CHIPPING, SHREDDING AND LAYERING

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Experiments in Geological Design Thinking

by
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A thesis
presented to the University of Waterloo
in fulfilment of the
thesis requirement for the degree of
Master of Architecture

Waterloo, Ontario, Canada, 2019

AUTHOR'S DECLARATION

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis including any required final revisions, as accepted by my examiners. I understand that my thesis may be made electronically available to the public.

ABSTRACT

In the recent history of the earth, the last 200 years specifically, human activity has changed the very stratigraphy of the planet. This is a direct result of industrialization at the turn of the 19th century, which was followed by rapid urbanization and exponential development across the globe[1]. This stratigraphic layer of human induced disturbance is being churned and spread across the Earth's surface to reveal all the environmental, sociological, and political indiscretions of the human species. The total story of the anthropocene is being exposed as one anthropogenic crust, that when examined closely, will tell all future epochs what, exactly, happened during this short period of time when humans roamed the planet.

The research and design methodology in *Chipping, Shredding and Layering* is distilled into two parts: *An Anthropogenic Geology* and *Materials at our disposal*. *An Anthropogenic Geology* will focus on a geologic investigation of the material that currently constructs the Port Lands. It explores the modern narrative of building material in the city and draws relationships between extraction sites, sites of production, and sites of disposal. This chapter uses a mixture of writing, mapping and diagramming to define the problems associated with modern material movement and to trace these shifting minerals across a landscape.

Part two: Materials at our disposal will explore ways to design using these difficult materials through three geologic design experiments. Each experiment focuses on a singular material that has been identified as difficult to dispose of and explores how it can be used periodically over both short and extended periods of time to create public spaces that change annually. Each material category has been identified as occurring in abundance on site during the excavation for the Don Mouth Naturalization and Port Lands Flood Protection Project and looks to utilize it in the aftermath. The three materials are categorized as dredgeate, contaminated soil and construction aggregate. The underlying principle serves as a commitment to a framework whereby all material found on site, contaminated or clean, will be dealt with and then used on site.

These speculative design experiments use a method of geological design thinking. Geological design thinking is a method that must pertain to the following rules: first, the primary material must come from site/ demolition activity. Second, each experiment must show how the primary material changes over an extended period of time, and in this case beyond the excavation of the Don Mouth Naturalization and Port Lands Flood Protection Project. Third, each experiment must address how we might, as Donna Haraway writes "live with the mess"[2], therefor it must engage public space and disrupt the future development on the site. And fourth, use design to address the un-remediated areas, and strategize how this remediation can

be integrated into the planning practices being used to shape the future site.

Using these geologic design experiments, this thesis explores a speculative future where the Don Mouth Naturalization and Port Lands Flood Protection Project incorporates three design experiments made of unusual materials for public spaces. Each experiment identifies ways to use excavated material to create new unconventional public landscapes. Though they may not have the capital value, or the green turf expected of large park projects, each experiment identifies significant parts of the site history and intentionally designs the long-term future of the park ensuring its continual success. Each experiment focuses on the accumulation and depletion of material, and how that might spark social agency or how, given a framework, naturally the site will make "living with the mess"[3] an enlightening experience.

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ENDNOTES - ABSTRACT

1 Paul J. Crutzen, "Geology of Mankind," *Nature* 415 (January 3, 2002): 23.

2 Donna Jeanne Haraway, *Staying with the Trouble: Making Kin in the Chthulucene*, Experimental Futures (Durham: Duke University Press, 2016).

3 Haraway.

ACKNOWLEDGMENTS

I would like to sincerely thank my supervisor, Jane Hutton. Her patience and empathy were crucial in the success of this thesis, especially at its final stages. I am grateful for her pragmatism, eagerness, and curiosity that challenged me to be comprehensive and rigorous in my approach to solving each design problem. Her wealth of knowledge regarding all things landscape, ecology, and geology related was an invaluable resource. Each conversation we had was productive and brought a new layer of information or refinement to my drawings, really making the project feel satisfyingly rich and complete at the end.

Thank you to Adrian Blackwell, my committee member and the instructor of my TRD1 course. The work I developed in the first term was a critical foundation that left me with questions I was eager to solve over the next three. Your reading suggestions and insistence to continuously move between thinking and making really helped push the project along. I appreciate you taking on the role of committee member and asking tough questions during my final review.

David Correa, my TRD2 professor, thank you for showing me Umberto's *How to Write a Thesis* and stressing the importance of being able to present complex thesis ideas clearly and concisely. I have already found this to be an invaluable skill in school and life.

Marie Paule-Macdonald, Jonathan Tyrrell, and Miguel Guitart thank you for attending my final review and giving me such positive, yet critical, feedback. Every comment and question have been listened to carefully.

To my friends here in Cambridge and elsewhere, thank you for your conversations, insight and advice. Having so many intelligent people around me who were excited to talk about design problems both related and unrelated to thesis work over the past two years has been such a privilege. To Alex and Siobhan, thank you for the constant warmth in terms of both food and friendship. May this continue to be a tradition we can always share, no matter where we are living! Michael, thank you for always being available to help in any way you can, it has meant so much to me.

And to my family, Jennifer, Chris, Sandy, Oscar and Finn, thank you for the immense amount of love, support and constant encouragement. Even when I had doubts in myself, their confidence in me pushed me to continue. This achievement would mean nothing if I didn't get to share it with them. Especially to my mom, Jennifer, thank you for always listening, your strength, wit and intelligence inspire me every day.

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INTRODUCTION

fig. 0.1 (opposite) Photo taken of a grain silo interior no longer in use, located at Silo City in Buffalo, New York.

In the recent history of the earth, the last 200 years specifically, human activity has changed the very stratigraphy of the planet. This is a direct result of industrialization at the turn of the 19th century, which was followed by rapid urbanization and exponential development across the globe[1]. Every inch of the earth has been affected by these human-made manipulations and they are causing negative ecological chain reactions within the environment. Today we are witnessing the outcomes and we can see they are widespread and that they are accelerating drastically[2].

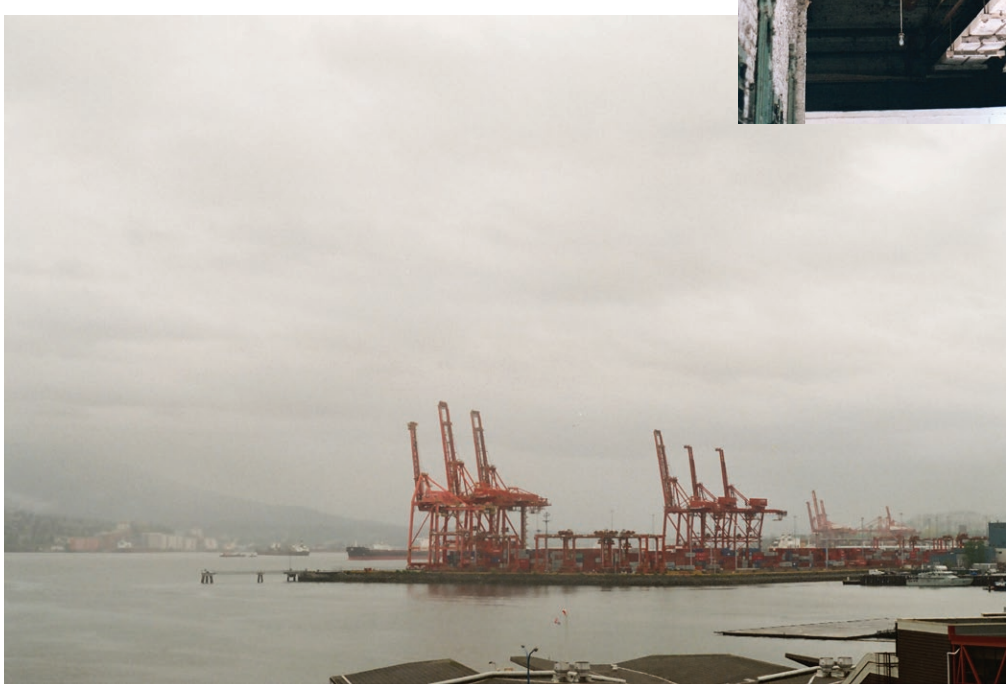
This stratigraphic layer of human induced disturbance is being churned and spread across the Earth's surface to reveal all the environmental, sociological, and political indiscretions of the human species. The total story of the anthropocene[3] is being exposed as one anthropogenic crust, that when examined closely, will tell all future epochs what, exactly, happened during this short period of time when humans roamed the planet. This crust consists of construction debris, pollutants, and all the other non-disposable, non-degradable material we have managed to create. Even when subjected to the most rigorous and expensive methods of disposal, these materials still manage to negatively affect the living things that surround them or break down at such a pathetically slow rate that they will never truly be absorbed by the environment in which they came from.

Chipping and Shredding and Layering is a thesis composed of two parts: a historical narrative and a set of speculative design experiments in geological thinking. The thesis title is taken from an excerpt from Donna Haraway's book: *Staying with the trouble: Making Kin in the Chthulucene*:

> *The unfinished Chthulucene must collect up the trash of the Anthropocene, the exterminism of the Capitalocene, and chipping and shredding and layering like a mad gardener, make a much hotter compost pile for still possible pasts, presents and futures.[4]*

This text is crucial to the way architects should begin to look at the future. How, in design, can we start gathering together the things we have already made, then sort them out and create something new from those pieces?

Through historical research, data visualization, and speculative design, *Chipping, Shredding and Layering* exposes the anthropogenic crust for what it is and what it could be. This thesis will culminate in three design experiments that use geological design thinking as a methodology. Geological design thinking must pertain to the following rules: first, the primary material must come from site/demolition activity. Second, each experiment must show how the primary material changes over an extended period of time, and in this case beyond the excavation of the Don Mouth Naturalization and Port Lands Flood Protection Project. Third, each experiment must address how we



might "live with the mess", therefore it must engage public space and disrupt the future development on the site. And fourth, use design to address the un-remediated areas, and strategize how this remediation can be integrated into the planning practices being used to shape the future site.

(opposite, from top to bottom)
fig. 0.2 Silo #5 located in Montreal, Quebec

fig. 0.3 Silo City located in Buffalo, New York

fig. 0.4 Silo City located in Buffalo, New York

fig. 0.5 Gantry cranes close to Gastown in Vancouver, British Columbia

This thesis will test the limits of the appropriate proximity between the processing of raw materials and constructing urban spaces as it proposes a new set of design experiments. These experiments will be exploring the potential of materials excavated from a massive earthwork project in the Toronto Port Lands, scheduled to occur over the next 5-years. What does it look like to live in the mess we continue to create? What kind of mess are we creating? And what would it look like if the site was, once again, the individual source of material for building?

The Toronto's Port Land and subsequent Don Mouth Naturalization and Port Lands Flood Protection Project by WaterfronTORONTO, located in Ontario, Canada, is carving out a new river channel at the base of the Don Valley River[5]. This large earthwork project started in the fall of 2018 and will continue until it's completion and development over the next 30+ years. The purpose of carving out a new river channel directly through the existing industrial infill (what is currently the Toronto Port Lands) is to create a new "naturalized" river mouth for the Don River that is more adaptable to the seasonal flood conditions that occur each year. By managing flood waters, creating new park space, and capping any existing contaminated soil the Toronto Port Lands will become a desired real estate location.

The new island, to be named Villiers Island, will become a new neighbourhood with residential and commercial real estate and is already being slated for the cities growing tech industry, with companies such as Google proposing it become an experimental "smart city"[6]. This will drastically disrupt operations taking place in the Port Lands currently and totally change the landscape from an industrial port to an urban island. The Waterfront lots, when originally created, had been intended strictly for industrial uses as well as a place to ship and receive goods coming from cities across Lake Ontario. Because of a major transportation shift from boats to trucks the Port Lands became quickly unnecessary, leaving sites in various states of deterioration since inception 100 years ago. In 2008 the city of Toronto called for proposals from urban designers and landscape architects to rejuvenate the site and make it viable development. This meant a drastic overall of the original land-use plan and a future of uncertainty for larger industrial companies still occupying sites in the Port Lands, including the storage and distribution of road salt and cement, both important integral industries to the operation and growth of the city.

The Don Mouth Naturalization and Port Lands Flood Protection Project is being designed by a large team of professional architects and engineers, therefore this thesis and its engagements with the Toronto Port Lands site are meant to be speculative ideas that provoke thinking about expansive time and material scales. It has become an inquiry into how the Toronto public might observe the newly excavated materials and how they might be included in the revitalization of the site. This means thinking about how the materials will change both seasonally and annually as they accrue on the site. Each experiment exploring a personal interest in how material can be a heavily active agent in the design process.

In this thesis, the Don Mouth Naturalization and Port Lands Flood Protection Project will be scrutinized and used as a testing ground for the ideas presented, illustrating new "compositionist practices"[7] that compose a livable world by taking advantage of all living and non-living agents, specifically focusing on the earth's crust. A "compositionist practice" is a way of practicing architecture, landscape architecture or urban design, by looking beyond just humankind and including a wider variety of stakeholders, including plants, animals, rocks, energy, and building materials. This type of practice also looks to engage different disciplines, like construction and biology, at the earliest stages of a project. This is to ensure that the gaps in the designer's own knowledge do not lead to misconceptions or poor assumptions, and all the aforementioned stakeholders are represented fairly. This new "compositionist practice" will be capable of sympoiesis - which is the act of "making-with". In the process of creating a new landscape from industrial land, how does the existing material on the site (soil, buildings, rocks) change? Can the existing material become a more active participant in its own transformation into a safe, healthy, and sustainable landscape?

This thesis disrupts the proposed Don Mouth Naturalization and Port Lands Flood Protection Project by imagining that all material found on the site during excavation will be used. The success of the work will not only be evaluated on the proposal but on the realistic and theoretical disruption of the site's future outcomes. At the most basic level, it will bring forward an understanding on the impact of industrialization - that it is vast and reaches deeply through time. There should be space for the material design strategies utilized by this thesis in the urban experience and collective memory, living amongst the mess and staying with the trouble instead of offloading these anthropogenic issues to unsuspecting natures.

The research and design methodology in *Chipping, Shredding and Layering* is distilled into two parts: *An Anthropogenic Geology* and *Materials at our disposal*. *An Anthropogenic Geology* will focus on a geologic investigation of the material that currently constructs the Port Lands. It explores the modern narrative of building material in the city and draws relationships between extraction sites, sites of production, and sites of disposal. This chapter uses a mixture of writing, mapping and diagraming to define the problems associated with modern material movement and to trace these shifting minerals across a landscape.

Part two: Materials at our disposal will explore ways to design using these difficult materials through three geologic design experiments. Each experiment focuses on a singular material that has been identified as difficult to dispose of and explores how it can be used periodically over both short and extended periods of time to create a changing public landscape. Each material category has been identified as occurring in abundance on site during the excavation for the Don Mouth Naturalization and Port Lands Flood Protection Project and looks to utilize it in the aftermath. The three materials are categorized as dredgeate, contaminated soil and construction aggregate. The underlying principle serves as a commitment to a framework whereby all material found on site, contaminated or clean, will be dealt with and then used on site.

The first experiment investigates material as an additive landscape building method. This means over time incrementally adding material as it becomes available. It looks to leverage dredge, a very unstable substance, as a building material. Using it to create a new wetland and spawn into a growing wetland. This experiment is critical of the chosen method of lake filling and questions the need for a truly solid ground.

The second experiment investigates how material can be used as a subtractive building method. This will explore assembling all the materials in one location during the project and slowly letting the materials accumulated be taken and used elsewhere on the site or in the city. The crucial part of this experiment is implementing a measurable pace of removal and the method of tracking it so that once the stock of construction aggregate has depleted, it is somehow traced or memorialized.

The third experiment investigates how the contaminated material of site might become both additive and subtractive to the landscape. This experiment will take contaminated material from the site and using remediation technology and time cleanse the material and make it usable for building once again. This experiment tries to integrate these large field size operations of cleansing material into a redevelopment process, meaning while buildings are erected a field right beside it will simultaneously be remediating the earth extracted from the new river channel.

Using these three geologic design experiments, this thesis explores a speculative future where the Don Mouth Naturalization and Port Lands Flood Protection Project incorporates three design experiments made of unusual materials for public spaces. Each experiment identifies ways to use excavated material to create new unconventional public landscapes. Though they may not have the capital value, or the green turf expected of large park projects, each experiment identifies significant parts of the site history and intentionally designs the long-term future of the park ensuring its continual success. Each experiment focuses on the accumulation and depletion of material, and how that might spark social agency or how, given a framework, naturally the site will make "living with the mess"[8] a pleasant experience.

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ENDNOTES - INTRODUCTION

1 Crutzen, "Geology of Mankind."

2 NASA, "Climate Change: How Do We Know?," *Global Climate Change: Vital Signs of the Planet* (blog), n.d., https://climate.nasa.gov/evidence/.

3 This term was used 1980's but was popularized by Paul Crutzen in the early 2000's. He felt strongly that the word represented much more than the term Holocene ever could.

4 Haraway, *Staying with the Trouble*.

5 WATERFRONToronto, City of Toronto, and Toronto and Region Conservation for The Living City, "Don Mouth Naturalization and Port Lands Flood Protection Project Amended Environmental Assessment Report" (Toronto, March 2014), https://trca.ca/conservation/green-infrastructure/don-mouth-naturalization-port-lands-flood-protection-project/don-mouth-environmental-assessment/.

6 Sidewalk Labs, "Vision Sections of RFP Submission," Request for Proposal (Toronto, October 2017), https://sidewalktoronto.ca/wp-content/uploads/2018/05/Sidewalk-Labs-Vision-Sections-of-RFP-Submission.pdf

7 Haraway, *Staying with the Trouble*.

8 Haraway.

PART ONE

AN ATHROPOGENIC GEOLOGY

fig. 1.1 (opposite) A moment along the Keating channel exposing a piece of this crust: steel, concrete and water.

The term Anthropocene has exhausted itself. It has become a common term used in both academia and mainstream media[1], loosely understood by all as the unstable, unpredictable geologic age that humans are currently in. Often the term is used to instill panic of urgency by the user, and sometimes it is charged with political motives instead of scientific facts. Recently Edward Burtynsky, with colleagues Jennifer Baichwal and Nicholas de Pencier, completed an exhibition at the National Gallery in Ottawa and AGO in Toronto of photography and cinematography named after the recently defined geologic era[2]. The large format images document the perceived global effects humankind has had on the earth's environment. The Prime Minister of Canada then staged a media event at the National Gallery standing in front of Burtynsky's "Cathedral Grove #1", a hauntingly beautiful life size image of a Boreal Forest on Vancouver Island, to discuss the newly proposed and contested carbon tax. This collision of science, art and politics inherently sensationalized the term and charged it with social conceptions opposed to understanding the term through a lens of geologic and scientific facts. In 2019, the year this thesis was written, it is hard to know if the term is still useful as a scientific term or is it just meant to sensationalize politics?

The term was first proposed by Nobel Laureate Paul J. Crutzen to deem this distinctly human dominated geologic age as something other than the Holocene[3]. Almost two decades ago, it became apparent to the scientific community that the technological advancements of humans since the 18th century were drastically altering the earth's natural order. Though homo sapiens have been roaming the earth for 198,000 years prior, it was only at this point of industrialization that the stripping of earth's recourses was taken to a new industrial scale, with an unlimited framework that valued capitalist growth. This anthropogenic crust is marked by a "a global layer of carbon laid down by the burning of fossil fuels" and some academics believe is stratigraphically distich from other epochs[4]. This change in the environment can be almost negligible to the perception of an individual in one lifetime, but when tracked at a global scale over hundreds of years becomes quite shocking: erratic temperature changes, species extinction, population growth, loss of tropical forest. Together these outcomes of the "human enterprise"[5] are known as the Great Acceleration[6], a set scientific data that document the increasing human pressures and outcomes on the Earth System.

In identifying this shockingly rapid change in the earth's surface condition and acknowledging that this stratigraphic event is negatively impacting the future of all species who currently live here, the responsibility falls solely on humans to propose inter-disciplinary solutions to these self-destructive tendencies. By re-imagining the way we understand nature and culture as congruent assemblages, it should be understood that they cannot continue


LAFARGE
CANADA
INC.

to be developed individually. This stratigraphic event is important, and it reveals itself to us as a thin layer of interesting surface material that can and should be used over and over again, so no other material need be disturbed.

Heidegger offers his theory that all of these problems caused by humans stem from technology. Martin Heidegger was an important philosopher who made seminal contributions to the fields of phenomenology and existentialism during the 1950's. He argued that the human approach to solving any modern problems is one rooted in scientific solutions that begin with the "enframing" or the objectification of nature that "challenges [humans] forth, to reveal the real". Heidegger explains this concept best when he writes: "Thus when man, investigating, observing, ensnares nature as an area of his own conceiving, he has already been claimed by a way of revealing that challenges him to approach nature as an object of research, until even the object disappears into the objectlessness of standing-reserve" [7]. The only real solution to experience an authentic encounter with nature is to do nothing and let it be. For the sake of this thesis it would be unproductive to work strictly in a Heideggerian way and wait for nature to present itself authentically, but instead it will be helpful to contemplate a method that might move from the objectivity of nature to the subjectivity of nature and abolish the notion that nature can be used as a "standing-reserve".

A product of this new anthropogenic crust is the "disturbed sites"[8] that have been created. This term is used to describe polluted and contaminated landscapes that have been affected by the lingering processes of industrialization. These sites include landfills, power-plants, factories, steel mills and airports that are no longer viable for anything. That is anything other than a public park. This method creates more public space within an urban area by remediating the disturbed landscape and making it safe for public occupation. Often this remediation effort includes capping the contaminated material with a "thin green veneer of grass and asphalt"[9]. The processes associated with any remediation effort are interesting and complex but once completed the park may have little to no trace of its disturbing past. Mira Engler has called this the "Camouflage Approach"[10]. This approach is used to placate the public who fear the uncertainty and risk inherently linked to disturbed sites. But this approach does not create any agency in the public, no push for reformation or any interest in environmental change. These sites hold the power to "move use to care about "the other""[11] and impact the social and ecological normatives previously cultivated amongst our society.

Now that we understand some of the social conceptions imposed on a disturbed site, we can dismantle it. We can deconstruct and rebuild it in a way that suits the larger agenda of this thesis. It is important to understand that "what used to be called nature has erupted into ordinary human affairs"[12] and so we need to fundamentally change the way we think about the other living and non-living things that occupy the planet. They have the potential to remediate the destruction that has already been committed. By identifying the organic beings and their strengths they can become active agents in this

fig. 1.2 *(top, opposite)* Prime Minister of Canada, Justin Trudeau speaking in front of Burtynsky's "Cathedral Grove #1".

fig. 1.3 *(middle, opposite)* Lafarge concrete silos, image taken during one of the first visits to site. These silos store concrete aggregate, which is shipped by barge from the Lafarge quarries.

fig. 1.4 *(bottom, opposite)* Piles of salt located in the Toronto Port Lands. These salt piles are used to salt the Toronto roads during the winter months *fig. 1.5* *(opposite, top)* Photo from Toronto archives of Essroc Silos shortly after their completion in 1970

fig. 1.6 *(opposite, bottom)* Photo from flickr user of Essroc Silos more than 30 years later

developing methodology for working with disturbed sites. Latour describes the issue as such: "We cannot simply bring objects and subjects together, since the division between nature and society is not made in such a way that we can get beyond it. In order to get ourselves out of these difficulties in composing the collective, we have to consider that the collective is made up of humans and nonhumans capable of being seated as citizens, provided that we proceed to the apportionment of capabilities"[13]. By appointing the other occupants of a landscape as subjects, rather than objects, a proper democracy can begin to take shape.

With any site manipulated so extensively by human intervention, it becomes easy to underestimate and overlook the invasive landscape that has cultivated itself after the site has been more or less neglected of human occupation. The existing ecology will be eradicated and replaced by something controllable and attractive in the future development plans. The Don Mouth Revitalization redevelopment plans, due to a capitalist structure and vested interests of hundreds of investors, have to be interested in efficiency and control of the landscape, rather than just this proposed method of chipping, shredding and layering what already exists to create something new and different. It is important to recognize that despite these other factors the proposal is still trying to rectify the modernist approach to the straightening of the river that happened in the 1920's. The Toronto Port Lands site can be described as "regular" in many ways, as it hosts a variety of industrial infrastructure common to city ports during the era in which it was constructed. Similar ruins appear across Canada and the United Sates: Silo #5 in Montreal, Quebec, Silo City, located in Buffalo, New York, each site has its own story and circumstances that lead to its current state of disrepair.

In Toronto, these industrial archives that are spread across the Port Lands site. Silos, warehouses, and armories from the past century have made themselves permanent because of the enormous expense, difficulty to remove and safe disposal. This physical manifestation of permanence contrasts with the impermanence of the soft landscape surrounding the modern ruins. Building a forensic analysis of how the site came to be is important in understanding what it might become. What evidence can this essay uncover that might shed light on a new collective narrative? Can this new evidence implicate those who have divested power and rights from the stakeholders, the organic life and matter, unable to speak? By building an index using the abiotic, biotic and cultural material components of the Port Lands site, an informed proposal balancing and the restoring the rights all stakeholders, human and non-human, can be made.

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ENDNOTES - INTRODUCTION

1 Whitney J. Autin and John M. Holbrook, "Is the Anthropocene an Issue of Stratigraphy or Pop Culture?," *GSA Today*, July 2012, 60–61, https://doi.org/10.1130/G153GW.1.

2 The exhibit and book were both called "Anthropocene" and showcase a series powerful large-scale images documenting irreversible human activity across the globe.

3 Crutzen, "Geology of Mankind."

4 William L. Fox, "From Rock Art to Land Art / From Pleistocene to Anthropocene," in *Geologic Now*, ed. Elizabeth Ellsworth and Jamie Kruse (Brooklyn, New York: Punctum Books, 2013), 42–45.

5 Will Steffen et al., "The Trajectory of the Anthropocene: The Great Acceleration," *The Anthropocene Review* 2, no. 1 (April 2015): 81–98, https://doi.org/10.1177/2053019614564785.

6 Will Steffen, Paul J. Crutzen, and John R. McNeill, "The Anthropocene: Are Humans Now Overwhelming the Great Forces of Nature?," *Ambio* 36, no. 8 (December 2007): 614–21.

7 Martin Heidegger, *The Question Concerning Technology*, trans. William Lovitt, First Edition (New York, N.Y.: Harper & Row, 1977).

8 Elizabeth K. Meyer, "Uncertain Parks: Disturbed Sites, Citizens and Risk Society," in *Large Parks*, ed. Julia Czerniak, George Hargreaves, and John Beardsley, 1st ed. (New York : Cambridge, Mass: Princeton Architectural Press ; In association with the Harvard University Graduate School of Design, 2007).

9 Meyer.

10 Mira Engler, "Waste Landscape: Permissible Metaphors in Landscape Architecture," *Landscape Journal* 15, no. 1 (1995): 10–25.

11 Meyer, "Uncertain Parks: Disturbed Sites, Citizens and Risk Society."

12 Haraway, *Staying with the Trouble*.

13 Bruno. Latour, *Politics of Nature : How to Bring the Sciences into Democracy* (Cambridge, Mass.: Harvard University Press, 2004).

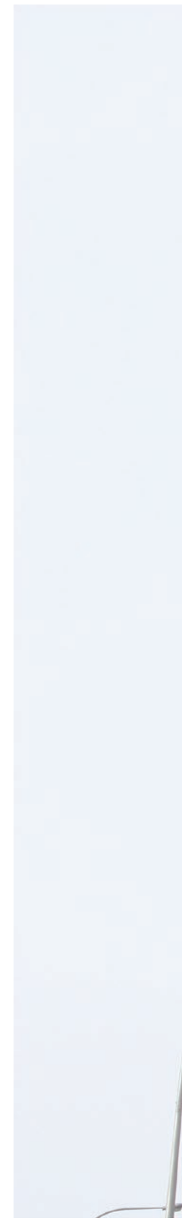
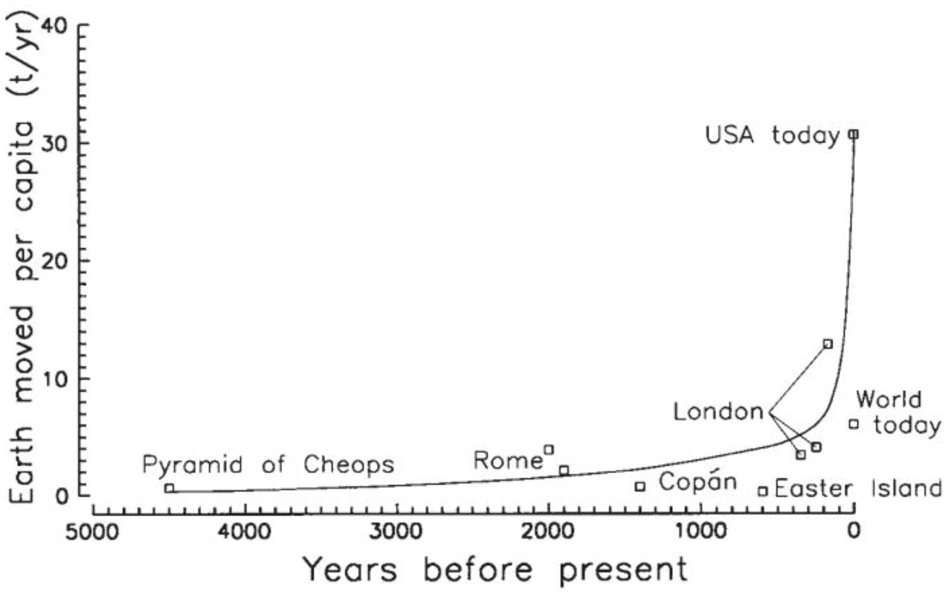


fig. 1.7 *(above)* Cherry Street bridge, originally built in 1930. It will be removed and replaced during the Don Mouth Revitalization project.

fig. 1.8 *(opposite)* An image of the underbelly of the Gardiner Expressway. This large piece of highway infrastructure is a large presence in the Port Lands, as it can be seen almost everywhere on the site.


Earth moved per capita (t/yr)
40
30
20
10
0
USA today
London
World today
Pyramid of Cheops
Rome
Copán
Easter Island
5000
4000
3000
2000
1000
0
Years before present

MATERIALS AT LARGE

fig. 1.9 (opposite) Graph made by Roger Hooke estimating amount of earth, including both soil and rock, moved per capita intentionally annually, by certain relativity advanced societies in the past; t is tons.

Geologist Roger Hooke has studied how human-kind has changed the surface of the earth so much more than any other species every has. In his paper *On the history of human as geomorphic agents* he illustrates (see fig. 1.10) humankind as the "premier geomorphic agents on this planet"[1]. He implies that humans alone are responsible for sculpting the landscape into what it is today. This graph illustrates the amount of earth moved per capita intentionally annually, by certain relatively advanced societies in the past, including the Egyptians, the roman empire, and Maya peoples.

Since the beginning of the 21st century many cities around the world, including Toronto, shifted from places of production to largely places of consumption as industry has migrated away from city cores. This means spaces of production have moved to the periphery of the cities and left large patches of land devoid of activity and awash with deteriorating infrastructure inside an otherwise dense city grid. This land is desirable in terms of its location and size, but generally difficult to work with because of ground contamination and the high cost of demolishing or renovating existing, outdated infrastructure. This has resulted in acres of contaminated properly remaining vacant in Toronto[2]. This thesis questions the approaches we take to landscape-making and how time and material are active agents in the creation. At a time where modern building technology is so advanced we have the ability as designers to snap our fingers and move 2 million cubic feet of soil, it is important to question the implications of that occurrence and its outcomes over time. We must decide if we only care about the product, or if we are interested in the process. In Carol Burns' essay "High-Performance Sites " from the book *Site Matters* she explains:

> *In the late-nineteenth century, an explosion in new technologies and materials began to transform architecture and construction. Materials and composites invented during this period include steel and reinforced concrete. Development of new materials continued to accelerate in pace, including a plethora of synthetic and sheet goods in the 1950s and continuing to the present day with new and expanded categories such as reinforced plastics, new adhesives, and alloys and metals including titanium. These goods typically require considerable transformation and processing. With origins in elementary matter extracted from the earth, construction materials increasingly take form and shape through industrial processes.*[3]

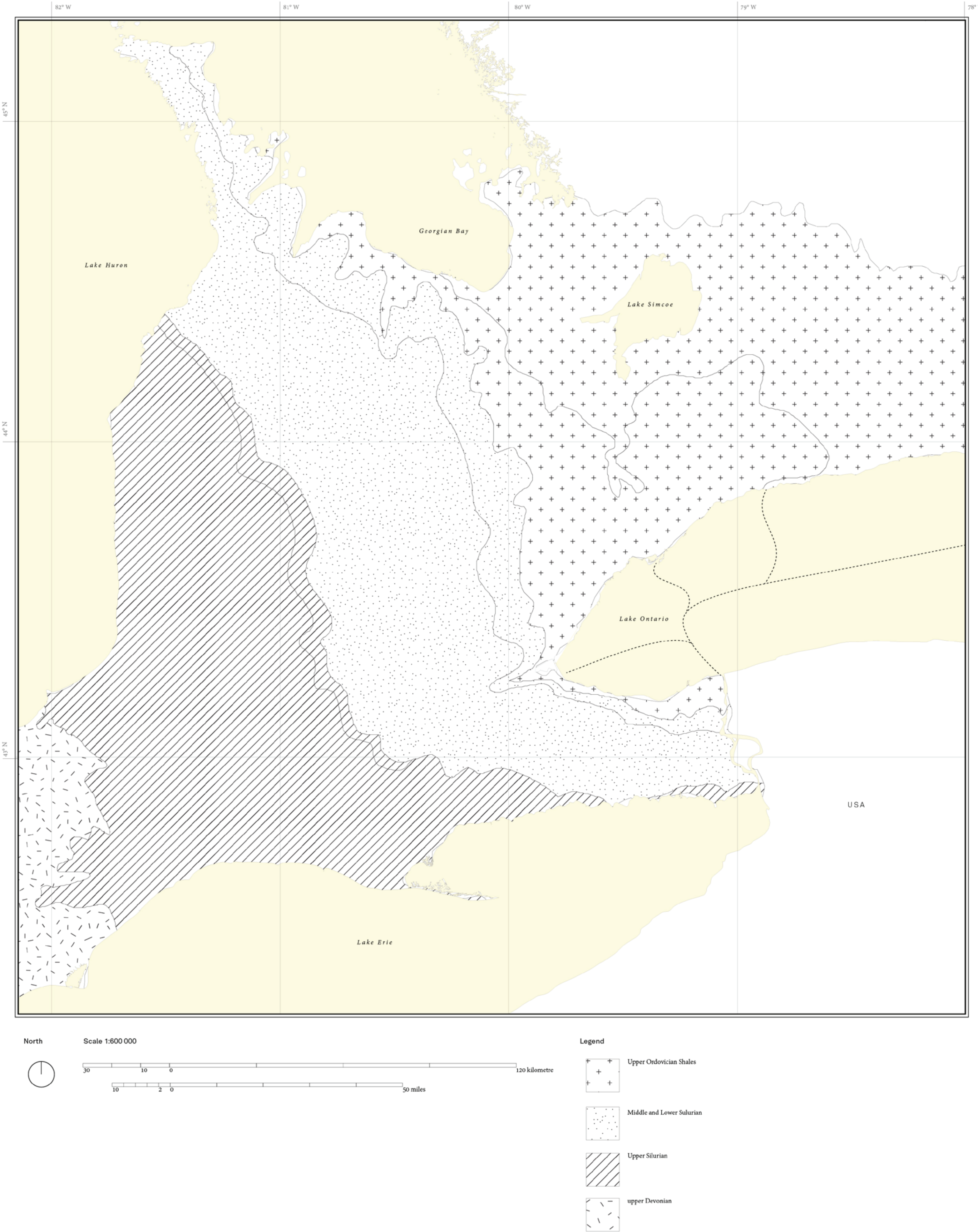
This phenomenon can clearly be seen in the way humans have chosen to organize the landscapes that carry these materials across this production conveyor belt. Moving material from their original place of origin to the place of consumption, and finally, to a place of disposal or decay.

The following pages contain a series of maps. These maps work together to depict the implications of industrialism, similar to those described by Carol Burn, on Toronto and southern Ontario. Each map traces corresponding sets of data to understand how various anthropogenic geology was formed across the landscape. They look to understand how we moved from the rise of industrialization to present day. How has humankind inscribed the landscape permanently and how does making a building touch the distant parts of that landscape? By looking at these data sets super imposed against one another, the reader should draw conclusions about how each piece of data is relevant to not only the larger landscape but also the site in question: the Toronto Port Lands. These maps depict how and why the anthropogenic crust in this region is situated the way it is. Understanding the original geologic formation of the land, and how that ultimately lead to the development of infrastructure and cities is important in understanding what, how and why the material make-up of the Port Land's is the way it is.

LOWER ONTARIO: BEDROCK GEOLOGY

fig. 1.10 *(opposite)* Map showing the lower bedrock geology of Southern Ontario.

The map on the right shows the Bedrock geology of Southern Ontario. Bedrock is a deposit of solid rock that is typically buried beneath soil and other broken or unconsolidated material. Bedrock is made up of igneous, sedimentary, or metamorphic rock, and it often serves as the parent material for soil. In the plotted area the two most relevant categories of bedrock to this narrative are Upper Ordovician Shales and Middle and Lower Silurian. The Upper Ordovician Shales consists of inter-bedded grey-green to dark grey shale and fossiliferous calcareous siltstone to limestone[4] and lie upon PreCambrian shield rocks 1.45 to 1.1 billion years old that are at least 70 km thick[5]. This is the bedrock that lies underneath Toronto and the Port Lands. It is generally covered by eroded material deposits. The middle and lower Silurian groupings are generally well exposed along the Niagara Escarpment. These layers are composed of mixed siliciclastics and carbonates. This means it has layers of quartz or other silcate minerals and layers of sandstone-based rock.



82° W
81° W
80° W
79° W
78° W
45° N
44° N
43° N
Lake Huron
Georgian Bay
Lake Simcoe
Lake Ontario
Lake Erie
USA
North
Scale 1:600 000
30
10
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120 kilometre
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50 miles
Legend
Upper Ordovician Shales
Middle and Lower Sulurian
Upper Silurian
upper Devonian

fig. 1.11 *(opposite)* Map showing the surficial geology of Southern Ontario. See Appendix A for full scale drawing.

Above these layers of bedrock are naturally occurring mineral deposits amongst the soil. These mineral deposits occur in pockets amongst the landscape because of glaciation. The Southern Ontario landscape we see today was shaped by the melting Wisconsin Glacier 10, 000 years ago. As the glacier began to recede after the ice age, it scraped up layers of soil and eroded layers of bedrock. These loose materials were pushed or pulled along the path of the glacier, eventually being deposited into a compression amongst bedrock or washed into deltas of the ancestral great lakes by the glacial runoff[5]. Clay, Sand and Gravel are all deposited in large swaths moving in similar directions, indicating the direction of the receding glacier. These mineral deposits have been categorized by size: gravel, sand and clay (see fig. 1.12).

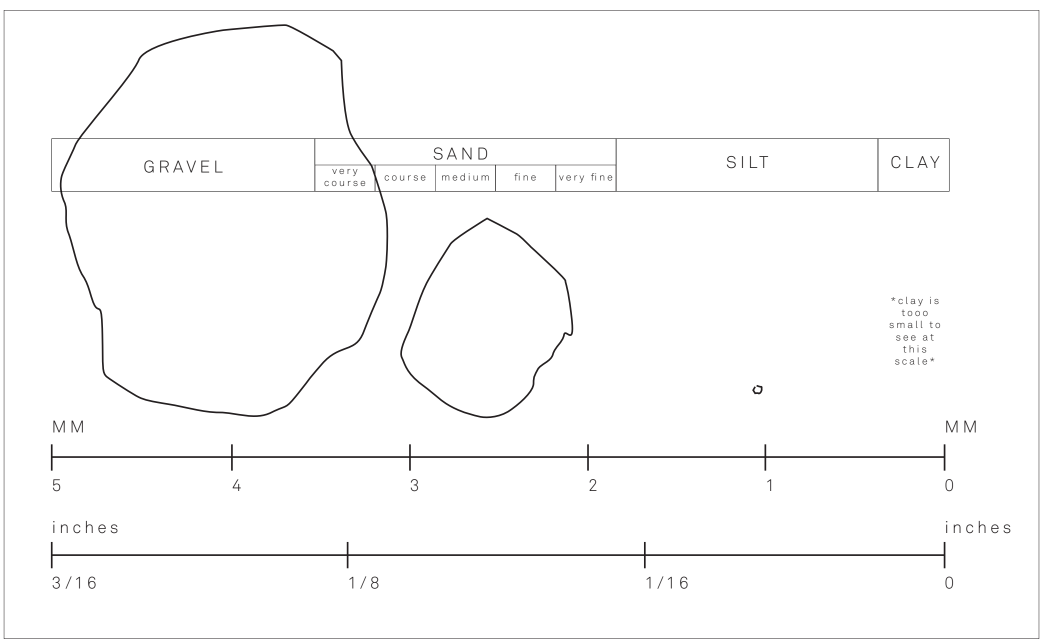
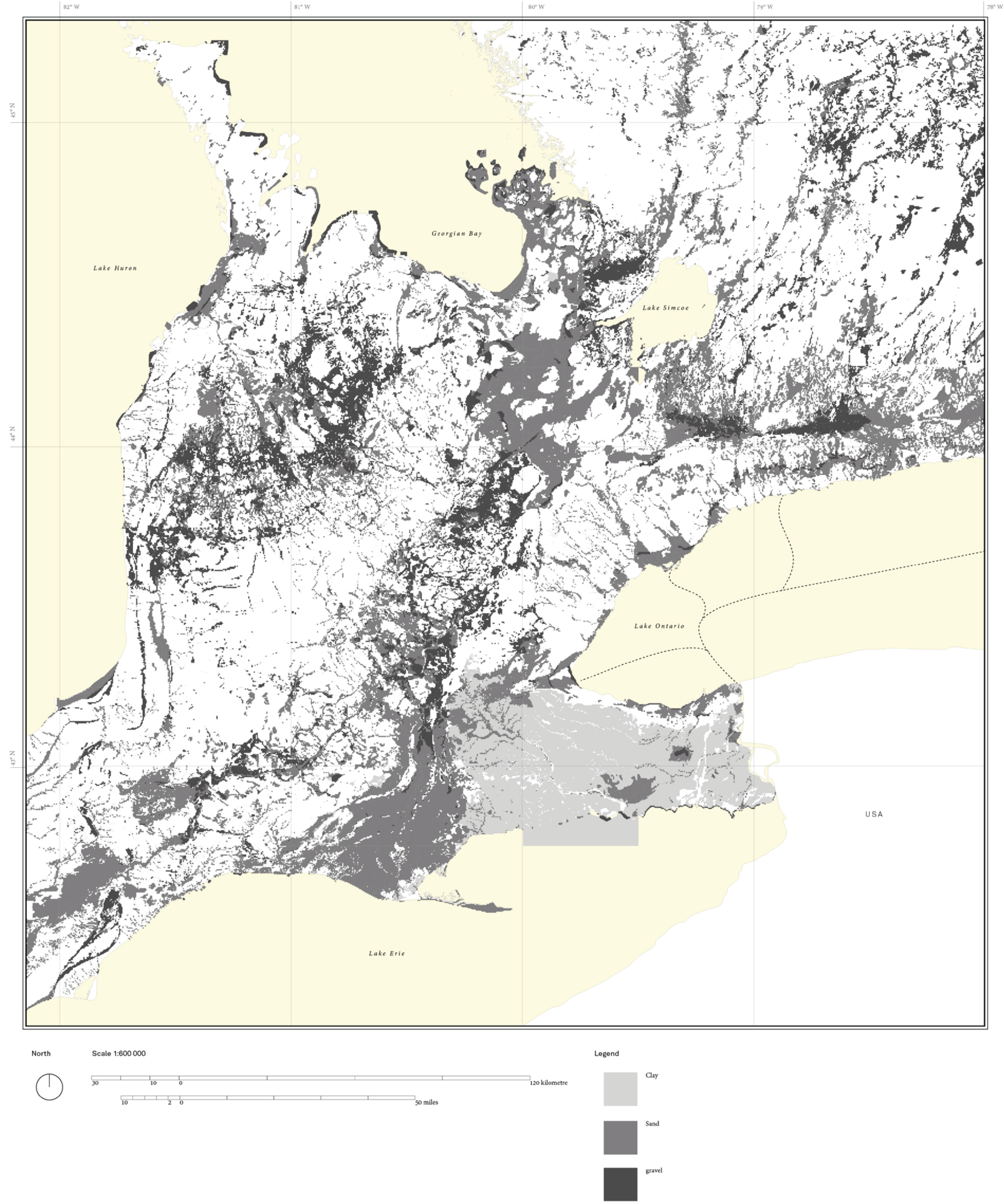


fig. 1.12 *(above)* Mineral deposit by category: gravel, sand and clay


82° W
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44° N
43° N
Lake Huron
Georgian Bay
Lake Simcoe
Lake Ontario
Lake Erie
USA
North
Scale 1:600 000
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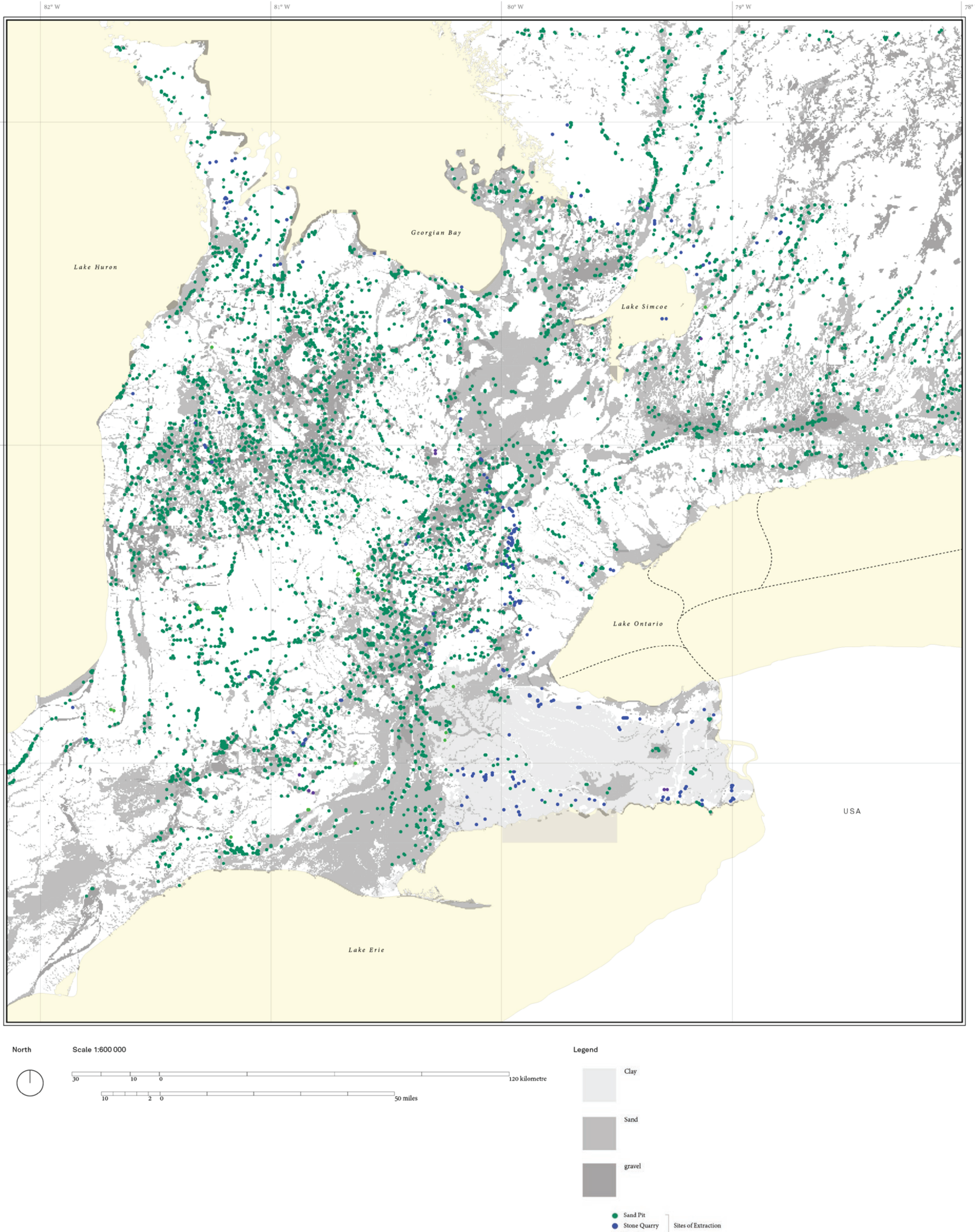
10
0
120 kilometre
10
2
0
50 miles
Legend
Clay
Sand
gravel

fig. 1.12 *(opposite)* Map showing sites of extraction in Southern Ontario.

These materials, both bedrock and the mineral deposits, can be extracted from the earth and manipulated by humans to provide not only shelter but massive amounts of other infrastructure: like roads and dams. It was discovered that these materials found below the surficial soils durable and could provide protection against many of the environment's toughest elements, including wind, water, and temperature. As technology developed, so did techniques for extracting and processing each material, making it easier, faster, and more efficient. Today there are hundreds of quarries and pits dotting the landscape extracting the materials for making bricks, concrete, aggregate and asphalt concrete.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43° N
Lake Huron
Georgian Bay
Lake Simcoe
Lake Ontario
Lake Erie
USA
North
Scale 1:600 000
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120 kilometre
10
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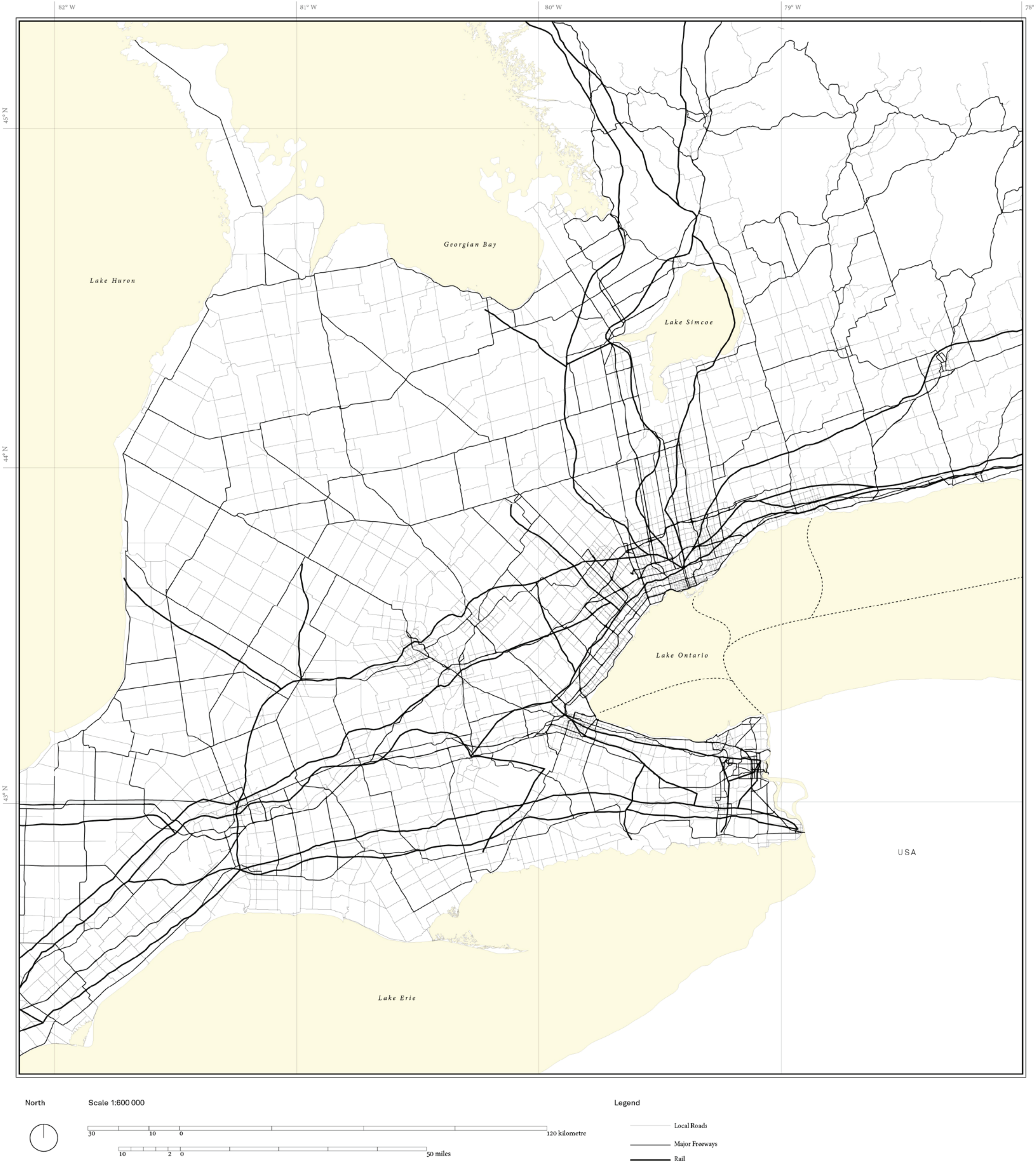
0
50 miles
Legend
Clay
Sand
gravel
Sand Pit
Stone Quarry
Clay Pit
Sites of Extraction

SOUTHERN ONTARIO: ROUTES OF TRANSPORTATION

fig. 1.13 *(opposite)* Map showing the major roads and shipping routes in Ontario.

The road network in Ontario is the primary method of transport. Materials move across the landscape, from the site of extraction, to the place of production, to the final place of construction. The 16 major highways and subsequent road network are a striking feature of the Southern Ontario Landscape; roads cutting through major topographical features to efficiently carry travelers and materials to their destinations. Moving cars across flat farm land or the hilly escarpment in severe perpendicular lines.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Georgian Bay
Lake Huron
Lake Simcoe
Lake Ontario
USA
Lake Erie
North
Scale 1:600 000
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120 kilometre
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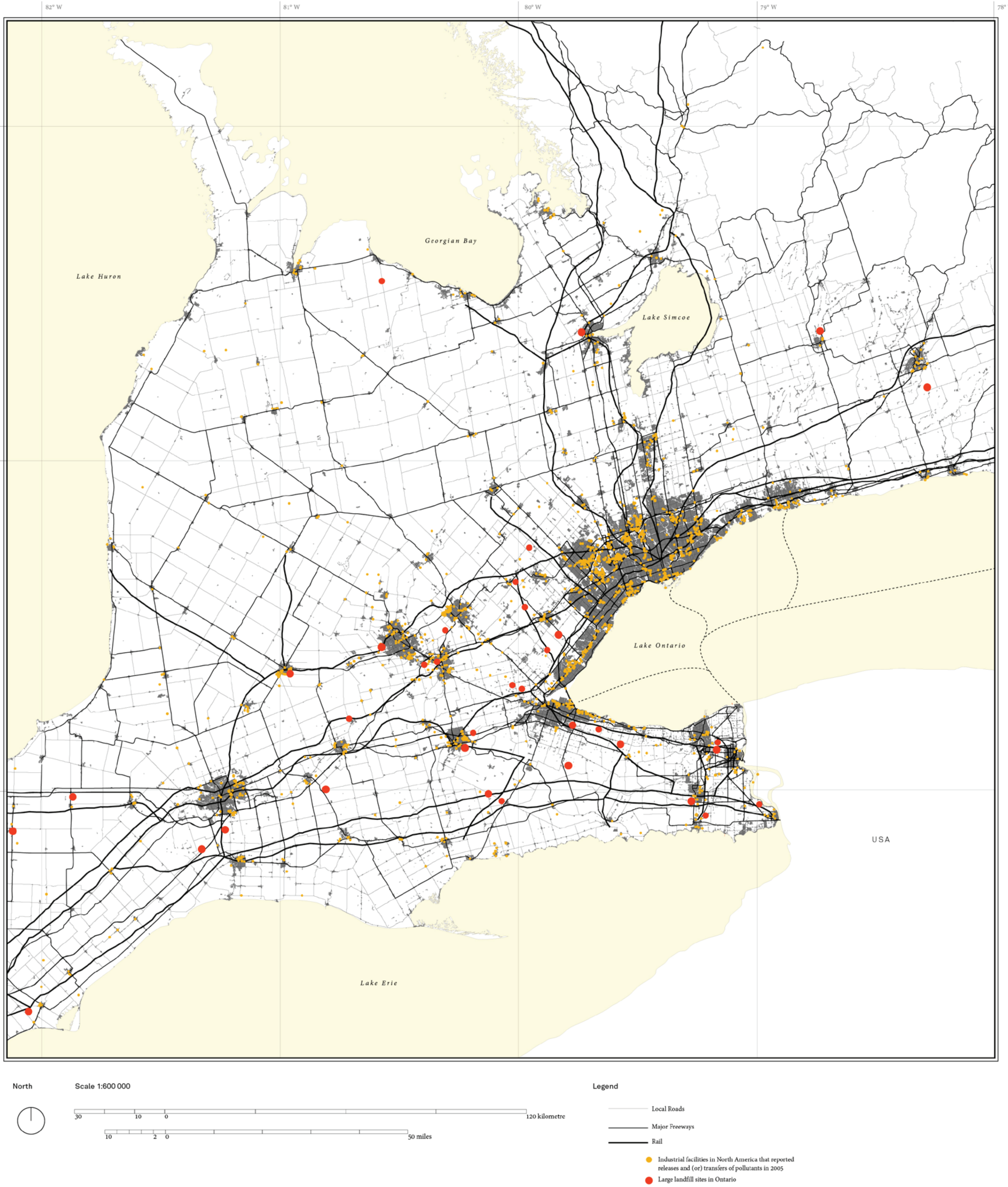
2
0
50 miles
Legend
Local Roads
Major Freeways
Rail

SOUTHERN ONTARIO: URBAN BUILD UP AND PRODUCTION/ WASTE SITES

fig. 1.14 *(opposite)* Map showing urban build up and production and waste sites in Southern Ontario.

Once the raw materials have been extracted and transported to a place of production, they are molded, shaped and mixed into more usable forms like bricks and other modular components. In Toronto, places of production have historically located in close proximity to the city. During the 1900's, five brickwork yards were located at the peripheral edges of the city, and at that time, sourcing clay from the Don and Scarborough beds[7]. Today, most industrial operations similarly take place in the employment lands located at the edges of the city or in peripheral urban areas surrounding Toronto, like Mississauga and Scarborough. This locates the production of material near the place of construction but still far enough away that there is available space for the required industrial operations. Once a building is no longer useful it is demolished. The materials are broken down and removed from the site. The are again transported beyond the edges of the city and dumped in landfills or places such as the Toronto Port Lands during infill or the Leslie Street Spit[8]. Once again, the materials are stagnant as they sit patiently waiting for the next phase of their journey.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Georgian Bay
Lake Huron
Lake Simcoe
Lake Ontario
USA
Lake Erie
North
Scale 1:600 000
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120 kilometre
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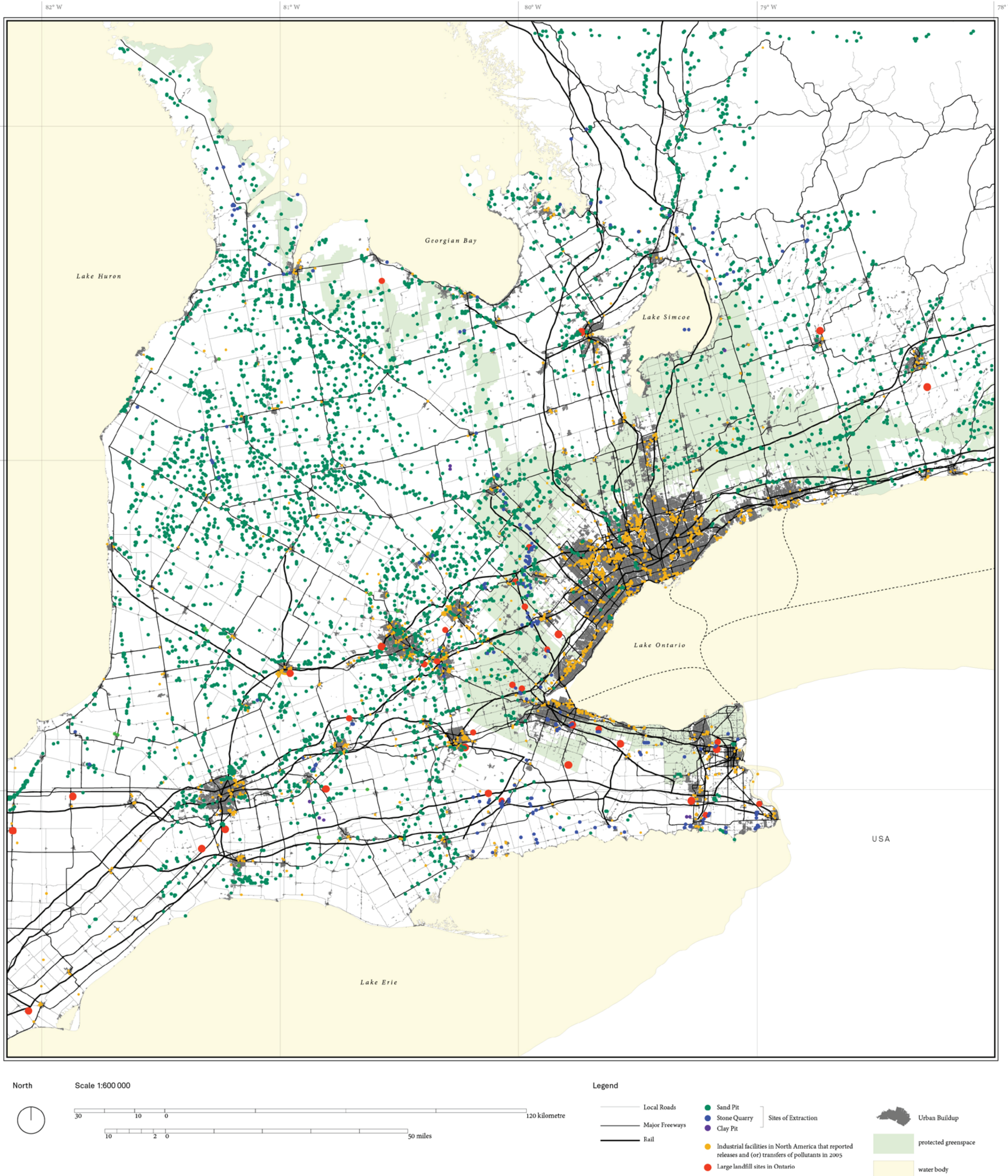
2
0
50 miles
Legend
Local Roads
Major Freeways
Rail
Industrial facilities in North America that reported releases and (or) transfers of pollutants in 2005
Large landfill sites in Ontario

fig. 1.15 *(opposite)* Map showing material streams in Southern Ontario. See Appendix A for full scale drawing.

This material consumption is not a cyclical process, it is linear. Materials move thousands of kilometers across multiple cities, provinces or even countries to the construction site. Here they are a one-time use commodity. After serving a purpose, they are then discarded. This flow of materials for construction purposes is just another stream in the consumer culture humankind has developed since industrialization. The process of obtaining new material is readily available and often cheaper than any alternative method. Carol Burns continues to explain:

> *Though the building site remains a platform for construction, the source of materials and the site of fabrication for building components multiplied and dispersed. Specific geographic areas took on specialized roles, some as the source for resource extraction, others as the locus of processing, and still others as the location of labor for assembly or fabrication. The materials and components of buildings were gathered and assembled from across numerous sites of accumulation prior to delivery to the construction site. Concurrently, material production became rationalized with respect to standard building systems, and the formulation of building codes became more uniform. Thus, mechanization in conjunction with seemingly unlimited access to fossil fuels superseded the locally based handcraft approach of producing building materials and components. The direct labor cost became a greater component of economic value than material costs of construction. Production of goods and materials for all sectors occurred easily and, arguably, to excess.*[9]

If, as designers, we truly care about the processes as opposed to just the product, it is essential that we turn this material flow into cycle. It is important to look at all the factors and decide where other sources of material could come from and how they could be used. How can re-cycling all material found on a site impact the system and how could it change the way we construct buildings and landscapes? In a post-human world how will we obtain our construction materials?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Lake Ontario
Lake Erie
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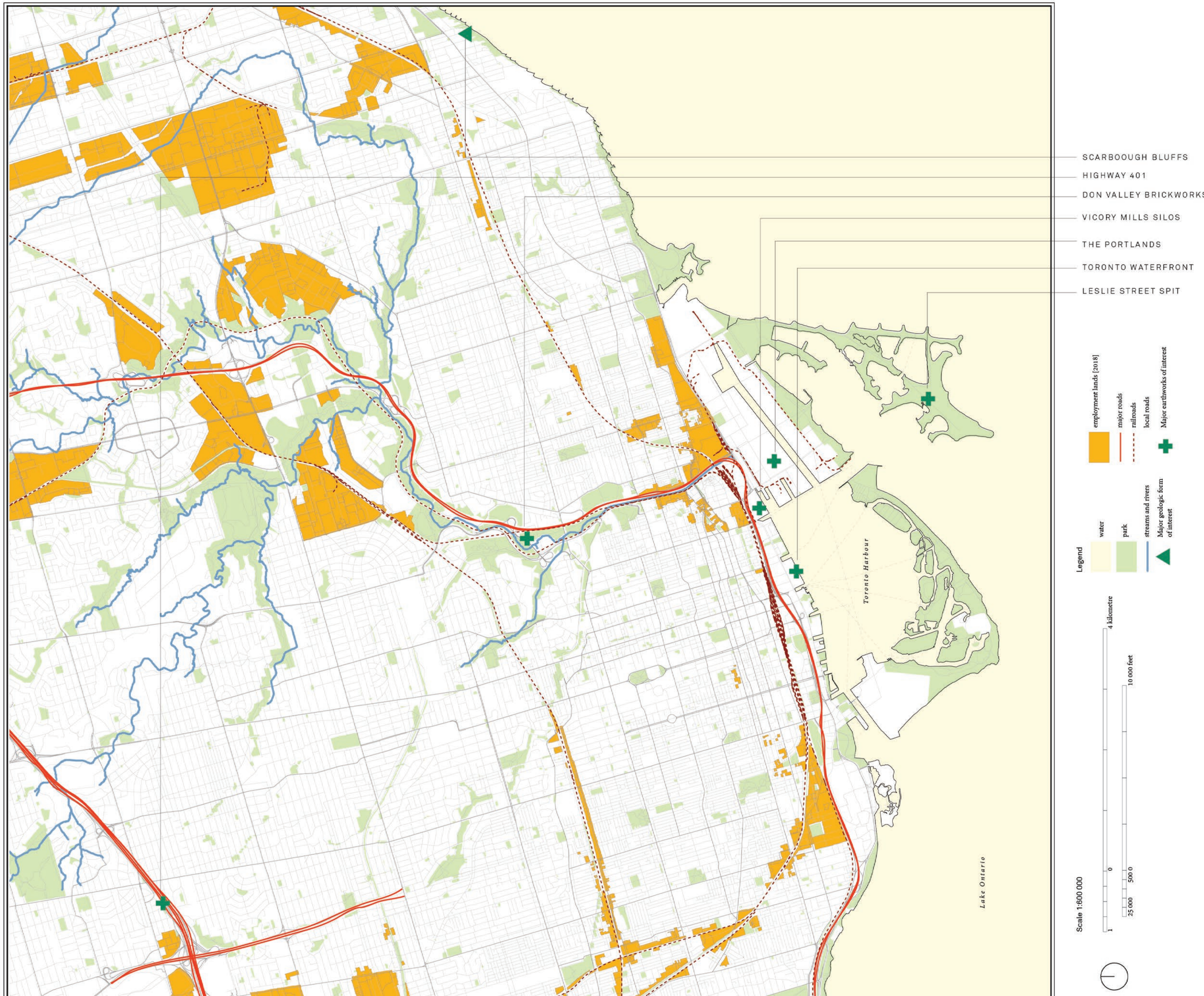
50 miles
Legend
Local Roads
Major Freeways
Rail
Sand Pit
Stone Quarry
Clay Pit
Sites of Extraction
Industrial facilities in North America that reported releases and (or) transfers of pollutants in 2005
Large landfill sites in Ontario
Urban Buildup
protected greenspace
water body

***fig. 1.16** (opposite)* Map of urban geology in Toronto. See Appendix B for full scale drawing.

This is a map of Downtown Toronto. It highlights, highways, employment lands, greenspace and some urban geological forms of importance, both to set precedents for the following design experiments and give some more historical context into how industrialization and geological forms have shaped the 21^{st} century Toronto. These include the Leslie Street Spit (fig. 1.3), the Victory Mills Silos (fig. 1.5), the Don Valley Brickworks(fig. 1.6), the Ontario Highway 401 (fig. 1.7), and Scarborough Bluffs (fig. 1.8). At the time of construction or erection, each monument heavily impacted the geological narrative of the city. Beginning with the Scarborough bluffs as a literal legend of the city's prior geological history, each major earthwork project built on top of this history and changed the topography of the city. The highlighted projects were selected because at the time of their construction they used the newest technology available and were considered cutting edge. Each project bolder than the last, displacing more and more tonnes of material.

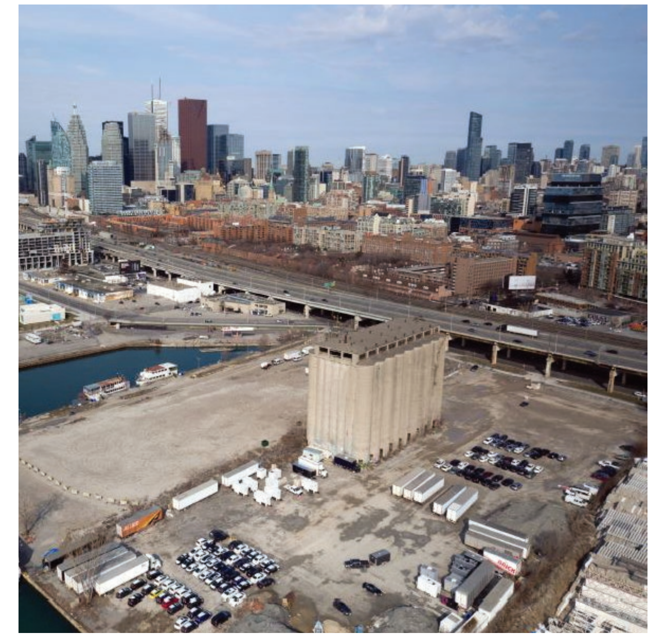

SCARBOOUGH BLUFFS
HIGHWAY 401
DON VALLEY BRICKWORKS
VICORY MILLS SILOS
THE PORTLANDS
TORONTO WATERFRONT
LESLIE STREET SPIT
Toronto Harbour
Lake Ontario
Legend
water
park
streams and rivers
Major geologic form of interest
employment lands [2018]
major roads
railroads
local roads
Major earthworks of interest
4 kilometre
10 000 feet
Scale 1:600 000

LESLIE STREET SPIT, TORONTO HARBOUR COMMISSION (1950)
fig. 1.17 (above)

"In a period of overall ecological decline, what are the implications of a celebratory posture concerning cycles of material displacement, reconstitution, destruction, disposal, disregard, and then spontaneous ecological inhabitation? ... If we are willing to look beyond the aesthetically pleasing surface qualities, if we are willing to think about the historic journey of the materials rather than simply admire the juxtaposition of verdant nature springing from ruins, then perhaps we can think seriously about the ecological and social justice dimensions of sustainability"[10]

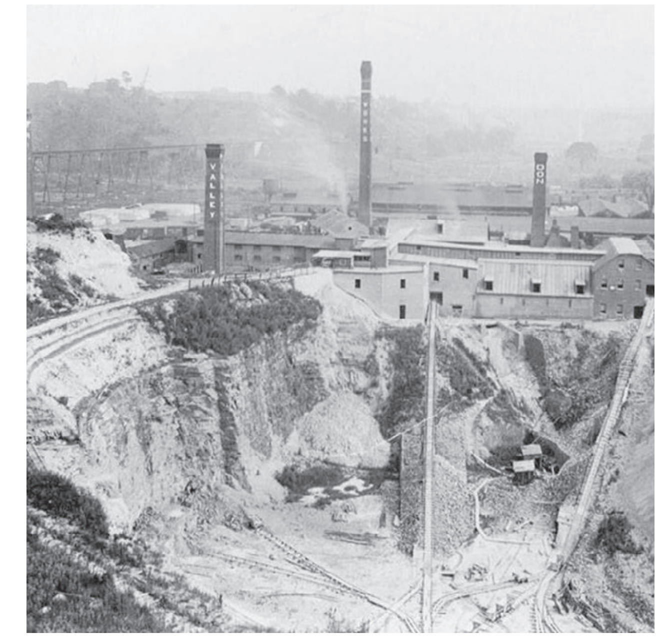
TORONTO PORT LANDS ESTABLISHED BY TORONTO HARBOUR COMMISSION, COMPLETED BY 1850
fig. 1.18 (above)

"Neither railroad cars nor harbour dredges were capable of delivering the additional material necessary for building anticipated port lands, and many parts of the waterfront remained improperly filled for decades. The land area that was created should be regarded as a by-product of short-run, selfish commercial interests, abetted by a City Council that gave only lip-service to the concept of a parklike lakefront."[11]



VICTORY SOYA MILLS SILOS ESTABLISHED BY E. P. TAYLOR, COMPLETED BY 1936
fig. 1.19 (above)

"The establishment of Victory Mills was expected not only to bring Toronto into the forefront of the processing industry, but to be an important milestone in the Canadian economy, opening the way for major changes in agricultural production"[12].



DON VALLEY BRICKWORKS ESTABLISHED BY THE TAYLOR BROTHERS, IN OPERATION FROM 1784-1984
fig. 1.20 (above)

"The north slope of the valley, near the Brick Works, is considered one of the most important geological deposits in North America. It has several layers covering thousands of years of Earth's geological record. University of Toronto professor A.P. Coleman famously performed extensive research there in the late 1800s and early 1900s. He discovered, among other things, that woolly mammoths once roamed the Don Valley. There are fossil specimens in the slope that have not been found anywhere else in the world"[13]

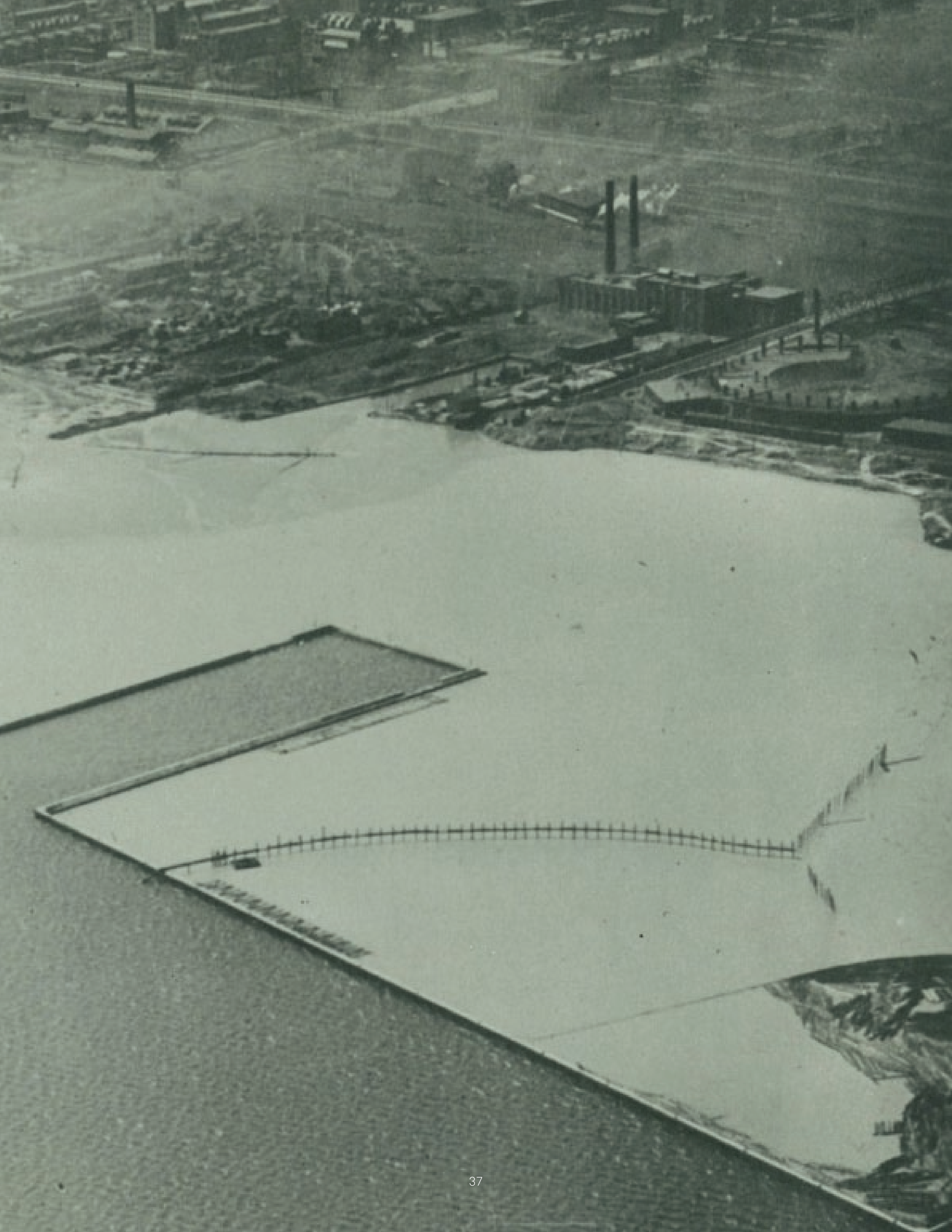
ONTARIO HIGHWAY 401 ESTABLISHED BY THE MINISTRY OF TRANSPORTATION OF ONTARIO, IN OPERATION FROM 1947-PRESENT
fig. 1.21 (above)

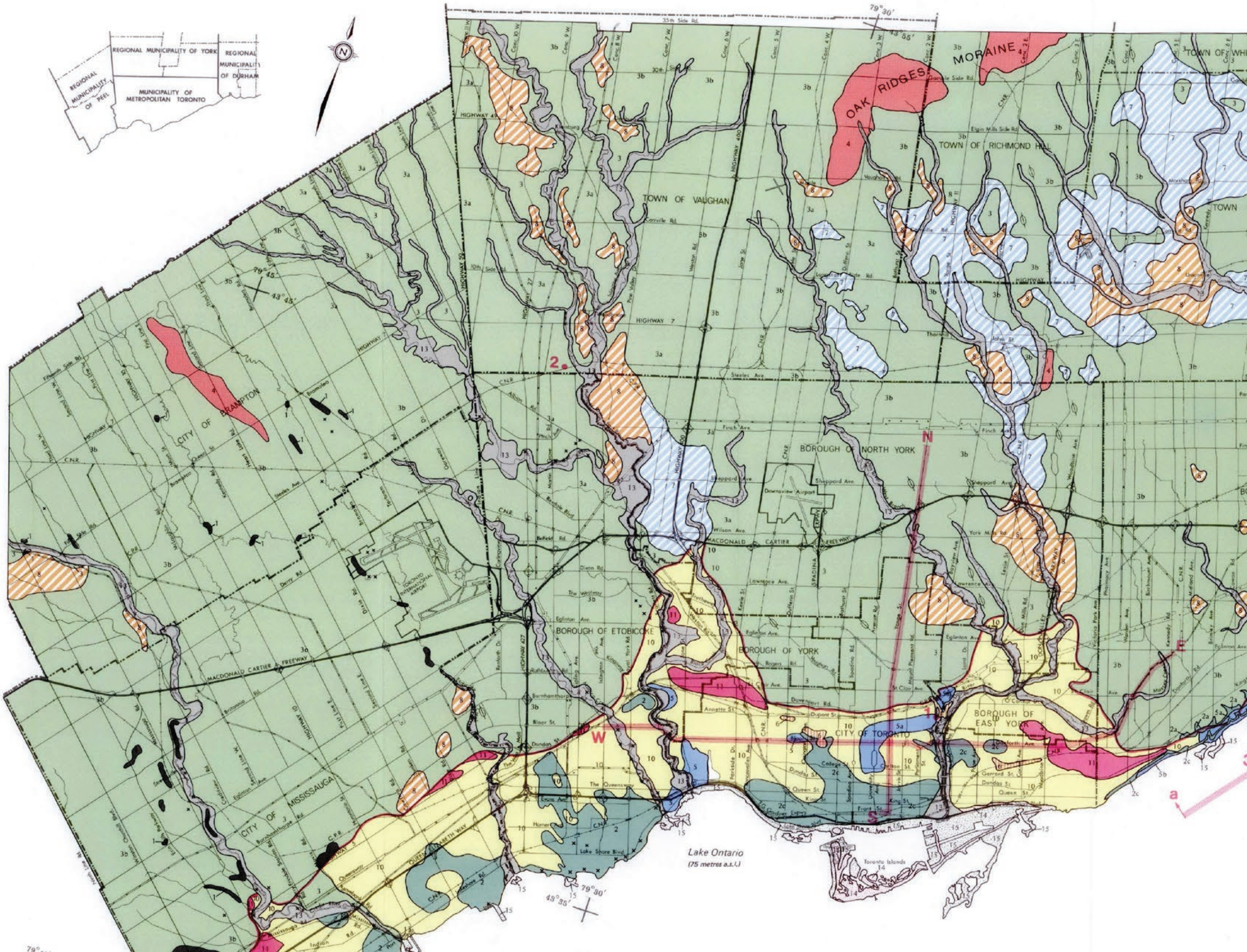
"The Regional Plan Association (RPA), which has been studying the development of megaregions throughout North America, has defined the Great Lakes Megaregion to include the cities of Chicago, Detroit, Toronto, Buffalo, Rochester, Pittsburgh, and Cincinnati. Within this region, Highway 401 is a freeway that runs for approximately 820 kilometers across Southern Ontario from the US border at Detroit through Toronto and into Quebec. It is North America's busiest highway, and one of the busiest in the world. The section of the 401 that cuts across the northern part of Toronto has been expanded to eighteen lanes, and typically carries 420,000 vehicles a day, rising to 500,000 at peak times, as compared to 380,000 on the I-405 in Los Angeles or 350,000 on the I-75 in Atlanta (Gray)"[14].

SCARBOROUGH BLUFFS NATURAL LANDFORM FORMED DURING LAST ICE AGE
fig. 1.22 (above)

"Where the land rises to 324 feet above the lake, & forms Scarborough Bluffs. Continual strong wave action erodes material away. The backwash from the waves removes sediment. The current moves it along the shore until the energy of the water is too low to let it be carried further. Niagara Current runs west along the north shore of Lake Ontario parallel to shore. Coastline is indented, forms sheltered area. Current slows, sands deposit, initially forming small pocket beaches, on the inner shore. The current eventually spread sand across baymouth from east to west forming a spit"[15]

fig. 1.23 Historical image of Toronto Harbour infilling, 1920's.



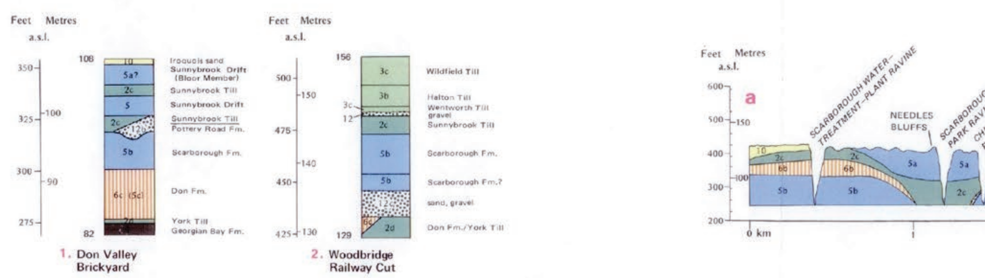


INDEX MAP

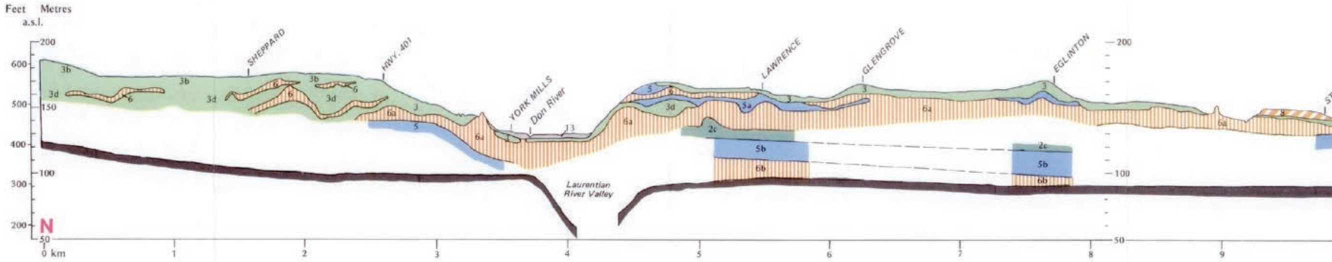
The following references were the source of most of the surface geology. The areas of these maps are shown on the index map. They are at a larger scale and will generally provide the user with more detailed information for particular areas. All have been published by the Ontario Department (or Division) of Mines.

1. Coleman (1933): The Pleistocene of the Toronto Region; ODM Map 41g. Scale 1:63 360.
2. Hewitt (1969a): Industrial minerals of the Markham-Newmarket area; ODM Map 2124. Scale 1:63 360.
3. Hewitt (1969b): Industrial mineral resources of the Brampton area; ODM Map 2176. Scale 1:63 360.
4. Karrow (1965): Pleistocene geology of the Scarborough area; ODM Maps 2076 and 2077. Scale 1:31 680.
5. Karrow (1970): Pleistocene geology of the Thornhill area; ODM Preliminary Map P. 244. Scale 1:25 000.
6. Watt (1957): Pleistocene geology of the Township of North York; ODM Map 1955-6. Scale 1:31 680.
7. Watt (1968): Pleistocene geology of Etobicoke; ODM Map 2111. Scale 1:31 680.
8. White (1973): Quaternary geology of Bolton; ODM Map 2275. Scale 1:63 360.

Note: This index includes only the most recently published map for an area.



REFERENCE SECTIONS (1–3)



SECTION N–S

(Yonge Street subway)

Horizontal scale is 1:25,000. Vertical exaggeration is x 10.

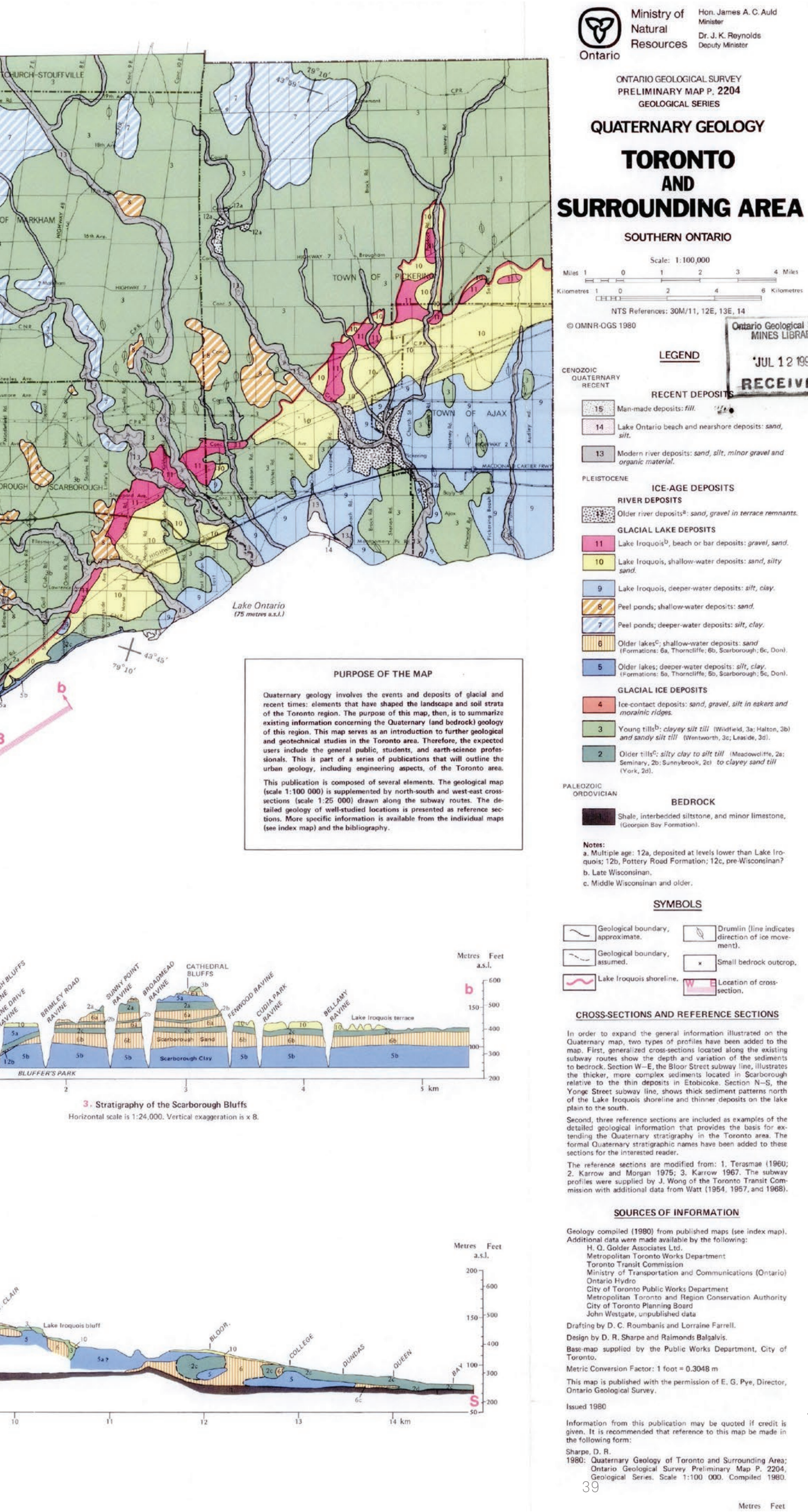


fig. 1.25 Historical Map showing sites of extraction in Southern Ontario


LEGEND
Existing Super-Highways.
Existing Highways widened to Super-Highways.
New Super-Highways.
Intersections
Major Highways
Major Arterial widening
New Arterial Roads
Rapid Transit Subways
Rapid Transit in centre of Super-Highways
Urban Limit
Agricultural Area, Green Belt, Large Parks, Commercial Airports.
Redevelopment Areas
Existing Industrial Areas
New Industrial Areas
New Residential Areas with Prospective Population.
50,000
Parkway
Golf Courses
G
Secondary Roads.
Scale in Miles
LAKE ONTARIO
TO LONDON
TO HAMILTON
TO MALTON
TO KINGSTON
HIGH PARK
SCARBOROUGH
ETOBICOKE
Finch
Sheppard
Wilson
Lawrence
45,000
50,000
10,000
40,000
30,000
35,000
25,000
15,000

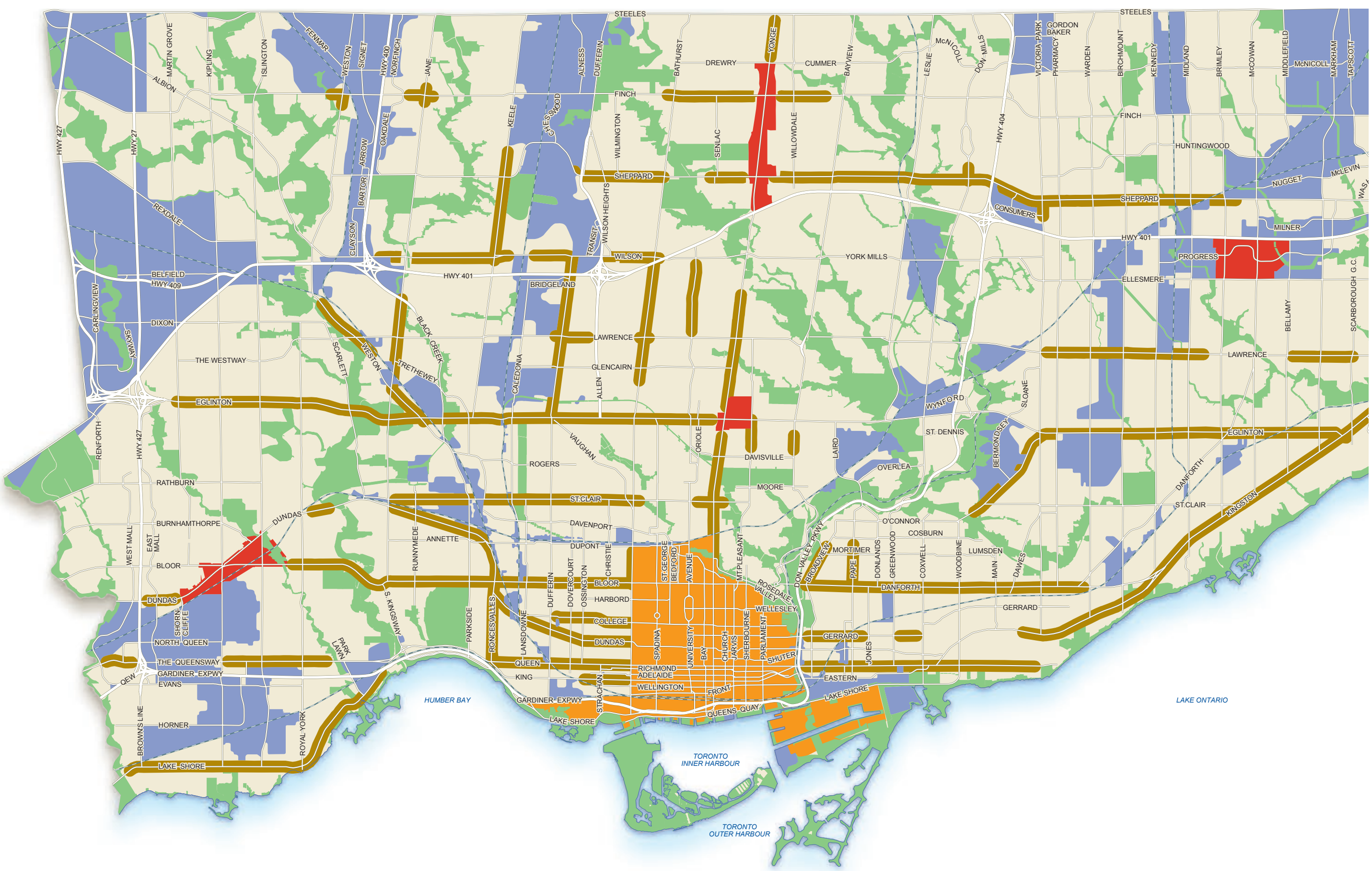


fig. 1.26 (opposite) Map from the 1943 "Master Plan for the Cite of Toronto and Enviroms", as reproduced in the Royal Architectural Institute of Canada Journal, June 1944

fig. 1.27 (above) Toronto Official Plan - Urban Structure 2015

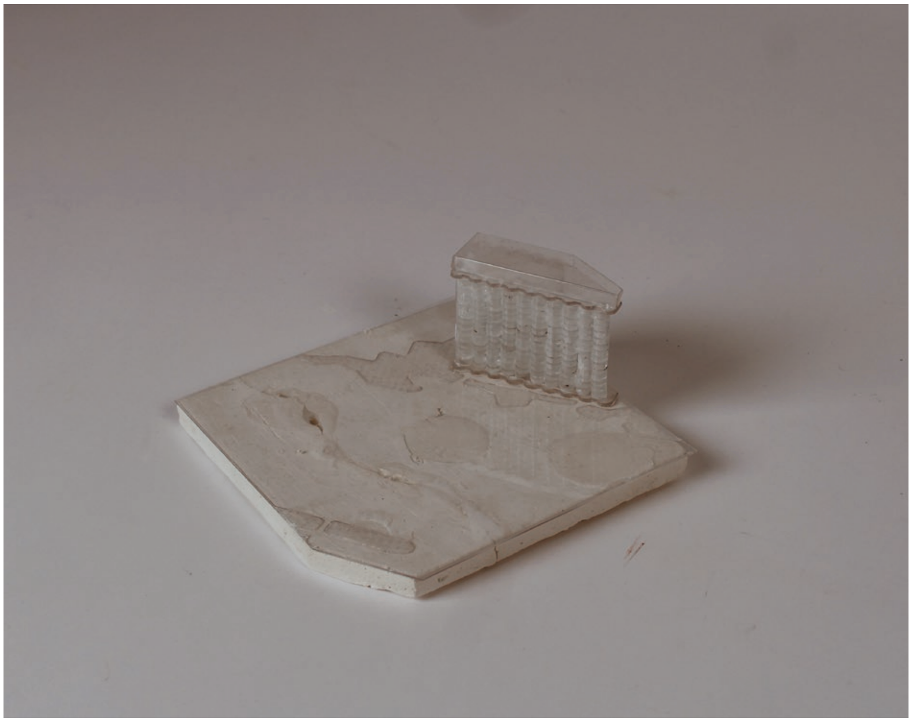


fig. 1.27(left) fragment model of Niagara Escarpment

fig. 1.28(center) fragment model of Don Valley Parkway

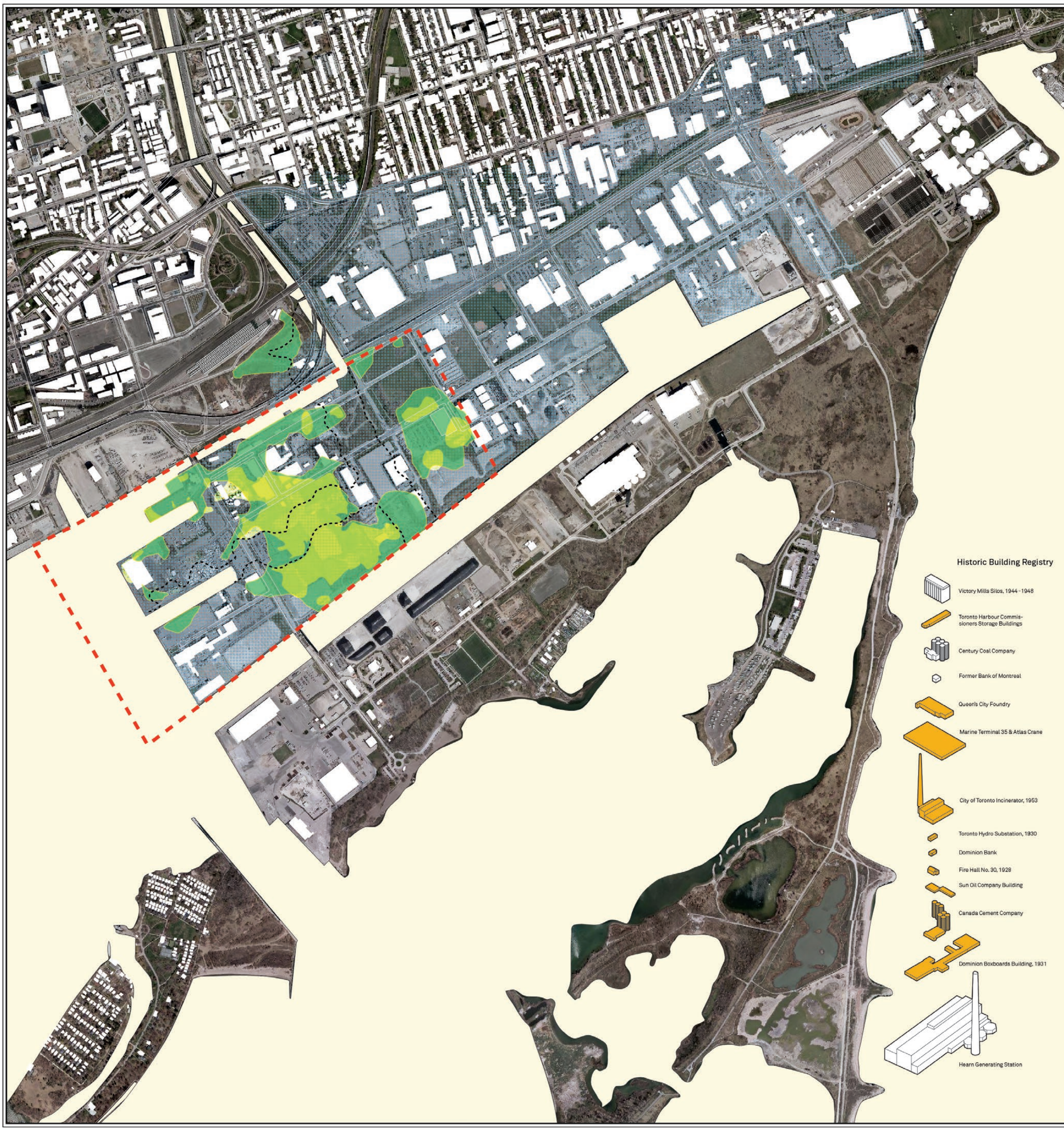
fig. 1.29(right) fragment model of Victory Soya Mills Silos

PORT LANDS: FLOODING, GROUND POLLUTION, AND HISTORIC INDUSTRIAL BUILDINGS

fig. 1.30(opposite) Map showing the conext of the Toronto Port Lands. See Appendix C for full scale drawing.

The Port Lands site located on the former Don River delta and most of Ashbridge's Bay is completely constructed of displaced material. The site is part of the 1930's extension of the Toronto Harbour that consisted of filling the water lot with materials sourced from the surrounding landscape: debris dredged from the bottom of Lake Ontario, concrete rubble from demolished buildings, limestone aggregate from local quarries, wooden piers from Northern Ontario logging processes. This created a very different type of urban geology. Unlike the rest of the naturally occurring, predictable geology of the surrounding area, there was a new type of urban fill that created brand new ground for the city. Over time the fill started to decompose, creating methane, and it buried artifacts long forgotten.

The Waterfront lots had been intended strictly for industrial uses, and as a place to ship and receive goods coming from cities across Lake Ontario. During the 1930's shipping was the most economical ways to move goods and therefore made an industrial port on the edge of the city and close to shipping routes ideal. Over the last 100 years, technologies have changed drastically and shipping by boat or rail are not economical for most goods. Today it is drastically more efficient to transport goods by truck or plane. This has made it much more appealing for any company who deals with shipping and receiving or handling large quantities of goods be located close to the 401. There are large swaths of available land for growth where as, the Port Lands has become land locked. These factors, as well as the impact of seasonal flooding and cost of land inside the downtown core has pushed companies who might be attracted to the Port Lands outside the city, creating a void in use of the area.



Scale 1 : 7 500

400 100 0 1600 meters

1000 20 0 4000 feet

Legend

Potential NAPL (contaminants that do not dissolve in or easily mix with water (hydrophobic), like oil, gasoline and petroleum products)

Limited Potential NAPL (contaminants that do not dissolve in or easily mix with water (hydrophobic), like oil, gasoline and petroleum products)

Boundry of waterlot

floodplain

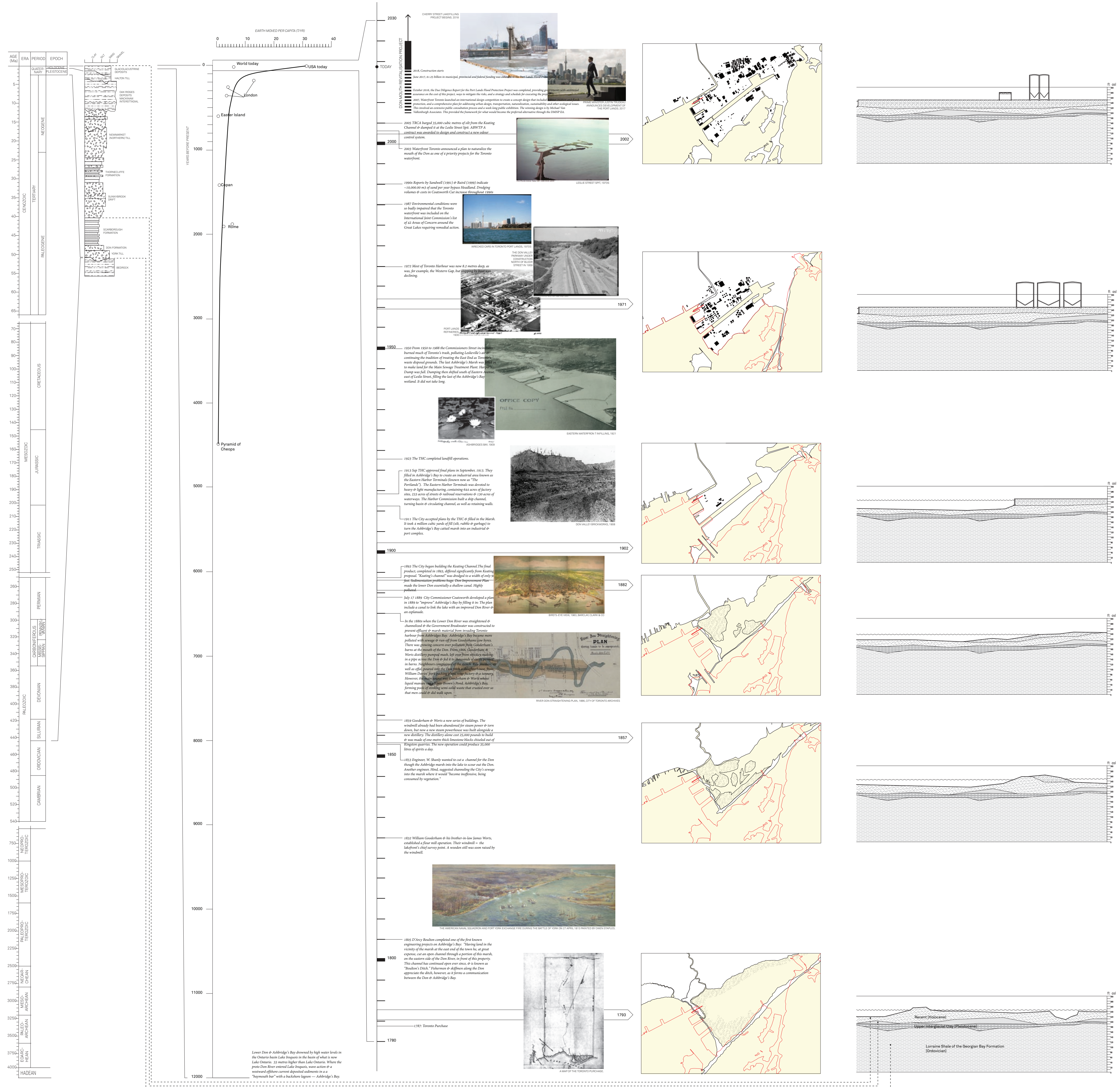
Site of Interest

fig. 1.31 (top), fig. 1.32 (middle), fig. 1.33 (bottom)
Images from site visit on March, 2018

fig. 1.34 (top), fig. 1.35 (middle), fig. 1.36 (bottom)
Images from site visit on March, 2018

fig. 1.37 (top), fig. 1.368(middle), fig. 1.39 (bottom) Images from site visit on October, 2018

fig. 1.40 (top), fig. 1.41 (middle), fig. 1.42 (bottom) Images from site visit on October, 2018


AGE (Ma)
ERA
PERIOD
EPOCH
CENOZOIC
TERTIARY
NEOGENE
PALEOGENE
MESOZOIC
CRETACEOUS
JURASSIC
TRIASSIC
PALEOZOIC
PERMIAN
CARBONIFEROUS
DEVONIAN
SILURIAN
ORDOVICIAN
CAMBRIAN
HADEAN
EARTH MOVED PER CAPITA (T/YR)
YEARS BEFORE PRESENT
World today
USA today
London
Easter Island
Copan
Rome
Pyramid of Cheops
2030
TODAY
DON MOUTH REVITALISATION PROJECT
CHERRY STREET LAKEFILLING PROJECT BEGINS. 2018
2018, Construction starts
June 2017, $1.25 billion in municipal, provincial and federal funding was awarded to the Port Lands Flood Protection Project.
October 2016, the Due Diligence Report for the Port Lands Flood Protection Project was completed, providing governments with additional assurance on the cost of this project, ways to mitigate the risks, and a strategy and schedule for executing the project.
2007, Waterfront Toronto launched an international design competition to create a concept design that included habitat creation and flood protection, and a comprehensive plan for addressing urban design, transportation, naturalization, sustainability and other ecological issues. This involved an extensive public consultation process and a week-long public exhibition. The winning design is by Michael Van Valkenburgh Associates. This provided the framework for what would become the preferred alternative through the DMNP EA.
PRIME MINISTER JUSTIN TRUDEAU ANNOUNCES DEVELOPMENT OF THE PORT LANDS. 2017
2005 TRCA barged 35,000 cubic metres of silt from the Keating Channel & dumped it at the Leslie Street Spit. ABWTP A contract was awarded to design and construct a new odour control system.
2000
2002
2003 Waterfront Toronto announced a plan to naturalize the mouth of the Don as one of 4 priority projects for the Toronto waterfront.
LESLIE STREET SPIT, 1970S
1990s Reports by Sandwell (1991) & Baird (1999) indicate ~10,000.00 m3 of sand per year bypass Headland. Dredging volumes & costs in Coatsworth Cut increase throughout 1990s
1987 Environmental conditions were so badly impaired that the Toronto waterfront was included on the International Joint Commission's list of 42 Areas of Concern around the Great Lakes requiring remedial action.
WRECKED CARS IN TORONTO PORT LANDS, 1970S
THE DON VALLEY PARKWAY UNDER CONSTRUCTION NORTH OF BLOOR STREET IN 1959
1972 Most of Toronto Harbour was now 8.2 metres deep, as was, for example, the Western Gap, but shipping by boat was declining.
1971
PORT LANDS REFINERIES, 1930
1950
1950 From 1950 to 1988 the Commissioners Street incinerator burned much of Toronto's trash, polluting Leslieville's air & continuing the tradition of treating the East End as Toronto's waste disposal grounds. The last Ashbridge's Marsh was filled in to make land for the Main Sewage Treatment Plant. Harper's Dump was full. Dumping then shifted south of Eastern Avenue, east of Leslie Street, filling the last of the Ashbridge's Bay wetland. It did not take long.
OFFICE COPY
EASTERN WATERFRONT INFILLING, 1921
ASHBRIDGES BAY, 1909
1923 The THC completed landfill operations.
1913 Sep THC approved final plans in September, 1913. They filled in Ashbridge's Bay to create an industrial area known as the Eastern Harbor Terminals (known now as "The Portlands"). The Eastern Harbor Terminals was devoted to heavy & light manufacturing, containing 644 acres of factory sites, 233 acres of streets & railroad reservations & 130 acres of waterways. The Harbor Commission built a ship channel, turning basin & circulating channel, as well as retaining walls.
1911 The City accepted plans by the THC & filled in the Marsh. It took 4 million cubic yards of fill (silt, rubble & garbage) to turn the Ashbridge's Bay cattail marsh into an industrial & port complex.
DON VALLEY BRICKWORKS, 1908
1900
1902
1893 The City began building the Keating Channel.The final product, completed in 1893, differed significantly from Keating proposal. "Keating's channel" was dredged to a width of only 90 feet. Sedimentation problems huge. Don Improvement Plan made the lower Don essentially a shallow canal. Highly polluted.
1882
July 17 1889 City Commissioner Coatsworth developed a plan in 1889 to "improve" Ashbridge's Bay by filling it in: The plan include a canal to link the lake with an improved Don River & an esplanade.
BIRD'S-EYE VIEW, 1983, BARCLAY, CLARK & CO
In the 1880s when the Lower Don River was straightened & channelized & the Government Breakwater was constructed to prevent effluent & marsh material from invading Toronto harbour from Ashbridges Bay. Ashbridge's Bay became more polluted with sewage & run-off from Gooderhams cow byres. There was growing concern over pollution from Gooderham's barns at the mouth of the Don. From 1866, Gooderham & Worts distillery pumped mash, left over from whiskey making, in a pipe across the Don & fed it to thousands of cattle penned in barns. Neighbours complained of the stench. Raw manure, as well as offal, poured into the Don from a slaughterhouse, from William Davies' pork packing plant, soap factory & a tannery. However, the main source was Gooderham & Worts whose liquid manure ran off into Brown's Pond, Ashbridge's Bay, forming pools of stinking semi-solid waste that crusted over so that men could & did walk upon.
River Don Straightening PLAN
RIVER DON STRAIGHTENING PLAN, 1886, CITY OF TORONTO ARCHIVES
1859 Gooderham & Worts a new series of buildings. The windmill already had been abandoned for steam power & torn down, but now a new steam powerhouse was built alongside a new distillery. The distillery alone cost 25,000 pounds to build & was made of one-metre thick limestone blocks chiseled out of Kingston quarries. The new operation could produce 35,000 litres of spirits a day.
1857
1850
1853 Engineer, W. Shanly wanted to cut a channel for the Don though the Ashbridge marsh into the lake to scour out the Don. Another engineer, Hind, suggested channeling the City's sewage into the marsh where it would "become inoffensive, being consumed by vegetation."
1832 William Gooderham & his brother-in-law James Worts, established a flour mill operation. Their windmill = the lakefront's chief survey point. A wooden still was soon raised by the windmill.
THE AMERICAN NAVAL SQUADRON AND FORT YORK EXCHANGE FIRE DURING THE BATTLE OF YORK ON 27 APRIL 1813 PAINTED BY OWEN STAPLES.
1805 D'Arcy Boulton completed one of the first known engineering projects on Ashbridge's Bay: "Having land in the vicinity of the marsh at the east end of the town he, at great expense, cut an open channel through a portion of this marsh, on the eastern side of the Don River, in front of this property. This channel has continued open ever since, & is known as "Boulton's Ditch." Fishermen & skiffmen along the Don appreciate the ditch, however, as it forms a communication between the Don & Ashbridge's Bay.
1800
1793
1787: Toronto Purchase
1780
A MAP OF THE TORONTO PURCHASE.
Lower Don & Ashbridge's Bay drowned by high water levels in the Ontario basin Lake Iroquois in the basin of what is now Lake Ontario. 55 metres higher than Lake Ontario. Where the proto Don River entered Lake Iroquois, wave action & a westward offshore current deposited sediments in a a "baymouth bar" with a backshore lagoon — Ashbridge's Bay.
Recent (Holocene)
Upper Interglacial Clay (Pleistocene)
Lorraine Shale of the Georgian Bay Formation (Ordovician)

PORT LANDS: HISTORICALLY, A DUMP

fig. 1.43(opposite) Timeline poster. Full scale image available in Appendix D.

The Port Lands today resides on top of what was once known as the Ashbridge's Bay marsh. Before human intervention the marsh was a naturally occurring marsh ecosystem in a healthy state of constant flux. Changing by way of hydraulic forces from both Lake Ontario and in the incoming creeks and streams of the Don Valley (that once totaled 11) and the sandbars would shift regularly. 12000 years before present the "Lower Don & Ashbridge's Bay [was] drowned by high water levels in the Ontario basin Lake Iroquois in the basin of what is now Lake Ontario. 55 metres higher than Lake Ontario. Where the proto Don River entered Lake Iroquois, wave action & a westward offshore current deposited sediments in a "baymouth bar" with a backshore lagoon — Ashbridge's Bay"[16]. "Ashbridge's Bay, deeper in east end, east of Leslie, marsh in shallow end where Don entered. Maze of channels connecting ponds with areas of open water. The marsh was 520 ha or 1,285 acres (Long Point 32 km & 28,000 ha)." It is recorded that this was a rich ecosystem home and considered to be a staging area for migratory wildfowl, wild rice, aquatic plants, cattails, water lilies, arrowhead, grasses & duck weeds in the sloughs between the dunes. This diverse landscape cultivated nutrients from the Don creating habitat for frogs, turtles, fish (pickerel, red trout, salmon) and many other species[17].

As Toronto's population began to grow, it had major problems with hygiene and its disposal of waste. Many factories began illegally dumping waste directly into the marsh. Soon the city Toronto decided to direct raw sewage into the Bay, and shortly thereafter, the thriving ecosystem became overloaded with sewage that it was unable to sustain itself as a prosperous habitat. Disease was rampant.

And so, with the demand for port access, land availability and overwhelming disgust at the marsh from residents, the most feasible solution was to fill in the marsh with dry waste from the city to create the Eastern Harbor Terminals (known today as the Port Lands).

△

ENDNOTES - MATERIALS AT LARGE

1 Roger Hooke, *On the History of Human as Geomorphic Agents*, vol. 28, 2000.

2 Christopher A. De Sousa, "Turning Brownfields into Green Space in the City of Toronto," *Landscape and Urban Planning* 62, no. 4 (February 2003): 181–98, https://doi.org/10.1016/S0169-2046(02)00149-4.

3 Carol Burns and Andrea Kahn, *Site Matters: Design Concepts, Histories, and Strategies* (Psychology Press, 2005).

4 Derek K. Armstrong and J.E.P Dodge, "Paleozoic Geology Of Southern Ontario" (Sedimentary Geoscience Section Ontario Geological Survey, 2007), https://maps.niagararegion.ca/Metadata/md/DocumentUpload/2007-08-09%2014-17-49.pdf.

5 Toronto and Region Conservation, "Geology and Groundwater Resources – Report on Current Conditions," 2009.

6 Giants Rib Escarpment Education Network, "Shaping the Escarpment," *Giants Rib Escarpment Education Network* (blog), n.d., https://www.giantsrib.ca/shaping-the-escarpment/.

7 Heidy Schopf and Jennifer Foster, "Mineral Migration: Extracting, Recomposing, Demolishing, and Recolonizing Toronto's Landscape," ed. Jane Hutton, *Landscript 5: Material Culture Assembling and Disassembling Landscapes* 5 (October 2017): 47–63.

8 Schopf and Foster.

9 "Site Matters | Design Concepts, Histories and Strategies," Taylor & Francis, accessed February 18, 2019, https://www.taylorfrancis.com/books/e/9781135931162.

10 Schopf and Foster.

11 Thomas McIlwraith, "Digging Out and Filling In: Making Land on the Toronto Waterfront in the 1850s," *Urban History Review / Revue d'histoire Urbaine* 20, no. 1 (1991): 15–33, https://doi.org/10.7202/1017560ar.

12 Toronto Heritage Preservation Services, "Victory Soya Mills Silos Heritage Property Research and Evaluation Report" (Toronto: City of Toronto, January 2016).

13 Chris Riddell, "What the Don Valley Brick Works Might Have Been," Torontoist, March 5, 2013, https://torontoist.com/2013/03/what-the-don-valley-brick-works-might-have-been/.

14 Geoffrey Thün and Kathy Velikov, "The Post-Carbon Highway," July 5, 2010, https://web.archive.org/web/20100705130628/http://alphabet-city.org/issues/fuel/articles/the-post-carbon-highway.

15 Thomas McIlwraith, *The Birds of Ontario*, 2nd ed. (Toronto: W. Briggs, 1894).

16 Leslieville Historical Society, "Ashbridge's Bay," *Leslieville Historical Society* (blog), April 13, 2015, https://leslievillehistory.com/timeline-ashbridges-bay/.

17 Leslieville Historical Society.

fig. 1.44 Drone still from a video of progress on the Cherry Street infill project taken in October 2018.

MATERIALS OVERTURNED

During the next 25 years this human-made quay will again undergo a massive transformation. Waterfront Toronto states that "the Don Mouth Naturalization and Port Lands Flood Protection Project (DMNP) is a precedent-setting undertaking aimed at revitalizing the mouth of the Don River. The DMNP will ultimately transform the existing mouth of the Don River, including the Keating Channel, into a healthier, more naturalized river outlet, while simultaneously providing critical flood protection to 240 ha of Toronto's eastern waterfront."[1] This process will involve carving out a new river bed through the existing Port Lands. And creating an island of new prime real-estate to be developed on. The primary challenge of this project is dealing with the massive amount of soil that has been contaminated from years of industrial operations leaching toxic solutions into the soil. This combined with the original infill being made up of waste, creating build ups of methane below the surface. Most of the soil is poor quality, made up of peat, it has terrible structural integrity and can't be built on because of its tendency to compact and shift.

Since the site was has increasingly been losing occupancy by humans in the 20th century, the vast majority of the Port Lands has become the ultimate urban oasis for many nonhumans. This lack of human presence making it easy for chubby racoons, renegade shrubbery and slow growing mosses to live in the shadows amongst the human detritus. To better understand the nonhuman inhabitation of the Toronto Port Lands site it might help to reflect on Jakob von Uexküll's semiotic theory of umwelt, or the world as it is experienced by a particular organism. Dorian Sagan explains that "Uexküll sees organisms' perceptions, communications, and purposeful behaviors as part of the purpose and sensations of a nature that is not limited to human beings" and "that natural selection is inadequate to explain the orientation of present features and behaviors toward future ends—purposefulness"[2]. By shifting ideas of perception and purposefulness, the human can start to understand other natural beings even without having a common method of communication, such as speech. When the human is able to change their perceptions and comprehension of space, they can acknowledge the attractiveness many critters find in the cool dark crevasses inside the silos, or the earthworms find the dampness of the dirt close to the lake. If the site can be re-thought by the collective and encourage a "political ecology"[3], then the city can start growing in a post-humanistic way. In this new way of designing humans are predicting and carefully calibrating rhizomatic connections but they are not controlling or dictating them.

The current re-development trends utilized in Toronto waterfront construction suggests that the future mixed-use developments of the site are predictable. Too commonly, design proposals and site development strategies are unconcerned with the material impact, current ecologic habitats and use of the geologic history as a tool for developing a symbiotic proposal for the site. Even without an understanding of the complex systems of this specific site, one could still speculate what the future will encapsulate because it will be similar to the other developments being constructed along the Toronto Waterfront. The array of mid-rise glass towers will be optimistic, boasting innovative technology that makes the building "green"[4], while at the same time, naively failing to account for the long-term environmental impact, material deterioration and changing human behaviour trends. The priority will be to intensify the site with residential and office towers in pursuit of short-term financial gain. This is a trend that already exists amongst condominium towers being built across Toronto. The standards for condominium construction are so low that it is estimated a standard curtain wall system used on a condo will need replacing or extensive retrofitting in 10-15 years[5]. This is not a sustainable way to construct a building, and this is not the method that should be employed to develop the Port Lands site.

Not only will this short-sighted approach drastically and, perhaps, negatively effect the landscape, but also it creates a blank slate at the urban level. Most of the buildings currently on the site, except a few with special heritage status, will be demolished. This will add to the project's net energy expenditure and piling of construction debris. Even buildings with special heritage status will be stripped of their decaying decorations and take on commercial rolls far from their intended use. Like many similar disturbed sites "Architects, planners and administrations however are struggling to acknowledge and theorize the rift between the lifespan of buildings and their original use"[6]. There is an opportunity for the Waterfront Toronto planned development to be extremely progressive and grapple with what already exists on the site, creating innovative material experiments and solutions prioritizing retrofitting and recycling construction materials.

Felix Guattari is a French philosopher who inspired many theories on urban design and city planning and is constantly questioning capitalism and the role ecology plays in the modern urban environment. One writing in particular, The Three Ecologies, explores an idea that "the ethics of the ecological is an inherently a political project with a commitment to countering the global dominance of capitalism"[7]. The instability of both the economy and the world's environmental equilibrium suggest that the current method of city building must change in order to slow, or even reverse, the continued polarization of nature and capitalism. This thesis proposes just that. By turning the existing flow of material into a cycle, capitalism and nature can continue to exist in parallel. In the case that this method was completely realized across the city, and literally everything was dismantled, sorted and re-used again, there would be no need to continue disrupting nature.

△

ENDNOTES - MATERIALS

OVERTURNED

1 "Don Mouth Naturalization and Port Lands Flood Protection Project," *Toronto and Region Conservation Authority (TRCA)* (blog), accessed February 19, 2019, https://trca.ca/conservation/green-infrastructure/don-mouth-naturalization-port-lands-flood-protection-project/.

2 Jakob von Uexküll and Dorian Sagan, *A Foray into the Worlds of Animals and Humans: With A Theory of Meaning*, trans. Joseph D. O'Neil, 1 edition (Minneapolis: Univ Of Minnesota Press, 2010).

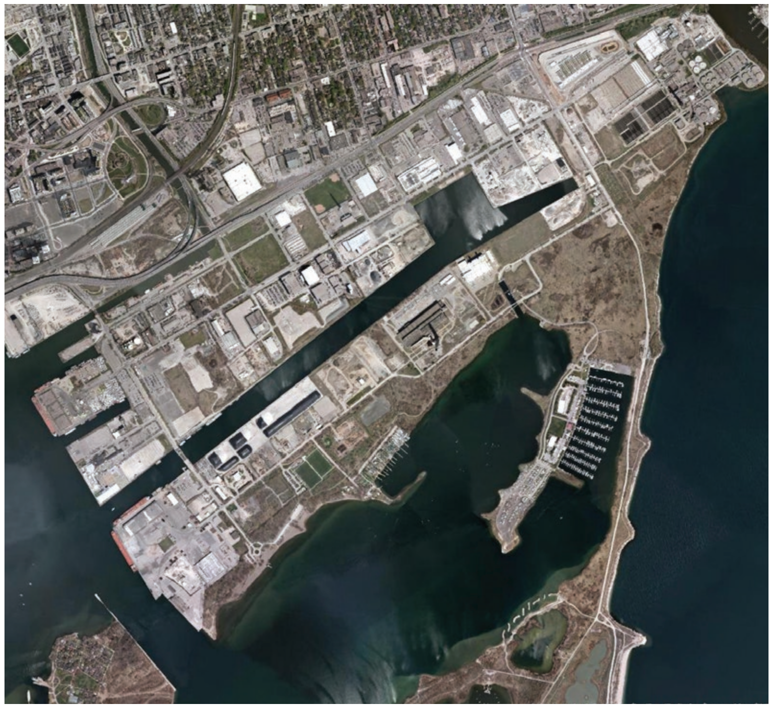
3 Latour, *Politics of Nature : How to Bring the Sciences into Democracy*.

4 The term green is used in this context to describe a trendy marketing term used by the building industry that can mean any of the following things: energy efficiency, sustainable, environmentally friendly, eco-friendly.

5 Ted Kesik, "The Glass Condo Conundrum" (University of Toronto, 2011), https://www.cbc.ca/toronto/features/condos/pdf/condo_conundrum.pdf.

6 Stephanie Davidson and Georg Rafailidis, "Free Zoning," in *Bracket [at Extremes]*, vol. 3, Bracket; Almanac 3 (Barcelona: Actar, 2015), 265.

7 Félix Guattari 1930-1992., *The Three Ecologies* (London: Continuum, 2008).



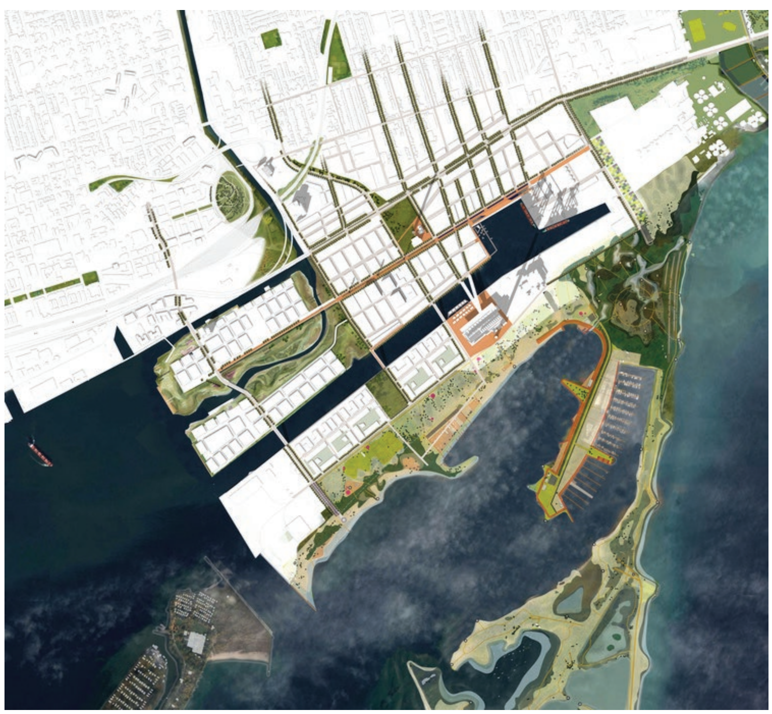
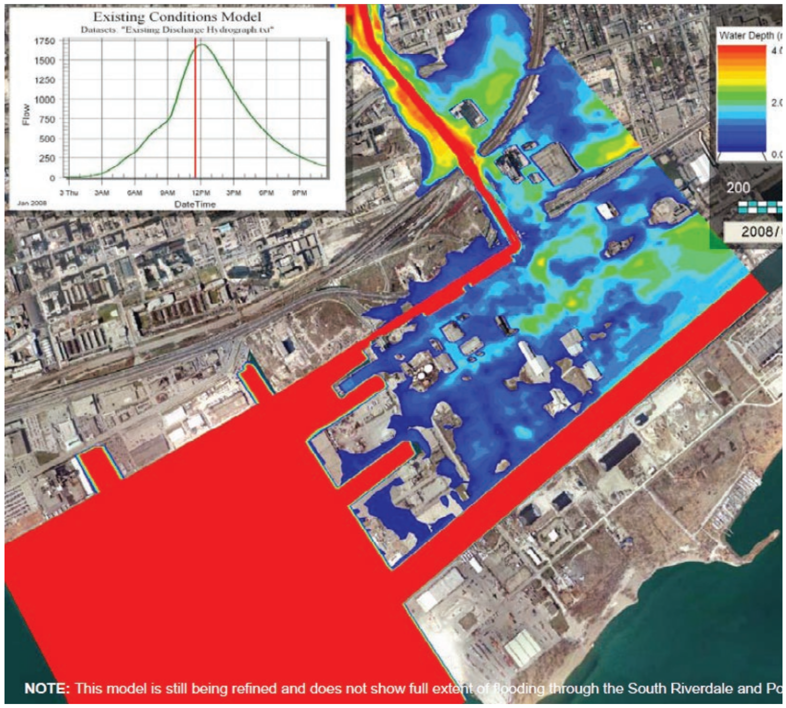


fig. 1.45 (top) An aerial image taken from google maps of the Port Lands at the end of 2017.

fig. 1.46 (bottom) A projected aerial render of the Toronto Port Lands after the Don Mouth Revitalization and other landscape intensive projects are completed



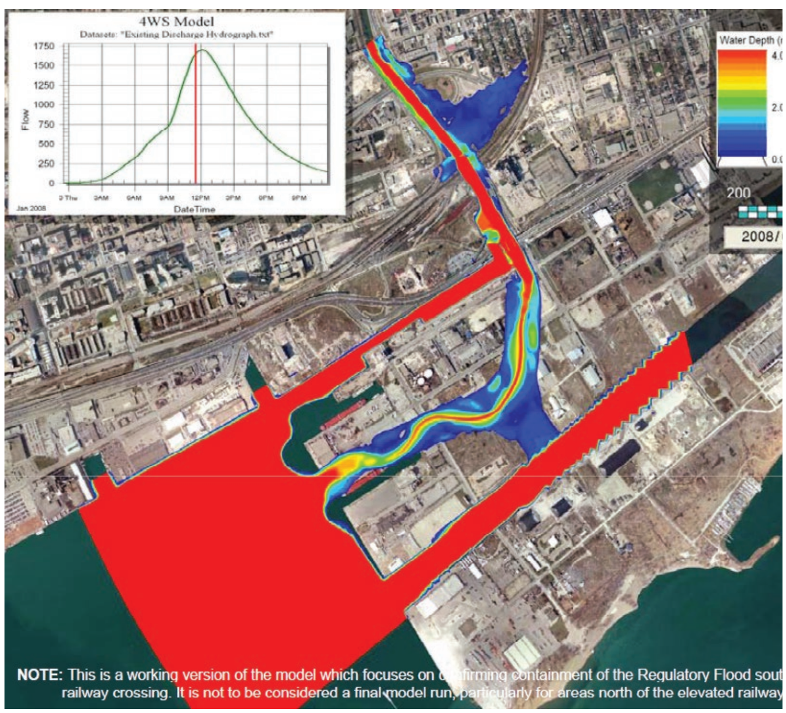


fig. 1.47 (top) An aerial image made by engineers showing the current seasonal floods that occur at the site before the revitalization project commences.

fig. 1.48 (bottom) An aerial image made by engineers to show how the revitalization project would impact and safely change the seasonal flooding patterns.

fig. 1.49(top) A rendering projecting the final state of the Port Lands after the revitalization project is compelte, a new island called Villiers Island with an artificial wetlands lined with concrete to keep polluted groundwater out.

fig. 1.50 (bottom) A more detailed look at the schematic urban design on the new Villiers Island design by Michael Van Valkenburgh Associates, Inc.

fig. 1.51 (top) A rendering by Michael Van Valkenburgh Associates, Inc. showing the new river channel.

fig. 1.52 (bottom) Another rendering depicting a summer scene along the edge of the new wetland.

TRANSFORMATION OF THE DON MOUTH NATURALIZATION AND PORT LANDS FLOOD PROTECTION PROJECT

The following section follows the construction timeline the previously described large scale earthworks project occurring over the next five years. Each of the drawing documents a key construction phases of the project and highlights an estimation of the associated material being displaced as either excavated, remediated or to be disposed of. WaterfronTORONTO has stated that there will be a conscious effort to remediate and re-use as much excavated soil as possible on site[1], claiming that potentially up to 50% could remain. Though this promise is surely not only driven by the landscape intentions of the project, it is still an exciting undertaking.

△

ENDNOTES -TRANSFORMATION

1 "Ministry Review of the Don Mouth Naturalization and Port Lands Flood Protection Project Environmental Assessment," Ontario.ca, October 14, 2016, https://www.ontario.ca/page/ministry-review-don-mouth-naturalization-and-port-lands-flood-protection-project-environmental.

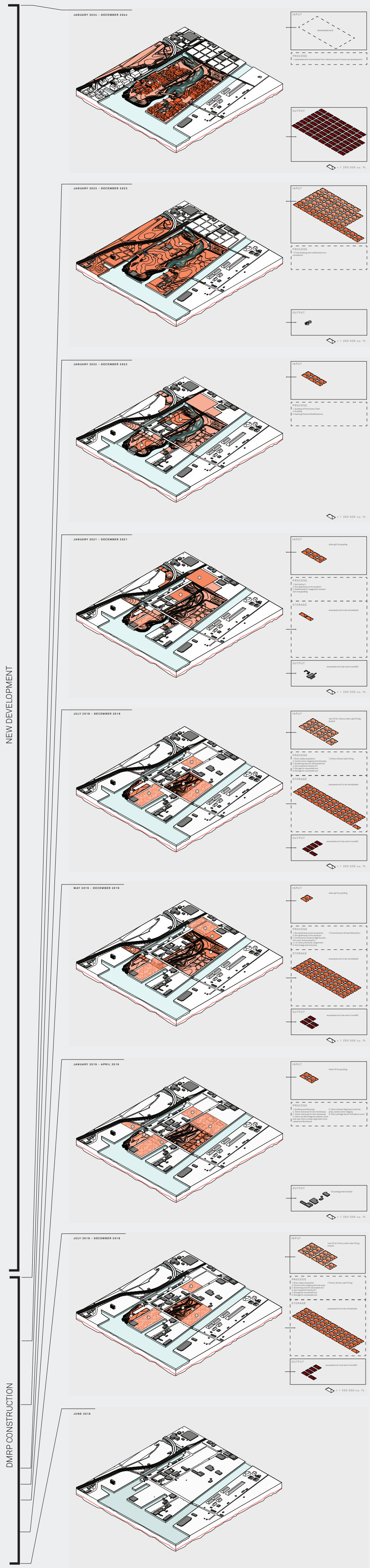


fig. 1.53 This drawing shows the project construction time-line, accompanied by individual drawings of each construction phase. Please see appendix E for a full scale version of this drawing.

JUNE 2018

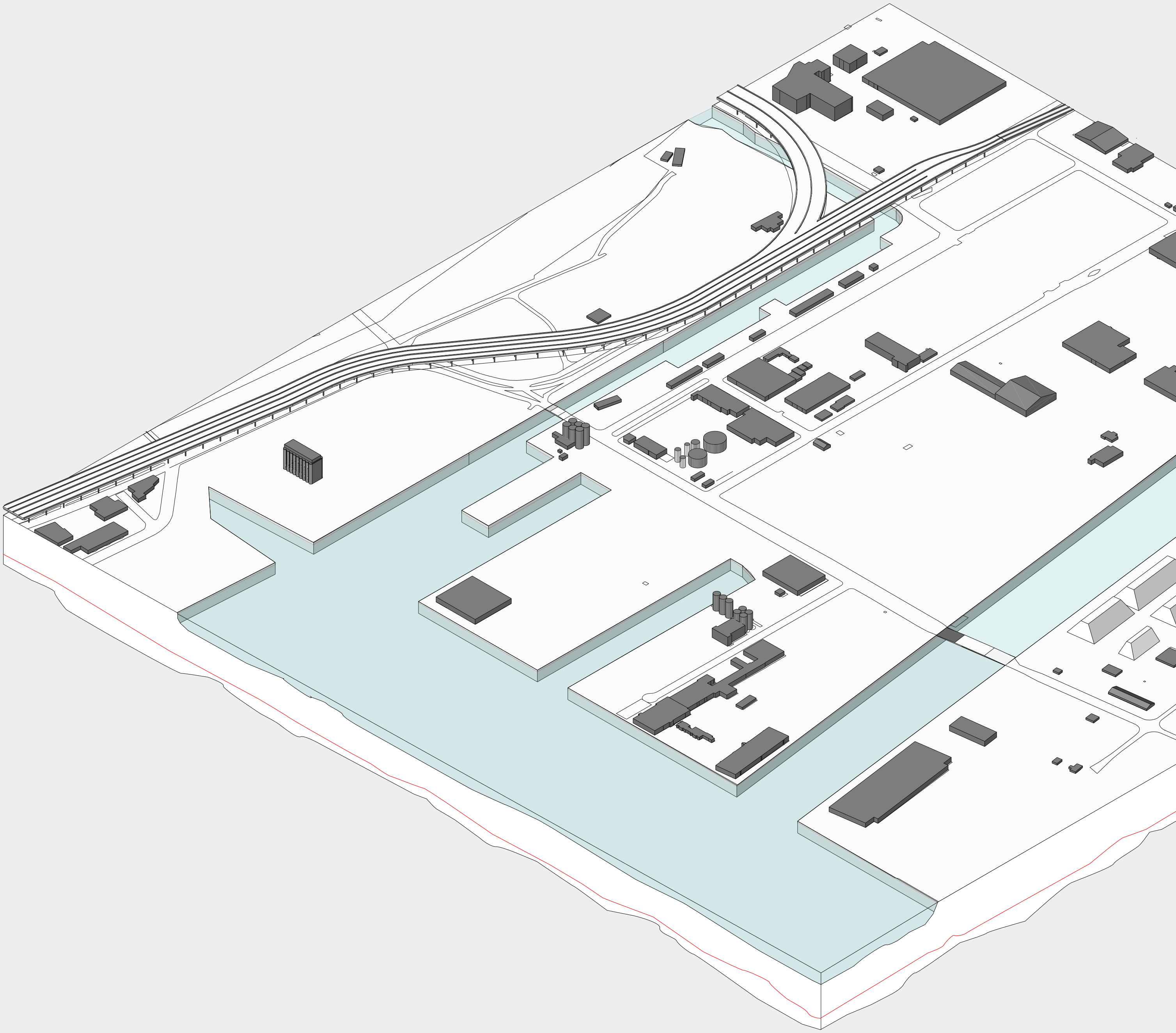
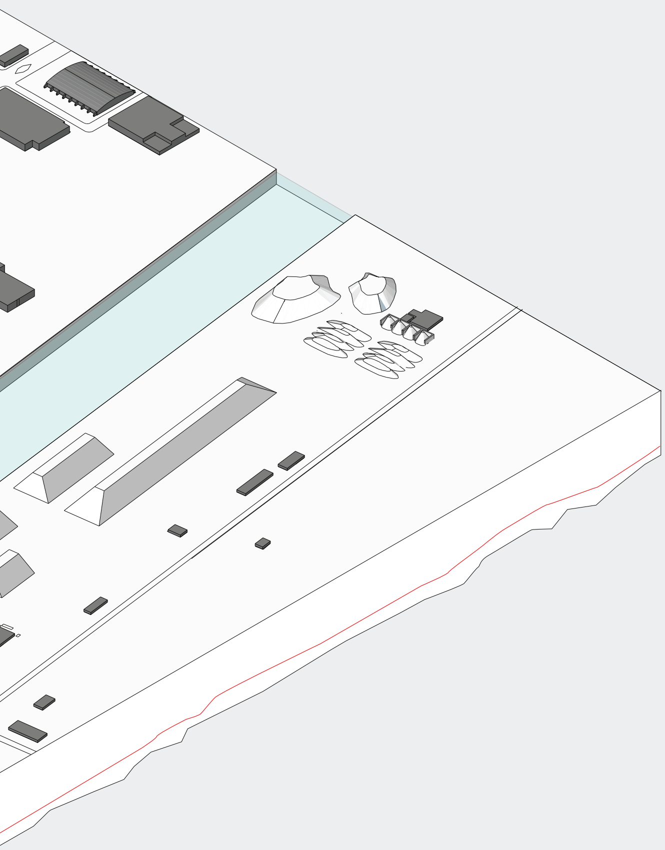


fig. 1.54 Prior to construction starting.



JULY 2018 - DECEMBER 2018

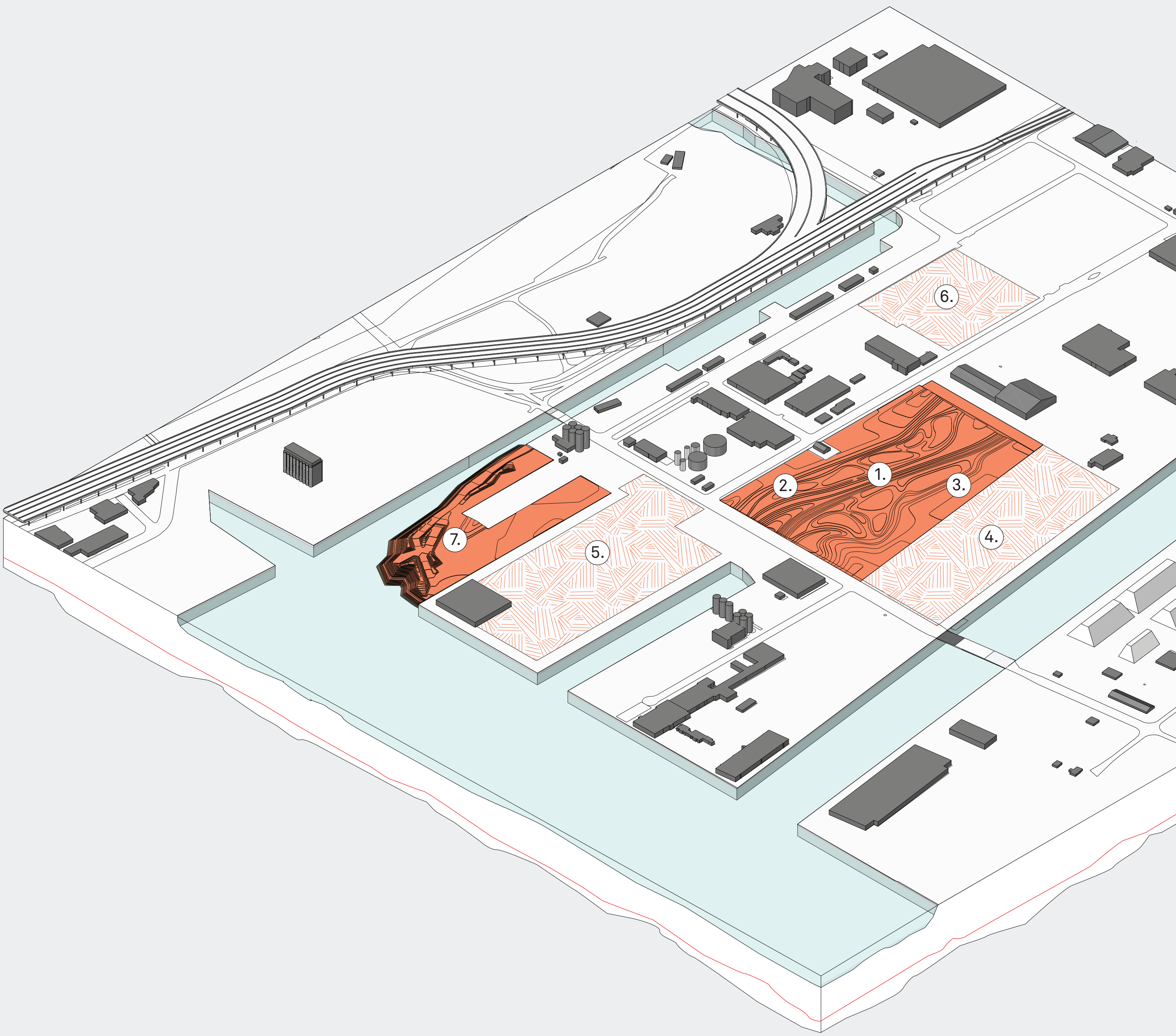
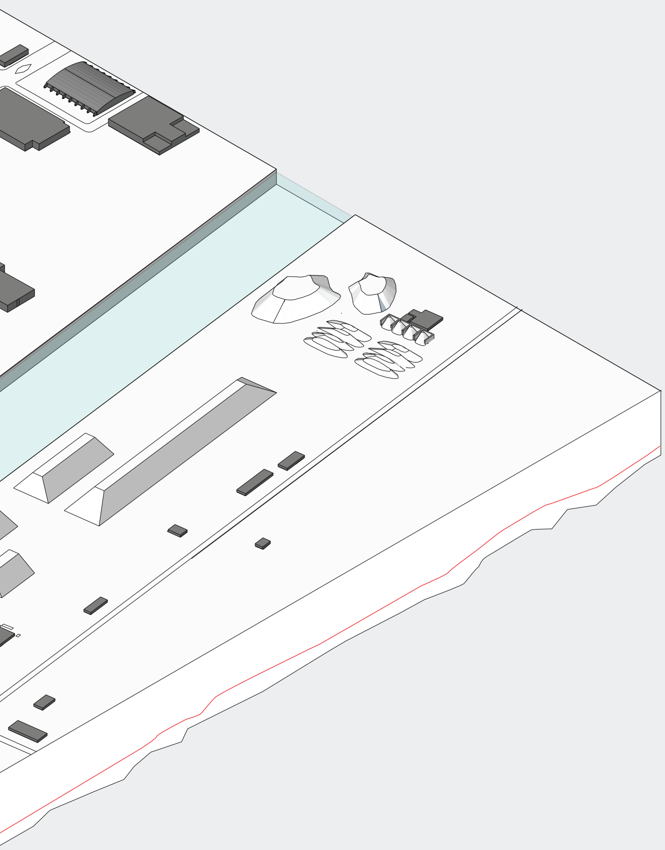


fig. 1.55



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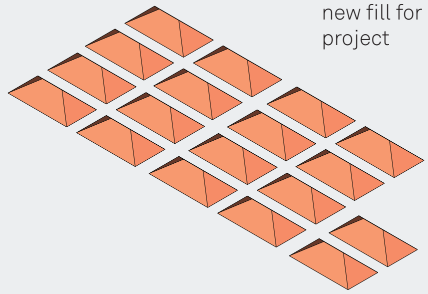
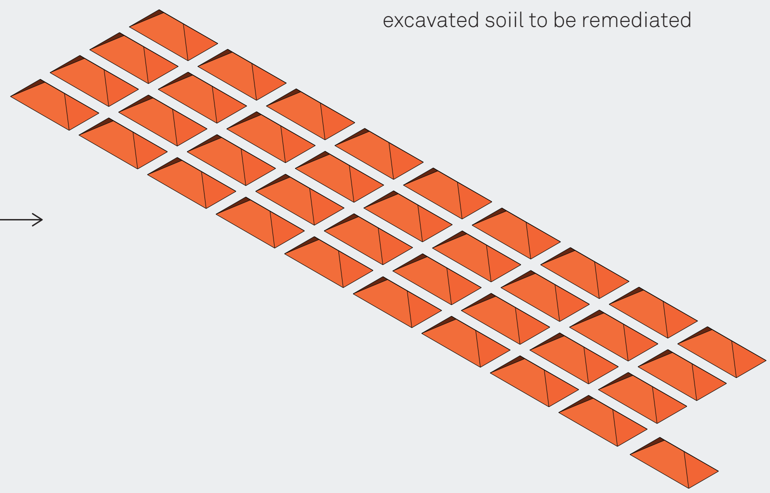


new fill for Cherry treet Lake Filling project

PROCESS

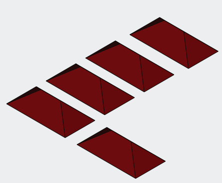
1. River valley excavation
2. Construction staging and site prep
3. Screening area for excavated soil
4. Soil treatment facility #1
5. Storage for excavated soil
6. Storage for excavated soil
7. Cherry Street Lake Filling

STORAGE

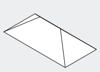


excavated soiil to be remediated

OUTPUT



excavated soil to be sent to landfill

 = 1 250 000 cu. ft.

JANUARY 2019 - APRIL 2019

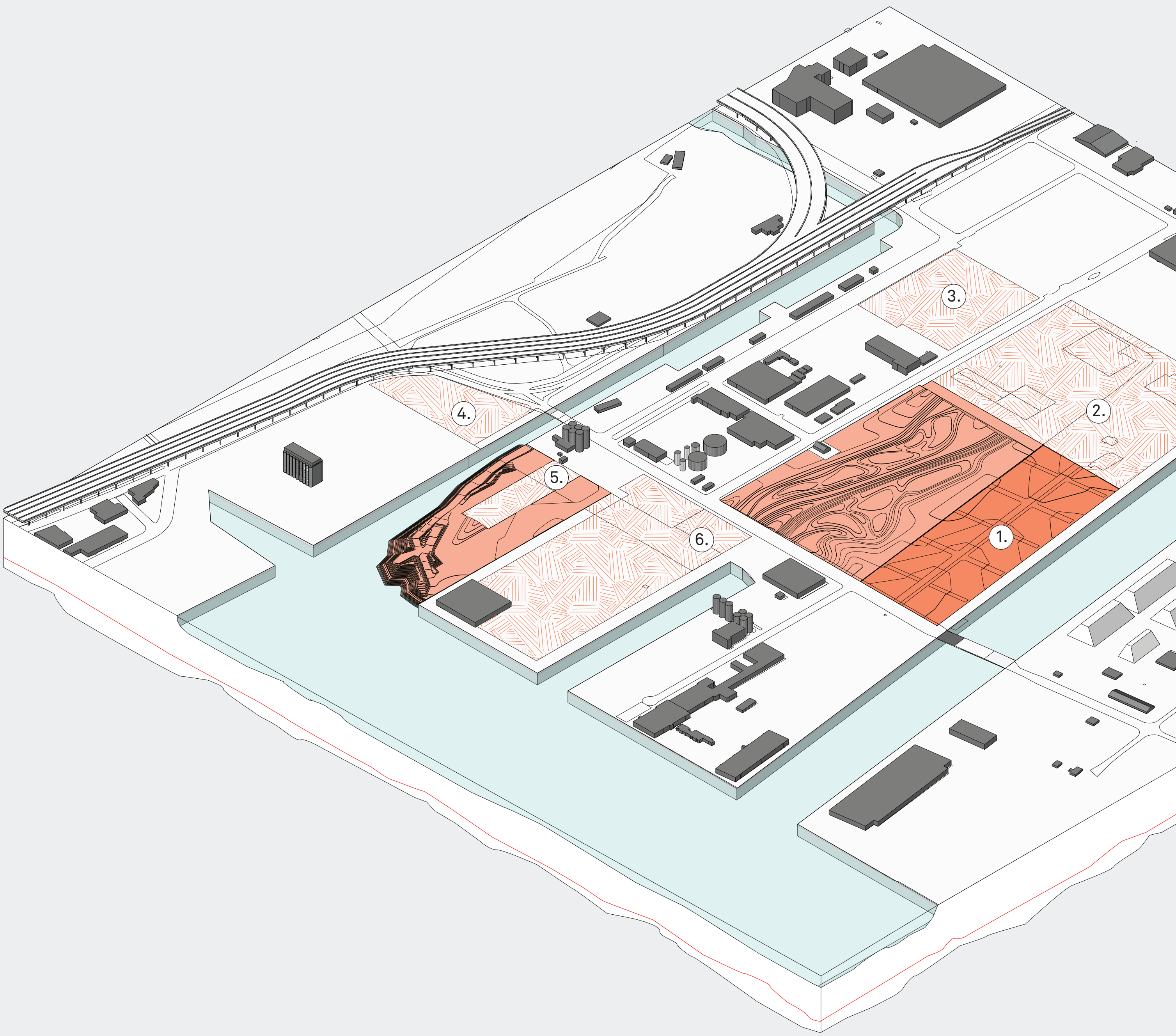
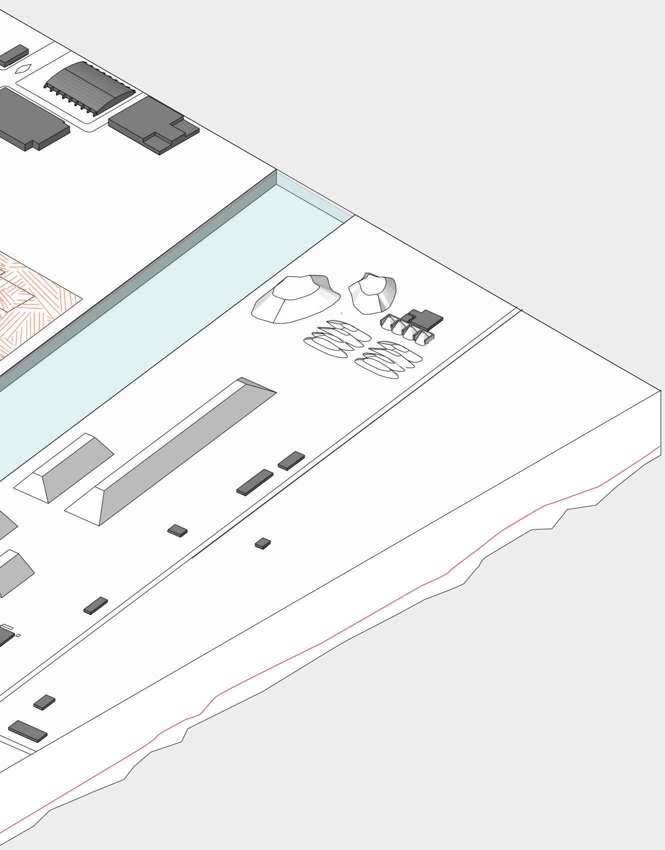


fig. 1.56



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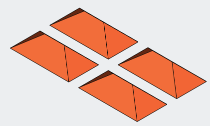
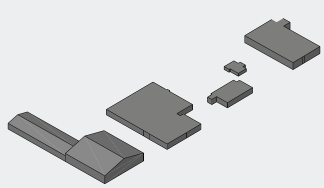


Clean fill for grading

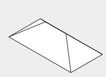
PROCESS

1. Grading and Site prep
2. Demo and prep for Don Greenway
3. Demo and prep for Don Greenway
4. Cherry street bridge foundation work and new Cherry street alignment from Lakeshore Boulevard
5. Cherry Street Alignment and site prep, construction staging
6. Cherry Bridge South foundation work

OUTPUT



5 buildings demolished

 = 1 250 000 cu. ft.

MAY 2019 - DECEMBER 2019

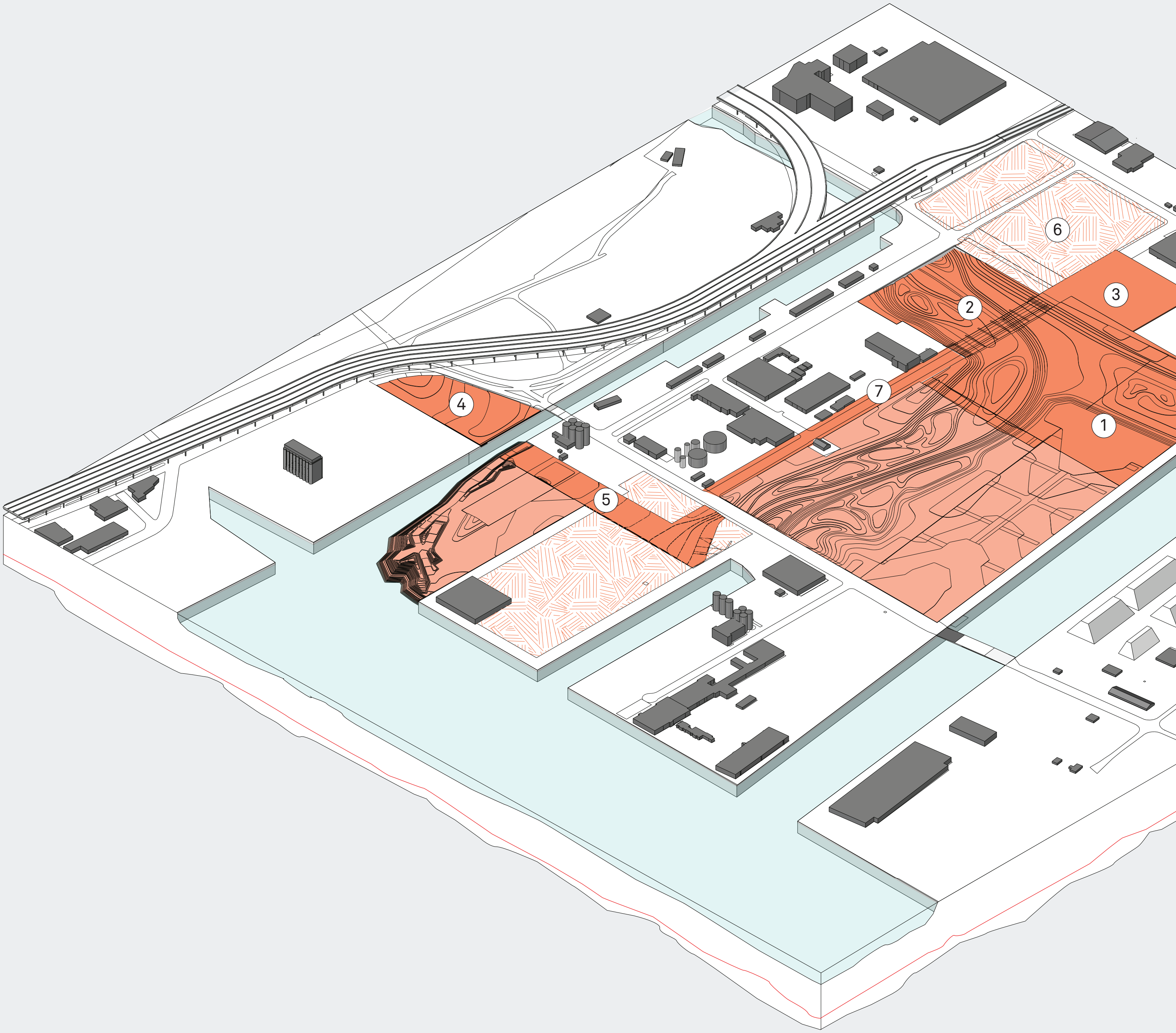
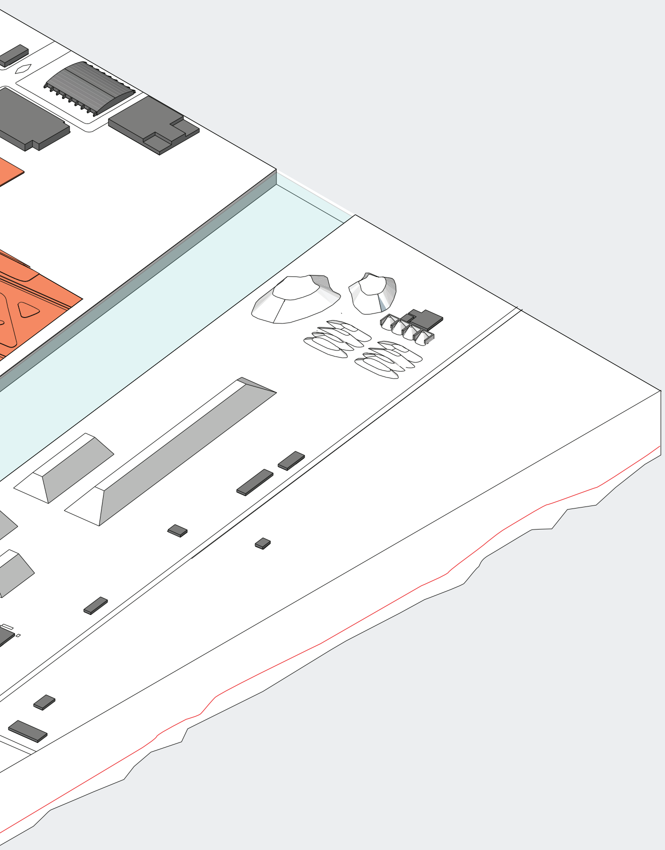


fig. 1.57



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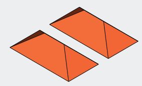
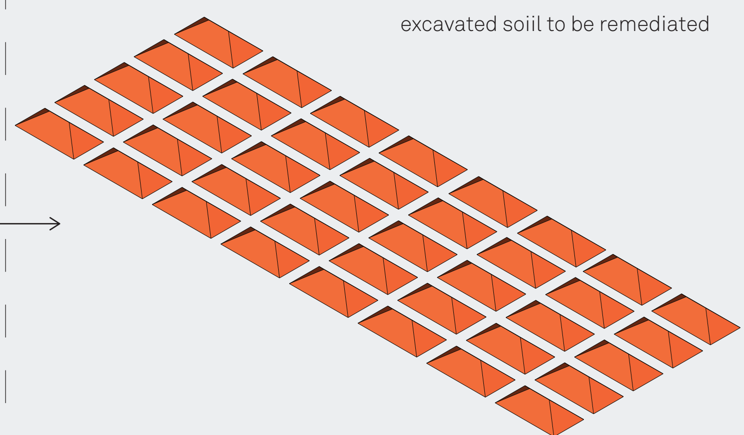


clean gill for grading

PROCESS

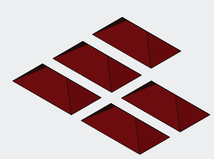
1. Don greenway south excavation
2. Don greenway north excation
3. Commisions street bridge founda-tion work and excavation
4 + 5. Cherry Stree Re-ailignment
6. Soil strage and site prep
7. Commisioners Street Demolition

STORAGE

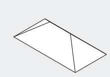


excavated soiil to be remediated

OUTPUT



excavated soil to be sent to landfill

 = 1 250 000 cu. ft.

JANUARY 2020 - DECEMBER 2020

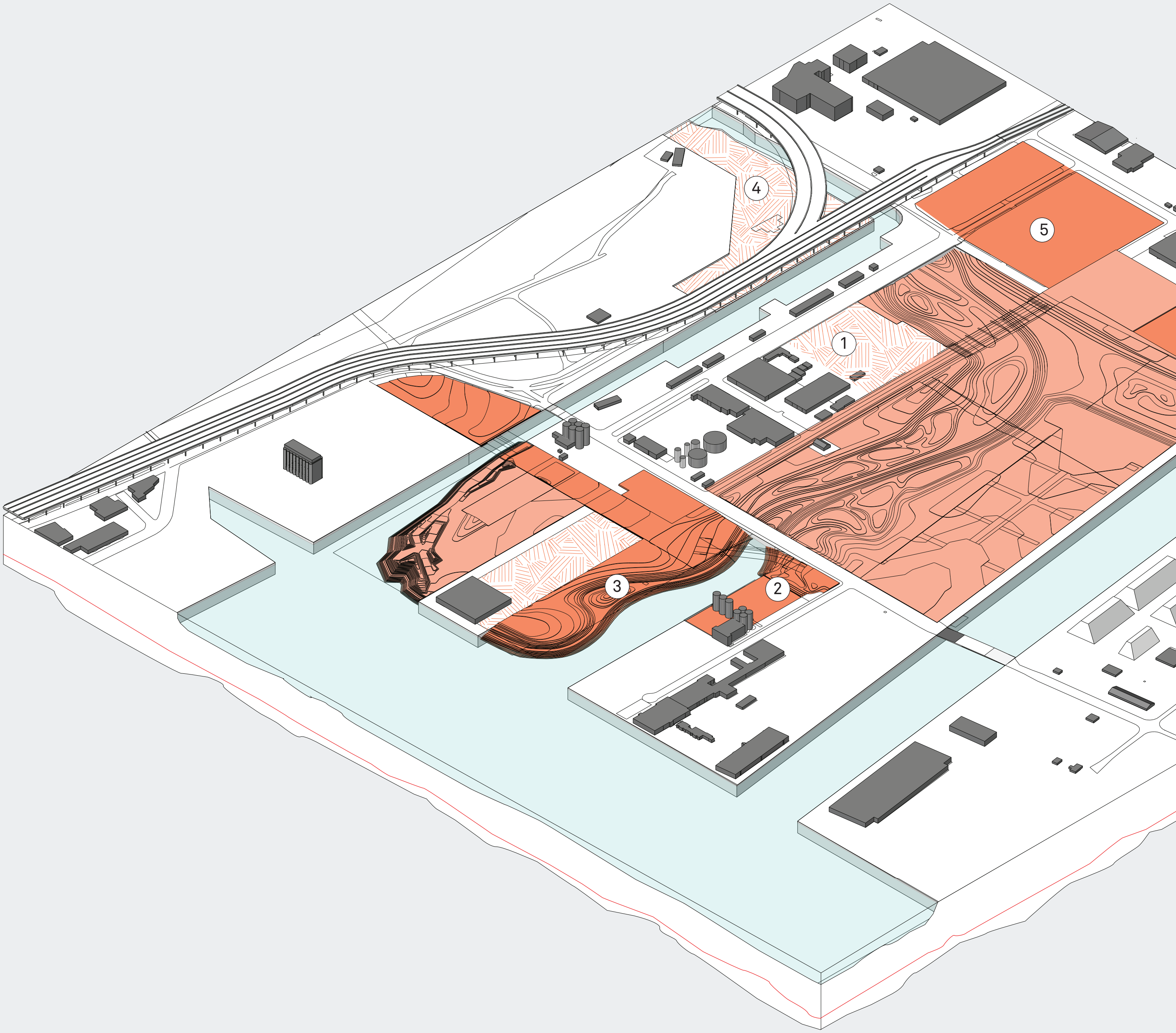
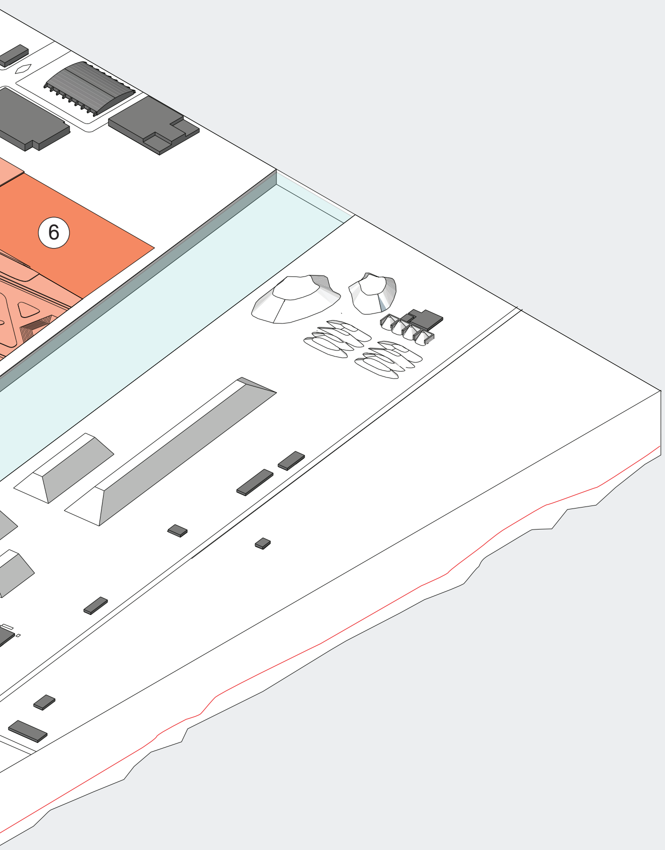


fig. 1.58



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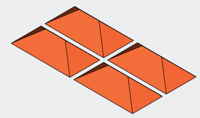
Clean fill for grading

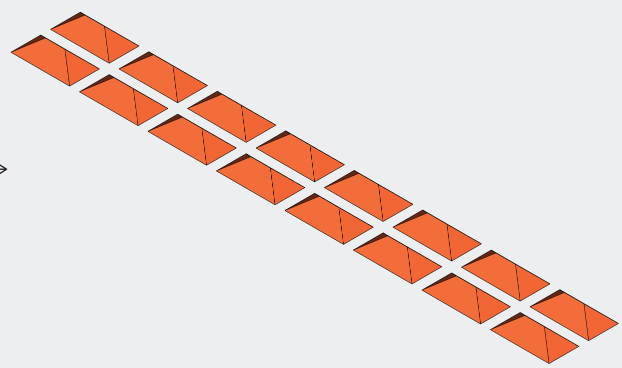


PROCESS

1. Soil Storage and treatment facilty 2
2. Chrerry Street bridge south
3. Polson Slip Demolition and excavation
4. Demolition and site prep for sediment management
5. Filling for Don Roadway valley wall feature(North)
6. Site prep for Don Roadway valley wall (south)

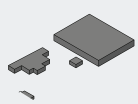
STORAGE

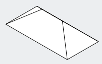
excavated soiil to be remediated



OUTPUT

5 buildings demolished



 = 1 250 000 cu. ft.

JANUARY 2021 - DECEMBER 2021

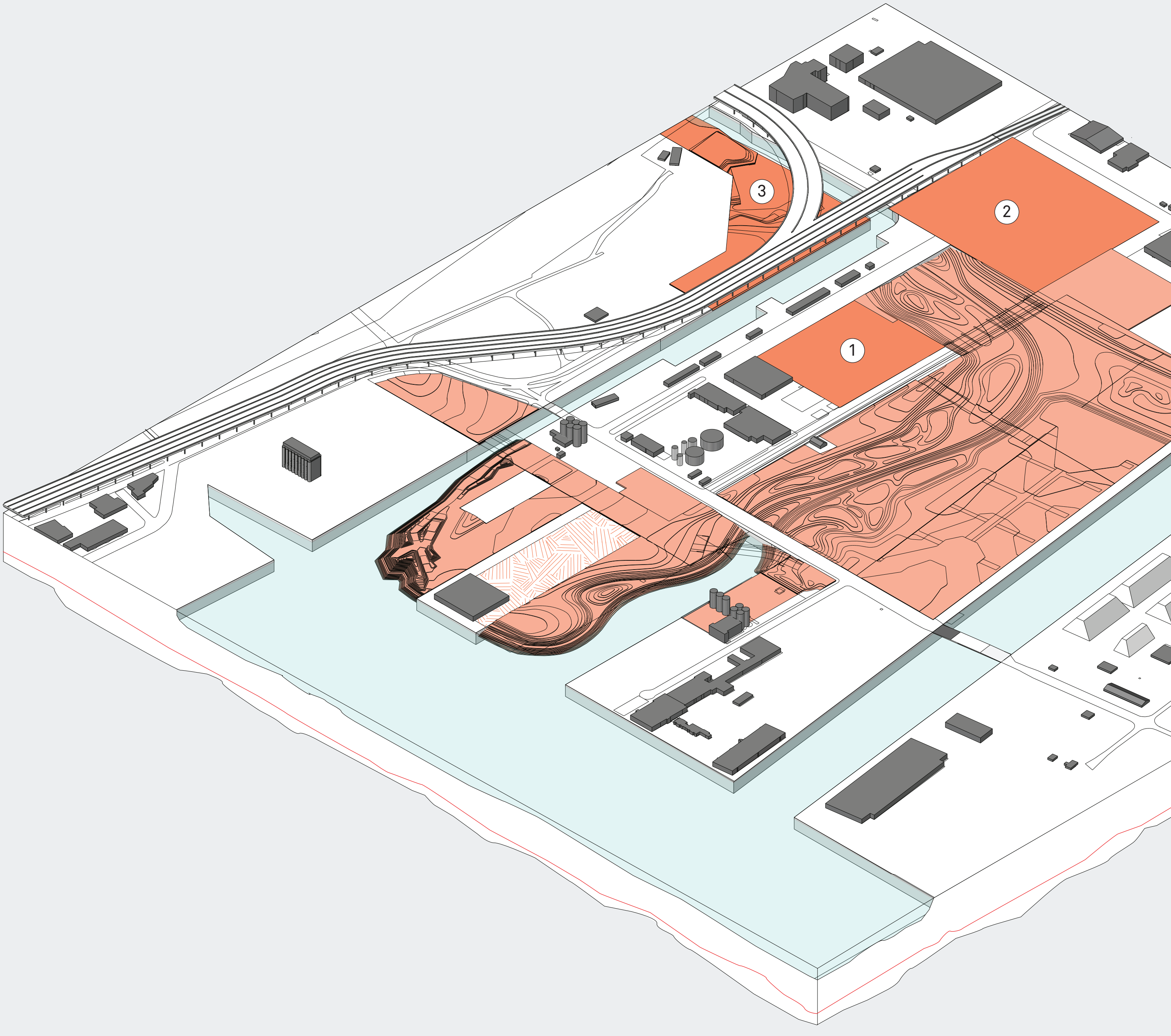
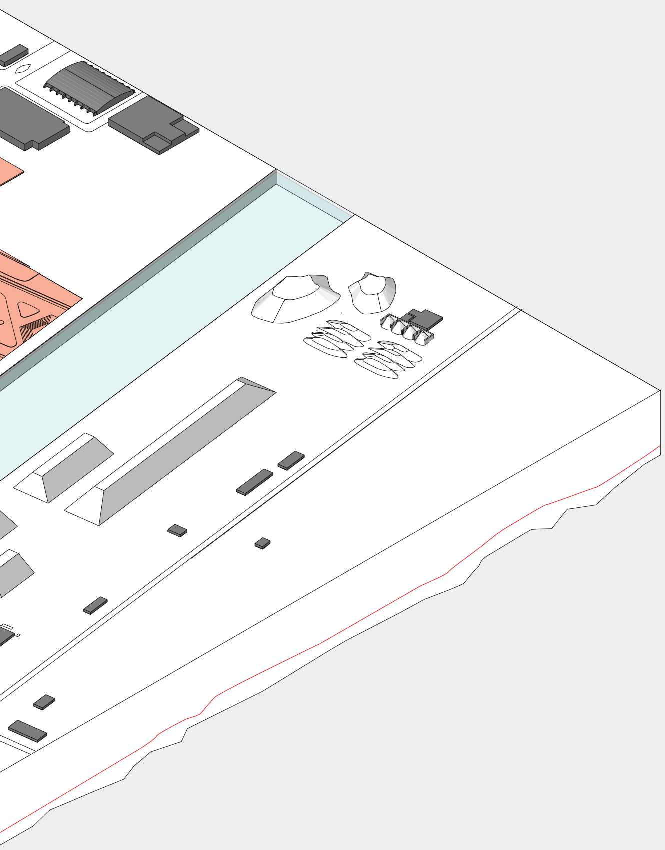
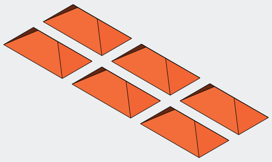


fig. 1.59



INPUT

clean gill for grading

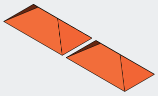


PROCESS

1. Soil facilty 2
2. Don greenway north excation
3. Sedimentation magement excavation and grading

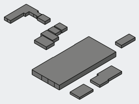
STORAGE

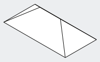
excavated soiil to be remediated



OUTPUT

excavated soil to be sent to landfill



 = 1 250 000 cu. ft.

JANUARY 2022 - DECEMBER 2022

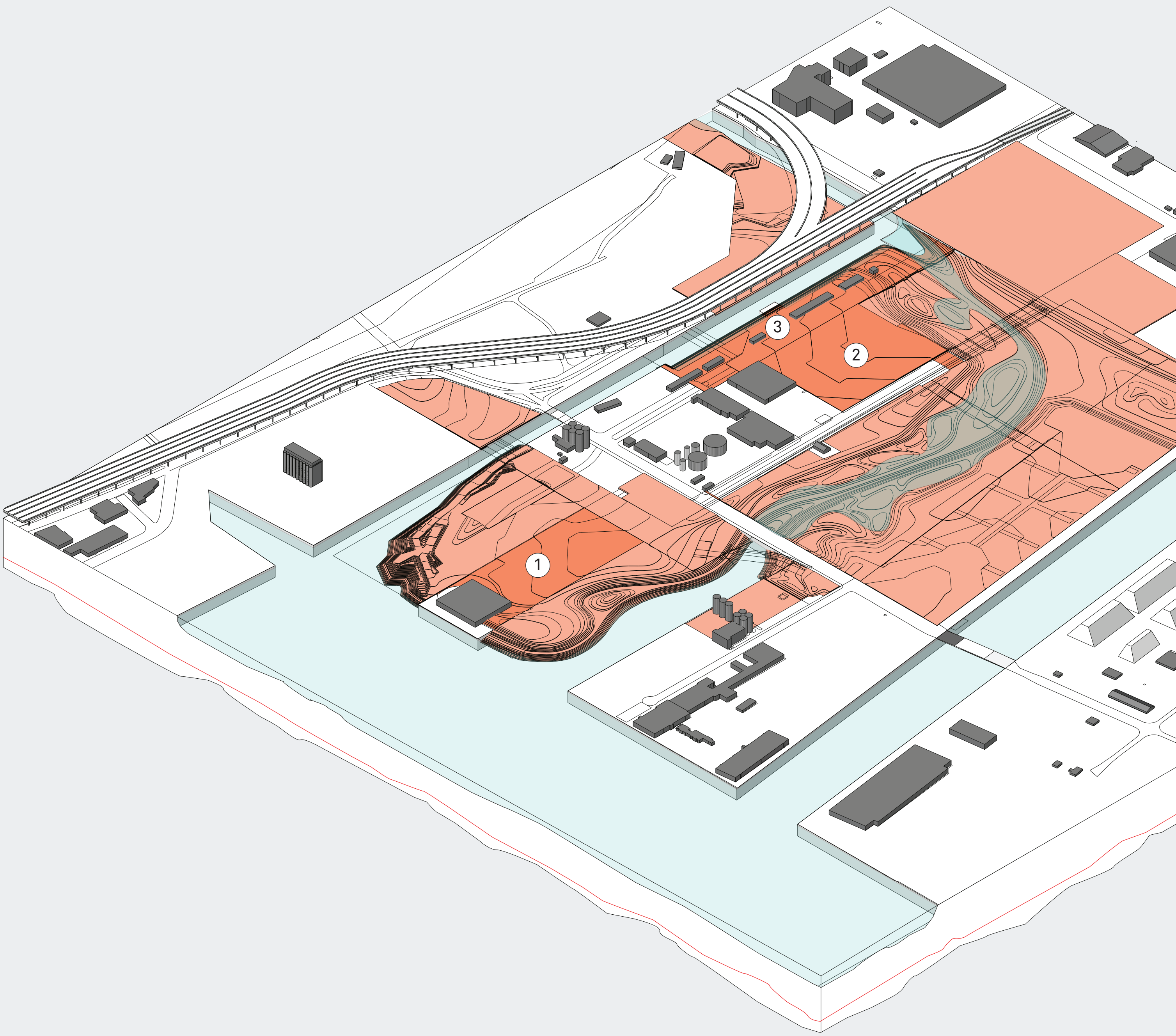
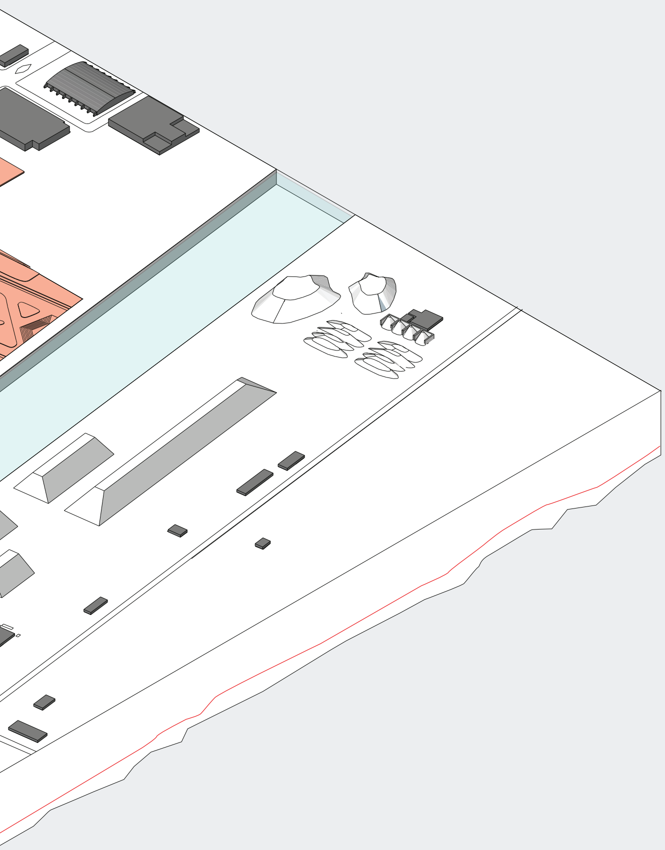
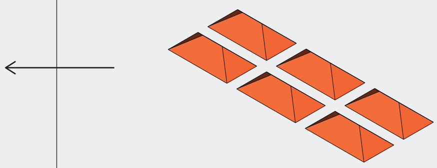


fig. 1.60

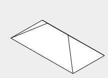


INPUT



PROCESS

1. Grading of Promontory Park
2. Grading
3. Keating Channel Modifications

 = 1 250 000 cu. ft.

JANUARY 2023 - DECEMBER 2023

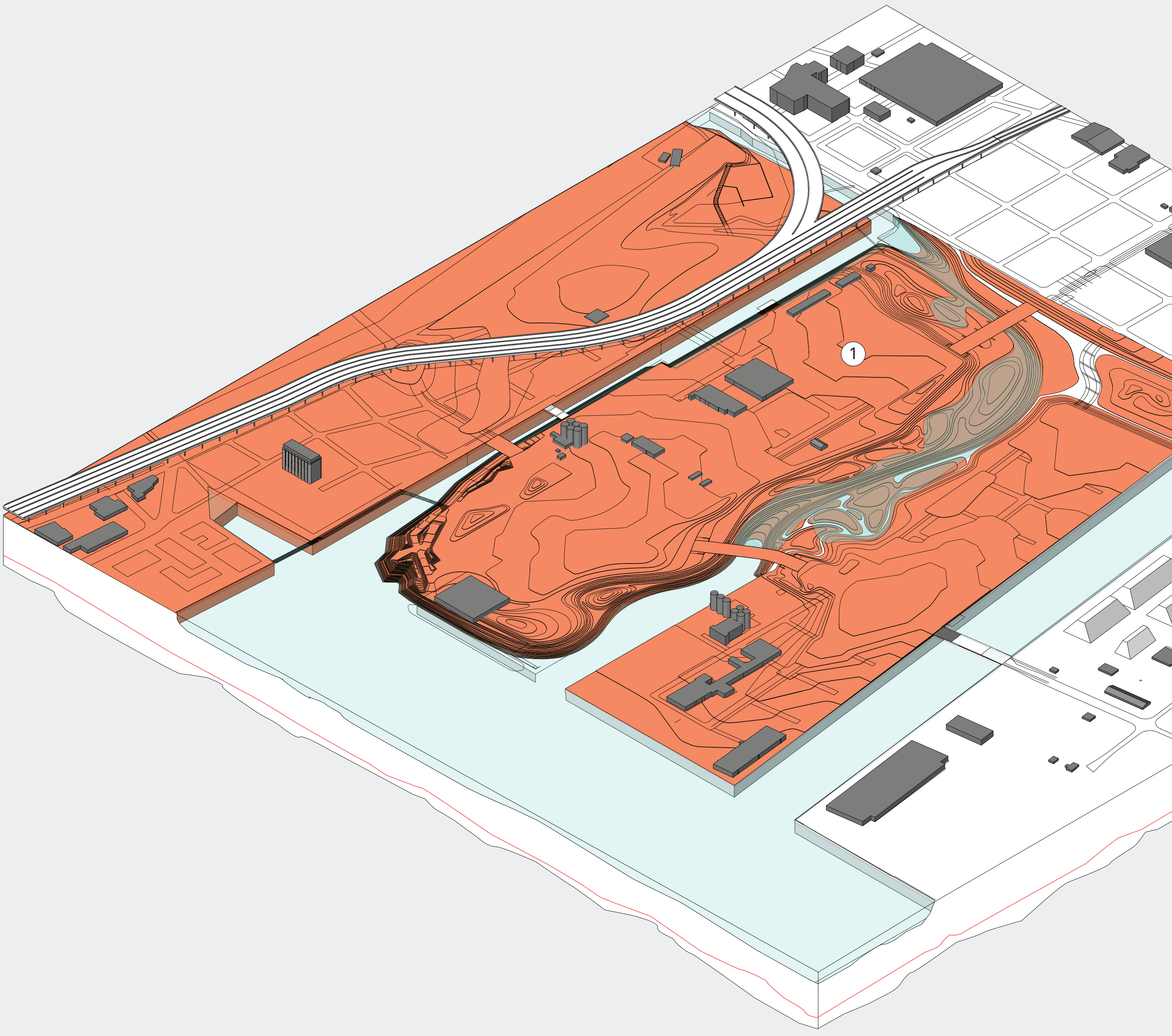
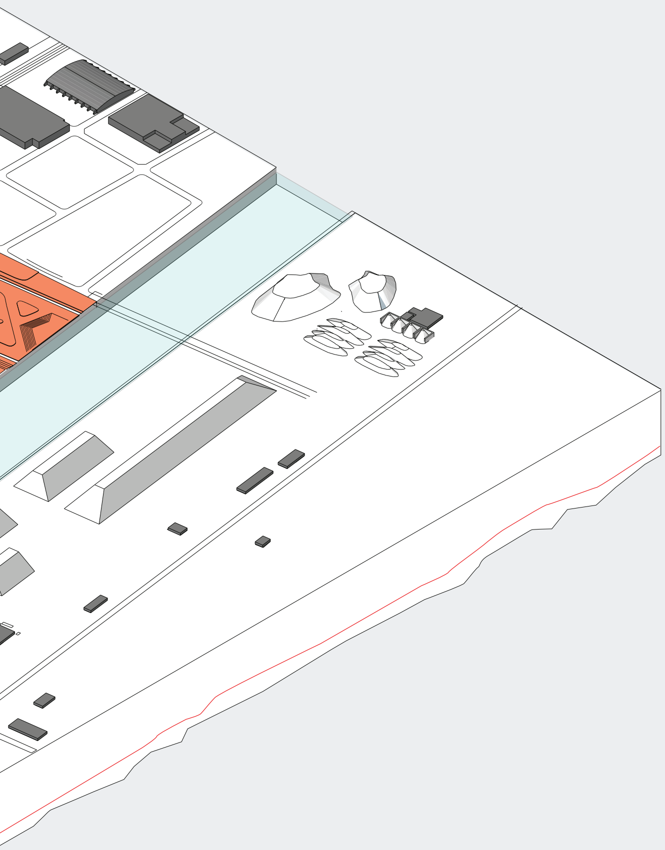
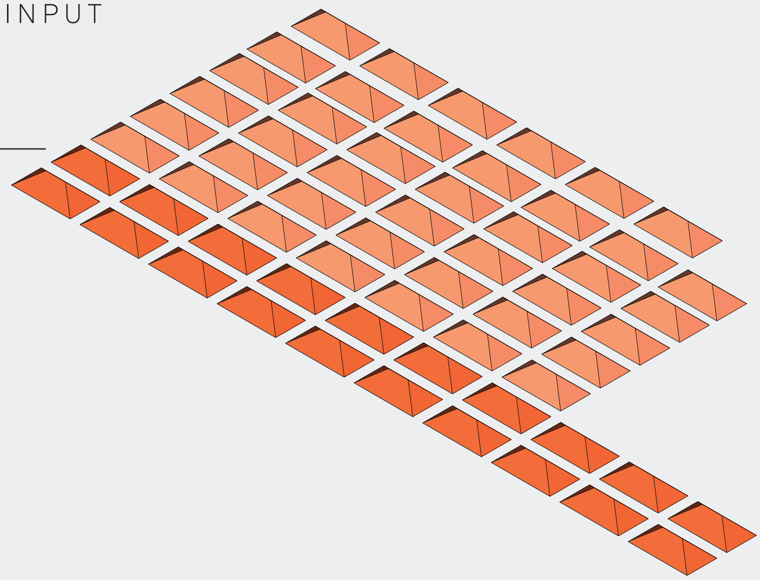


fig. 1.61



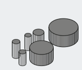
INPUT

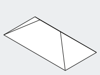


PROCESS

1. Final Grading and modifications to completion

OUTPUT



 = 1 250 000 cu. ft.

JANUARY 2024 - DECEMBER 2044

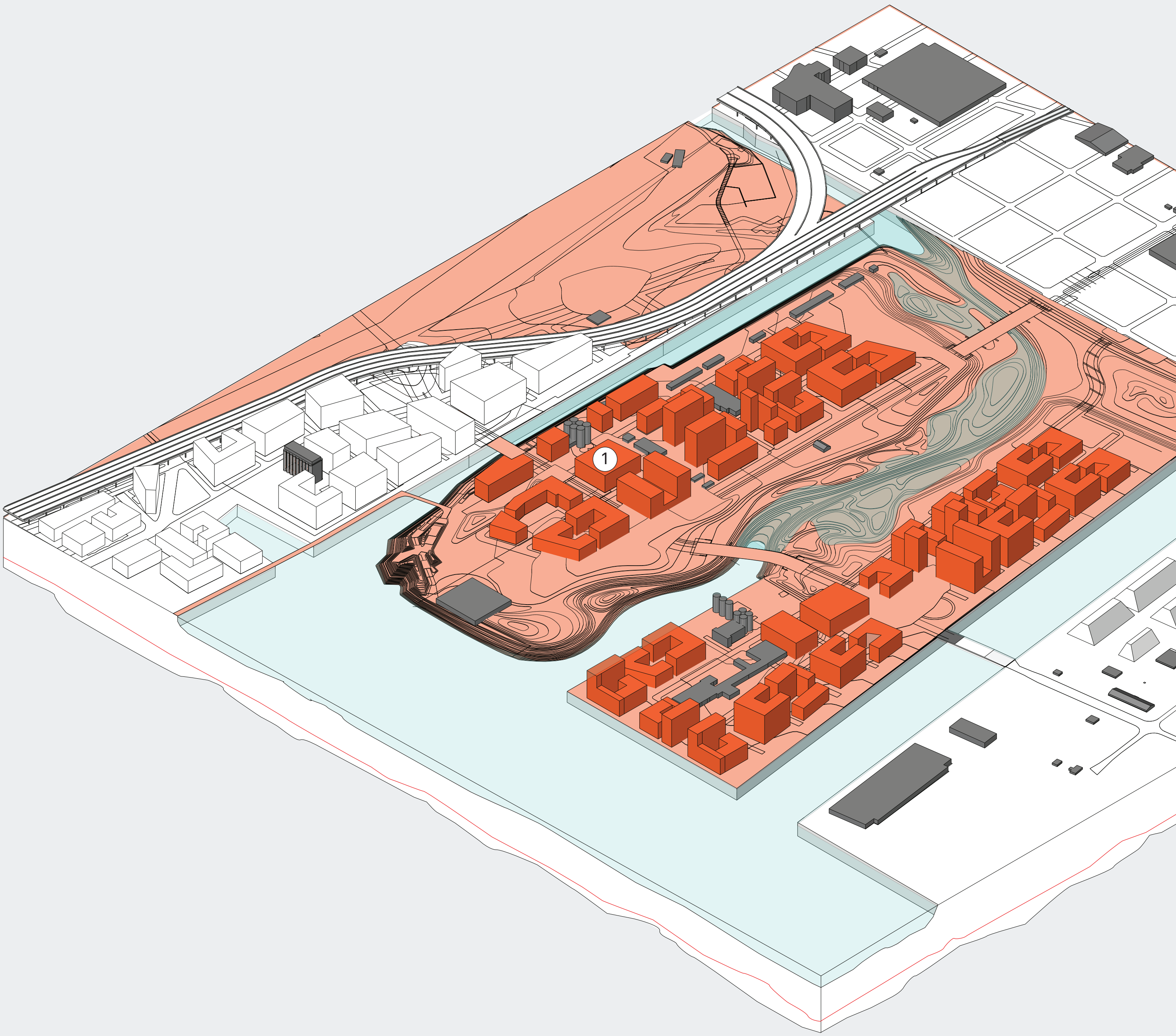
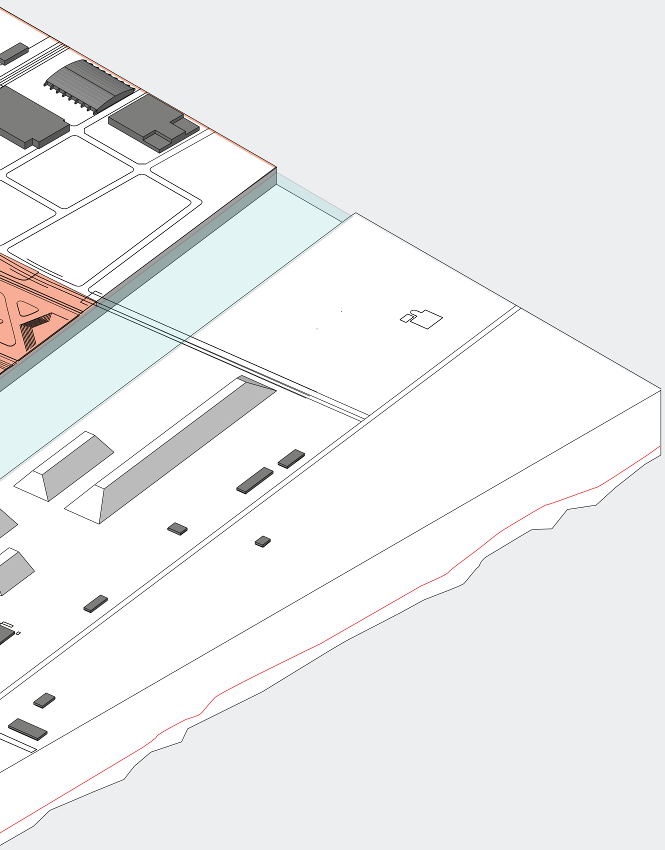
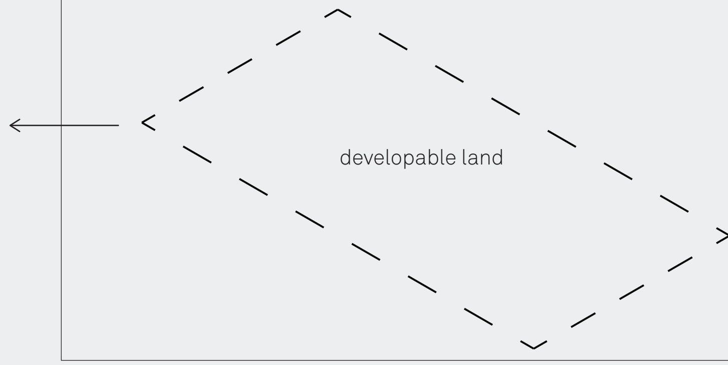


fig. 1.62



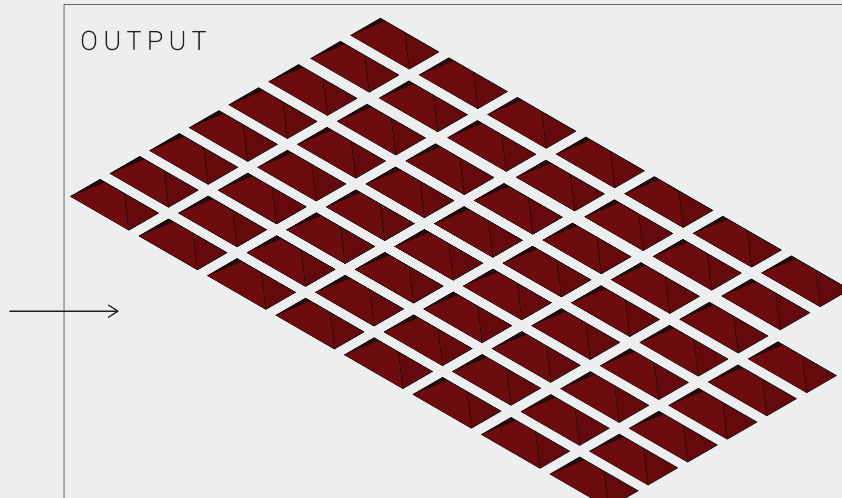
INPUT

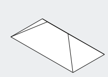


PROCESS

1. redevelopment of portlands from industrial use to mixed use development

OUTPUT



 = 1 250 000 cu. ft.

MATERIAL STUDIES

This careful investigation of logistics that make up the Port Lands site presents a new necessity to thoroughly map and document the site in its current state, looking at small areas, each distinctly different. This mapping will "reveal and realize hidden potential" and attempt to "[construct] the unconscious"[1] by shedding light on all the overlooked subjects. By highlighting the cultural, biotic and abiotic systems acting over different parts of the site, there is a unique opportunity to intelligently assemble all the stakeholders into a collective body and propose a new way to design for that body. Gilles Clément puts it most eloquently as such:

> *To reconstruct the diversity of the site in its totality would require not only an exhaustive inventory of the elements that can be equated with the site's specific biodiversity, the number of plants and animal species that occupy the place, but also a census, a kind of ecological index to evidence human presence on the site, objects that speak of certain behaviors and practices.*[2]

The following material studies use found material, specific to a certain area with-in the Port Lands site, to make bricks. The materials are collected, photographed, sorted and then bound together with binding substances, such as concrete, resin and plaster to create cuboids. After casting the materials between plaster and resin, and removing from a mold, each brick is a monument to the time and place from which it came from. Reassembling the material fragments to create something new, yet symbolic of each object's past use and history. Each brick is only at the scale of a person, an object that can be held in one's hands, but it begs the question of how making building blocks in this way would impact a building or construct a landscape.

△

ENDNOTES - MATERIALS AT LARGE

1 James Corner, "The Agency of Mapping: Speculation, Critique and Invention," in *Recovering Landscape : Essays in Contemporary Landscape Architecture* (New York: Princeton Architectural Press, 2011), 89–101

2 Gilles. Clément et al., *Gilles Clément, Philippe Rahm : Environ(Ne) Ment : Manières d'agir Pour Demain = Approaches for Tomorrow*, 1st ed. (Milano : Montréal: Skira, 2007).

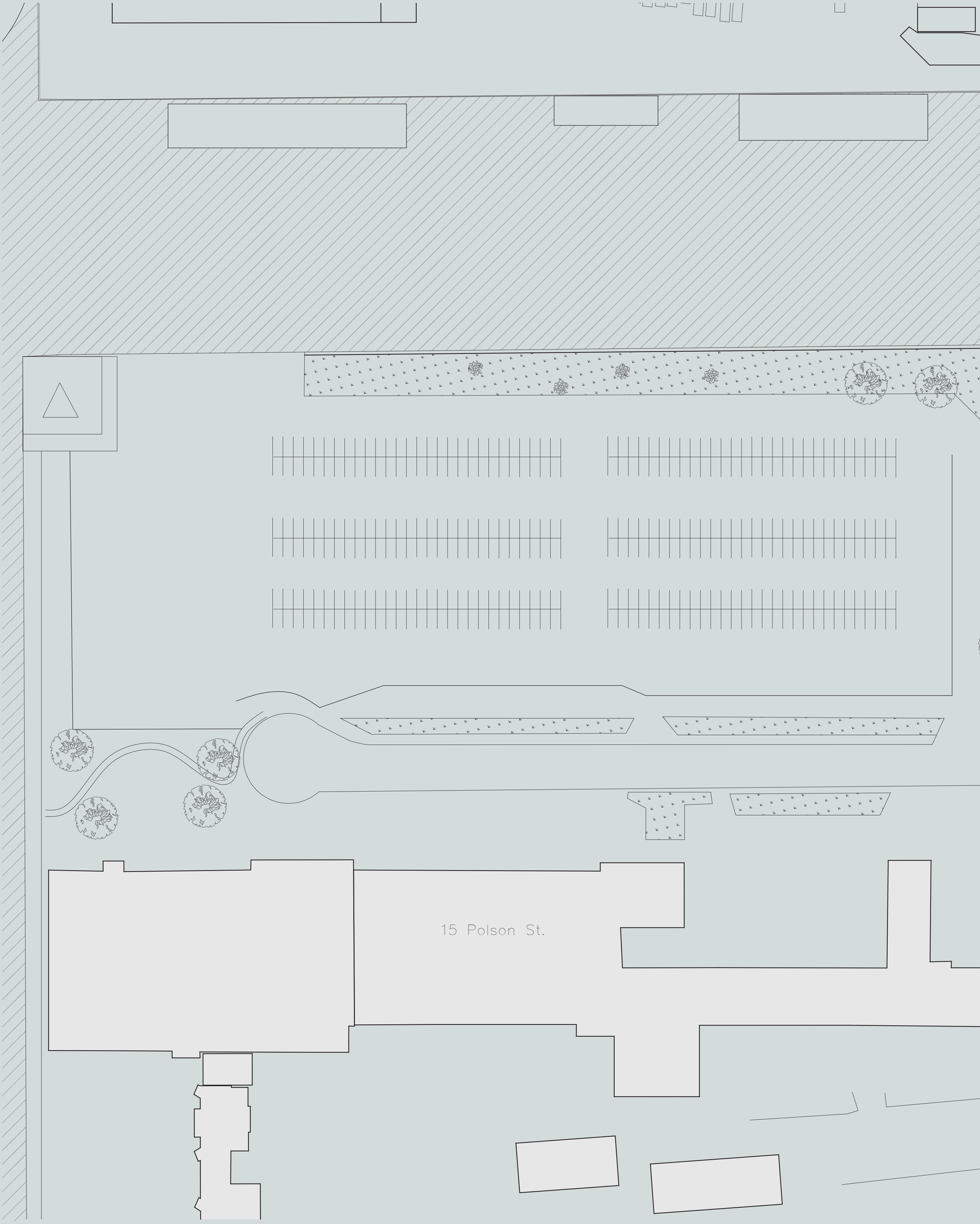
fig. 1.63*(top, left)* On site digging up material samples.

fig. 1.64*(top, right)* Melamine coated chipboard brick sized molds.

fig. 1.65 *(bottom, right)* Material samples organized into site specific boxes

fig. 1.66 *(bottom, left)* Casting bricks that represent a materiality associated with a specific location or site within the Port Lands.

fig. 1.65 Site plan of Canada Cement Company and surrounding context.



[Material Study 1]

Canada Cement Company

54 Polson St,
Toronto, ON

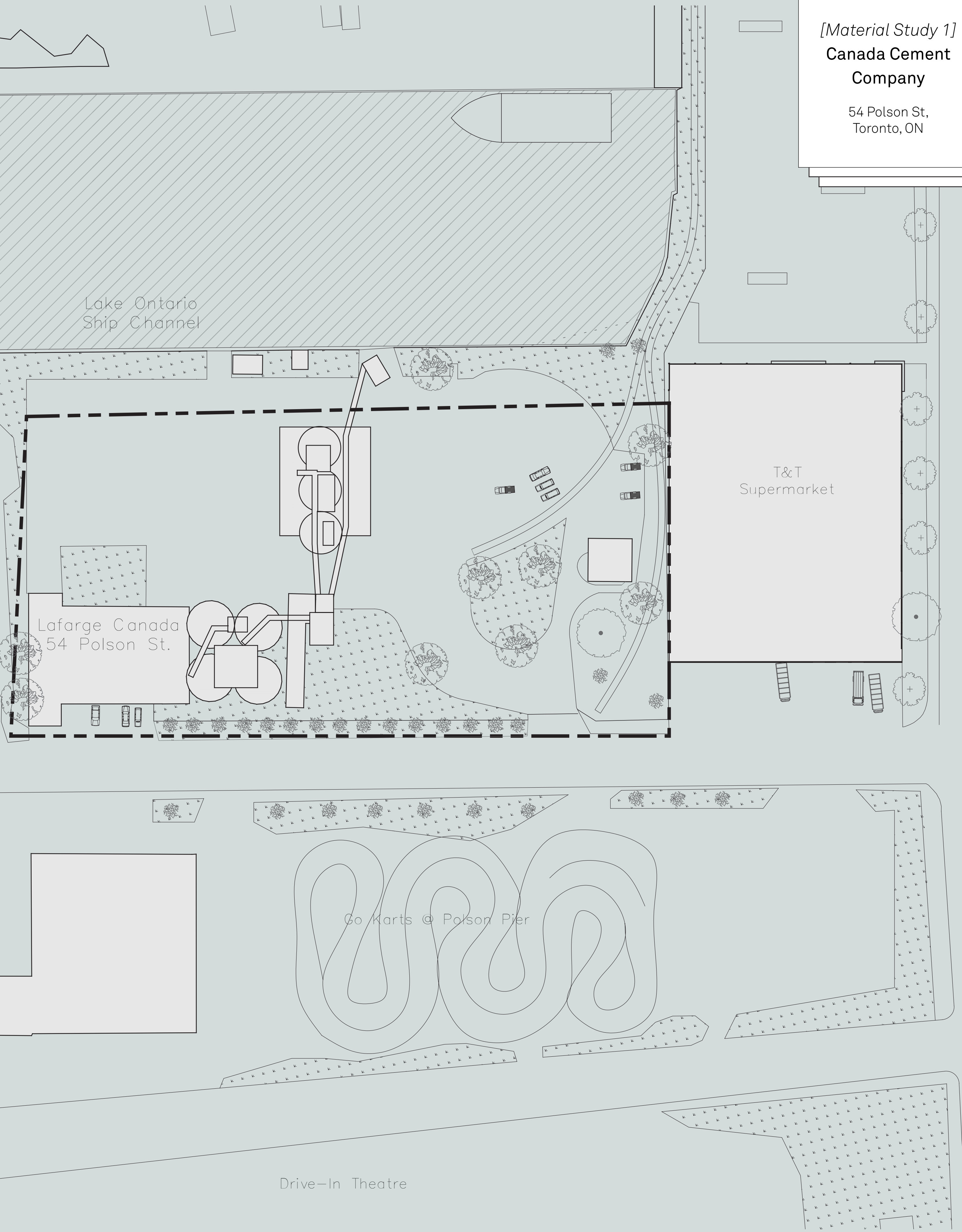


fig. 1.66 *(above)* layers of concrete and asphalt, punctuated by bright yellow blockades denoting caution or areas boundaries.

fig. 1.67 *(right)* Lafarge Concrete Silos, a storage holding facility for cement brought by ship from the companies inland quarries.

fig. 1.68 *(right)* Close up of Lafarge cement silos, the walls constructed of thick poured in place reinforced concrete

fig. 1.69 *(below)*

Notes

1. Various organic debris including moss fluff, decomposing leaf fragments, twigs, acorn bits
2. Sand Fill. Used as an economical backfill for around houses & other buildings. Used as base or backfill for sewer/watermain applications. Compacts very well but not suitable where drainage is needed.
3. Mineral Rock
4. 2" Clear Limestone. Used for a base where drainage is important. The product is 2" pieces with the fines removed. Large variation in size, and colour. Great variety in grey, organized by size and shade.
5. Road Salt Road salt is halite, which is the natural mined mineral form of table salt or sodium chloride (NaCl). While table salt has been purified, rock salt contains mineral impurities, so it is typically brownish or gray in color. Additives may be mixed with the road salt to prevent caking and ease delivery using gritting machines. Examples of additives include sodium hexacyanoferrate(II) and sugar.

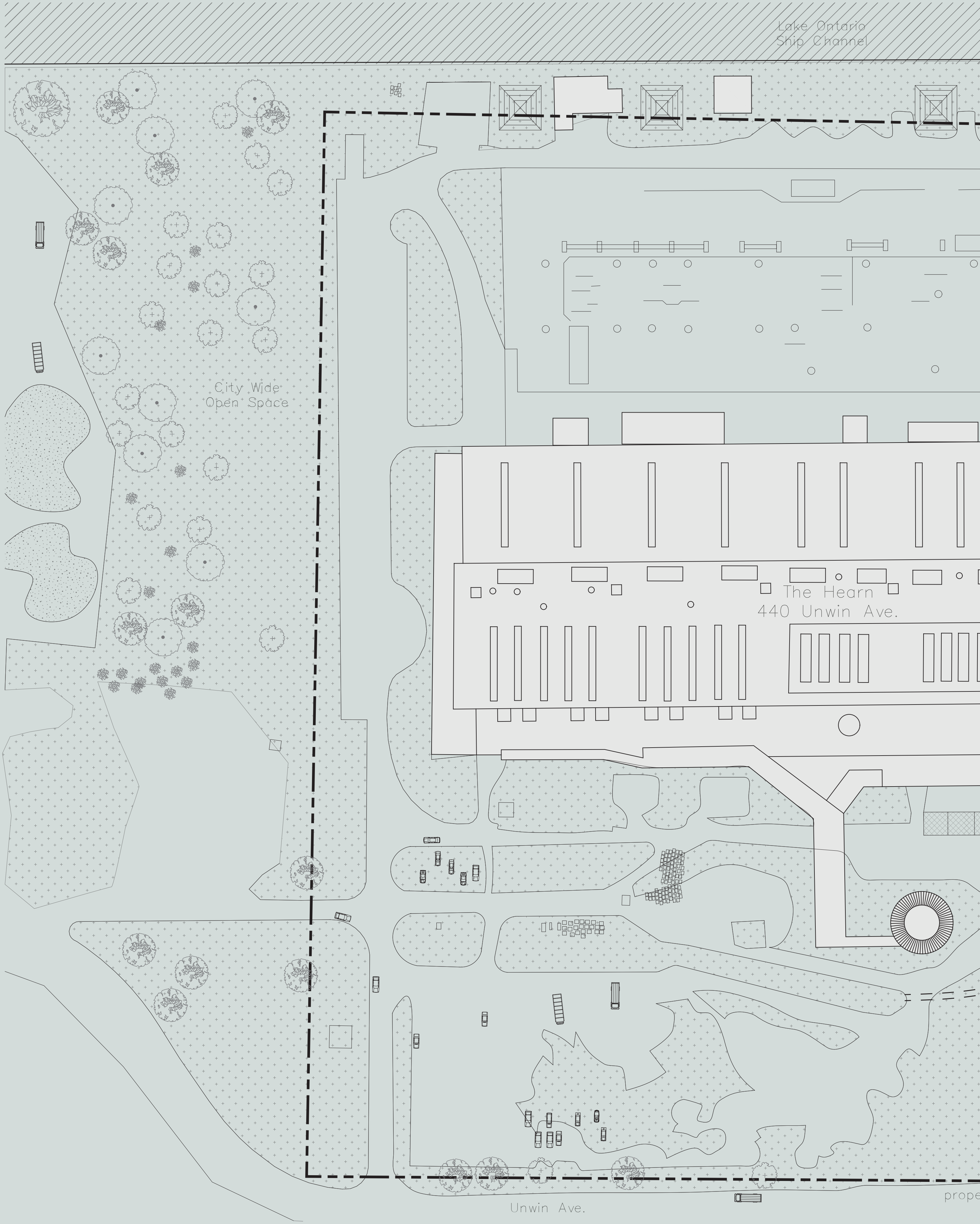
fig. 1.70 *(top, left)* Material samples

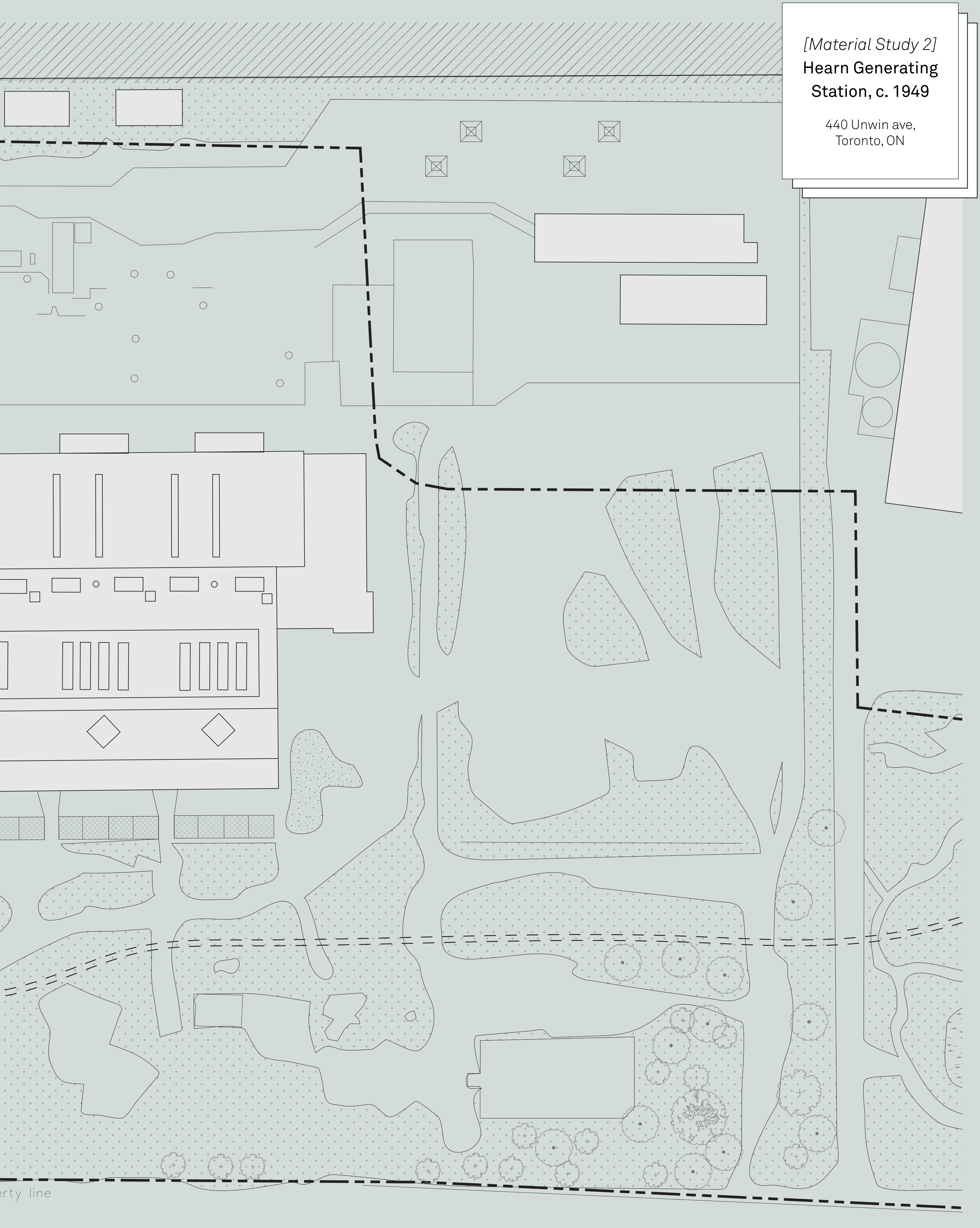
fig. 1.71 *(top, right)* Material samples laid out in photo studio

fig. 1.72 *(bottom)* Materials arranged by type, documented in photo studio

fig. 1.73 A brick representative of the material found at the Canada Cement Company site.

fig. 1.74 Site plan of the Hearn Generating Station and surrounding context.



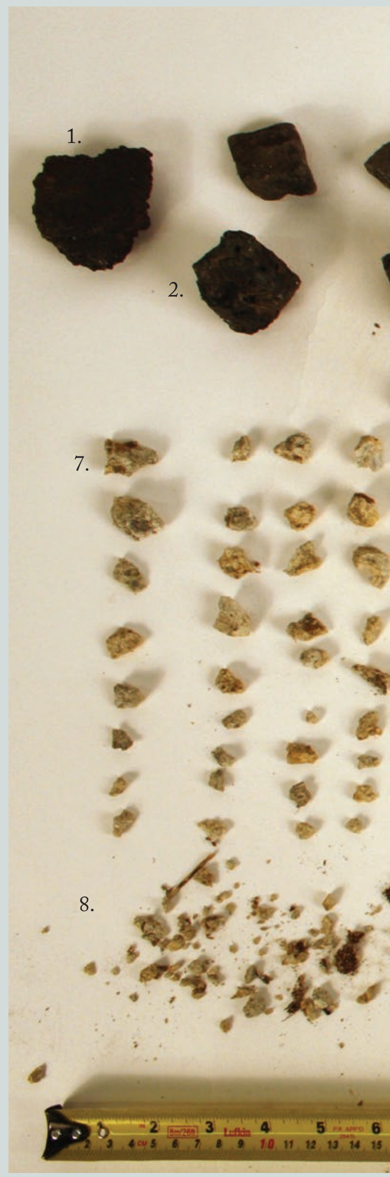


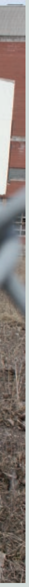
[Material Study 2]

Hearn Generating Station, c. 1949

440 Unwin ave,
Toronto, ON

fig. ***1.75*** *(above, left)*, ***fig. 1.76*** *(above, middle)*, ***fig. 1.77*** *(above, right)*, ***fig. 1.78*** *(below, right)*, ***fig. 1.79*** *(below, left)* Site Images





Notes

1. Asphalt, also known as bitumen is a sticky, black, and highly viscous liquid or semi-solid form of petroleum
2. Various rocks, dark in colour
3. Concrete chunks, lighter in colour than asphalt
4. Lighter grey coloured rocks
5. Railroad spike (iron)
6. Grass
7. Crumbling concrete, very light in colour, very crumbly (small)
8. Various debris from crumbling concrete
9. Crumbling concrete, very light in colour, very crumbly (large)
10. Small sticks
11. Chunk of rusting metal
12. Snail shells (empty)

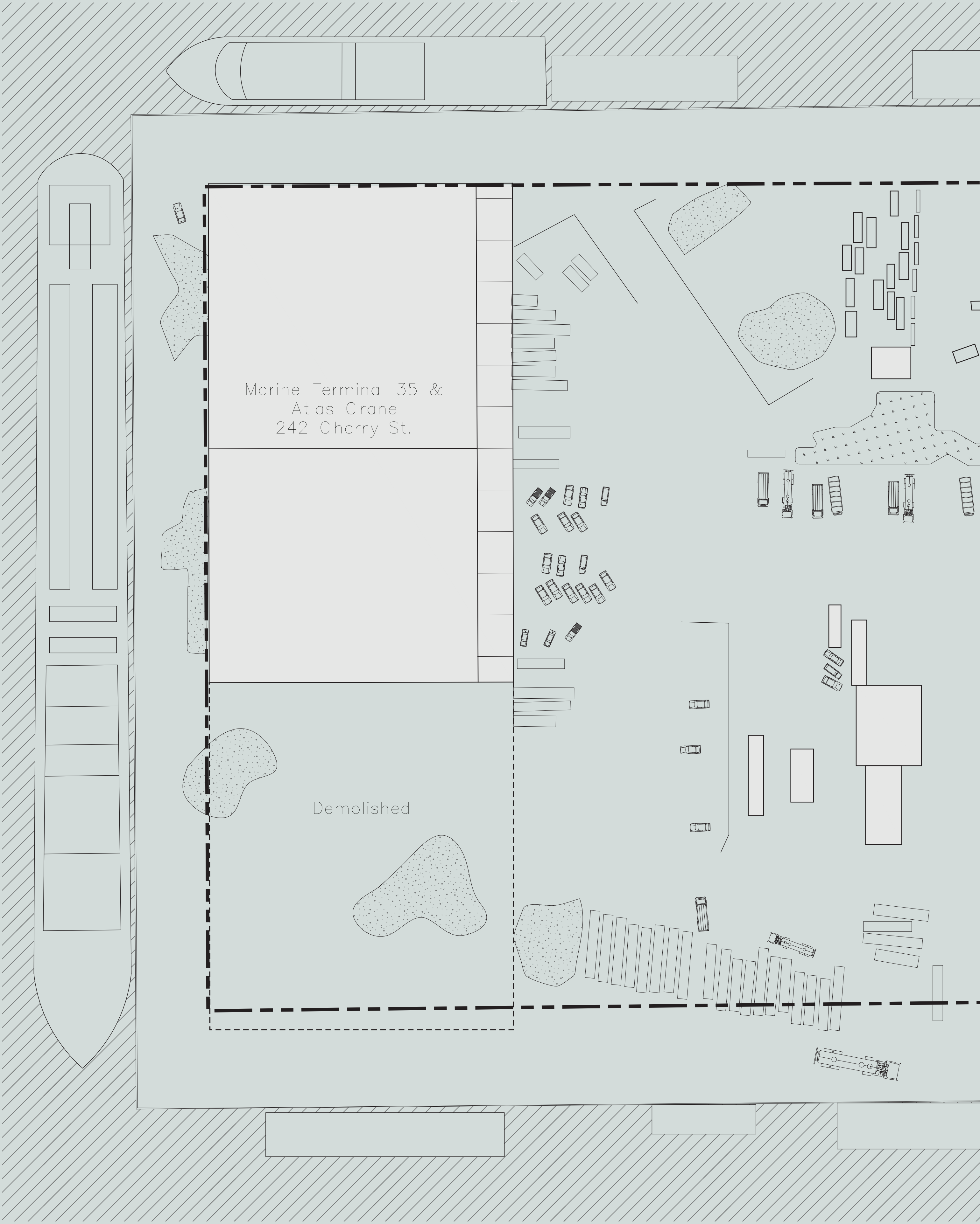
fig. 1.80*(top, left)* Material samples laid out in photo studio.

fig. 1.81 *(top, right)* Material samples in sample box from site collection.

fig. 1.82 *(bottom)* Materials arranged by type,

fig. 1.83 Brick representative of the Hearn Generating Plant.

fig. 1.84 Site plan of Marine Terminal 35 & Atlas Crane and surrounding context.



[Material Study 3]

Marine Terminal 35 & Atlas Crane

242 Cherry Street,
Toronto, ON

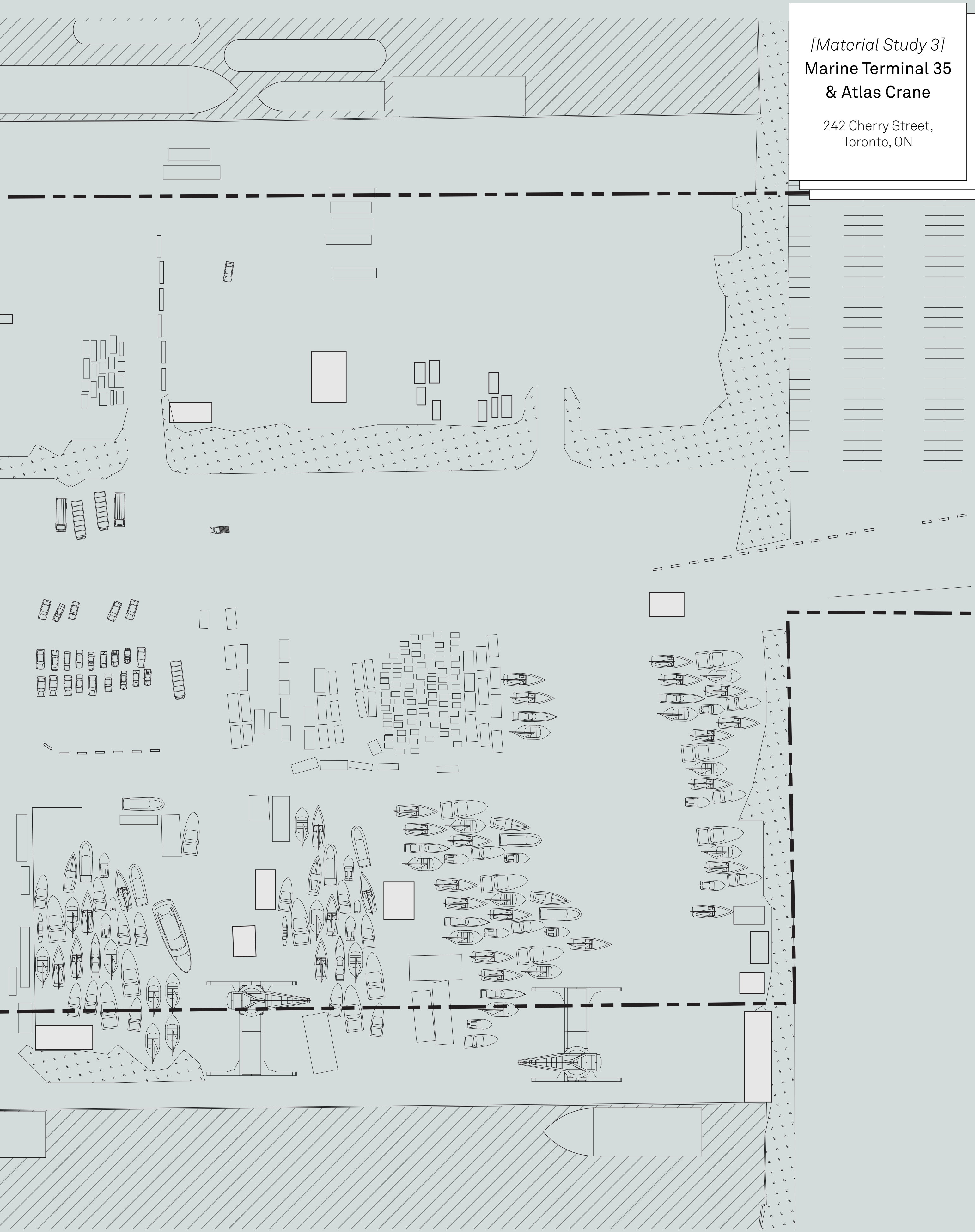
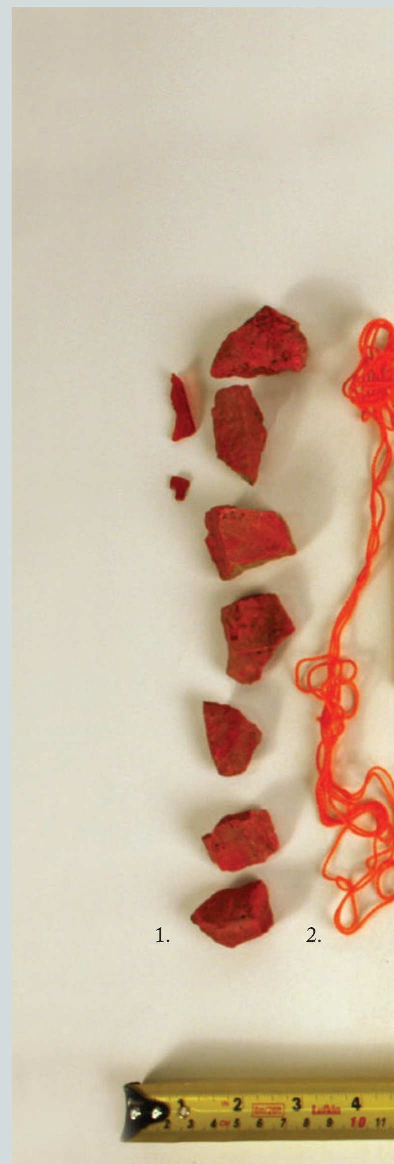


fig. 1.85 *(above, left)*, ***fig. 1.86*** *(above, middle)*, ***fig. 1.87*** *(above, right)* , ***fig. 1.88*** *(below, right)*, ***fig. 1.89*** *(below, left)* Site Images



Notes

1. Rocks coated with fluorescent pink spray paint
2. Orange cotton string
3. Hard yellow plastic, 1/8" thickness
4. Thin, flexible yellow plastic, cut into pieces, 1/32" thickness
5. Soft, flexible green plastic, 1/16" thickness
6. Assorted shades of broken green glass. Sifted from dirt piles scattered around site
7. Translucent straws.
8. Light blue extruded polystyrene, broken into pieces
9. Assorted clear glass. Sifted from dirt piles scattered around site.
10. Flexible wire.
11. Chunks of Rubber that look like rock.
12. Assorted concrete fragments.
13. Black translucent acrylic square.

fig. 1.90 (top, left) Material samples laid out in photo studio.

fig. 1.91 (top, right) Material samples in sample box from site collection.

fig. 1.92 (bottom) Materials arranged by type, documented in photo studio.

fig. 1.93 Brick representative of the Marine Terminal 35 & Atlas Crane

PART TWO

MATERIALS AT OUR DISPOSAL

fig. 2.1 (opposite) Gravelly crust surface of the Port Lands site

geological
adjective
relating to the study of the earth's physical structure and substance.

Unlike living things, rocks do not change through biological processes. This is a character of things that are abiotic, much better known for their physical presence. In their physicality they have the ability to tell stories through time by duration. In the composition of rock, the narratives that can be extrapolated are much more persistent than the collective memory of the living. Rocks can't lie and manage place human existence as a microscopic spec in the infinite history of the earth. This is important to the thesis because the foundation of any site sits atop a bed of rock, shaped by that same infinite history. Abiotic material is used as a primary construction material for modern buildings and so, it makes up a very large percent of any urban context. Rocks are easily displaced and even more easily adapt, the only consequence to them is a change in their historical narrative.

Robert Smithson, a landscape artist from NY, had a strong working relationship with rocks and the role they play in the composition of a site. As an artist, he was interested in communicating an awareness to the "site" as the unprocessed, found physical matter located at a geographical location and what he called the "non-site": a manifestation of the artists perception of the site (maps, photographs, displaced physical evidence). In this way every architectural project must have a site (the geographical location) and a non-site (the physical exhibition of site analysis). Or in this case maybe we can consider that the Port Lands is the site (a geographical location that exists in the physical world) and the material I present to you today as the non-site (the displaced physical and cartographic evidence projecting what I think the site is and could be).

The Port Lands as a site is interesting, obviously. During the first half of this thesis I explained many key social and ecological pressures that are currently acting upon it, primarily focusing on the immediate future. The next 5 years will totally change the face of the site, taking the run-down industrial port and carving out a new engineered wetland and creating 240 hectares of seemingly brand-new developable land for the city. This exercise will unearth a large chunk of the anthropogenic crust, pulling it up and disposing of it quickly and quietly.

Some will be neatly sorted into piles and sent to material yards to be sold. Some will be pulled from the water and sent by barge out to soupy islands in the lake. Some of it will be used to increase the grade, helping mitigate the seasonal flooding that occurs every year. The messy, icky, contaminated stuff will be buried once again and covered with new bright green turf. And the really toxic, unsalvageable stuff will be shipped by train to landfills far up North. *Chipping, shredding and layering* leverages the Waterfront Toronto proposal for the Port Lands site and uses three new design experiments in geological thinking to show Toronto how they can start to think about living with their mess and jump start a larger conversation about how a city could start to metabolize its own waste at the urban scale. These three experiments are inspired by the writing and creating done by radical landscape artists of the 1970's. Artists like Robert Smithson, Martha Schwartz, and Michael Heizer, who each completed their own landscape experiments that tried to grapple with the leftover occupation of industry and the ecological impact it had, without covering up the traces of its existence. Michael Jakob does a succinct job proposing his perceived intentions of Robert Smithson's work:

> *Rather than cover up the wounds in the earth's flesh, [Smithson] proposed exactly the opposite: to make the cultural trace of humanity visible. This place where excavation, hollowing out, and exploitation is visible in its full violence points to a fundamental fact: the artificial mountain, the positive rising-up, the built and the consolidated, the titanic self-affirmation, is directly related to that which is dug out: the negative, the hollow form, the uncanny hole and the wounded earth.*[1]

Using instrumentalism to build each art work, each piece managing to then expose the hyper-objectivity of the chosen material. Using different quantities and qualities of material in different volumes to evoke both "shock" and "awe".

What is "a design experiments in geological thinking"? A design experiment in geologic thinking must pertain to the following rules. First, the primary material must come from site/demolition activity. Second, each experiment must show how the primary material changes over an extended period of time, and in this case beyond the initial excavation and site prep of the Don Mouth Naturalization and Port Lands Flood Protection Project. Third, each experiment must address how we might "live with the mess", therefore it must engage public space and disrupt the future development on the site. And fourth, use design to address the un-remediated areas, and strategize how this remediation can be integrated into current planning practice that will shape the future of the Port Lands site[2]. To remediate the site both phytoremediation and bioremediation techniques will be used. Phytoremediation is "the use of vegetation to remediate, contain or prevent contaminants in soils, sediments and groundwater, and/or add nutrients, porosity and organic matter"[3]. Unlike phytoremediation, bioremediation introduces new microorganisms to soil to break down contaminants.

The Don Mouth Naturalization and Port Lands Flood Protection Project brings forth such an exciting opportunity to crack open this anthropogenic crust the we have created and see what kind of "specula-tive fabulation, science fiction, science fact, speculative feminism, soin de ficelle"[4] has been cooking inside. By digging it up and spreading it out "chipping, shredding and layering like a mad gardener"[5] we can roughly sort the material make up off the crust and use each pile to build a mess we can, and might be interested in living with. A project this large and with a landscape so marginalized, there is a responsibility placed upon the designers to bring honesty and beauty to

fig. 2.2 (above) Cherry Street Lake filling project begins, large cranes move new material from barges and ships into the harbour, where dump truck and bulldozer flatten and shape the new landscape.

fig. 2.3 (middle) More cranes.

fig. 2.4 (below) Instruments currently litter the entire site,. Each one with a crucial job in the construction project, moving materials from one place to another, as the team slowly carves and shapes the landscape into what they think it should be

fig. 2.5 (above, right) Robert Smithson, Spiral Getty (1970), Great Salt Lake, UT, USA

fig. 2.6 (above left) Landing Studio, Lumen (2016) , Staten Island, NY, USA

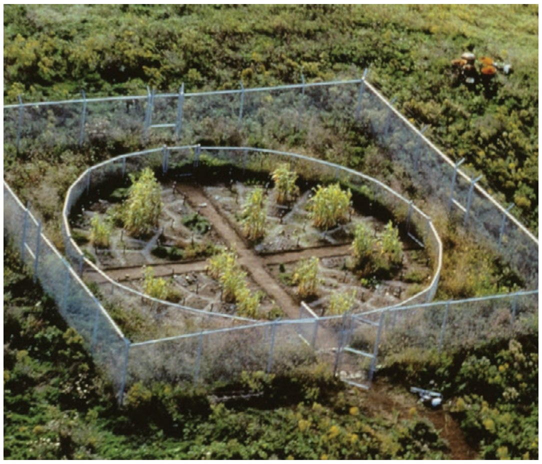
fig. 2.7 (opposite, right) Mel Chin, Revival Field (1991), St. Paul, Minnesota, USA

fig. 2.8 (opposite, left) Michael Heizer, City (1972 - ongoing), Garden Valley, Nevada, USA

the landscape, the let its past be present in its future. In his essay *Neither Wilderness nor Home*, Anuradha Mathur explains that landscapes across cities "are being increasingly commodified, monitored, and constructed in ways that discourage spontaneous appropriation and unplanned transformation. In resistance to this over-determinism, a few contemporary landscape architects and urbanists are seeking to promote qualities of indeterminacy, open-endedness, and temporality in their work"[6]. It is essential the Toronto Port Lands does not become one of these spaces of complacency, underpinning the capitalocene. It has the potential to be a place that is "neither wilderness or home"[7], a place that has agency causing a "collectivity of individuals to act different in their everyday lives"[8].

In the article "Buried Localities: Archaeological Exploration of a Toronto Dump and Wilderness Refuge", Heidy Schopf and Jennifer Foster shed light on how a similar space of industrial heritage, the Leslie Street Spit, has been misunderstood and culturally misrepresented[9]. Through a similar forensic investigation of site, they develop an honest history of the spit and how it has been linked to both regretful parts and positive parts of Toronto's history. I found this process of investigation critical in my design methodology. It was important to me that the following design project accepted the honest and unbiased history of the Port Lands and allowed for unexpected monuments, representing the vibrant past life of the site, but still allowed things to change with minimal restrictions. They write "recognizing the Leslie Street Spit as the ruins of Toronto in an unromaticised manner allows one to assign greater meaning to the landscape. Viewing the Spit in this light allows it to function as a site of memory in addition to being a site of urban wilderness"[10]. By encouraging people not to fetishize disturbed sites, but to instead look at them objectively and with a critical eye the history and shortcomings that lead them to that state will be better understood.

Each experiment exploits one of these seemingly unsightly material categories that will occur in abundance during the five-year excavation and reconfiguration of the Port Lands. Together, these three experiments shift the focus from the efficiency and the immediate capital gains (often referred to as *time = money*) to the extreme recycling of the materials being

excavated on site, designing a speculative post human landscape, and using instrumentality[11], or the tools, machines and techniques we as humans have developed, to inform brand new material practices. In each experiment the role of the design "is not to prettify such sites but to redefine their beauty through absolute stewardship"[12]. Inspired by landscape architects like Julie Bergman, each experiment explores what it means when "asphalt becomes mulch and slag is the new green"[13].

These three loosely categorized materials include: dredgaete, contaminated soil, and construction aggregate. All three material categories are interesting, if not a bit tricky, to build with and quite difficult to dispose of. But, individually, each has category has a very unique set of material characteristics and parameters to make them easy to sort, and very recognizable. Based on the research I have conducted, both pertaining to site and non-site, there will be a surplus of these materials during The Don Mouth Naturalization and Port Lands Flood Protection Project, and much of will go unseen or be disposed of elsewhere. Though these materials are what compose the entirety the site at the present moment and yet they are almost completely absent from the future narrative of the site. These experiments look to exploit these materials and make them more present in the future of the Port Lands.

△

ENDNOTES - MATERIALS AT LARGE

1 Michael Jakob, "On Mountains: Scalable and Unscalable" accessed February 18, 2019, https://www.academia.edu/27475695/On_Mountains_Scalable_and_Unscalable.pdf.

2 Most of the information regarding the processes and details of phytoremediation in this next section of the thesis were primarily learned from the textbook *Phyto.* This book is an amazing tool for all designers, as it uses illustrations and diagrams, a tool designers already know how to read, to communicate many complex remediations strategies. It helps develop a working knowledge of the information, so designers can develop projects with scientists and remediation experts successfully. It also includes guides to setting up a successful phytoremediation projects, including case studies, that were unbelievably helpful in the development of the following design experiments. Kate Kennen and Niall Kirkwood, *Phyto: Principles and Resources for Site Remediation and Landscape Design* (Abingdon, Oxon ; New York, NY, Abingdon, Oxon : Routledge, Taylor & Francis Group: Routledge, 2015).

3 Kennen and Kirkwood.

4 Donna Jeanne Haraway, *Staying with the Trouble: Making Kin in the Chthulucene*, Experimental Futures (Durham: Duke University Press, 2016).

5 Haraway.

6 Anuradha Mathur, "Neither Wilderness nor Home," in *Recovering Landscape: Essays in Contemporary Landscape Architecture*, ed. James Corner (New York: Princeton Architectural Press, 1999).

7 Mathur.

8 Elizabeth K. Meyer, "Uncertain Parks: Disturbed Sites, Citizens and Risk Society," in *Large Parks*, ed. Julia Czerniak, George Hargreaves, and John Beardsley, 1st ed. (New York : Cambridge, Mass: Princeton Architectural Press ; In association with the Harvard University Graduate School of Design, 2007).

9 Heidy Schopf and Jennifer Foster, "Buried Localities: Archaeological Exploration of a Toronto Dump and Wilderness Refuge," *Local Environment* 19, no. 10 (November 26, 2014): 1086–1109, https://doi.org/10.1080/13549839.2013.841660.

10 Schopf and Foster.

11 B. Davis, "Landscapes and Instruments," *Landscape Journal* 32, no. 2 (n.d.): 293–308.

12 Lee Graves, "Queen of Slag: Transforming Industrial Wastelands," Virginia Magazine, accessed June 12, 2019, https://uvamagazine.org/articles/queen_of_slag.

13 Graves.

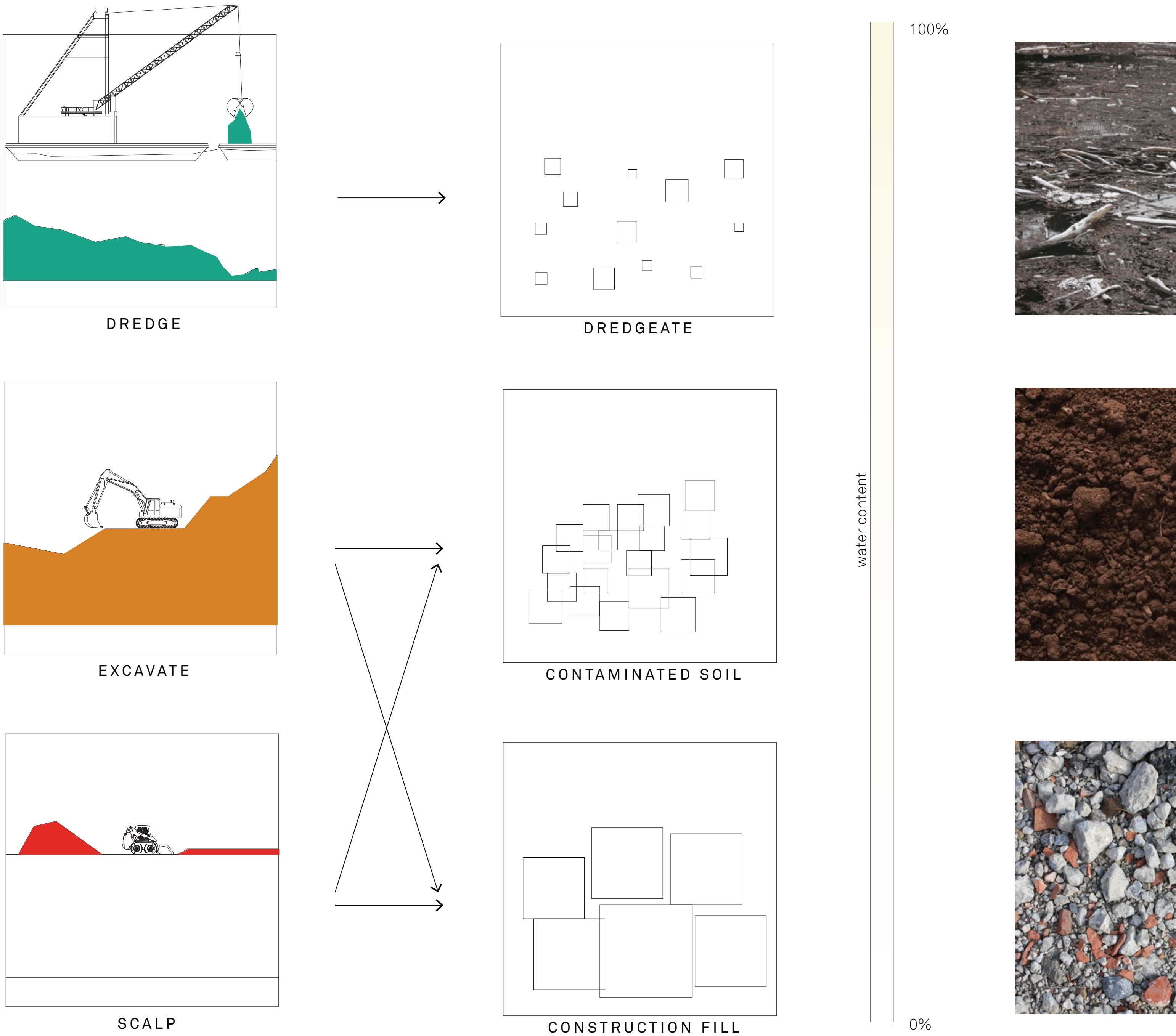
GEOLOGIC DESIGN EXPERIMENTS

The following three experiments take one of the aforementioned materials: dredgeate, contaminated soil or construction aggregate and uses it as the primary building material in a site-specific design intervention in the Port Lands and in conjunction with The Don Mouth Naturalization and Port Lands Flood Protection Project. The following pages set up as follows: a site plan and diagrammatic strategy of material and site usage, then a detailed overview of the chosen and the experiment methodology. This includes the purpose, procedure and hypothesis of the design intervention. After the three experiments, there is section that speculated on the future of the site as a whole and how each experiment will affect the over-all development and future of the Port Lands, as well as projecting the cyclical use of each material category. The three experiments are woven together with a pathway network. These pathways facilitate connecting the public to each site, letting people experience the experiments as they develop, in a safe way.

fig. 2.9 (left) Samples collected during the final site visit in October. Each glass container holds a distinct material sample categorized by a classification system designated by the author. The categories are as follows: dredgeate, contaminated soil, and construction aggregate.

AVAILABLE MATERIAL CLASSIFICATION PARAMETERS

fig. 2.10 (below) Diagram showing methodology to sorting and organizing each material, what the material actually looks like, and how the input/output flow of the material in relation to time will affect each design experiment.



MASTER PLAN LEGEND

fig. 2.11 (below) The legend below corresponds with the Master Plan that appears on the following page

Legend

buildings

heritage buildings

infastructure

EXPERIMENT 1: LAND FILL (75 YRS)

EXPERIMENT 1: LAND FILL (25 YRS)

EXPERIMENT 1: LAND FILL (5 YRS)

EXPERIMENT 2: LAND FARM (75 YRS)

EXPERIMENT 2: LAND FARM (25 YRS)

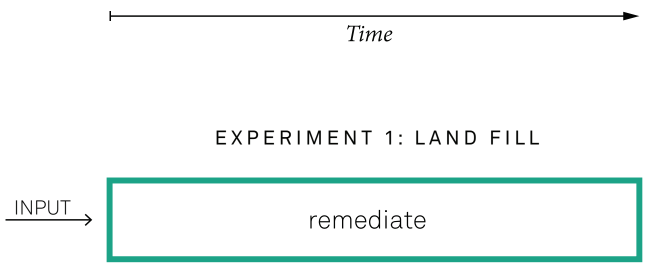
EXPERIMENT 2: LAND FARM (5 YRS)

EXPERIMENT 3: LAND FORM (75 YRS)

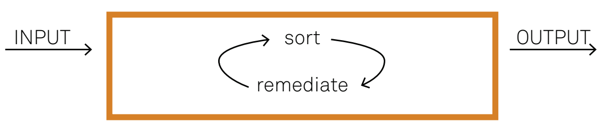
EXPERIMENT 3: LAND FORM (25 YRS)

EXPERIMENT 3: LAND FORM (5 YRS)

EXPERIMENT 1: LAND FILL



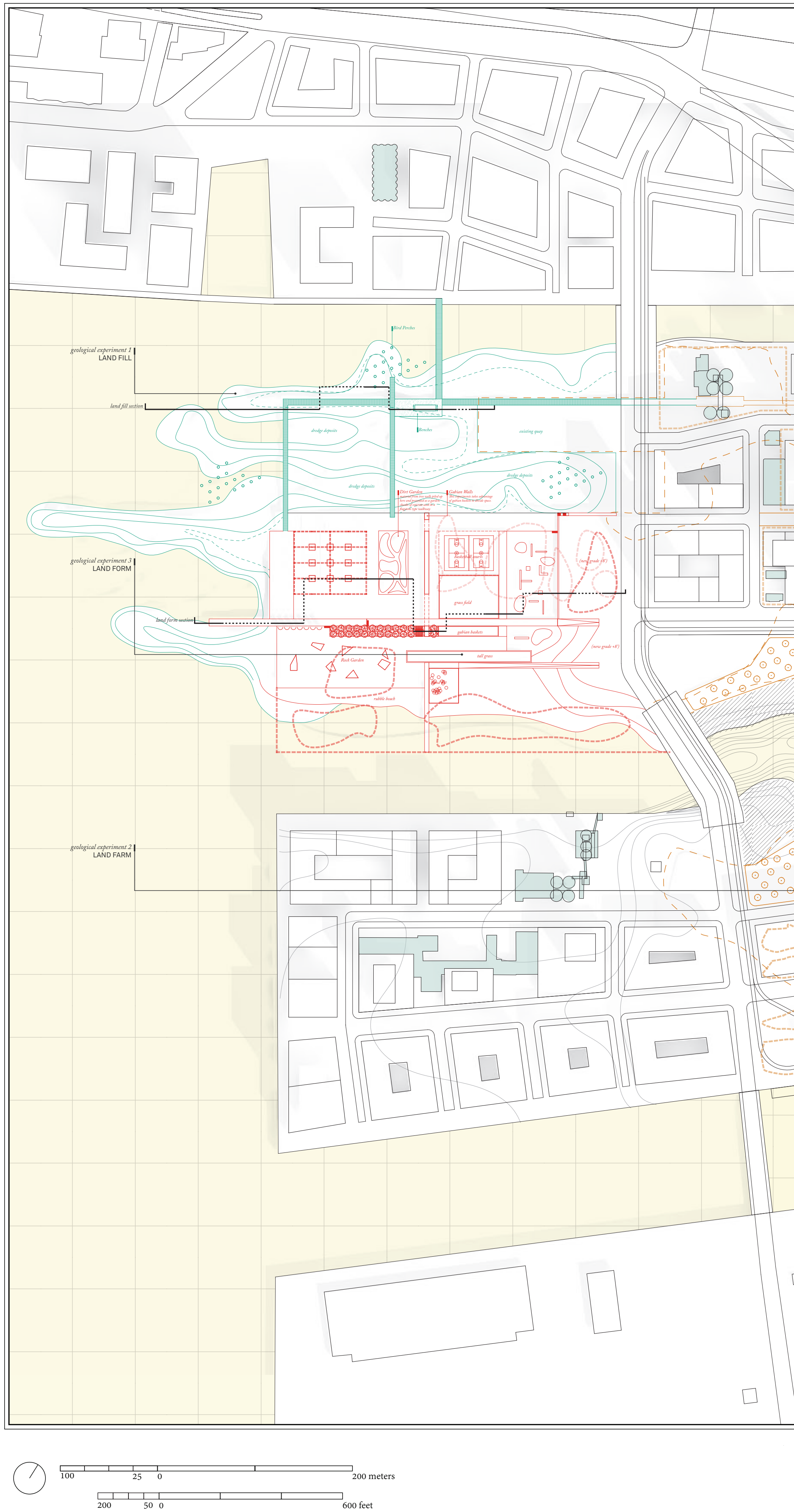
EXPERIMENT 2: LAND FARM



EXPERIMENT 3: LAND FORM

MASTER PLAN

fig. 2.12(right) Site plan of the Port Lands show the location and progression of each design experiments as well as providing some-context of what parts are being changed by the Don Mouth Revitalization Plan. For full scale drawing see Appendix F.




land farm section
market and fieldhouse
Wildflowers
greenhouses
allotment gardens
Extent of contamination
poplar forest
Don Mouth Revitalization Project
new river channel
Don Mouth Revitalization Project
Extent of contamination

SECTION 1

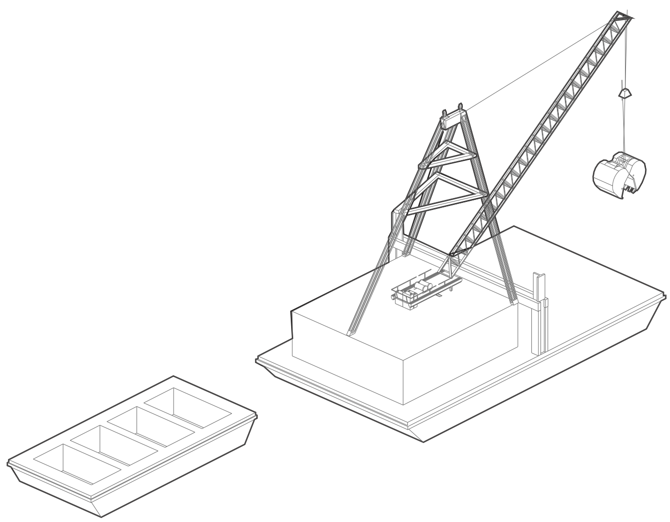


fig. 2.14 (above) Dredge and Barge icon

[DREDGEATE]

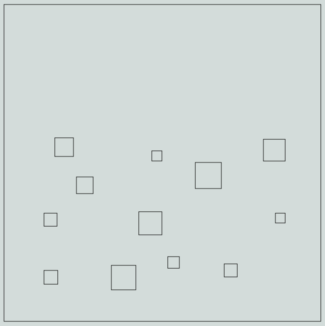


fig. 2.13 (above) particle diragram of dredgeate material

Every year, 40 000 cubic meters of dredgeate material is scooped from the bottom of the Keating Channel[1]. Dredgeate is a mixture of sediment made up of silt and debris suspended in water.

Typically, erosion from slopes creates sediment farther up the Don River where it is still somewhat naturalized. Rivers move the sediment downstream. The Lower Don was straightened and lined with concrete in the 1940's, this meant an increase in flow speed and almost no opportunity for the sediment to be stopped along the smooth concrete embankments. Before the Keating Channel and Toronto Port Lands were constructed, the sediment would be deposited in the then marshy Ashbridge bay[2]. In the 1920's the Keating Channel was built to divert the river 90 degrees into the Toronto harbour. This sharp turn was an easy place for this dredgeate to accumulate. Today the aggregation of this dredgeate material causes a host of problems; but the biggest issue is it causes a blockage at the only outflow point for the entire Don Valley river system, which usually leads to extreme flooding.

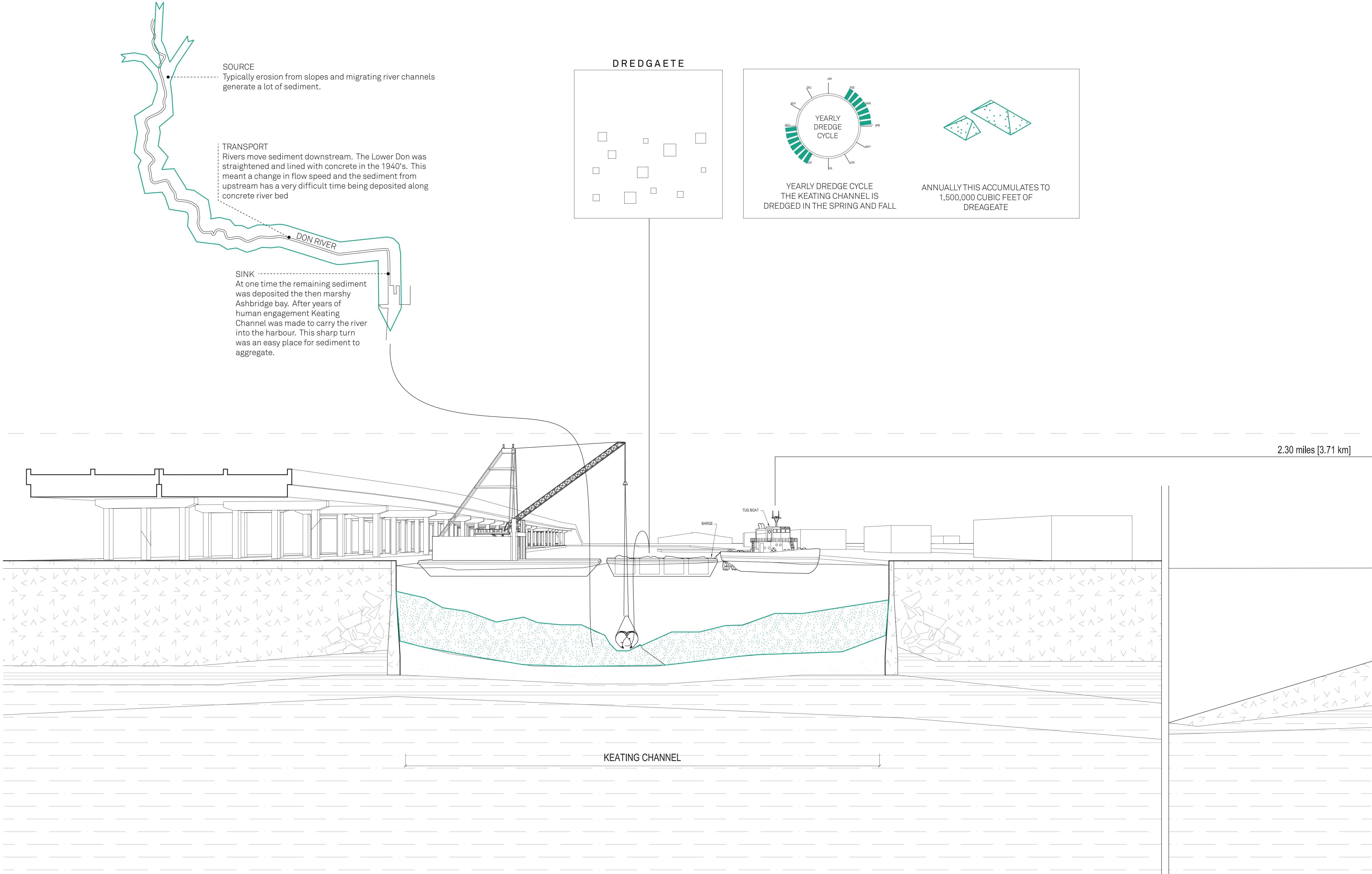
To prevent this flooding the channel is dredged for twelve weeks during the summer[3]. Along the course of the Don River the sediment usually becomes contaminated or picks up pollutants on its journey. This makes the final mixture of dredgeate difficult to dispose of because it is not safe to use unless it is remediated. Instead of remediating the dredgeate, it is scooped onto a barge by a 60-year-old crane with a clamshell bucket, and the pulled 2.3 miles into Lake Ontario. It is then dumped into a containment cell along the Leslie Street Spit. When these containment cells are full of contaminated dredgeate, they are capped with clay[4].

When the Don Mouth Naturalization and Port Lands Flood Protection Project is completed there will be a sediment trap which will ensure the dredgeate doesn't block the Keating Channel[5]. The dredgeate will still need to be removed annually and disposed of safely.

fig. 2.15 *(left)* dredgeate material dredged from the Keating Channel

fig. 2.16 (middle)floating debris ab the bas of the Don River as it enters the Keating Channel

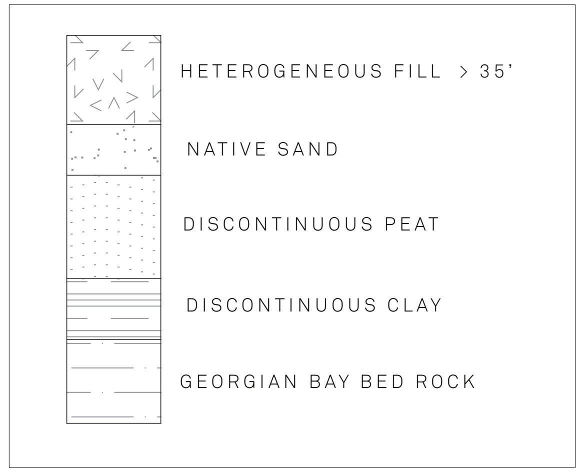
fig. 2.17(right) Clamshell bucket hoisting dredgeate into a barge, beside PortsToronto employee

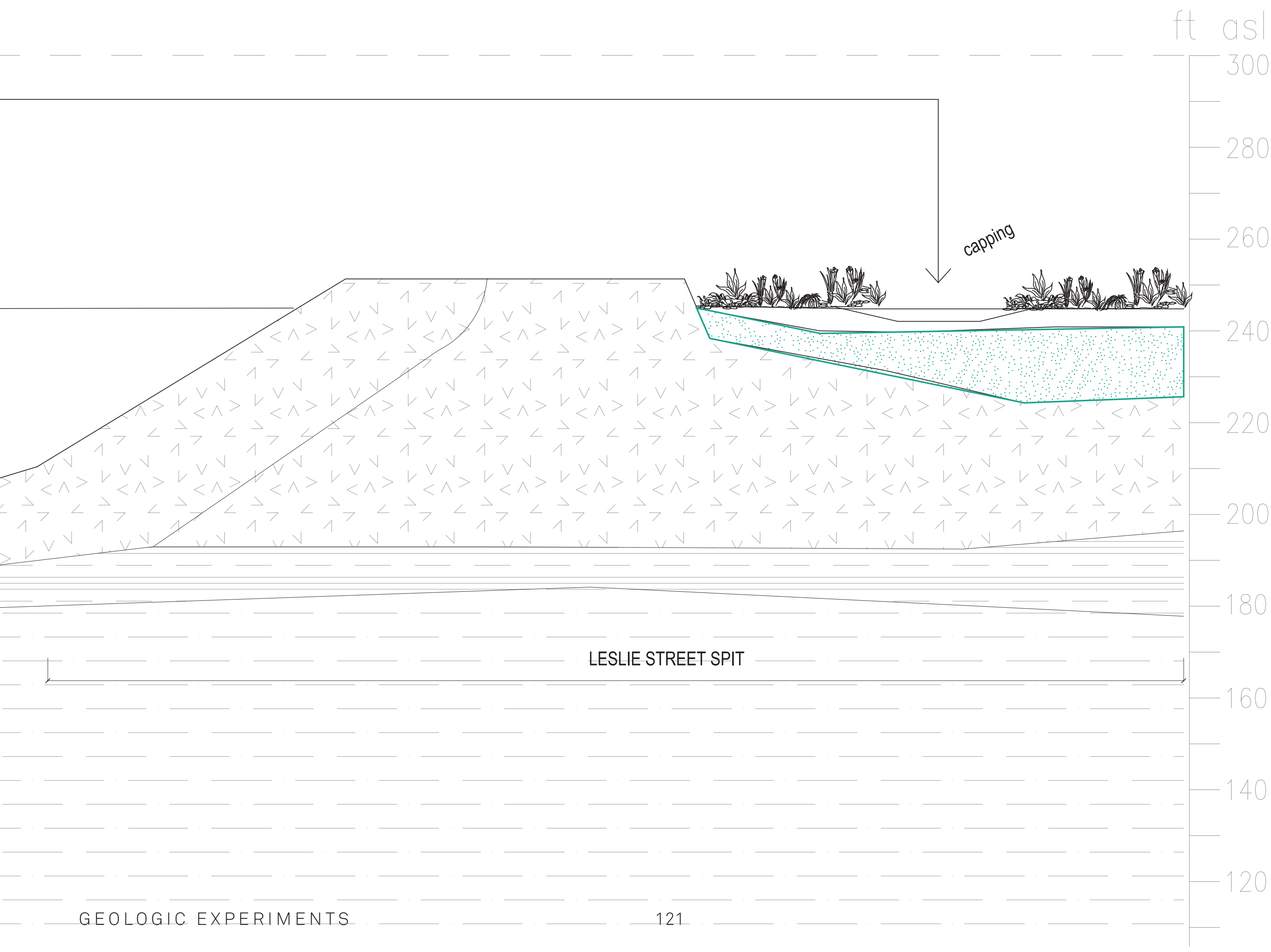


SOURCE
Typically erosion from slopes and migrating river channels generate a lot of sediment.
TRANSPORT
Rivers move sediment downstream. The Lower Don was straightened and lined with concrete in the 1940's. This meant a change in flow speed and the sediment from upstream has a very difficult time being deposited along concrete river bed
DON RIVER
SINK
At one time the remaining sediment was deposited the then marshy Ashbridge bay. After years of human engagement Keating Channel was made to carry the river into the harbour. This sharp turn was an easy place for sediment to aggregate.
DREDGAETE
YEARLY DREDGE CYCLE
YEARLY DREDGE CYCLE THE KEATING CHANNEL IS DREDGED IN THE SPRING AND FALL
ANNUALLY THIS ACCUMULATES TO 1,500,000 CUBIC FEET OF DREAGEATE
2.30 miles [3.71 km]
TUG BOAT
BARGE
KEATING CHANNEL

EXISTING DREDGEATE MATERIAL INFRASTRUCTURE

fig. 2.18 *(right)* Yearly dredgeate accumulation in the Keating channel. Every year the Keating channel accumulate 40,000 cubic meters of dredgaete material. Currently to deal with this the channel is dredged bi-annually and the material is sent by barge to the leslie street spit. Here it is dumped and capped with shale and clay. It is then planted.





Geological Experiment 1

LAND FILL

The following design experiment investigates how dredgeate material being dredged from the Keating Channel can be used as an infill material in construction of the Cherry Street lake filling project. This new landscape will become public space.

fig. 2.19 (left) Geological Experiment 1, 12 years after induction.

The purpose of this experiment is to use the 40,000 cubic meters of dredge collected annually as a building material for the Port Lands site as it is developed, and changes use in the next 50 years. Every year the chosen site must be able to accept and accommodate the newly acquired dredge. The site must also look to remediate the dredgeate and make it safe as a public space and park.

The procedure for the experiment should be executed in the following way: first, using construction aggregate acquired from the third experiment in this series (please see experiment 3: Land form, page 122) piers will be constructed that extend into the Toronto Harbour. These piers will be made simply by dumping the collected construction aggregate into the harbor, and the will extend out from the existing pier 43 and pier 42. The piers will be built slowly as necessary to accommodate the amount of dredgeate collected each year.

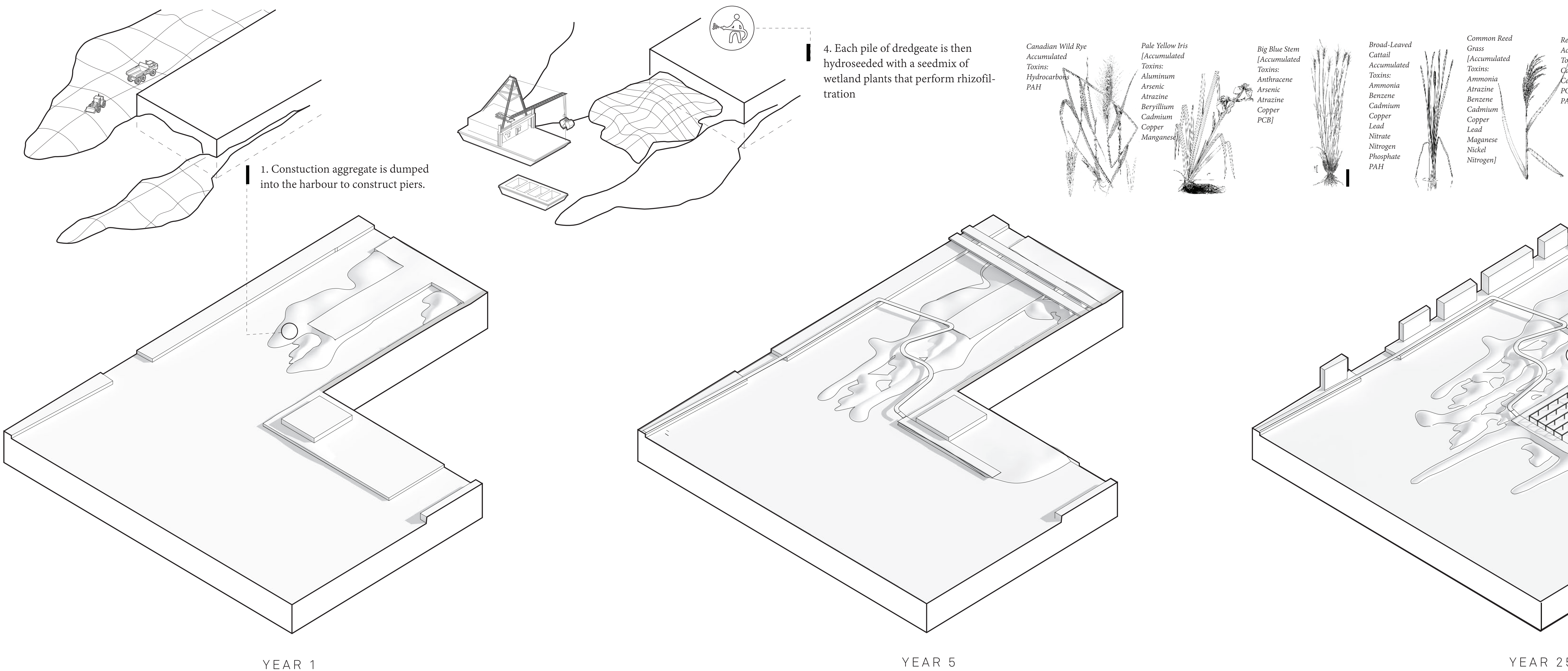
Next, the dredgeate will be moved from the channel or the sediment catch and deposited between the construction aggregate piers. Clay will be added to the dredgeate to help neutralize some of the contaminants and add structural support so the dredgeate can be formed into to piles. The piles will be arranged in variable heights and widths to create a diverse landscape and allow for pools of water to form.

Each pile of dredgeate is hydroseeded after it has been deposited with a seed mix of local plants that perform rhizofiltration. Rhizofiltration is a type of phytoremediation where the contaminant is filtered from water by roots and soil of certain types of plants, the soil microbes then destroy the contaminants[6] . This seed mix will contain Canadian Wild Rye, Pale Yellow Iris, Big Blue Stem, Broad Leaved Cattail, Common Reed Grass, and Reed Canary Grass (for a list of the pollutants each plant filters please see fig. 2.21). Once the annual dredgeate deposit has been monitored for a period and deemed safe to be used as a public park, pathways are built to be used by the public. The piles and piers continue to grow every year as more and more material is deposited. The park varies in the stages of its development; some areas become overly vegetated, attracting many different species of birds and frogs, while other more recent deposits still appear murky and barren. Once the wet land begins to interfere with shipping channels it is deemed "full" and can no longer accept anymore incoming dredgeate. Though at this time, perhaps the Don river has been fully naturalized in another project and there is barley and dredgeate left in the channel to deposit or perhaps they must resume sending it the Leslie Street Spit to be buried in containment cells.

When the experiment is considered "full" and can longer accept any more material the experiment will be completed. There will be a large wet land at varied stages of development and it will have attracted a wide variety of new local types of plant and animal life. The wet land will be very different from what the public may be used seeing to but that is ok. Through exposure to this new type of landscape, the public will hopefully learn about the dredgeate being created through anthropogenic processes and come to understand that this landscape is metabolizing the waste humankind has created.

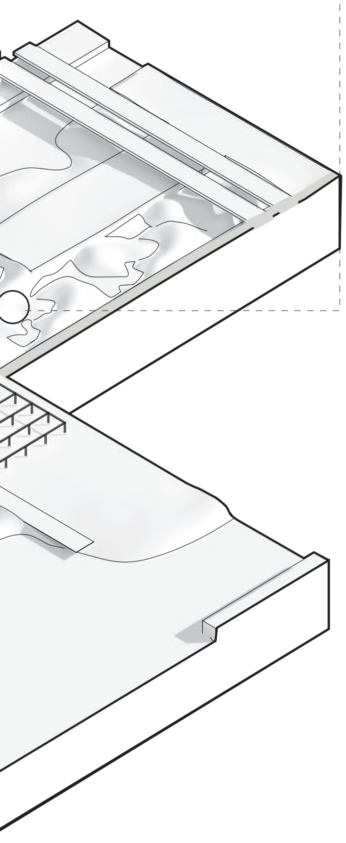
STRATEGIC MATERIAL USE DIAGRAM

fig. 2.20 (below) Site plan of the Port Lands show the location and progression of each design experiments as well as providing some-context of what parts are being changed by the Don Mouth Revitalization Plan.

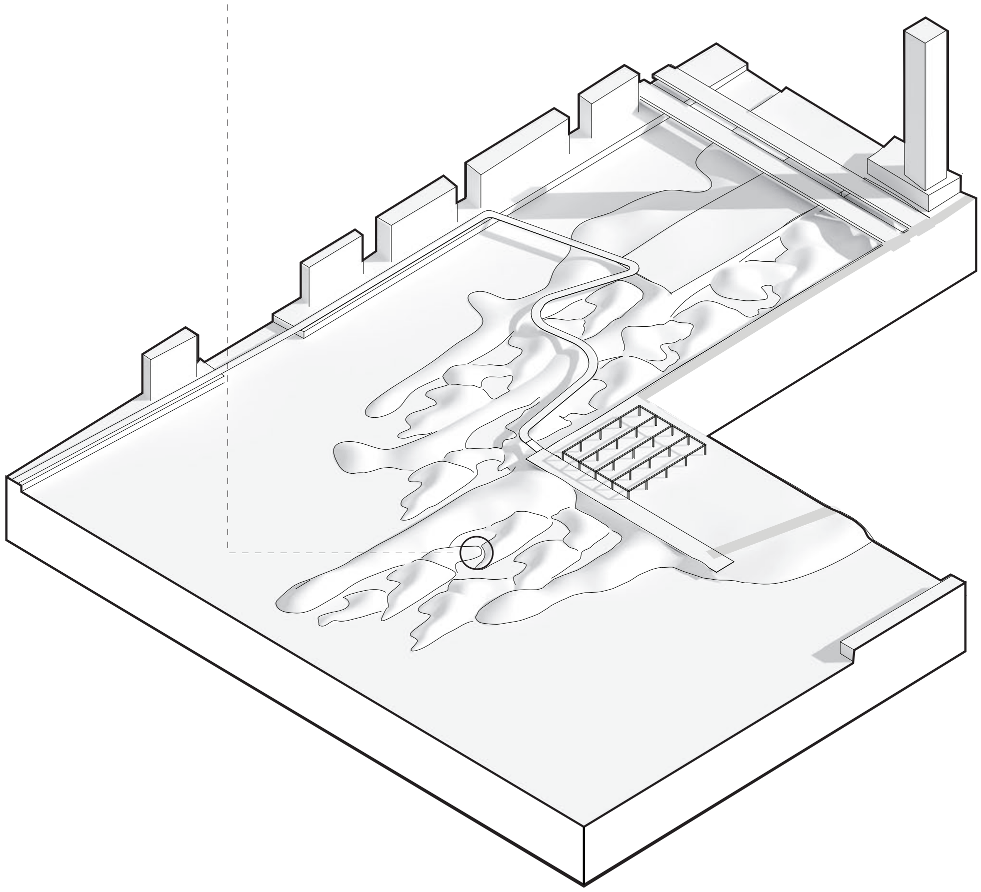


After hydroseeding there is a slow build up of plant life over the course of a few years. Eventually wetlands are created and become home to plenty of urban wildlife looking for a home

At some point maximum capacity is reached and now more dredge can be added.



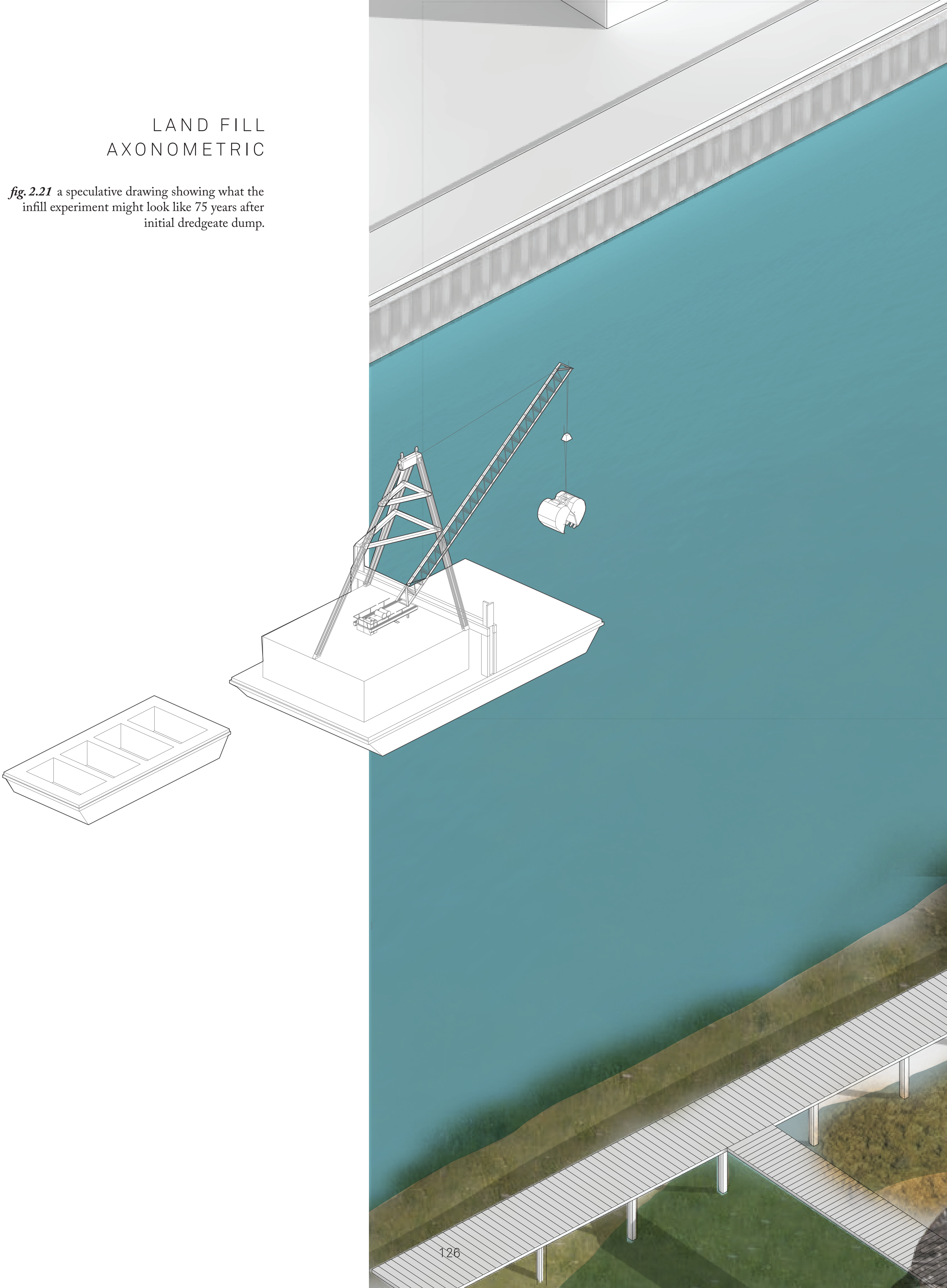
5

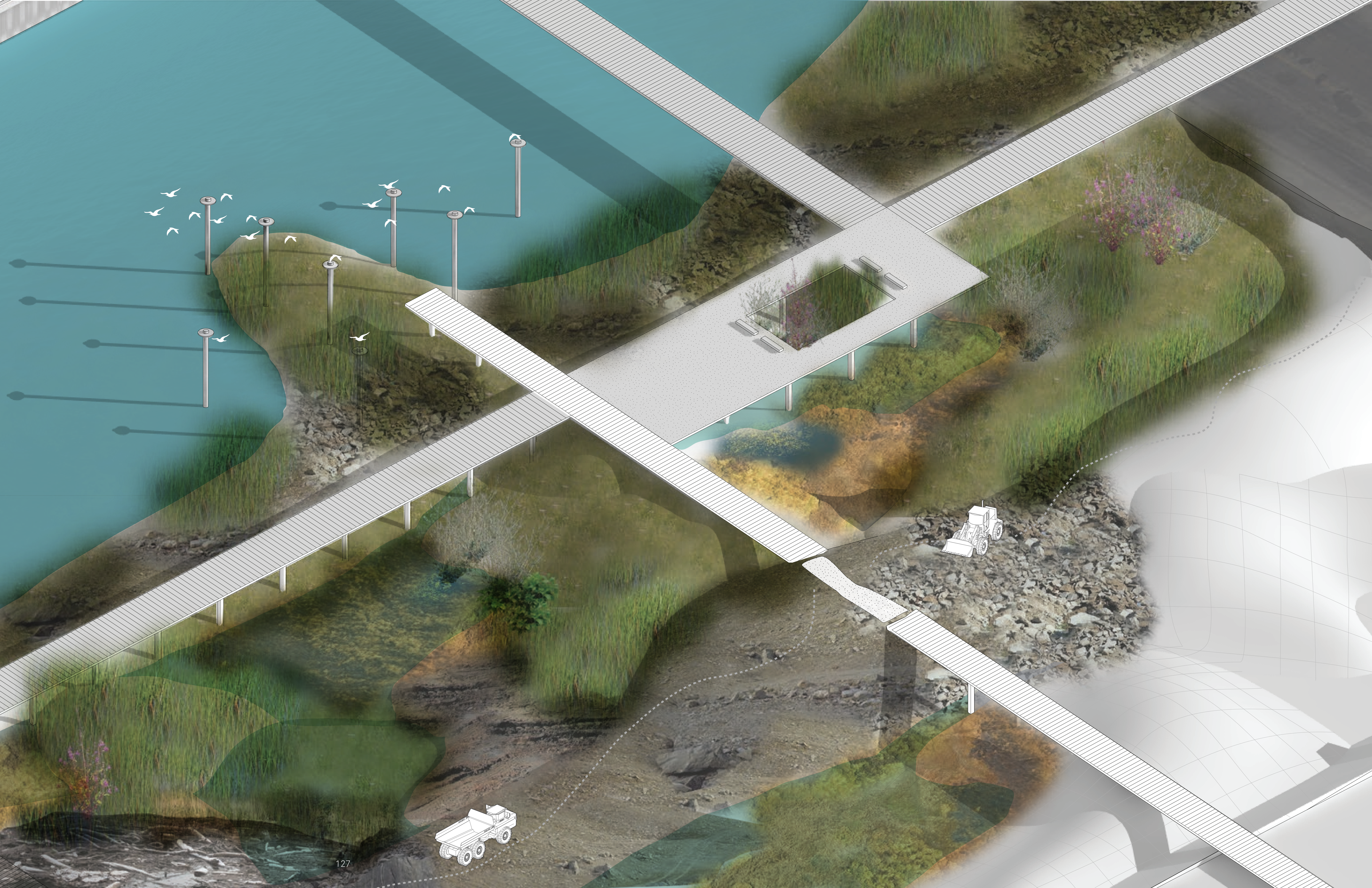


YEAR 75

LAND FILL AXONOMETRIC

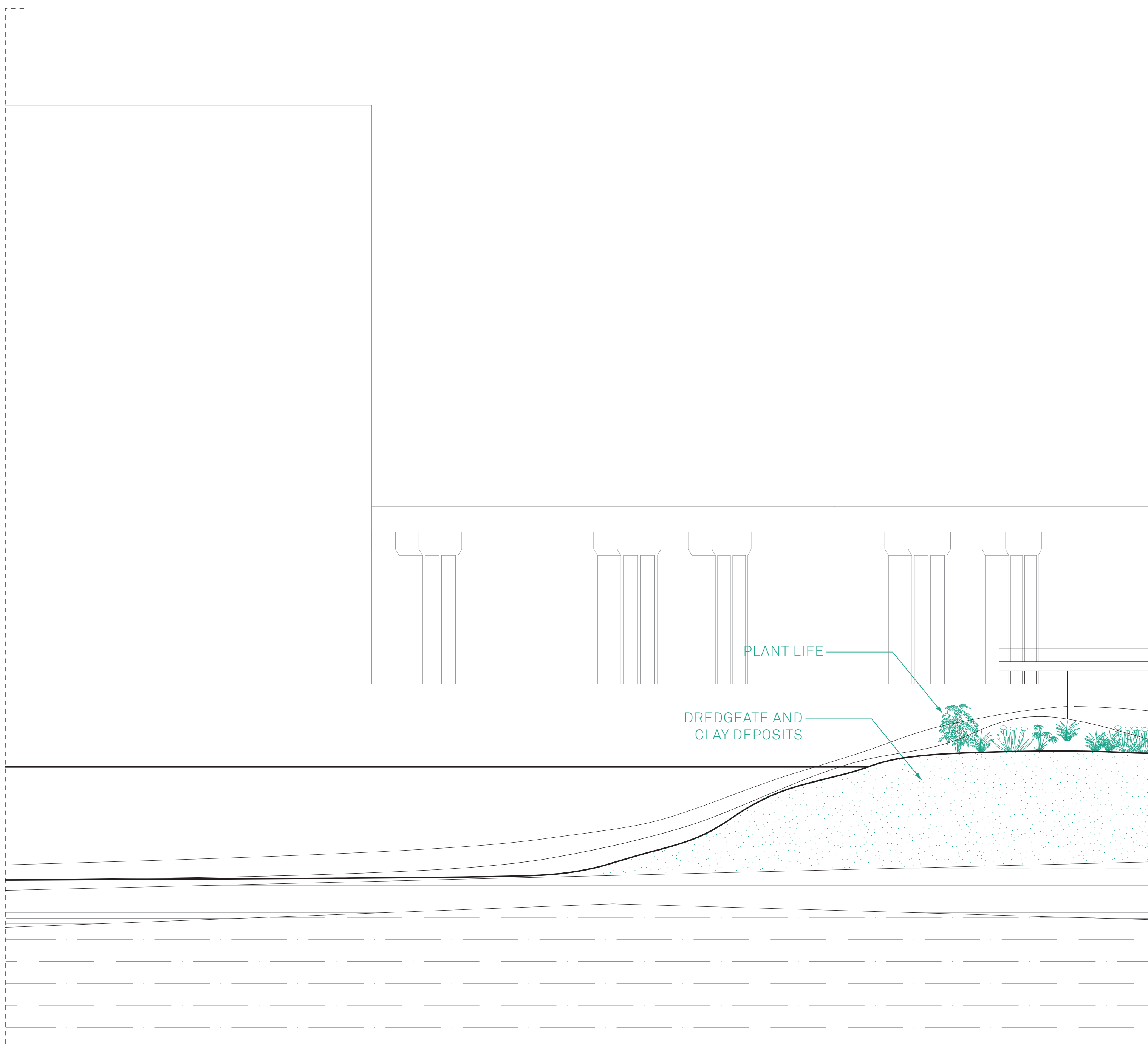
fig. 2.21 a speculative drawing showing what the infill experiment might look like 75 years after initial dredgeate dump.

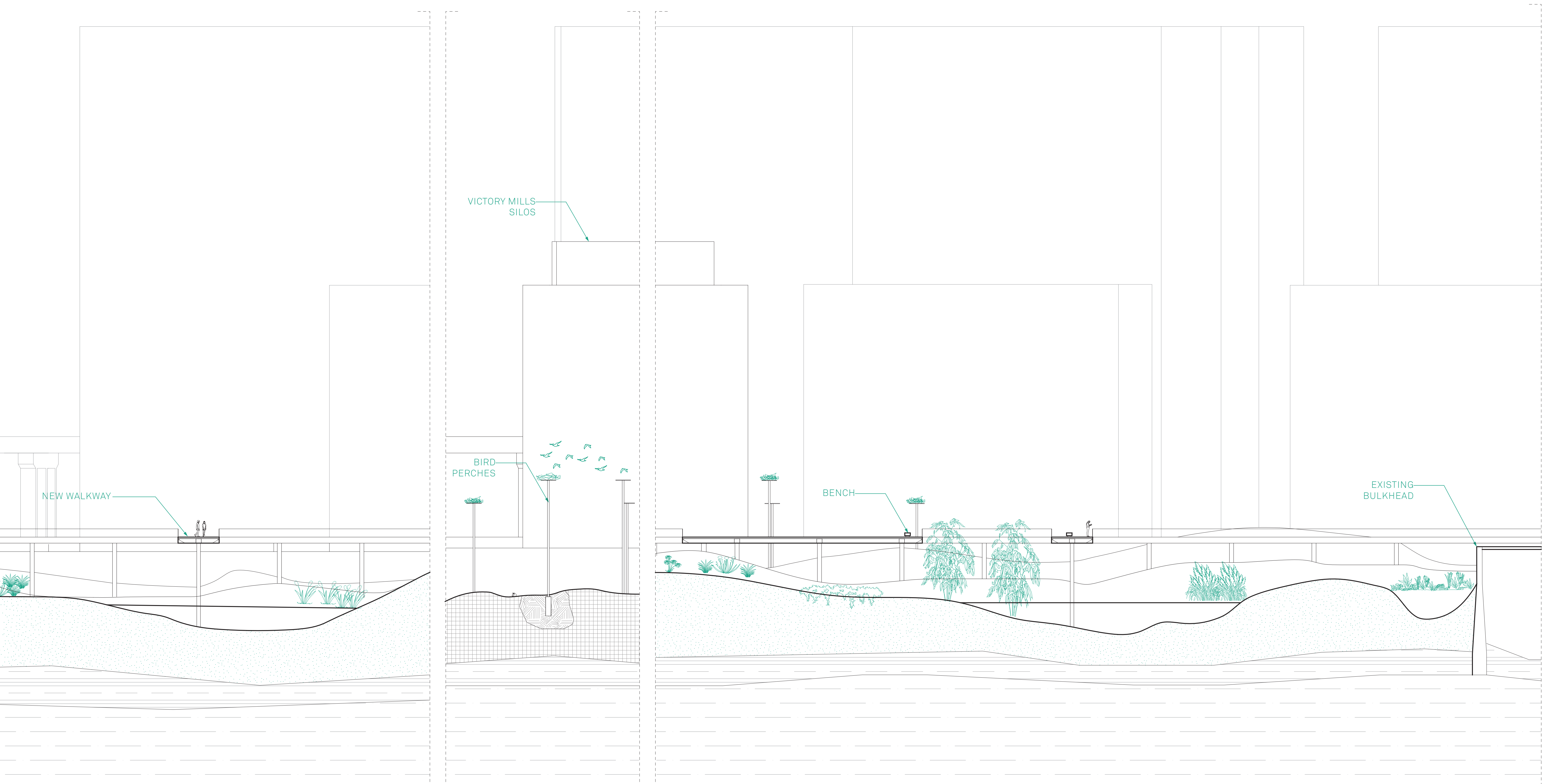


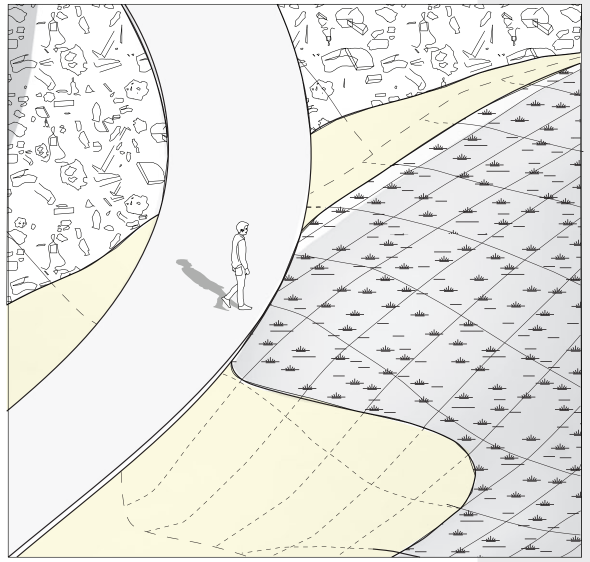


LAND FILL SECTION

fig. 2.22 Site plan of the Port Lands show the location and progression of each design experiments as well as providing some-context of what parts are being changed by the Don Mouth Revitalization Plan.




VICTORY MILLS
SILOS
BIRD
PERCHES
NEW WALKWAY
BENCH
EXISTING
BULKHEAD

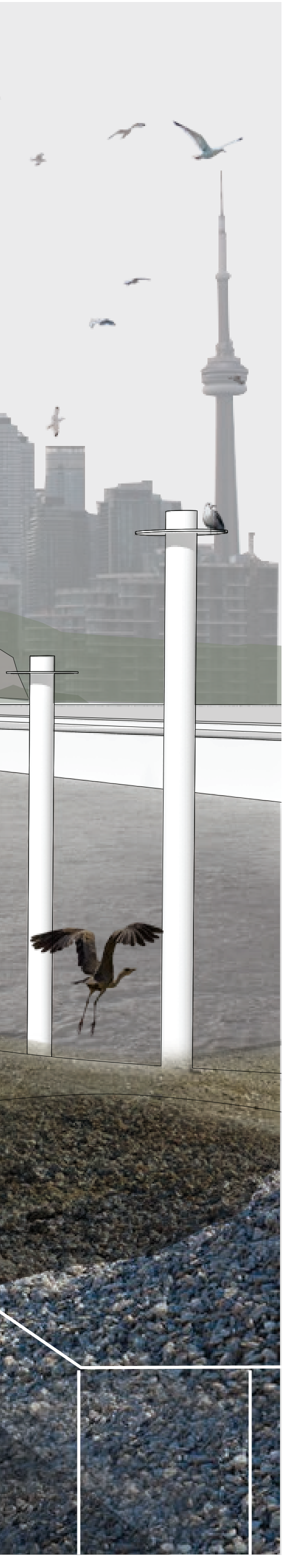


INITIAL
HYDROSEEDING AT
LAND FILL(YR 2)

fig. 2.23 (right) A year after the project has started the hydroseeding commences. Small plants start to spout out of the dredgeate material, but it is still relitivley murky looking.

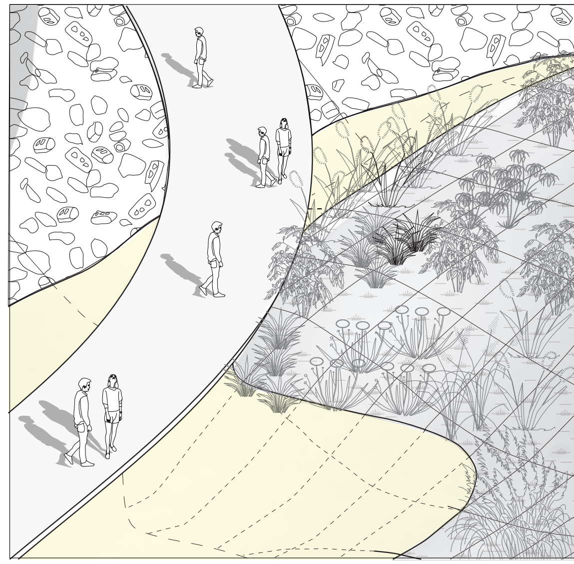
BIRD WATCHING AT
LAND FILL(YR 10)

fig. 2.24 (above) 10 years of depositing dregeate into the Toronto Harbour has resulted in new plants and animals to the area. It brings in many Bird watchers, who wish to see birds stationed at the new bird resting platforms.



GENEROUS PLANT GROWTH LAND FILL(YR 13)

fig. 2.25 (right) 12 years after the first hydroseeding, the mounds of dredgeate are full of plant life! What was once a murky mud piles are now a thriving wetland!



SECTION 2

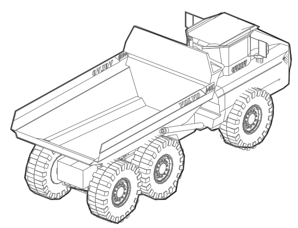


fig. 2.26 (previous page) dump truck icon

[CONTAMINATED SOIL]

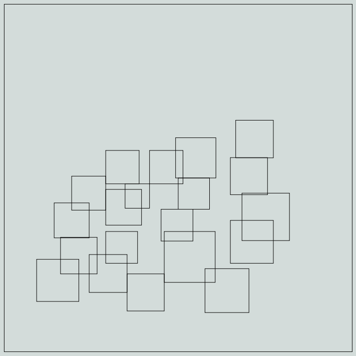


fig. 2.27 (above) Contaminated soil icon.

Soil contamination is caused by the presence of human-made chemicals or other alteration in the natural soil environment. It is typically caused by industrial activity, agricultural chemicals, or improper disposal of waste. The most common chemicals involved are petroleum hydrocarbons, polynuclear aromatic hydrocarbons, solvents, pesticides, lead, and other heavy metals. The concern over soil contamination stems primarily from health risks, from direct contact with the contaminated soil, vapors from the contaminants, and from secondary contamination of water supplies within and underlying the soil. Often these contaminants can be neutralized or harnessed by plant life or adding new materials to the soil to change the chemical balance. The Don Mouth Naturalization and Port Lands Flood Protection Project will be taking advantage of bio-piles in the short term for material dug out of the new river channel.

fig. 2.28 (left) Soil in the Port Lands being excavated
fig. 2.29 (middle) Soil piled 20' high
fig. 2.30 (right) Soil waiting to be remediated

EXISTING
CONTAMINATED
SOIL MATERIAL
INFRASTRUCTURE

fig. 2.31 Contaminated Soil has been building up on the site for generations. , with every industrial operation contributing to this toxic stratification. since the sites inception as an lakefill project. in this diagram are various methods to remdiate the excavated material in-situ.

IN-SITU

PHYTOREMEDIATION

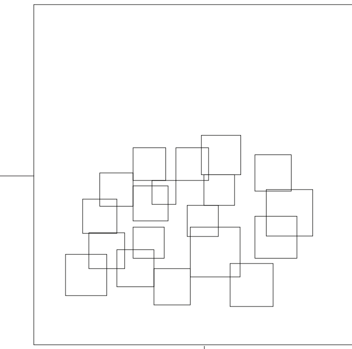
2 - 7 YEARS

BIO-VENTING

Bioventing is an in situ remediation technology that uses microorganisms to biodegrade organic constituents adsorbed on soils in the unsaturated zone. Bioventing enhances the activity of indigenous bacteria and simulates the natural in situ biodegradation of hydrocarbons in soil by inducing air or oxygen flow into the unsaturated zone and, if necessary, by adding nutrients. Bioventing primarily assists in the degradation of adsorbed fuel residuals, but also assists in the degradation of volatile organic compounds (VOCs) as vapors move slowly through biologically active soil.

1- 3 YEARS

CONTAMINATED SOIL



SOIL

CLAY

sediment with particles smaller than silt, typically less than 0.00016 inch (0.004 mm).

SI

sediment whos
between clay ar
(typically 0.002

CONTAM

Chemicals detected at concentrations in soil include the following:

Metals and Inorganics

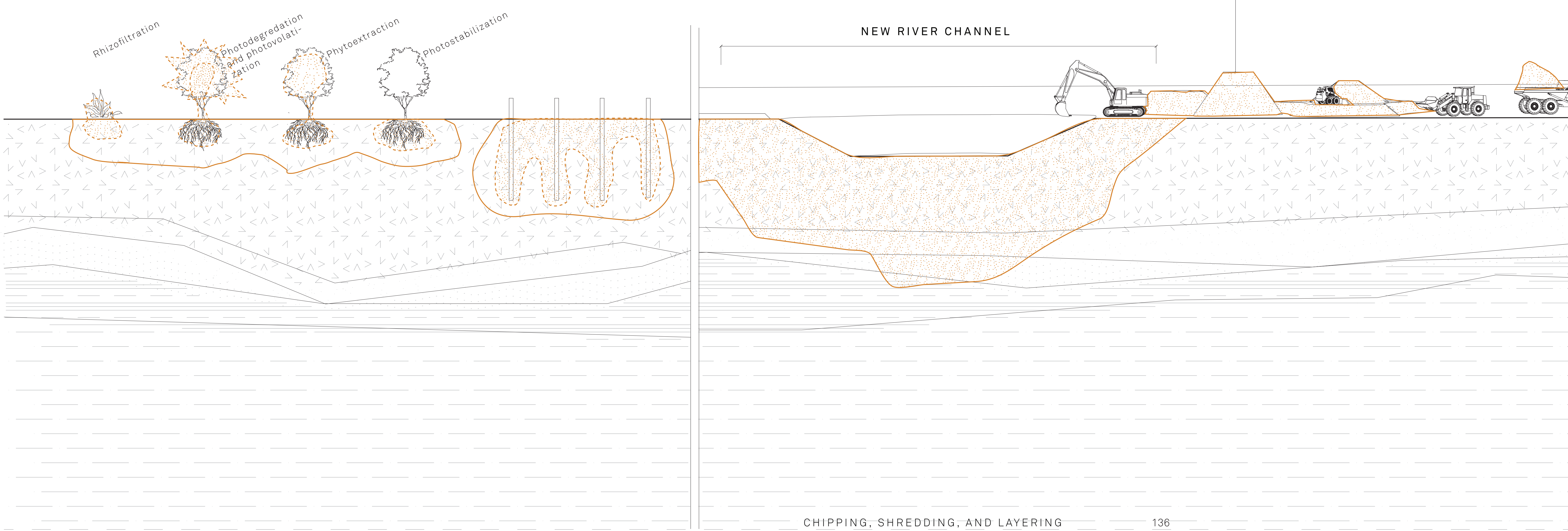
Elemental pollutants found on the periodic table that have been released into enviroment
Antimony
Arsenic
Barium
Beryllium
Boron
Boron (hot water extractable)
Cadmium
Chromium
Chromium, Hexavalent (Cr6+)
Cobalt
Copper
Cyanide
Electrical Conductivity
Lead
Mercury
Molybdenum
Nickel
Silver
Sodium Absorption Ratio
Thallium
Uranium (U)
Vanadium
Zinc

PHCs

Petroleum hydrocarbons are typically fuel spills, leaky underground or above ground storage tanlks
PHC F1 (C6-C10)
PHC F3 (C16-C34)
PHC F2 (C10-C16)
PHC F4 (C34-C50)

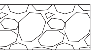
VOC

Volatile organ
1,1,1,2-Tetrach
1,1,1-Trichloro
1,1,2,2-Tetrac
1,1,2-Trichloro
1,1-Dichloroet
1,1-Dichloroet
1,2-Dibromoe
1,2-Dichlorob
1,2-Dichloroe
1,2-Dichlorop
1,3-Dichlorob
1,3-Dichlorop
1,4-Dichlorob
2-Butanone
4-Methyl-2-Pe
Acetone
Benzene
Bromodichlor
Bromoform
Bromomethar
Carbon tetrac
Chlorobenzer
Chlorodibrom
Chloroform
cis-1,2-Dichlo
Dichlorometh
Ethylbenzene
Methyl tert-bu
n-Hexane
Styrene
Tetrachloroet
Toluene
trans-1,2-Dich
Trichloroethyl
Trichlorofluor
Vinyl Chloride
Xylenes, Total



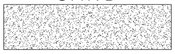
L TYPE

LT



e particles are
nd sand in size
–0.06 mm).

SAND



sediment whose particles are larger than silt (typically greater than 0.06 mm).

MINANTS

greater than the accepted standards

Cs

nic compounds
hloroethane
ethane
hloroethane
oethane
thane
thene
thane
enzene
thane
ropane
enzene
ropene
enzene
entanone
romethane
ne
chloride
ne
omethane
roethene
ane
e
utyl ether (MTBE)
hene
hloroethene
lene
omethane

PAHs

Polycyclic aromatic hydrocarbons
1+2-Methylnaphthalenes
Acenaphthene
Acenaphthylene
Anthracene
Benzo(a)anthracene
Benzo(a)pyrene
Benzo(b&j)fluoranthene
Benzo(b)fluoranthene
Benzo(g,h,i)perylene
Benzo(k)fluoranthene
Chrysene
Dibenzo(a,h)anthracene
Fluoranthene
Fluorene
Indeno(1,2,3-Cd)Pyrene
Naphthalene
Phenanthrene
Pyrene

PCBs

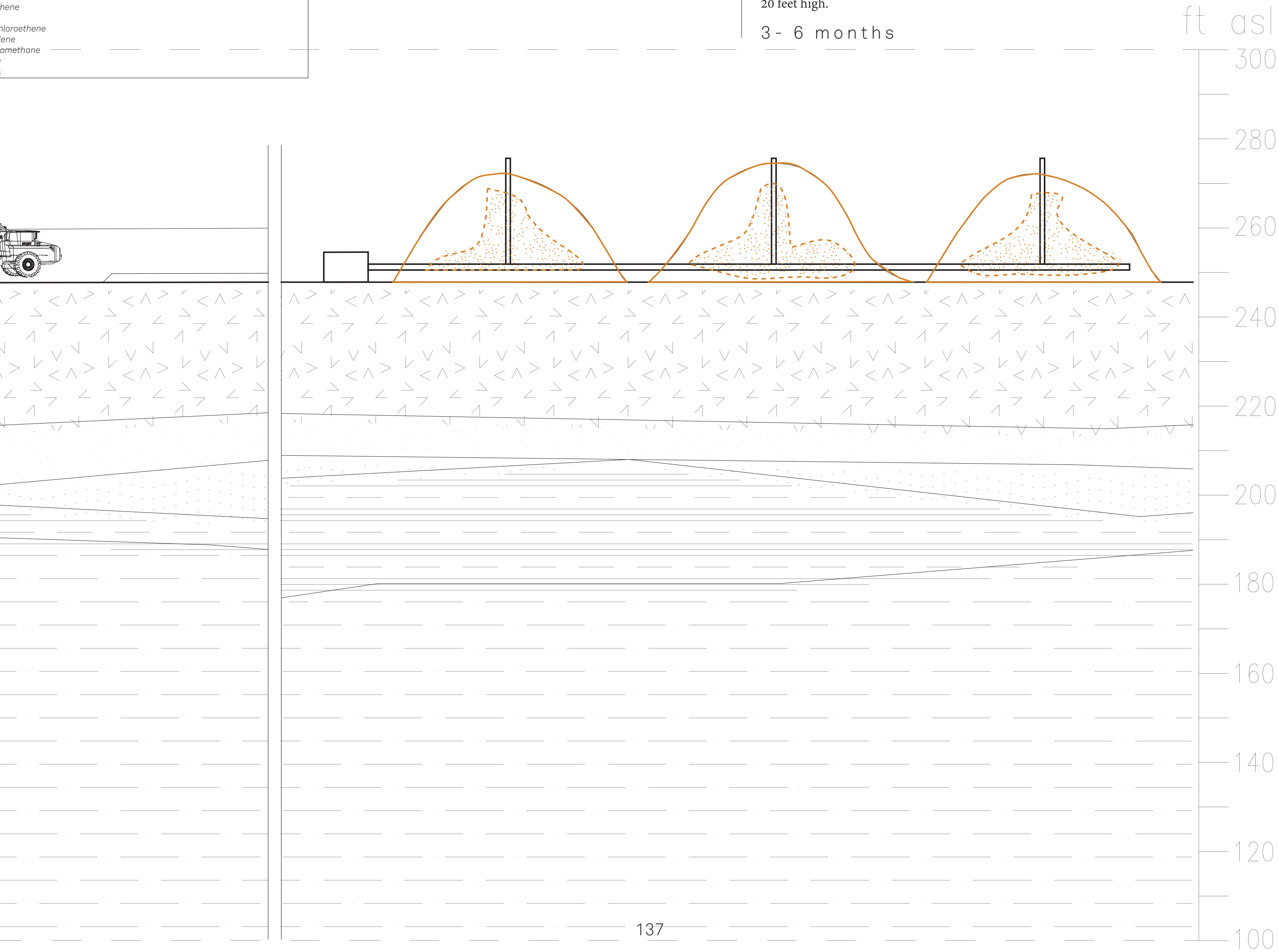
historically used as pesticides or in products such as caulking and insulation
PCBs, Total

EX-SITU

BIO-PILES

A bio-pile is a bioremediation technology in which excavated soils are mixed with soil amendments, formed into compost piles, and enclosed for treatment. The basic bio-pile system includes a treatment bed, an aeration system, an irrigation/nutrient system and a leachate collection system. Moisture, heat, nutrients, oxygen, and pH are controlled to enhance biodegradation. An irrigation/nutrient system is buried under the soil to pass air and nutrients through the soil. Soil piles can be up to 20 feet high.

3- 6 months



Geological Experiment 2

LAND FARM

The following design experiment investigates how all the contaminated soil during the excavation of the new river channel can be used on site and remediated. This remediation process will be accessible to the public in a variety of ways, so the people living and working close the chosen site will be able to see the changes across each season as well as annually.

fig. 2.32 (left) Geological Experiment 2, 25 years after inception

Almost all the soil excavated during The Don Mouth Naturalization and Port Lands Flood Protection Project will be problematic in some regard. It will be contaminated due to previous industrial pollution or the quality of the soil will consist of mostly peat and be unusable because of its lack of stability. Currently the Don Mouth Naturalization and Port Lands Flood Protection Project is using soil remediation techniques over the course of the project, and trying to re-use as much soil as possible, but this does not account for the soil being excavated for any of the development slated for after the project's completion. This experiment will try to identify exactly how much soil will be excavated over a 50-year period and find a way to continually be accepting contaminated soil, remediating it through means of bioremediation or phytoremediation, and then donating the clean soil to be used elsewhere.

The procedure of this experiment should begin with the implementation of a land use by-law. This by-law would state that all contaminated or poor-quality soil must remain inside the identified Port Lands Site boundaries. Before excavation for any development can begin the smaller site must be remediated to specified degree using an approved method phytoremediation or bioremediation. There would be an incentive for this co-operation: higher site density.

During this remediation period all major roads would be completed. Visitors could come to the site and see the remediation sites at different phases and using different methods. A permanent strip of land would be designated as a remediation park, it would run perpendicularly to the new engineering wetland and river channel, creating a sharp contrast. This park would have a more permanent installation of safe remediation sites and public facilities. There would be a mixture of bioremediation sites and phytoremediation sites. Running directly through the site is a public walkway that will allow people to walk through the site seamlessly and interact with each smaller site safely at every phase of its development.

The first site is a silver maple forest. This would have a forest of large silver maple tree. Silver maples perform phytoextraction, a process of phytoremediation where the tree accumulates drastically higher amounts of contaminants and stores them in harvested tissue, to eventually to be harvested and destroyed. This site would be interwoven with bio-venting pipes. These would extract gases from deep in the soil and capture them. This gas would be collected stored for future uses in fuel production.

The next site in this experiment would be the sunflower fields in combination with the fieldhouse and public market, and allotment gardens. The sunflowers would perform rhizofiltration, and annually they are harvested. Both the fieldhouse and public market would renovate existing structures already on the site, and no new foundations would be made. The fieldhouse would store all the equipment for maintaining the experimental park and the public market would act as a farmer's market and event space to the new neighbourhood. In close proximity to the market would be a plot for community allotment gardens.

The next site would be a dedicated wildflower field. Many native species of plants would be grown here including white clover, bent grass, chrysanthemum, alfalfa and American vetch. The wildflower fields would be low maintenance and a variety of phytoremediation processes would occur[7].

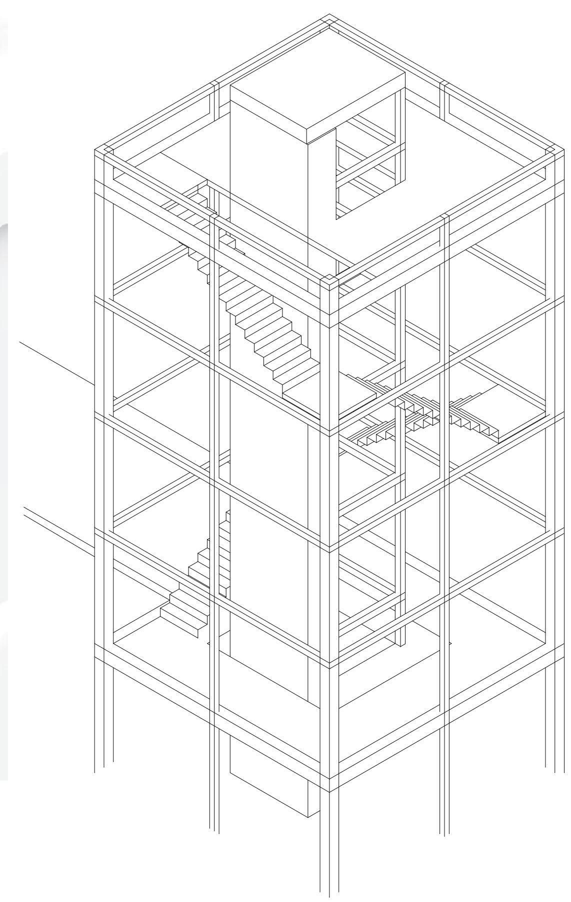
Continuing south, there would be two sections that would be dedicated poplar tree forests. Poplar trees are excellent proprietors of phytoextraction. At a certain point these forests would need to be cut down and burned to dispose of the contaminants accumulated. I imagine this could happen every decade. The forest would be safely burned and replanted. This would be an interesting celebration and afterward a new forest is planted.

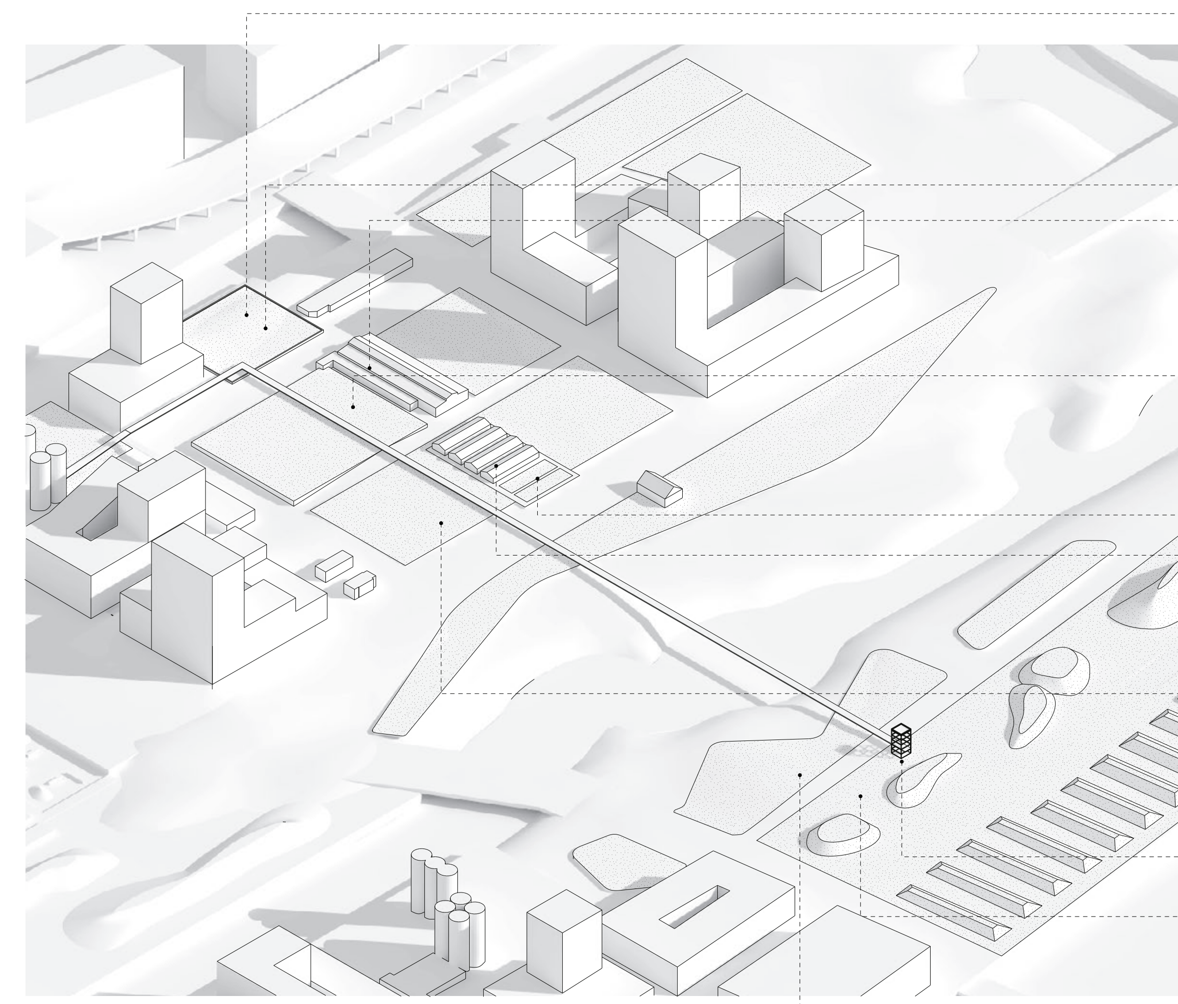
The final section of this new landscape is the bio-pile fields. This happens at the southern part of the site. At conception it is very large and can accept tons of contaminated soil for remediation. Bio-piles are created by burying irrigation/nutrient tubes under piles of dirt 15 feet wide, 15 - 20 feet high and 30 ft deep[8]. Air, nutrients and water pass through the piles and the moisture, heat, nutrients, oxygen, and pH are controlled to enhance the biodegradation of contaminants. It can take 6-12 months to remediate the soil, it can then be used safely somewhere else on the site. As site continues to be developed the bio-pile field is reduced until it is a city block, accepting a proportionate amount of soil to the development occurring across the Port Lands.

An observation deck is built during as the of the Don Mouth Naturalization and Port Lands Flood Protection Project begins construction. The public can continue to visit the observation tour throughout the construction of the river channel, they can witness the scale of the biofields, and they can experience the burning of the poplar forest every 10 years at a safe distance. It will help make the changes happening throughout all three experiments and the

1. Implement a land-use law that states all contaminated earth must be dealt with before excavation can begin. There would also be incentives for co-operation, for example participation in phytoremediation efforts would be granted higher density per site.

At the beginning of construction on the DMRP a lookout tower and path would be constructed. This would be accessible through construction and integrated into the final plans. Giving public access to interact with construction activities





2. The following years would be a patchwork of sites in construction progress as well as in remediation progress. The phytoremediation sites woul accept soil drom the previous DMRP excavation.

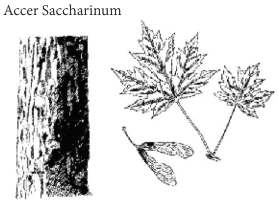
Don Mouth Naturalization and Port Lands Flood Protection Project much more visible to the public.

This experiment would be constantly in flux; changing both in scale annually and in flora and fauna seasonally. It would create an interesting dichotomy between what it means to design a park space, a farm, and a construction site. This experiment would also test a way to manipulate the rules that capitalism adheres too. How can city by-laws and the way we design disturbed site entice or structure the way developments work? By allowing higher site density, would these major capitalist ventures be inclined to invest in the proposed remediation efforts, even though that means waiting up to five more years to develop a building?

STRATEGIC MATERIAL USE DIAGRAM

fig. 2.33 (right) Site plan of the Port Lands show the location and progression of each design experiments as well as providing some context of what parts are being changed by the Don Mouth Revitalization Plan.

Silver Maple Forest
Accer Saccharinum



PVB, Vinyl Chloride, TCE

Bio-venting

Market + Fieldhouse

Various Wildflower fields
White Clover
Bentgrass
Chrysanthemum
Alfalfa
American Vetch

Various Metals
PCB
Hydrocarbons
Diesel Fuel

Allotment Gardens

Greenhouses on existing Foundation

Sunflower Fields
genus Helianthus

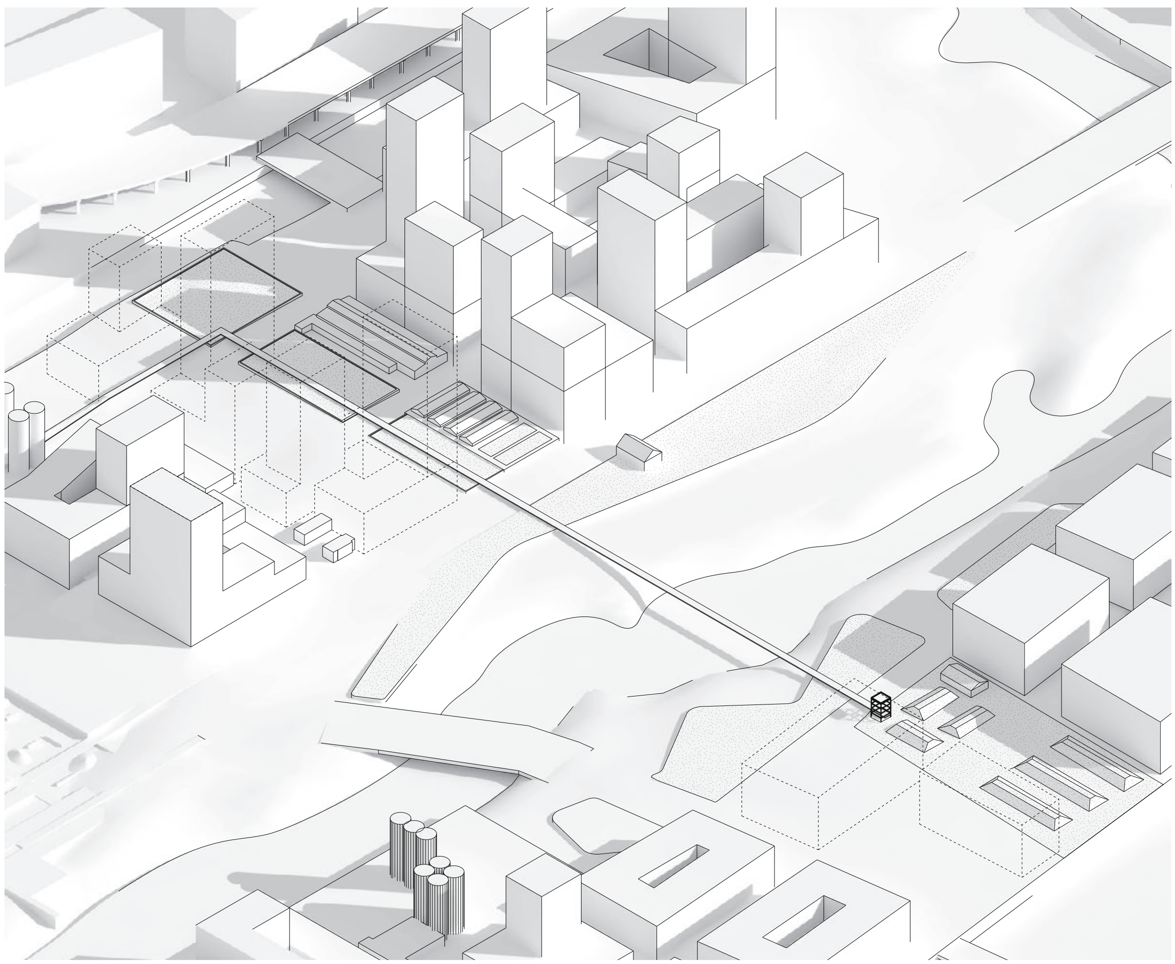
Arsenic
Cadmium
Chromium
Copper
Lead
Mangenese
Nickel
PCB
Zinc

Observation Tower

Soil cleaning facilities
Biopiles

Poplar fields
Populus

Benzene
Ethyl
PCE
TCE
Vinyl Chloride
Xylen

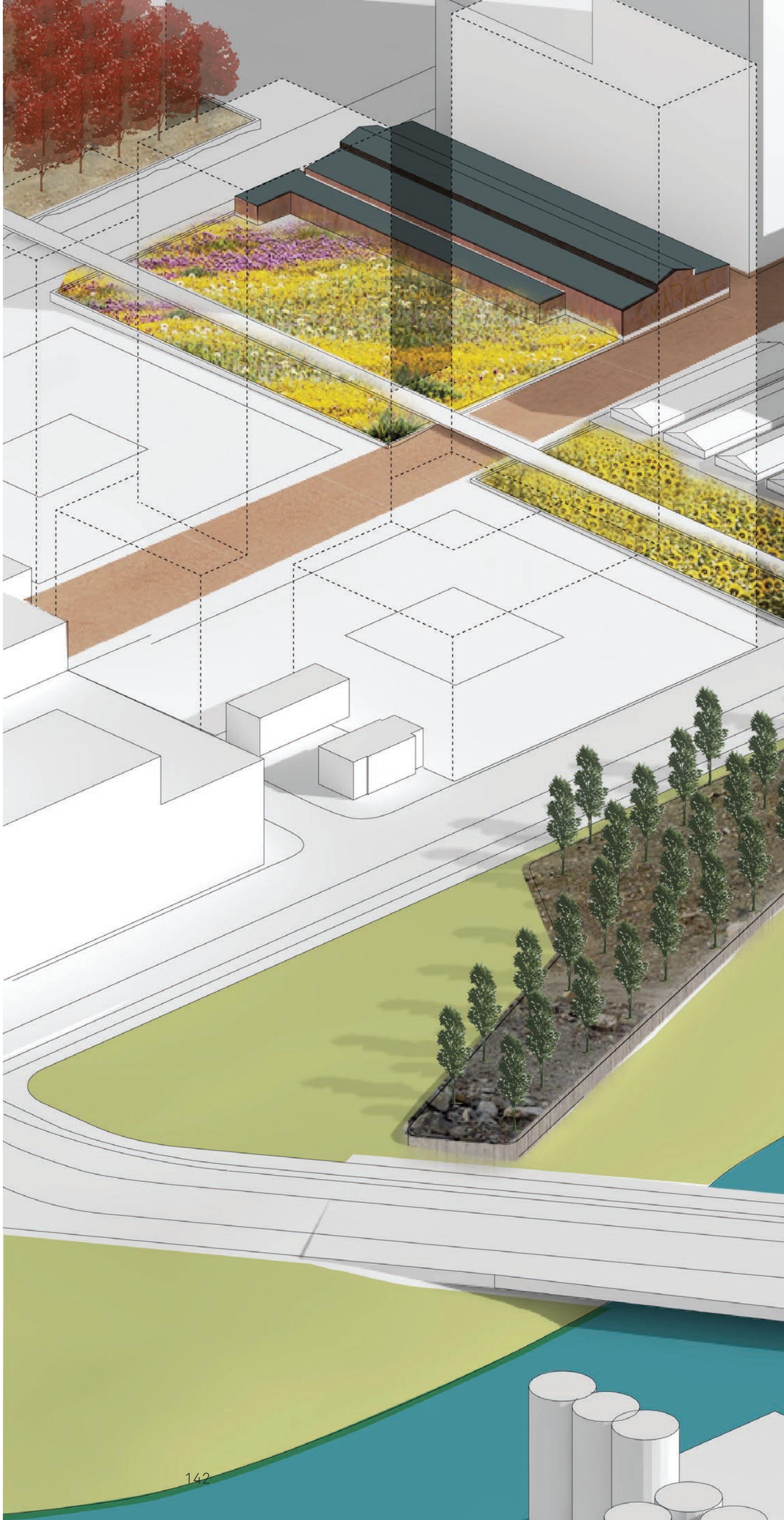


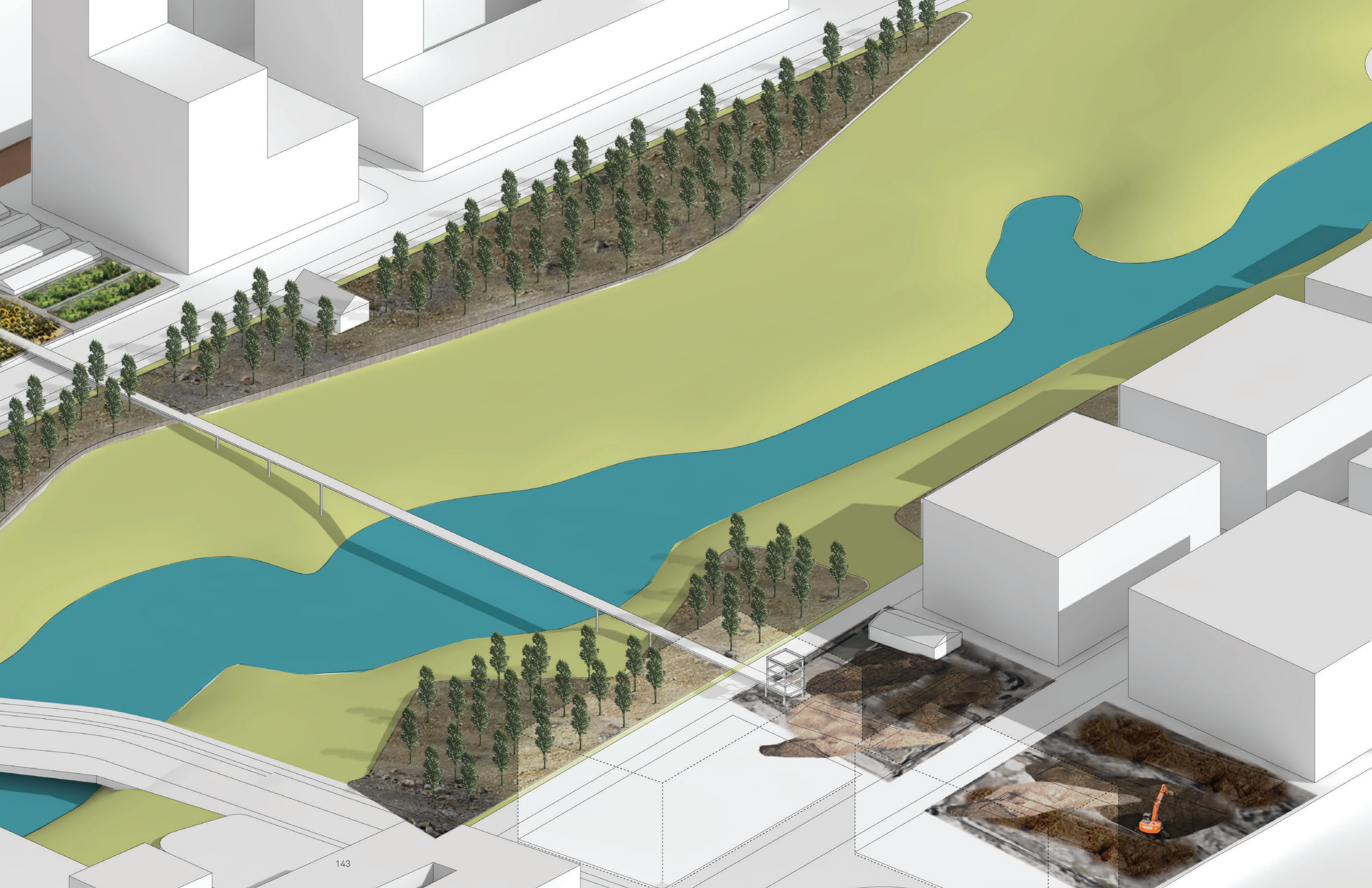
3. The final buildout of the site has been completed. A strip of hardy plants remains as monument to occurances. The southern portion remains an active biopile site, accepting soil from excavation of final towers in the site.

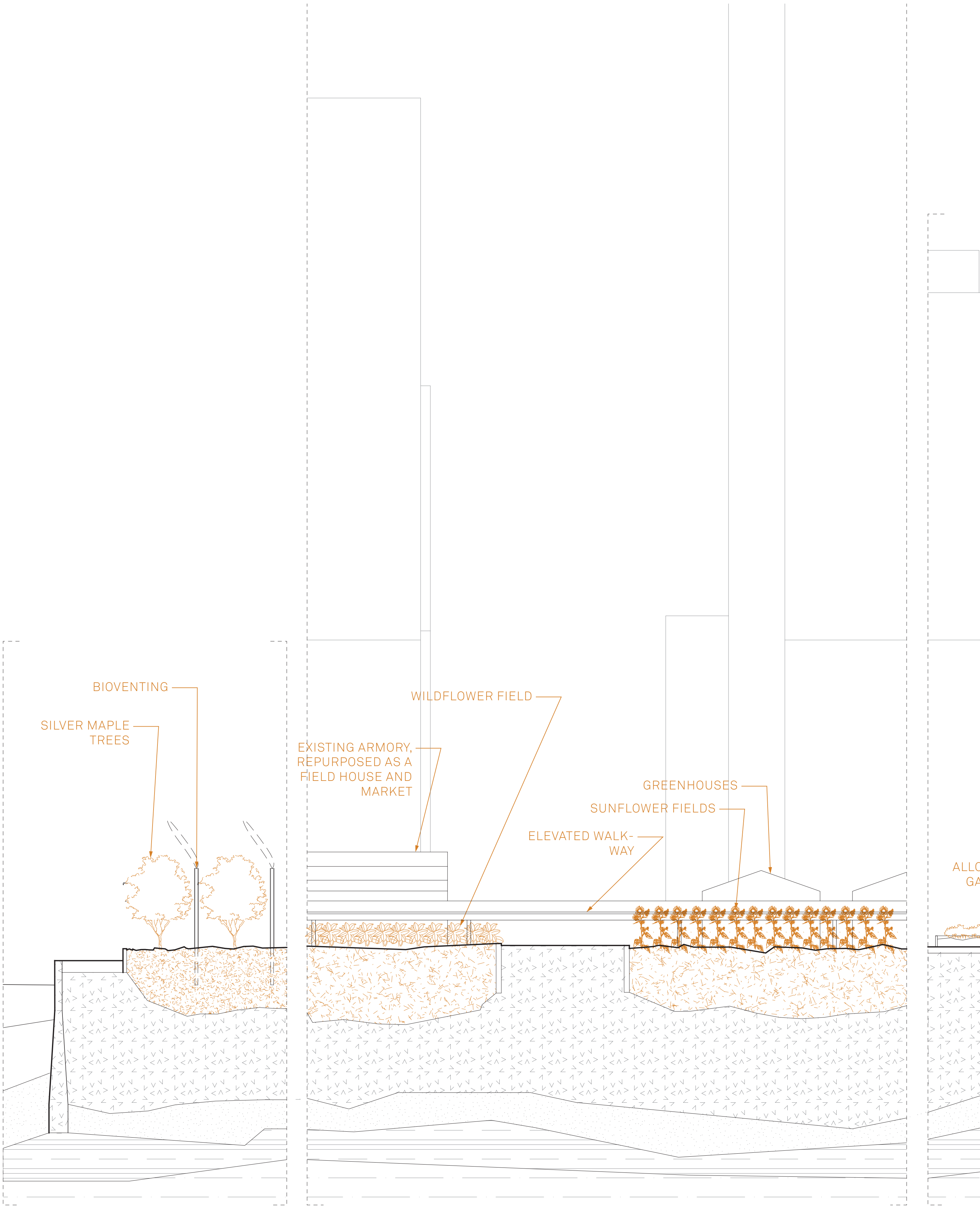
LAND FARM

AXONOMETRIC

fig. 2.34 a speculative drawing showing what the infill experiment might look like 75 years after initial inception

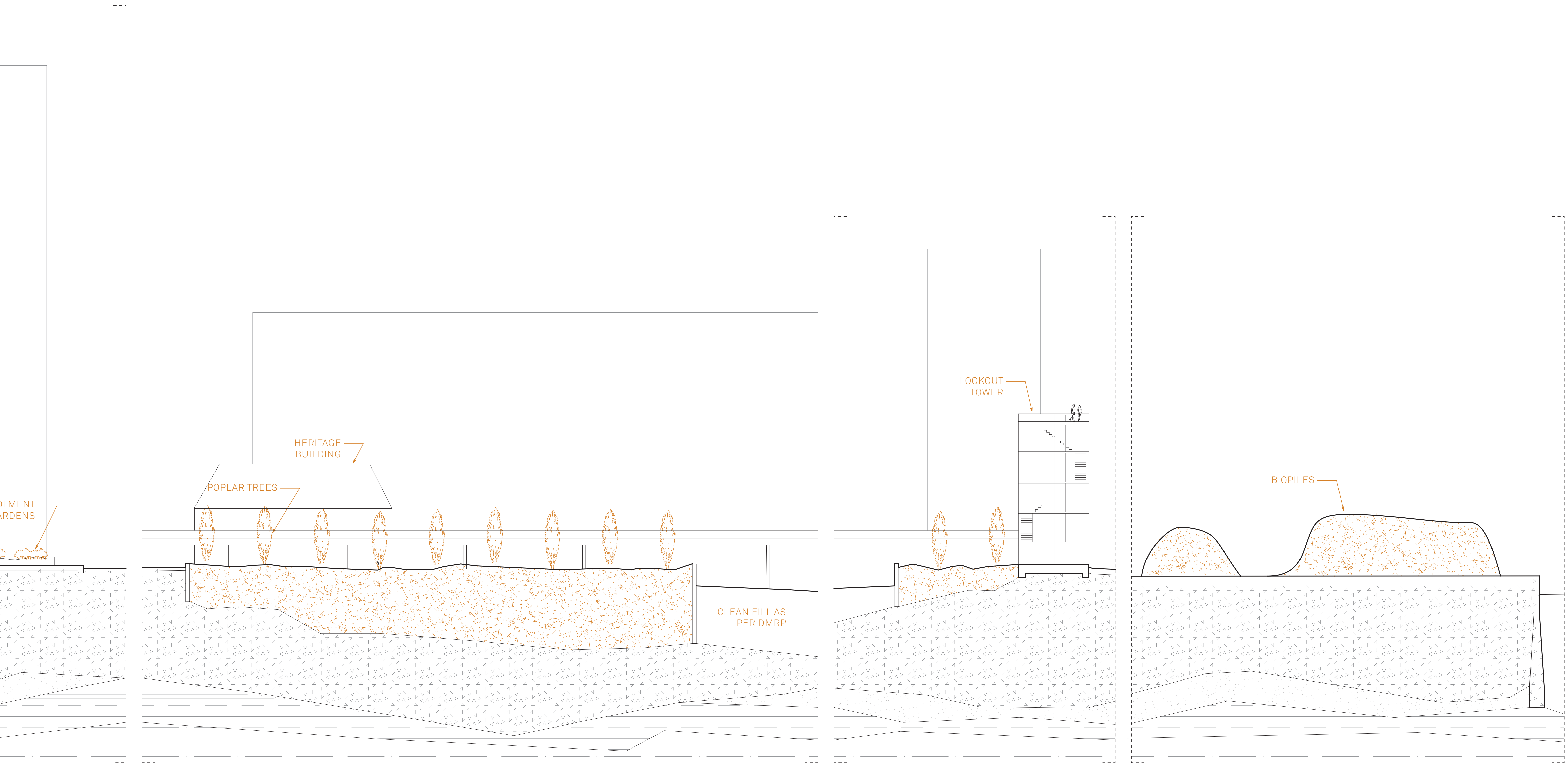




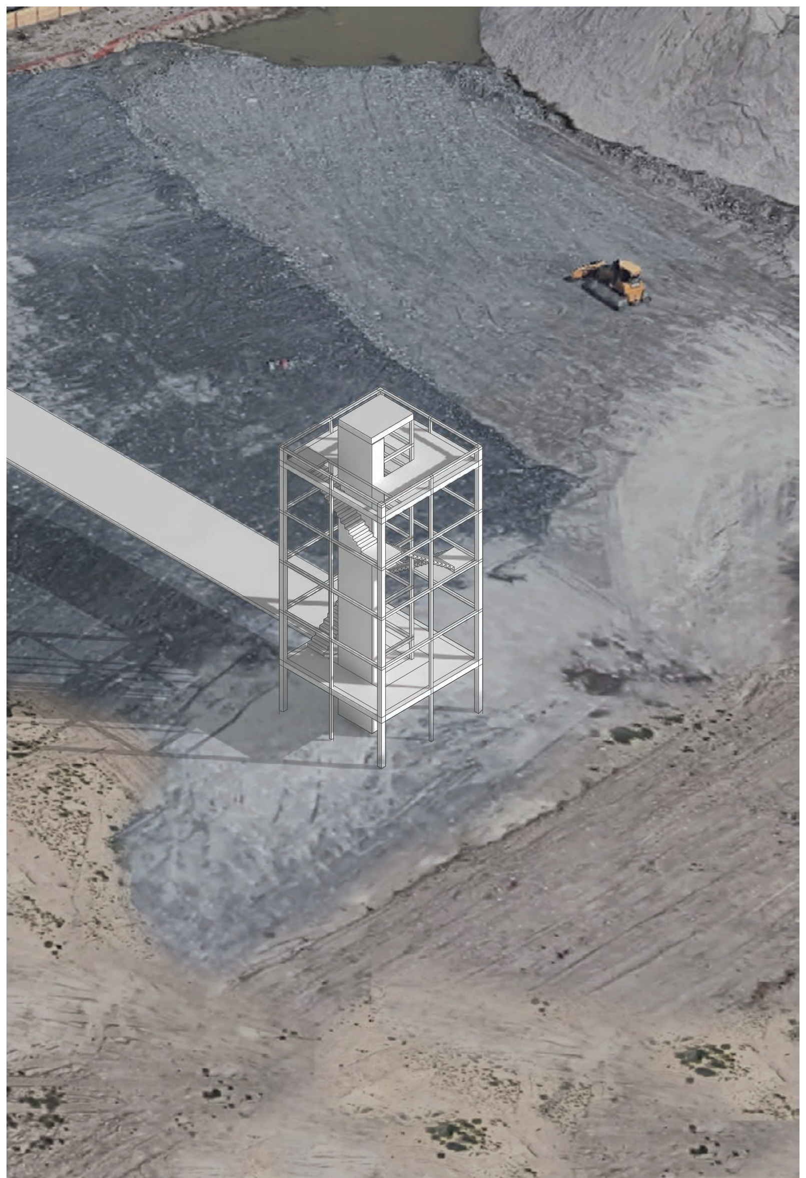

BIOVENTING
SILVER MAPLE TREES
EXISTING ARMORY, REPURPOSED AS A FIELD HOUSE AND MARKET
WILDFLOWER FIELD
GREENHOUSES
SUNFLOWER FIELDS
ELEVATED WALK-WAY
ALLO
GA

LAND FARM SECTION

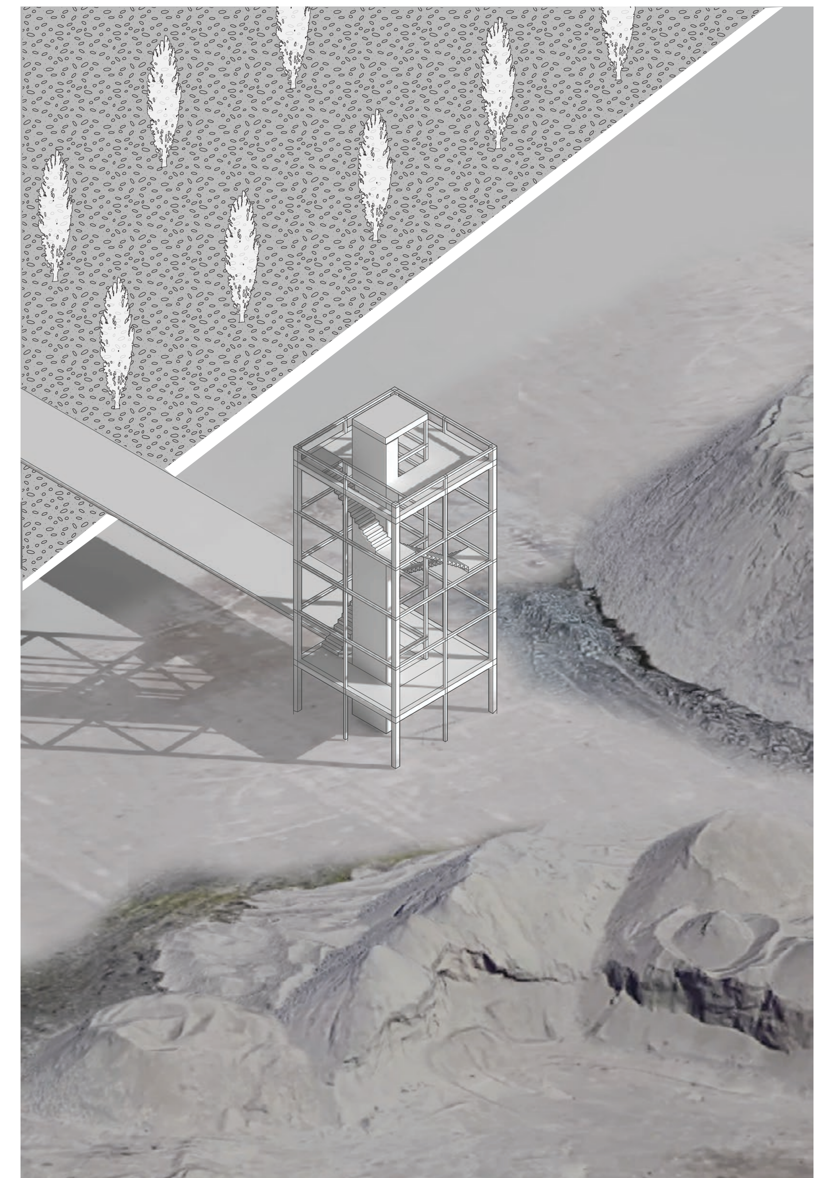
fig. 2.35 (left) Section looking at the technical nature of mixing and piling contaminated soil in the public realm.



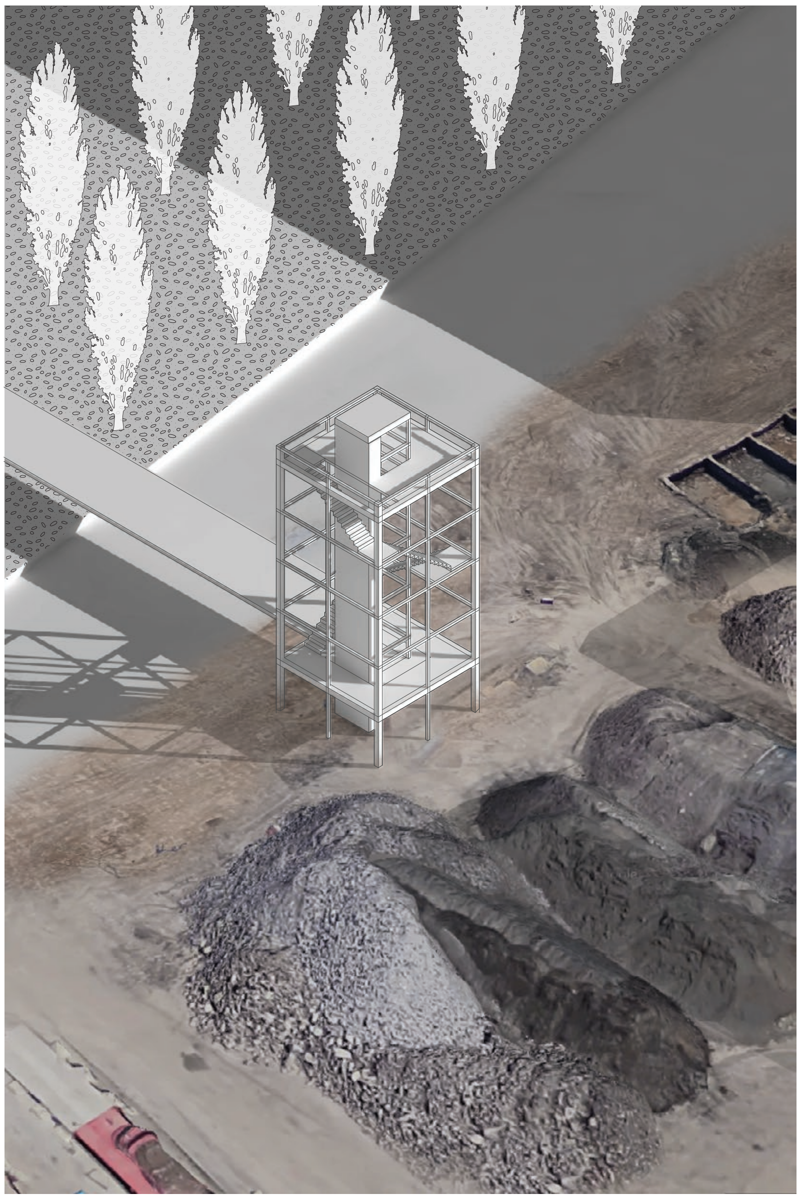
SUNFLOWER FIELDS
LAND FARM(YR 27)
fig. 2.37 (left) Sunflowers in bloom! Spectacular!



WATCHTOWER AT
LAND FILL(YR 7)
fig. 2.36 (above)



WATCHTOWER AT
LAND FILL(YR 28)
fig. 2.38 (above)



WATCHTOWER AT
LAND FILL(YR 70)
fig. 2.39 (above)

SECTION 3

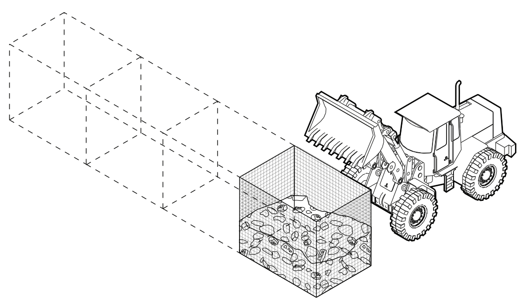


fig. 2.40 Digger icon

[CONSTRUCTION AGGREGATE]

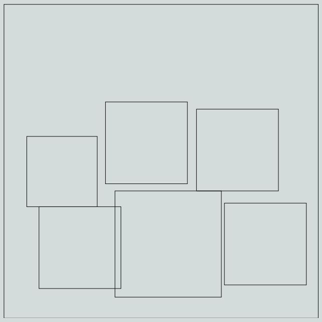
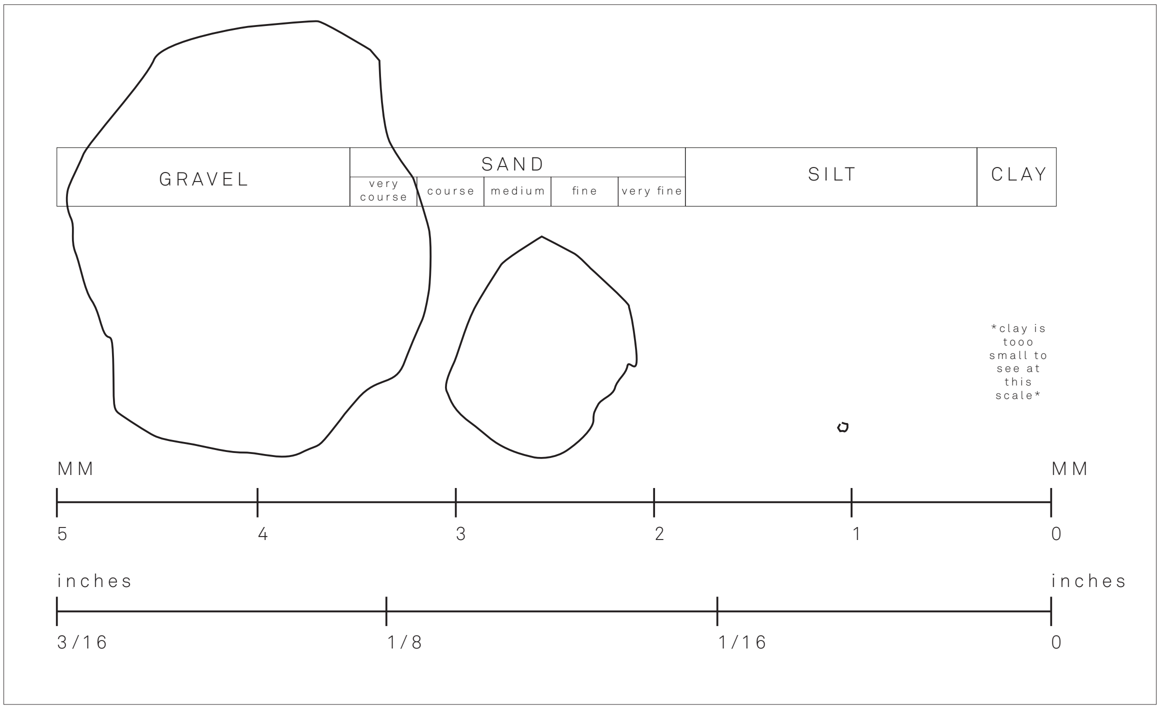
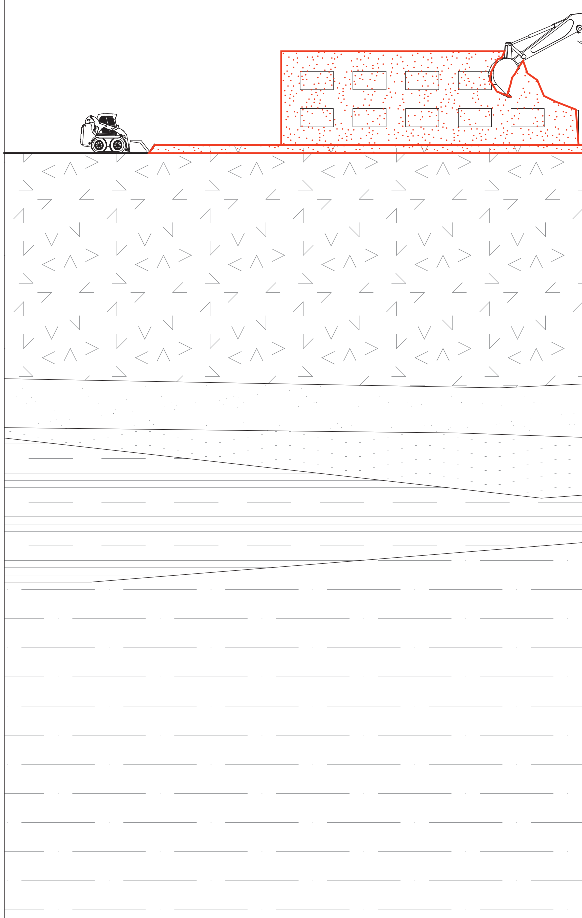


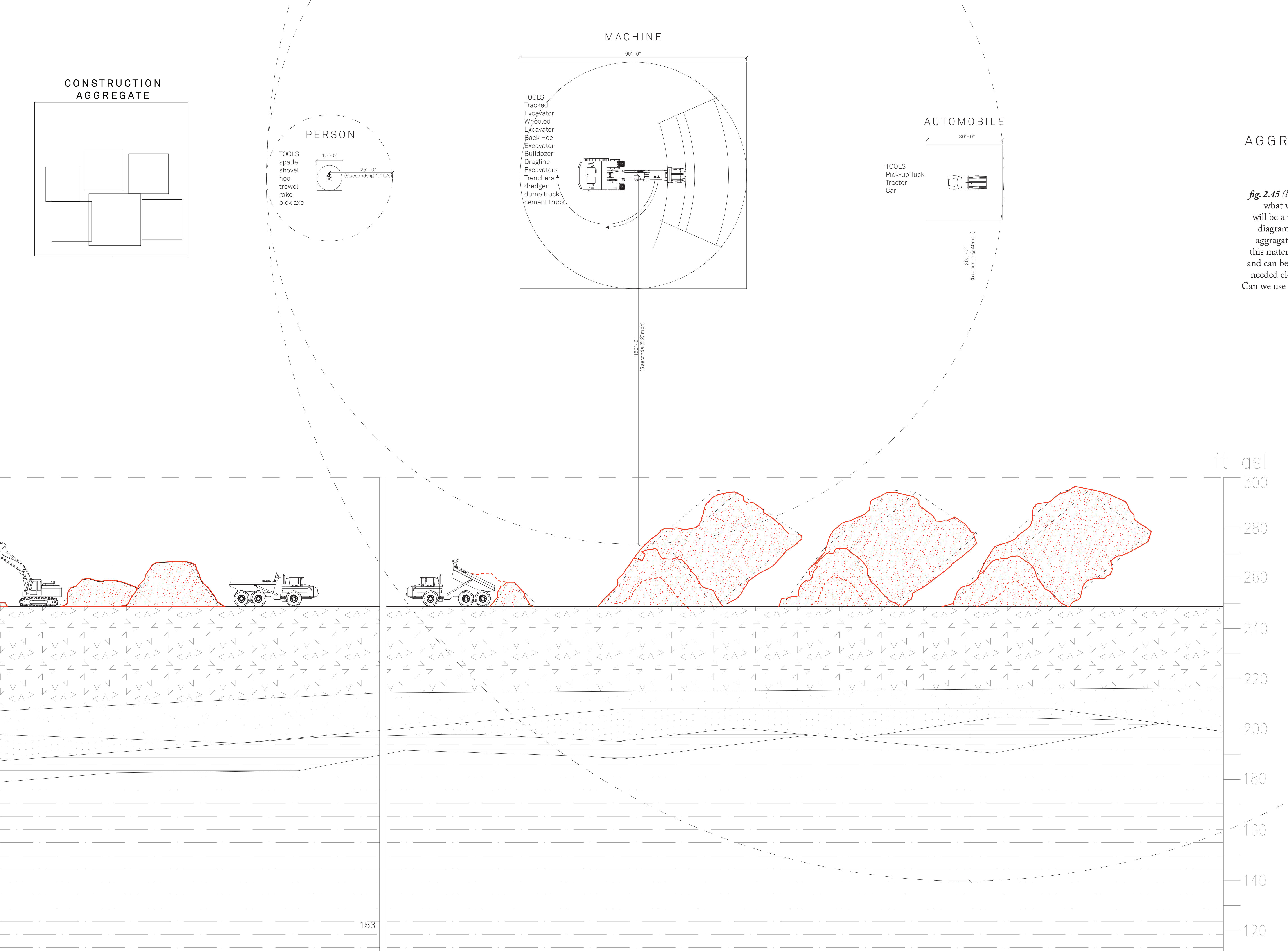
fig. 2.41 (above) Construction aggregate icon

Construction Aggregate is a category of material made to describe any clean, coarse to medium sized particulate matter. This category of material can be deployed in a variety different construction operation without much refinement other than properly sorting the material by size. These materials include sand, crushed stone, and broken construction debris like glass and concrete. It can be used for building roads, used as aggregate in new concrete, retaining walls, infill material for creating topography or dykes.

fig. 2.42 (left)
fig. 2.43 (middle) Construction aggregate close up
fig. 2.44 (right) Large pile of aggregate in the Port Lands


GRAVEL
SAND
very course
course
medium
fine
very fine
SILT
CLAY
clay is tooo small to see at this scale
MM
MM
5
4
3
2
1
0
inches
inches
3/16
1/8
1/16
0





EXISTING CONSTRUCTION AGGREGATE MATERIAL INFASTRUCTURE

fig. 2.45 (left) Once the DVMR has excavated what will be the future river channel. , ther will be a ton of material to sort through. This diagram identifies what exactly construction aggragate and looks at it's scale. Where will this material be kept? As it is considered clean and can be used as a capping material it will be needed close to last in the order of operations. Can we use is all on site? Where will it sit in the meantime?

Geological Design Experiment 3

LAND FORM

The following design experiment investigates how construction aggregate can be used to create a topographical park that incorporates the existing pier 35 and strategically accepts water during seasonal flooding. The material must be assembled and sorted, then it used to creatively solve these problems.

fig. 2.46 (left) Geological Design Experiment 3, 7 years after inception

During excavation there will be an abundant amount of construction aggregate from scraping up the surficial layers of asphalt and gravel. Once the Don Mouth Naturalization and Port Lands Flood Protection Project is complete this material will be in high demand and vanish quickly. Construction fill can be used for many things and so it will be sold or used in the construction of other earthworks on site. It is a shame to imagine all this material becoming unseen and not understood as the primary structure in this new engineered wetland.

This experiment seeks to expose the mass amount of construction aggregate used, making a hyperobject[9] out of a normally perceived singular piece of gravel. When you pick up a handful of gravel from a pile on the ground it is hard to imagine, or maybe it doesn't even cross your mind, the energy it has transmitted on its journey from its place of origin to your hand. Thousands of years this small chunk of rock has existed, similar to millions of other rocks but uniquely individual. Can you even fathom the amount rock moved by humankind as theorized by Roger Hooke (see fig. 1.10)? This experiment will show the local accumulation and dispersion of the construction aggregate found on the Port Lands site. During the course of this accumulation and dispersal of material a phased park will be created, monumentalizing the left-over construction aggregate.

The process will begin with designating pier 35 as a holding site for all uncontaminated material during The Don Mouth Naturalization and Port Lands Flood Protection Project. Here the material is sorted by sieves into piles of similar sized particulate. The site is initially used only for industrial activity and can only be observed by the public by means of a board walk constructed at the eastern edge of the quay. This can be accessed by walking through the pedestrian pathway that moves through experiment #1. Onlookers can watch the daily operations of sorting and piling excavated material.

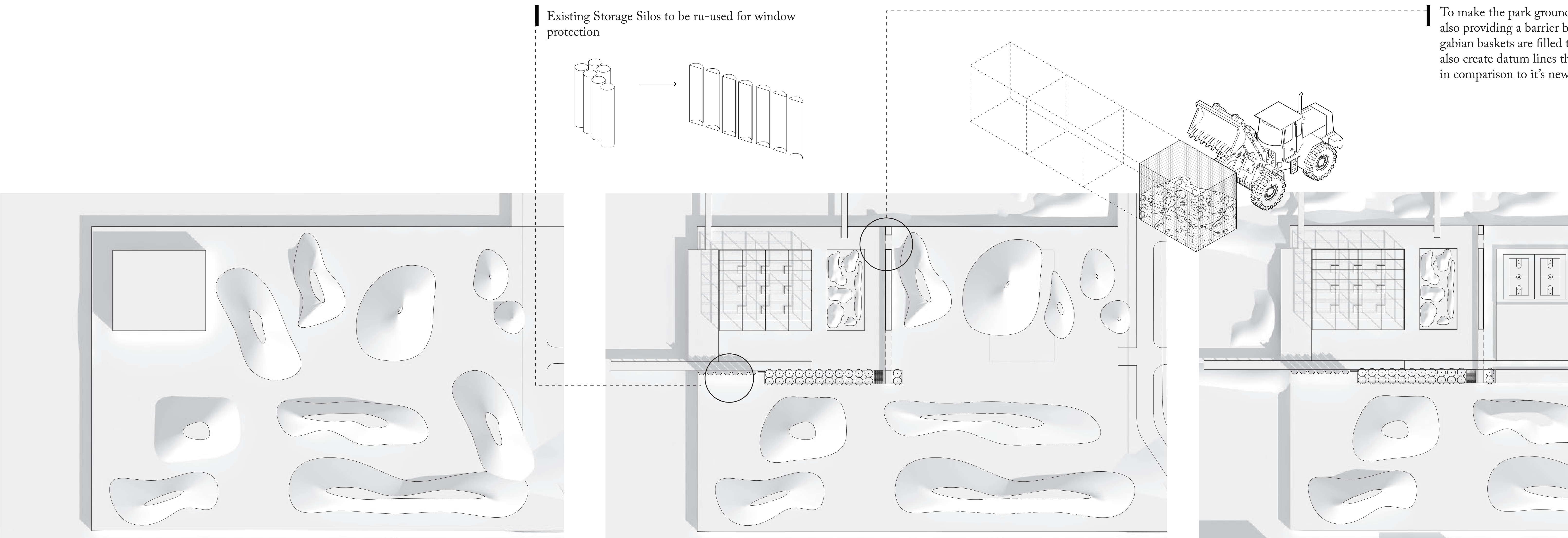
With each passing year the piles are reduced due to the material's re-use elsewhere on site or in the creation of each new phase of the public park. Starting at the boardwalk the public park grows inward. To make the park each phase accessible while still providing a barrier between industrial operation, gabion baskets are used to create walls and hard edges. These rock walls also create datum lines to indicate the initial grade of the quay in comparison to its new edge and raised grade accessible during seasonal flooding. The construction fill continues being used up, and the park continues to grow. Each phase uses rectilinear forms to create occupiable rooms that are made using simple construction techniques and create rhythm and constancy through the park.

Eventually there will no longer be construction fill and the park is finished. Over time traces of flood mark the gabion baskets. People are intrigued by the enormity of the walls, but those who watched the parks slow and gradual development know that this is nothing compared to the thousands of tonnes construction fill that once occupied the site.

△

STRATEGIC MATERIAL USE DIAGRAM

fig. 2.47 (left) Progression drawing showing change in quantiy of construction aggragate material.



1. Create a holding site for all uncontaminated material. Here the material is sorted by seives into piles of similar sized material. The site is used only for industrial activity. At the end of the quay there is a pedestrian boardwalk.

2. With each passing year the piles are reduced. Starting at the boardwalk th park grows inwar. Excavation takes place along the southern edge to create a wetland edge in accordance with the DMRP.

3. The construction fill continues being used up, and th to grow. The form shapes rooms that can accomodate parks and cater to several different gardens and leis

available as soon as possible while
ween industrial and park space,
create rock walls. These rock walls
indicate the initial grade of the quay
dge and raised grade.

e park continues
e many smaller
ure activities

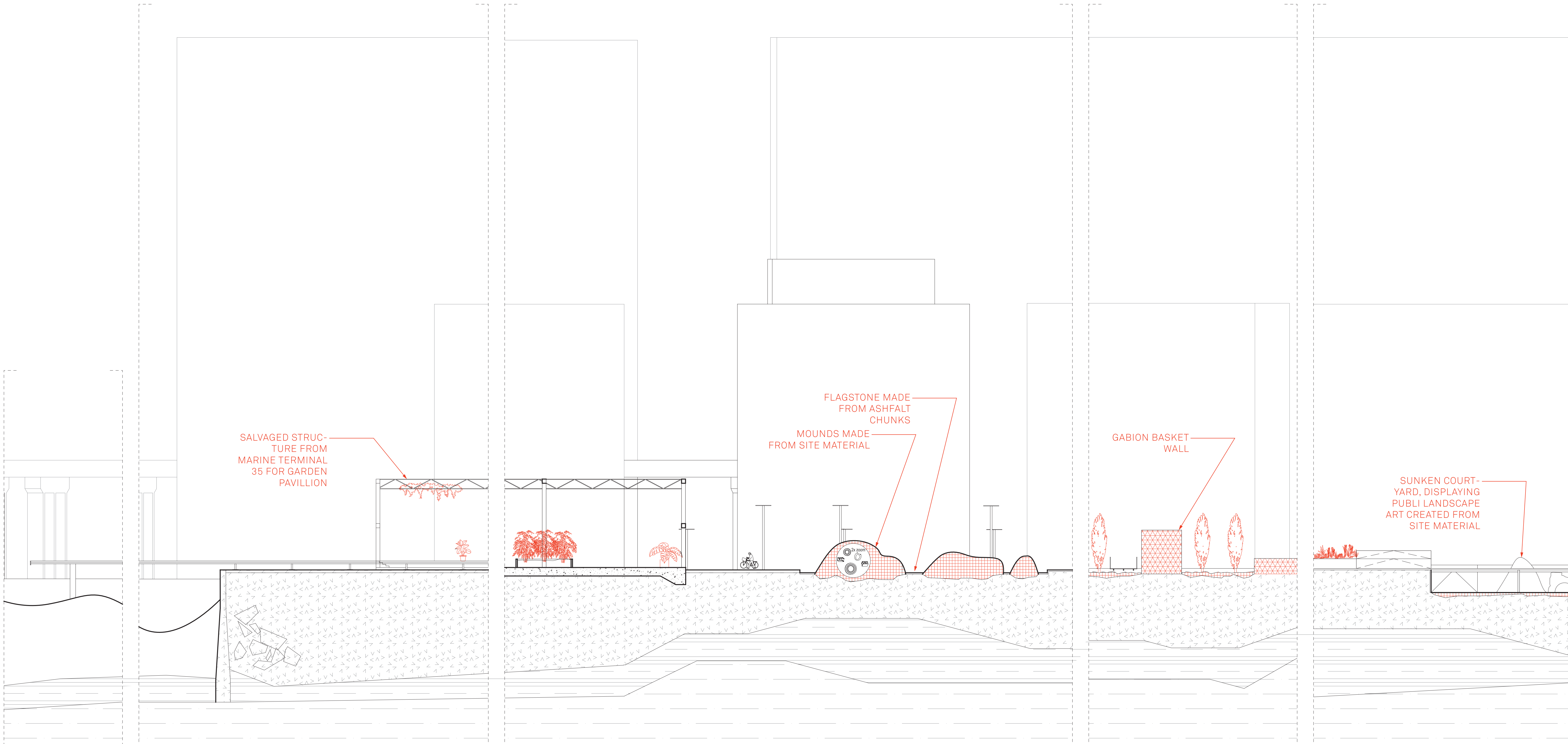
4. Eventually there is no more construction fill left and the park is finished. There is on lot for development. The proximity to the park and rock walls surrounding the lot make it especially desirable.

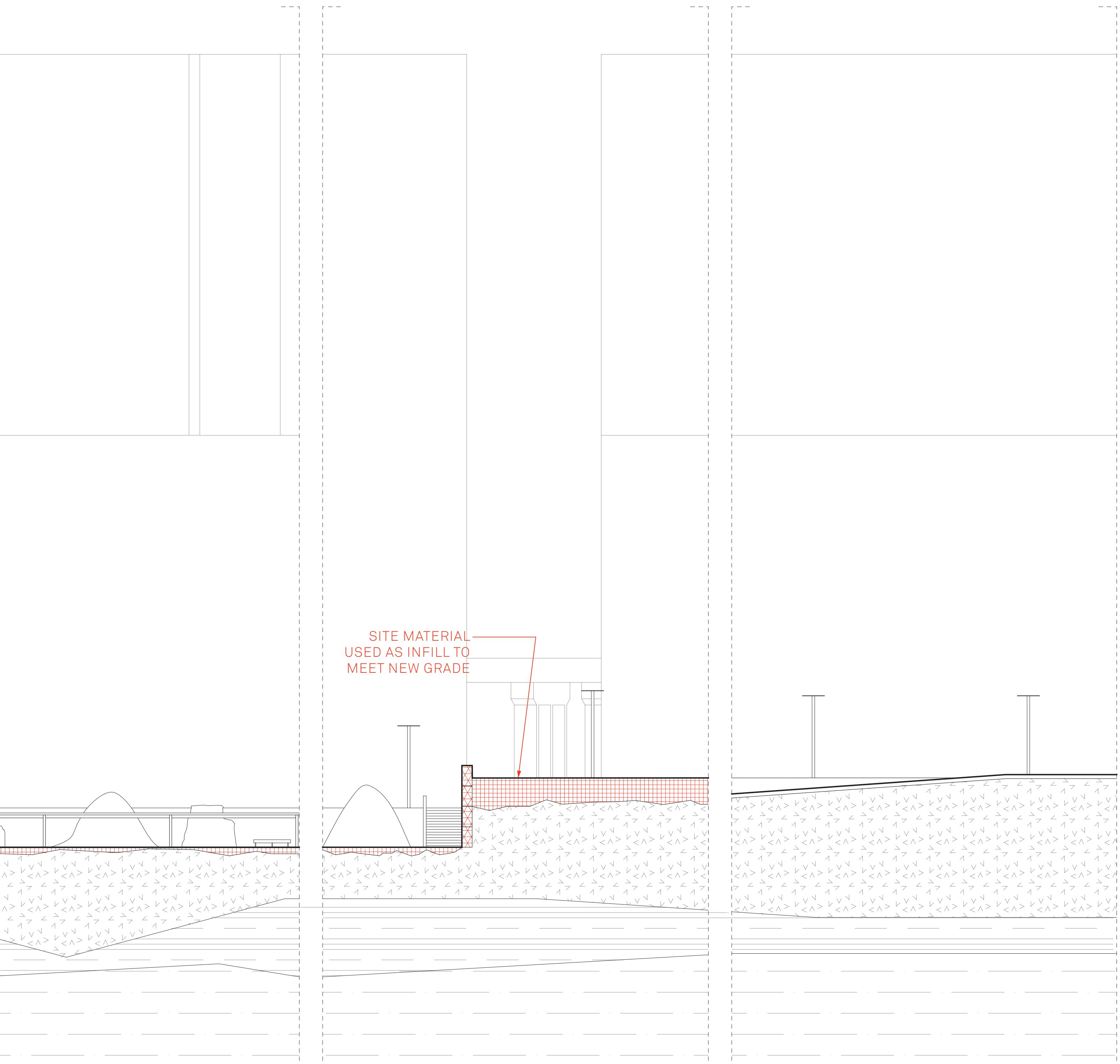
LAND FORM AXONOMETRIC

fig. 2.48 (left) a speculative drawing showing what the infill experiment might look like 75 years after phased park project begins.

LAND FORM SECTION

fig. 2.49 (below) Section looking at the technical nature of the phased park



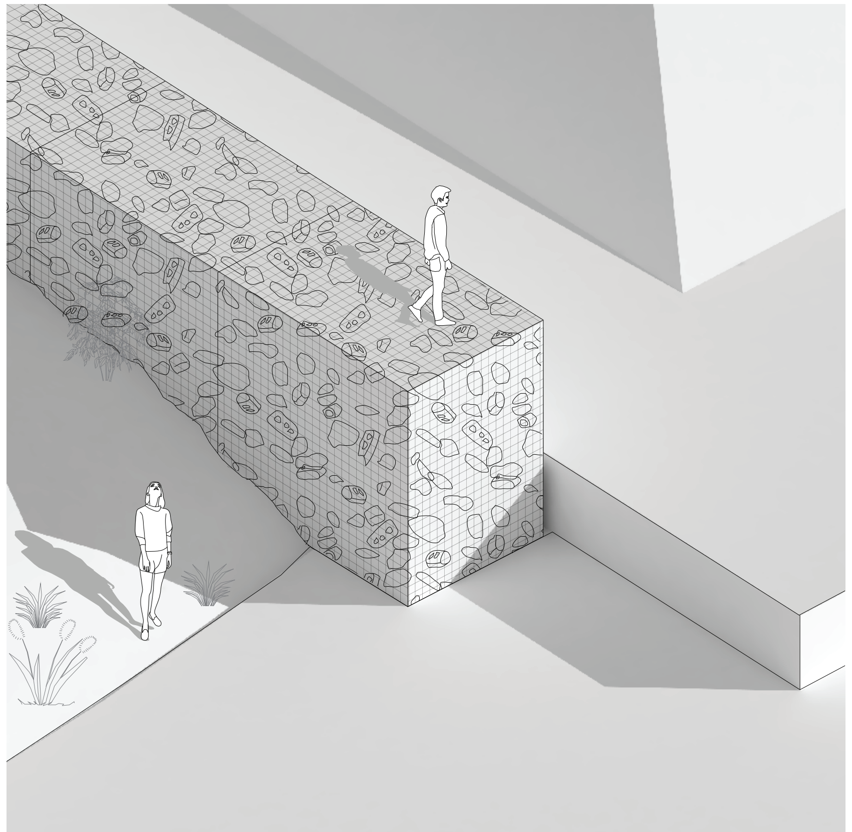

SITE MATERIAL
USED AS INFILL TO
MEET NEW GRADE

GARDENS

GROWING AT

LAND FORM(YR 3

fig. 2.50 (left) Basic infrastructure is in place and gardens are starting to grow thanks to the new P Lands gardening Society

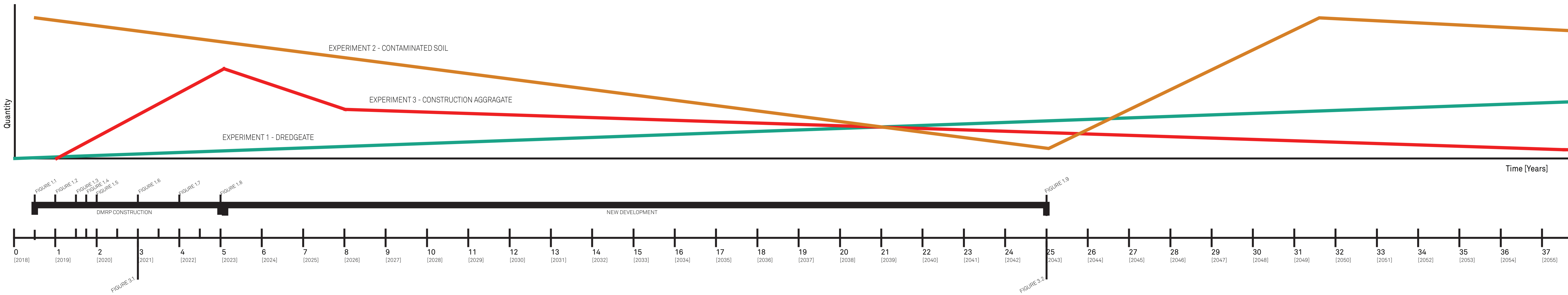


GABIAN BASKET
DETAIL AT RUBBLE
BEACH (YR 30)

fig. 2.51 (above) 7 years of depositing dregeate into the Toronto Harbour has reultied in new plants and animals to the area.

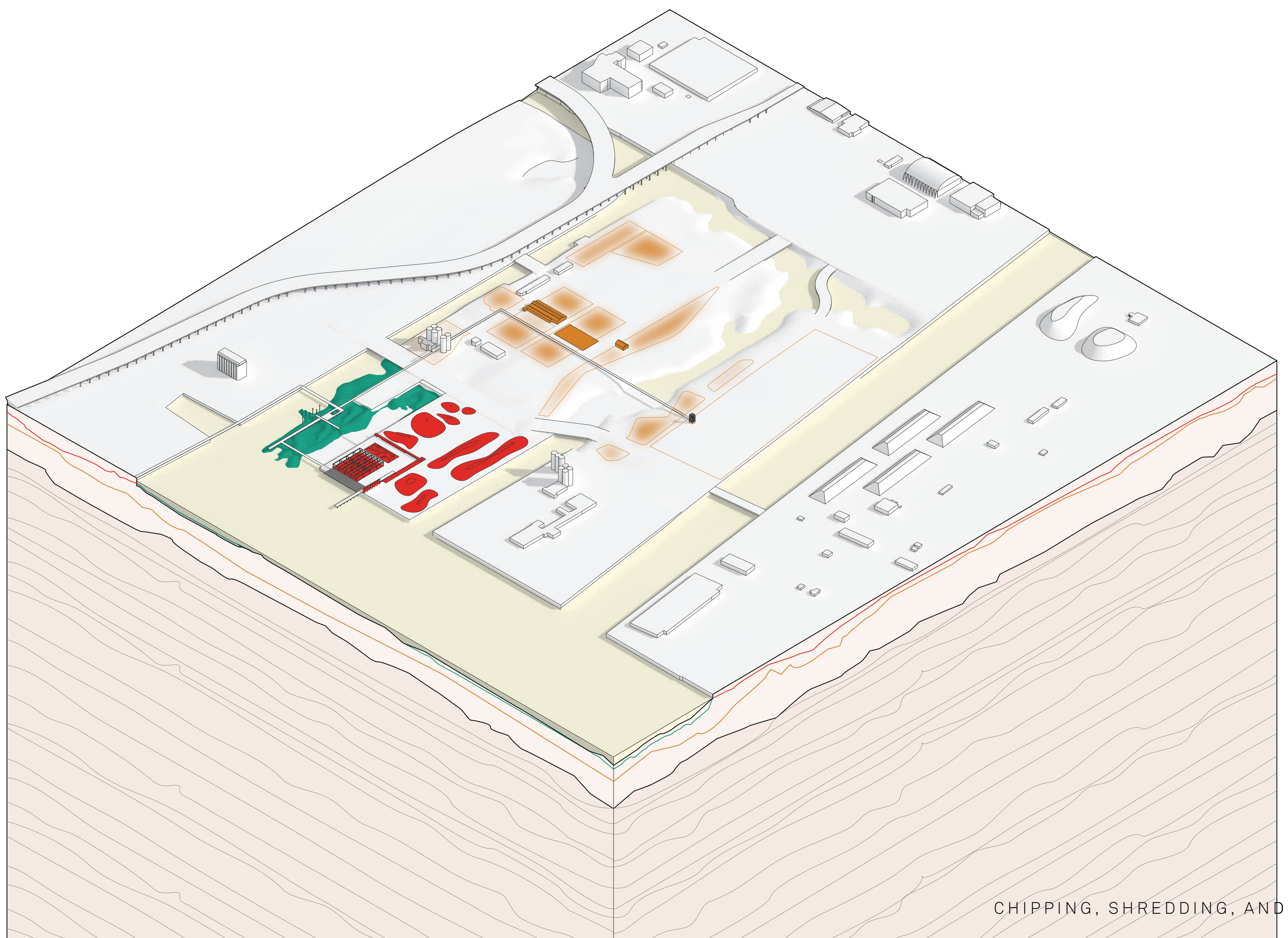
FINAL MATERIAL REMOVED AND PHASED PARK IS
FINALLY COMPLETE
LAND FILL(YR 28)

fig. 2.52 (above)



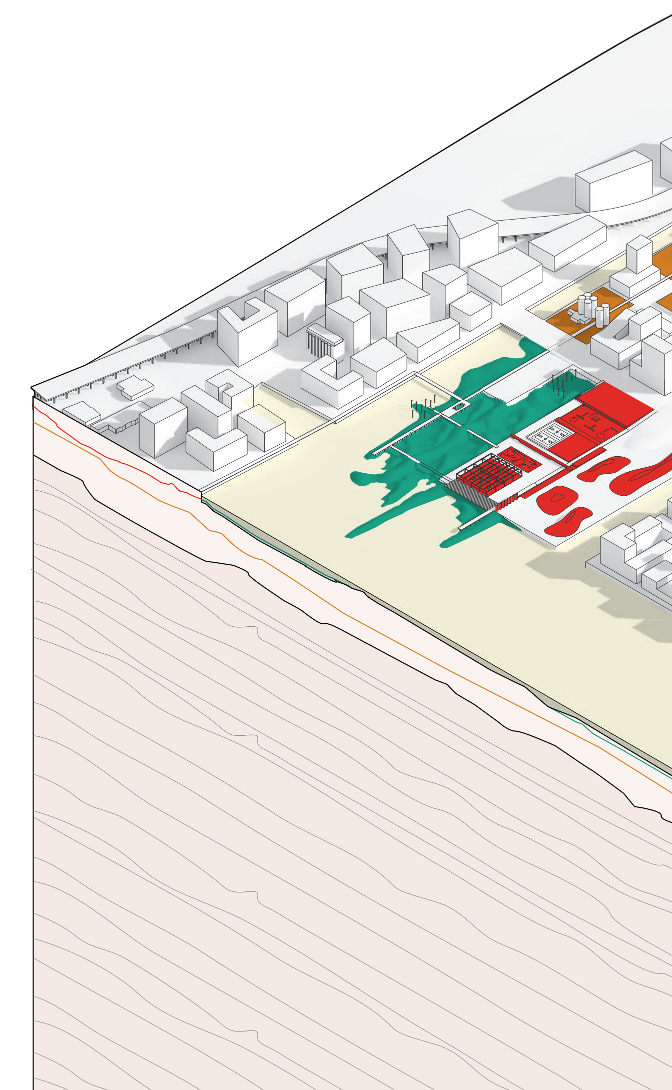
GEOLOGICAL EXPERIMENTS TIME SCALE

fig. 2.53 (above) This experimental drawing attempts to visualize the amounts of each material being accumulated. This drawing was made to aid in design, helping determine the accumulation and duration of certain materials during each year.



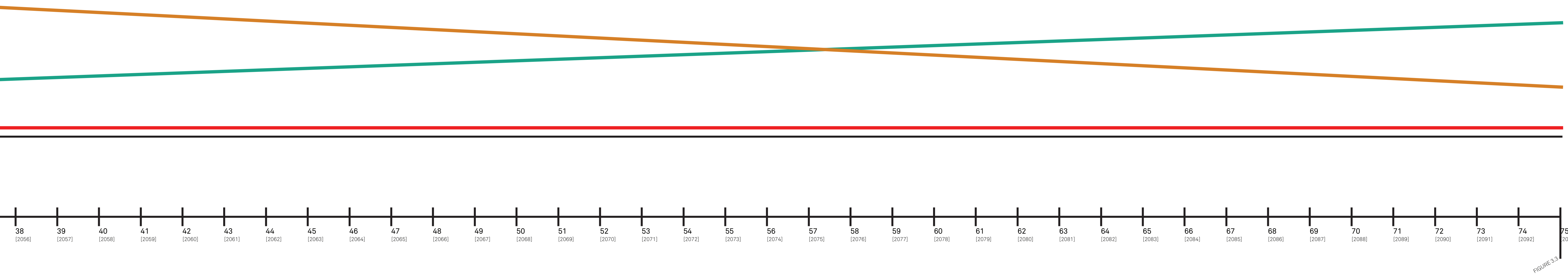
GEOLOGICAL EXPERIMENTS AT YEAR 5

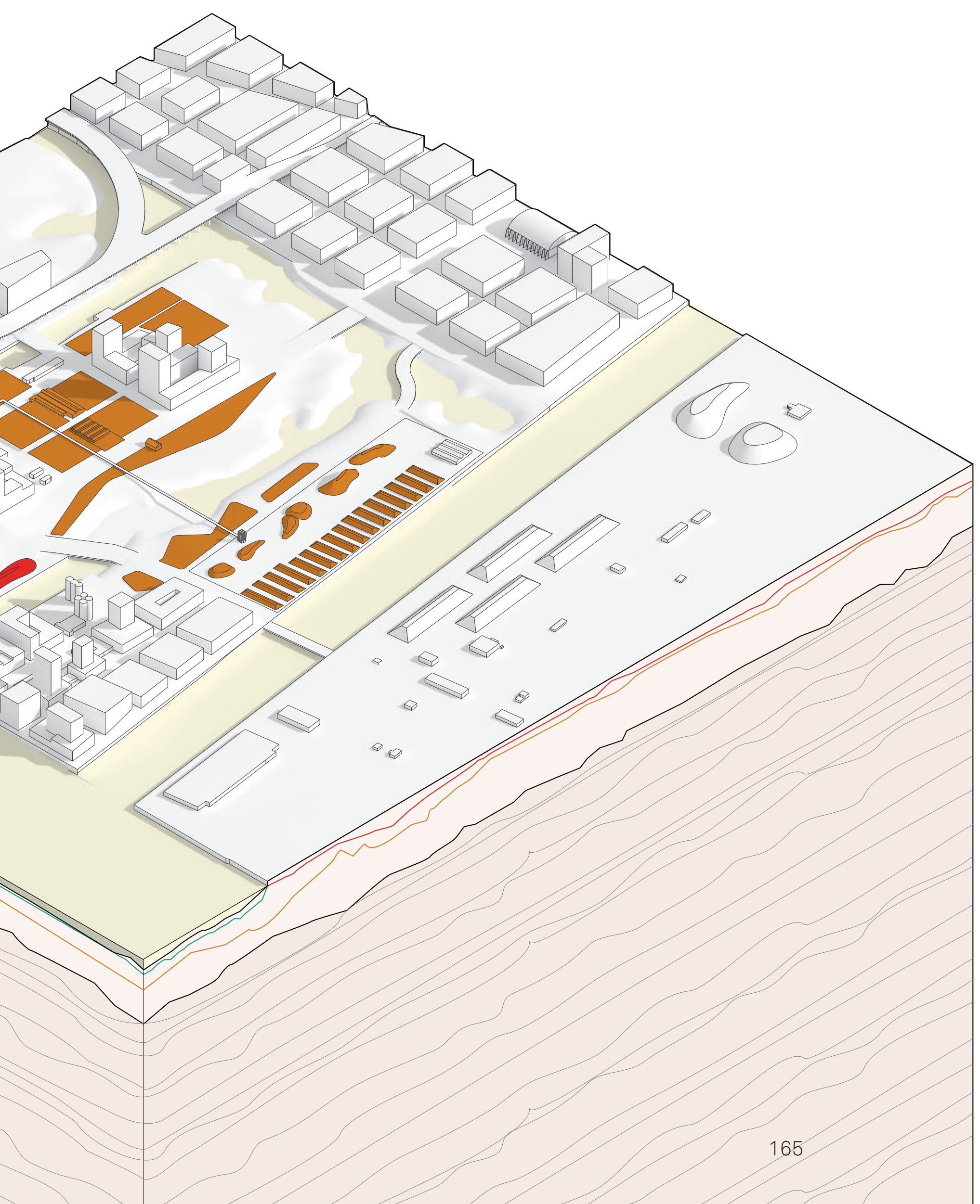
fig. 2.54 (above) This experimental drawing attempts to visualize the amounts of each material being accumulated. This drawing was made to aid in design, helping determine the accumulation and duration of certain materials during each year.

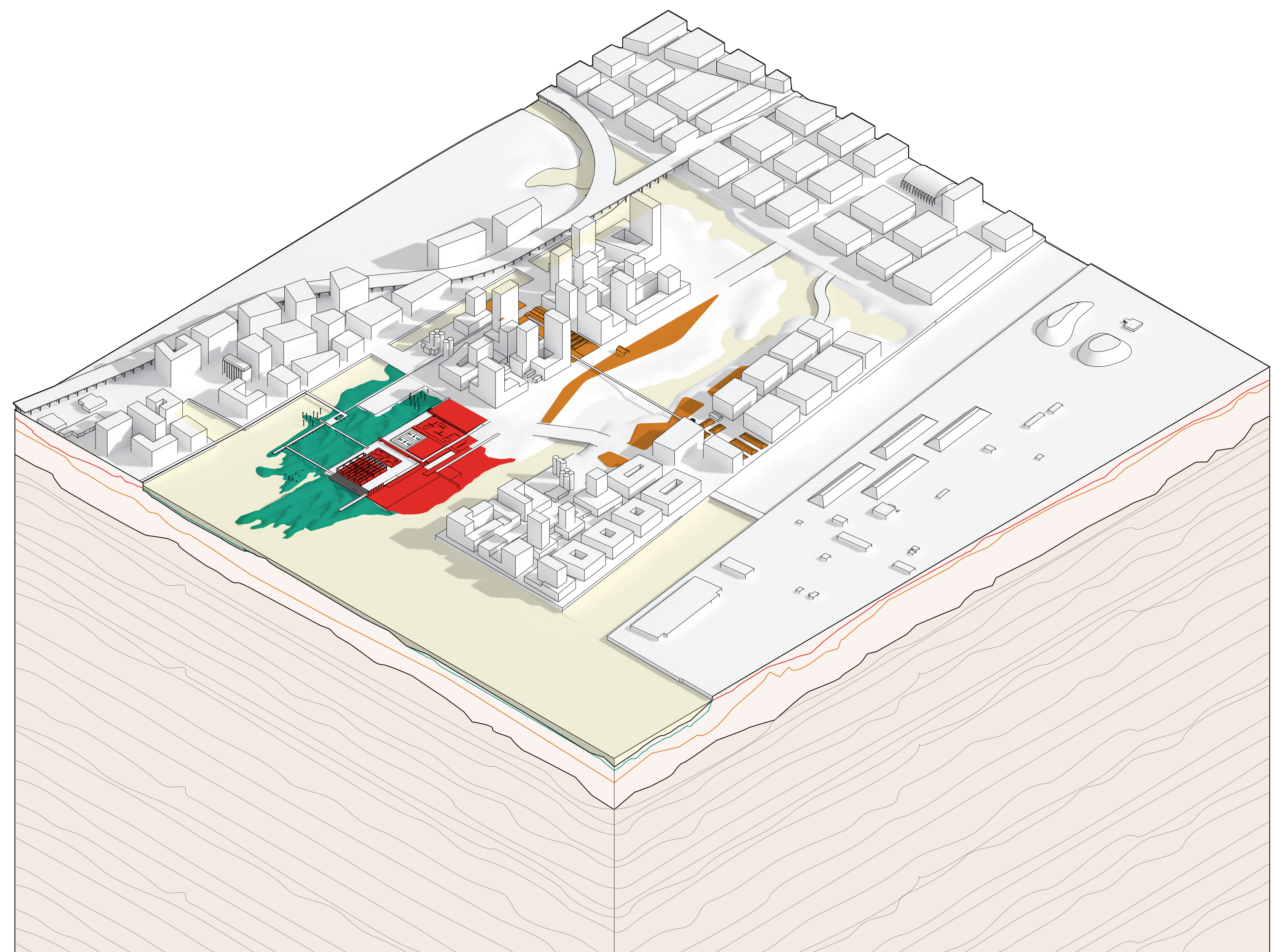


GEOLOGICAL EXPERIMENTS AT YEAR 25

fig. 2.55 (above) This experimental drawing attempts to visualize the amounts of each material being accumulated. This drawing was made to aid in design, helping determine the accumulation and duration of certain materials during each year.







GEOLOGICAL EXPERIMENTS AT YEAR 75

fig. 2.56 (above) This experimental drawing attempts to visualize the amounts of each material being accumulated. This drawing was made to aid in design, helping determine the accumulation and duration of certain materials during each year.

ENDNOTES - GEOLOGICAL EXPERIMENTS

1 PortsToronto, “PortsToronto Commences Dredging Activities,” October 2017, http://www.portstoronto.com/portstoronto/media-room/feature-stories/portstoronto-commences-dredging-activities.aspx.

2 Leslieville Historical Society, “Ashbridge’s Bay.”

3 Jon Lamont, “Scraping the Bottom of the Channel,” *Toronto Observer*, March 1, 2016, sec. News, https://torontoobserver.ca/2016/03/01/scraping-the-bottom-of-the-channel/.

4 PortsToronto, “PortsToronto Commences Dredging Activities.”

5 WATERFRONToronto, City of Toronto, and Toronto and Region Conservation for The Living City, “Don Mouth Naturalization and Port Lands Flood Protection Project Amended Environmental Assessment Report.”

6 Kennen and Kirkwood, *Phyto*.

7 For a move detailed description of every plant mentioned and their associated phytoremediation categories please see Emil Nyutstumo Horn’s thesis “R > R > U Phytoremediation Appendix”. Emil Nyutstumo Horn, “R > R > U Phytoremediation Appendix” (The Oslo School of Architecture and Design, 2015), https://issuu.com/emilnh/docs/s101686_rru_phytoremediation_bookle.

8 BATTELLE, “Biopile Design and Construction Manual” (Port Hueneme, California: Naval Facilities Engineering Service Center, June 1996), https://clu-in.org/download/techfocus/bio/Biopile-design-and-construction-1996-tm-2189.pdf.

9 Timothy Morton, *Hyperobjects: Philosophy and Ecology after the End of the World*, Posthumanities 27 (Minneapolis: University of Minnesota Press, 2013).

CONCLUSION

fig. 2.57 (above) Final Thesis Review presentation

CONCLUSION

The reason for developing this thesis was to explore a very simple idea: can all existing material be re-used on site during a new project? Though this may be fundamentally a simple question, it is hardly ever explored in practice. This is because it is impractical given the existing economic constraints developed by society. It is much cheaper, faster, and safer to excavate all the material, with its associated risk, uncertainties and pollutants, and move it to a new place far away. Out of sight[site] and out of mind.

The Don Mouth Naturalization and Port Lands Flood Protection Project presented a unique opportunity for me to interject into and disrupt the outcome of. I could use the excavation plans already in place to provide enough material to develop a wildly different proposal than the originally developed design. The site is so unique in some ways, specifically its location and identity to a changing Toronto, but also very generic in almost all others. Most cities around the world have a port that was similarly born out of industrialization, but now lingers in various states of desolation, experiencing similar issues of soil contamination, dredge management and industrial ruins[1].

Through this thesis, I was able to set parameters that made it manageable to explore the idea of material cycling through the lens of the Don Mouth Naturalization and Port Lands Flood Protection Project. This created the grounds to develop a speculative project that was valued based on the success of its ability to recycle and re-use all material excavated on the site, opposed to success based strictly on the economic cost and value of the project. I was able to create three experiments that framed the purpose of landscape as a method of challenging environmental issues as social, political and economic problems. Creating public spaces that make the sticky, smelly, leftover materials approachable and beautiful, provoking thought and new agency.

△

ENDNOTES - CONCLUSION

1 Sean Burkholder, "Designing Dredge: Engaging the Sediment Landscapes of the Great Lakes Basin," *Journal of Landscape Architecture* 11, no. 1 (January 2, 2016): 6–17,

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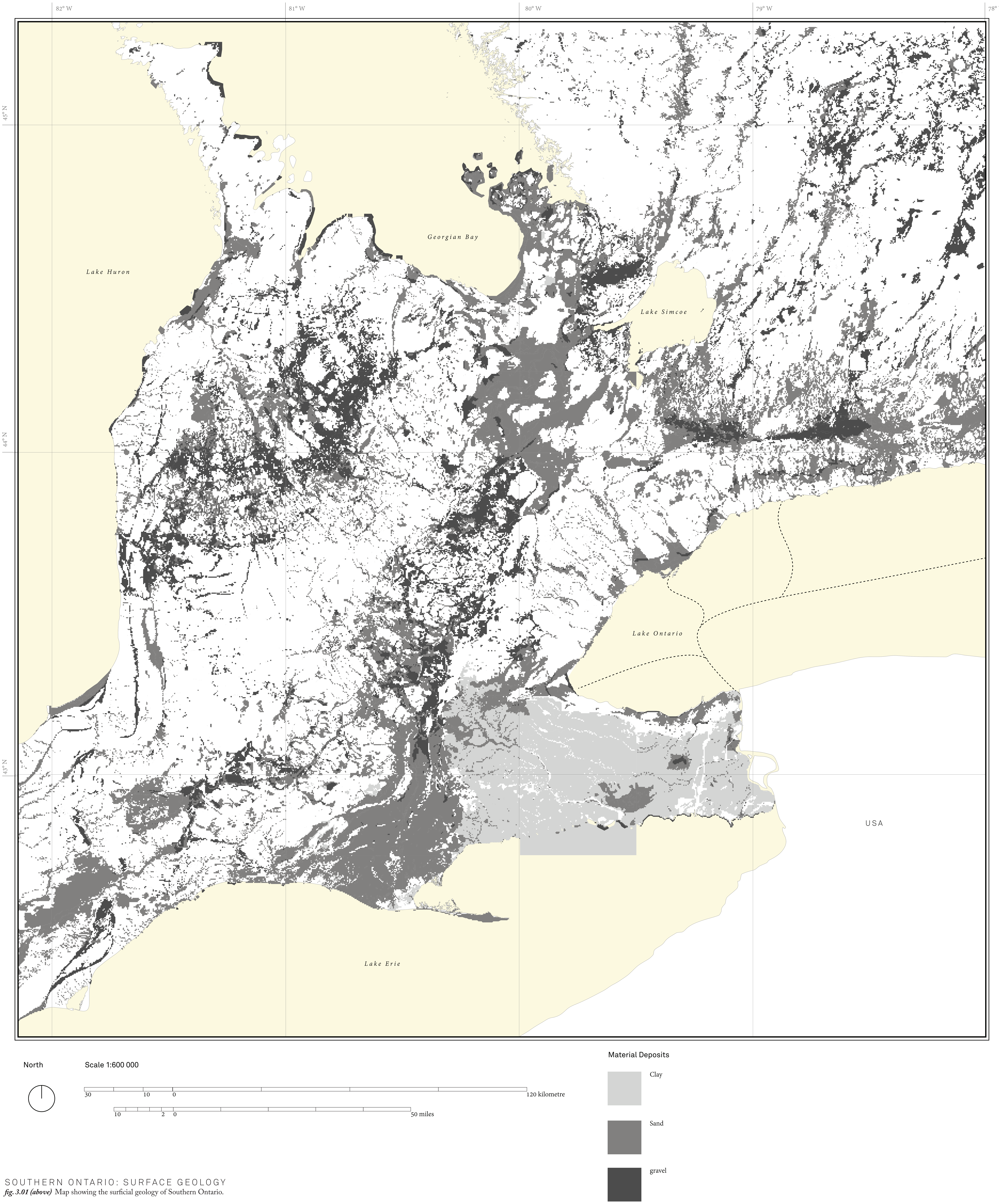
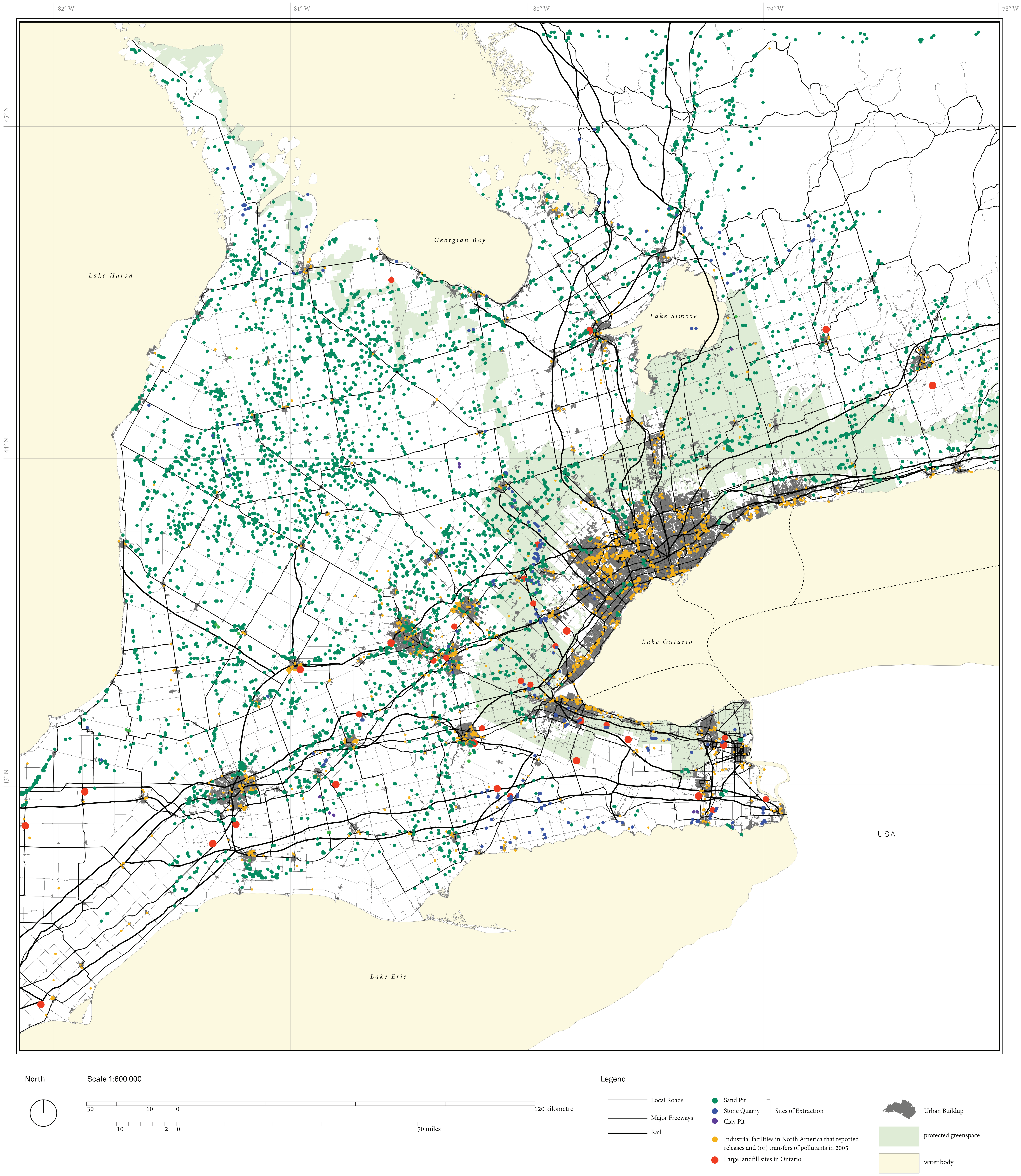
APPENDIX



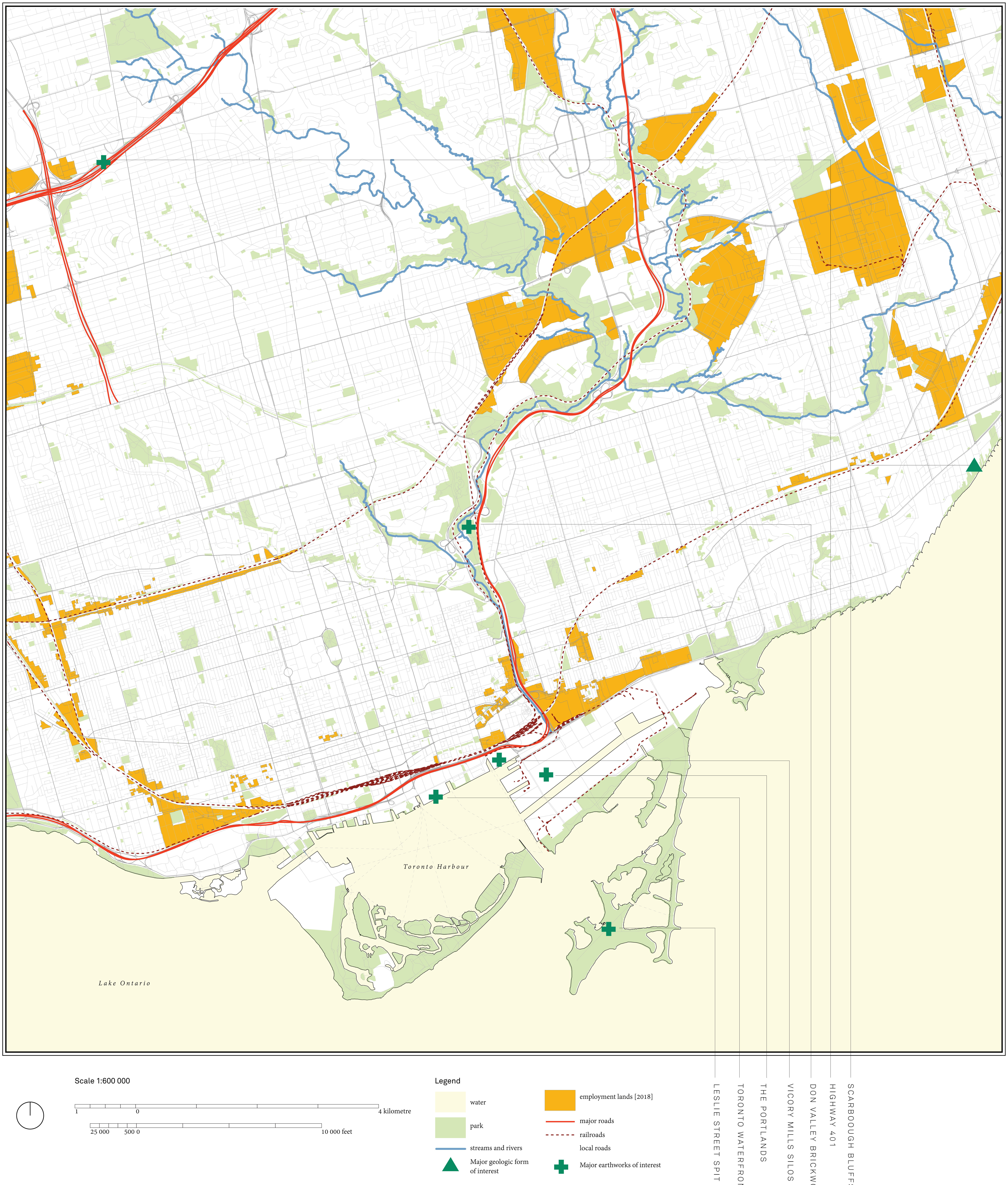
SOUTHERN ONTARIO: SURFACE GEOLOGY

fig. 3.01 (above) Map showing the surficial geology of Southern Ontario.



SOUTHERN ONTARIO: MATERIAL STREAMS

***fig. 3.02** (above)* Map showing material streams in Southern Ontario.

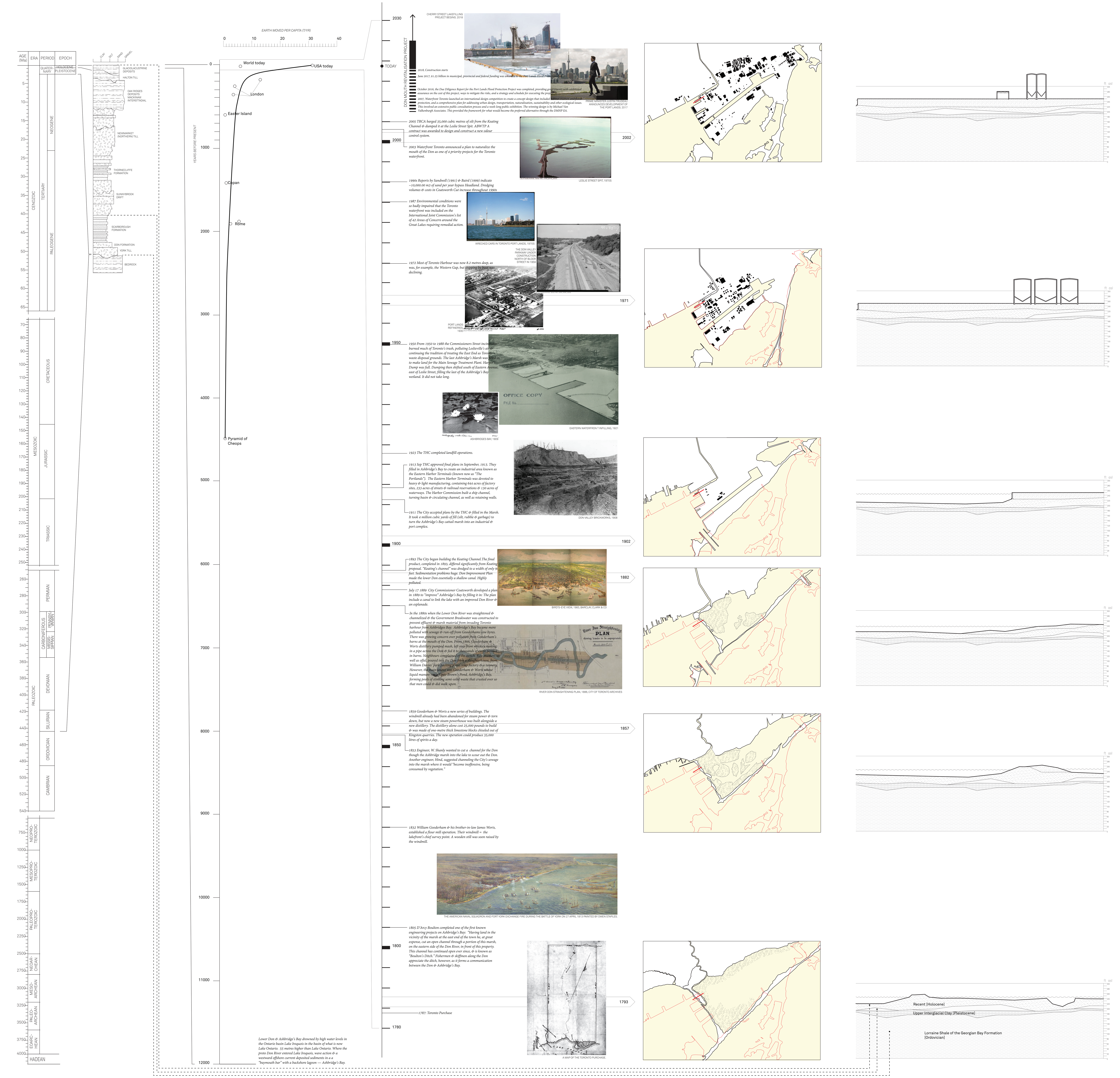


TORONTO: URBAN GEOLOGY

fig. 3.03 (above) Map of urban geology in Toronto

PORT LANDS: FLOODING, GROUND POLLUTION, AND HISTORIC INDUSTRIAL BUILDINGS

fig. 3.04 *(above)* Map showing the conext of the Toronto Port Lands.



PORT LANDS: HISTORICALLY, A DUMP

fig. 3.05 (above) Timeline poster. The Port Lands today resides on top of what was once known as the Ashbridge's Bay marsh. Before human intervention the marsh was a naturally occurring marsh ecosystem in a healthy state of constant flux.

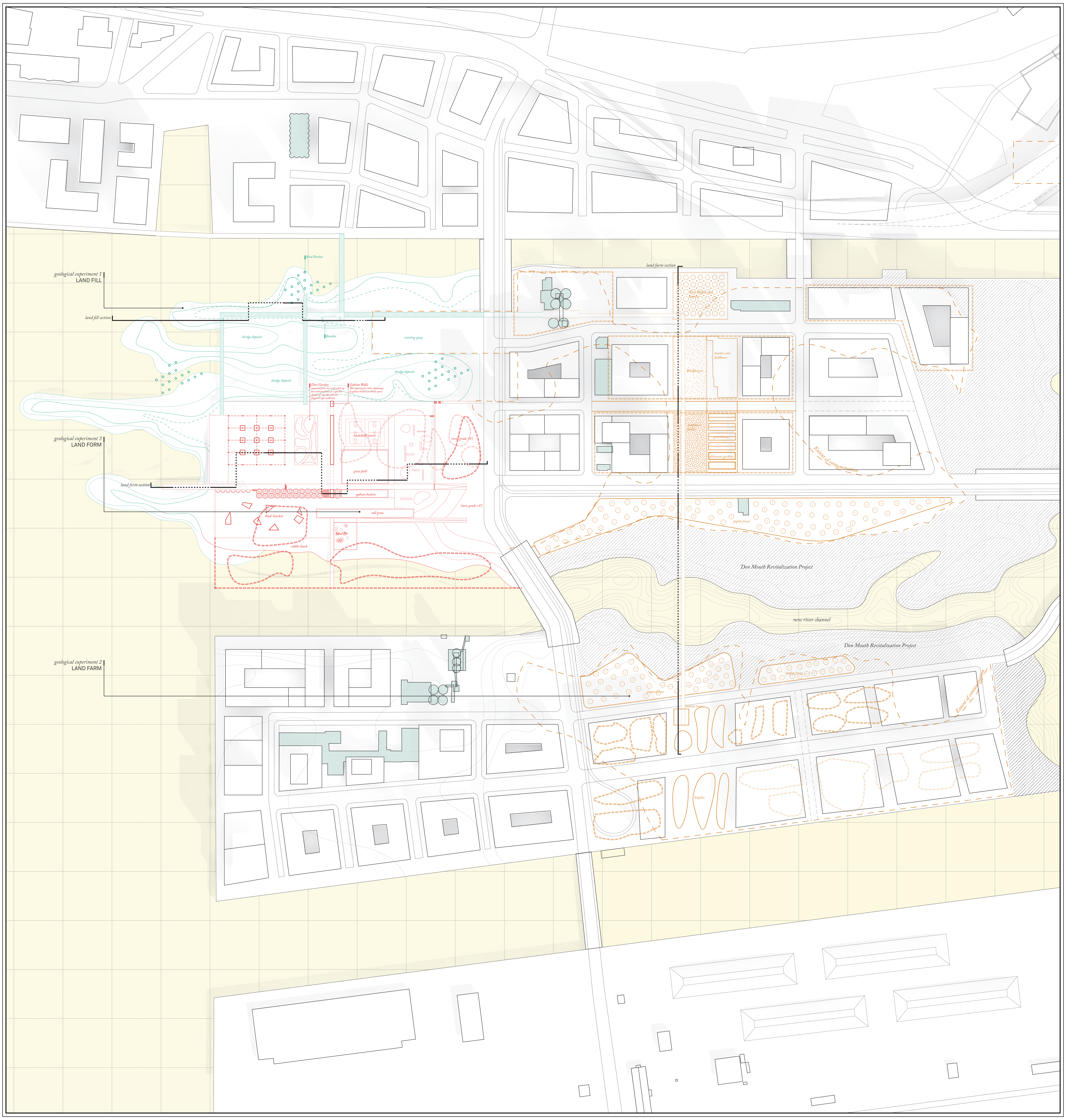
TRANSFORMATION OF DON MOUTH REVITALIZATION PROJECT

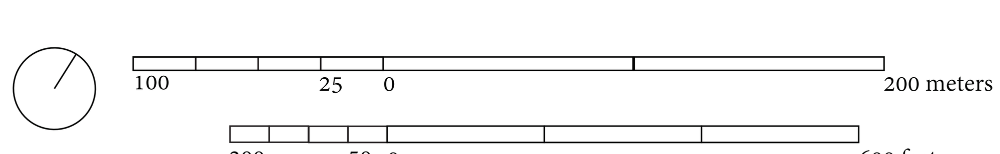
fig. 3.06 (above) The project construction time-line, accompanied by individual drawings of each construction phase.

CHIPPING, SHREDDING, AND LAYERING

F

GEOLOGICAL DESIGN EXPERIMENTS

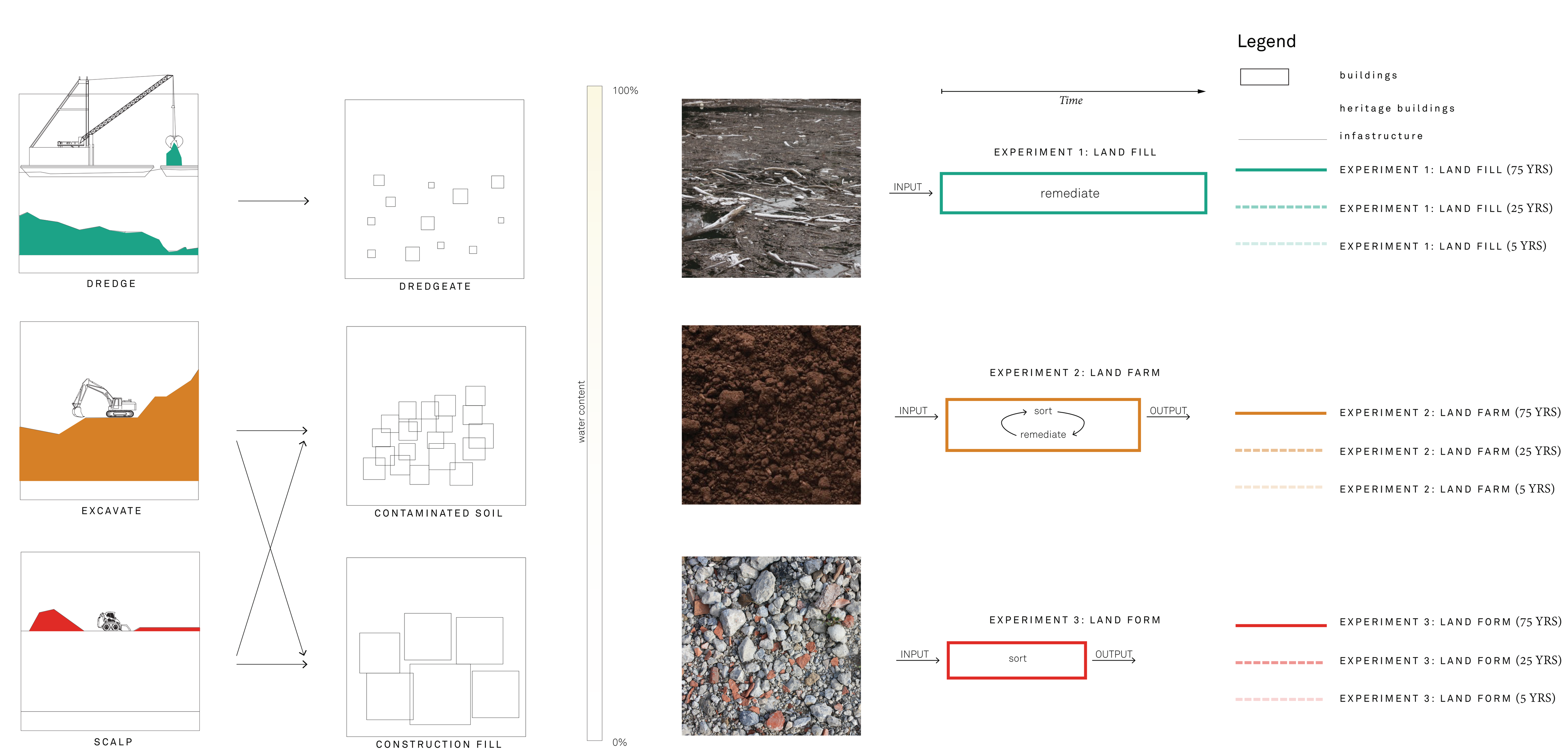




SITE PLAN

1/128" = 1'-0"

fig. 3.07(above) Site plan of the Port Lands show the location and progression of each design experiments as well as providing some-context of what parts are being changed by the Don Mouth Revitalization Plan.



AVAILABLE MATERIAL
CLASSIFICATION PARAMETERS

fig. 3.08 (right) Diagram showing methodology to sorting and organizing each material, what the material actually looks like, and how the input/output flow of the material in relation to time will affect each design experiment.