

THE PLURALITY OF URBAN WATER

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Reconnecting people to underutilized post-industrial spaces through a system of green spaces

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To my mother, nana, uncle,
(Judy, Nellie Ann, and Nick)

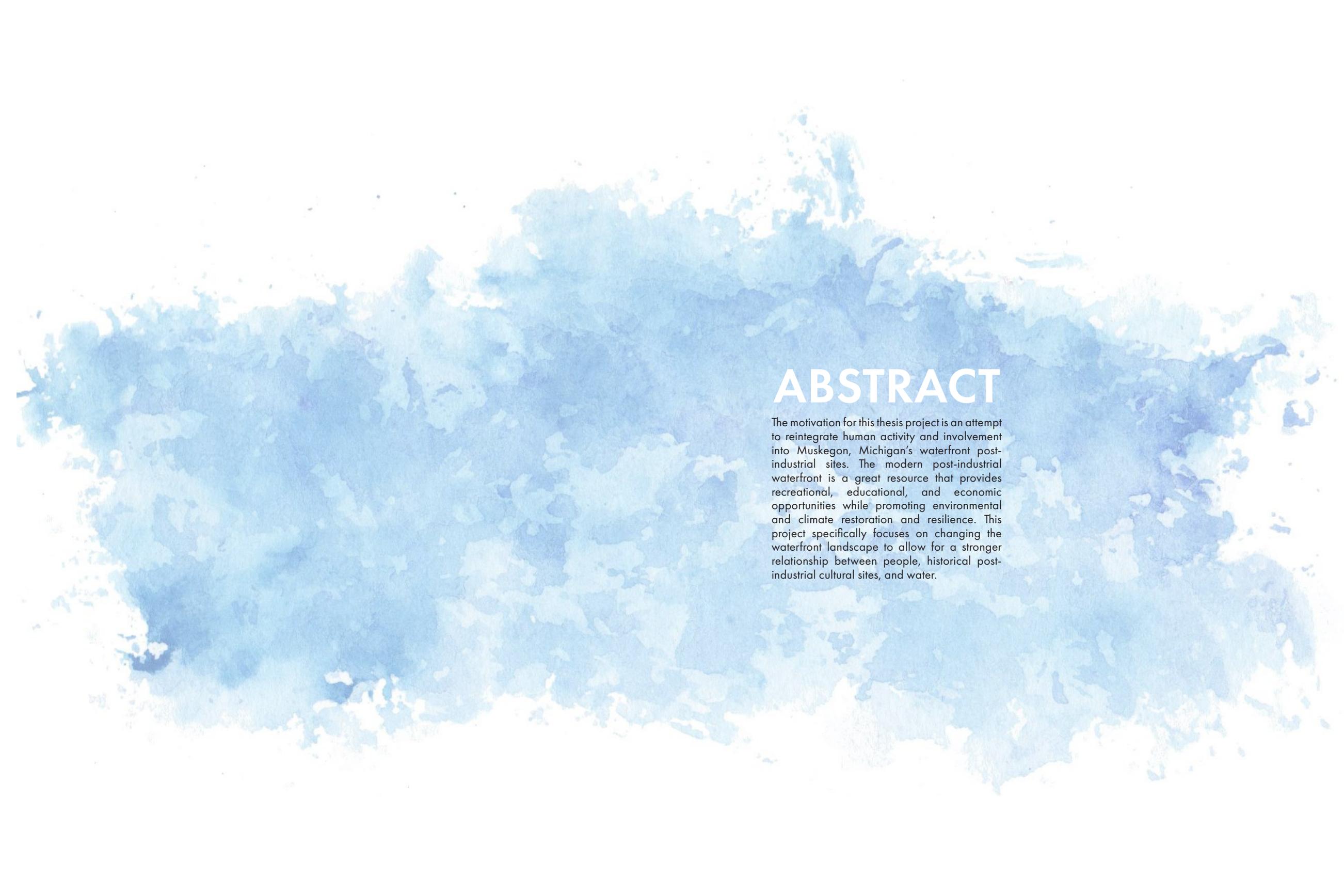
late-father and late-step-father,
(Brian and Randy)

and friends,
(Alison, Hannah, Kallan, and Sarah)

thank you for your unequivocal love and support.

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ABSTRACT

The motivation for this thesis project is an attempt to reintegrate human activity and involvement into Muskegon, Michigan's waterfront post-industrial sites. The modern post-industrial waterfront is a great resource that provides recreational, educational, and economic opportunities while promoting environmental and climate restoration and resilience. This project specifically focuses on changing the waterfront landscape to allow for a stronger relationship between people, historical post-industrial cultural sites, and water.

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PREFACE

00

THESIS STATEMENT

Similar to many post-industrial waterfront cities, Muskegon, Michigan's inhabitants have been segregated from their waterfront to make way for industrial activities; in Muskegon's case—shipping, paper production, coal refining, marine storage, and petroleum processing activities. This thesis project aims to reconnect people to Muskegon Lake through a system of green spaces, publicly accessible areas, and an enhanced regional-circulation system.

Two post-industrial sites have been chosen for their rich history of economic development of the area, as well as being a physical landmark for the residents of Muskegon. The B.C. Cobb Plant was once a prominent producer of electricity for the city—burning coal for energy. Monolithic buildings, engineered land, and a 650-foot-tall smokestack littered the Cobb Plant site, which defined the area. Before its razing, the Amoco Tank Farm site held seven oil storage tanks that claimed the waterfront land. Using these two now-vacant sites can establish publicly accessible amenities for year-round activities.

The motivation for this thesis project is an attempt to reintegrate human activity and involvement into Muskegon, Michigan's waterfront post-industrial sites. Historically, industrial waterfront areas shut off public access to allow for industrial operations to occur. The modern post-industrial waterfront is a great resource that provides recreational, educational, and economic opportunities while promoting environmental and climate restoration and resilience. This project specifically focuses on changing the waterfront landscape to allow for a stronger relationship between people, communities, historic post-industrial cultural sites, and water.

The Amoco Tank Farm represents its residential and waterfront context as a public park with public amenities. The proposed plan has a public swimming beach, play areas, observation areas, pathways, and a celebration of the seven oil storage tank footprints and ecological habitats. The more significant site, The B.C. Cobb Plant site, displays a series of programmable terrains that resemble and represent the former coal mounds and fields that once shifted the site's landscape. Multiple land regeneration aspects are currently underway on this site to remediate the negative impacts of the former coal-burning facility. The coal-ash ponds will be fortified into a new aquaculture fishery to spawn local fishes to repopulate Muskegon Lake—assisting with delisting Muskegon Lake as an EPA Area of Concern (AOC).

Each site follows a set of design guidelines to allow for adequate access to the site and the water, healthy and nourishing environments that will have positive impacts on the visitors and the environment, and allow for the history of the post-industrial site to be represented through design and remediation.

KEY THEMES

**Accessibility**

Accessibility, or inaccessibility, refers to the physical issues relating to a person being able to access the site or the water. Multiple barriers confront the accessibility of people to water and site—poor landscaping and physical presence of buildings and industrial rubbish.

**Connectivity**

Connectivity differs from accessibility through terms of subjectivity. A body of water or site may be accessible to many, but some may hold a sense of disconnectivity to the object. Creating places, not spaces, that people can engage with or feel a sense of belonging, attachment, or nostalgia remediates the mental and emotional feelings of disconnectivity.

**Education**

Utilizing educational aspects such as outdoor learning environments, teaching and learning pods throughout the site, engaging and experimental programming, and historical signifiers around the site can inform visitors of the post-industrial site's past and future.

**Memory/History**

When proposing design strategies for post-industrial sites, it is essential to introduce agents to signify its history through architectonic elements and landscaping strategies. These strategies unveil the site's presence in its context and also assists in connecting people to the newly-designed area.

**Placemaking/Wayfinding**

Muskegon's post-industrial sites and the pathways that connect them—the Muskegon Lakeshore Trail and the abandoned railroad—lack a sense of place. Segments of the lakeshore trail are missing, damaged, or disconnected. Users do not experience a comprehensive pathway and often become confused about where the trail starts or ends. The post-industrial locations are inaccessible, poorly maintained, and dangerous. They are devoid of any possible engagement with its surrounding residents or visitors—changes in materiality, proper signage, and placemaking are solutions in creating an inclusive environment for all people.

**Shifting Landscapes**

Shifts in the natural landscape are inevitable. Factors such as climate change, water currents, biodiversity, and human intervention mechanically and naturally adjust the landscape—the landscape is resilient and adaptable. Designing post-industrial sites with this in mind will allow for adjustments over time, whether they be a shift in program, advanced climate change, and rising water levels, or pits and peaks in its context's population.

INTRODUCTION & CONTEXT

01



AUTHOR'S NOTE

For me, this thesis project is more than a task, a deadline, or a bulleted item on my to-do list; it is an objective and goal that was, seemingly, years in the making. Fortunately, throughout my childhood and adolescence, I was always within a few miles from the shores of Lake Michigan and Muskegon Lake. Growing up near the water lent me an immense opportunity to take solace and to find happiness in a swim in the Big Lake, a scenic car ride, or a hike in the dunes.

Like many of my cohorts, I have always had an intrinsic feeling to understand and study architecture. It started with building things from Lincoln Logs and Legos in our family's living room, drawing ships and houses in my Nana's study, to trying to navigate through the college application process (and not comprehending what I was doing). The University of Detroit Mercy School of Architecture taught me design, architecture, urban design, landscape design, and place-making, but most importantly, it taught me how to design for and with people.

After years of giving me hope, faith, solace, and happiness, I am empowered to give back to Muskegon and Muskegon Lake. This thesis project researched the Muskegon Lake area, its history, its issues, its opportunities, and its people to provide an exceptional design proposal for the reuse and revitalization of Muskegon Lake's waterfront. With these design strategies and possibilities, Muskegon's residents and visitors will finally be allowed to occupy and enjoy the lake's post-industrial waterfront, which is ideal for picnics, adventuring, learning, sightseeing, and sunset-watching.

THE GREAT LAKES WATERSHED

The unparalleled, natural beauty of the Great Lakes inspires a sense of wonder and possibility. They are one of the world's most significant water resources and the most extensive freshwater system on Earth. The Great Lakes—Superior, Michigan, Huron, Erie, and Ontario—represent thousands of years of history and continue to play an important role in the physical and cultural heritage of North America. They are critical to the social and economic vitality of the entire North American continent.¹

²Great Lakes Surface Area: 94,250 sq. mi.

³Total Watershed Surface Area: 201,480 sq. mi.

⁴Population: 40,000,000 (10% of the US's population and 30% of Canada's population)

⁵Agricultural: Nearly 25% of Canadian agricultural production and 7% of American farm production

⁶Water: The Great Lakes contain 20% of the surface freshwater in the world and 90% of the freshwater in the United States



FIGURE 1.1 – the Great Lakes Watershed.



012



013

THE LAKE MICHIGAN WATERSHED

⁷Lake Michigan Surface Area: 22,400 sq. mi.

⁸Total Watershed Surface Area: 45,600 sq. mi.

⁹Population: 12,052,800 (All U.S.)

¹⁰Shoreline: 1,640 mi.

¹¹Water: Lake Michigan is the third largest Great Lake by surface area and the sixth largest freshwater lake in the world.

(Left): FIGURE 1.2 – the Lake Michigan Watershed. (Right): FIGURE 1.3 – a 1901 campaign to illustrate that the Muskegon, Milwaukee, and Chicago commercial district - which was once the greatest commercial district in inland America.

THE MUSKEGON LAKE BASIN & MUSKEGON RIVER WATERSHED

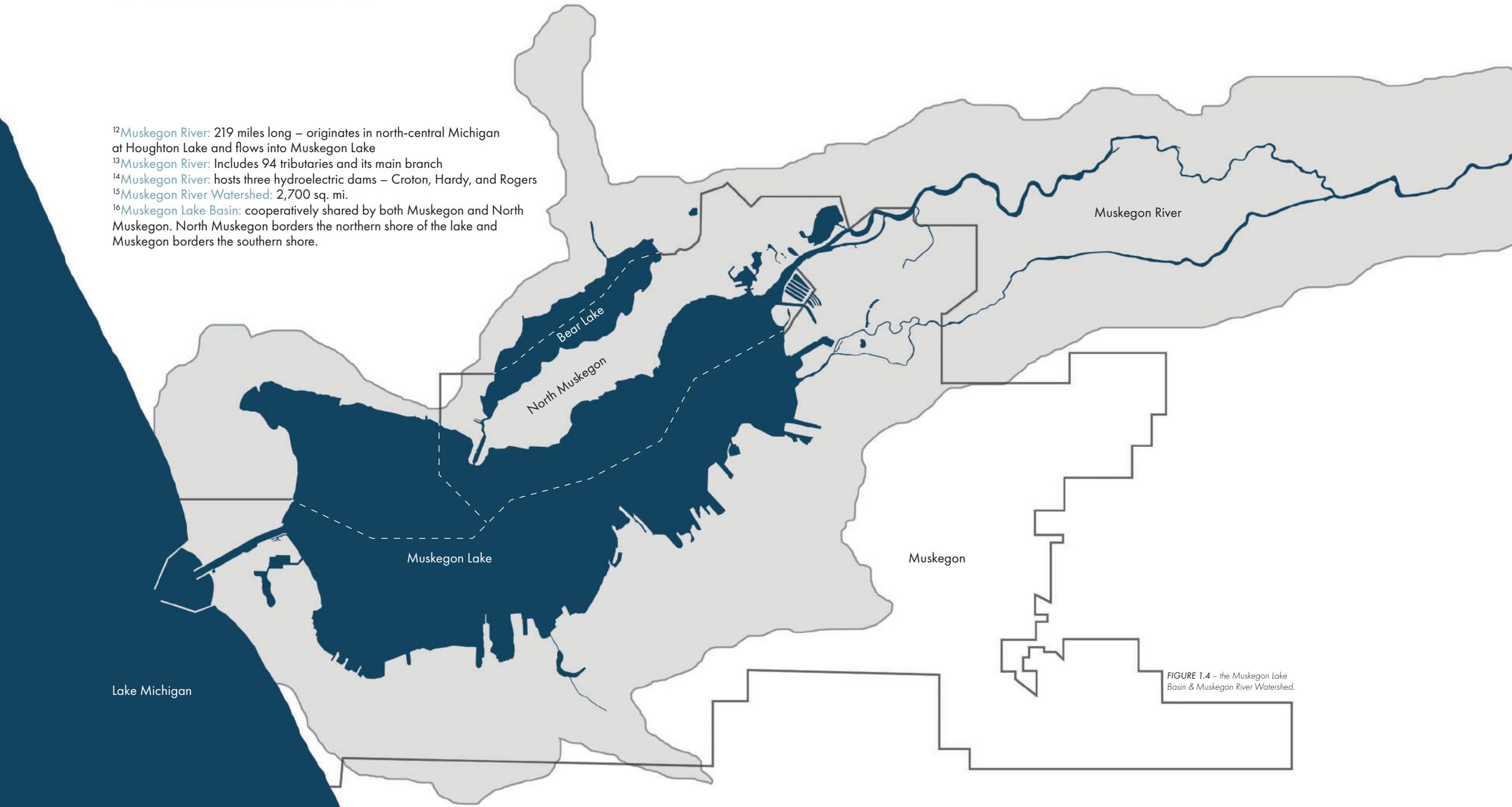
¹²Muskegon River: 219 miles long – originates in north-central Michigan at Houghton Lake and flows into Muskegon Lake

¹³Muskegon River: Includes 94 tributaries and its main branch

¹⁴Muskegon River: hosts three hydroelectric dams – Croton, Hardy, and Rogers

¹⁵Muskegon River Watershed: 2,700 sq. mi.

¹⁶Muskegon Lake Basin: cooperatively shared by both Muskegon and North Muskegon. North Muskegon borders the northern shore of the lake and Muskegon borders the southern shore.



Lake Michigan

Muskegon River

Bear Lake
North Muskegon

Muskegon Lake

Muskegon

FIGURE 1.4 – the Muskegon Lake Basin & Muskegon River Watershed.

MUSKEGON

02



A HIDDEN JEWEL

A prosperous Native American settlement, a prominent resources hub that helped rebuild Chicago, an epicenter of robust shipping and manufacturing, a vacation destination to some, and home to many. Muskegon, Michigan, has withstood tremendous paradigm shifts: declines in population, industrialism, and economies, increases in housing and tourism, and rapid climate change.

Muskegon is well-known for its recreational opportunities. Aside from its proximity to the world's fifth-largest body of water, Lake Michigan, Muskegon is home to Michigan's Adventure—the largest amusement park in Michigan. Muskegon also hosts a renowned Olympic training site for downhill luge. Moreso, Muskegon is attractive for many because of Muskegon Lake. Muskegon Lake is the deepest and largest outflow lake for Lake Michigan—it hosts multiple sailboat regattas and professional and recreational fishing tournaments. The logging and the modern-industrial boom would not have happened if it was not for Muskegon Lake. The 80-foot depth of the lake lent itself the opportunity for large ships to travel closer into Muskegon's shores.¹ Its proximity to Milwaukee, Wisconsin (80 miles), and Chicago, Illinois (110 miles) assisted gaining large importing and exporting partnerships, as well.

It would be difficult to find a newcomer in Muskegon. Many of her residents have deep roots in the area, sprawling multiple generations—a city of 40,000 people; it is hard to find a stranger. Many people's grandparents worked at the same factory, lived only a few blocks away, went to the same church, or had adjacent spots at the beach or the local diner. On any given day, one could find Muskegon's residents seeking refuge in the dense forests of Muskegon State Park, the dunes of Pigeon Hill, the Pere Marquette Beach, on their sailboat in the middle of the lake, or wandering the streets of Downtown Muskegon trying to find a parking spot or a cold beer.

Muskegonites are receptive and responsive to change and progression but wary of motionlessness—rustbelt-bootstrap-puller-uppers, summer-loving, winter-hibernating people who take pride in their lawn care, weekly winter car washes, family, and lake. However, the progression and development of Muskegon's infrastructure and the power and strength of Muskegon's people did not spawn during World War eras; it spawned from decades and centuries of communities immigrating, contributing, hunting, gathering, building, and developing modern-day Muskegon.

(Left, from top to bottom): FIGURE 2.1 – a postcard from 1930-1945 illustrating bathers at Lake Michigan's Pere Marquette Park, Muskegon, Michigan; FIGURE 2.2 – a postcard from 1930-1945 illustrating West Western Avenue, Downtown Muskegon, Michigan.



(From top to bottom): **FIGURE 2.3** – an artistic depiction of prehistoric nomadic people foraging mammoth bones; **FIGURE 2.4** – a village of Shoshone Indians after a gruesome battle in 1908; **FIGURE 2.5** – the exterior of the Shuniah Hotel and Trading Post, located in Pottsville, taken from the Ferry landing on Porcupine Lake, 1910; **FIGURE 2.6** – men loading precut lumber onto a ship on Muskegon Lake during the late 1800s.

SETTLEMENT & DEVELOPMENT

GLACIATION RETREAT

The human occupation and development of Muskegon can be traced to 6,000 B.C. when nomadic peoples concentrated into areas after the retreat of the glaciers.² The melting of the glaciers was a lengthy migration of the frozen, superimposed environment, but it rearranged the landscape to make way for the Great Lakes. The Great Lakes became a beacon for wayfinding and placemaking for nomadic peoples, Native Americans, and later, European colonialists. Only 2,000 years ago, the Native Americans that began civilization in the Muskegon area composed of various bands of the Ottawa and Pottawatomi tribes.³

NATIVE AMERICAN SETTLEMENT

The name of the county and city, Muskegon, comes from the Ojibwa language of the Ottawa Indians. Muskegon or Masquigon translates to a “marshy river or swamp.”⁴ When European settlers migrated through West Michigan, they diligently mapped the landscapes and waterways. Some established fur trading posts along the Muskegon River, Muskegon Lake, and Lake Michigan. In the mid-1800s, Frenchmen subdivided land and properties, formalizing the settlement of Muskegon and its surrounding areas. The physical settlement and development of Muskegon ran parallel with the growth of the lumber industry.

THE FUR TRADE AND COLONIZATION

For a century and a half, Michigan’s life centered in the fur trade industry. To expand the fur trade into the western Great Lakes, the French made alliances with Indian nations, whose members had the skills to hunt and trap at a commercial level.⁵ With transportation from the water and land, hubs of commercial activity were created along coastlines of lakes and rivers to create markets for the selling of furs. Through the popular trading routes from Sault Ste. Marie, Mackinac, Detroit, and the Grand River Valleys, the French appropriated land and parceled it off for trading and residential use. They also brought the rational designs of city planning to the New World. Contrary to organic city form, the French bought and seized land and gridded it off into specific townships, which then was governed by individuals and groups of people. This colonization drove Native American tribes to emigrate West.⁶

THE LUMBER INDUSTRY

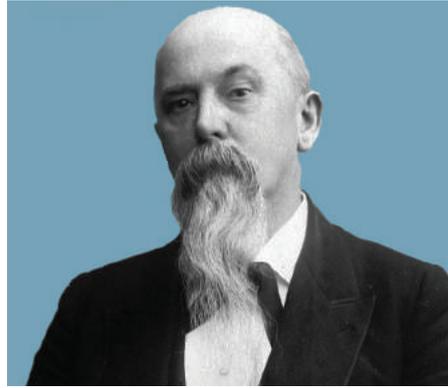
Once coined the “Lumber Queen of the World,” Muskegon’s success in industrialism came from its ideal location, plentiful resources, and imaginative lumber-barons. The Muskegon River originates at Houghton Lake in northern Michigan and flows 216 miles to Muskegon Lake. At the time of European settlement, northern-to-mid Michigan was lush with coniferous forests that were populous with pines, firs, and spruces, as well as deciduous forests that were rich with maples, elms, and oaks.⁷ These species of trees were particularly appealing to lumber barons because of their proximity to the Muskegon River – which was the passageway to Muskegon Lake and the rest of the world. Lumbermen from New England flocked to Muskegon in hopes of claiming their spot on the Muskegon shoreline; and that they did: in the mid-to-late-1800s, there were nearly 50 sawmills along the perimeter of Muskegon Lake and dozens more surrounding nearby lakes.⁸

Although the period of prosperity lasted for a half-century, a handful of lumber barons became quite wealthy. Local lumber barons had the opportunity to buy land for as little as \$1.25 per acre,⁹

allowing even the modest businessman to get a substantial return on a small investment. Some of the most successful lumber barons of Michigan included: Charles Mears, Martin Ryerson, Lyman Mason, Charles Hills, George Ruddiman, and Charles H. Hackley.¹⁰ Charles H. Hackley, the most successful entrepreneur—in terms of monetary gains—left a lasting impression on Muskegon. Hackley moved one-third of his fortune to the city of Muskegon; his name appears on the city’s hospital, a school, park, museum, the city library, and roadways.

THE FOSSIL-FUEL INDUSTRY

The late nineteenth-century brought an economic downturn in the Muskegon area; the lumber industry was declining, and local investors began brainstorming ways to reinvent Muskegon. The advancement in shipping transportation technology eventually delivered a diverse industry sector. In the early 1900s, Muskegon was a prominent producer of machinery, plastics, paper, and energy.¹¹ This production of resources required an influx of energy sources such as coal, oil, petroleum, and natural gas. These fuels, particularly coal, brought manufacturing, shipping, and skilled-trade jobs to Muskegon and allowed for the electricity grid to expand and power more businesses and homes. However, with the prosperity of employment and energy came pollution, disease, and death. For almost 70 years, the B.C. Cobb Generating



Plant, a facility located at the mouth of the Muskegon River on the northeastern shore of Muskegon Lake, was one of the most powerful, profitable, and polluting coal-to-energy plants in the State of Michigan. At its peak, the B.C. Cobb Generating Plant operated by 200 employees. According to a report conducted by a federal climate change and epidemiological organization – the Clean Air Task Force – an annual 34 deaths, 55 heart attacks, 580 asthma attacks, and 21 cases of chronic bronchitis were linked to the distribution of fine particle pollution produced by the B.C. Cobb Generating Plant burning coal for energy.¹² These incidences inevitably led to the decommissioning of the plant in 2016, similarly to the dozens of coal-burning power plants across the United States. Consumers Energy has closed multiple coal-to-energy plants throughout Michigan and is committed to introducing and implementing sustainability in their present and future energy practices. While the Cobb Plant site is one of the largest, now vacant, industrial areas on Muskegon Lake, there are nearly a dozen industrial areas interlaced long the lake – some are active, and some are inactive.



RESTORATION AND REMEDIATION

Muskegon Lake was designated an Area of Concern (AOC) in 1987 due to ecological problems caused by shoreline development and hardening, historic sawmill debris, and foundry sand filling open water and coastal wetlands, and localized groundwater contamination moving toward the lake and its tributaries.¹³ Muskegon Lake is now seeing the community benefits from restoration and remediation being conducted in the AOC. Recreational use of Muskegon River and Muskegon Lake by residents and visitors has increased, tourism is up, and property values have grown. Communities and organizations identified eleven management actions to delist Muskegon Lake as an AOC. These actions include sediment remediation projects aimed at restoring critical habitats, such as wetlands, necessary for local fish and wildlife populations.



(Left, from top to bottom): FIGURE 2.7 – a portrait of Muskegon’s most popular and influential lumber-baron, Charles H. Hackley, in 1850; FIGURE 2.8 – flattened coal fields at the B.C. Cobb Plant, just weeks after its decommissioning in 2016. (Right, from top to bottom): FIGURE 2.9 – a person shoveling snow in the 1980s near Tank 4 at the Amoco Tank Farm; FIGURE 2.10 – remediation efforts underway at the Zephyr Oil Refinery in 2018.

THE WORKING SHORELINE

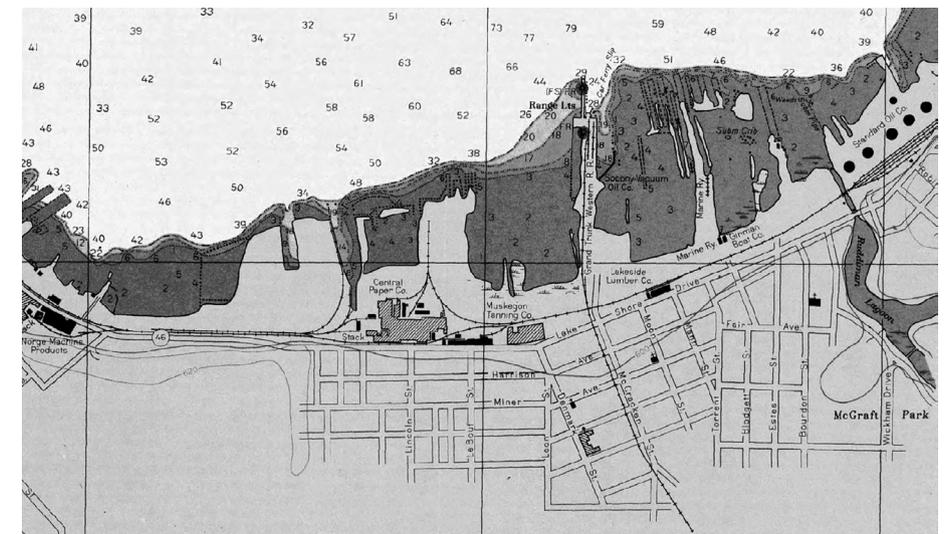
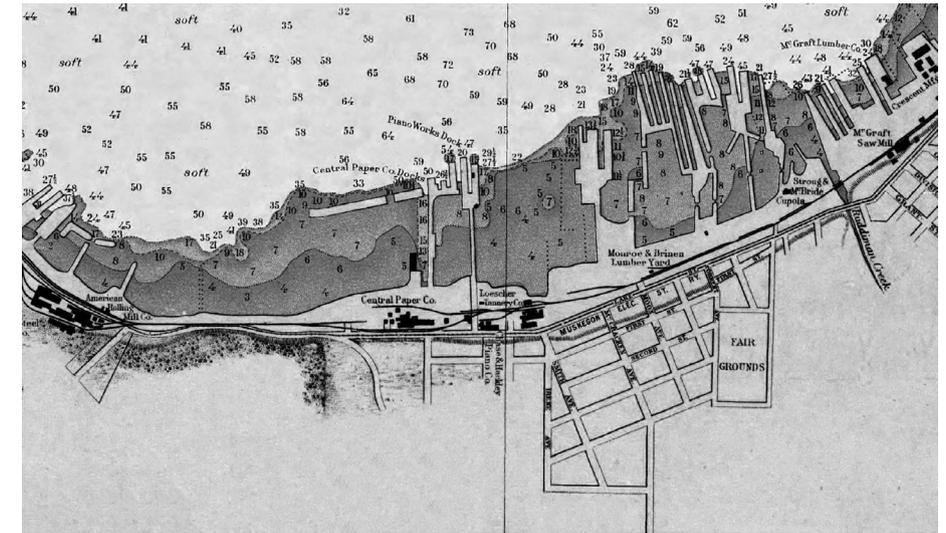
As mother nature has the power and ability to alter her landscape via erosion, storms, flooding, and biodiversity; humans also possess these skills, but more so with mechanics and engineering. The natural shoreline of Muskegon Lake is unrecognizable from its state one-hundred years ago. Yes, human engagement and naturally occurring modifications operate parallelly, but also combat one another. Individually, the shoreline of Muskegon Lake would still be unrecognizable due to natural weather patterns and evolution. However, humans have played an antagonist role in the shape and severity of our natural landscape, and climate-overpopulation, technology, and industrialization have set hazardous conditions for ourselves and the world in which we live.

Throughout the last few centuries, the municipality of Muskegon has endured multiple paradigm shifts, and her lake and shoreline are no different. Before Muskegon's lumber boom in the mid-1800s, the shoreline comprised of marshes, swamps, and wetlands; hence "Muskegon" deriving from the Ottawa Indian tribe term "Masquigon," meaning "marshy river or swamp."¹⁴ When European settlers discerned Muskegon's lake and inflow river as an agent for appropriating economies, the shoreline, and city of Muskegon overall, drastically transformed.

At the apex of the lumber boom, there were over fifty lumbermills along the perimeter of Muskegon Lake.¹⁵ This uprising of industry led to hundreds of feet of shipping docks protruding into the lake to surpass shallow waters. Accompanying these shipping docks were retention areas for freshly-cut trees to buoy on the surface of Muskegon Lake—awaiting transportation to a mill to become lumber (see FIGURE 2.13). The differentiation from land to water became convoluted—the buoying logs acted as an extension of the land. In terms of population, development, industry, and economies, the late-nineteenth-century brought immense successes to Muskegon.¹⁶ However, it also induced a definite sense of ever-lasting industrialism and irresponsibility toward the natural landscape.

Through advancements in modern technology and shipping in the early to mid-1900s, Muskegon, once again excelled as a beacon of prosperity, employment, and power. Oil-processing, coal-burning, paper-making, marine-storing, and furniture-manufacturing industries took the lumbermills' place along the southern perimeter of Muskegon Lake. Continuous dredging to control and alter Muskegon Lakes' submarine environment was endless. 1,000-foot-long ships would enter Muskegon Lake from Lake Michigan to import and export coal to burn for electricity, oil and petroleum for local operations, aggregate for construction and roads, and salt for winter roads.¹⁷ The shoreline of Muskegon Lake continuously extended to serve for larger ships with more substantial drafts to dock, while simultaneously creating more usable land along the coast of the lake—utilized solely by industry.

[Right, from top to bottom]: FIGURE 2.11 – the Muskegon Harbor Nautical Chart from 1902 illustrates the Central Paper Company being developed between the railroad and shore of Muskegon Lake; FIGURE 2.12 – the Muskegon Harbor Nautical Chart from 1947 showing channels that were alternately excavated and filled across the site to facilitate shipping and other uses. (Next page): FIGURE 2.13 – artists rendition of the bird's eye view of the city of Muskegon, Michigan in 1868.





CHURCHES.

1. Methodist
2. Catholic
3. Congregational
4. Universalist
5. Dutch Reform.
6. Norwegian
7. Cemetery

HOTELS

8. National House.
9. American House
10. Occidental
11. Forest City House
12. Washington House
13. Farmers Hotel.
14. Masonic Hall
15. Opera House

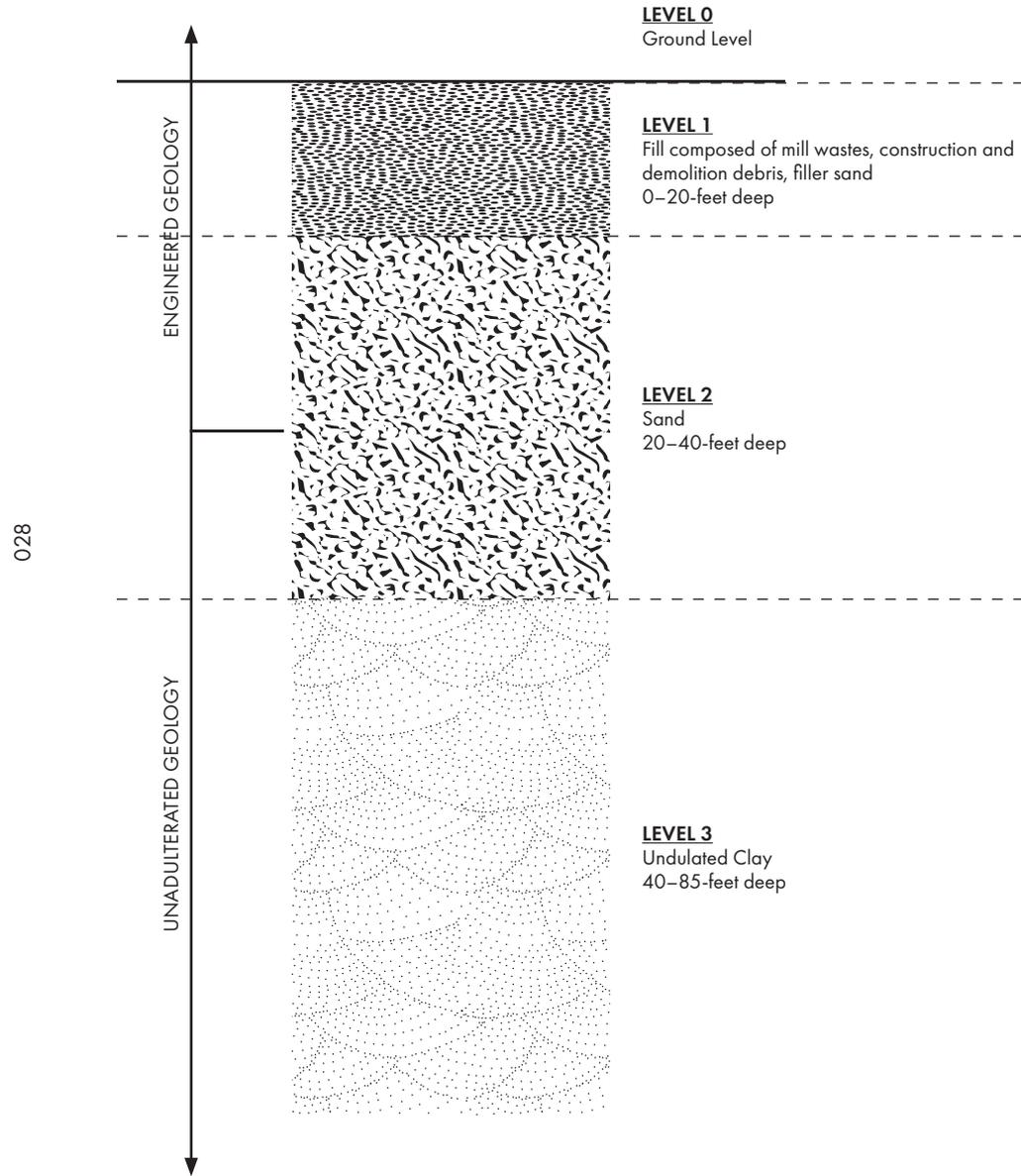
BIRD'S EYE VIEW OF THE CITY
OF
MUSKEGON
MUSKEGON CO. MICHIGAN 1868.

SAW MILLS.

17. Arms Mill
18. Wilson & Beece
19. C. Davis & Co
20. Ryerson, Hills & Co
21. Marsh & Posa.
22. L. G. Mason & Co
23. Wm. H. Bigelow & Co
24. Geo. R. Roberts & Co
25. Truscadd & Orton.

SAW MILLS.

26. Backley & Sons
27. J. H. Badler
28. Barkley & Mc Gordon
29. White & Swan
30. Wm. Otue & Co
31. O. P. Pillsbury & Co
32. Rogers Foundry
33. Davis Foundry



THE EVOLUTION OF INDUSTRIAL GEOLOGY

Sitting on 120-acres with almost one-mile of shoreline, the Sappi Paper Plant was one of the most extensive industrial facilities on Muskegon Lake. For almost 110 years, it generated paper pulp and paper, which was distributed across the world.¹⁸ At its peak, Sappi employed nearly 1,200 people with good-paying, union jobs.¹⁹ Throughout its expansion, it modified the landscape to allow for feasible and buildable land, resulting in adverse environmental impacts. A multitude of waste, industrial and older-sawmill debris, and coarse aggregates had been laid into Muskegon Lake to the accretion of land.²⁰

Conceptually, the geology of the former Sappi Plant is a tripartite system—the base of which is the undulated surface of a thick clay unit forty feet below the ground's surface. Atop the clay is a sand unit of about twenty feet in depth. The most surface-level layer is a wedge-shaped unit of fill composed of mill wastes, construction and demolition debris, and filler sand.²¹ In this tripartite system, the base unit is mostly unadulterated, while the second layer and topmost layer are entirely engineered through years of human and mechanic intervention.

The following aerial images display a dramatic shifting of the landscape for the Sappi Plant site over eighty years.

FIGURE 2.14 – an aerial image of the former Sappi Paper Plant in 1938 showing toxic waste blooming into Muskegon Lake.



FIGURE 2.15 – an aerial image of the former Sappi Paper Plant in 1950 projecting the industrial debris into the lake to create more buildable land.



FIGURE 2.16 – an aerial image of the former Sappi Paper Plant in 1955 displaying Muskegon Lake being further polluted by waste.



FIGURE 2.17 – an aerial image of the former Sappi Paper Plant in 1974 showing the completion of the new land configuration.

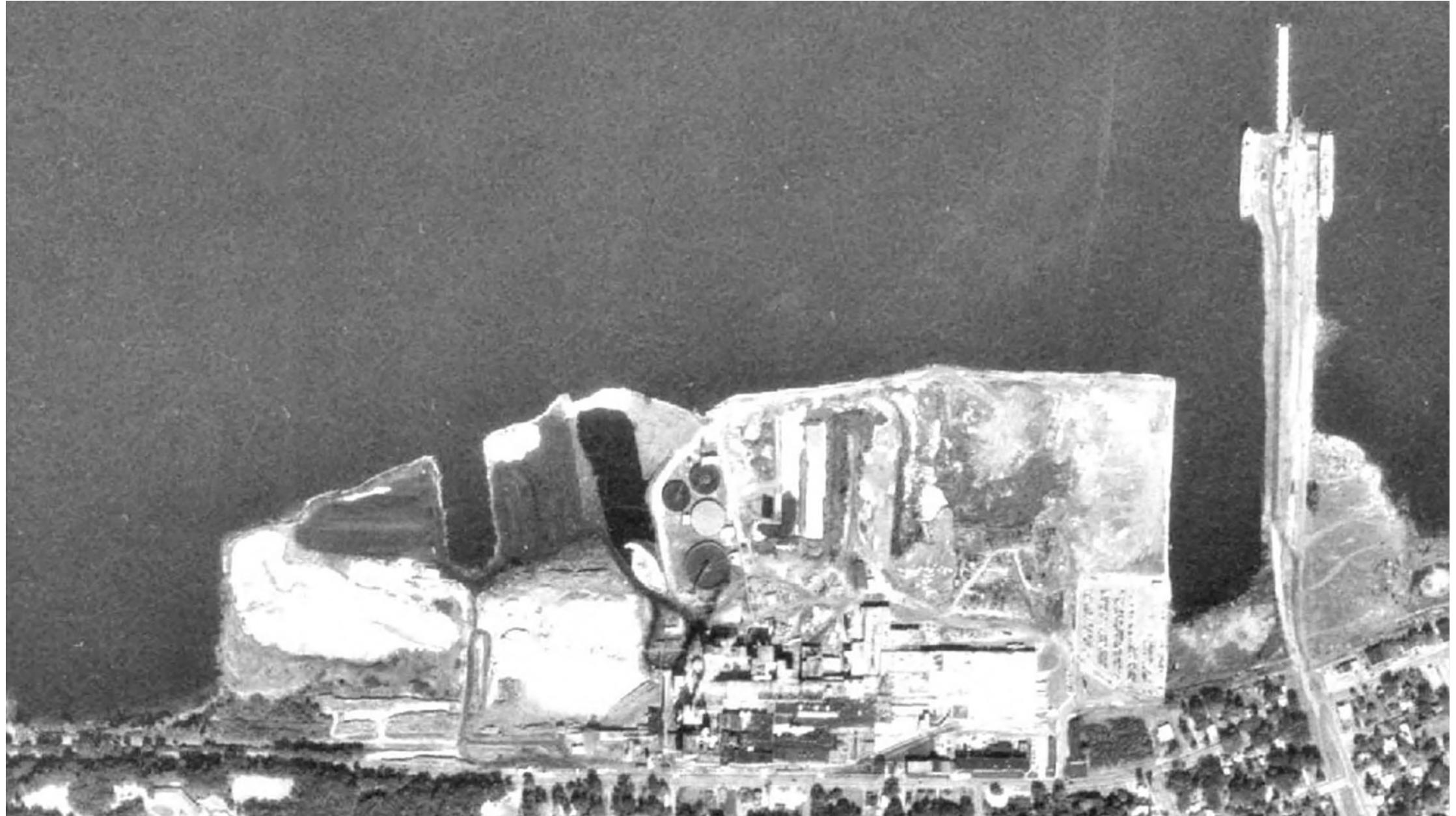


FIGURE 2.18 – an aerial image of the former Sappi Paper Plant in 2009—only a few years before its decommissioning.

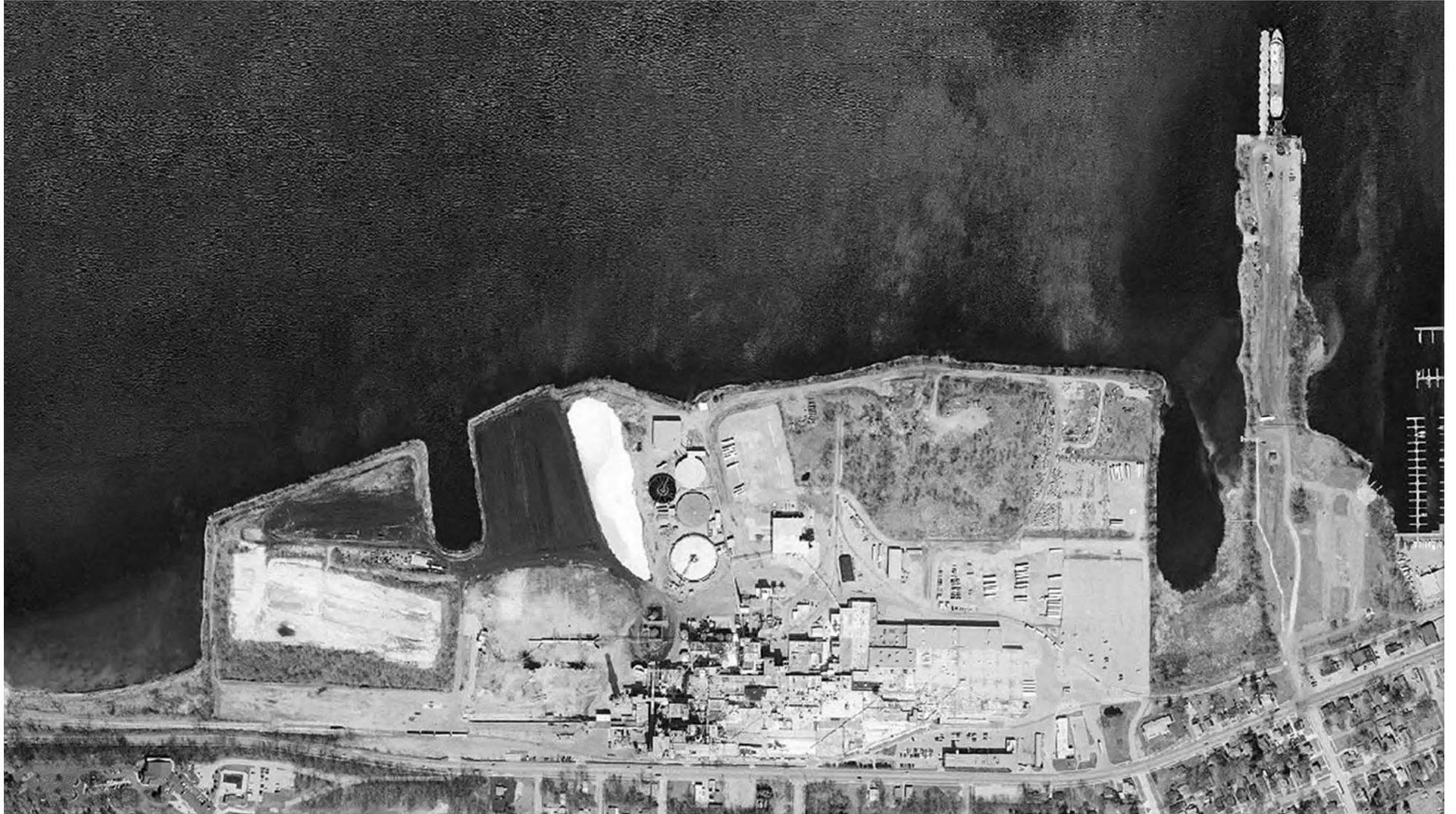


FIGURE 2.19 – an aerial image of the former Sappi Paper Plant in 2018—cleared of all industrialism and waiting for further development.



040

041



FIGURE 2.20

AREA OF CONCERN

Because of the horrendous ecological issues caused by historical industrial discharges of toxins and pollutants into Muskegon Lake, drastic shoreline hardening and industrial shoreline development, old sawmill debris and toxic foundry fill to extend the land into the lake, and contaminated groundwater that has percolated into the lake and its tributaries,²² Muskegon Lake was designated an Area of Concern (AOC) in 1986.

Years of industrial activity and careless environmental behavior resulted in “sediment contaminated with petroleum hydrocarbons, oil, mercury, lead, other heavy metals; excessive fill and loss of natural shorelines along Muskegon Lake and large-scale impacts to critical wetlands; high levels of nutrients, solids, and toxins entering the lake; and degradation of water quality.”²³ Community and environmental organizations, scientists, ecologists, designers, and average Muskegonites have banded together to strengthen Muskegon Lake and free it from being a designated Area of Concern. Recreational use of the rivers and Muskegon Lake by residents and visitors has increased, tourism is up, and property values have grown.²⁴

“A good sign cleanup and restoration work [are] succeeding is the removal of beneficial use impairments. Beneficial Use Impairments (BUI) are designations given by the International Joint Commission representing different types of significant environmental degradation. As cleanup work is completed, and monitoring demonstrates sufficient environmental health improvements, BUIs can gradually be removed.”²⁵ Due to the proactiveness of Muskegon’s community, four BUIs have been eliminated from the list in the last decade. Once all the items are removed from the list, delisting of Muskegon Lake as an AOC can proceed. Through urban and landscape design, this thesis project aims to assist in removing the five remaining Beneficial Use Impairments, in efforts to lift Muskegon Lake from the EPA’s list of Areas of Concern. The list of total BUIs are listed below—the BUIs in orange are the remaining impairments:

- 01. Beach Closings – Removed in 2015
- 02. Restrictions on Fish and Wildlife Consumption – Removed in 2013
- 03. Eutrophication or Undesirable Algae**
- 04. Restrictions on Drinking Water Consumption, or Taste and Odor – Removed in 2013
- 05. Degradation of Fish and Wildlife Populations**
- 06. Degradation of Aesthetics**
- 07. Degradation of Benthos**
- 08. Restrictions on Dredging Activities – Removed in 2011
- 09. Loss of Fish and Wildlife Habitat**

BARRIERS & EDGES

03



TANGIBLE BARRIERS

The issues surrounding the accessibility to Muskegon Lake are apparent to this thesis project and the residents of Muskegon. Historically, humans congregated on and around bodies of water for freshwater, food, travel, commerce, and health benefits such as positive physical and cognitive states, increased creativity, calmness, and happiness.¹ As the industry, trade, and commerce grew, the waterfront became a beacon for large industrial buildings, ships, docks, and machinery. Waterfront settlements, both Native American and European, moved inland while the industry monopolized the waterfront. These architectonic elements along the shoreline became substantial physical barriers between the people of Muskegon and Muskegon Lake.

However, these elements are just a part of the barriers that enclose the shoreline of Muskegon Lake. Shoreline Drive, a five-lane highway, acts as another barrier between the city and the lake which divides the urban setting from the water. The other divisive element in this scenario is that most of the land that surrounds Muskegon Lake is private. Businesses and individuals privately own approximately ninety-percent of Muskegon Lake's fourteen-mile shoreline. The remaining ten-percent is publicly accessible and owned by either the cities of North Muskegon and Muskegon, Muskegon County, or the State of Michigan.

With most of Muskegon Lake's shoreline being inaccessible to the public, many visitors and residents do not utilize these areas because they are merely unkempt, unaesthetic, and not programmed. Two types of shorelines outline Muskegon Lake: softened and hardened. Softened shorelines are categorized as natural, such as beaches and marshes. Hardened shorelines are composed of riprap, seawalls, or leftover industrial debris.

INTANGIBLE BARRIERS

In addition to the physical material barriers that hinder access to the lake, many residents and visitors, based upon multiple community-led surveys and analyses (see Appendix A), feel emotionally and mentally disconnected from Muskegon Lake. Many people encounter a lack of reasoning when it comes to their relationship with the lake—from personal interviews and on-site observations within this thesis project, many permanent residents of Muskegon have asked: "What is on or near the waterfront for my family and me?" "How can I benefit from being on Muskegon's lakeshore?" These questions are valid and essential to the reuse and revitalization of Muskegon's post-industrial waterfront.

A commonly unrecognizable barrier within this community is existential. With Muskegon Lake being encompassed by two municipalities, Muskegon and North Muskegon, there are inherent similarities and differences. To the researcher, however, the differences in sociodemographics are more visible (see Appendix C). First, the population and median household income are hugely disproportionate between Muskegon and North Muskegon, with Muskegon having a larger population with a substantially lower median household income and North Muskegon possessing the opposite.² Second, race and ethnicity are much more diverse in Muskegon, rather than North Muskegon, which is comprised of almost ninety-two percent caucasian people.³ Third, the educational attainment of individuals within the two communities, is staggering. A majority of Muskegonites only hold a high school diploma or equivalent. At the same time, North Muskegonites have an evenly diversified educational attainment of people who retain a high school diploma or equivalent, a bachelor's degree, and a graduate degree or higher.⁴

FIGURE 3.1



SHORELINE OWNERSHIP

One of the most significant issues with accessibility to Muskegon Lake is that visitors are not allowed to access the lake in certain areas. The influx of industrial facilities and desires to live directly on the lake, as well as harsh zoning restrictions, has led to a primarily privatized shoreline. An astounding ninety-percent of the parcels that surround Muskegon Lake is privately owned, while the remaining ten-percent of waterfront parcels are publicly accessible.⁵ The ten-percent of public land is owned by Muskegon and North Muskegon, as well as Muskegon County and the State of Michigan.⁶ North Muskegon and the entire northern shore of Muskegon Lake is predominantly comprised of residential parcels. In contrast, Muskegon and the southern coast of Muskegon Lake are mainly industrial, waterfront marine, commercial, and open-space recreational areas.

For residents and visitors to feel connected with Muskegon Lake, more publicly accessible areas should be instituted. Instituting parks, play areas, public marinas, swimming beaches, fishing piers, and inclusive green spaces in Muskegon's post-industrial regions would allow the public, visitors and residents alike, to better experience the lake and all of her natural features, as well as becoming educated on the history and heritage of the former industrial facility.



SHORELINE EDGE

The physical barrier that prevents people from being in Muskegon Lake retrospectively helps the land combat rising water levels and aggressive climate. Muskegon Lake has two different types of shorelines. Softened shorelines are categorized as natural transitions that are horizontal, such as beaches, wetlands, or marshes.⁷ On the other hand, hardened shorelines are comprised of engineered vertical elements, such as metal seawalls, rock riprap, or wooden walls.⁸

In Muskegon, hardened shorelines were engineered to contain the humanmade land that is made of industrial debris and fills. These vertical surfaces were also manufactured to support shipping; having a seawall or pier allowed for large ships to enter Muskegon Lake and get as close as possible to the resource that was being imported or exported. As a once-thriving industrial playground, the implementation of hardened lakeshore edges was immediate. Industrialism was not the single agent in the actualizing of engineered shorelines; residential properties created seawalls and riprap to prevent flooding, as well as creating a host for their watercraft and manicured lawns. Still, approximately seventy-five percent of Muskegon Lake's shoreline remains hardened-leaving only twenty-five percent of the shoreline to live natural.

However, multiple initiatives and action plans have been executed to soften and remediate Muskegon Lake's coast. As waterfront post-industrial sites become redeveloped, their shorelines do too. Just as important as reconnecting people to the lake, restabilizing and reconstructing wetlands promotes the natural ecosystem that self-remediate the water and the land.

Softening and remediating Muskegon Lake's coastlines not only positively impacts the local ecosystems and people's accessibility to the water, but it also significantly affects the local housing and property values.⁹ Paul Isely, Elaine Sterrett Isely, Carrie Hause, and Alan Steinman conducted a "socioeconomic analysis which included a travel cost survey for lake recreation and a hedonic housing valuation to estimate the return on investment"¹⁰ if specific areas of Muskegon Lake's southern shoreline were softened and remediated. The analysis illustrated that houses located between one hundred and eight hundred meters of Muskegon Lake's shoreline in the Beachwood-Bluffton, Lakeside, Nims, Nelson, and Jackson Hill neighborhoods, would experience a total value change of almost twelve million dollars.¹¹ Restoring Muskegon's waterfront post-industrial sites and coastlines would significantly impact the multitudes of ecosystems, the land, the water, and the accessibility and attractiveness of Muskegon Lake.

(Left, from top to bottom): **FIGURE 3.2** – the softened restored shoreline of the Grand Trunk site in Muskegon, Michigan; **FIGURE 3.3** – the metal seawall of the B.C. Cobb Plant's massive shipping pier.



HARDENED SHORELINES

Shoreline hardening “interrupts natural shoreline processes, reduces nursery habitat for marine species and foraging habitat for wading birds, degrades water quality, and can increase erosion processes.”¹² Although vertical shorelines can protect the land against aggressive climate situations, they end up harming the natural cycles for their local and regional ecosystems. Hardened shorelines such as metal seawalls and riprap can increase erosion in areas that are not protected by vertical surfaces, such as neighboring shorelines, and do not provide any filtration of runoff from land to water.¹³ With hardened shorelines, fish, birds, and other wildlife do not have a transitional area between the land and water to find food, rest, or build protective habitats and shelters.¹⁴ To the user, hardened shorelines cost more than the living shoreline or the softened shoreline.



(From top to bottom): **FIGURE 3.4** – metal seawall (bulkhead). A wall parallel to the shoreline intended to hold soil in place and to protect against aggressive water; **FIGURE 3.5** – rock riprap (revetment). Lays over the slope of the shoreline and protects it from erosion and waves; **FIGURE 3.6** – industrial and miscellaneous debris. Unmaintained conditions comprised of fallen trees and shrubs, rock, and wood.



SOFTENED SHORELINES

“Natural infrastructure solutions like living shorelines provide wildlife habitat, as well as natural resilience to communities near the waterfront. Living shorelines are sometimes referred to as nature-based, green, or soft shorelines. They are an innovative and cost-effective technique for coastal management.”¹⁵ Unlike hardened shorelines, softened shorelines and living shorelines heavily support local ecosystems by providing food and shelter for marine life and other wildlife. They also filter pollutants from stormwater runoff and, similar to seawalls and riprap, protect the land from waves and rising water.¹⁶ Softened shorelines also add an aesthetic value to its context and allowing human engagement through educational purposes, curiosity, and adds a sense of place.



(From top to bottom): **FIGURE 3.7** – a living shoreline (sills). Parallel to vegetated shoreline which reduces wave energy and prevents natural ecosystem disruption and erosion; **FIGURE 3.8** – a natural sloped beach. A clear sand or rock beach is suitable for human engagement and supports local ecosystems; **FIGURE 3.9** – a natural wetland/marsh is an area of low-lying land which is flooded in wet seasons and in times of high water levels. Marshes support local marine and avian ecosystems.

FIGURE 3.10

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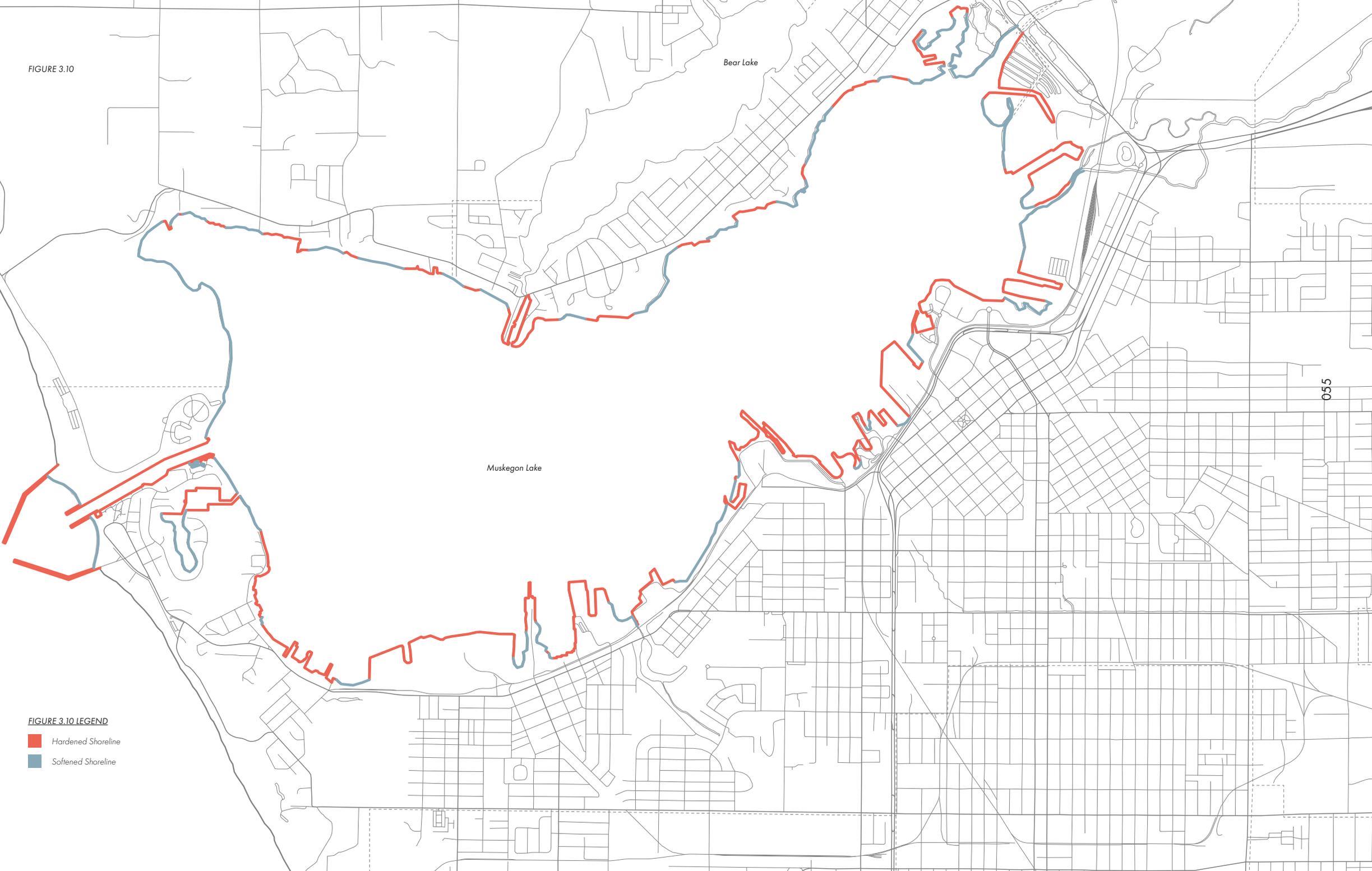


FIGURE 3.10 LEGEND

- Hardened Shoreline
- Softened Shoreline

WATERFRONT INDUSTRIALISM

04

// *Firstly obsolescence, then the abandonment of vast industrial areas, buildings deserted, productive plants closed, with the relative problems of deterioration of both a physical and social nature of relevant portions of the urban fabric.*

Waterfronts: A New Frontier for Cities on Water, Rinio Bruttomesso



WATERFRONT INDUSTRIALISM

“Two opposing forces seemed to be pitted against one another on the industrial waterfront: that of industrialism, which was grudgingly accepted in the name of progress, and that of an escapist drive for recreation and play, which seemed indicated, but hampered.”¹

For decades, Muskegon Lake and her shoreline forcibly submitted to extensive industrial facilities, toxic waste, and engineered prosthetics altering the land and the water. Before the industrialization of Muskegon Lake, the coastline and the water were used naturally and at smaller scales. The lake was utilized for its freshwater and plentiful fish, and the land surrounding Muskegon Lake was rich with fertile soils, which was great for growing crops.

Although, the industrial landscape was consistently the backdrop for many recreational activities on Muskegon Lake. Fishers still fished; swimmers still swam; boaters still boated. Muskegonites beat on against the industrial current—utilizing their lake for what it was intended. As life, economies, politics, and people progress and evolve, as did Muskegon. Reluctantly and proactively, the companies, communities, organizations, and individuals of Muskegon knew that the integrity of Muskegon Lake was weakening.

Waves of environmental and ecological responsibilities flooded Muskegon. Muskegon’s efforts did utterly put an end to industrialism on Muskegon Lake—nationwide economic downturns, and environmental protection seized opportunities within the Muskegon area. While waterfront industrialism started dissolving, communities and organizations saw the silver lining behind economic downturns—to remediate and regenerate the contaminated lands that once hosted lesions of mega factories.

Independent non-profit, non-political, non-sectarian organizations such as the Muskegon Lake Watershed Partnership (MLWP) were created to “working cooperatively for the improvement of the Muskegon Lake ecosystem, and for the delisting of Muskegon Lake as an [EPA] Area of Concern.”²

The MLWP, along with numerous other organizations and individuals, have significantly impacted Muskegon Lake and her shoreline through remediation efforts tailored to revitalizing Ruddiman Creek, Ryerson Creek, and the former Zephyr Oil Refinery, Amoco Tank Farm, and Grand Trunk sites.³

(Left, from top to bottom): FIGURE 4.1 – Sappi Fine Paper is a backdrop to ice fishermen in the Snug Harbor area of Muskegon State Park in February 2004; FIGURE 4.2 – An aerial view of Central Paper Company in 1941. The paper plant later became S.D. Warren and then Sappi Fine Paper.

ACTIVE INDUSTRIALISM



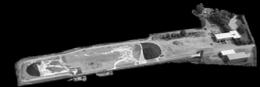
LAFARGE MIDWEST, INC.⁴
Status: Active
Function: cement, concrete, and aggregates
Property Size: 4-acres



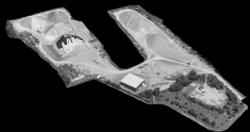
VERPLANK DOCK, CO. DOCK⁷
Status: Active
Function: dry-bulk commodities—
construction materials and equipment
Property Size: 24-acres



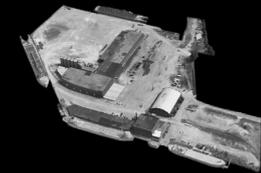
WATERFRONT STORAGE, LLC⁵
Status: Active
Function: indoor and outdoor marine storage
Property Size: 25-acres



ANDRIE, INC.⁸
Status: Active
Function: asphalt and fuel oil
transportation, vessel and fleet
management, project management,
specialty cargo, general towing, ship
assistance, ice breaking
Property Size: 14-acres



G.L.V., LLC⁶
Status: Active
Function: dry bulk commodities—limestone, slag, salt, and coal
Property Size: 23-acres



WEST MICHIGAN DOCK & MARKET CORP.⁹
Status: Active
Function: indoor and outdoor marine storage
Property Size: 30-acres

INACTIVE INDUSTRIALISM



GRAND TRUNK DOCK¹⁰

Status: Inactive
Current Function: storage for the SS Milwaukee Clipper
Former Function: railroad car ferry between Muskegon & Milwaukee
Property Size: 7-acres



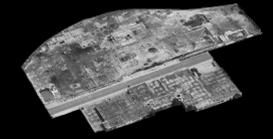
SAPPI PAPER MILL¹¹

Status: Inactive
Current Function: vacant, future PUD
Former Function: large paper manufacturing facility
Property Size: 122-acres



B.C. COBB PLANT¹²

Status: Inactive
Current Function: vacant, remediation
Former Function: coal-to-energy generating facility
Property Size: 140-acres



WESTPACK, LLC¹³

Status: Inactive
Current Function: vacant
Former Function: manufactured protective industrial packaging materials
Property Size: 7-acres



AMOCO TANK FARM¹⁴

Status: Inactive
Current Function: vacant, lakeshore tail around perimeter
Former Function: oil storage
Property Size: 25-acres



064

ENDINGS & BEGINNINGS

In the last ten years, there have been two significant dismantlings of Muskegon's most prominent industrial facilities. After sitting vacant since 2009, over one-million square feet of industrial facilities, boilers, and smokestacks have crashed to the ground due to controlled demolitions from 2012 to 2018. The large waterfront property was sold to a private developer and has set plans to develop the land to "accommodate more than 500 homes, a hotel, and various other businesses."¹⁵ The development would cost about \$300-\$400 million and could take up to fifteen years to complete. Muskegon City Manager, Frank Peterson, said that the benefits from this development are multifaceted and will increase the quality of life, increase population, and increase tourism and investment into the city and its waterfront.¹⁶

The most recent dismantling of Muskegon's most prominent industrial landmarks is the demolition of the B.C. Cobb Plant. Since 1948, it has powered hundreds of thousands of homes and businesses by burning coal for electricity. The Cobb Plant's owner, Consumers Energy, decommissioned the plant in 2016 in hopes of cleaner energy sourcing.¹⁷ Foresite Development acquired the property to conduct intensive environmental research and remediation of the toxic site. "Forsite's initial vision for the Cobb site is to create a port terminal that will enable multiple maritime cargoes to be shipped from Muskegon Lake. [A] Potential catalyst to spur other economic development projects in and around Muskegon."¹⁸

(Left, from top to bottom): **FIGURE 4.3** – explosives bring down the 200-foot tall section of the former Sappi Fine Paper, 2013; **FIGURE 4.4** – Doug Melching, right, celebrates with Tom Frost after the successful demolition of the 200-foot tall section of the former Sappi Fine Paper in Muskegon, 2013.

065

SYSTEMS

05

*"...when the students received outdoor lessons, they were significantly more engaged in their next instructional period on all measures than if they'd received lessons indoors. This held true for different teachers, different times of day, and different times of year."*¹

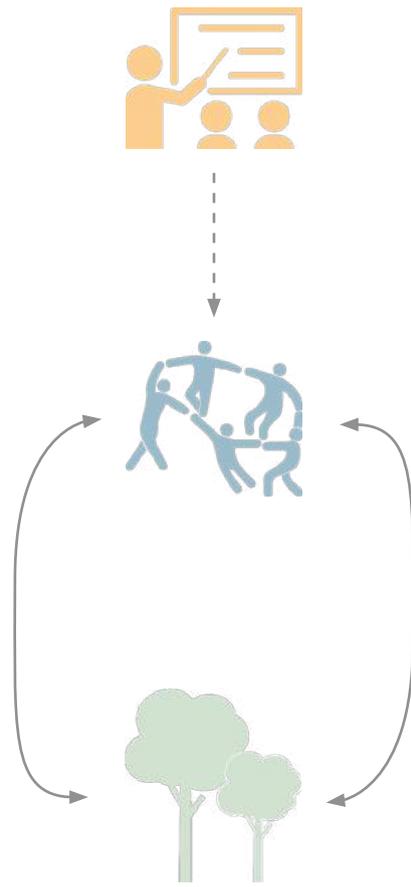


FIGURE 5.1

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EDUCATIONAL & NATURAL SYSTEMS

Researching the layers of Muskegon’s urban fabric in an attempt to establish appropriate programming for Muskegon’s waterfront post-industrial sites led to the subsequent analysis of the context’s educational and natural systems. In the realm of this thesis project, the educational systems were analyzed within a midcentury mentality of education of physical school buildings,² regardless of educational type. Learning can occur anywhere, of any scale, and any condition, but for this analysis, an etic objective approach was used. Three educational types, public, private, and charter, have been identified within the cities of Muskegon and North Muskegon. Each educational category contains some form of primary, secondary, and post-secondary schooling—typically, elementary, junior high, and high schools—with the addition of some community, technical, and vocational post-secondary institutions.

Along with analyzing the education systems in the Muskegon Lake area, natural systems were also examined. Here, natural systems are categorized as open space recreation areas, beaches, and parks. By overlaying the education and natural systems maps, it is evident which educational institution lies within a half-mile and one-mile of a park or green space. There are fifty educational systems within the confines of Muskegon and North Muskegon’s city limits. Thirty-four (68%) of those are located within one half-mile of a park, while forty-two (84%) educational systems are located within a one-mile radius of a park or green space.

Although a majority of the community’s educational systems are within a tangible distance, there is continuously a lack of connectivity to Muskegon Lake. The lake, as well as the historical post-industrial sites, offer immense opportunity for educational involvement. Students and visitors of these sites can be freely informed or be guided through the history of the site, its former glory, and how design impacted the way the site is utilized and regenerated.

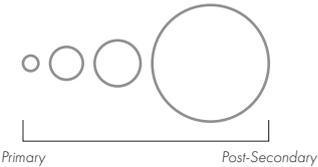
EDUCATIONAL SYSTEMS*

*FIGURE 5.2

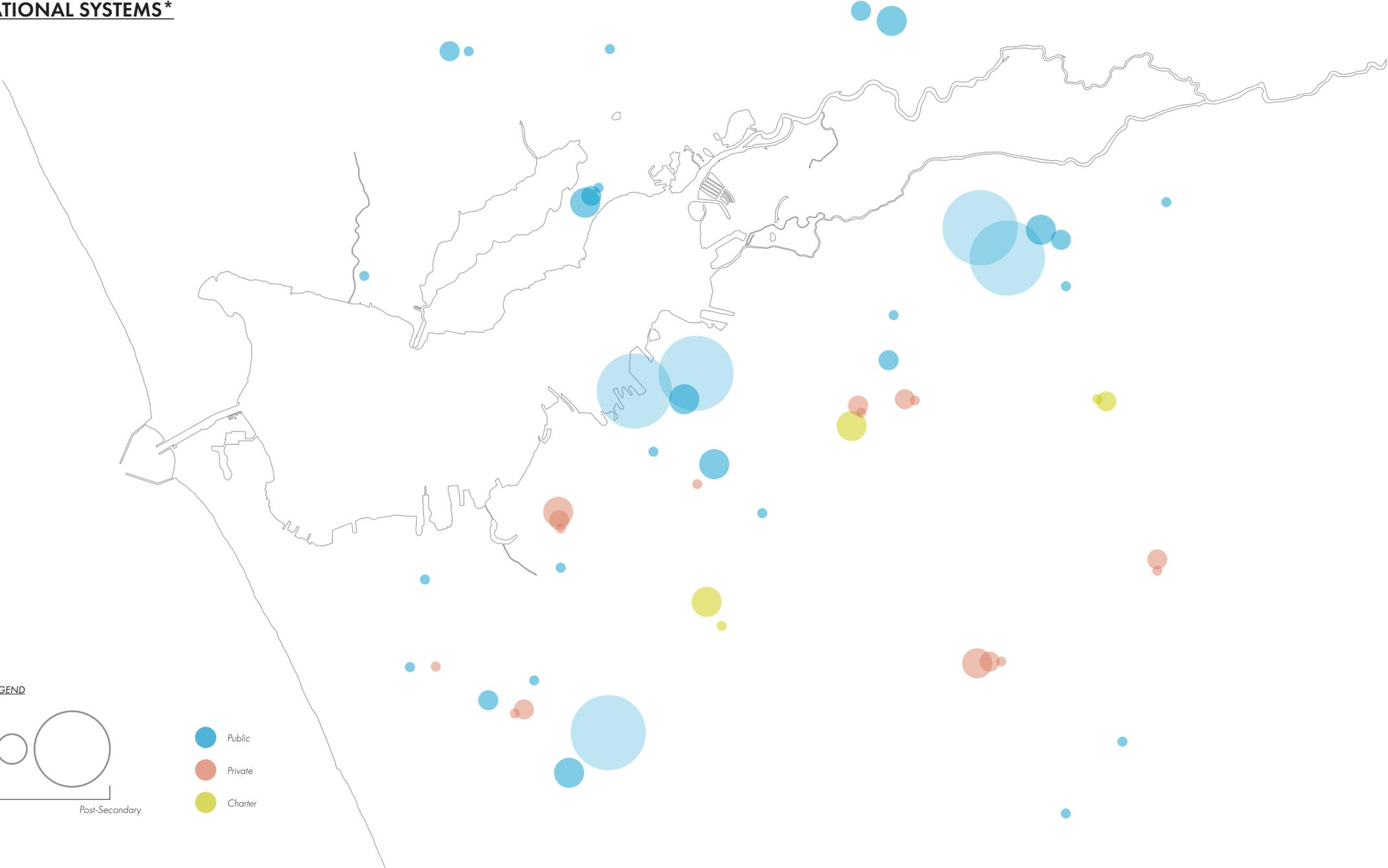
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FIGURE 5.2 LEGEND



- Public
- Private
- Charter





NATURAL SYSTEMS*

*FIGURE 5.3

072

073

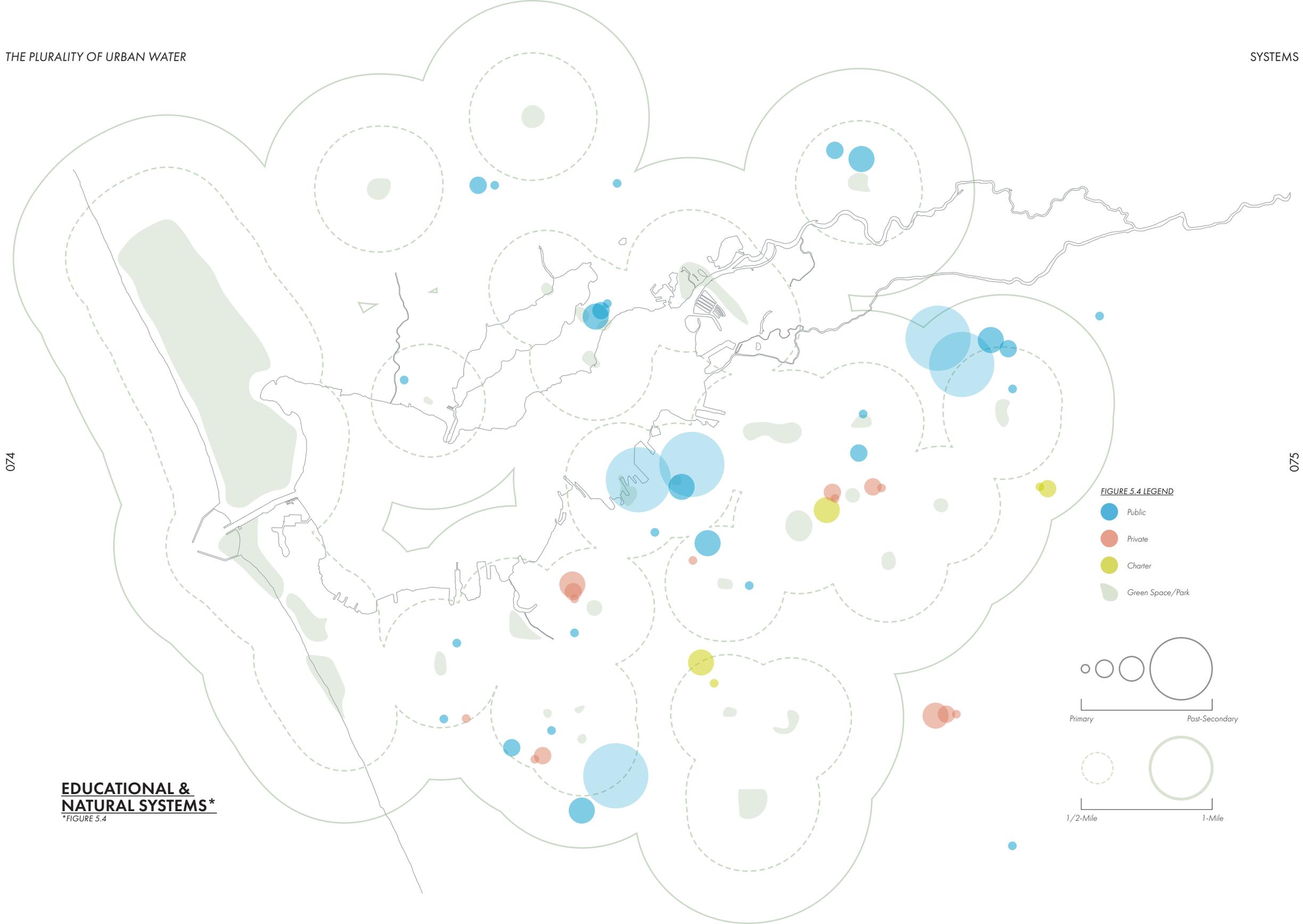
FIGURE 5.3 LEGEND

Green Space/Park



1/2-Mile

1-Mile



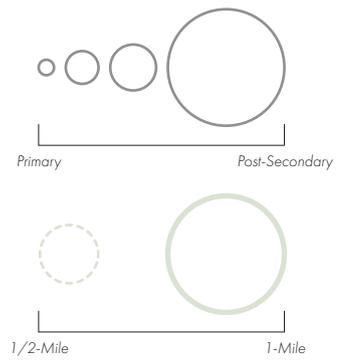
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EDUCATIONAL & NATURAL SYSTEMS*
*FIGURE 5.4

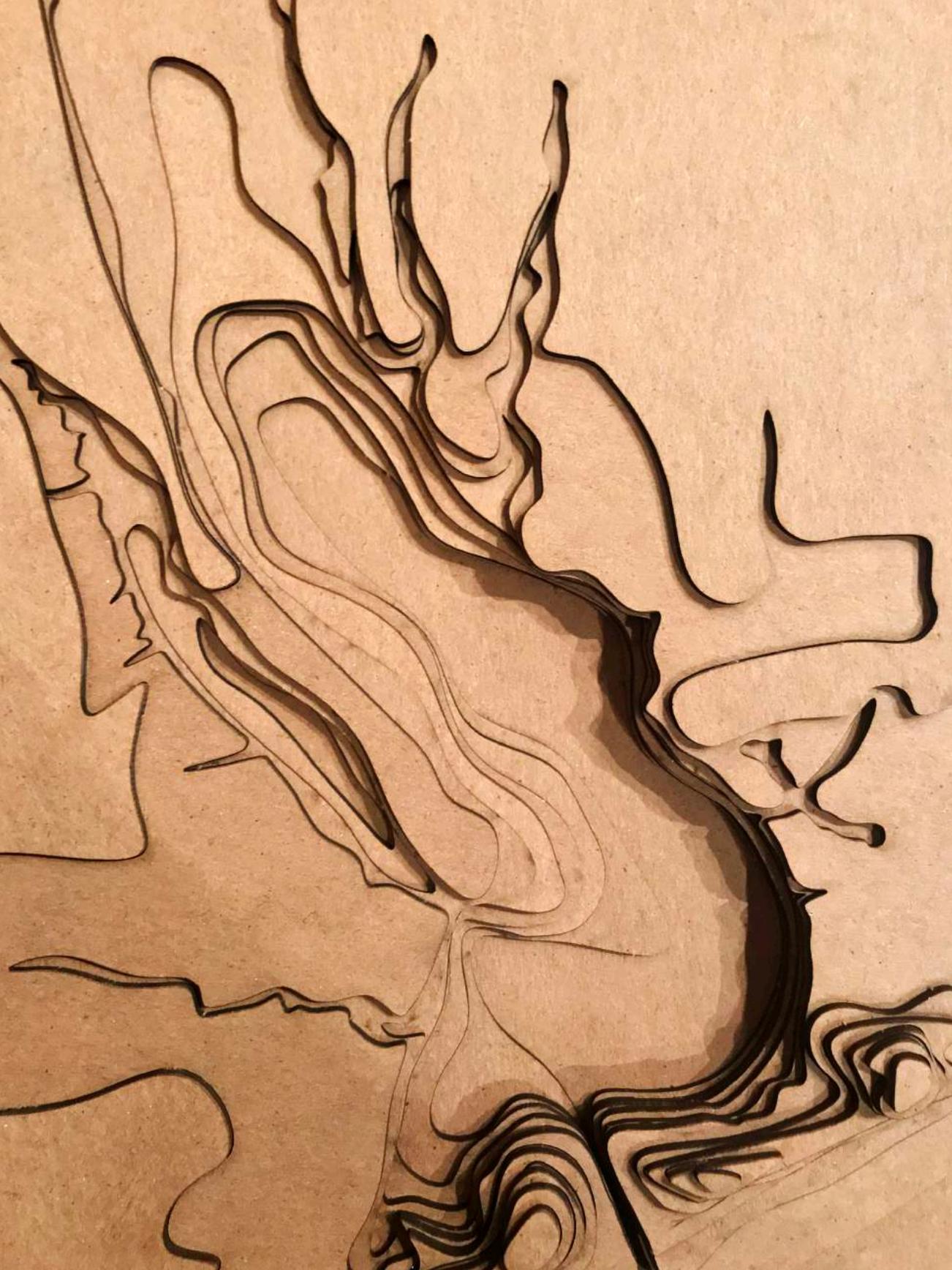
FIGURE 5.4 LEGEND

- Public
- Private
- Charter
- Green Space/Park



EXPERIMENTATION

06



SKETCH PROBLEM I

This sketch problem delved deep into Muskegon's greatest assets - the land and the lakes. The combined topography of the land and the bathymetry of the water illustrates the size and variety of Muskegon Lake and the surrounding land. These series of physical models demonstrate where and how the Muskegon River feeds into Muskegon Lake, and also the connection to Lake Michigan through a deep channel. These models experiment with the idea of bringing water into the landscape through canals, pocket ponds, and wetlands, and bringing the landscape into the water through docks, piers, and industrial ports. Altering the topography through habitable and programmable terrain would enhance the industrial waterfront by creating a public interest for viewing platforms and all-season activities such as sledding, picnicking, resting, and can be a host for events.

The experimental strategies of the Injection of Water, Projection of Land, and Programmable Topography were schematic and abstract in thought and practice, but have translated into practical implementations for the design proposals for the B.C. Cobb Plant and Amoco Tank Farm sites. These design strategies are also representative of Muskegon's history-the projection of land into the water, and the injection of water into the landscape was common practice amongst industries during Muskegon's lumber boom and modern-industrialization.

Researching and experimenting with Muskegon's topography and bathymetry assisted in comprehending the city's landscape on a deeper level, both physically and metaphorically. Although they are composed of different ecosystems and conditions, a body of water's bathymetry and the terrain is a continuous extension of the topography.

(Left): FIGURE 6.1 - a three-dimensional model created from three-ply chipboard that illustrates the gradient of hardscapes to softscapes through the land's topography to the water's bathymetry.

SKETCH PROBLEM II

BACKGROUND

According to The Great Lakes Environmental Research Laboratory (GLERL) at the National Oceanic and Atmospheric Administration (NOAA), Lake Michigan's water level is the highest it has been in 17 years.¹ The projected 5-year analysis of Lake Michigan's water level does not show any pause in increasing water levels. Furthermore, throughout the last six years, the water level of Lake Michigan has risen 4.8 feet, which is the highest recorded water increase in a six-year interval.² Storm surges (a rising of the sea as a result of atmospheric pressure changes and wind)³ are frequent in the winter months. However, during the last six years, storm surges accompanied by overall high-water levels have caused persistent flooding and infrastructure damage. Intense dune erosion, property damage, and municipal infrastructure damages seem everlasting in the water level crises. Overall, water level increases and storm surges also trigger the water table to accumulate pressure, rise, and expand, causing flooding in unsuspected areas.⁴

Since Muskegon Lake is an inflow to Lake Michigan through a channel, the repercussions of Lake Michigan's rising water directly affect Muskegon Lake. This Sketch Problem studied the flooding that occurs in the Muskegon Lake area, what areas are affected, and who is being affected. This experiment also analyzed accessibility and connectivity concerning people and water — how long would it take to walk to specific areas near the lake? How long would it take to drive to specific areas near the lake? How long would it take to kayak around the lake?



FIGURE 6.2

MATERIALITY

This topography model was constructed of a superimposed arrangement of a street-based map of Muskegon and paper-mâché terrain. The terrain was built from flattened-wooden blocks, which represented the physically plateaued areas of Muskegon. In contrast, the more aggressive terrain (dunes and hills) was created from wadded heavy-weighted paper to create rigidity and natural texture. Imposed onto the base map and topographic structures were strips of paper-mâché newspaper. Multiple layers of paper-mâché newspaper strips were added onto the model to create a cohesive layer, as well as preserving the shape of Muskegon Lake and illustrating accurate topography.

PROJECTION & PRODUCTS

Superimposed onto the paper-mâché model was a set of projections that illustrated median household income, flooding zones and conditions, connectivity, and site strategies. Floodplain maps created by The Federal Emergency Management Agency (FEMA) and the National Oceanic and Atmospheric Administration (NOAA) were studied. Before the overlay of the median household incomes in the area with the recently flooded areas, there was an assumption that the lower-income areas were experiencing the worst flooding, while the higher-income areas were experiencing



FIGURE 6.3



FIGURE 6.4

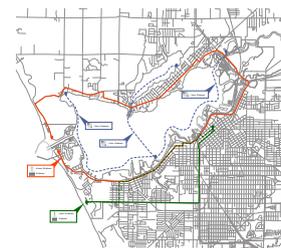


FIGURE 6.5



FIGURE 6.6

a lesser amount of flooding. That assumption was incorrect. The perimeter of Muskegon Lake encounters higher amounts of flooding, compared to the overall area. The perimeter of the lake is also generally composed of medium-high to high-income households, which in turn, experience the most flooding. The correlation between flooding and income would not have been made if an analysis was not conducted through three-dimensional mapping and an analytical projection.

Dysconnectivity, connectivity, and circulation were analytical tools during this sketch problem. In its current condition, the southern shore of Muskegon Lake does not house any public swimming beaches. For someone to sink their toes into the sand, they must go to a Lake Michigan beach. A layered map demonstrates the length of time it would take to walk and drive from Muskegon's Downtown District to the nearest swimmable beach; by foot: one hour and thirty-five minutes and by vehicle: twelve minutes. As well, there is no physical connection from Muskegon to North Muskegon on the western side of Muskegon Lake; one must travel around the entire lake to get to the other side, which would be a thirty-minute vehicle ride and an almost five-hour trip by foot. Layered with the land-travel circulation is a travel analysis by watercraft, more specifically, by kayak. Muskegon Lake is a predominant recreation lake and travel by boat, canoe, and a kayak is ordinary. Travel times range from one hour and fifteen minutes to two hours by connecting each public boat launch with a common path of travel of a kayak.

RESULTS

Throughout the analysis of local median household incomes, recent flooding, and land and water circulation, site selections and design strategies are apparent. The former B.C. Cobb Plant and the former Amoco Tank Farm were chosen based on their location in the city and on the lake and their industrial and cultural significance. Located at the mouth of the Muskegon River is the B.C. Cobb Plant. In its prime, it set precedence for power and industry in the area and continues to be a landmark of the community with its proposed program of public amenities, ecological nature preserves, waterfront park, and community center. Located in the middle of the southern shore of Muskegon Lake is the former Amoco Tank Farm. Being on the waterfront in the historic Nims Neighborhood has the opportunity to a family and nature-oriented home base; opportunities such as play areas for children, a public swimming beach, and historical and educational elements will be implemented to bond the community to the lake.



(Left, from top to bottom): **FIGURE 6.7** – a digitally projected map illustrates the existing conditions of the site—its topography, bathymetry, and the systems of roads that outline Muskegon Lake; **FIGURE 6.8** – a map showing Muskegon and North Muskegon’s local median household incomes—the darker blues represent the higher household incomes, while the lighter blues represent the lower household incomes; **FIGURE 6.9** – a map showing the context’s recent flooding areas in red. (Right, from top to bottom): **FIGURE 6.10** – a map displaying the flooding zones being superimposed onto the median household incomes map; **FIGURE 6.11** – a map that tracks the most likely paths of travel by vehicle, by foot, and by watercraft—in this case, a kayak’s circulation distances were studied; **FIGURE 6.12** – a conclusion map was conducted to understand the feasibility of site selection from this stage in the thesis project—the B.C. Cobb Plant and Amoco Tank Farm sites were chosen because of their rich history as an economy generator and cultural site, as well as their geographic location on the shores of Muskegon Lake.

SITE SELECTION & ANALYSIS

07



FIGURE 7.1 – Environmental Program Manager for the Muskegon Lake Watershed Partnership (MLWP), Kathy Evans, giving the Muskegon Lake Restoration and Action Plan progress updates on Thursday, November 7, 2019. This MLWP meeting discussed Public Outdoor Recreation and Access to Natural Resources for the City of Muskegon and Muskegon Lake.

COMMUNITY INPUT

A public meeting for the Muskegon Lake Watershed Partnership (MLWP), which discussed public access to Muskegon Lake and the future planning initiatives in Muskegon, sparked a series of connections that lent professional and personal input into the site selection process. A survey was created and distributed to Muskegon residents and visitors to gain public commentary and interest into the opportunistic future of Muskegon's post-industrial waterfront (see Appendix A).

The survey outlined general sociodemographic information such as residency, age, ethnicity, education, and income, Muskegon-related questions like people's affiliation with Muskegon and how often and why they visit Muskegon Lake, questions relating to how satisfied people are with Muskegon Lake's public swimming beaches, fishing areas, walking trails, public parks, and boat launches, and finally, site-oriented questions that asked what the community would like to see in place of some of the vacant post-industrial sites, such as the B.C. Cobb Plant, Amoco Tank Farm, and Sappi Paper Mill.

Joining multiple community Facebook groups, such as *Muskegon Lake Watershed Partnership Shoreline Stewards*, *Fans of Lakeside Neighborhood Association*, *Muskegon Heights Connection*, and *Muskegon's Memory Lane* provided large, diverse groups of people that could participate in the survey. After posting the survey in the Facebook groups, over 120 people responded. Eighty-four percent of those respondents long for public parks and green spaces on Muskegon Lake, seventy-four percent of respondents would like to see better quality nature trails and lakefront trails, and sixty percent would like to see public swimming beaches along the lake. In place of the former B.C. Cobb Plant site, a majority of pollees would be interested in seeing a public park or green space, and nature preserves with pathways, and some form of community aspect (event center, community gathering space). The least popular answers were interventions of new industrial activities, housing developments, and municipal marinas, respectfully.

The survey yielded similar results for what the community would like to see at the former Amoco Tank Farm. Sixty-five percent of them seeing a public park or green space as a viable option, and fifty percent considering a nature preserve with pathways the right choice for this site. Additionally, forty percent of pollees would like to see fishing areas and fishing piers implemented into the future planning of this site. Following, seventy-five percent of those who voted for an intervention of fishing areas and docks said that they would also like to see a public boat launch/boat slip in the former Amoco Tank Farm site for its adjacency to highly-residential areas. Although the Sappi Paper Mill was a specific site on the survey, this site was not a contender for site selection due to its active development that transpired throughout strategic planning.

It is vital to recognize the community's feedback and opinions when it comes to regenerating areas of cultural, industrial, and personal heritage—to transform the vacant and unaccessible post-industrial sites into nourishing green-space environments for Muskegon's residents and visitors. Using the survey as a strategic framework, paired with extensive research in urban waterfronts and post-industrial revitalization, will lend the opportunity for Muskegon's community to see the possibilities of their waterfront.

THE ACTION PLAN

Following the community survey, the B.C. Cobb Plant and Amoco Tank Farm sites were selected for their rich history of industrialism, their optimal location on Muskegon Lake, their sheer presence as architectural landmarks, and overall potential. As well as analyzing and proposing design strategies for the Muskegon Lakeshore Trail, which is a popular multiuse trail that spans the perimeter of Muskegon Lake's southern shoreline.

In accordance with the survey and the City of Muskegon's *Imagine Muskegon Lake* revitalization plan, four key metrics were picked to analyze and address the B.C. Cobb Plant, Amoco Tank Farm, and the Muskegon Lakeshore Trail, collectively. **SUSTAIN**, **ADVANCE**, **CONNECT**, and **CONVENE** are themes that seek to accentuate the symbiotic relationship with the city, water, and people by balancing the natural and the urban elements along the lakeshore. This balance is about creating broad opportunities to experience, activate, recreate, and reconnect with the lake. It is a plan to bring people back to the water and to connect water to the people with small scales, short and long-term interventions, and innovative ideas for the future.¹

"The balance between the city and her lake is about making choices that can achieve continued port enterprise, enhanced tourist activities, robust development potential, and varietal, exciting, and engaging public access. This provides tactics, strategies, and recommendations to inform these choices."²

To **SUSTAIN** is to improve water quality, preserve and enhance natural features, and build a connected network of green infrastructure. To **ADVANCE** is to maintain and support shipping and deep port industries, support tourism in all forms by recognizing and promoting nature and ecology-based educational and recreational activities while programming post-industrial sites to advance their usage and rich history. To **CONNECT** is to link all modes of transportation together and access the community's assets and opportunities while leveraging proximity to residential, commercial, and downtown areas through a connected lakeshore trail. To **CONVENE** is to make the shoreline accessible to residents and visitors alike, all ages, and at all times of the year; to preserve, maintain and accentuate existing access and continue to build new access to the lake through a new system of green spaces, public access easements, and through other city-owned lands; to increase lakeside amenities for visits of varying durations.³



SUSTAIN

To improve water quality, preserve and enhance natural features, and build a connected network of green infrastructure. Sustainable elements are diamonds in the rough. This metric measures what parts of the site can be strengthened—some, with little-to-no human interaction, others, with a multitude of human and urban design engagement.



ADVANCE

To maintain and support shipping and deep port industries, support tourism in all forms by recognizing and promoting nature and ecology-based educational and recreational activities while programming post-industrial sites to advance their usage and rich history.



CONNECT

To link all modes of transportation together and access the community's assets and opportunities while leveraging proximity to residential, commercial, and downtown areas through a connected lakeshore trail. Also, connections of memory and history are significant in continuing the legacy of each site.



CONVENE

To make the shoreline accessible to residents and visitors alike, all ages, and at all times of the year; to preserve, maintain and accentuate existing access and continue to build new access to the lake through a new system of green spaces, public access easements, and through other city-owned lands; to increase lakeside amenities for visits of varying durations. Specific urban design guidelines, educational elements, viewsheds, site programming, and responses to the survey will be enacted.

B.C. COBB PLANT

08

B.C. COBB PLANT

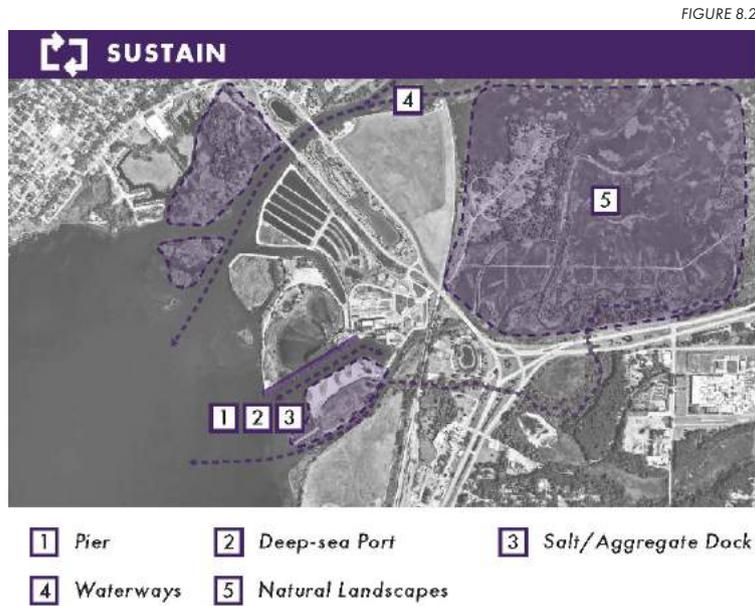
This most extensive construction job in the community's history is also its most unusual and fascinating. Consumers Energy chose the site at the mouth of the Muskegon River for three reasons: the flow of clear, cold water in Muskegon River, the convenience of bringing in coal by ship, and the ample area for ash disposal. One hundred and sixty piles about 200-feet long were driven to bedrock to overcome foundation problems for the massive structure.¹ After each pile was driven, the earth and water will be blown out with compressed air, and the pipe then filled with concrete. The steel piles were approximately 23 inches in diameter.² They were manufactured for bomb casings and converted to the present use.

Forsite Development acquired the plant from Consumers Energy in October of 2017. Forsite's initial vision for the Cobb site is to create a port terminal that will enable multiple maritime cargoes to be shipped from Muskegon Lake.³ This port acts as a potential catalyst to spur other economic development projects in and around Muskegon.

The ecological health of the Cobb Plant's site and surrounding water is undergoing remedial actions. Contrasting the developer's initial ideas and based on community input, the program of this site will feature natural landscapes that are accessible to the public, fishing areas, a kayaking launch station, event space, playable terrain, and multiple architectural elements to ensure community engagement.



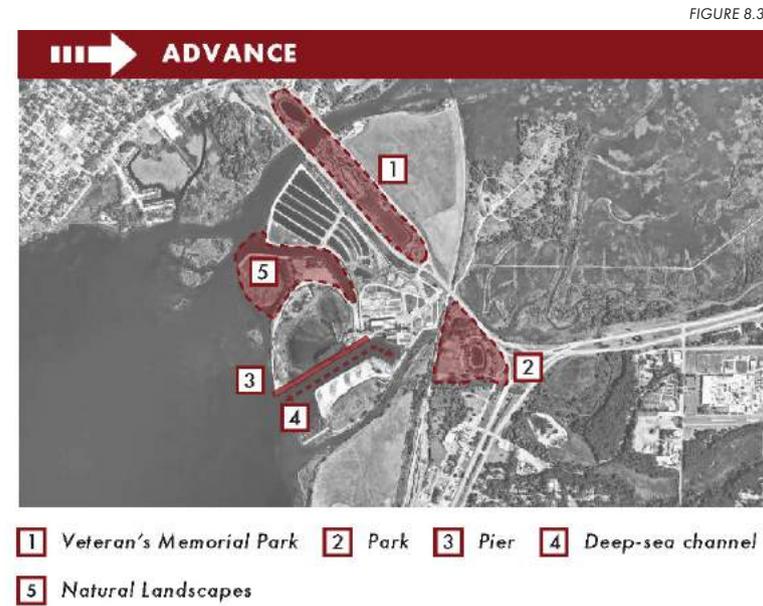
FIGURE 8.1 – The B.C. Cobb Plant from Fisherman's Landing, 2012.



SUSTAIN

Through on-site observations (see Appendix B) and immense site research, five significant elements of the B.C. Cobb Plant site were identified to represent the sustain metric. To sustain is to improve water quality, preserve and enhance natural features, and build a connected network of green infrastructure, as well as what parts of the site can be strengthened with minimal human intervention. Therefore, the sustaining elements of the Cobb Plant are its pier and deep-sea port, the Verplank, Co. Salt & Aggregate Dock that is adjacent to the site, the waterways that digress through and around the plant, and the natural landscapes, such as wetlands and marshes, that surround the context.

Using the sustain metric to determine these five measurables will ensure that the natural landscapes persist and are resilient to their climates and ecosystems, as well as engaging uses into and around them. Sustaining the pier and deep-sea port will allow for possible future industrial activity if need be, but allows for a relationship between the future users of this site and the B.C. Cobb Plants industrial heritage.



ADVANCE

To advance is to recognize and promote nature and ecology-based educational and recreational activities while programming post-industrial sites to advance their usage and rich history, as well as enhancing a specific, measurable, or element, of the site to its maximum potential and opportunity. Five measurables have been identified within the advance metric.

The Veteran's Memorial Park is an elongated park that buffers the major road that runs parallel to the B.C. Cobb Plant. This park is utilized by some but ignored by many. The park acts as a transition from Muskegon into North Muskegon and can be enhanced through ecological and urban design strategies. Richards Park, a green space that is just outside of the Cobb Plant, experiences high rates of flooding and low user experience. As well as sustaining the natural landscapes, pier, and deep-sea port, they should also be advanced into useable experiences.



FIGURE 8.4

- 1 Lakeshore Trail
- 2 Community Connectivity
- 3 History of Site
- 4 Bridging

CONNECT

The third metric, connect, is designed to link all modes of transportation together and access the community's assets and opportunities through a connected lakeshore trail, as well as connecting memory and the history of the site. The B.C. Cobb Plant is a pivotal site because of its location on Muskegon Lake—its located at the mouth of the Muskegon Lake and the northernmost area of the lake, as well as being municipally divided directly down the middle between the city of North Muskegon and the city of Muskegon.

Connectivity is a huge aspect that is missing in this area. The proposal for this site is a gathering area for people from all communities, similar to its geographical location. The architectonic portions of this site have been wiped away without a trace—enacting design strategies that represent the history of the site as an energy generator and landmark is of most importance. The B.C. Cobb Plant is the first interaction that users of the Muskegon Lakeshore Trail experience. Using the connect metric to optimize the lakeshore trail and its connectivity to communities and public sites is ideal.

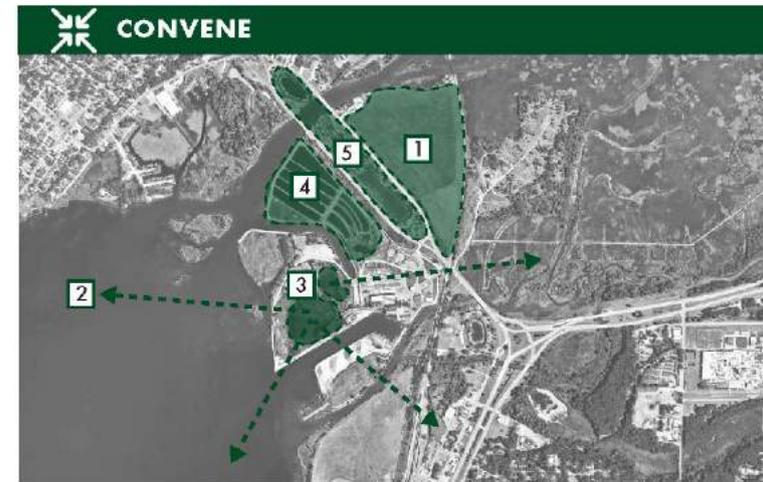


FIGURE 8.5

- 1 Program
- 2 Views
- 3 Topography
- 4 Fly Ash Ponds
- 5 Veteran's Memorial Park

CONVENE

For the B.C. Cobb Plant, convene is to make the shoreline and proposed site accessible to residents and visitors alike, all ages, and at all times of the year; to increase lakeside amenities for visits of varying durations. Specific urban design guidelines, educational elements, viewsheds, and site programming are enacted.

This sites' convene metric represents ideas that were created during Sketch Problem I. The idea of programmable and playable topography will be represented through the coal mounds that once littered and shifted the landscape of the B.C. Cobb Plant. Instead of coal mounds, they will be replaced with grassy terrain for all-season activities for its users—sledding in the winter, picnics in the spring and summer, and a host for viewsheds for sunsets and fireworks displays. The former coal ash ponds will be converted into sustainable aquaculture farming—to produce fish in contained ecosystems in order to release them into Muskegon Lake to populate the decreasing fish population.



FIGURE 8.6

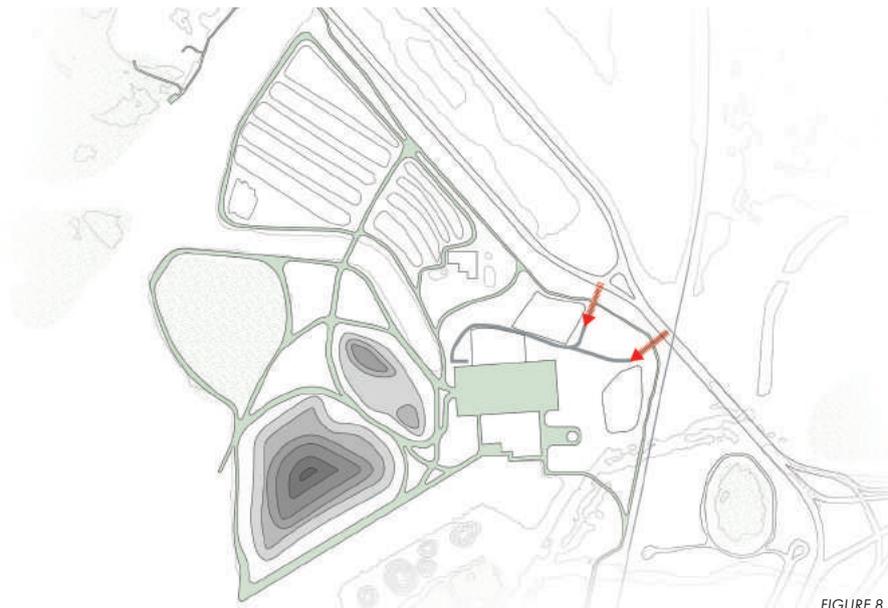


FIGURE 8.7

SITE PLANNING – B.C. COBB PLANT

Following the site analysis guided by the sustain, advance, connect, and convene measurable metric system, two schematic site planning exercises were conducted. Each site planning exercise focused on programming the site, as well as prioritizing zones and elements of the site, referencing the sustain, advance, connect, and convene metrics.

The first site planning exercise focused on schematically programming the site based upon the most recent aerial image. Here, zones in and around the site were prioritized required further site research and analysis. The existing Muskegon Nature Preserve, Veteran’s Memorial Park, Richards Park, and the large grassy plot of land north of the site were classified as opportunity zones. Research was conducted for each opportunity area to determine if there were plans for future development from the city of Muskegon or the city of North Muskegon.

Based on the input that was received from the community survey and the sustain, advance, connect and convene metrics, schematic programming on the interior of the site was determined. In place of the former coal mounds, grassy terrain would be created to resemble the former use and act as a host for human interaction year-round. An overwhelming percentage of individuals that responded to the survey would like to see more interventions of natural landscapes, reconstructed wetlands, and nature preserves with pathways introduced into the B.C. Cobb Plant site.

The second site planning exercise focused on laying out the selected programs atop a topography map. In this more study, diagrammatic planning was conducted in order to design walkways throughout the site. In some areas, minimal pathways were allotted to ease the disruption to its natural ecosystem. In this rendition of planning, a large plaza would replace the electrical fields that distributed the electricity to the surrounding context. The idea of a plaza would not correlate with the community interest survey, nor would it have fit the context and scale of the site.

Proceeding iterations of this site would address adaptive-reuse typologies with the coal ash ponds and general circulation within site. Organic pathways and minimal intervention within the B.C. Cobb Plant site will allow for productive environmental and ecological ecosystems, as well as the creation of a seemingly-natural landscape for the community to utilize year-round.



DESIGN PROPOSAL – B.C. COBB PLANT

Through on-site observations, community engagement and feedback, sustain, advance, connect, and convene site analyses, and multiple iterative site planning exercises, the finalized site plan for the former B.C. Cobb Plant site was created to optimize the site's spacial, historical, ecological, and community spaces. In this design proposal, toxic coal ash ponds are remediated and transformed into a fish hatchery, landscaped topography resembles and replaces the former coal mounds, natural landscapes are enhanced and accessible to the public, and the footprint of the industrial facility is inverted.

Specifically, through the sustain and advance site analyses, the B.C. Cobb Plant has many unscathed natural resources. Winding pathways around the perimeter of the wetlands allow for human intervention within the natural landscapes, without being over-intrusive. "...design infrastructure that uses natural materials or mimics the physical properties of natural habitats to support the habitat requirements of native species and reduce the influence of non-native species."⁴ The pathways are constructed of wood to reduce the intrusiveness of human intervention.

FIGURE 8.8 – a marketing poster for the grand opening of the B.C. Cobb Plant, in 1949.

OVERALL SITE PLAN
FIGURE 8.9

- A. Detailed Plan A
- B. Detailed Plan B
- 1. Muskegon Lakeshore Trail
- 2. Retrofitted railroad
- 3. Aquaculture / fishery
- 4. Filter station
- 5. Educational facility
- 6. Roundabout
- 7. Nature preserve
- 8. Event space
- 9. Kayak launch
- 10. Parking
- 11. Playable topography
- 12. Enhanced pier
- 13. Inverted landmark
- 14. Partially-returned smokestack



COAL ASH POND TO FISH HATCHERY

Coal ash is produced primarily from the burning of coal in coal-fired power plants.⁵ Coal ash ponds are used to stabilize the ash from entering the air: fly ash, bottom ash, and boiler slag are placed into pits in the ground and filled with water.⁶ For these contaminated ponds to sustain wildlife or ecological ecosystems, remediation actions must occur. Plants such as Indian grass, Indian mustard, willow trees, poplar trees, and sunflowers clean the toxic soil through a process called Phytoremediation.⁷ Then, the ponds will be converted into a fish hatchery where a variety of fish such as trout, bluegill, salmon, bass, walleye, and perch can healthily and safely breed and be released into Muskegon Lake to supplement the existing populations—which will assist in the delisting of Muskegon Lake as an EPA Area of Concern.

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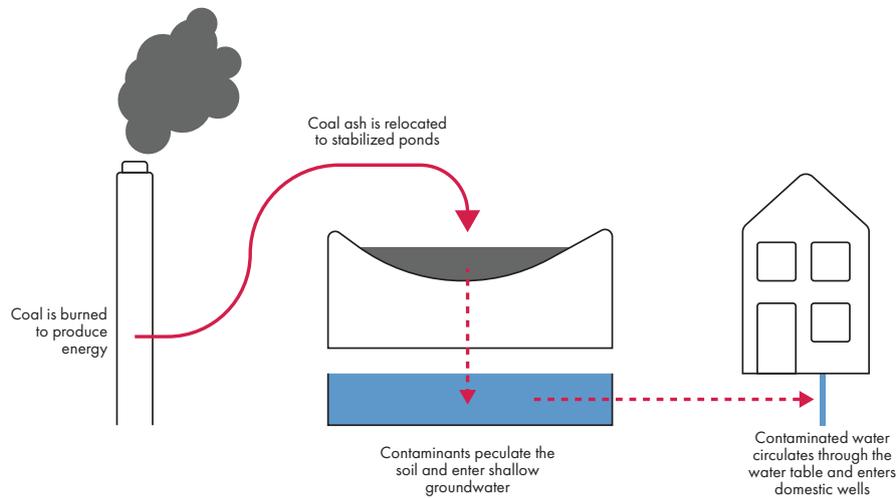


FIGURE 8.10

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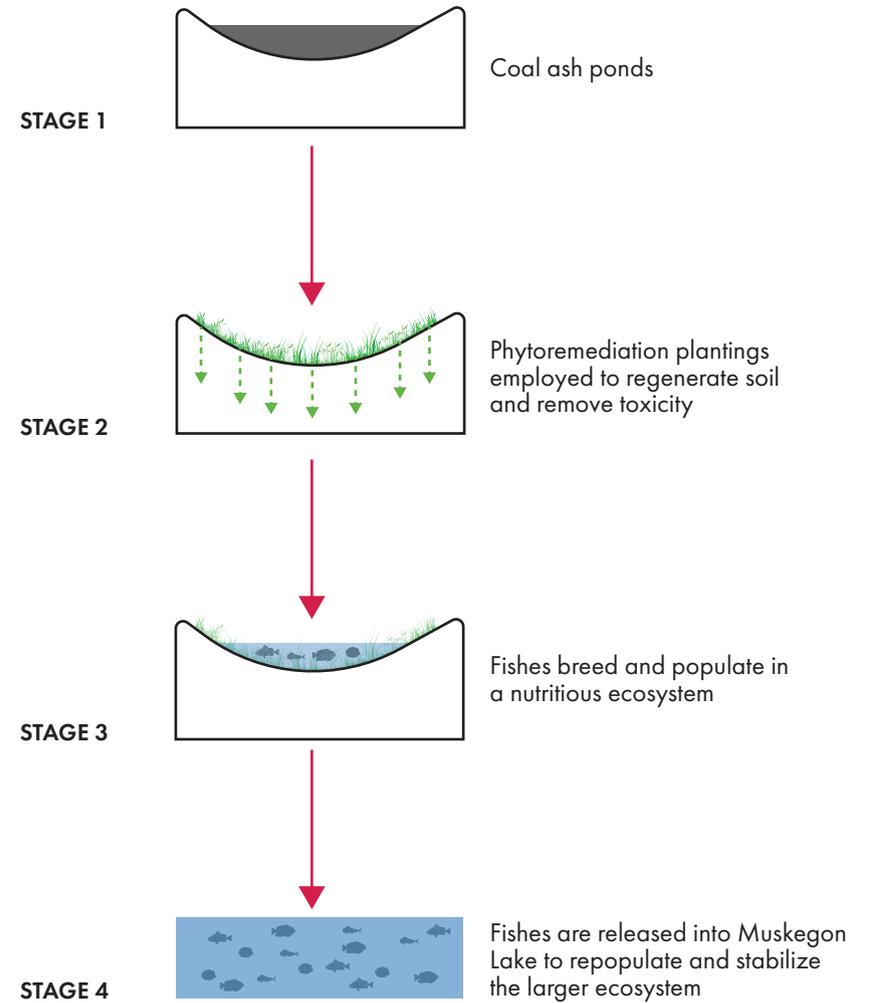
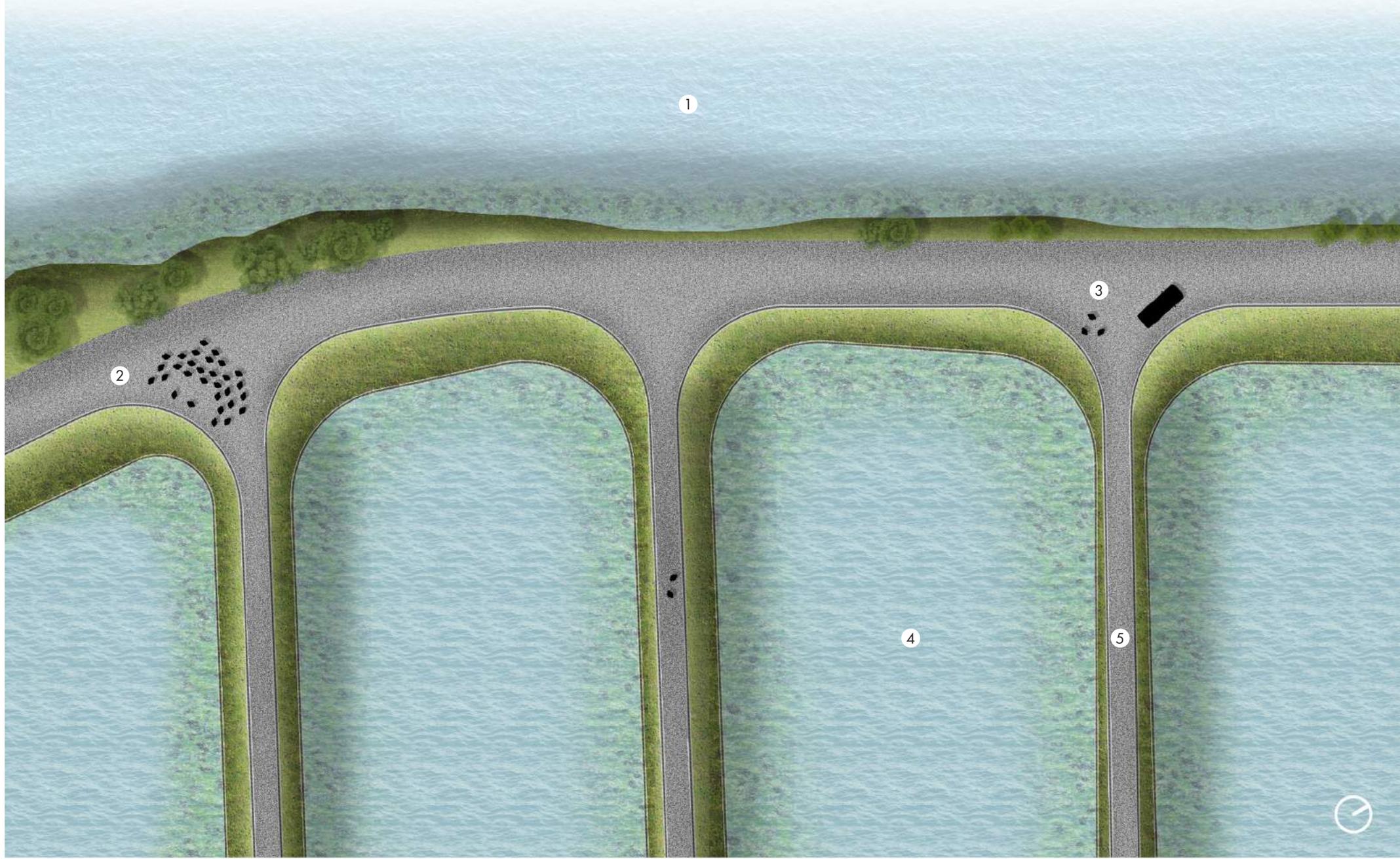
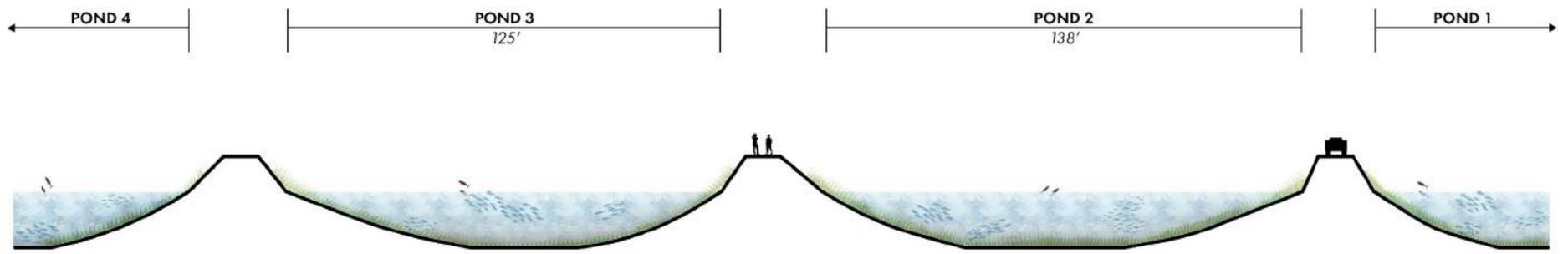


FIGURE 8.11

DETAILED PLAN A
FISH HATCHERY
FIGURE 8.12



- 1. Muskegon River
- 2. Educational opportunities
- 3. Maintenance
- 4. Fish hatchery ponds
- 5. Walkways



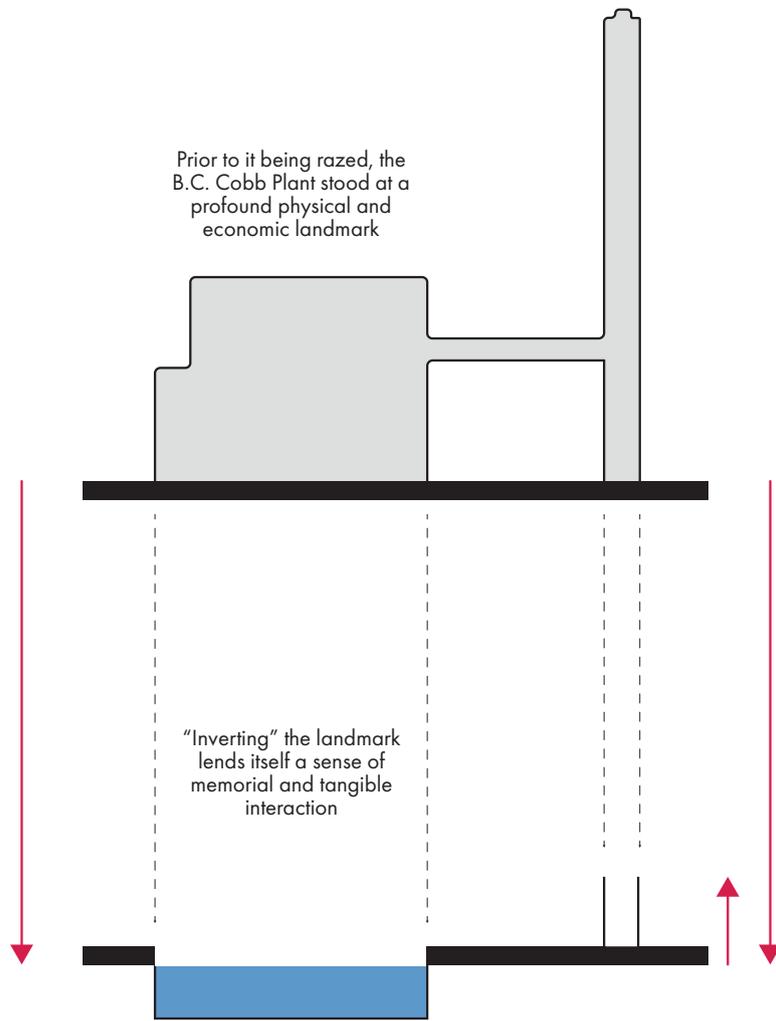
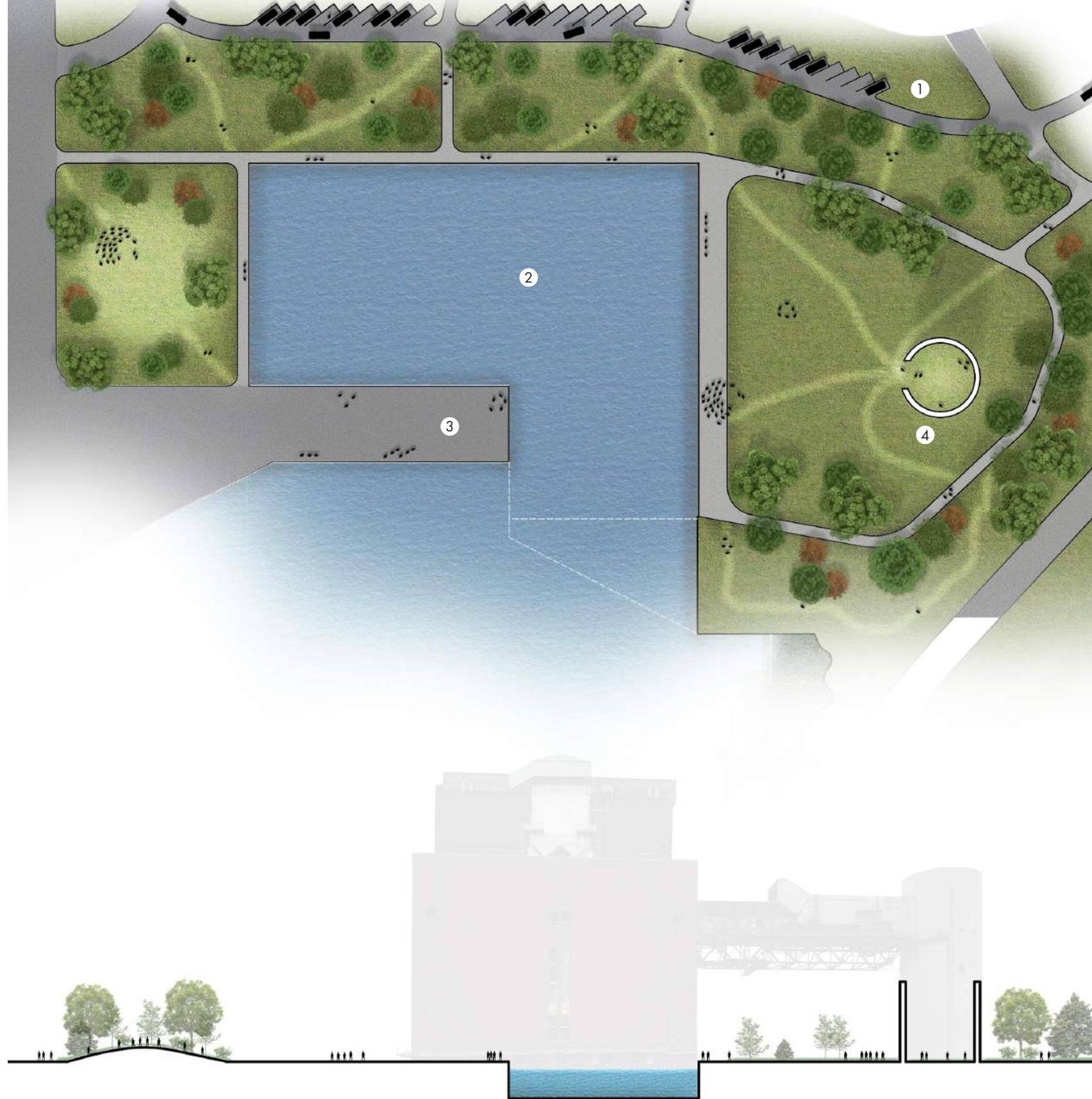


FIGURE 8.13

INVERTED LANDMARK

The Cobb Plant once resembled the power and ingenuity of Muskegon’s industrialism. It stood as a landmark, both architecturally and economically. Currently, the architectonic elements of the former B.C. Cobb Plant are completely demolished. The footprint of the industrial facility will be inverted to represent its history and architectural significance. Excavating the footprint of the plants’ main facility and allowing the water of Muskegon Lake to flood the excavation will enhance a visitor’s interest and invoke the idea of the sheer size of the monolithic building that once stood.

DETAILED PLAN B
INVERTED LANDMARK
FIGURE 8.14



- 1. Parking
- 2. Inverted landmark
- 3. Pier
- 4. Partially-returned smokestack

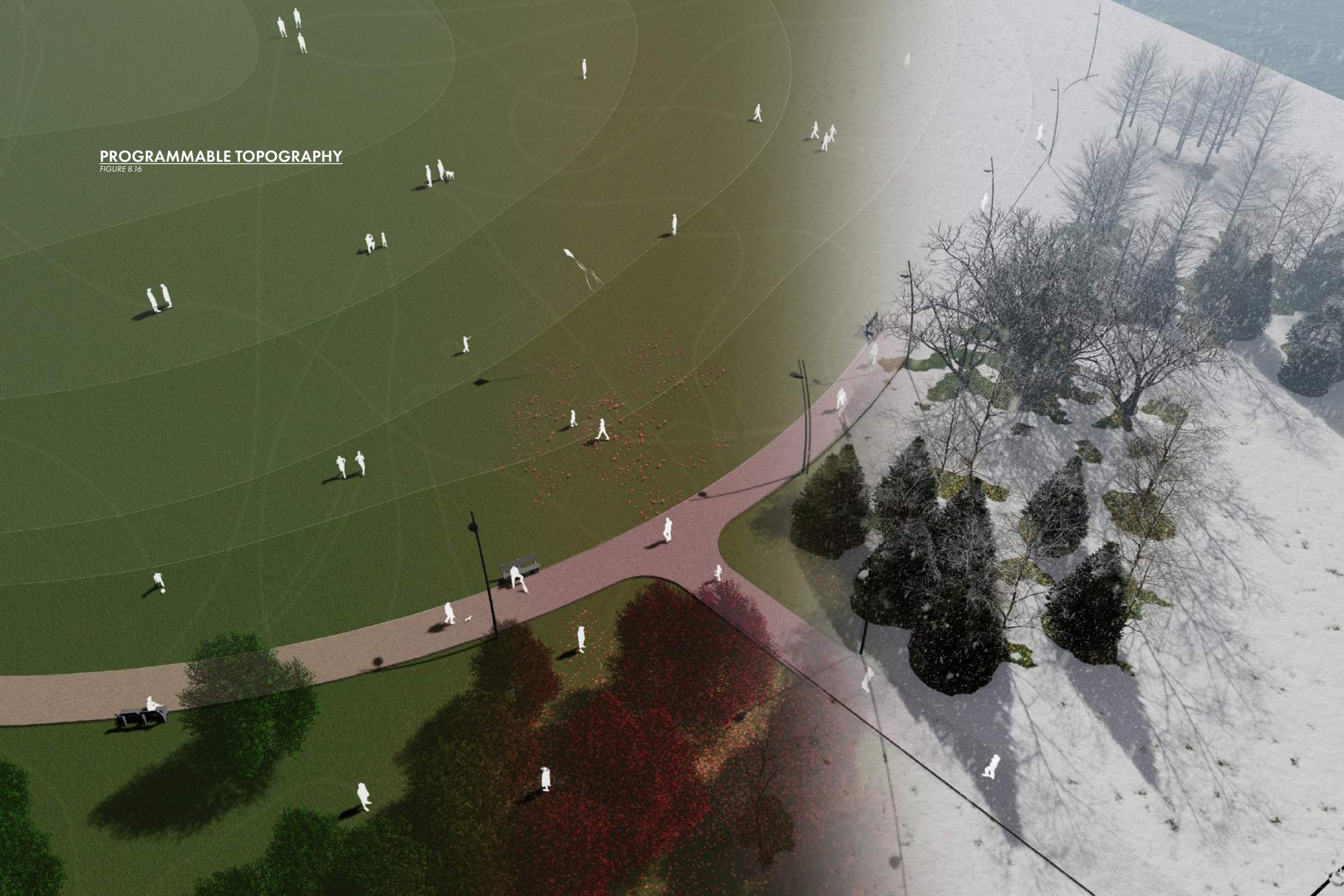


COAL MOUNDS TO GRASSY TERRAIN

A massive portion of the B.C. Cobb Plant site was dedicated to coal placement. Large ships, like the one-thousand-foot-long freighter, the James R. Baker, delivered around fifty-eight-thousand tons of low-sulfur Western coal to the industrial facility.⁸ The coal was exported from the ship and placed into large mounds to await burning. The B.C. Cobb Plant is now decommissioned and dismantled, and in order for the dominant landmark to continue, large grassy hills will replace the toxic coal hills. This new topography acts as a catalyst for viewing fireworks and sunsets, picnic, playing, resting, and sledding in the winter. The replacement of material and activity will not only allow for human engagement but for the history of the large mounds to recapitulate—perhaps being recognized by older generations who once worked at the Cobb plant or who are familiar with the area.

PROGRAMMABLE TOPOGRAPHY

FIGURE 8.16



AMOCO TANK FARM

09



FIGURE 9.1 – The Amoco Tank Farm, 1992.

AMOCO TANK FARM

During the 1980s-1990s, the tank farm was razed, and remedial activities were undertaken.¹ There is strong community support for the restoration of fish and wildlife habitats to increase public uses of the property for passive outdoor recreation, including open-access fishing, kayaking, canoeing, and wildlife-watching.² Local and statewide communities and organizations band together to support this regeneration of post-industrial heritage. Several supporting partnerships include the City of Muskegon, the Muskegon Lake Watershed Partnership (MLWP), the Michigan Department of Environmental Quality Remediation Division (MDEQRD), and the Michigan Department of Natural Resources (DNR).

The entirety of the former Amoco Tank Farm site is restricted from human activity, shut off by a concrete and barbed wire wall that encloses the site. The historic toxicity of the site and the surrounding water must be sustained. As well, there are remains of the seven sixty-five-foot diameter storage tanks that once littered the land of the Amoco Tank Farm. These seven circular foundations must be sustained to preserve the history of the site and will act as a catalyst for the future program. The site itself is flanked by two natural marshes that support local wildlife and will be sustained for environmental, recreational, and educational purposes.

The Amoco site experiences severe flooding throughout the year due to low topography. The Muskegon Lakeshore Trail that physically encompasses the site is often closed due to the flooding. Improving the trail by elevating it to create a boardwalk element will combat flooding and service local ecology while serving residents of the neighboring communities and visitors alike. As a significant node for the Nims Neighborhood, the Amoco Tank Farm site will act as a facilitator for people to be reconnected to Muskegon Lake.

The Lake Express Ferry is a prominent tourist transporter from May to October. The high-speed ferry navigates between Milwaukee and Muskegon three times a day for five months out of the year, cutting a five-hour trip in half. This tourism mechanism transports 45,000–85,000 people per year to and from Muskegon.³ The Muskegon Terminal for the Lake Express Ferry is within walking distance of the Amoco Tank Farm. Connecting these two nodes will act as an entryway for people traveling to Muskegon.

Per the community input survey, public swimming beaches, natural landscapes, play areas for children, and improved paths and green space were the top contenders for the future program of the Amoco site. With its residential location, public park amenities will enhance its sense of place and history on Muskegon Lake's shoreline.

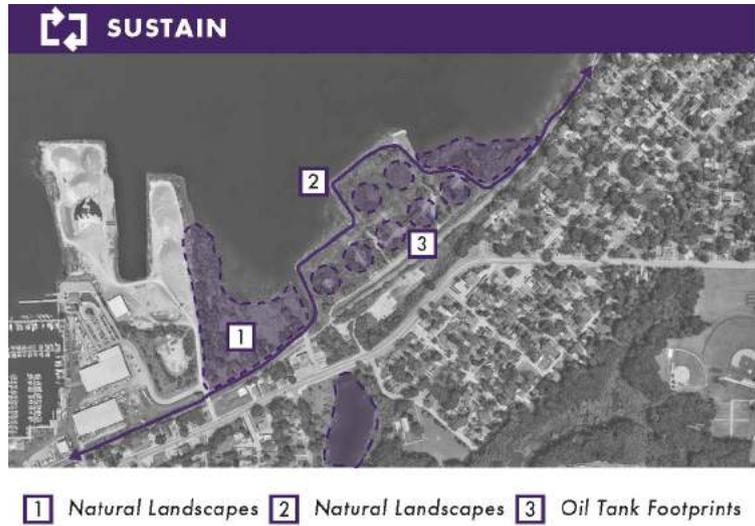


FIGURE 9.2

SUSTAIN

In scale, compared to the B.C. Cobb Plant, the Amoco Tank Farm site is significantly smaller. Although the decommissioning of the site and demolition of the seven oil storage tanks occurred in the 1990s, the interior of the site remains vacant, unused, and unmaintained. On the perimeter of the site, following Muskegon Lakes shoreline, is a segment of the Muskegon Lakeshore Trail that is widely used by residents and visitors of Muskegon.

To the west, a large natural wetland separates the Amoco Tank Farm from G.L.V. L.L.C.—a prominent port for the shipping of aggregate and to the south is Ruddiman Creek and the historic Nims Neighborhood—a medium-density, single-family residential community. Sustaining the natural ecosystems will allow for the appropriate buffering of natural landscaping. Even thirty years later, the footprints of the seven oil storage tanks are imprinted into the site. Sustaining the physical elements as well as the history of the site will engage the local communities into familiar territory.



FIGURE 9.3

ADVANCE

Aforementioned, the Muskegon Lakeshore Trail offsets the coast of Muskegon Lake. As popular as the trail is to residents and visitors alike, high winds and waves have eroded portions of the trail, making it dangerous and impossible to access. Just east of the Amoco Tank Farm, a one and a half-mile long segment of the trail is completely closed due to its erosion and slippage into Muskegon Lake. Situations like these will not go away unless design proposals address the rising water levels and increasing rate of storm surges—designs should allow the water to flood and recede, instead of attempting to design to combat these challenges.



CONNECT

As the Amoco Tank Farm is located in a historic residential neighborhood, it is crucial to re-establish that connection of water and site to the neighborhood. Connectivity can be measured by open access, in terms of walkways into the site and to the water, as well as public easements and amenities.

Physical connections are not unmatched. Creating connectivity through design proposals should go more in-depth than physicalities. In essence, the history and heritage of the site should be expressed in order for residents and visitors to feel connected on an emotional and mental level.



CONVENE

Per the community interest survey, the community would see the Amoco Tank Farm site more engaging if it was maintained and programmed. Designing play interventions for children of all ages, creating a public swimming beach, and establishing reconstructed wetlands would crucially impact the way the surrounding communities interact with the site, as well as visitors from across the state.

All while programming the Amoco Tank Farm, it is imperative to represent and illustrate the history of the site through landscaping strategies and architectural elements. Educating site visitors on-site is also a key metric in designing a waterfront post-industrial site. Educational elements assist in human interaction and memory to post-industrial sites.



FIGURE 9.6



FIGURE 9.7

SITE PLANNING – AMOCO TANK FARM

Following the site analysis guided by the sustain, advance, connect, and convene measurable metric system, two schematic site planning exercises were conducted. Each site planning exercise focused on programming the site, as well as prioritizing zones and elements of the site, referencing the sustain, advance, connect, and convene metrics.

The first site planning exercise focused on schematically programming the site based upon the most recent aerial image. During its industrial apex, seven large cylindrical oil storage drums cluttered the site; the footprints of these oil storage tanks are evident in its urban fabric. Using these impressions to program the site with play areas for children, walkways, and place of engagement would hone in the site’s heritage and represent its legacy as an industrial landmark on Muskegon Lake.

Between the historic Nims Neighborhood and Muskegon Lake is multiple layers of barriers that unsurpassable—steep topography, an abandoned railroad system, and unmaintained vegetation. Creating a circulation system of varying hierarchies of widths and materials will allow for uses to interact individually with the site, as well as decipher specific areas of the Amoco Tank Farm site. Through community feedback, a public swimming beach will make a great addition to this site because of its residential context.

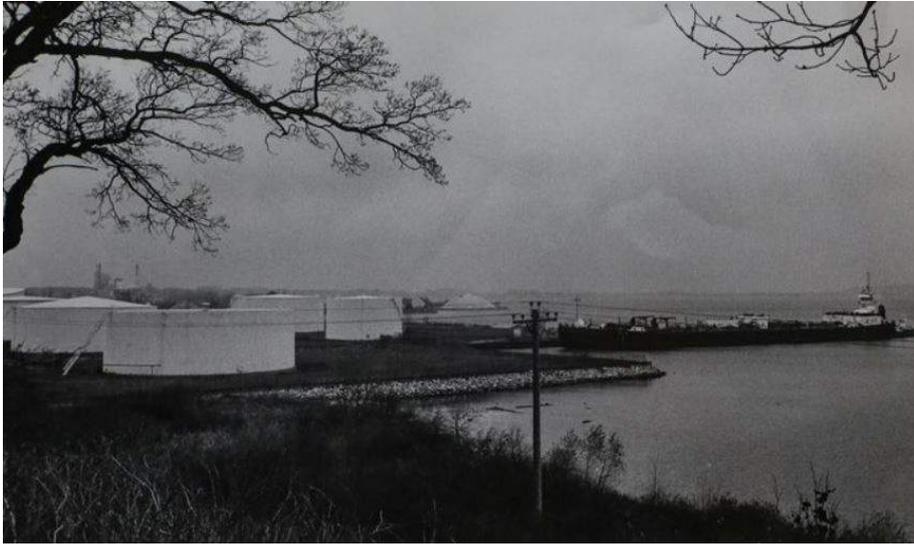


FIGURE 9.8 – the Amoco Tank Farm, 1986.

DESIGN PROPOSAL – AMOCO TANK FARM

Through on-site observations, community engagement and feedback, sustain, advance, connect, and convene site analyses, and multiple iterative site planning exercises, the finalized site plan for the former Amoco Tank Farm site was created to optimize the site's spacial, historical, ecological, and community spaces. In this design proposal, the former-seven oil storage tank footprints convert into programmable catalysts, a public swimming beach is established to further people's desire to be in, on, and near Muskegon Lake, the site's natural terrain is dignified to provoke a sense of place and program year-round, play areas for children of all ages are invoked to accompany the Amoco Tank Farm's highly-residential context, wetlands, and natural ecological ecosystems are reconstructed to sustain wildlife and allow for human interaction and education, and the former shipping dock for oil-importing and exporting is converted into a public marina that can sustain eighteen boats.

During one of its remediation phases, the Amoco Tank Farm lost half of its one-thousand-foot long shipping dock that extended into Muskegon Lake. This design proposal features a representative public marina and watercraft docking area in place of the former shipping dock. This initiative brings the feeling of docking back to its original purpose; not with large ships that import and export oil, but with people's boats to visit the site from Muskegon Lake.

Tank seven of the Amoco Tank Farm stood at the northeastern corner of the site, juxtaposed to the natural terrain and Muskegon Lake. Similarly to the inverted landmark design strategy that is featured in the B.C. Cobb Plant design proposal, the footprint of tank seven will be excavated - allowing a shallow portion of the lake to flow into this circular element. Following remediation of the toxicity of the lake and land, this will be the epicenter of a sizeable reconstructed wetland that will support local wildlife and allow for human interaction.

OVERALL SITE PLAN
FIGURE 9.9



- 1. Marina
- 2. Swimming beach
- 3. Returned tanks
- 4. Viewing platform
- 5. Play areas
- 6. Open area
- 7. Ecological preserve
- 8. Utility
- 9. Parking
- 10. Community center
- 11. Access points
- 12. Retrofitted railroad

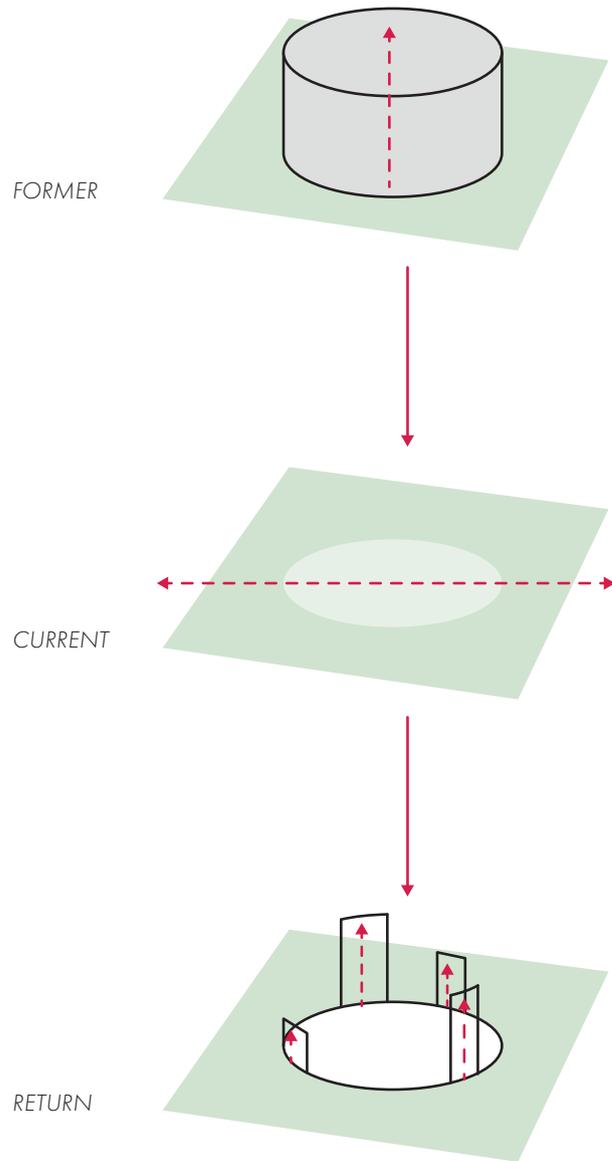


FIGURE 9.10

OIL TANK FOOTPRINT CATALYSTS

Maintaining the seven oil tank footprints that embroider the site allows for designated areas of the program, as well as representing the site's history and culture. The former oil storage tanks stood thirty-feet-tall and were sixty-five-feet in diameter. The site's pathways will engage with the area of the oil tanks while allowing for each tank's footprints to represent itself and its designated program. Some of the oil tank traces act as a catalyst for an activated program, and some of them are transformed by returning the tanks into the site—with the use of precast concrete. The open-space that the returned oil tank possess acts as a catalyst for future events, gatherings, and sculptural displays. The seven areas enable functions of play, rest, viewing, education, and natural ecology.

TANK RETURN STRATEGY

FIGURE 9.11





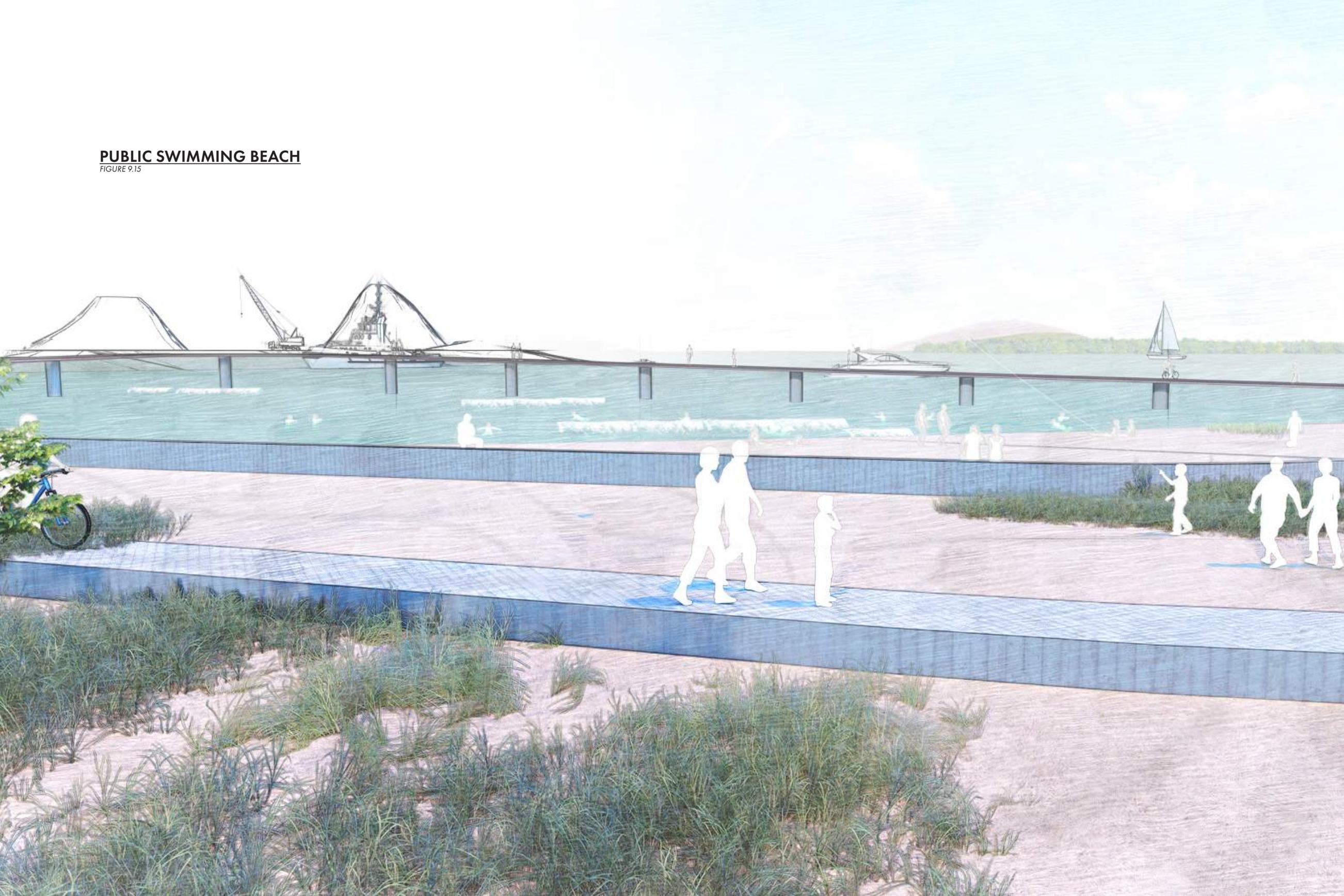
PUBLIC SWIMMING BEACH

Per the community interest survey *(see Appendix A)*, a majority of the community members that responded would prefer to see a public swimming beach on the southern shore of Muskegon Lake. Currently, there is only one small public swimming beach for Muskegon Lake in the Beachwood-Bluffton neighborhood, near the Lake Michigan-Muskegon Lake channel. The former Amoco Tank Farm is an excellent area for a public swimming beach due to its proximity to the highly-residential neighborhoods, Nims and Lakeside. Reinforcing the beach with a concrete frame will protect the sand beach from daily wind and water erosion and water level rise. The concrete frame doubles as a linear sitting and walking edge. The sand will replace the current location of the Muskegon Lakeshore Trail to create a more extensive beach—forcing the path of the trail to extend into the water as a platform dock, which also gives the beach a sense of place.

(Left, from top to bottom): FIGURE 9.12; FIGURE 9.13; FIGURE 9.14.

PUBLIC SWIMMING BEACH

FIGURE 9.15





PROGRAMMABLE TOPOGRAPHY

The idea of programmable or playable topography spawned from the Sketch Problem I design exercise. Although the Muskegon area is relatively flat, in terms of topography, the areas around Lake Michigan and Muskegon Lake are comprised of steep terrain due to glacial erosion. The design proposal for the B.C. Cobb Plant site creates an engineered topography setting for specific programmable use. In contrast, the plan for the Amoco Tank Farm utilizes the existing forty-foot terrain difference as an incentive for multi-seasonal activities. The hill that separates the site from the Nims and Lakeside neighborhoods, as well as Lakeshore Drive, is converted into a manicured slope that inhibits picnics, play, and viewing in the warmer months, and sledding and other recreational winter activities in the colder months. This may seem like a small design gesture, but enacting this proposal will draw in individuals and families into the site during the entire year. As well, programmable topography is performed within the site in the areas where tanks three and four once stood. Various-scaled hemispherical hills and voids create a playscape for children—possessing netted-trampoline characteristics for children of all ages to enjoy.

(Left, from top to bottom): FIGURE 9.16; FIGURE 9.17; FIGURE 9.18.

PROGRAMMABLE TOPOGRAPHY

FIGURE 9.19



MUSKEGON LAKESHORE TRAIL

10

// *A lake is the landscape's most beautiful and expressive feature. It is earth's eye; looking into which the beholder measures the depth of his own nature. The fluviate trees next the shore are the slender eyelashes which fringe it, and the wooded hills and cliffs around are its overhanging brows.*

Walden, Henry David Thoreau

MUSKEGON LAKESHORE TRAIL

“Over a lengthy period of Muskegon’s history, Muskegon Lake was valued mainly for its ability to support heavy industry, not recreation. For the general public, access to most of the city’s shoreline, which meanders around Muskegon Lake, took real effort.”¹ In the 2000s, the Muskegon Chronicle interviewed someone from Milwaukee who had visited Muskegon. He stated that “a stroll around Muskegon Lake requires dodging cars, jumping chunks of concrete and skirting barbed wire.”²

The twelve-mile-long Muskegon Lakeshore Trail winds along the shore of Muskegon Lake. Paralleling Lakeshore Drive and Shoreline Drive, the trail offers views of the lake, the channel, the South Pier Light House, and provides partial pedestrian access to historical and maritime attractions, dining venues, and seasonal festivals.³ The Muskegon Lakeshore Trail is anchored in the east at the Muskegon Nature Preserve and in the west at the historic Lake Michigan Pere Marquette beach.

Between the two anchors, the pedestrian trail navigates through residential, commercial, waterfront, and industrial zones, but the path does not change. The lack of differentiation and wayfinding confuses its visitors and does not lend itself to act as an agent for connectivity. In some areas, specifically the Amoco Tank Farm site, the Muskegon Lakeshore Trail is closed due to flooding and infrastructure damages. In other areas, the trail seems to disappear into the street without any designation of walking or cycling.

High winds and waves have eroded portions of the Muskegon Lakeshore Trail, making them dangerous to access. Most recently, a one and a half-mile long segment of the trail closed due to its erosion and slippage into Muskegon Lake. Muskegon city officials cannot repair the severe damages until the warmer months because asphalt plants are seasonal.⁴ Seasonal erosion



is not the only predator for the multiuse trail—climate change that has risen Lake Michigan/Muskegon lake water levels profoundly impact the condition of the trail. Seventy-five percent of the Muskegon Lakeshore Trail runs parallel with Muskegon Lake’s shoreline;⁵ adapting the trail for climate change would leave a lasting impact on its use and its users.

Additionally, in many segments of the trail, there is a lack of buffering, shading, and resting and refreshment areas. In order to reestablish the Muskegon Lakeshore Trail as the predominant artery of Muskegon’s circulation and recreation, interventions of wayfinding, placemaking, nodes, and landmarks are strategies in the design proposal. The trail must act as a threshold to reconnect the community to its lake. Material changes, proper wayfinding devices, the biodiversity of vegetation and surrounding context, and a properly maintained lakeshore trail are employed.

(Top): FIGURE 10.1 – a map of the Muskegon Lakeshore Trail, its connections to other trails, parking areas, and boat-launching areas. (Right): FIGURES 10.2 & 10.3 – photos that show the damage caused by high water and wind and wave erosion to a 500-foot section of Muskegon’s Lakeshore Trail.



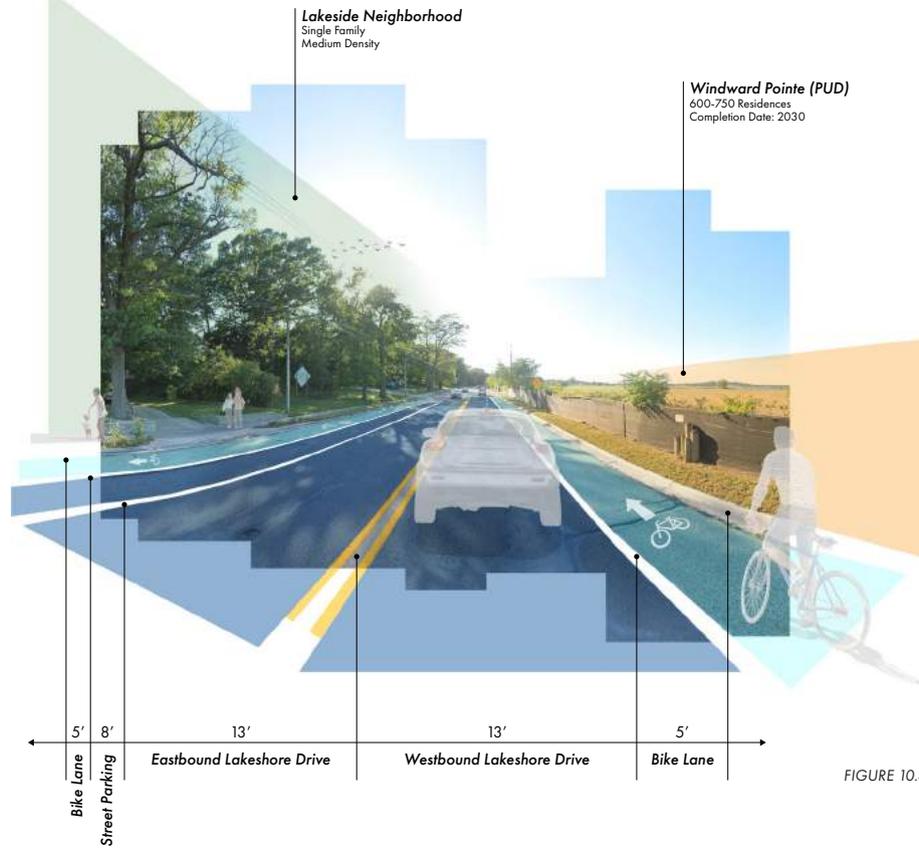


FIGURE 10.4

THE MISSING LINK

While the research and analysis of the Muskegon Lakeshore Trail were occurring, the complexities of the trail and its varying contexts and conditions were evident. However, there was a more definite sense of urban typology in which the lakeshore trail could consist. Although the Muskegon Lakeshore Trail winds through empty grasslands, industrial parks, natural wetlands, along Muskegon Lake, and hugging Lake Michigan's dunes, it flows through broader contexts, as well. More ubiquitous environments such as the suburban, urban, and waterfront contexts were identified.

A subsequent analysis of each context and its conditions, both positive and negative, was conducted. There are overarching themes in which the multiuse trail lacks—a sense of place, wayfinding devices, connectedness, activity, accessibility, and safety, to name a few. Also identified were urban design and architectural issues such as a lack of resting and refreshment areas, poor lighting, limited shading, and programming and activity zones. Within a trail that can host recreational activities such as running and walking, cycling, and snowmobiling in the winter months, these lacking elements are crucial in creating a cohesive atmosphere.

Connectivity was the most apparent issue—a large portion of the Muskegon Lakeshore Trail was missing. Bordering the former Sappi Paper Plant on Lakeshore Drive (a broad two-lane road that acts as a primary circulation path for vehicles to go from Muskegon's urban and residential areas to Lake Michigan), the trail dissolves into the road without proper wayfinding devices. The graphic to the left is the design proposal for this stretch of the Muskegon Lakeshore Trail. The proposed design creates a new streetscape for this area, without creating street-adjacencies.

FIGURE 10.5 – Suburban Context Map



FIGURE 10.6 – Waterfront Context Map



FIGURE 10.7 – Downtown Context Map



SUBURBAN CONTEXT

While the design proposal for the suburban segment of the Muskegon Lakeshore Trail caters explicitly to the Lakeside Neighborhood, the trail itself passes through three other residential neighborhoods—Beachwood-Bluffton, Nelson, and Nims. When the Sappi Paper Company was in operation, Lakeshore Drive was the primary street for traveling to and from the factory; it was heavily used by cars and by large trucks. Therefore, the street had to be of large scale, measuring almost forty-four feet wide. Presently, the factory is gone. Within the next ten years, a sizeable planned-unit development of 600-750 residences will take its place. Considering the busyness and congestion of Lakeshore Drive when construction of the development completes, is appropriate, but enhancing the community scale of the streetscape would ensure public interest from future developers, residents, and visitors.

In its current state, the suburban section of the Muskegon Lakeshore Trail, on Lakeshore Drive, lacks connectedness, a sense of place, shading, and scale. Although the houses that run parallel to Lakeshore Drive are physically connected to the street (via architectural positioning and pathways), an interaction of connectivity is not evident. Overall, this stretch of the trail is free of landscaping—there are minimal trees for scale and shading.

The proposed plan for this portion of the Muskegon Lakeshore Trail places the driveable street on a diet. The proposed street shrinks to two-lanes, one in each direction, contrasting the existing streetscape. This strategy will allow for parallel street parking on the eastbound side and a bike line in each direction, which emphasizes its fluidity and connectedness with the lakeshore trail. Trees are also added on each side of the street to ensure scale and shading for users.

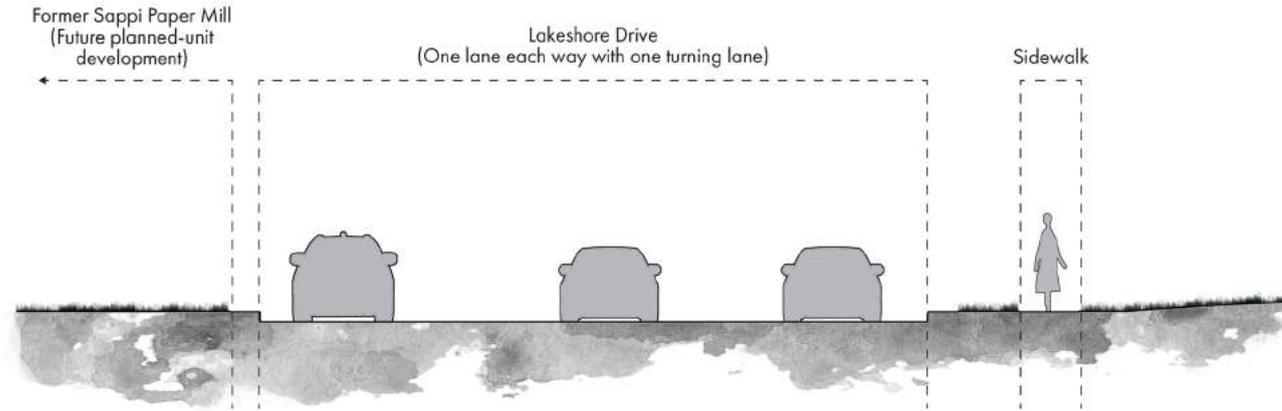


FIGURE 10.8

EXISTING LAKESHORE TRAIL SECTION (SUBURBAN CONTEXT)

Lacks:
 Connectedness
 Sense of place
 Shading

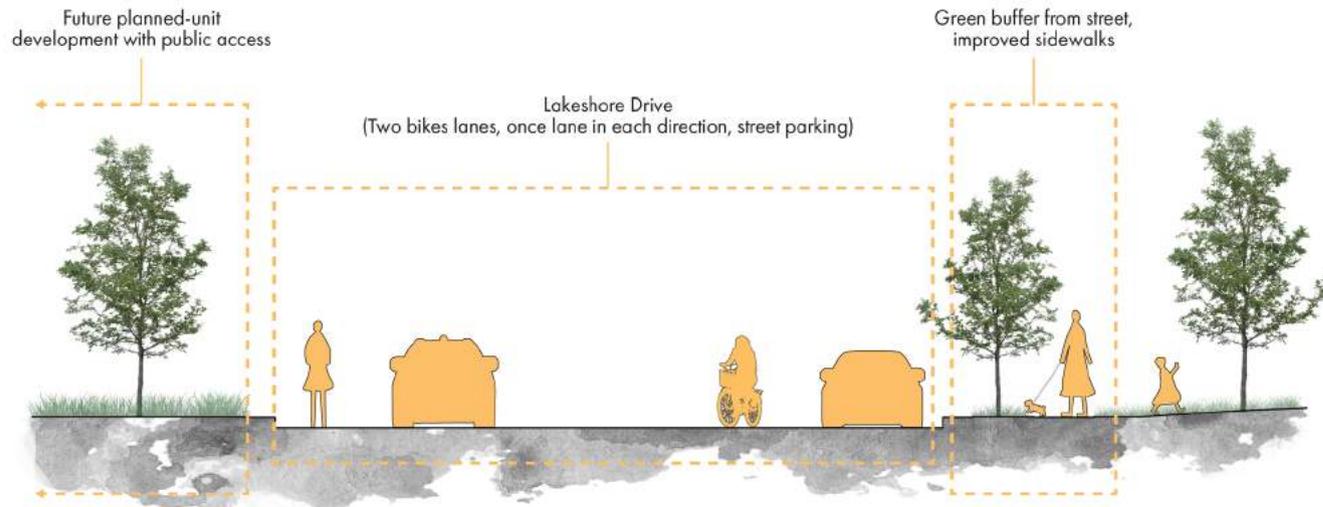


FIGURE 10.9

PROPOSED LAKESHORE TRAIL SECTION (SUBURBAN CONTEXT)

Enhances:
 Sense of place
 Connectedness
 Activity
 Shading
 Safety
 Accessibility

DOWNTOWN CONTEXT

Although the downtown portion of the Muskegon Lakeshore Trail is the most maintained portion of the trail, it is bleak and empty in appearance. As the path roams around the perimeter of Downtown Muskegon, users have the opportunity to experience views of Muskegon Lake, the Shoreline Inn, the historic Mart Dock, Downtown Muskegon, and the city's largest park, the Heritage Landing. A majority of the downtown segment of the Muskegon Lakeshore Trail is composed of large grassy clearings that separate the waterfront from the city, a railroad, and Shoreline Drive—a 80-foot broad causeway that winds around the city and its harbor.

Here, there is a definite absence of connectedness to the city center and the waterfront, shading, proper lighting, and resting and refreshment areas along the trail. Within the downtown context, the lakeshore trail is merely a paved pathway, ambiguously going in two directions. There are a variety of barriers that separate the Muskegon Lakeshore Trail from the lake and the city. Hardscapes such as the railroad and Shoreline Drive, which both run parallel with the trail, establish hard boundaries for users that wish to overcome to experience the trail and the lake.

Nevertheless, urban and scenic views go unhindered. However, the proposed design strategy for the downtown part of the Muskegon Lakeshore Trail enhances the aspects that residents and visitors cherish. The design proposal enacts multiscaled vegetation to the median of Shoreline Drive and between the trail and railroad—which acts as a green buffer to create a sense of place, creates shading from sunlight and wind, and provides scale for the vast area. Creating areas of refuge refreshment may seem like a small design gesture, but they allow users to stop and relax amidst their run or walk, tie their shoes, and drink water.

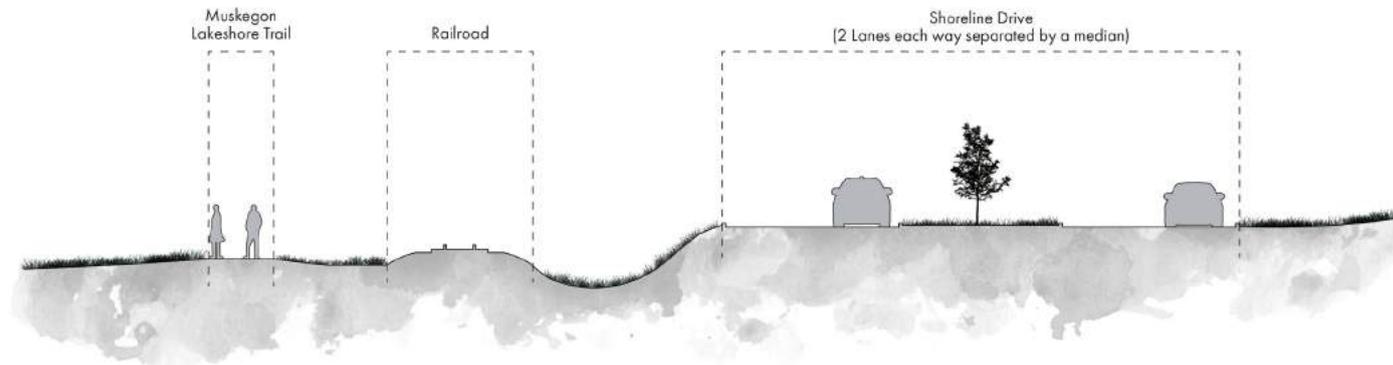


FIGURE 10.10

EXISTING LAKESHORE TRAIL SECTION (DOWNTOWN CONTEXT)

- Lacks:**
- Sense of place
 - Connectedness
 - Shading
 - Resting areas
 - Wayfinding devices
 - Lighting sources

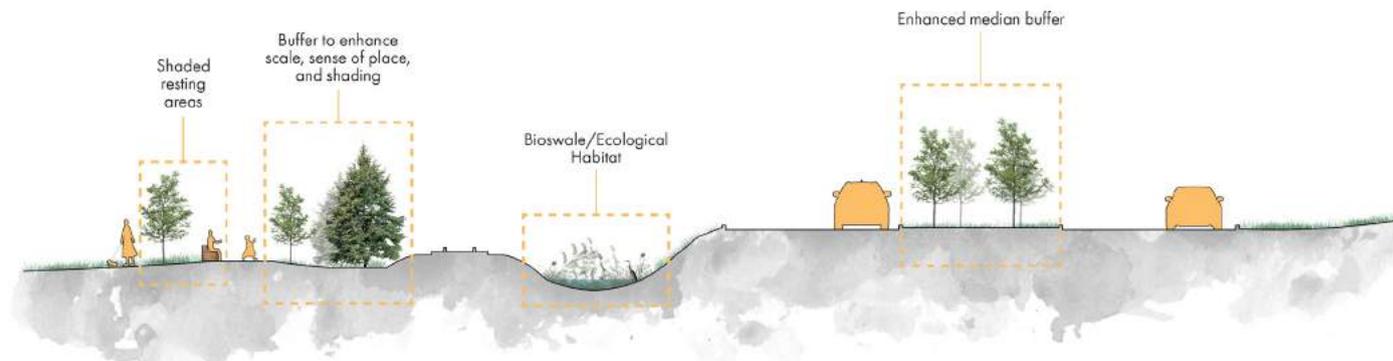


FIGURE 10.11

PROPOSED LAKESHORE TRAIL SECTION (DOWNTOWN CONTEXT)

- Enhances:**
- Sense of place
 - Connectedness
 - Shading
 - Resting areas
 - Ecological habitats
 - Green buffers

WATERFRONT CONTEXT

The waterfront section is the most drastically altered portion of the Muskegon Lakeshore Trail, due in part to its current hazardous conditions and predictions of rising water levels. The waterfront context portion of the trail spans an array of different sites and landscape conditions. However, the most damage to the Muskegon Lakeshore Trail has occurred where the trail encompasses the former Amoco Tank Farm. Here, the trail winds around the perimeter of the site, outside of the retaining walls that once enclosed the seven large oil storage tanks. At the Amoco Tank Farm site, the trail is at sea level and often floods and becomes inaccessible to its users. Coinciding with the downtown and suburban contexts of the lakeshore trail, the connectedness of the trail and its site, adequate accessibility, activity and program, and safety are lacking.

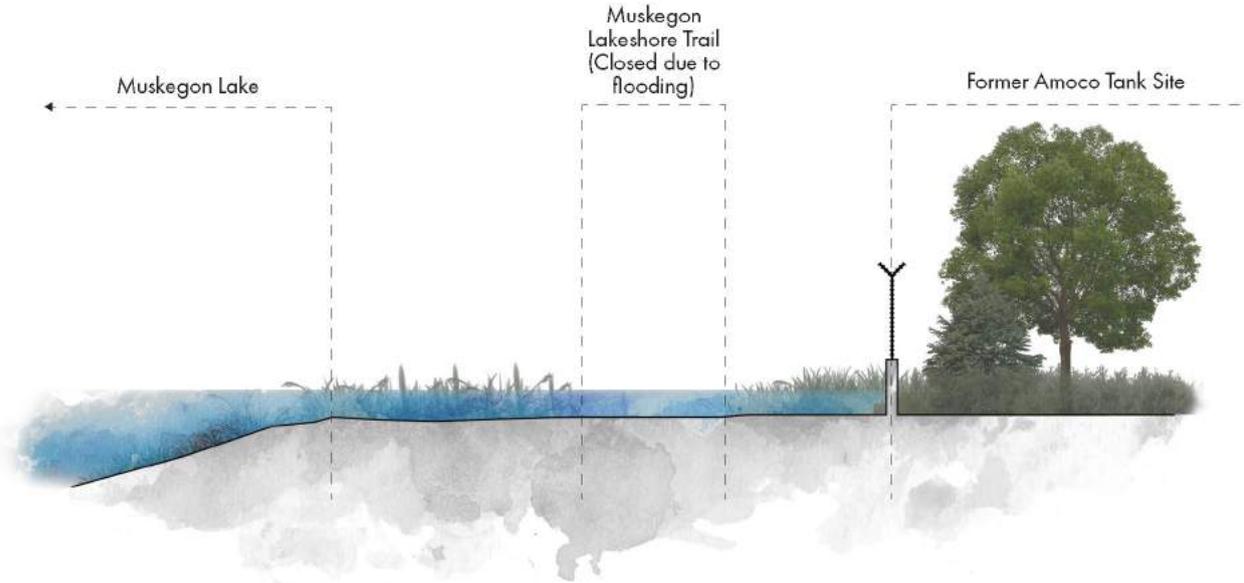


FIGURE 10.12

EXISTING LAKESHORE TRAIL SECTION (WATERFRONT CONTEXT)

- Lacks:
- Connectedness
 - Lighting sources
 - Accessibility
 - Activities and program
 - Safety

The proposed plan for this specific context of the Muskegon Lakeshore Trail directly corresponds with the design proposition for the former Amoco Tank Farm. The tank farm site will transform into a waterfront public park. In response to the consistent flooding in this area, the design solution for the trail is to lift it from the ground and create an elevated wooden walkway. This design will allow Muskegon Lake's water levels to increase and decrease while protecting the walkway and reestablishing healthy wetlands around the elevated pathway. The differences in materiality, size, and direction will heighten the areas' sense of place, its accessibility, and its connectedness to the Amoco Tank Farm site, and the trail in its entirety. Allowing for changes in water levels and biodiversity, instead of combating it, allows for nourishing ecological habitats to flourish, which is beneficial for the sensitive and complex ecosystems of Muskegon Lake.

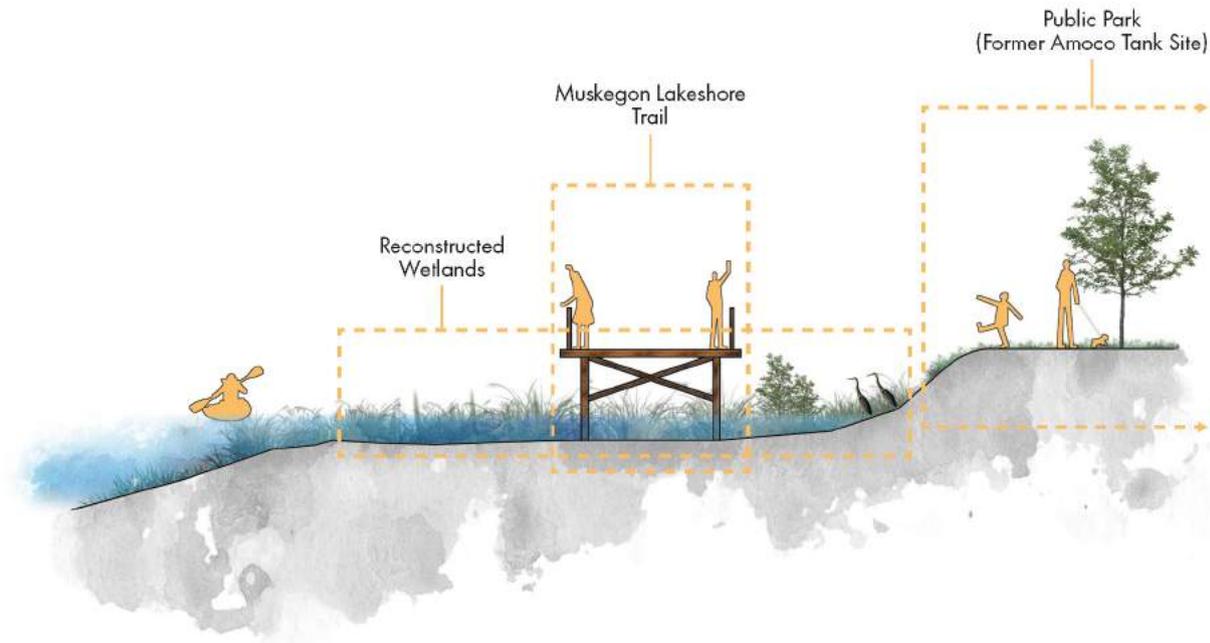


FIGURE 10.13

PROPOSED LAKESHORE TRAIL SECTION (WATERFRONT CONTEXT)

- Enhances:
- Sense of place
 - Connectedness
 - Activity
 - Accessibility
 - Ecological habitats
 - Viewing platforms

CONCLUSION

11



ACTIVISM

Muskegon was once an illustriously industrial area that powered homes and business, employed thousands of blue-collar workers with stable unionized jobs, and catalyzed the idea of a working-class industrial city. Like many industrial cities in the United States, Muskegon has persevered through countless cultural, social, environmental, and economic paradigm shifts that caused fluctuations in jobs, facilities, and pollution. As the science and education of our changing world progresses, as does (hopefully) the mentalities of company executives, workers, and the communities and organizations that share a living context with each industrial facility. Some may point fingers at liberal governments and activist organizations for the downfall of the fossil-fuel industries of Muskegon. Still, the defeat of the toxic-polluters comes to no surprise. The transition to cleaner energy and safer industrial facilities does not benefit a few; it helps all in the world that we inhabit.

Muskegon, Michigan, will invariably be considered an industrial, blue-collar, working-class city. In the same vein, the progression and regeneration of Muskegon Lake, its shoreline, and the people who enjoy the lake all share a common idea of protecting the land and the water. Municipalities like the city of Muskegon and North Muskegon, Muskegon County, and the State of Michigan, as well as dozens of independent organizations such as the Muskegon Lake Watershed Partnership (MLWP), the Michigan Department of Environmental Quality Remediation Division (MDEQRD), and the Michigan Department of Natural Resources (DNR), have put forth initiatives and proposals for the betterment of Muskegon Lake.

From the beginning of its human occupation, the Muskegon Lake area has been surrounded by people who push the envelope and cumulative ideas, and its present-day population is no different. On a smaller scale, Muskegon-area residents are motivated to conduct beach clean-ups, and dozens of boaters and kayakers skim the top of Muskegon Lake and its wetlands to collect litter and pollution. On a larger scale, neighborhood organizations and environmental organizations rally together to remediate shorelines and post-industrial sites.

(left, from top to bottom): **FIGURE 11.1** – Brian Anderson picks up trash using his kayak during the 26th annual Grand Trunk Restoration Day on Friday, May 20, 2016, in Muskegon. Anderson picked up a variety of trash, including baseball caps, shoes, and used his kayak to pull out a large pallet and tire; **FIGURE 11.2** – a man picks up trash along the shoreline during the 26th annual Grand Trunk Restoration Day on Friday, May 20, 2016 in Muskegon.

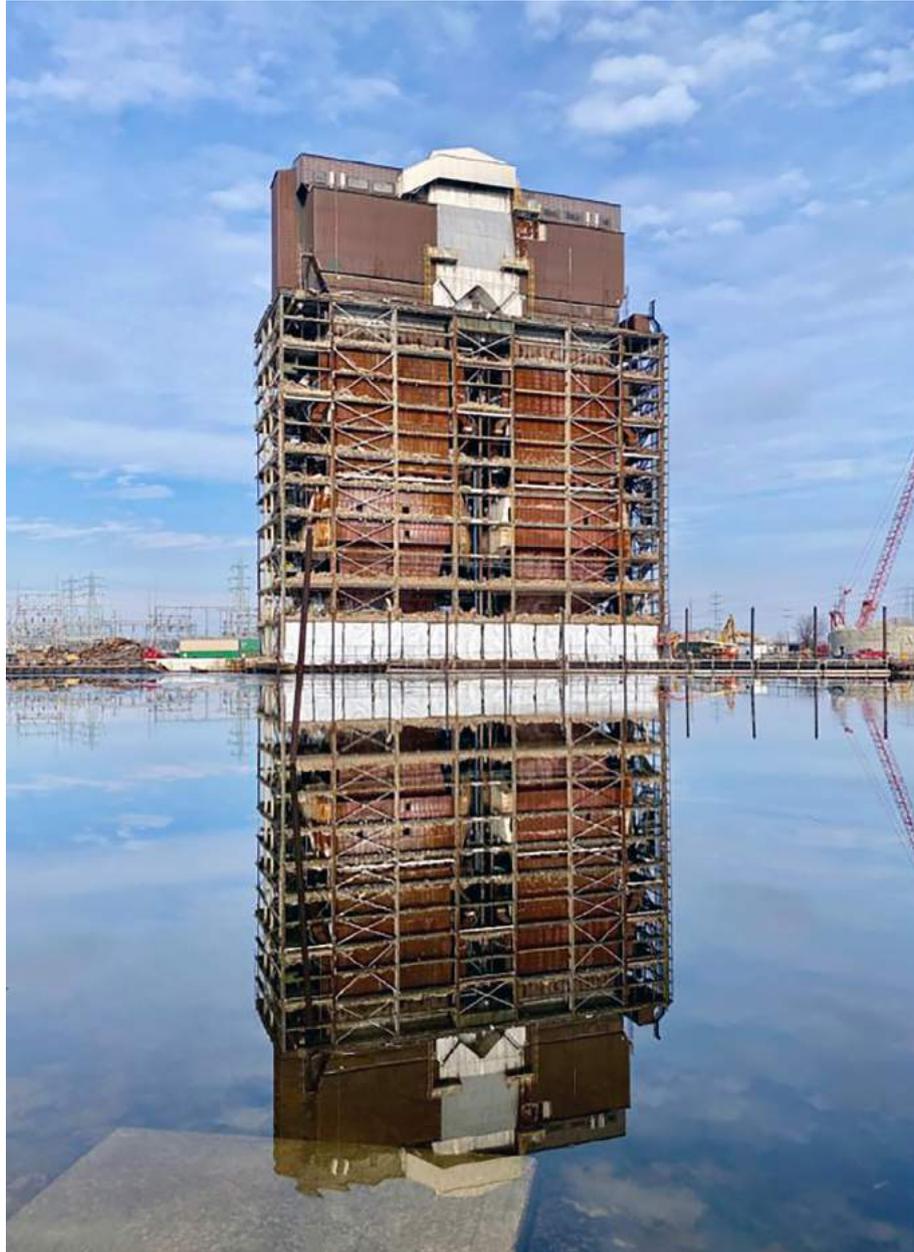


PROGRESSION

In terms of environmental cleanup, regeneration, and care, as well as developmental and economic resiliency, more improvement is being made in the last twenty years, than any other year of Muskegon's settlement. Dozens of community organizations and thousands of individuals are banding together to fight for the health and cleanliness of Muskegon and Muskegon Lake. Additionally, developers begin to see the potential in Muskegon Lake's post-industrial waterfront and other properties in Muskegon. The downtown district of Muskegon looks near-unrecognizable to its design and arrangement in the twentieth century, due to the collapse of the downtown mall and the evacuation of dozens of businesses. But, that is a positive attribute—Muskegon's downtown core is experiencing an influx of breweries, shops, and commercial and residential developments.

One deposition to the remediation and regeneration of Muskegon's post-industrial sites is the immediate idea and action of demolition when it comes to the architectonic elements. Some contaminated sites and facilities in the Muskegon Lake region have no saving grace and have been or plan to be demolished. However, there are vast examples of reclaimed post-industrialism throughout the world that Muskegon and its developers could take as precedent.

(left, from top to bottom): **FIGURE 11.3** – demolition crews work on removing the former Anaconda Wire building in the 1000 block of Western Avenue on Monday, Oct. 24, 2016 in Muskegon; **FIGURE 11.4** – crews from Melching, Inc. and other sub-contractors continued demolition work at the former Sappi paper plant on Wednesday, July 25, 2012.



CONCLUSION

Amid Muskegon's comeback and emergent resiliency, the design proposals for the former B.C. Cobb Plant, former Amoco Tank Farm, and the Muskegon Lakeshore Trail ensure the appropriate contextual scale, proper accessibility for people of all ages, and necessary ecological and anthropomorphic qualities of Muskegon, Muskegon Lake, and its residents and visitors.

The design proposition for the B.C. Cobb Plant site utilizes its already changing landscape to confront toxicity in land and water while allowing the community-led program to become activated within this large site. The demonstration of the inverted landmark, fish hatchery, and added topography are newly-designed features but represent the site's longstanding history of being a landmark of power and economies. The remainder of the site is conditionally designed as well but lends the idea of flourishing natural landscapes for Muskegon and North Muskegon's residents and visitors to enjoy.

Elements of the Amoco Tank Farm site follow the same design guidelines as the B.C. Cobb Plant site, but at a smaller scale and context. Situated in the highly-residential neighborhoods of Nims and Lakeside, softer programs of play interventions and a public swimming beach will accurately represent its context. Near the Amoco Tank Farm site is the Muskegon, Michigan Terminal for the Lake Express Ferry that travels between Milwaukee, Wisconsin and Muskegon multiple times a day during the warmer months. Having a multi-programmed park near this terminal will allow visitors a warmer-welcome as they adventure into Michigan.

Finally, the design proposals for the urban, suburban, and waterfront contexts of the Muskegon Lakeshore Trail address the impeding issues that it currently faces and is tremendously damaged. With these design guidelines for the scenic trail, users will experience a sense of place within each segment of the trail, as well as resting areas and refreshment areas for cyclists, joggers, runners, and walkers.

Through extensive community engagement, etic and emic research methods, and subjective and objective site analyses, the designs for the B.C. Cobb Plant site, Amoco Tank Farm site, and the Muskegon Lakeshore Trail ensure appropriate accessibility to each site and Muskegon Lake, a cohesive and comprehensive connectivity strategy, educational and recreational possibilities, the representation of history and memory, proper placemaking and wayfinding devices, and the acknowledgment and dissection of our world's shifting landscapes.

Left: FIGURE 11.5 – the B.C. Cobb Plant's structural body is unveiled during demolition during the fall of 2019.

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APPENDIX A



FACEBOOK POST A

JANUARY 19, 2020 1:55 PM

Logan Flowers to the Muskegon Watershed Partnership Shoreline Stewards Facebook page:

*Hi, Everyone,**My name is Logan Flowers (a Muskegon area native). I am a graduate thesis candidate at the University of Detroit Mercy School of Architecture. Being proud of my roots in Muskegon, my Master's Thesis project is researching Muskegon Lake's shoreline. Through urban design, ecological awareness, and current/future planning initiatives, my thesis project will create a plan to create more useable, accessible, and aesthetically pleasing public spaces on the southern coast of Muskegon Lake. In November, I attended a MLWP meeting that discussed public access to Muskegon Lake (which was a fantastic meeting).**I am currently researching the old Amoco Tank Farm site as a point of opportunity for future public recreation and activity. Does anyone have any personal accounts (you or someone you know) of working at the Amoco Tank Farm, good-quality historical images, or any information about the Amoco Tank Farm and its site?**Thanks, everyone!
-Logan***FACEBOOK POST B**

JANUARY 23, 2020 1:18 PM

Logan Flowers to the Muskegon Watershed Partnership Shoreline Stewards Facebook page:

*Hi, Everyone,**Again, thank you for your awesome connections and references in relationship to my graduate thesis project. I've created a short anonymous survey to gain community input for my research. The questions include some sociodemographic information and some specific questions concerning Muskegon Lake. If you wish, I'd love for you to complete my survey. It will only take about 5 minutes to complete! If you have any questions or concerns about my graduate thesis work or the survey, please comment below and I will answer promptly.**Thanks, everyone!
-Logan**Survey:
<https://forms.gle/t3JPcGcfS9WeQdt7A>***FACEBOOK POST C**

JANUARY 20, 2020 11:34 AM

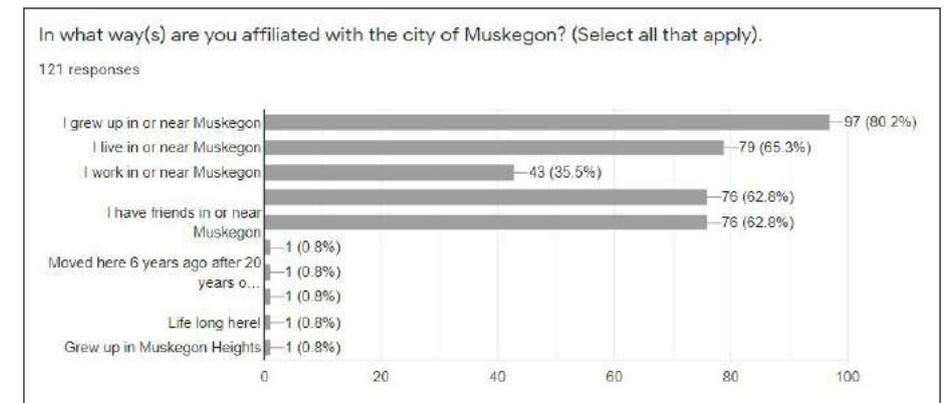
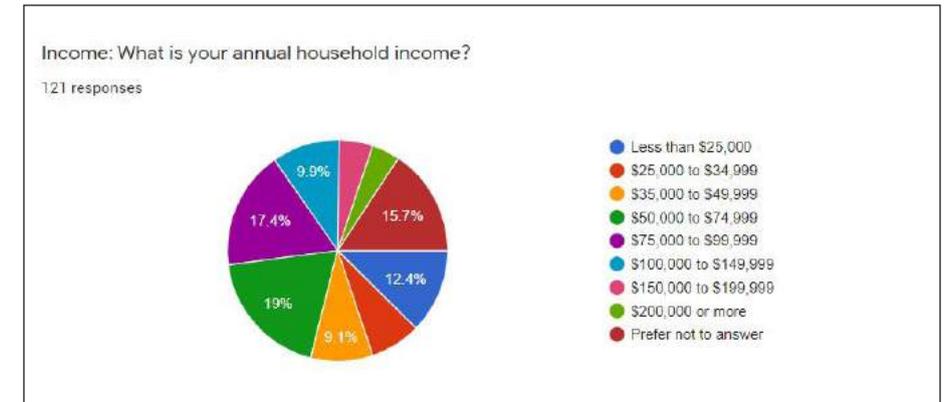
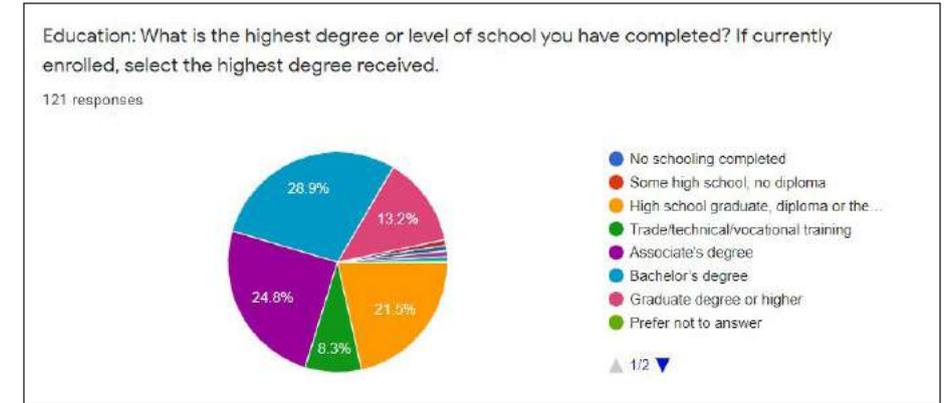
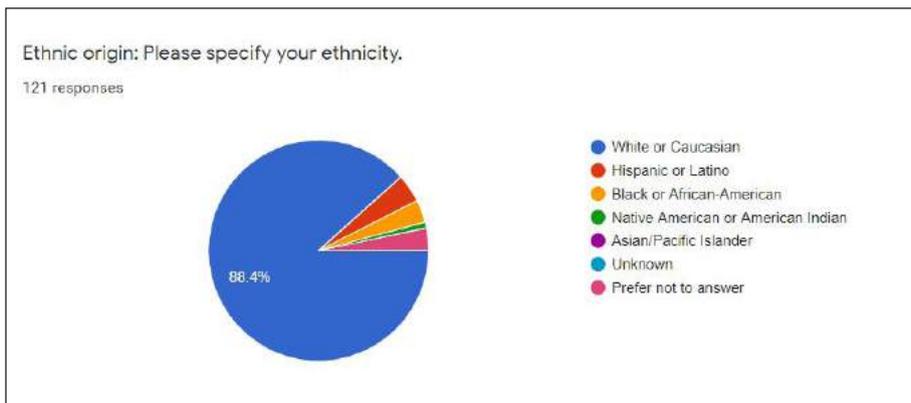
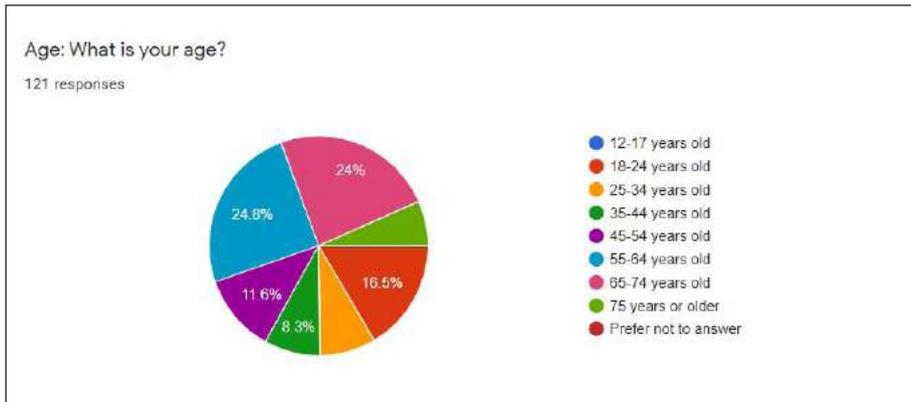
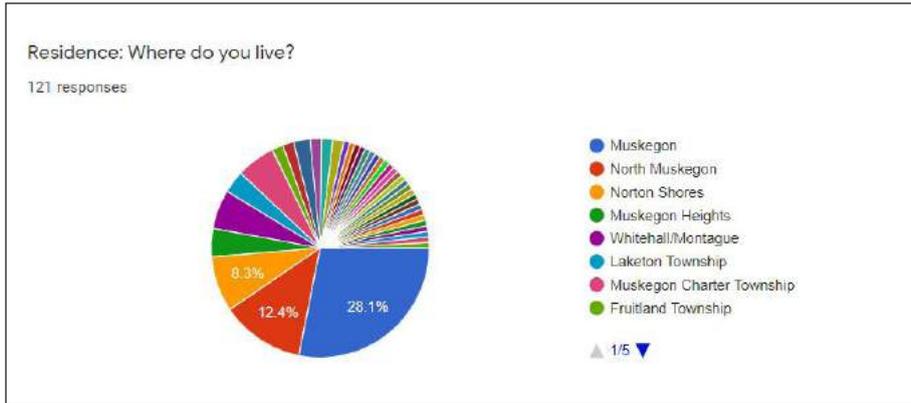
Logan Flowers to the Muskegon's Memory Lane Facebook page:

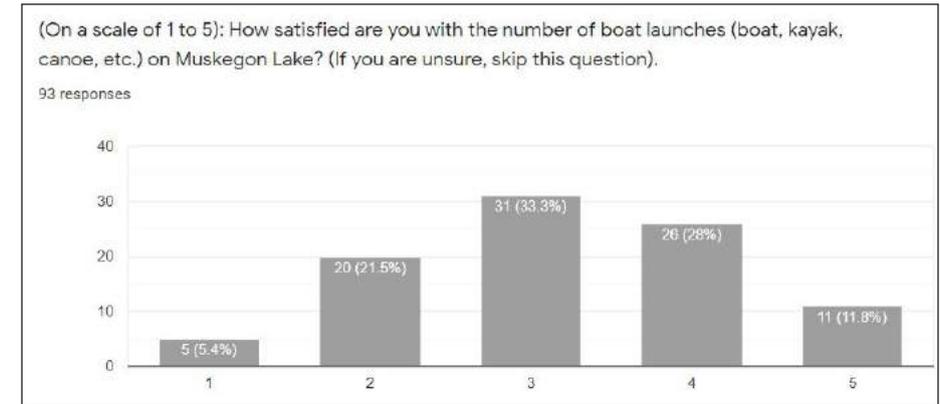
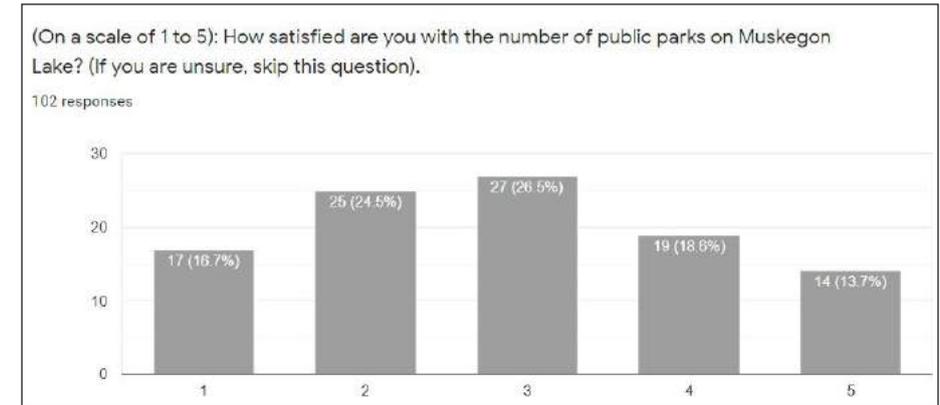
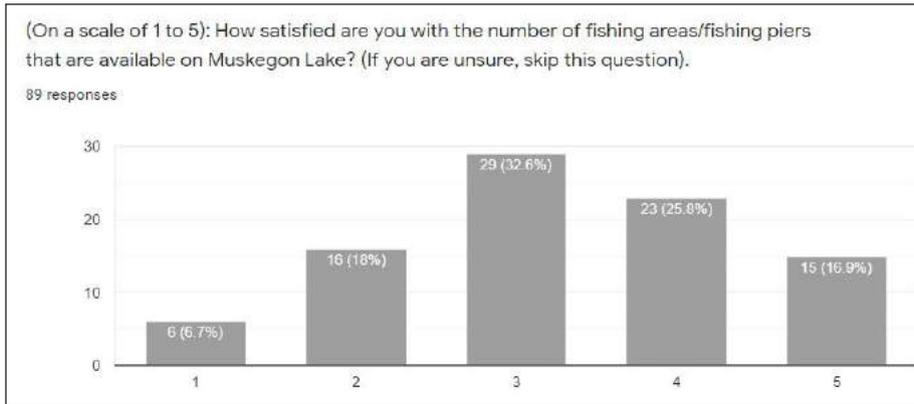
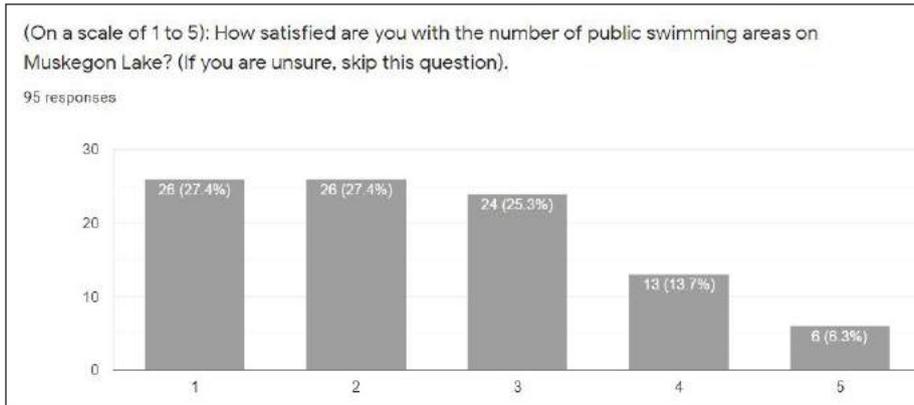
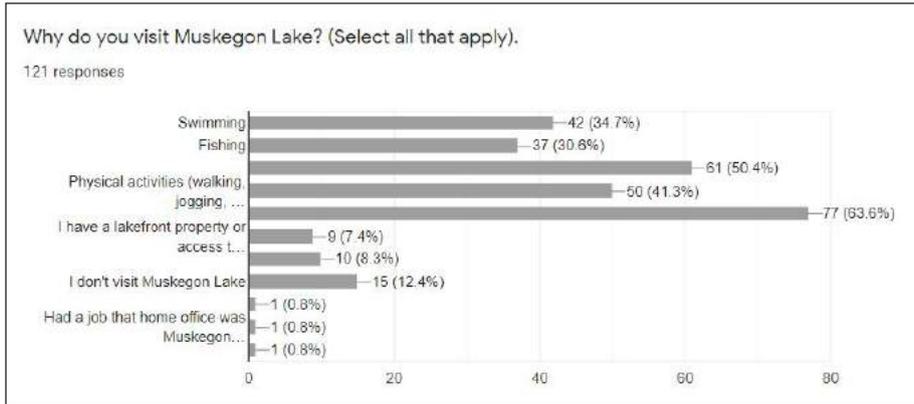
*Hi, Everyone,**My name is Logan Flowers (a Muskegon area native). I am a graduate thesis candidate at the University of Detroit Mercy School of Architecture. Being proud of my roots in Muskegon, my Master's Thesis project is researching Muskegon Lake's shoreline. Through urban design, ecological awareness, and current/future planning initiatives, my thesis project will create a plan to create more useable, accessible, and aesthetically pleasing public spaces on the southern coast of Muskegon Lake.**If anyone has personal accounts of working in any old factories that were located on Muskegon Lake (Sappi, B.C. Cobb, Amoco, etc.) or any high-quality imagery of anything to do with Muskegon Lake and its shoreline, that would be fantastic! I will also happily take other information, statistics, opinions on the lakeshore.**Thanks, everyone!
-Logan***FACEBOOK POST D**

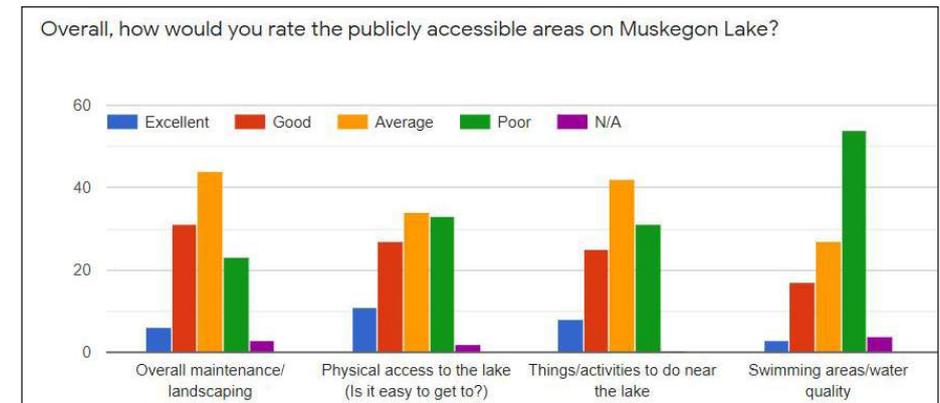
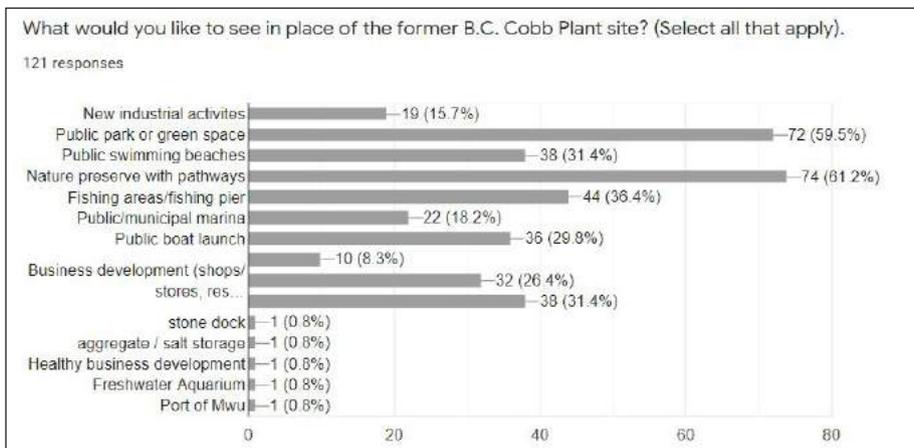
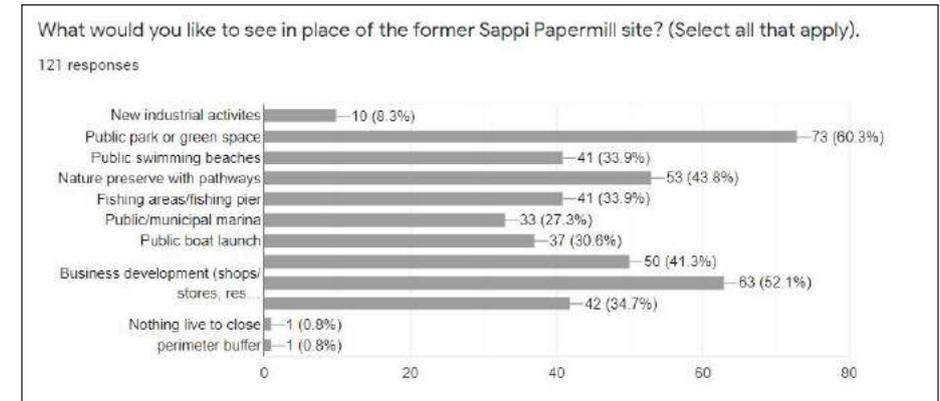
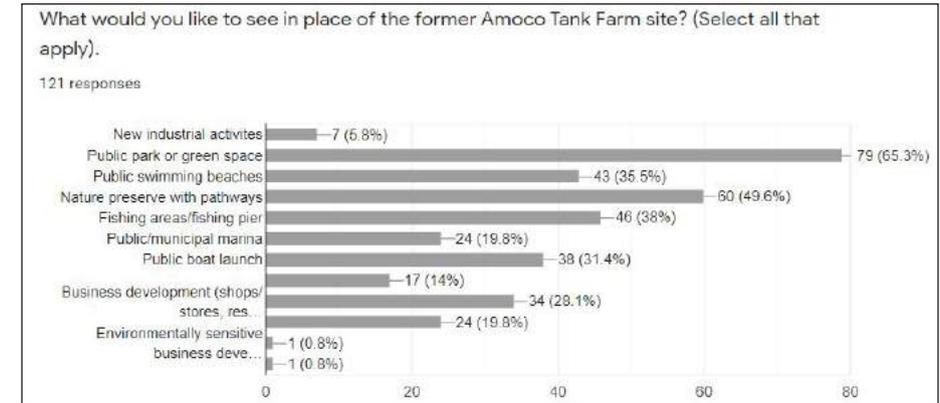
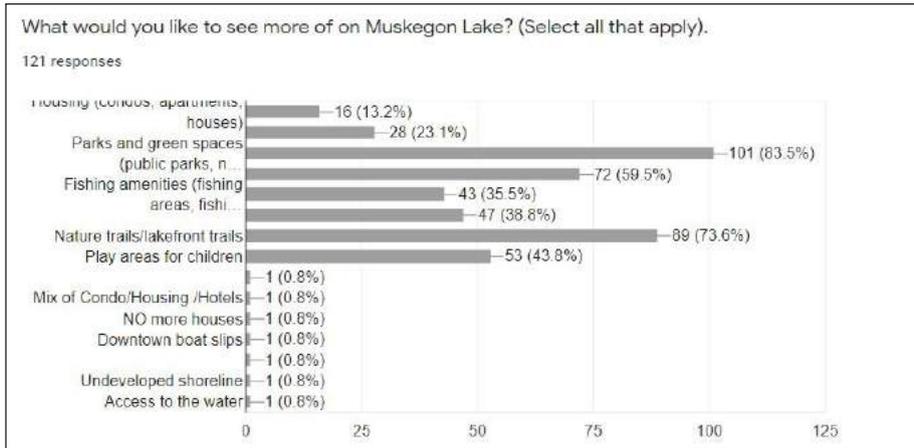
JANUARY 23, 2020 11:04 AM

Logan Flowers to the Muskegon's Memory Lane Facebook page:

*Hi everyone,**Again, thank you for your awesome connections and references in relationship with my graduate thesis project. I've created a short anonymous survey to gain community input for my research. The questions include some sociodemographic information and some specific questions concerning Muskegon Lake. If you wish, I'd love for you to complete my survey. It will only take about 5 minutes to complete! If you have any questions or concerns about my graduate thesis work or the survey, please comment below and I will answer promptly.**Thanks, everyone!
-Logan**Survey:
<https://forms.gle/t3JPcGcfS9WeQdt7A>*





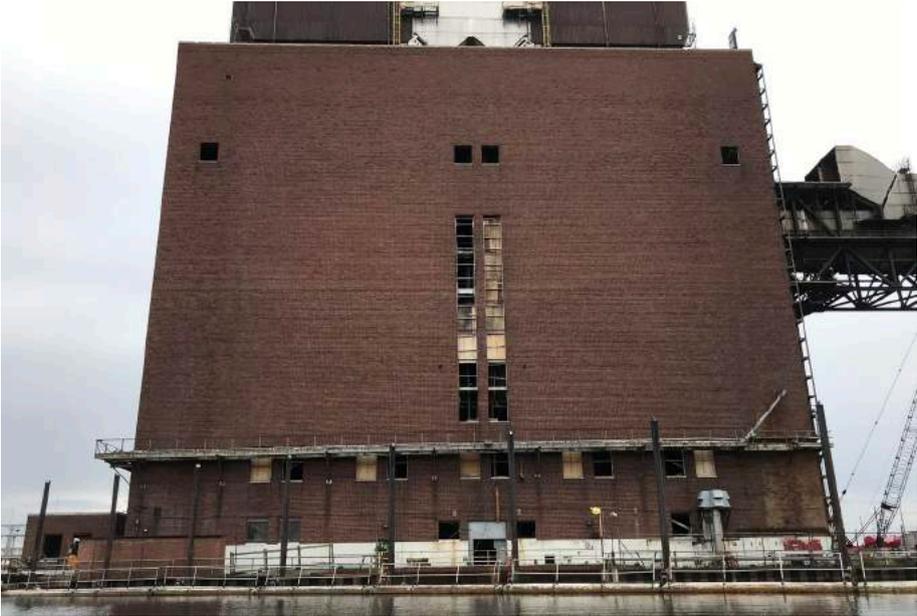


APPENDIX B

iv









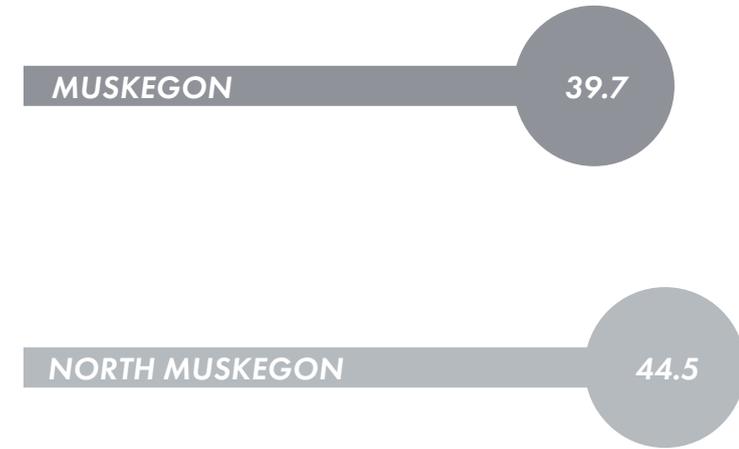
APPENDIX C



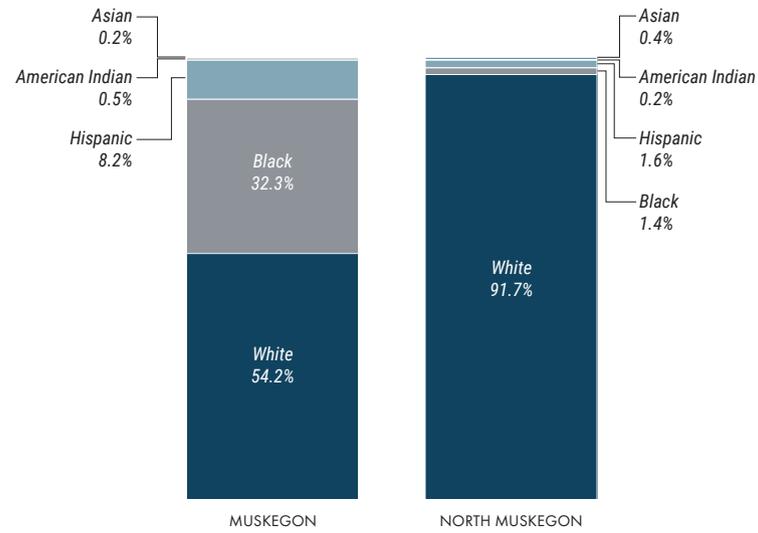
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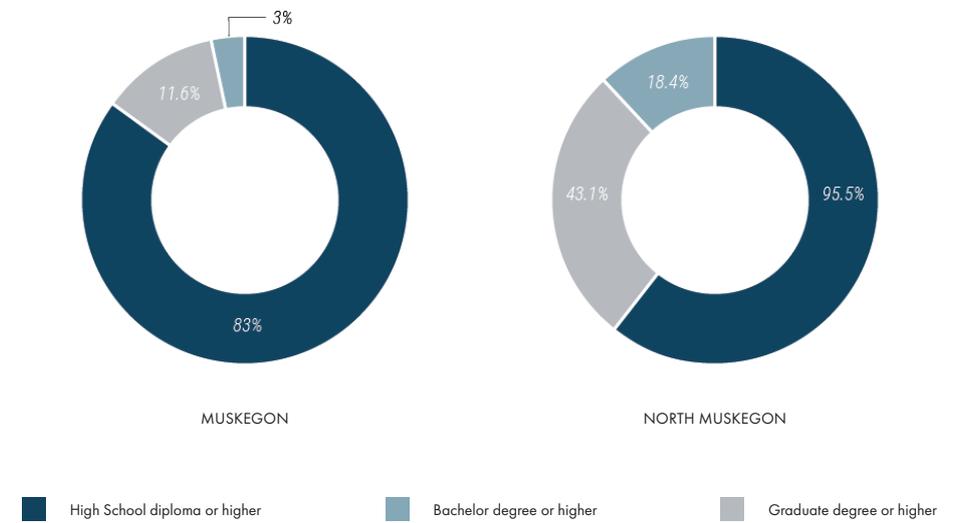
C. MEDIAN AGE



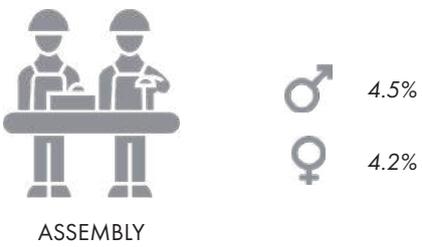
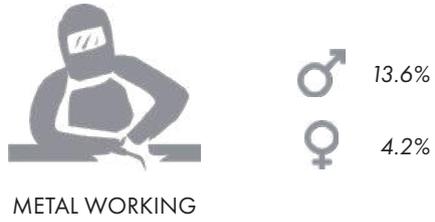
B. RACE & ETHNICITY



D. EDUCATIONAL ATTAINMENT



E. MOST COMMON OCCUPATIONS IN MUSKEGON



F. MOST COMMON OCCUPATIONS IN NORTH MUSKEGON

