Urban Resilience:
Re-Designing Existing Architecture for
the Community of Maynard Lake

by

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Submitted in partial fulfilment of the requirements
for the degree of Master of Architecture

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DALHOUSIE UNIVERSITY

SCHOOL OF ARCHITECTURE

The undersigned hereby certify that they have read and recommend to the Faculty of Graduate Studies for acceptance a thesis entitled "Urban Resilience: Re-Designing Existing Architecture for the Community of Maynard Lake" by Caroline Howes in partial fulfilment of the requirements for the degree of Master of Architecture.

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ABSTRACT

This thesis proposes the renovation of existing rental units in ten low-rise apartment buildings in order to foster urban and ecological resilience. Existing ex-military apartments on the north shore of Maynard Lake in Dartmouth, Nova Scotia, Canada are adapted through strategic additions and subtractions to create a gradient of spaces: from private to communal to public. The site is conceived as an urban threshold to the lake, organized around new communal amenity spaces for the inhabitants and new diverse mixed-use spaces for the public. At the heart of the project lies the design strategy of effecting big change in the quality of existing space through small interventions. Relatively low-cost incremental design moves transform bleak and alienating spaces into livable places where renters will benefit from the support of their community.

ACKNOWLEDGEMENTS

CHAPTER 1: INTRODUCTION

In the capitalist world view, development is seen as the path leading to utopia. This linear idea is beginning to crumble in the contemporary world; we are realizing that our resources are finite and rapidly diminishing. Post-development theory provides an alternative to the linear ideas of development. In post-development theory, change is cyclical and regenerative, not singular and abrupt like the modernist tabula rasa. Ideas of re-use and adaptability are gaining momentum, particularly in the work of John Habraken, who generated the term "open building" to describe open-ended, adaptable architecture. In addition, a report by the National Trust for Historic Preservation has shown, through life-cycle analysis, that retrofitting existing buildings instead of demolition and new construction can greatly reduce environmental impacts such as emissions, energy consumption, and resource depletion. New construction can take ten to eighty years to offset the initial impacts of demolition and construction.[1] Therefore, the re-use of existing buildings, through renovation, retrofitting, or adaptive re-use, is a viable option for saving energy and resources. Adaptable architecture enables building re-use by providing room for change. Adaptability also fosters a resilient urban fabric that can change and regenerate easily, without necessarily undergoing periods of intense decay or abandonment. All buildings hold the potential for adaptation; additions and renovations are particularly common in residential architecture. The renovation of

UTOPIA

the present

Development

cyclical regeneration
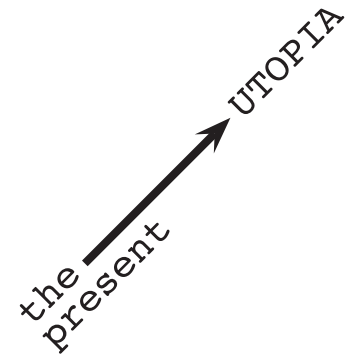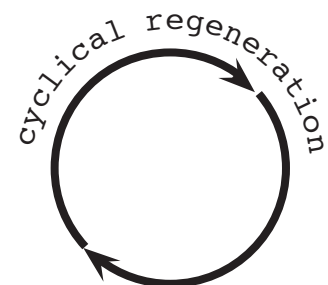
Post-development

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1. Preservation Green Lab, *The Greenest Building: Quantifying the Environmental Value of Building Reuse* (Washington: the National Trust for Historic Preservation, 2011), vi.

low-income housing by Lucien Kroll demonstrates the possibilities offered by renovation rather than demolition and the importance of good quality housing for rental tenants.[2]

The three-storey brick walk-up apartment is a common residential type across Canada. The Lakefront Apartments in Dartmouth, Nova Scotia were built for the military following the Second World War. The buildings are now falling into disrepair and decay, a state not uncommon in Dartmouth. The city of Dartmouth was founded in 1750 to supply resources to the British Navy and to Halifax. The abundance of fresh water in Dartmouth was a major reason for its founding. There are twenty-five lakes within the current city limits, but the landscape of lakes is not reflected in the architecture of the city. The sprawling suburbs could be found anywhere in Canada. In this thesis, I examine how existing walk-up apartments on the shore of a Dartmouth lake can be redesigned to become an adaptable and resilient part of the neighbourhood, connecting the apartments to the city, and the city to the lake. I am interested in testing how small change can have a big effect on the quality of existing space. Theories of adaptability, urban ecology, and identity are important to frame how the existing conditions might be adapted.

Thesis Question

How can existing apartment buildings be adapted in order to foster urban and ecological resilience and diversity?

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2. Lucien Kroll, *Lucien Kroll: Buildings and Projects* (New York: Rizzoli, 1987), 5.

CHAPTER 2: ADAPTABLE ARCHITECTURE AND URBAN RESILIENCE

Theories of Adaptability

The existing research on adaptable architecture can be categorized into three main approaches: architecture as an organism in a state of constant renewal; architecture as a series of layers that change at different rates, depending upon typology; and architecture as a framework of patterns within which elements constantly change. All of the approaches are based on the post-development idea that change is cyclical and regenerative rather than linear progress towards a final state.

Stewart Brand has developed a theory of adaptable architecture by examining photos of buildings over many years and drawing out the causes and effects of the visible changes. General trends become apparent through the analysis of particular examples. Brand describes adaptable architecture as a series of layers – site, structure, skin, space plan, stuff – that change at different rates.[3] The typology of the building plays a major role in the speed at which it changes. Commercial buildings change the fastest because of the changing nature of industry, while residential buildings change more slowly. Institutional buildings change at the slowest rate because they are designed for a very specific use.[4] The more generic a building, the more it can change. The generic nature of the brick walk-up presents ample opportunity for change.

3. Stewart Brand, *How Buildings Learn: What Happens After They're Built* (New York: Penguin, 1994), 13.
4. Ibid., 7.

In order to create adaptable buildings, Brand proposes what he calls "scenario planning". Scenario planning is a method of generating strategies by examining the driving forces in a situation, and imagining future scenarios. The best strategy might be the one that fits most scenarios or the one that can be changed most easily. Scenario planning offers a method of testing architecture within definite parameters, such as economic or environmental. Brand's method doesn't necessarily recognize the importance of the qualities of space. It is important to consider the architectural quality of each scenario. Generic buildings may adapt most easily, but do they make their inhabitants happy? A balance between the specific and the generic, between identity and adaptability must be sought, a balance I propose to seek through diversity.

Trained as a biologist, Brand sees identity and diversity as qualities that grow over time. Adaptable architecture is more likely to generate these qualities that make urban life vibrant. Brand does not examine adaptability at a large scale, but the idea of urban resilience can be inferred from the particular architectural examples he cites. Buildings that change constantly at different scales and rates in a method akin to fractal geometry are, in his opinion, the most pleasing to their users.[5]

Benoit Mendelbrot, inventor of the term "fractal," uses the terms "scalebound" and "scaling" in order to explain fractal relationships in architecture and design.[6] Scalebound objects have few elements of a distinct scale. Mendelbrot

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5. Ibid., 208.
6. Benoit Mendelbrot, "Scalebound or Scaling Shapes: A Useful Distinction in the Visual Arts and in the Natural Sciences," *Leonardo* 14, no. 1 (1981): 45-47.

cites the architecture of Mies van der Rohe as an example of scalebound architecture. Often, his buildings were characterized by single repetitive elements, such as the size of a window bay or the structural grid. In opposition to the scalebound, scaling objects are composed of a multitude of different elements at an infinite variety of scales. The Paris Opera House fits such a description for Mendelbrot. For Brand, adaptable architecture would have to be scaling in order to change at different rates and different scales. Scaling architecture promotes diversity and complexity. Following the biological viewpoint, Mandelbrot writes that most objects in nature are scaling, though some scalebound objects do exist, such as crystal formations. Scaling architecture is more likely to function in methods akin to biological processes.

N.J. Habraken also approaches adaptable architecture from a biological viewpoint. To Habraken, architecture and the built environment are organic, in a constant state of change and renewal. In order to understand change and to design suitable architectural solutions, Habraken believes one must study the patterns that control change. Habraken's term "open building" describes open-ended designs that adapt over time.[7] Much like Brand's changing layers that make up a building, Habraken's adaptive building is composed of autonomous systems and patterns rather than vertically-integrated, centralized systems. Environments must be cultivated through understanding structures of control and hierarchy, not invented based on ideology. In applying the
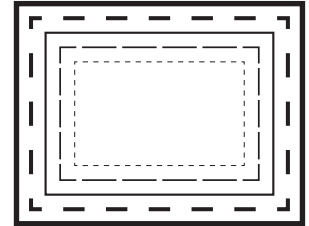
Brand's layers
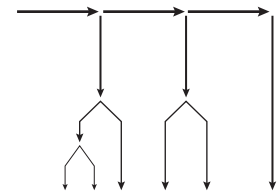
Habraken's hierarchies
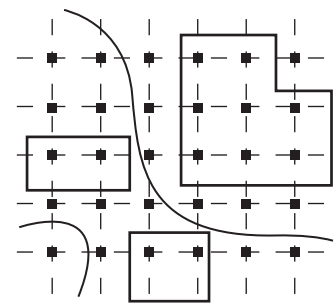
Hester's framework

7. N.J Habraken, *The Structure of the Ordinary: Form and Control in the Built Environment* (Cambridge: MIT Press, 1998), xvi.

concept of autonomous systems to my study of Dartmouth, I chose to overlap data on local demographics and amenities, the ecosystem of the lake, and the Maritime climate.

Following in the biological vein, Randolph Hester sees architecture as intrinsically part of natural ecologies. Biological processes should be used as models for resilient urban spaces. For Hester, adaptable architecture can be created by developing an overall guiding framework and allowing change to happen within the framework.[8] The framework provides the intention that holds all subsequent changes together. Like Brand, Hester believes that adaptable architecture should be fractal, or scaling in Mendelbrot's terms, and must be able to change at all scales, and at different rates.

At the urban scale, Hester proposes the concept of resilience as a matter of local diversity. He writes, "The more everyday necessities that are provided – including local food production, industrial fabrication of everyday hardware, and salvage yards for recycled products for household repair – the more resilient the neighborhood will be."[9] The ecology of an urban environment is healthy when it is able to withstand shocks, and when it is able to change. Diversity offers room for change.

Through his research, Hester found a number of architectural types that are especially adaptable. The courtyard scheme, live/work spaces, and cloister gardens are able to change more easily, according to Hester, because the organization of
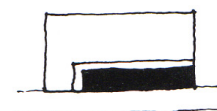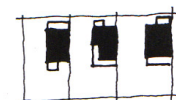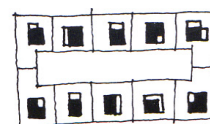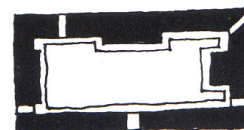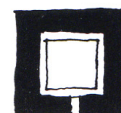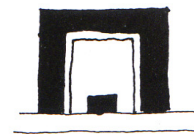
Hester's adaptable typologies, from Hester, *Design for Ecological Democracy*

8. Randolph Hester, *Design for Ecological Democracy* (Cambridge: MIT Press, 2010), 263.

9. Ibid., 192.

the spaces includes landscape as well as interior spaces.[10] Different layers between inside and outside create versatile, multipurpose space by allowing flexibility between interior and exterior.

Jane Jacobs has analyzed the elements of a successful neighbourhood in a city, and how neighbourhoods decline and regenerate. As a forerunner to Brand and Habraken, Jacobs offers tactics for understanding cities as organisms rather than human-controlled machines. By using direct examples and working from the particular to the general, Jacobs is able to grasp concepts not easily quantifiable. I adopted Jacobs' method of working from the particular to the general because I believe that diversity can be generated in this manner.

Lucien Kroll is a Belgian architect who was called upon by the government to find a way to renovate rather than demolish publicly-owned, low-income apartment buildings in varying states of decay. Kroll determined the appropriate adaptations by studying the needs of the inhabitants. For example, the Perseigne housing complex, built in the 1960s, was re-designed by Kroll. Located in Alençon, France, Perseigne was in a state of decay, both physically and socially, when local councillors hired a sociologist to live on site to determine the main issues. Following months of study, the sociologist determined the key problems: "the dwellings must be rehabilitated, public spaces are empty and monotonous, social life is wilting for lack of support."[11] Kroll and his studio were hired by the municipality to listen to the inhabitants, imagine the district in twenty-five years, and

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10. Ibid., 262.

11. Lucien Kroll, "Alençon: The Impossible Rehabilitation of Perseigne," *Architectural Association Quarterly* 13 (1982): 16.

plan projects that could be realized by a number of different architects.[12] Kroll began by asking the tenants what they didn't like about the area. After many public consultations, Kroll was able to create a design proposal that would address the sum of the concerns expressed by the inhabitants:

> What we wanted were more compact peripheral areas, parks, pedestrian thoroughfares through the district, personal initiative, work, colors, a new secondary school for 600 pupils, a house for children, a yard for the handicrafts, a communal hall, small gardens, and offices... We planned a compact cityscape, full of surprises, which lives from within, and shows it.[13]
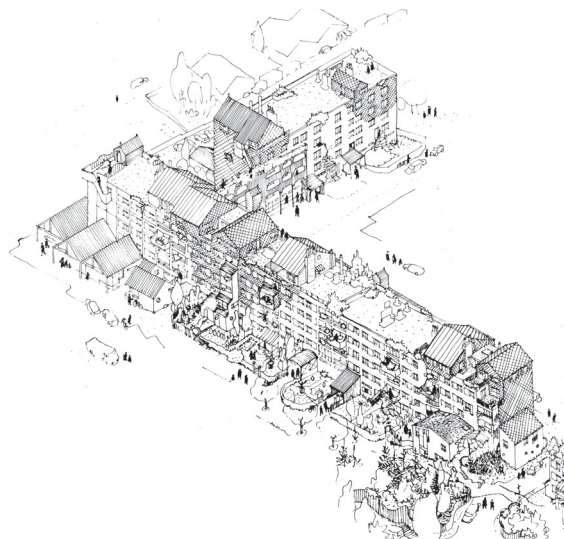
From Kroll, *Lucien Kroll: Buildings and Projects*

Kroll's sketches reflect his desire for an architectural mosaic. From Kroll, *Lucien Kroll: Buildings and Projects*

In his renovation work, Kroll consulted tenants to solve problems with existing buildings and public spaces. The ecologies of the site also play a role in improving private and public spaces, and in generating diversity and complexity.
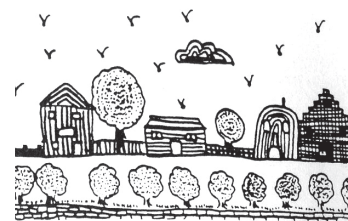
Kroll's drawing representing diversity. From Kroll, *An Architecture of Complexity*

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12. Ibid., 17.

13 Lucien Kroll, *Lucien Kroll: Buildings and Projects* (New York: Rizzoli, 1987), 102.

Urban Ecology

> Modern man does not experience himself as a part of nature but as an outside force destined to dominate and conquer it. He even talks of a battle with nature, forgetting that, if he won the battle, he would find himself on the losing side.[14]

There is much written on ideas of urban ecology and the relationship between built form and natural form. The landscape architect Michael Hough believes that buildings must exist symbiotically with the natural landscape in a multi-functional, productive manner. To Hough, parks that have traditionally been used only for recreation will have to take on a multitude of other roles to deal with the needs of the city in the future. In Dartmouth, a city of lakes and parks, the productive potential for working landscapes is very great indeed.

In his holistic approach to urban design, Hough sets out a number of design principles including the acceptance of process and change, a focus on economy of means, the idea of diversity as being necessary for social and environmental health, and the idea that human process and natural process must be fundamentally and fully integrated.[15] Hough is interested in making connections between seemingly disparate elements in order to create a symbiotic system. His strategies and principles form a useful framework for developing integrated site systems that increase diversity and create multi-functional landscapes. These ideas of diversity fit naturally with urban resilience.

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14. E.F. Schumacher, *Small is Beautiful: A Study of Economics as if People Mattered* (London: Abacus, 1974), 11.
15. Michael Hough, *City Form and Natural Processes: Towards a New Urban Vernacular* (New York: Van Nostrand, 1984), 25.

Frank Egler is also interested in holistic environments. To Egler, the natural and human world cannot be separated; ecosystems have no beginning or end, but rather encompass vegetated areas as well as built-up urban areas.[16] The stance of this thesis is aligned with Egler's position. This shift in perception is intended to generate ideas of how buildings can be beneficial elements of an ecosystem, and how this can affect public space.

Community and Identity

> Just as the home reflects in its shape the rhythm and extent of family life, so the commons are the trace of the commonality. There can be no dwelling without its commons.[17]

People need to be part of a community, something that has become harder in the car-oriented suburban world. Dartmouth is a city designed around the car, not the pedestrian, and as a result, many neighbourhoods lack inhabitable public space. How can comfortable, inviting, and inhabitable public space be created in this environment?

Christopher Alexander has studied the patterns that create good, livable spaces. *A Pattern Language* is a compendium of architectural moves that can be used in different combinations to generate desirable spaces. Alexander works from the perspective of the inhabitant, capturing the patterns of built form through haptic descriptions as well as technical criteria. I have adopted the point of view of the inhabitant in this thesis in order to generate changes from the small scale to the large scale. Beginning with private

16. Frank E. Egler, *The Nature of Vegetation, Its Management and Mismanagement: An Introduction to Vegetation Science* (Norfolk, Conn: Aton Forest, 1977).

17. Ivan Illich, *In the Mirror of the Past: Lectures and Addresses, 1978-1990* (New York: Marion Boyars, 1992), 59.

spaces of the inhabitant, this thesis moves to communal and public spaces shared by inhabitant and visitor. The design of communal and public spaces was informed by the principles of cohousing.

Cohousing is a form of urban design in which dwellings are grouped together around a communal space in order to promote human interaction and social activity. Originating in Scandinavia, cohousing allows inhabitants to choose a balance between private and communal activities. Cohousing is not based on a common ideology or set of beliefs shared by the inhabitants; it is simply a method of consciously creating what was once created unconsciously: community.[18] The design process is participatory, meaning that the future inhabitants are involved in order to achieve a successful design. It is therefore not a strategy that can be applied to a large-scale existing set of apartment buildings, as is the site for this proposal.

Nevertheless, ideas of how to design shared spaces that have been developed through the study of cohousing are extremely useful in residential design. McCamant and Durrett have concluded that every residential unit should have a front porch for informal social activities, and private spaces that are separated from the common areas. The common areas should be flexible in order to adapt as the population shifts in age, or as inhabitants change. Cohousing emphasizes the importance of varying thresholds between public and private spaces, as well as a sense of individual and communal identity.

18. Kathryn McCamant and Charles Durrett, *Creating Cohousing: Building Sustainable Communities* (Gabriola Island, BC: New Society Publishers, 2011), 15.

Communal spaces should foster a sense of identity. Identity and inhabitant are deeply interrelated; the identity of a place exists in the identity of its inhabitants. Christian Norberg-Schulz writes: "The particular place is part of the identity of each individual."[19] The identity of a place can be understood in various ways; I have used the work of Aldo Rossi as a method for understanding Maynard Lake and Dartmouth.

As an architectural theorist, Rossi created a method of analyzing a particular city through its urban geography, economics, and history. Rossi identifies the city as an artifact whose change can be measured against itself. Shifting between scales, the city is investigated as a whole and as a set of individual parts. The relationship between the collective and the individual, as well as between history and memory, is used as another means of telescoping between scales of existence. This thesis is organized through the movement between scales, starting at the scale of an apartment unit, and moving towards the scale of the city of Dartmouth. Rossi's method of urban analysis formed the basis for a study of Dartmouth and its historical development.

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19. Christian Norberg-Schulz, *The Concept of Dwelling: on the way to figurative architecture* (New York: Electa/Rizzoli, 1985), 9.

CHAPTER 3: SITE

Maynard Lake, Dartmouth, Nova Scotia

Maynard Lake is an urban lake located east of downtown Dartmouth, Nova Scotia, Canada. Built as military housing in 1954, the Lakefront Apartments sit atop the steeply-sloped northern shore of the lake. The apartments are mid-range rental units, currently owned by Killam Properties. When Lakefront was built, local residents were unhappy with the repetitive apartment blocks that lacked any warmth or identity, and this sentiment continues today. The apartments are in need of repair, both in their physical performance and in the architectural qualities of the complex. The bleak quality of the site is sharply contrasted by the beautiful lake below and the views across to the harbour. The existing site and buildings hold much potential to become a vibrant urban community on the lake.
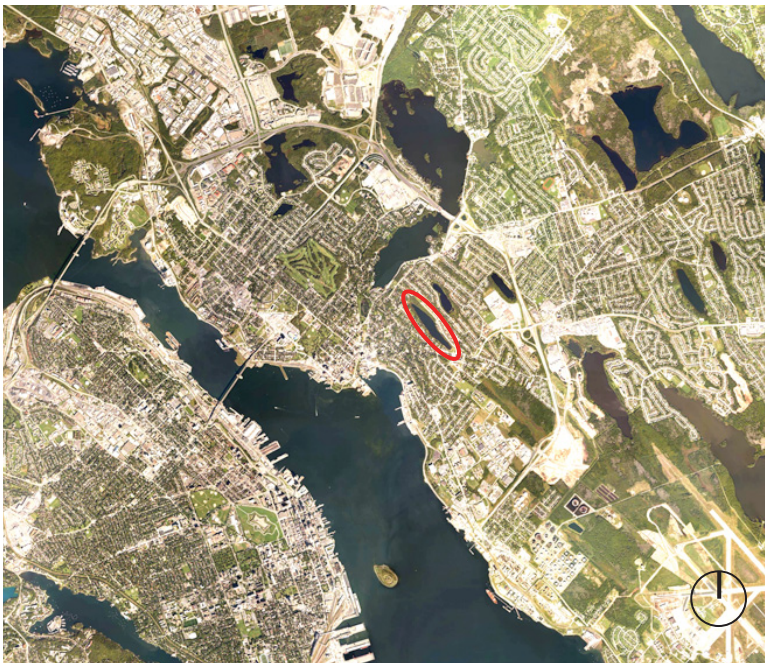
Satellite image of Halifax and Dartmouth showing Maynard lake circled in red. From Bing Maps

Aerial photo of Maynard Lake and the Lakefront Apartments, circled in red. From Killam Properties Inc

The same brick apartment block is repeated across the site, generating a homogeneous, bleak site.
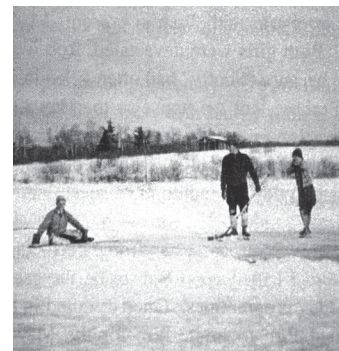
History of Maynard Lake

When Halifax was founded by the British in the mid-eighteenth century, Dartmouth was settled to supply resources to the new colony, including fresh water from its many lakes. A large part of the identity of Dartmouth can be traced back to this primary relationship. As Dartmouth developed and grew into a city, resources remained the main raison d'être for the settlement, but the lakes changed from natural resources to recreational resources. There are twenty-five lakes within the city limits, leading to the colloquial name "City of Lakes."

Maynard Lake has long been known for the purity of its water. It is surmised that underwater springs provide fresh water to the lake. The lake was originally connected to the sea by a stream; sea trout used to migrate into the lake in the spring. In 1858, a pipeline was built to supply water from the lake to the Nova Scotia Asylum, now know as Mount Hope Hospital. The pipeline was blocked off in the late nineteenth century, in the construction of a municipal water supply system.

Clearing the ice to play hockey on Maynard Lake. From Payzant, *Rob and Francie: Vol. 1 - 1912 to 1939*

Ice being slid across Portland Street on a raised platform. From the Dartmouth Heritage Museum

An early map of Dartmouth c. 1770 showing the link between Maynard Lake and the first settlement. From the Dartmouth Heritage Museum

Historical Growth

Along with fresh water, agriculture was also an important resource in colonial Dartmouth. The region around Maynard Lake has a strong agricultural history. The area south of the lake was farmland until 1938 when the land was divided into lots and sold individually.[20] Over the next decades, houses were built on the plots. The land north of the lake remained agricultural until the 1950s, when the current subdivision, Manor Park, was built. When the MacDonald Bridge was built in 1955 to connect to Halifax, the population of Dartmouth increased rapidly as people bought cheap land to build houses on the periphery of the town.

Throughout the history of Dartmouth, the lakes have remained the most permanent elements. The historical development shows how the city has spread to encompass the lakes, with little regard for their existence. The urban form of the city does not change around the lakes, but rather conceals the lakes at the centre of suburban rings.

View from the northwest shore of Maynard Lake in 1963. From the Chronicle Herald

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20. Joan Payzant (local historian), conversation with author, 15 Oct. 2011.

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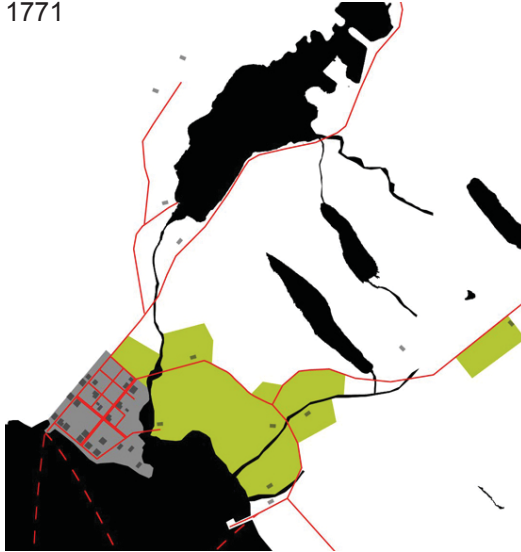
18th Century

1750 - Dartmouth is laid out, starting with two streets that form a cross: King and Queen St.

1773 - An estate including Maynard Lake is granted to James Creighton. The lake is named after Creighton's son-in-law, Captain Thomas Maynard, who lived near the lake.

1788 - Dartmouth Commons is created.

Maynard Lake is connected to the ocean, and sea trout travel up the stream to the lake. The land surrounding the lakes has not yet been developed for agriculture.
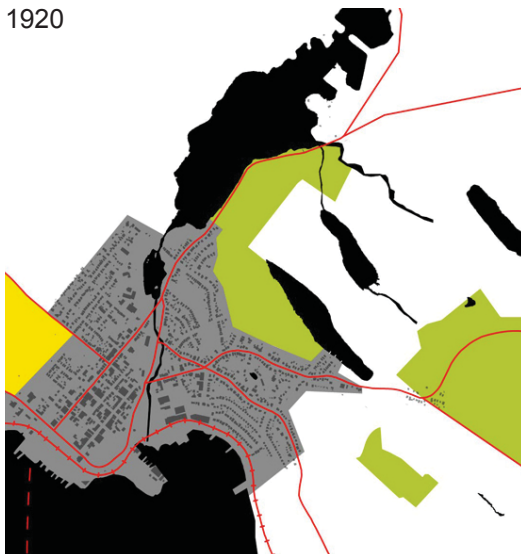
19th Century

1826 - The construction of the Shubenacadie Canal begins. Sullivan's Pond is built as a holding pond for boats before the locks.

1836 - The ice cutting industry grows.
- ●   Otto's Ice Company ice barns

1858 - A pipeline is built from Maynard Lake to supply drinking water to the Nova Scotia Asylum.
— —   pipeline

1873 - Dartmouth is incorporated as a town.

1920

Early 20th Century

1903 - The car begins to appear in Dartmouth.

1917 - Halifax Explosion: Some buildings near the harbour are damaged, but most of the destruction takes place in Halifax.

	built form	—— major roads
	agriculture	– – ferry
	parks	

Patterns of Historical Development. Base map from Halifax Regional Municipality GIS database
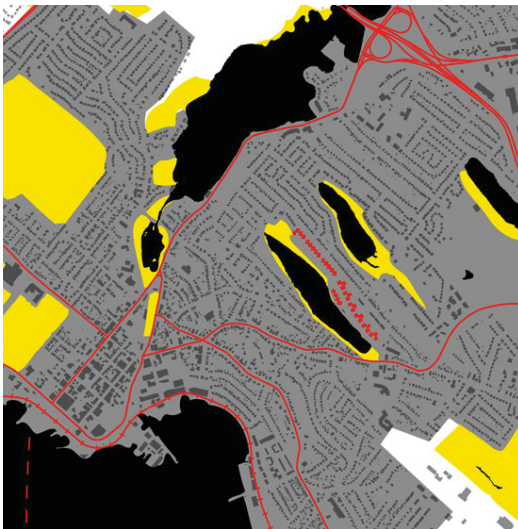
1954

Mid-20th Century

1950 - Warm winters and the advent of the refrigerator cripple the ice industry.

1954 - The Lakefront Apartments, shown in red, are built for to house military personnel.

1955 - The MacDonald Bridge opens. The population of Dartmouth increases rapidly as people buy cheap land and build houses on the periphery of Dartmouth.
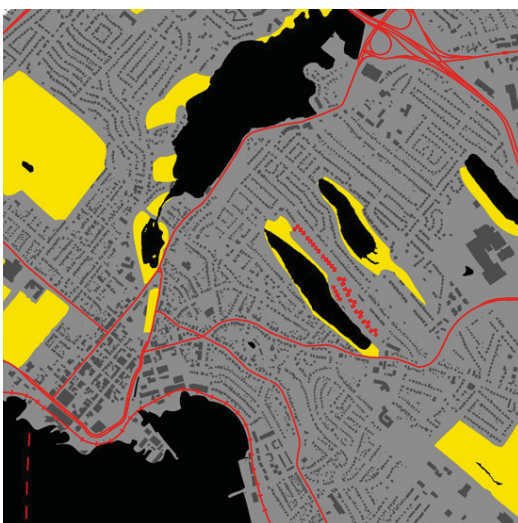
1973

Late 20th Century

1970s - Following an environmental research study, Dartmouth begins to buy the land surrounding numerous lakes in the city.

1970 - The MacKay Bridge opens.

1996 - Dartmouth is incorporated with Halifax and surrounding towns into the Halifax Regional Municipality.

2012

21st Century

Present-day Dartmouth is a city of suburbs serviced by shopping centres. Downtown Dartmouth is in a state of decay, and growth continues outward from the city.

Patterns of Historical Development (con't)

Ecology

The ecosystem of Maynard Lake exists in a delicate balance. When the drinking water supply line was built to the Nova Scotia Asylum, all outflow from the lake was effectively blocked. As a result, and in combination with a very small watershed, the retention period of the lake is extremely long. It takes approximately two years for water to pass through the lake, a rate much longer than that of other Dartmouth lakes. Because the water changes so slowly, substances can accumulate that would pass more quickly through other lakes. The Lakefront Apartments constitute about half of Maynard Lake's watershed, meaning that the site has a large influence over the health of Maynard Lake. Currently, storm water runoff is untreated, carrying salt, lawn pesticides, and fertilizers into the lake.

In the 1960s and 70s, the water quality of Maynard Lake decreased greatly until the water was deemed unsafe for swimming. This degradation of water quality was linked to runoff from neighbouring lawns and overfeeding of the duck population. Since the 1970s, the water quality of the lake has improved. Studies from 2000 show that Maynard Lake has acceptable levels of "pH, major ions, nutrients, organic matter and elements".[21] Fishing is very common and HRM stocks rainbow trout on a yearly basis. Skating has long been a popular winter activity; Maynard Lake is quite shallow and freezes early in the season.

The wild edge and the urban edge of the lake

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21. P. Clement et al., *Synoptic Water Quality Survey of Selected Halifax Regional Municipality Lakes* (Dartmouth: Ecosystem Research Division, Dept. of Fisheries and Oceans, Bedford Institute of Oceanography, 2007), 7.

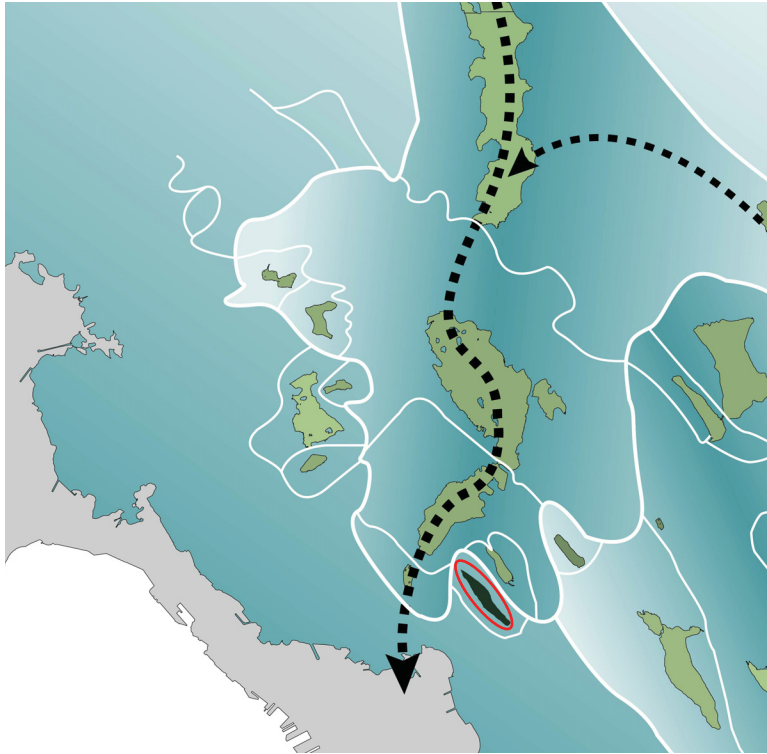sodium (mg/L)
pH
chloride (mg/L)
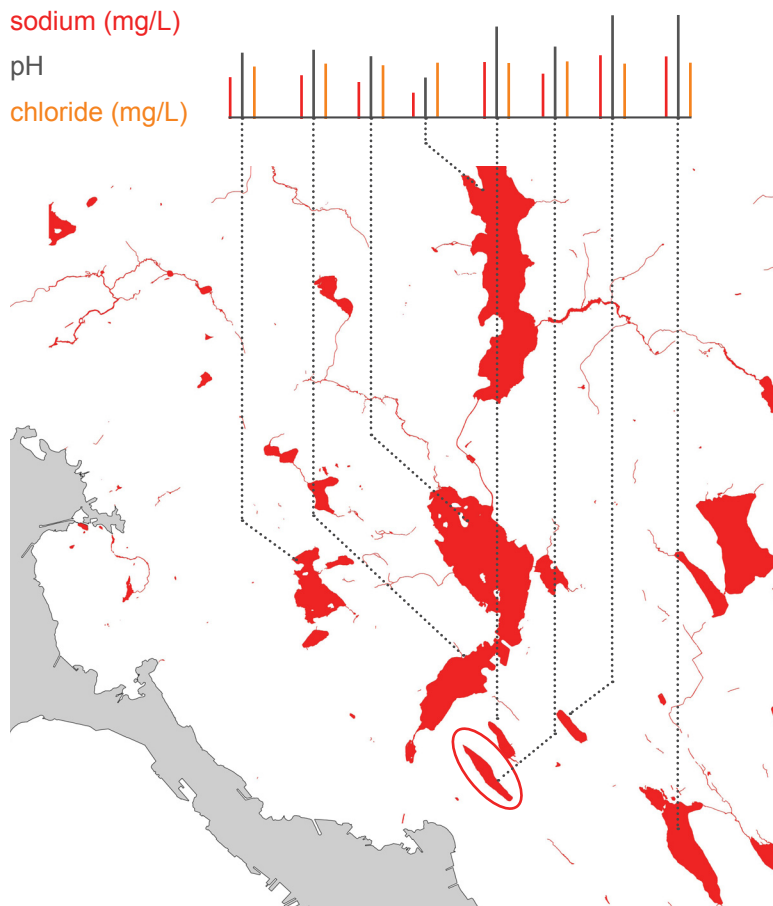
Lake System

The twenty-five lakes in Dartmouth are connected by numerous streams. In general, water flows towards Dartmouth Cove. Maynard Lake, circled in red, has no visible inflow or outflow. It is fed by underwater springs. According to studies undertaken by HRM, sodium and chloride levels are indicative of anthropogenic influence on the lakes.

Data source: P. Clement et al., *Synoptic Water Quality Survey of Selected Halifax Regional Municipality Lakes on 28-29 March 2000* (Dartmouth: Dept. of Fisheries and Oceans, 2007), v.

Lake Edges and Built Form

Many of the lakes in Dartmouth are surrounded by development. The diagram to the left shows municipally-owned park spaces around the lakes and undeveloped land in Dartmouth. The patterns of public lake edges and built form can be related to the water quality of each lake, as shown in the top diagram.
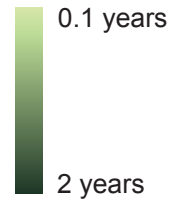
City of Twenty-Five Lakes. Base map from Halifax Regional Municipality GIS database

City of Twenty-Five Lakes (con't)

Watersheds

major water flow

lake water retention rate

0.1 years

2 years

Urban Lake Systems

In the 1970s, the town of Dartmouth created a plan to buy parcels of land surrounding many of the lakes. The plan was meant to protect the water quality by controlling the shores of the lakes, and therefore the runoff into the lakes. There have been a number of studies about the possibility of connecting all the park space around the lakes in Dartmouth into a coherent system of trails and parks. The Shubenacadie Trail has been built, but the overall system has not yet been fully realized.

Other cities, such as Boston, have greatly benefitted from a coherent landscape strategy connecting city lakes. The Emerald Necklace in Boston is a well-known chain of parks, waterways, and wetlands designed by Frederick Law Olmsted beginning in 1878 and realized by 1900.[22] The waterways and ponds are buffered by park spaces to protect the water and create a recreation loop.

Minneapolis, on the Mississippi River in Minnesota, is also called the City of Lakes. The Grand Round Scenic Byway is a system of roads and trails that loops around Minneapolis. When Minneapolis was developing in the late 19th and early 20th century, the city bought up all the land surrounding the lakes in order to preserve them as parks. The parks around the lakes are not connected into an overall loop of green spaces, but are connected by roads. The name, Grand Round Scenic Byway, suggests a bias towards the car as prime means of transportation.
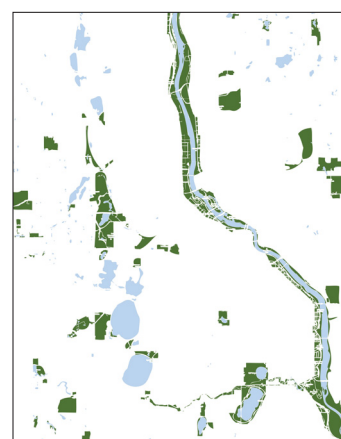
Diagrams show, from the top, Dartmouth, the Emerald Necklace, and Minneapolis. The relationship between bodies of water and parkland has been isolated. Based on Google Maps

22. The Emerald Necklace Conservancy, "Frederick Law Olmsted," http://www.emeraldnecklace.org/about-olmsted (accessed 11 Nov. 2011).

Identity

Existing Site Character

The Lakefront Apartments are geometrically homogeneous buildings sitting in a bleak and repetitive landscape without identity or landmarks. The spaces between and behind the blocks of building are ambiguous and feel unsafe. Parking is clearly the dominant force on the site and fences break up the spaces in an arbitrary way; some paths lead from Joffre St. down to the lake while others terminate abruptly at fences. In contrast to the bleak urban fabric, the beautiful views over Dartmouth to the harbour and Halifax stand out gloriously between the buildings.

The views from the top units of the Lakefront apartments towards Maynard Lake to the south and Oat Hill Lake to the north are particularly beautiful. Maynard Lake sits in the landscape like a fold in a blanket. On a calm day, ducks cross the lake, leaving trails of growing ripples. Tenants spoke of being able to see trout jumping in the spring, and herons wading in the shallows. The colourful houses of Dartmouth sit clustered on the hill, framed by the ocean view beyond.

The northern end of the lake

Repetitive brick blocks

Ambiguous spaces behind the apartment blocks

View over Maynard Lake towards Halifax

View over Oat Hill Lake

View of Maynard Lake from the beach on Portland Street

View of the apartments from across the lake

Demographics

The neighbourhood surrounding the Lakefront Apartments is quite wealthy, and the local schools are well-known in Dartmouth. For this reason, the neighbourhood has a high concentration of children. The inhabitants of Lakefront are mainly working class families and couples whose children attend the local schools. A large proportion of the tenants do not own cars and the Portland St. bus route is heavily used.

Dartmouth is currently a sprawling city built for cars. There are few local amenities within walking distance of Maynard Lake. The bleakly suburban Penhorn Mall is a fifteen-minute walk uphill along the heavily-trafficked Portland St. There are very few shops or restaurants within walking distance of the lake.

A painting by a child living in the Lakefront Apartments shows the centrality of the lake in daily life.

 = 10 children

 = 10 couples

children

single parents

married parents

married couples

single people

single seniors
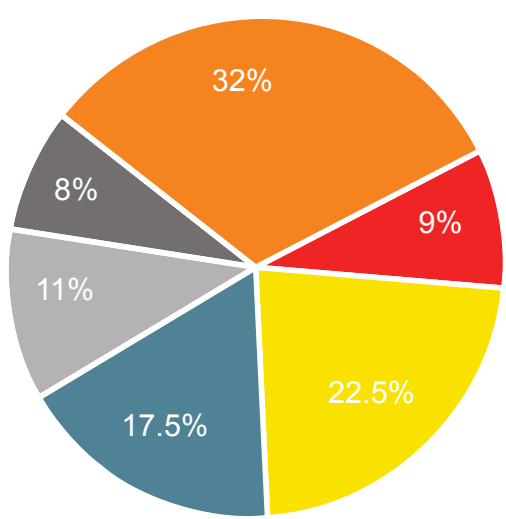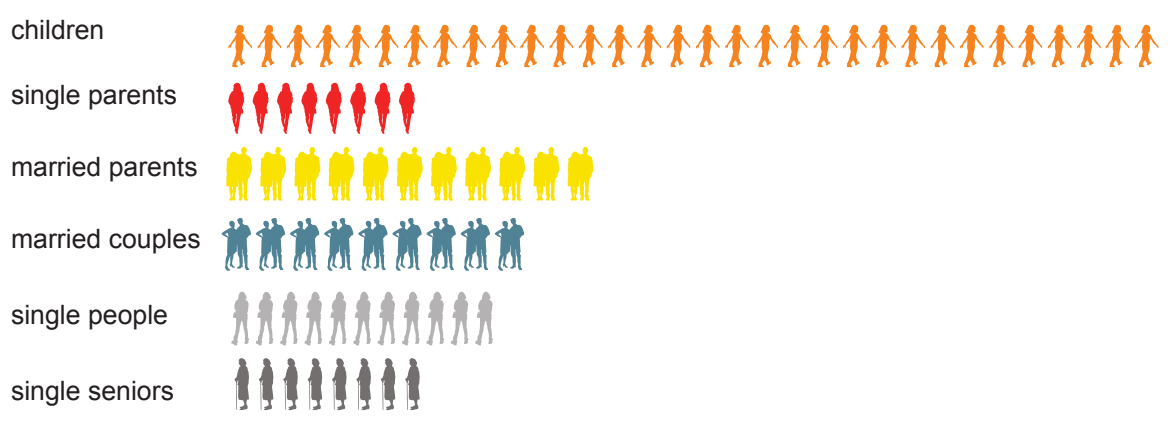
Lakefront Apartment Demographics. From Statistics Canada

Four Main Tenant Groups

I chose four main tenant groups and developed stories that portray their lifestyles and daily routines. The appropriate programs were developed from analysis of the users, their needs, and local amenities.

Dana & James

Dana is a twenty-six-year-old single mother of a three-year-old boy, James. Having no car, they rely on the bus.

Suitable Programs

daycare, places for children to play, activities by the lake, communal, social, and workshop spaces

From Regan, "Mother with child"

Alice and Jason

Alice and Jason have lived in Lakefront for six years. Jason was injured working in the shipyards two years ago and can no longer work.

live/work spaces, communal workshop, gardens, and space for socializing with neighbours

From She Knows, "Middle-aged couple"

Mrinalini, Paisal, Sahar and Amira

The family immigrated to Dartmouth from India eight months ago and found an affordable three-bedroom apartment in the Lakefront Apartments.

places for children to play, activities by the lake, after-school activities, communal, social, workshop, garden spaces, live/work apartments
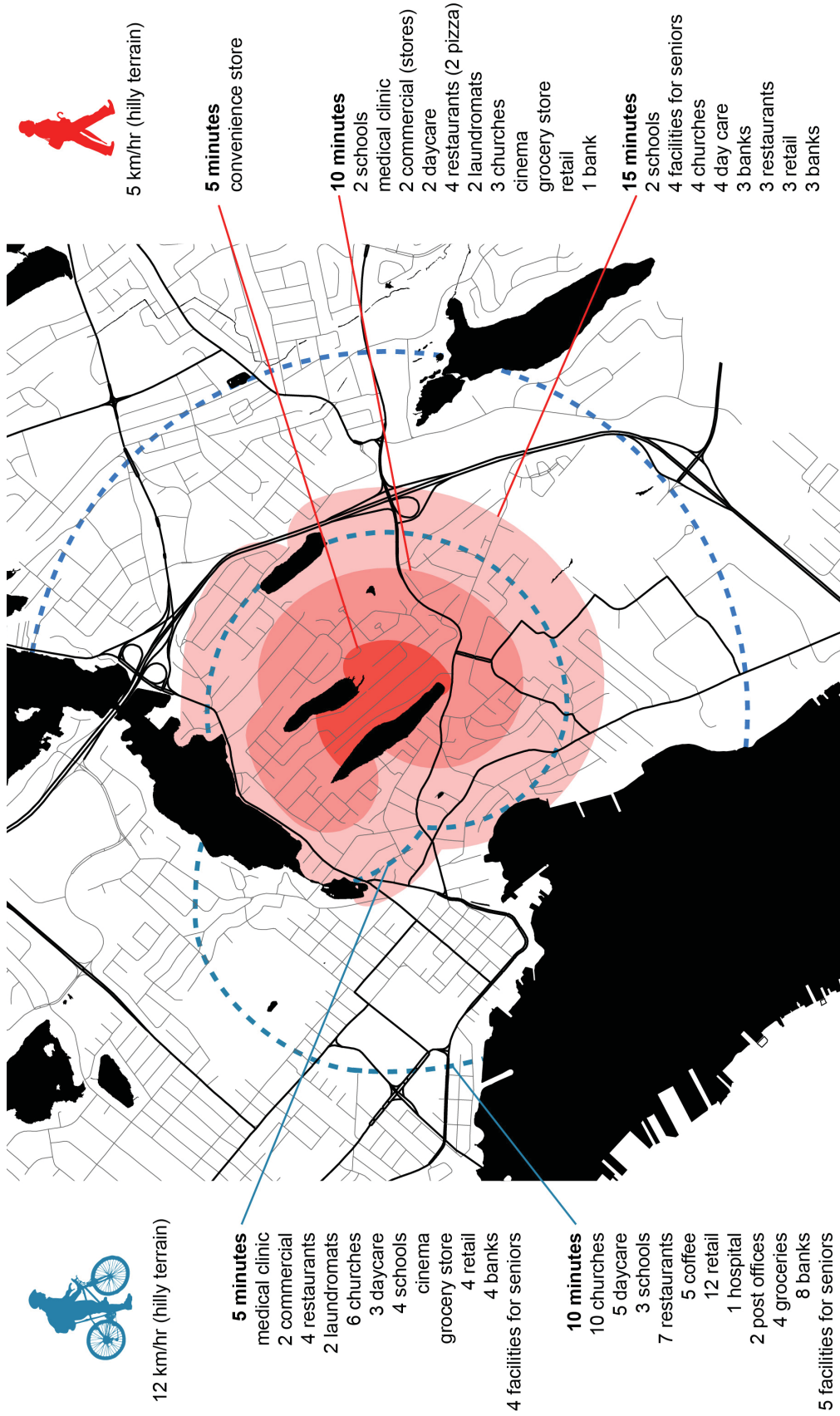

From Jitu Das, "All About Indian Family"

Margaret

Margaret is 83 years old and lives by herself in a one-bedroom apartment in Lakefront. She has lived all her life in Dartmouth.

communal social space, accessible paths, places for her children and grandchildren to stay when they visit, activities with other seniors

From Senior Living Residences, "Elderly Lady"

5 km/hr (hilly terrain)

5 minutes
convenience store

10 minutes
2 schools
medical clinic
2 commercial (stores)
2 daycare
4 restaurants (2 pizza)
2 laundromats
3 churches
cinema
grocery store
retail
1 bank

15 minutes
2 schools
4 facilities for seniors
4 churches
4 day care
3 banks
3 restaurants
3 retail
3 banks

12 km/hr (hilly terrain)

5 minutes
medical clinic
2 commercial
4 restaurants
2 laundromats
6 churches
3 daycare
4 schools
cinema
grocery store
4 retail
4 banks
4 facilities for seniors

10 minutes
10 churches
5 daycare
3 schools
7 restaurants
5 coffee
12 retail
1 hospital
2 post offices
4 groceries
8 banks
5 facilities for seniors

Local Amenities

Existing Apartment Buildings

Along with a knowledge of demographics and amenities, a detailed understanding of the existing buildings is vital in renovation projects in order to understand how they function and how they can be changed. The Lakefront Apartments are in good condition structurally, but show distinct signs of water damage on the brick facades. The buildings are wood-frame with a brick veneer, and limited vinyl cladding. The units are generous in overall area, but much of the space is used as circulation. The window sills are 0.8m tall, which generates the impression of smaller rooms.

The three-story brick apartment building with double-loaded corridor is a common residential type in Canada. Killam Properties owns a number of examples in Dartmouth. Maplehurst is a complex of apartments in Dartmouth, south of Maynard Lake, on the edge of the harbour. The complex suffers from the same bleak, ambiguous space as the Lakefront Apartments. The ideas tested on the Lakefront Apartments can be applied to a broader range of buildings across Canada.

Other existing walk-up apartments in Dartmouth owned by Killam Properties. From top: Jamieson St., Victoria Rd., Maplehurst Apartments. From Google Maps

Site Data

There are approximately 770 people living in the Lakefront Apartments, based on the number of units and a vacancy rate of 3.5%.[23] From conversations with the property manager, it became apparent that many of the tenants are long-term residents of the property.

site area: 26 acres

density: 15 units per acres

residential blocks: 36

each block has 11 units

2 x 1 bedroom units - $625 monthly rent

7 x 2 bedroom units - $670 monthly rent

2 x 3 bedroom units - $760 monthly rent

total units: 396
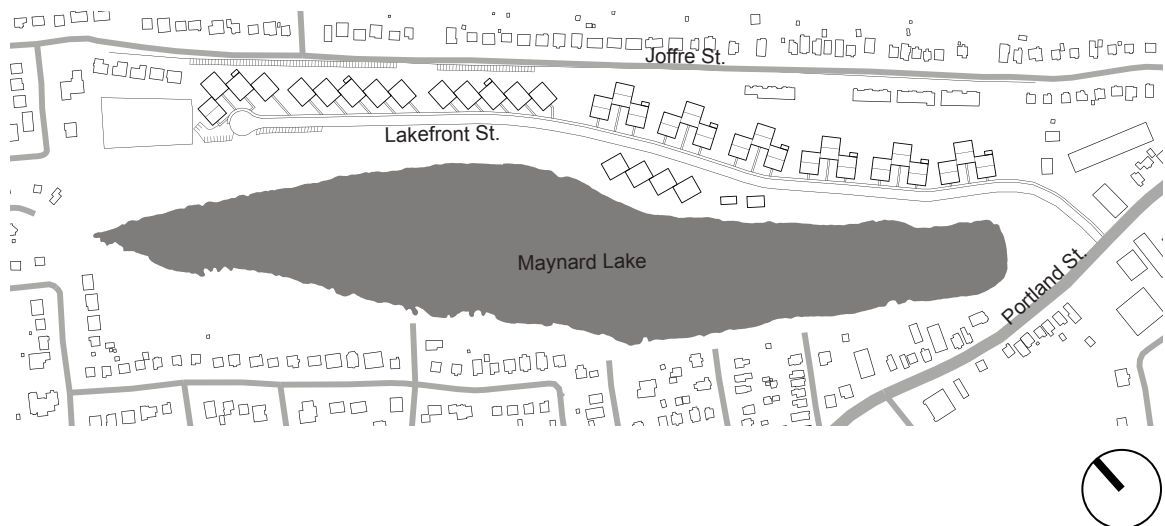
Map of Maynard Lake. Base map from Halifax Regional Municipality GIS database

23. Killam Properties Inc., conversation with author, 17 Nov. 2011.

One-Bedroom Apartment

total area - 58.5 m²

living space - 15.8 m²

kitchen - 9.3 m²

bathroom - 3.0 m²

master bedroom - 14.3 m²

circulation - 8.8 m²

storage - 4.2 m²
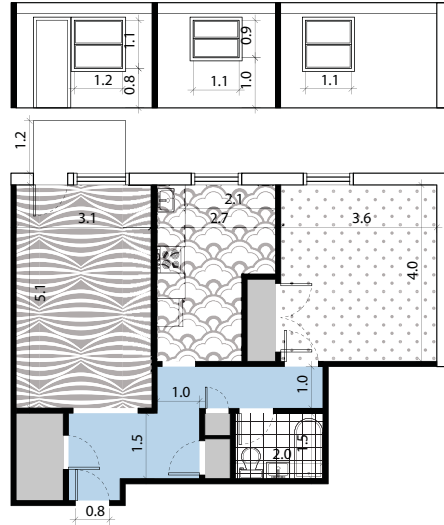
Two-Bedroom Apartment

total area - 63.5 m²

living space - 14.8 m²

kitchen - 10.5 m²

bathroom - 3.0 m²

master bedroom - 12.0 m²

bedroom- 7.5 m²

circulation - 8.4 m²

storage - 3.5 m²
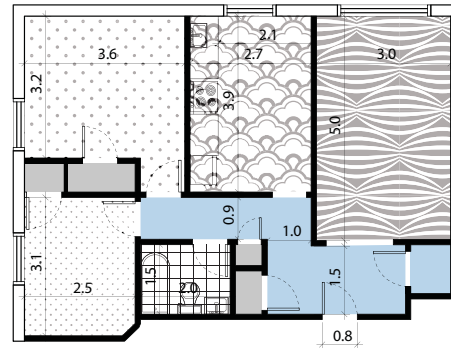
Three-Bedroom Apartment

total area - 82 m²

living space - 15.4 m²

kitchen - 10.7 m²

bathroom - 3.0 m²

master bedroom - 12.0 m²

bedroom- 7.6 m²

bedroom- 9.0 m²

circulation - 14.3 m²

storage - 5.4 m²
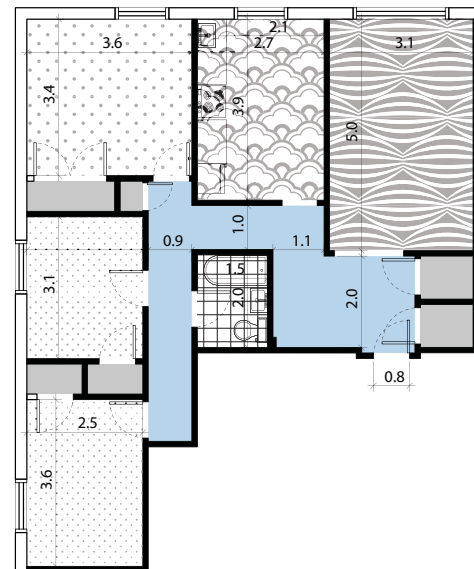
Existing units. Base drawings from Killam Properties

exterior wall compositi
brick
airspace
building fabric
wood sheathing
2x6 wood studs
drywall

efflorescence

deep parapet flashing

metal siding on top floors

efflorescence at window heads

staining

rusting sills

efflorescence at corners
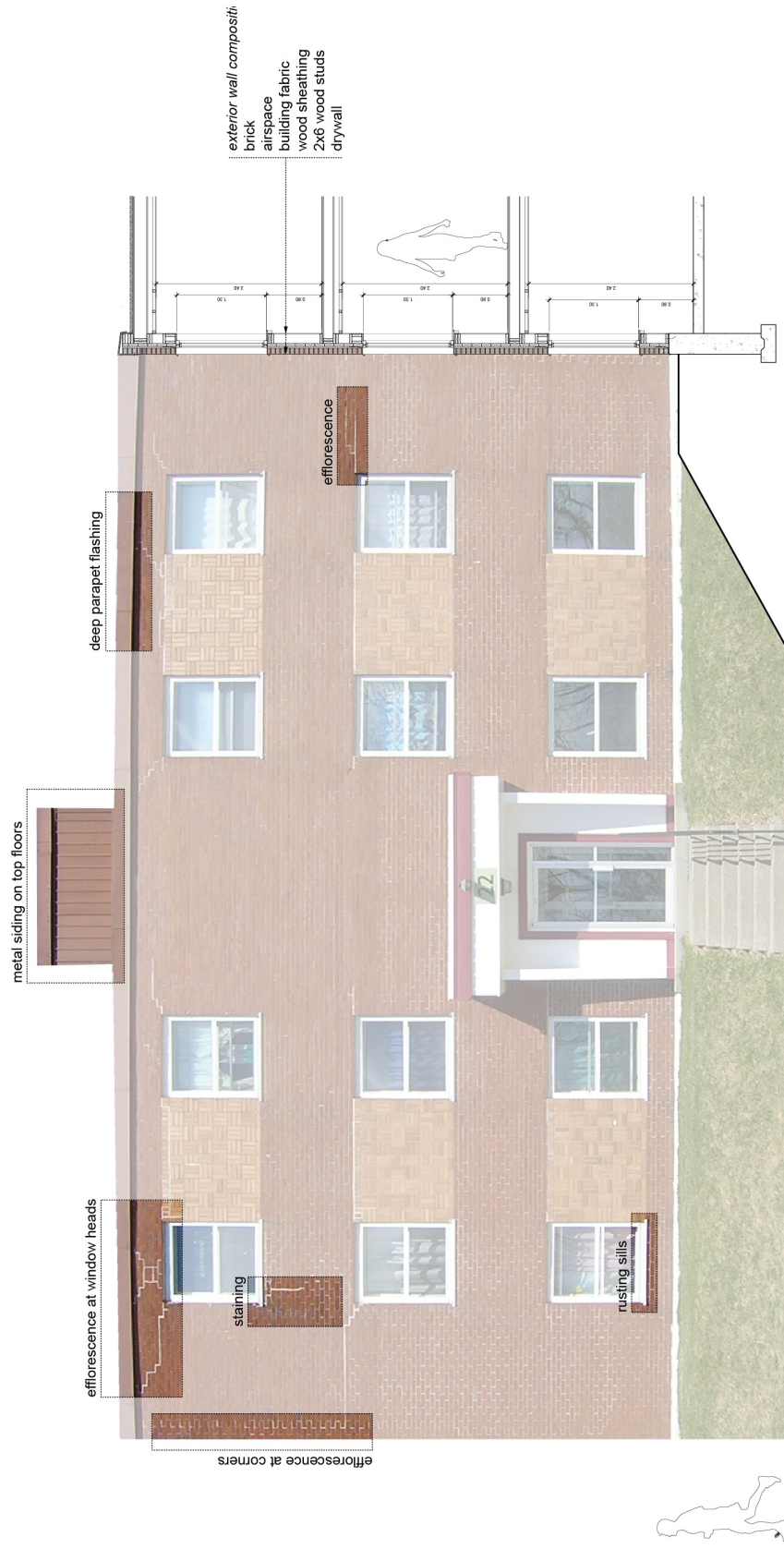
Existing section showing deterioration of particular portions of the building

Program

Dartmouth is called the City of Lakes, yet the lakes of Dartmouth are not celebrated. Maynard Lake has two characteristics that make it unique: a small watershed and a long water retention period. The water quality and health of the lake are directly affected by the Lakefront Apartments. I propose a new type of relationship between built form and lake. Through its relationship to the landscape and the hydrological cycle, the architecture of the site will protect and improve the health of the lake.

The lake

Across the site, the collection and treatment of water is celebrated in communal spaces. Along this network of drainage, the water travels down the hill to wetlands at the edge of the lake which clean the water before it enters the lake. If Dartmouth is the city of lakes, then Maynard Lake will be the lake city: a residential complex on the hillside, existing symbiotically with the lake below.

The forest

Diversity

In this thesis, I propose diverse programs that will create a complex neighbourhood. The main program of the site is residential, specifically affordable rental. Within the residential framework, there are communal spaces for the residents and public spaces for the neighbourhood. The residential, communal, and mixed-use areas are organized so as to create a hierarchy of spaces on the site, each with its own identity. Hitherto ambiguous spaces become inhabitable and recognizable when occupied with specific programs. Additional thresholds create layers of inhabitation and flexibility.
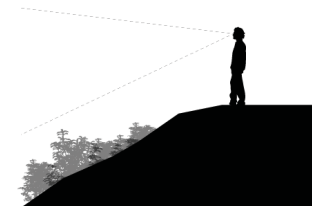
The hilltop

There are three main conditions on the site: the lake edge, the forested areas, and the top of the hill. Together, these conditions encapsulate the identity of the site.

The Lake Edge

The lake edge is accessible to the Lakefront tenants and the local population. There is a series of alcoves around the lake that contain a variety of programs for the tenants and for the public.   The alcoves are linked by the trail that runs around the perimeter of Maynard Lake. At certain points, the trail becomes a boardwalk, passing over the shallow water. Docks at key points cross into the deeper water, allowing access for boating. There are two manufactured wetlands that purify the water runoff from the buildings on the site. Paths leading up the hill link the lake to the hilltop.
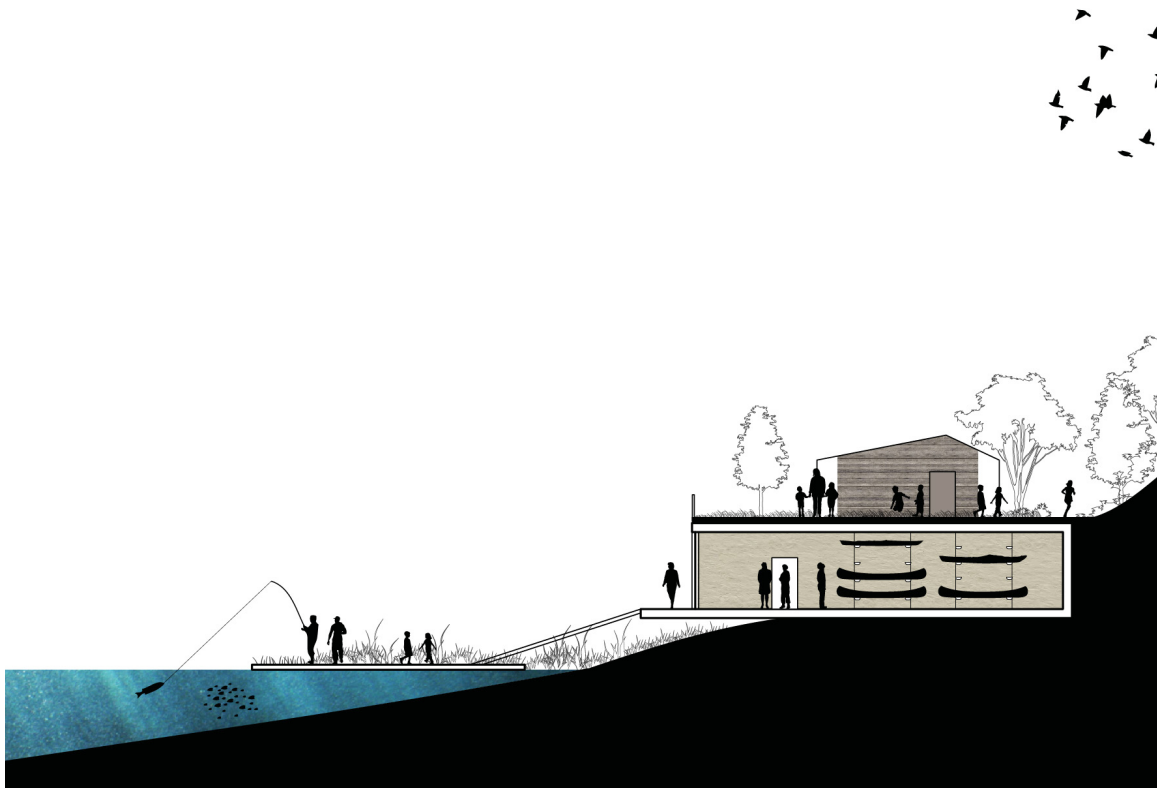
A detail from a program diagram shows a new boathouse and dock on the shore of the lake, allowing people access to the lake for recreation.

The Gardens

> At a community level, gardening has been found to enhance community interaction, reduce vandalism, and improve the physical surroundings of low-income areas.[24]

> Gardening provides for adults what water, mud and plants provide for children: a manipulable environment that provides a feeling of control – of proof that one is able to change one's physical surroundings.[25]

The gardens celebrate the agricultural history of the site and offer the tenants a way of growing food for themselves, for a small-scale market, or for the Dartmouth market. The gardens are quiet social spaces spread across the site. There are garden plots, workshops, storage, and social spaces. A similar garden arrangement exists at Benny Farm in Montreal[26], also ex-military housing. At the northern end of the site lies a communal garden with storage and dining pavilion.
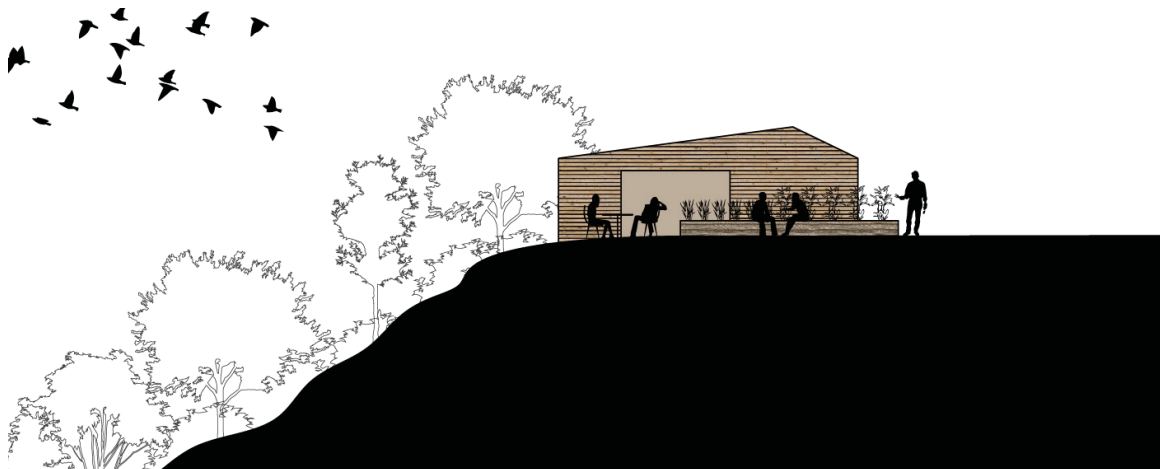
The addition of communal gardens on top of the hill overlooking the lake creates places for tenants to grow their own food and socialize.

24. Hough, *City Form and Natural Processes: Towards a New Urban Vernacular*, 23.

25. Ibid, 23.

26. Canadian Mortgage and Housing Corporation, *Innovative Buildings: Benny Farm Redevelopment, Montréal*, (CMHC, 2006).

The Hilltop

There are numerous outlooks from the hilltop that offer beautiful views of Dartmouth, the harbour, and Halifax. The views are celebrated and offered to all, tenant and neighbour. Each point of entry to the site offers a view and a place from which to appreciate it. The view corridors link the neighbourhood to the lake, and the city to the region.
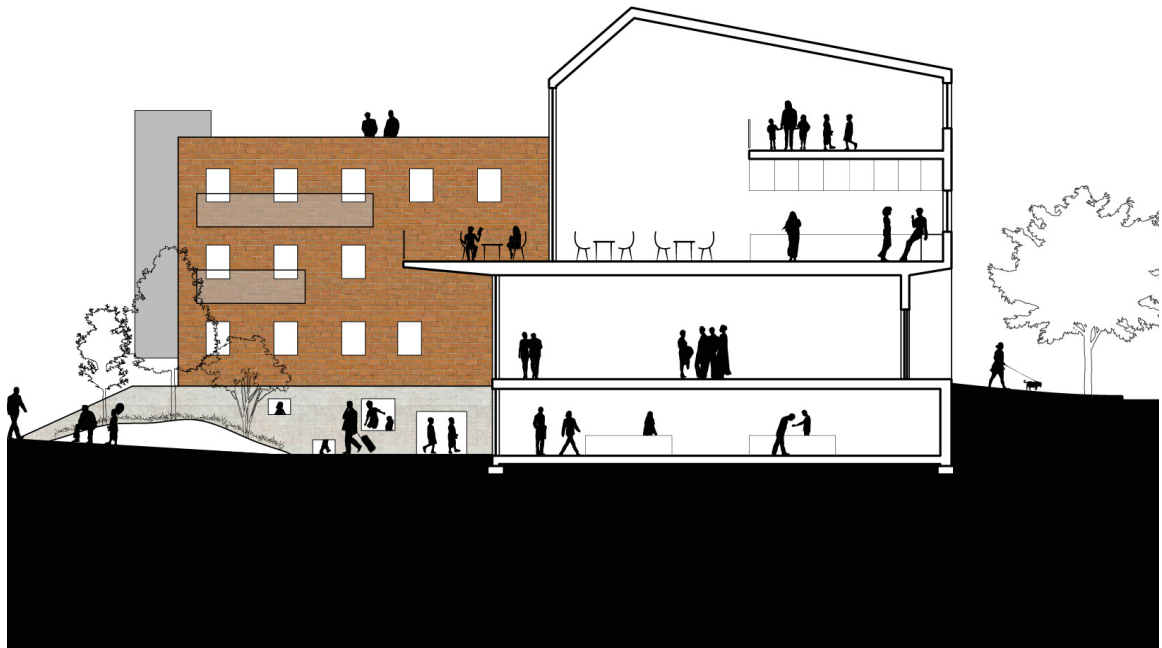
This program diagram shows an addition to the existing apartments. The addition houses communal space with panoramic views to the lake and the harbour beyond.

kitchen

dining hall

terrace

kid's play house

hilltop

garden plots

storage

workshops

social space

gardens

kid's play house

boat & equipment storage

lake

fishing

boating

Program section - summer

kitchen

dining hall

kid's play house

hilltop

workshops

social space

gardens

kid's play house

lake

warming huts

ice fishing

skating

hockey
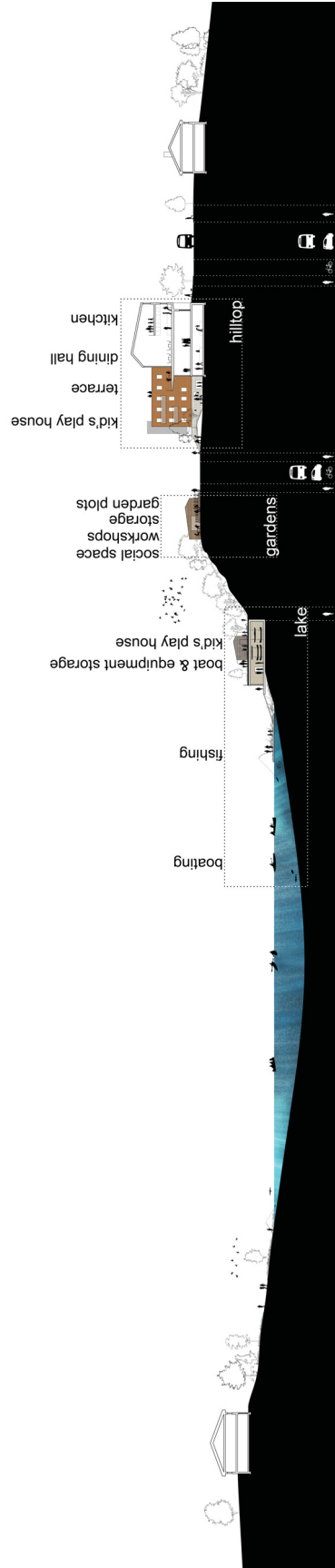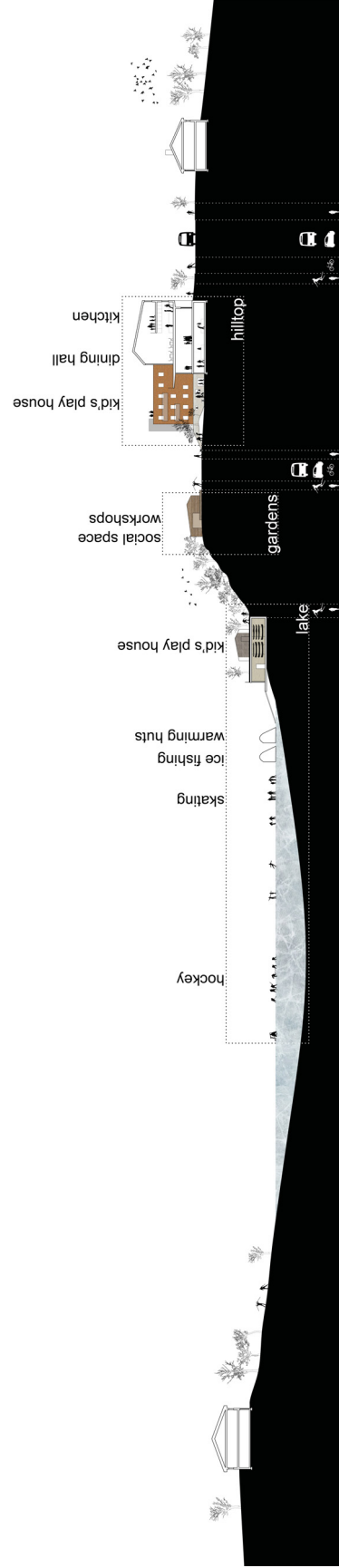
Program section - winter

CHAPTER 4: WORKING METHOD

Solid, Void, and Thresholds

The repetitive, monotonous quality of space in and around the Lakefront Apartments arises from the stark opposition of solid and void form. There is an abrupt threshold from interior to exterior, from solid to void. This condition forms the basis for my working method: the addition of multiple thresholds at different scales. Thresholds allows inhabitation of the site at a variety of scales. Thresholds are also adaptable. Rooms that connect indoor and outdoor spaces are versatile because they can become either interior or exterior, depending on the needs of the inhabitants. If more interior space is needed, thresholds can expand outwards to encompass more area. If exterior space is required, thresholds can open up, becoming outdoor rooms.

Four Scales

I have considered the site at four scales: the unit, the courtyard, the group, and the site. Working from the detail scale to the site scale, I began by imagining the needs of the tenants, specifically the four groups identified in the demographics section of the thesis report. The following diagrams describe the existing site conditions of solid and void at four scales.

solid

void
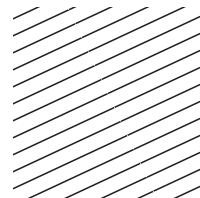
threshold

1. The unit
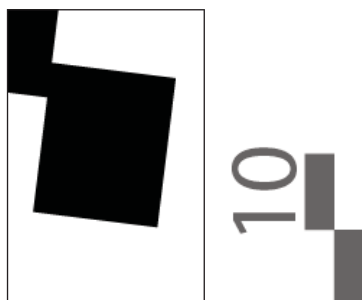
2. The courtyard
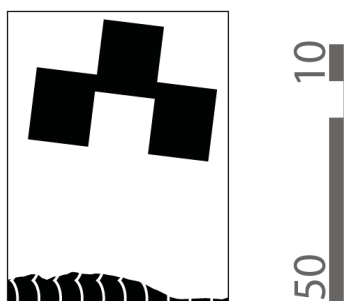
3. The group
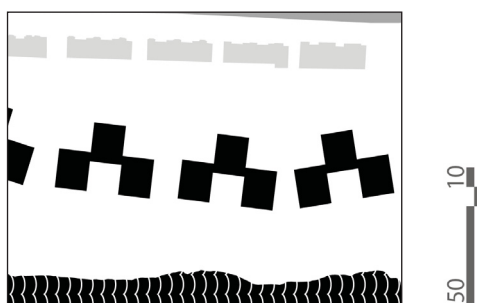
4. The site
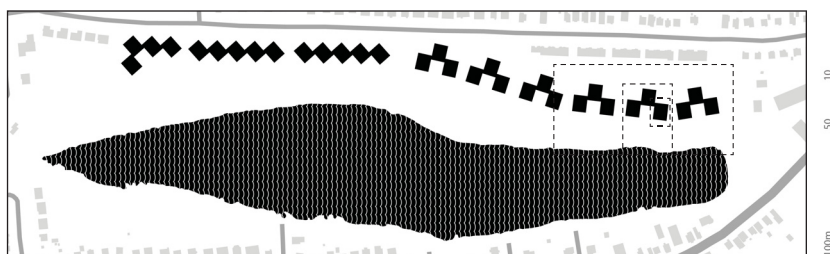
Existing Scales of the Site. Base map from Halifax Regional Municipality GIS database

Thresholds at Each Scale

At each scale, I generated identity through the definition of particular rooms. The term "room" signifies specific areas defined by surrounding thresholds. Once a room is identified, it can be more easily inhabited. I have identified the rooms for each scale, and the thresholds that link the scales.
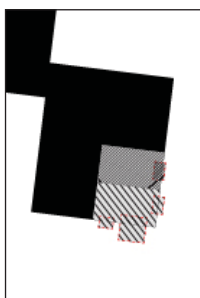
existing retained

existing demolished

new

private
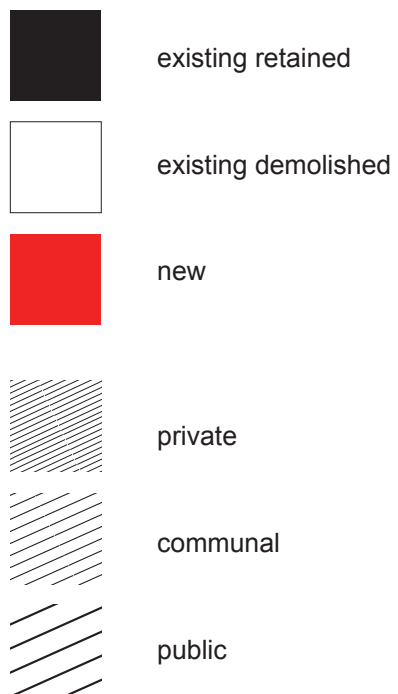
communal

public

Graphic Legend

1. The unit

Rooms
- private rooms
- common rooms
- exterior space

10

Thresholds
- terrace/balcony
- entrance
- windows

2. The courtyard

Rooms
- terraces
        private
        communal
        public

10

50
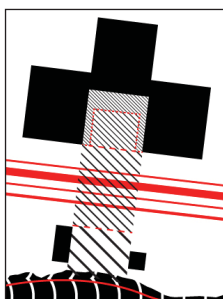
Thresholds
- circulation
        street
        pedestrian
        bicycle
- topography
- rain water swale
- vegetation

3. The group

Rooms
- side yards
- lake edge
- back lane

10

50
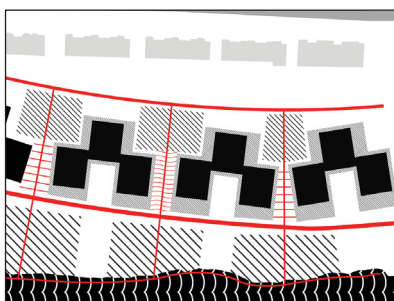
Thresholds
- circulation
        street
        rear lane
- rain water swales
- topography
- vegetation
- views

4. The site

Rooms
- entrances to the site
- lake edge alcoves

10

50

100m

New Scales of the Site. Base map from Halifax Regional Municipality GIS database
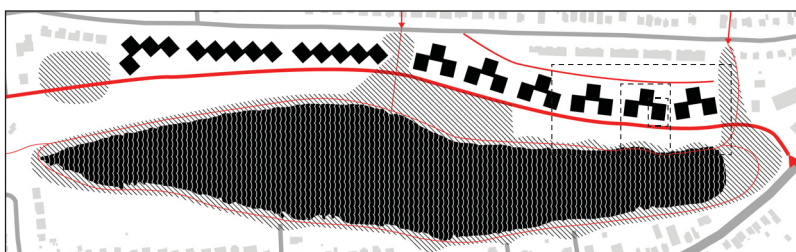
CHAPTER 5: DESIGN

Design Sketches

Scale 1: The Unit

The design process began with sketching over photographs of the existing buildings and site. In order to determine the most important moments of change, I imagined specific tenants and re-designed their units. These designs became a set of guidelines for the re-design of all the units. The movement of the sun and views to the lake also played an important role in the design. A series of shadow studies were taken from a digital model in order to track the sun's path across the site.

Sketches showing ideas of inhabiting the threshold between interior and exterior.
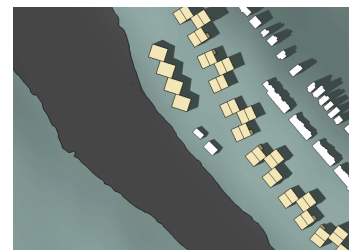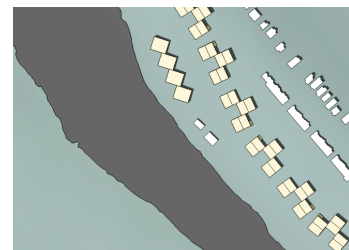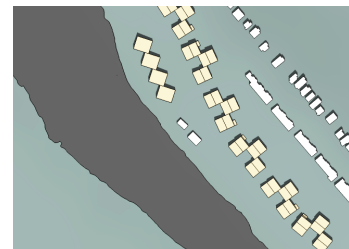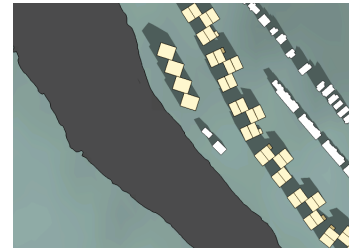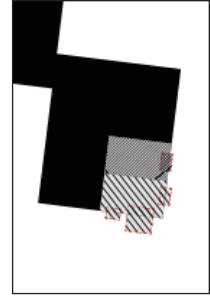
Shadow studies of the site showing the movement of the sun in different seasons. From the top: December 21 at 10:00; April 21 at 12:00; June 21 at 14:00; September 21 at 16:00.
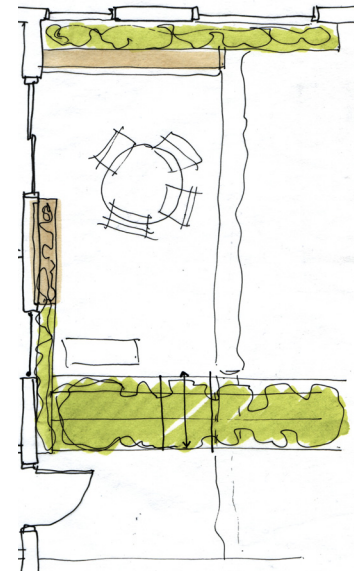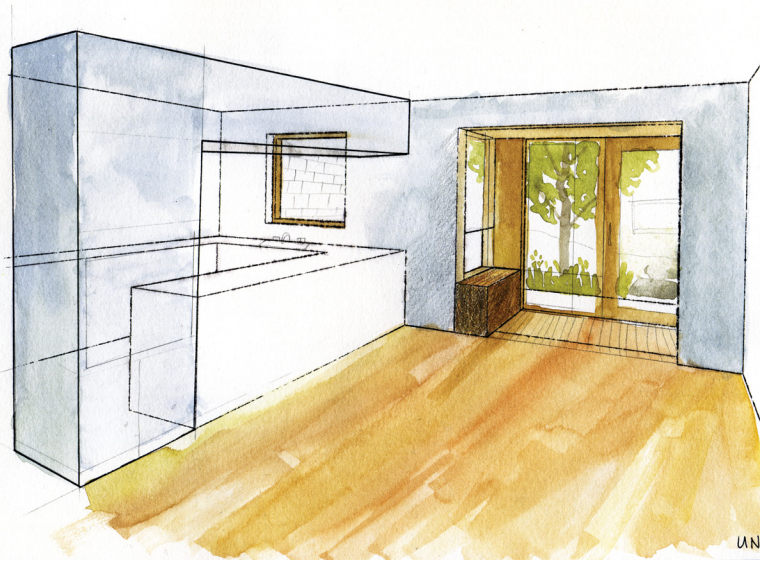
The threshold between the kitchen and the living space is open, yet clearly defines the spaces. The entrance into the unit from the exterior contains a place to sit and view the lake.

A private terrace may be defined by planters and benches. The terrace remains open, but retains a sense of privacy.
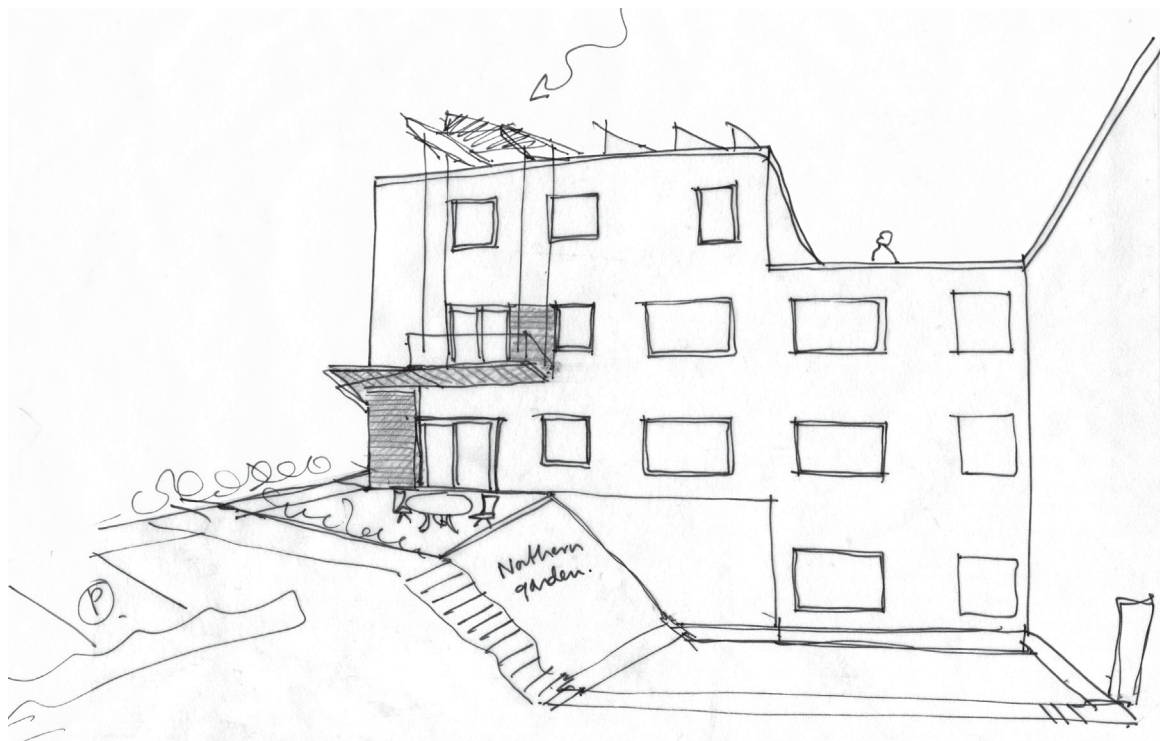

New structures hanging from the existing building can play many roles: on the roof, solar collection; for an upstairs unit, a balcony; for a ground-floor unit, an entrance canopy.
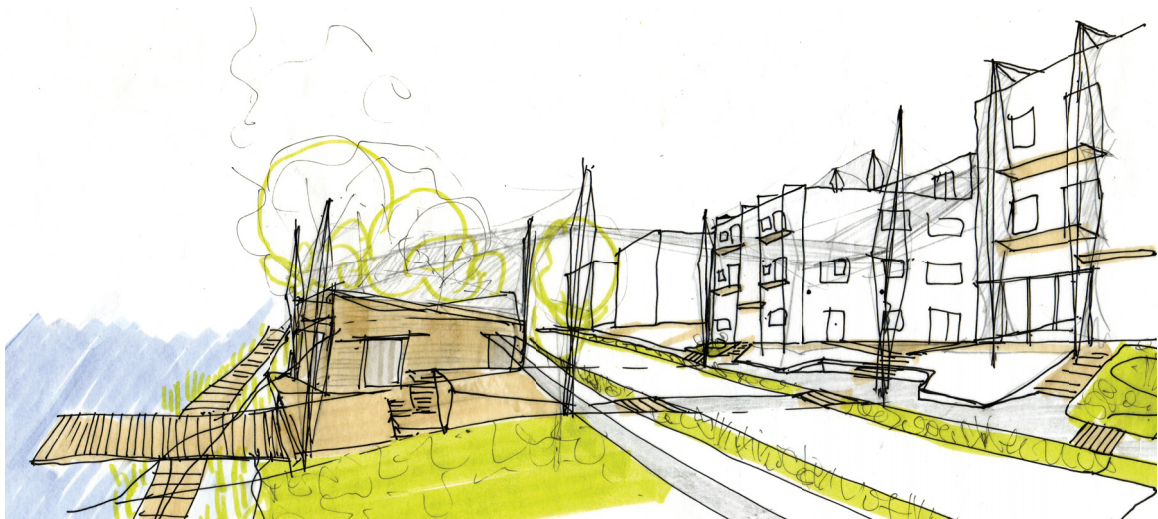
Scale 2: The Courtyard

Each courtyard on the site has a different design in order to accommodate a variety of programs, such as after-school groups, concerts, block parties, and summer camps. The courtyard is a direct link between the apartment buildings and the lake. As the terraces step down to the lake, they move from private to communal to public.
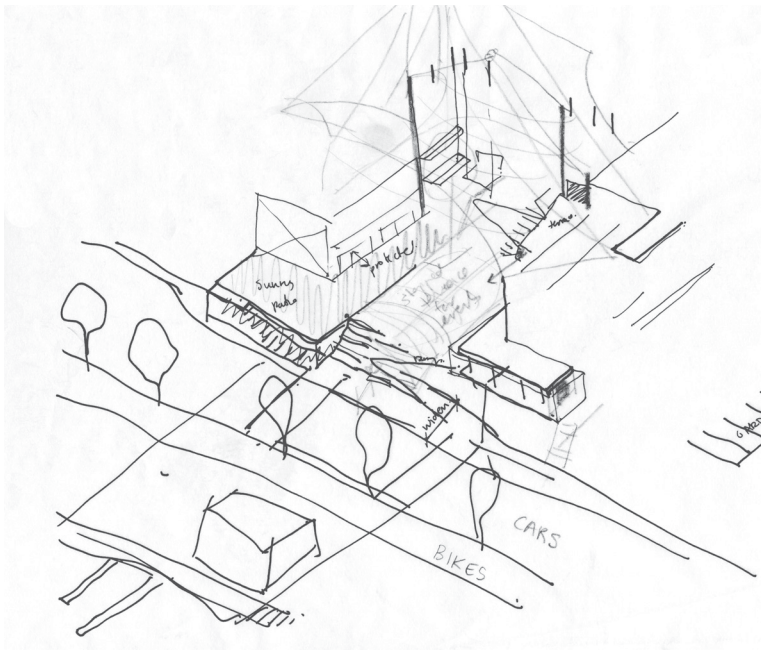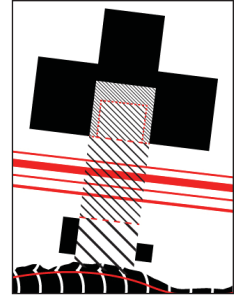

Courtyard sketch
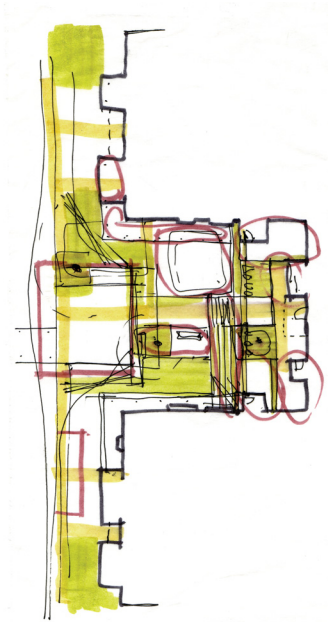
Terraces in the courtyard

Sketch of the street and after-school/day camp pavilion and docks

Scale 3: The Group of Buildings

The spaces between each set of courtyard buildings act as linear parks, linking the city to the lake.   Behind the apartment buildings, the addition of parking garages sunk into the hillside liberates the site from the tyranny of the parking lot and creates a usable rear lane.
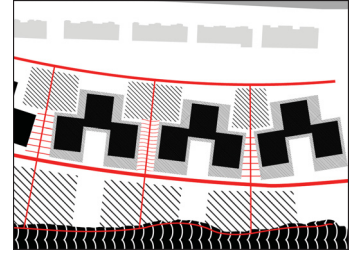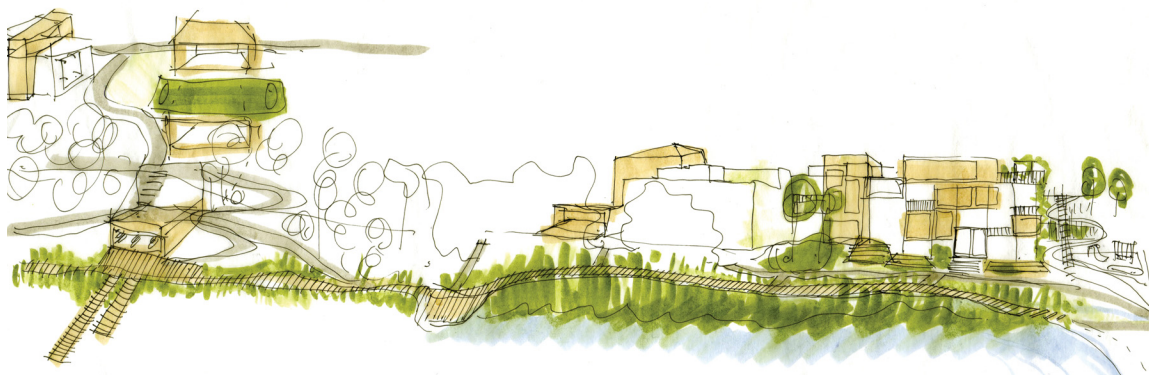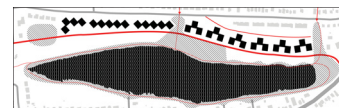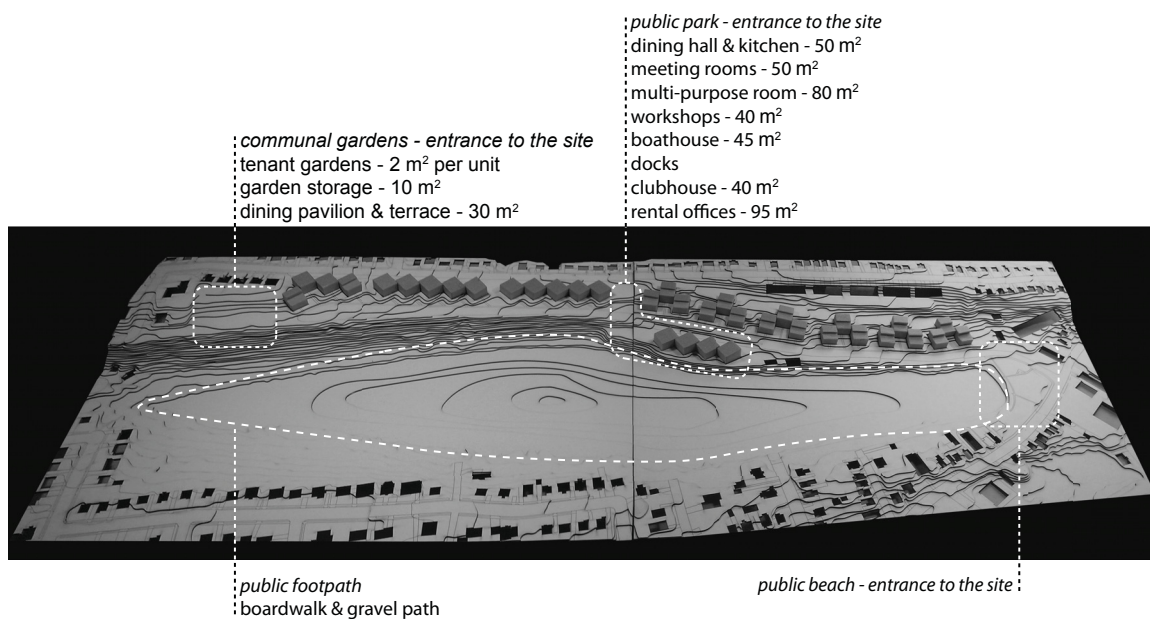
Park space between existing apartment blocks
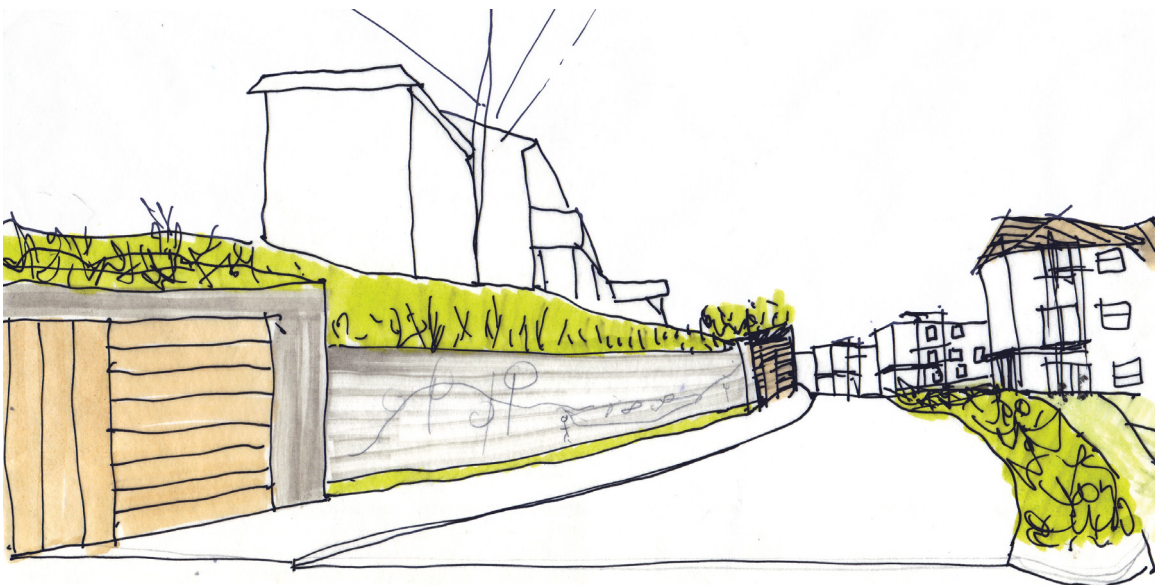
Rear lane behind existing apartments

Scale 4: The Site

The site is a threshold between the city and the lake. There are three main entrances to the site: the beach, the park, and the gardens.

These sketches show the view from the lake. At certain moments, the site reaches down to the lake, while at other moments, the lake is edged in forest.

public park - entrance to the site
dining hall & kitchen - 50 m²
meeting rooms - 50 m²
multi-purpose room - 80 m²
workshops - 40 m²
boathouse - 45 m²
docks
clubhouse - 40 m²
rental offices - 95 m²

communal gardens - entrance to the site
tenant gardens - 2 m² per unit
garden storage - 10 m²
dining pavilion & terrace - 30 m²

public footpath
boardwalk & gravel path

public beach - entrance to the site

A topographic model of the site shows the relationship between the buildings and the lake, as well as the entry points to the site.

Unit Design

Through detailed re-design of a number of units, a set of parameters was developed for the re-design of all units. The guidelines are as follows.

Each unit shall have:

- Access to an outdoor terrace or balcony

- Direct access, if the unit is at grade

- Open common space between kitchen and living room

- Common spaces with windows on two walls

- Reduced circulation space

- Lowered window sills

- Sliding closet doors
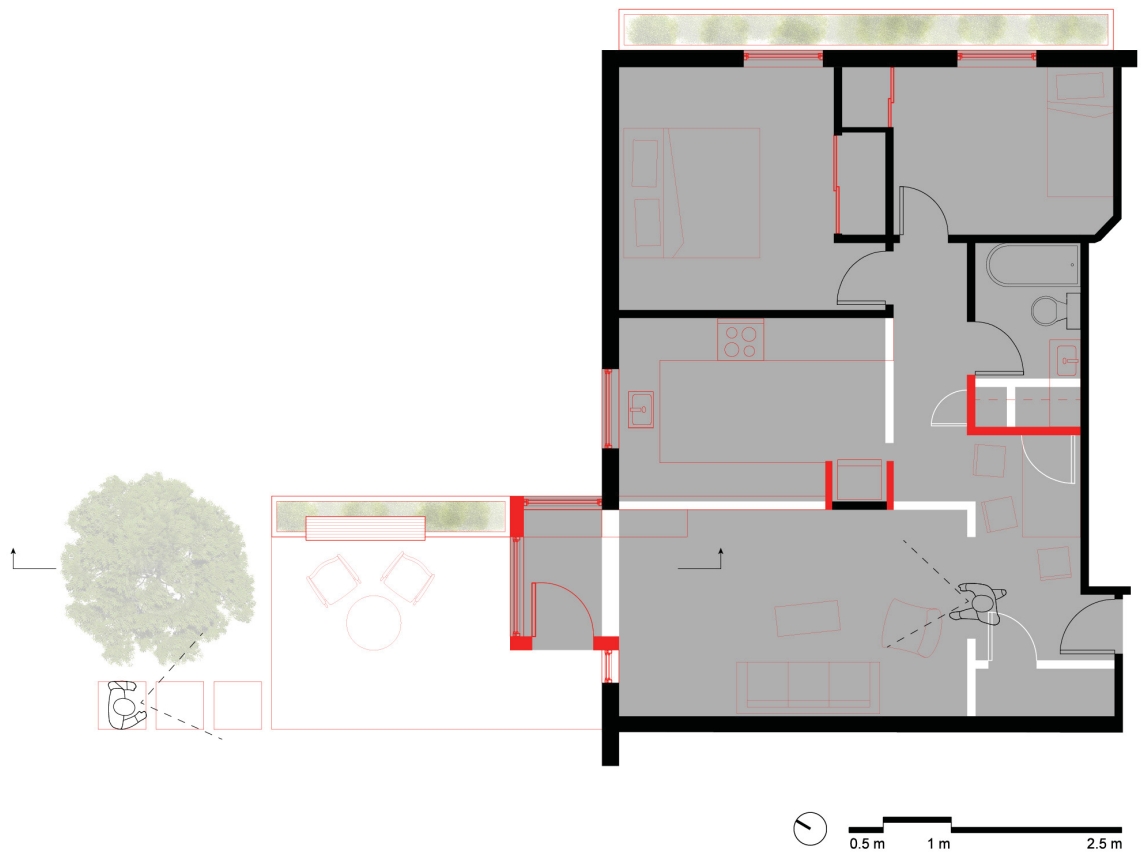
- Increased bathroom size
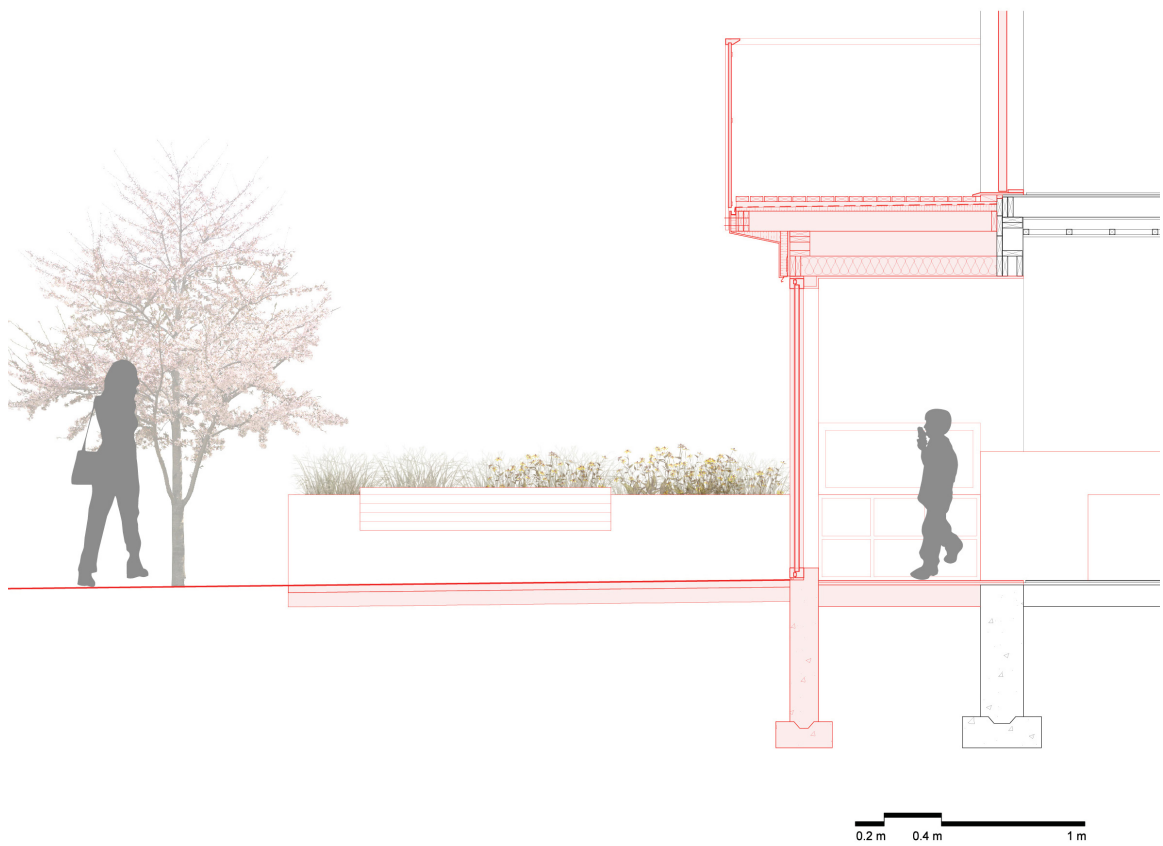
single mother and son

family of four

middle-aged couple

Unit 1: Two-Bedroom, Single Mother and Son

The two-bedroom unit, located on the upper terrace of the courtyard, has a new patio and entrance with a view down to the lake. At the back, the bedrooms are buffered from the outside by a planter.

existing retained

existing demolished

new

Plan of two-bedroom unit at grade

The detailed section shows the entrance sequence: passage under a flowering tree; the patio with planter and bench; the vestibule with a bench and a view to the lake; a higher counter separating the kitchen from the living room.
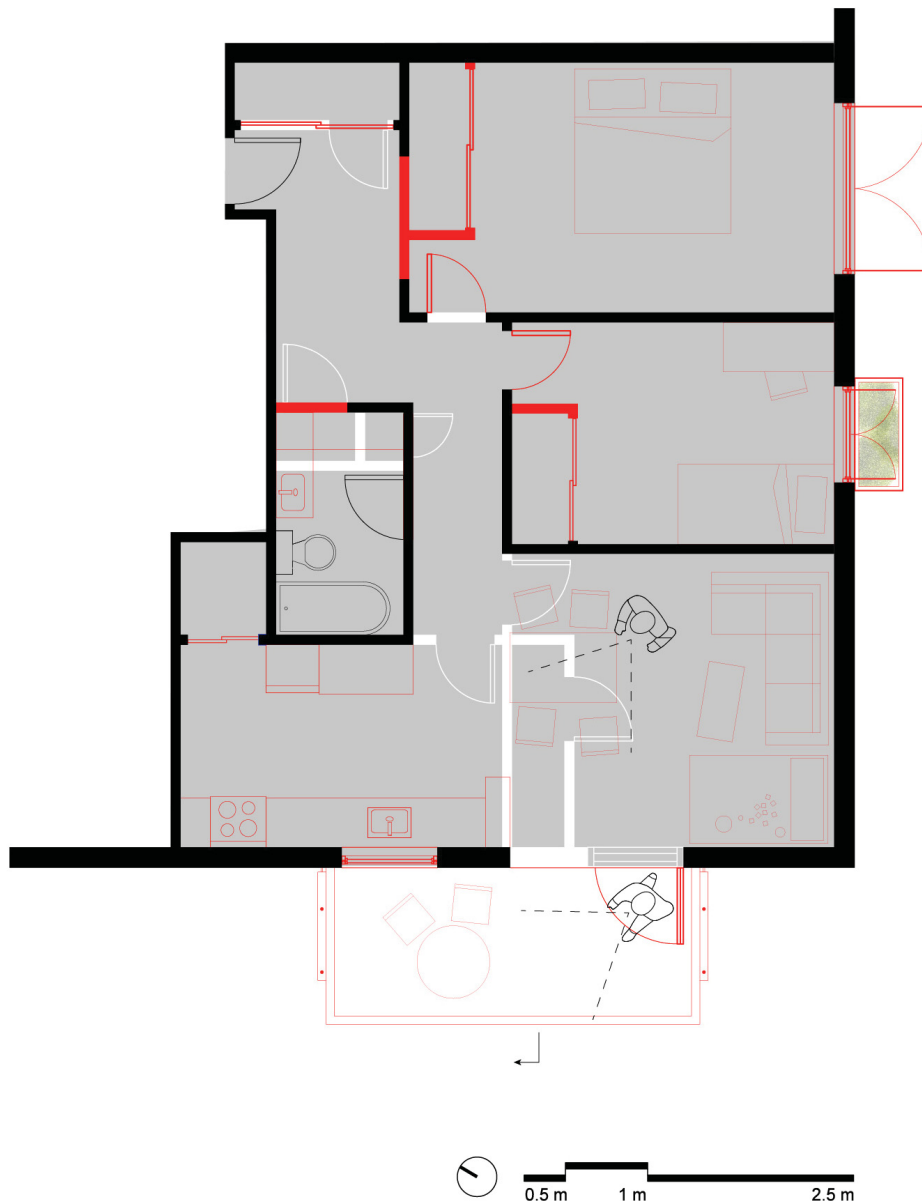
Existing living room

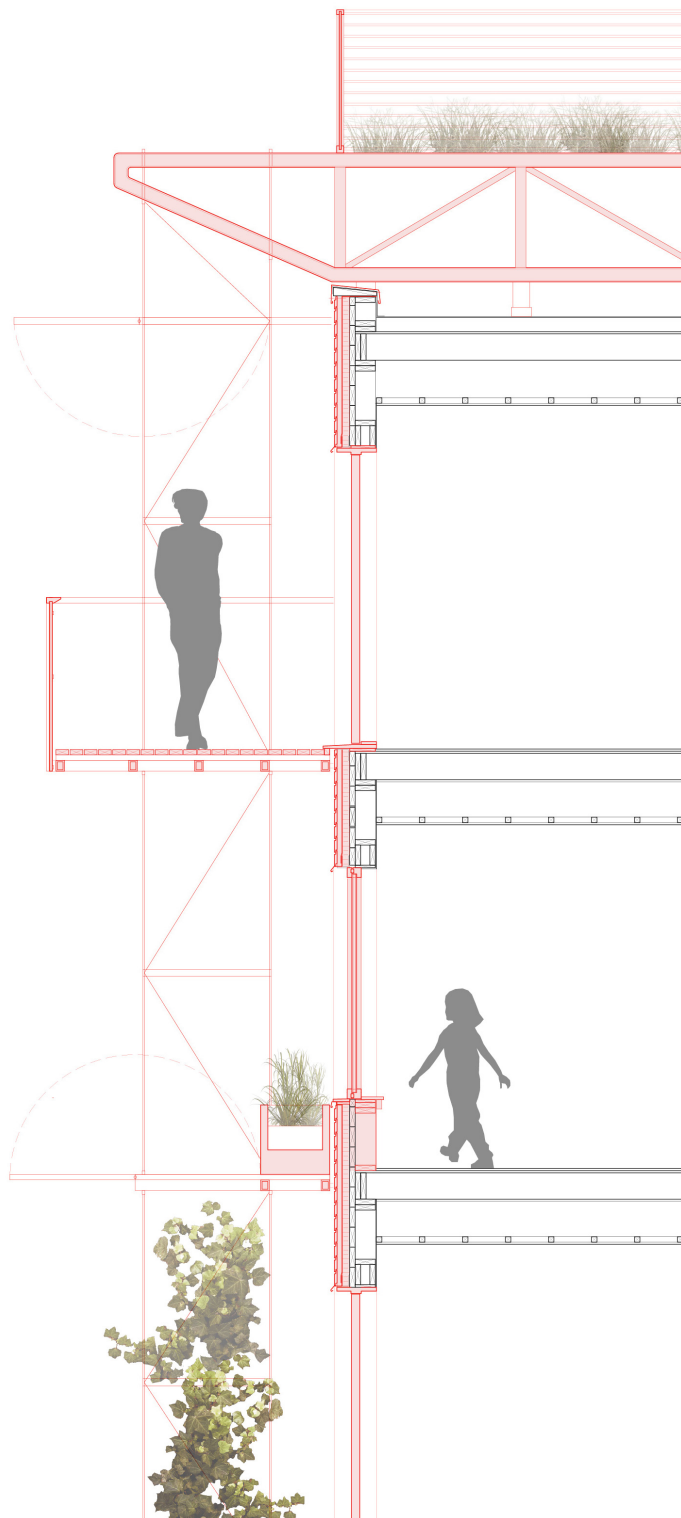Adapted living room

Existing unit entrance

Adapted unit entrance

Unit 2: Two-Bedroom, Middle-Aged Couple

The two-bedroom unit on the second floor was re-designed with the living room and kitchen overlooking the lake, and the bedrooms overlooking the courtyard. Although moving the kitchen requires a great deal of work, it was necessary in order to optimize the existing space.

0.5 m   1 m   2.5 m

Plan of two-bedroom unit

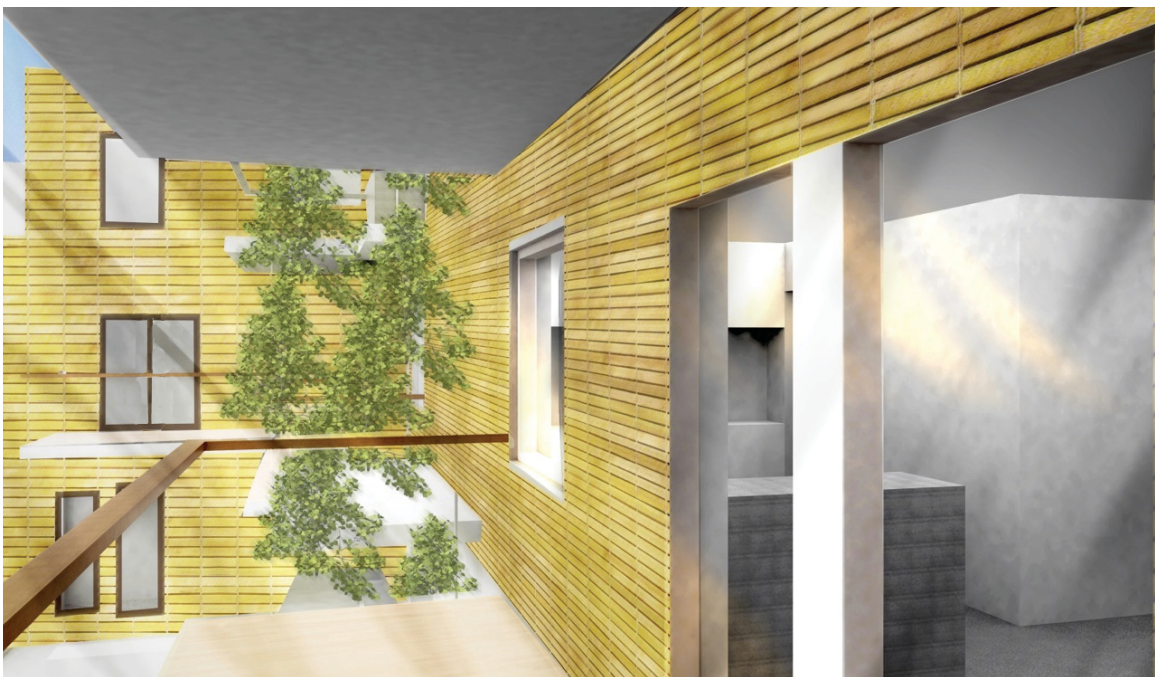Detailed section showing the balcony structure hanging from trusses on the roof

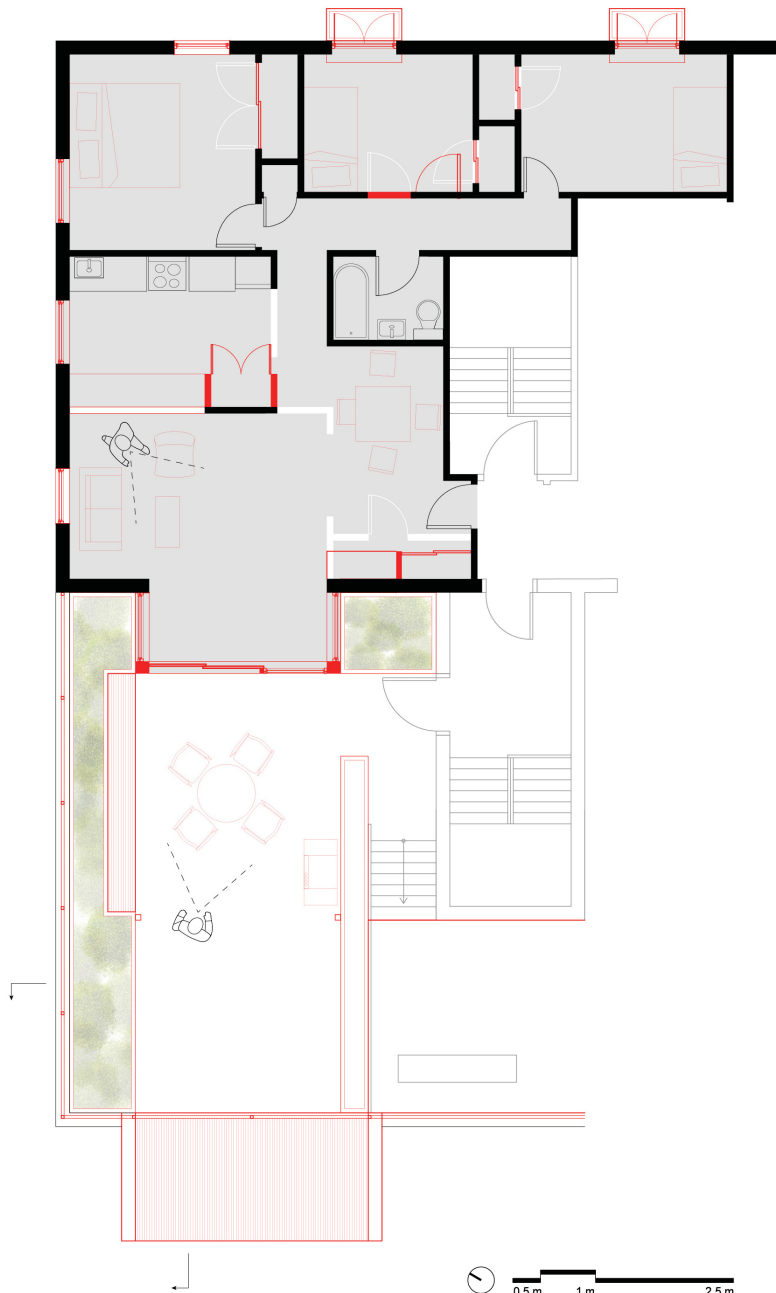Existing living room

Adapted living room

Existing facade

Adapted facade with new balcony

Unit 3: Three-Bedroom, Family of Four

The three-bedroom unit was re-designed to allow access to a roof terrace overlooking the lake. The trusses that carry the balconies hold planters and benches that delimit the terrace.

0.5 m   1 m   2.5 m

Plan of the three-bedroom unit

0.2 m   0.4 m   1 m
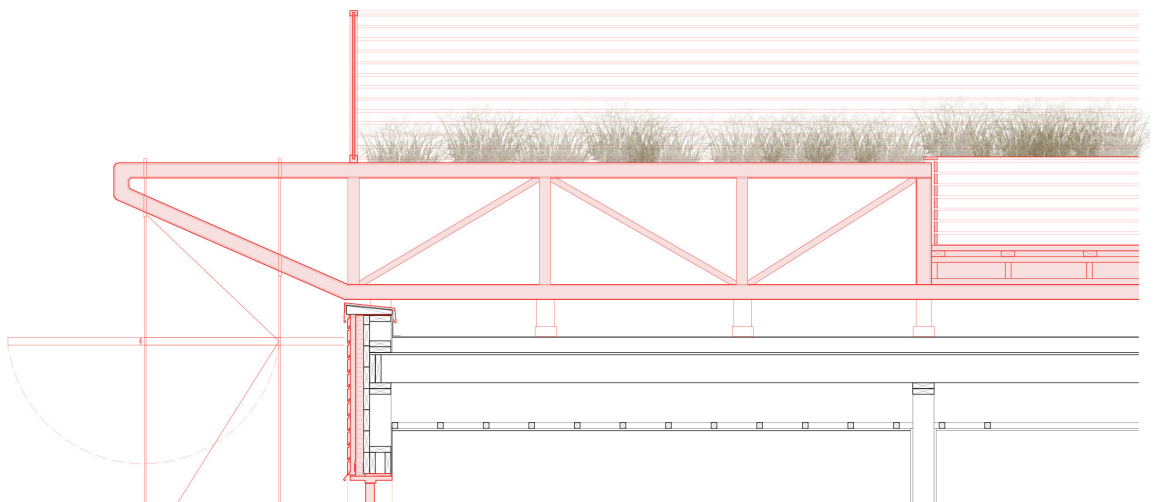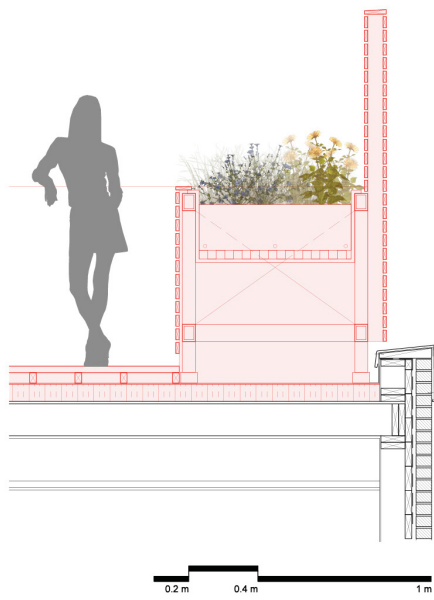
Detailed sections showing balcony truss, planter, and bench detail

Existing living room

Adapted living room

Adapted rooftop terrace
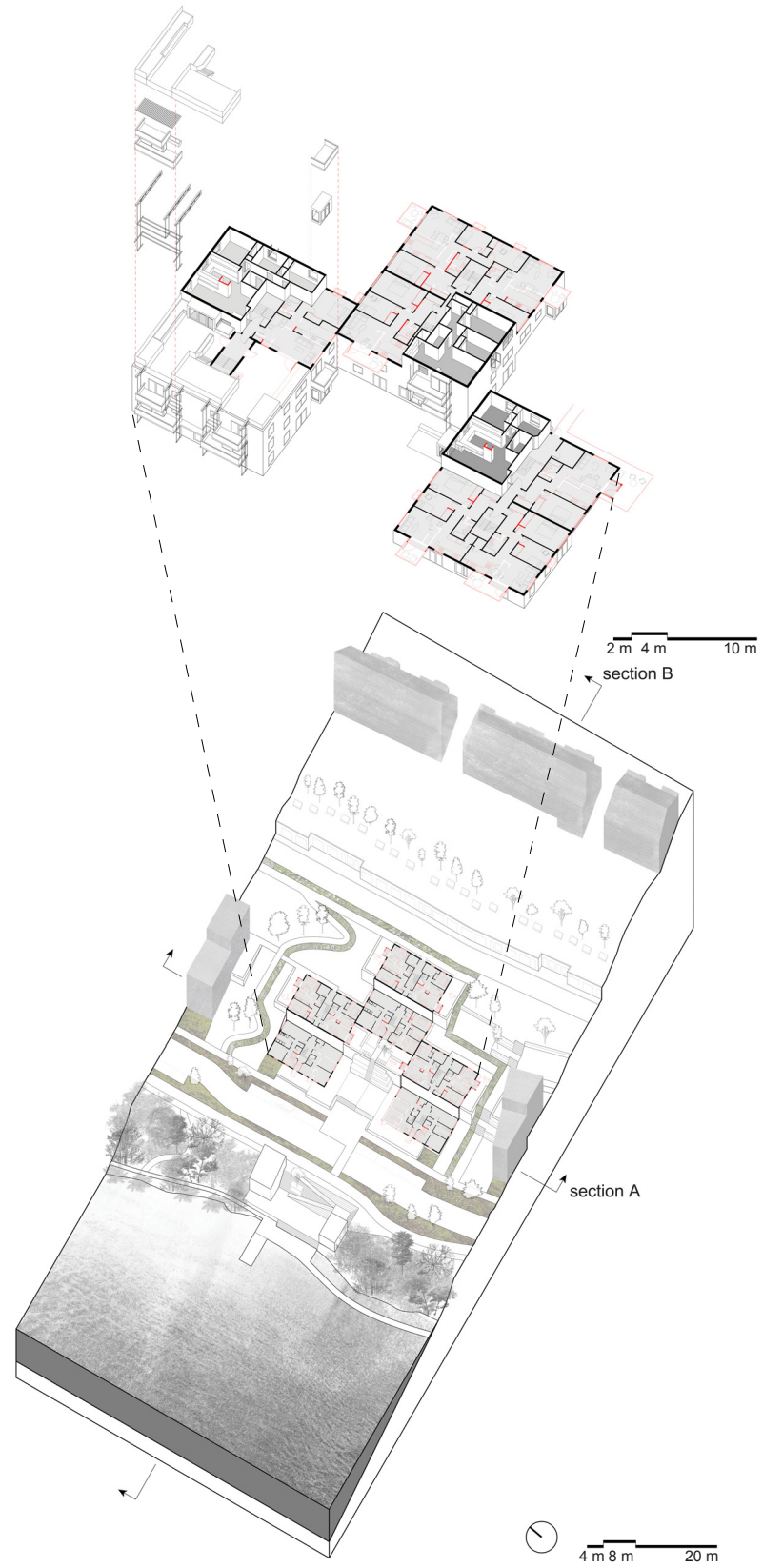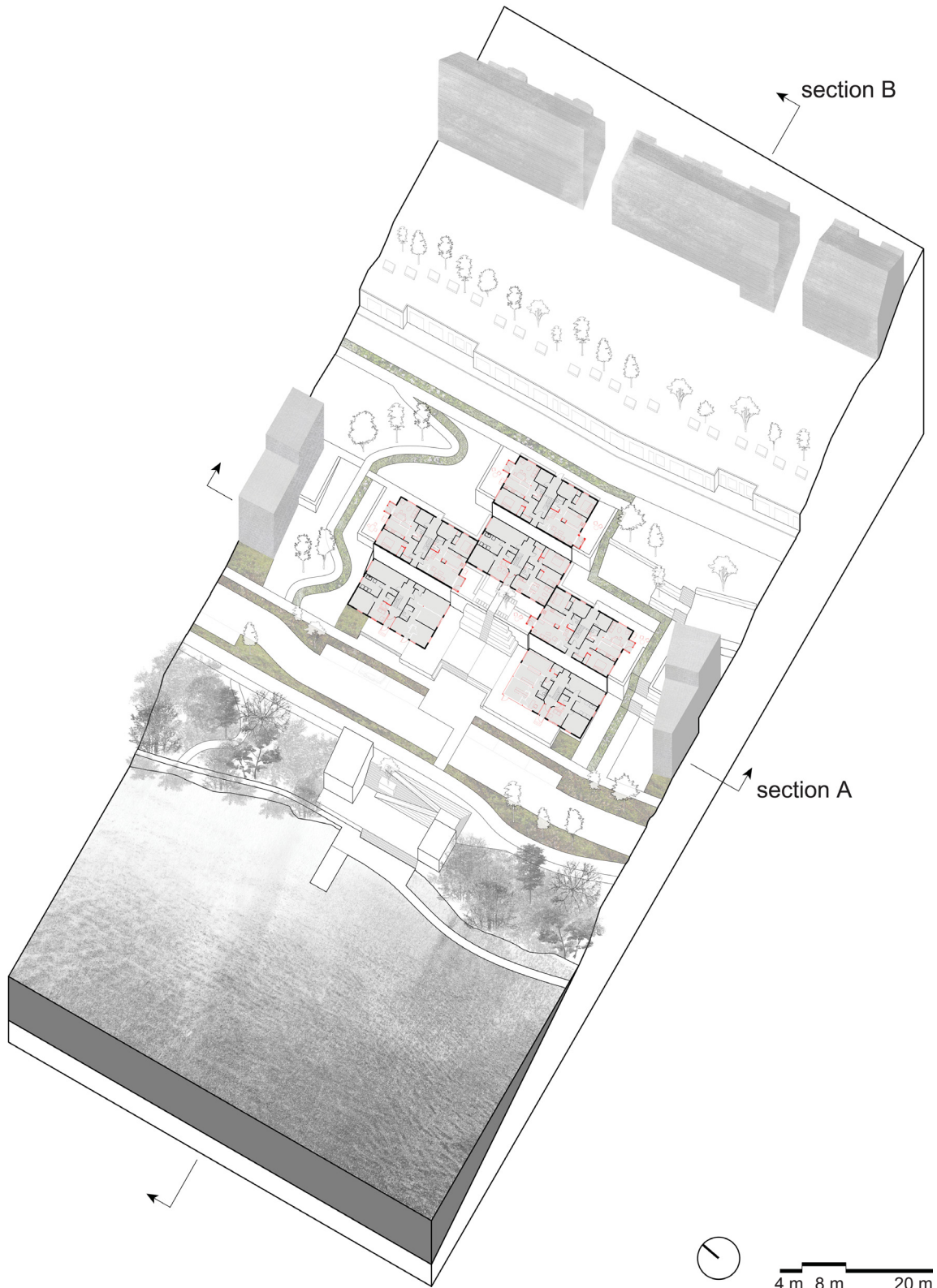
Courtyard Design

The courtyard is conceived of as an exterior room that connects the buildings to the lake. The terraces become more public as they step down to the lake. At the upper level of the courtyard, the terraces are private while the next level down is more communal. The two units at grade facing onto the courtyard have been re-programed as commercial spaces; one is a daycare, the other a convenience store. On the street, parking is denoted by rainwater swales that run on either side of the street. The terraces continue across the street, stepping down to the lake edge. An after-school program and day camp are housed in the new buildings that frame the terraces. A dock connects to the public path that runs around the perimeter of the lake.

2 m 4 m   10 m

section B

section A

4 m 8 m   20 m

Axonometric showing the courtyard and the second, third, and fourth floor plans above. On each floor, the unit that was re-designed in detail has been extruded.

section B

section A

4 m 8 m   20 m

Axonometric of the courtyard
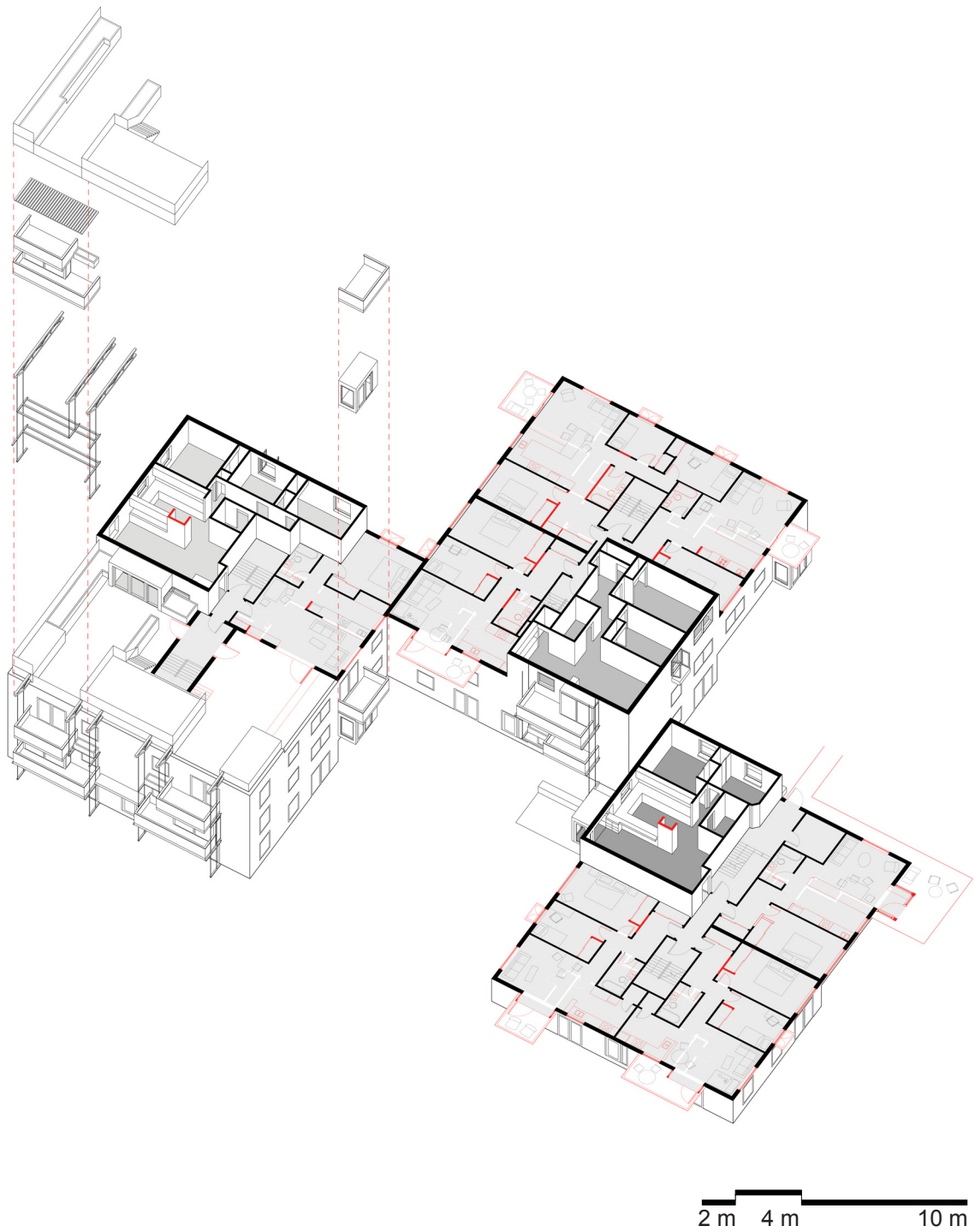
Axonometric of the second, third, and fourth floors

2 m   4 m   10 m

Balcony details

Detail of 1:100 courtyard model

Building Group Design

The spaces between the buildings are conceived of as outdoor rooms. The existing mechanical rooms at the rear of the buildings have been relocated underground between the building to create terraces that overlook the lake. An alternating pattern of terraced and sloped paths between the buildings sets up a rhythm across the site. Each path is paired with a rainwater swale that brings water from across the site down to the lake. Parking in the rear lane is relocated to garages sunk into the hillside. The garages can also serve as workshop space for the tenants, or for small businesses.

Section A through the spaces between the buildings and through the courtyard

2 m 4 m 10 m

Section B through Joffre Street, the rear lane, the courtyard, and the lake edge

2 m 4 m 10 m

5 m

2 m

1 m
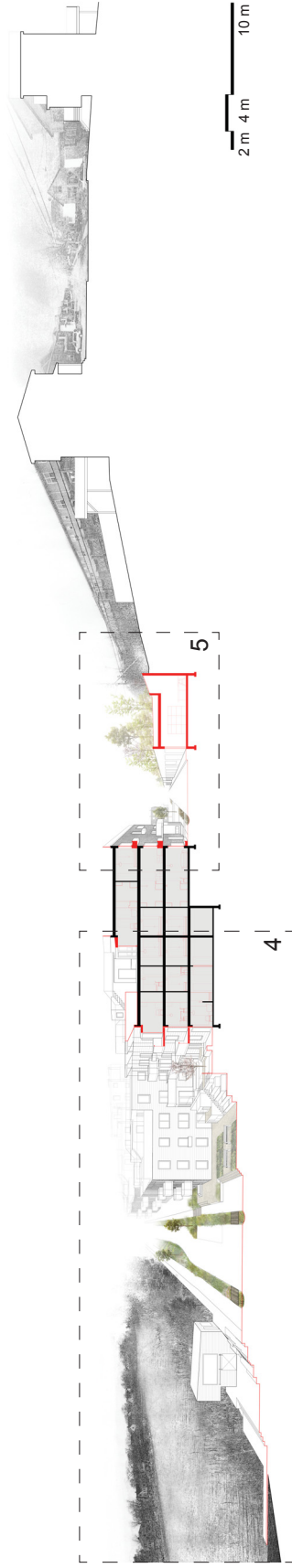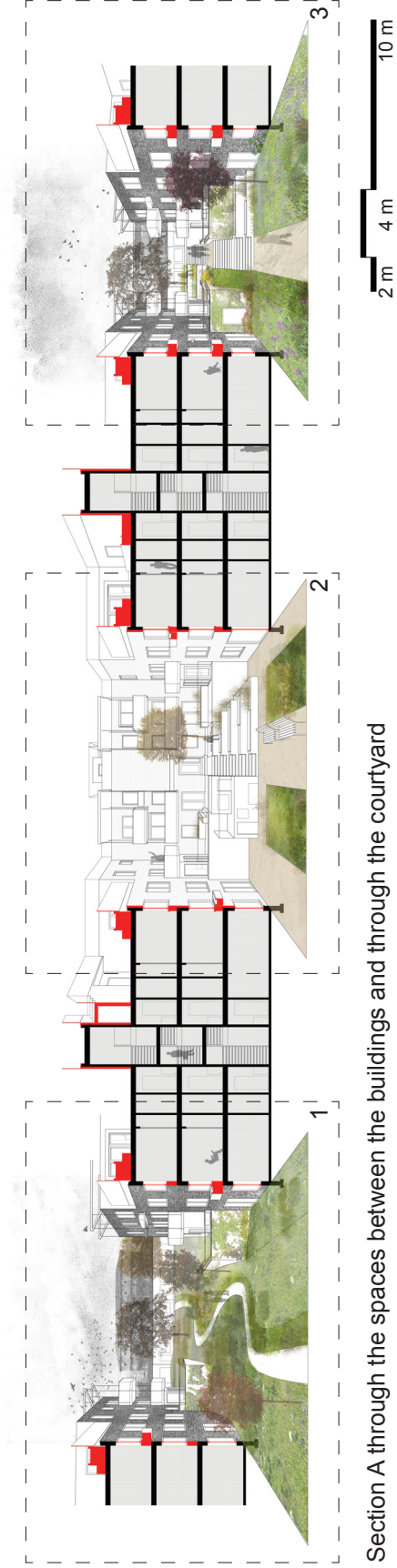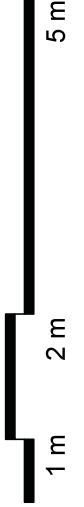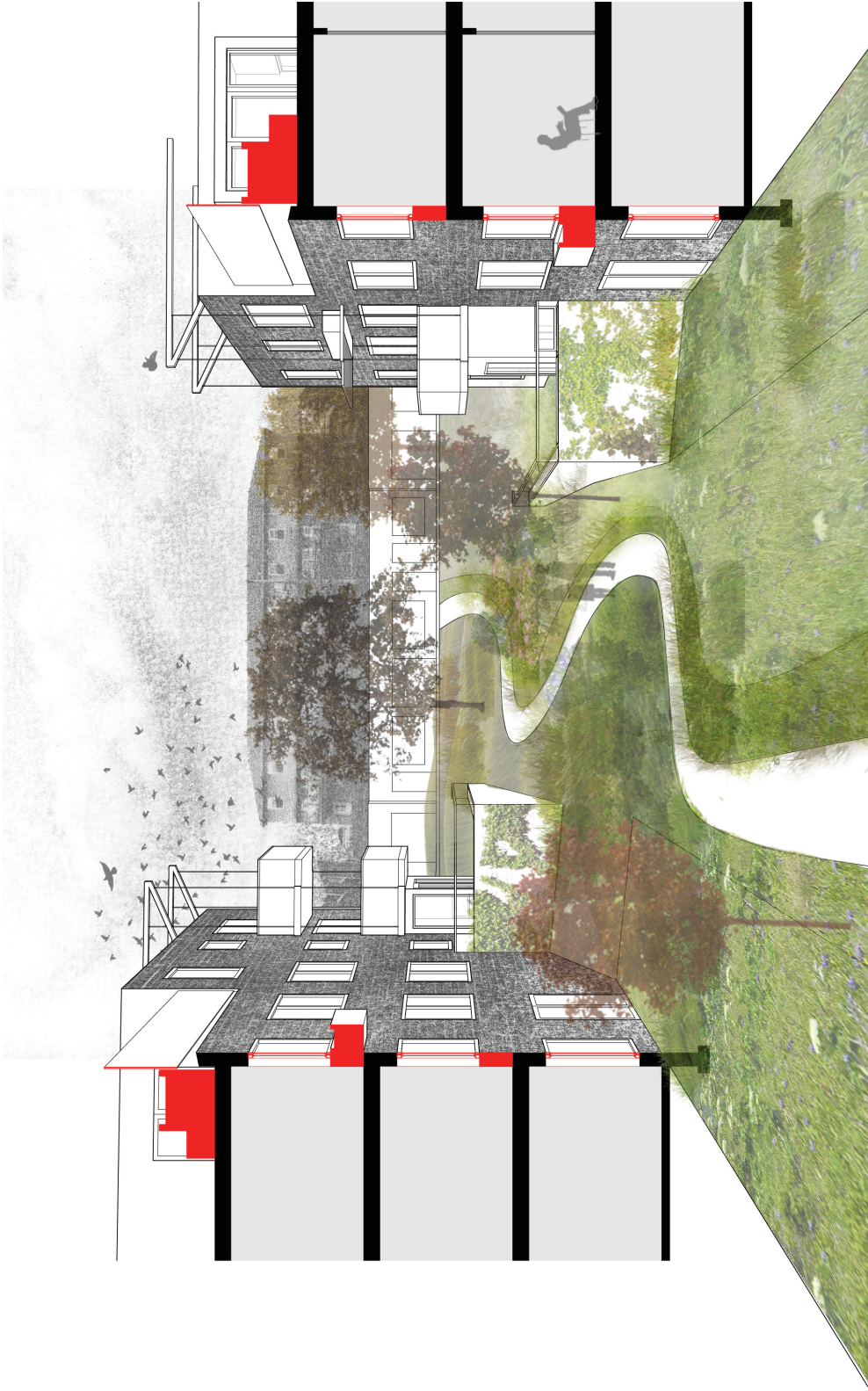
Section A detail 1

Section A detail 2

1 m 2 m 5 m

Section A detail 3

1 m   2 m   5 m

5 m

1 m 2 m

1.5 m

2.5 m

5.0 m

1.5 m

2.5 m

1.25 m

Section B detail 4

5 m

2 m

1 m

Section B detail 5

Site Design

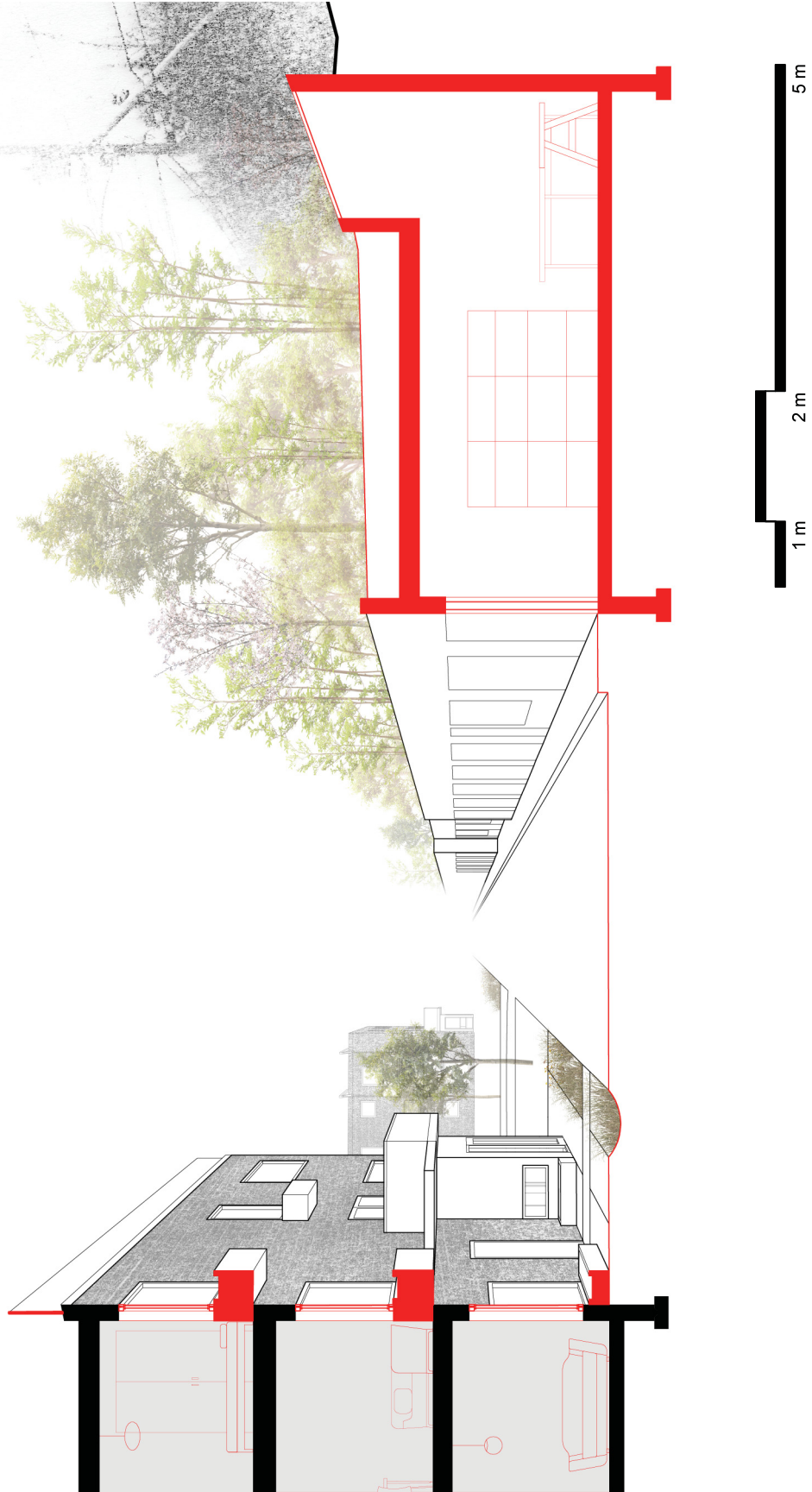The design of the entire site is a culmination of smaller moves within an overall framework. A major component of the framework is the rainwater swale. The swales run on either side of the street and along the paths across the site. The collected rainwater is deposited into two ponds which settle and cleanse the water before it enters the lake. The street is also important in the framework of the site. The street extends to connect into the existing Dartmouth grid. A bike lane runs alongside the street.

There are three main entrances to the site: the beach on Portland Street; the park at the centre of the site; and the communal gardens at the far end of the site. The first rainwater pond is located at the beach, in an existing marshy area. The central park connects Joffre Street to the lake via a series of terraces, and the communal gardens link the site to the neighbourhood. A dining pavilion in the gardens can be used by a nearby church, or as a small-scale market or event space.
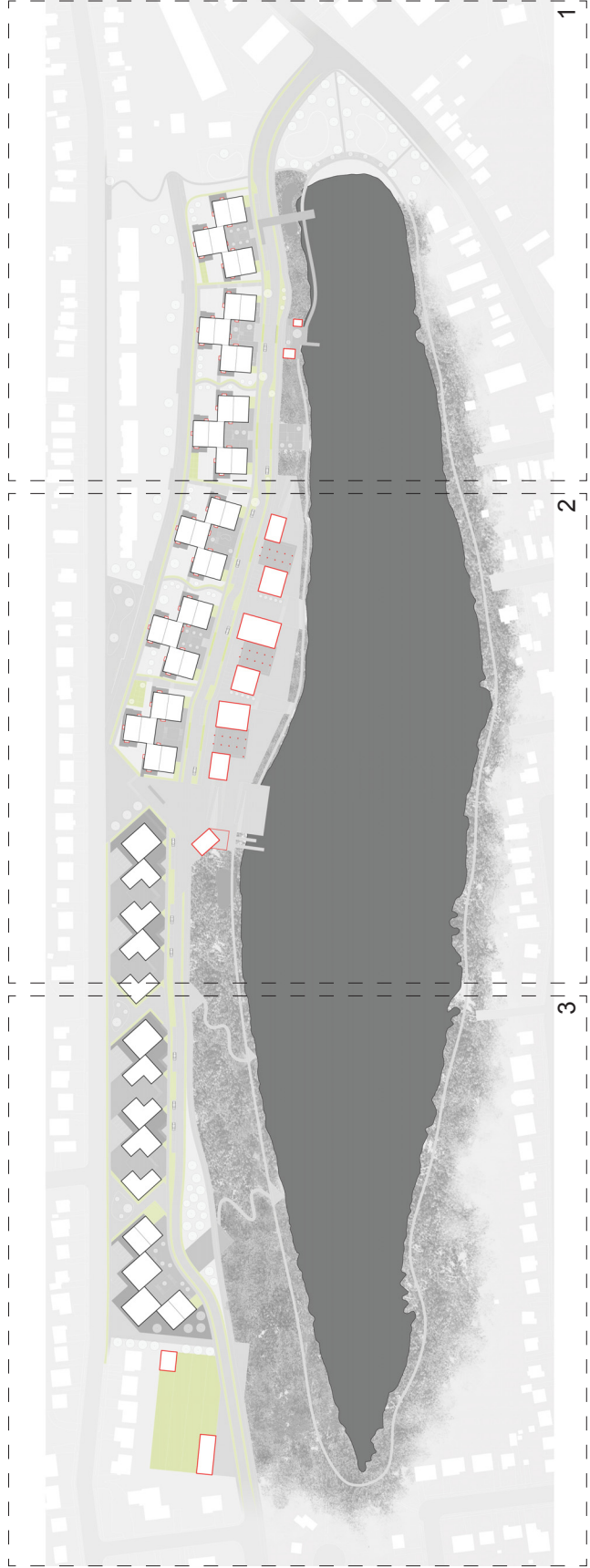
Site plan
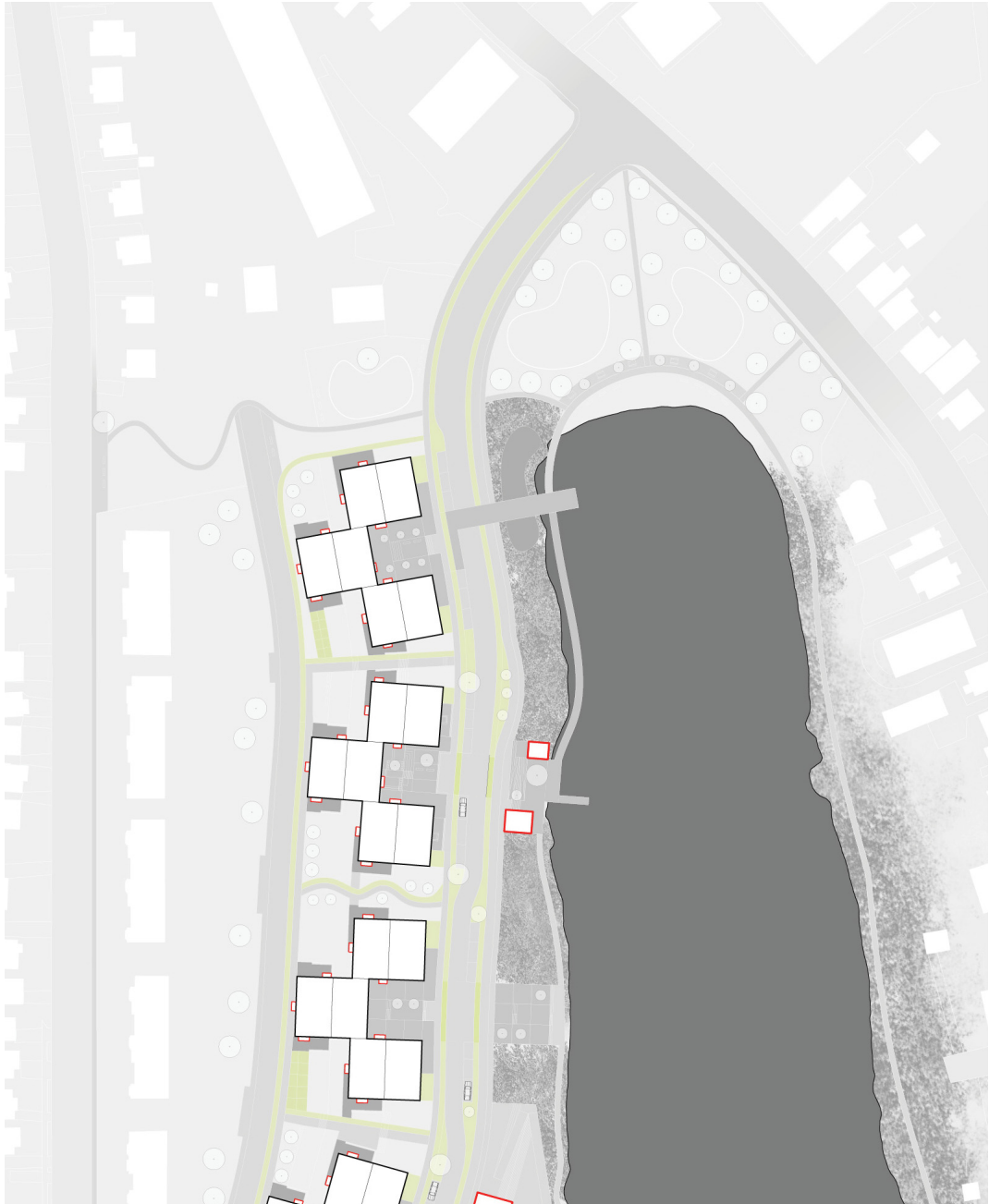
Site plan detail 1

10 m   20 m   50 m

Site plan detail 2

50 m

20 m

10 m

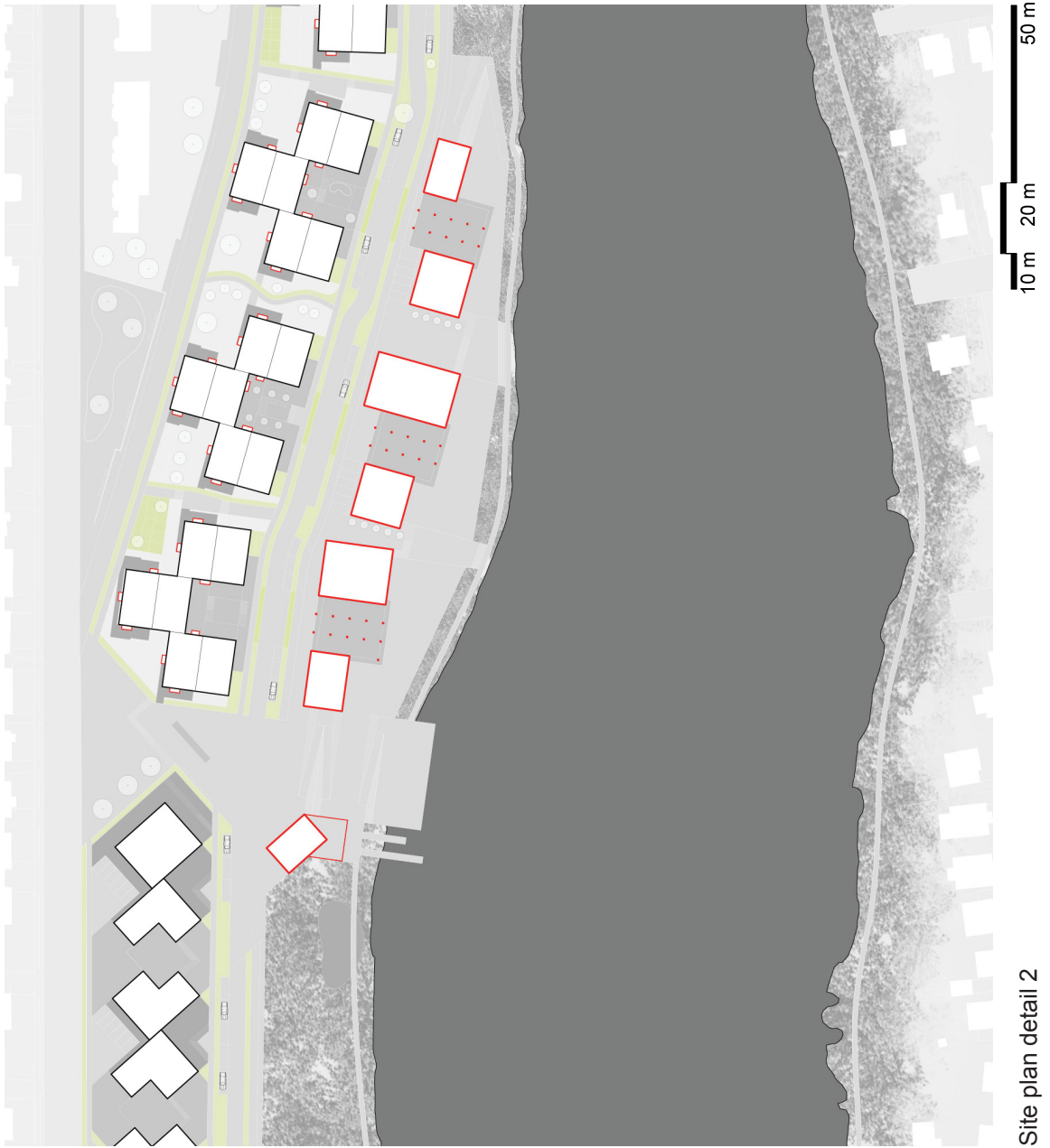Site plan detail 3
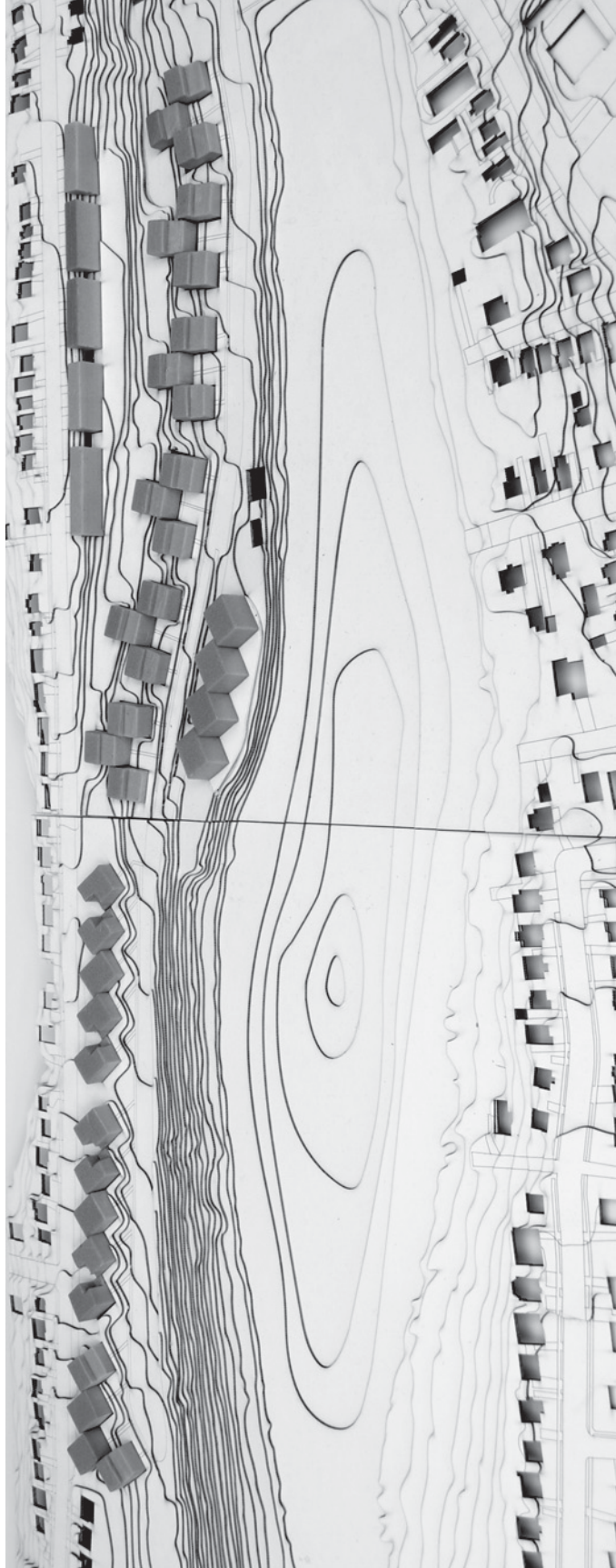
Site model showing existing site conditions
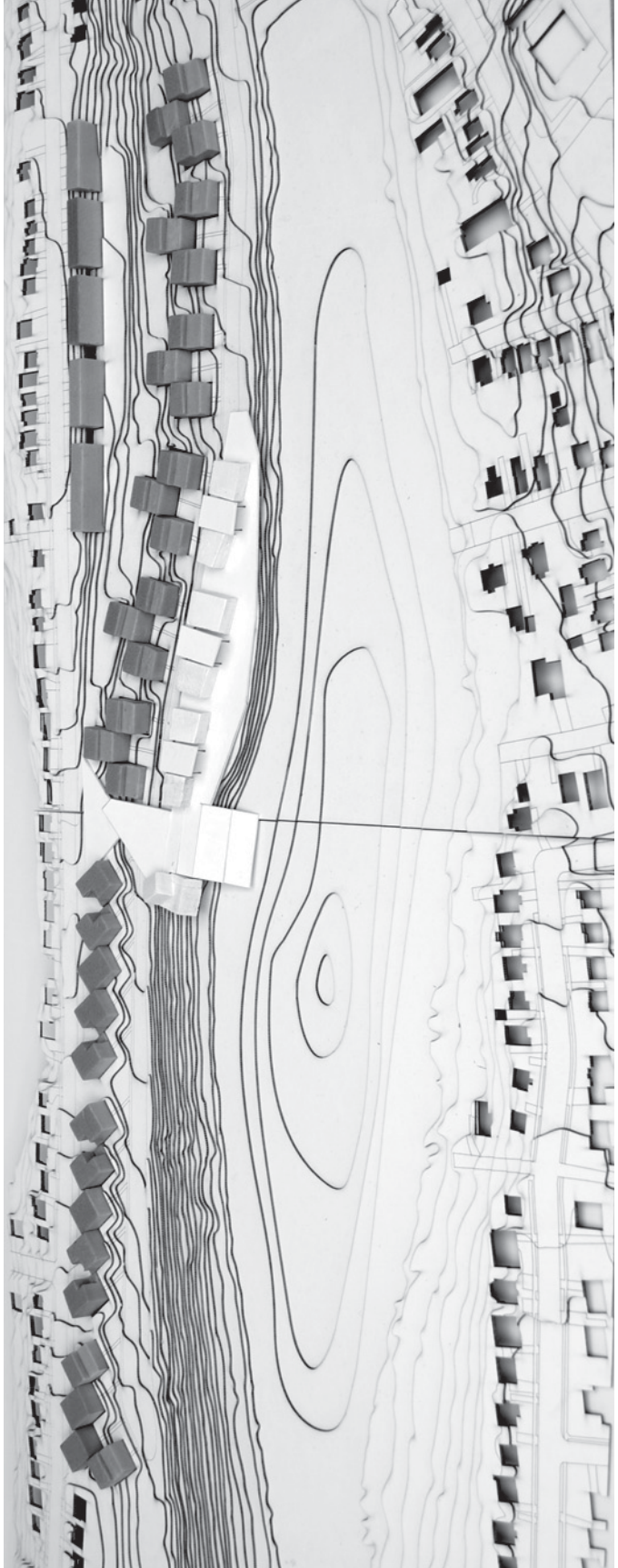
Site model showing proposed new buildings

The Central Park

The park at the centre of the site is a gateway to the lake. The four existing apartment blocks on the edge of the lake have been replaced by a series of adaptable courtyard buildings linked by an arcade and a promenade that runs along the lake edge. The courtyards of the buildings are covered and aligned with the existing courtyards; they may serve as public event space, market space, workshop space, or communal tenant event space. The programs in the buildings are diverse. There are amenity spaces for the tenants that include a communal dining room, workshops, meeting rooms, multi-purpose rooms, guest accommodation, and athletic rooms. The rental headquarters for the site is located in the new buildings, alongside small-scale rentable commercial spaces. A boathouse and docks bound the edge of the park.
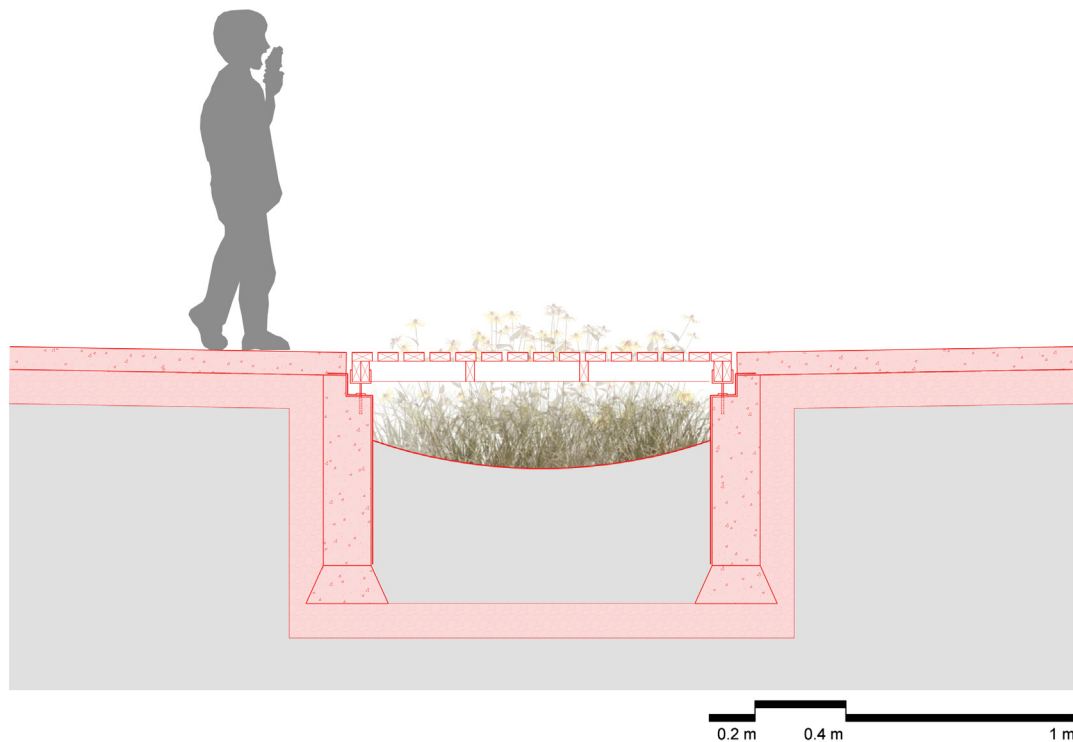
The detail of the bridge over the rainwater swale represents the notion of the site as a watershed and the linking of human and natural ecologies.
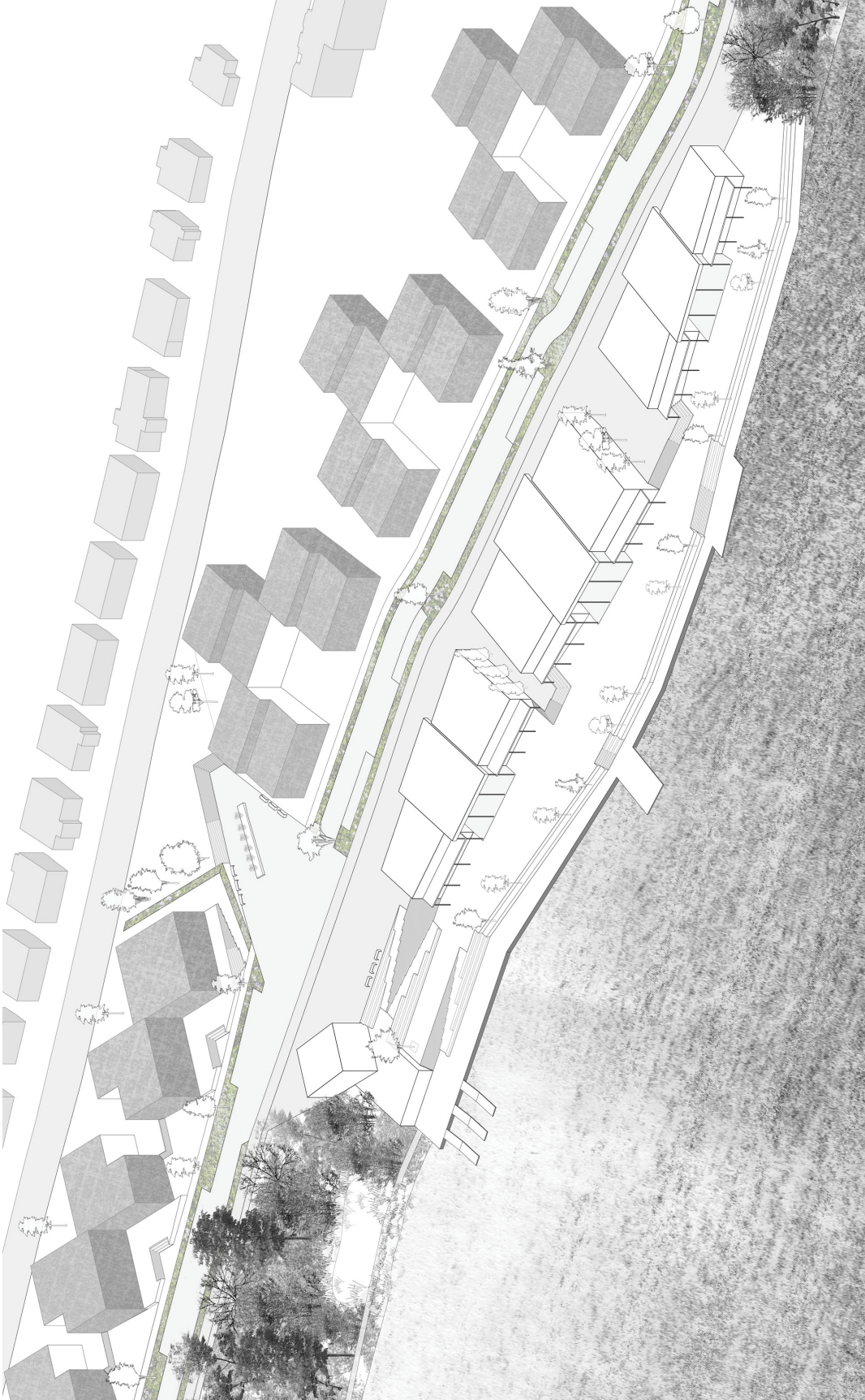
Axonometric view of the central park and promenade along the lake edge

CHAPTER 6: CONCLUSION

In the field of architecture and urban design, diversity and complexity have been recognized as positive characteristics of resilient, healthy cities. A growing interest in retaining and renovating existing buildings is based on the theory that diversity and complexity are layers that accrue over time, not characteristics generated by demolition and reconstruction. The re-design of existing buildings begins with the pinpointing of areas that can be changed with the least use of energy. At each scale, I sought out the parts of the building and the site that could be changed for the greatest effect. In order to find these moments, I had to determine which forces were controlling the site at each scale. Some moves required more energy than others, but at all times, I sought the balance between energy and effect. For example, at the scale of the unit, lowering the sill height of a window requires little energy because the framing under a window is not structural. At the site scale, consolidating the parking and burying it in the hillside requires more energy, but frees the site from the control of the parking lot.

The Lakefront Apartments are a common residential building type found across Canada, and further study would be very relevant to the current architectural and urban discourse. There are a number of specific areas in which further study would be extremely beneficial: density, new building systems, adaptability, and phasing. Increased density on the site would support more diverse programs, and generate a more resilient neighbourhood. Density could be increased through the addition of new floors on existing buildings, or the construction of new buildings. The addition of new building systems to existing structures is also a promising area of

study. The Lakefront Apartments could be connected in a district energy system. The geology of Dartmouth allows the use of geothermal systems, and the balcony structure holds the potential for incorporating solar energy technology as an adaptable element. The framework for the adaptable elements is laid out, but the elements themselves require further development and diversification. Lastly, the phasing of the work is an interesting and relevant area of study. It may be possible to use a phasing system to generate diversity. If a framework of change is set up, subsequent phases could build upon one another, regenerating an existing site.

In the course of this thesis, it has become clear that change happens most readily within a framework. We can't predict the outcome of future change, but we can set up a system that is adaptable to change. As Hester wrote, the guiding framework should hold intention, but should not be prescriptive. We must look for what works best in our existing buildings, and balance ease of change with the benefits of change.

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