

Establishing an Ecological Understanding to Urbanism:
Healing the Don through Education and Diversity

by

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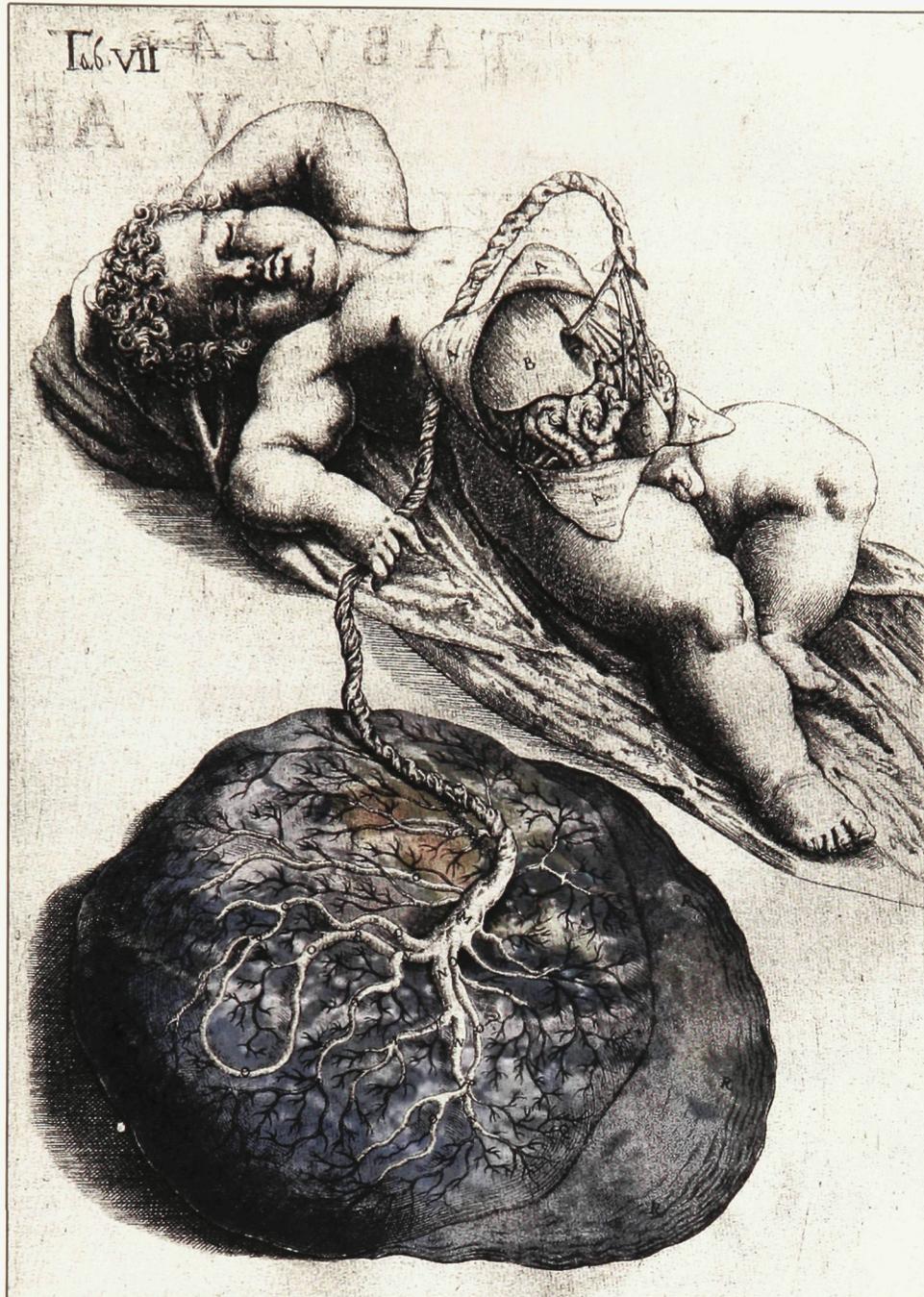
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This thesis is dedicated with love to
Nancy and Jim, my parents;
who taught me love and respect,
as well as Shaun and Adam, my brothers;
who push me to excel.

I want to express my appreciation to Dr. Kelly Crossman,
for his thoughtful critique and enthusiasm towards the completion of this thesis.
It was a delight to have Kelly as an advisor.

Abstract

This thesis explores a dynamic and environmentally responsible strategy for urban redevelopment of the de-industrialized Port Lands located at the mouth of the Don River in Toronto. The Don River is a river without spectacular scenery or rare plants and like many urban rivers has been abused and is quite ugly in parts. Nonetheless it remains, to a surprising degree, a reservoir of natural places of great integrity. In addition, the Don River valley has been, over many decades, the site of a wide range of human and industrial activities. Today that history forms the basis of our current understanding of the area as a cultural landscape of significant value.

In particular this thesis will investigate possible strategies for redevelopment in reference to the idea of the post-industrial “brownfield” site and incorporate the application of phytoremediation, a progressive remediation technique now being explored worldwide. The utilization of this passive remediation technique *in situ* enables the public to witness and participate in the healing of the site while stimulating a collective environmental stewardship. In this way, the thesis also explores the fragile site condition as a catalyst for conceptualizing alternate patterns of urbanism that are ecologically responsible and restore curiosity with citizens.

The prototype design for the Don River Discovery Pavilion is an architectural response that questions how to appropriately build adjacent to a constructed wetlands condition. The pavilion investigates how architecture and landscape can create a new public understanding of the relationship between nature, people, and cities. This model for future sustainable development represents a critique of the unsustainable actions of the past and explores the possibility of a new architectural paradigm that takes its cues from an imitation and emulation of natural processes. The proposal signifies a move towards a philosophy of sustainability, which promotes human development that is environmentally responsible, economically feasible, and theoretically clear to the public.

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Chapter 1: Introduction

The built environment is a reflection of a culture and defines how people relate and interact with their surroundings. It is the physical manifestation of a culture's existential view. The traditional values that have shaped the physical landscape have contributed little to environmental health or creating enriching places to live in. The purpose of this thesis is to find alternative approaches to thinking about the physical environment that establishes a balanced relationship between nature and urbanism. The thesis asks if architecture has the potential to heal the way a society engages landscape?

The late 20th century has seen a dramatic increase in the number of people living in urban areas. During this time of increased urbanization, the climate and environment has changed rapidly. A large majority of the forthcoming built environment has yet to be designed, which raises the question of how society will build in the future. What is the relationship between the built environment and nature? Will we continue to construct uninspiring buildings or will we be critical and build another layer on the urban palimpsest that is sensitive to human needs and conscious of place? A debate on the urban design of cities needs to address new ecological patterns of settlement that challenge our collective consciousness and understands the relationship between people and their surroundings. Urban design theory needs to acknowledge the long-term impacts of urbanization and establish healthy environments for all inhabitants that share the planet.

Western culture cannot continue on its current path. Annually, records are broken for the consumption of energy, water and materials as well as the amount of pollution and waste created. We need to change our worldview. Architects need to stop designing to

the boundaries of their buildings and evaluate architecture's connection to its surrounding environment and its larger relationship to the city. Architects should step back and ask how it might be possible to build a better world rather than simply how we can build better buildings. The present-day division between natural and human processes in our thinking leads to an unbalanced urbanism that has little respect for place. Architecture can be a healing act, a kind of "nutrient" in the creation of place. An ecological architecture operates in balance with nature by reflecting natural processes, which creates a respect for place, the cycles of life and people. Progressive remediation techniques, such as phytoremediation, engage people in the healing of the site.

In accordance with these principles and out of a desire to investigate the possible application of new and emerging strategies in the context of contemporary architecture and urban design, this thesis has been structured in eight parts. The first section introduces the general urban/ecological context that consists of the Don River Watershed. The Don River Watershed is a series of urban and rural river systems that has been a significant landscape in the urbanization of southern Ontario. The second section of the thesis will investigate current and emerging ideas about the relationship between nature and sustainability and how it can awaken the sense of belonging to the wider natural world. The third section of the thesis will look at the concept of industrial brownfields and present remediation strategies as catalysts for imagining new urban patterns. The fourth section of the thesis will present case studies that demonstrate and reinforce the connection between brownfield redevelopment and sustainability. The fifth section of the thesis will introduce the project site, its present-day situation and its connection to the city. The sixth section of this thesis will present the site framework, its fundamental interventions and how these

steps restore an interconnected urbanism at the mouth of the Don River. The seventh section of this thesis presents design principles for building adjacent to wetlands. Lastly, the eighth section of this thesis proposes a prototypical architectural design for building adjacent to the wetlands conditions that examines architecture's potential to engage people with the landscape.

Chapter 2: General Context of Thesis Investigation: Don River Watershed

On December 6th 2007, Environment Canada released a report outlining the water quality of Canadian rivers. The Don River scored an embarrassing 34.8, on a scale out of 100, labeling it Ontario's dirtiest river, and one of the worst in Canada. The Don River is a river without spectacular scenery, rare plants or mammals, great views or magnificent waterfalls. Like most urban rivers, it has been abused and is quite ugly in parts. But the 'dirty' Don is a surprising reservoir of natural places of great integrity and a cultural history of exceptional value. Despite the Don River Watershed's current health conditions, the Don is a cultural landscape of significant value.

The Ontario Provincial Policy Statement (OPPS, 2005) under the Ontario Planning Act defines a cultural landscape as 'a defined geographical area of heritage significance which has been modified by human activities and is valued by the community.'¹ Historically, policy makers have had little interest in the health of the Don River. Within the past few decades, the river's health has seen considerable improvement since a large majority of the public has recognized the influence the health of the Don River Watershed to the environmental character of Toronto. People have demanded a change to public policy that reflects this public environmental consciousness.

UNESCO's 1992 *Operational Guidelines* identified three main types of cultural landscapes: designed landscapes, evolved landscapes, and associative landscapes.² The watershed could be diagnosed as an evolving landscape, since over time it has been

¹ Ontario Ministry of Culture, "Heritage Resources in the Land Use Planning Process: Cultural Heritage and Archaeology Policies of the Ontario Provincial Policy Statement, 2005," (Toronto: Queen's Printer of Ontario, 2006) Info Sheet 2, 1.

² United Nations Educational, Scientific and Cultural Organization, "Operational Guidelines for the Implementation of the World Heritage Convention" (UNESCO World Heritage Centre, March 27, 1992).

transformed from an early agricultural settlement, to an industrial and manufacturing precinct, to a transportation artery, and now forms the context of a recreational corridor with a diverse ecology. Throughout its continuous transformation, the landscape has remained historically significant. Urban rivers differ fundamentally from rivers in the countryside because of their stronger and more developed connection to human processes. The OPPS defines significance where cultural heritage resources are 'valued for the important contribution they make to our understanding of history of a place, an event, or a people.'³ It is in this sense that the Don River Watershed can be seen as a landscape of significant cultural value.

History

The Don River Watershed is one of the major watersheds in the Greater Toronto area, covering 360 square kilometres. Its rural headwaters begin at the Oak Ridges Moraine aquifer and drops 220 metres, spilling into Lake Ontario 38 kilometres away. The Oak Ridges Moraine aquifer supports many watersheds, lakes and catchment areas that make up the water commons for this region. The portion of the Don River Watershed known as the Lower Don is formed from the confluence of the east and west river branches; a 7 kilometre section north of Lake Ontario, flowing through the most urbanized portion of the watershed.

³ Ontario Ministry of Culture, "Heritage Resources in the Land Use Planning Process: Cultural Heritage and Archaeology Policies of the Ontario Provincial Policy Statement, 2005," (Toronto: Queen's Printer of Ontario, 2006) Info Sheet 2, 2.



Fig. 1. Oak Ridges Moraine, Southern Ontario, 2005. Created by Norman Einstein.

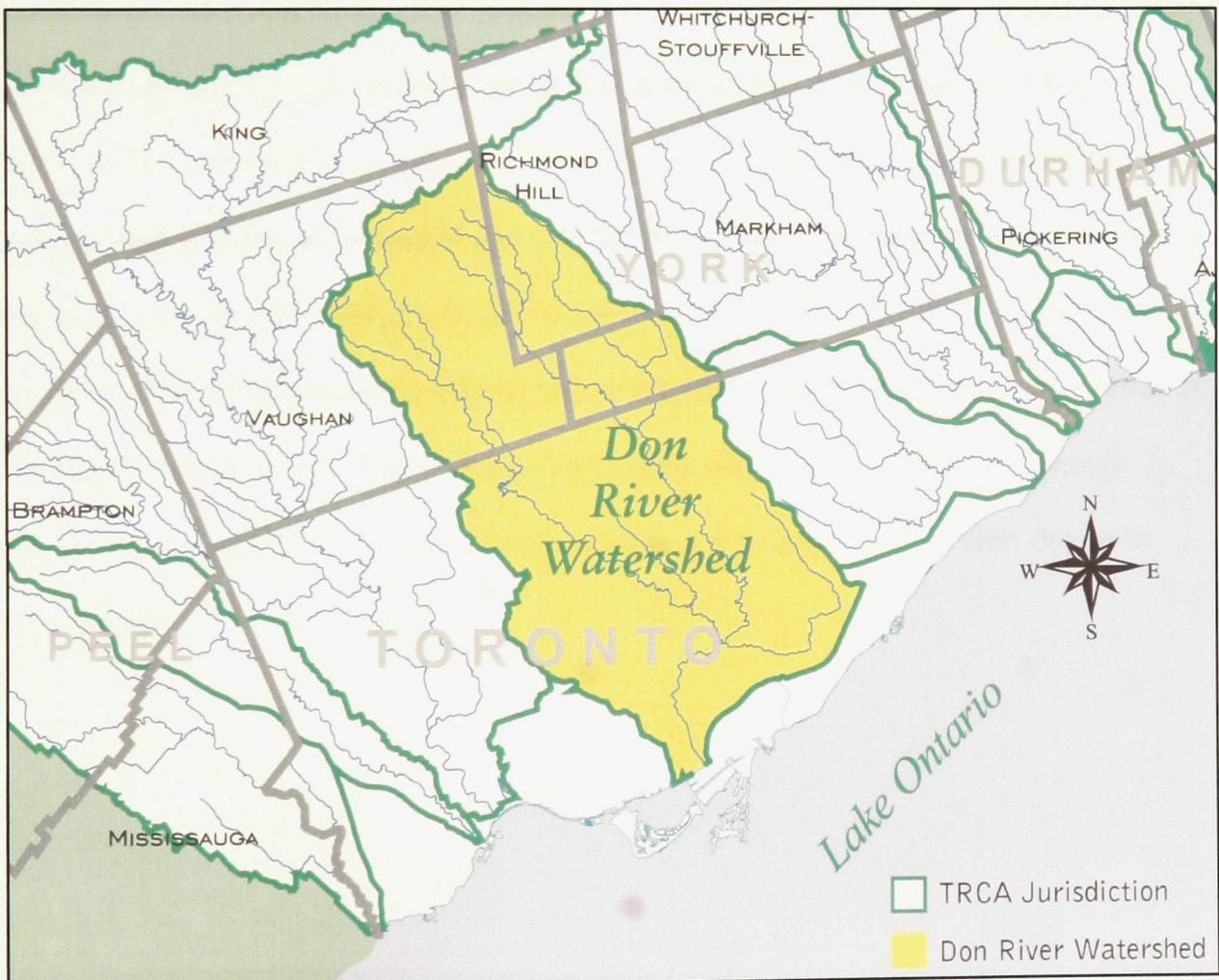


Fig. 2. Don River Watershed, Southern Ontario, 2003. Created by Toronto Region Conservation Authority.

The Mississauga Indians were the first people to establish settlements around the Don for hunting, fishing, and trading. French traders mapped the area as early as 1688, but major colonization did not take place until after the Toronto Purchase of 1787. A number of industries were developed surrounding the Don River in the 19th century. By 1852, almost 40 flour, grist, textile, and lumber mills lined the Don, forever altering the ecosystem.⁴ At that time the watercourse naturally zigzagged through the city until it reached Ashbridges Marsh at the mouth of Lake Ontario. During Toronto's early expansion, the Lower Don was perceived as an obstacle to the eastward growth of the city. Ashbridges Marsh remained as a vast fertile wetland habitat until 1912 when it was filled as part of the largest lake-filling project in North America to create new industrial property on reclaimed foreign soil. The marsh was criticized as an unhealthy swamp, which influenced the justification for channelizing the lower portion of the river and filling in the marsh to "secure a sanitary condition."⁵ The channelization of the river removed its natural ability to regulate the water quality and maintain a consistent hydrological cycle. As a result, the Don is perpetually choked with debris, ice jams and algae. In the more distant past, floods regularly swept away the original mills and bridges adjacent to the river as a result of the river's channelization. Today while neighbouring watersheds flourish from people fishing and canoeing in their waters, these activities are prohibited in the Don due to its poor health.

⁴ Mark Wilson, *Don Watershed Regeneration*, 1999, <http://www.mwilson.on.ca/don/html> (accessed 2008).

⁵ Michael Hough, *Cities and Natural Process: A Basis for Sustainability* (New York: Routledge, 2004) 42.



Fig. 3. Ashbridges Marsh, Toronto, Ontario, 1873. Painting by Lucius O'Brien.



Fig 4. Reclaimed Shoreline 1876/2006, Toronto, Ontario. Created by author.

Toronto's strong industrial heritage reminds us of not only the industrial past but also the attendant neglect and ill use of the landscape. The Lower Don's physical character was most dramatically altered in the early 1960s when the river was straightened and channelized to accommodate the Don Valley Parkway, a new highway built in the river valley bordering the river. This created a situation in which the river was trapped between two major roadways, the Don Valley Parkway and Bayview Avenue. This had the effect of restricting ordinary people's access to the valley. The introduction of the Don Valley Parkway into the Lower Don generated great urbanization pressure on the natural systems and reinforced the prevailing view at the time of the Don as an industrial and transportation corridor. The planning of this infrastructure displayed no respect for geological or natural features of the valley.

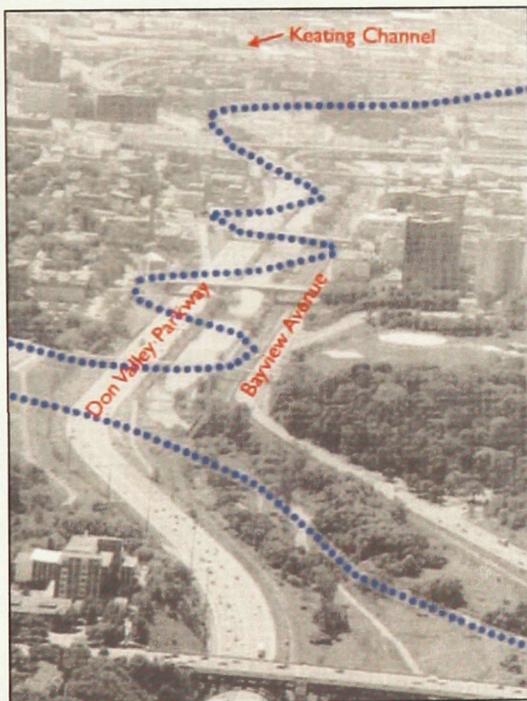


Fig. 5. Lower Don River Pre-Urbanization Water Course, Toronto, Ontario, 2008. Created by author, Photograph by Steve Frost.



Fig. 6. Toronto's Industrial Waterfront, Toronto, Ontario, 1974. Photograph by City of Toronto Archives.

Settlement around the Don happened in three stages. During the late 18th century, the first stage was comprised of village settlements in the Lower Don. After World War II, suburbanization of the middle of the watershed marked the second stage of settlement. Rapid suburbanization near the watershed's headwaters in York Region has occurred since the 1980s, constituting the third stage of settlement. Today, the rural land in this area still has a predominant natural character but continues to be threatened by human development. Urban growth into the surrounding suburban areas has severely altered the character of the watershed through the filling in of ponds and marshes and the widespread removal of vegetation. The Don River valley still acts as a major migratory route for wildlife in Northern Canada migrating to warmer regions. The Leslie Street spit adjacent to Lake Ontario has become a world-renowned site for migratory birds and wildlife. The industrial uses of the Lower Don have been in transition for over a decade and are slowly acquiring a passive recreational character. A number of sailing and rowing clubs have been established in Toronto's Outer Harbour. The Martin Goodman Trail is a popular walking, cycling, and inline skating trail that weaves through the Lower Don, the Port Lands adjacent to the Toronto harbour and towards the waterfront itself.

In 1991, the Royal Commission on the Future of the Toronto Waterfront conducted an environmental assessment on the industrial area in the Port Lands. The research found that generally, water quality in the area could be described as poor. The waters are characterized by high levels of nutrients within the Inner Harbour bordering on a eutrophic state with the Keating Channel already eutrophic.⁶

⁶ Joanna Kidd, *Water and Sediments: Environmental Audit of the East Bayfront/Port Industrial Area Phase II*, Royal Commission on the Future of the Toronto Waterfront (Toronto: The Commission, 1991) 1.

Threats

The Don River Watershed is a diverse ecosystem that has continually been ignored and despoiled for over two hundred years. The river's natural values have been degraded by urban development that has demonstrated little understanding or concern for ecological consequences. The river's once pristine waters are now badly degraded as a result of three major external human pressures.

Population is the first major threat to the health of the watershed. The Don River is the most highly urbanized river in Canada. Today, the Don River Watershed is estimated to be 86% urbanized and home to 800,000 people.⁷ Toronto's Official Plan expects an increase of 2.7 million new residents by 2031. Based on these numbers, it is reasonable to anticipate an increased pressure on the watershed from further urbanization.

The second major threat to the health of the watershed is water contamination from the overflow of the old combined sewer systems, a product of Victorian engineering. Roughly 70% of the urbanized area surrounding the Don River was developed during the early settlements of Toronto and before storm water management.⁸ This old-fashioned system collects rainwater from the roofs of buildings and connects the water directly to the sewer system instead of releasing the water onto the ground. During periods of heavy rainfall, the sanitary sewers receive the overflow from storm sewers. As a result, raw sewage flows directly into the Don River. Disconnecting the roof drainage from the sewer system is crucial to maintaining consistent flow patterns in the sewer system.

⁷ Mark Wilson, *Don Watershed Regeneration*, 1999, <http://www.mwilson.on.ca/don/html> (accessed 2008).

⁸ Toronto & Region Conservation Authority, "Forty Steps to a New Don," (1994), 2.

The third major threat to the health of the watershed is polluted storm water run-off. Storm water makes up a large portion of the river's water. As a product of urbanization, many forests have been removed and replaced with hard surfaces, dramatically altering the natural water cleansing cycle. The soil in the Lower Don is filled with sediment contamination from previous industrial uses. When it rains, these sediments along with pesticides, road salts and other contaminants used on the modern landscape wash directly into the river system without being broken down by plants and trees.

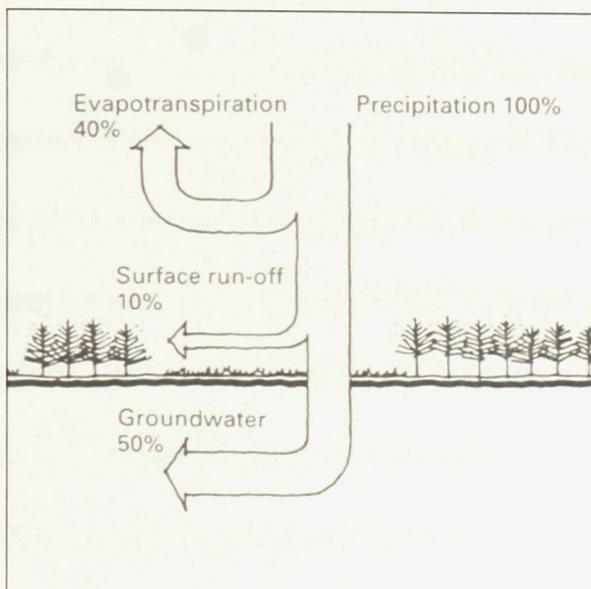


Fig 7. Pre-Urban Hydrological Condition.
Created by Ministry of the Environment.

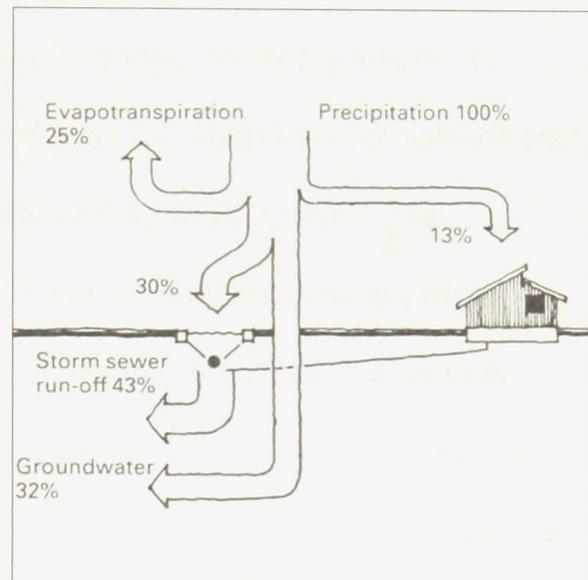


Fig 8. Urban Hydrological Condition. Created
by Ministry of the Environment.

Challenges

The degradation of the Don River Watershed's natural environment over the past two hundred years brings into question the ethics of policy makers. Concerned citizens have seen the warning signs for years and recognized the importance of the watershed's health to their quality of life. Citizens reacted by taking ownership and responsibility for the health and regeneration of the Don corridor through the formation of citizen action groups, advocating for the Don's renewal.

The past eighteen years has seen a critical shift in the life of the Don River Watershed. In 1990, a group called the Task Force to Bring Back the Don (TFBBD), formed as an act of faith by concerned citizens about the natural heritage of Toronto. This citizen group, sponsored by the City of Toronto formed with the sole purpose of initiating the renewal of the Don River as a 'clean, green and accessible'⁹ watershed, specifically in Toronto's jurisdiction. The task force's formation created a surge of public interest and the first step towards the difficult question of how to regenerate the damaged Don River Watershed ecosystem. In 1994, the task force's regeneration strategy titled *Forty Steps to a New Don* was the first step in the watershed's resurrection as a healthy, vibrant ecosystem. It presented the first green urban image of Toronto's industrial waterfront that concentrated less on economic renewal and more on improving habitat and accessibility. The regeneration strategy received global attention for its community involvement after receiving an international award for environmental planning. A number of grassroots community action groups are the primary voice of citizens. In the City of Toronto, the TFBBD is always consulted for their input regarding any matters that may impact the river.

The TFBBD has four primary goals: firstly, to restore natural habitat and re-establish ecological diversity in the lower valley in ways that would integrate its cultural history with human and non-human values; secondly, to regain public access and restore its sense of place as an urban river; thirdly, to reconnect the river to the lake and restore the estuarine marshes; and fourthly, to improve the water quality.¹⁰

⁹ City of Toronto, www.toronto.ca/don/ (accessed 2008).

¹⁰ City of Toronto, http://www.toronto.ca/greentoronto/green_tftbbtd.htm (accessed 2008).

In 1992, following the formation of the City's task force, the Toronto Region Conservation Authority (TRCA), the body responsible for protecting resources, wildlife habitat, and water management projects formed the Don Watershed Task Force to monitor the regeneration of the entire watershed. This was subsequently followed by a Provincial government agency called the Waterfront Regeneration Trust. The City of Toronto committed to regenerating the Don River by stating, "we stand at a pivotal point in the life of the watershed where we need to maintain the momentum and build on our successes."¹¹ The City of Toronto has a twenty-five year, \$1 billion dollar plan to clean up the big pollution sources: contaminated sewers, the leaching of chemicals and fertilizers into the city's rivers, and the overflow of storm water by replanting bushes and woodlots. The complex Don River Watershed has a strong historical significance in relation to what it tells us of the early development of Toronto but it also plays an even greater role in building a new ecological appreciation for nature in the city. The Toronto Region Conservation Authority has stated, "it took a century to get the Don River to a degraded state...we are ready to spend another century, if necessary, to bring it back."¹²

The OPPS definition of significance in regards to cultural heritage recognizes resources that are "valued for the important contribution they make to our understanding of history of a place, an event, or a people."¹³ The Don River has a distinct natural and cultural character whose health is strongly tied to human processes. Classifying the Don River Watershed as a cultural landscape implies a distinct valuation at a broader regional level. Eighteen years is only a flicker of time at the scale of a watershed, but within this time there

¹¹ City of Toronto, www.toronto.ca/don/ (accessed 2008).

¹² Toronto & Region Conservation Authority, "Forty Steps to a New Don," (1994), 11.

¹³ Ontario Ministry of Culture, "Heritage Resources in the Land Use Planning Process: Cultural Heritage and Archaeology Policies of the Ontario Provincial Policy Statement, 2005," (Toronto: Queen's Printer of Ontario, 2006), Info Sheet 2, 2

has been a critical shift where the groundwork has been laid for the resurrection of a healthy watershed.



Fig. 9. *Don River as Natural Oasis*, Toronto, Ontario, 2008. Photograph by author.

Chapter 3: Strategies for an Ecological Urbanism

Environmental Crisis/Design Crisis

The environmental crisis is a design crisis. It is a consequence of how things are made, buildings are constructed, and landscapes are used. Design manifests culture, and culture firmly rests on the foundation of what we believe to be true about the world.¹⁴
– Sim Van Der Ryn

Rapid exploitation of the Earth is causing a plethora of environmental damages; catastrophic changes in weather patterns, unacceptable air quality and tragic wildlife extinction, just to name a few. The ecological integrity of natural and cultural landscapes is being degraded by insensitive development. Every new sterile subdivision and shopping mall being planned seems to ignore its cultural and geographical identity by swiftly destroying the remnants of the past that made each community distinct and relentlessly creating places that seem like no place in particular. Banal, monoculture designs reduce diverse landscapes to a handful of architectural experiences and cleverly camouflage the living world with uninspiring models of settlement that have little understanding of the other living creatures that share the planet. As Sim Van der Ryn, the pioneer of “sustainable architecture” says, the environmental crisis is simply a failure to design a suitable living world.¹⁵

Damage to basic planetary life support systems raises the issue of how nature and humanity are connected within the socio-cultural structure of contemporary society. Design is the link between nature and culture. Design refers to the intentional shaping of matter, energy, and processes to meet a perceived need or desire.¹⁶ When a design is responsible for the destruction of a natural habitat, we are in fact destroying a part of

¹⁴ Sim Van der Ryn, *Ecological Design*, 2nd (Washington: Island Press, 2007), 24.

¹⁵ Van der Ryn, 24.

¹⁶ Van der Ryn, 24.

ourselves. This creates a deep sense of loss. Loss is revelatory. Fifty years ago, biologist Rachael Carson woke up the world to the law of unintended consequences in her highly influential book *Silent Spring* by connecting the loss of birds to the widespread use of the biocide DDT, which produces genetic changes during the reproduction of birds.¹⁷ Carson also highlighted the fact that humans control the conditions of life above the natural transformation. The reason for designing and constructing architecture is to create a habitat for life. It seems that along the way we have instead concentrated our energies on creating a habitat for the automobile.

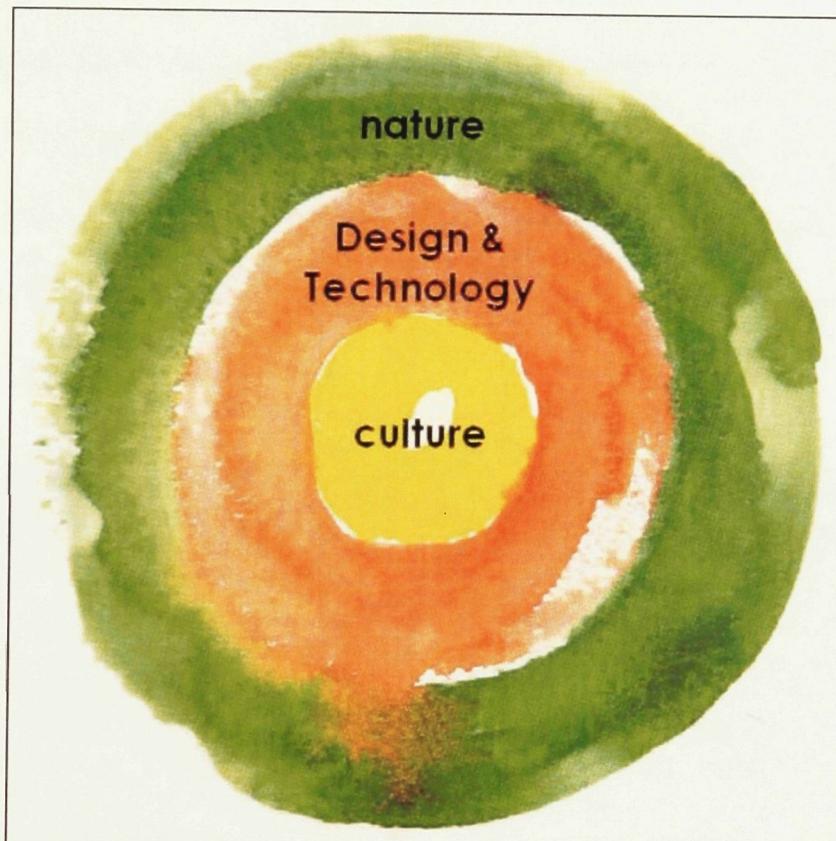


Fig. 10. *Three-Ring Diagram*. Created by Sim Van der Ryn.

To achieve harmony with nature, people need to abandon the belief of superiority over the natural world. Throughout the 20th century, nature was viewed as a picturesque landscape and architecture as a superior form that hovered above it. The mass conversion

¹⁷ Sim Van der Ryn, *Design for Life* (Layton: Gibbs Smith, 2005), 8.

of forests, farmland and wetlands to urban and suburban uses in the second half of the 20th century exhibits this cultural devaluation of nature. Not only has this attitude destroyed the original natural landscape, it has also almost overpowered the collective ability to remember what the landscape looked like before development. This approach to nature has rendered both nature and the consequences of our own technologies increasingly invisible to urban people. As a consequence, many people feel no responsibility towards the maintenance and stewardship of the natural environment. According to the Worldwatch Institute, buildings consume roughly forty percent of all global energy, forty percent of all raw materials annually extracted from the earth, produce forty percent of the carbon dioxide emissions and forty percent of the total waste.¹⁸ A design strategy that manifests the life-cycle of water in our environment by revealing water supply, the treatment of waste, and other natural processes that support life would be an example of how design can help stimulate an environmental awareness of natural cycles and promote the values of an ecological stewardship.

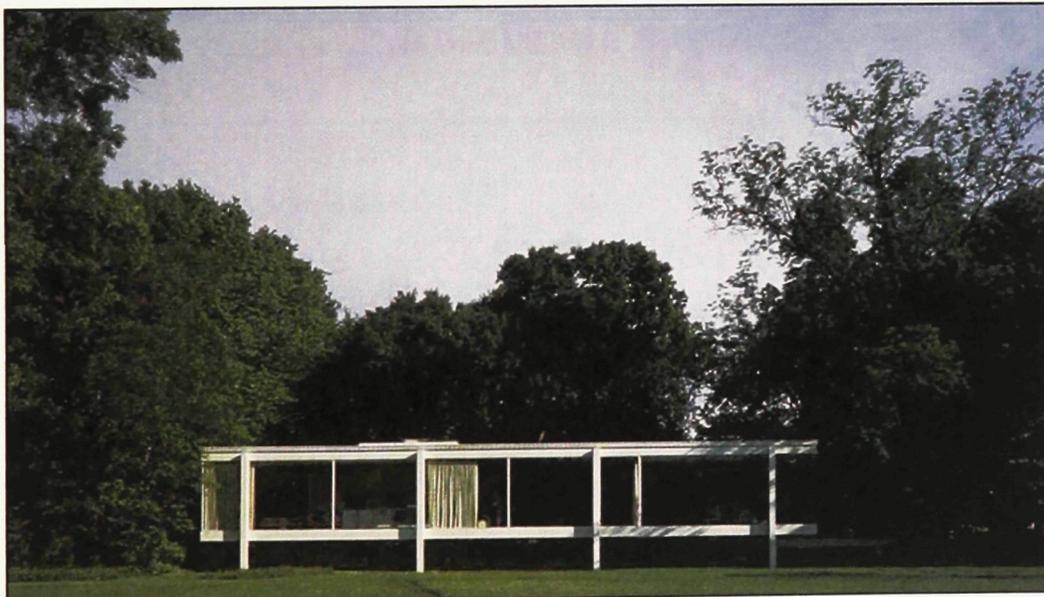


Fig. 11. *Superiority over Nature: Farnsworth House*, Plano, Illinois, 1951. Architect: Mies van der Rohe, Photograph by Peter Cook.

¹⁸ Rocky Mountain Institute, "High Performance Building: Perspective and Practice." (U.S. Green Building Council, 2007).

The 18th century political philosopher Edmund Burke once said, society is a partnership, not only between those who are living, but also between those who are living, those who are dead, and those who are to be born.¹⁹ It is only within the last forty years that sustainable design has emerged in response to the environmental crisis. Architects have embraced a terminology to describe the environmental impacts of their designs and have begun to discover the ability to create harmonious places between humanity and nature. We seem to be reaching a moment in human development when buildings are beginning to be considered as living organisms rather than static objects.

Metaphor

In his 1969 book *Design with Nature*, Ian McHarg, landscape architect and prominent writer on regional planning stated, that all architecture since the industrial revolution has been designed without reference to nature.²⁰ Architectural design in the 20th century has been grounded by the influential modern metaphor of the machine for living in. This shortsighted metaphor believed technology and engineering advances had the capacity to cure all problems, a concept that is still very strong today at the beginning of the 21st century. This concept implies an exploitative relationship with nature that requires vast amounts of energy to solve problems.

Over the course of its history, the automobile has been a significant instrument of freedom and mobility. Unfortunately it has also had a disastrous effect on the environment and the human scale of cities. Conventional design values that shaped the urban landscape

¹⁹ Edmund Burke, *Reflections on the Revolution in France*, Vol. 3, in *The Works of the Right Honorable Edmund Burke* (1899), 359.

²⁰ Chris & Phil Cousineau Zelov, "Why is Architecture Oblivious to the Environment?," in *Ecological design handbook: sustainable strategies for architecture, landscape architecture, interior design, and planning*, ed. Fred Stitt (New York: McGraw-Hill Press, 1999), 17.

during the twentieth century have contributed little to the environmental health of our world and have played a role in creating a mental dichotomy between humanity and nature, which has profoundly affected the relationship of society with the natural world. It is often the case that people regard urban areas as places where people live as compared to non-urban areas that are characterized as areas more connected with nature. This reflects an attitude in which nature is understood as an externality, separate from human actions, which can only be studied in a non-urban setting. This perception of the city as disconnected from the natural processes that support life is a central problem in the environmental crisis. Many urban environmental problems, such as poisoned air and water, exhausted resources and the loss of habitat, can be attributed to these traditional design values.

Typologies of Landscape in Urban Design

The formal landscape and the natural landscape are two contrasting landscape typologies that exist in cities. These two typologies symbolize a fundamental conflict of environmental values. The first typology can be described as the nurtured landscape. This homogenous formal landscape, filled with fountains, flowerbeds, and immaculate lawns has traditionally been the focus of civic design. In this tradition, good design is independent of place and based solely on conventional aesthetics. Formal landscapes are unsustainable since they are dependent on a high contribution of energy for its survival. The second landscape typology can be described as the natural landscape. This fortuitous landscape is often the unintentional landscape found in the forgotten places in the city.

In 1987, the United Nations' World Commission on Environment and Development produced a well-known report titled *Our Common Future*, otherwise known as the

Brundtland Report. This report defined sustainable development as “development that meets the need of the present without compromising the ability of future generations to meet their own needs.”²¹ The report contains many subjective phrases such as ‘quality of life’, which left the new concept of sustainability open to critical interpretation and speculation but it established the intention to compromise. The 1992 Earth Summit held in Rio de Janeiro, also known as *Agenda 21*, created more recent impetus for the exploration and development of the concept of sustainability. As an extension of the Brundtland Report, *Agenda 21* focused on strategies that change patterns of consumption, alleviate poverty, and improve health standards. If society accepts the Brundtland Report’s definition, we must recognize that the present form of living is unsustainable. If everyone in the world were to require the same ecological footprint as a typical Canadian/American, three earths would be needed to support them.²² We must transform our attitudes and address our current flaws as design problems with a deep understanding of ecology. Society cannot continue to believe in the modern ‘machine for living in’ metaphor and trust that technology will find solutions to all problems. This is the denial of an addiction.

Ecological Design

According to architect and educator Samuel Mockbee, sustainable design “involves a combination of values; aesthetic, environmental, social, political, moral. It is about using one’s imagination and technical knowledge to engage in a central aspect of architecture; designing and building in harmony with our environment.”²³ Its most basic message is sensitivity of place; no human intervention into nature should be valued without a thorough

²¹ World Commission on Environment and Development, *Our Common Ground* (Oxford: Oxford University Press, 1987), 1.

²² Jason McLennan, *The Philosophy of Sustainable Design* (Kansas City: Ecotone, 2004), 27.

²³ Mindy Fox, “Building Dreams: An Interview with Samuel Mockbee,” in *Sustainable Architecture: White Papers* (New York: Earth Pledge Foundation, 2005), 208.

analysis of the harmony between a building and its environment. Unlike the certainty projected by modernism, the outcome of ecological design is not a forgone conclusion.

The word *sustainable* is a synthetic word that is increasingly being used in the field of design. It is an inadequate word and therefore is often ridiculed as a design philosophy. The word *ecological* is more appropriate as it describes the restorative attitude by implying the need for change and the challenges ahead. It indicates a responsibility and respect for people, place, and the cycles of life. Ecology comes from the Greek root word *oikos* or house. It refers to “the logos of dwelling – the intersecting resonance of past and present in our stories of home.”²⁴ The influential German philosopher Martin Heidegger argued, “we attain to dwelling, only by means of building.” He differentiates building and dwelling by stating, “dwelling does not merely relate to inhabiting a building but involves a particular mode of building involving preserving, nurturing, and cultivating as much as constructing.”²⁵

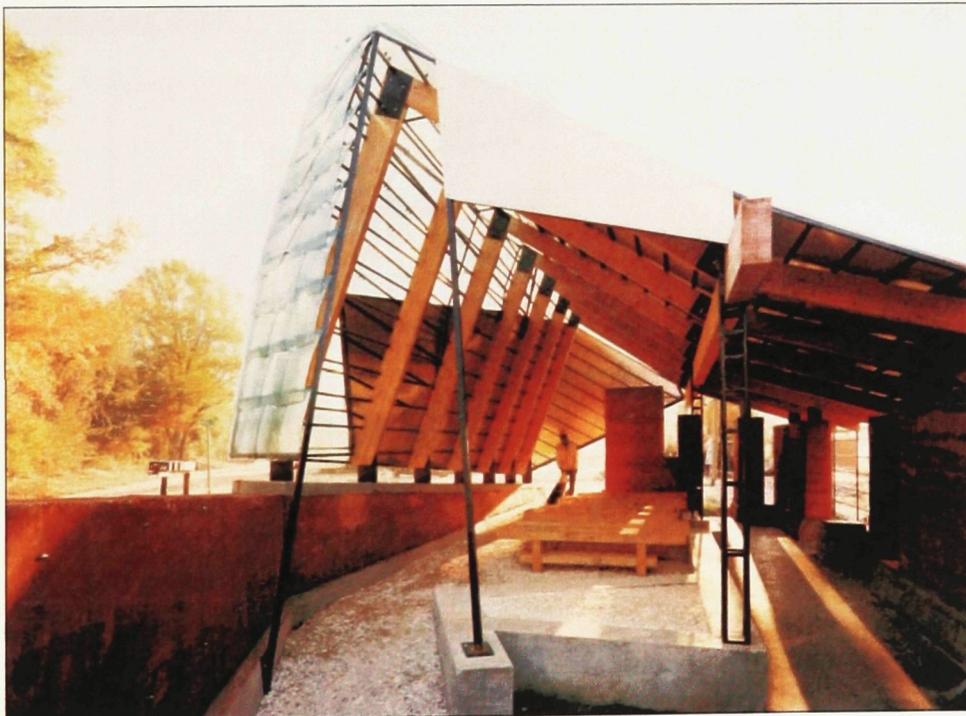


Fig. 12. Mason's Bend Community Center, Hale County, Alabama. Architect: Samuel Mockbee & Rural Studio.

²⁴ Amy Lavender Harris, "Imagining Toronto: The Ecological City," *Spacing Magazine* Fall 2007, 52.

²⁵ Martin Heidegger, *Poetry, language, thought*, 1st trans. Albert Hofstadter, 1st (New York: Harper & Row, 1971), 347.

Ecological design is not an option but a responsibility for design professionals. It involves finding alternative methods to current problematic practices by rethinking our value system. It re-examines the details of how design can nourish living systems and adopts a long-term approach to achieving a sustainable world.

A contrasting approach to the idea of ecological sustainability is that of technological sustainability. Environmental educator David Orr describes this as the belief that “every problem has either a technological answer or a market solution.”²⁶ Technological sustainability is superficially compelling since no change is necessary to adopt into the existing power structure. These two approaches embody different images for a future sustainable society. Ecological design awakens the sense of belonging to the wider natural world by restoring natural habitat and human health along with enhancing quality of life. Ecological design is inevitably tied to a specific place by fostering overall solutions to an area’s environmental impact.

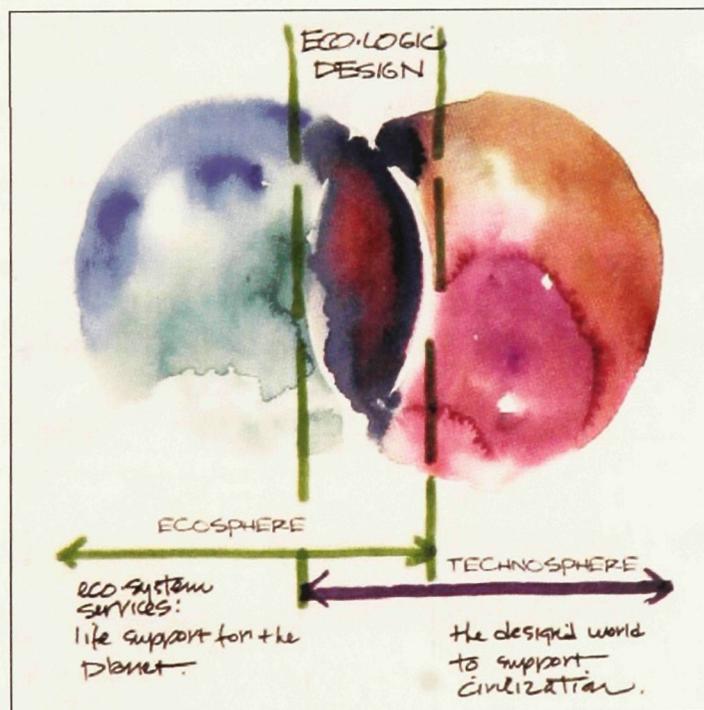


Fig. 13. *Merging Nature and Design*, Created by Sim Van der Ryn.

²⁶ Sim Van der Ryn, *Ecological Design*, 2nd (Washington: Island Press, 2007), 20.

The Human Factor

It is of prime importance to realize that it is not buildings, but people and events, which need to be constructed to create socially sustainable urban environments. The achievement of ecological goals is contingent on the interdependence of environmental quality, social equity, and economic prosperity. The presence of people, activities and events, to a large degree, demonstrates the success or failure of an urban environment. If individuals are to genuinely engage sustainable design initiatives, strategies must reflect the publics' values. People-centred design emphasizes the importance of lived experience in creating urbanity.

As Sim Van der Ryn wrote, "much of the human search for a coherent and fulfilling existence is intimately dependent upon our relationship to nature."²⁷ In general, people learn more about their surroundings by means of constant and direct experience with the environment in their daily lives than through the detached observation characteristic of an occasional visit to a museum. Active participation with the environment reveals and teaches humankind how closely connected it is to natural processes. The creation of habitat must be seen as part of larger systems of climate, landform, vegetation, and water rather than a series of individual elements. It is essential to understand what type of habitat you are trying to restore. Understanding the landscape at a much larger scale than the actual site itself is critical.

Too often in the current reality, economic imperatives hold a greater priority over cultural, social, and environmental values in the decisions of cities.²⁸ The only way forward

²⁷ Sim Van der Ryn, *Ecological Design*, 2nd (Washington: Island Press, 2007), 187.

²⁸ Getty Conservation Institute, *Economics and Heritage Conservation* (Los Angeles: Getty Conservation Institute, 1999), 14.

to create balanced environments is to accommodate rather than deny economic realities. Economists often reduce the discussion of value and cultural heritage of cities to a question of cost. It is of course a matter of cost but it is also a question of moral obligations concerning how we treat our environment. Ignoring the problem now is only going to make the problem a bigger and more costly issue in the future. The fundamental limit of economic thinking is that it cannot discern important cultural and social values.²⁹ Restoring human and non-human habitats in the regional context to create diverse environments requires considering the social and environmental factors as well as economic considerations.

Biomimicry

Biologist Janine Benyus created the term *biomimicry* in 1996 from the Greek word *bios* meaning life and *mimesis* meaning imitation. Benyus described the science of Biomimicry as having three major components: nature as model, nature as measure and nature as mentor. Biomimicry is the main principle of contemporary sustainable design. This principle fundamentally rejects the exploitive modern machine metaphor for building and replaces it with nature itself. It is a concept that looks to nature for guiding principles. This approach contains an attitude towards climate and place, the use of energy and materials and ultimately comfort and prosperity. Buckminster Fuller once stated, "we do not seek to imitate nature, but rather to find the principles she uses."³⁰ Designing with nature requires patience and does not necessarily produce visually dramatic results for instant consumption. However, the long-term benefits are extremely rich.

²⁹ Getty, 10

³⁰ Bob Berkebile & Jason McLennan, "The Living Building: Biomimicry in Architecture, Integrating Technology with Nature," *The Living Building*, 2007, <http://elements.bnim.com/resources/livingbuildingright.html> (accessed August 8, 2007), 4.

When the metaphor for building changes, a new set of rules emerge that can guide the design process. Nature can be an instructive and inspirational influence helping us find a new system of design that mimics natural processes. Looking to nature, leading sustainable designer Jason McLennan suggests a flower as a metaphor for buildings of the future. “A flowers are literally and figuratively rooted to place, able to draw resources only from the square inches of earth and the sky they inhabit. The flower must receive all of its energy from the sun, all of its water needs from the sky, and all of the nutrients necessary for survival from the soil. Flowers are like ecosystems, supporting and sheltering microorganisms and insects like our buildings do for us.”³¹ Looking to nature for inspiration recognizes that humans cannot redesign the rules crafted for us by nature. Respecting the wisdom of natural systems by embracing biomimetic principles is difficult since it almost completely opposes what conventional society teaches and recognizes as valuable.

Ecological Landscape

Landscape relies substantially on the qualities of a place to inform the design process. The 19th century Scottish biologist Patrick Geddes introduced his very influential concept of “regions”, which celebrates the distinct character of local places. This concept lies at the core of urban design principle. Traditionally, architects and urban designers have put their aesthetic energies into controlling the landscape and framing it as a beautiful object rather than integrating the complexity of the ecosystem into the public image of cities. Designing the landscape in an ecological manner embraces regional values by emphasizing the inherent distinctiveness of a particular place, the thing that makes one place different from

³¹ Bob Berkebile & Jason McLennan, 2.

another. It requires learning what is unique about a given place and making interventions that preserve these unique characteristics.

In many ways all cultures are defined by our surroundings. People identify themselves with place. Architectural historian and theorist, Christian Norberg-Schulz wrote about regional architecture and the phenomenology of place. "A concrete term for environment is *place*. It is common usage to say that acts and occurrences *take place*. In fact it is meaningless to imagine any happening without reference to locality and therefore place is evidently an integral part of existence."³² As cultural beings, people ultimately depend upon our relationship with nature for emotional attachment to place and a coherent sense of identity. The character of a place is composed of tangible substance of shape, texture, colour as well as the more intangible cultural connections such as a certain patina given by human use over time. All places deserve a regional architecture that embraces and learns from its uniqueness of place, respects its regional differences and environmental health and embraces appropriate technologies.

Stewardship:

Respect for People & Place

If you respect something you honour it, you act as its protector, as a steward or parent.³³ The most common rationale for preserving buildings and sites is that they represent an accurate record of what has occurred through the control of place. The preservation of buildings and sites within a city engages the public to see nature as a whole and understand the interrelationships between human and non-human life. It produces a

³² Christian Norberg-Schulz, *Genius Loci: Towards a Phenomenology of Architecture* (New York: Rizzoli, 1979), 6.

³³ Jason McLennan, *The Philosophy of Sustainable Design* (Kansas City: Ecotone, 2004), 6.

strong environmental education and community action in the places where people live. At a grass-roots level there is an increasingly sophisticated and powerful understanding of the environmental and social issues in the city. Cultural capital can be described as the ability to inspire or to be inspired.³⁴ Architects must be advocates of the natural world, ensuring that it is not something separate from the design process.

Respect for Water & Natural Resources

In the Great Lakes region of North America, water is everywhere, so it is often taken for granted. However, of all our natural resources, water is the most precious. 'Hurricane Katrina and other recent major environmental disasters have increased the public's awareness of the delicate human relationship between cities and their water.'³⁵ Human beings need water daily for their very survival, but as a society we continue to misuse water and other natural resources. In a resource rich country like Canada, the relatively low-cost of resources has created a public irresponsibility to maintaining water quality. A river cannot be viewed as just a body of water, but should be understood as a piece of a much larger interconnected system of creeks, rivers, lakes, storm and sanitary sewers that transport water across the landscape. What goes down a sewer at the local scale affects the conditions of river and lakes many hundreds of kilometres away.

Understanding the connectedness of urban systems is crucial. All water transported through the pipes of a filtration facility is treated to equal standards of potability, regardless of whether the water is to be used for drinking or fighting fires. Of all the water treated, only one percent is used for drinking.³⁶ Personal hygiene is depleting our water system.

³⁴ Getty Conservation Institute, *Economics and Heritage Conservation* (Los Angeles: Getty Conservation Institute, 1999), 8.

³⁵ Michael Hough, *Cities and Natural Process: A Basis for Sustainability* (New York: Routledge, 2004), 24.

³⁶ Hough, 13.

The average Canadian uses 589 litres of water everyday, while the average Torontonion uses much less at 253 litres of water per day.³⁷ Water saving technologies, such as improvements to toilet efficiency and other water hungry fixtures developed in the past few decades have created a shift towards more responsible water use. Utilizing a rainwater harvesting system is another technique that could lower water consumption. A respect for natural resources recognizes that all natural resources have intrinsic value and foundational economic value in their natural state.³⁸

Most of the barriers to a more sustainable future are not technological but fear and ignorance based. Cities continue to hold a great ability for change as well as the potential for enormous problems. Nature as an inspiration for building can create a new way of thinking and patterns of settlement that begin to build cities comprehensively in a environmentally responsible way.

³⁷ Karen Nasmith, "Toronto vs. Other Cities," *Spacing Magazine* Fall 2007, 28.

³⁸ Jason McLennan, *The Philosophy of Sustainable Design* (Kansas City: Ecotone, 2004), 82.

Chapter 4: Brownfield Sites and Emerging Techniques of Urban Redevelopment

Industrial Brownfield

The term "brownfields" refers to both buildings and the land they occupy that have real or perceived contamination from former industrial activities. After an area is perceived as contaminated, the land is often under-utilized or abandoned and redevelopment is slow due to the lack of inexpensive solutions towards contaminated sites. The term brownfield is preferred over contaminated in North America to avoid negative connotations and as a semantic counterpart to the term greenfield, which refers to undeveloped land and implies that the very act of development could render the land, to some degree, brown.

Brownfields are excellent examples of the Brundtland Commissions' definition of how past activities have compromised the ability of this generation to meet its needs. Brownfields are a problem in many industrialized countries because of the steady migration of industry to greenfield sites, leaving cities with an abundance of vacant industrial sites. Although the exact number of brownfield sites in Canada is unknown, it has been estimated that potentially as much as 25% of the urban landscape was potentially contaminated from its former industrial tenants. In 1998, Hemson Consulting prepared a report for the City of Toronto that found there are 865 acres of brownfields in its urban area. While this number is substantial, it is significantly less than the largely accepted estimate of 25%.³⁹

³⁹ Christopher De Sousa, "Turning Brownfields into Green Space in the City of Toronto," *Landscape and Urban Planning* 62, no 4 (2003), 182.

The vast industrial landscape that was a feature of many wealthy North American cities in the middle of the 20th century is dead. There is growing recognition among community groups and environmental organizations that brownfield sites possess a great potential for 'greening' cities and conceiving new urban models. Early criteria for the cleaning up of contaminated sites varied greatly, oftentimes requiring soil conditions to reach a pristine quality found only in untouched grounds. The cost of cleansing brownfield sites to this quality has not proved to be feasible in most cases and private stakeholders generally believe brownfield redevelopment to be more difficult than greenfield development on the urban periphery. Liability is regarded as being of paramount importance in framing questions concerning the remediation of brownfield sites. More recently, all the provinces and territories in Canada have embraced the 'polluter pays' principle, which specifies that the person responsible for polluting a site pay for its remediation.



Fig. 14. Typical Industrial Brownfield Demolition. Photograph by Dallas Contracting.

According to Christopher De Sousa, a leading brownfield researcher, the key barriers to the redevelopment of brownfield sites is the lack of financial resources for undertaking remediation and redevelopment, the lack of knowledge of the impact of soil contamination on human health, the perception that the economic benefits of brownfield projects are debatable and the lack of government leadership.⁴⁰

The public understands brownfield sites as an urban blight. The social deterioration associated with brownfield sites are often considered to be just as much of a liability as the toxins in the soil. The greening of brownfield sites has great potential to improve social, environmental, and economic conditions. De Sousa highlighted the key benefits of brownfield redevelopment as reducing the development pressure on greenfield sites, decreasing the risks to public health and safety, restoring the former landscapes, renewing the urban cores, counteracting the negative social stigmas associated with brownfield sites, restoring the tax base of the local government, and increasing the utilization of existing municipal services.⁴¹ A 2003 study by Hara Associates revealed that the value of a commercial property surrounding a brownfield redevelopment typically increased by 10%, while the value of residential property by 30%.⁴² A 2002 study for the National Round Table on the Environment and the Economy revealed that every \$1 spent on brownfield redevelopment in the Canadian economy generates an additional \$3.80 in outputs from industries Canada wide.⁴³ This displays the tremendous economic potential of brownfield redevelopment.

⁴⁰ De Sousa, 188.

⁴¹ De Sousa, 182.

⁴² Christopher De Sousa, "Positioning brownfields as an essential building block for sustainable communities," in *Brownfields 2003* (2003), 2.

⁴³ De Sousa, 2.

Brownfields are valuable assets for cities as catalysts for imagining new patterns of culture and settlement. The recycling of neglected industrial lands for alternate urban uses has repeatedly been attempted but has frequently done very little to heal the environment. Perhaps the architecture of remediation has to be able to extend the act of healing from the contaminated site and engage the public in wider problems facing the post-industrial city.

Wetlands

The term *wetland* conveys a mixed meaning as a place neither of land nor water. It is low-lying land saturated with moisture from shifting water levels. Wetlands are the most productive natural ecosystems and host a great diversity of life. They play a significant role in the water cycle by regulating both water quality and quantity. Increased urbanization around wetlands has continued to decrease the amount of time it takes rainfall to reach rivers, resulting in higher and more rapid water flow patterns. In addition to creating aquatic habitat, wetlands are critical in restoring a natural cycle to unbalanced urban environments.

Wetlands have many benefits. Its aquatic plants act as a filtering system by intercepting surface run-off and cleaning unwanted sediment, excessive nutrients and organic waste before reaching open water. Wetlands act as natural flood control mechanisms by functioning in the same way as a sponge by storing water before slowly releasing it. Since water stays in the ground longer around wetlands before reaching rivers and lakes, ground water is recharged to support vegetation growth. Wetlands also nourish healthy fisheries since most freshwater fish are dependent on marshes and riparian wetlands to spawn during spring flooding. The aquatic plants act as a natural control on shoreline erosion

control by dissipating wave energy. The biggest limitation to wetlands is the large amount of land required to create suitable habitats.

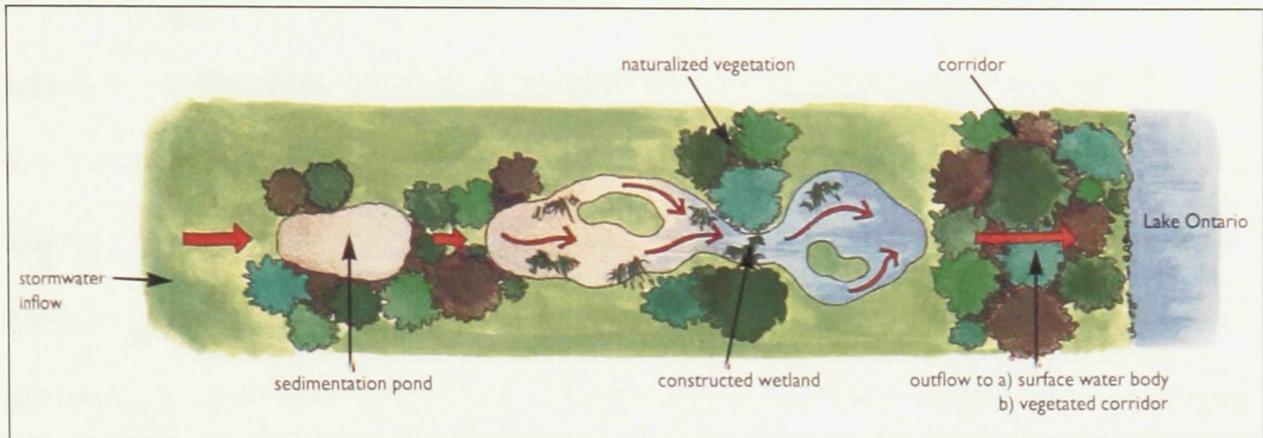


Fig. 15. *Constructed Wetlands*, 1997. Created by Waterfront Regeneration Trust.



Fig. 16. *Typical Wetlands Condition*. Photograph by author.

Phytoremediation

Phytoremediation is a process that utilizes plant systems to absorb or neutralize soil, sediment and water-borne contaminants into simpler, often more benign compounds. It is an emerging passive remediation technique that transforms soil *in situ*. Phytoremediation is an alternative remediation technique that goes beyond the traditional dig and dump approach to brownfield site clean up by introducing plants to remediate the soil and simultaneously rejuvenate the habitat. It is an increasingly feasible concept that in some cases is the preferred technique to remediate polluted brownfields. Phytoremediation is a low cost remediation strategy, generally costing about one-fifth the cost of conventional techniques.⁴⁴ Phytoremediation requires a shift in thinking from a mechanical to a biological solution. This shift towards a passive remediation approach acknowledges the importance of the natural processes to cleanse environmental contamination while at the same time questioning the boundaries between nature and technology.

Natural biodegradation of organic materials occurs normally in the environment and is able to detoxify a large amount of contaminants. Natural degradation rates of man-made organic contaminants are very slow. Therefore a practical biodegradation involves manipulating natural processes to enhance contaminant removal from the environment.⁴⁵

“When a plant encounters a contaminant in soil, water or air, it has several possible interactions. It may find the contaminant toxic and die, it may ignore it completely, it may

⁴⁴ Eric Carman, "From laboratory to landscape: a case history of possible future direction for phyto-enhanced soil bioremediation," in *Manufactured Sites: Rethinking the Post-Industrial Landscape*, ed. Niall Kirkwood (New York: Spon Press, 2001), 44.

⁴⁵ Dzantor, E. Kudjo, Robert G. Beauchamp, "Phytoremediation, Part I: Fundamental Basis for the Use of Plants in Remediation of Organic and Metal Contamination," *Environmental Practice* (Cambridge University Press) 4, no. 2 (August 2005), 77.

transform the contaminant into products that are useful to the plant, or it may take the element into the roots of the plant and store it."⁴⁶

The shortfall of phytoremediation is that the long-term repercussions have not been studied extensively yet. The transfer of organic and metal contaminants into the food chain through plant absorption and subsequently to wildlife is not currently well understood. Regardless of the type of contamination, temperature is the greatest limitation to the appropriateness of phytoremediation since most bioremediation occurs during the warmer parts of the year. At the moment, phytoremediation can only be implemented to contaminated soil depths of approximately twenty feet since the root structure of trees and plants cannot reach beyond this depth. The knowledge of plant species known to be conducive to phytoremediation is limited but new plant research has developed plant systems that reach down to the water table in some contaminated soils. Certain trees known as phreatophytes, take up large volumes of water and can be used to control water before it goes off-site.⁴⁷ Experiments with a number of hybrid tree species such as poplars and willows have been shown to exhibit great aerial growth to intercept contaminated groundwater. The lack of plain, easy to comprehend information on phytoremediation technologies is an obstacle to informing the public of its benefits as well as its widespread implementation. Nonetheless, phytoremediation offers the greatest opportunity for the remediation of metal contamination. Since metal compounds cannot be biodegraded, metal contamination is typically excavated and physically moved to another site by way of

⁴⁶ Steven Rock, "Phytoremediation: integrating art and engineering through planting," in *Manufactured Sites: Rethinking the Post-Industrial Landscape*, ed. Niall Kirkwood (New York: Spon Press, 2001), 52.

⁴⁷ Eric Carman, "From laboratory to landscape: a case history of possible future direction for phyto-enhanced soil bioremediation," in *Manufactured Sites: Rethinking the Post-Industrial Landscape*, ed. Niall Kirkwood (New York: Spon Press, 2001), 43.

the dig and dump approach. This method is very costly and has serious limitations since the contaminated soil is never treated.

As straightforward as it appears, phytoremediation has not been seriously considered as a remediation technique until recently. The fact that phytoremediation is visible to the public has great demonstrative potential to teach the public how their actions can affect their environment. Phytoremediation is gaining widespread public recognition as an aesthetically and psychologically acceptable solution since it enables contaminated soil to remain in place during its reconditioning. If phytoremediation becomes a conventional approach to the remediation of contaminated environments, could the public develop complacency towards future contamination? Phytoremediation offers the greatest opportunity for using natural systems to heal the scars of industrialization and remediate brownfield sites in a passive, environmentally safe and aesthetically pleasing way.

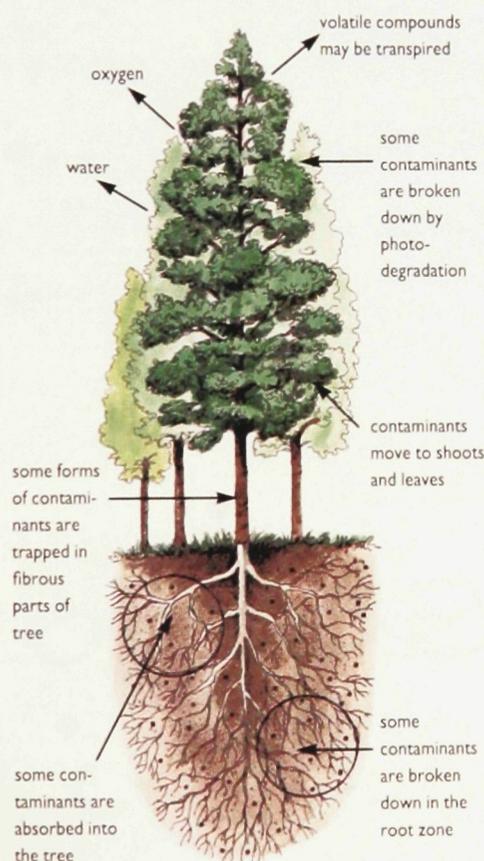


Fig. 17. *Phytoremediation*, 1997. Created by Waterfront Regeneration Trust.

Chapter 5: Case Studies

Duisburg-Nord Landscape Park | Duisburg, Germany

Duisburg-Nord Landscape Park is a 230-hectare park in Germany's heavily industrialized Ruhr region realized by landscape architect Peter Latz between 1990 and 1999. The project was the result of an international competition to reclaim the industrial land through natural processes rather than flattening the site for a planned landscape design. Latz recognized that the combination of industry and nature in the act of remediation could create an experience rich with memories, associations and emotions.

Latz has described his working method as one of "adaptation and interpretation, a metamorphosis of the industrial structures."⁴⁸ His goal for the park was not to remove the existing architecture to create a blank slate, but rather acknowledge and celebrate the site's strong industrial aesthetic and activate the fragmented architecture with new life. The former blast furnace was converted to an open-air theatre and made publicly accessible for people to wander its industrial skeleton; rail lines were transformed into cycling paths; and scuba diving was introduced to the large cylindrical storage facility known as the gasometer. Infused with new programmatic activities, the old steel mills are monumental sculptures that serve as reminders of the site's past. The projects demonstrative capacity engages the public and generates a respect for place. Latz reveals the natural process through the reintroduction of water. A series of water retention basins were introduced to cleanse the contaminated sewage channel and symbolize its remediation.

⁴⁸ Peter Latz, "Landscape Park Duisburg-Nord: the metamorphosis of an industrial site," in *Manufactured Sites: Rethinking the Post-Industrial Landscape*, ed. Niall Kirkwood (New York: Spon Press, 2001), 151.

Duisburg-Nord exhibits a clear example of the union of historical preservation and remediation techniques of a brownfield site to create healthy, diverse and socially wealthy environments and a strong cultural connection to its 19th century heritage. Latz utilizes physical nature as a symbolic theme, which reflects his belief that time will transform the site.⁴⁹ There is a sense of mystery between the deterioration of the man-made world and the biological renewal of the natural world. The bird, insect and plant habitat reconstructed by humans is now stimulating a renewed life over the industrial past.

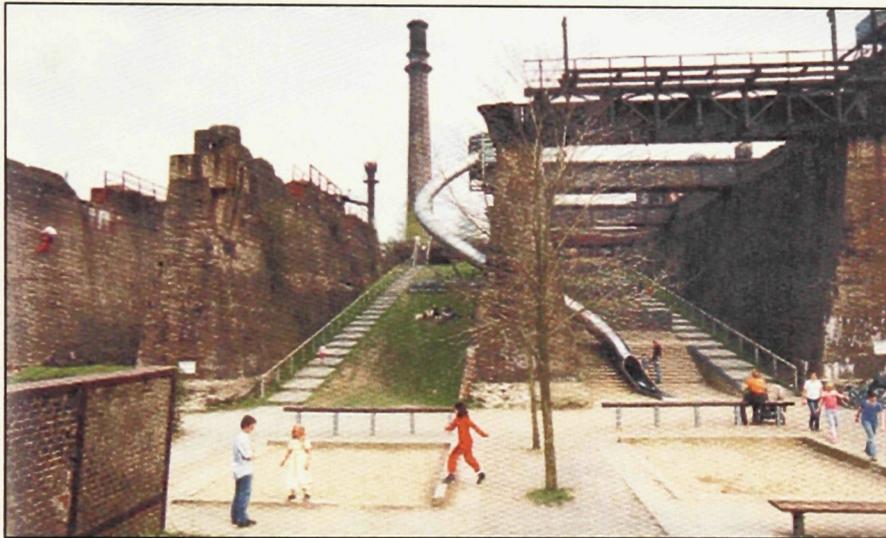


Fig. 18. *Playground in Ore Bunker, Duisburg Germany.* Photograph by Harf Zimmermann.

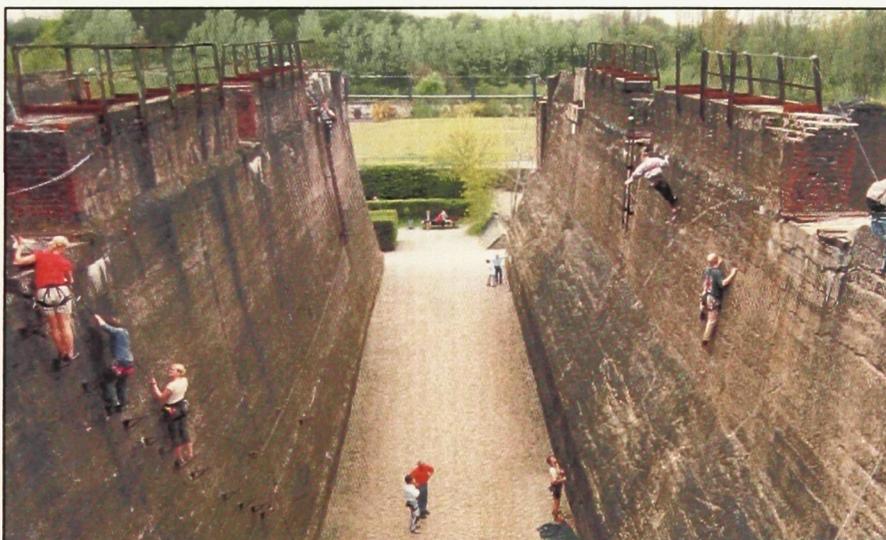


Fig. 19. *Ore Bunker Adapted to Climbing Wall, Duisburg, Germany.* Photograph by Harf Zimmermann.

⁴⁹ Niall Kirkwood, *Manufactured Sites: Rethinking the Post-Industrial Landscape* (New York: Spon Press, 2001), 163.

Don Valley Brick Works | Toronto, Canada

From 1889 to 1984, the Don Valley Brick Works was one of Canada's pre-eminent brickyards, sited in the natural oasis of the Don River valley. Nearly all the bricks in Toronto's skyline were extracted from the quarry and manufactured at the Brick Works. Today, the Brick Works is being transformed from one of Canada's oldest industrial sites to a natural environment park. Evergreen, a non-profit organization has proposed to redevelop the abandoned site into a cultural centre with a focus on ecological restoration. After redevelopment, the land is to become publicly owned and designated as a Natural and Cultural Heritage Site.

The revitalized Brick Works is composed only of the re-inhabitation of existing buildings. The initial master plan focused its attention on a one hundred and ten thousand square foot garden and nursery, a children's discovery area, conference and event facilities, skating surfaces, an organic farmer's market and the continued evolution of the existing forty acre park complete with walking trails, meadows, and wetlands.⁵⁰ These new uses encourage people to learn about the region and about how nature shapes our cities and furthermore how we shape our natural environment. For example, the Evergreen Gardens is a native plant nursery that demonstrates naturalized, pesticide-free gardening; the new restaurant uses the organic produce cultivated in the demonstration gardens and youth leadership and art programs. The project is as much about cultivating ideas and relationships as it is cultivating the land.⁵¹

The Don Valley Brick Works represents a paradox of development. Known as an

⁵⁰ Ian Chodikoff, "Bricks and Mortar," *Canadian Architect*, January 2007, 20.

⁵¹ The Evergreen Foundation, "Master Plan: Evergreen at the Brickworks," (June 2006), 12.

industry that once contributed to the degradation of the valley, it has now become part of its restoration – an appropriate way of understanding heritage as a continual dynamic process of renewal.⁵² The project signifies a shift to holistic thinking and substantiates the cultural significance of the Don River Watershed to Toronto's identity.



Fig. 20. *Evergreen Brick Works*, Toronto, Ontario, 2006. Created by DTAH.



Fig. 21. *Evergreen Gardens*, Toronto, Ontario, 2006. Created by Claude Cormier Architects.

⁵² Michael Hough, *Cities and Natural Process: A Basis for Sustainability* (New York: Routledge, 2004), 52.

Chester Springs Marsh | Toronto, Canada

Chester Springs Marsh is a three hectare constructed wetland located just south of the Bloor Street viaduct in Toronto's Lower Don. It is sited on a former city landfill (c.1920) that contained a two to three metre layer of ash, cinder, broken glass, and porcelain. The city sponsored citizen group called 'Bring Back the Don' initiated the restoration project in 1996 as a first experiment in an ongoing effort to restore natural habitat in the Don Valley. In recent years, the regeneration projects concerning the Don River Watershed have prospered from the strong citizenship participation. Citizen involvement is largely responsible for the construction, maintenance and regular monitoring of Chester Springs Marsh.

The wetland is severed into two parts by the Don River. The east marsh is open to the public to visit and interact with, as it is adjacent to the trail system in the river valley. The west marsh is a protected wildlife habitat that hosts a great diversity of life, which is essentially inaccessible to the public. As the designers of the project have written, Chester Springs Marsh is an inspiring project that expresses a profoundly different and relatively new understanding about the city as part of nature.⁵³ It demonstrates how it is possible to repair the damages resulting from past activities and how we open the river valley up to gentler forms of use and creating a sense of place within the city and its ecosystem.

Chester Springs Marsh exhibits the role wetlands can play in the environmental restoration of degraded ecosystems. Today, the marsh attracts many new and old plant and animal species, the presence of which indicate that the wetland is functioning as a

⁵³ Harrington and Hoyle, <http://www.harrington-hoyle.com/eco.htm> (accessed 2008).

healthy ecosystem.⁵⁴ Foxes and coyotes have been seen regularly as far south as Chester Springs Marsh. In addition to the creation of habitat, the extensive use of interpretative signs surrounding Chester Springs Marsh has helped educate the public about the viability and importance of habitat in the Don Valley. Although not initially considered a primary objective of the project, a strong social capital associated with the wetland restoration has manifested.



Fig. 22. *Chester Springs Marsh Demonstration Wetland, Toronto, Ontario, 1996.* Photography by City of Toronto.

These case studies are relevant to this thesis investigation because they demonstrate ways in which cities can coexist with natural processes. In the case of Duisburg-Nord Landscape Park, the design learns from the re-use of the site's industrial built heritage and adds another layer to the site by embracing new uses for existing structures. The project

⁵⁴ City of Toronto, http://www.toronto.ca/don/chester_spring.htm (accessed 2008).

also demonstrates the use of a phytoremediation strategy to restore the contaminated landscape. Don Valley Brick Works is beginning to heal its degraded site by first viewing its context as a culturally significant landscape and restoring health by connecting people to place. Chester Springs Marsh exhibits the wetlands condition and how it can restore habitat as well as cleanse soil and water of their toxins. Designing with nature requires patience as it usually does not produce instant visual results, but the long-term benefits are known to be extremely rich.

Working from these precedents outlined above, I have developed a dynamic and environmentally responsible architectural/landscape strategy for this thesis investigation. This is articulated through the creation of a prototype design for a Discovery Pavilion that generates a new public understanding for the remediation of post-industrial brownfield sites.

Chapter 6: Site Conditions

Site & Surrounding Context

I have chosen to explore a post-industrial brownfield site located at the mouth of the Don River in Toronto. The site exists as a leftover site regularly forgotten during the city's planning process. The site functions as a hinge, connecting three major waterfront precincts currently scheduled for redevelopment with new uses; namely the West Don Lands, the East Bayfront, and the Port Lands. Despite the site's visibility afforded by the transportation infrastructure and its proximity to the city's downtown core, the Don Mouth remains at the periphery of Toronto's urban consciousness. The Don River is perceived as a gap between neighbourhoods, rather than a place in itself. It has been bridged, fenced, and bypassed so much that people have become numb to the qualities and value of the river valley in their midst.

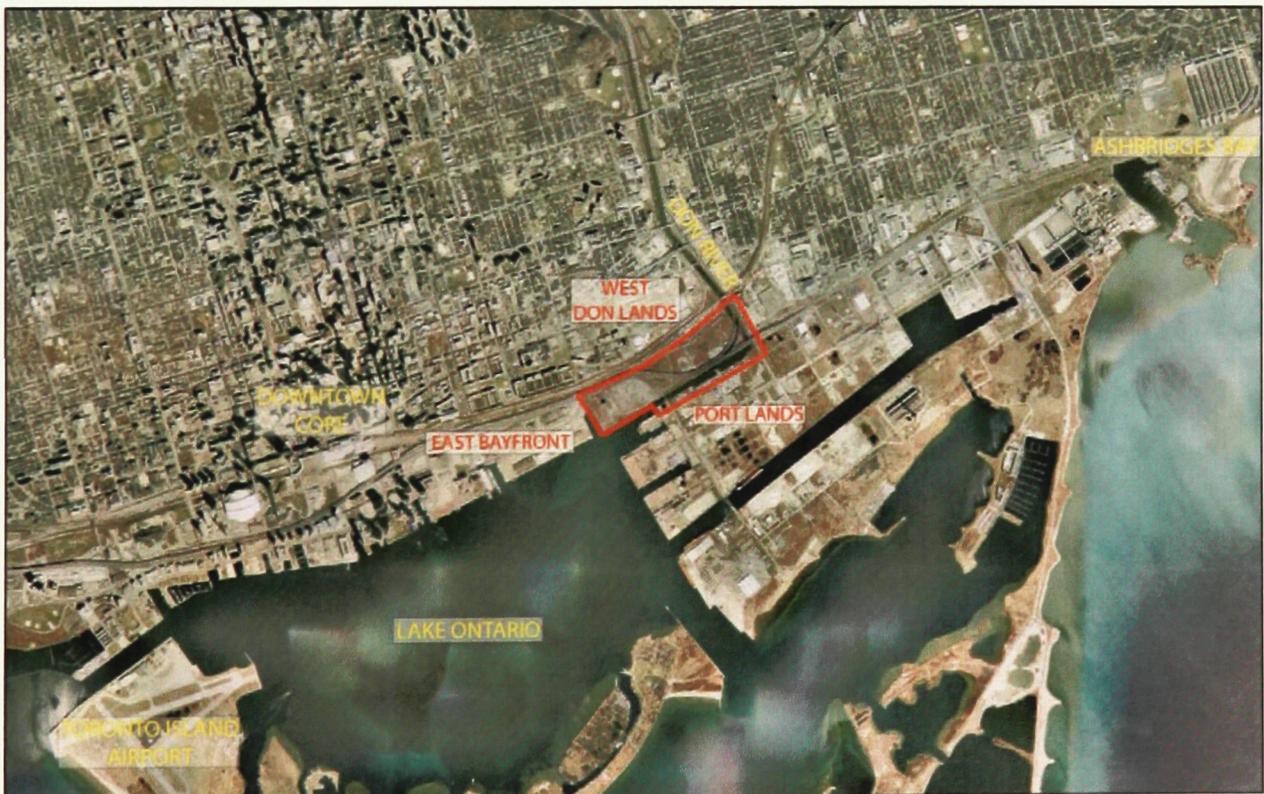


Fig. 23. *Site Context*, Toronto, Ontario, 2008. Photograph by Google Earth. Created by author.



Fig. 24. *West Don Lands Design Scheme*, Toronto, Ontario, 2005.
Created by Urban Design Associates.



Fig. 25. *Lower Don Lands Design Scheme*, Toronto, Ontario, 2007.
Created by Michael van Valkenburgh Associates Inc.

The site links the Don River system to Toronto's Inner Harbour and acts as a gateway to the south for the Port Lands. The Martin Goodman Trail is a popular walking, cycling and inline skating trail that begins at the popular Ashbridges Bay, continues through the Port Lands, across the proposed site and leads into Toronto's downtown core. The channelization of the Lower Don has made the mouth of the river vulnerable to flooding. The collection of debris, ice jams, and rapid snowmelt are the major causes of flooding in the spring.

The site is disconnected from the rest of the city. The impenetrable north edge of the site consists of a Canadian National Railway rail yard and Lakeshore Boulevard/Gardiner Expressway thoroughfares. The south site edge condition fronting the Keating Channel consists of a concrete seawall. Both the east and west edges of the site are disjointed from neighbouring sites by water.

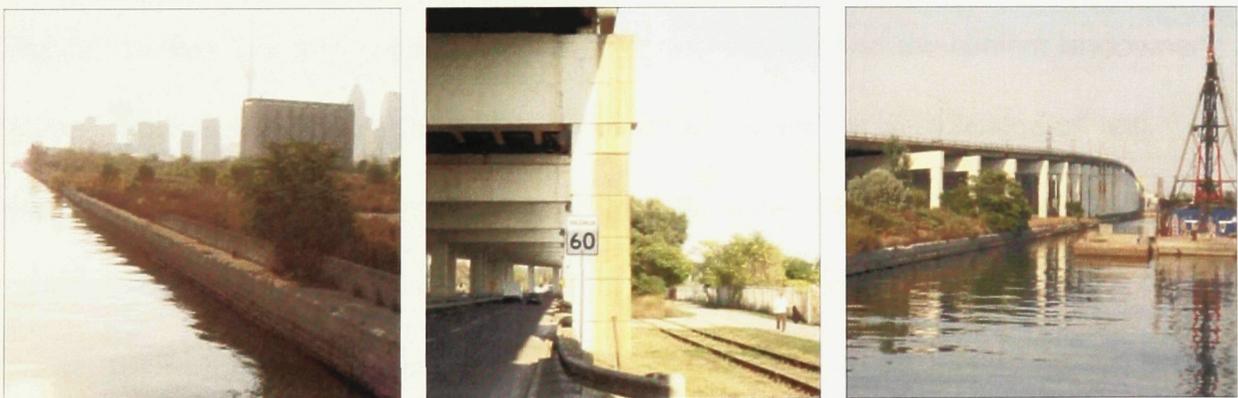


Fig. 26. *Site Edge Condition: South, North, South, 2008.* Photographs by author.

Site History

Much of the Don River's history has been discussed in chapter two of this thesis. As already stated, the mouth of the Don River once existed as a vast wetlands known as the Ashbridges Marsh. The marsh was filled in 1912 to create new industrial waterfront land primarily on the area known today as the Port Lands as well as the site under investigation in this thesis. The filling in of Ashbridges Marsh removed the majority of the vegetation in the Lower Don and severely altered the character of the natural habitat. In 1943, Victory Soya Mills built two large concrete silos and other processing facilities ideally on what is now the western portion of the proposed site to receive and ship goods via rail, trucks and ships. To put into perspective the heavy industrial uses in this area, when Victory Soya Mills closed in 1991 it processed the largest amount of soybeans annually in Canada.

Similar to many other sites in the Port Lands, the proposed site has been in a state of uncertainty since its former uses went into decline. With the area abandoned, a large number of Toronto's homeless population moved to the site in 1998 to form "Tent City Toronto." The homeless population resided in a fairly organized fashion, appointing a "mayor" to their city and respecting each other until 2004, when the current landowner Home Depot forced the homeless out. Ever since, the site has been fenced off and abandoned. After studying the Port Lands, Toronto urban designer Ken Greenberg concluded that the Port Lands emerged from an engineered landscape from which the city has derived enormous prosperity through much of the 20th century. What we see today is the remains after the retreat of the Industrial Glacier.⁵⁵

⁵⁵ City of Toronto, "Toronto Waterfront Design Initiative: Report of the Results," 2002, 12.



Fig. 27. Victory Soya Mills, Toronto, Ontario, 1947. Photographer unknown.

Don River Mouth: 1954



Fig. 28. Don River Mouth: 1954. Photograph by City of Toronto Archives, Created by author.

Don River Mouth: 2003

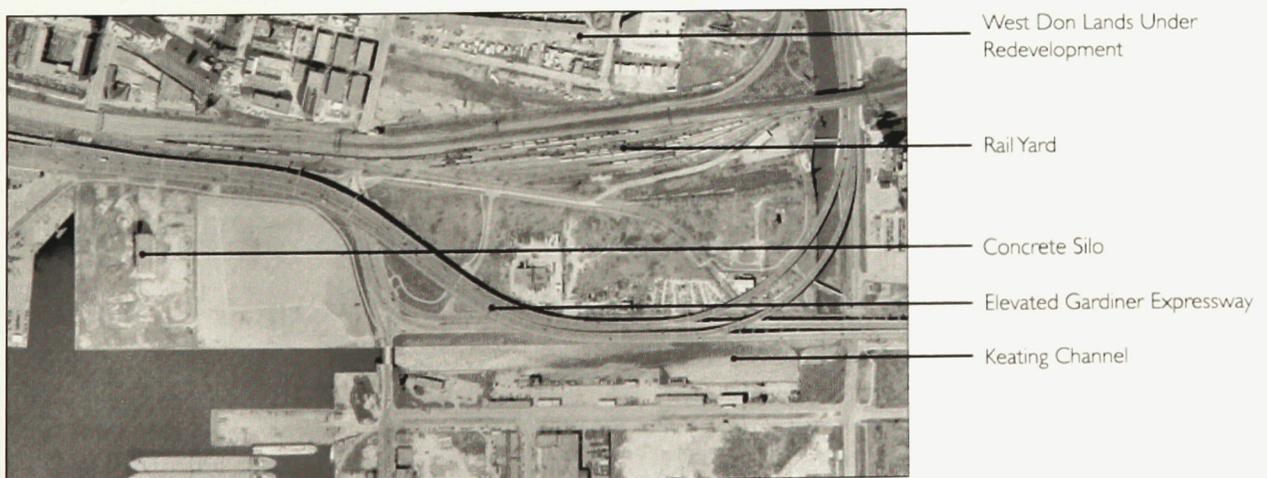


Fig. 29. Don River Mouth: 2003. Photograph by City of Toronto Archives, Created by author.

Current Condition of Site

Soil/Landscape

The site's soil is currently environmentally contaminated. This legacy of environmental problems is believed to be partially as a result of the site's former heavy industrial uses in combination with the illegal dumping of toxic waste during the 1950s. The soil would be required to be remediated before any new uses could inhabit the site. The soil composition across the site is inconsistent as the land was reclaimed from an assortment of sources in 1912.

While much of the landscape in the Don River corridor has been under increased pressure due to urbanization, other parts continue to exist as a remarkable place with one of the most significant wildlife habitats in the Great Lakes Region. While it has been estimated that Toronto's tree canopy coverage is approximately twenty to twenty-five percent, in contrast, the Port Lands and the Don River mouth's tree canopy coverage is only three percent.⁵⁶ Expansion of the tree canopy would not only supply areas of shade and reduce the overall temperature, but also filter dust, improve air quality and slow down storm water run-off

Water

The mouth of the Don River is configured around transportation efficiency and as a result it is inaccessible to the public. The lack of public understanding of the natural processes has created a manufactured river mouth that is susceptible to flooding in the

⁵⁶ Michael Hough, Beth Benson, Jeff Evenson, *Greening the Toronto Port Lands* (Toronto: Waterfront Regeneration Trust, 1997), 20.

spring. At a great expense, the Keating Channel is dredged regularly to remove debris, heavy metals, suspended sediments, and pesticides that accumulate at the mouth of the Don River. An extensive environmental assessment of the Port Lands and the mouth of the Don River shows the water quality in the Inner Harbour to be very poor. This is a reflection of the current detachment between nature and the urban consciousness. Storm water management is crucial to improving the Don River mouth's habitat and water quality. The waterfront cannot be viewed as simply a narrow band along the Lake Ontario shore. The water is connected to the Great Lakes via rivers and creeks, water mains, and storm and sanitary sewers throughout the Metropolitan area.

Built Heritage

Since the deterioration of Victory Soya Mills in 1991, the current landowner has demolished the majority of the industrial and port built heritage. A single concrete silo is the only significant built heritage remaining on the site. The poignant visual quality of the concrete silo along with a number of industrial remnants, such as old rail spurs that scatter the landscape act as an ever-present reminder of the site's previous character. The concrete silo is one of only two remaining silos from Toronto's industrial port era. Home Depot submitted a proposal for the redevelopment their property but this has been vehemently rejected by the Toronto's planning department for the proposals lack of public enjoyment and use of the waterfront. Instead of adding new layers to the existing built heritage, the site has been treated as a *tabula rasa*.

Social

The public is inherently connected to the Don River's cultural heritage by strong emotional attachments and social bonds. A broad public understanding of how the Don's

fragile ecosystem functions will strengthen this bond to the river as well as position resident's sense of place within the larger human ecosystem. The large number of community groups and environmental organizations formed to breathe new life into the Don River is evidence displays that most residents believe the Don is valuable to their community.

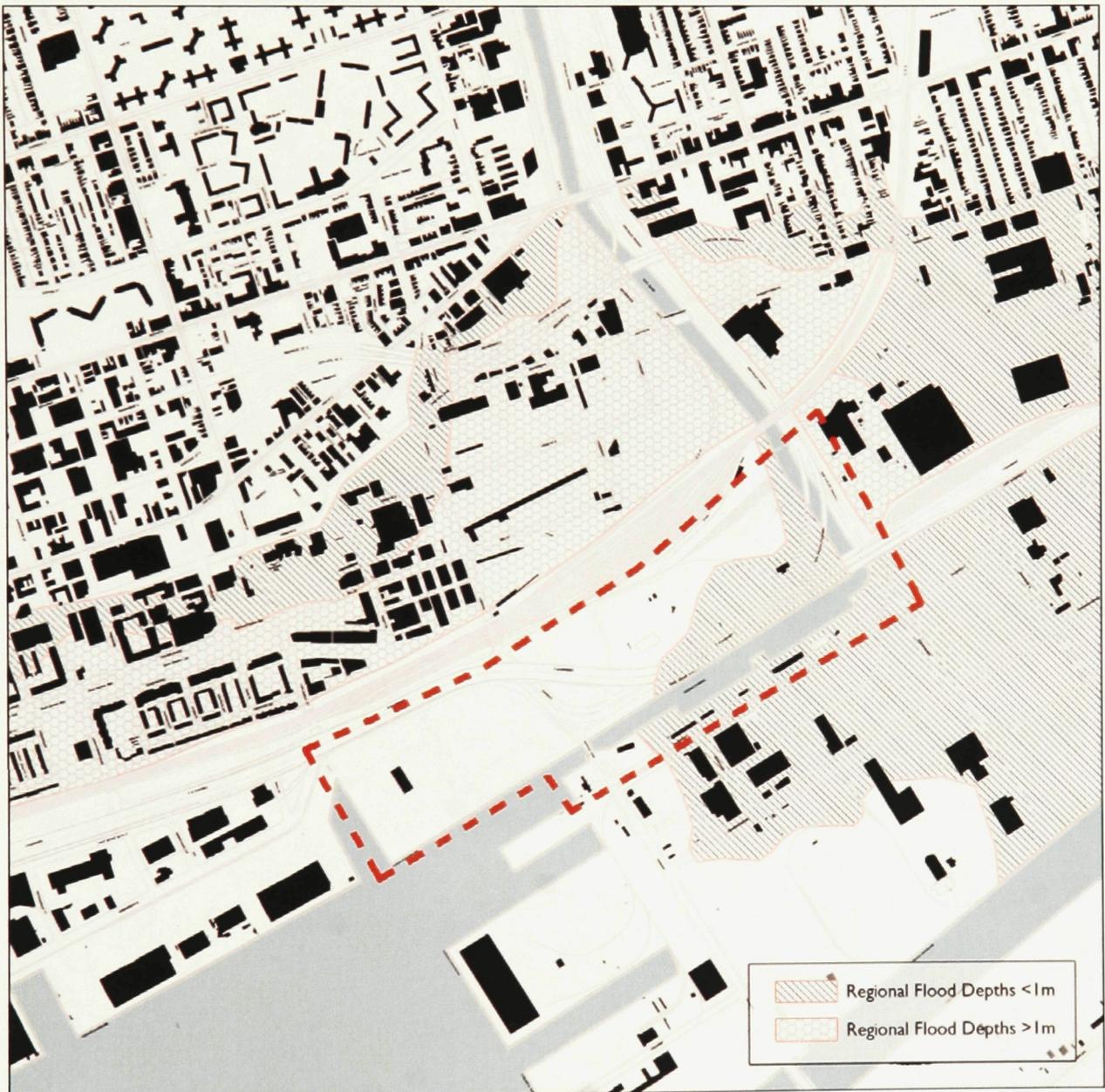


Fig. 30. *Don River Mouth Flood Diagram, 2008*. Based on 1990 TRCA Survey. Created by author.



Fig. 31. *Reflections on the Environment*, digital collage, 2008. Created by author.

Chapter 7: Plan for Site Regeneration: Proposal of a Framework for Development

At the scale of the site and based on the research investigated in this thesis, it is proposed that a twenty-year framework be implemented to return environmental health to the Don River mouth. Cleaning up the industrial past in an ecologically stable way would be evidence of a renewed sense of responsibility towards the Earth and the life of future generations. It would also be an important step towards the creation of a long-term plan to ensure the viability of this brownfield site. The framework proposes an intensified connection to water, new infrastructure and the introduction of new typologies and adoption of a value system upon which the built form and landscape can evolve. Implementing a framework over twenty years anticipates an emergence, preservation and transformation of the complex natural and cultural processes with a mix of new uses. It acknowledges high architectural quality only has great conditions if planning defines the interaction between the city, its infrastructure and the natural environment. It is important to recognize the framework for renewal of the Don River mouth is not a master plan, but a strategy to guide future work.

One of the goals of the framework is to restore an ecologically functional river mouth by establishing wetlands to remove the risk of flooding, to bring health back to the soil and water and link people to the natural processes. This approach promotes learning how the delicate ecosystem functions, the public's sense of place within it, and yields a natural environment for both pedestrians and wildlife. Engaging people in the architecture of remediation broadens the act of healing from the proposed site to address larger issues of the post-industrial urban environment. Changing the public's attitude towards the

environment is critical to community action. Another goal is to create an urbanism that can give back to the environment and encourage human health by contributing an enhanced quality of life.

The framework consists of three stages, which would bring about the “healing” of this post-industrial brownfield site. The first four years is described as the “treatment” stage. This stage primarily focuses on the first steps of soil remediation and the creation of major infrastructure linkages across the site. The second stage described as “recovery” occurs between years four and ten. This stage introduces minor linkages throughout the site as well as core built form that engages people to investigate the site. The third stage described as “health” occurs after ten years. This stage introduces secondary built form and educational components to the site that emphasize the inherent sense of place of the mouth of the Don River. The holistic strategy understands adding new layers in succession to the contaminated port/industrial heritage are part of its remediation.

Stage I: Treatment [years 0 to 4]

The framework’s multi-functional vision takes into account the realities of the brownfield site condition and transforms the mouth of the Don River incrementally. The framework defines how health and a prosperous built environment can be brought back to the site. The first stage of the framework labeled “treatment” establishes critical connections across the site, involves the community towards future design decisions and initiates remediation of the soil.

The first stage introduces treatment of the landscape as a precursor to any built form. Stage one proposes re-aligning the mouth of the Don River through the site to create a

riparian water's edge condition. This is a major step in establishing wetlands to cleanse the poisons in the soil and the water. Inconspicuous swales made up of grasses, reeds and other lowland plants are used to retain and purify storm water run-off, acts as a natural filtration system and prevents the run-off from leaving the local area. To begin to cleanse the brownfield site, fast-growing pioneer plant species that can adapt to periodic flooding are initially used to quickly supply a vegetative cover, improve soil drainage, fix nitrogen levels and stimulate micro-organisms to create more favourable conditions for durable plant species. Restoring health to the river is based on two benchmarks. The water quality must be healthy enough to allow the passage of migratory fish as well as be able to support flora and fauna at the bottom of the river.

The first stage of treatment builds on the way the site functions as a hinge to the three surrounding neighbourhoods and as a gateway to the Lower Don River valley by interlinking existing patterns with a number of new infrastructure moves structuring the public realm. As it exists, the eastern portion of the site is inaccessible to the pedestrian due to the two major thoroughfares. Re-aligning Lakeshore Boulevard from underneath the Gardiner Expressway as a boulevard across the north section of the Port Lands and eventually by means of an elegant bridge over the re-aligned Don River creates a better pedestrian connection across the site. The Parliament Street slip is used to create a strong pedestrian connection from north of the CN Rail lines to the site by introducing a passage along the water underneath Lakeshore Boulevard. This north-south connection adds a new layer to the existing infrastructure, improves public access and begins to introduce water back into the city.

The first stage of treatment is an opportune time for architects and urban designers to get the community involved in ideas of future use. Canvassing the community is the first step to restoring the connectivity between human behaviour and the natural cycles of our surrounding environment. This means moving away from thinking of nature as an externality and understanding our role within this sensitive watershed.



Fig. 32. Stage 1: 'Treatment', digital collage, 2008. Created by author.

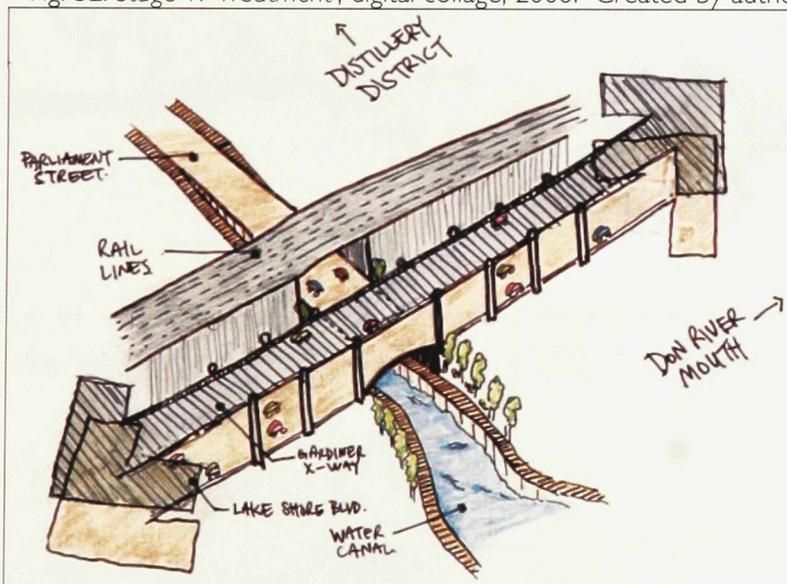


Fig. 33. Parliament Street Connection Detail, colour pencil and pen, 2008. Created by author.



Fig. 34. *Perspective 1*, pen sketch, 2008. Created by author.

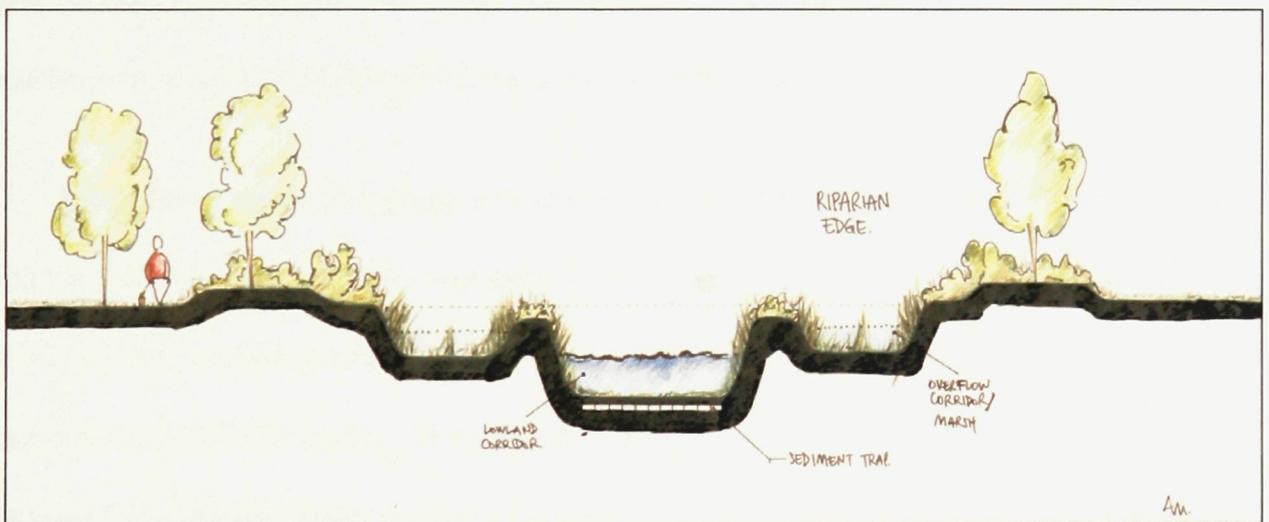


Fig. 35. *Cross Section*, colour pencil and pen, 2008. Created by author.

Stage 2: Recovery [years 4 to 10]

The second stage of the framework termed "recovery" diversifies both the natural and built environment by adding another layer to the site's rich history. This intermediate stage introduces native plant species to take over from the initial pioneer plant species. These plants metabolize and detoxify contaminants in an environmentally safe and undisruptive manner. The second stage of recovery diverts the Don River through the Port Lands and into the shipping channel as a secondary river mouth discharge point. Diverting the river through the Port Lands has very little effect on existing land uses.

The second stage of recovery creates a further connection through the site to the surrounding neighbourhoods. Extending Queen's Quay roadway from the East Bayfront, across Parliament Street slip as an elegant bridge, brings a continuous flow to the city and a greater connection to the site. The two pedestrian overpasses and one vehicular bridge over the re-routed river mouth connect the existing trail and vehicular infrastructure with the circulation of the site. The proposed cycling and walking trails dwell on the abandoned rail lines to serve as a reminder to the site's industrial past.

The second stage of recovery introduces the first phase of built form. The built form during this phase acts as node elements. The framework proposes adaptive re-use of the concrete silo, a rowing/canoe/fitness club, a restaurant and an educational pavilion as potential uses for the nodes. These public elements are phased into the framework to activate new life and foster a sense of place with the mouth of the Don. The preservation and re-use of the industrial remnants creates a cultural connection to the site's heritage.



Fig. 36. Stage 2: 'Recovery', digital collage, 2008. Created by author.

Stage 3: Health [years 10 to 20]

During the third stage of framework termed "health", the site evolves and signals a change in value. The mouth of the Don River is understood as a place in itself. A second phase of built form introduces constant elements such as residential units, live/work units and office space to inhabit the site during various times of the day. With a thorough understanding of the delicate nature of the environment and change in values, the process of naturalization respects an ecological approach to the design and maintenance of the urban landscape. The contaminated soil is cleansed from the slow-growing plant species.

The restoration of the Don River mouth is inevitably tied to human activity and natural processes. Linking heritage, ecological design and brownfield renewal is an appropriate way to educate future generations in the way their individual actions effects the surrounding environment.

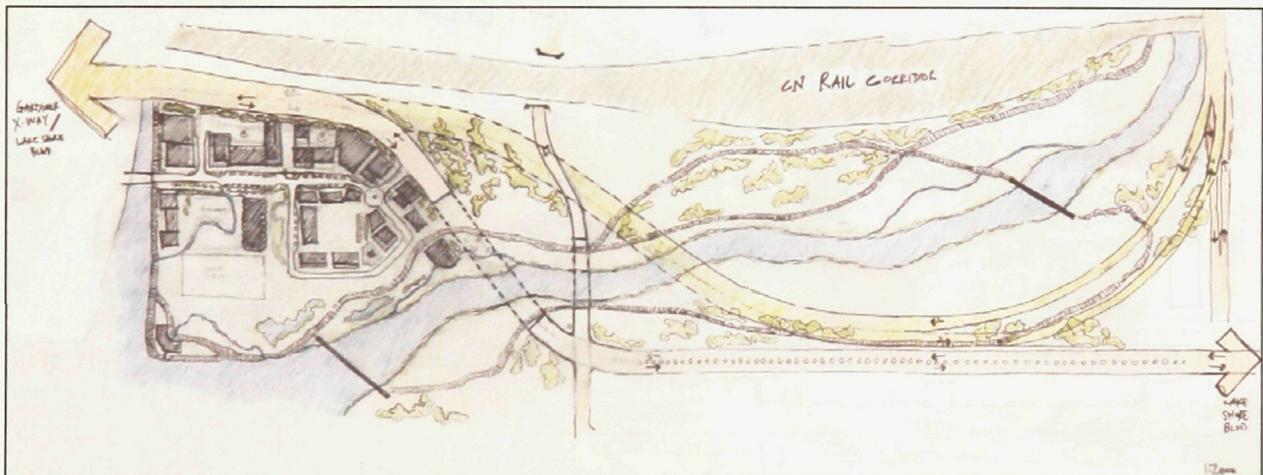


Fig. 37. Stage 3: 'Health' Sketch, colour pencil and pen, 2008. Created by author.



Fig. 38. Stage 3: 'Health', digital collage, 2008. Created by author.



Fig. 39. *Framework Model*, basswood and cardstock model @ 1:2500, 2008. Created by author.

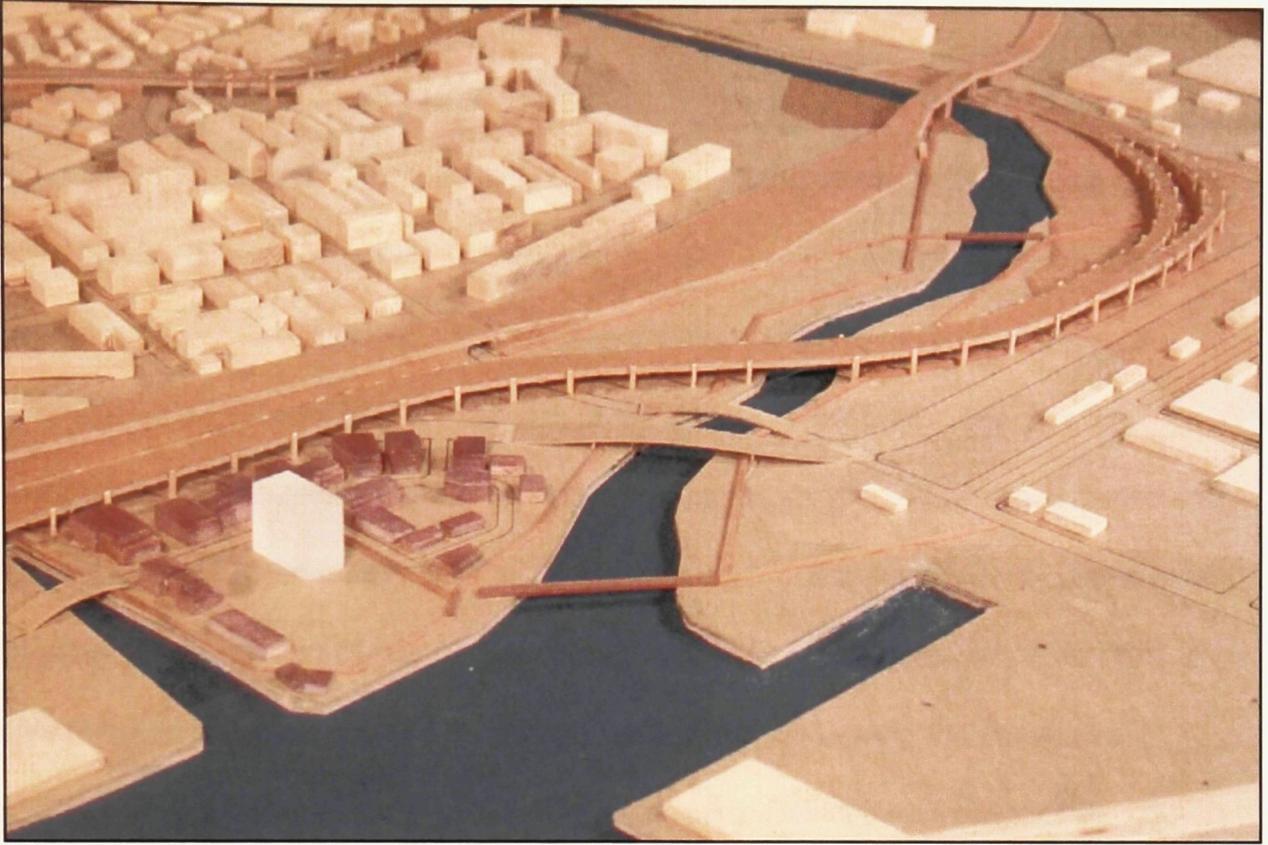


Fig. 40. *Framework Model*, basswood and cardstock model @ 1:2500, 2008. Created by author.



Fig. 41. *Framework Model*, basswood and cardstock model @ 1:2500, 2008. Created by author.

Chapter 8: Design Principles for Building Adjacent to Wetlands

The architectural component of this thesis developed from the proposed site remediation strategies towards the production of a prototype design for building adjacent to wetlands. It investigates how architecture can play a role in healing the brownfield condition, a condition that often and certainly in the case of the Lower Don River, a consequence of the unsustainable actions of the past. The prototype searches for architecture which functions as a “nutrient” to its surroundings to allow urban dwellers to experience the Lower Don River in a manner that does not jeopardize its environmental integrity. The design responds to the site’s rich potential to influence the public in conceiving new architectural and landscape paradigms. Conceiving the design as a prototype has a tremendous possibility for a spin-off of ideas beyond the specific architectural proposal. In order to build adjacent to wetlands, the thesis first suggests design principles for building in this condition.

The design principles for building adjacent to wetlands outlined below interpret the clues offered by the natural world. Perhaps the prototype architecture could mimic its surroundings by functioning as its own self-sustaining ecosystem. Creating this harmonious relationship with its surroundings balances human needs with the capacity of the natural environment.

Energy Conservation

In order for architecture to create a balance with the wetlands condition and a heightened environmental awareness, the relationship of a building to its context is paramount. The building placement is a basic design element that is often overlooked. Respecting the site's context, architecture should be sited so as not to interrupt mature vegetation, wildlife and other natural features. Building placement should also be sited to harness the sun's energy to provide natural conditioning techniques thereby reducing energy demands and dependence on mechanical systems.

The sun is a significant asset in a cooling climate such as Toronto. Utilizing passive solar design orientation principles reduces or eliminates the need for mechanical systems. A building sited to receive an abundance of natural daylight and fresh air generates energy from a renewable source, makes people feel refreshed and creates a stronger connection to place. Passive solar design harnesses the sun's energy and provides comfort levels by allowing heat by way of solar radiation to enter a building when it is needed in the heating season and blocks heat through shading devices when the heat is not needed in the cooling season. Increasing the thermal mass can collect the sun's energy and moderate daily temperature extremes. Openings oriented towards the sun's exposure (south elevation) should be maximized to allow heat gain, while openings in shade (north elevation) should be minimized to prevent heat loss. Planting deciduous trees on the south elevation can provide shade in the summer and allow solar heat gain in the winter. Planting coniferous trees on the north elevation protect the building from winter winds and therefore improve energy efficiency.

Photovoltaics is a popular technology that could be described as an active solar design system that utilizes panels to harness, trap and store the sun's energy for free energy generation. Typical photovoltaics are most effective when placed perpendicular to the sun's rays. A more recent technology known as building-integrated photovoltaics has great potential as an integral part of the architectural design rather than simply being added to the surface as traditional photovoltaics.

Water Conservation

Conventionally, treated water is supplied to a building by way of underground infrastructure and leaves the building as sewage. This process hides water from the experience of architecture and in turn the consciousness of the public. The key to water conservation is awareness. When water is collected or recycled as grey water, it becomes an asset to make water conservation visible and the architecture as an active participant in the natural processes. The term "grey water" is used to describe water not suitable for ingestion but useful for other purposes, while "black water" describes water that contains potentially harmful contaminants, and "potable water" is water suitable for human consumption.

Grey water systems recognize that the current black and white division of water is not necessary or sustainable. It acknowledges that water could have different levels of quality suitable for various uses. It asks why drinking quality water is needed to flush toilets? Grey water systems filter rainwater that falls onto a building and mimics natural water cycles by following nature's basic principle of storage. This filtering process from building to landscape displays the dynamic nature of the remediation process. Incorporating porous paving materials maximizes infiltration of run-off from paved surfaces. A grey water system possesses many ecological benefits. It lowers the amount of fresh water extracted from aquifers and subsequently the impact on water treatment facilities. Utilizing grey water to irrigate soil aids plant growth and forces groundwater recharge by storing water in the ground longer before returning to river and lakes.

Material Conservation

The selection of building materials should reflect an understanding of how various raw materials are harvested and their diverse implications on the environment. The extraction, processing, manufacturing and transporting of all new building materials damage the natural environment to some extent. The salvaging of recycled materials into the building palette retains the material's embodied energy; the energy used in the production of materials. Wood, glass and steel are materials that can easily be found in the Port Lands, recycled and incorporated into architecture at the Don River mouth. The analysis of material approaches of historic regional building styles exhibits time-tested durable local materials that should be considered when possible to limit the need for transport. Following the recycling principle of materials, a design should look for ways building materials can be dismantled and reused at the end of a building's lifespan.

The sun is going to shine and the sky is going to rain. These are naturally occurring events that take place. Taking advantage and diverting these renewable resources gives back to the environment in an ecological manner. It is one of an architect's many responsibilities to advocate for change in all areas within their sphere of influence. The decisions regarding orientation, technologies and materials specified have far-reaching implications beyond the individual piece of architecture.

Chapter 8: Architectural Proposal: Don River Discovery Pavilion

Situated at the mouth of the Don River, the objective of the Don River Discovery Pavilion is a widespread conservation of energy via education and the embrace of ecological principles within contemporary society. Educating the public of the land use patterns in the Lower Don through this architecture of remediation demonstrates to the skeptical population architecture's potential to heal this brownfield site's environmental scars. The Don River Discovery Pavilion is conceived as a living laboratory to the ecological implications built form has made on the city. It is designed to uncover the cultural memory of the Lower Don River by making visitors discover how the landscape has changed due to urbanization. Building on a brownfield site is inherently a restorative gesture that carries with it the task of revealing the significance of everyday places.

Program

The pavilion is programmatically organized into three main elements: an indoor rest area, an observation platform and an outdoor exhibition space. The pavilion is located on the northern edge of the wetlands, adjacent to the Don River trail system. The indoor rest area is a quiet space that gives walkers and cyclists a chance to rest, pause and reflect. The rest area acts as a kind of theatre overlooking other people in the sunken exterior exhibition space to the south. The exhibition space is the social space of the architecture. Because it exhibits both cultural and natural history of the river it has the potential to create a strong cognitive connection between natural processes and the visitors. The exhibition space is sited adjacent to a sedimentation pond that demonstrates the collection and cleansing of rainwater before releasing it into the river. Since the exhibition space opens up to the pond, the natural world begins to act as a secondary exhibit by displaying

the hydrological cycles of water. The observation platform is located on the second level above the exhibition space. It is a reflection space that looks out onto the wetlands and the monumental infrastructure that surrounds the pavilion. The observation space is a kind of urban oasis where a visitor may begin to question their surroundings.

Circulation Narrative

The experience of moving from a traditional urban street to an urban recreation landscape to a floodplain with wetlands and meadows is a form of learning about the complexity of the river system. Circulation through the Discovery Pavilion is an extension of the trail system that runs through the site. The rammed earth walls project out into the trail to welcome passers-by into the architecture. The low-lying, ruin-like walls begin to appear as a natural extension of the earth.

As a visitor descends down along the rammed earth walls into the exhibition space, the grounds texture slowly changes from the ground of the trail system to gravel. This change in texture from the stable hard surface to the unstable gravel texture makes the visitor aware of the shifting quality of the wetland and the delicate quality of the ground. Once inside the exhibition space, the rammed earth walls open up to the adjacent wetlands. The circulation through the exhibition space focuses on the physicality of the site, how the site has been treated and ultimately a reflection of how the public understands the natural processes.

Materiality

Rammed earth is used as a primary building material, a material that has a long building history throughout the world. The building is sited with its longitudinal axis, perpendicular

to the sun's southern exposure to collect the sun's energy as well as for the psychological benefits of constant exposure to the natural elements. Formally, one of the rammed earth walls severs the outdoor exhibition space and the indoor rest area. Visually, the stratum of the rammed earth walls begins to speak of time and in particular to the site's historical use of soil. The exposed roof structure is made of reclaimed wood from the Port Lands. The natural quality of the rammed earth walls and the reclaimed wood roof structure celebrates the material characteristics. The pavilion expresses ecological design through its materiality, its relationship to the sun, its heightened awareness of place and the visual transformation of the site through wetlands and phytoremediation.

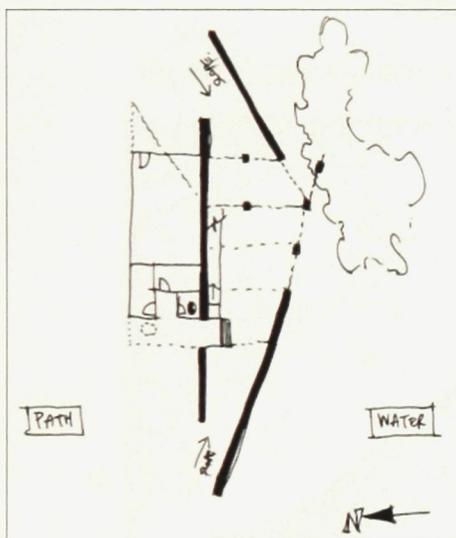


Fig. 42. Discovery Pavilion: Initial Sketch Plan, pen, 2008. Created by author.

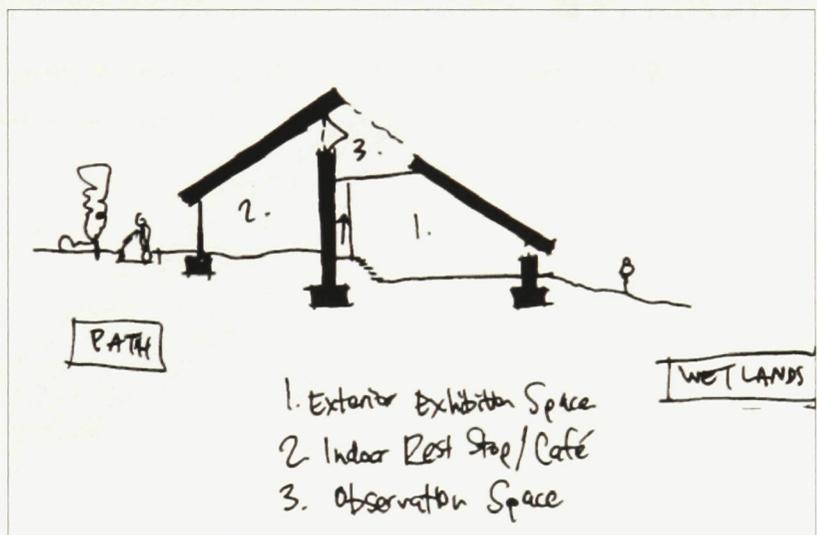
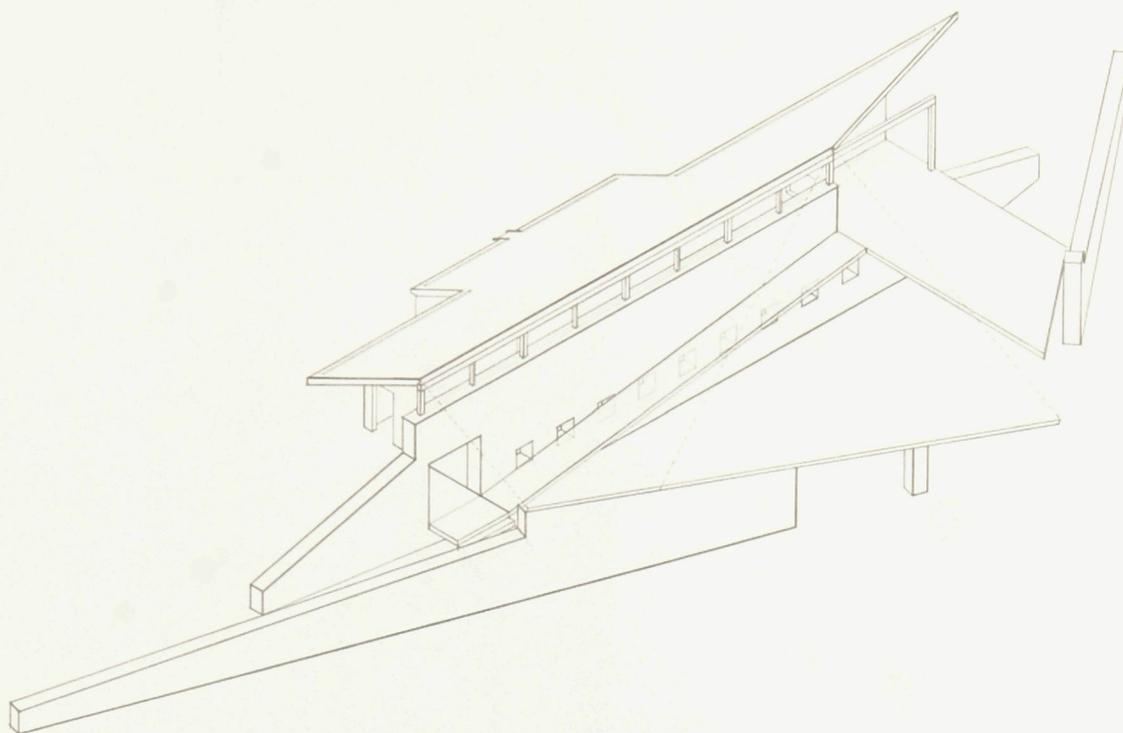


Fig. 43. Discovery Pavilion: Initial Sketch Section, pen, 2008. Created by author.



DON RIVER DISCOVERY PAVILION

Fig. 44. *Pavilion: Axonometric Drawing*, graphite, original 23" x 35", 2008. Created by author.



Fig. 45. *Pavilion: Context Plan*, graphite, original 20" x 20", 2008. Created by author.

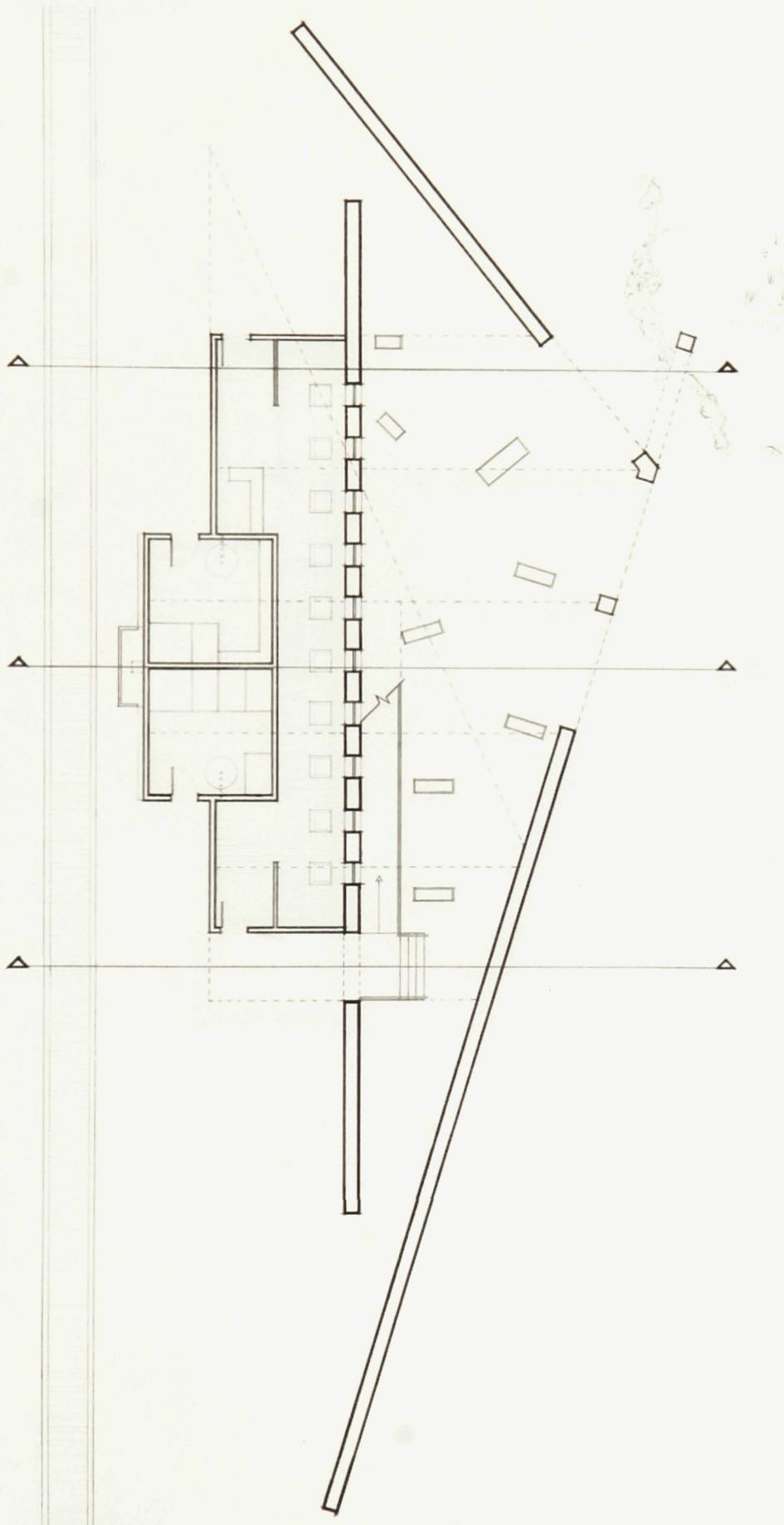


Fig 46. *Pavilion: Ground Floor Plan*, graphite, original 12" x 23" @ 1:100, 2008. Created by author.

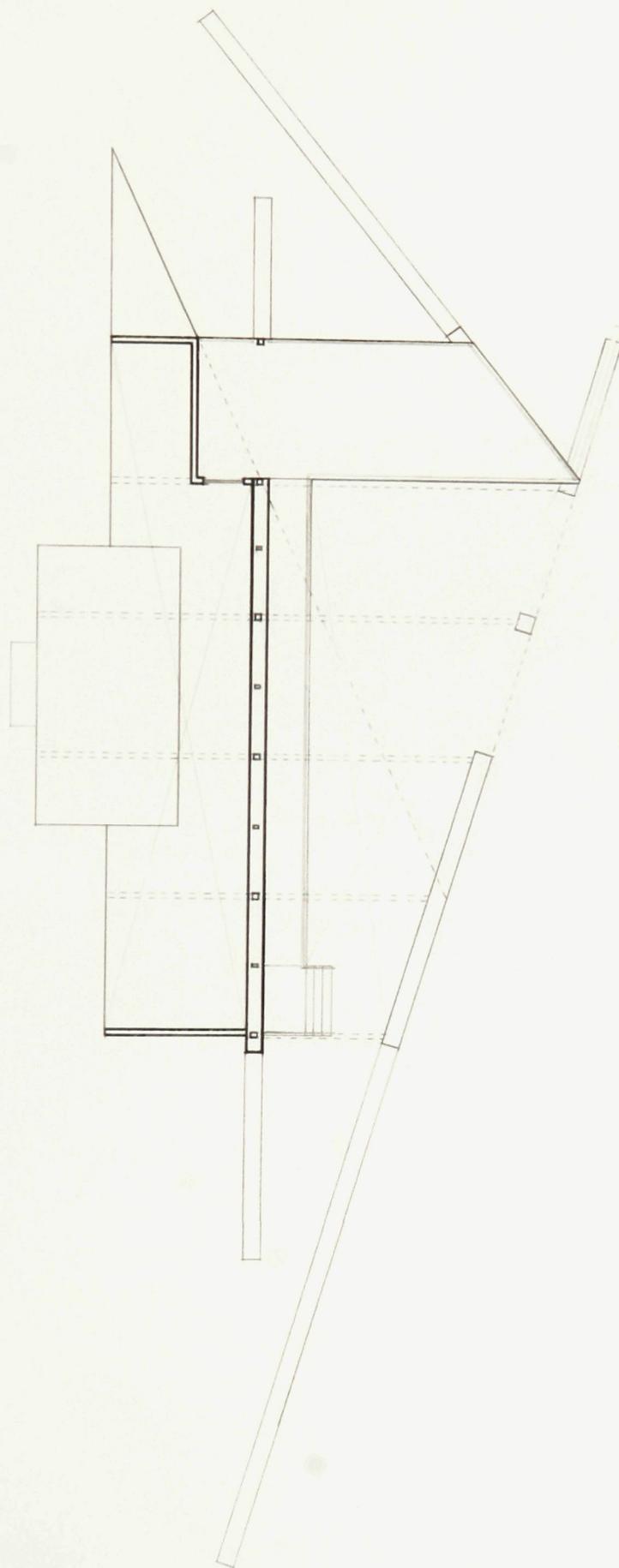


Fig. 47. *Pavilion: Second Floor Plan*, graphite, original 12" x 23" @ 1:100, 2008. Created by author.

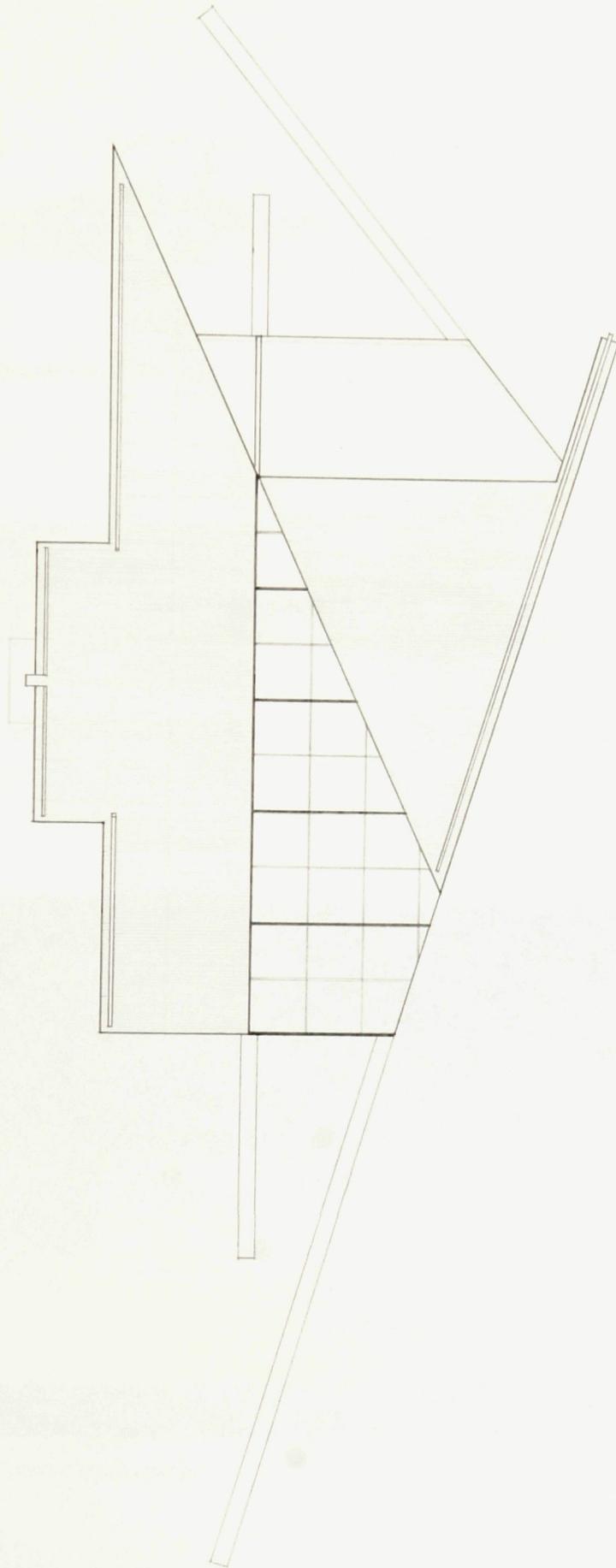


Fig. 48: *Pavilion: Roof Plan*, graphite, original 12" x 23" @ 1:100, 2008. Created by author.



Fig. 49. *Pavilion: South Elevation*, graphite, original 8" x 25" @ 1:100, 2008. Created by author.

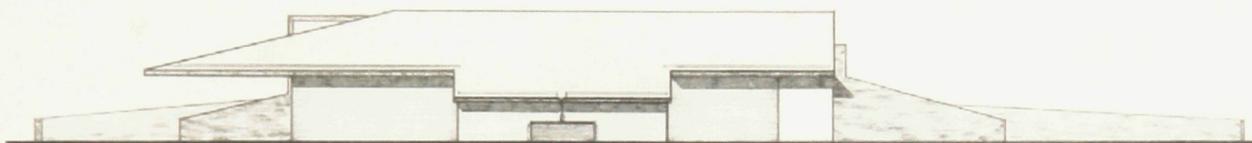


Fig. 50. *Pavilion: North Elevation*, graphite, original 8" x 25" @ 1:100, 2008. Created by author.

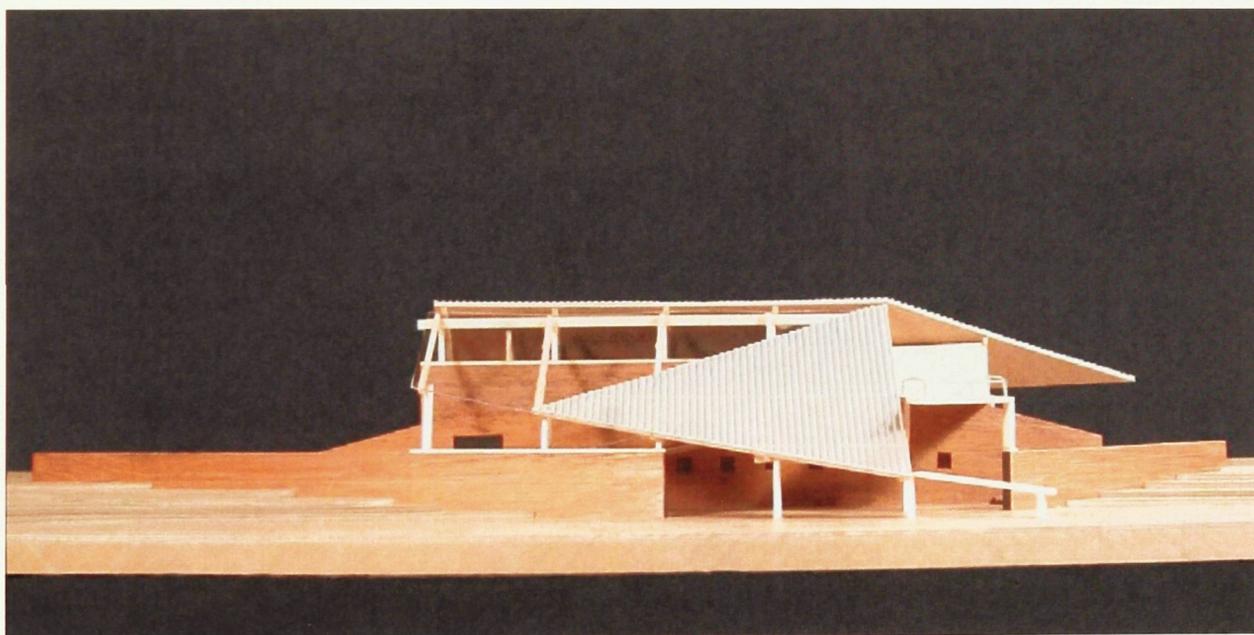


Fig. 51. *Pavilion: South Elevation*, wood model @ 1:100, 2008. Created by author.

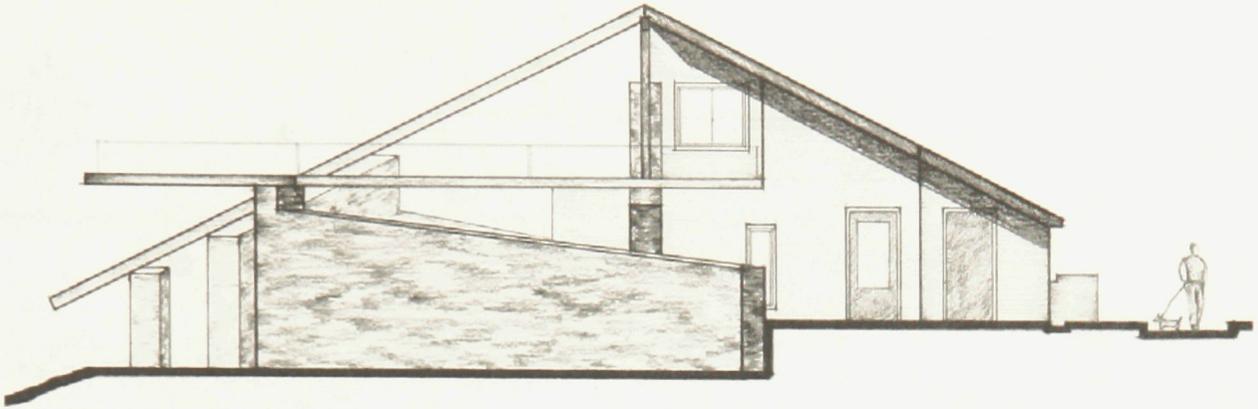


Fig. 52. *Pavilion: East Elevation*, graphite original 8" x 14" @ 1:100, 2008. Created by author.

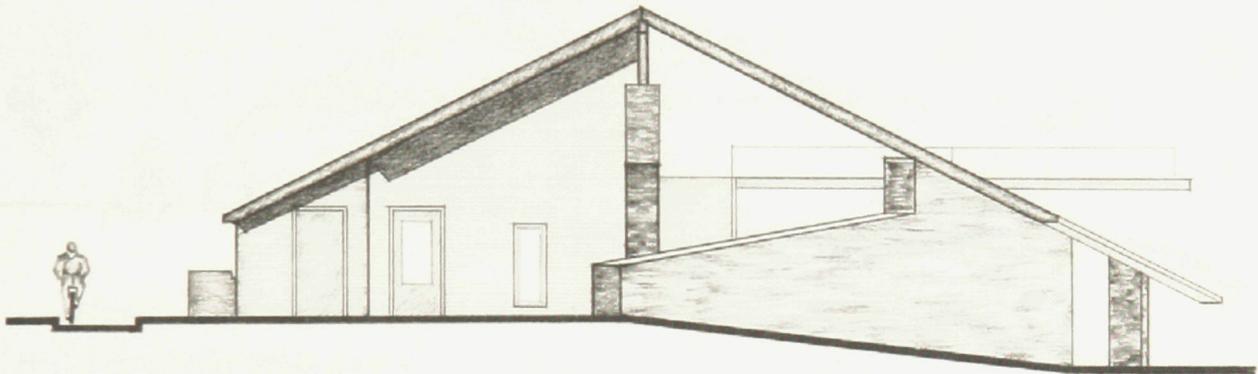


Fig. 53. *Pavilion: West Elevation*, graphite, original 8" x 14" @ 1:100, 2008. Created by author.



Fig. 54. *Pavilion: View from Wetlands*, wood model @ 1:100, 2008. Created by author.

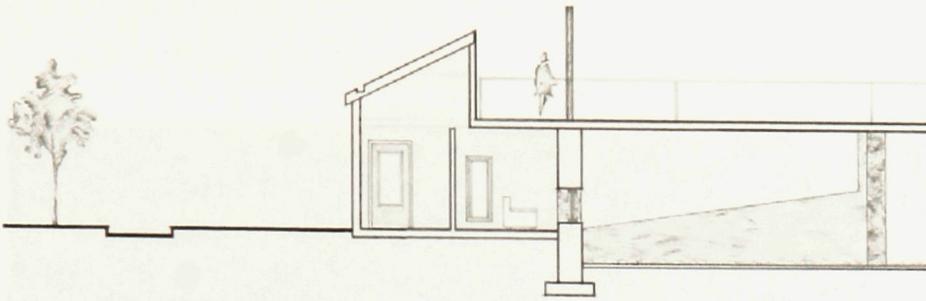


Fig. 55. *Pavilion: Section AA*, graphite, original 8" × 20" @ 1:50, 2008. Created by author.

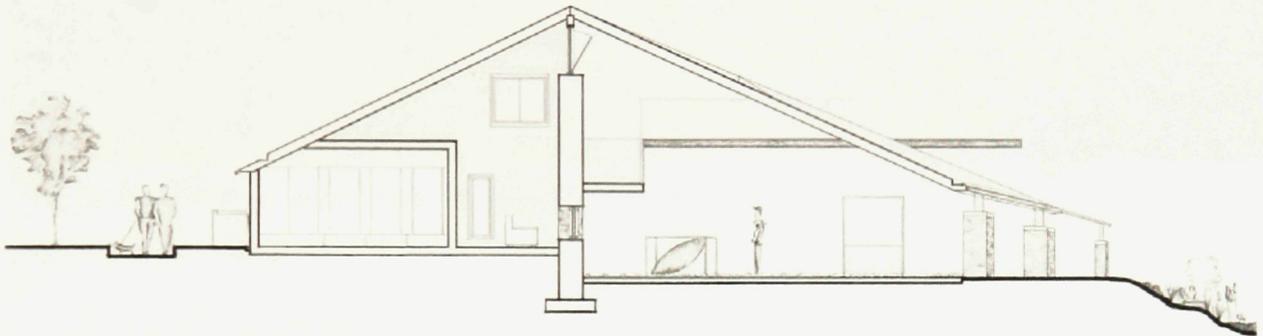


Fig. 56. *Pavilion: Section BB*, graphite, original 8" × 20" @ 1:50, 2008. Created by author.

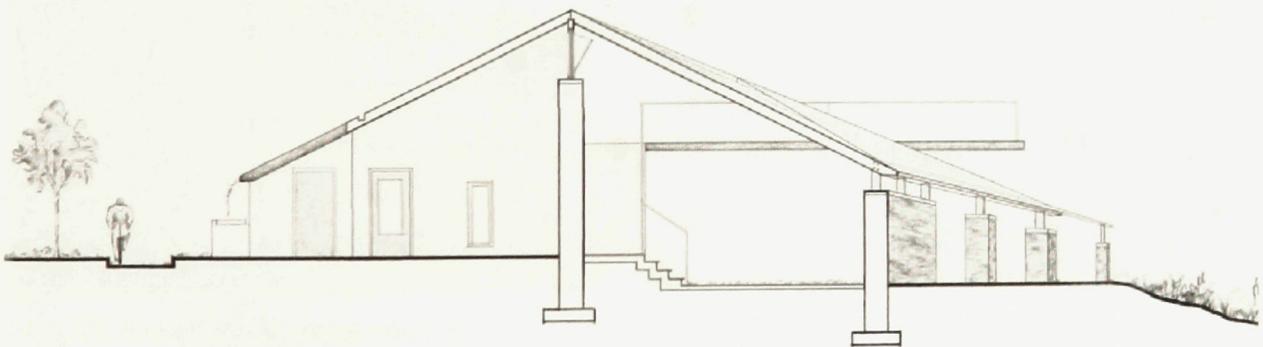


Fig. 57. *Pavilion: Section CC*, graphite, original 8" × 20" @ 1:50, 2008. Created by author.

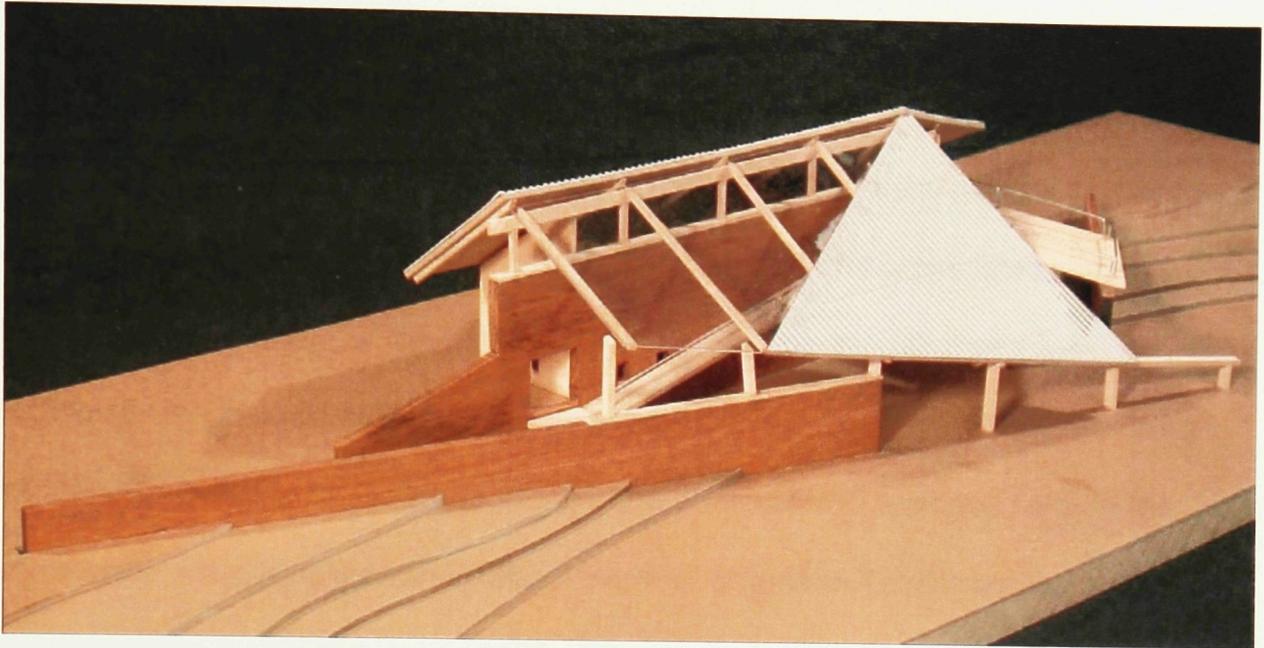


Fig. 58. *Pavilion Model*, wood model @ 1:100, 2008. Created by author.

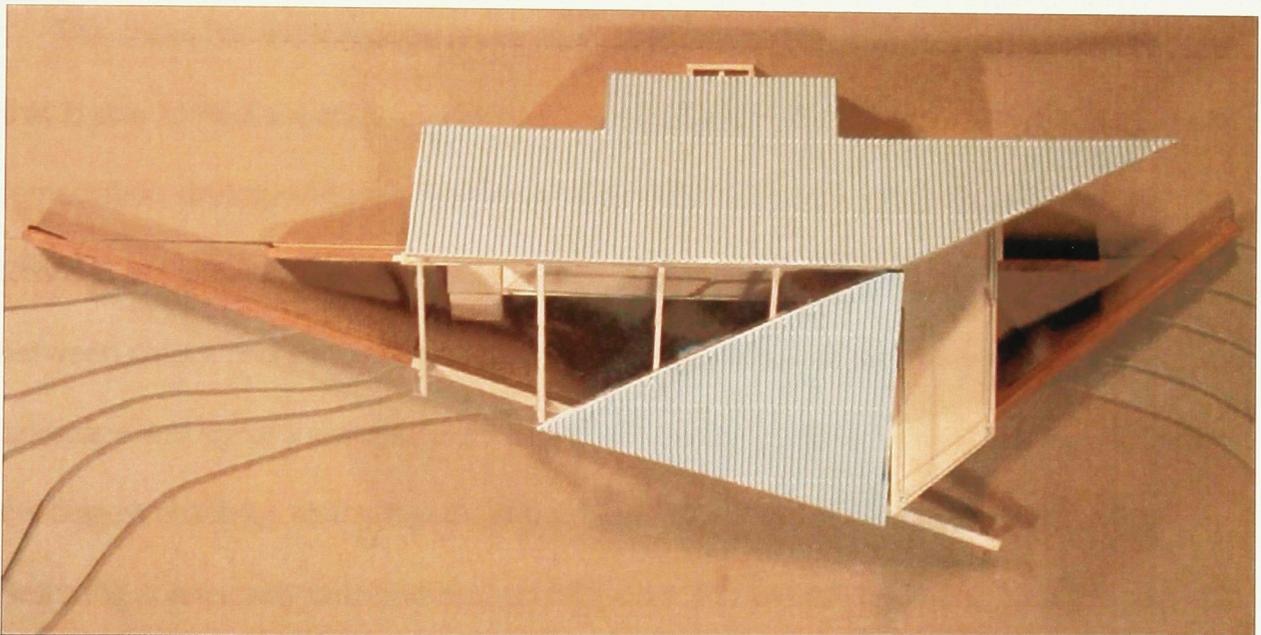


Fig. 59. *Pavilion Model*, wood model @ 1:100, 2008. Created by author.

Chapter 8: Conclusion

In reference to the detachment of people from their city, the Poet Laureate of the City of Toronto, Pier Giorgio DiCicco elegantly stated that the problem is to make people aware that anonymity is as toxic to the ecology of heart as hydrocarbons are toxic to the atmosphere. The goal is to restore intimacy, curiosity, trust, and play into the happenstance encounter of citizens, in an era when the happenstance and the unpredictable are a threat.⁵⁷ DiCicco speaks of the environmental crisis as a design crisis that moves beyond technology and techniques and thinks about how a project can restore the human body into the citizen and proactively weaves itself into the social and ecological fabric of the community. Integrating the complexity of the river ecosystem into the public image of the city encourages a collective stewardship. The environmental problem can be seen as a source of inspiration for innovation in architecture.

This thesis has explored the brownfield condition as a catalyst towards an architecture that is able to heal societies engagement with the landscape. The move towards a passive remediation strategy utilized phytoremediation and indigenous plantings to curtail the toxins in the ground. The thesis has proposed site strategies that questions the dualities between nature and culture and past and present in order to alter perceptions of the landscape and signal a common sense of responsibility towards it. This strategy recognized the biggest challenge to the mouth of the Don River is not physical, but psychological. Restoring connectivity between human behaviour and the natural hydrological processes is needed to create a new set of values that contribute to its renewal. The Don River

⁵⁷ Pier Giorgio DiCicco, "Preface," *Spacing Magazine* Fall 2007, i.

Discovery Pavilion tested the strategy by proposing an environmentally responsible architecture that is theoretically clear to the public.

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