A Mosaic of Micro-Landscapes: Finding a Future in Environmental Education

by

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A Practicum submitted to the Faculty of Graduate Studies of

The University of Manitoba

in partial fulfillment of the requirements of the degree of

MASTER OF LANDSCAPE ARCHITECTURE

Department of Landscape Architecture

University of Manitoba

Winnipeg

2020

A MOSAIC OF MICRO-LANDSCAPES

Finding a Future in Environmental Education

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Preface

Site location & research methods

This document represents the practicum research and proposed design work conducted within Grand Rapids, Manitoba.

The site selected for design intervention is a 350 x 150 m abandoned borrow pit, southwest of the Grand Rapids townsite. Created by Manitoba Hydro during the 1960's construction of the Grand Rapids Generating Station, this borrow pit has been left to natural succession for over half a century. At the time of this writing, the site has undergone no official rehabilitation procedures, practices which are now legally required by Manitoba Hydro. As such, the borrow pit represents a unique nature, both disturbed and untouched- an opportunity to explore rehabilitation practices and their potential to intertwine with community engagement; specifically, the elementary curriculum of Grand Rapids School.

The borrow pit itself was identified as an area of interest through extensive regional studies and site analysis, compounded with research regarding the community of Grand Rapids. Once the site was identified, drone surveys were conducted in the spring, summer, and winter seasons of 2016-2019, in tandem with ground photography and analysis. Drone documentation resulted in detailed aerial imagery, precise contour data, and a point cloud recreation of the site in virtual space. The extensive surveillance of the site was crucial in identifying and understanding the existing conditions. Through this understanding, the potential for the site to become a space for outdoor education was revealed, and it was possible to develop a well-informed site design.

The resulting design represents a proposed future for the borrow pit, in which nature may find a new form within a disturbed site, and the students of Grand Rapids may find an opportunity to engage in environmental education.

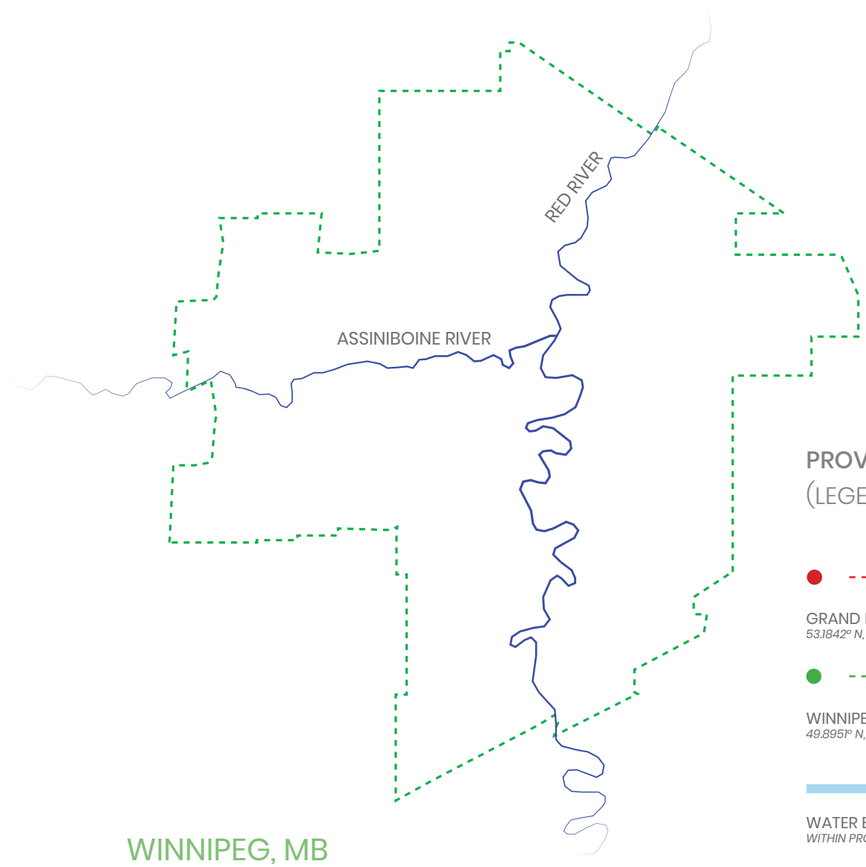
South-facing view of the borrow pit that would become the site chosen for design intervention. Created c. 1960.

MANITOBA, CA

2019 pop. 1.369 mill. ppl
pop. density 2 ppl/km²

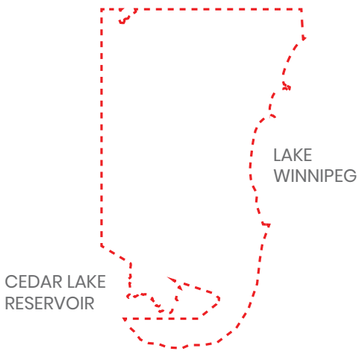
0 50 100 200 KM

1 : 5 000 000



WINNIPEG, MB

2018 pop. 753,700 ppl
pop. density 1430 ppl/km²



GRAND RAPIDS, MB

2016 pop. 1136 ppl
pop. density 13 ppl/km²

PROVINCIAL & CONTEXT MAP
(LEGEND)

GRAND RAPIDS, MANITOBA
53.1842° N, 99.2679° W

WINNIPEG, MANITOBA
49.8951° N, 97.1384° W

WATER BODIES
WITHIN PROVINCE OF MANITOBA

PTH 6
ROUTE CONNECTING SETTLEMENTS

The location of Grand Rapids within Manitoba has been documented in terms of its relationship to Winnipeg, the capital of the province. Grand Rapids is accessible via Provincial Trunk Highway 6; 434 km or roughly a 4.5 hour drive northwest from Winnipeg's city centre.

By size and population, Winnipeg's density is approximately 700 times that of Grand Rapids. In terms of geographical features, while Winnipeg may be referred to as a 'River City', Grand Rapids finds its place between two standing bodies of water: Lake Winnipeg, and the Cedar Lake Reservoir.

0 2 4 8 KM

1 : 175 000

The settlement of Grand Rapids is divided into three distinct residential factions, as defined opposite.

LAKE WINNIPEG

CEDAR LAKE RESERVOIR

1

2

3

0 50 100 200 M

1 : 7000

1 HYBORD

The most westerly neighbourhood within Grand Rapids is Hybord. This community consists of a concrete paved cul-de-sac of single family unit housing. Hybord was built circa 1960, at the beginning of the Grand Rapids Generating Station project, to house Manitoba Hydro employees and their families. East of the cul-de-sac is a a multi-unit condominium for single Hydro workers. The neighbourhood includes a basketball court, a baseball diamond, and a small recreational center.

2 GRAND RAPIDS TOWNSITE

To the west of the Saskatchewan River at the point of its northernly flow into Lake Winnipeg is the Grand Rapids townsite. This community is composed of Metis, non-Aboriginal, non-Status Cree people, in single family dwellings along Grand Rapids Drive, the main, concrete paved thoroughfare. Amenities located on the townsite include the Grand Rapids School (highlighted in blue), Grand Rapids Community Center, several denominational churches, as well as the Northbrook Inn, RCMP Station, and the Regional Health Authority.

3 RESERVE 33

East of the Saskatchewan River lies Misipawistik Cree Nation, i.e. Grand Rapids Reserve (No. 33), inhabitated by Canadians of Cree Status. The popular Pelican Landing Restaurant, which shares a lot with the Shell Gas Station, marks the beginning of the reserve land along PTH 6, when traveling north from Winnipeg. Single-family units line the gravel street through the reserve, which is dotted with play structures on grassy plots of land just off each highway entrance.

Background

Personal history & previous studies

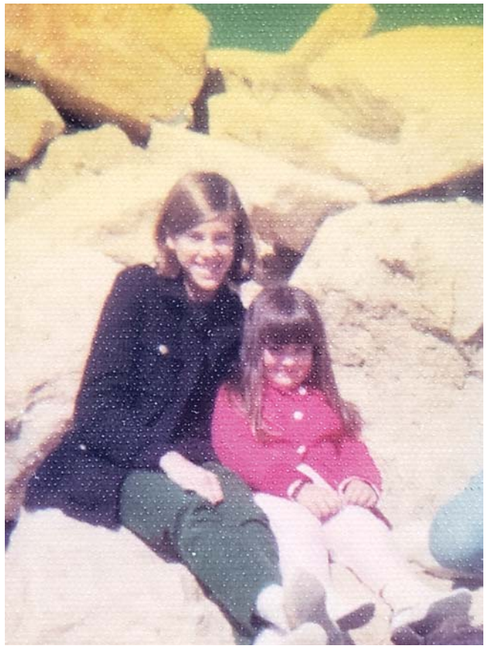
Through my work, I wish to engage with the knowledge and interests of the community of Grand Rapids, and to use this understanding to encourage local improvements in landscape design. This practicum and its proposed design work to devise a method that will revitalize a disturbed site, and supplement a traditional education with one acknowledging the landscape changes brought about by construction and human influence. My hope is that, in reviewing this document, the reader will come to understand the former and current nature of Grand Rapids, and consider my approach to re-vegetation practices.

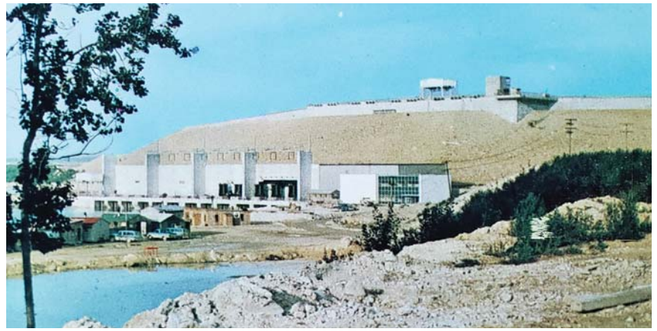
The inspiration behind the chosen location for my practicum is close to my heart, and is detailed on the following spread, along with an explanation regarding the catalyst for intervention.

To further engage with this content and my travel experiences, I would suggest reviewing my previous document, "Recovering Memories: A Journey Through Grand Rapids", available through the University of Manitoba Libraries' MSpace.

-Jane Hilder

A view down Hybord Avenue offers a glimpse into Grand Rapids' Hybord neighbourhood, occupied by Manitoba Hydro workers and their families.





Judy Taylor (mom)

INSPIRATION

When searching for a site for my practicum, I intended to find one where I could engage with topical notions of landscape architecture- indigenous rights and issues, and environmentalist design within disturbed landscapes. Through this lens, I was drawn to the northern community of Grand Rapids, Manitoba.

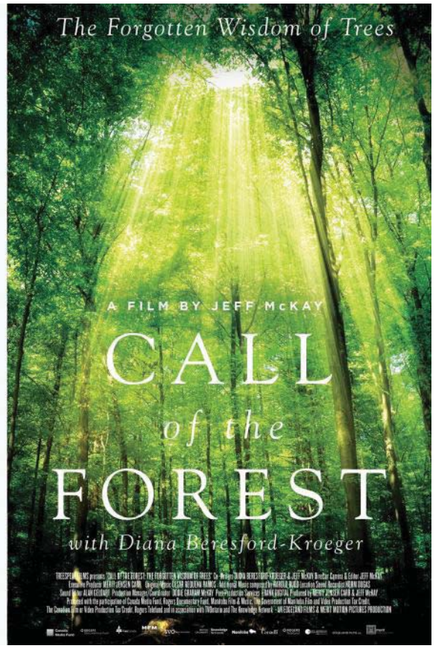
My interest in the community came from hearing stories of my mother's childhood, as she lived in Grand Rapids, in the 60's, as the daughter of a Manitoba Hydro engineer. My mother and her family were stationed in the Hybord neighbourhood during the construction and early operation of the generating station. Knowing my maternal grandfather, who has since passed away, I have nothing but respect and admiration for him, and those feelings transferred over to my general impression of Manitoba Hydro.

It was not until my early adulthood that I began to be aware of the deeply complicated and reprehensible history of Manitoba Hydro, regarding their relationship with the indigenous peoples of Canada, and the northern landscape at large.

This awareness came largely from my travels in the summer of 2016 as a guest with the University of Manitoba's Native Studies department, to the communities of Grand Rapids, Norway House, Cross Lake, Gillam, Split Lake, South Indian Lake, Leaf Rapids, Nelson House, and later, to Shoal Lake. It was during this time that I first heard direct accounts from individuals and community panels detailing the lasting impact that Manitoba Hydro has had on the nature and culture of the north.

Following this trip, I gave a presentation at the University of Manitoba's 2017 Atmosphere conference, accounting my experience of the nature and people of Grand Rapids.

Trying to unite these two separate accounts, i.e. a lifelong understanding with postsecondary education, has been challenging. So my solution was to set forward in my work with the intention to create a space for the youth of Grand Rapids to enjoy their childhood the way my mother did; exploring and playing in nature.



Diana Beresford-Kroeger

DISCOVERY

Knowing the outcome I wanted my design to have on the community - encouragement of environmental education and play - I was still left with a void for how to achieve said outcome. The catalyst for my design came upon viewing the documentary "Call of the Forest: The Forgotten Wisdom of Trees".

The subject of the film, Diana Beresford-Kroeger, has an incredible passion for nature, one which seems to derive from two sources-

1. Her childhood in Ireland, growing up surrounded by beautiful wilderness.

2. Her education rooted in nature, studying Brehon knowledge of plants and nature, and later, botany and medical biochemistry.

In early research of Grand Rapids, it seemed that the community benefited from the first of these two sources, a childhood nestled in the mid-Boreal lowland forests, along the shore of Lake Winnipeg. However, as a result of Manitoba Hydro's construction and commercialization of their land, the people of Grand Rapids have experienced a severe disconnect from their land, and the nature education that would normally have accompanied a childhood in an Indigenous community. I came to learn that Grand Rapids has recently developed a 'Culture Camp', 10 km north of the townsite, specifically to engage the youth in traditional Indigenous outdoor practices. This knowledge re-framed the focus of my practicum, as it is clear that the community has already taken it upon themselves to preserve traditional landscape practices.

The Culture Camp sets a precedent for the second source derived from the documentary, education in nature, and paves the way for further environmental programs for the youth of Grand Rapids. Thus I endeavoured for my design to also introduce the discipline of landscape architecture to the youth of Grand Rapids, while approaching environmental education in a unique way.

GLOSSARY

BORROW PIT	*Mineral soil borrow sites (comprised of sand, till, etc.); an area whose physical contents have been used in a process of construction, typically for smaller works as part of a larger project*
BP, BORROW PIT DESIGN SITE	*Site chosen for design intervention, 0.18 km², located south of the Grand Rapids Generating Station*
GR, GRAND RAPIDS	*The geography contained within the government-designated land boundary of the community of Grand Rapids, Manitoba*
EMPA	*Excavated material placement area (for stockpiles of construction waste and overburden); according to Hydro's current rehabilitation practices, such areas are designated/selected prior to construction, and rehabilitated with maximum wall slopes of 10% grade*
PTH-6	*Provincial Trunk Highway 6, running N/S through Grand Rapids and creating a connection between neighbouring communities, including Winnipeg*
GRAND RAPIDS PROJECT	*The 1960-1968 construction of the Grand Rapids Generating Station and Cedar Lake reservoir*
MCN	*Misipawistik Cree Nation, Grand Rapids Reserve 33*
MASL	*Metres above sea level, referring to topographical elevation*
LANDSCAPE SCAR	*Land disturbed by man-made intervention, no rehabilitation*
HIGH COMPACTION AREAS	*Haul roads, camps, work areas, areas of packed granular material*
LOW COMPACTION AREAS	*Access trails, low traffic areas, no placing and/or packing of granular material*
VR	*Virtual reality*
POINT CLOUD	*A set of points in space; data collected through a 3D scan*

Fauna

Alces alces	MOOSE
Anas sp.	BLACK DUCK/PINTAIL
Aythya cf. affinis	LESSER SCAUP
Bison bison	BISON
Branta canadensis	CANADA GOOSE
Canachites canadensis	SPRUCE GROUSE
Canis familiaris	DOG
Castor canadensis	BEAVER
Erethizon dorsatum	PORCUPINE
Eutamias minimus	LEAST CHIPMUNK
Gavia immer	COMMON LOON
Haliaeetus leucocephalus	BALD EAGLE
Larus delawarensis	RING-BILLED GULL
Lepus americanus	SNOWSHOE HARE
Lutra canadensis	OTTER
Lynx canadensis	LYNX
Marmota monax	WOODCHUCK
Martes americana	MARTEN
Martes pennanti	FISHER
Mustela vison	MINK
Odocolieus virginianus	WHITE-TAILED DEER
Olor buccinator	TRUMPETER SWAN
Ondatra zibethicus	MUSKRAT
Pelecanus erythrorhynchos	WHITE PELICAN
Phalacrocorax auritus	DOUBLE-CRESTED CORMORANT
Rangifer tarandus	WOODLAND CARIBOU
Tamiasciurus hudsonicus	RED SQUIRREL
Ursus americanus	BLACK BEAR
Vulpes fulva	RED FOX

Flora

Abies balsamea	BALSAM FIR
Agrostis scabra	ROUGH HAIR GRASS
Betula papyrifera	PAPER BIRCH
Caloplaca durietzii	CRUSTED ORANGE LICHEN
Campanula rotundifolia	HAREBELL
Cornus sericea	RED OSIER DOGWOOD
Cyperaceae	SEDGES
Cypripedium reginae	SHOWY LADY'S SLIPPER
Dasiphora fruticosa	SHRUBBY CINQUEFOIL
Equisetum fluviatile	SWAMP HORSETAIL
Hierochloe odorata	COMMON SWEET GRASS
Hypnales	FEATHERMOSSES
Juniperus communis	COMMON JUNIPER
Larix laricina	TAMARACK
Lilium philadelphicum var. andinum	WESTERN WOOD LILY
Phleum pratense	TIMOTHY-GRASS
Phragmites australis	COMMON REED GRASS
Picea glauca	WHITE SPRUCE
Picea mariana	BLACK SPRUCE
Pinus banksiana	JACK PINE
Poa glauca	TIMBERLINE BLUE GRASS
Populus balsamifera	BALSAM POPLAR
Populus tremuloides	QUAKING ASPEN
Portulaca oleracea	PURSLANE
Salix pentandra	LAUREL LEAF WILLOW
Salix repens	SILVER WILLOW
Senecio pauperculus	PACKERA PAUPERCULA
Syntrichia ruralis	HAIRY SCREW MOSS
Typha latifolia	COMMON CATTAIL
Xanthoria	ORANGE WALL LICHEN

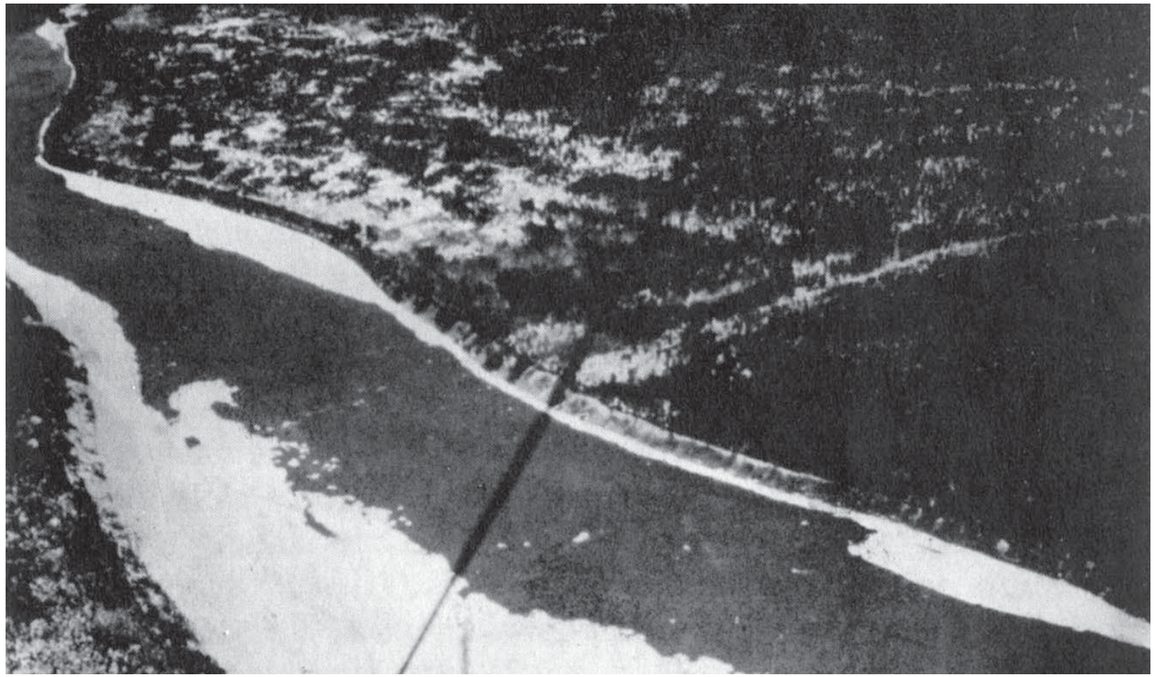
Human History

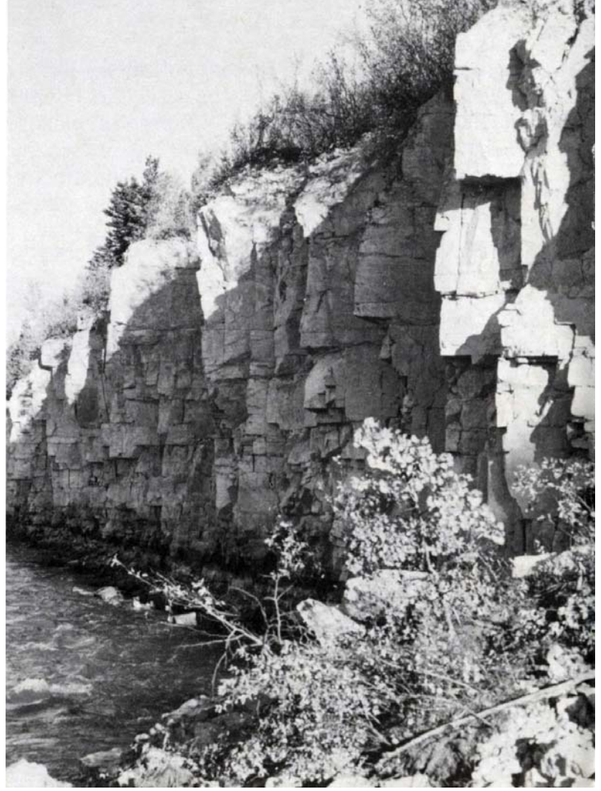
Periods of population influx

To understand people, it is necessary to understand their environment. To this end, the following section examines the human history of Grand Rapids.

Written history, as it concerns Grand Rapids, can be traced through from first contact with European explorers, to the arrival of Hudson's Bay Company Trade workers, to the current occupation of Manitoba Hydro and its employees. These events reveal a history of newcomers and entrepreneurs with little to no interest in the Indigenous people, their knowledge, and the ecology of their land. Rather, what becomes evident is a desire to conquer and exploit the land, particularly the power of the rapids from which the town derives its name.

Grouting performed at Grand Rapids during the 1960's construction of the Cedar Lake Reservoir.





LOCATION

At a distance of 433 km northwest of Winnipeg along MB-6 N, nestled in the horseshoe of the Saskatchewan River, lies the town of Grand Rapids, Manitoba (85.95 km2). The location of Grand Rapids signifies the meeting of the Saskatchewan River watershed and the watershed of Lake Winnipeg, as the river empties into the lake's northwestern shore. Grand Rapids owes its name to an impressive series of now non-existent rapids, drained as a consequence of the construction of the Grand Rapids Generating Station.

TRADE HISTORY

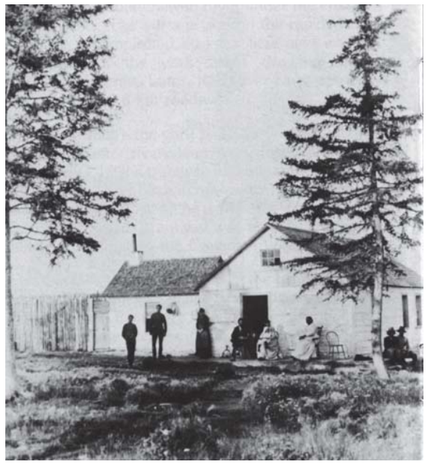
Archaeological investigations conducted around the time of this intervention indicate Grand Rapids' rich history as a hub of transportation and trade, with cultural influences ranging "from the southwest grasslands, the northwest Boreal forest, the Great Lakes, and even from the northern tundra" (McCarthy, 1988).

PRE-CONTACT

Grand Rapids' anthropological history is best understood by examining periods of population influx. Examination of the pre-contact history of the Indigenous peoples of Canada reveals the presence of tribes in Northern Manitoba for thousands of years prior to the present day (Mayer-Oakes, 1974). Grand Rapids itself is considered "one of the oldest occupied sites in northern Manitoba" (Payne, 1990). As early as can be confirmed, the community, known today as Misipawistik Cree Nation, existed in a semi-nomadic form, engaged in a lifestyle of hunting, sturgeon fishing, trapping, and gathering, in accordance with the current season (Kulchyski and Neckoway, 2006).

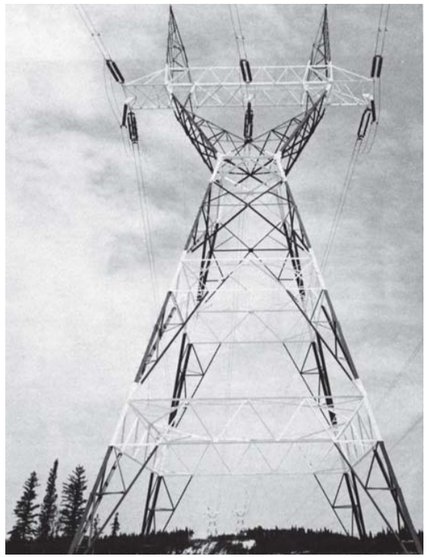
FIRST CONTACT

The first documented contact with the Indigenous people of Grand Rapids was in 1739, marking the arrival of the French Canadian explorer, La Vérendrye. From this time forward, Grand Rapids was linked through trade with the Europeans. Grand Rapids existed at one end of a trade route that extended west to the Rockies. The settlement encompassed what was considered to be the most dangerous part of the course, where the Saskatchewan River dropped 20 metres across 6 kilometres of powerful rapids (Letourneau, 1975). By the late 19th century, a light iron tramway was established in Grand Rapids to expedite trade transport, altogether bypassing the dangers of the rapids.



HUDSON'S BAY COMPANY

With the creation of the tramway came the second period of population influx, and the introduction of rail workers; an industry whose jobs and presence remained significant in Grand Rapids for roughly a quarter century. Immigrants to western Canada, rail workers, and members of the Hudson's Bay Company trade network all passed through Grand Rapids during this time. In 1909, the Grand Rapids trading post was retired, along with the tramway system, after nearly a decade of minimal management and trade (Letourneau, 1975).



MANITOBA HYDRO

The third and most recent influx of residents came in 1960, upon the negotiation and construction undertaking of the Grand Rapids Generating Station, dam, and Cedar Lake Reservoir. The Grand Rapids Forebay Administration Committee negotiated the surrender of reserves from the Chemawawin tribe, who saw their ancestral land flooded and the adjacent shoreline and species habitats forever changed. The people of the Misipawistik tribe were now to become permanent hosts to thousands of Manitoba Hydro workers and their families, as well as drifters looking to gain employment from the project, as the process of dam construction continued over the next eight years. As a result of major quarry blasting, ancient burial sites within Grand Rapids were displaced, and many residents have since suffered from the effects of PTSD (Kulchyski and Neckoway, 2006).

Forebay Negotiations are finalized with the signing and handoff of the Manitoba Hydro Settlement Agreement on November 14, 1990, with the Chemawawin First Nations and the community of Easterville. This community was established when previously occupied land was flooded during the creation of the Grand Rapids Dam.

Landscape Portrait

Regional Study

The following set of analytical maps represent a regional study of the current state of the landscape of Grand Rapids and its immediate surroundings. This study was undertaken with the intention to understand the context and characteristics of the area, prior to developing a site design.

Representing the various landscape and cultural layers of the region, the maps encompass a maximum area of 625 km^2.

Each map is accompanied by observations which expand upon relevant topographical and constructed features of the area represented. Annotated drone scans are provided on the following spreads.

Orange wall lichen, Xanthoria, grows on the edge of a east-facing wall of the Grand Rapids Floodway Structure

HYBORD

Manitoba Hydro workers and family housing

CEDAR LAKE RESERVOIR

1353 km², completed 1968

TOWN OF GRAND RAPIDS

Population 870, Metis and non-Indigenous, or non-Status

LAKE WINNIPEG

24,514 km², freshwater

MISIPAWISTIK CREE NATION

Population 275, Reserve 33, Cree Status

MANITOBA HYDRO GENERATING STATION

Completed 1968

ELECTRIC SUBSTATION

Voltage transformation from generation system

UNNAMED ROAD, DIVISION NO. 21

Access to floodway control structure

BORROW PIT

Land excavated in 1960's

MID-BOREAL LOWLAND FOREST

Untouched by Manitoba Hydro

PTH 6

Access to Grand Rapids

FORMER SASKATCHEWAN RIVER

Cedar Lake Reservoir Floodway

BORROW PIT DESIGN SITE

Land excavated in 1960's

GR

Drone Scan

April 17, 2019, 5:45 p.m.

TRANSMISSION LINE

Manitoba Hydro, 500 kv

FORMER SASKATCHEWAN RIVER

Cedar Lake Reservoir Floodway

MID-BOREAL LOWLAND FOREST

Untouched by 1960's era construction

BORROW PIT

Land excavated in 1960's by Manitoba Hydro

BORROW PIT DESIGN SITE

Land excavated in 1960's

UNNAMED ROAD, DIVISION NO. 21

Access to floodway controls

BORROW PIT

Land excavated in 1960's by Manitoba Hydro

FLOODWAY CONTROL STRUCTURE

Completed 1968

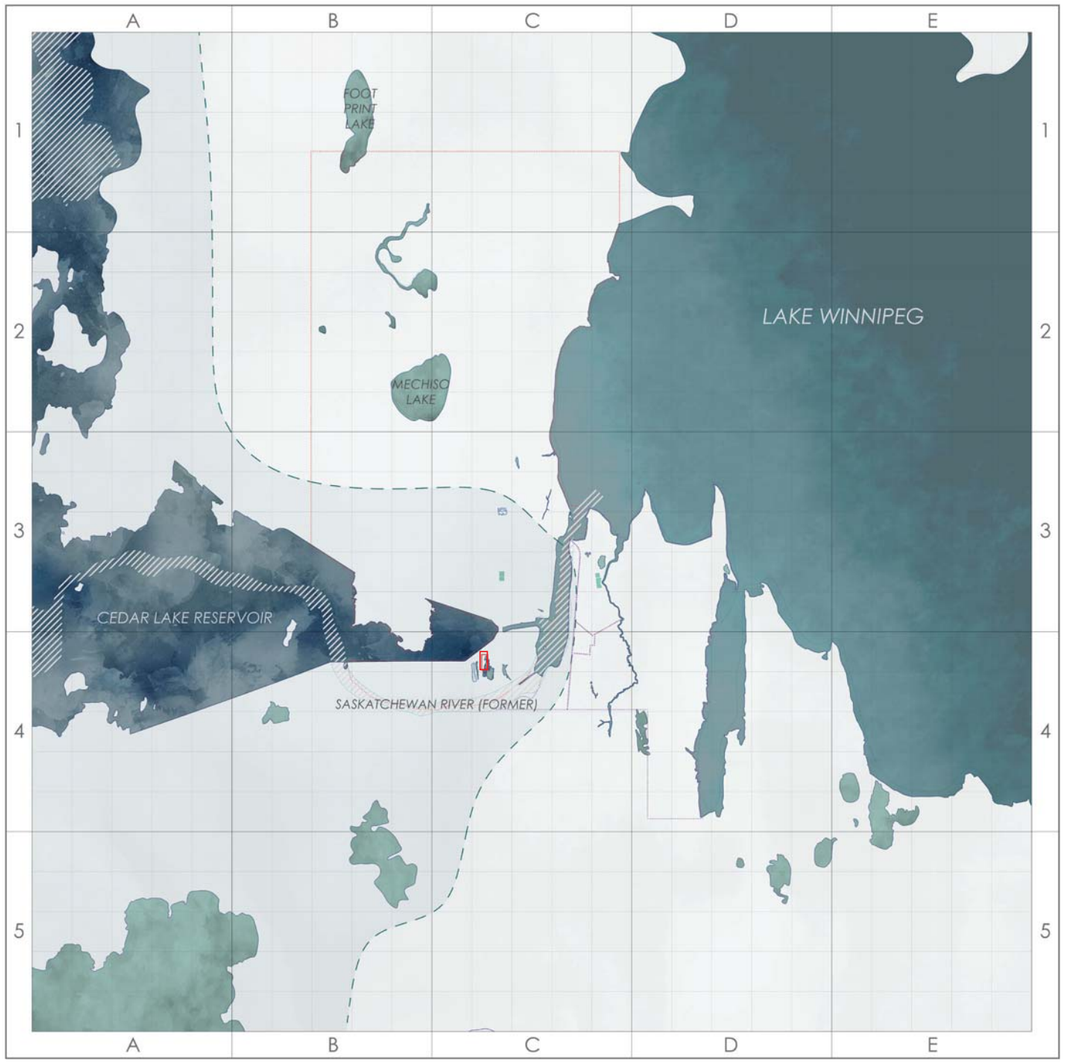
CEDAR LAKE RESERVOIR

1353 km², completed 1968

GR

Drone Scan

November 26, 2016, 6:10 p.m.



HYDROLOGY

0 1 3 5 KM

1 : 150 000

LEGEND

2018 WATER BOUNDARIES
CURRENT CONDITIONS AS OF JULY 2018

PRE-1960 WATER BOUNDARIES
PRIOR TO DAMMING OF SASKATCHEWAN RIVER

SASKATCHEWAN RIVER BASIN
LAND DRAINED BY SASKATCHEWAN RIVER

GRAND RAPIDS LAND BOUNDARY
TOWNSITE AND RESERVE

CHOSEN SITE BOUNDARY
ABANDONED BORROW PIT

CEDAR LAKE RESERVOIR

The first of Grand Rapids' two dominating freshwater hydrological landforms - the other being Lake Winnipeg - is the man-made result of the Grand Rapids Generating Station, constructed 1960-1968 by Manitoba Hydro.

The primary inflow source of Cedar Lake Reservoir is the east-flowing Saskatchewan River, which also serves as the primary outflow channel, controlled through the four turbine generators, periodically aided by the four spillway gates during times of high water levels.
Maximum depth of the reservoir's 1353 km^2 surface area is 10 metres.

The reservoir serves as a source of fishing and boating for the community, as well as housing a power-generating capacity of 479 MW. Winnipeg, Thompson, The Pas, and Dauphin are all connected via transmission lines to this source.

LAKE WINNIPEG

The inflow system of Lake Winnipeg is more complex than that of the Cedar Lake Reservoir, due to the size of its watershed. To summarize, the primary inflow sources are the Winnipeg River, the Saskatchewan River (through Cedar Lake Reservoir), and the Red River. The primary outflow of the lake is north to the Nelson River.

Lake Winnipeg, classified as a temperate lake of the second order, covers a surface area of 24,514 km^2, with an average depth of 12 metres and a maximum depth of 36 metres. The lake provides boating, fishing, and swimming opportunities for the community, with a vast shoreline dotted with docking stations.

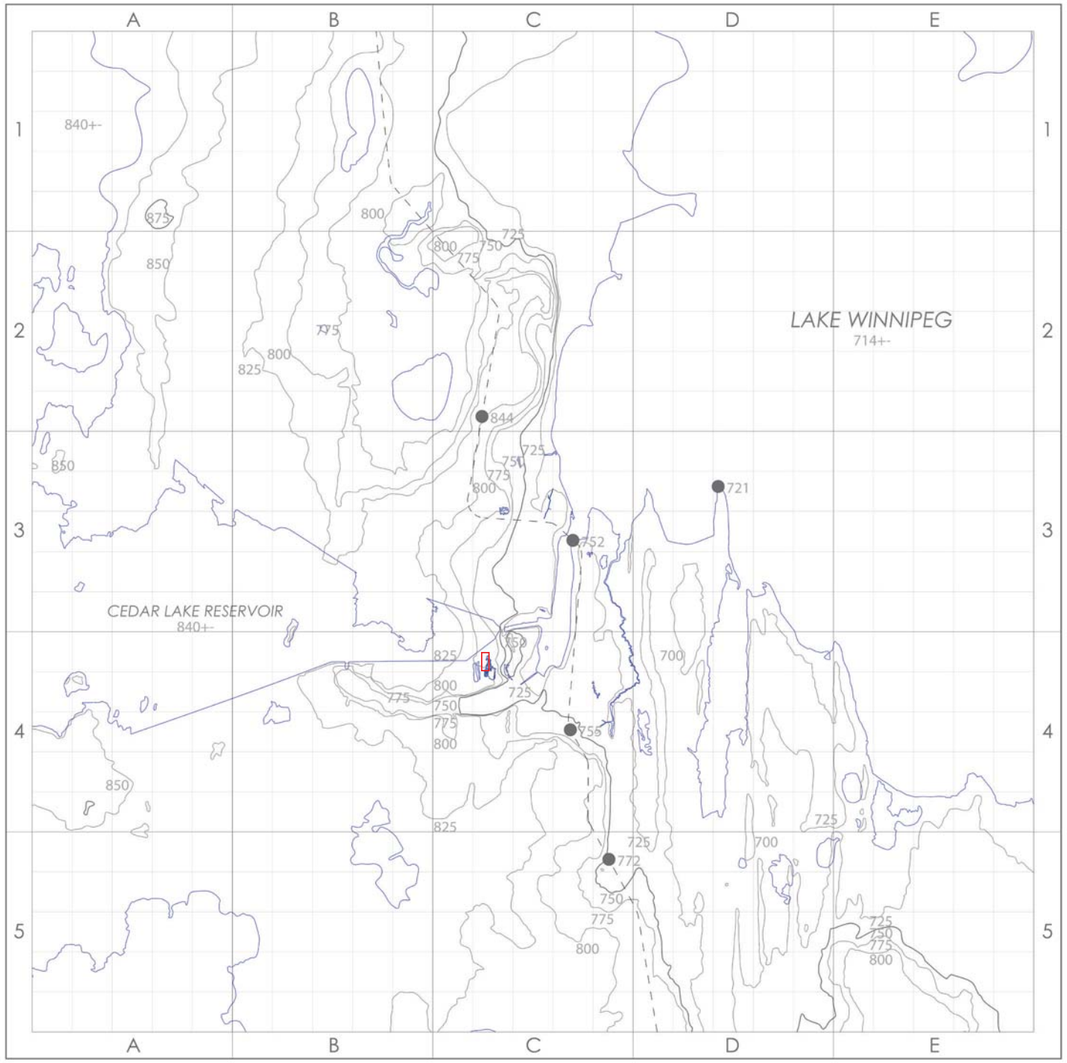
SASKATCHEWAN RIVER (FORMER)

The 6 km long site of the former Saskatchewan River's rapids, southeast of the Cedar Lake Reservoir, now serves as the spillway for Hydro's use during high water periods. It is otherwise unoccupied and left to natural succession.

SASKATCHEWAN RIVER (EXISTING)

The Saskatchewan River currently begins as the confluence of the North and South rivers of the same name, each which originate from glaciers in the Alberta Rockies, flowing east to eventually drain into Lake Winnipeg.

While the majority of the river was dammed in the creation of the Cedar Lake Reservoir, a 4 km stretch of river still exists, as the output of the generating station.



TOPOGRAPHY

0 1 3 5 KM

1 : 150 000

LEGEND

2018 WATER BOUNDARIES
CURRENT CONDITIONS AS OF JULY 2018

PROVINCIAL TRUNK HWY 6
CONNECTING ROUTE TO WINNIPEG

CONTOURS
CONTOUR INTERVAL OF 25 FT (7.62 M)

HIGH POINTS
POINTS OF DISPARITY IN SURROUNDING ELEVATION

CHOSEN SITE BOUNDARY
ABANDONED BORROW PIT

HISTORY

The topography of Grand Rapids, part of central Manitoba, is largely defined by the former Lake Agassiz. Grand Rapids is located at the border of the Saskatchewan River Basin and that of Lake Winnipeg, where low-lying, generally level topography is typical of the area.

TRENDS

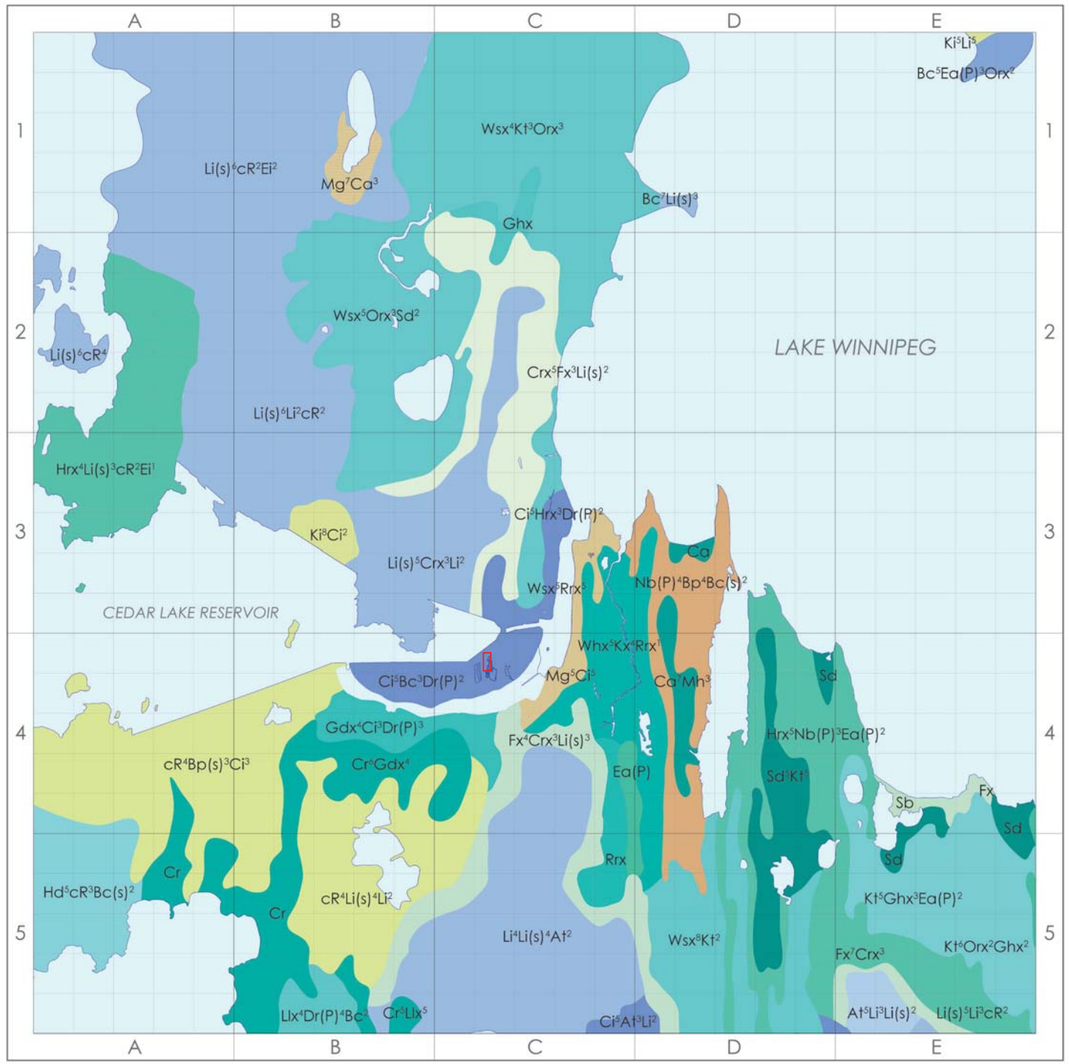
The area delineated by the map border pictured opposite represents an elevation change of 53.34 m, across Grand Rapids and its immediate surroundings (approximately a 5 km extended zone). The lowest lying areas of land exist at an elevation of 213 MASL, and are found south of Lake Winnipeg, surrounding the Grand Rapids reserve land.

HYDROLOGY

Lake Winnipeg sits at an approximate elevation of 217 MASL, establishing a 38.4 m drop from Cedar Lake Reservoir, which sits at approximately 253 m surface elevation. This elevation change is due in part to the original topography of the Saskatchewan River and its rapids, which, prior to the damming, dropped 21 m over 6.4 km (McCarthy, 1988). However, the prevailing cause of the current disparity is flooding of the Cedar Lake Reservoir by Manitoba Hydro.

ANOMALIES

Driving along PTH 6, it becomes clear that the prevailing landscape is relatively flat swaths of boreal forest. This monotony causes the shock of quarries that dot the landscape to appear even more remarkable. Understood best from an aerial perspective, these quarries and borrow pits are scars by which the work of Manitoba Hydro is defined. As a counterpart to the drops in elevation represented by the construction scars, the flood dike that surrounds Cedar Lake Reservoir towers over the community of Grand Rapids, as the point of highest elevation, and a reminder of the power of engineering construction.



SOILS

LEGEND

2018 WATER BODIES
CURRENT CONDITIONS AS OF JULY 2018

CHOSEN SITE BOUNDARY
ABANDONED BORROW PIT

TRENDS

At a scale of 1:150,000, soil types of the Grand Rapids area appear in largely homogenous N-S strips, with the borrow pit site existing within the loamy soil classification. Mesic and fibric peats are the trend bordering Lake Winnipeg's shore, while further inland and around Cedar Lake Reservoir exists sand and gravel surface materials. Clay and bedrock zones are spotted throughout, significant on reserve land and to the east.

ANOMALIES

What is not visible at an analysis of this scale is the diverse surface materials found in disturbed sites, such as the borrow pit or the quarries throughout the area. A more detailed soil survey based on current conditions is provided in the following chapter.

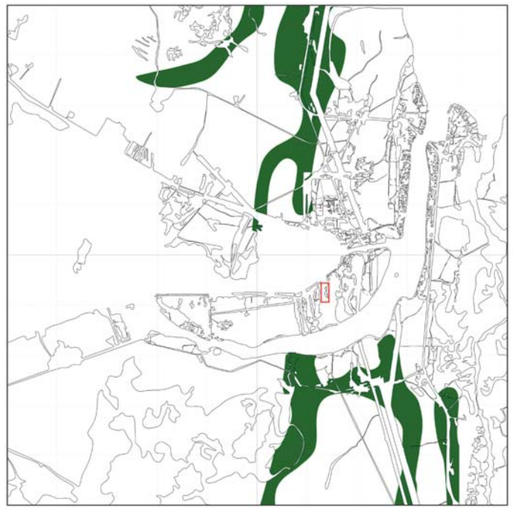
INVENTORY

The following represents the various soil profiles of the Grand Rapids area, originally catalogued by the Land Resource Research Institute of Agriculture Canada.

LEGEND	PROFILE TYPE	LANDFORM	TOPOGRAPHY	SOIL MATERIAL
MESIC & FIBRIC PEATS *POOR TO VERY POOR NATURAL DRAINAGE*	Typic mesisol (lithic phase, sphagnic phase), terric mesisol	Horizontal fen, ribbed fen, flat bog, blanket bog, domed bog	Depressional to level to gently sloping	Fibric sphagnum peat on surface, layer of mesic forest peat, limestone bedrock
LOAMS *WELL TO IMPERFECT NATURAL DRAINAGE*	Eluviated eutric brunisol, carbonated/ shallow to very shallow lithic phase	Level, undulating and ridged moraine, morainal veneer overlying level to gently sloping bedrock	Level to undulating	Extremely calcareous, loamy, very stony till, limestone bedrock
SAND & GRAVEL *RAPID TO POOR NATURAL DRAINAGE*	Eluviated eutric brunisol, rego gleysol, orthic regosol	Lacustrine beach and outwash veneer overlying bedrock	Gently undulating to ridged	Stratified, calcareous fragmental to sandy-skeletal deposits, overlying limestone bedrock or extremely calcareous, loamy till
CLAY & BEDROCK *RAPID TO POOR NATURAL DRAINAGE*	Bedrock, gleyed gray luvisol, rego humic gleysol (peaty phase)	Lacustrine veneer overlying undulating moraine, terraced bedrock	Level to undulating to depressional	Moderately to strongly calcareous, clayey, stone-free lacustrine sediments, overlying extremely calcareous, loamy, moderately stony till

1

2



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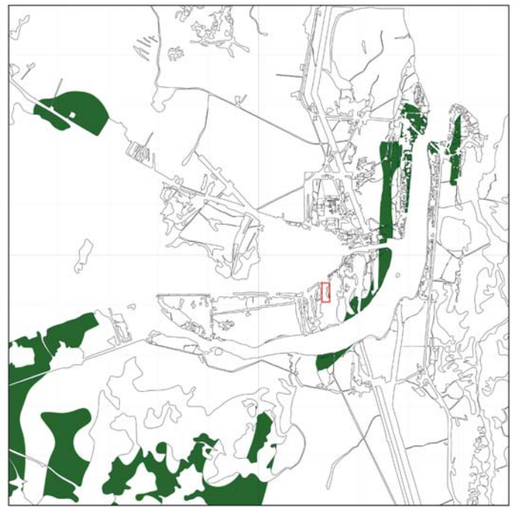


4

VEGETATION BY SOIL TYPE

0 1000 2000 5000 M

1 : 120 000

LEGEND

2018 WATER BODIES
CURRENT CONDITIONS AS OF JULY 2018

VEGETATION BOUNDARIES

VEGETATION
GROUND COVER BY SOIL TYPE

CHOSEN SITE BOUNDARY
ABANDONED BORROW PIT

ECOREGION

Documented in the maps pictured opposite is the overall vegetative trends defined by soil material. As a part of the mid-boreal lowland ecoregion, Grand Rapids is characterized by "medium to tall, closed stands of trembling aspen and balsam poplar with white and black spruce, and balsam fir occurring in late successional stages". Due to its low elevation, the ecoregion, which extends from "the eastern shore of Lake Winnipeg to the Cumberland Lowlands in Saskatchewan", also displays extensive wetland cover. These wetland ecosystems were largely drained in the Grand Rapids area during the construction of the Cedar Lake Reservoir.

INVENTORY

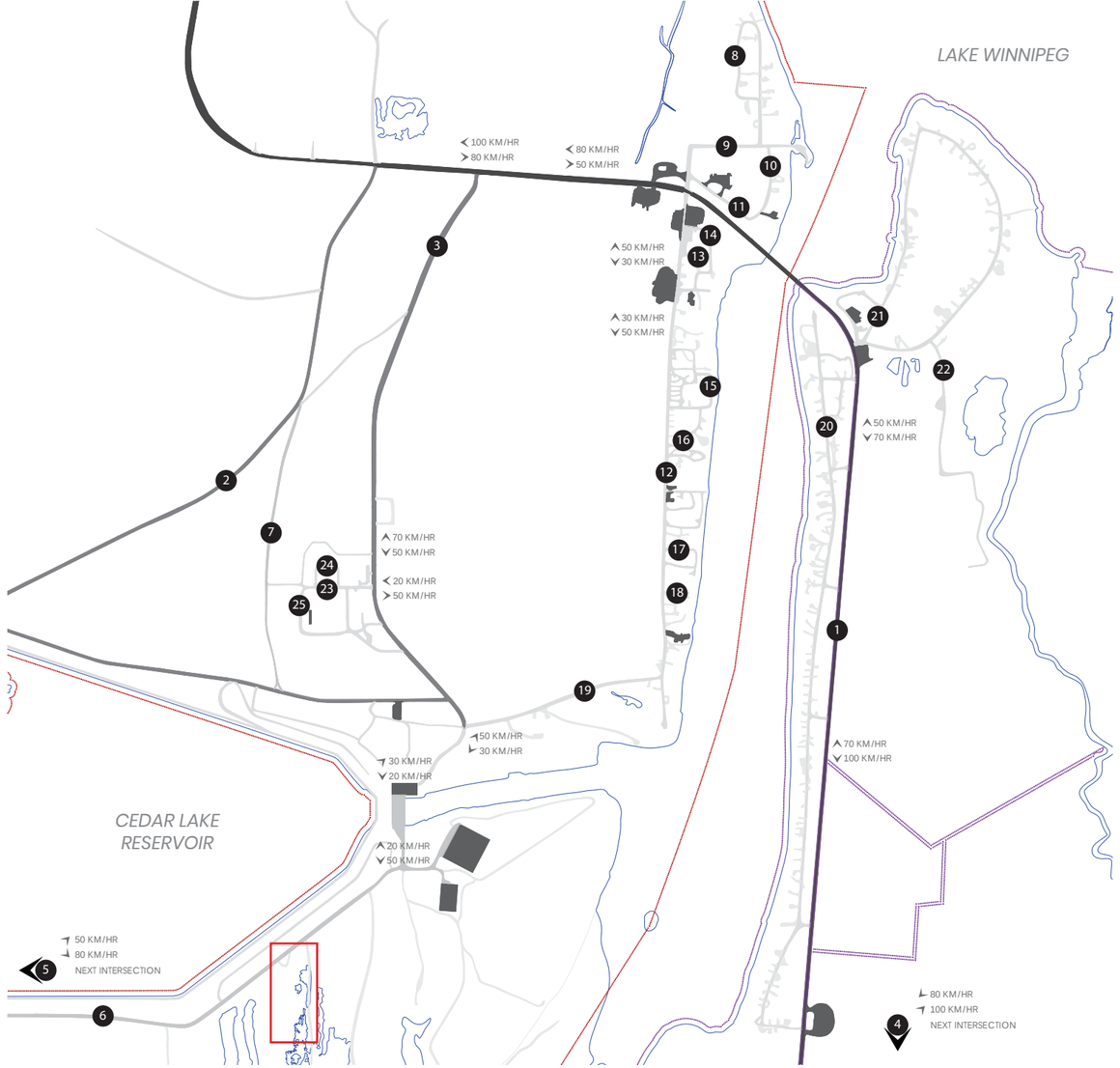
The following represents the typical vegetation found in the Mid-Boreal Lowland Ecoregion, based on soil types observed in Grand Rapids area, originally catalogued by the Land Resource Research Institute of Agriculture Canada.

LEGEND		DOMINANT VEGETATION	
1	MESIC & FIBRIC PEATS	Sedges Mosses Feathermosses stunted Black Spruce stunted Tamarack Swamp Birch Ericaceous Shrubs	(*Cyperaceae*) (*Sphagnum*) (*Hypnales*) (*Picea mariana*) (*Larix laricina*) (*Betula alleghaniensis*)
2	LOAMS	Black Spruce Jack Pine Aspen Willow	(*Picea mariana*) (*Pinus banksiana*) (*Populus*) (*Salix*)
3	SAND & GRAVEL	Jack Pine Black Spruce Aspen Balsam Poplar Willow Labrador Tea Mosses Feathermosses	(*Pinus banksiana*) (*Picea mariana*) (*Populus*) (*Populus balsamifera*) (*Salix*) (*Rhododendron groenlandicum*) (*Sphagnum*) (*Hypnales*)
4	CLAY & BEDROCK	Jack Pine Black Spruce Aspen Labrador Tea Mosses Feathermosses Lichens	(*Pinus banksiana*) (*Picea mariana*) (*Populus*) (*Rhododendron groenlandicum*) (*Sphagnum*) (*Hypnales*)

ROADS

The following is an inventory of the roadways running through Grand Rapids.

The northwestern view across the PTH 6 bridge is photographed here on June 27, 2018. The bridge leads into the Grand Rapids townsite from the reserve land.



0 150 450 600 M

1 : 25 000

LEGEND

- PTH 6
- ARTERIALS
- COLLECTORS
- LOCAL ROADS
- PATHS
- LOTS
- TOWNSITE BOUNDARY
- RESERVE BOUNDARY
- WATER BODIES
- CHOSEN SITE BOUNDARY
  ABANDONED BORROW PIT

INVENTORY

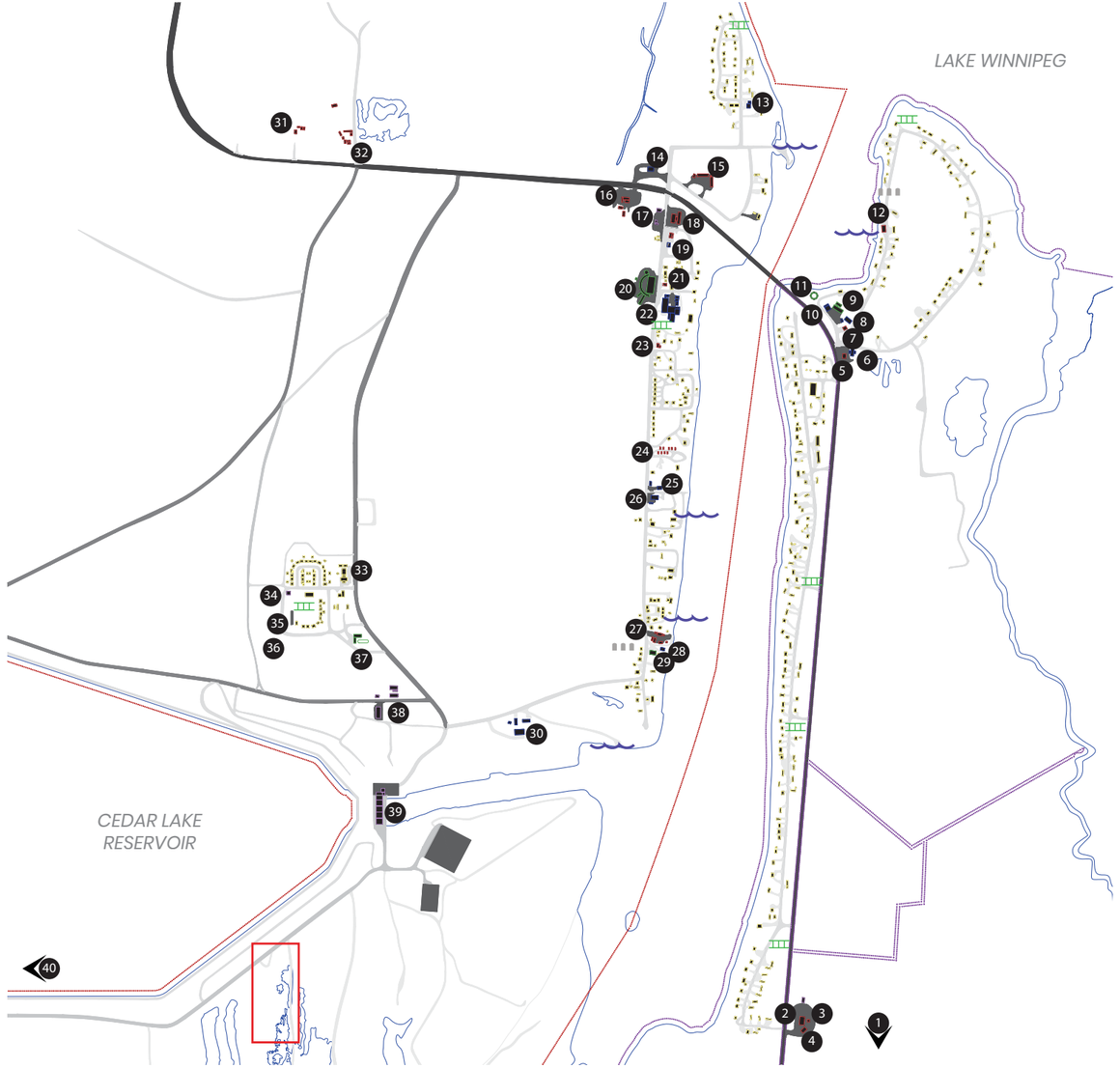
1. Provincial Trunk Hwy 6
2. Airport Road
3. Government Road
4. Mannix Road
5. Unnamed Road
6. Unnamed Road, Division No. 21
7. Unnamed Road
8. Centennial Bay
9. Campbell Avenue
10. Saskatchewan River Drive
11. Ferry Road
12. Grand Rapids Drive
13. Birch Avenue
14. Tamarac Drive
15. Riverview Bay
16. Sinclair Drive
17. Johnson Avenue
18. Gertrude Avenue
19. Mckay Avenue
20. River Road
21. Beardy Point Road
22. Lagoon Road
23. Hybord Avenue
24. Stephens Crescent
25. Mcgregor Drive

BUILDINGS

The following is an inventory of the buildings and major industry locations in Grand Rapids.

The welcome sign to Grand Rapids is pictured here, visible when traveling north on PTH 6 before entering reserve land.

Sign content: "Welcome to Grand Rapids Working with the community to provide 'Energy for Generations' - Manitoba Hydro"



0 150 450 600 M

1 : 25 000

LEGEND

- BOAT LAUNCH
- PLAYGROUND
- CEMETERY
- TOWNSITE BOUNDARY
- RESERVE BOUNDARY
- DESIGN SITE BOUNDARY
- WATER BODIES
- RECREATIONAL
- RESIDENTIAL
- LAGOON
- INSTITUTIONAL
- COMMERCIAL
- INDUSTRIAL

INVENTORY

1. Waste Oil Equipment Rental
2. Shell Gas Station
3. Pelican Landing Restaurant
4. MCN Foods
5. Sipishk Manor
6. Little Niska Daycare Centre
7. Public Works Garage
8. Grand Rapids Nursing Station & EMS
9. Chief Peter Beardy Memorial Centre
10. Cree Nation Child & Family Caring Agency
11. Powwow Arbour
12. Grand Rapids Fisherman's Coop
13. RCMP Station
14. UCN
15. Grand Rapids Lodge
16. Esso Gas Station
17. MB Hydro Facility
18. Northbrook Inn
19. Norman Regional Health Authority EMS
20. Grand Rapids Community Centre
21. MCN Foods
22. Grand Rapids School
23. Big Joe's (Out of Business)
24. Pine Grove Cabins
25. St. James Anglican Church
26. Town Office
27. Boat Docking Station
28. Church
29. Community Hall
30. MB Conservation Services
31. Gravel Pits
32. Firestone Tires
33. MB Hydro Employee Residence
34. Parking Garage
35. Volleyball Court
36. Baseball Diamond
37. Recreational Centre
38. MB Hydro Facilities
39. Generating Station
40. Floodway Control Structure

Site Portrait

Site Analysis & Synopsis

The landscape layers documented in the regional study are now applied to maps detailing the features of the borrow pit site (total area covered 0.81 km^2).

Aerial imagery and contour data were collected through drone scans of the area, and are pictured on the following spreads. The most extensive scan was completed in the summer of 2018, and provided the base for the following analytical data.

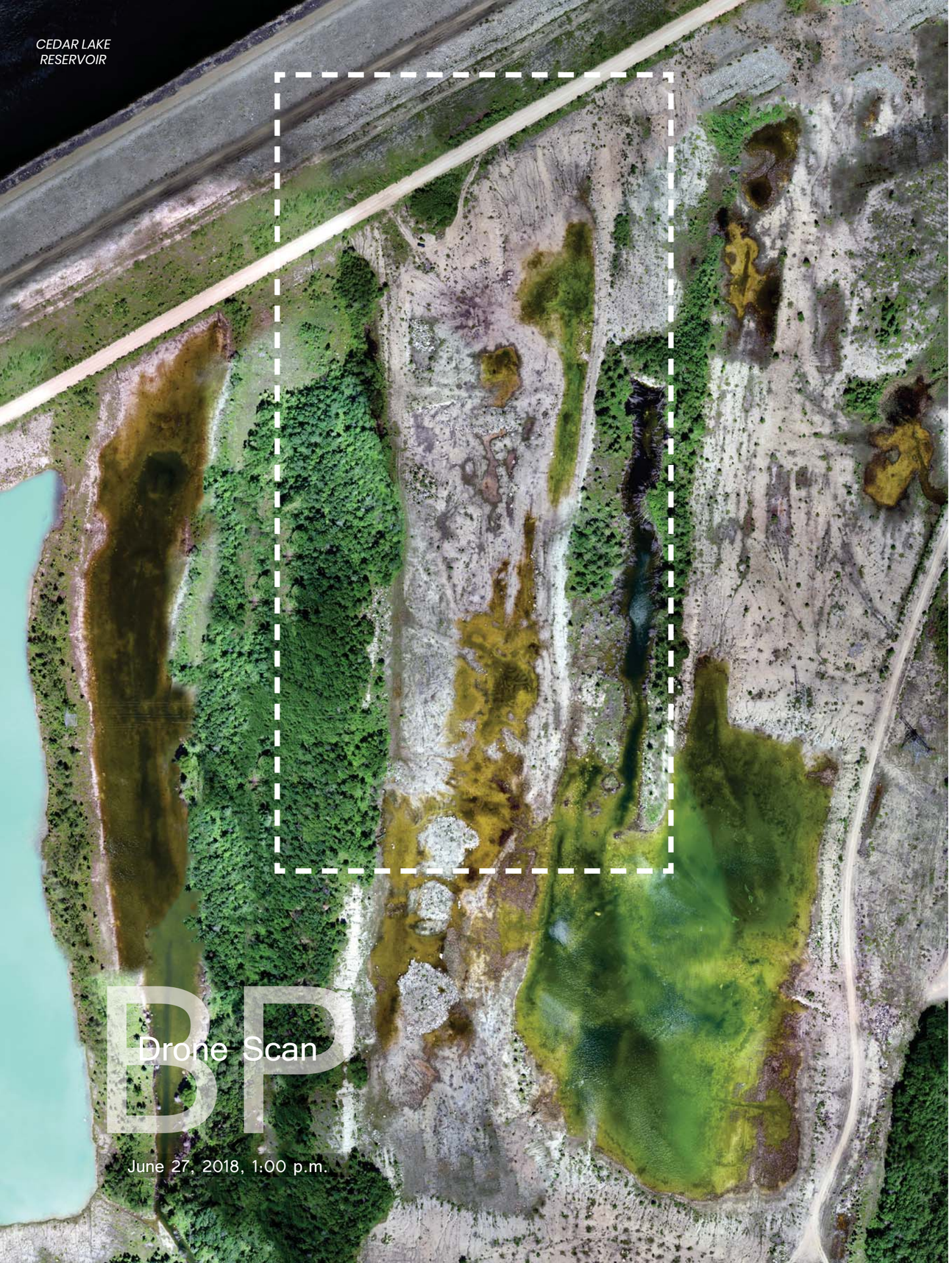
Large boulders deposited on site during 1960's construction with vegetation that has grown in the gaps where fertile loam remains.

SPRING DRONE SCAN

As no detailed aerial imagery or contour data exists for the borrow pit site, it was necessary to collect and create information that would inform the site design. Pictured left is one of two extensive drone surveys that were conducted of the site. Captured in April 2019, this scan defines spring water boundaries, and reveals the ratio of coniferous to deciduous trees bordering the site. Without the presence of spring-summer vegetation, silt patterns are more visible, and help to confirm contour data collected in the second drone scan, pictured on the following spread.

0 10 20 40 M

1 : 2500



SUMMER DRONE SCAN

The aerial imagery displayed here represents the summer drone scan, captured in June 2018. This scan is the basis for all future contour data and vegetation mapping laid out in the following maps. By expanding the area covered by the scan (far left), context to the site is given, as it relates to Cedar Lake Reservoir, and the borrow pits that mirror the site along its east and west sides.

0 10 20 40 M

1 : 2500

Based on the point cloud gathered by the drone scan in June 2018, a VR model was developed. Through this technology, 'site visits' were possible at any time, as one could easily step into virtual space. During design development, this technology was invaluable, as the project could be viewed on site as a VR rendering.

SITE LAYERS

1- VEGETATION

The borrow pit, like the town of Grand Rapids, is a part of the mid-boreal lowland ecoregion. Species typical of this classification, and still observed on site today include: trembling aspen, balsam poplar, white spruce, black spruce, and balsam fir.

2 - ROAD/PATHS

In addition to the maintained gravel service road running along the northern border of the site, remnants of Manitoba Hydro construction processes are visible in the overgrown paths that border the site on the eastern and western sides.

3 - CLAY

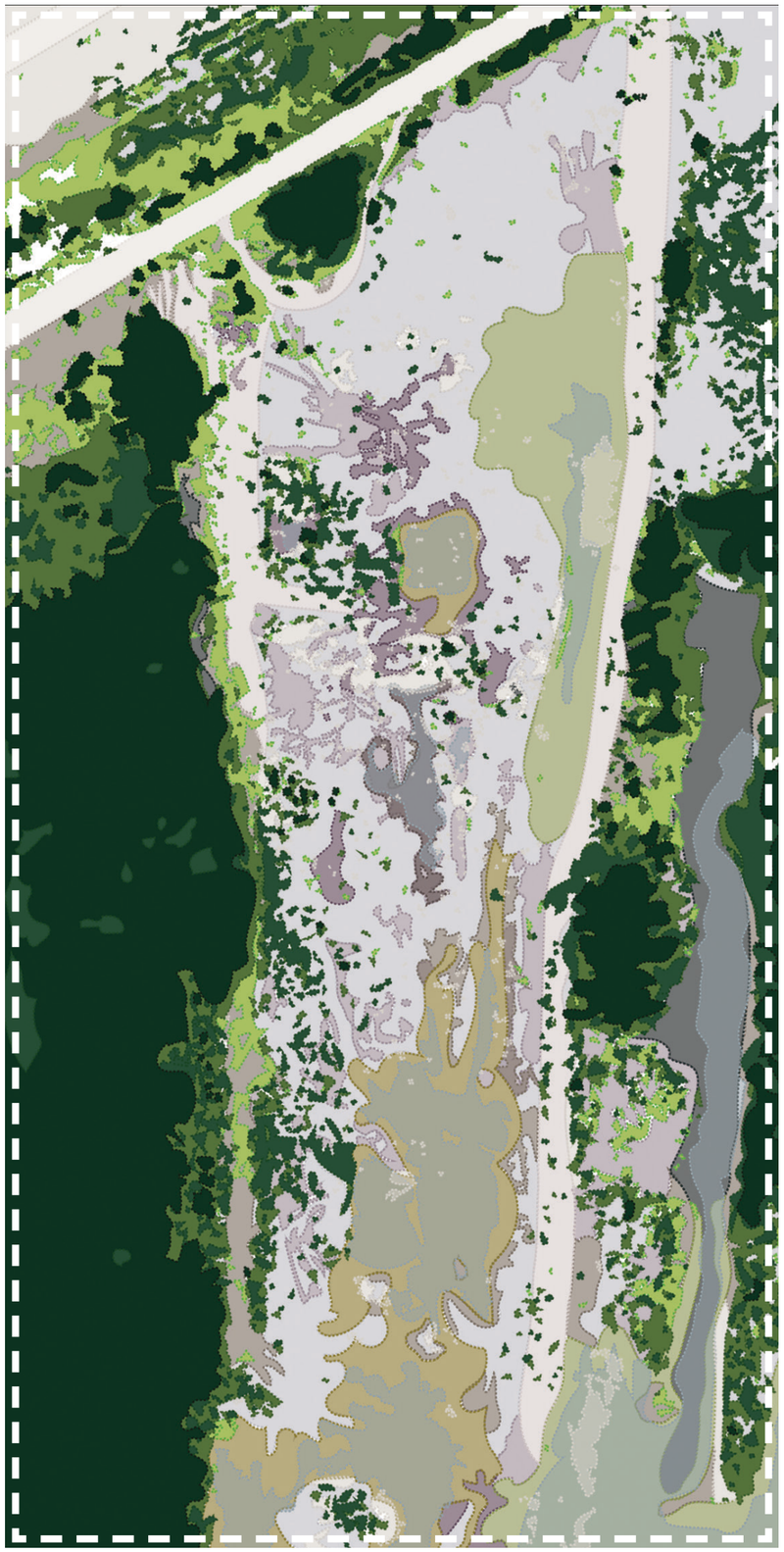
The site retains areas of loamy soil, in strips untouched by construction and confirmed by existing vegetation. Such areas resemble what is expected in the Chitek series soil profile, of which the borrow pit is a part. Area that has been razed by construction has revealed clay of varying degrees of moisture and vegetation presence. Increased darkness on the map denotes increased moisture.

4 - LIMESTONE ROCKS

Loose limestone bedrock unearthed from Manitoba Hydro construction is littered throughout the site, ranging in diameter from 0.3-0.9 m. Gravel used as construction vehicle paving is also present.

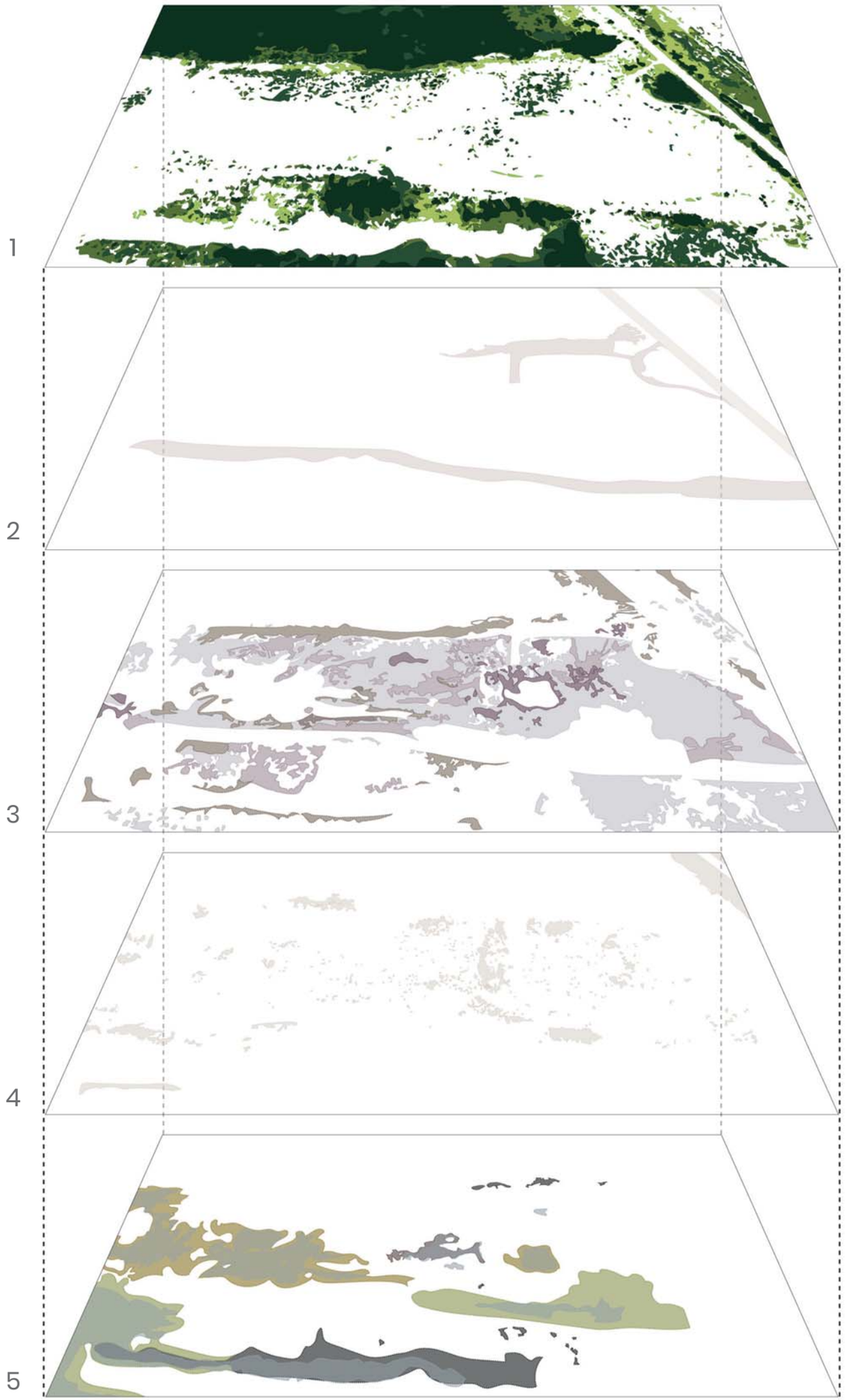
5 - WATER BODIES

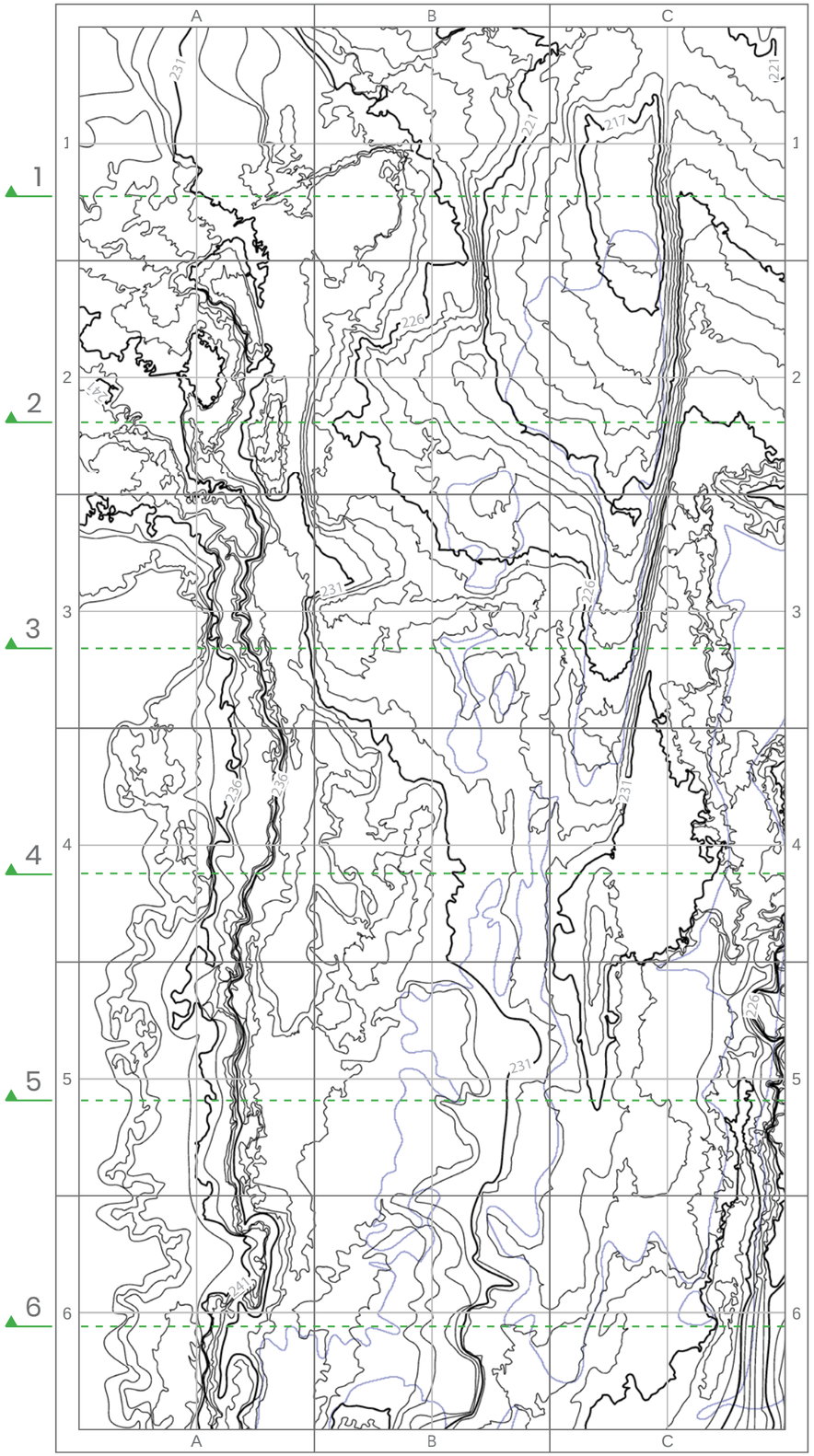
Water collection on site ranges in depth from 0.1-0.5 m. These areas are documented in change throughout the seasons, as the light blue curvilinear forms denote spring collection, as opposed to the multicoloured forms, which were observed in summer.



0 10 20 40 M

1 : 2500





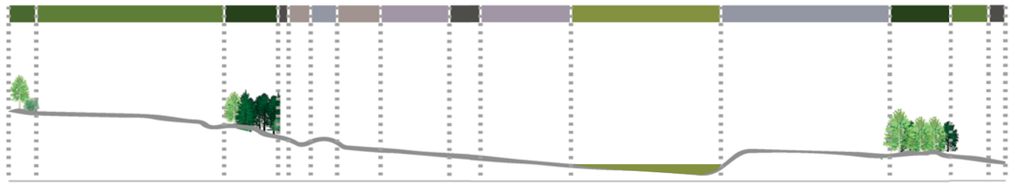
TOPOGRAPHY

Contours collected from the drone scans provide a detailed image of the site, from predictions of water collection zones, to areas that require bank stabilization. This data directly informed the final site design in terms of ground-level navigation.

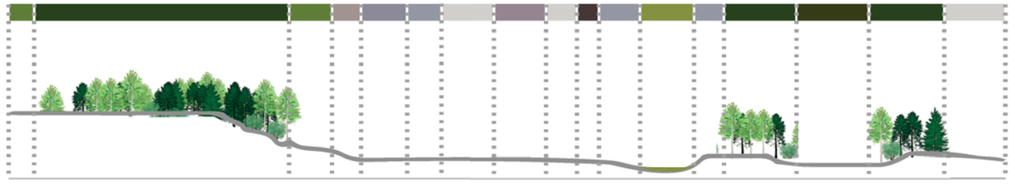
0 10 20 40 M

1 : 2500

SECTION 1



SECTION 2



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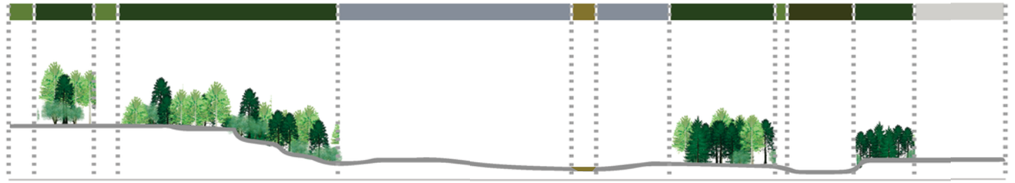

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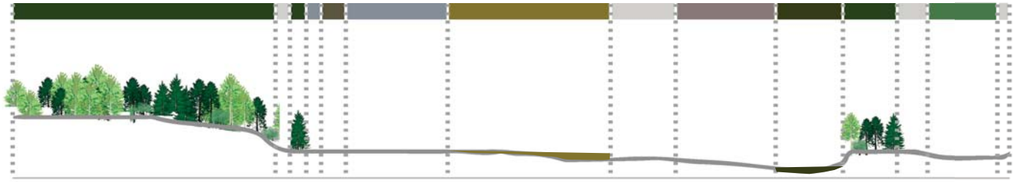
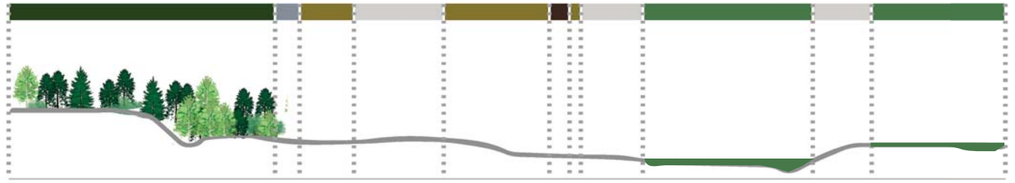


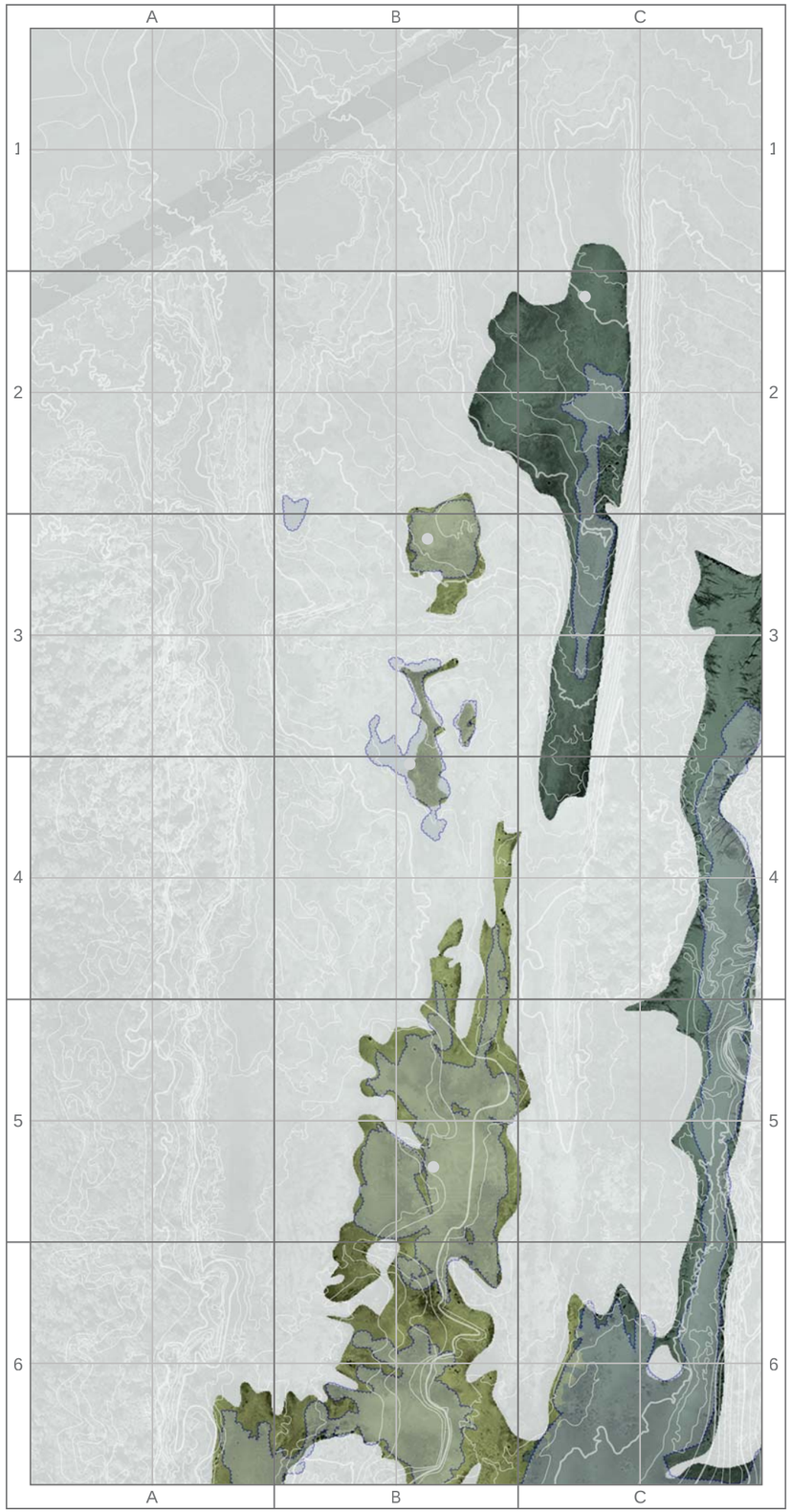
SECTION 5



SECTION 6

0 10 20 40 M

1 : 2500



HYDROLOGY

0 10 20 40 m

1 : 2500

LEGEND

WATER COLLECTION (SUMMER 2018)
LOW GROUND FILTRATION, MAX. DEPTH 0.3 M

WATER COLLECTION (SPRING 2019)
LOW GROUND FILTRATION, MAX. DEPTH 0.3 M

ACCESS ROAD
UNNAMED ROAD, DIVISION 21

LOW POINTS
POINTS OF DISPARITY IN SURROUNDING ELEVATION

CEDAR LAKE RESERVOIR

The reservoir waters are not visible from the borrow pit, as the pit rests approximately 7 metres below Cedar Lake's surface level. In contrast, the dike structure, which runs directly northwest of the borrow pit, is visible from all areas on site.

There is no direct access to the reservoir from this location, although driving further down the access road will reveal vehicle ramps at regular intervals along the structure. The material of the dike mirrors that of the exposed and crushed limestone spread across the borrow pit., with an underlying clay layer.

BORROW PIT WATERS

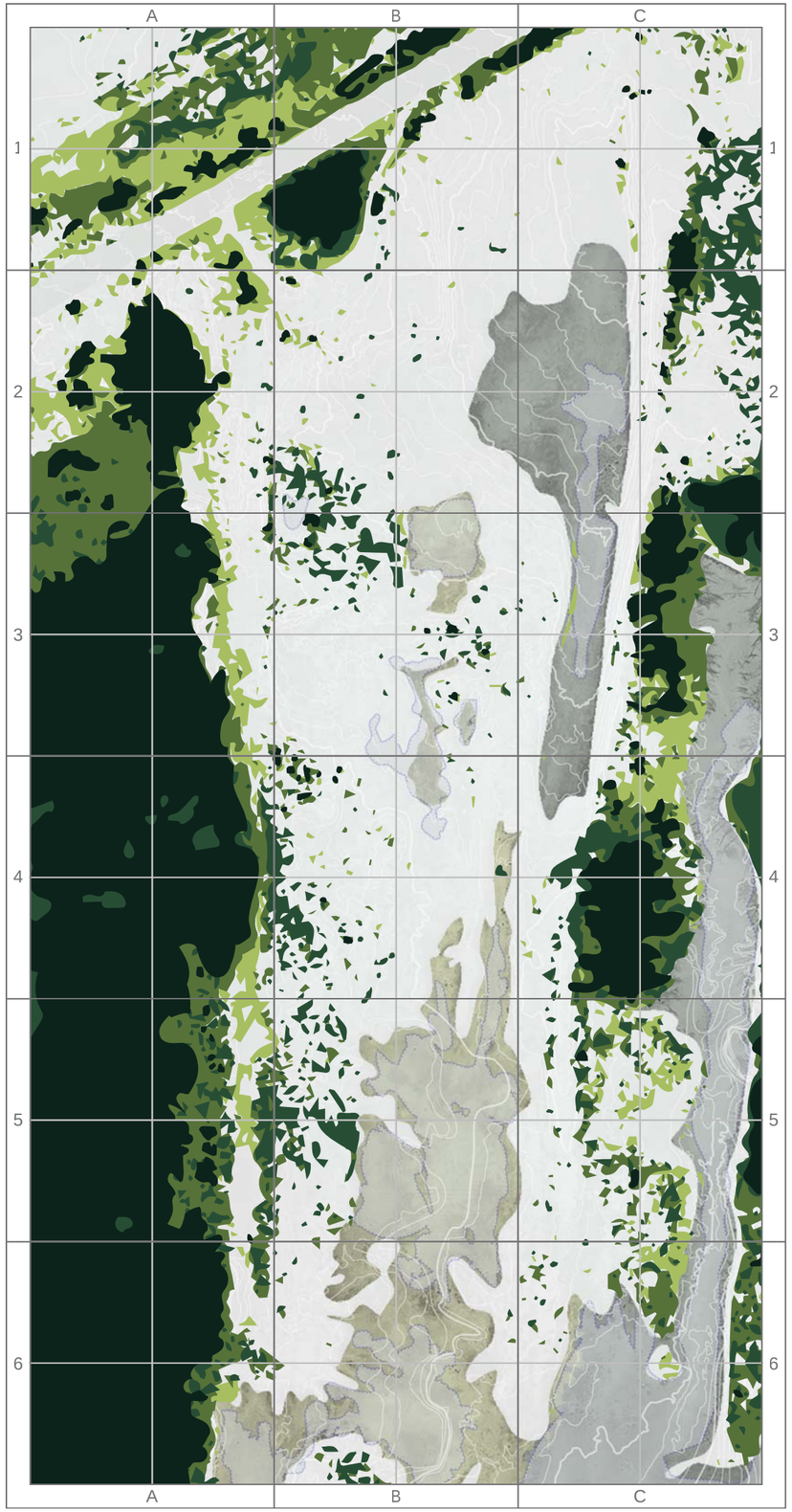
Classified in terms of the site as standing bodies of water of a depth between 0.3 and 0.5 metres, borrow pit waters appear in the immediate surroundings and throughout the site. Around the perimeter of such areas, tall grasses are prevalent, similar to the species found in the low point water collection areas.

Southwest of the site, with a E/W width of approximately 150 m, the largest borrow pit water body is found. This body boasts an impressive array of littoral flora, as excavating practices have left miniature peninsula along its northern border. It can be assumed that this body of water functions as a temporary resting place for water birds, as a *Gavia immer* was observed.

LOW POINTS

At the points of lowest elevation on site, rainwater has collected and remained as standing water, giving rise to small zones of aquatic vegetation. Such vegetation includes *Equisetum fluviatile*, *Typha latifolia*, and *Phragmites australis*, the last of which is classified as an invasive species in Manitoba. The water is at no point deeper than 0.3 m, and the stagnation has allowed for small Mollusca to flourish.

Gavia immer is observed in the borrow pit waters southeast of the site. Aquatic vegetation such as Phragmites australis, and Typha latifolia surrounds the body of water.



VEGETATION

0 10 20 40 M

1 : 2500

LEGEND

VEGETATION 1
>50 YRS OLD GROWTH, MIXED FOREST

VEGETATION 2
UNDERGROWTH & SHRUBS, 2 M-0.5 M HEIGHT

VEGETATION 3
GRASSES & SMALL SHRUBS, 0.5 M-0.3 M HEIGHT

VEGETATION 4
GRASSES & GROUNDCOVER, <0.3 M HEIGHT

ACCESS ROAD
UNNAMED ROAD, DIVISION 21

VEGETATION 1

Including the borrow pit site and its immediate surroundings, vegetation on site consists of four identifiable categories.

Along the eastern and western borders of the site Vegetation 1 is found: mixed forest typical of the mid-boreal lowland ecoregion. The vegetation found in these strips of closed forest is also observed scattered through the site, as evidenced by the information provided in the soil survey. At the northern entrance to the site, a bosque of trees also remains untouched by construction efforts, part of Vegetation 1 type. This bosque is encircled by an entrance loop, originally constructed for heavy machinery access to site.

The N/S forested strips of land have benefited from increased soil and nutrients as a result of topsoil dumping during previous construction. Between the old growth observed in these strips, and the bosque to the north, a picture of the site's former nature comes into focus. Likely dominated by boreal forest, this site is nearly unrecognizable as a part of the mid-boreal lowland ecoregion. The ecoregion, where its original nature still exists, is characterized by mixed boreal forest and poor drainage that has resulted in extensive fen and bog coverage. Areas suitable for borrow pits would have been identified by Hydro as those in need of little draining, whereas grubbing would not have been too large of an issue for the machinery available. Thus it can be deduced that the borrow pit site was at one time largely forested, not wetland.

VEGETATION 2

Vegetation 2 type is found in and around Vegetation 1, consisting of the undergrowth layer of the forest, and smaller shrub species.

VEGETATION 3 + 4

The last two typologies, Vegetation 3 & 4, account for grasses and groundcover, existing largely on the margins of the closed forest, and in areas of increased ground moisture.

TYPE	DOMINANT VEGETATION
VEGETATION 1 + 2 *FOREST AND UNDERSTORY*	Aspen (*Populus*) Balsam Poplar (*Populus balsamifera*) Balsam Fir (*Abies balsamea*) Black Spruce (*Picea mariana*) White Spruce (*Picea glauca*) Feathermosses (*Hypnales*) Jack Pine (*Pinus banksiana*) Willow (*Salix*)
VEGETATION 3 + 4 *EXPOSED LIMESTONE AND CLAY*	stunted Black Spruce (*Picea mariana*) stunted Tamarack (*Larix laricina*) Swamp Birch (*Betula alleghaniensis*) Sedges (*Cyperaceae*) Mosses (*Sphagnum*)

BORROW PIT WALL

112% slope

BORROW PIT WATERS

Low ground filtration, max depth 0.3 m

JACK PINE

Pinus banksiana

PAPER BIRCH

Betula papyrifera

COMMON SWEET GRASS

Hierochloe ordata

GUYED STEEL TOWER

100 m right-of-way width, 500 kV

RED OSIER DOGWOOD

Cornus sericea

COMMON JUNIPER

Juniperus communis

ELEGANT SUNBURST LICHEN

Xanthoria elegans

BORROW PIT WATERS

Low ground filtration, max depth 0.3 m

BALSAM GROUNDSEL

Senecio pauperculus

COMMON REED GRASS

Phragmites australis

TIMOTHY-GRASS

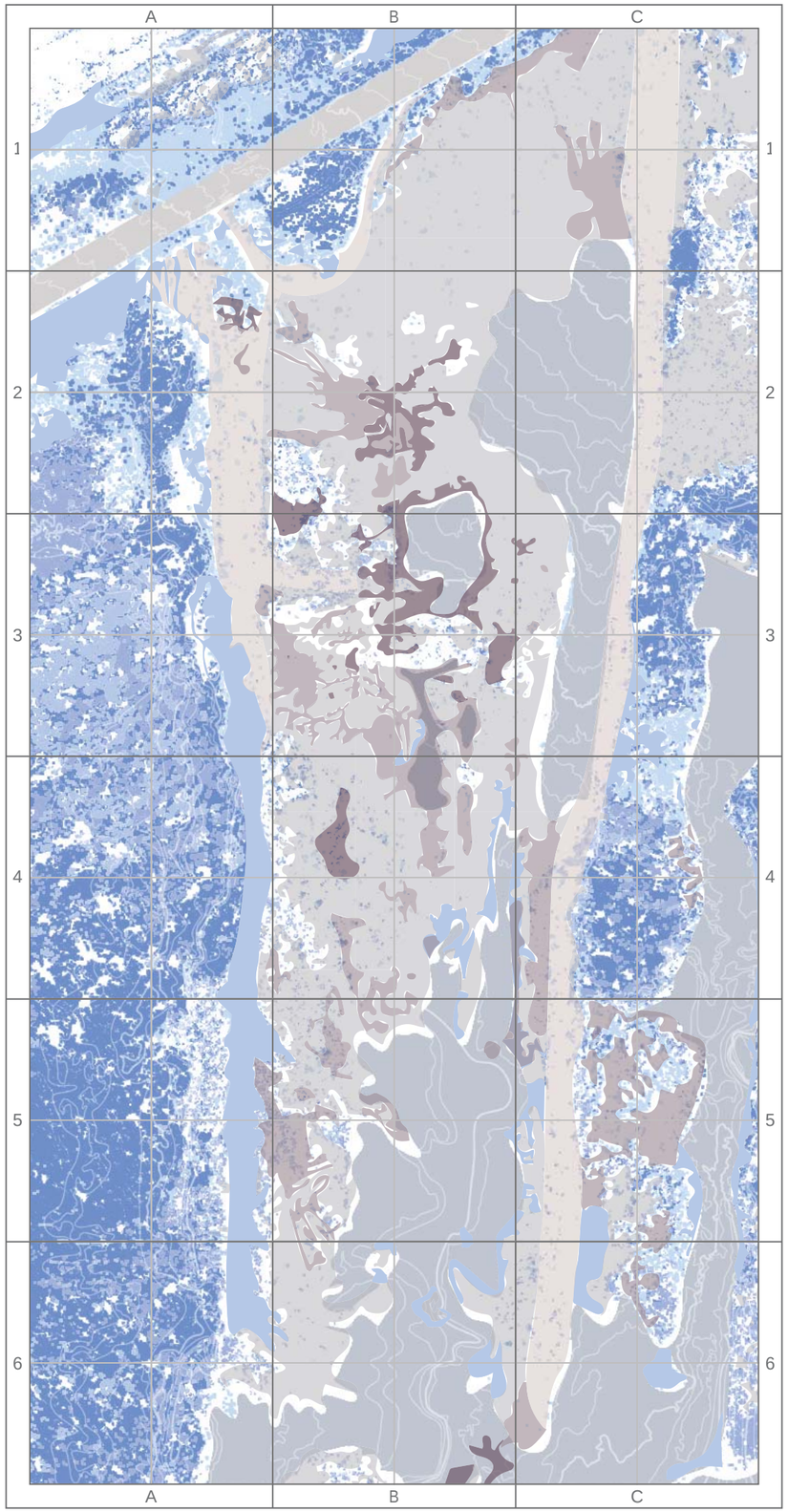
Phleum pratense

BLACK SPRUCE

Picea mariana

BP GROUND PHOTOGRAPHY

June 27, 2018, 1:00 p.m.



SOILS

0 10 20 40 M

1 : 2500

LEGEND

WATER BODIES
AS OF JUNE 2018

CLAY
MOISTURE INCREASES WITH DARKNESS

GRAVEL PATHS
CONSTRUCTION VEHICLE PATHS

ACCESS ROAD
UNNAMED ROAD, DIVISION 21

SOIL HISTORY

As observed in the regional soil survey, the borrow pit originally existed as part of the Chitek Series, with extremely calcareous, loamy till as the prevailing soil material. On such a basis, it is expected to find vegetation such as *Picea mariana*, *Populus*, and *Salix*.

The site has maintained such soil material in N/S strips of approximately 150 m in width. These remaining strips were excluded from the grubbing and stripping processes performed on the borrow pit site, as topsoil and upper layers of the landscape were removed. Some of the upper layer was distributed in Hydro's construction of the Hybord neighbourhood for landscaping its employee's housing area. It can be presumed that some material was deposited in the most efficient method, directly along the sides of the linear borrow pit. This dumping method, now prohibited under Hydro's environmental standards, contributed to the lush nature of these closed forest stands.

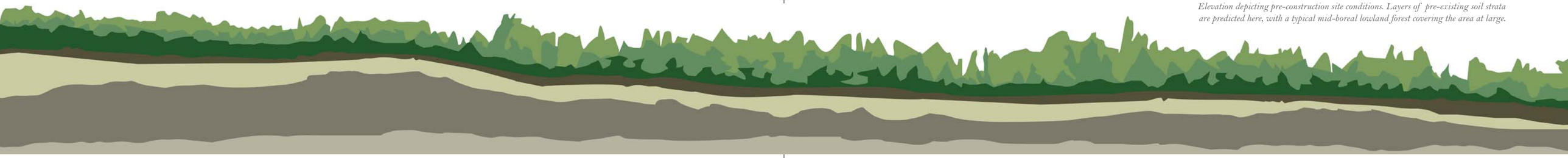
The stands exhibit varied undergrowth species, including *Cyperaceae*, *Hypnales*, sphagnum and peat mosses, and ericaceous shrubs, all typical of the rich loams previously covering the borrow pit site.

As for the borrow pit site itself, the majority groundcover is observed to be clay, with outcroppings of limestone bedrock and boulders. Vegetative areas on site often coincided with boulder groupings, in which topsoil was caught and propagated plant life, species such as *Picea mariana*, *Populus*, and *Pinus banksia* were observed.

INVENTORY

The following represents the original soil profile of the borrow pit site, originally catalogued by the Land Resource Research Institute of Agriculture Canada.

LEGEND	PROFILE TYPE	LANDFORM	TOPOGRAPHY	SOIL MATERIAL
CHITEK SERIES *IMPERFECT DRAINAGE*	Gleyed eluviated eutric brunisol	Ridged moraine	Level to undulating	Extremely calcareous, loamy, very stony till



Elevation depicting pre-construction site conditions. Layers of pre-existing soil strata are predicted here, with a typical mid-boreal lowland forest covering the area at large.

Pre-Construction (pre-1960)

SOILS

The original soil profile of the borrow pit, defined by the Canada-Manitoba Soil Survey, is part of the Chitek series, whose profile type is specifically Gleyed Eluviated Eutric Brunisol on glacial till. The till of the Chitek series is calcareous, loamy, stony fill, with a pH ≥ 5.5. This soil profile results in imperfect drainage. The ecodistrict includes two other significant soil profiles: Gray Luvisols on clayey, glaciolacustrine sediments, and Humic Gleysols/ Cumulic Regosols on alluvial deposits. The borrow pit site originally would have drained into the Saskatchewan River, though now, due to excavation, it is marked by standing water. Grand Rapids at large drains east, as a part of the Lake Winnipeg Watershed. Topography ranges from level to undulating, and the landforms are influenced by north-south ridged moraine, over Paleozoic limestone bedrock.

FOREST-STAND SPECIES

Part of the mid-boreal lowland ecoregion, of the boreal plains ecozone, the forested areas of Grand Rapids consist of mixed-forest species including *Picea mariana*, *Populus tremuloides*, and *Salix*. Other species in the ecodistrict include *Populus balsamifera*, *Picea glauca*, and *Abies balsamea*. Due to frequent forest fires in bedrock-dominated zones, *Pinus banksiana* is also widespread throughout the ecodistrict.

UNDERSTORY SPECIES

Much of the mixed-forest zones are closed, meaning that the understory tree species are reflected in the greater forest-stand. In fen zones, species such as *Cyperaceae* and *Larix laricina* are observed. Bog areas support *Picea mariana* and ericaceous shrubs.

GROUND COVER

The uppermost layer of the Chitek soil profile is ≤ 7 cm of partially decomposed, slightly acidic leaf litter; with dark to reddish-brown colouring. This ground cover is typical in areas of closed mixed-forest stands. Fen and bog peatlands cover much of the remaining ecodistrict, both supporting *Byrophyta*, with fens supporting brown moss, and bogs supporting sphagnum moss.

FAUNA & HABITATS

Areas of the borrow pit site identified as coniferous-deciduous productive forest, 6 bird species and 12 mammalian species typical to the ecoregion have been recorded. 18 more bird species were documented within marsh and treeless muskeg shrub bogs, along with 4 mammals (see *Species*).

Post-Construction (1960-present)

SOILS

The soils surrounding the linear borrow pits that run perpendicular to the Cedar Lake Reservoir still fall within the Chitek series. However, this loamy fill is no longer found in the borrow pits themselves. Rather, exposed Paleozoic glacial till (largely dolomite rock) is what remains after the complete grubbing and stripping process conducted in the 1960's. As a result, the surface layer is majority clay, with exposed limestone and boulders.

FOREST-STAND SPECIES

Mixed-forest remains along the east and western borders of the borrow pit. These border areas are a gradation of untouched forest, dating to pre-1960, on the far edges of the site, to rich topsoil, deposited during the grubbing process directly on either side of the disturbed site. Tree species existing prior to the disturbance of the site can be found returning in clusters, including *Populus balsamifera* and *Picea mariana*.

UNDERSTORY SPECIES

Understory species along the borders of the site are varied and lush, due to the quality of loam deposited during the construction process, and then left to natural succession. Species in particularly moist areas of the understory include *Cypripedium reginae* and *Equisetum fluviatile*.

GROUND COVER

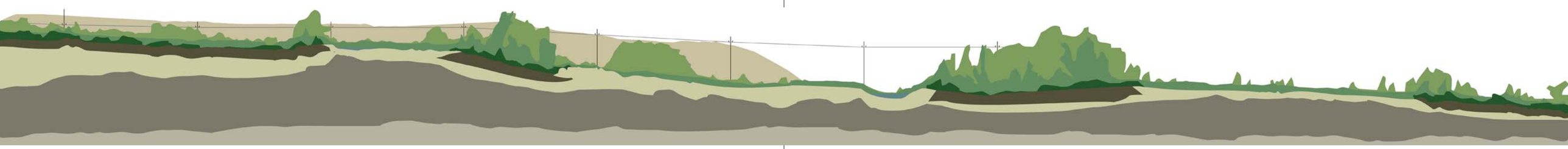
On site ground cover species consist mainly of invasive grasses, ranging from limestone-tolerant *Phleum pratense*, to aquatic species like *Phragmites australis*. Several ruderal wildflowers were observed, including *Campanula rotundifolia*, *Lilium philadelphicum var. andinum*, *Cypripedium reginae*, and *Senecio pauperculus*. Such species have arisen as a result of original habitat disturbance by Manitoba Hydro.

FAUNA & HABITATS

Due to habitat destruction, many species can no longer be found in the area. Those which were identified by either their physical presence or that of scat/prints amounted to 4 bird species, and 3 mammalian species.

SPECIES

The following species were identified pre-construction: *Lepus americanus*, *Castor canadensis*, *Alces alces*, *Canis familiaris*, *Ursus americanus*, *Rangifer tarandus*, *Lynx canadensis*, *Bison bison*, *Mustela vison*, *Ondatra zibethicus*, *Eutamias minimus*, *Erethizon dorsatum*, *Martes pennanti*, *Lutra canadensis*, *Vulpes fulva*, *Tamiasciurus hudsonicus*, *Martes americana*, *Marmota monax*. Post-construction review was able to identify physical proof of approximately 1/4 of these species.



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Elevation depicting post-construction site conditions. Hydro poles are visible in the distance, backed by the Cedar Lake Reservoir dike. Soil strata reflects construction processes.

Climate Data

Detailing yearly averages

Located within climate zone 2b, according to USDA, Grand Rapids represents the mid-range of plant species hardiness in Manitoba, which on whole ranges from zones 0a to 4a.

An understanding of climate patterns and the growing season direct the design and dictate the site's main period of use. The selection of vegetation and hard materials which appear in the site design were based on those appropriate for a climate with a distinct yearly temperature variance (48 degrees C).

The discipline of landscape architecture cannot ignore the increasing climate crises that threaten the habitability of Canada's northern regions, and our planet as a whole. In response to these changes, landscape architects must integrate large-scale concepts in small-scale designs. Such concepts include the monitoring of climate patterns, the use of sustainable, low emission materials, and the understanding that design will have to adapt to an ever-changing earth.

West-facing sky of Grand Rapids, captured during a drone survey on April 17, 2019, at 4:50 p.m.

Grand Rapids, MB
Climate Patterns 1980-2016

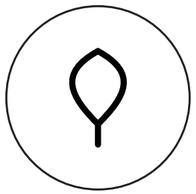
Data collected by Weather Spark. Icons pictured refer to temperature, sun, wind, cloud cover, and precipitation patterns.

WARM SEASON

May 26-Sept 15, avg. high >+16 C
(HOTTEST DAY: July 24 high +24 C)

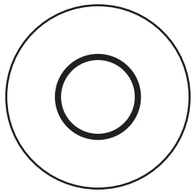
COLD SEASON

Nov 27-Mar 3, avg. high <-6 C
(COLDEST DAY: Jan 14 low -24 C)



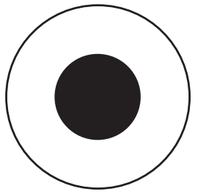
GROWING SEASON

3.6 months of consistent temperatures above 0 C, May 29-Sept 17



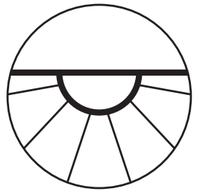
BRIGHTER PERIOD

Apr 29-Aug 18
(BRIGHTEST DAY: 6.6 kWh, June 26)



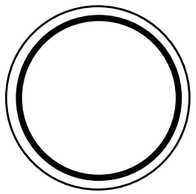
DARKER PERIOD

Oct 23-Feb 16
(DARKEST DAY: 0.7kWh, Dec 19)



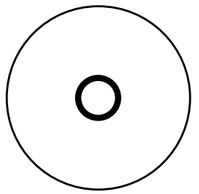
SUNSET

EARLIEST: 16:19 Dec 13
LATEST: 22:08 June 24



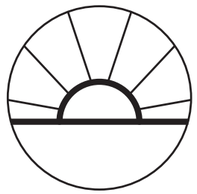
MOST DAYLIGHT

June 21, 16hrs 58min



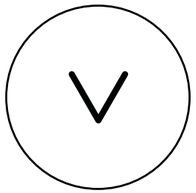
LEAST DAYLIGHT

Dec 21, 7hrs 32min



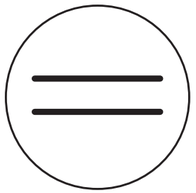
SUNRISE

EARLIEST: 05:09 June 17
LATEST: 08:51 Dec 30



NORTHERN WIND

Jan 27-May 31, June 8-June 24,
Sept 5-Oct 27



CLEAR PERIOD

Apr 11-Oct 19
(CLEAREST DAY: Aug 1)

WET SEASON

May 6-Oct 9
(WETTEST DAY: June 23)

SOUTHERN WIND

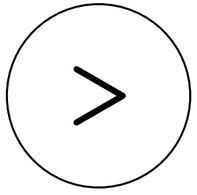
Negligible

CLOUDY PERIOD

Oct 19-Apr 11
(CLOUDIEST DAY: Feb 15)

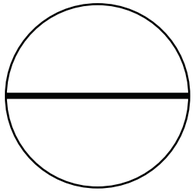
DRY SEASON

Oct. 9-May 6
(DRIEST DAY: Dec 31)



WESTERN WIND

June 24- Sept 5, Oct 27-Jan 27

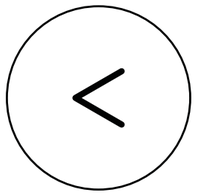


CALM PERIOD

Oct 28-Mar 15, avg. speed <15 km/h
(CALMEST DAY: Nov 27, 12 km/h)

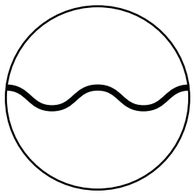
RAIN STATISTICS

(ONLY RAIN: April 8-Nov 9
MOST RAIN: June 12-July 11)



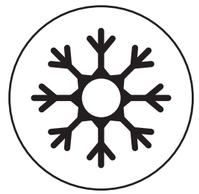
EASTERN WIND

May 31-June 8



WINDY PERIOD

Mar 15-Oct 28, avg. speed >15 km/h
(WINDIEST DAY: April 25, 18 km/h)



SNOW STATISTICS

(ONLY SNOW: Nov 9-Apr 8
MOST SNOW: Nov 16-Dec 15)

Environmental Protection

Examining Manitoba Hydro practices

The following is a review of the contemporary environmental protection practices of Manitoba Hydro, contrasted against on site observations of the work done at the borrow pit site. Through this review and comparison, it becomes clear that the 1960's-era project operated under virtually no constrictions regarding environmentally-conscious construction practices and habitat rehabilitation.

Due to a lack of treatment, the site exists today largely as it did following its decommissioning in the 1960's: a linear landscape scar consisting of exposed clay, limestone boulders, and varied grass species. Patches of woody vegetation can be observed throughout the site in areas of increased ground moisture, and the site overall is flanked by two closed mixed forest stands along its eastern and western borders. (refer to *Site Portrait* for further analysis).

From these observations, it is interesting to consider what the nature of the site may have been if current environmental rehabilitation practices had been in place, and it is possible to develop a site design that begins this rehabilitation process as soon as possible.

"The best time to plant a tree is twenty years ago.
The second best time is now."

-source unknown

A patch of Equisetum fluviatile, or swamp horsetail, grows along the western border of the borrow pit site, backed by a mixed forest.

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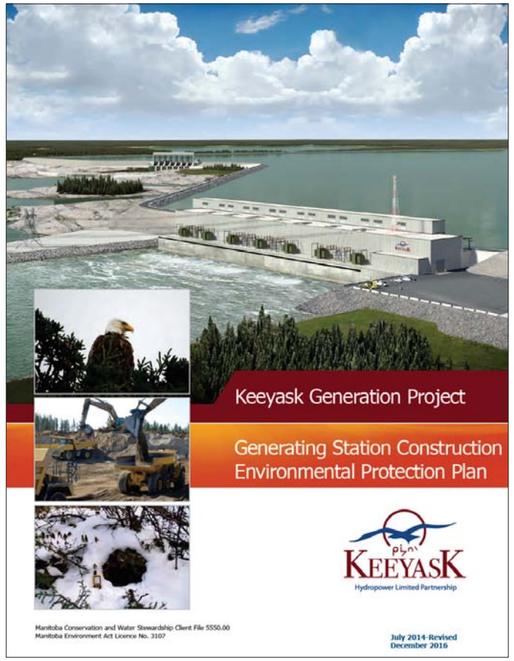
To gain insight into Manitoba Hydro's current environmental protection standards, the following is a review of Manitoba Hydro's 2016 specifications, as defined in the *Keeyask Generation Project: Generating Station Construction Environmental Protection Plan* (hereafter referred to as the "Keeyask document").

In tandem with this review, site documentation of the current state of the borrow pit provides proof of the disparity between current practices and that of a 1960's-era Manitoba Hydro project.

The gridded map opposite highlights particular points on site in which a physical contradiction of current environmental practices was observed. Ground details are denoted by circular icons; site perspectives are denoted by triangular icons, with the acute point of the triangle indicating the spot at which the photo was taken. The corresponding numbers will be used as reference in the following analysis images.



TERRESTRIAL HABITAT PROTECTION

The first of Hydro's environmental practices put into action before engaging in site construction is the protection of terrestrial species habitats. The measures put in place under these regulations work to ensure minimal impact to existing fauna and plant life. The protective orders may include physical habitat buffers, temporary relocation, and/or eradication of invasive species. The following three regulations were chosen to review, as restoration of the borrow pit site would have benefited from their implementation.

(7.2 FISH, WILDLIFE AND TERRESTRIAL HABITAT PROTECTION)

1

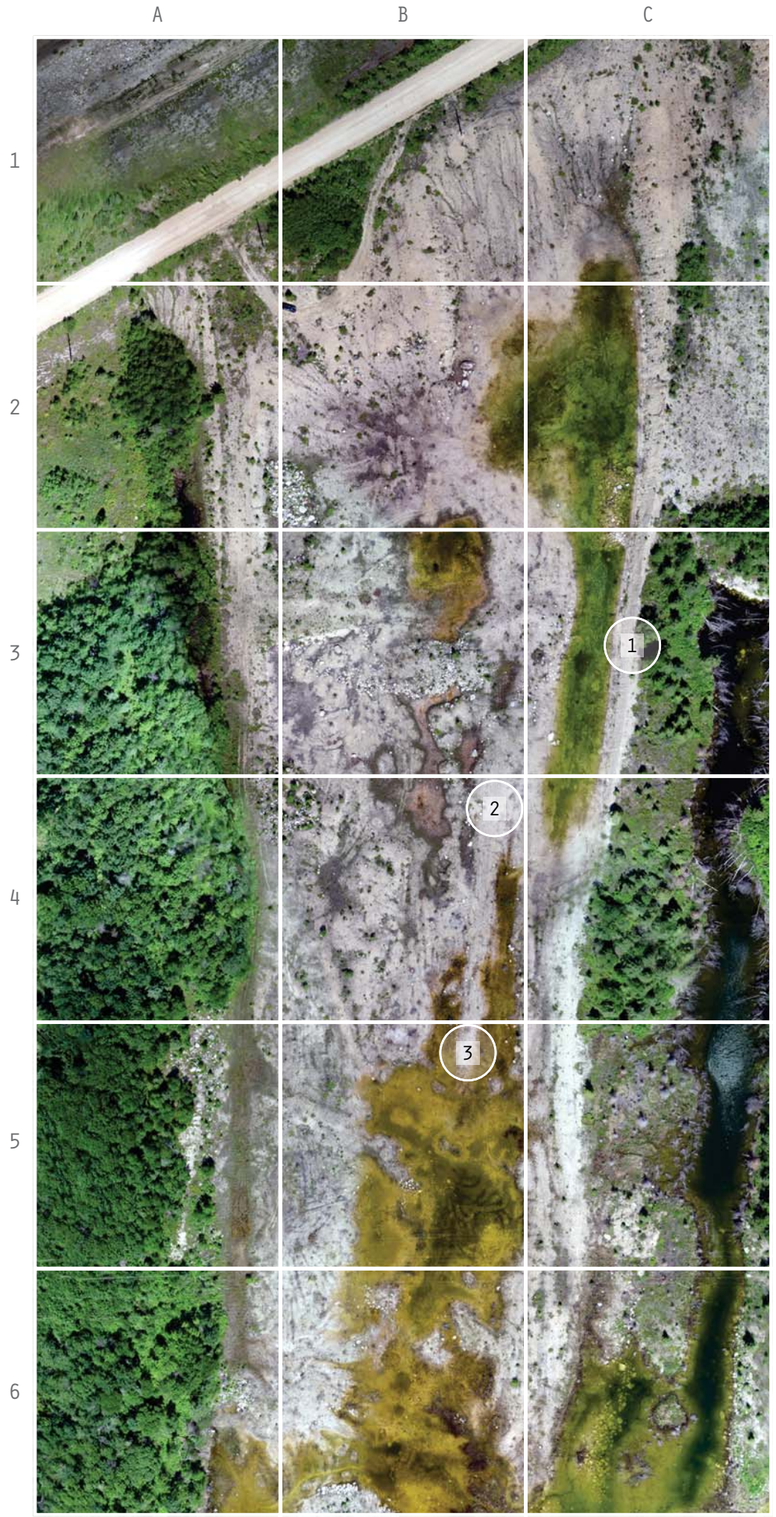
Terrestrial species whose habitats are protected with a habitat buffer or a relocation order include gray wolf, black bear, wolverine, caribou, beaver, and muskrat. (Manitoba Hydro, 2016, p. 7-5)

2

100m vegetation buffers are ordered as a protection measure for bird and mammal habitats within creeks, streams, ponds, and lakes that are adjacent to project site. (p. 7-6)

3

Where invasive plants threaten existing site vegetation, habitat protection in the forms of containment, eradication, and/or control programs will be implemented. (p. 7-6)



Castor canadensis had gnawed away at several trees along the eastern border of the site. No dam was observed in the area immediately surrounding the borrow pit, although a previous site survey with a larger focus area revealed the presence of the species on the southern side of the floodway gates.

Young trees in the center of the borrow pit site were also affected by debarking, indicating that the specimen was collecting material for both food and shelter.

Odocolieus virginianus tracks were among the few pieces of fauna evidence on site. These tracks were observed running N-S along the center line of the borrow pit site. Further evidence of fauna on site included the scat of *Canis familiaris*.

No evidence of species warranting a habitat buffer was found, although further observation would be necessary to rule out their presence altogether. Understanding of the ecoregion, combined with archaeological reviews, would indicate the presence of species including, but not limited to: *Alces alces*, *Lepus americanus*, *Ondatra zibethicus*, *Vulpes fulva*, *Marmota monax*, and *Ursus americanus*.

Phragmites australis, classified as an invasive species in Manitoba, was found in several areas surrounding water collection on site. The presence of this species implies that water is present in certain areas year-round, as well as indicating a distinct type of ground material; alkaline clay. Understanding the ground conditions sets a precedent for choosing future plantings.

The presence of this particular invasive species, identified by its dense stands, implies that few attempts at eradication were made on the part of Manitoba Hydro.

EROSION & SEDIMENT CONTROL

During and post-construction, Manitoba Hydro has established clear regulations for maintaining site integrity, and the processes necessary for rectifying a disturbed site. These regulations are achieved through an understanding of native plants and the value of unique ecoregion habitats, as reseeding processes take place. The following points dictate three distinct actions and considerations to be completed.

(7.9 EROSION AND SEDIMENT CONTROL)

4

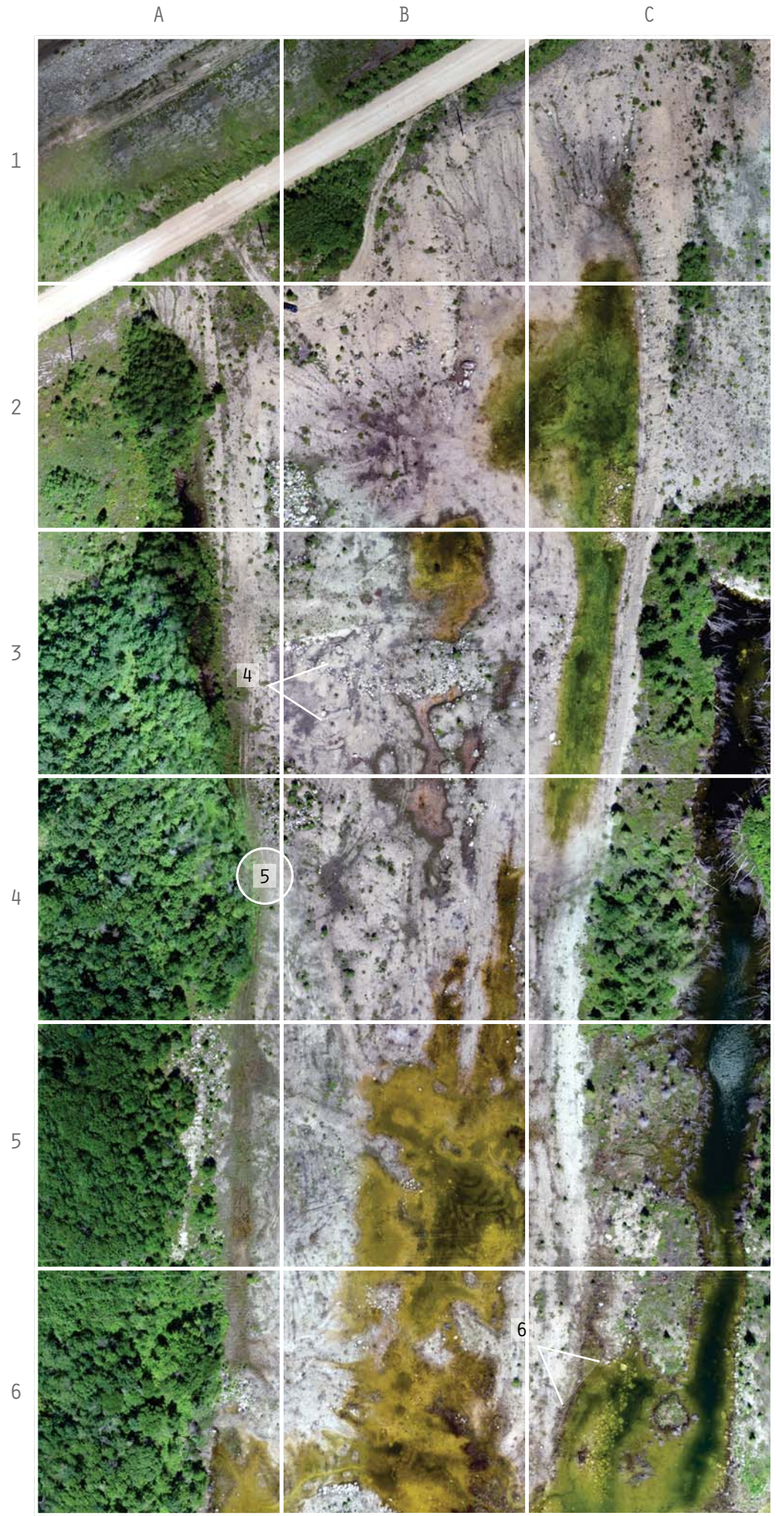
Following construction, areas that underwent sediment removal will be vegetated/seeded to stabilize and prevent further erosion. (Manitoba Hydro, 2016, p. 7-12)

5

Seed mixes that are employed to control erosion will consist solely of either native species or introduced species confirmed to be non-invasive, as approved by Manitoba Hydro. (p. 7-11)

6

Disturbed areas, e.g. borrow pits, within 100m of wetlands will undergo containment practices to prevent damage to these high-quality ecosystems. (p. 7-12)



Observing the layout of fines that follow a dune-like pattern in sloped areas of site, there is no evidence that the borrow pit was stablized by vegetation following construction processes.

Erosion control measures are nonexistent on site, and vegetation that has appeared on sloped ground are hardy, ruderal species, such as *Portulaca oleracea*, not the result of considerate planting. Such species occur sporadically throughout the site.

The borrow pit fines and chemicals were not contained to protect wetland ecosystems, although species such as *Gavia immer* have returned to stagnant water collection areas on site. Many wetland ecosystems, common to the ecoregion, were flooded to during the creation of the Cedar Lake Reservoir, and those that were not are likely to have suffered the effects of chemical runoff.

GRUBBING

Following the protection of existing terrestrial habitats, the next step in the environmental protection process is to monitor grubbing activity.

To prepare a landscape to work as a borrow area, it is necessary to conduct grubbing, which consists of the removal of the top layer of organic matter, including any root systems. The following points detail general constrictions of this process, the potential results of this which are not observed in the current state of the borrow pit.

(7.11 GRUBBING)

7

Grubbing is prohibited within 6m of tree stands, with the primary intention of protecting root systems, and along shorelines, excluding sites that have been designated for construction. (Manitoba Hydro, 2016, p. 7-14)

8

Erosion stabilization of the grubbed site should occur as soon as possible, through grading and/or seeding processes. (p. 7-14)

STRIPPING & GRADING

Following grubbing, a borrow pit must be stripped of topsoil, which is required as of 2014 by Manitoba Hydro to be deposited and vegetated offsite with plans for future reimplementation. The grading process, which occurs concurrently with stripping, ensures that the site will be available for future vegetative rehabilitation, or construction projects. The following points outline Hydro's current practices regarding the handling of excavated/stripped material.

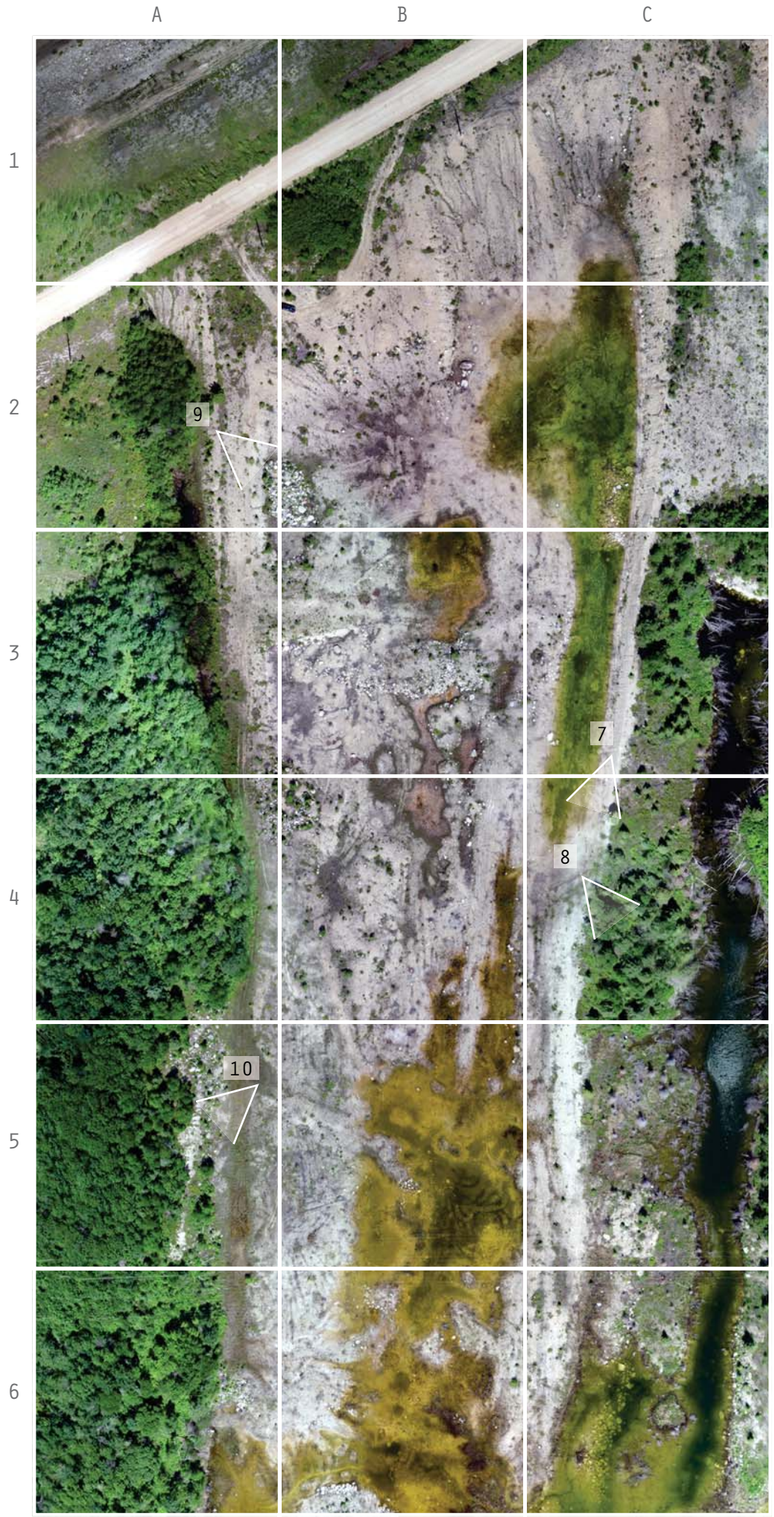
(7.12 STRIPPING AND GRADING)

9

Where stripping occurs, the material that will be retained for future site rehabilitation includes organic material, topsoil, and overburden. These materials will be piled separately from inorganics. (Manitoba Hydro, 2016, p. 7-14)

10

Material stockpiles will be stabilized, and covered in a layer of vegetation, if they are stored for an extended period of time. The purpose of the vegetation is threefold: the minimization of nutrient loss, prevention of fine erosion, and maintenance of stockpile structure. (p. 7-14)



0 10 20 40 m

1 : 2500

Due to ingrowth over time, there is no definitive line that marks construction limits. By observing vegetation physically leaning in towards the borrow pit, due to ground cover and root disruption, it can be deduced that grubbing occured up to, and perhaps through, existing tree stands.

No contour evidence was observed that would suggest erosion stabilization processes were ever put in place. Due to this neglect, fines have been sifting into the tree stands bordering the site, potentially choking out smaller species in the undergrowth layer.

No organic material stockpiles were observed in areas surrounding the site. Inorganic materials left on site are piled without the clear intention of site rehabilitation. As these stockpiles inadvertently contained fertile soil displaced during grubbing, these areas now host some of the most successful vegetative areas in the borrow pit.

The method of vegetating stockpiles was not implemented offsite, and this particular pile of inorganic material, observed in the the southwest corner of the borrow pit, has been abandoned to erode fines into the adjacent tree stand.

DECOMMISSIONING & REHABILITATION

It is crucial for the rehabilitation process that those in charge understand the previous nature of the site, and have taken the steps mentioned in pre-construction to maintain site integrity. Parties to be consulted through the decommissioning and rehabilitation stages of the project include Manitoba Mineral Resources, and Manitoba Sustainable Development, who is to be represented by a Conservation Officer.

Site rehabilitation specifications are deemed to be case-specific, and a separate document is created for each project undergone by Manitoba Hydro. Present across all projects is the responsibility of Manitoba Hydro to remove all equipment, structures, fuel, and stockpiles from site. This accounts for the removal of all items, both chemical and physical, that were not on site prior to the project's commencement, and are not required for ongoing project operation. (fig. 11)

(7.25 DECOMMISSIONING & REHABILITATION)

12

The walls of borrow areas must not exceed a slope of 25%; this may be overruled by Manitoba Hydro. (Manitoba Hydro, 2016, p. 7-23)

13

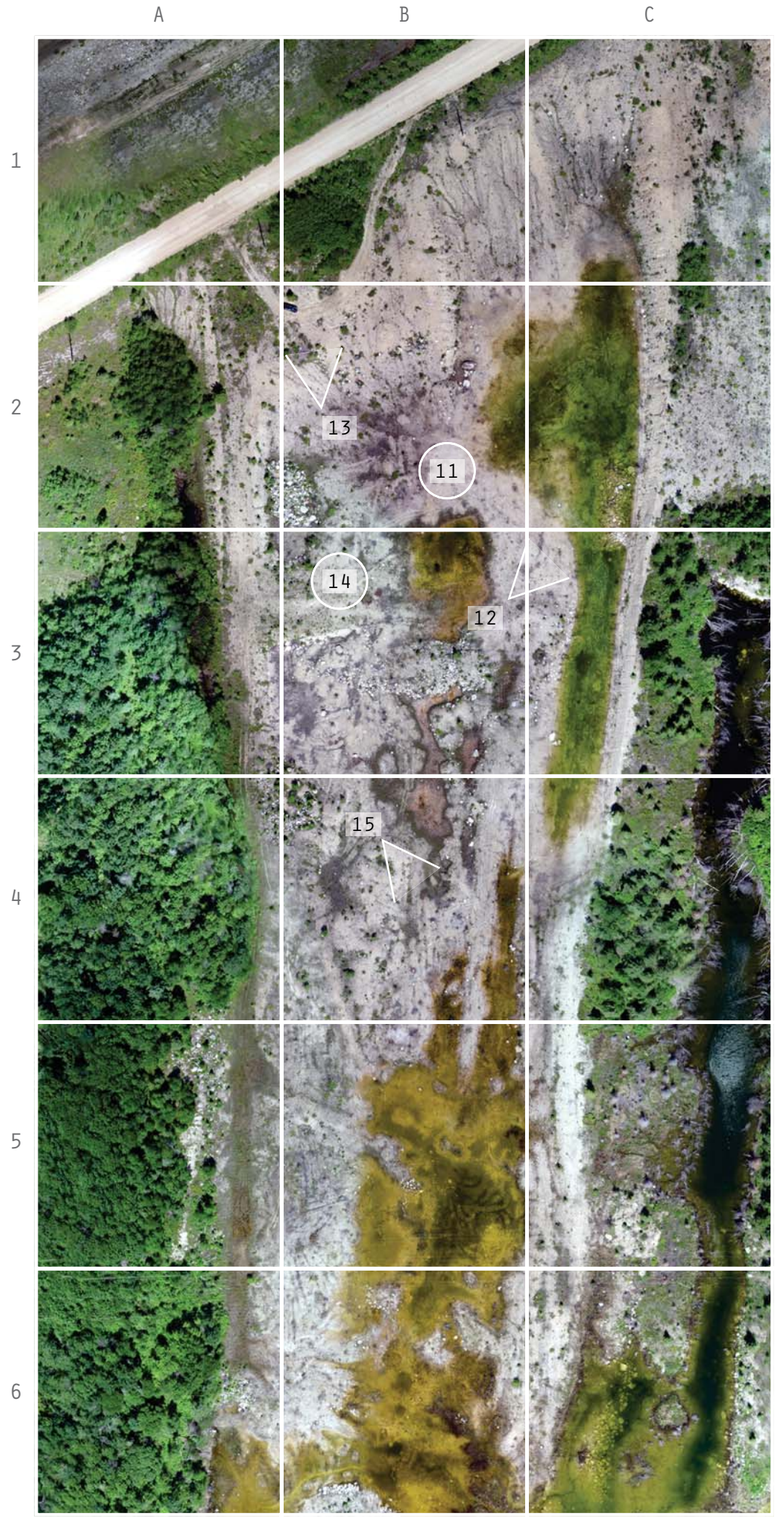
Sites will have physical protection, in the form of vehicle barricades at former access points, to prevent human interference that would hinder encourage the rehabilitation process. (p. 7-24)

14

Landscaping methods such as the spreading of organic material/seeding/planting will occur in borrow areas and quarries, and future use of the site will be considered with adequate drainage and eventual revegetation as direct goals. Stockpiles consisting of organic material/topsoil/subsoil, will be returned to and spread across the decommissioned site. (p. 7-24)

15

Sites will be analyzed to determine suitable preparation methods that will lead to reestablishing vegetation. Such methods may include scarification, grading, contouring, and fertilizing. All seed mixtures applied in the process of revegetation will consist solely of either native species or introduced species confirmed to be non-invasive, as approved by Manitoba Hydro. Additionally, species will tend towards those that will not be susceptible to deer and other wildlife. (p. 7-24)



0 10 20 40 m

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Pieces of unidentified metal debris can be found on site, further proving that the care and attention to detail Hydro now promises were not present during the 1960's era project.

All four embankments that surround the borrow pit exceed the maximum slope of 25%, with the east side reaching 112% at its steepest grade.

Former access points to site via roadway display no signs of the existence of vehicle barriers.

Exposed limestone and clay characterize the ground plane of the site; no spreading of organic material is evident.

Native species have begun to populate the site, in no part due to revegetation practices by Manitoba Hydro. No scarification, grading, or topsoil cover is observed on site.

Education Principles

Curriculum Methodology

With an understanding of the landscape layers of the borrow pit site, and knowledge of professional rehabilitation practices, the final component considered in the creation of a holistic site design is approaches to education, and pedagogical concepts.

Of particular consideration were the educational practices and community programs already in place in Grand Rapids; the provincial standards of education in Manitoba, and approaches that address the need for adaptable spaces.

As the site is intended for young students as its primary users, the following pedagogies were reviewed:

1. Grand Rapids School & Community
2. Grand Rapids Culture Camp
3. Indigenous Guardians
4. Seven Cree Teachings
5. Manitoba Science Curriculum
6. Reggio Emilia

Western shore of Lake Winnipeg, as seen from the Grand Rapids Culture Camp on April 17, 2019.

A boat docking station on the west side of Lake Winnipeg serves as a popular recreational gathering hub during the summer months.

Beautifying efforts by the high school horticultural class have been taken to establish flower plantings in Grand Rapids' Memorial Park.

GRAND RAPIDS SCHOOL & COMMUNITY

Grand Rapids School offers an ever-increasing amount of nature-based education opportunities. Beautifying initiatives bring the students out of the classroom to the town's memorial park; horticulture classes are offered at a high school level, and students in the middle school classes have been implementing raised garden beds in their backyards, fostering productive crops and engaging parents in the program.

While the school works to promote outdoor education as much as possible, individual teachers introduce nature learning in unique ways. An example worth noting is a former grade 3 teacher whose instruction included trips into the bush to locate and identify plant species. Buses are available throughout the day to transport students to and from school, and there is precedent for spur-of-the-moment trips. While teachers have freedom to create programming, the turnover of faculty at the school means that, at this time, there is no long-standing environmental program that engages with students at the elementary school level.

Several environmental projects are on the horizon for implementation in the community. Teachers at Grand Rapids School have expressed interest in developing a beekeeping community, to complement the beautification practices already in place. A program offering literacy in mushroom growth and picking is set to be established, which will provide a more abstract approach to environmentalism, as the species can grow in highly varied habitats. Most recently, funding has been allocated for a new greenhouse to be constructed behind the school, as the Health Authority and Manitoba Hydro are eager to contribute to the town's environmentalist agenda. Greenhouse construction and operation will be a community endeavour, with the intention of creating a sense of ownership and pride in the project.

The notion of ownership and community pride is considered in the proposed design of the borrow pit site. When the community has a hand in project development, they will be more likely to maintain said creation, as opposed to a project implemented without consultation or community engagement. Furthermore, creating a physical framework in a site of interest will allow teachers to develop curriculum that can be more easily continued should they leave Grand Rapids.

SEVEN CREE TEACHINGS

Represented in various artistic forms throughout Grand Rapids School are the Seven Grandfather Teachings, some form of which is present in most Indigenous denominations.

These teachings are meant for students to apply in their everyday lives, not only in their work at school. Each teaching provides a different aspect of guidance in how to approach relationships with friends, family, and the environment.

THE EAGLE – LOVE

"Love all people and all creatures of the world and this love will be returned to you" (Seven Grandfather Teachings: Character Development, p. 13)

Encouraged and valued as the core of all relationships, love is considered "the greatest and most powerful medicine and healing agent" (p. 13). This love is meant to extend beyond interpersonal relationships to include one's relationship with the world and its creatures.

THE BEAVER – WISDOM

"(Know your) gifts and use them to the best of (your) abilities" (p. 14)

Wisdom is exemplified in the work of the beaver, a creature that recognizes its talents and uses them in the most productive way. All members of a community have been given gifts of skill, and with wisdom they can.

THE TURTLE – TRUTH

"Always seek truth. Living the truth is living the Seven Teachings" (p. 12)

The markings of the turtle's shell represent all Seven Sacred Teachings, given to humans by the Creator. Also visible in the markings of the turtle is an old calendar, which is defined by the true movement of the earth.

THE WOLF – HUMILITY

"The animal must share for the survival of the pack" (p. 14)

A lesson in humility is also one in community awareness. To have humility is to understand your place in the world and do the most you can to fulfill your obligations.

THE BUFFALO – RESPECT

"This spirit of respect was shown toward all of life because Native people saw the interconnectedness to all life" (p. 13)

Respect is the true connector between humans and nature. If one is to rely on the land for sustenance and shelter, respect for all it provides is crucial.

SABE – HONESTY

"In order to have a strong spirit we must be honest to ourselves and to others" (p. 13)

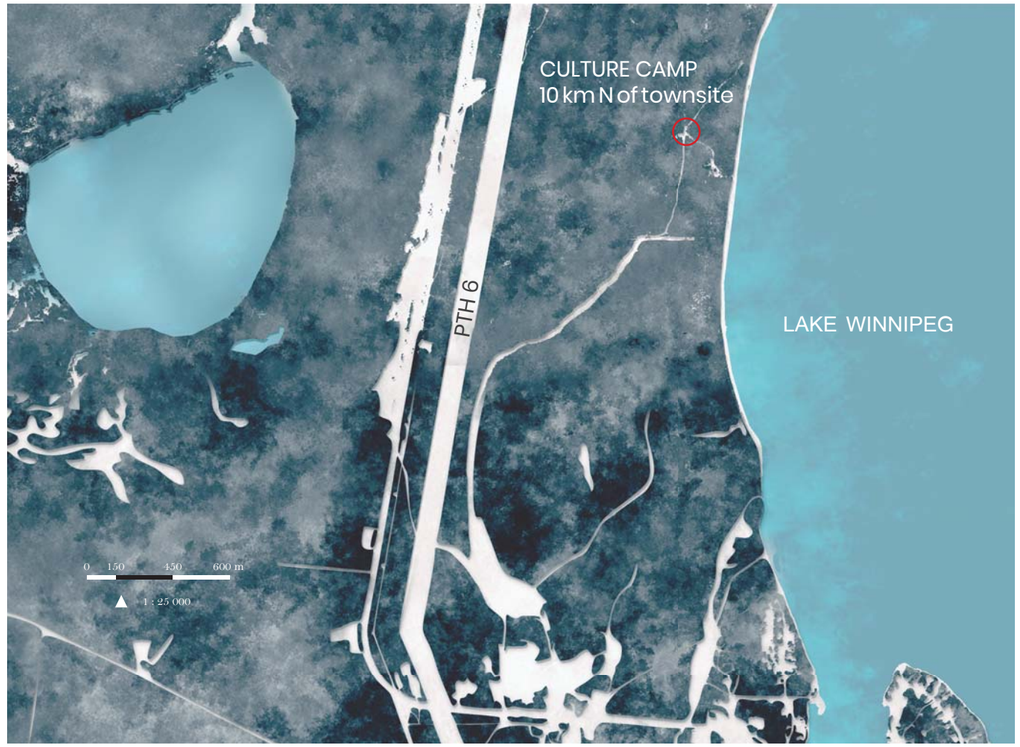
By maintaining honesty in all relationships, including with one's own self, the inner spirit is able to flourish. Honesty is also necessary in healthy relationships with others and with the Creator.

THE BEAR – COURAGE

"To have the mental and moral strength to overcome fears that prevent us from living our true spirit as human beings" (p. 13)

Courage means to live by your heart, in all that it loves and wishes to protect, and to live by your spirit, to do what is right. The teaching is to have courage in one's convictions, and to act in accordance.

The graves of six people from Grand Rapids, whose remains were disturbed by Hydro construction, lie here alongside the floodway (formerly the Saskatchewan River). This location also marks the beginning of a forest trail, maintained by the community.



10 km north of the Grand Rapids townsite, east of PTH 6 is the Culture Camp. Factors that drove the site's selected location include its accessibility to Lake Winnipeg, abundance of Betula papyrifera, and surrounding boreal bush context.

GRAND RAPIDS CULTURE CAMP

With the intention of maintaining the traditional Indigenous knowledge of a land-based lifestyle, the community of Grand Rapids has established a Culture Camp, 10 km north of the townsite.

The camp was conceptualized by a number of locals from the reserve and the townsite, all of whom wanted to pass traditional Indigenous knowledge to the youth of Grand Rapids. Thus the focus of the culture camp is outdoor survival education, through the lens of Indigenous traditions. The camp is located in a clearing surrounded by and scattered with birch trees. This natural landscape feature was a key factor in choosing the location for the camp, as birch trees have extensive uses both in ritual ceremonies and practical construction techniques. Adjacency to Lake Winnipeg was also considered.

Activities currently offered at the camp include instruction on how to pluck geese, make fires, fish with nets, trap, build shelters and sweat lodges, and how to conduct outdoor prayer ceremonies.

The community allows students to stay at the camp for week-long excursions, with the grade 7 class taking two trips, one in March and one in September, and the grade 6 class camping on an annual basis, in the month of June. Funding for the camp was provided by the Regional Health Authority, community donations, and Manitoba Hydro.

The culture camp sets an excellent precedent in Grand Rapids for the community interest and success of short-term, nature based field trips. In the case of the camp, focus is placed on concepts of tradition, outdoor survival, and land use practices.

The design of the borrow pit site will complement the traditional education offered at the camp, by introducing concepts of scientific inquiries and land rehabilitation. Students will benefit from having a land-based education that acknowledges their culture and history, as well as contemporary practices of landscape design.

Interior of sleeping cabin, including metal furnace, storage, and bed

Exterior of typical sleeping cabin, 1-4 beds available

Exterior of cabin with camp stove and tables; used for medicine preparation

Tipi constructed by students under elder supervision

Outdoor garden, surrounded by chainlink fence to protect from wildlife

Exterior of group buildings for maintenance and eating

Courtyard of camp, surrounded by sleeping cabins; Betula papyrifera is the prevailing species in the area

Entrance loop to the camp courtyard and outdoor seating

MANITOBA SCIENCE CURRICULUM

KINDERGARTEN-GRADE 4 MANITOBA FOUNDATIONS FOR SCIENTIFIC LITERACY

In collaboration with all provinces and territories of Canada, the Manitoba Government has created a framework of outcomes deemed appropriate for the scientific education of Kindergarten to Grade 4 students. "The [Pan-Canadian Science] Framework is guided by the vision that all Canadian students, regardless of gender or cultural background, will have an opportunity to develop scientific literacy." (Council of Ministers of Education, 1997, p. 2) This framework rests on a foundation of 5 parts, outlined in the sections to follow.

The overall intention of this curriculum is to enhance the scientific literacy and curiosity of each Manitoban student, while imbuing skills that will carry over into all aspects of life. Consideration is given towards teaching methods, as the framework acknowledges that "students learn most effectively when their study of science is rooted in concrete learning experiences, related to a particular context or situation, and applied to their world where appropriate" (Soltess, 1998, p. 1.3). This guiding structure is key to meaningful education.

NATURE OF SCIENCE AND TECHNOLOGY

The first of the five foundations is the necessity for students to understand the definitions of both 'science' and 'technology'. According to the Manitoba curriculum, the difference between the two lies in intent. While science proposes explanations for the natural world, technology proposes solutions to the problems that arise in our relationship with the world. Regardless of location or culture, science and technology have long been at the root of humanity, and are, in some sense, creative endeavours.

SCIENCE, TECHNOLOGY, SOCIETY, AND ENVIRONMENT

The second portion of the document is best highlighted by the statement that "there can be no greater contribution or more essential element to long-term environmental strategies leading to sustainable development that respects the environment… than the education of future generations in matters relating to the environment" (UNESCO, 1988, p. 8).

As grade level increases, so too does the complexity of a student's understanding. Application of knowledge expands from local to global, students become more considerate of other's perspectives, and begin to understand the 'grey area' in decision-making. This culminates in the understanding of how research affects judgement, and the ability of students to draw independent conclusions.

SCIENTIFIC AND TECHNOLOGICAL SKILLS AND ATTITUDES

The third foundation to scientific literacy is the development of a mindset that will encourage inquiry, problem solving and decision making. These skills, necessary to the scientific process, are valuable in all areas of life. The intention of this education is to empower young minds, fostering curiosity and positive attitudes towards scientific exploration.

Scientific Inquiry, as examined in 'The Nature of Science and Technology', involves "skills such as questioning, observing, inferring, predicting, measuring, hypothesizing, classifying, designing experiments, collecting, analysing (sic), and interpreting data" (Soltess, 1998, p. 2.10).

'Technological Problem Solving', refers to the design process, working to achieve solutions to the queries identified in the scientific process. 'Decision Making' works in tandem with problem solving, as it involves "making a thoughtful decision based on the information available" (p. 2.10). 'Attitudes', the feelings and perceptions that encourage students to pursue knowledge through science are developed as part of "a lifelong process that involves the home, the school, the community, and society at large" (p. 2.10).

ESSENTIAL SCIENCE KNOWLEDGE

The fourth foundation represents the technical framework of a scientific curriculum. This framework outlines the larger categories into which contemporary scientific knowledge is divided.

Firstly, 'Life Science' "deals with the growth and interactions of life forms within their environment in ways that reflect their uniqueness, diversity, genetic continuity, and changing nature" (p. 2.12). Studies of life science may lead to careers in ecology, biochemistry, or biotechnology. 'Physical Science', the second category, "deals with matter, energy, and forces" (p. 2.12). Paving the way to careers in engineering and research, physical science is concerned with the basic principles that guide the movement of the universe. 'Earth and Space Science' is essential to a holistic education in the sciences, as it "brings local, global, and universal perspectives to students' knowledge" (p. 2.12). Understanding the patterns of the world and the universe open the door to careers ranging from geology to astronomy.

UNIFYING CONCEPTS

The final foundation to scientific literacy encompasses the "key ideas that underlie and integrate all science knowledge and extend into areas such as mathematics and social studies" (p. 2.13).

'Similarity and Diversity', the first of the four unifying concepts, stresses the importance of recognizing characteristics of observations and how they relate to one another. Once students gain the understanding and terminology to express these observations, they are equipped to communicate their ideas to others. The second concept, 'Systems and Interactions', includes the study of nature and technology, and the corresponding systems of each. This concept encourages students to "think about the whole in terms of its parts and, alternately, about parts in terms of how they relate to one another and to the whole" (p. 2.13). The third concept encompasses Change, Constancy and Equilibrium; essentially, understanding the properties that govern the principles which affect all matters in the universe, thus underlying scientific study. Energy is the fourth and final unifying concepts, and is seen as a connection between all other elements of study.

Students of École Robert H. Smith School in Winnipeg study microclimates and document species during an outdoor science class; circa 2001

INDIGENOUS GUARDIANS

MISSION

Established in 2013, the Indigenous Leadership Initiative (ILI) represents a national program designed to engage and empower Indigenous Canadians in environmental conservation and sustainability practices.

The mission of The ILI is to facilitate "the strengthening of Indigenous nationhood" (Indigenous Leadership Initiative, n.d.). This statement is the foundation for the particular goals of the ILI, which are to ensure the following:

1. The "fulfillment of the Indigenous cultural responsibility to our lands",

2. The "emergence of new generations of Indigenous leaders",

3. That "communities develop the skills and capacity…to become fully respected and equally treated partners in Canada's system of governance and its economic and social growth."

GRAND RAPIDS DIVISION

Throughout Canada, the title of this initiative and its programming are localized. In Grand Rapids, the Indigenous Guardians Program, or *Kanawenihcikewak*, is the form that ILI has taken, circa 2017. The volunteer members of the program work to "monitor and patrol the traditional territory of MCN to educate on respectful land use and prevent abuse of resources" (Misipawistik Cree Nation, 2018). The community has identified a focus in the observation of fishery and forestry practices, as well as protecting the moose population.

PRACTICAL APPLICATION

General responsibilities of the ILI that transcend provinces include the management of traditional territories, assisting in the drafting of land use plans as well as monitoring future development projects, and the study and protection of wildlife. The ILI intends in every community to "honour Elders' knowledge and connect youth to the land" (ilinationhood.ca). Beyond the community scale, the initiative addresses the unique capacity that nature conservation on Indigenous land has in creating positive impact at a global scale.

The revegetation and study of the borrow pit has the potential to be integrated into the Indigenous Guardians program of Grand Rapids. By engaging the Guardians in the land use planning process, young students will be able to connect to Elders and imbue a layer of traditional land use onto the site. Working with an established program like the Guardians will further encourage and inspire the next generation towards careers in environmental protection.

The three focuses of the ILI within Grand Rapids are the monitoring of the fishing industry, holding forestry practices environmentally accountable, and protecting habitats of the moose population.

A Toronto Kindergarten classroom that has been designed following the principles of Reggio Emilia, circa 2013, is contrasted here to the proposed site of the outdoor education design in the borrow pit.

REGGIO EMILIA APPROACH

The Hundred Languages of Children examines the city of Reggio Emilia, Italy, and its practical approach to holistic childhood education. In chapter 18, *Connecting through Caring and Learning Spaces*, Lella Gandini explores the nature of space, the individual perspectives of children, and what elements combined make for a successful learning environment.

Our first understanding of space and quality of environment comes from an imposition of our own childhood memories, as we see the world through the lens of personal experience. To deepen this initial understanding of space, Gandini suggests a second layer of understanding, achieved by observing, rather than imposing. This understanding is possible when the visitor centers their observations around two qualities: "the extent to which everyone involved is at ease and how everyone uses the space itself" (Gandini, p. 318). While this cannot be wholly separated from imbuing some sense of self into a new space, the practice of refocusing observations is crucial in determining if said spaces are functioning well.

Transparency and communication are two highly valued characteristics in the Reggio Emilia approach to education. In the case of Gandini's observations, this transparency manifests in a clear statement of history of space as well as current usage, displayed immediately upon entering the school. The information in these displays are supplemented by descriptions of the teachers and other adults who interact daily with the children. Documentation of the teachers, as well as a publicly available event schedule represent a main pillar of Reggio Emilia, which is "partnership among children, teachers, parents, educational coordinators, and the community" (Gandini, p. 318). Education does not exist in a vacuum, and this extended network of support is fundamental to the comfort of the children, as they develop their personal identities and their understanding of the world.

Organization of space is carefully considered, but even more highly valued are the opportunities for the students to manipulate space, "offer(ing) tools, materials, and strategies connected with the organization of space to extend or relaunch ideas, to combine them, or to transform them" (Gandini, p. 319). In essence, Reggio Emilia creates the capacity for individual interpretation of space within an academic setting.

The following terms represent criteria found in Ceppi and Zini's *Children, Spaces, Relations: Metaproject For An Environment For Young Children.* The terms define "fundamental principles (necessary in) constructing educational experiences" (Gandini, p. 323) identified by teachers and architects.

REGGIO EMILIA PRINCIPLES

AS INTERPRETED FROM "THE HUNDRED LANGUAGES OF CHILDREN"

OVERALL SOFTNESS

The architecture of traditional learning spaces is rigid, delineating space by usage, and limiting connectedness. The Reggio Emilia approach intends to create a soft flow between spaces. This is reflected in conversations between adults and children, in kindness and open dialogue.

RELATIONAL SPACE

Giving students a voice and platform to express their ideas opens the potential to spaces that reflect unique structures of learning. The dialogue between students, teachers, and parents is what allows for ideas from varied viewpoints to translate to spaces of many possibilities.

CONTINUITY

Connections, both in physical space and human relationships, are not limited to the educational space. Reggio Emilia emphasizes continuity between the community and the natural surroundings to influence the culture of learning.

SENSORIAL EXPERIENCES

An understanding of reality and space is formed through sensory experience, and as such it is necessary to consider not only materials, but the use of colour and light in an architectural design.

FLEXIBILITY/ADAPTATION

As is the basis with all of Reggio Emilia, the conversations between parties using a space is fundamental to understanding how that space can be adapted and improved. Initial design must also accomodate future potential for change.

COMMUNITY/PARTICIPATION

The community is the driving force and influence behind the experience of the educational environment. Through communication they adapt the space to their needs. In this sense, the design belongs to the users.

SOCIAL CONSTRUCTIVISM

Through the guidance of the teacher, knowledge is gleaned by way of physical exploration: materials, tools, programs, etc. A dialogue of knowledge between social parties progresses and enriches the educational experience.

NARRATION

Narration is represented through space and documentation. By these formats, the community visiting an educational center understands the daily activities and care the students go through, as well as witnessing the creations they make.

EVERYDAY RICHNESS

When architectural space is carefully considered from the onset of a project, it creates a malleable framework for students and teachers to develop a rich, creative curriculum.

Land-Use Plan

Intervention over time

Recalling the intentions set forth at the beginning of this practicum, to create a space for children to learn and partake in environmental education, the following chapter details the proposed site design of the borrow pit. In order to engage children with their land, and properly display its potential for education, the proposed activities are directed through the lens of a landscape architect. All of the components of the landscape, from the soil, to the water, vegetation, and contour trends, create a mosaic that defines the way life is lived within an ecoregion, and how it can be improved in those parameters. Landscape architects are skilled at reading and interpreting these mosaics, and by introducing concepts of landscape design to elementary-age students, it is possible to foster an environmentally engaged generation.

The future of the borrow pit site has been projected across four years, with each year representing a stage in which students may participate in site documentation and revegetation practices, under the guidance of teachers, elders, and landscape design professionals. Curriculum activities are proposed, and correspond to the thematic approach of each particular year.

Informed by the educational practices of the Cree community, the philosophies of Reggio Emilia, and the curriculum recommendations of the Manitoba Government, each year seeks to educate and inspire the students of Grand Rapids to engage in environmentalism, and in their community.

Proposed curriculum activities vary in suggested age engagement, with the intention that educators can develop appropriate activities for a wide range of school-age children. As depicted in the following graphics, and reviewed in *Education Principles*, the curriculum developed in this document is designed with Kindergarten-Grade 4 students in mind.

Showy lady's slipper, Cypripedium reginae, observed on the eastern border of the borrow pit site, surrounded by Juniperus horizontalis, or creeping juniper.

WATER BODIES
AS OF JUNE 2018

ACCESS ROAD
UNNAMED ROAD, DIVISION 21
BIKE LANE & CROSSWALK ADDED YEAR 1

PARKING LOT
20 REGULATION SPOTS ADDED YEAR 1

EXISTING VEGETATION
AS OF JUNE 2018

WOODY SHRUBS & TREES
ADDED YEAR 1

GRASSES & GROUNDCOVER
ADDED YEAR 1

LICHEN, MOSS & FLOWERS
ADDED YEAR 1

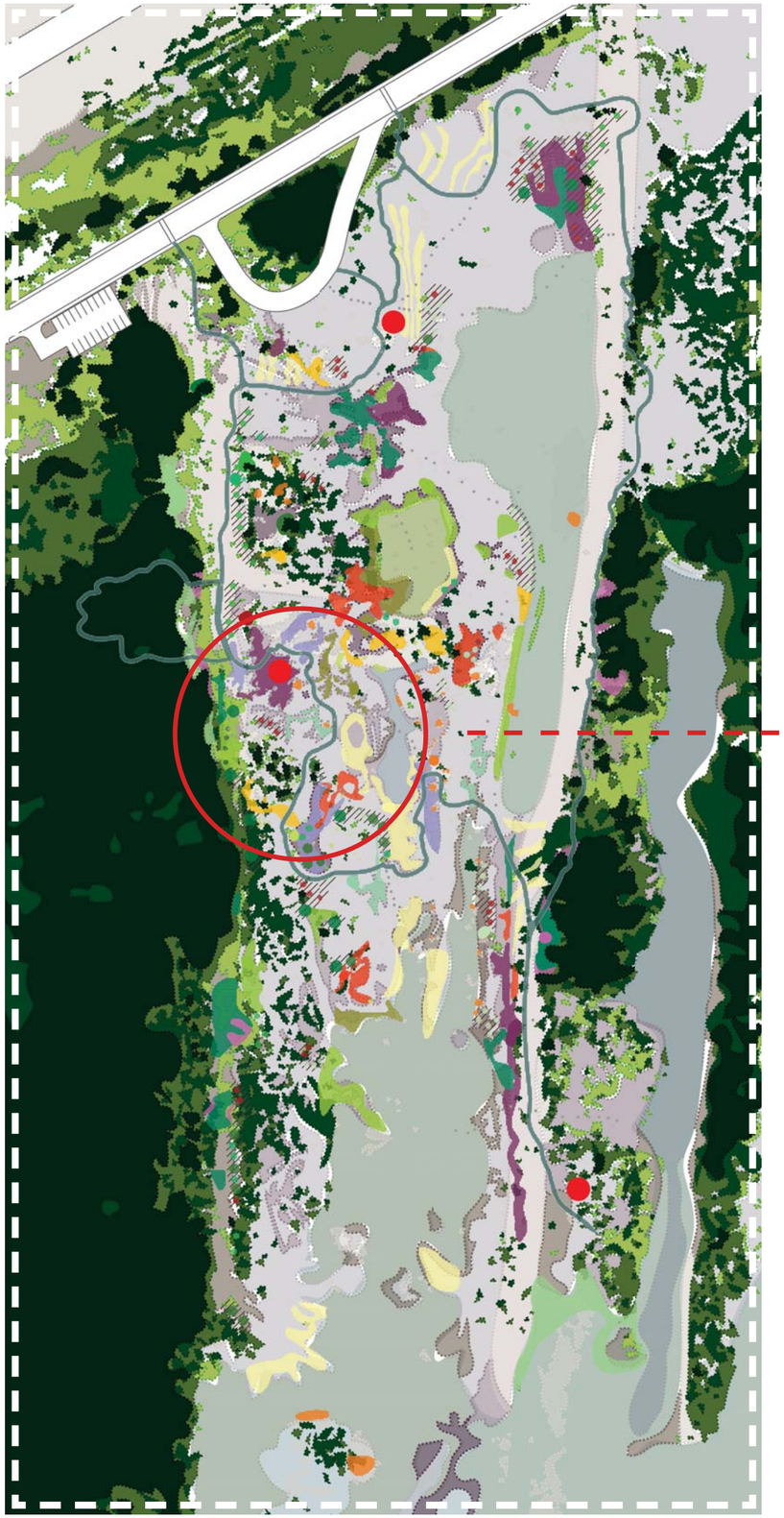
SHELTER LOCATION
ADDED YEAR 2

PATHWAY MATERIALS
ADDED YEAR 3

BEEHIVE VILLAGE
ADDED YEAR 4

SITE DESIGN

A prospect of the site's appearance over five years from first design intervention is pictured here. In addition to the existing vegetation and water conditions, mapped elements include a mosaic of introduced plants, soil material, pathways and structures; the result of natural succession guided by the hand of landscape architecture.



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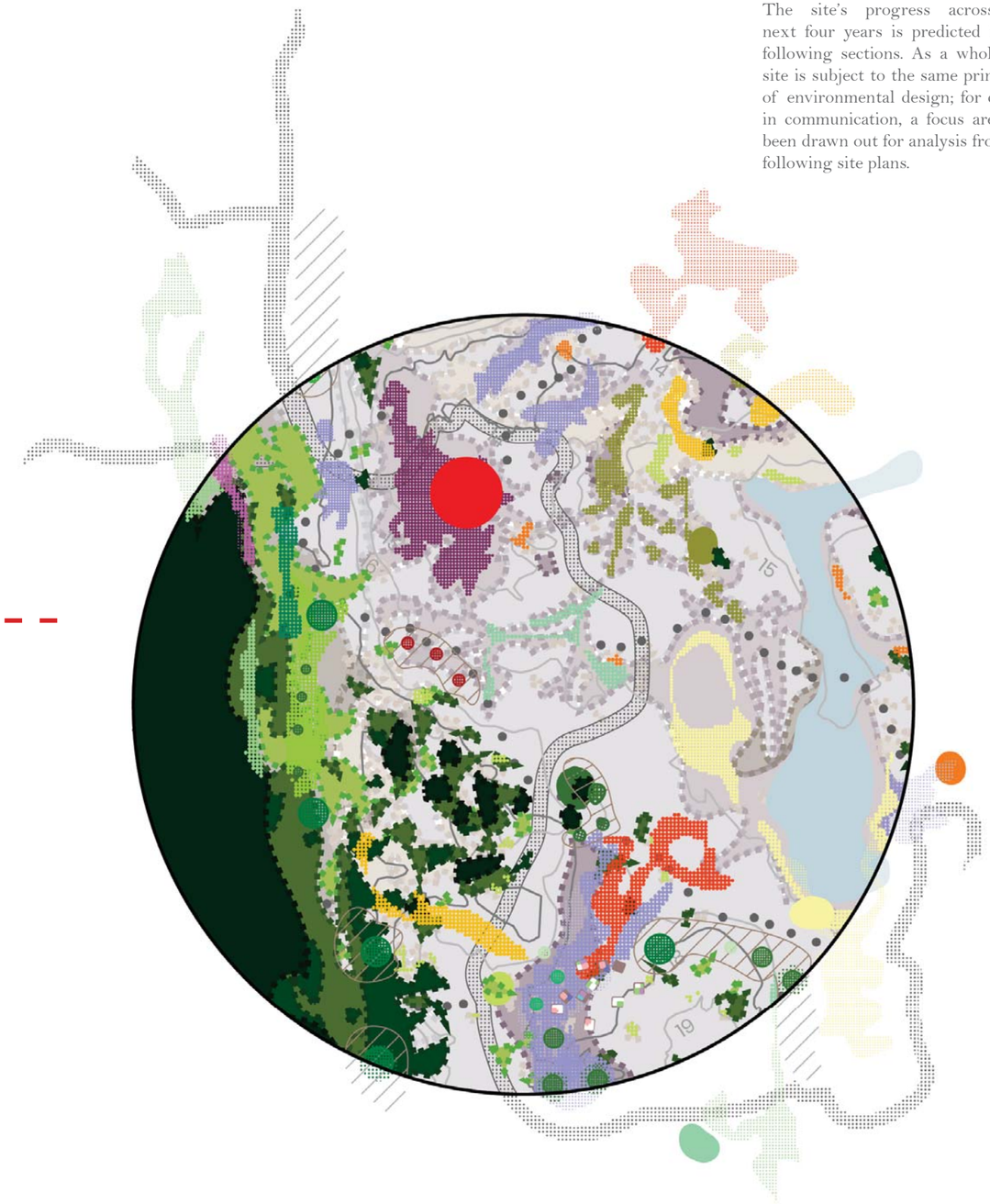
FOCUS AREA

The site's progress across the next four years is predicted in the following sections. As a whole, the site is subject to the same principles of environmental design; for clarity in communication, a focus area has been drawn out for analysis from the following site plans.



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Year 1

Vegetation

The first year of implementing site design will consist of grading and seeding, accomplished through small machinery and community involvement.

Following current guidelines set by the environmental rehabilitation department of Manitoba Hydro, the majority of slopes exceeding 45% will be lowered and seeded with a mixture of native plant species. This work is to be completed by construction professionals, after which point students will be introduced to the site.

In determining the appropriate seeding locations and seed varieties, students will first be taught to evaluate soil and water quality on site. Plant species mapping will be a secondary method of consideration. In documentation of what plants are already successful in certain micro-habitats, students will learn how to predict the success of future plantings. These methods of evaluation will lead to discussions about site-specific design, lead by nature's cues.

This year will also include extensive site documentation in the form of photography, drone scans, and sketching, conducted by the students, and design professionals.

The focus of the first year will be documentation of the current state of nature, while adjusting topography to create a safe framework in which students can begin to document change.

PROPOSED CURRICULUM

1 EXPLORE

Enter the site! Look for areas with woody plants and flowers. Does the ground where these plants grow look the same as the ground elsewhere?

2 LOCATE

Mark the location of plants that you like. What do you like about them? Take a picture of your favourite plant, and make a note of its surroundings.

3 IDENTIFY

Compare the picture you took with the photos in your plant book. Note the name of your plant, where it grows, and how it helps the land.

4 DISCUSS

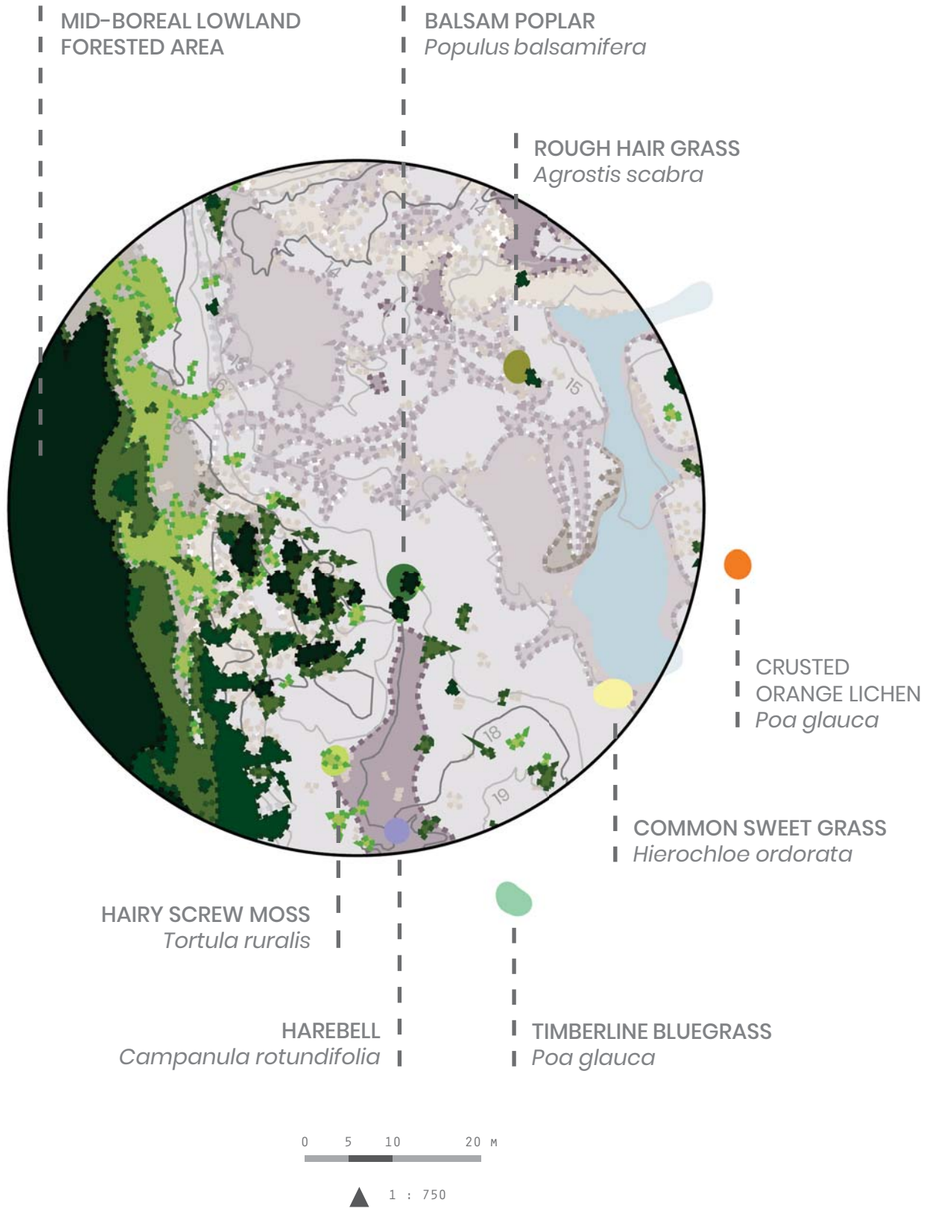
Talk to other classmates who have chosen the same plant. Did they find the plant in a different location? Compare notes and photos.

5 REVIEW

Revisit the areas where everyone has placed their markers. At each site, discuss the reasons why they were chosen, and consider where else these plants may grow!

OBSERVED SPECIES

Students will have many opportunities to explore the site and document vegetation, following which they may collectively devise a map to represent the prevailing species and their locations. The following spread represents a selection of common species found on site.



Flora Inventory
July 2018

Species observed on the borrow pit site, Grand Rapids, MB. Including trees, woody shrubs, grasses, mosses, lichens, and flowers.

Laurel Leaf Willow
Salix pentandra

Silver Willow
Salix alba

Balsam Poplar
Populus balsamifera

Paper Birch
Betula papyrifera

Jack Pine
Pinus banksia

Black Spruce
Picea mariana

Red Osier Dogwood
Cornus sericea

Common Juniper
Juniperus communis

Shrubby Cinquefoil
Dasiphora fruticosa

Swamp Horsetail
Equisetum fluviatile

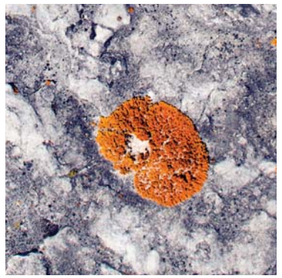
Timothy-Grass
Phleum pratense

Purslane
Portulaca oleracea

Rough Hair Grass
Agrostis scabra

Common Sweet Grass
Hierochloe Odorata

Timberline Bluegrass
Poa glauca



Crusted Orange Lichen
Caloplaca cerina

Hairy Screw Moss
Tortula ruralis

Harebell
Campanula rotundifolia

Showy Lady's Slipper
Cypripedium reginae

Wood Lily
Lilium philadelphicum

Balsam Groundsel
Packera paupercula

SITE REHABILITATION RECOMMENDATIONS

HISTORY

According to Manitoba Hydro's current remediation processes as outlined in the 2015 *Keeyask Generation Project: Vegetation Rehabilitation Plan*, the following points define the process through which quarry rehabilitation should occur. Such rehabilitation methods are also to be applied to the borrow pit site as part of the first year design process.

The borrow pit site is at a disadvantage, as it did not undergo Hydro's contemporary practices, which state that rehabilitation processes must begin immediately upon sites that are no longer needed for construction. Left to natural succession for over 50 years, the site is still largely devoid of vegetation, due to neglect on the part of the construction team. Hydro currently advocates for rehabilitation work to run in tandem with project construction.

Current practices also dictate that the amount of time organic material remains stockpiled is kept to a minimum. Seed stock within organic stockpiles will be less viable and likely to germinate the longer it remains stockpiled. As this was not the practice during the 1960's, new seed stock will need to be introduced.

PRESENT

After applying processes that ideally would have been prescribed immediately upon project completion, the first step towards revegetation is to seed the disturbed site with native species as soon as possible, to decrease the pressure of invasive species establishment.

Rehabilitation processes in general should be developed based on two factors: re-establishing the pre-construction environment, and maximizing post-construction use, e.g., habitat creation. These processes are developed through site surveys, in which the new surface material is identified, soil moisture is quantified, and compaction is tested in order to determine appropriate rehabilitation responses.

The community will be consulted during professional rehabilitation work, as students are brought in to understand and interpret the nature of the site, forming recommendations towards the rehabilitation approach.

NOTABLE FACTORS

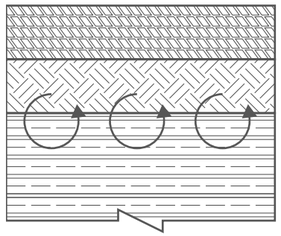
At the recommendation of the community and with the guidance and expertise of the landscape architect, the site will be graded with slopes ≤ 45% for effective species establishment and safe navigation for students on site. Based on native species, vegetation will be chosen in the form of trees, grasses, and shrubs; planting processes will be specified, including seed application rates and tree spacing. Other factors to consider in rehabilitation are seed volumes, seed collection, scheduling of site preparation work, and scheduling of tree planting.

Site preparation may include the processes of scarification, decompaction, grading and/or contouring, and spreading and incorporating organic stockpiled material. In an ideal scenario, no additional soil material would be introduced to the site; due to the nature of the borrow pit, this is unfeasible, and new groundcover materials will be incorporated with the intention to recreate the site's former habitats.

Through these formal rehabilitation processes, the borrow pit site will develop a new nature, in which students, teachers, and landscape architects will work together to create a space for environmental education.

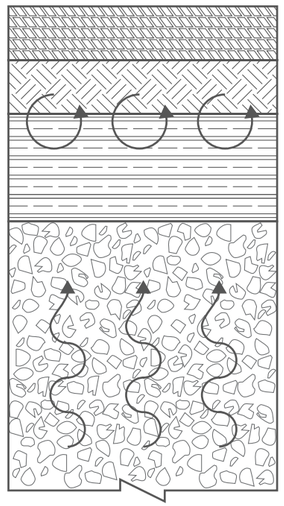
Dozing and Scraping work at the site of the future Long Spruce Generating Station, Manitoba, circa 1970's.

GROUND TREATMENTS



1 LOW COMPACTION AREAS

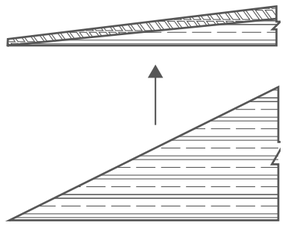
Topsoil, peat, etc. will be spread across low compaction areas of the site, to depth of ≈ 10 cm. Harrowing/discing processes will combine organic material with the upper 20 cm of exposed surface material. Finally, another 10 cm of organic material (including tree debris) will be spread across the site.



2 HIGH COMPACTION AREAS

Decompacting of compressed mineral material by sub-soiler will be conducted to a depth of ≥ 50 cm. To reduce erosion risk, the decompaction will run perpendicular to existing slopes.

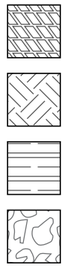
Proceeding this, rehabilitation of High Compaction Areas will follow the same methods outlined for Low Compaction Areas.



3 EMPAS

Stockpiles will be spread to a slope of ≤ 10%, and covered with organic material. This coverage is intended to prevent further erosion of stockpiles, and to encourage the re-establishment of native vegetation.

LEGEND



Organic Material
Tree debris

Topsoil/Peat
Organic Materials

Exposed Surface Material
Clay

Compressed Mineral Material
Including bedrock

0 10 20 40 CM

1 : 12

YEAR 1 MAP (LEGEND)

VEGETATION 1
>50 YRS OLD GROWTH, MIXED FOREST

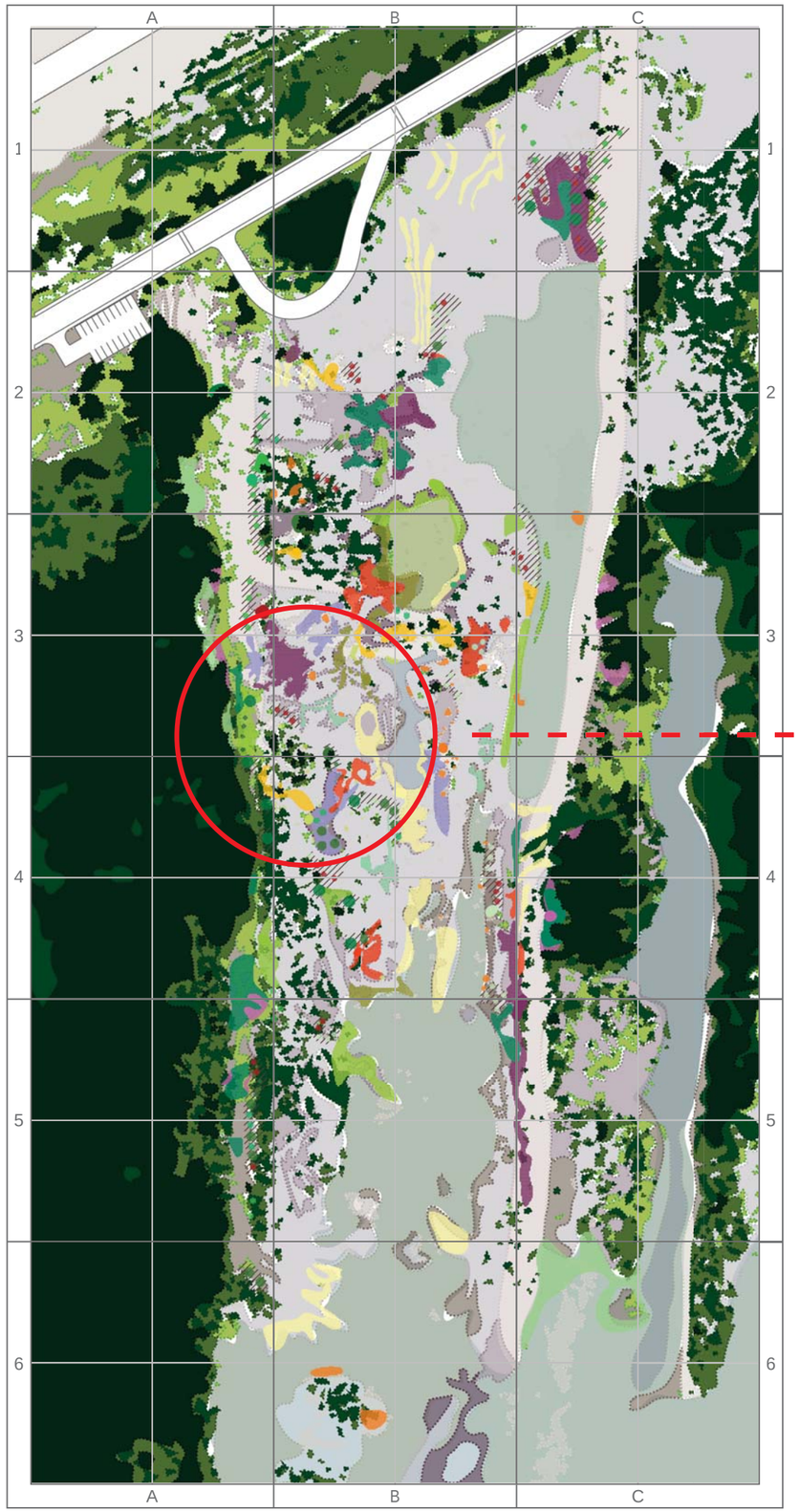
VEGETATION 2
UNDERGROWTH & SHRUBS, 2 M-0.5 M HEIGHT

VEGETATION 3
GRASSES & SMALL SHRUBS, 0.5 M-0.3 M HEIGHT

VEGETATION 4
GRASSES & GROUNDCOVER, <0.3 M HEIGHT

ACCESS ROAD
UNNAMED ROAD, DIVISION 21
BIKE LANE & CROSSWALK ADDITION

PARKING LOT
20 REGULATION SPOTS



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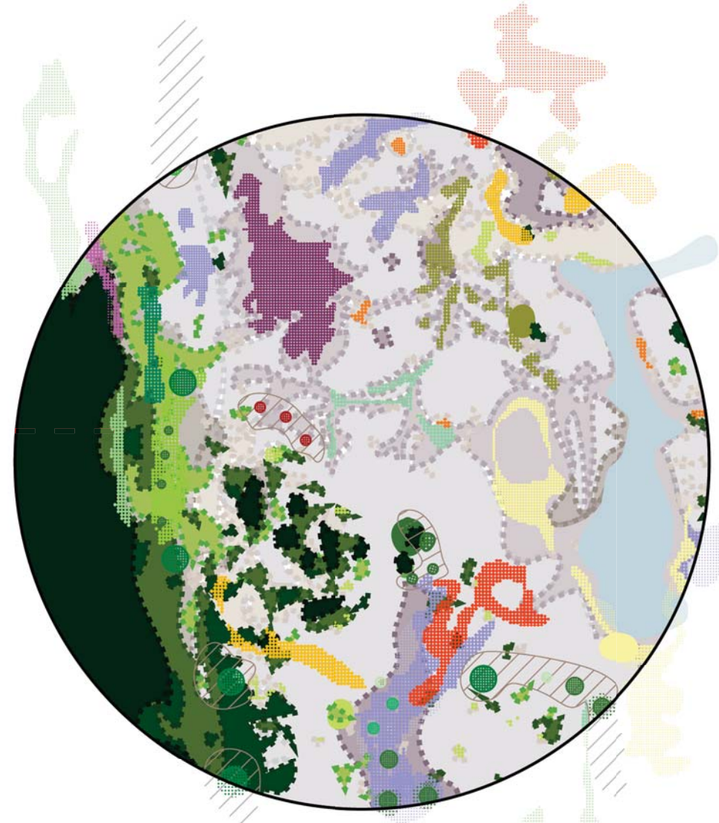
SITE DESIGN

Following site rehabilitation treatments, students will work with a landscape architect to create a planting plan, consisting of naturally occuring site species.

FOCUS AREA: VEGETATION

The drone surveys in the *Site Portrait* section of this document detailed soil typologies, and those findings are used here as the guide to determining planting locations. Each species type has been evaluated for its moisture and sunlight requirements, and laid out as such in the site plan. The prediction of species success is further encouraged by previous records of specimens on site. *Portulaca oleracea*, represented in the focus area in a deep magenta hue, is depicted in other areas on site that match the soil type of where its specimen was originally found.



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WOODY SHRUBS & TREES

- *Betula papyrifera*
- *Cornus sericea*
- *Dasiphora fruticosa*
- *Juniperus communis*
- *Picea mariana*
- *Pinus banksiana*
- *Populus balsamifera*
- *Salix pentandra*
- *Salix repens*

GRASSES & GROUNDCOVER

- *Agrostis scabra*
- *Equisetum fluviatile*
- *Hierochloe odorata*
- *Phleum pratense*
- *Poa glauca*
- *Portulaca oleracea*

LICHEN, MOSS & FLOWERS

- *Caloplaca durietzii*
- *Campanula rotundifolia*
- *Cypripedium reginae*
- *Lilium philadelphicum var. andinum*
- *Syntrichia ruralis*

- *Soil addition*

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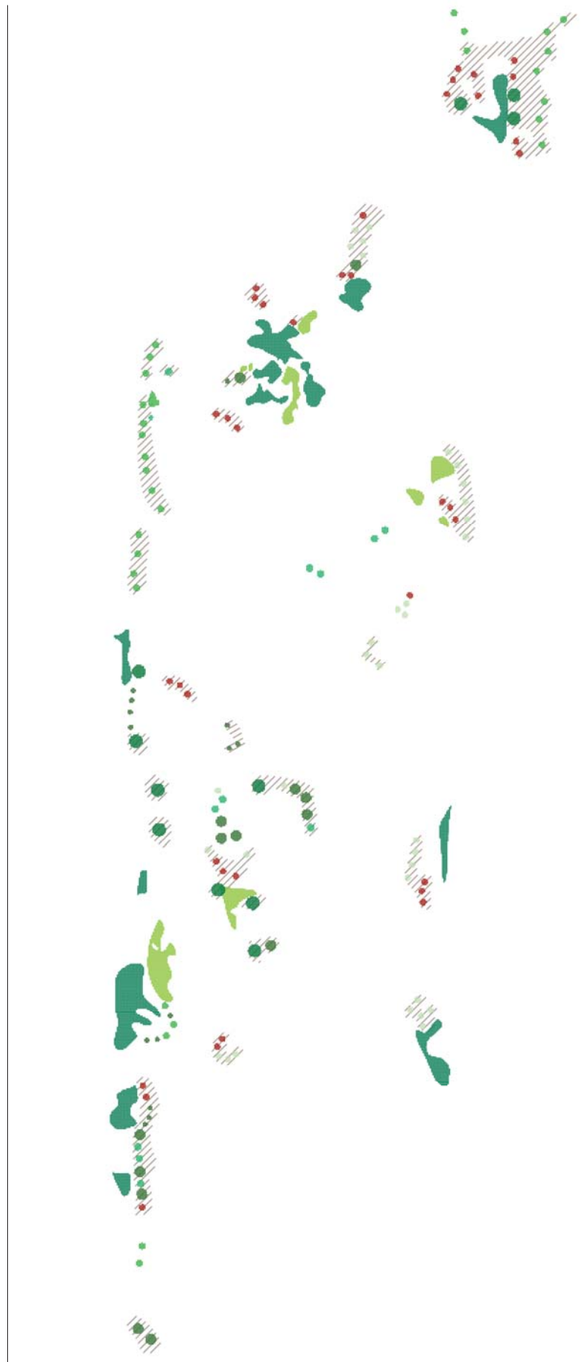


WOODY SHRUBS & TREES

GRASSES & GROUNDCOVER

LICHEN, MOSS & FLOWERS

Year 2

Shelters

The second year will see the introduction of permanent site structures, specifically, three unique shelters that respond to site-specific conditions. These structures will provide space for students to congregate under the guidance of their teachers. Curriculum opportunities may dictate future usage of these spaces, as well as the possibility to open the site up to public/community events.

The design of these shelters is to be a joint collaboration between the landscape architect and the Grand Rapids school workshop classes, who will participate in the construction process.

While the construction of these shelters takes place, other student groups will catalogue seeding success from the previous year's interventions; this continued documentation will help guide the design of a pathway system to be implemented in year three.

The focus of the second year will be establishing a physical presence on site, and considering methods of circulation. Documentation from the first year continues, recognizing the changes that have occurred.

PROPOSED CURRICULUM

1 ASSESS

Where are plants thriving? Has water collection changed? What areas of the site remain with exposed clay and/or rocks covering the ground?

2 LOCATE

Where would you like to stop and site? What views do you enjoy the most? Choose your favourite three sites and place a marker at each.

3 SKETCH

Based on your chosen locations, create drawings to represent an open-air structure that could be used to host presentations, concerts, or any outdoor event you like.

4 DISCUSS

Talk to your classmates and compare drawings. Did you select the same sites? As a group, create a final design.

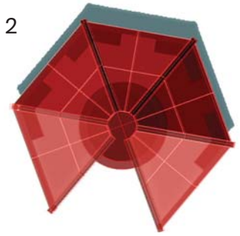
5 BUILD

With the help of a landscape architect and the school's workshop team, you will construct 3 versions of the structure designed by you and your classmates.

1

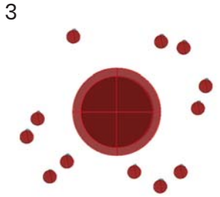
Curved stationary bench, no roof, central dual-level platform

2



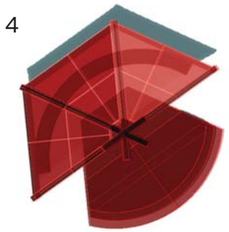
Angled stationary benches, 5/6 roof with central vent, central dual-level platform

3



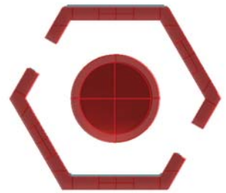
Circular mobile seating, no roof, central dual-level platform

4



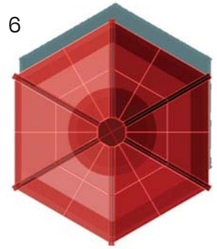
Curved stationary bench, 1/2 roof with extension, tri-level platform stage platform

5



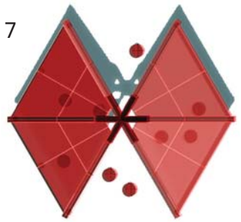
Angled stationary benches, no roof, central dual-level platform

6



Angled stationary bench, full roof with central vent, central dual-level platform

7

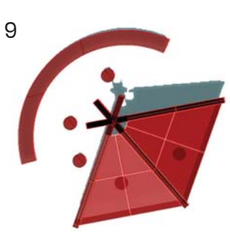


Circular mobile seating, 2/3 roof with extension and central vent, no platform

8

Curved stationary benches, 1/3 roof with extension, no platform

9



Curved stationary bench, circular mobile seating, 1/3 roof with extension, no platform

SHELTER ITERATIONS

Shelters will act as meeting points throughout the site, at three designated locations. Site-specific design will include the notion that the community and school workshop class will have strong input on the form each design would take. Nine iterations are provided above.

The base form for the iterations was inspired by the form of a traditional Indigenous arbour, one of which exists on reserve land east of the PTH 6 bridge. Taking a familiar form and reinterpreting it to align with the values of the site would help spark discussions regarding indigenous land use practices. Construction of such structures would be another way in which the youth of Grand Rapids can reconnect with their cultural history.

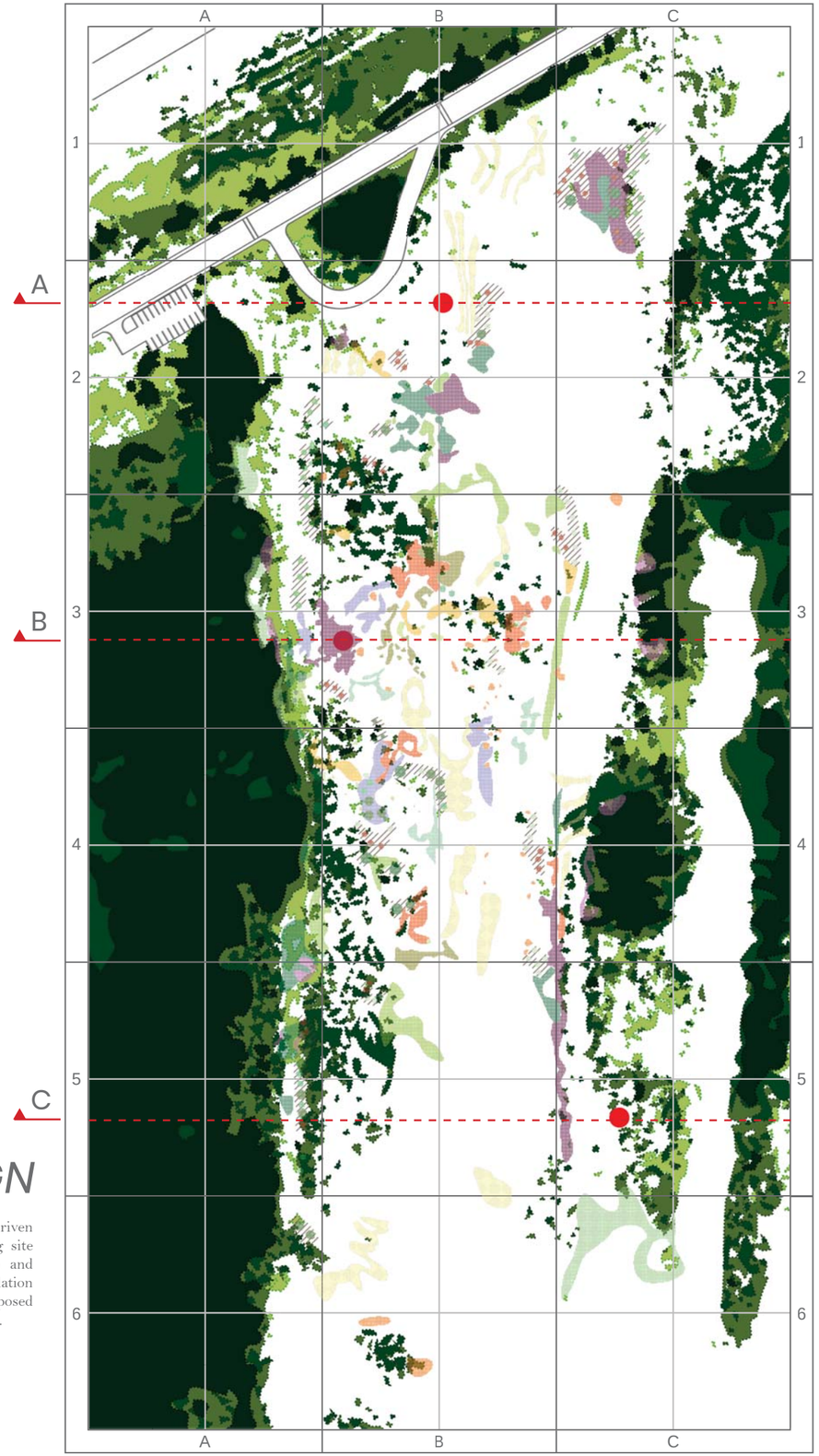
YEAR 2 MAP
(LEGEND)

VEGETATION 1
>50 YRS OLD GROWTH, MIXED FOREST

WATER BODIES
AS OF JUNE 2018

SHELTER LOCATION
PROPOSED SURFACE AREA

ACCESS ROAD
UNNAMED ROAD, DIVISION 21



SITE DESIGN

The location of the shelters is driven by planting success, pre-existing site opportunities such as elevation and viewsheds, and the recommendation of the landscape architect. Proposed locations are recorded in this map.

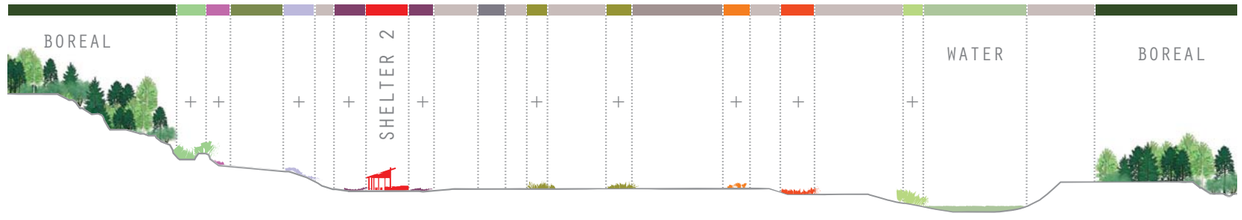
0 10 20 40 m

1 : 2500

SECTION A

NORTHERN SHELTER (ITERATION 6)

-initial gathering/muster point
-adjacency to entrance
-high point in topography



SECTION B

CENTRAL SHELTER (ITERATION 9)

-access to boreal forest/bush
-central view of site
-low point in topography

SECTION C

SOUTHERN SHELTER (ITERATION 4)

-viewpoint to water body
-southern border of borrow pit
-farther removed from main area

0 10 20 40 m

1 : 900

By late summer of the second year, seeding from the previous year has created an informal circulation system throughout the site. These natural paths are further directed by woody shrubs and trees which are now established.

The central shelter is pictured here with students interacting both with the structure and beyond, as they explore plant species. The northern shelter is visible in the distance.

Year 3

Pathways

The third year will mark the implementation of a full pathway system throughout the borrow pit site, and extending into the western stand of mixed forest. This extension will allow for students to perform comparison studies of untouched vs disturbed landscape, as well as collect natural materials with which to create pathways, assisted by construction professionals.

Materials suggested for pathway construction include the introduction of asphalt and gravel, supplemented with deadwood and rocks collected from in and around the site. The larger pathway system that extends from site entrance to each shelter will fluctuate between gravel and asphalt, considering the contours of the site to create an exploratory experience for the students. The more malleable materials such as deadwood and rocks will be used at the student's discretion to create a secondary circulation system, leading to areas of interest such as standing water or flower patches.

The focus of the third year is the creation of a cohesive pathway system to further exploration of the site. Site documentation continues.

PROPOSED CURRICULUM

1 SCAN

With the help of the landscape architect, perform a drone scan of the borrow pit. Print the map, labeling size and direction.

2 EXPLORE

Visit the site with the drone map. As you walk around, trace your steps on the map. Are you following the same route you always do? Why?

3 SKETCH

Using your traced exploration map, sketch out a path design for the site. Consider materials that would look good and feel nice to walk on.

4 DISCUSS

Talk to your classmates and compare pathway drawings. By layering each map, can you find common ground? Pathways that everyone uses?

5 SELECT

With the help of a landscape architect, visit material manufacturers and select materials you would like to use to form a pathway system on site. Refer back to your drawings.

As a result of no rehabilitation practices being initially put in place when the borrow pit was decommissioned, there exists the remnants of a construction vehicle route traversing the site. Rather than attempt to completely revegetate the areas where gravel is already laid down, the planting plan in year one specifically left space for these routes to be repurposed as paths for visitors to the site.

Running along the western edge of the borrow pit is a path of this type, pictured here. An imagining of a reinforced walkway, working with the same route system is inset.

YEAR 3 MAP
(LEGEND)

GRAVEL
LOOSE PATH MATERIAL

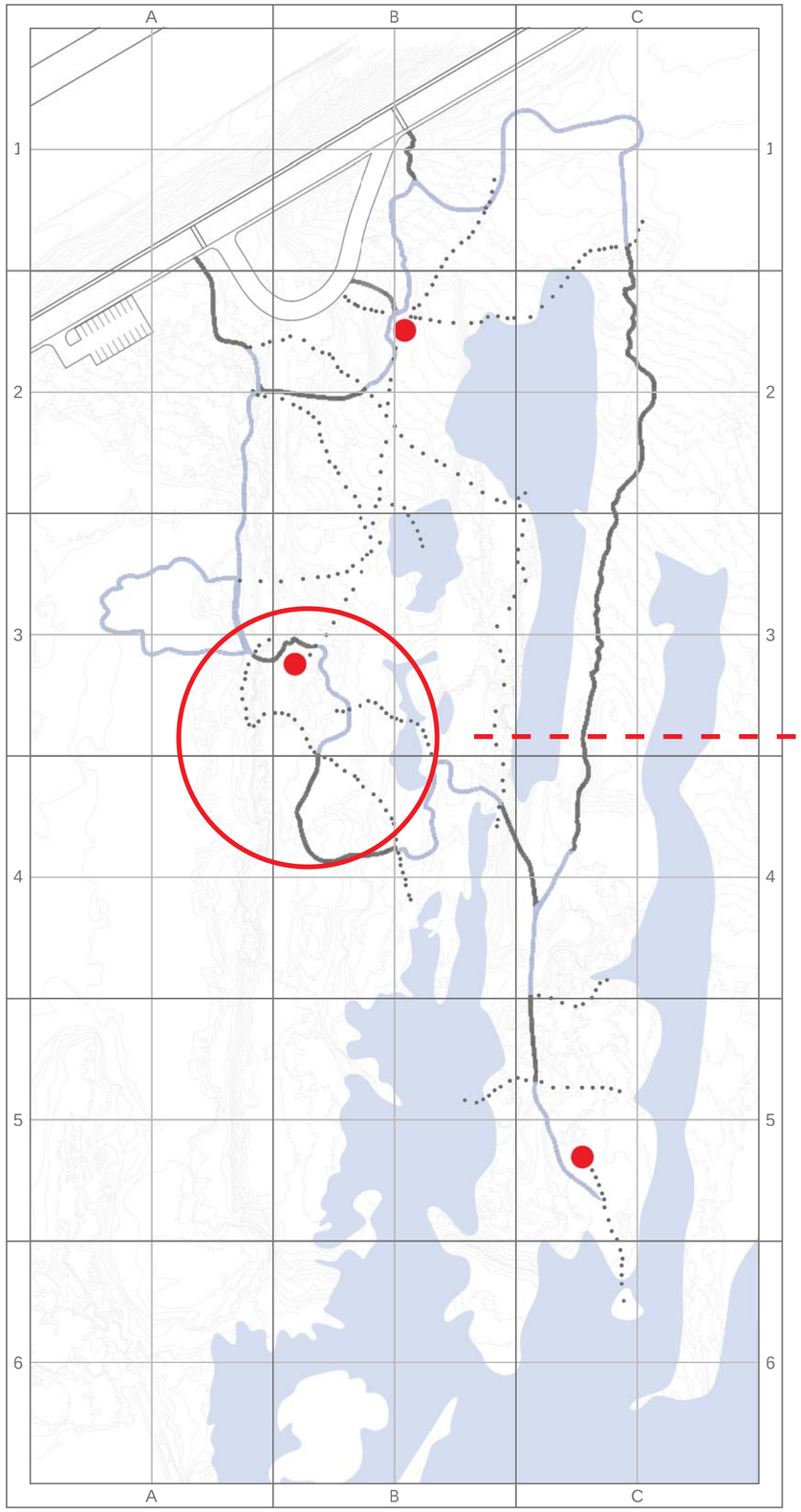
ASPHALT
PERMANENT PATH MATERIAL

LIMESTONE BOULDERS
MOVEABLE PATH MATERIAL

WATER BODIES
AS OF JUNE 2018

SHELTER LOCATION
PROPOSED SURFACE AREA

ACCESS ROAD
UNNAMED ROAD, DIVISION 21



SITE DESIGN

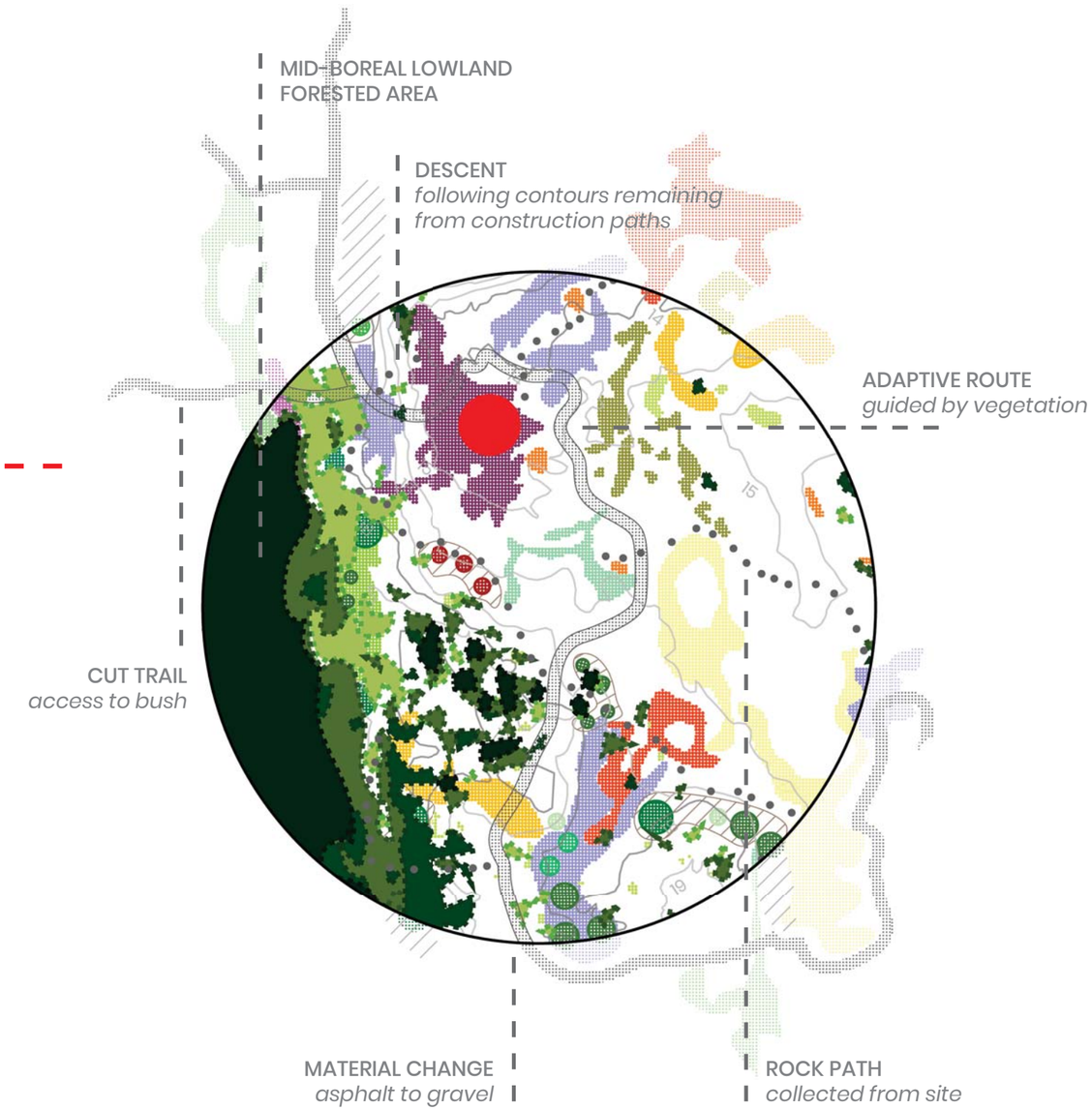
The location of pathways is driven by contour data and vegetation, as represented in the focus area pictured opposite. The map clearly illustrates the layout of the pathway system, oriented by the shelters and large bodies of water, i.e. relatively permanent features.

0 10 20 40 M

1 : 2500

PATHWAY NAVIGATION

Pathway design will proceed naturally as students observe the way they move through site. Drone scans performed during year three will provide a new perspective on the relative success of vegetating the site, and encourage the students to consider how nature and vegetation can direct our movements through space.



0 5 10 20 M

1 : 750

The pathway materials used in the design correspond to changes in direction, vegetation, and elevation.

Pictured here is a reinforced construction vehicle route which descends from the western edge of the site to the center. From this point, the path material changes to limestone rocks arranged in a stepping-stone manner, which terminate in the large body of water in the northeastern corner of the borrow pit.

Year 4

Community Programs

The fourth year centers on the creation of long-standing curriculum opportunities, with the introduction of a beehive community in the southwestern quadrant of the site. Beekeeping was identified by teachers at Grand Rapids School as a community interest regarding environmental activities. Other programs to be considered on site are a mushroom growing program, and general horticulture and beautification practices, some of which have already been put into place around the townsite in the form of backyard flower beds.

Beyond the creation of realistic, long-term environmental education opportunities, the programs suggested will become a positive way to engage the community of Grand Rapids at large. The implementation of beehives introduces an opportunity for adult members of the community to interact with the site. Students, under supervision will also be able to learn skills of beekeeping, and explore new plant species. Monitoring and maintenance of plant species introduced in previous years will continue.

The focus of the fourth year is community engagement and education through tangible natural production. The bees introduced to site will encourage pollination of previously established species, and documentation will now expand to include the success of the hive community.

PROPOSED CURRICULUM

1 INTERVIEW

How can the community become involved in the nature of the borrow pit? Prepare a series of questions about outdoor activity/program interest. In groups, pose these questions to members of your community.

2 RESEARCH

Conduct research on the most popular suggestions from the community. Are there similar programs in surrounding areas of Manitoba?

3 DISCUSS

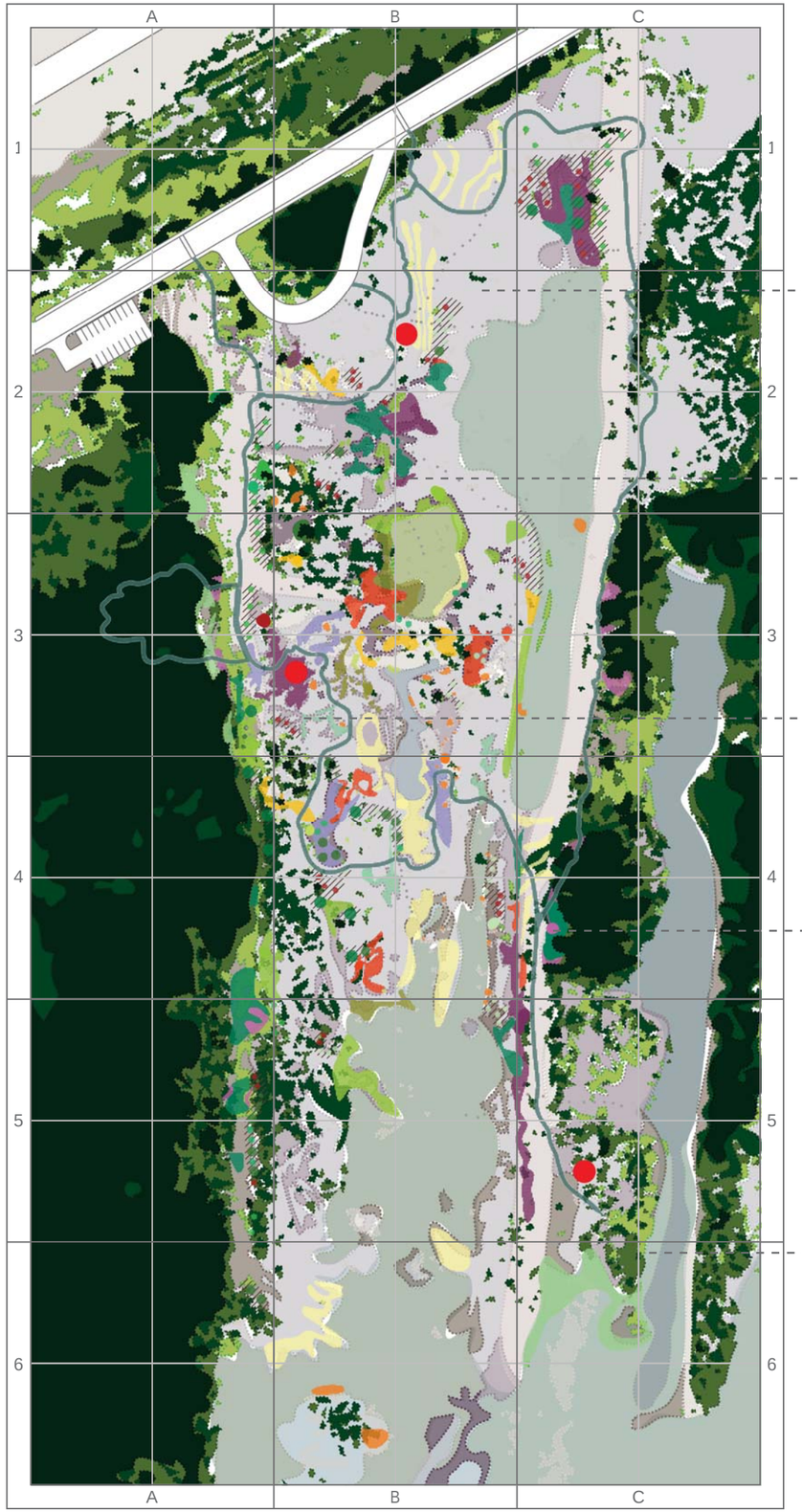
Discuss your findings. Did your classmates receive similar answers from the community? What interests were confirmed? What patterns can you find in your research?

4 SELECT

Select one community project based on your interviews, discussions, and research. Work together to develop a method of installation.

5 INSTALL

Work with the landscape architect and members of your community to install your chosen project. Consider wind, sunlight, water, and accessibility when choosing a specific site.



OPPORTUNITIES

The following icons represent opportunities for community engagement programming, identified by the people of Grand Rapids.

COMMUNITY GREENHOUSE

-level ground, meeting point with adjacency to roadway

FLOWER PLANTINGS

-vegetation established, medium moisture at ground level

BEEHIVE VILLAGE

-flora plantings established, level ground, access to eastern light

LOCAL SPECIES GARDENING

-Showy Lady's Slipper observed at marked location; potential habitat for future plantings

MUSHROOM ESTABLISHMENT

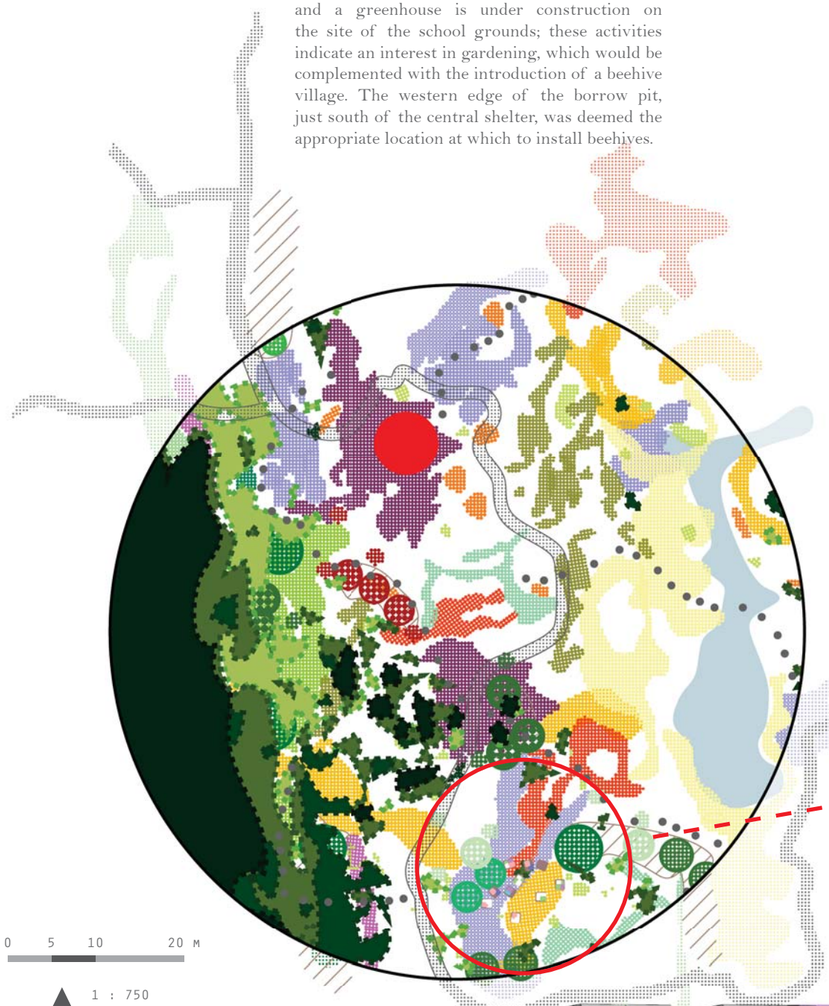
-moist ground, rocky with wet-meadow vegetation; partial shade cover

0 10 20 40 M

1 : 2500

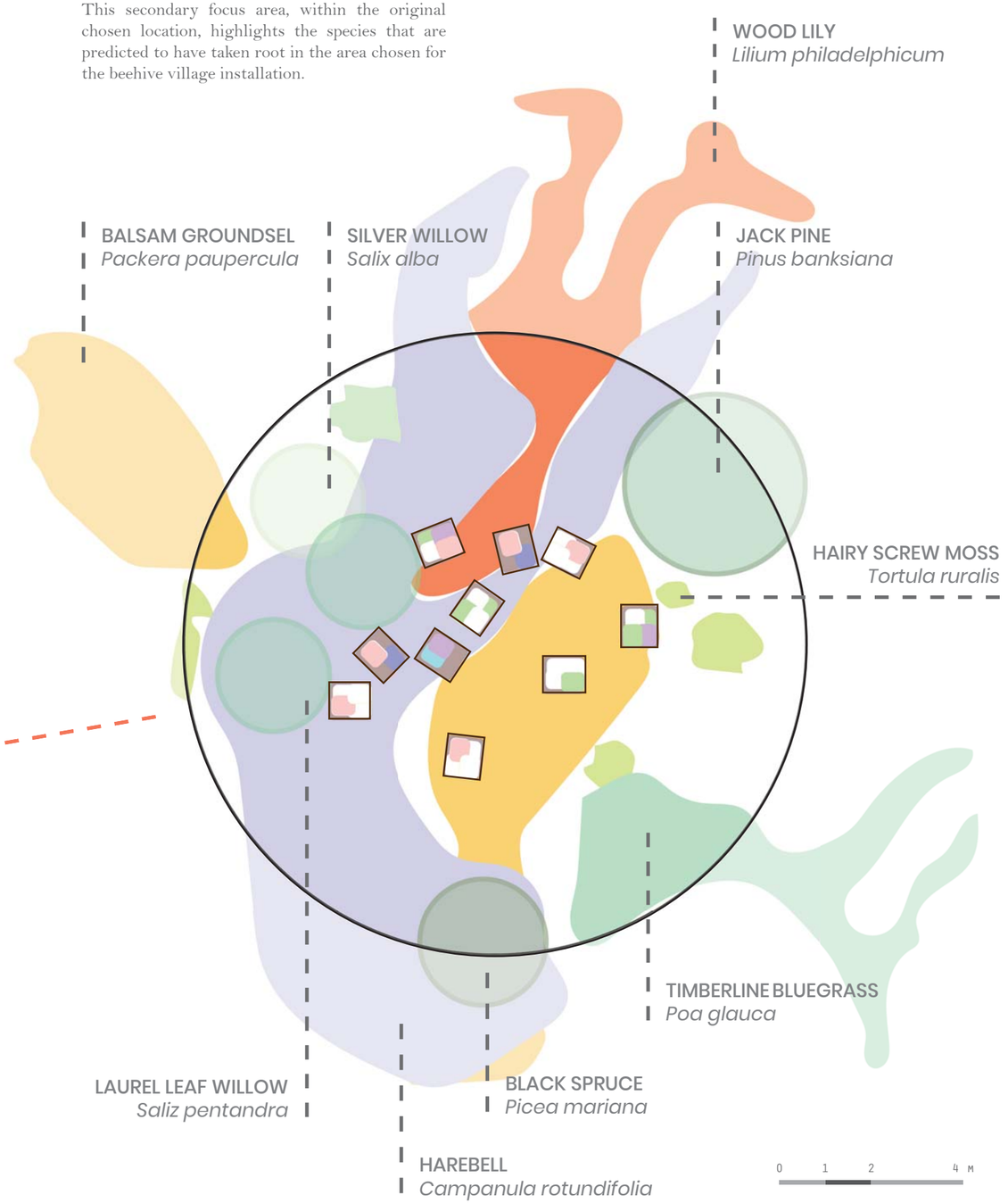
BEEHIVE VILLAGE

A beekeeping program was chosen as the community activity to be implemented in this proposed design. Grand Rapids has established flower plantings within their Memorial Park, and a greenhouse is under construction on the site of the school grounds; these activities indicate an interest in gardening, which would be complemented with the introduction of a beehive village. The western edge of the borrow pit, just south of the central shelter, was deemed the appropriate location at which to install beehives.



FOCUS AREA: SPECIES

This secondary focus area, within the original chosen location, highlights the species that are predicted to have taken root in the area chosen for the beehive village installation.



Year 5+

Site Monitoring & Continuation

Having established a significant presence of vegetation on site, constructed outdoor meeting spaces, developed a cohesive pathway system, and introduced community programming, the design question now becomes "where do we go from here?" The fifth year would begin with a compiling of site documentation, including updated drone imagery, which would then be presented to the community. At this time, the community would have the opportunity to discuss the application of similar methods of reclaimed design to the abandoned borrow pits that flank the site.

Landscape architects would be available to the community throughout the previous four year outline, and could provide suggestions for possible projects moving forward, while maintaining steady improvements to the nature of the original borrow pit site.

From the fifth year onwards, the focus of the project will be a review of progress made, ongoing maintenance, and a discussion of practical re-vegetative processes that may be applied to the future of disturbed sites in the Grand Rapids area.

The VR model is pictured here in an abstract representation of the borrow pit site's future appearance. Spreading east and west beyond the strips of mixed forest that line the site, the potential for future interventions on disturbed sites is endless.

This project has offered the opportunity for the youth and the community of Grand Rapids to gain the experience and skill set to conduct landscape design on disturbed sites. With these skills, it is possible to picture a future in which landscape scars are no longer a marked feature on the landscape of Grand Rapids, Manitoba.

To achieve this level of site vegetation cover is predicted to take upwards of 20 years, thus turning this five-year intervention into a multi-generational school project, deeply entwined in the education of Grand Rapids School.

By collecting, interpreting, and adapting to the implications of short and long term data, the site will act as an opportunity to address and counteract climate change. The site is an ideal sandbox for applying innovative vegetation practices to a disturbed landscape. Beyond its implications to improve global environmentalism, the site is an example of the potential of community-driven reclamation work, which could successfully be applied in other northern communities in Canada.

BP

VR Model

Future perspective

Conclusions

Summary of document

Knowing that my mother grew up in Grand Rapids, I was always interested in the childhood experience of living and learning in a remote northern town. The more I studied Grand Rapids through this practicum project, I saw the potential for landscape architecture to create inter-generational community engagement, not just for the children.

It was through the creation of the map series, when I carefully studied the layers of the landscape, that I really came to care for the land, and it was in discussions with the principal and teachers of Grand Rapids School that I truly came to care for the future of the community.

At a time when our planet is on the brink of environmental crisis, it is crucial that every individual foster within themselves a sense of care and duty towards the earth, and translate those feelings into acts of environmentalism. By engaging children in nature from a young age, a sense of leadership and responsibility for the land becomes ingrained in their being.

Allow the space for children to make small changes in their environment, and they will understand that, through collaboration, they have the potential to make expansive changes in their community and beyond.

With this design, I intend to give the children of Grand Rapids the tools and platform to take the future nature of their community into their own hands.

A path along the floodway offers a glimpse into the nature of the mid-boreal lowlands, and an idea of what the borrow pit site might look like, far into the fututre.

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p. 14 Taylor, J. (c. 1970). *Judy and Connie pose on the Cedar Lake Reservoir Structure*. [photograph].

p. 14 Taylor, J. (c. 1970), *Judy in the garden*. [photograph].

p. 14 Unknown, *Manitoba Hydro Generating Station*. [postcard].

p. 15 Taro PR (2017). *Diana Beresford-Kroeger's documentary Call of the Forest reveals how our health and the health of the Earth depends on the state of our forests. The film's Toronto opening is May 12 and 13*. [image] Available at: https://www.canadiangeographic.ca/article/new-documentary-call-forest-will-change-how-you-think-about-trees.

p. 20 Unknown, *Grouting at Grand Rapids c 1960s*, Exhibited at: Manitoba Electrical Museum and Education Centre.

p. 22 Unknown, *Saskatchewan River Spring Break-up*, Exhibited at: Manitoba Electrical Museum and Education Centre.

p. 22 Unknown, *Limestone Cliffs on the North Side of Grand Rapids*, Exhibited at: Manitoba Electrical Museum and Education Centre.

p. 23 Unknown, *Unloading Cargo Barges at Grand Rapids*, Exhibited at: Manitoba Electrical Museum and Education Centre.

p. 23 Unknown, *Hudson's Bay Company House at Grand Rapids c 1890*, Exhibited at: Manitoba Electrical Museum and Education Centre.

p. 23 Unknown, *Transmission Tower*, Exhibited at: Manitoba Electrical Museum and Education Centre.

p. 24 Unknown, *Forebay Negotiations are finalized with the signing and handoff of the Manitoba Hydro Settlement Agreement on November 14, 1990, with the Chemawawin First Nations and the community of Easterville*, Exhibited at: Manitoba Electrical Museum and Education Centre.

p. 32 Water Body information derived from Department of Natural Resources Canada.

p. 34 Contour data derived from Department of Natural Resources Canada.

p. 36 Soil information derived from the Land Resource Research Institute of Agriculture Canada.

p. 38 Vegetation cover derived from Google Earth Satellite Imagery.

p. 41 Road information from Google Earth Satellite Imagery & Street View; data confirmed during site visits.

p. 43 Building information from Google Earth Satellite Imagery & Street View; data confirmed during site visits.

p. 64 Soil information derived from the Land Resource Research Institute of Agriculture Canada.

p. 75 Manitoba Hydro (2016). *Keeyask Generation Project: Generating Station Construction Environmental Protection Plan*. [image] Available at: https://keeyask.com/wp-content/uploads/2014/08/Keeyask-Generation-Station-Construction-Environmental-Protection-Plan.pdf.

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p. 94 Unknown, *Northern Drying Meat*, Exhibited at: Manitoba Electrical Museum and Education Centre.

p. 96 McDonell, A. (2013). *A Toronto Kindergarten Classroom, inspired by the principles of Reggio Emilia*. [image] Available at: https://thecuriouskindergarten.blog/tag/reggio-inspired-classroom-setup/.

p. 108 Unknown, *Long Spruce Dozing and Scraping c 1970s*, Exhibited at: Manitoba Electrical Museum and Education Centre.

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