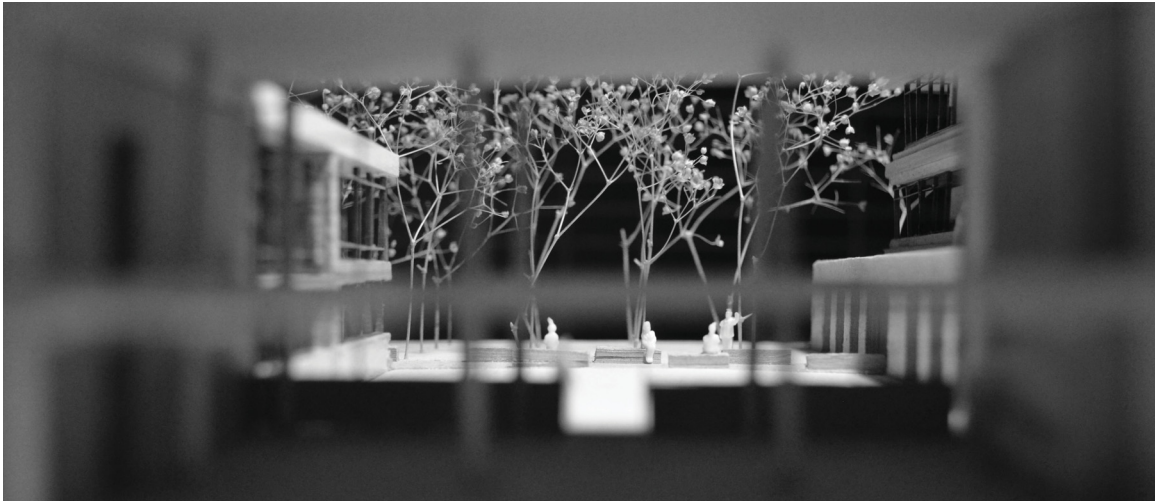


*Stages from the 'Hub' phase*

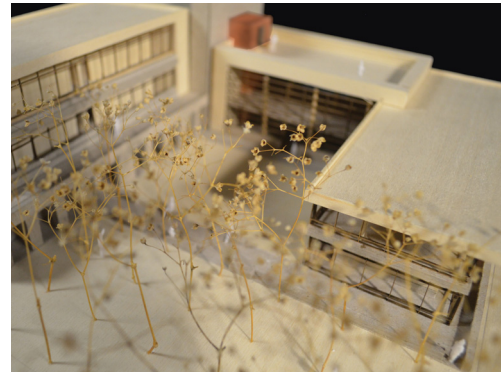
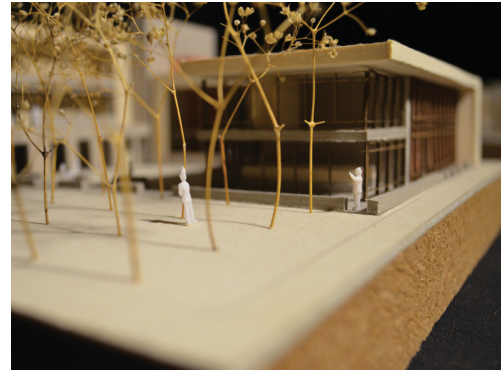
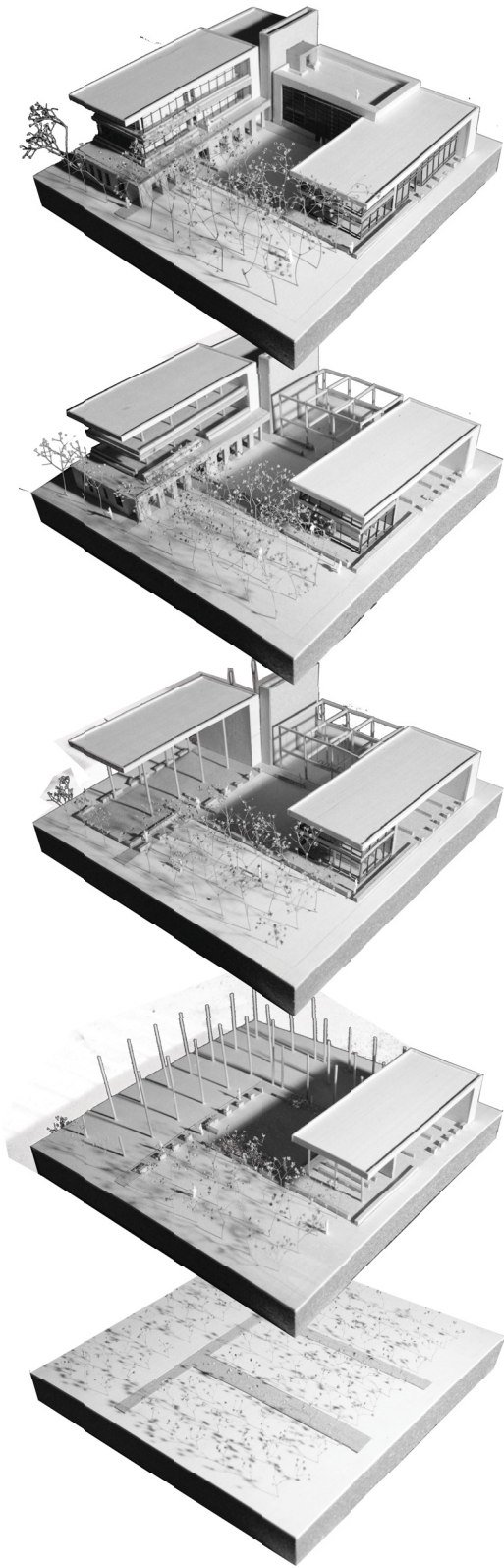


**North/South section**

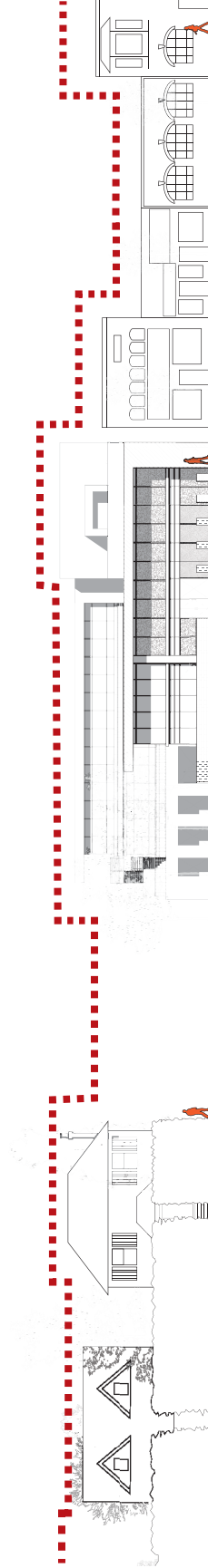
*Section illustrates the protected courtyard playground and relationship of private and public spaces.*



*The 'Housing' phase*



*Phases from park to housing*



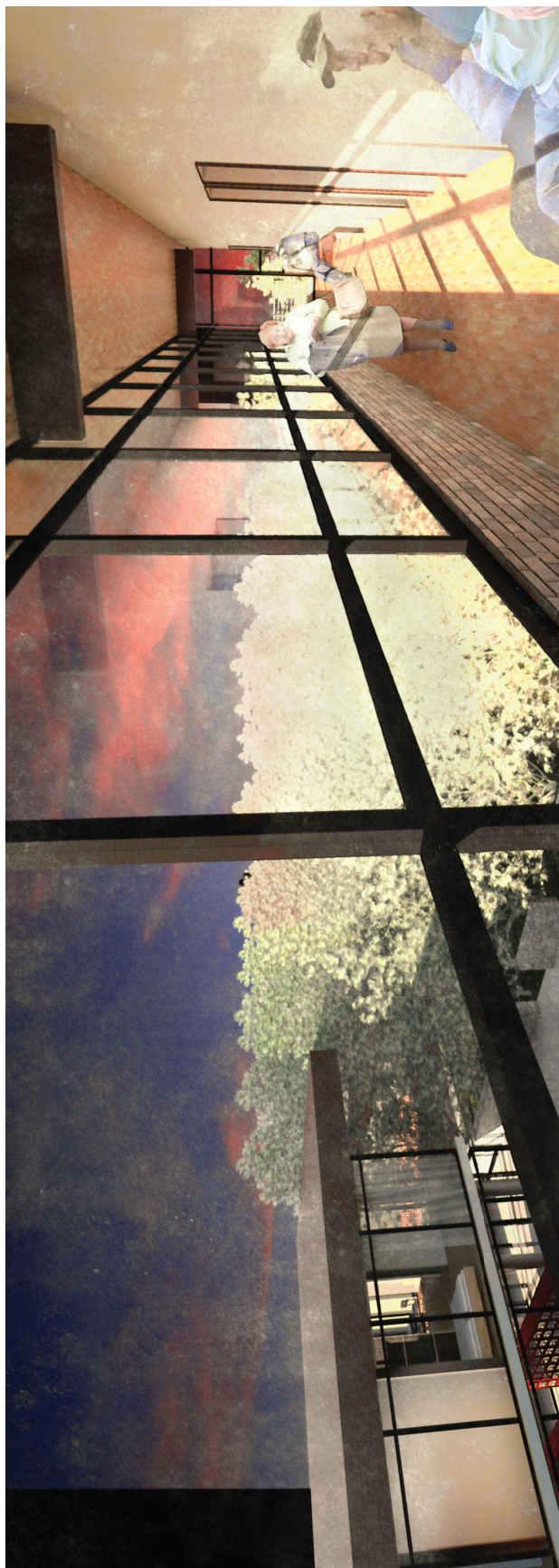
**41st avenue elevation**

*The new building respects the scale of the neighborhood to maintain a residential feel.*



*Lunch at the café*

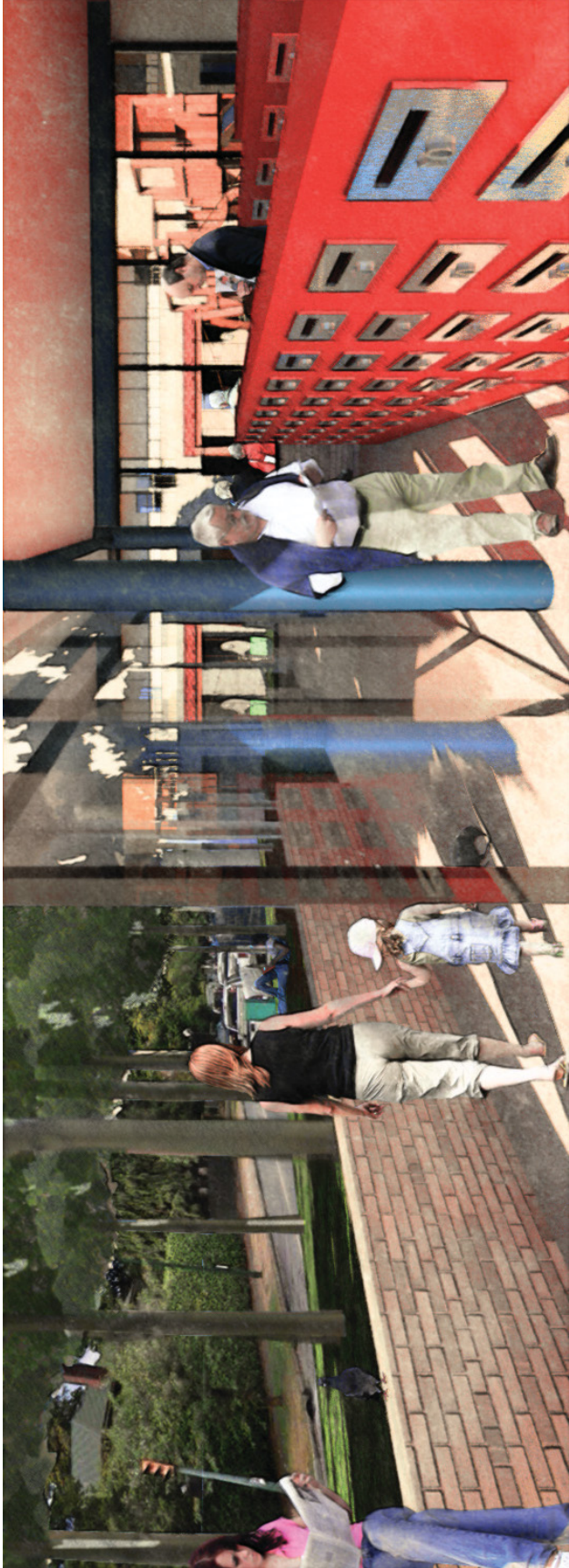




*Morning in the North wing*



*Volunteering at the daycare*



*Grabbing the mail after lunch*

## CHAPTER 3: CONCLUSION

This thesis was motivated by a previous studio designing a palliative care residence in Glasgow, UK. The project led to an interest in senior housing, and subsequently my choice of thesis topic. What was originally intended as a small scale project though, changed significantly after a visit to an old, and now derelict, childhood hang-out.

By choosing a vacant service station lot for a housing development the thesis' scope quickly expanded as opportunities from these lot types became apparent. The quantity and characteristics of these sites lend themselves to a network approach and the phased growth allows the community to take ownership of the site and influence its development.

Not surprisingly this incremental development also creates some design obstacles, specifically with construction sequencing and program development. The challenge is in producing unique, usable spaces, which then can be added to every few years, while maintaining both a uniqueness with each iteration and a cohesiveness in the final design. Although I abandoned prefab modular building fairly early on in favour of a more context based design, looking back I wonder if prefab might have offered the solution. As a development strategy based on a "kit-of-parts" programming, prefab components seem practical but I think that careful attention would have to be paid to ensure that the buildings' local identity would not be compromised by the lure of increasing economies of scale.

In researching the idea of incremental building growth I am now curious about how it could be applied in a broad range of contexts to allow projects to adjust to changing levels of user demand. Additionally, I am eager to continue to explore new strategies for senior housing as alternatives to "traditional" typologies. I think that new ideas about public and private space, and the community and the individual, could help shape and be shaped by future housing design.

As average life expectancy continues to climb, people will soon be spending nearly half their lives as "seniors". With these impending demographic shifts, public perceptions of what it is to be a senior will start to change as well. Architects working in the coming decades have a unique opportunity to help support and shape this change and in doing help build a less insular and more inclusive society.

## **APPENDIX**

The following is a rough feasibility report. For the sake of simplicity it is only concerned with the break-even density of the residential component of the development. Density is based on a 50:50 ratio of market-priced to affordable units. In this example a non-profit developer "VanHomes" is proposing the development.

# Preliminary Market Research

## Resident Demographics

Research shows that **46%** of tenant households spend more than **30%** of their household income on shelter costs.

Average average monthly shelter costs for rented dwellings is over **\$1000/mnth.**

Quintiles 1 and 2 can **not afford** those levels of shelter costs.

Total Population by quintile of adjusted after-tax family income Vancouver City 2010	Total
1st Quintile	155,625
2nd	96,960
3rd	97,310
4th	100,970
5th	139,345
Total	590,210

National Household Survey Vancouver CY

Shelter Costs Vancouver City	Total
Total number of households	263,590
Spending less than 30% of household income on shelter costs	164,140
Spending 30% or more of household income on shelter costs	99,450
Spending 30% to less than 100% of HI on shelter costs	74,475
Number of tenant households	136,135
% of tenant households in subsidized housing	14%
<b>% of tenant households spending more than 30% of HI on shelter</b>	<b>46%</b>
Median monthly shelter costs for rented dwellings	\$1004
Average monthly shelter costs for rented dwellings	\$1089

National Household Survey Vancouver CY

Includes economic families of two persons or more and unattached individuals		
BC	Average Total Income 2011	30% of income (rental allowance/yr)
		Max affordable rent/month
Quintile 1	\$13,800	\$4,140
Quintile 2	32,500	9,750
Quintile 3	54,500	16,350
Quintile 4	86,500	25,950
Quintile 5	166,700	50,010

<http://www5.statcan.gc.ca/cansim/047/202-0701>

# Preliminary Market Research

## Resident Demographics

### Choice of unit type: 1 Bedroom

- Vacancy rates below 2%
- Majority of seniors are single
- Unit type large enough to have guest and family members for short stays

1.1.2 Private Apartment Average Rent (\$) by zone and bedroom type (OCT/13)

Zone	Bachelor	1 BDR	2 BDR	3BDR+	Total
<b>City of Vancouver 1-10</b>	<b>917</b>	<b>1090</b>	<b>1541</b>	<b>1964</b>	<b>1144</b>
West End 1	938	1188	1863	3004	1239
English Bay 2	951	1172	1715	2452	1202
Downtown 3	996	1222	1811	2590	1246
South Granville 4	908	1140	1610	2005	1193
Kitsilano 5	907	1140	1620	2321	1205
<b>Westside 6</b>	<b>857</b>	<b>1124</b>	<b>1731</b>	<b>2503</b>	<b>1335</b>
Marpole 7	748	850	1122	1196	889
Mount Pleasant 8	879	948	1275	1459	997
East Hastings 9	816	893	1179	1340	926
Southeast Vancouver 10	862	955	1282	1262	1058

(MHC Rental Market Report Vancouver and Abbotsford)

1.1.1 Private Apartment Vacancy Rates (%) by zone and bedroom type (OCT/13)

Zone	Bachelor	1 BDR	2 BDR	3BDR+	Total
<b>City of Vancouver 1-10</b>	<b>0.9</b>	<b>1.1</b>	<b>1.0</b>	<b>0.6</b>	<b>1.0</b>
West End 1	1.1	0.7	1.3	0.0	0.8
English Bay 2	0.3	0.8	0.6	0.0	0.7
Downtown 3	0.9	1.1	0.9	2.1	1.0
South Granville 4	1.5	1.1	0.7	**	1.1
Kitsilano 5	0.6	0.7	1.0	0.0	0.8
<b>Westside 6</b>	<b>0.0</b>	<b>1.2</b>	<b>1.0</b>	<b>0.0</b>	<b>1.0</b>
Marpole 7	0.9	2.5	3.0	0.0	2.4
Mount Pleasant 8	0.4	0.4	0.7	0.0	0.4
East Hastings 9	1.4	1.5	0.9	**	1.4
Southeast Vancouver 10	1.0	2.2	0.5	0.0	1.5

(MHC Rental Market Report Vancouver and Abbotsford)

1.1.3 Number of Private Apartment Units in the Universe by Zone and Bedroom Type by zone and bedroom type (OCT/13)

Zone	Bachelor	1 BDR	2 BDR	3BDR+	Total
<b>City of Vancouver 1-10</b>	<b>8490</b>	<b>37648</b>	<b>8935</b>	<b>538</b>	<b>55,611</b>
West End 1	716	2645	477	39	3877
English Bay 2	873	5146	686	27	6732
Downtown 3	2170	6770	1147	41	10,128
South Granville 4	1294	4823	1397	56	7570
Kitsilano 5	861	4929	1280	46	7116
<b>Westside 6</b>	<b>204</b>	<b>1718</b>	<b>929</b>	<b>98</b>	<b>2949</b>
Marpole 7	374	2900	716	22	4012
Mount Pleasant 8	953	4307	936	81	6277
East Hastings 9	827	3279	743	71	4920
Southeast Vancouver 10	218	1131	624	57	2030

(MHC Rental Market Report Vancouver and Abbotsford)

# Preliminary Market Research

## Conclusions

### Development Housing Objectives

Establish an economically sustainable housing development that provides assisted senior housing at 50:50 ratio of market-priced to affordable.

Affordable units will be offered under the 30%, 70% shelter-to-income-ratio for assisted living units and supportive living units respectively.

### Preliminary Costing Study

#### Soft Costs

- Marketing
- Taxes
- Finance Charges
- Insurance
- Interest Payments
- General Administration
- Legal Fees
- Real estate commissions and fees
- Design fees,
- Property Management fees
- Engineering
- Other Consultants
- Geotechnical fees
- Survey fees
- Sewage and water connection fees
- Equipment rental fees
- Parking Consultants
- Market Consultants

#### Hard Costs

- Construction contract (Labour, materials, equipment, mech and electrical services etc....
- Land Acquisition Costs
- Broker fees
- Permits
- Title fees
- Property assessment fees
- Furniture, Fixtures and Equipment
- Tables, desks, chairs, computers etc..
- Tenant Improvements
- Paying for items specific to certain tenants
- for example if one tenant wants different windows or carpet etc...



# Costing Breakdown

## Construction Costs

**PROJECT SQF:**

7000

**CONSTRUCTION COST:**

\$1,170,000

**TOTAL SOFT COSTS**

\$530,000

**TOTAL MORTGAGE AMOUNT:**

\$1,775,000

**CONSTRUCTION MORTGAGE:**

\$3,750/month

**MORTGAGE:**

\$7,500/month

Construction Cost:		1-3 Story Apt	\$
RsMeansCalc Medium			1,260,500
By SQF	\$175		1,225,000
Rough Estimate:			1,300,000
Credit Existing Foundation/Excavation Costs			
(10% of Total Cost)			-130,000
<b>Final Estimate:</b>			<b>\$ 1,170,000</b>

Project SQF:	7000
Total Number of Units:	<u>12</u>

	Market Priced	Affordable	Total
Assisted	4	4	8
Regular	2	2	4

Median Senior Income:	\$	23,270
-----------------------	----	--------

Affordable Max Rent for Seniors in Assisted Living (70% of income)	\$	1,357
Affordable Max Rent for Seniors Economic Rent	\$	582
Market Rate for a 1BDR Westside Zone	\$	756
Market Rate for a 1BDR Assisted Living	\$	1,124
	\$	1,900

Mortgage on Final Cost to VHNP per month:	\$	7,500
Construction Mortgage (1/2 full amount)	\$	3,750

# Costing Breakdown

## Construction Costs

### UNIT BREAKDOWN:

- 2 Market Priced Assisted
- 4 Market Priced Supportive
- 2 Affordable Assisted
- 4 Affordable Supportive
- Total of 12 Units

### RENTAL PRICES:

- Market Priced Assisted = \$1900.00
- Market Priced Regular = \$1125.00
- Affordable Assisted = \$1350.00
- Affordable Assisted = \$580.00
- Total of 12 Units

### Soft Cost Calculations: 18 Unit Building at 41st and Larch

<b>Financing and Insurance:</b>	<b>\$ 47,400</b>
Mortgage Application Fee \$200/unit	2,400
Interest During Construction (mortgage x 12 months)	45,000
<b>Site Related Soft Costs:</b>	<b>\$ 1,000</b>
Deed Transfer Tax (Bc Govt Paid)	-
Title Search (Bc Govt Paid)	-
Site Survey (Bc Govt Paid)	-
Phase 3 Environmental (Bc Govt Paid)	1,000
Demolition (Bc Govt Paid)	-
<b>Professional Fees:</b>	<b>\$ 478,800</b>
Architect (Rs Means)	126,000
Engineer (25% of Architect Fee)	31,500
Legal (0.5% of Architect Fee)	6,300
Contractor Overhead and Profit (Rs Means)	315,000
<b>Municipal Fees and Charges:</b>	<b>\$ -</b>
Property Taxes During Construction (waived)	-
Demolition Permit (waived)	-
Municipal Building Permit (waived)	-
<b>VanHouseNonProfit Costs:</b>	<b>\$ 3,000</b>
Administration Fee	3,000
<b>Contingency</b>	<b>\$ 10,000</b>
<b>Total Soft Costs Including Contingency</b>	<b>\$ 527,275</b>

# Costing Breakdown

## Construction Costs

### BC HOUSING ENDOWMENT:

\$15,000 grant per unit  
12 Units  
\$180,000 Savings

### M.I.L.P, Housing-Related Infrastructure:

Mortgage rate at 0.5% over  
Canada Bond Rate (1.5%)

### TOTAL EXPENSES/MONTH

Assisted Units = \$1150  
Regular Units = \$675

### RENTAL PRICES:

Market Priced Assisted = \$1900.00  
Market Priced Regular = \$1124.00  
Affordable Assisted = \$1350.00  
Affordable Assisted = \$580.00

Total of 12 Units

Mortgage/Rent Calculations: 18 Unit Building at 41st and Larch	
Construction Cost	\$ 1,300,000
Soft Costs from Above	\$ 527,275
Land Costs (Contributed by BCGovt)	-
Fridges and Stoves (#Units x \$1000)	\$ 12,000
<b>Sub-Total</b>	<b>\$ 1,839,275</b>
Plus GST at 5% on applicable costs	\$ 91,964
<b>Revised Sub-Total</b>	<b>\$ 1,931,239</b>
Less 100% Rebate to GST as a commercial Product	-\$ 91,964
	<b>\$ 1,839,275</b>
Less 15k per unit (Bc Housing Endowment)	-\$ 180,000
	<b>\$ 1,659,275</b>
Plus GST/2 - 50% Rebate to HCH as a Non-Profit Society	\$ 41,482
	<b>\$ 1,700,757</b>
<b>Cost to VHNC</b>	<b>\$ 68,465</b>
Change of Occupancy	\$ 50
Legal (title search)	\$ 500
Disbursements	\$ 300
Deed transfer tax @ 1% of sale price	\$ 16,593
Mortgage Application Fee @ 1% of mortgage amt	\$ 17,008
Mortgage Insurance Fee @2% of mortgage amt	\$ 34,015
	<b>\$ 1,769,222</b>
<b>Total Mortgage Amount (Cost to VHNC + Closing Costs)</b>	<b>\$ 1,769,222</b>
Mortgage/month at 2% for 25yrs on M.I.L.P. low interest	\$ 7,500
Average Mortgage Cost/Unit	\$ 625.00
Ave. Monthly Operating Costs/Unit	\$ 435.04
Supportive Assisted	\$ 537.00
	\$ 237.00
	<b>\$ 1,162</b>
Total Expenses/Supportive Unit/Month ("Economic Rent")	<b>\$ 672</b>
Total Expenses/Assisted Unit/Month ("Economic Rent")	<b>\$ 672</b>

# Costing Breakdown

## Construction Costs

**TOTAL GROSS EFFECTIVE RENT:**

\$200,000

**TOTAL OPERATING EXPENSES:**

(\$65,000)

**DEBT SERVICE:**

(\$90,000)

**NET OPERATING INCOME**

**\$45,000**

<u>VHNP Annual Income VS Expenses: 18 Unit Building @ 41st and Larch</u>	
<b>Annual Income:</b>	
Gross Rental Market Priced	\$ 118,176
Regular (2 units)	\$ 26,976
Assisted (2 units)	\$ 91,200
Gross Rental Income Affordable	\$ 79,118
Regular (4 units)	\$ 13,962
Assisted (4 units)	\$ 65,156
Less Vacancy Allowance at 5%	-\$ 9,865
<b>Total Gross Effective Rent</b>	<b>\$ 197,294</b>
<b>Annual Expenses:</b>	
Taxes	\$ 6,705
Utilities	\$ 3,000
Insurance (\$38/unit/month)	\$ 6,384
Water (\$19/unit/month)	\$ 3,192
Garbage Removal	\$ 1,000
Maintenance/Overhead	\$ 9,865
Meal Contract with Community Station Restaurant	\$ 28,500
Replacement Reserves	\$ 3,000
Other	\$ 1,000
<b>Total Operating Expenses</b>	<b>\$ 62,646</b>
<b>Net Cash Flow: TGER - TOE</b>	<b>\$ 134,648</b>
<b>Debt Service: mortgage x 12</b>	<b>\$ 90,000</b>
<b>Total Expenses: TOE + Debt Service</b>	<b>\$ 152,646</b>
<b>Net Operating Income: GER - TE</b>	<b>\$ 44,648</b>

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