LAYERS
LAC LEAMY + LEBRETON FLATS

by

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ABSTRACT

This thesis explores cut and fill operations to create an occupiable archive of LeBreton Flats' intertwined industrial and environmental histories. Employing visualization techniques which draw historical elements into dialogue, the thesis develops a method for understanding the cut and fill operations and flow formations which have shaped the region since the turn of the 19th century. In this time, this prominent site has seen resources cut from it, rubble used as fill to create "new land," and pollution flow into its soils.

The thesis envisions a reflective landscape for the LeBreton Flats site, which currently sits as a vacant brownfield west of the parliamentary precinct in Ottawa, Canada's capital city. Drawing upon the work of Anuradha Mathur and Dilip da Cunha, this project uses time-based studies and sectional and layered drawings to question the perception of impermeable boundaries between land and water. Translation of the dynamic qualities of the site to a tangible scale is achieved through a series of constructions embedded within a reimagined landscape. These constructions provide frameworks through which temporal processes of environmental fluctuation and human control are rendered visible and accessible.

ACKNOWLEDGEMENTS

To my advisor, Catherine, for your steadying guidance through a year filled with changes and surprises. Your patience as I wandered between thoughts, ideas, and strategies, and your ability to adapt and apply your knowledge to work in harmony with my interests made this thesis a reality.

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CONTENTS

LIST OF IMAGES

UNDERSTANDING THE SITE

1.01 Satellite Image of the Capital Region
SPOT Satellite, 2003.

Introduction

Ottawa's LeBreton Flats neighbourhood sits immediately south of the Ottawa River's Chaudière Falls. The flats originally attracted settlers due to an abundance of harvestable wood in its forests, prompting the formation of a working class community by the middle of the nineteenth century. For the better part of a century, the flats flourished as an industrial neighbourhood. In preparation for Canada's centennial, beautification efforts by the city deemed the industrial and working class residential occupancies of the flats a blemish on the city, and demolished it entirely. The volatility of this decision coupled with the residue from years of industry on the flats prevented any development until recently. Aside from the Canadian War Museum and a small condominium development, the flats remains a vacant brownfield site immediately west of Ottawa's downtown core.

This examination of the site's history relies heavily upon Phil Jenkin's book *An Acre of Time*. In this text, Jenkins situates one acre of LeBreton Flats within a landscape defined by geological and hydrological processes, occupied and understood by indigenous people who had lived in the area for thousands of years. Jenkins then traces this acre through the periods of European contact, settlement, industry, and expropriation which have pushed LeBreton Flats to its current state. Inspired by Jenkins' approach, which understands the time of human occupation of the site as a brief moment in a long span of time, the thesis focuses on the interactions between human activity and the hydrological, geological, and botanical processes of the site. While this thesis provides a summary of the sociopolitical history of the site, the design intervention provides frameworks for human visitors without envisioning a permanent reoccupation of LeBreton Flats.

An Imagined Tabula Rasa

Ten thousand years ago the Champlain Sea receded, revealing the Ottawa Valley landscape for the first time. Years of sea cover had left the region blanketed by a layer of limestone. These marine deposits, infused with fossilized whales, crustaceans, and other aquatic species, give a glimpse into a different era of the site.[1] The receding waters of this era gave way to a new one, which would eventually become dominated by human interactions with and interferences in the land.

Archaeological evidence confirms that indigenous people have been living in the Ottawa Valley for at least eight thousand years. The first people in the area inhabited a land filled simultaneously with opportunity and danger. Indigenous rituals, customs and beliefs prioritized relationships between the land and all living organisms as a means for maintaining balance and ensuring survival of the community.

In the Capital Region, the Chaudière Falls was an entity that needed to be respected. The scale and power of the falls dominated the landscape, with its sound allegedly heard from miles away.[2] The indigenous groups presented tobacco offerings to the spirits of 'asticou' in attempts to appease the spirit and minimize the number of deaths that undoubtedly resulted from venturing too close to the falls.[3]

A nomadic people during the warmer months, the indigenous groups would return to the same riverside campsites each winter.[4] The different groups maintained a separation from one another during the year, utilizing a system of territorial demarcation based on relationships to different land features. The

1 Phil Jenkins, An Acre of Time (Toronto: Macfarlane Walter & Ross Publishing), 22.
2 Jenkins, 48.
3 Jenkins, 6.
4 Jenkins, 8.

territories were created to ensure adequate space for survival of each group, based on the required yield to sustain the family. Should a boundary need to be crossed in order to ensure survival, it was permitted, with the understanding that a similar opportunity was granted for the other family in the future.[5]

The boundaries of this time were flexible - products of a relation-based worldview. Moreover, the boundaries were not physically imposed on the landscape, but created in harmony with it. Rather than through the creation of walls or fences, these boundaries were understood based on rivers, ridges, trees, and swamps.[6] These 'soft' boundaries changed with the seasons, with territories swelling and contracting based on environmental conditions. This dynamic landscape would remain unbroken for thousands of years, until its first introduction to the analytical European eye.

5 Jenkins, 55.
6 IBID.

Contact

European desire for land and goods prompted a wave of exploration in search of 'new worlds' in the early 16th century, stemming from Columbus' first successful cross-Atlantic journey. Early European interaction with the territory that would one day be named "Canada" came primarily through fishing and trading with indigenous nations along the Atlantic coast. As demands on the fur trade and curiosity of the other potentials of the new world increased, explorative attention shifted to the interior of the continent. French explorer Jacques Cartier reaching present day Montreal by the mid 16th century. By the turn of the 17th century, Europeans had moved further westwards, nearing what we today know as the cities of Ottawa and Gatineau, the modern day National Capital Region.

Samuel de Champlain, a French explorer credited with founding Quebec City, is similarly credited as the first European to reach the Chaudière Falls. In the year 1613, one of his expeditions led him to the mouth of the Ottawa River, and, seeking riches that he believed to exist along the golden river, began the journey upriver.[7] On day fourteen, de Champlain's group of explorers reached the falls. His June 13, 1613, journal entry is the first written record of the falls, in which he describes that there "are many small islands which are nothing more than rough, steep rocks, covered with poor, scrubby wood…rough rocks for about a quarter of a league [a mile] which is the length of the fall."[8]

7 Jenkins, 40.
8 Jenkins, 48.

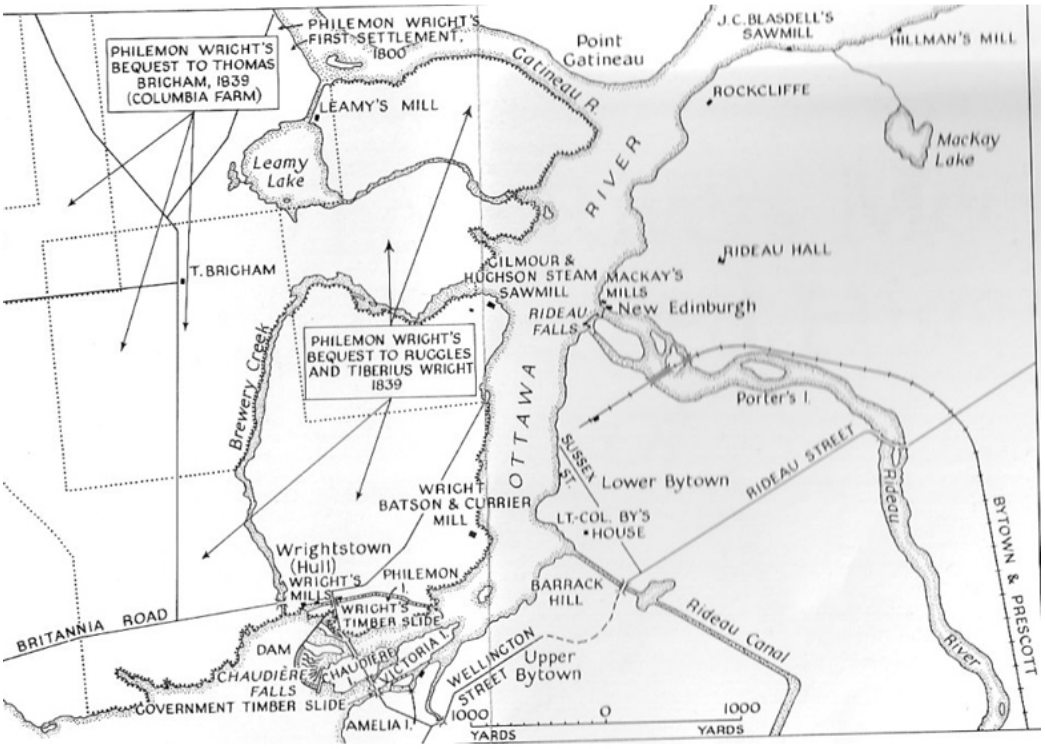
Breaking Ground

Nearly two hundred years after Champlain's passage through the capital region, the British government had wrested the land from the French, claiming Upper and Lower Canada as their own. In order to maintain this control, the land needed to be occupied by loyal British subjects, who would fight to protect it. The land would have to be prepared for the new occupants, and the first step in the process was surveying. This began in 1794 in Nepean, a region in the Ottawa Valley southwest of the Chaudière Falls. The surveying methods of the time required chopping down sight lines through the forest, imposing a physical grid directly onto the landscape.[9] This enabled the surveyors to measure and document the landscape. Through this process, Europeans imposed their acres on a land that before they arrived had flowed from sea to sea, joyfully free of measurement.[10]

Led by Philemon Wright, from Massachusetts, the first permanent settlers of the capital region arrived in 1800 in search of a location prime for developing industry. Reaching the Chaudière falls, the settlers found their ideal location, complete with the ample supply of timber and an excellent means for power generation in the Ottawa River and the falls. As shown in figure 1.02, Wright and his followers elected to settle on the north side of the river, founding Wright's Town. In a landscape populated with forests of white pine and maple, Wright quickly constructed a mill and began harvesting lumber from the shores of the river, with the intention to export the wood to Europe.[11]

By the mid-19th century, a series of mills would come to populate the islands and shorelines near the Chaudière Falls. After purchasing 200 acres of land around Lac Leamy in 1835, Andrew Leamy constructed a mill of his own

9 Jenkins, 5.
10 IBID.
11 Jenkins, 99.

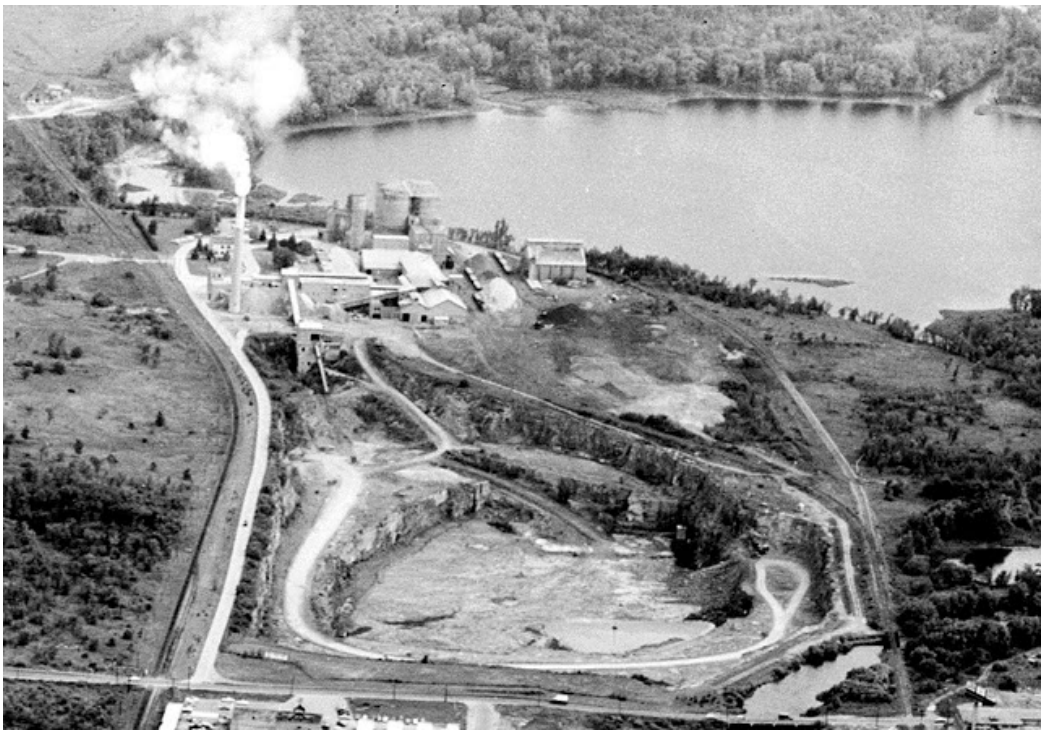


1.02 Map of Wright's Town Settlement
This map illustrates the expanse of the Wright family's industrial empire on the site of modern day Gatineau.
Bond and Hughson, Hurling Down the Pine.

on the banks of the lake in 1853.[12] In order to operate the mill, Leamy needed to connect the closed lake to a river as a means for guiding logs to the mill. This was achieved by carving an access channel from the Gatineau River, connecting the river to the north side of the lake. Operation of the sawmill led to pollution of the lake, prompting a drainage channel to be cut through the eastern bank of the lake to the Ottawa River. With the addition of the drainage channel, the sawmill's effluent problems were washed into the river. The steam-powered mill ceased operation after a boiler explosion.

At the same time, Ruggles Wright, son of Philemon Wright, founded the Hull Lime and Cement Works, making lime and hydraulic cement. This company

12 "Andrew Leamy," Wikipedia; The Free Encyclopedia, last edited October 21, 2019. https://en.wikipedia.org/wiki/Andrew_Leamy



1.03 Limestone Quarry at Lac Leamy
Library and Archives Canada.

relied on the import of the dry components of portland cement from England. Capitalizing on an exceptionally deep deposit of limestone to the south of Lac Leamy, a portland cement manufacturing company was founded in 1889, becoming the first location in Canada to produce cement entirely on site.[13] This company was integrated into the newly formed Canada Cement Company in 1909, bringing the product to a national scale.[14]

On the south shore of the river, the lumber industry took over the flat landscape immediately adjacent to the falls, which had been purchased by John LeBreton in 1820. Proximity to the falls and mills made this area, which became known as LeBreton Flats, an ideal location for storing lumber. As a result, lumber yards quickly came to dominate the shoreline. A rail yard was introduced to the flats in 1882, shifting the lumber industry's primary means of transporting goods from river to rail.

13 R.A. Serne, "Cement Industry" in The Canadian Encyclopedia (Historica Canada, 2013).
14 IBID

1.04 Lumber Yards at LeBreton Flats
Library and Archives Canada.

With the rise of employment opportunities in the lumber industry on LeBreton Flats came a demand for residences for the workers and their families. While initially based on the production of lumber, the flats would quickly become the home for a myriad of other industrial businesses, including a paint works, a foundry, a glassworks, and multiple scrap yards, among others. A second wave of industry that followed the lumber boom enabled the flats to remain a prominent community well after the region's lumber industry faded to the background. The consistent use of the flats as a hotbed for industry fostered the creation of a working class community. LeBreton Flats was defined by its industry from the early days of lumber mills until the community was uprooted in the 1960s.

History of Erasure

European settlement of the Capital Region was reliant on strategies of erasure, both through physical operations and mental tactics. In order to successfully take control over the land occupied by the indigenous peoples already in the region, the settlers had to work to erase indigenous claims to the land. The history of land relations between the two groups highlights a series of one sided 'deals,' with European colonizers claiming ownership over the lands they desired, a process that David Hugill notes is similar across "most urban genesis stories."[15] In doing so, they forced the indigenous population further and further from their traditional territories, eventually confining them to reserves.

On the morning of April 26, 1900, fire spread through the waterfront industrial neighbourhoods of Hull.[16] The dry stacks of timber awaiting shipment on the banks of the river expedited the fire's expansion, with the wind blowing the embers across the river and igniting the stacks on the Ottawa side of the river at LeBreton Flats. When the fire was eventually extinguished, two-thirds of Hull and one-fifth of Ottawa had been destroyed.[17] The waterfront industrial areas were among those most affected by the fire, including the entirety of the LeBreton Flats neighbourhood. The businesses and residences damaged by the fire were primarily restored to their pre-fire state, ensuring that the fabric of the community remained intact after the process was completed.

In preparation for Canada's centennial year of 1967, the Canadian government, led by then Prime Minister Mackenzie King, sought to portray Canada as a place of natural beauty.[18] The curation of the capital was intended

15 David Hugill, "Settler Colonial Urbanism: Notes from Minneapolis and the life of Thomas Barlow Walker," in Settler Colonial Studies, vol. 6 no. 3, (Toronto: Routledge, 2016), 266.
16 Jenkins, 151.
17 Ottawa and Hull Fire Relief Fund, Report of the Ottawa and Hull Fire Relief Fund, 7.
18 "The Gréber Report," City of Ottawa, accessed December 12, 2019. https://ottawa.ca/en/arts-heritage-and-events/city-ottawa-archives/exhibitions-and-displays/witness-change-visions-andrews-newton-photographs/construction-and-expansion/greber-report

1.05 Great Fire Reaches LeBreton Flats
Library and Archives Canada.

1.06 Charred Rail Bed on the Flats
Library and Archives Canada.

1.07 Courthouse of Canada, Post Fire
Library and Archives Canada.

1.08 The Fire Damaged Flats
Library and Archives Canada.

1.09 Remnants of a Brick Facade
Library and Archives Canada.

to portray the city, and by extension the country, as world class. French urban planner Jacques Gréber was hired to begin the transformation of the capital region, releasing his scheme in 1950. His proposal revolved around the theme of cleaning up the dirty city, through the removal of rail lines and industry from the downtown core of the city, improving substandard living environments, and improving the quality of the river.[19] Each of these three 'problems' directly led to the LeBreton Flats neighbourhood, and as a result, the land became a target location for change in the eyes of the city. On April 19, 1962, residents and property owners of LeBreton Flats received notices of expropriation from the National Capital Commission.[20] By 1965, the entirety of the flats had been demolished. Despite a series of proposals, the land remained vacant until 2005, when the Canadian War Museum was completed on the site of the former lumber yards at the northern portion of the flats. A series of mid-rise residential buildings and parks have since been completed, but much of the land remains vacant today.

19 IBID.
20 Jenkins, 186.

1.10 Aerial View of LeBreton Flats Pre-Expropriation
GeoOttawa.ca

1.11 Aerial View of LeBreton Flats Post-Expropriation
GeoOttawa.ca

BOUNDARIES

Understanding the Line

A mathematical line is perfectly straight, extends infinitely, and contains infinitely many points. It is without breadth or thickness.[21] A line segment is a portion of a line, as defined by two distinct endpoints. Like a line, it is perfectly straight, contains infinitely many points, and is without thickness. Outside of the mathematical realm, the definition of a line is less strict. This definition of a line is still based on a series of points, and remains infinitely narrow in breadth, however it permits the use of the term 'line' without infinite length, and with curvature.

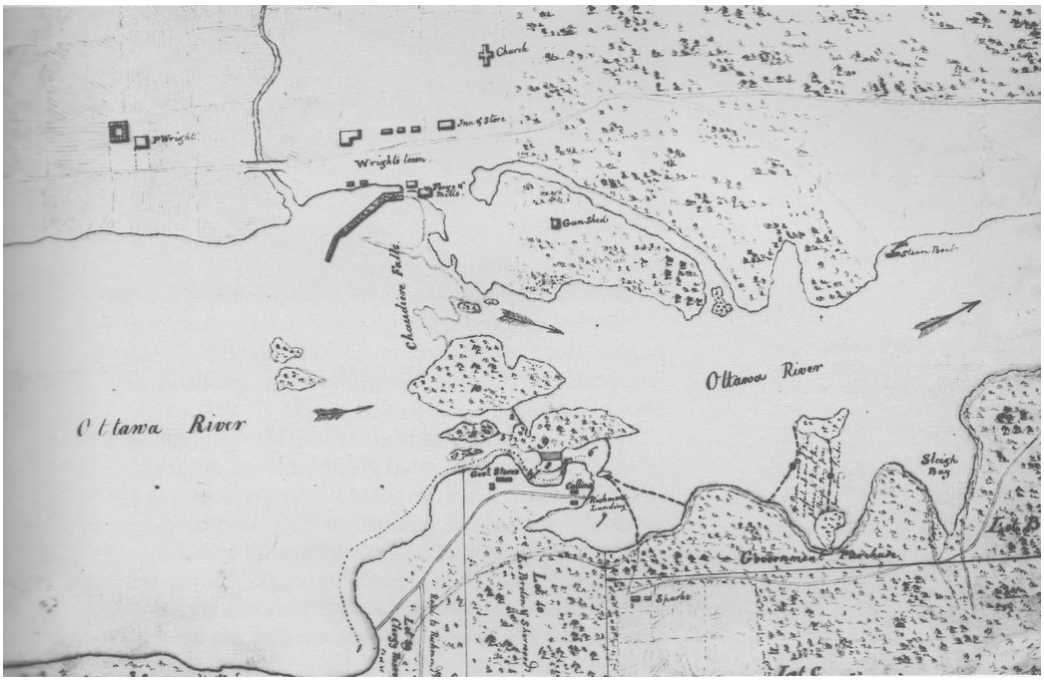
In mapping, lines are used to denote any number of things: roads, rail corridors, rivers, shorelines, topographic datums, building footprints, property lines, and political jurisdictions, among others. When used in a single drawing, each of these elements will see their representative lines given a different quality. Whether lighter, darker, coloured, or dashed, the author will work to create a difference between the line types to promote clarity of the information. In the creation of clarity between the different groups of lines, there will also be an inherent hierarchy of importance given to the groups. This hierarchy will influence the way in which the map is perceived, and consequently, which information is prioritized.

21 Dictionary.com, "Line," accessed December 10, 2019.

Authority

When Samuel de Champlain asked his indigenous guides to draw him a representation of the land in their control, they presented him with a map of the Ottawa rivershed. Each of the five rivers in Algonquin control was represented as a singular line, scrawled across a piece of birch bark. This sketch is believed to be the first map of the Ottawa river and its tributaries.[22]

The map is a product of western ideals, and as such would have been foreign to these early indigenous cartographers. As discussed previously, traditional indigenous understandings of the land focus on relationships between different landforms, such as rivers, ridges, swamps, and vegetation. The maps defining the territory were experiential; they were created, refined and conveyed through verbal and visual cues, relying on a human scale interaction with the site. By nature, these maps are dynamic, immediately accommodating changes



2.01 "Great Map," Lord Dalhousie, 1824.
Dalhousie uses hard, orthogonal lines in order to map the region based on land ownership. These lines are drawn with indifference to the existing landscape.
Library and Archives Canada

22 Jenkins, 40.

in the territory. As the swamp recedes during the dry season, the boundary of the swamp recedes. The language of the map enables its continual fluctuation.

In contrast to the Algonquin map, the lines of the European map are definitive, permanent, and non-negotiable. Maps are drawn situated in exceptional, out of person viewpoints and times.[23] There is no way to experience an environment from the perspective of the map. In their permanence, the lines of a map project a specific time on a place, defined by the cartographer and their interaction with the site as they measured its features. As such, the map prioritizes their perspective, giving them the authority over what does and does not make the cut. Jenkins argues that European maps are a reflection of their opinion of themselves, placing Europe in the centre, with the other landforms and countries revolving around them.[24] Likewise, lines drawn by Europeans demarcate colonial concepts of permanent land relations and ownership, as can be seen in early maps of Ottawa.

The line is a political act. It acts with authority, connecting and disconnecting different elements each time it is deployed. The line itself, as noted in the definitions explored previously, is inherently a means for connection. Each line is made up of infinitely many points being connected visually to form the line. If we understand a line to have a beginning and an end point, the line connects those two points. Through the act of connection, there is a simultaneous act of separation. The area through which a line passes is divided by the line, creating two separate zones.

This thesis explores the effects of the line as a boundary through a series of layered drawings on acetate. By stratifying the lines of historical maps based on year, the authority of each map is drawn into question. Each layered

23 Dilip da Cunha, The Invention of Rivers (Philadelphia: Penn Press, 2017), 16.
24 Jenkins, 70.

map portrays a single representation, and consequently a single interpretation, of a specific geographical area. Examining the maps individually, the lines are absolute. Each element of the drawing is positioned with specificity and permanence, leaving no room for debate.

When one map is overlaid with another, the authority of each map is brought into question. The roads no longer line up perfectly, nor do the buildings, nor do the waterways. Some elements disappear from one map to the next, and others are added. All of the discrepancies between the maps highlight temporal changes of the site, and suggest the inability of the fixed, singular line to exactly represent the various elements of a site. A fixed map cannot perfectly represent the site, as the site is dynamic rather than static.

The Water's Edge

No line on a map is more subject to change than the line representing the boundary of a body of water. Water is boundless by nature, and as a result is everywhere in some capacity.[25] With this understanding of water, it is difficult to comprehend a line representing the edge as permanent, despite the efforts of cartographers to convince us of this fact.

Water operates vertically, rather than horizontally. The movement of water is entirely based on its interaction with gravity. As a liquid, water falls from the sky in the form of rain. When contacting something on the earth's surface, it stops momentarily, and is either absorbed into the surface that it hit, or is collected into a flow, moving from a high point to a low one. Large scale flows have been dubbed 'creeks,' 'streams,' and 'rivers,' among others. These flows eventually reach large bodies of still or slow moving water, labelled as 'ponds,' 'lakes,' 'seas,' and 'oceans.' With added thermal energy, the water will begin to evaporate, changing from a liquid to a gas, and will rise well above the earth's surface. As the air around it cools, the water vapour condenses, forming clouds, and beginning the cycle once again.

When attempting to depict where the boundaries of the various types of water bodies lie, cartographers are forced to decide how they wish to represent the edge condition. As pointed out by Dilip da Cunha in his decades of work on the topic, cartographers and colonial explorers around the world have struggled to depict and understand water existing in specific places, contained to a series of named courses and collections.[26] As such, the line of a riverbank has three tasks, it separates water from land, confines water to a course, and calibrates water into a flow.[27]

25 da Cunha, The Invention of Rivers, 9.
26 Dilip da Cunha, "Wetness vs. Water," Presentation, Carleton University, 2017.
27 da Cunha, The Invention of Rivers, 56.

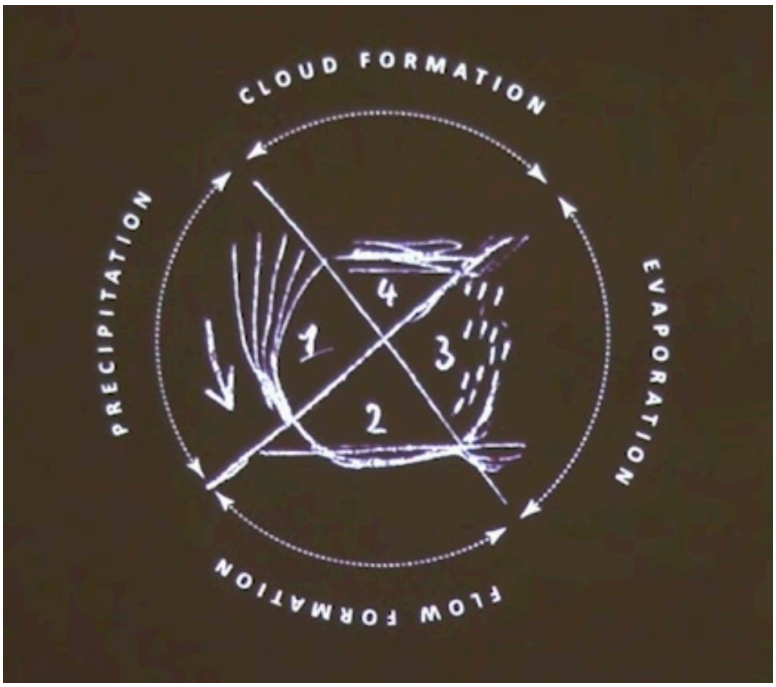
Through the aforementioned mapping exercise, the boundaries of the water bodies within the capital region have been highlighted as dynamic rather than fixed. By overlaying different maps, a series of modifications to the shoreline become apparent.

The maps of Lac Leamy (figures 3.02-7) illustrate a series of gradual changes to the edges of the lake and Brewer's Creek to the south from 1820 to 1965. The small pond on the western shore of Lac Leamy disappears in the transition between 1820 and 1908, which is offset by a widening of the course drawn for Brewer's Creek in the latter map. The map from 1940 introduces a secondary connection between Lac Leamy and the Gatineau River to the north, which subsequently disappears in the map from 1965. By 2019, the creek is cut off in favour of an artificial lake in the former quarry, as is the outflow from Lac Leamy to the Ottawa River.

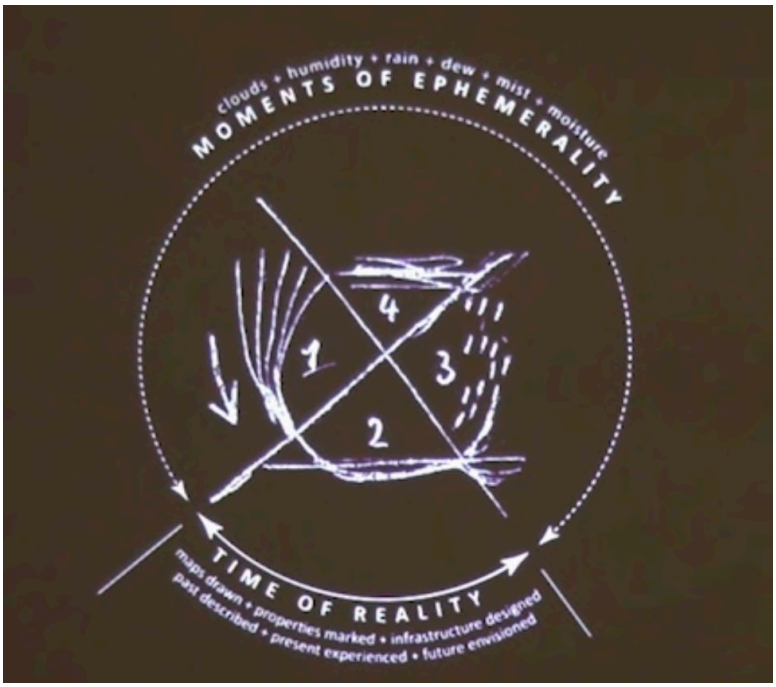
At LeBreton Flats (figures 3.08-3.12), the river's edge expands slowly throughout the early maps, before being drastically altered by land reclamation, as shown in the 1962 map. Similarly, the islands to the north expand into the river from one map to the next. In addition to manipulations which extend into the river, water is also diverted, channelized, and covered. A canal is drawn in the map from 1870, partially erased in the 1894 map, and reappears in a narrow channel in the map from 1901.

Each of these maps presents a different version of the Ottawa River. The maps encompass over a century of time, and as such, only represent a small fraction of the river's states during the time frame. For example, during any of the land reclamation processes, each load of material dumped into the river would have created a new version of the map.

Outside of human intervention, the maps could be represented differently



2.02 “The Water Cycle,” Paul Klee
The Invention of Rivers, Dilip da Cunha



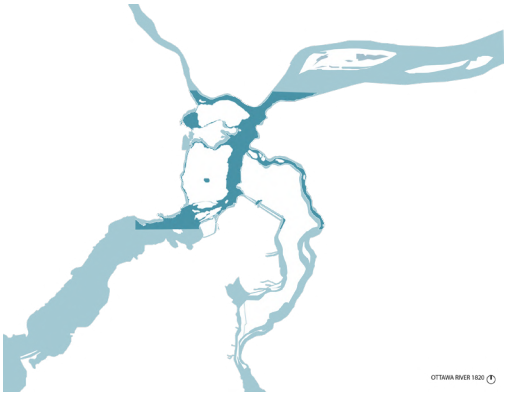
2.03 “The Water Cycle, Adapted” Dilip da Cunha
The Invention of Rivers, Dilip da Cunha

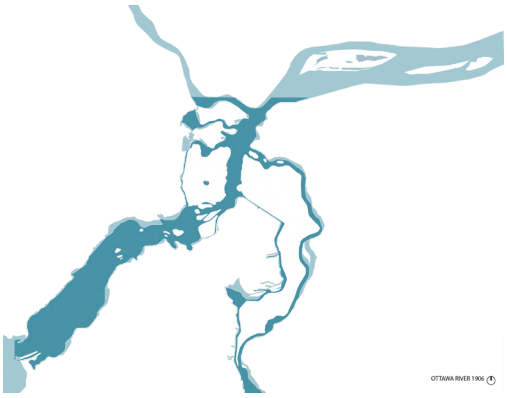
depending on the environmental conditions on the day of representation. In figure 2.02, da Cunha amends Paul Klee's representation of the water cycle to suggest that cartographers and designers have largely adopted a time of "water" rather than one of "wetness." This design decision enables the river to be seen as an entity separate from the land through which it flows.[28] Rivers, such as the Ottawa, are drawn according to this logic of separation. If any of the maps of the Ottawa River had been drawn in a time of precipitation, the lines would appear differently on the maps, as the boundary between water and land would be blurred by the precipitation and its effects. The Ottawa River's water level fluctuates by over two metres on average throughout a calendar year.[29] If a map was drawn at the high and low water mark of the year, the edges of the each version of the river would often be metres apart. In a winter landscape of snow and ice, the edges of the river are almost non-existent, with snow covering both the frozen river and ground with an even blanket.

The manipulations and processes discussed in this section have been classified into operations of cut, fill and flow, and provide the basis for the explorational methods for this thesis.

28 da Cunha, The Invention of Rivers, 50.

29 The Ottawa River Regulation Planning Board, Ottawa River at Gatineau, (2020). accessed March 23, 2020. http://ottawariver.ca/information/historical-water-level-streamflow-summary/ottawa-river-at-gatineau/



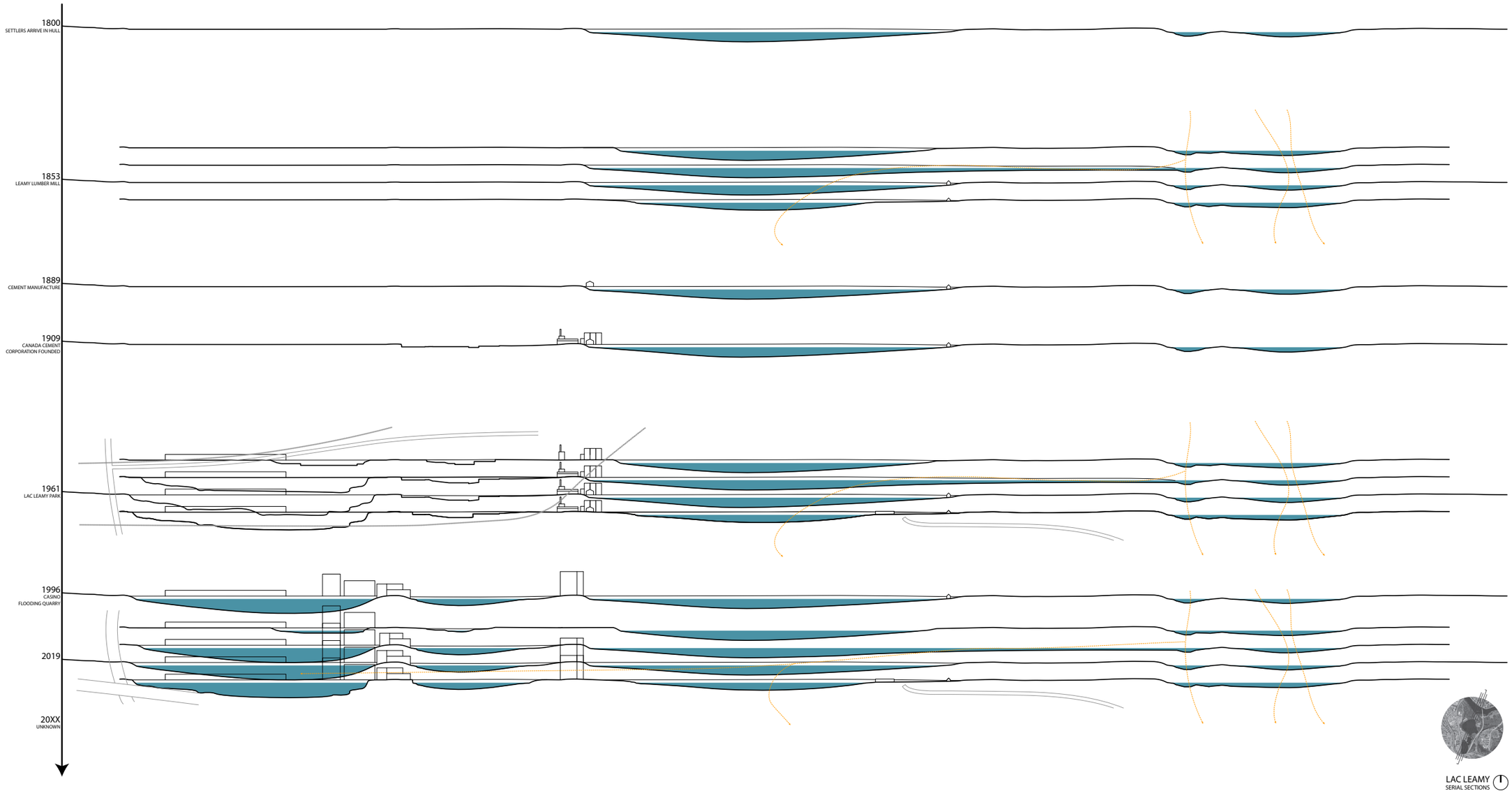


2.04 Ottawa River Boundary Study

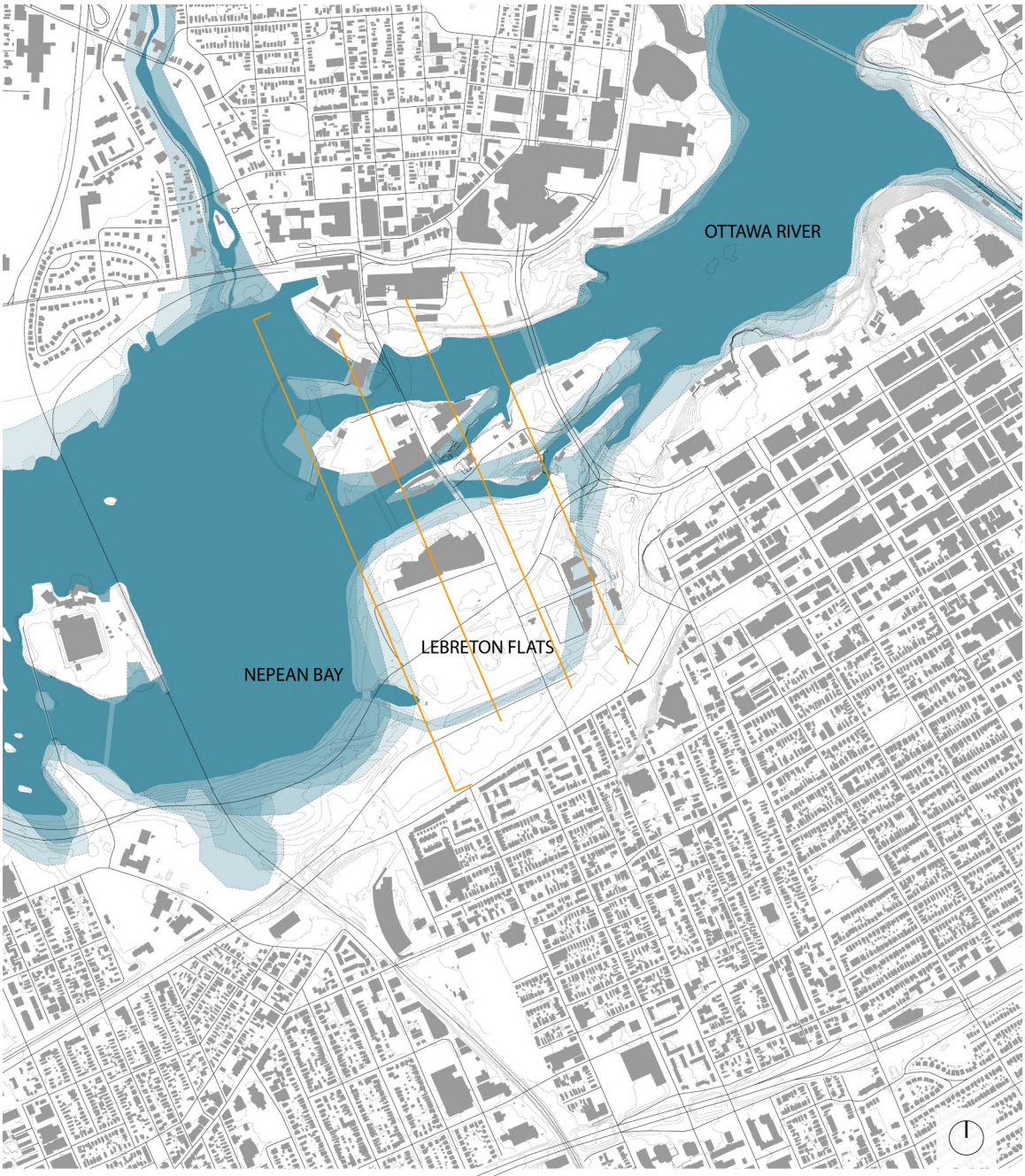
This collection of drawings was created by extracting the waterways from historical maps, and overlaying them. The extremities of the river as provided by the maps was then traced to create the light blue layer. Overlaying the water from each historical map renders the changing rivercourse visible.

2.05 Lac Leamy Historical Section Key Plan

This drawing traces a section through Lac Leamy, cutting through different times in the site's history. Years of major development unfold into serial sections, in which annotations trace flows of traffic (grey) and water (orange). When Andrew Leamy constructed his lumber mill in 1853, he cut a channel to aid in the transport of logs, introducing a flow from the Gatineau River, through Lac Leamy, and into the Ottawa River. The NCC's creation of Lac Leamy Park in 1961 included the creation of a beach through infill. Water quality fell when the lake was cut off from the Gatineau and Ottawa rivers, and flow stopped. The channels have since been reopened. The creation of Lac de la Carriere in the former quarry south of Lac Leamy has created a stagnant lake in which little life survives, due to the lake's great depth.

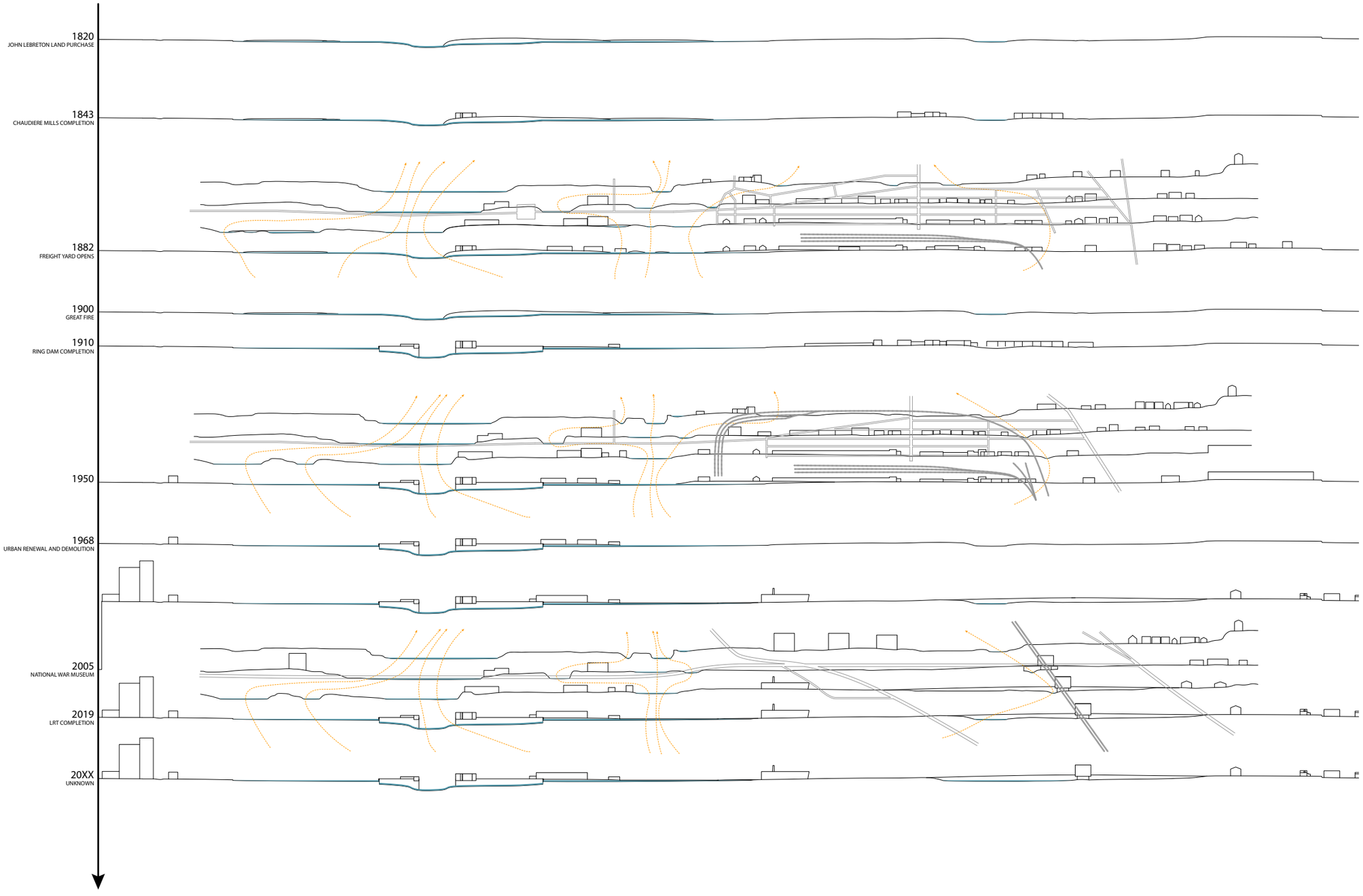


2.06 Lac Leamy Historical Section



2.07 LeBreton Flats Historical Section Key Plan

This drawing traces a section through LeBreton Flats, cutting through different times in the site's history. Years of major development unfold into serial sections, in which annotations trace flows of traffic (grey) and water (orange). The 1882 completion of a freight yard on LeBreton Flats introduced a new means for transporting goods, replacing the Ottawa River. By 1950, the river had been dammed and channeled through the flats. In addition, railway tracks had completely encircled and terminated at the flats, cementing the flats as a staple in the industrial flows of the region. Less than two decades later, the flats had been razed, and motion through the flats was reserved for the river. Today, the river remains dammed and channeled through this landscape, and human and industrial flow is guided through, rather than to, the flats, as it had been with the railways in 1950.



2.08 LeBreton Flats Historical Section

OPERATIONS

Cut

In design, the cut is often a physical operation performed on land or building. The Lac Leamy and Lebreton Flats sites are inherently linked to their exploitative industrial pasts, which relied upon cutting as a means for extracting natural resources in the lumber and cement industries. Cutting was a catalyst for these industries; without cutting trees, there was no lumber, and without cutting the earth, there was no limestone for cement. To support the industries, waterways were dredged to maintain or increase flow, and new channels were cut to create log slides to improve productivity, and the Rideau Canal to connect to Kingston.

Cutting, however, is not merely a physical exercise on the land, but also an operation that has been used systematically on these sites to gain control of the land. When settlers arrived, they cut the indigenous populations out of the landscape, uprooting them and forcing them away from their traditional territories. Similarly, the urban renewal scheme of LeBreton Flats evicted all residents of the 'industrial slum neighbourhood' in 1962.

LeBreton Flats' industrial past left the site contaminated with a collection of heavy metals, debris, and petrol chemicals. In order to remediate the landscape, the proposed strategy is through removal of the contaminated soil down to bedrock, and a reintroduction of clean soil to the site.[30] By completely removing all of the soil from the site, the remediation process works to eliminate the history of the site, effectively cutting out the years of industry from the site's past. The goal for remediation and redevelopment is to create and seize an opportunity to begin once again from a clean slate.

Cutting is an act of violence. Cuts act as boundaries, sever objects, and

30 National Capital Commission, LeBreton Flats Remediation and Infrastructure Project (Ottawa: National Capital Commission, 2011).

separate the resulting fragments.[31] Cutting is the precursor to removal, and removal results in stress, particularly in ecology, with habitat loss at the forefront. Cuts create visible scars on the landscape, reminders of the force with which something has been removed from its former location.

The act of cutting is also one of discovery. By cutting into something, a glimpse of the interior is revealed, introducing a new perspective on the cut object. Archaeologists learn about the past by cutting into the ground to reveal lost objects, and extrapolate their findings to suggest patterns of life from past eras. This thesis positions itself in a similar role, cutting into the sites as a means for understanding their histories, and the legacy those histories have left behind.

31 Lesley McFadyen, “Practice Drawing Writing Object,” in Rethinking Anthropology, ed. Tim Ingold, (London: Routledge, 2011), 33-43.

Fill

The fill operation is directly related to cutting; in order to fill, something must first be cut. Conversely, for something to be filled, there must first be a cut. Construction materials are born through extraction. The material produced through the lumber and cement manufacturing industries was used in the creation of the buildings and infrastructure of the capital region, filling the landscape with human constructions. Similarly, the solidification and extension of the islands near the falls, and the land reclamation in Nepean Bay were products of fill operations, often using waste material as substrate.[32]

By filling in different sections of the Ottawa River, the watercourse became increasingly constricted. This forced the river to flow through a smaller channel, particularly in the area around the Chaudière Falls. A major consequence of this is the increased rate of water flow through the islands. Another is the lowered tolerance for fluctuation of the water level along the shore.

At Lac Leamy, the remnants of the quarry cutting into the land along its southern shore provided the opportunity for the creation of a new lake. Lac de la Carrière was born through the flooding of the former quarry, filling in and covering up the history of extraction.

32 Jenkins, 186.

Flow

As has been discussed previously, the settlement of the capital region was made possible by the Ottawa River. The river shortened the distances between locations for the inhabitants of the region both prior to and post European settlement.[33] Boat traffic enabled the populations to move from one location to another in a landscape otherwise disconnected by infrastructure, leading the Ottawa River to be considered as the 'colonial trans-Canada.'[34] The Ottawa River enabled the mill workers to utilize its south-easterly flow as a means for transporting cut lumber downriver to the ports along the St. Lawrence in Montreal. This helped the region become one of the greatest exporters of lumber on the continent.

Furthermore, the flow of the river and the falls made power generation

3.01 LeBreton Flats Context Plan

33 Jenkins, 33.
34 Jenkins, 61.

possible. The fifteen metre drop of the Chaudière Falls ensured a consistent and ample supply of power for the early settlers. By channeling and damming the falls, the region was able to further capitalize on the falls' generative possibilities. Likewise, the Fleet Street Pumping Station was designed to operate based on the power of the river's flow around the falls. The pumping station works due to the natural elevation changes of the river, capitalizing on the power generated through the falling water to pump water up the escarpment.[35]

The majority of water in the capital region eventually works its way into the Ottawa River. The capital region has a relatively shallow depth of impermeable bedrock, which prohibits water from replenishing aquifers, instead directing the absorbed water through cracks in the rock to the region's various waterways.[36] The precipitation and other forms of wastewater collected by the cities of Ottawa and Gatineau are also redirected into the Ottawa River, with only the wastewater being treated for contaminants.

The flow of water through the sites directly impacts the flow of contaminants. Surface contaminants are picked up by water as it flows along the impermeable surfaces of the ground, making their way into the soil as the water is absorbed in areas with higher porosity. The heavier contaminants work their way into the soils, remaining there, while the lighter contaminants work their way through the groundwater to the river, and are washed downstream. After upwards of a century of contamination in some areas, the contaminants of the LeBreton Flats and Lac Leamy sites are firmly entrenched as components within their respective ecosystems.

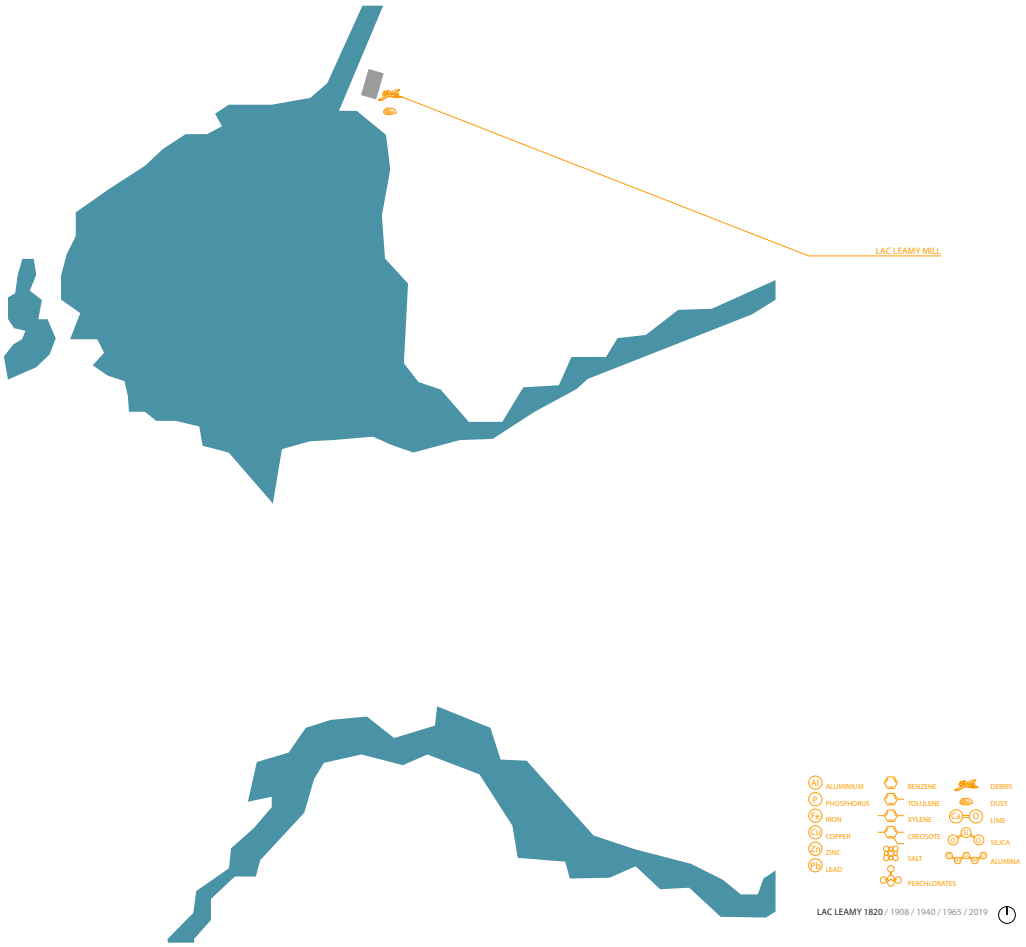
Since the arrival of settlers, the flows at work within the site have been subjected to extensive human intervention. As mentioned above, the waterways

35 Diane Holmes, Report to Planning and Environment Committee and Council (Ottawa: 2007), 1.
36 Canadian Geoscience Education Network, "Geoscape - Ottawa-Gatineau," 2019.

were continually channelized in order to define where the flow could and could not go. In a similar sense, the street infrastructure imposed onto the landscape defines another level of flow on site. The gridded pattern of streets and sidewalks prescribe where and how people move through the site, differentiating zones within it. The rail lines on site are perhaps the greatest example of the desire for total control; trains are completely confined to their tracks, and are rendered useless should they attempt to circumvent the infrastructure into which they are placed. The planner and designer effectively claimed dominion over the various flows on site. However, as they carefully orchestrated flows of people, vehicles and water channels, flows of contaminants were treated with less care and control.

In his work, Dilip da Cunha argues that natural disasters do not exist, all disasters are results of human design.[37] Drawing lines and assuming the permanence of boundaries which separate spaces of water and land, specifically, directly leads to the disaster of flood. Through fill operations on the banks of the Ottawa River, city officials and planners have attempted to control the water, and in so doing, have increased the likelihood of flood. As a result, the capital region has experienced catastrophic floods in both 2017 and 2019. This thesis responds to the notion of the shoreline as a fixed entity, providing space for water within the project. Moreover, the project celebrates the dynamic nature of the water, designing interventions to be used as measuring devices for the change in water levels, both seasonally and in situations of extreme weather.

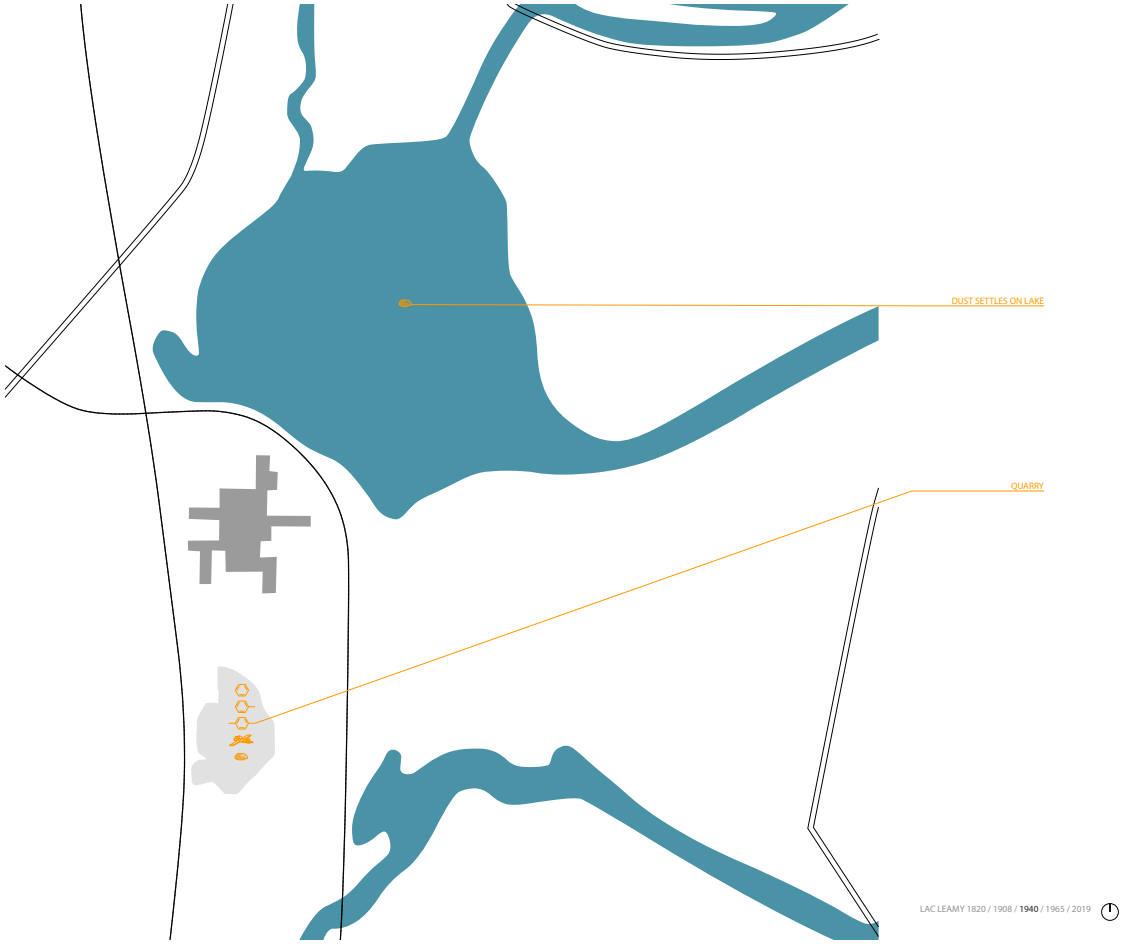
37 Dilip da Cunha, “In Rain is the Commons,” Presentation, Ottawa Art Gallery, 2020.



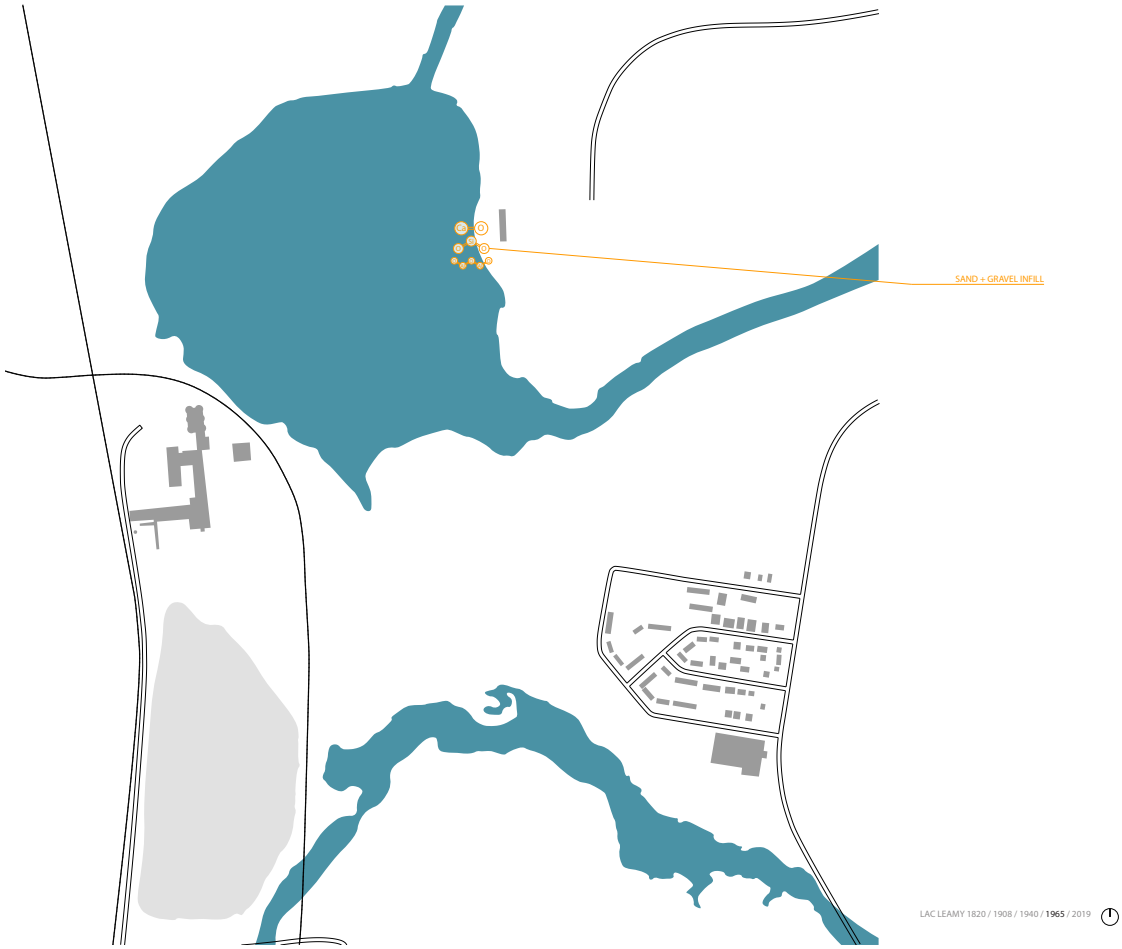
3.02 Lac Leamy, 1820
This map shows the original location of Andrew Leamy's Mill on the northeast shore of the lake.

3.03 Lac Leamy, 1908

Leamy's Mill has been demolished, and a concrete plant has been erected on the opposite shore of the lake. Road and rail infrastructures now connect the lake to Hull (off map to the south). Brewer's Creek has expanded in breadth.

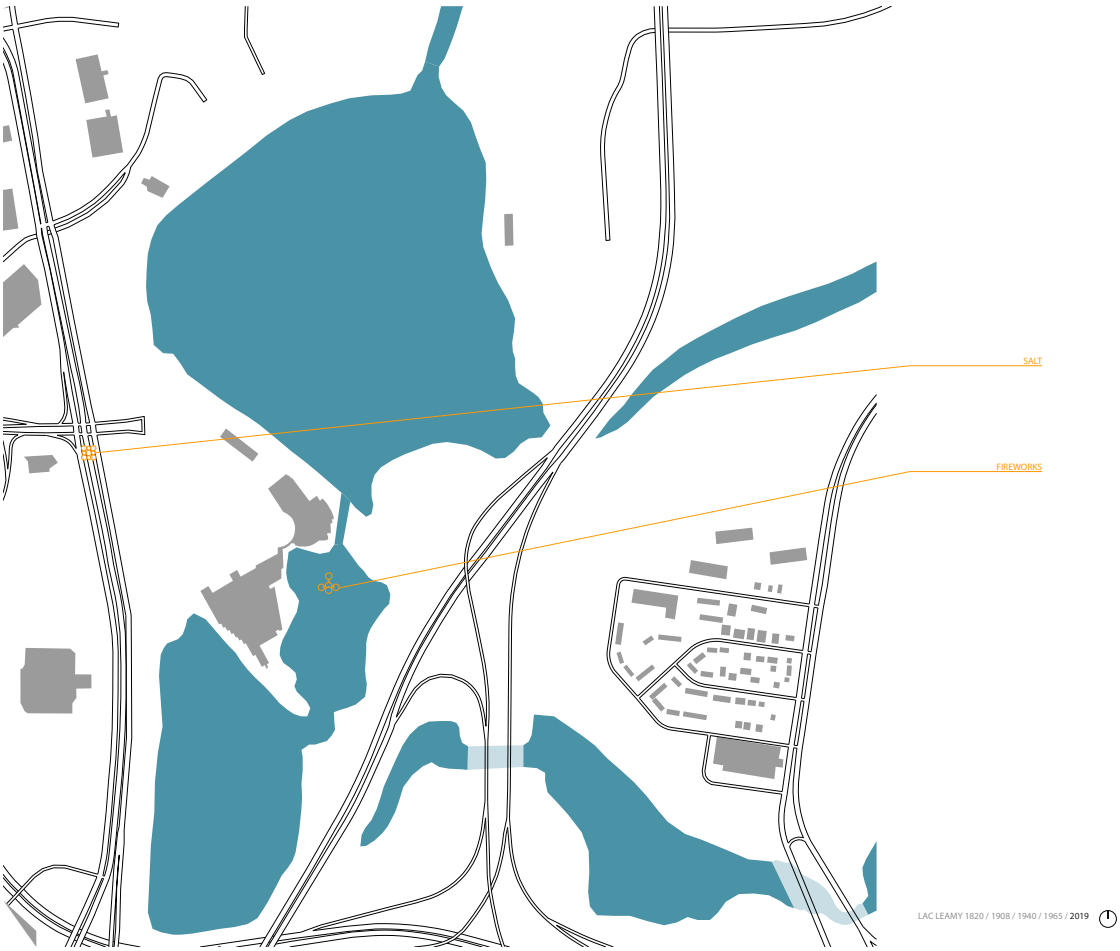


3.04 Lac Leamy, 1940
Two new roadways have been constructed around the lake. The cement plant has opened a quarry immediately south of the facility.



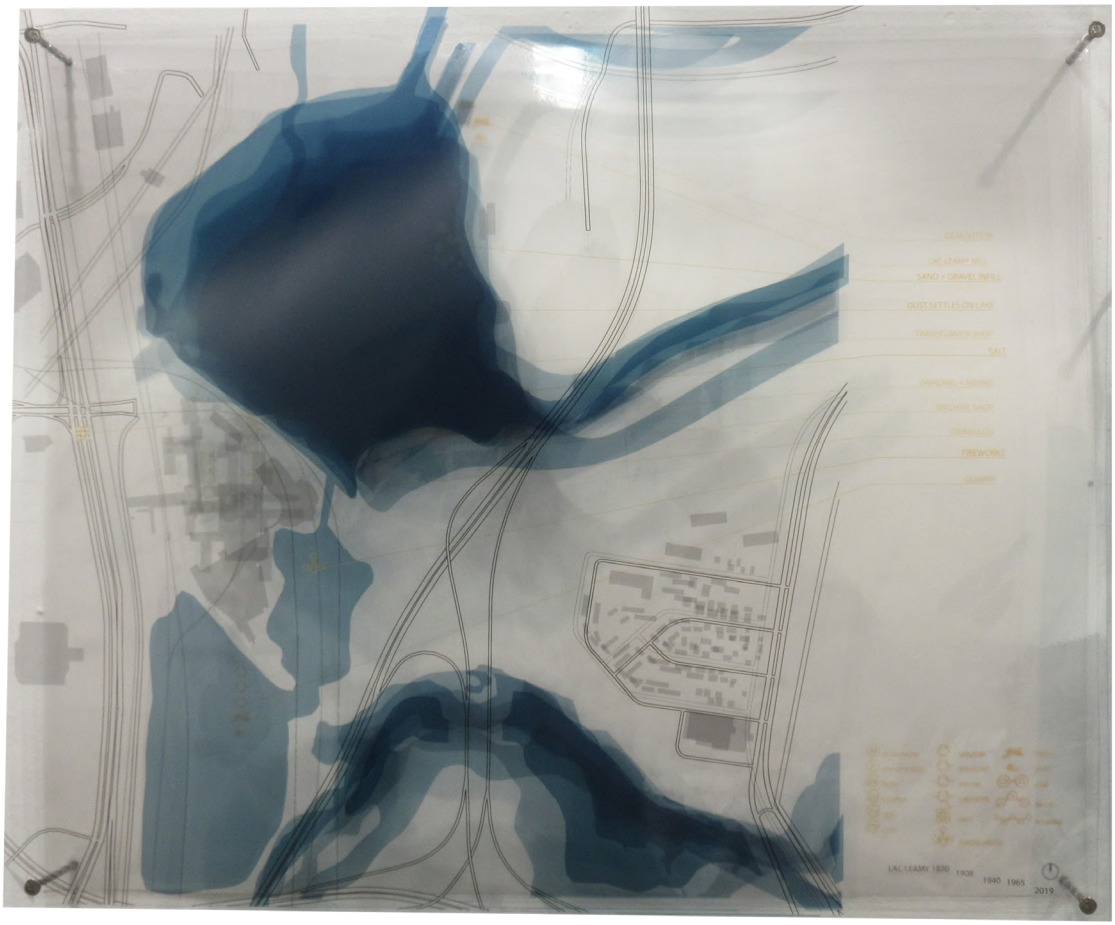
3.05 Lac Leamy, 1965

A residential subdivision has been built southeast of the lake. The quarry has continued to grow, reaching its bounds of roadways and waterways. On the eastern shores of the lake, the NCC has filled in a portion of the lake to create a beach.



3.06 Lac Leamy, 2019

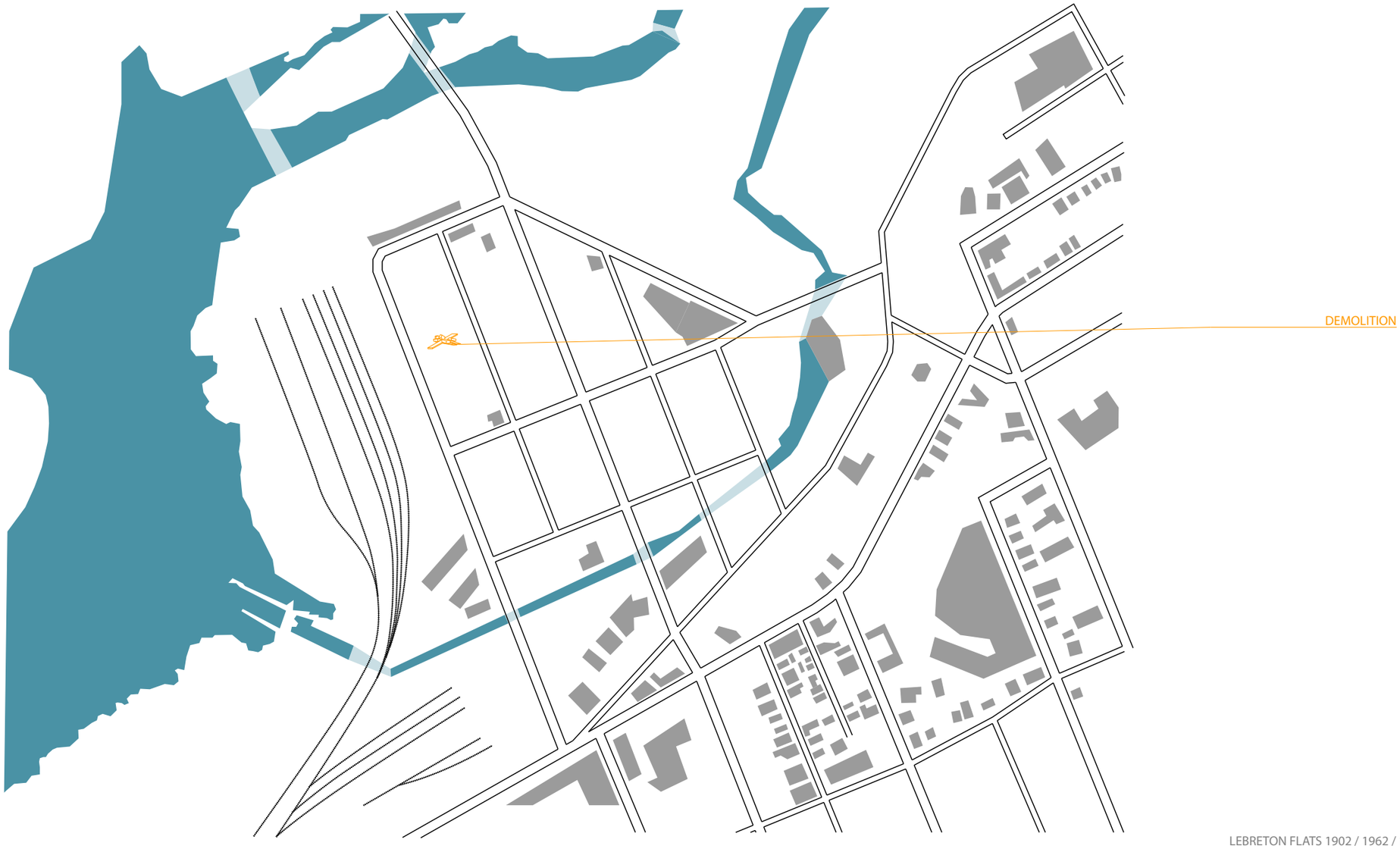
The cement facility has closed and been replaced by a casino. The quarry has been flooded to create an artificial lake, Lac de la Carriere. Large scale commercial developments occupy the land to the west of the lake. A series of major roadways have replaced the rail lines, bounding the lake on three sides. Brewer's Creek has been cut off to the west.



3.07 Lac Leamy, 1820-2019
Overlaying the five maps makes trends in development more apparent. Darkened areas on the map denote constant elements, such as the centre of Lac Leamy and Brewer's Creek. As a result, differences in mapped edges become more apparent. Through the layers, water channels and edges, roadways, and buildings all move with respect to their previously mapped positions.

3.08 LeBreton Flats, 1902
After the Great Fire of 1900, LeBreton Flats was restored and remained an industrial hub for the capital region. Extensive rail networks terminated in the western portion of the flats, on the shores of Nepean Bay.

3.09 LeBreton Flats, 1962
By the mid 20th century, the flats became less dense. Buildings and rail lines had both been removed from the flats. In Nepean Bay, land reclamation was beginning, as evidenced by the appearance of several islands in the bay.



LEBRETON FLATS 1902 / 1962 / 1965 / 2019

3.10 LeBreton Flats, 1965
Exproporiation had elminated the vast majority of the built environment of the flats by 1965. The rail yards to the west remained, however the tracks which had previously encircled the flats were removed. Land reclamation claimed several metres ‘back’ from the Ottawa River.

LEBRETON FLATS 1902 / 1962 / 1965 / **2019**

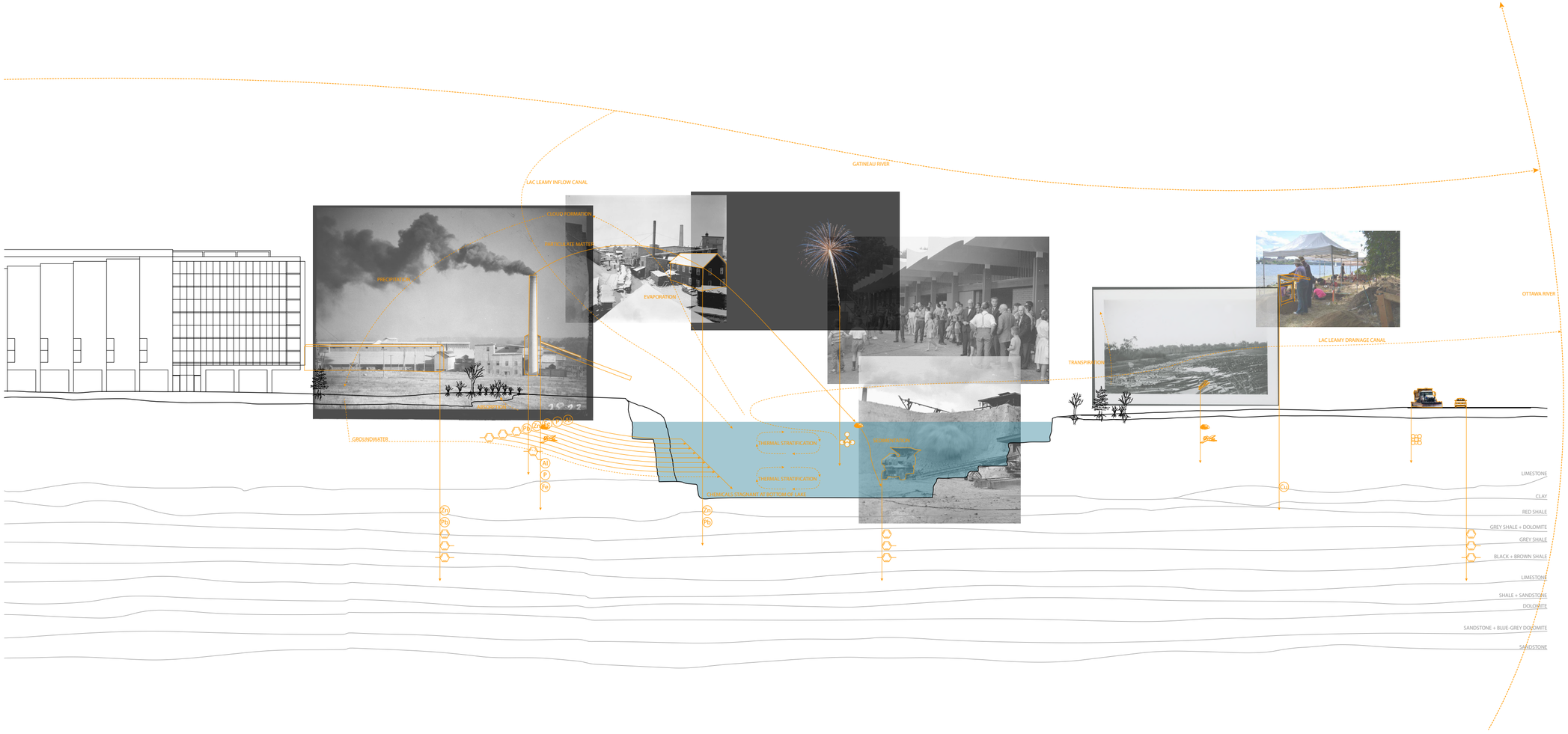
3.11 LeBreton Flats, 2019

From expropriation to the present day, LeBreton Flats has remained predominantly vacant. For a brief period of time, the flats were used as a garbage dump, aiding in land reclamation. In 2005, the Canadian War Museum began construction on the northern portion of the site. In the years since, a small condo development and a light rail track and station have been the only additions to the site.

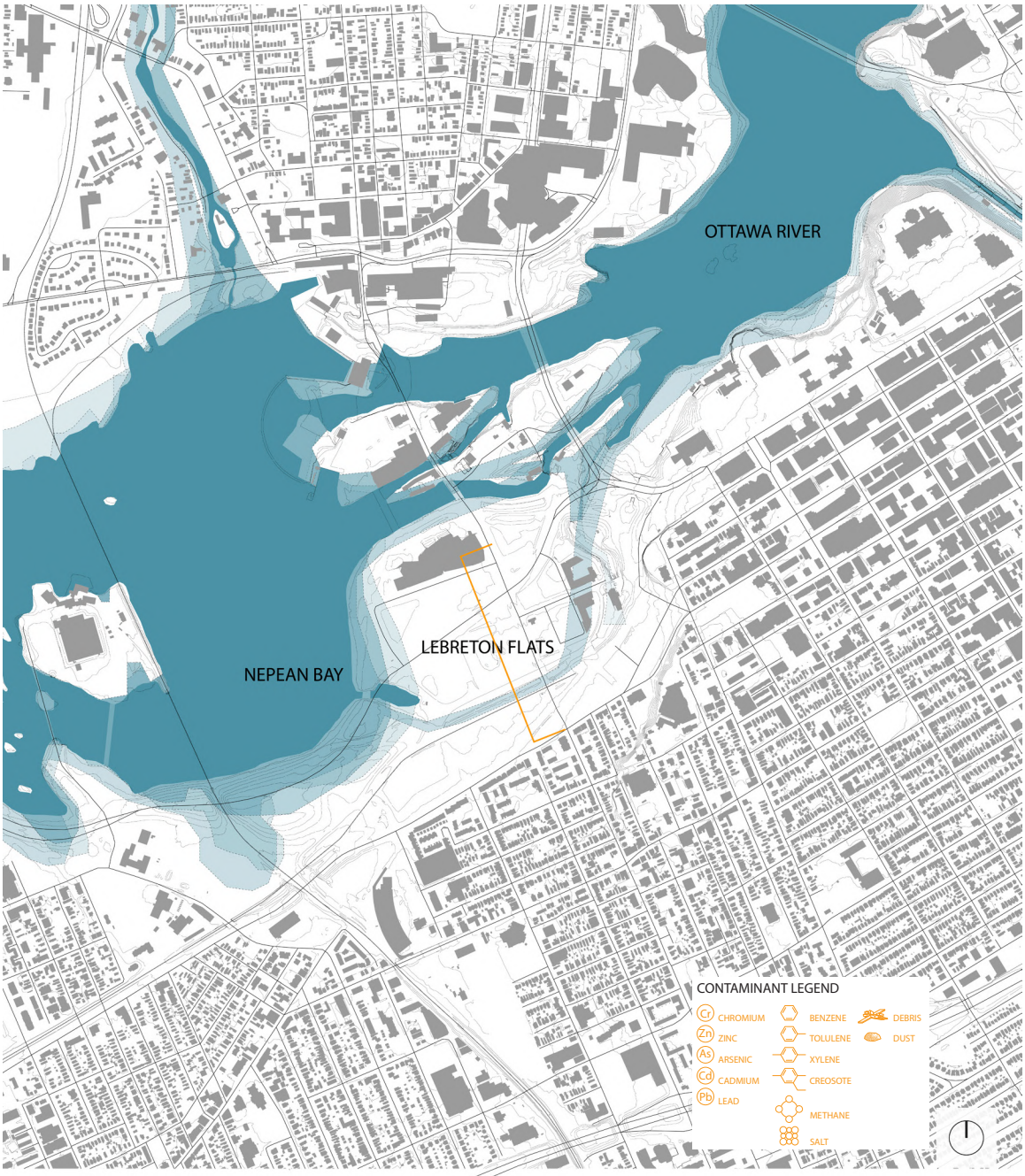
3.12 LeBreton Flats, 1902-2019
Overlaying the LeBreton Flats maps draws attention to the simultaneity of the decreasing built environment atop the flats and the expansion of the flats into the Ottawa River.

3.13 Lac Leamy Flow Section Key Plan

This section traces the current and historical flows of chemicals and water on the Lac Leamy site. The section operates based on the current conditions on the site, with images referencing the processes which lead to its contamination. Aluminium and iron were left on site in waste products from the cement manufacture, leaching into soils near the surface. Zinc and lead, which are heavier and consequently sink further into the soil, were products of the blast furnace used in firing materials for use in the cement factory. Petrol products which leaked from machinery used in the quarry, as well as automobiles on the roadways surrounding the site, are carried by water and their greater weight deep into the soil and into waterways. Flow patterns guided the contaminants into the water, leading to a series of water quality issues throughout the lake's recent history.

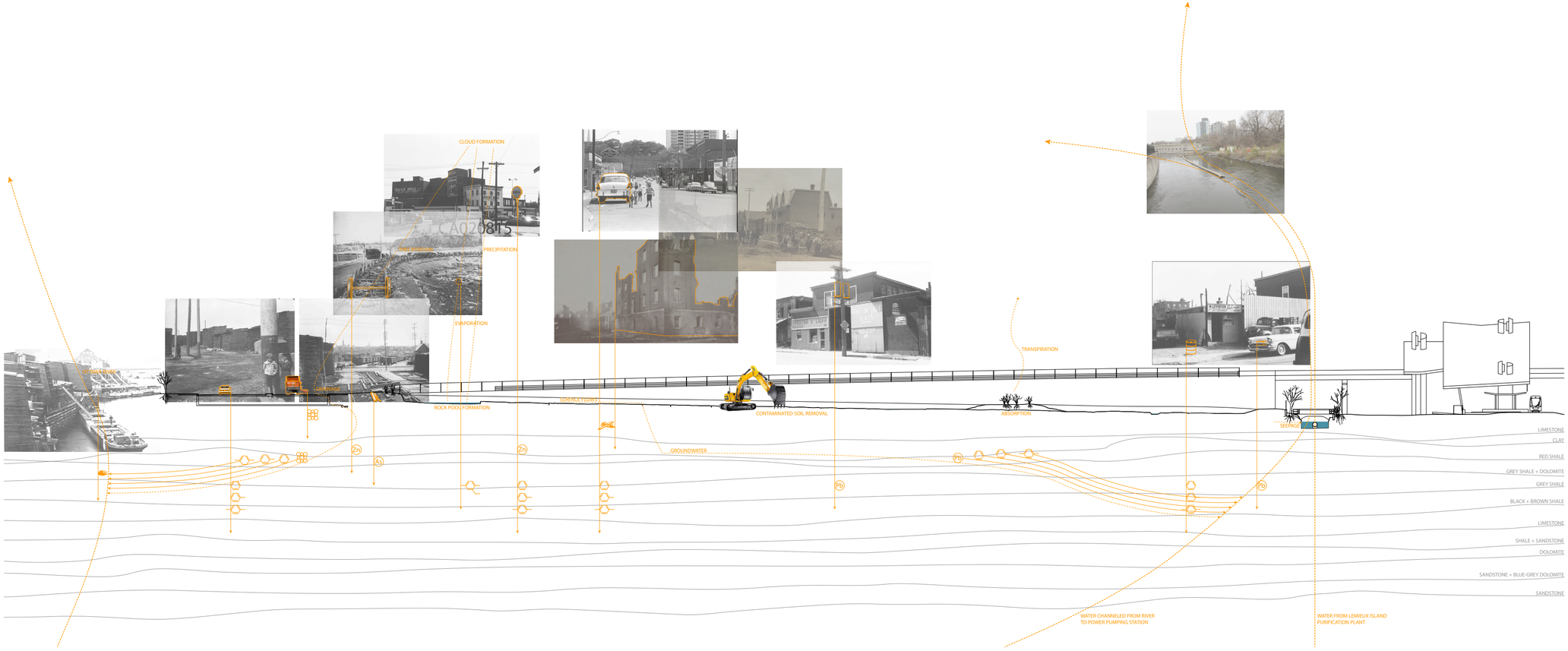


3.14 Lac Leamy Flow Section



3.15 LeBreton Flats Flow Section Key Plan

This section traces the current and historical flows of chemicals and water on the LeBreton Flats site. The section operates based on the current conditions on the site, with images referencing the processes which lead to contamination on site. Years of industrial use leached chemicals into the soils on site, and flow patterns guided the contaminants into the Ottawa River. Major chemical contaminants remaining on site include zinc, lead, and petrol chemicals. Zinc, the lightest of these contaminants, leached into the soil from galvanized metals left exposed in scrap yards or after expropriation. Lead contamination came from paint suppliers, in addition to being mixed in with petrol chemicals at petrol stations, and from any leaking automobiles or machinery. Arsenic was introduced to the soil through weatherproofing treatments on lumber. Debris is scattered across the site, both remnants from former businesses, and relics from expropriation.



3.16 LeBreton Flats Flow Section

CONSTRUCTIONS






4.01 Site Photographs at LeBreton Flats

4.02 Site Photographs at LeBreton Flats

The Current Landscape

Today, the landscapes of Lac Leamy and Lebreton Flats are in drastically different states. Lac Leamy is home to a park, featuring a public beach, walking trails, and picnic areas. Immediately south of Lac Leamy sits Lac de la Carrière, the shore of which holds a casino. The program suggests that this is a space for leisure. LeBreton Flats struggles to offer the same atmosphere. While there are a series of parks in the flats, they are small, and offer little to encourage occupation. Pindigen Park and Fleck Fountain Plaza are located at the intersections of Booth Street and Wellington Street and Booth Street and The MacDonald Parkway, respectively. The combination of major roadways and a lack of amenities in close proximity to the parks leave them predominantly vacant.

These parks sit across from the Canadian War Museum, fronted by LeBreton Flats Park, and the National Holocaust Memorial. As is the case with Pindigen Park and Fleck Fountain Plaza, LeBreton Flats Park offers little of interest to the visitor, and as such is primarily unoccupied throughout the year, aside from Canadian geese. This vast, flat, trimmed field plays host to the annual RBC Bluesfest event in the middle of July, during which it is briefly transformed into a concert venue. After the festival, it returns to its dormant state for the remainder of the year.

The other side of the flats is rendered inaccessible by a chain link fence, presenting the site as a desolate, dangerous and empty landscape. Bedrock exposed during previous NCC efforts to clean up the site's industrial remnants makes up the majority of the flats' surface contained between Nepean Bay, the MacDonald Parkway, Booth Street, and the recently completed O-Train Confederation line. The exposed bedrock symbolizes an attempt to completely

eradicate the site's history, scraping the site of its toxic past, and providing a blank canvas for the future.

North of the Parkway, the aforementioned Canadian War Museum and the LeBreton Flats Park sit atop the same sheet of bedrock, separated from it by a cover of clean soil, open and accessible to the public. This, the NCC appears to suggest, is the answer to the problem of the flats.

The Reflective Landscape

This thesis proposes a landscape strategy that acknowledges the site's past. The site is broken into zones and designed interventions based on its former programmatic uses and urban fabric. The zones are defined by their prior industrial uses, and new site manipulations and installations directly relate to each area's respective historical industry. Furthermore, each of the zones corresponds with a different ecosystem native to the capital region. The ecosystems are partnered with the industrial zones based on their current states and on historical industrial uses.

The landscape will be divided into four 'eco-zones,' with each zone housing a different construction. The landscape consists of forest, grassland, rock plain, and wetland zones. Each of these zones will be introduced to one quadrant of the site. As the landscape matures, the zones will begin to overlap and blend. The zones will consequently weave themselves into one another, with elements from each zone working their way into those adjacent.

The first European settlers of the capital region settled in large part due to the forests on the banks of the Ottawa River. On LeBreton Flats, the forest at the turn of the nineteenth century was dominated by white pines.[38] Before John LeBreton began working on his newly acquired tract of land on the flats, Philemon Wright had the area stripped of the most valuable trees for the profit of his lumber trade and for building construction in Wright's Town. The focus of the raids were the aforementioned white pines, as well as the maple trees. As such, the forest to be reintroduced will be made up of these species. The northwestern portion of the site was selected as the forest region due to the former lumber yards which were historically located there. The reintroduction of a mature forest

38 Jenkins, 99.

to the flats will take nearly a century to complete.[39]

Victoria Foundry was located on what is currently the northeastern portion of LeBreton Flats Park, and is the proposed location for the grassland eco-zone. This zone will replace the existing, largely vacant plaza and "Memorial Park" that faces the War Museum, and will operate in relation to the planted green roof of the museum. The selection of this site for the grassland was made in part due to the current state of the site as a manicured grass field. The new, designed grassland will be planted with the native grasses Big Bluestem, Indian Grass, and Switchgrass. Each of these grasses has an average height of approximately 1.5m, which will ensure that they are able to be mixed and maintain a cohesive appearance.[40]

LeBreton Flats, as Phil Jenkins writes, is the result of a large section of limestone falling from the cliffs to the east, which will be exposed in the rock plains eco-zone. Over time, soils accumulated atop the rock, and vegetation grew, eventually becoming forests. In the past 200 years as the forest was removed, the soil became the repository for all things discarded on the flats, including the chemical waste of its industries. With heightened awareness of the dangers of these chemicals within the soil, the NCC elected to begin soil remediation on LeBreton Flats, and scraped the site clean down to the bedrock. Niall Kirkwood argues that abandoned sites are often ecologically rich, with regenerating vegetation creating a habitat that flourishes in a hostile environment.[41] The site's current state is visible proof of this: the uneven surface of bedrock collects water in small pools and plants sprout in soils collected in the wind. The exposed bedrock will be left uncovered in the design, as a

39 Niall Kirkwood, Manufactured Sites, (New York: Spon Press, 2001), 97.
40 Canadian Wildlife Federation, Native Plant Database, (Canadian Wildlife Federation, 2020).
41 Kirkwood, xi.

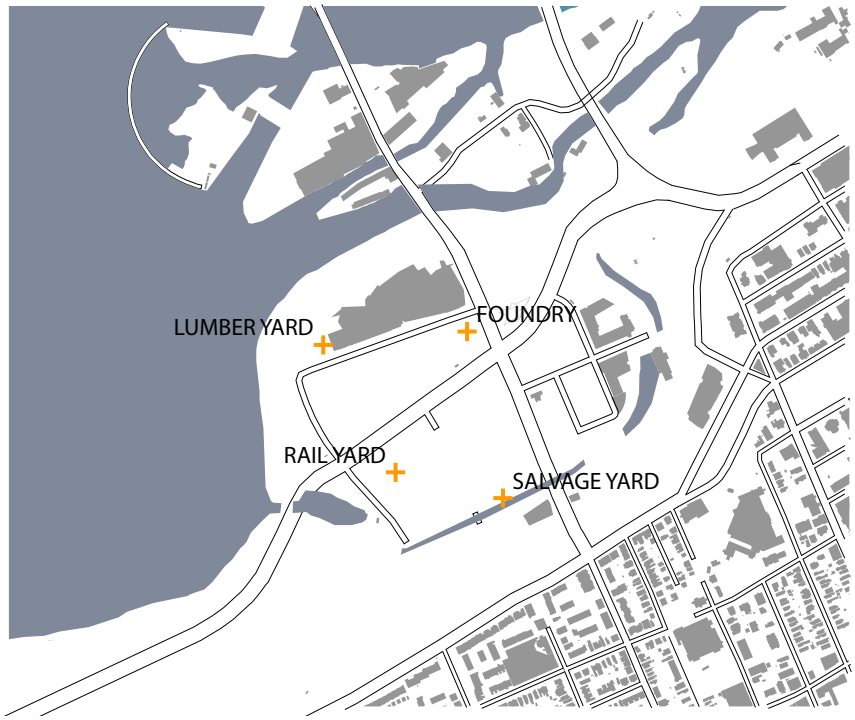
reminder of the past operations at both human and geological scales. It will continue to be a canvas onto which cycles of weather can paint themselves.

The final zone introduces a wetland to the southwest edge of the site. As part of the Gréber Plan, land was 'reclaimed' here within Nepean Bay in order to facilitate the construction of the Sir John A. MacDonald Parkway along the shores of the river. The wetland provides more space for water fluctuation than the hard edges of the existing canal, which brings water to the Fleet Street Pumping Station. As a result, the wetland will provide a buffer and collection zone during times of high water, providing overflow relief from the river. The wetland will also provide a means for cleaning the water. The Ottawa River's cleanliness is a frequent cause for concern among residents. After intensive treatment at either the Lemieux Island or Britannia Bay Purification Plants, the water is safe for consumption, and is the primary source of water for much of the region. Water from the Lemieux Island plant is piped through the existing canal on LeBreton Flats to the Fleet Street Pumping Station on its eastern edge. The vegetation, microbial and animal life for whom the wetland will provide a habitat will break down many of the river's contaminants, rendering the water downriver cleaner.[42] Once established, the wetland intervention could act as a biological filter in place of the purification plants.

The design's cut and fill strategy is derived from analysis of historical maps. The major infrastructural elements of the maps become defining features in the landscape. Former roads, rail lines, and shorelines are used as axes for division within the site. Each of these elements are imposed on the landscape, breaking up the site both visually and physically through cut and fill operations to create changes of grade across the site. The former rail and shorelines are both raised above the ground through fill operations. Both figure most

42 Kirkwood, 125.

prominently into the designed wetland, operating as berms separating and slowing the flow of water through the wetland. The shoreline continues outside the wetland as the boundary for the raised field currently existing in LeBreton Flats Park. The rail line continues atop the platform, and becomes the base for the pathway in this portion of the park. The road networks are also built up through fill operations while on top of the current park. They are uniform in height in the north, and transition down to become cuts into the bedrock to the area south of the MacDonald Parkway, which is re-routed around the site, following Booth Street to the south, before continuing west along Albert Street. The material that is moved in the cut and fill operations on site remains entirely on the flats, with the material cut from the excavation of the road channels and the constructed wetland being used for the berms.

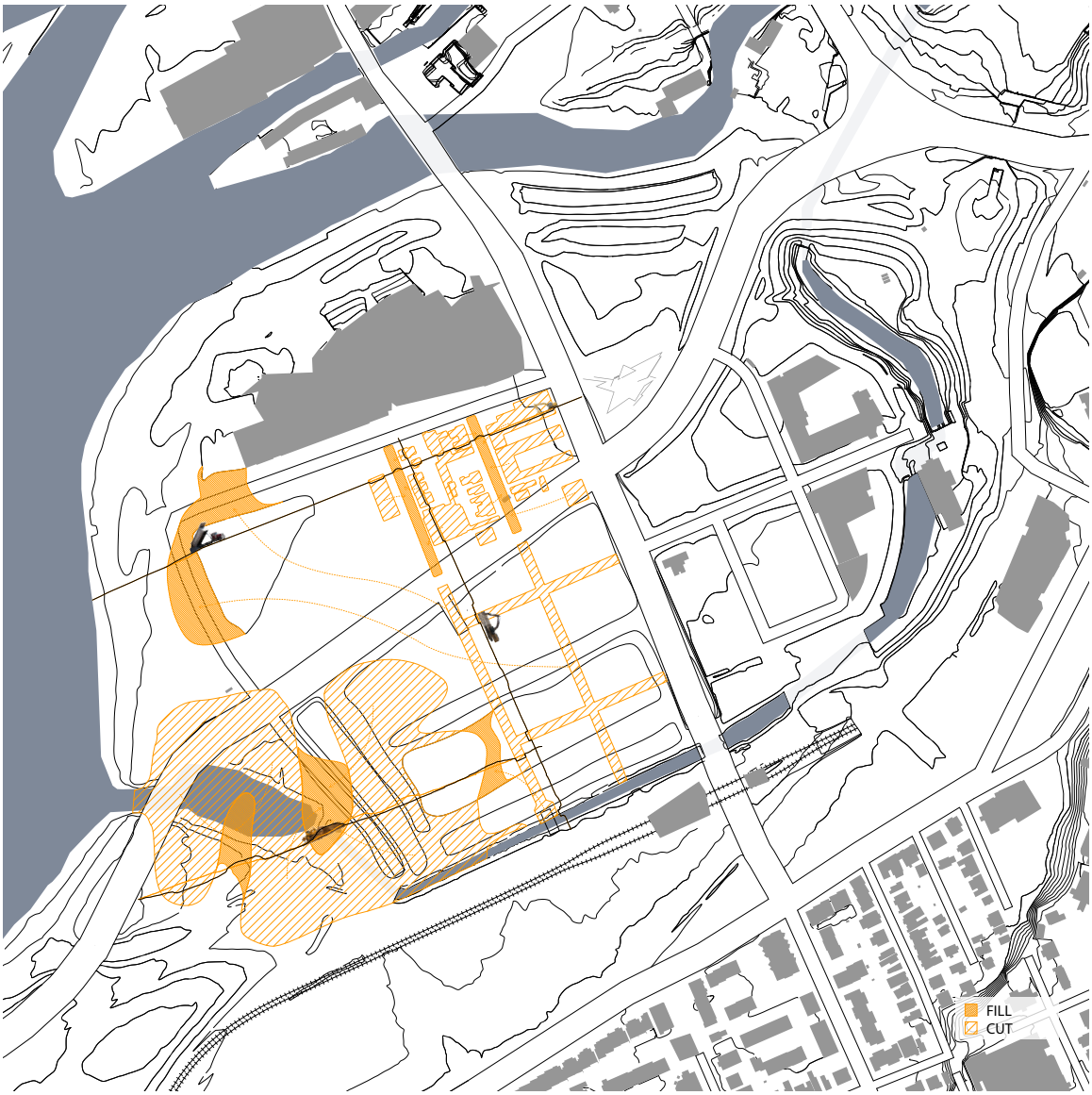


4.03 Former Industry Locations

4.04 Proposed Landscape Zones

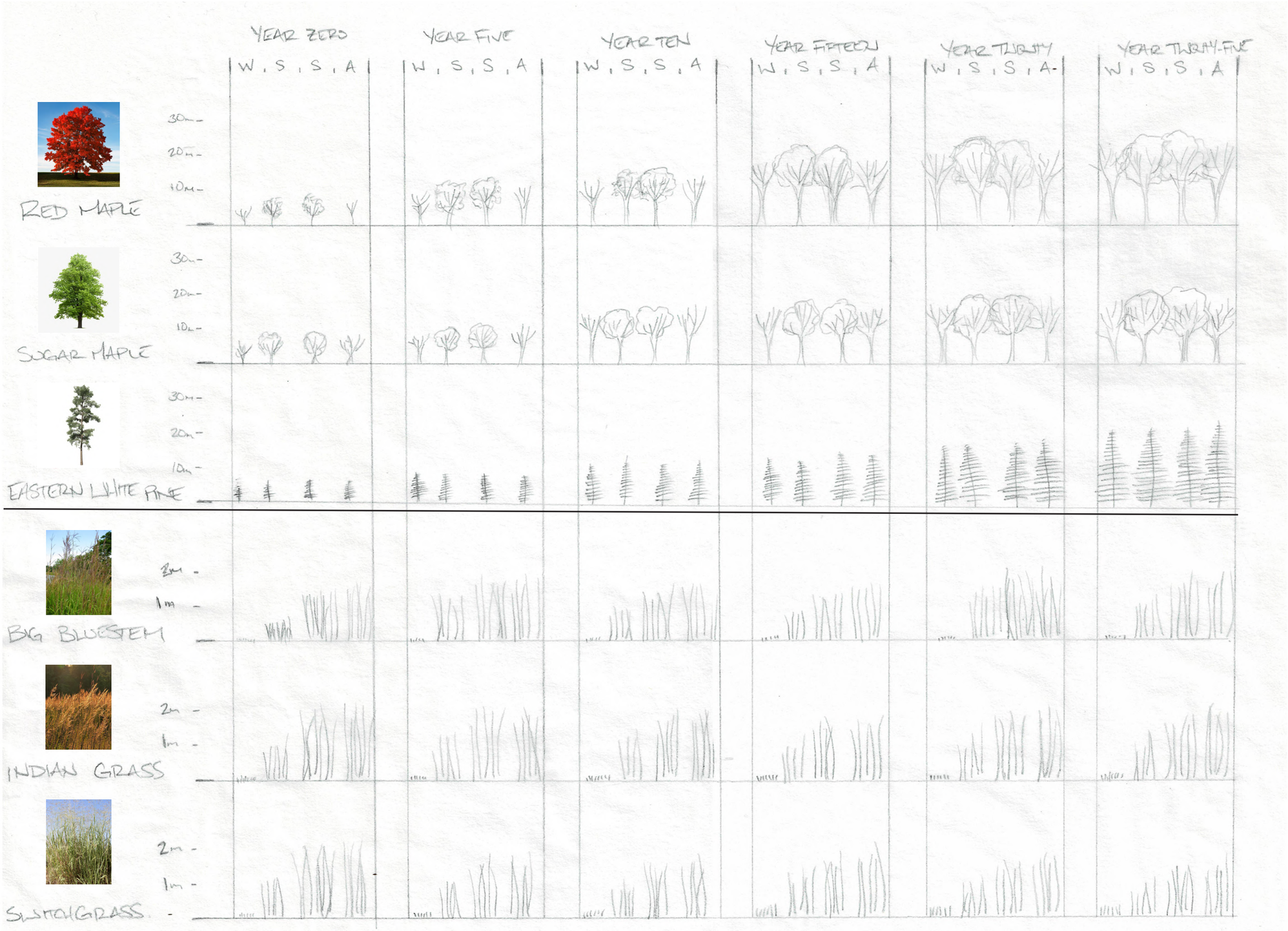
4.05 Former Road, Rail and Shore Lines

4.06 Former Buildings



4.07 Diagram of Cut and Fill Operations on Site

This drawing speculates on the movements of material on site during construction. All material cut from the site will be reused on site as fill. Annotation lines denote the direction of material flow from cut location to fill location.



4.08 Vegetation Growth Patterns

Determining the Program

This thesis strives to create an occupiable archive to curate a series of relationships between visitors and the landscape of the flats. To create a set of parameters for the proposal, three programmatic elements were cut from the brief for the NCC's joint Ottawa Public Library and Library and Archives of Canada project, which is currently under construction at 555 Albert Street. The cut elements are: 1; reading room, 2; preservation lab, and 3; living Ottawa: past, present, and future. Each program is redefined in terms of the site's history as a landscape of extraction.

The Oxford English Dictionary defines reading as an individual experience based on interpretation and consideration.[43] This experience is most often connected to literature, understood through the written word. Signage is another

4.09 Existing Site Plan With Proposed Joint OPC-LAC Facility

43 Oxford English Dictionary, "Reading," www.oed.com, (2020).

media which is read. Signs may be entirely written, composed of a combination of words, symbols or images, or entirely image based. In each instance, interpretation of the sign is referred to as 'reading.' The constructions designed for LeBreton Flats will provide frameworks for new interpretations of the site. Each construction will situate, orient and position the occupant to create a variety of new relationships with the landscape and the forces which move through it. The resulting relationships will be built upon references to specific historical layers, moments and spatial conditions.

The thesis treats the physical site as a living preservation lab. The landscapes and constructions work to reconstruct or regrow elements from the past. These elements include ecological zones which previously defined the site and land use patterns that defined the urban environment of the flats during its industrial era. Through cut and fill operations on the site's topography, historical occupations are referenced to preserve the memory of previous eras. The eras addressed through the project include the arrival of settlers in the capital region and the subsequently founded lumber industry, the introduction of the rail yards and growth of the flats as an industrial neighbourhood, the eventual expropriation of the site by the National Capital Commission, and the period of vacancy that followed expropriation.

Likewise, the 'Living Ottawa' exhibit from the NCC project brief will be incorporated into the design of the different zones within the physical, material landscape. By drawing on historical references and reintroducing historical elements from the flats, this series of infrastructural and topographical insertions acknowledge and build upon the site's unique history. In providing a public park as an amenity to the citizens of Ottawa, the project addresses a present need for residents and visitors to Canada's capital. Finally, the project looks

forward to the future in its attention to the environment, demonstrated through the introduction and reintroduction of native ecosystems to improve biodiversity within the city.

Constructions

Each of the constructions is located on the same site as a former industrial operation. Through analysis of historical maps and fire insurance plans, a series of industrial sites were located within the former LeBreton Flats community. Of these sites, four are within the boundaries of the proposed site for the thesis. The locations of these industries were consequently selected as the sites for the different constructions.

The first industry to appear in the flats was the lumber industry, and the former site of the lumber yards holds the first construction. This construction is situated in the forest eco zone. The construction orients its occupants towards the Chaudière Falls by framing the falls with a trio of covered landings along a ramp that slopes down towards the shoreline immediately west of the Canadian War Museum. The axis created by the construction extends into the forest, with a 12 metre swath of land extending from the base of the ramp to the shoreline, unobstructed by trees. The ramp cuts into the ground, negotiating between the raised field south of the museum and the shoreline's lower elevation. A channel cut into the ramp collects water and directs it towards the river. Each side of the ramp is bordered by a retaining wall, which has a minimum height of one metre. The retaining wall focuses attention towards the end of the ramp, as past the first landing, the wall is too high for the average person to see over. The walls and ramps are made of concrete. The canopy above each of the platforms is wooden. At each landing is a bench, which fits into a jog in the retaining wall that widens the structure by three metres. The bench positions ensure that occupants at each bench will be focused solely on the view of the landscape and the falls, as the benches are hidden from view of the others further up the ramp.

The second construction is a series of depressions in the grassland zone. The depressions are 1.5m excavations into the landscape that correspond with former building footprints from the flats prior to their expropriation. As mentioned previously, the depressions become the grasslands, as they are planted with a mixture of the native grasses Big Bluestem, Indian Grass, and Switchgrass. These grasses grow to an average height of approximately 1.5m, meaning that by the end of the growing season the tips of the grass will be approximately at grade. The remainder of the grassland will also be planted with these species of grass, however the grass in these areas will be kept short. A pathway of wooden planks embedded in the ground guides visitors through the field of depressions.

Only one of the depressions will be physically accessible to visitors. This depression is the former site of the Victoria Foundry, located at the project's northeast edge. The former foundry site will house an enclosed and heated café and viewing location. The viewing location will be surrounded by windows to the western and southern sides, in the direction of the other depressions. These windows will have platforms beneath them, enabling people to stand atop them and have direct access to the windows. Due to the depth of the adjacent depressions, however, they will not be visible. On the other hand, the raised roadbeds will be visible to the west. This deliberate visual erasure of the depressions references the fact that the entirety of the flats was expropriated in the Gréber Plan in favour of an auto-centric business park. The remainder of the foundry depression will be a combination of grassland and a plaza. The grassland will surround the pavilion in the western half of the depression. Within the grasses, clearings with benches and fire pits will encourage visitors to take a moment for respite. The plaza will occupy the eastern portion of the depression,

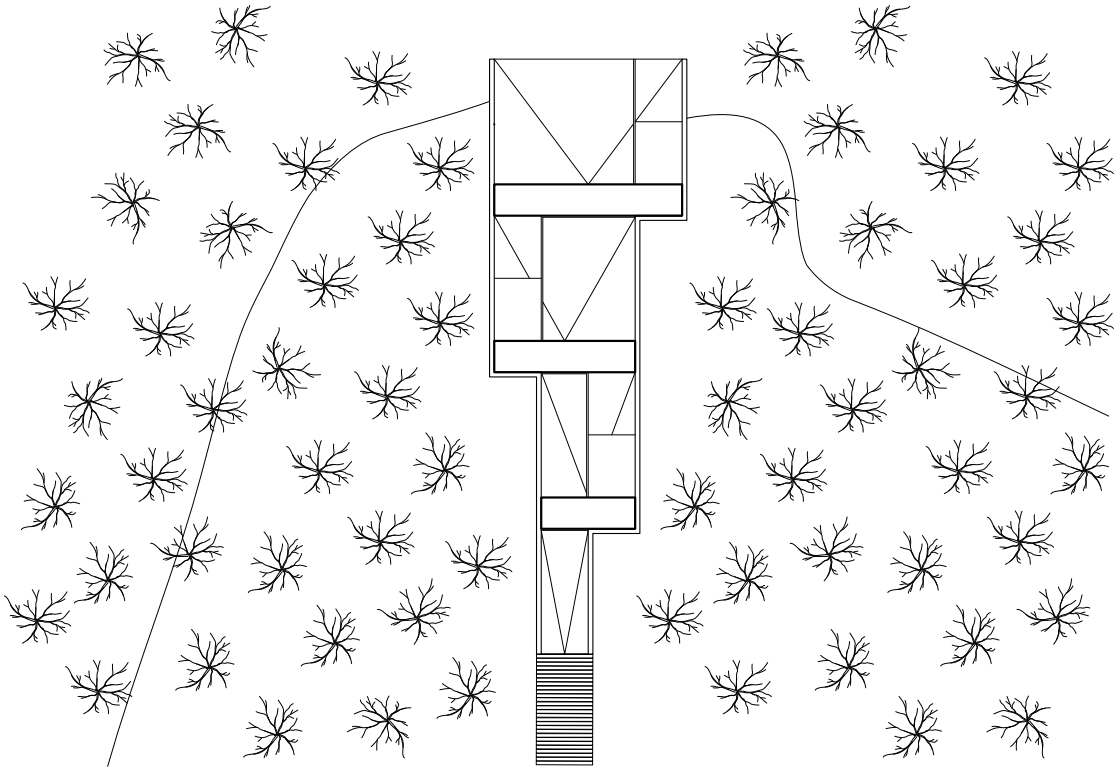
operating as a community gathering space which can be used to hold larger scale events.

The third construction is located in the canal carved through the flats to power the Fleet Street pumping station. Twice in the past three years, the Ottawa River has flooded its banks, causing damage to hardscaping maintained by the NCC and to private homes along the banks of the river, particularly in Gatineau. The bridge intervention brings visitors into close contact with the water, providing them with an opportunity to understand water as a dynamic element in the landscape. The bridge lowers occupants below surface level within the canal, placing them near eye level with the water's surface. As the water levels rise, the gap between the top of the bridge and the water's surface decreases. If the water levels rise enough, the water from the canal will spill over the walls of the bridge, and flood it. Depending on the height of the floodwater, the bridge could be rendered uncrossable.

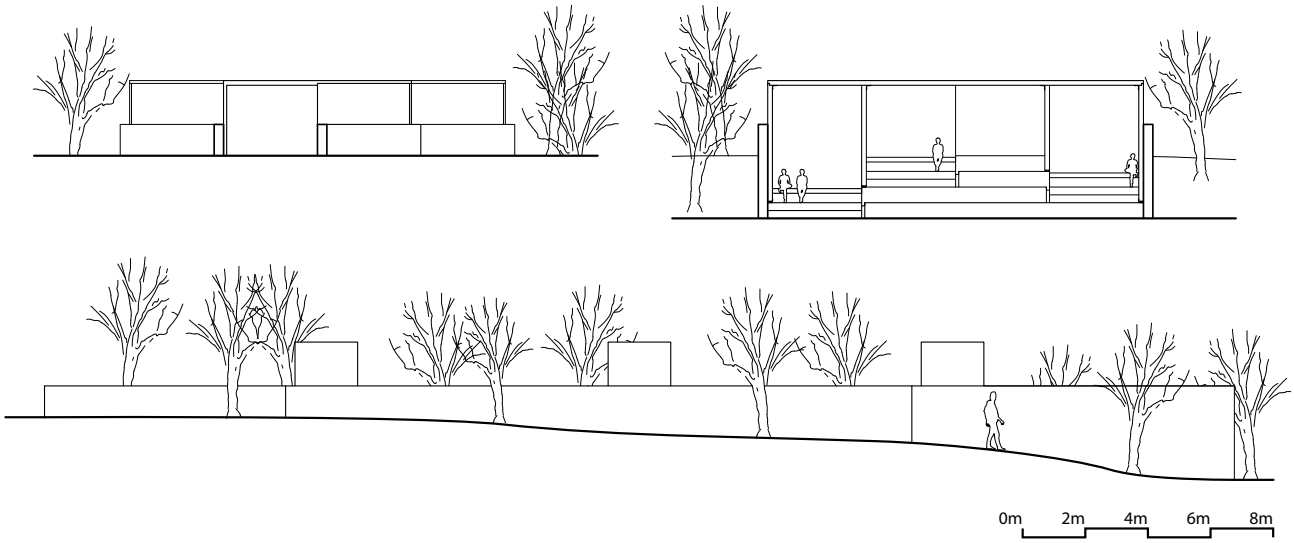
The third construction also includes the series of cuts made into the rock plains defined by the former roads of the LeBreton Flats neighbourhood. The two north-south roads west of Booth Street crossed over the canal, so the corresponding cuts reach the canal's edge. The cuts incline away from the canal's edge, and as such, provide another gauge for the fluctuations in the canal's water level. The cuts are accessible to the public from the grassland, enabling visitors to travel to the water's edge, no matter its current location. The cuts also make the travel of groundwater visible to visitors. As groundwater travels through the layers of rock, it will reach a cut and run down the exposed face of rock. In winter, the groundwater will reach the edges of the slab and cool, freezing into icicle formations along the edges of the cuts.

The fourth and final construction is the pathway system negotiating the

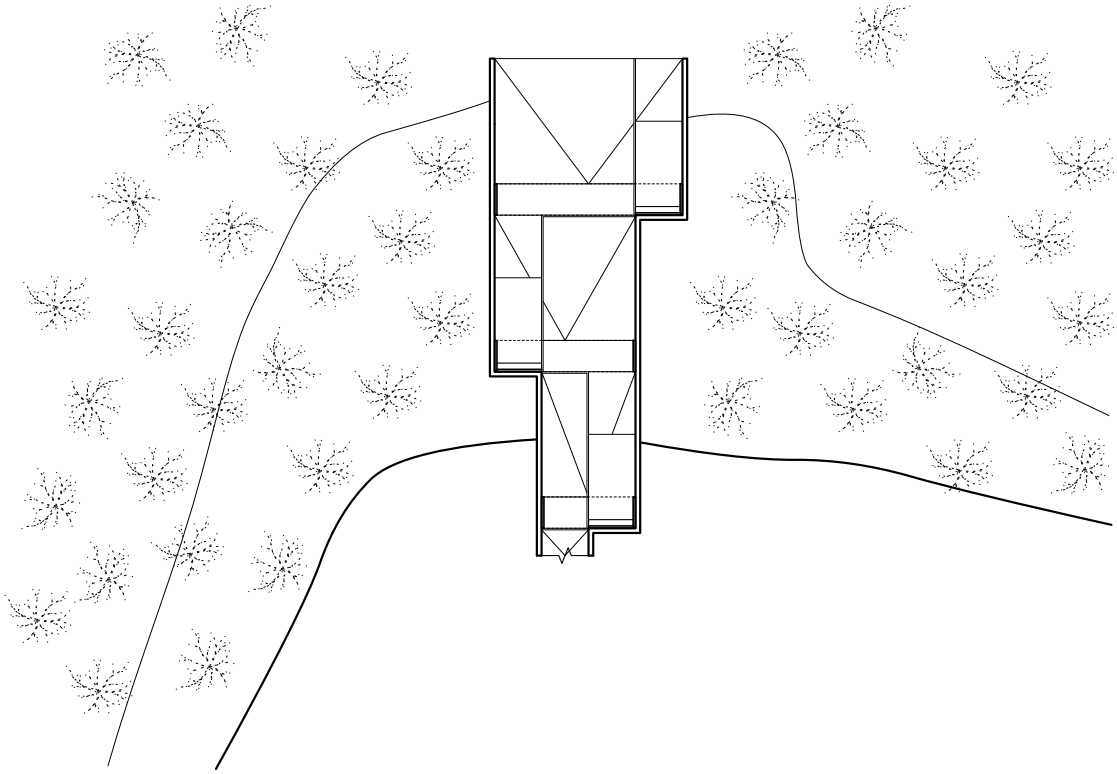
wetland. Situated in the location of the former rail yard, the pathway follows the historical rail lines of the site, an infrastructure designed to assist the flow of industrial freight. The pathway system is constructed to directly reference the railway in its dimensions, adopting the sizing and spacing of rail ties in the wooden plank hardscaping system. In order to create a walkable pathway system, an additional tie is included in between each pair of traditionally spaced ties. The walls of the bridge maintain the standard rail tie spacing. The handrails for the bridges are created from rail tracks, which are fastened horizontally onto the walls. The pathway sits well above the average water height within the wetland to minimize the time it will be under water. Small gaps between the planks of the walkway's surface ensure that water can move through the pathway construction, both during times of precipitation and high water levels. When the water and air temperatures are substantially different, fog will form at the surface of the water, and the pathway will enable visitors to move through the fog.



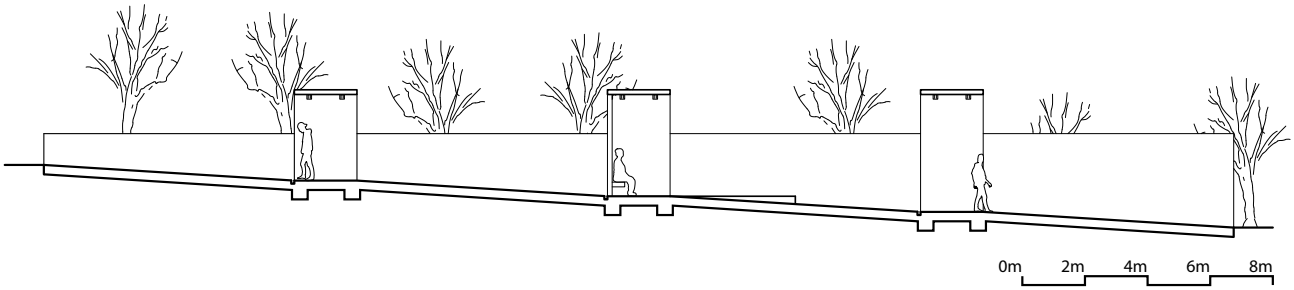
4.10 Forest Construction Site Plan



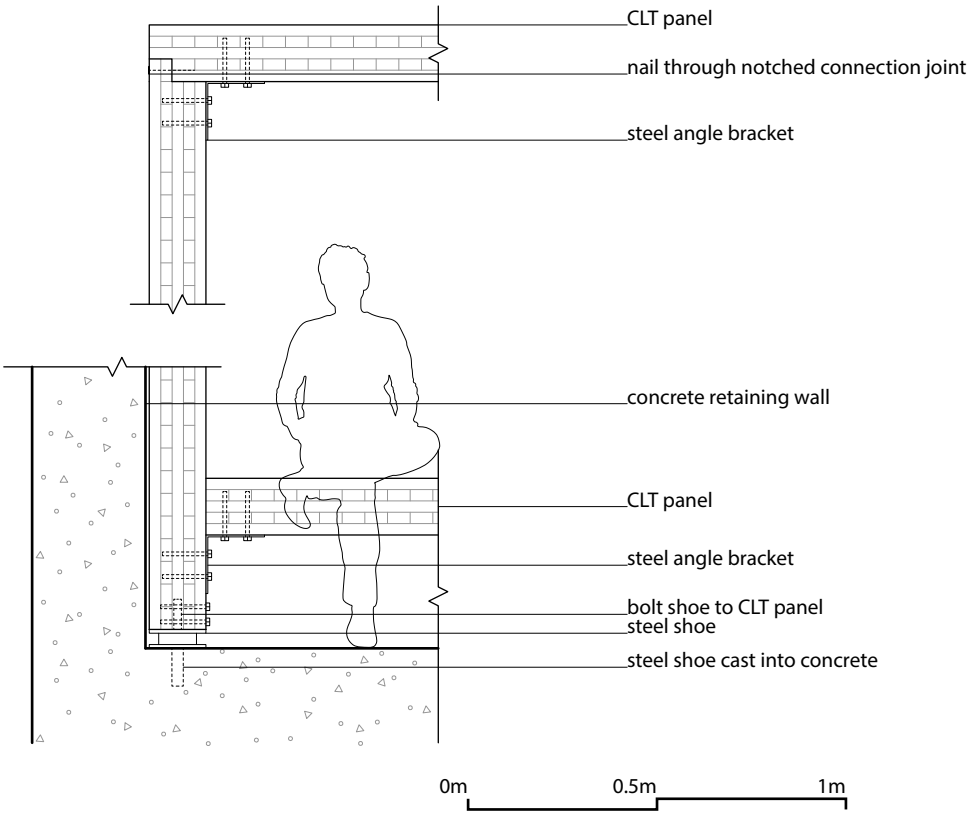
4.11 Forest Construction Elevations



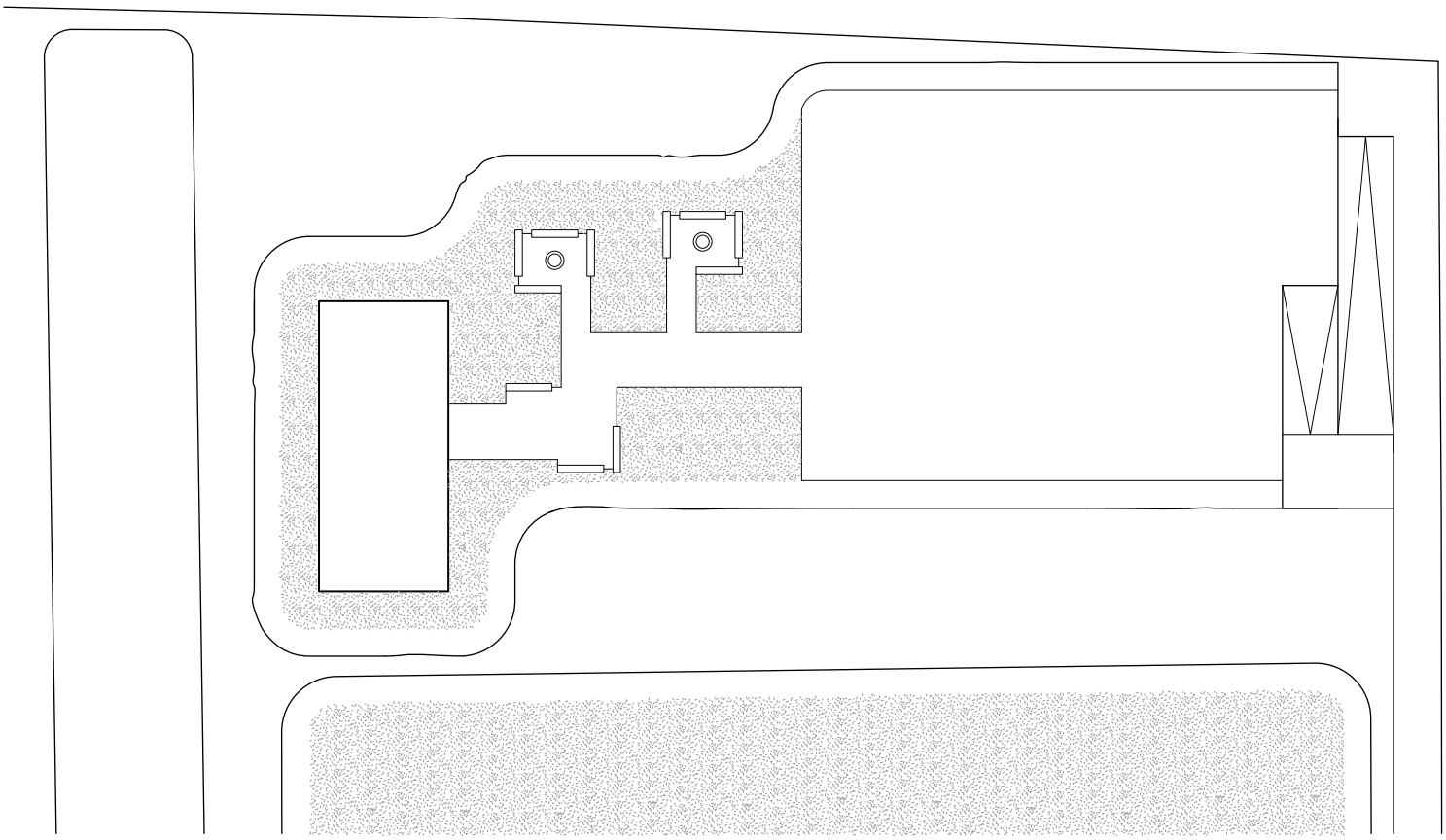
4.12 Forest Construction Plan



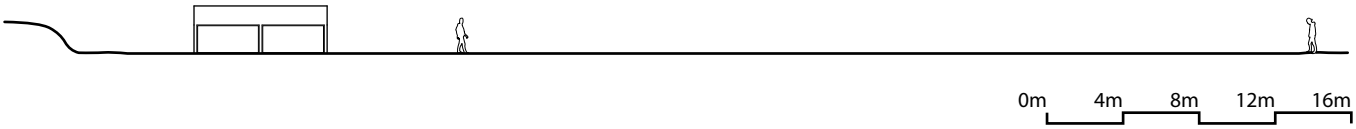
4.13 Forest Construction Section



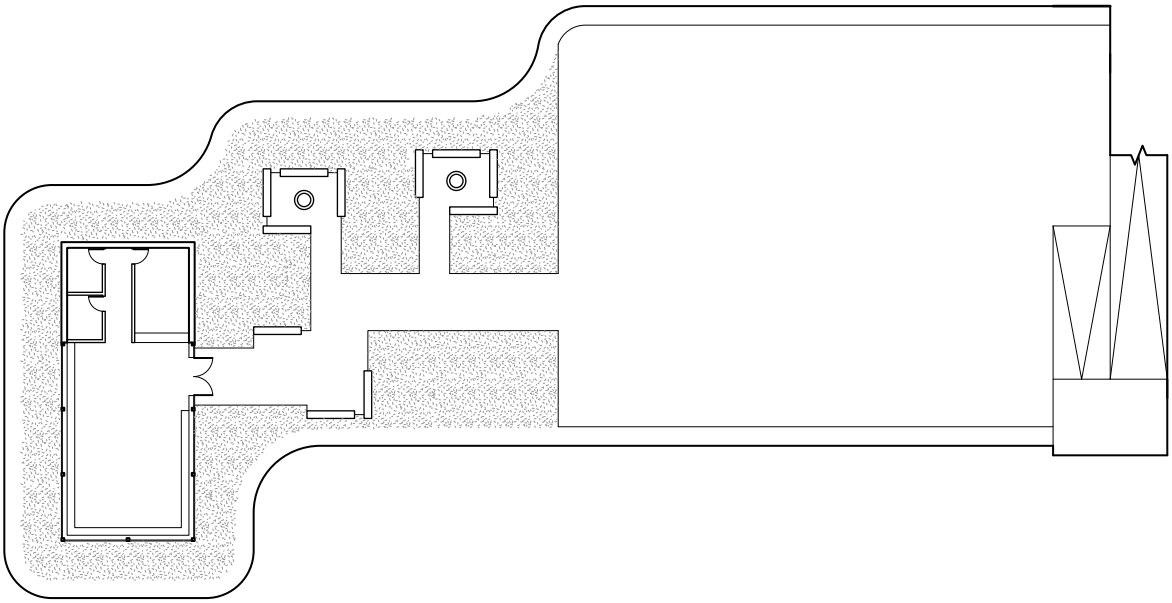
4.14 Forest Construction Detail



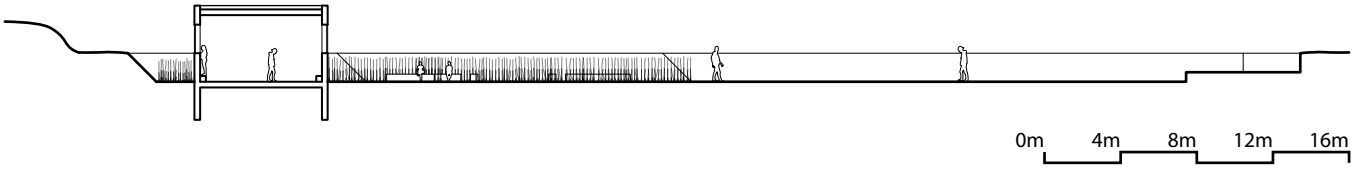
4.15 Grassland Construction Site Plan



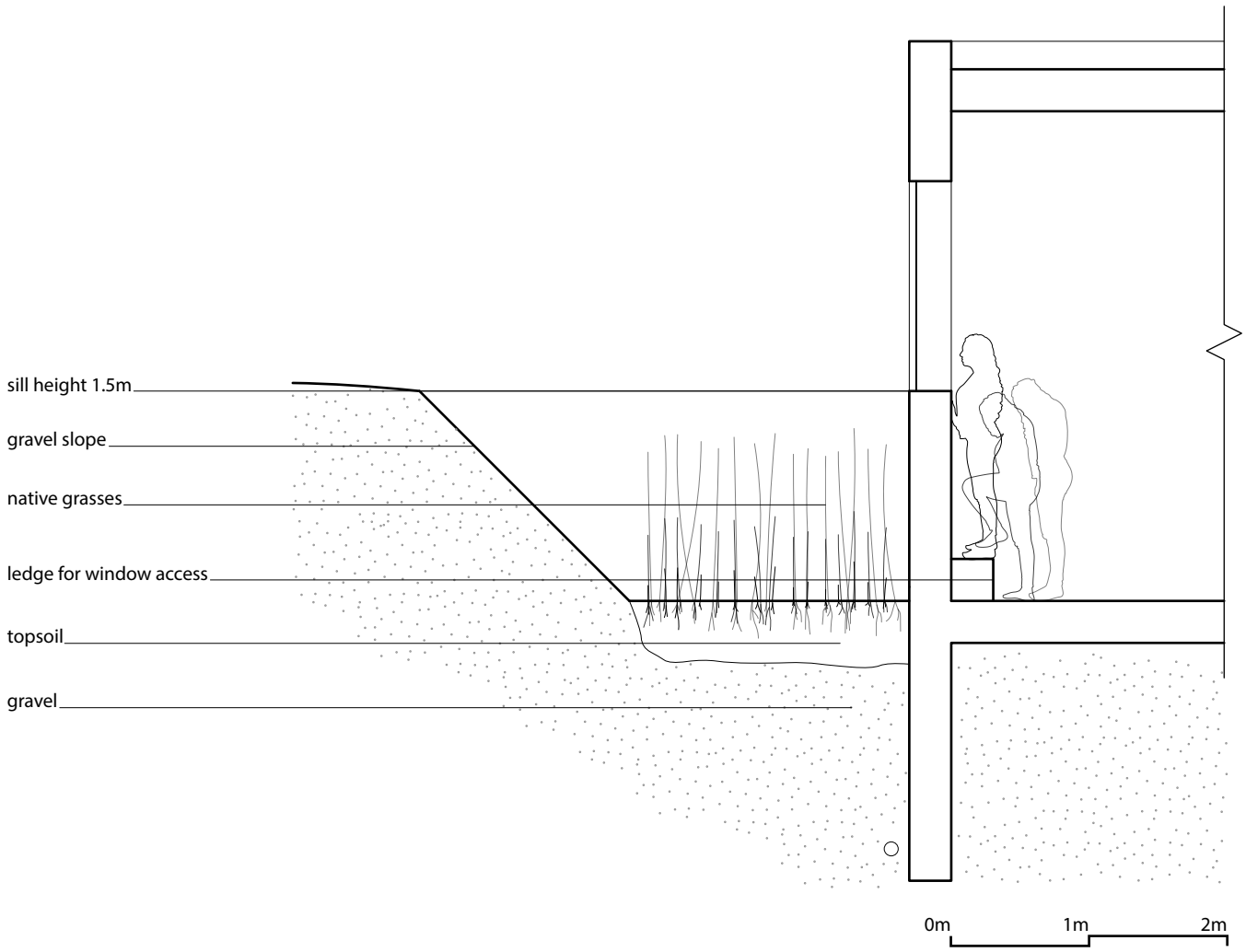
4.16 Grassland Construction Elevation



4.17 Grassland Construction Plan



4.18 Grassland Construction Section



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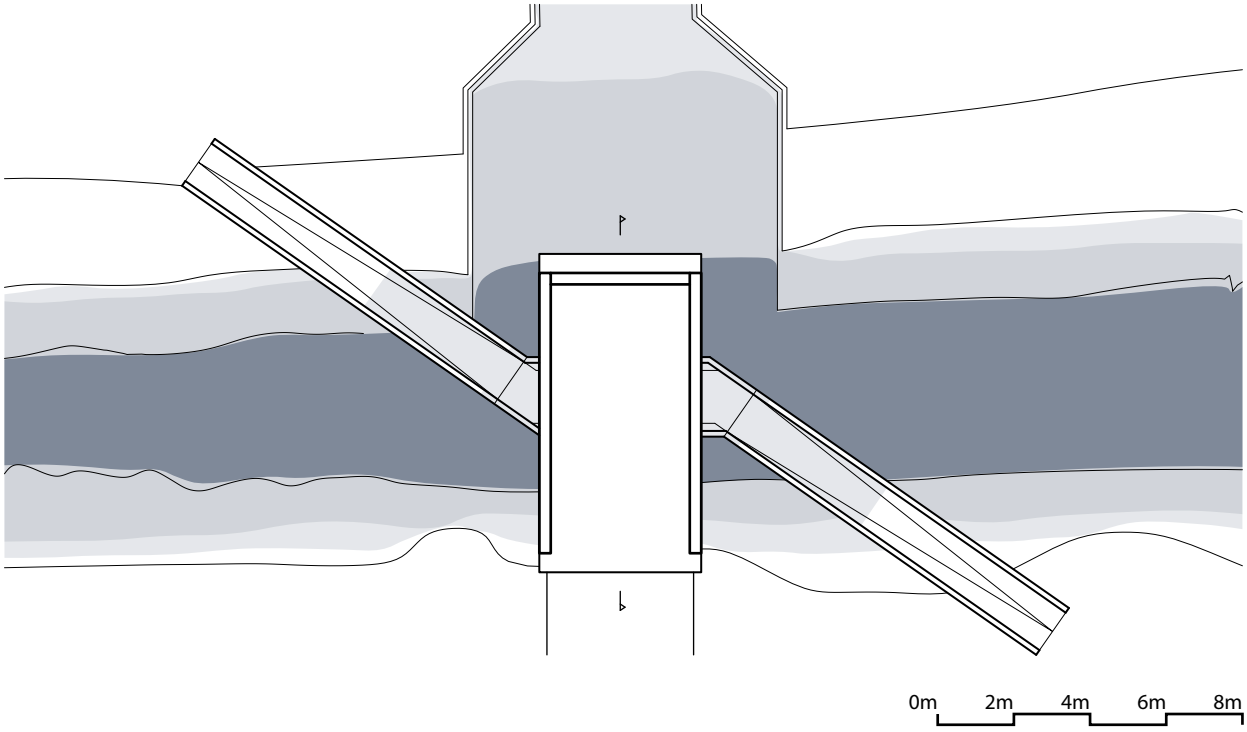
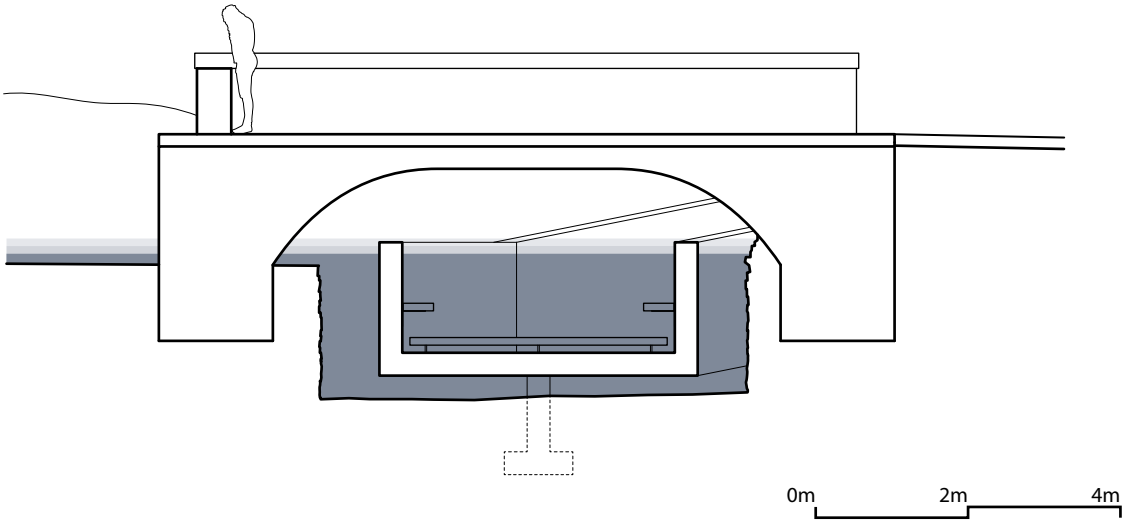
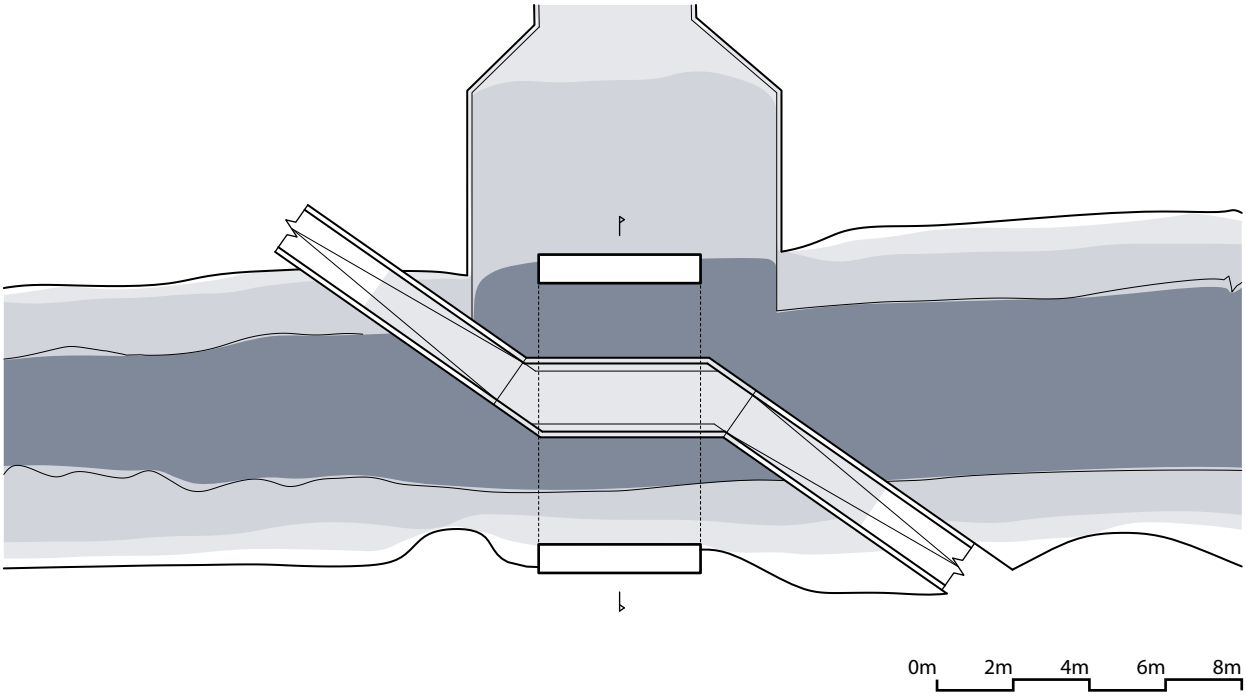


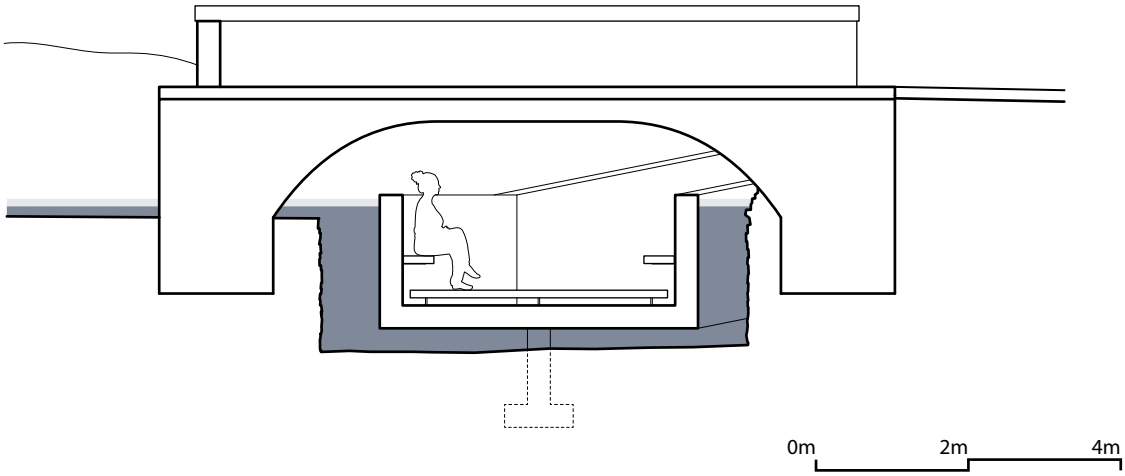
4.20 Bridge Construction Site Plan



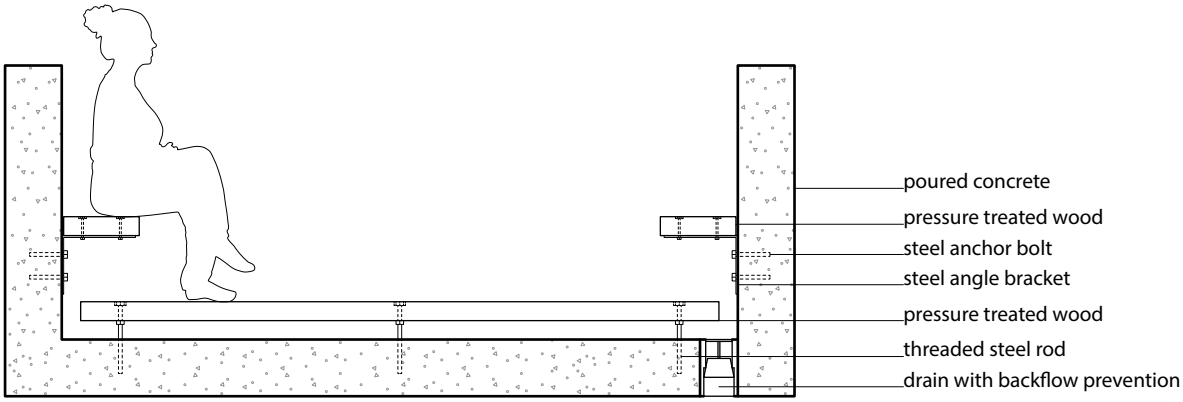
4.21 Bridge Construction Section at High Water

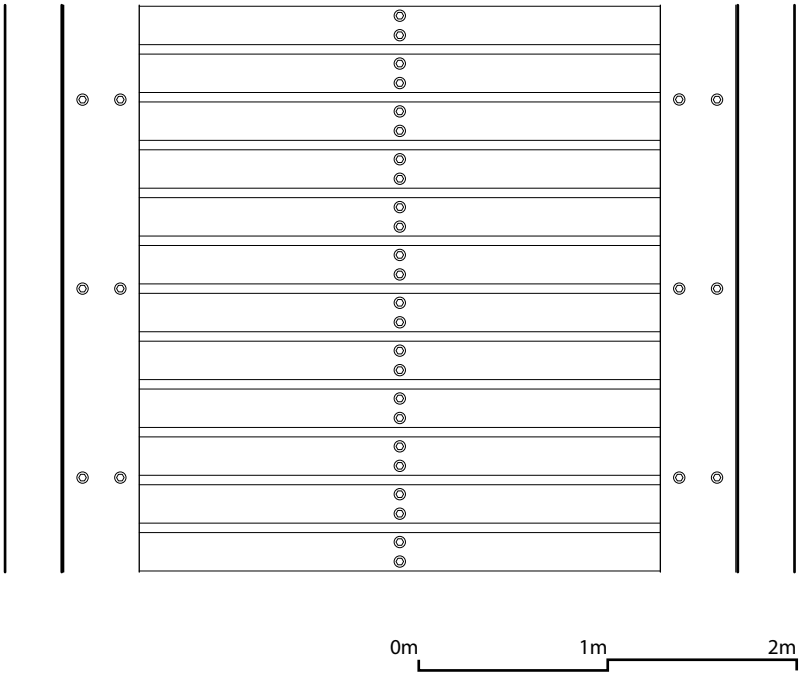


4.22 Bridge Construction Plan

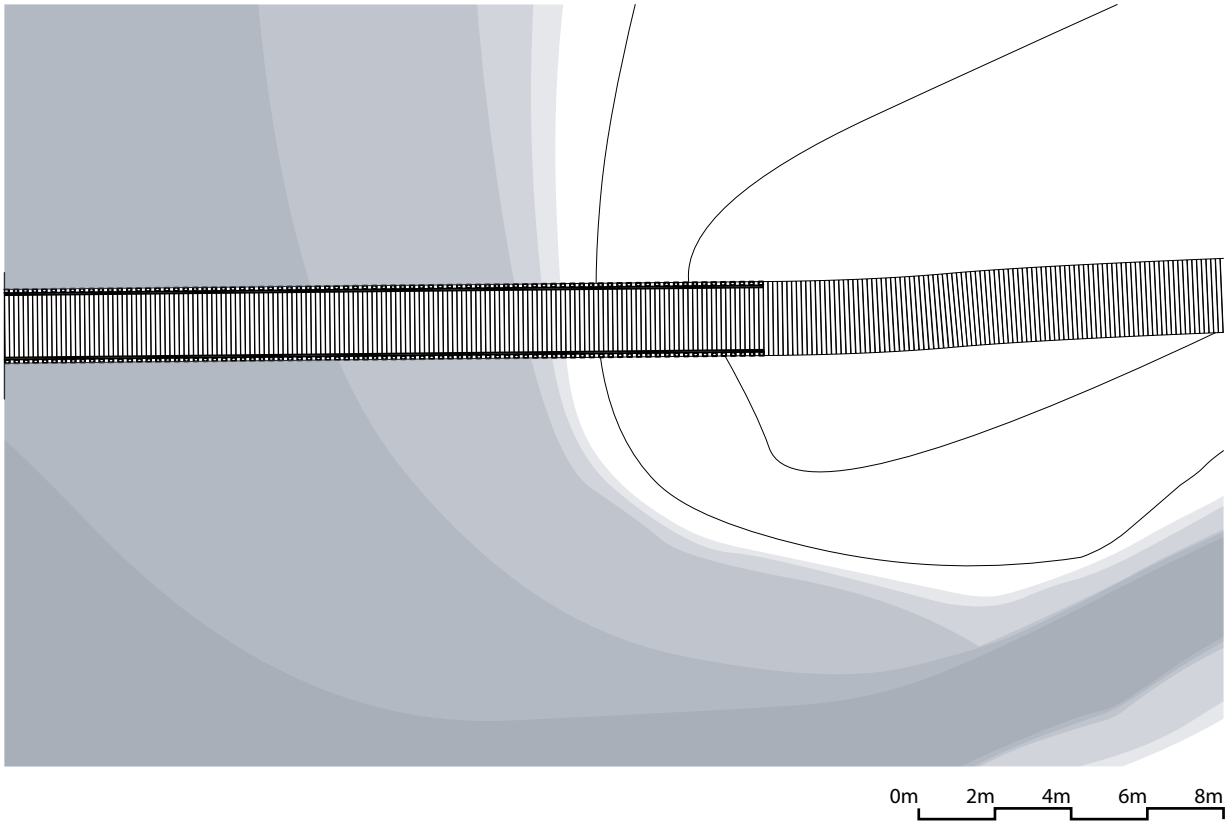


4.23 Bridge Construction Section at Low Water

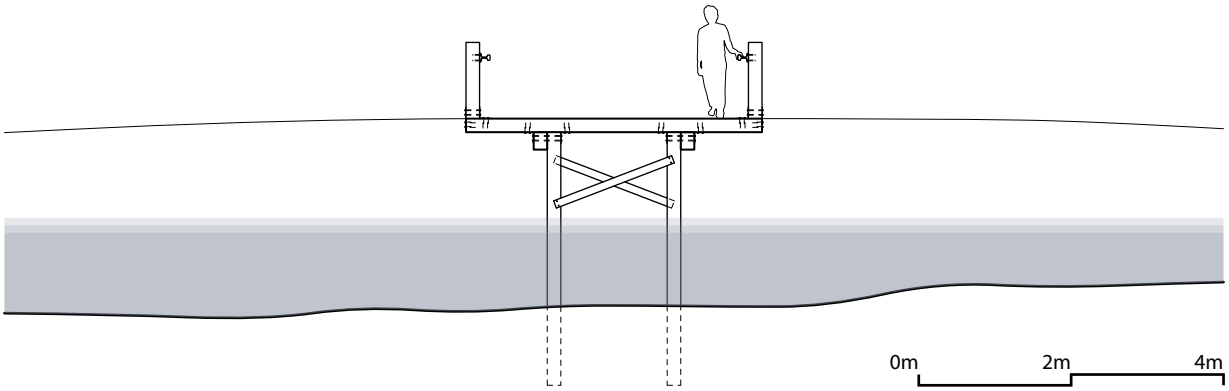




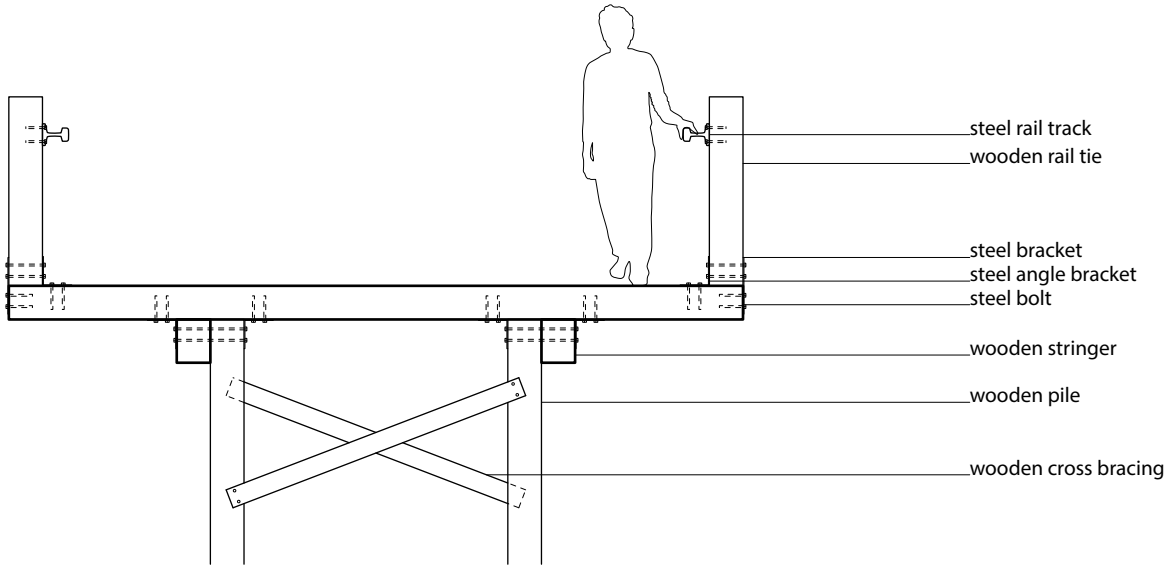
4.24 Bridge Construction Details

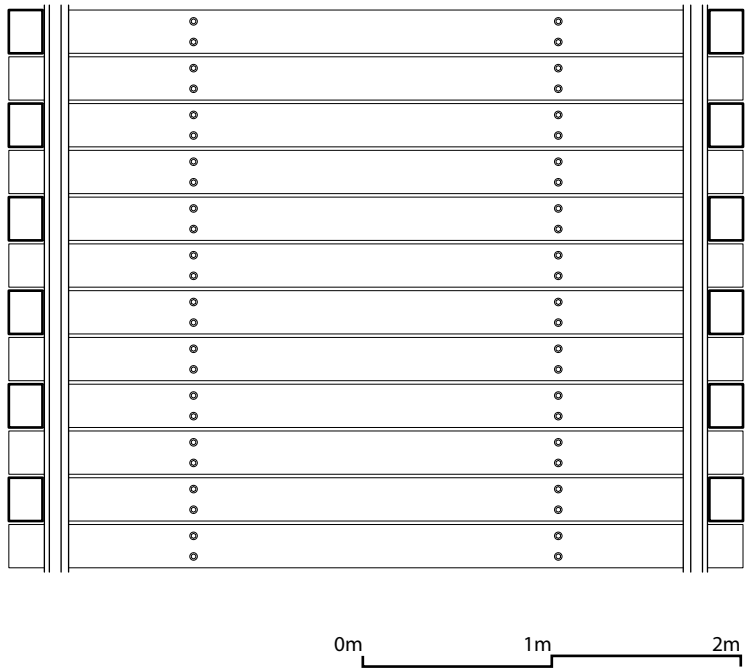


4.25 Wetland Construction Plan



4.26 Wetland Construction Section





4.27 Wetland Construction Details

Instruments of Measurement

Each of the constructions interacts with its site as a measurement device, situating itself within a specific time and location. The constructions are permanent entities within a dynamic landscape, with their permanence displayed through material choices and relationships to the site. The material palette for the constructions acts as a reference to the major industrial extraction processes from the capital region's past. Both the lumber and cement industries played pivotal roles in the capital region's economic and built landscapes. As such, the constructions are built predominantly of wood and concrete.

As a result of being exposed to the elements, both the concrete and wood will undergo physical transformations which will render the effects of exposure visible to visitors. The edges and surfaces of both of these materials will be worn with the passing of time, softening their edges. The visible effects of environmental exposure of these materials will mirror similar processes on the landscape elements within the project. The cuts of the rock plains will weather and soften over time, as will the excavations into the grassland. Vegetation will mature and spread across planted lines, further blurring edges within the project.

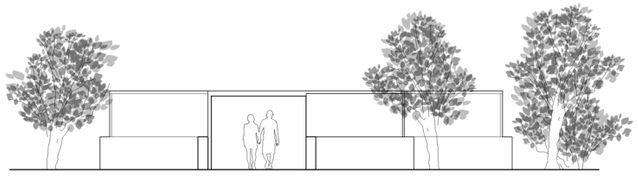
Likewise, the surfaces will become stained as a result of contact with water, and the elements dissolved within the water. These stains may be temporary, potentially caused by precipitation or melting snow and ice running through the channel in the ramp or down the walls of the forest pavilion (figure 4.30). They may also be permanent, like those caused by fluctuating water levels on the submerged surfaces of the bridge (figure 4.35). The bridge's descent into the canal brings visitors closer to the water to form a direct relationship between the visitor and the water's surface. Seasonal water level fluctuations will render the bridge impassable at times of extreme high water, emphasizing the dynamic

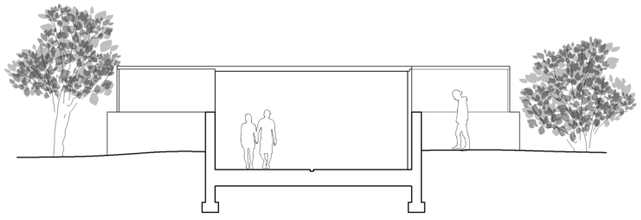
qualities of the water. Weathering on the constructions will render the passage of time and the fluctuation of the environment visible to visitors.

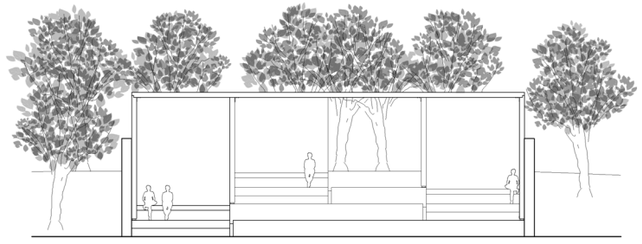
The constructed landscapes of the project will provide another layer of measurement on site. The road cuts bring water into the rock plains as the water levels rise, exposing and concealing the strata of rock beneath the surface of the flats with the fluctuation. Simultaneously, groundwater seeps through the bedrock layer, dripping down the surface of the rock, and forming icicles in sub-zero weather.

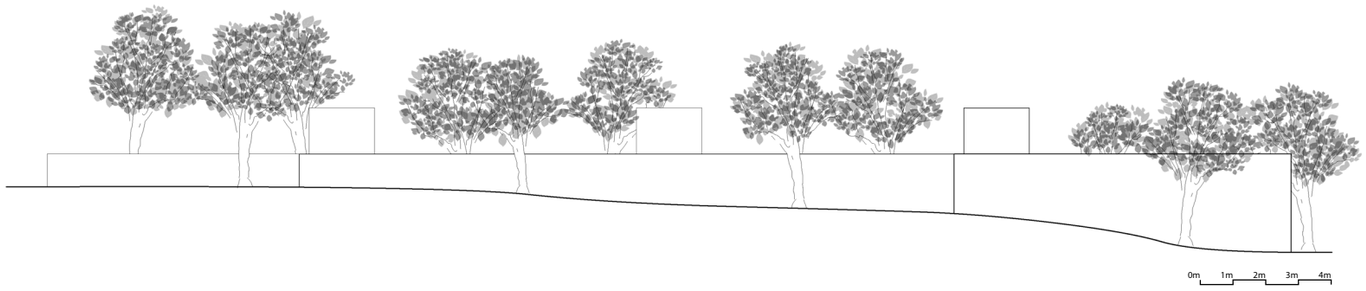
Annual vegetation growth throughout the year provides further evidence of seasonal patterns, particularly through the rapid growth of grasses in the grassland construction (figures 4.31-3). The forest will similarly display visible signs of seasonality through the pattern of canopy growth in the maple trees, as the buds begin to develop in the spring, growing into leaves throughout the summer, before eventually changing colour and falling to the forest floor in the autumn. Working in unison with the construction, the trees will be continually on display as a framing element for the Chaudière Falls.

Each experience of the site will provide a new perspective and understanding of the processes at work within the site. A single visit will afford a snapshot in time, of the site constructions and the visual, ecological, and programmatic relationships with which they engage. The experiences that are created are immediate and direct, but can also be appreciated in reference to the known history of LeBreton Flats. Multiple visits in different times and seasons will allow visitors to more fully perceive the dynamism of the environment, where tangible evidence of change is visible at each construction in each time and season.

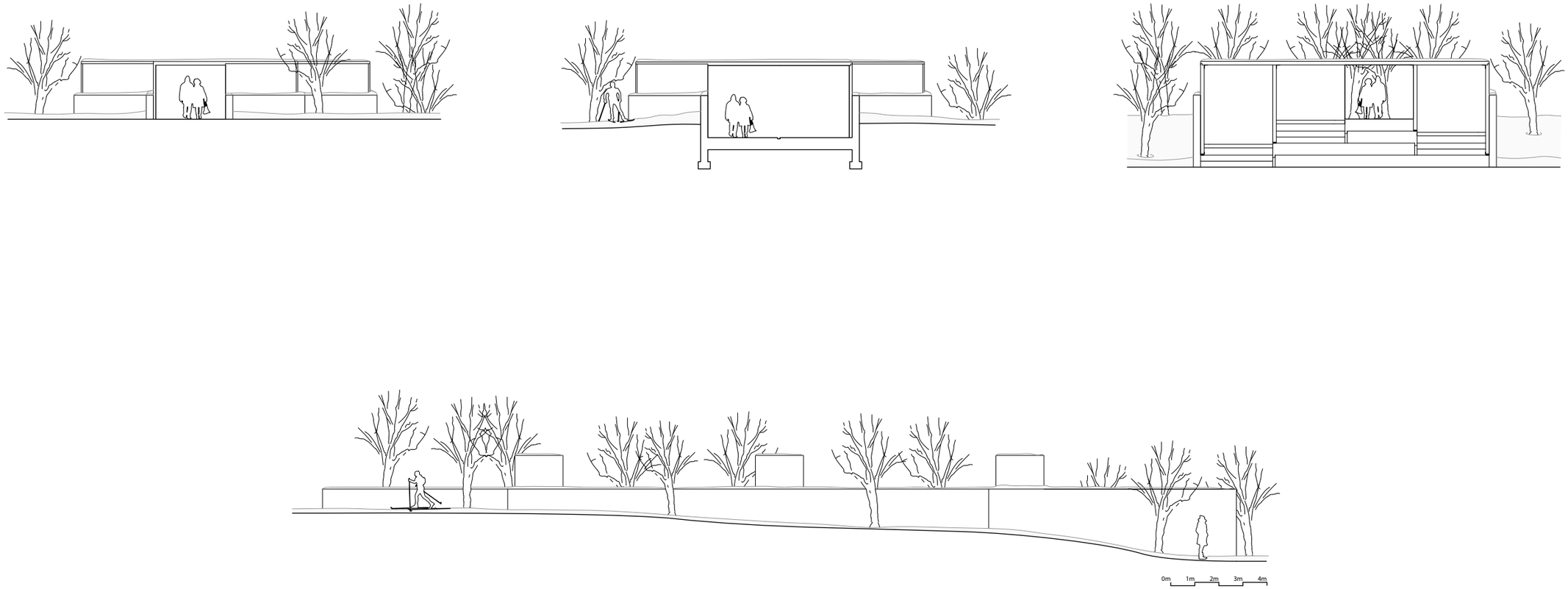




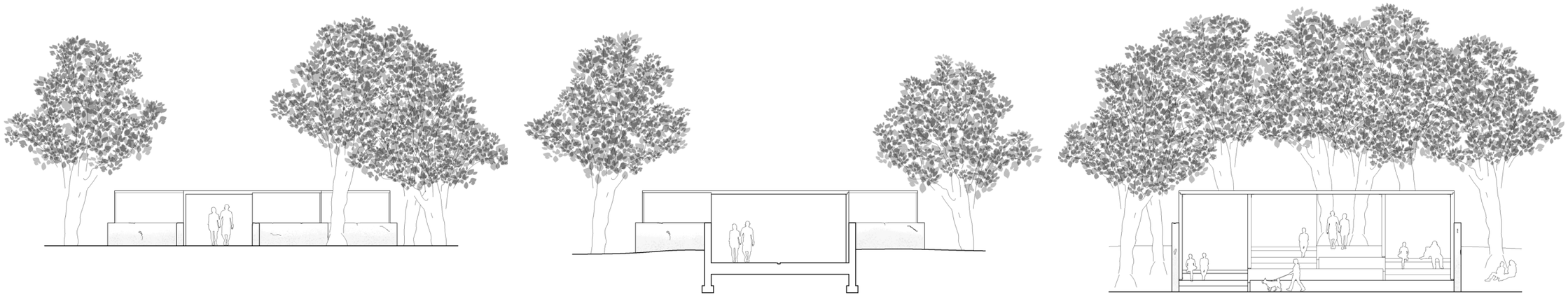


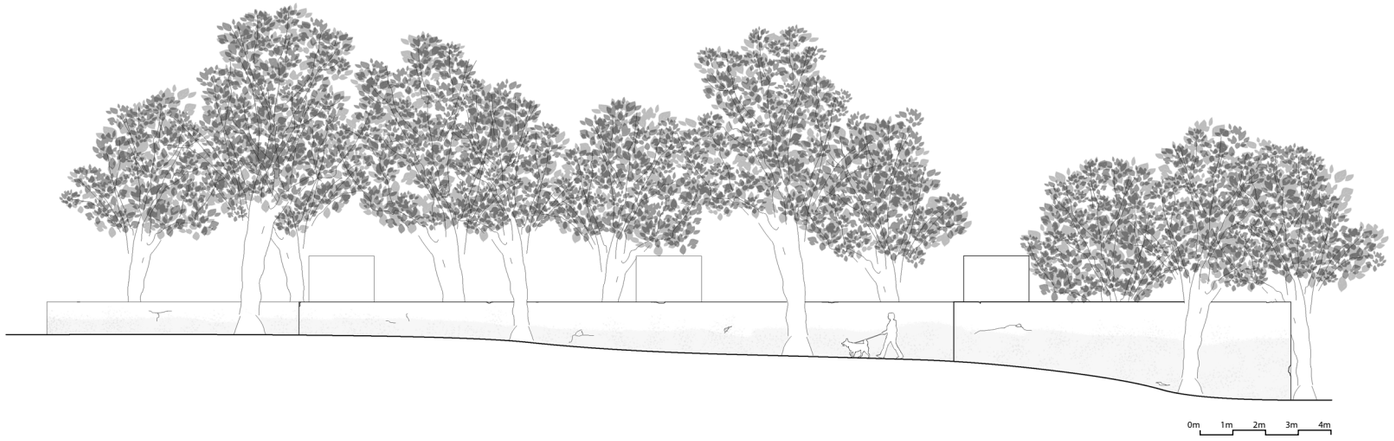


4.28 Forest Construction Summer 2030

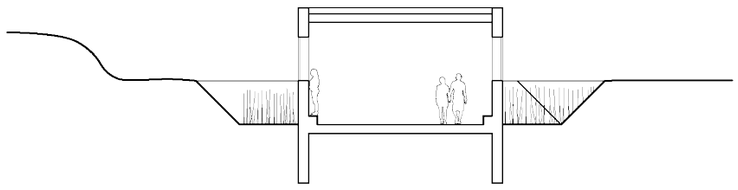


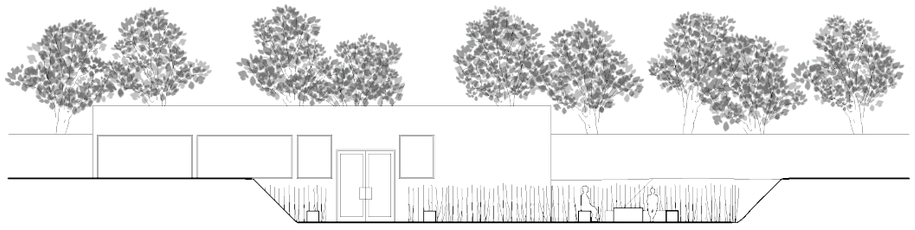
4.29 Forest Construction Winter 2030

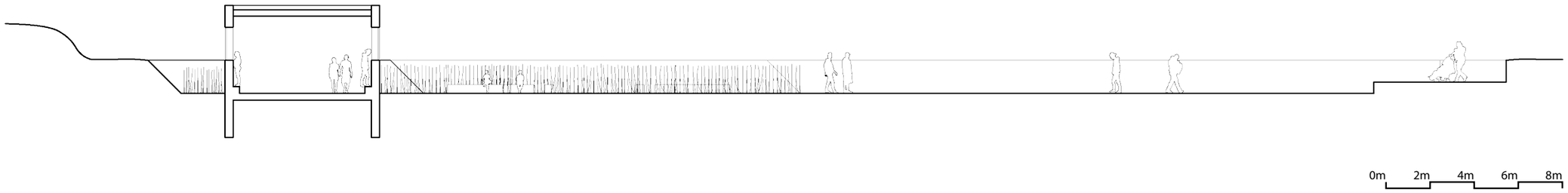




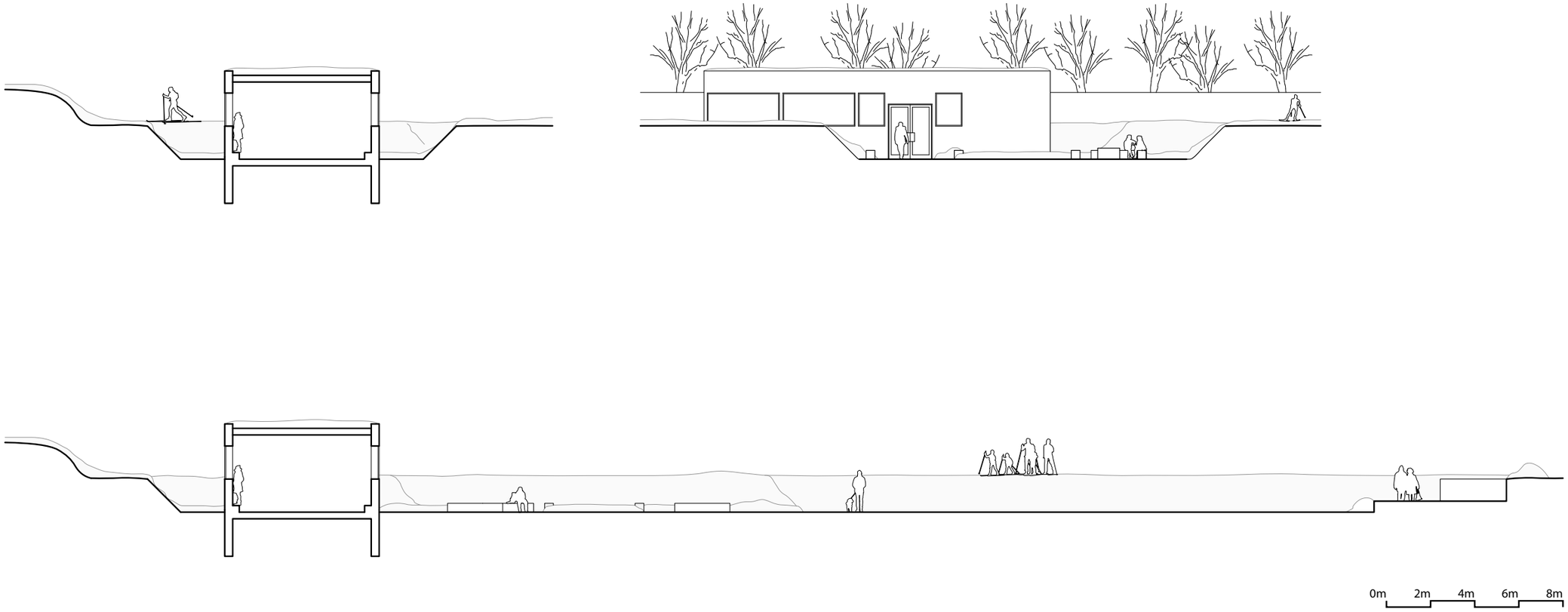
4.30 Forest Construction Summer 2070



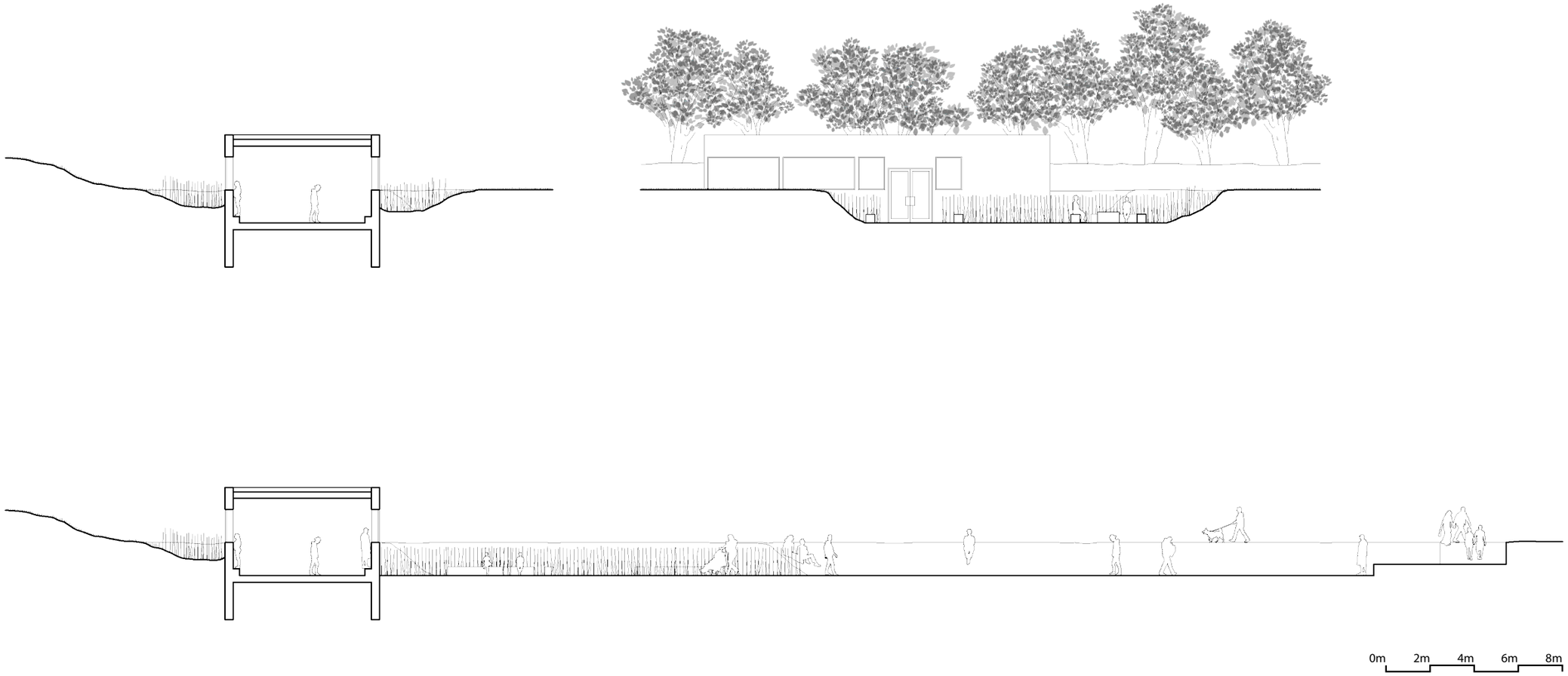




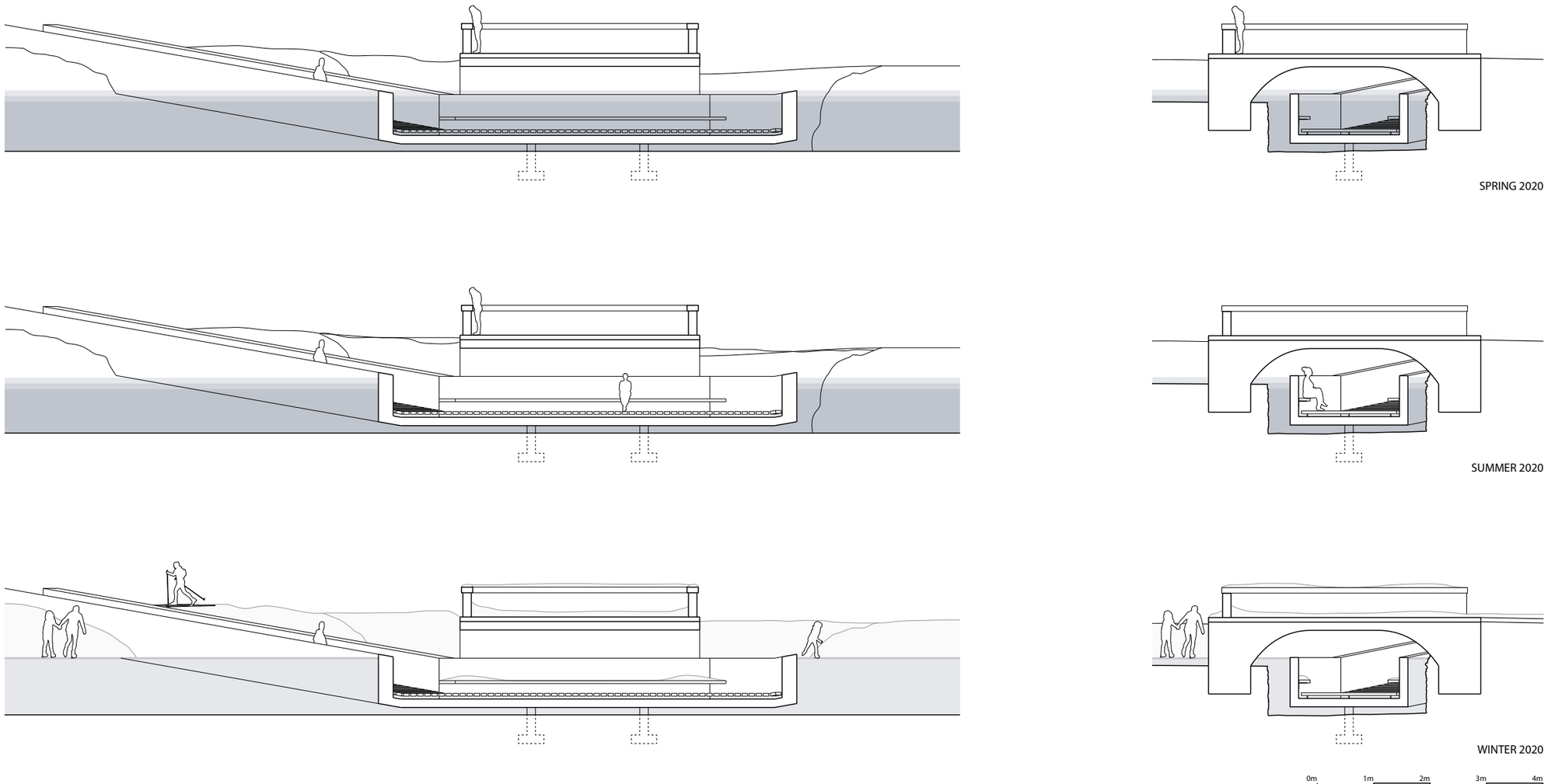
4.31 Grassland Construction Summer 2020



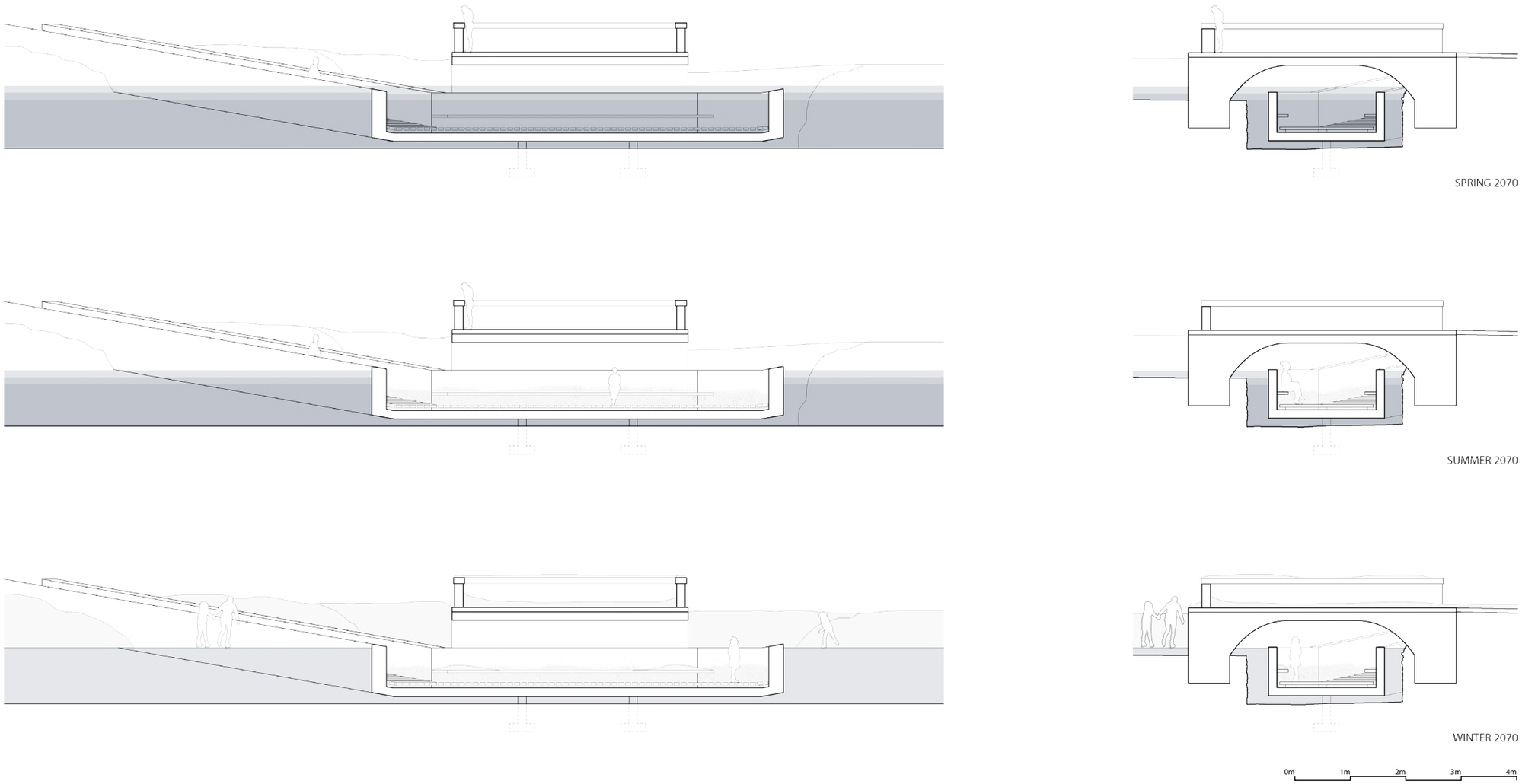
4.32 Grassland Construction Winter 2030



4.33 Grassland Construction Summer 2070



4.34 Submerged Bridge Seasonal Cycle 2020



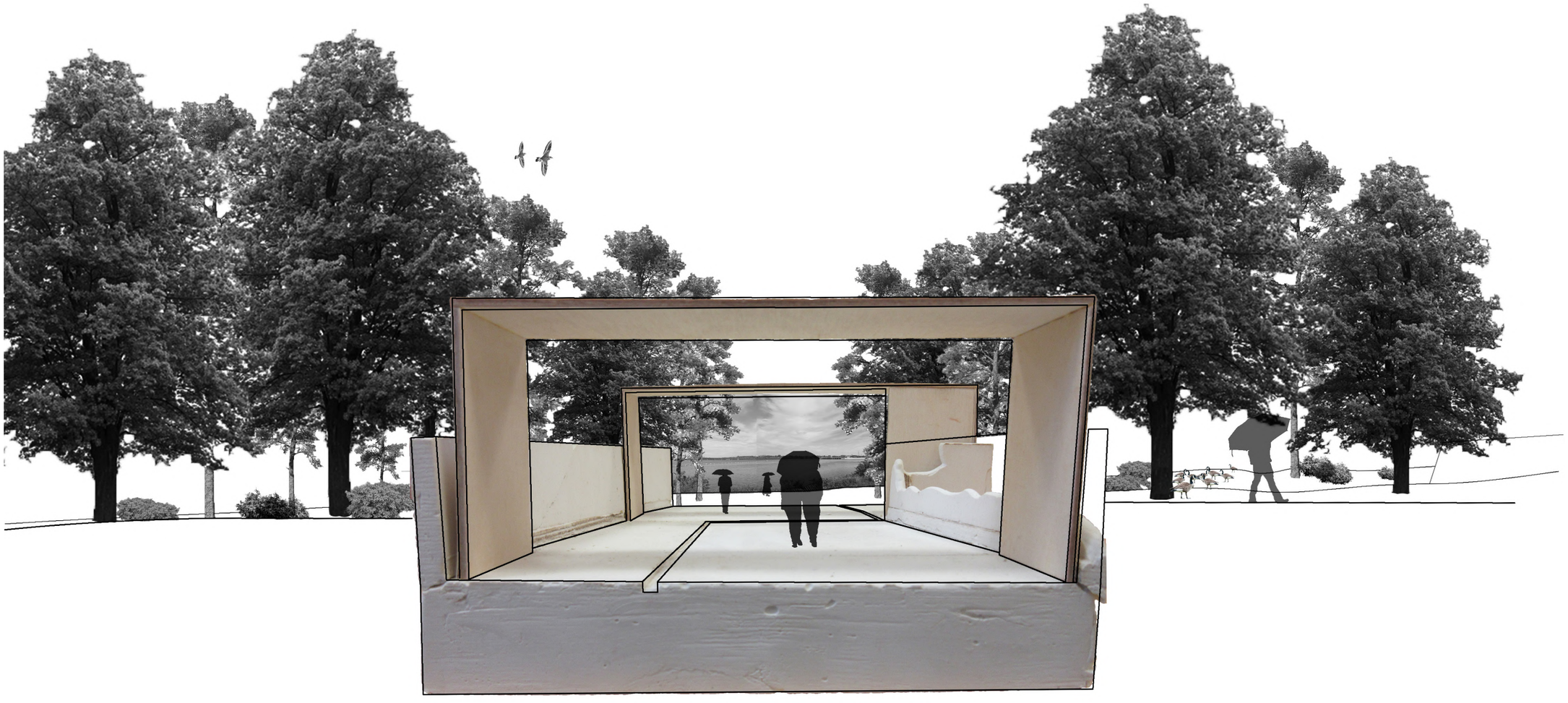
4.35 Submerged Bridge Seasonal Cycle 2070

Framing the Past, for the Future

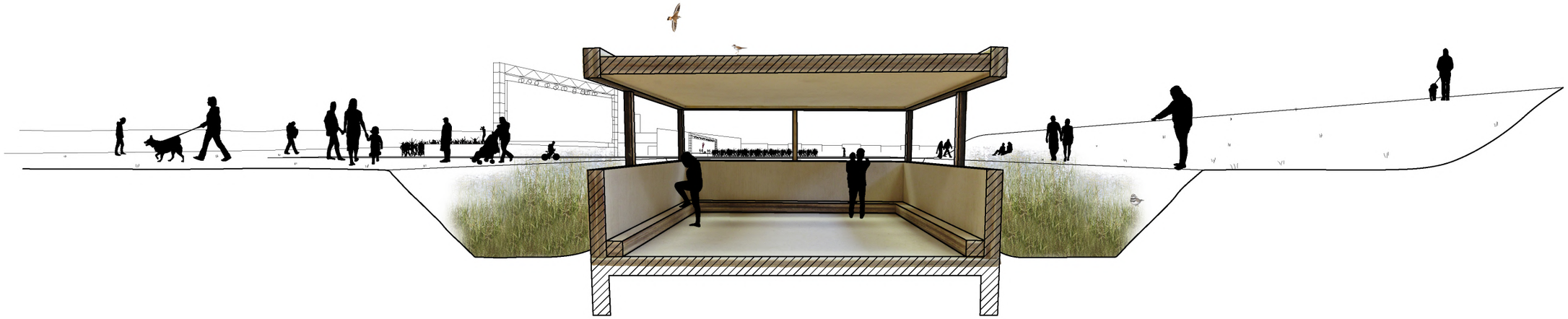
Each of the constructions is built in order to provide visitors with a framework for situating themselves in relation to site processes and histories. The focal points are derived from historical land use patterns. A series of viewfinder models were constructed to imagine the views which would be created by each of the constructions. In producing the models, the constructions are physically or digitally modelled, to act as the framing device for the viewfinder. The models are then collaged into images which simulate the view from within the constructions.

The models act as the catalysts for their corresponding ecosystems. The physical construction of each of the interventions are built as stand-alone entities, to be populated by planned and unplanned natural and social processes. Vegetation grows from an imagined structure around the model, facilitated by the model's existence. As such, the insertion of the constructions into the landscape provide a guide and measure for future forms, occupations, and growth, without dictating a fixed logic.

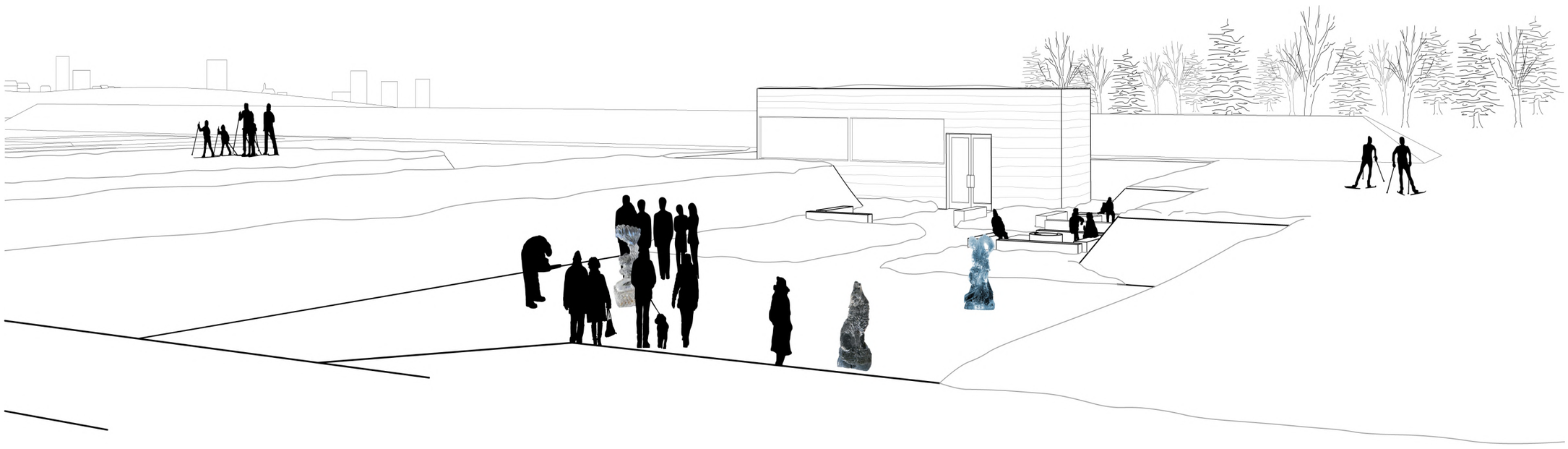
The viewfinders act as testing grounds for the construction designs. The drawings speculate on proposed relationships between the sites physical constructions, the ecosystems designed around them, and the surrounding urban context. The vignettes orient the viewer towards the specific elements that each construction is designed to frame. In doing so, the vignettes emphasize the constructions as frameworks for the landscape and the ecological processes which take place within it. The inclusion of elements from the surrounding cityscape in the vignettes embeds the project within Ottawa's historical, current, and future urban fabrics.



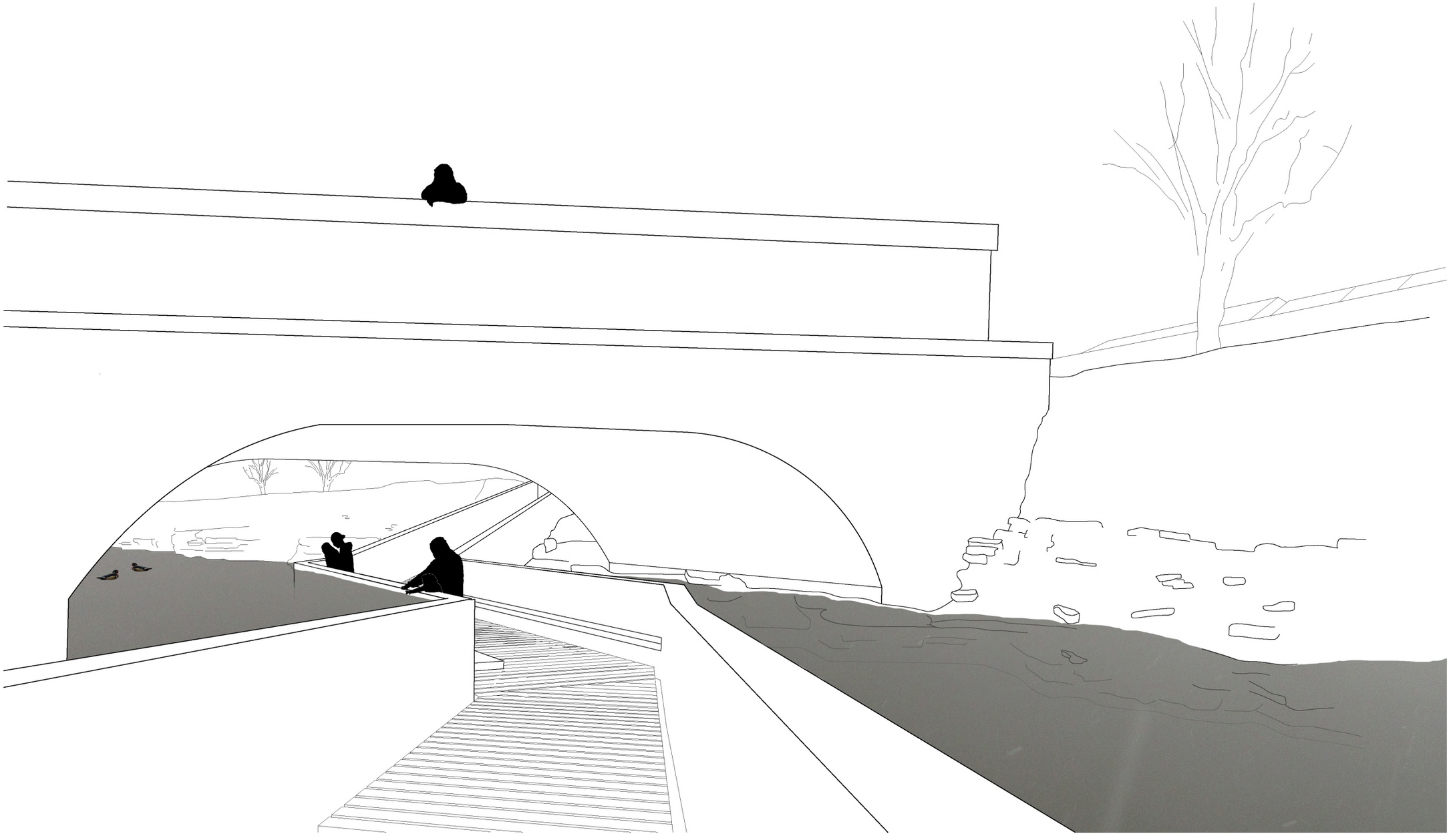
4.36 Forest Viewfinder



4.37 Grassland Viewfinder



4.38 Winterlude



4.39 Bridge Viewfinder

4.40 Wetland Viewfinder

PROJECTIONS

Projective and Reflective Drawings

This thesis relies upon the dynamism of the environment in which it sits in order to reach its designed potential. As such, the representation of the project must encompass the project as a mutable entity. Representations, like the constructions themselves, are intended to negotiate a relation between visitors and environmental phenomena. As such, the design drawings will imagine multiple times and conditions, however they will always remain partial.

In light of the selection of one specific and geographically small site, it is striking to suggest that the design exists in many spaces. The multiplicity of spaces in this definition are not unique in geographical location, but rather unique moments in time at one geographical location. The space of the flats is inherently different based on the environmental conditions at different moments in time, and to visitors with different interests and abilities. The site will appear differently under a blanket of snow than it will during a dry summer day. The water levels on site will create variable spaces within the constructions, depending on the moment at which they are inhabited. A centimetre of difference in water height might render an area of the site inaccessible, and will consequently shift visitor perceptions of the site and the constructions. As such, space is not static in the project.

In order to understand each drawing as a representation of the processes of the site, a system for layering and differentiating information was required. The early studies made from historical maps and fire insurance plans aimed to illustrate the imperfections of the map. This was achieved by printing the maps on acetate and overlaying them, as was discussed in the chapter “Boundaries.” These drawings effectively communicated the difference between each map, demonstrating the subjectivity of the location of each line on the drawing.

Buildings, roads, and edges all moved in location from one map to the next, regardless of whether or not there had been real world modifications to the different elements.

Similarly, the sectional drawings made to analyze flows on the Lac Leamy and LeBreton Flats sites were composed of layered sheets of acetate. In these drawings, the acetate was used to differentiate permanent elements found on site from historical imagery and flow formations operating across these spaces and time frames.

To represent the thesis proposal as a series of constructions within a dynamic site, representation of the site must include multiple potential states. The project situates itself in the present, drawing heavily on the past, and firmly entrenches itself in the site as a fixture for the future. The drawings consequently layer elements from each of these eras, drawing them into dialogue.

The site plan is influenced by the mapping studies, drawing the plan as a layered entity rather than representing it in a definitive moment in time. Historical elements which were modified or erased occupy one layer of the drawing. This layer is positioned at the back of the drawing, acting as a reference to the past, and reminding the viewer of the origin of the design. Within the historical layer, the lines are given a light colouring, and all hatching is removed from solid objects to create a difference between that which exists and that which has been removed.

Atop the layer of history, the current and proposed infrastructure and built environment are drawn. These elements of the drawing are given a more significant weight, as they make up the most permanent elements of the site design.

The final layer of the drawing contains the temporal elements of the

project. Vegetation and water are treated as dynamic rather than static in the project, constantly involved in a process of change. To represent this dynamism, the flexible elements within the design are drawn as multiples. The edges of the river, wetland and canal all change throughout the year, depending on the height of the water. As such, different edges are added to the drawing in the form of lighter shades of blue. The river's edge can consequently be seen as in a state of flux, rather than as a permanent fixture.

The sectional drawings are used to examine the vertical relationships between the constructions and the dynamic landscape. Similarly to the site plan, the base layer of the sections focuses on the more permanent elements within the design. The overlays will introduce the temporal elements of water and vegetation to the drawings. Water heights will activate and deactivate the zones within the project. By including multiple different scenarios in each drawing, the site will be seen as an integral portion of the system. Likewise, the vegetation will be introduced in stages, cataloguing the seasonal growth of the grasses, and the yearly growth of the trees.

Reflective and Projective Site Plans 2020 - 2120

5.01 LeBreton Site Plan - Existing

5.02 LeBreton Site Plan - Reflection
Overlaid in orange are former roadways and building footprints from previous eras in flats history.

5.03 LeBreton Site Plan - 2020
The site is projected as a reflection of the former land uses on the flats through landscape interventions and pavilions. The site is understood as dynamic, and is drawn as such, with impermanent boundaries between water and land.

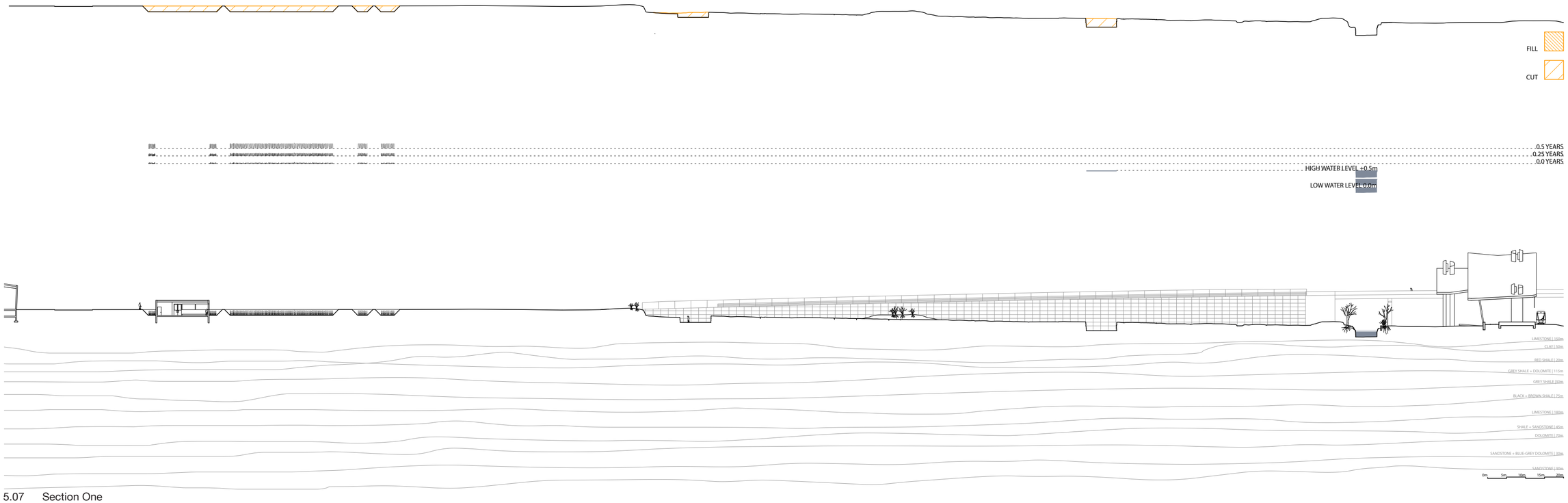
5.04 LeBreton Site Plan - 2040
Twenty years after completion, the grassland has extended to the south and west, and has crossed the wetland. Water levels have risen, and the wetland has extended into the rock plains, submerging it under water for a greater percentage of each year.

5.05 LeBreton Site Plan - 2070
Half a century of growth has pushed the grasses well into the wetland and onto its southern shores. The forest has matured and begun to extend into the grassland. The earthworks of the grassland and the rock plains have eroded, leaving many of the original mounds and depressions indiscernible beneath the site's grasses and waters. The NCC has pushed forwards with its LeBreton Development plans along Albert Street.

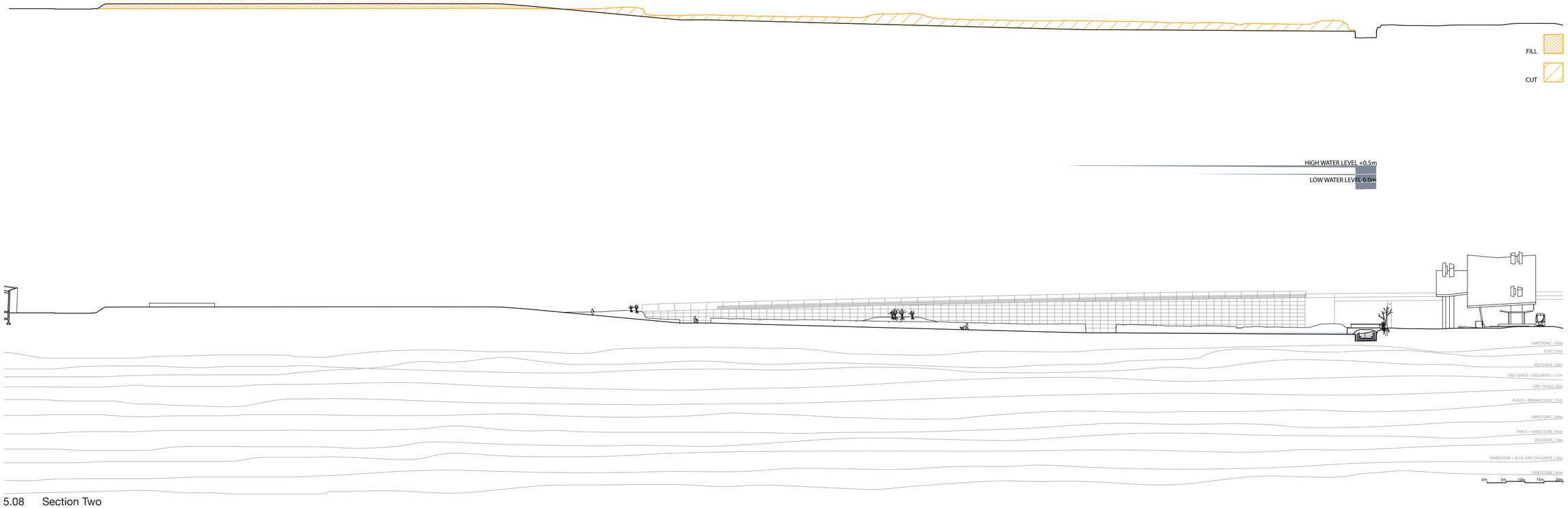
5.06 LeBreton Site Plan - 2120

The site has become completely blanketed by vegetation, with grasses and trees extending to all edges of the site, on both sides of the wetland. Waterflow through the wetland has eroded the eastern berm, and completely overtaken the former rock plains.

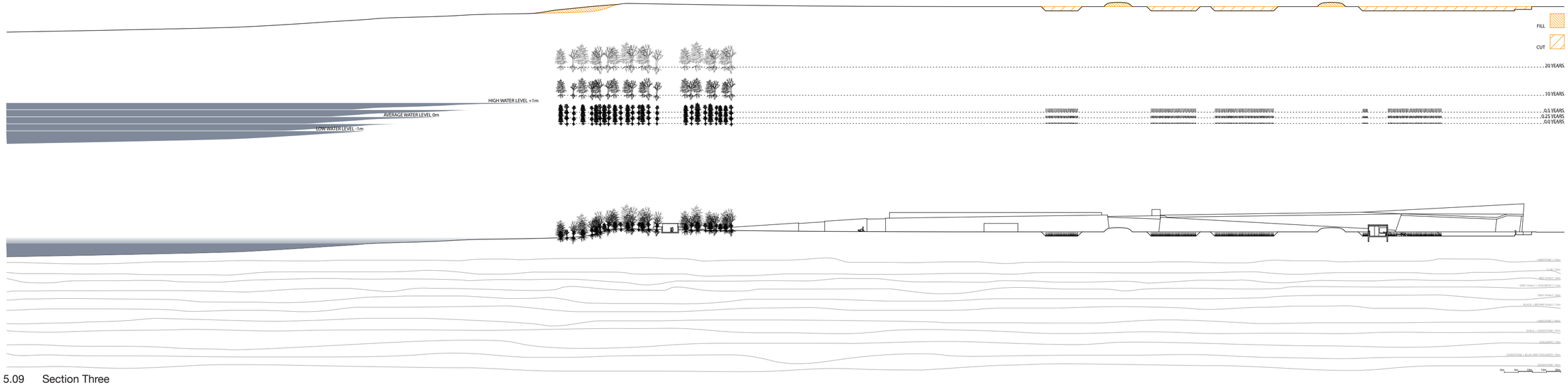
Reflective and Projective Site Sections 2020 - 2120



5.07 Section One



5.08 Section Two



5.09 Section Three

Constructing Wilderness

This project positions the design as a catalyst for autonomous future developments. The project intends to permit geological, hydrological, and biological processes to operate unobstructed. Physical insertions into and extractions from the site provide a canvas onto which these processes will 'paint' the project. In order to enable the site to evolve and mature into a predominantly self-regulating, constructed wilderness, the designer is required to choreograph a gradual relaxation of maintenance procedures on site.

The designed interventions on the site are intended to render changing environmental conditions visible to its visitors. Weathering patterns on the surfaces of the constructions are a primary means through which these processes become visible. Likewise, seasonal and annual vegetation growth act as signifiers of time passed. As such, any maintenance on the built or planted components of the design will inherently alter the experience of the project.

As the proposed site maintenance schedule (figure 5.10) outlines, the project's success depends on a balance being struck in the site's maintenance strategies. The constructions must simultaneously remain safe for occupation and demonstrate the effects of weathering. In order to ensure safety, the constructions will require repairs, and eventually, replacement or removal. Purposeful maintenance of the site's vegetation strengthens specific relationships within the project. At its conception, the project relies on specific patterns of cuts in the vegetation to define the zones within it. Grasses and trees are cut in specific patterns to accentuate the earthworks throughout the project, most notably throughout the grassland and forest eco-zones. These patterns are intended to be maintained as the project matures, with the understanding that over time the earthworks will erode. Erosion will make careful maintenance

increasingly difficult as the project matures. Eroding earthworks will break through the clean boundaries between maintained and unmaintained zones, and compromise the precision of future maintenance procedures.

In order to properly address the unpredictability of the site's maturation, the maintenance procedures will become less strict as the project ages. While the site's transformation is not a clear, linear process, a loose timeline for the gradual relaxation of maintenance procedures will be implemented. In the strategy, maintenance of the constructions and the pathway system is reserved for operations to ensure structural stability and safety. There will be no removal of surface wear, discolouration, or any similar effects resulting from weathering processes. There is a similar 'hands off' policy for the vegetation around site. No maintenance of the forest's trees or undergrowth is permitted, aside from the preservation of the clearing extending from the base of the forest construction to the river. In the grassland, the grasses in the depressions are to be untouched after planting. In the interstitial zones of the grassland, the grasses are to be maintained weekly for the first five years. In the following ten years, the grasses are to be maintained bi-weekly. Throughout this time, it is anticipated that many of the edge conditions between the depressions and the surrounding ground will begin to soften. As this softening progresses, they will become inaccessible for mowing equipment, and will consequently be left untrimmed. Eventually, the entirety of the site will be left to grow unimpeded. Throughout this time, the grasses along the pathway system will be maintained by the continual passage of visitors. Grasses will grow sparingly on this well-trodden ground.

While the aforementioned maintenance schedule is intended to fully govern the development of the project, it must be noted that after completion of the project, the designer relinquishes control over the project. As such, the

design or maintenance procedures could be modified at any time. Due to the site's prime location in downtown Ottawa, and the corresponding value of the site's land, there will be economic pressures to develop the land. This could lead to a decision to maintain the site as it was initially constructed, preventing the site from displaying physical effects of hydrological, geological and ecological processes. It could also lead to the site being partially or completely developed as a commercial, residential, or mixed-use neighbourhood, eliminating some or all of the ecologies of the project. The site's future will depend on the governing body which oversees the site.

…

One hundred years into the future, the flats' transformation renders it unrecognizable. Vegetation has taken over, grasses and trees loom large on either side of the pathway system. Definition between eco-zones has eroded, as have the earthworks, with remnants of the ridges and cuts barely discernible beneath the grasses and waters which stretch across the site.

The constructions remain, but are in varying states of repair. The forest construction has been maintained, with the canopies replaced as required. The vision tunnel through the forest has been kept clear of trees, in order to maintain its function as a staging area for public gatherings.

In the grassland, the warming shelter remains operational as a popular café amongst visitors across the seasons. Soil settlement fills much of the depression around the building, further embedding it within the landscape. The construction sits within a sea of grasses rising to eye level with people following the pathway. Hidden amongst the grasses are a pair of hardscaped clearings maintained for public gatherings.

Rising water levels of the Ottawa River have extended into the wetland

and the canal. A century of unrestricted flow has carved into the banks and berms of the wetland, completely severing the eastern berm, temporarily dividing the site by cutting off access along its arterial pathway. Access has been restored with the introduction of a third wetland bridge, following the same design strategy as the original bridges. The waters of the wetlands have become a favourite spot for recreational kayaking and canoeing, and in the winter its ice plays host to thousands of skaters.

With the rising waters, the rock plains have gone completely underwater with increasing frequency. Rising and receding waters have carried sediment, depositing it in the cuts of the former road beds, gradually filling them in. Similarly, soils have spilled into the rock plains from the grasslands to the north. In concert with the southbound spread of grasses, the rock plains have been almost entirely overtaken.

Consistent water pressure and seasonal freeze-thaw cycles have begun to break down the concrete of the original submerged bridge, and the aforementioned rising water levels overtake the bridges walls with increasing frequency. A proposal has been made to replace the submerged bridge with the historical bridge which sits above it. This proposal has been met with strict opposition by users of the park who cite the original design intention for the submerged bridge to be used as a measuring device as a reason for maintaining its significance within the park. The proposal remains open, however is losing traction.

Grasses from the flats quickly crossed the wetland, and have come to dominate the southern shores of Nepean Bay. Amidst the grasses, trees have grown out of seeds carried in the wind or left behind from migratory birds which occupy the site during the summer months. Aside from maintenance along the

pathway, this area has remained free of human maintenance. This area has become a popular nesting ground for waterfowl and a variety of small mammals, such as mice and squirrels.

In areas of the flats untouched by the landscape design, the National Capital Commission has proceeded with its LeBreton redevelopment scheme. The vacant lots east of Booth Street have been filled with residential towers, and the lands along Albert Street are also predominantly residential, while incorporating commercial occupancies in the lower levels of the buildings. Proximity to the park and the magnificent views the park provides residents have made these towers a fixture amongst the most sought-after pieces of real estate in the region. The parcel furthest to the west houses a stadium, replacing its predecessor in suburban Kanata.

This development stands in contrast to the constructed wilderness which has overtaken the designed site. On one side, people congregate in a commercial hub, surrounded by buildings. On the other, people traverse a landscape of forests, grasses and waters. Over the course of a century, LeBreton Flats has been transformed from a barren landscape to one teeming with life. The flats have transformed into an integral component of the Ottawa River's ecosystem, providing habitat for various species of vegetation and wildlife. The project resists economic pressures promoting development to promote a symbiotic relationship between elements of wilderness and the city. In doing so, the project reinforces the continued importance of the Ottawa region's geological, hydrological, and biological processes in the creation and maintenance of a sustainable urban development.

YEAR	MAINTENANCE TASKS
1-5	1. Manually clear snow and ice from constructions as required. Do not use salt or sand. Pathways do not receive winter maintenance. 2. Perform maintenance check on entire pathway and all constructions in May. Complete any repairs necessary to ensure occupant safety. 3. Trim all grasses of the grassland that are not in the depressions on a weekly schedule, from May to October. 4. Trim grasses and brush in the forest clearing from the construction to the water's edge on a weekly schedule, from May to October. 5. Remove weeds from planted grasslands and forest to ensure proper growth of the young plants. 6. Trim trees at the edges of the clearing in the forest from the construction to water's edge annually, in November.
6-15	1. Manually clear snow and ice from constructions as required. Do not use salt or sand. Pathways do not receive winter maintenance. 2. Perform a controlled burn of the uncut areas of grassland in mid April, on a five year cycle. Burn only half of the grassland in the first year, and the following year, burn the other half, to protect species living in the grassland. 3. Perform maintenance check on entire pathway and all constructions in May. Complete any repairs necessary to ensure occupant safety. 4. Trim all grasses not in depressions on a bi-weekly schedule, from May to October. 5. Trim grasses and brush in the forest clearing from the construction to the water's edge on a weekly schedule, from May to October. 6. Trim trees at the edges of the clearing in the forest from the construction to water's edge annually, in November.
16-25	1. Manually clear snow and ice from constructions as required. Do not use salt or sand. Pathways do not receive winter maintenance. 2. Perform a controlled burn of the uncut areas of grassland in mid April, on a five year cycle. Burn only half of the grassland in the first year, and the following year, burn the other half, to protect species living in the grassland. 3. Perform maintenance check on entire pathway and all constructions in May. Complete any repairs necessary to ensure occupant safety. 4. Trim all grasses not in depressions on a monthly schedule, from May to October. 5. Trim grasses and brush in the forest clearing from the construction to the water's edge on a weekly schedule, from May to October. 6. Trim trees at the edges of the clearing in the forest from the construction to water's edge annually, in November.
26-XX	1. Manually clear snow and ice from constructions as required. Do not use salt or sand. Pathways do not receive winter maintenance. 2. Perform a controlled burn of the grassland in mid April, on a five year cycle. Burn only half of the grassland in the first year, and the following year, burn the other half, to protect species living in the grassland. 3. Perform maintenance check on entire pathway and all constructions in May. Complete any repairs necessary to ensure occupant safety. 4. Trim grasses and brush in the forest clearing from the construction to the water's edge on a weekly schedule, from May to October. 5. Trim trees at the edges of the clearing in the forest from the construction to water's edge annually, in November.

5.10 Maintenance Schedule Part One

YEAR	UNDER NO CIRCUMSTANCES WILL THE FOLLOWING PROCEDURES OCCUR
ALL	1. Clearing of underbrush or removal of dead or dying vegetation, other than in exceptionally dangerous circumstances. This includes pruning or shaping of trees or bushes. 2. Maintenance of any erosion of earthworks or shorelines. 3. Application of paint to mask the effects of weathering or staining on any of the constructions. 4. Application of any fertilizer, pesticides, fungicides or herbicides in any capacity. 5. Watering of any vegetation.

5.11 Maintenance Schedule Part Two

CONCLUSION

Reflections

The thesis began with research into the idea of a fluid boundary, and an exploration into the problematic nature of defining specific zones and systems of control for water. Despite this, each of the constructions proposed is permanent rather than ephemeral, and solid rather than dynamic. The constructions sit in paradox, simultaneously as a means for examining the ephemeral, and testaments to a desire towards permanence. The constructions defiantly obstruct and orchestrate the flows in which they are situated, becoming exterior instruments of measurement rather than integrated elements within the processes they aspire to privilege.

In the work, LeBreton Flats is understood as a landscape defined by erasure, however one might argue that it is defined equally by resilience. Erasures have necessitated resilience both in the landscape and in the culture of the site's occupants. The drawings and studies analyze the site's topography, geology and built structures, and the manipulations they have been subject to throughout the past two centuries. While the thesis strives to understand the processes of change and the repercussions of trauma on the site, it acknowledges but does not directly address the cultural implications of the erasures. LeBreton Flats is a landscape fraught with political, social and economic conflict which has yet to be resolved. This thesis neither attempts to resolve these issues, nor does it directly reference them in the proposed design. The interventions address the erasure of the built environments which belonged to the settler communities who previously resided on the flats. This is a result of the desire to challenge the notions of the map and the line as absolute; the elements which are brought back to the site were once drawn with a definitive stroke, and have since been eradicated in physical form.

Furthermore, the scope of the thesis is limited to the period after European arrival in the capital region. The design draws upon only western colonial footprints, and seeks to understand and improve western colonial interactions with the landscape. The people who inhabited the region prior to settlement inhabited a landscape Phil Jenkins suggested was boundless, a notion that had significant implications on the way in which the design was considered. The attempts to erase lines and blur boundaries within the project draw upon this idea, however in no way does the design suggest that this is a sufficient means for restoring a political, cultural or ecological environment which was lost upon the arrival of settlers.

The design of the project does not directly address the site's current brownfield status. While research into various processes of remediation was conducted, the thesis elected to focus on the utilization of physical operations independent of remediation. The thesis leaves the door open for measures to be taken towards remediation on the site. Many of these measures could be integrated directly into the processes and design decisions that are currently being proposed for the project, whether through modifications of the earth or through planting processes. The project does not suggest itself as a permanent fix, but rather as one imagination of restored ecologies and new possibilities for LeBreton Flats.

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