SYMBIOSIS OF NATURE AND CULTURE:

an ecological approach to new residential development

by

larissa panachtchenko

a practicum submitted to the faculty of graduate studies in partial fulfillment of the requirements for the degree of master of landscape architecture

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SYMBIOSIS OF NATURE AND CULTURE: AN ECOLOGICAL APPROACH TO NEW RESIDENTIAL DEVELOPMENT

BY

LARISSA PANACHTCHENKO

A Thesis/Practicum submitted to the Faculty of Graduate Studies of The University

of Manitoba in partial fulfillment of the requirements of the degree

of

MASTER OF SCIENCE

To my mother,
Nelly Andreyevna
Podbolotova
and my husband,
Roger Kwadzo
Amenyogbe

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ACKNOWLEDGMENTS

"Are you saying I can fly?"

"I say you are free."

(Richard Bach, from "Jonathan Livingston Seagull")

So many people I would like to thank for giving me the best lessons in professionalism, creativity, friendship, and patience. Over the past several years I've been very lucky to learn landscape and building architecture from great academics and professionals.

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Finally, to all of my friends who continue to enrich my life and make Canada a real home for myself and my family.

Thank you.

INTRODUCTORY CHAPTER

Shall I not have intelligence with the earth?
Am I not partly leaves and vegetable mold myself?
-Henry David Thoreau

A Symbiosis of Natural and Urban structure in the Seine River Corridor. (The Royalwood Residential Development as an example of a new design approach)

DISCUSSION: Over time human activities on earth have become more intensive. Our footprint is spreading all over the planet in the forms of urban, rural, agricultural, industrial and other types of development. The repetitions of similar patterns that can be observed on the land (urban and rural subdivisions or grid of agricultural fields) are the result of the interaction between the human cultures and the Earth. But what is the nature of this interaction ?

There are many questions about our relationship with the planet Earth, which are reflected in different concepts that explain the nature of our existence. The religious points of view, that have been dominant in the West, see the Earth as a gift from God, given for the benefit of humans, whose responsibility is that of a steward. Another concept is that of a Mother-Earth, from which all the living things, including human beings, are growing. This is reflected in the ancient beliefs of aboriginal nations of America. As human cultures we see nature and our place in it in very different ways. It certainly affects our lifestyles and the way we treat our environments on each level - in a household, in a community, and in our governments.

In the late 1960's a new view of the world was formulated by British atmospheric scientist James Lovelock and American microbiologist Lynn Margulis. It was the Gaia hypothesis, the scientific expression of the ancient Greek belief that the planet Earth is a living creature, and humans are compared to a colony of bacteria on it. (Conacher, 1992, p. 178). Gaia hypothesis states that the Earth's climate and surface

environment are controlled by the plants, animals, and microorganisms that inhabit it. That taken as a whole, the planet behaves not as an inanimate sphere of rock and soil, sustained by the automatic and accidental process of geology, as traditional earth science has long maintained, but more as a biological superorganism - a planetary body - that adjusts and regulates itself (Joseph, 1990, p. 1). James Lovelock argues that the Gaia Hypothesis is an invention, explaining that a theory is not so much an idea *per se* as a generator of ideas, something that performs a useful function repeatedly, like a good tool. (Joseph, 1990, p.23). And indeed, Gaia allows us not only to re-evaluate our most common attitude: "master the earth" (Genesis 1:28), but also it allows us to find our rightful place in the circle of life. "...One wonders at the hubris of creatures that inflict so much damage on the Earth and then declare themselves its stewards or healers... What is the role of humanity in the great Gaian scheme?... The Gaia hypothesis implies that the stable state of our planet includes man as a part of, or partner in, a very democratic entity." (Joseph,1990, p. 197).
Human development and consumption of natural resources cannot be stopped or reversed, but it can be modified and regulated in such a way, that `conquest and exploitation' of nature by humans will be substituted by a `symbiosis' - mutually beneficial close association - a major principal of survival. "...Symbiotic cooperation is at least as important as `survival of the fittest' competition; in order to compete - in order to get in the game in the first place - you have to cooperate. We now believe that the doctrinaire Darwinian view of `Nature red in tooth and claw' is naive and incomplete. **Symbiosis means survival.**" (Joseph,1990, p. 37).

INTENT: In the current proposal urban development, one of the major forms of human impact on the land, is analyzed based upon the philosophical concept of Gaia, with the objectives to find new forms of symbiotic coexistence of the natural environment of river corridor and the cultural environment of human settlement.

The similarities of spatial organization of our cities from ancient times to modern days can be explained through the analogy of `snowflakes'. Each snowflake has an individual pattern, but yet is similar to the others, because all of them are created by the same process of crystallization. Our cities are created by the same process of natural interaction of the bacterial culture Homosapiens and the material environment of the planet Earth. The use of an analogy to a microworld is chosen based on the similarities of bacterial communities and human cultures. For microbiologist Lynn Margulis (Joseph, p.38) multicellular creatures are not fundamentally different from single-celled ones, just more complex. Laurence Joseph compares interaction of cells within the microbial community to a healthy body, or a city with the government that works (Joseph, p.39).

In light of the Gaia theory, a city should not be considered as a system which is regulated on the basis of technical and economical criteria, but rather as a natural system. As any living system, the city is constantly changing. Its ecological footprint is spreading, absorbing, processing and wasting more and more of the Earth's resources. Now that we are becoming aware of the danger of exhausting the "food" for human "bacteria", we want to manage it wisely so that it will sustain us and our generations to come, and so that the other species of the natural world will continue to maintain their populations. For that we need to find a new way of treating the land we live on in such a way that it will benefit from our presence as we benefit from it's resources. It seems difficult to achieve such symbiotic association, but we can start by trying to at least reduce the damage that urban development inflicts upon nature, of which we are a part.

One of the unique ecological systems within the urban environment is a river. Big or small, it is a source of transportation, water supply, food, recreation and spiritual inspiration. Riparian corridors (stream corridors, that include stream channel, its edges, the flood plane, the banks

Fig.1 Natural stream: Seine River, Winnipeg
Disturbance regime: Low
Habitat quality: High

Fig.2 Natural stream: Truro Creek, Winnipeg
Disturbance regime: High
Habitat quality: Low

Fig.3 Constructed stream: Peace Gardens
Disturbance regime: High
Habitat quality: Low

above the flood plane, and part of the upland above the banks) of urban rivers and streams are also an extremely valuable resource for wildlife habitats, that provide a movement of terrestrial plants and animals across the landscape (Forman, 1986). Unfortunately, over the years urban development has pushed the boundaries of river corridors towards the banks, damaging and destroying the ecology of riparian structures. Many rivers have disappeared underground into pipes; many are about to. Ironically, people and rivers are inseparable. In many cases urban rivers are the reason for the choice of settlement location. In modern times the appreciation of nature and public demand for the natural areas within the city is increasing. This creates a conflict between the protection of urban wildlife reserves and their destruction due to the human disturbance.

The current proposal demonstrates a scheme of development which will lead to the re-emergence of a riparian structure beyond the artificial lines of the 'corridor' that have been established in the landscape for purposes of ownership and development. It will connect the Seine River Oak forest to the other habitat reserves of the area, restoring the connectivity of a natural landscape.
The Seine River corridor is a mixture of a high quality wildlife habitats, almost undisturbed in some areas, and polluted and almost destroyed, primarily by local industries, in others.
A feasibility study and design proposal for a nature interpretive trail along the Seine River (between Provencher Ave. and Marion St.) was initiated by S.O.S. (Save Our Seine River Environment Inc.), and carried out over the summer of 1995. The current proposal is based on some of the data, derived from that project.

The main objective of the current project is to demonstrate a landscape and urban design strategy that considers the ecosystem of the area of a new development, both at the regional and local scales. The final product is a design proposal for the 300 acre site, chosen along the Seine River in St. Boniface, a Southeast district of the City of Winnipeg.

Ecology of the landscape is analyzed based upon the principles developed by Richard Forman in his writings *"Landscape Ecology"* and *"Land Mosaics"*. Publications such as " Wildlife Reserves and Corridors in the Urban Environment - A Guide to Ecological Landscape Planning and Resource Conservation" by Lowell W. Adams and Louise E. Dove, "Yard Street Park, The Design of Suburban Open Space" by Cynthia L. Girling and Kenneth I. Helphand, and "Assessment of Built Projects for Sustainable Communities" by William T. Perks and David R. Van Vliet, were reviewed as an example of landscape strategies used in urban planning as well as a summary of related case studies. An assessment of Vegetation and Wildlife Habitat Quality For The Seine River Parkway, 1995, prepared by Andrew Cowan for Parks and Recreation Department, City of Winnipeg, was used to create a native species pallet, recommended for the planting of new and restoration of existing habitats in the study area.

PHILOSOPHY:

The philosophical basis of this project has been inspired by the Gaia theory: **equal rights of natural (wildlife) and cultural (human) habitats for the resources of this planet, based on the principle of symbiosis**. This concept is reflected in the relations between the built and natural environments within the urban neighborhood. No longer should nature be **'hired'** for recreation and entertainment of humanbeings, but rather **'invited to stay'** and share the urban space with us.

Nature **'hired'** for recreation and entertainment can be found throughout the city - lawn carpets that are fed and groomed, ponds that are flushed, flower beds that need to be protected from the weed invasion, and so on. Tremendous efforts are required to keep habitats that are inherently dynamic, continuous and generally undisturbed in a static, fragmented state and a heavily disturbed urban environment.

Nature **'invited to stay'** means that the natural areas within the urban fabric can function as a system that sustains itself and accommodates wildlife movement through the landscape.
Physical access and disturbance of the natural areas by humans should be considered in some areas and discouraged in others. In fact, *visual* access to the natural landscape features such as forests, lakes or meadows has proven to be as valuable for people as *physical* access. An important aspect of this is that there is no damage from the human

disturbance to the natural habitats.

The current study is an answer to some of the fundamental questions :

Why do we need natural habitats in our urban neighborhoods?

What benefits will it provide for the wildlife and human dwellers of urban areas?

How can we re-inforce and support natural systems in the city?

"Why" Because it is what we want & need

In the 1st Century B.C., the Roman poet Horace wrote regarding city dwellers:

> "Why, amid your varied columns you are nursing trees,
> and you praise the mansion which looks out on distant fields"
> (Glacken, 1967).

CASE STUDIES & LITERATURE REVIEW

The first efforts to employ nature in civic landscape as parks, trees, and gardens can be traced as far back as the creation of cities themselves. "This search for nature has been evidenced, over the millennia, in garden plots, parks and promenades, suburbs, and utopian proposals for garden cities. In the seventh century B.C., Sennacharib built a park for the citizens of Ninevah; in the nineteenth century, cities set aside huge tracts of woods and meadows for the education, health, and enjoyment of their residents. Philosophers in ancient Athens gathered their students in gardens with groves of trees; residents of seventh-century cities strolled along tree-lined promenades. Citizens in medieval European cities tended abundant gardens within city walls, just as city gardeners today cultivate tiny plots on penthouse terraces and in vacant lots" (Anne Spirn, The Granite Garden, 1984, p.29).

Unfortunately, city dwellers have been mostly concerned with the aesthetics of nature - its pleasing and comforting qualities, neglecting and often damaging the structure and function of the underlying ecological system. In "The Granite Garden", Anne Spirn provides a comprehensive analysis of numerous problems of a city environment, such as air and water pollution, urban heat islands and contaminated soil. She states that most of the urban ecology problems are caused by unwise management of natural resources of developed areas, from the beginning of settlement.

Transformations:

What we got

An excellent example of a city environment being transformed, altered and modified from landforms to flora and fauna, is the city of Boston, founded on an unwooded peninsula in 1630. When nearby native woodlands were stripped to provide the growing city with fuel, the colonists brought fruit trees and garden crops with them from Europe. "Many trees planted in eighteenth- and nineteenth-century Boston were imported European species; Lombardy poplars, lime trees, and English elms were all popular. The fashion of planting exotic species peaked in nineteenth century when botanical gardens were planted in Boston and in other cities throughout United States and Europe. The result is today's cosmopolitan flora. Trees on Boston's city streets have mixed origin; the honey locust is native to the central United States, the Norway maple and little leaf linden to Europe, the gingko to eastern China. The Kentucky bluegrass in private yards and parks is not a native of Kentucky, but an asiatic transplanted to North America by way of Europe" (Edgar Anderson, Plants, Man and Life, 1969, p.12, quoted in Anne Spirn, Granite Garden). The landforms of Boston also underwent tremendous modifications - hills were cut to fill in tidal flats and ponds; the course of tides and rivers was changed. The result was increased damage from earthquakes due to unstable filled grounds, increased water pollution due to more frequent flooding, and increased maintainance costs of designed landscapes.

Parks:

Realizing what we lost

Large landscape projects were undertaken in developing cities of North America in the nineteenth century to accommodate their growing population with a green open space. The natural native habitats were destroyed and replaced with man-made landscapes. "Like Franklin Park in Boston, the landscape of New York City's Central Park was entirely remodeled and replanted with more than four thousand new trees and shrubs. These pastoral parks, designed as an idealized form of nature derived from British country estates, require an enormous amount of maintenance. Today, many of them are in decline and badly in need of renovation" (Anne Spirn, The Granite Garden, 1984, p.26).

Similar projects were undertaken in Canada, and Winnipeg is no exception. Parks and golf courses located within city stream corridors such as those of Red, Assiniboine, and Seine rivers provided a great recreational opportunity for the city dwellers at the expense of wildlife habitats forced out of their inherent real estate. The native prairies and riparian forests were in many areas completely wiped-out and replaced with pavement, lawns and introduced plant species that require a high level of maintenance and cannot sustain themselves.

The Garden City:

DEFINIG WHAT WE WANT

Regardless of a comprehensive effort to improve the health, safety, and welfare of the nineteenth century city residents through the alteration of the physical environment, many rejected the old city in favor of the "garden city". This new model of suburban settlement was described in 1902 by Ebenezer Howard as an ideal city, where "...industry and commerce would be integrated with homes, gardens, and farms" (Ebenezer Howard, Garden Cities for To-morrow, 1902; reprint, 1965).

"The garden City, as envisioned by Ebenezer Howard in 1902, recalled many aspects of Thomas More's Utopian city. Aspiring to the integration of nature and city, the garden city and the new towns and suburbs it inspired incorporated the trapping of nature, but failed to address underlying natural processes....garden cities were in fact built both in Britain (Welwyn and Letchworth) and the United States (Greenbelt, Maryland, and Radburn, New Jersey) and provided the impetus for a new town movement still influential today in cities such as Reston, Virginia, and Columbia, Maryland" (Spirn, p. 28).

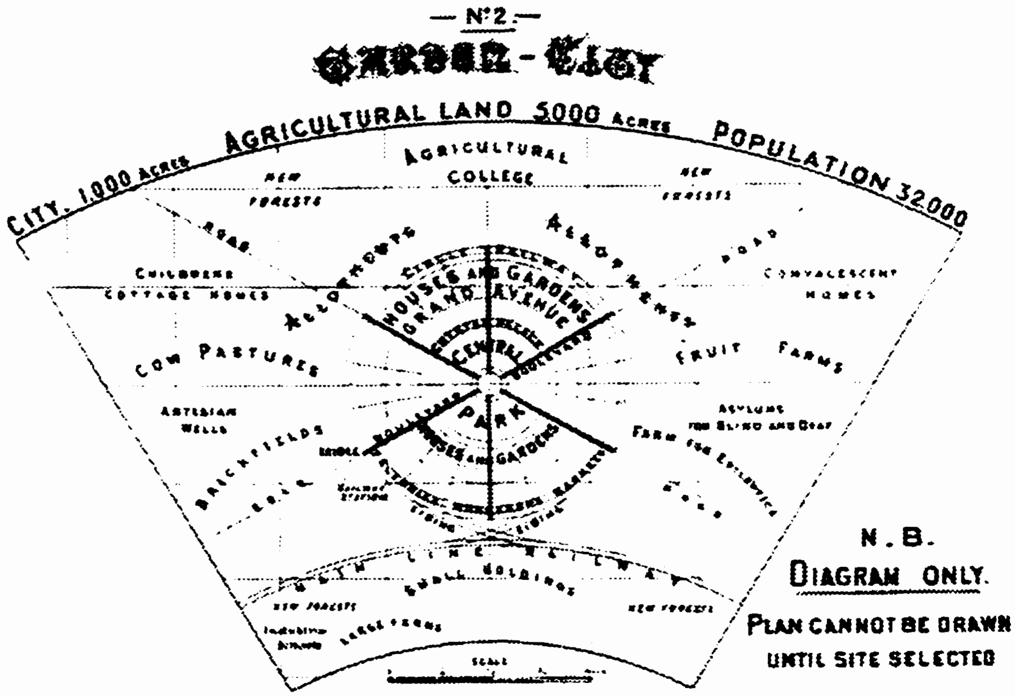


Fig.4 Ebenezer Howard's Garden City diagram, 1898.

Urban residents in Canada and USA were surveyed to identify a degree of their interest and involvement in the interaction with the wildlife. The results are summarized in Adams and Dove, 1989.

Supporting Research:

COMMUNITY SURVEY

For example, in a 1985 national survey of Americans (U.S. Dep. Inter., Fish and Wildlife Serv. and Dep. Commerce, Bur. of Census, in press), it was estimated that 58% of Americans (16 years old and over) maintained an active interest in wildlife around the home through such activities as observing, identifying, photographing, and feeding wildlife, or maintaining natural areas or plantings like shrubs and other vegetation for benefit to wildlife. Furthermore, some 65% of the adult population enjoyed seeing or hearing wildlife while pursuing other activities. Some 67% of Canadians (15 years old and over) fed, watched, studied, or photographed wildlife around their homes or cottages (and slightly over 70% of these individuals were urban residents). Gilbert (1982) reported that 90% of the respondents to a survey of residents in Guelph, Ontario felt that the city should be doing more to encourage wildlife conservation, and 46% said they were willing to pay a special municipal tax to support such activities ... Ninety-six of the respondents in a survey of residents of New York City, Buffalo, Utica-Rome, and Binghamton, New York indicated that it was important for children to have the opportunity to take part in nature programs beyond those offered in school or at home, and 73% expressed interest in a program to learn how to encourage wildlife to live in their backyard or neighborhood area (Brown et al. 1979), quoted in Adams and Dove, 1989.

REALIZATIONS:

SUSTAINABLE COMMUNITIES DON'T GO FAR ENOUGH

A number of built projects for sustainable communities was assessed by William T. Perks and David Van Vliet. The final draft, completed in March 1993, includes five case studies of sustainable communities built in Denmark, Norway and Sweden. Although all of the projects demonstrate successfully implemented strategies such as efficiency of building materials, solar energy conservation, reduction of traveling distances, provisions for gardening, and so on, ecology is viewed from the egocentric standpoint. In all of the case studies the value of the natural elements such as trees, grass, and ponds, is related to human use: provision of recreation, shade, groundcover, drainage, and so on. Although important for the community residents, these amenities don't provide for the wildlife habitat dwellers.

For example, in the project of an eco-village of Tuggelite, Sweden, an adjacent forest area was municipally owned. It was to be further developed as a park that incorporates bicycling / skiing paths, with lighting during the evening. In the sketch of typical eco-village features for Lövåsen in Sundsvall, Sweden, the only function of the forest is recognized as provision of a wind-break. In the Egebjerggård neighborhood of Ballerup, Denmark, the character of the natural environment of the region was maintained by special attention to the position of buildings at the edge of an existing forest, but an opportunity to connect the forest to the other habitat reserves through the neighborhood open area system wasn't addressed at all. The stormwater retention pond in the same community was formally integrated with housing and available for recreation, but wasn't considered as an opportunity site for a wildlife reserve. In the Sun-village of Solbyn in Dalby, south Sweden, fruit trees and berry-bushes were planted throughout the community, but the possibility of maintaining the native key-species was not addressed.

The neglect of the provision for the natural habitats in the sustainable communities' design strategies does not negate the importance of the major objectives achieved, such as reduced energy consumption and reduced impact of human development on the natural environment. In recognition of the range of sustainable development issues, the authors of the mentioned above study concluded: "There is no consistent definition of an eco-village. At one end of a spectrum, a project may have as its goal simply 'doing better' or 'achieving more' - usually in marginal ways and in a provision for some collective service or common building facility" (Perks and Van Vliet, 1993).

What benefits?

Interventions:

GETTING BACK WHAT WE LOST

"Although the integration of nature and city is a frequently cited goal of new towns an implicit one of suburbs, most new towns and suburbs merely incorporate the trappings of nature, like trees, lawns, gardens, and lakes, but are built with as little regard for the processes of nature as were the old cities" (Anne Spirn, The Granite Garden, 1984, p.34). However, the search for an integration of nature into the urban fabric continued into twentieth century, resulting in successful strategies being implemented in cities around the world. In "The Granite Garden" we read about the cities that have dealt in a comprehensive way with at least one urban problem.

ENVIRONMENTAL BENEFITS

For example, Stuttgart, West Germany, has deployed its parkland to **funnel clean, cool air into congested downtown**; Woodlands, a new town in Texas, has created private and public open spaces, that function as **an effective storm drainage system, soaking up floodwaters and preventing floods downstream**; Boston has purchased wetlands upstream of the city for flood storage at a fraction of the cost of a new dam; Zurich and Frankfurt manage their urban forests for **timber production as well as recreation** (Anne Spirn, The Granite Garden, 1984, p.10).

Ottawa, Ontario can serve as an example of a wise planning strategy that considered an integration of nature and the city by preserving the functionality of the natural system on a regional scale. The masterplan for Ottawa and its environment, known as Gréber Plan (1950), incorporates some of the elements of the garden city, such as the creation of a greenbelt and extension of a parkway network. In recommending the establishment of a greenbelt, Gréber, a French architect who worked closely with his Canadian colleagues John M. Kitchen and Edouard Fiset, developing Master Plan for National Capital, hoped to **confine urban development to the area which could be provided with sewer and water facilities at reasonable cost, and to avoid uncontrolled urban sprawl as well as unsightly ribbon development along the main highways into the Capital. This same greenbelt would provide future parks and public open space and would also have important conservation aspects. Reforestation of waste lands** and protection of stream courses and swamp areas would **protect the water table**, thus ensuring that lands both inside and beyond the greenbelt would continue to have adequate water supply (A Capital in the Making, National Capital Commission, 1991, p.30). The Greenbelt proved to be a valuable resource for the city dwellers as well as wildlife inhabitants. It **accommodates the flow of wildlife** along the Ottawa River Valley, diverting it from developed areas of the city and connecting the flow back into the river corridor. For a growing city that has expanded beyond the greenbelt, this natural corridor provides important functions such as **air and water purification** as well as an **opportunity for**

recreation along its trail system.

A very important element of the natural system of the Ottawa region is Gatineau Park, located northwest of the Greenbelt, across the Ottawa River valley. It has provided an oasis of natural beauty to people as well as a refuge for a numerous native wildlife habitats from the earliest days of settlement. "Today, the park covers some 35,600 hectares, of which 2,400 hectares are lakes, and the National Capital Commission controls all but 1,600 hectares. The remaining land is mainly owned by private individuals who have homes or summer cottages in the area" (A Capital in the Making, National Capital Commission, 1991, p.30).

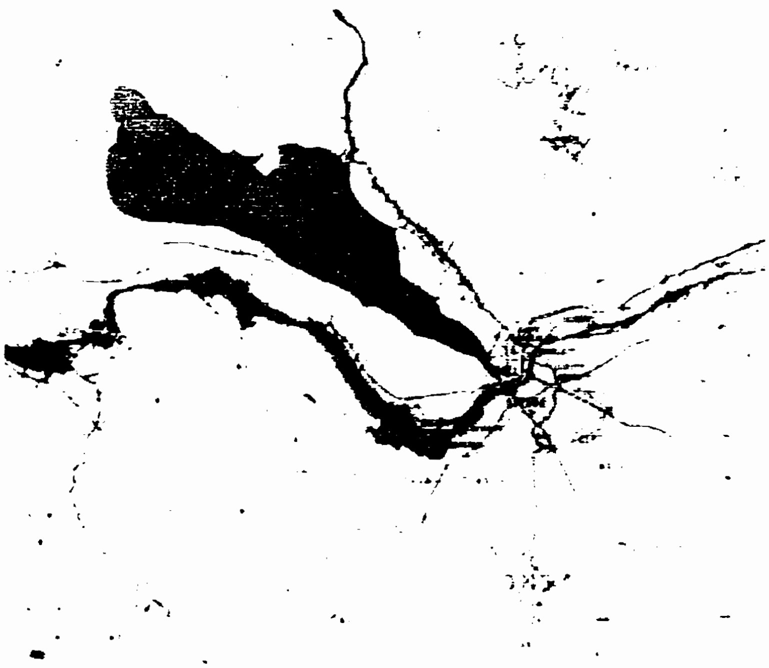


Fig.5 Regional Open Space Plan (Gréber).

Fig.6 Gatineau Park

Fig.7 Green Belt

The desire to beautify and cleanse urban environments is not the only reason behind the continuous efforts of urban dwellers to pull nature back into the city and keep it there - either 'hired', 'trapped', or 'invited to stay and share'. Numerous early writings as well as recent studies of the affect of visual access to the natural landscapes on mental and physical health add an important aspect to the relationship between people and nature, and, in fact, may offer solutions to urban planning problems.

PERSONAL (HUMAN) BENEFITS

In the United States in the 1860s and 1870s, the renowned landscape architect Frederick Law Olmstead wrote at length about his intuitively based conviction that visual contact with nature is beneficial to the emotional and physiological health of city dwellers. He asserted that an environment containing vegetation or other natural elements "employs the mind without fatigue and yet exercises it; tranquilizes it and yet enlivens it; and thus, through the influence of the mind over the body, gives the effect of refreshing rest and reinvigoration to the whole system" (The value and care of parks, Olmstead, F. L., 1865 (Reprinted in Landscape Architecture 17:20-23, 1952).

A century after Olmstead, authors from both the social and natural sciences have advanced a number of quite different theoretical perspectives that are relevant to explaining why people may derive enhanced well-being from passive contact with flowers, trees, and other plants. Importantly, all these theoretical viewpoints, despite their differences, agree in predicting that passive experiences with environments having vegetation or other natural elements should tend to have positive effects on physiological well-being (Ulrich and Simons, 1986).

Roger S. Ulrich, Associate Dean of Research at the College of Architecture at Texas A&M University, has been involved in research of the effects of experiences with designed and natural surroundings on human well-being and health. Many of his publications demonstrate that, in fact, visual access to a natural landscape decreases stress, increases creativity and speeds up the recovery from illness amongst urban dwellers, regardless of age, gender or ethnic background.

A recent study by Yi (1992) investigated the roles of cultural and occupational differences in influencing the natural landscape preferences of diverse groups of South Koreans and Texans, including farmers, ranchers, and nonfarmer urban groups. Individuals were shown a collection of color photographs depicting diverse natural settings in Korea and Texas...Yi's results reveal high agreement among all groups in their aesthetic preferences. Differences attributable to culture and occupation were statistically significant but comparatively minor, accounting for little of the variance. It should be mentioned that the groups were similar in according especially high preference to landscapes having water features or savanna-like characteristics (Biophilia, Biophilia, and Natural Landscapes by R. S. Ulrich in "The Biophilia Hypothesis, Kellert,

S.R. and Wilson, E.O., 1993). This knowledge becomes particularly important for urban design and planning strategies in areas with diverse ethnic populations, such as Canada and United States.
Another study of the records on recovery after cholecystectomy of patients in a suburban Pennsylvania hospital between 1972 and 1981 was undertaken to determine whether assignment to a room with a window view of a natural landscape might have restorative influences. Twenty-three surgical patients assigned to rooms with windows looking out on a natural scene had shorter postoperative hospital stays and took fewer medications than 23 matched patients in similar rooms with windows facing a brick building wall. (View Through a Window May Influence Recovery from Surgery, R. Ulrich, Science, vol. 224).

The results of this research provide us with important information. If visual access to a natural landscape speeds-up recovery of hospital patients, it will surely provide health benefits for people who spend long hours in their homes. The advance of new technologies such as the internet, will result in a shift of work stations into private homes in the coming century. It will also provide people at home with access to services such as banking, libraries, shopping, etc. For many people, especially urban dwellers, it will result in confinement to an enclosed environment of a house or an apartment for long periods of time. This condition could contribute to higher stress levels and stress-related health problems. Based on the results of the research discussed above, the state of the city's natural environment and visual access to it will become extremely important for urban dwellers, particularly in areas with the restrictive climatic conditions, such as Winnipeg. In laboratory research, visual exposure to settings with vegetation has produced significant recovery from stress within only five minutes, as indicated by changes in physiological measures such as blood pressure and muscle tension. Views of vegetation foster restoration from stress apparently because of a combination of beneficial effects: they produce increases in positive feelings; reduce negatively toned or stress-related feelings such as fear, anger, or sadness; hold interest/attention effectively and hence may block or reduce stressful thoughts; and elicit positive changes across different physiological systems (R.S. Ulrich, R. Parsons, Influences of Passive Experiences with Plants on Individual Well-Being and Health, in "The Role of Horticulture in Human Well-Being and Social Development", 1992).

"How"

FORMAN'S PRINCIPLES

In order to construct a functioning landscape, we have to understand its inherent elements, structure and function. Forman defines a landscape as a "...heterogeneous land area composed of a cluster of interacting ecosystems that is repeated in similar form throughout " and can be characterized by :

1. **Structure,** the spatial relationships among the distinctive ecosystems or "elements" present - more specifically, the distri bution of energy, materials, and species in relation to the sizes, shapes, numbers, kinds, and configurations of the ecosystems.
2. **Function,** the interactions among the spatial elements, that is, the flows of energy, materials, and species among the compo nent ecosystems.
3. **Change,** the alteration in the structure and function of the ecological mosaic over time. (Forman, 1986, p.11).

Forman refers to the basic, relatively homogeneous, ecological elements or units of the land as **landscape elements** (whether they are of natural or human origin). He describes them as being identifiable in aerial photography and often range from around 10 m to 1 km or more in width (Forman, 1986, p.12). Analyzing the relationships between landscape elements in his book Landscape Ecology, Forman identified seven major statements regarding principles of landscape structure, function and change.
The current project is based on the following three principles, which are most relevant to the objectives of the present study:

Landscape Structure and Function Principle - Landscapes are heterogeneous and differ structurally in the distribution of species, energy, and materials among the patches, corridors, and matrix present. Consequently, landscapes differ functionally in the flows of species, energy, and materials among the structur al landscape elements.

Species Flow Principle - The expansion and construction of species among landscape elements has both a major effect on, and is controlled by, landscape heterogeneity.

Landscape Change Principle - When undisturbed, horizontal landscape structure tends progressively toward homogeneity;

moderate disturbance rapidly increases heterogeneity, and severe disturbance may increase or decrease heterogeneity. (Forman, 1986, p.25).

More specifically, in order to model a natural landscape, it is important to:

- **Recognize existing landscape elements** - their structure and function (identify existing patches, corridors and matrix and an opportunity for their re-inforcement);
- **Analyze existing species composition and flow**, and try to achieve connectivity and heterogeneity;
- **Assure moderate level of disturbance** (close to natural distur bance for a given system type) in order to achieve species diversity and heterogeneity of a landscape.

Further, analyzing landscape elements in a greater detail, Forman emphasizes the importance of their properties, such as

patch shape, size, isolation and number;
corridor connectivity (presence of breaks), height and width
matrix porosity, connectivity and heterogeneity;
boundary shape.

By modifying any of these properties, it is possible to achieve the best functionality and productivity of natural landscapes, wild or built. Many studies, conducted in urban areas across the world have proven that **the quality of natural habitats in cities (species richness and diversity), depends mostly on the size of the habitat area, degree of habitat isolation, and percentage of vegetative cover**.

TESTING THE PRINCIPLES

Results of many of the field studies, summarized by Adams and Dove, 1989, help us to test some of Forman's principles of Landscape Ecology, and to begin to derive area requirements for various habitats. Vertebrates, birds, mammals and invertebrates were monitored in vegetated areas of various cities across the world. The overall results show that species richness (total number) and diversity increases with the habitat patch size and decreases with habitat isolation (distance away from similar habitats).

Vizyovå (1986) studied the importance of habitat area size, degree of habitat isolation (barrier effect), and percent vegetative cover on species number of land vertebrates in urban woodlots. Field work was conducted during 1982-1984 on twenty-one sites, ranging in size from 0.6 to 47 ha, in the town of Bratislava, Czechoslovakia. Study sites included city parks, cemeteries, and remnant woodlots within the town and surrounding suburbs. Vizyovå concluded that, for managing land vertebrate communities in urban woodlots, minimum island size should be at least **5 ha**, but an optimum minimum area would be **20-30 ha**. Smaller and more isolated woodlots should have denser vegetative cover. Areas larger than **10 ha** containing clearings will create conditions for some forest edge species. (Adams and Dove, 1989, p.13). Results of studying mammals, reptiles, and amphibians by Dickman (1987) in the city of Oxford, England, show, that for all vertebrate species studied, more species were usually retained in two small habitat patches than would be expected in a single larger patch equal to their combined area. The size of patches studied varied from 0.16 to 20 ha. For mammals, excluding large species such as Fallow and Roe Deer, Dickman recommended that a system of small (at least **0.65 ha**) woodland habitat patches be maintained throughout the city area. Habitat patches (at least **0.55 ha** in size) that provide permanent sources of water are important for retaining amphibians and reptiles. Tilghman (1987) studied the characteristics of urban woodlands affecting breeding bird diversity and abundance in Springfield, Massachusetts. The number of bird species increased rapidly as the size of woodland increased from **1 to 25 ha.** At **25 ha**, about **75%** of the maximum number of species were represented. Above 25 ha the increase in number of species with size was more gradual. Woods with streams flowing through them, or those adjacent to lakes, had greater bird species diversity and total bird abundance (Adams and Dove, p.15). Matthiae and Stearns (1981) studied mammalian species-area relationships and the effect of the surrounding landscape on species richness of forested habitat patches in southeastern Wisconsin. The beech-maple forest islands ranged from **0.4 to 40 ha**. The 22 forested patches were isolated by urban and agricultural landscapes. Results showed, that species richness generally increased with island size. Rural sites were most diverse. Urban islands served as refuges for small rodents and larger nocturnal scavengers and omnivores (most notably gray squirrels and raccoons). Islands in the urban-rural transition zone had lower species richness and abundance. The authors speculated that this observation may have resulted from greater isolation of islands and the absence of diverse adjacent habitat in the area (Adams and

Dove, p.18).

The predicted numbers of species for urban terrestrial "habitat islands" of different sizes were summarized in a table (Fig.8) by Adams and Dove.

Table 1. Predicted numbers of species for urban terrestrial "habitat islands" of different sizes. See text for details.

Island size (ha)	Woodland birds[a]	Woodland birds[b]	Woodland birds[c]	Chaparral birds[d]	Land vertebrates[c]	Urban parks[e] Flies	Urban parks[e] Beetles
1	---	---	6.4	1.6	8.7	---	---
2	---	24.0	13.8	2.5	13.5	---	---
4	13.0	27.0	21.2	3.4	21.0	25.2	6.6
8	21.0	31.0	28.6	4.3	32.8	29.7	7.7
12	27.0	33.0	32.9	4.8	42.5	32.6	8.5
16	29.0	36.0	36.0	5.2	51.1	34.9	9.0
20	31.0	37.0	38.3	5.5	58.9	36.8	9.5
24	31.5	39.0	40.3	5.7	66.2	38.4	9.9
30	32.5	40.0	42.7	6.0	76.4	40.5	10.4
36	33.0	42.0	44.6	6.2	85.8	42.2	10.8
42	33.5	43.0	46.2	6.4	94.7	43.8	11.2
65	---	48.0	---	7.0	---	48.5	12.3
100	---	---	---	7.5	---	53.7	13.6
200	---	---	---	---	---	63.2	15.8
300	---	---	---	---	---	69.5	17.3

Fig.8

Besides the patch size and shape, another important element of landscape structure is the corridor, or a string of smaller islands, that can function as "stepping stones" between larger forested areas, reducing habitat isolation. The best argument for corridors is that the original landscape was interconnected. (Noss, 1987) Further, habitat connectivity declines with human modification of the landscape and the use of corridors is an attempt to maintain or restore some of the natural landscape connectivity. Pertinent in this regard is the call for a national "Greenways for Americans" initiative from the President's Commission on Americans Outdoors. Among other things, the Commission recommended a network of greenways across the United States and called for linking existing parks, river and stream corridors, grasslands, hiking and biking trails, abandoned rail lines, and other areas of open space for use by people and wildlife. (Adams and Dove, p.27).

GUIDELINES

The number of guidelines and recommendations for creation and support of wildlife habitats in urban areas, as outlined by Adams and Dove, was used in this study in combination with recommendations developed by local naturalists. The principles listed below are most relevant to the site chosen in the present study, its context and scale:

- Avoid unnecessary fragmentation of forests.
- Retain vegetation diversity to gratest extent feasible.
- In smaller tracts (even 2 ha or less) it is beneficial to maintain the maximum continuous woodland with the least amount of edge.
- Management units that approach the shape of a square are more effective in preserving forest-interior birds than are long, narrow ones - especially when managed tracts are small.
- If wooded fragments must be isolated from the forest proper, retain a connecting corridor, such as along a stream; or if a for est tract has already been separated, consider planting a cor ridor to reconnect it.
- Maximize patch size of woody vegetation. In the planted envi ronment, maximizing the crown of trees and shrubs is likely the one management practice or goal that will yield the greatest increase in breeding bird species richness.
- The pond site should be located in an area where disturbances to valuable existing wildlife habitat by construction activities will be avoided or minimized.
- Impoundments with gently sloping sides (on the order of 1:10) are preferable to impoundments with steep slopes. Gently slop ing sides will encourage the establishment of marsh vegetation. Vegetation will provide food and cover for wildlife and help to enhance water quality. Impoundments with gently sloping sides also are safer than steep-sided ponds for children who might enter the impoundments, and gently sloping sides facilitate use by terrestrial wildlife.
- Water depth should not exceed 61 cm for 25-50% of the water surface area, with approximately 50-75% having a depth not less than 1.1-1.2m. A greater depth may be advisable for more northern areas subject to greater ice thickness.
- An emergent vegetation/open water ratio of about 50:50 should be maintained.

Having outlined the ecological principles and guidelines chosen for the present site, it is important to develop an overall strategy for the study area and its context. The history of urban development from the utopian cities to modern megapolises demonstrates an egocentric approach. Even if "nature" was literally placed in the center (central park in Garden City or New York City), it was first of all 'hired' to serve the city dwellers as a recreational facility and had a secondary or no value as a wildlife habitat reserve. In most cases the city , town, or neighborhood centre is associated with high density development, residential, and commercial uses.

The previous discussion allows us to conclude that the need for access to nature (physical and more so visual) is an important factor that determines our choice of dwelling. An ecocentric approach to neighborhood planning can help to achieve a symbiotic relationship between natural and built environments. **Nature placed in the center** supports wildlife habitats and allows us unlimited visual access and regulated physical access.

'Nature placed in the center' has two aspects:

- an ecological system is recognized and provided for;
- a wildlife habitat patch placed in the neighborhood center makes a design statement of the important position occupied by nature in an ecocentric approach to neighborhood planning.

Urban reserves and corridors provide ecological and environmental quality. They help to maintain biological diversity (the number of species of plants and animals found throughout the world), thus reducing the threat of species becoming endangered and possibly extinct. Species extinction is of grave concern. Based on a review of the scientific evidence, Myers (1988) reported that the present-day extinction rate (due almost entirely to human modification of the landscape) is at least hundreds of times higher than the long-term natural rate (Adams and Dove, 1989).

CONCLUSIONS

Why do we need nature in our cities?

- to maintain the urban area's natural beauty and uniqueness;
- to reduce pollution of air, water and soil;
- to provide an educational opportunity for city residents;
- to provide health benefits for city residents.

How can we invite natural habitats to stay and share urban environment with people?

This can be achieved by:

- identifying inherent ecological systems in urban area and surround ings;
- preserving and restoring native species;
- accommodating wildlife flow through urban landscape

What are the benefits for people and wildlife?

ENVIRONMENTAL

- clean, cool air ;
- storm drainige / flood control;
- enrichment / protection of wildlife habitat;

ECONOMIC

- reduction in maintainance cost of open areas;
- reduction in health care cost;
- increase in property values;

PERSONAL

- opportunities for recreation and leisure activities;
- improved emotional and physiological health;
- spiritual well-being of reconnecting with nature;

SUMMARY

The current study focuses on researching and applying strategies for sustaining wildlife habitats within the urban environment. It is a hope of the author to 'achieve more' in the delivering of an invitation to Nature to stay and share the urban landscapes with people, and as well, in promoting a more sensitive attitude of people towards Nature, recognizing its natural beauty without artificial make-up and decorations, and giving it a 'space' to carry on undisturbed and protected.

"If there is an enduring theme to the science of Gaia, it is this seamless continuity of life and environment - that to a vital extent all life forms adapt their surroundings to their needs and that, taken as a whole group, we biota are collectively responsible for the Earth's hospitable climat" (Joseph, 1990, p. 249).

TOPIC

Symbiosis of Nature & Culture: An ecological Approach to New Residential Development along the Seine River Corridor.

GOAL

To design a new residential community environment which will integrate into the existing natural environment, enhancing it with its designed open area system.

OBJECTIVES

- Mutual benefits for the neighborhood residents as well as wildlife habitats from the preserved natural oak forest and the man-made pond systems
- Maximum opportunity for pedestrian movement
- Maximum opportunity for wildlife movement
- Diverse residential house types/Diverse natural habitat systems
- Unique character of the community/Pristine character of nature

DESIGN CONSIDERATIONS

The issues to be explored in the design proposal:

NATURAL ECOLOGY
(biodiversity and connectivity)

- landscape type (existing and proposed)
- landscape structure (existing and proposed)
- landscape function (existing and proposed)
- species types (existing and proposed)

evaluation: area of the naturally functioning landscape.

ECOSYSTEM TYPE	•reserves and corridors •riparian corridor •large remnant patch of Oak forest (reserve) •pond system (reserve) •forested belts (corridors) •matrix (existing) - agriculture/urban •matrix (natural) - forest/prairie
ECOSYSTEM FUNCTION	•area drainage •energy conservation •energy flow •air purification •water purification •habitat support
COMMUNITY TYPE	•children (day care or home care) •students •adults (working outside of home) •adults (working out of home) •adults/seniors
COMMUNITY FUNCTION (5 - 15 minutes walking distance)	•daily uses (small retail, banking, dry cleaning, fast food) •active recreation/fitness (walking, biking, skiing, playing) •passive recreation (nature watching, spiritual/psychological meditation) •meeting/interaction •options for privacy or sociability
ARCHITECTURE & BUILDING ECOLOGY (diversity & access to nature)	•building types •building heights •microclimate •visual access to natural areas •physical access to natural areas evaluation: number of units, number of units with access to nature

TRAFFIC & TRANSPORTATION

(maximum accessibility, minimum traveling distance, maximum length of recreational pathways)

- pedestrian priority
- road/path types
- minimize traveling distance (necessities)
- maximize distance for recreational pathways
- land use supports public transportation
- minimized size of parking lots & r.o.w
- safety

evaluation: road length, travelling distances.

LAND USE

(minimum intervention - maximum enhancement)

- types and densities
- open space systems
- patterns
- private/semi-private/pubic

evaluation: proportion of percentage of build/natural area, total density

METHODOLOGY

In order to understand the riparian structure of the Seine River corridor as well as the urban structure of the St. Boniface area, principles of landscape ecology were researched along with case studies of natural and cultural landscapes, as well as their influence on human health. Appropriate principles and recommendations have been applied in the development of design strategies for the current study.

The state of the natural environment of a landscape reflects the cultural values of people that dwell on it. It is important, therefore, to analyze changes in the ecosystem of the Seine River corridor within its historical context. In order to achieve this, existing data was researched (such as maps and aerial photographs) for the study area to determine if there is a correlation between urban development and the changes of the river corridor over time.

Computer software such as MiniCad+ and Photoshop were used for data enhancement, overlays and analysis. The outcome of this research and analysis provided a better visualization of the problems and opportunities of the Seine River corridor within the study area, and helped to work out the strategy for potential reconstruction of the natural environment of the Seine River corridor and redeveloped urban environment.
A sustainable approach is proposed for the new

development as a demonstration of an environmentally conscious design and planning solution. In this new residential community, the planning strategy is designed in such a way, that the critically important structural elements of the existing natural systems (such as river upland forest and remnant forest patches) will function and remain in a natural condition. This will provide as well an opportunity for passive recreation and nature watching for the residents with the possibility of further extending upland planting into the urban matrix. This and other design strategies provide mutually beneficial environments for people as well as wildlife species of the river corridor. (Possibility for symbiosis: Nature and Culture adapting to each other as well as shaping one another with mutual benefits.)

PRODUCT

Inventory maps	existing land use land ownership habitat quality assessement vegetation types
Analysis maps	circulation (vehicular, pedestrian) circulation (wildlife) natural and man-made determinants
Concept maps	conceptual alternatives
Design drawings	design plan alternatives sections perspective drawings
Project data	unit number calculations area percentage of land uses forest species inventory (field data) recommended plan & species list for future community planting Supporting text & computer slide presentation

HISTORY

The Seine, Winnipeg's secret garden.

The written history of the first immigrant settlements along the banks of Seine River begins in the early 1800s. Prior to this time the Aboriginal populations of the past fished and hunted, drank and lived from its stream.

Although some of it's banks are being converted into residential backyards, industrial lots and golf courses, it is still largely unspoiled by urban development. It is now the responsibility of planners, designers and developers to ensure the best ecological solutions for each new site along the Seine River that is consumed by human expansion.

Pattern is a manifestation of a process.
The history of Winnipeg's Seine River is very similar to many urban rivers which have survived development. First came the road network, then isolated settlements, larger industrial sites, and greater-cultivated agricultural fields. All of these spread within the 'green' matrix of natural vegetation and landforms, consuming one and changing another. The early map of Winnipeg (fig.9) indicates a distinct forested area spreading along the Red and Seine rivers from north to south.

20 years later, a map of the same area (fig.10) shows the new boundaries of river lots, omitting the riparian forest of the north portion of the Seine river. The forest had not been destroyed yet, it just had became much less important than the surveyed properties.

On the modern-day map of the same area (fig.10), we can hardly see any forest left in the northern portion of the Seine River, where industrial sites and resi-

Fig.9 Map of the Red River and the Seine River, dated 1816

Fig.10 Map of the Red River and the Seine River, dated 1837

dential development have wiped-out a significant portion of the riparian habitats. Later agricultural fields dominated the overall matrix of the area, leaving only isolated patches of remnant vegetation. These native woodlots and grassland patches became a refuge and stepping-stones for wildlife movement . On the other hand urban sprawl creates another matrix, that spreads and overlays the agricultural fields, consuming the remnant patches of vegetation and creating eclectic patches of introduced species. This process forces the native wildlife habitats out of the developed areas, breaking the connectivity between the river corridor and surrounding landscape, and reduces the overall quality of the urban environment, pushing new residential development further away from city center in search of 'natural areas'. Without an understanding of the underlying ecological systems, irreversible damage could be done to the land through urban consumption.

According to Gaia theory, if our planet does function like a body, it may have the equivalent of vital organs and vulnerable points. Much as the liver or spleen is necessary to the survival of the body as a whole, then forests, rivers, seas, and other systems of the earth are vital to their geographic regions and the entire global environment. "Once destroyed, these planetary organs can debilitate the entire system, much as an injury to the spine can cripple one's body up through the neck and down to the toes" (Joseph, 1990) .

The question remains: "How can we restore, reinforce and support natural systems in the city? Can we afford to have a beautiful wilderness in our front yards and share it with the rest of its species? Would that be a SYMBIOSIS?
Hopefully, yes.

Fig.11 Ortho photograph of the Red River and the Seine River, 1994
Source: Lynnet Geomatics

SITE LOCATION

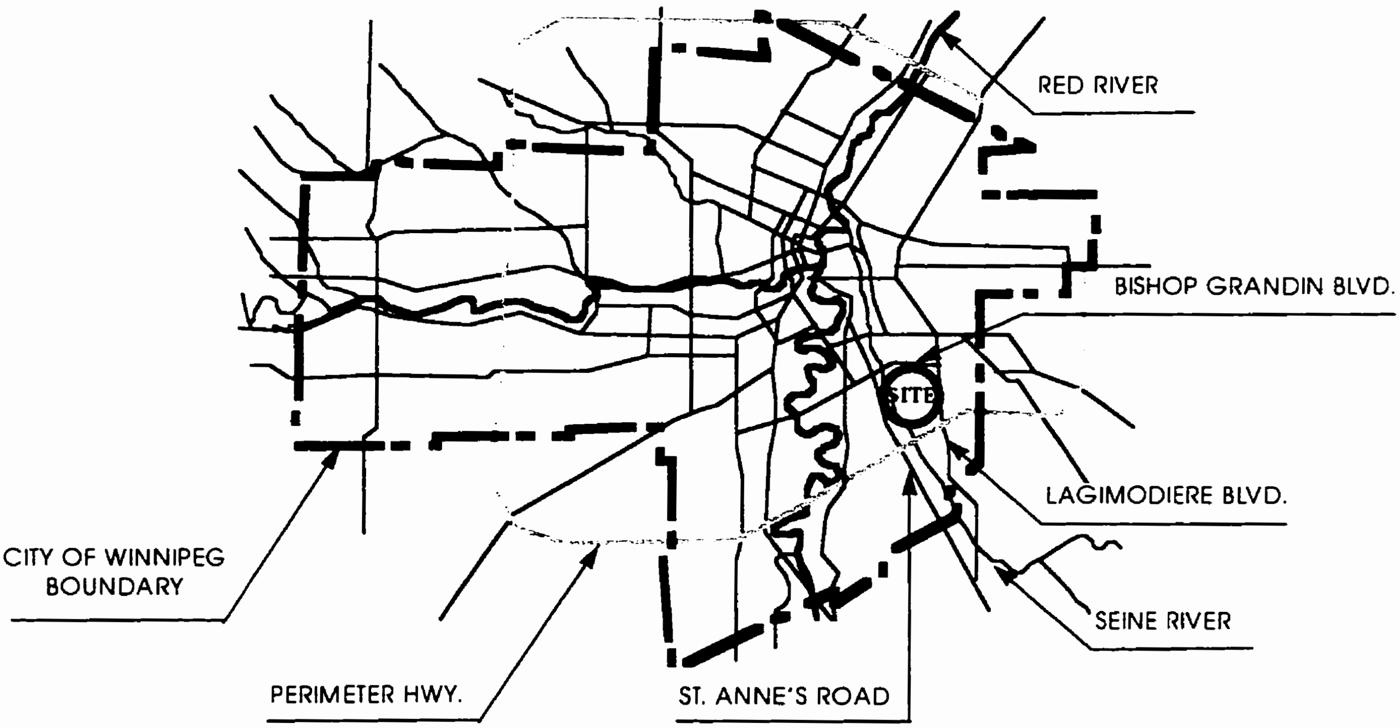


Fig.12 Location map

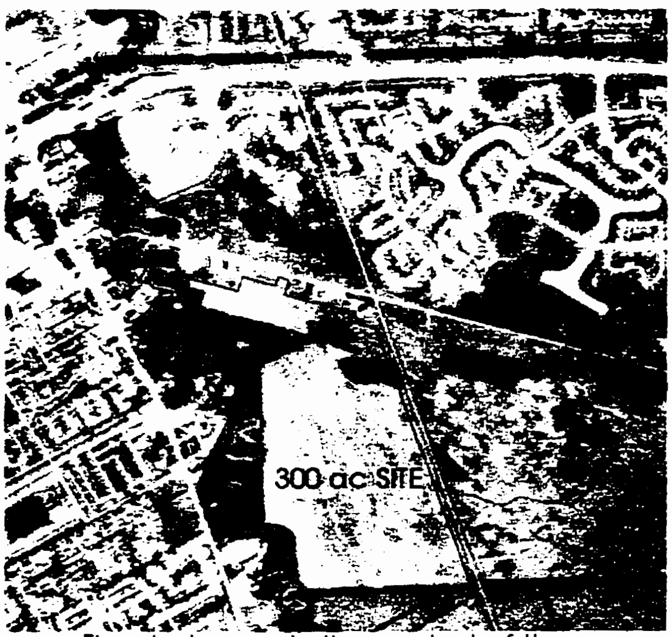


Fig.13 The study area in the context of the new residential development.

——— SITE BOUNDARY

The study area of this project is located in St. Boniface, the South East portion of the City of Winnipeg, and is bounded by Bishop Grandin Boulevard (North), Perimeter Highway (South), St. Anne's Road (West), and Lagimodiere Boulevard (East). It is adjacent to the Seine River and contains a portion of the river upland forest. The area context can be characterized as a threshold between the existing agricultural land and the expandidng urban development. The area to the north of the site has been recently developed as residential neighborhoods and can serve as an example of current trends in neighborhood planning and design.

SITE CONTEXT: EXISTING LAND USE

- AGRICULTURE
- PARKS
- SINGLE FAMILY RESIDENTIAL
- MULTI FAMILY RESIDENTIAL
- COMMERCIAL
- FORESTED AREA

Fig.14 **(1) - Site, looking North**

Fig.18 **Existing Land Use**

Fig.15 **(2) - Railway (East Boundary)**

Fig.19 **(5)-Existing path to the oak forest**

Fig.16 **(3) - Typical houses @ the Island Lakes**

Fig.20 **(6) - Pond @ the Island Lakes**

Fig.17 **(4) - Interior of the oak forest (West)**

Fig.21 **(7) - St. Anne's Road.**

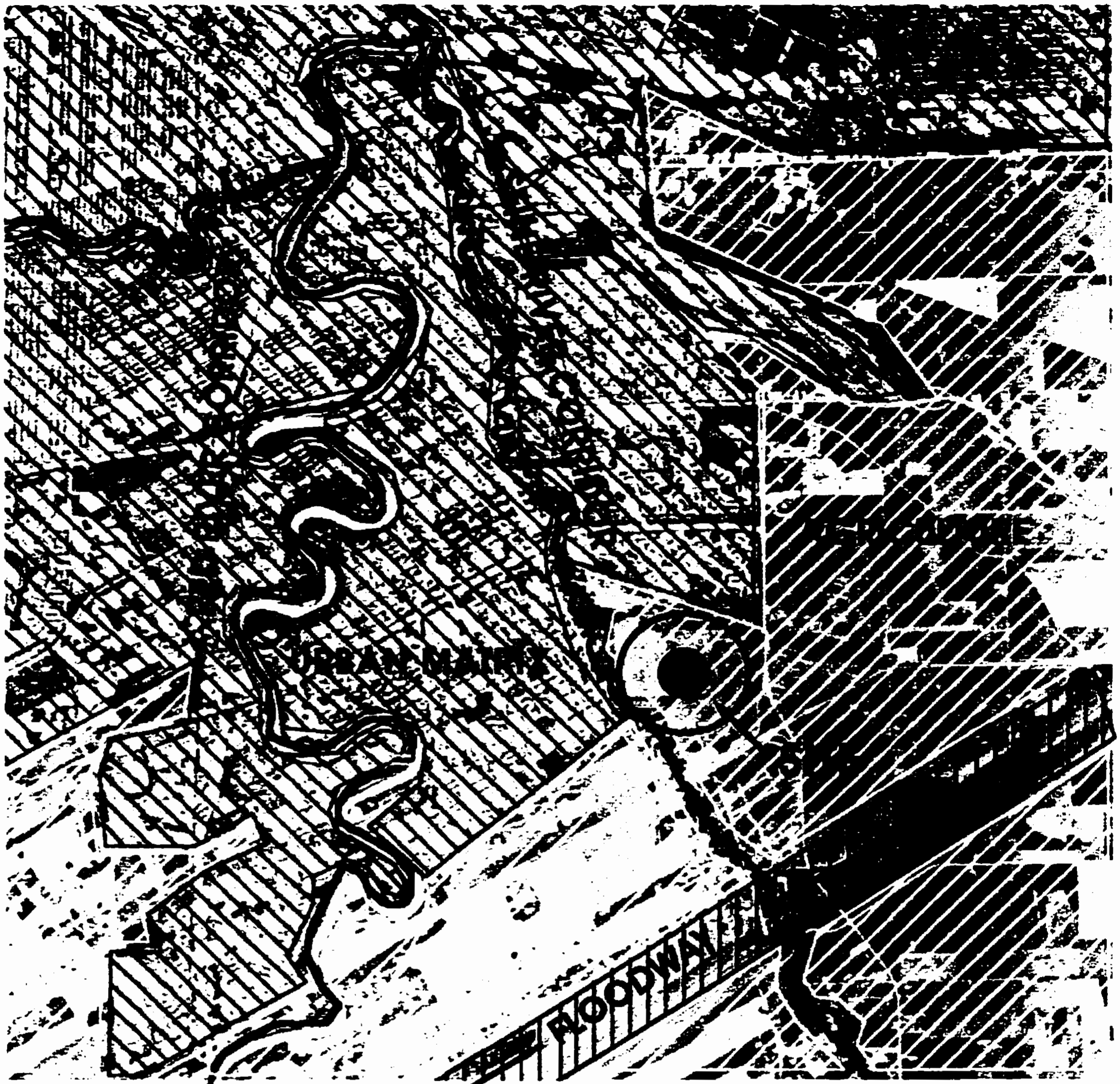


Fig.22 Existing matrix of the area.

SITE CONTEXT: REGIONAL LANDSCAPE

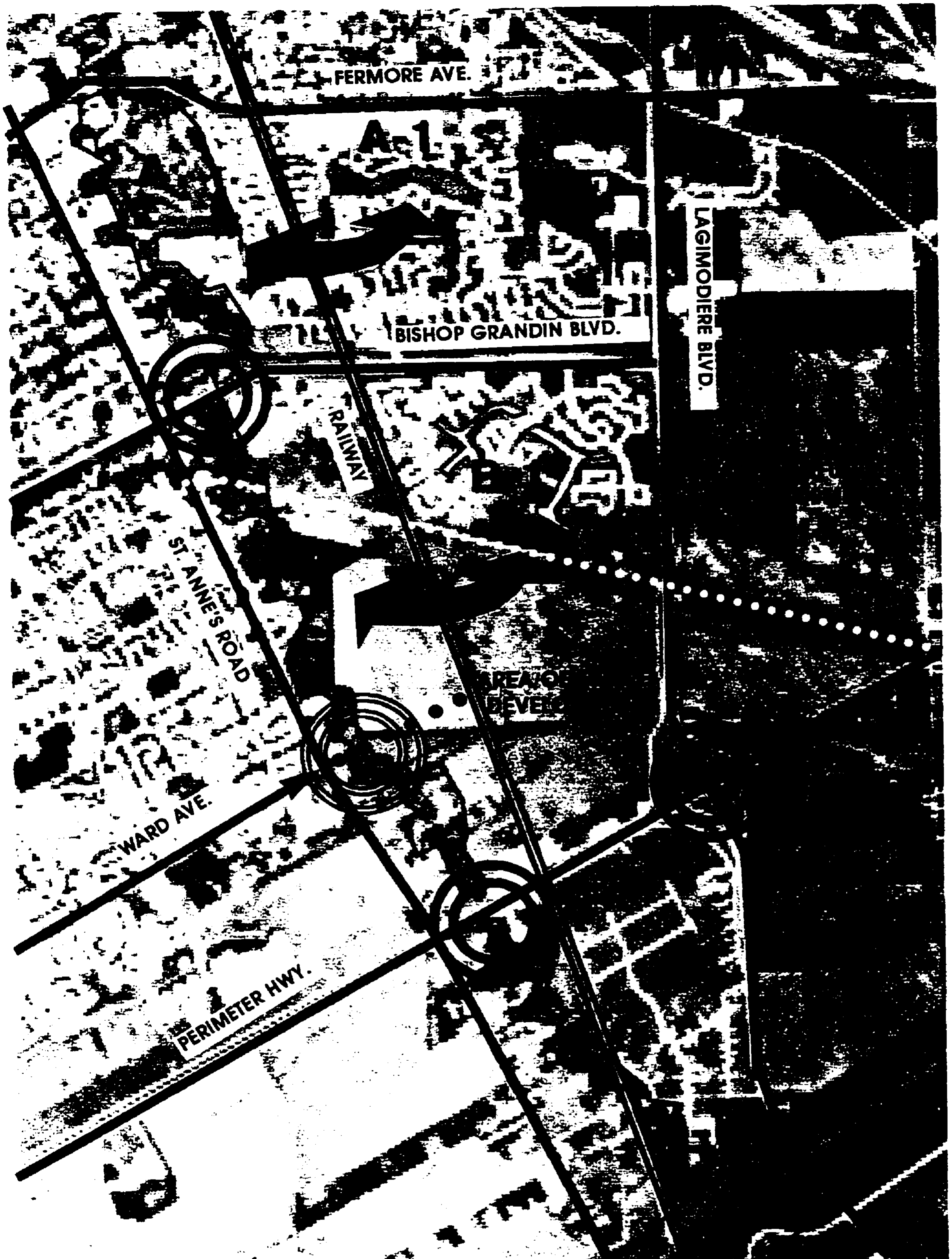
URBAN MATRIX

AGRICULTURE

FLOODWAY

The Red River Corridor (West), the Seine River Corridor (East) and the Red River Floodway (South) form a greenway triangle on the regional scale.

It provides an opportunity for the continuous movement of wildlife species through the urban and agricultural matrixes.



In order to reinforce and extend the existing wildlife traffic zone, reserves such as A, B, and C should be connected through safe road crossings, and extended (where possible) into wildlife reserve opportunity sites such as A-1 and B-1. The 'new extentions' to the natural systems should be able to function regardless of any future development of surrounding areas.

- MAJOUR ROAD INTERSECTION OUTSIDE OF WILDLIFE TRAFFIC ZONE
- MAJOUR ROAD CROSSING OF WILDLIFE TRAFFIC ZONE
- FUTURE MAJOUR ROAD CROSSING OF WILDLIFE TRAFFIC ZONE
- SAFE ROAD CROSSING OF WILDLIFE TRAFFIC ZONE (BRIDGE)
- HABITAT OPPORTUNITY SITE/POND

A SEINE RIVER GOLF COURSE - WILDLIFE TRAFFIC AND RESERVE OPPORTUNITY SITE

A-1 RETENTION POND - WETLAND HABITAT OPPORTUNITY SITE

B SEINE RIVER UPLAND FOREST - "A" QUALITY HABITAT SITE

B-1 RETENTION POND - WETLAND HABITAT OPPORTUNITY SITE

C RED RIVER FLOODWAY - WILDLIFE TRAFFIC ZONE

- MAJOUR ROADS - BARRIERES FOR WILDLIFE TRAFFIC
- RAILWAY - OPPORTUNITY FOR WILDLIFE CORRIDOR
- JOHN BRUCE ROAD - TO BE CLOSED
- WARD AVENUE - TO BE EXTENDED

close proximity of the proposed site to a high wildlife traffic zone provides an opportu-
or an extension of the natural environment into the new residential community and
igh it into the existing constructed pond system of the Island Lakes residential devel-
ent, which is considered as an opportunity site for a wildlife reserve.

chard Forman states in "Landscape Mosaics", the top-priority ecological 'indispens-
s' in planning a whole landscape are:

1 = a few large patches of natural vegetation;
2 = major stream or river corridor;
3 = connectivity with corridors and stepping stones between large patches;
4 = heterogeneous bits of nature across the matrix. (Forman, 1995, p. 452)

presence of the major stream corridor at the proposed site was identified on the
nal scale (the Seine River).

der to identify the remaining three 'indispensables', the site has to be analyzed on
ocal scale.

ANALYSIS: ECOLOGY

ysis of the existing data for the osed site (air photo, city s) as well as site visits, indicate presence of the large patches atural vegetation within the area.

vegetated patches East of the forest, are primarily oak and n trees, where oaks form the or of the patches, and the ns grow more densely at the es.

Fig.23 Existing landscape elements.

Fig.24 Aspen/oak patch at the North boundary of the

Aspens form a ring at the interior clearings in the Oak forest as well as around Oak patches in the area. This might be due to an inability of the Aspen species to establish their population in the shaded areas, under the canopy of the oak trees. Aspen can be considered as an edge species of the forested patches, present on the site.

A tree sampling of the area forest was done in October 1997, using the quadrat sampling and point quarter sampling techniques. The heights, circumferences, and distances between the trees were measured as well as species distribution for five 10mX10m quadrats in the forest edge and interior. Core samples were taken to establish the average age of the trees. The results indicate that the dominant tree species of the forest was Bur Oak with the relative dominance of 75% (75% of the trees present) and an average age of 50 - 60 years. The average height of the oak trees in the forest along the Seine River, including the study area, was aproximetely 12 feet, with a narrow crown in the forest interior (6 to 8 feet) and a much wider crown at the edge or separately standing trees (8 to 12 feet). This might be due to reduced competition for sunlight at the forest edge or in open areas. The age and circumferences of the Oak and Ash trees increased at the forest interior, and decreased at the forest edge. The average circumference of the Oak trees in the interior was 51cm and 43 cm for Ash trees, and, respectively, 23 cm and 15 cm at the forest edge. The distances between the trees increased at the interior, with the average distance between trees in the interior 4-5 m and 1-2 m at the edge.

The presence of understory - young growth of the Bur Oak and Green Ash trees, as well as a shrub layer, confirms a high quality habitat area as evaluated by City Parks and Recreation Department in the 1995 habitat quality assessment for the Seine River Parkway.

Fig.26 Aspens @ the forest interior openir

Fig.27 Mixed shrubs @ the forest edge

Fig.28 Oak seedlings @ the forest interio

Fig.29 Forest Inventory & Classification

- WILDLIFE ENHANCEMENT
- VEGETATION RESTORATION
- WETLANDS
- UPLAND FOREST
- BOTTOMLAND FOREST
- SITE BOUNDARY

As assessed by the City of Winnipeg Parks and Recreation Department, the natural area of the site mainly consists of the river upland forest, a patch of a wetland (North portion of the forest) and the river bottomland forest.

Fig.30 Habitat Ranking

- "A" QUALITY HABITAT
- "B" QUALITY HABITAT
- "C" QUALITY HABITAT
- "D" QUALITY HABITAT
- SITE BOUNDARY

Most of the natural area is an oak forest and is evaluated as an "A" quality habitat: virtually undisturbed by people or recovered to an extent where community structure and composition is intact and reflects historical natural vegetation and wildlife habitat. It also indicates a high degree of native vegetation present and a lack of weedy or non-native species. (An Assessment of Vegetation and Wildlife Habitat Quality For The Seine River Parkway, 1995)

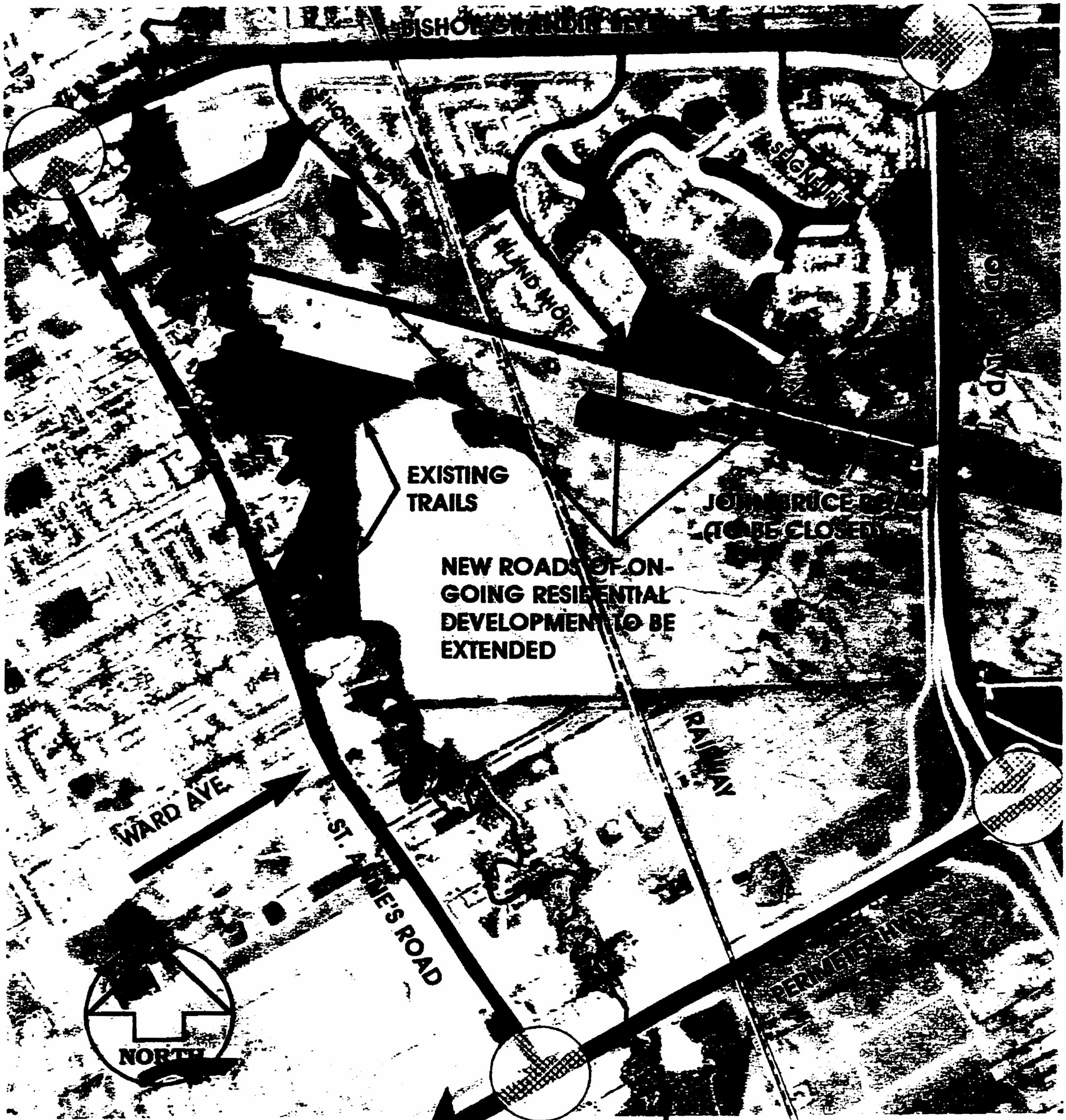


Fig.31 Circulation Diagram

SITE ANALYSIS: VEHICULAR CIRCULATION

The direction of major vehicular traffic on the site is expected from the North (Bishop Grandin Blvd) to the South (Perimeter Hwy). The collector roads of the newly developed residential areas North of the site (Shorehill Drive and Island Shore) are expected to be extended further South, accommodating the North-

l - looking east

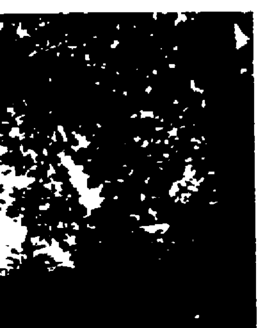
South vehicular flow. The existing gravel road (John Bruce Road) that connects St. Anne's Road (West) and Lagimodiere Boulevard (East) will be closed, and, therefore, the closest connections between West and East parts of the site will be available through Perimeter Highway and Bishop Grandidn Boulevard.

The CN Railway, crossing the site from North to South, creates a strong physical barrier for the vehicular and pedestrian circulation.

north

LDLIFE
OVEMENT

The information collected during the site visits as well as provided by the Parks and Recreation Department of the City of Winnipeg, indicates, that the study area is rich with the native plant and animal species. A group of nine White-tailed deers was observed at the site. The deers were crossing the railway, moving between the east and west forested patches. Other animal tracks were observed along the edge of the Oak forest, near the railway, across the field, and along the Seine River channel. The following animal species can be found in the study area: Gray Squirrel, Least Weasel, Long-tailed Weasel, Mink, Skunk, Raccoon, Cottontail Rabbit, Red Fox, Franklin Ground Squirrel, Black Bear, Coyote, Snowshoe Hare, White-tailed Jack Rabbit, White-footed Dear Mouse, Field Mouse, Gapper's red-backed Vole, Short-tailed Shrew, House Mouse, and White-tailed Deer. (An Assessment of Vegetation and Wildlife Habitat Quality for the Seine River Parkway, 1995). With new development moving onto the site, existing agricultural fields will be converted into built-up areas, and will no longer accommodate the free movement of wildlife.



om the forest

n Bruce Road

The open area system of the new neighborhoods will have to support the wildlife flow through the area.

Fig.36 Habitat circulation patterns

Locations of White-tailed Deer sitings

Locations of Rabbit sitings

Locations of rodent sitings

Site boundary

Fig.37 Existing remnant vegetation

SITE ANALYSIS: EXISTING LANDSCAPE ELEMENTS

RIPARIAN FOREST - HABITAT RESERVE

REMNANT PATCHES-STEPPING STONES

CONSTRUCTED POND SYSTEM - OPPORTUNITY FOR HABITAT RESERVE

FORESTED STRIPS - CORRIDORS

SITE BOUNDARY

The landscape elements present on the site have been analyzed according to Forman's principles:

- a 100 ac Oak forest is a part of the Seine River riparian corridor; the largest portion of it - an 80 ac patch is located within the site boundary, and can be classified as a wildlife reserve;
- remnant forest and grassland patches of a total area of 50 ac are located between the Oak forest and the constructed pond system and can be classified as stepping stones of the wildlife movement;
- forested strips located south of the site can be

classified as corridors;

•the constructed pond system provides an opportunity for establishing a reserve for wetland habitats

SITE DESIGN: LANDSCAPE STRATEGY

Following the guidelines, outlined in the case studies of this document, an ecological strategy for the chosen site was developed.

RESTORING CONNECTIVITY

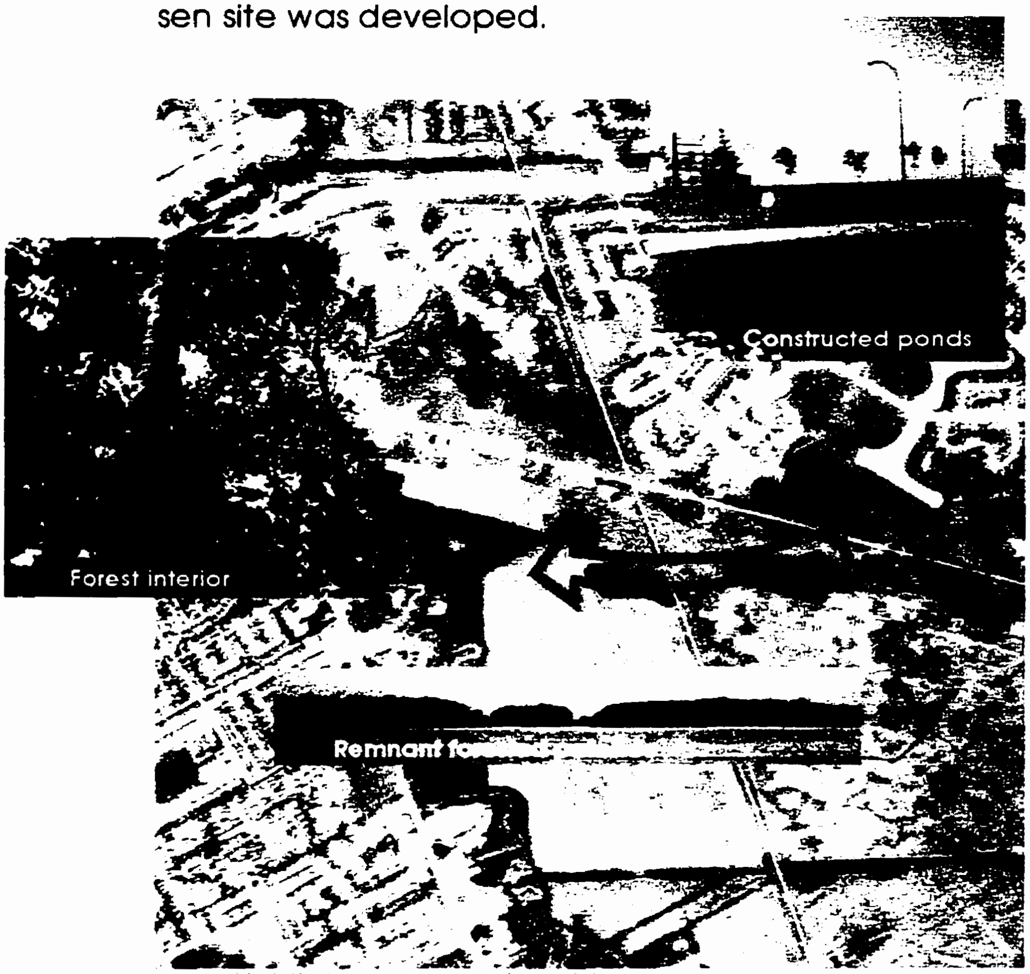


Fig.38 Habitat reserves and corridors

•create wildlife habitat reserve in the constructed pond area (see recommended species list in appendix);

•preserve existing aspen/oak patches;

•reconnect existing forested patches by planting shrub and tree species, native to the area;

•establish a natural corridor to connect the oak forest and constructed pond system;

•protect the existing oak forest from human disturbance and water run-off from the developed area;

The existing program for the site (provided by the developer) includes a 10 acre retention pond, as well as 4 acre school site and a 10 acre active park. Although the main function of the retention pond is to accommodate the run off from the site, it can also function as a wildlife habitat as well as a buffer from the potential danger or hazard areas (such as a railway).

In the proposed design, two alternatives for the location and function of the retention pond are considered:

1. **buffer from the railway** (East)
2. **buffer from the proposed development** (West)

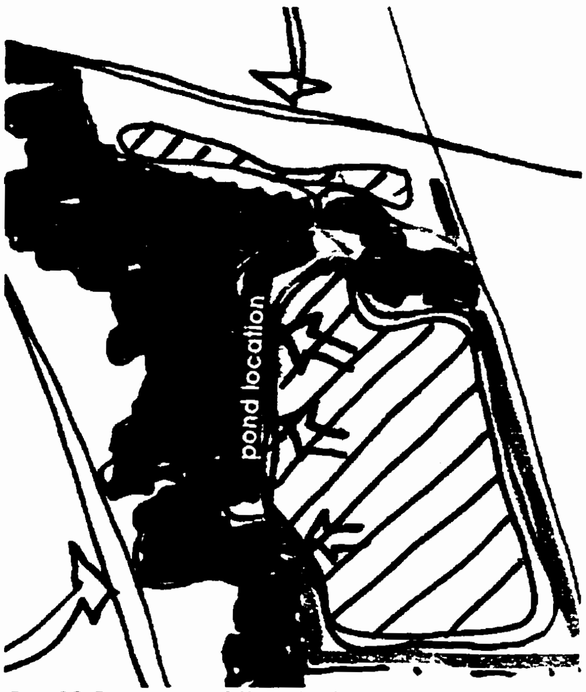


Fig. 38 Diagram of the study area - location of the pond (alternative 1)


impact from the new residential development

riparian corridor/oak forest

The **first alternative** is based on the concept of the secondary channel of the river: each natural stream has a secondary channel located on top of the bank, which functions as a moisture back-up for the main channel.

As exaggerated secondary channel, the retention pond is located along the forest edge, at the West boundary. It is expected that in case of the overflow of the flood water, it will spill into the existing oxbow of the Seine River and then into the river channel.

As a function for the residential development, the pond shore will accommodate recreational activities, such as walking and biking.

Designed as a natural stream, the pond will function as a duplicate of the Seine River, protecting the original from the unnecessary access and therefore, reducing the disturbance.

Fig. 39 Cross-section of a natural stream with the back channel

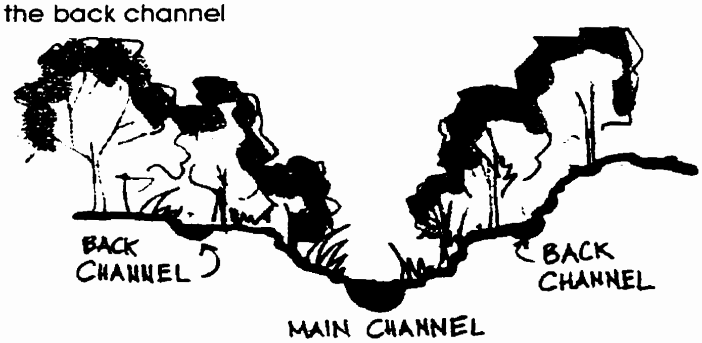
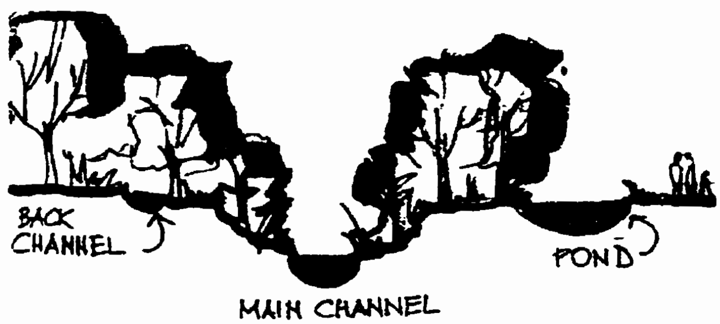


Fig. 40 Cross-section of a proposed area with the pond



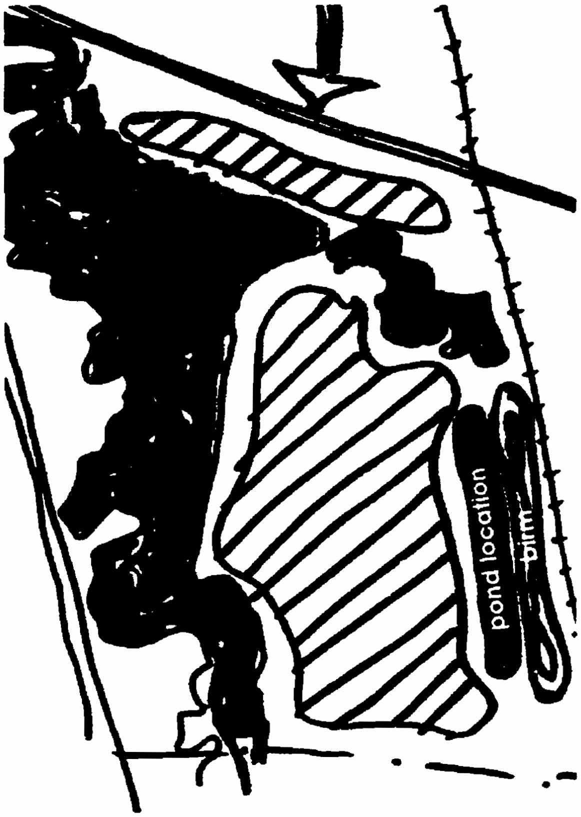


Fig.41 Diagram of the study area - location of the pond (alternative 2)

new residential development

riparian corridor/oak forest

The **second alternative** is based on the balancing of the natural quality of the site by buffering the railway with the natural features (a berm and a pond) from the East and allowing the forest to penetrate the site from the West, creating a good quality environment for the site residents.
The pond is designed as a natural wetland community, with the benefit of a low maintainance regime as well as an opportunity for the wildlife to sustain their habitats.
The connectivity of the proposed pond, existing pond system of the Island Lakes residential development and the existing oak forest will create a diverse natural environment, and will sustain a significant number of the wildlife habitats.
The proposed scheme of the landscape strategy will define the following percentage of the natural versus build area:

NUMBERS:
NATURAL VERSUS BUILD

Total Site Area (including oak forest): **326.6 ac**
Buildable Area (excluding oak forest): **245.7 ac**
Oak Forest: 80.9 ac (**24.8 %** of the total area)
Preserved forested patches (buffer belt): 6 ac
Infill forested patches (buffer belt): 5.3 ac
Total area of the buffer belt: 11.3 ac (**3.5 %** of the total area)
Total Area of the forest: 92.2 ac (**28.2 %**).

Additional tree plantings through the residential area as well as the naturalized retention pond will increase the percentage of the green space of the proposed site.

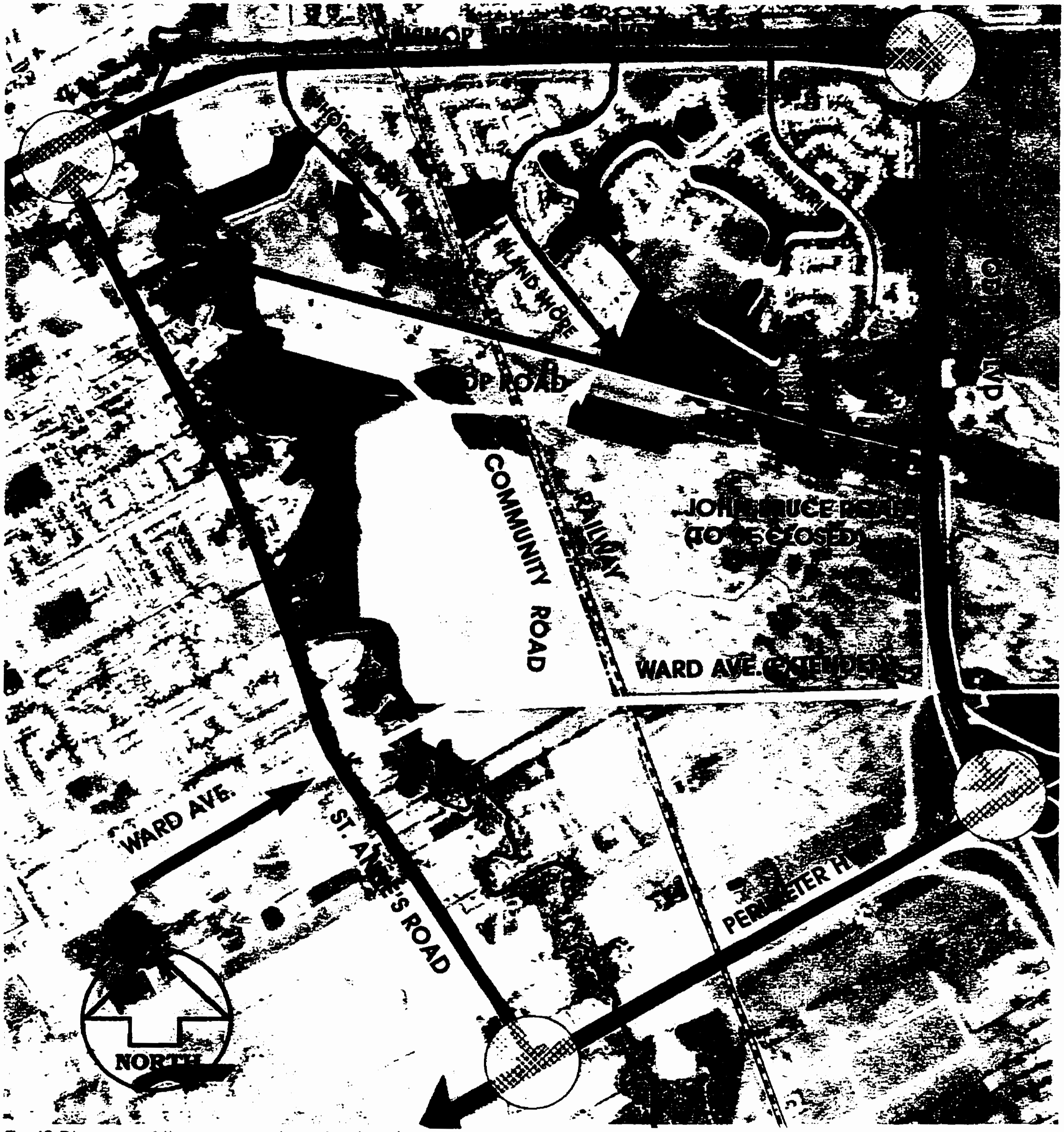


Fig.42 Diagram of the proposed road network

SITE DESIGN: CIRCULATION STRATEGY

In order to reduce vehicular traffic through the site, it is proposed to connect Shorehill Drive and Island Shore (collector roads) to accommodate the main vehicular flow with the minimum impact on the residential areas. The West-East traffic through the site will be conducted through the extended Ward Av. at the South boundary.

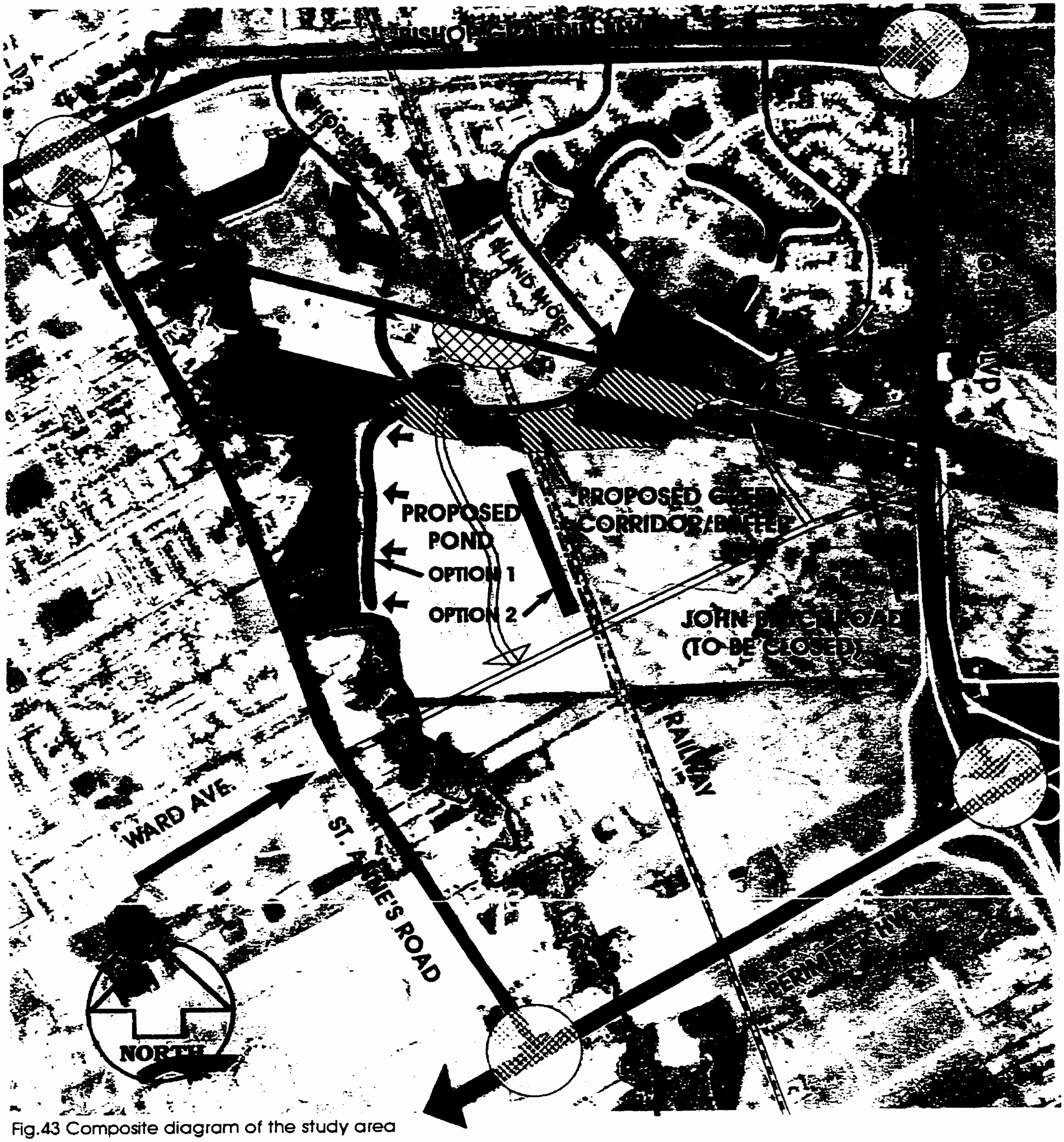


Fig.43 Composite diagram of the study area

The community 2-lane road will connect the South loop (Shorehill/Island Shore) and Ward Av., close to the railway (East boundary), leaving the residential area free of major traffic and making it more pedestrian oriented.

Fig.44 Concept layout of the Design Option One

SITE DESIGN: OPTION ONE

FOREST
FOREST INFILLS
SINGLE-UNIT RESIDENTIAL
SCHOOL
ACTIVE PARK
COMMUNITY HALL
RETENTION POND
COMMERCIAL/RESIDENTIAL
MULTI-UNIT RESIDENTIAL
BUSINESS PARK/PLAZA

Design Option One is based on the 'Townstreet' concept. The proposed landuse provides for business/commercial use of the buildings along the community road (C-2) as well as inside the loop road (C-1). The C-2 commercial area is designed to accommodate people who work out of home, as well as to encourage pedestrian flow along the street. The C-1 zone will include high-rise residential development with the business/commercial use at the ground level.
The retention pond is located at the forest edge and serves the Oak forest as a 'buffer' from the human disturbance.

OPTION ONE: SITE ECOLOGY

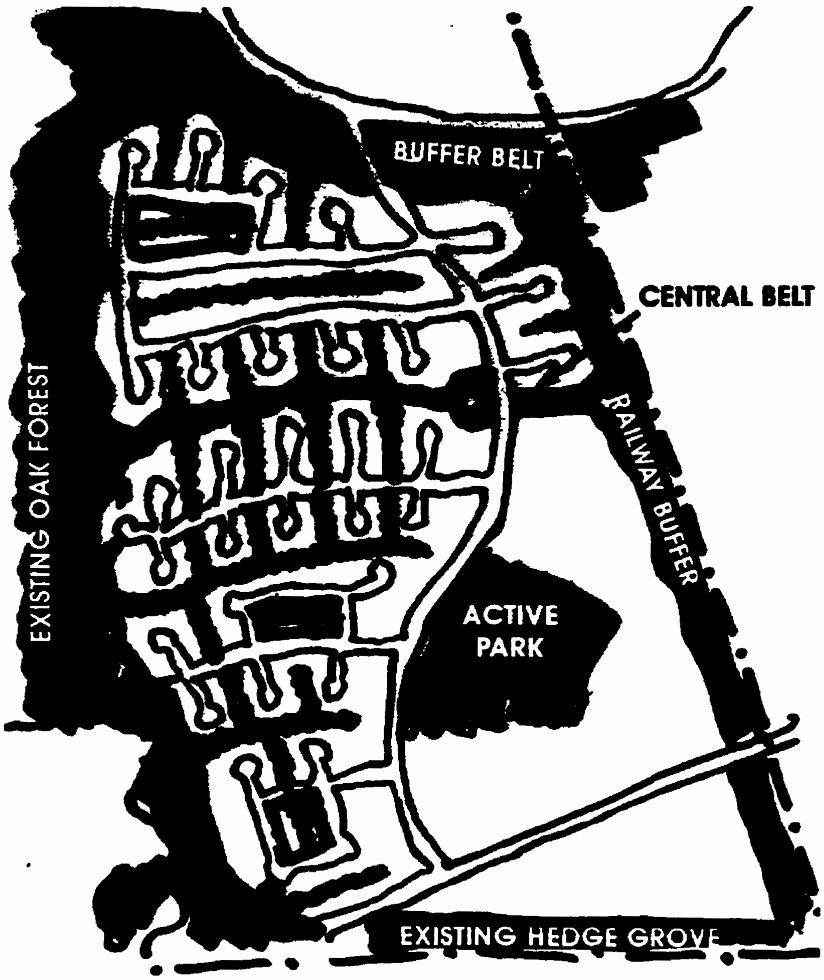
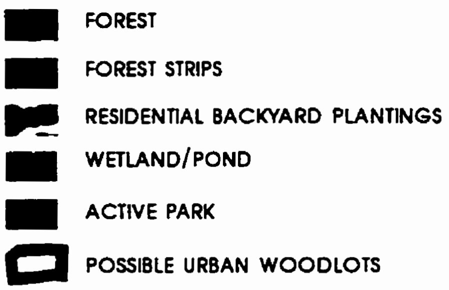


Fig.44-a Concept layout of the natural landscape system of the Design Option One.

The overall natural system of design option one supports even penetration of wildlife habitats throughout the residential area. The habitat reserve of Oak forest is extended into the built area through the residential backyard plantings. (for the recommended species list refer to appendix C) The major green corridors of the site are composed of a buffer belt, a central belt, the railway right-of-way and buffer, and an existing hedge grove. (fig. 44-a) The structure of the natural landscape in design option one supports the flow of wildlife species. The bufferbelt will allow connections between the new wetland habitat of the proposed retention pond and the existing constructed pond system of the Island Lakes residential development. (fig. 37) In order to achieve maximum habitat richness of the proposed natural system, some of the residential lots could be left as urban woodlots, serving as habitat reserves.



NUMBERS:
UNITS, LAND COVER, ROAD

The suggested in option one **land use type** and **lot layout** will provide the following number of units:

Total number of units: 780
(730 if woodlots are considered)

Land cover configuration will provide:

Open space (active park, business plaza, pond:
25.95 ac (**8 %** of the total site area)
Forest area (Oak forest, buffer belt, central forested belt):
95 ac (**28 %** of the total site area)
Total area of natural landscape (open area + forest area):
119.97 (**36%** of the total site area)
Built Area (single residential, row housing, condominiums, business/commercial, school):
155.37 ac (**47 %** of the total site area)

The total length of the road system in the new development is **32,310 ft**. This includes part of the loop road which connects Shorehill Drive and Island Shore Road (8,200 ft), and all of the neighborhood roads (24,309 ft). In relation to the built area (155.37 ac), the road length can be calculated at **209.23 ft/ac**.

DESIGN OPTION TWO: SITE ECOLOGY

Fig.44-b Concept layout of the natural landscape system of the Design Option Two.

The overall natural landscape structure of Design Option Two supports the system of habitat reserves and corridors. The landscape pattern directs wildlife flow from one habitat reserve (Oak forest) to the others (grassland patch, retention ponds) through a system of corridors (forest strips) and stepping stones (backyard plantings).

Design Option Two was chosen as a final option based on the following criteria:

- natural habitat system areas are diverse and support connectivity;
- radial pattern of natural corridors and roads directs the flow of people and animals toward safe crossings;
- percentage of natural area (44%) in comparison to built area meets initial objective of equal distribution of land among wildlife species and people;
- natural character of forest strips (dense understory) discourages physical access of residents and provides them with visual access;
- centered location of the grassland community patch makes a design statement of 'nature in the front yard' and promotes a positive attitude toward respecting wildlife.

Fig.45 Concept layout of the design Option Two

SITE DESIGN: OPTION TWO

- EXISTING FOREST
- INFILL PLANTINGS
- SINGLE-UNIT RESIDENTIAL
- SCHOOL
- ACTIVE PARK
- COMMUNITY HALL
- RETENTION POND
- COMMERCIAL/RESIDENTIAL
- MULTI-UNIT RESIDENTIAL
- BUSINESS PARK/PLAZA
- FORESTED STRIPS

The Design Option Two is based on the ecocentric approach to neighborhood planning. The first priority is given to the structure and function of the natural landscape. The prairie grass patch is placed in the center of the community, serving as a grassland community reserve. The forested stripes connect the Oak forest of the Seine River Corridor to the grassland patch and the wetland community of the retention pond. The buffer belt (aspen/oak patches) serves as a main wildlife corridor, connecting habitat reserves: oak forest and naturalized pond system of the Island Lakes residential development.
The other function of the forested stripes is to provide the residents with visual access to the natural landscape.

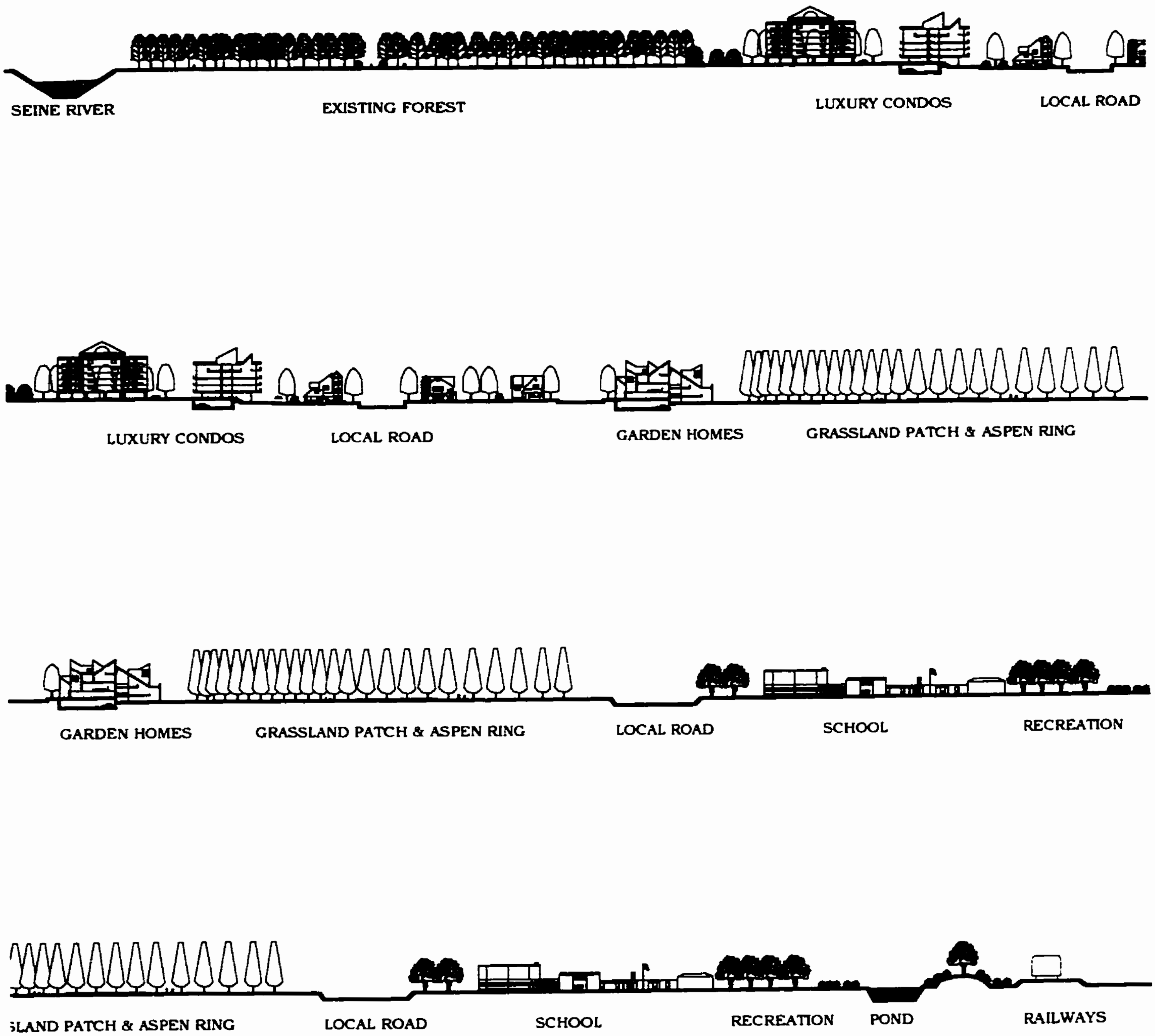


Fig.46 Cross-sections through the proposed development.

Along with an important **function for the natural environment** (wildlife movement), the proposed green corridor will provide an important **function for the built environment** as well. It will create a strong buffer from the proposed loop road for the residential area, creating the sense of enclosure for the interior space of the loop, as well as protecting the area to the South from the Northern winds, noise and pollution from the traffic. It will also allow for the higher density buildings inside the loupe (business. commercial), screening the lower buildings of the residential area. The mutually beneficial association of two environments - build and natural - establishes an opportunity for the symbiotic relationship.

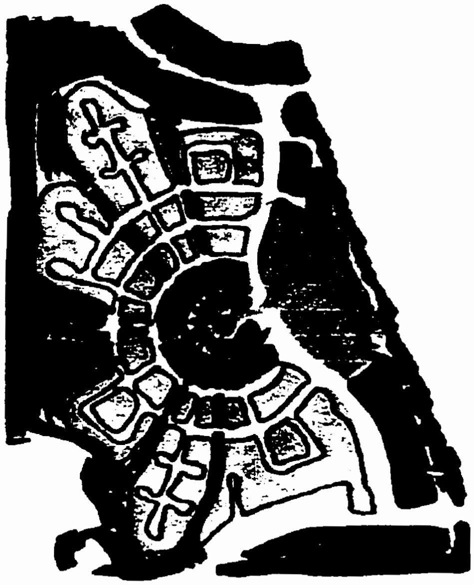
Giving the first priority to the planning of the natural habitats areas and flows, street pattern and lots layout of the residential area will integrate into the site with the minimum harm and disturbance.
The final design option two provides the following area configuration:

NUMBERS:
LANDCOVER

Built Area (single residential, row housing, condo, business/commercial, school): **183.5 ac (56.2 %** of the total site area)
Open Space (active park, community plaza, busi ness plaza, pond, community centre): **33.85 ac** (**10.38 %** of the total site area)
Forest area (oak forest, buffer belt, residential forest stripes) **109.26 ac** (**33.5 %** of the total site area)
Total area of natural landscape (open area + for est area) **143.11 ac** (**43.88 %** of the total site area)

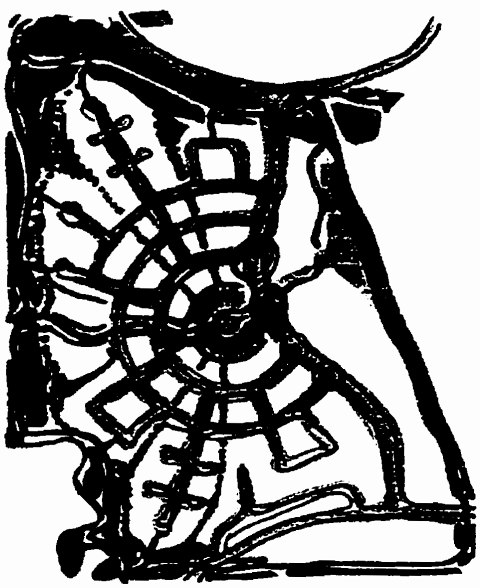
As a result of the landscape design and planning strategy, the natural area of the site will increase by 8.7 % from the initial plan, recommended by the developer, where only **the river Oak forest** is consid-

NUMBERS:
UNITS



SINGLE-UNIT RESIDENTIAL
SCHOOL
APARTMENTS
ROW HOUSES

NUMBERS:
ROAD LENGTH



ROADS AND WALKWAYS
PEDESTRIAN NODES & PATHWAYS
PEDESTRIAN SAFETY CROSSINGS

ered as preserved natural environment, according to the City Parks and Recreation Department's regulations.

The suggested in option two **land use type** and **lot layout** will provide the following number of units:

Single Detached residential: 560 units
Row Housing: 80 units
Condo/Apartments: 200 units
Total number of units: 840

The possibility of placing a high density residential building with business/commercial uses at the ground level in the interior space of the proposed loop road will provide an opportunity for a higher number of the **residential units** to the maximum of approximately **1000**.

The total length of the roads in the new development is **26,617 ft**. This includes part of the loop road which connects the Shorehill Drive and the Island Shore Road (8,200 ft), and all of the neighborhood roads (18,417 ft). In relation to the build area (183.5 ac), the road length can be calculated at **145 ft/ac**.

In order to compare the efficiency of the landuse and the road layout of the new development with an existing neighborhood, similar calculations were done for the Island Lakes residential development Southeast of the study area.
The existing land use type and lot layout of the Island Lakes residential neighborhood provides the total number of units: **1530**. The area configuration is as following:

Detached Residential: 250 ac
Condominium: 13.7 ac
Commercial: 8.7ac
Total Built Area: 271.8 ac (**57.8 %** of the site)
Open Space (active park & pond): **96.86 ac** (**20.6%** of the total site area)

Fig.47 Plan of the existing and proposed developments

The total length of the roads at the Island Lakes development is **57,400 ft**. This includes part of the loop road which connects the Shorehill Drive, and the Island Shore Road (18,696 ft), and all of the neighborhood roads (38,700 ft). In relation to the build area (271.8 ac), the road length can be calculated at **211 ft/ac**.

The comparative analysis of the existing residential neighborhood and the proposed development is based on the three criteria:

	• total density (unit per acre)		• area of natural landscape (%)		• total road length (feet per acre)
EXISTING DEVELOPMENT	**3.25**	EXISTING DEVELOPMENT	**NONE**	EXISTING DEVELOPMENT	**211**
PROPOSED DEVELOPMENT	**3.5**	PROPOSED DEVELOPMENT	**28.2**	PROPOSED DEVELOPMENT	**145**

MEASURABLE BENEFITS:

From the figures above we see that the proposed development provides almost 30% more natural landscape for plant and animal species and human enjoyment than the existing development, which has almost none. It has approximately 40% less ground surface covered by roads than the existing development, which would significantly reduce construction and maintenance costs, as well as travelling distances throughout the neighborhood. This is accomplished while maintaining the same relative density of units per acre.

CONCLUSION

The current proposal demonstrates a symbiotic approach to the design of a residential community. Its philosophical basis, inspired by Gaia theory, determines the equal distribution of land between people and wildlife, promotes the functionality of natural and cultural landscapes, and a symbiotic co-existance of human and wildlife species.
The constructed system of natural reserves, corridors, and stepping stones reinforces the existing ripirian system of the Seine River, and expands it throughout the area of the new development, connecting it to the existing neighborhoods. This 'new extention' to the natural system can be built upon by utilizing existing or constructing new landscape elements, according to the principles of landscape ecology demonstrated in this document.

Just like the proposed development of the study area, the City of Winnipeg can sustain a wide range of wildlife habitats and acommodate grater species movement through constructed natural landscape. This way we will reduce the impact of urban devel-

opment on wildlife, and make a step toward the protection of Gaia's vital organs and vulnerable points from consumption by 'human bacteria'.
For this idea, generated by the Gaia hypothesis, I am gratefull to Lynn Margulis and James Lovelock, as well as to professor Romanowsky, who introduced me to its possibilities and inspired this project.

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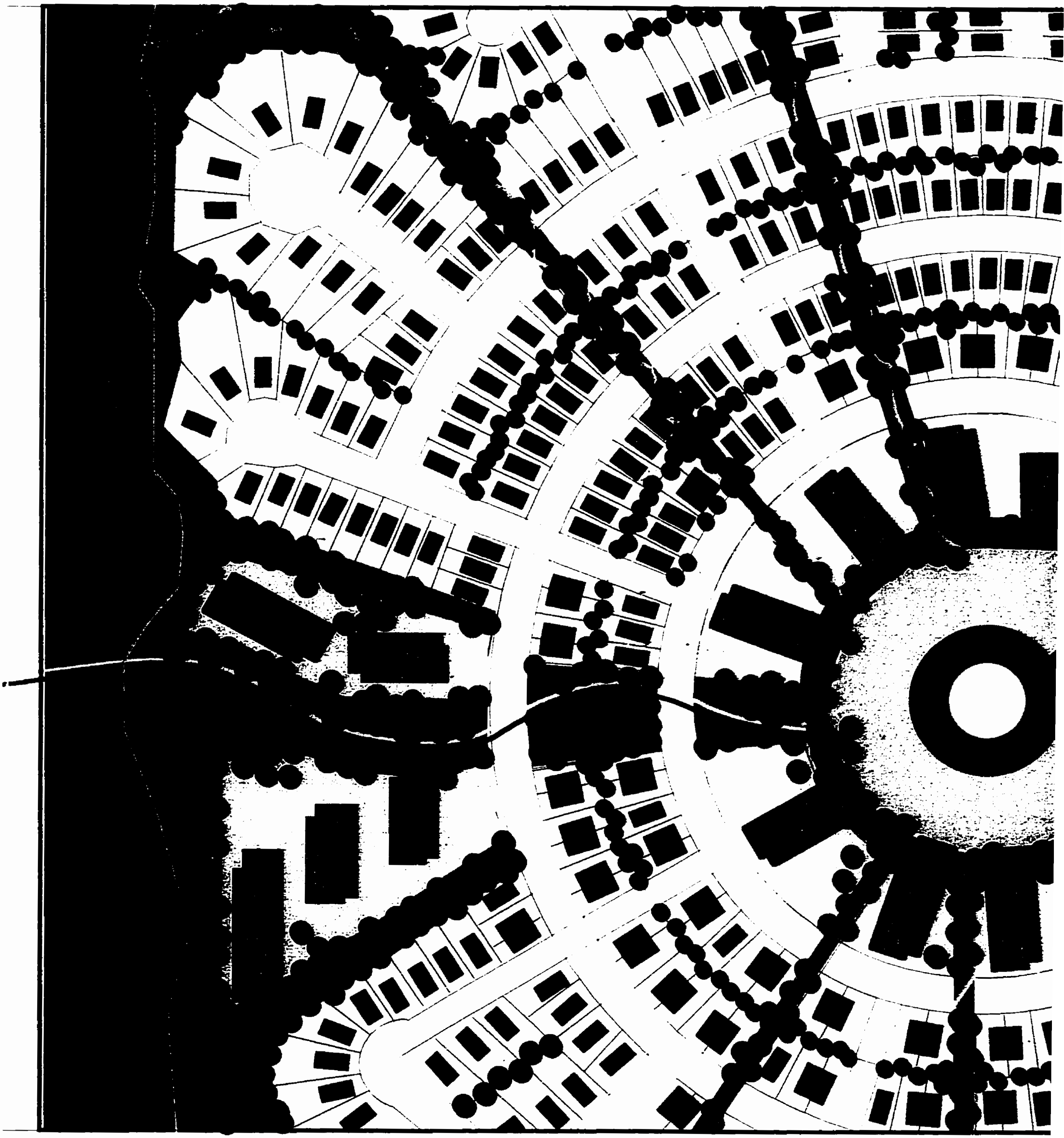
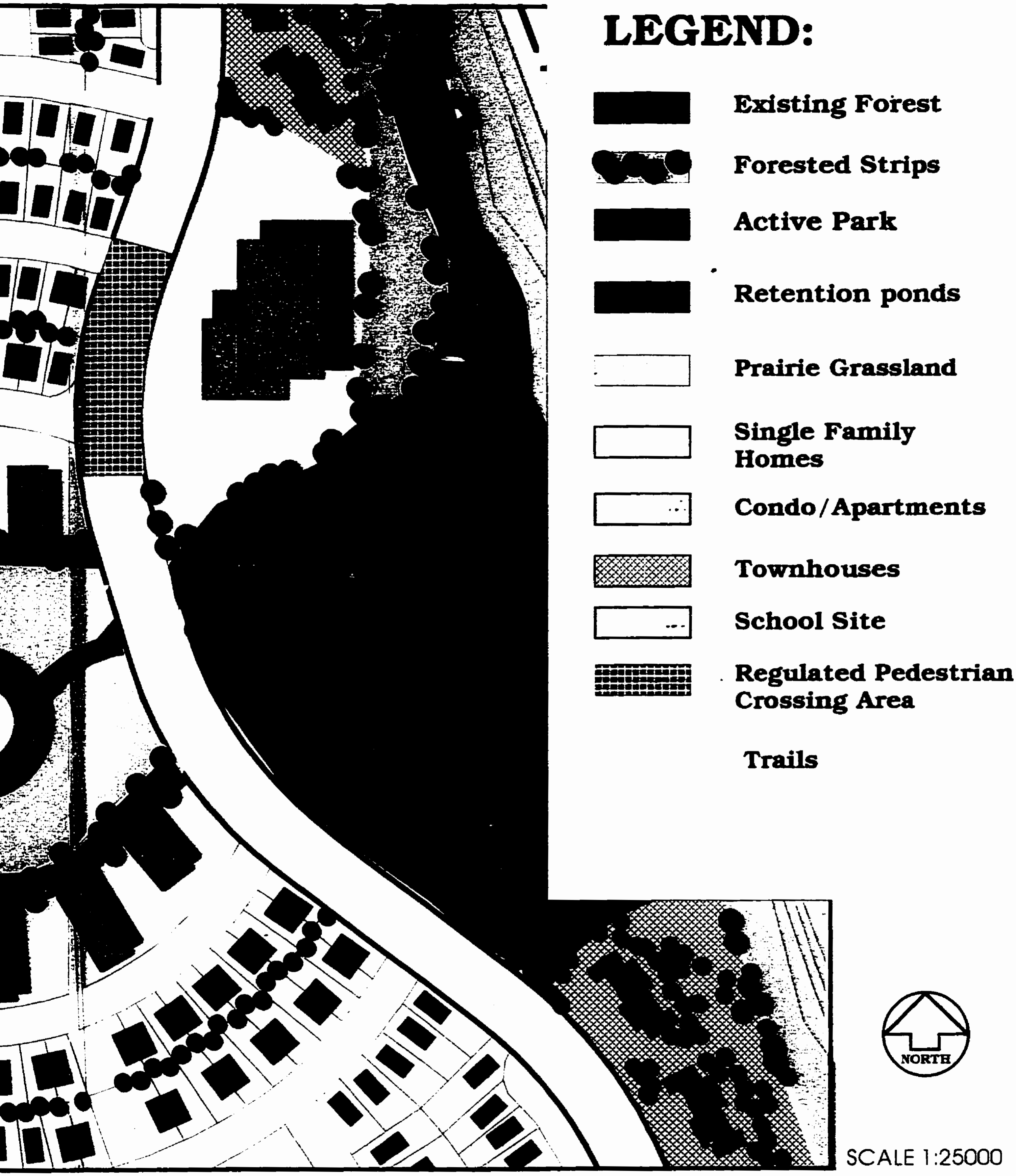
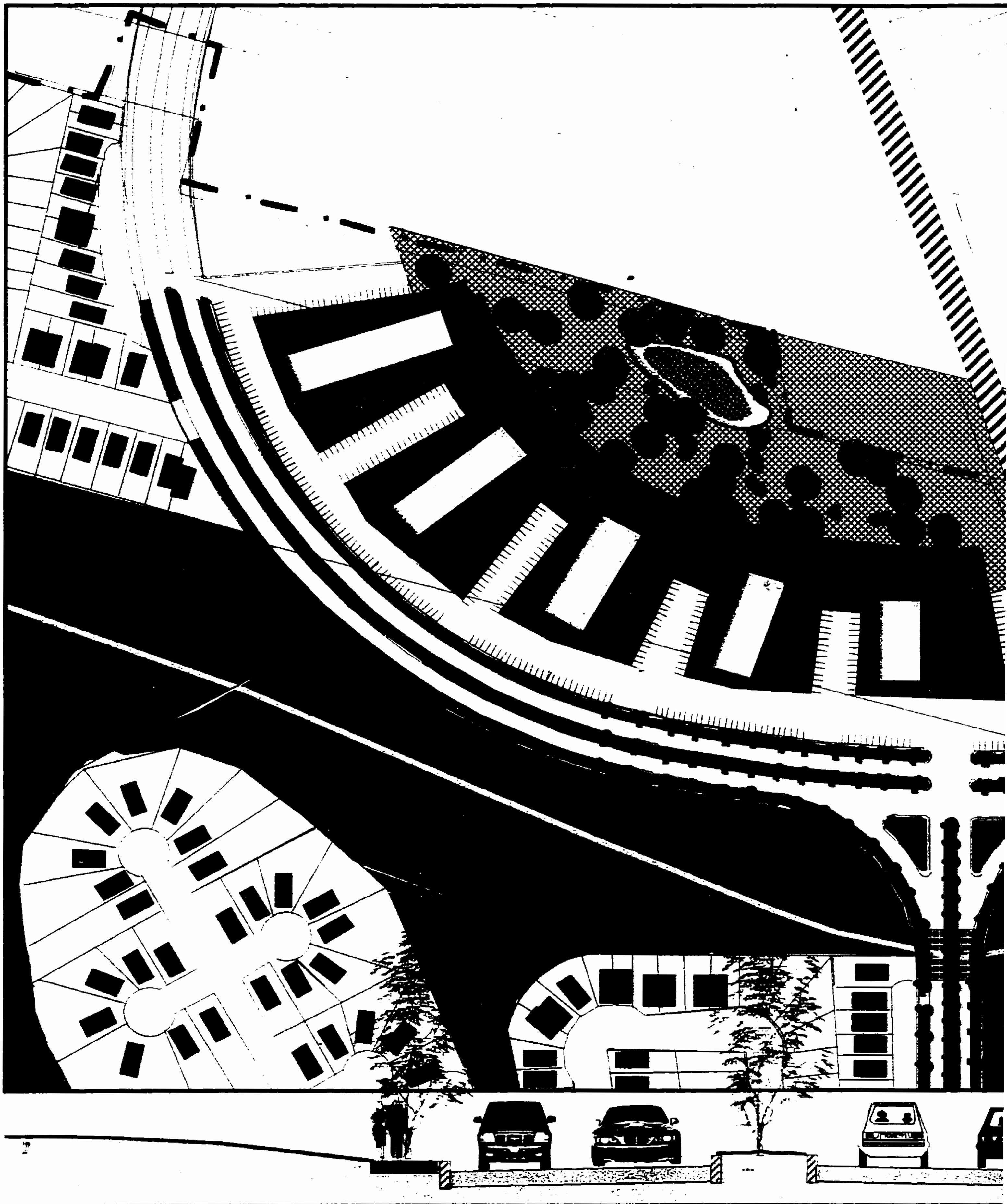
APPENDIX A
DESIGN PLANS & SECTIONS



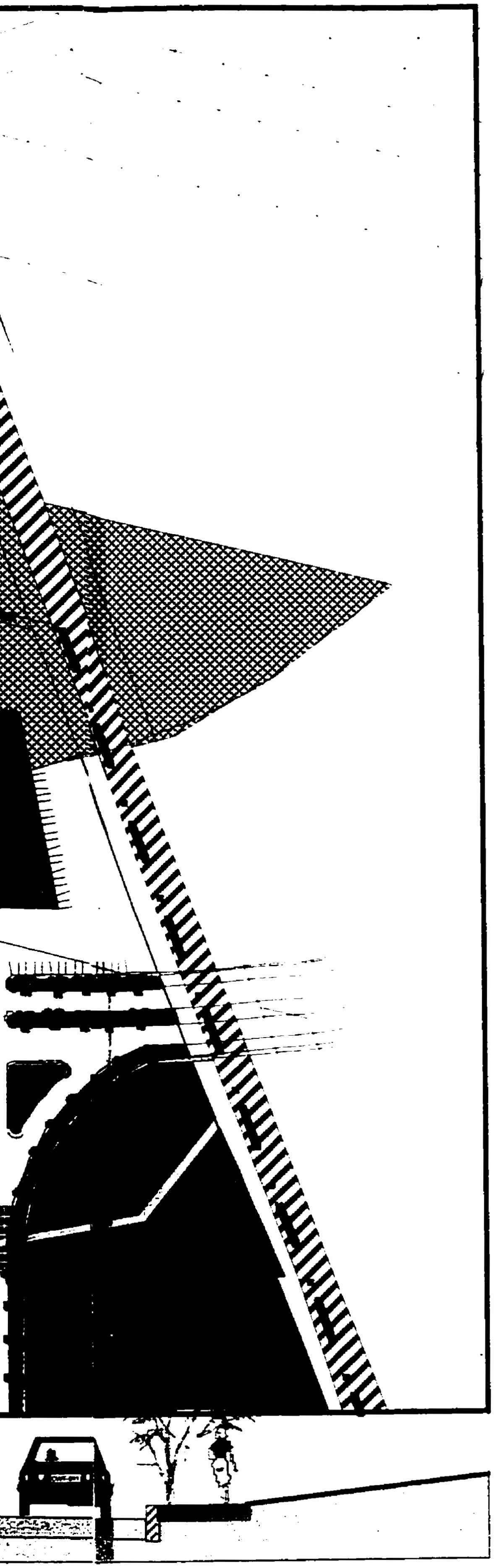
OPTION T



TWO: LANDUSE & DENSITIY TYPES



TYPICAL CROSS-SECTION THROUGH COMMU



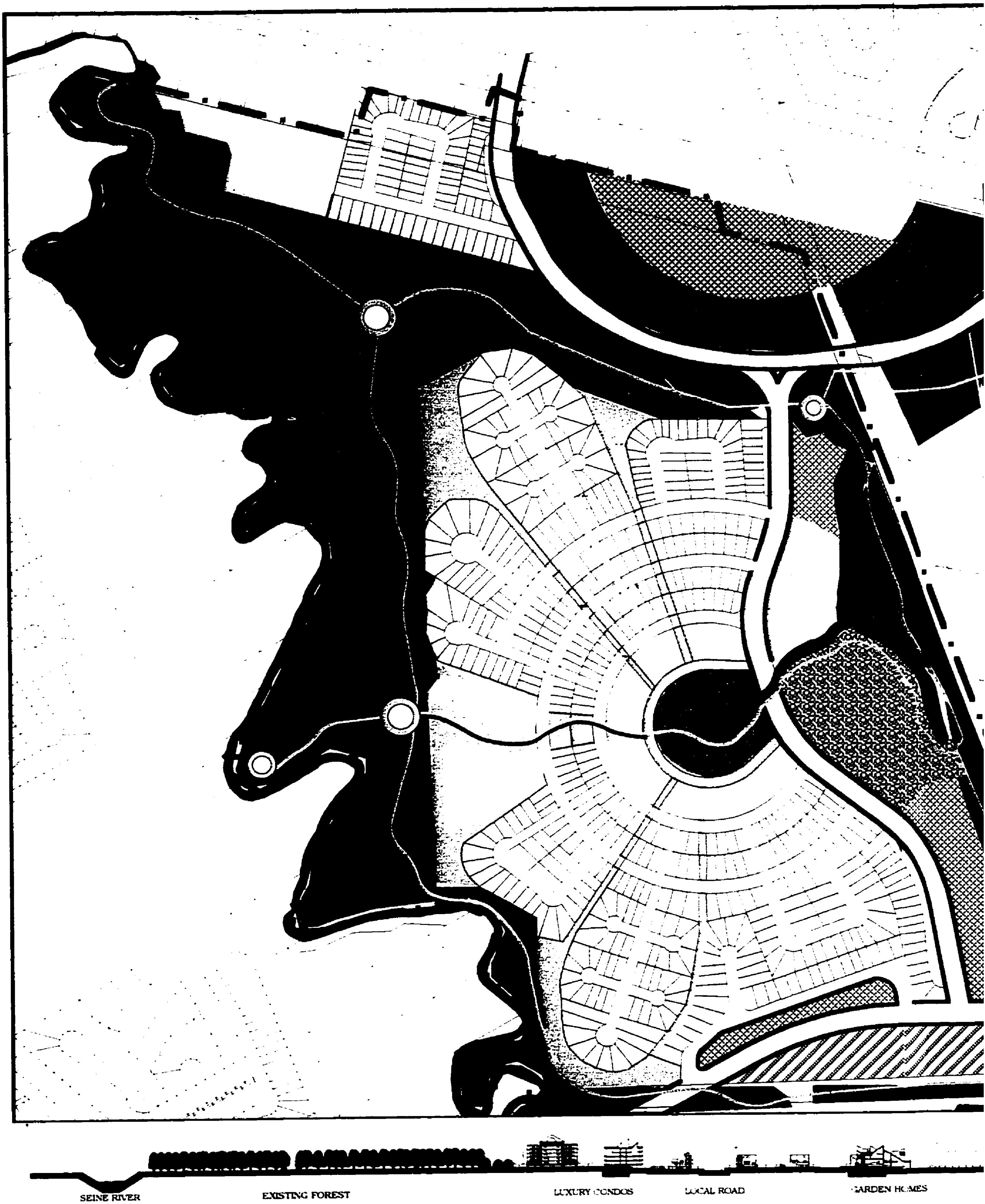
IMUNITY ROAD

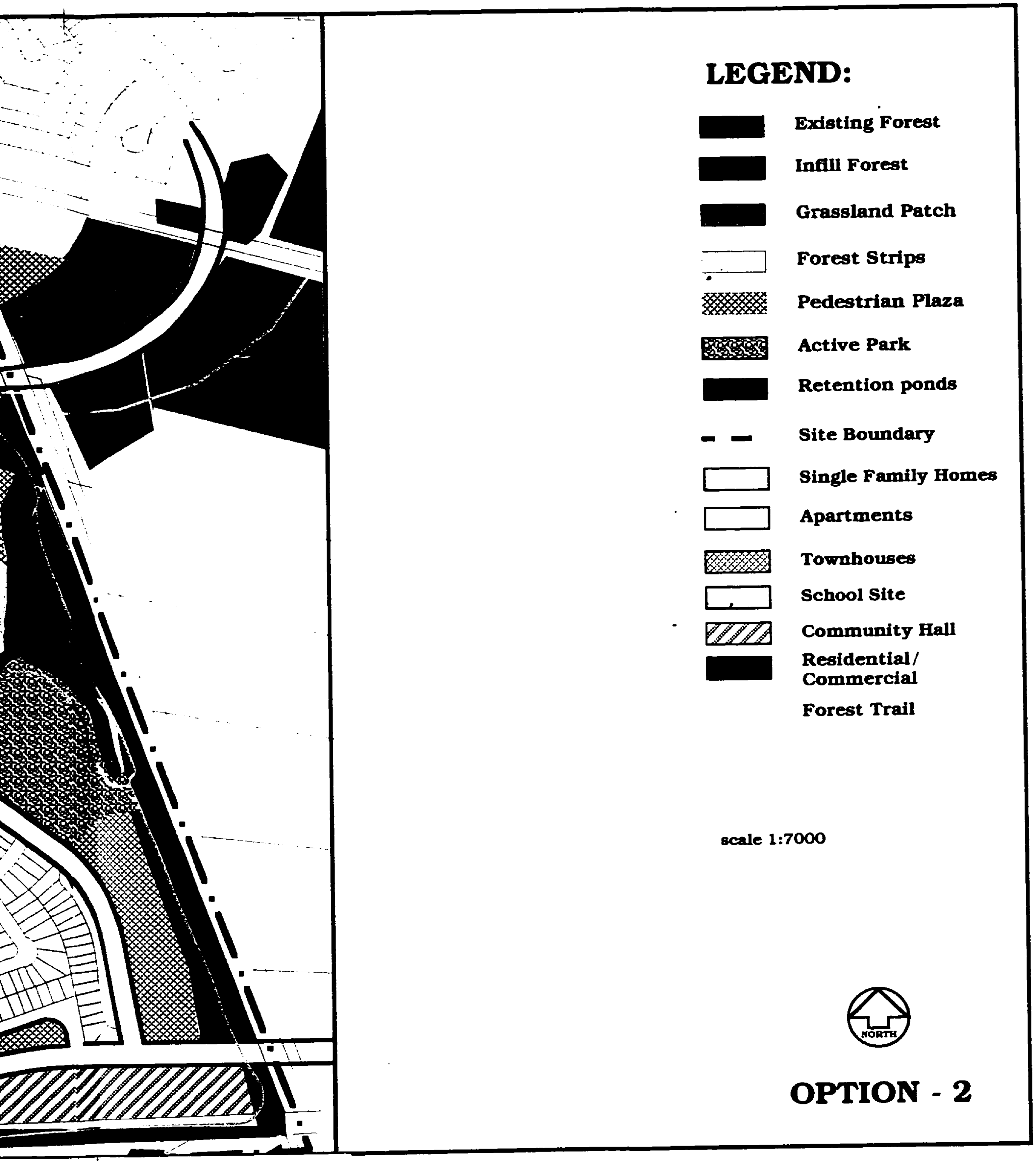
LEGEND:

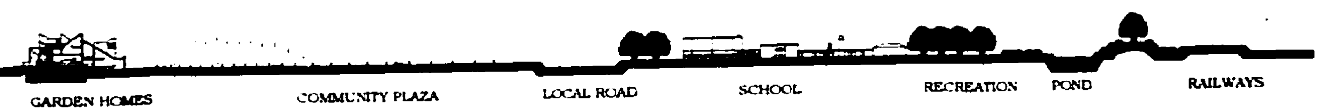
- Existing Forest
- Infill Forest
- Forested Strips
- Pond
- Site Boundary
- Single Family Homes
- High-rise residential
- Commercial
- Pedestrian-oriented Plaza
- Forest Trail

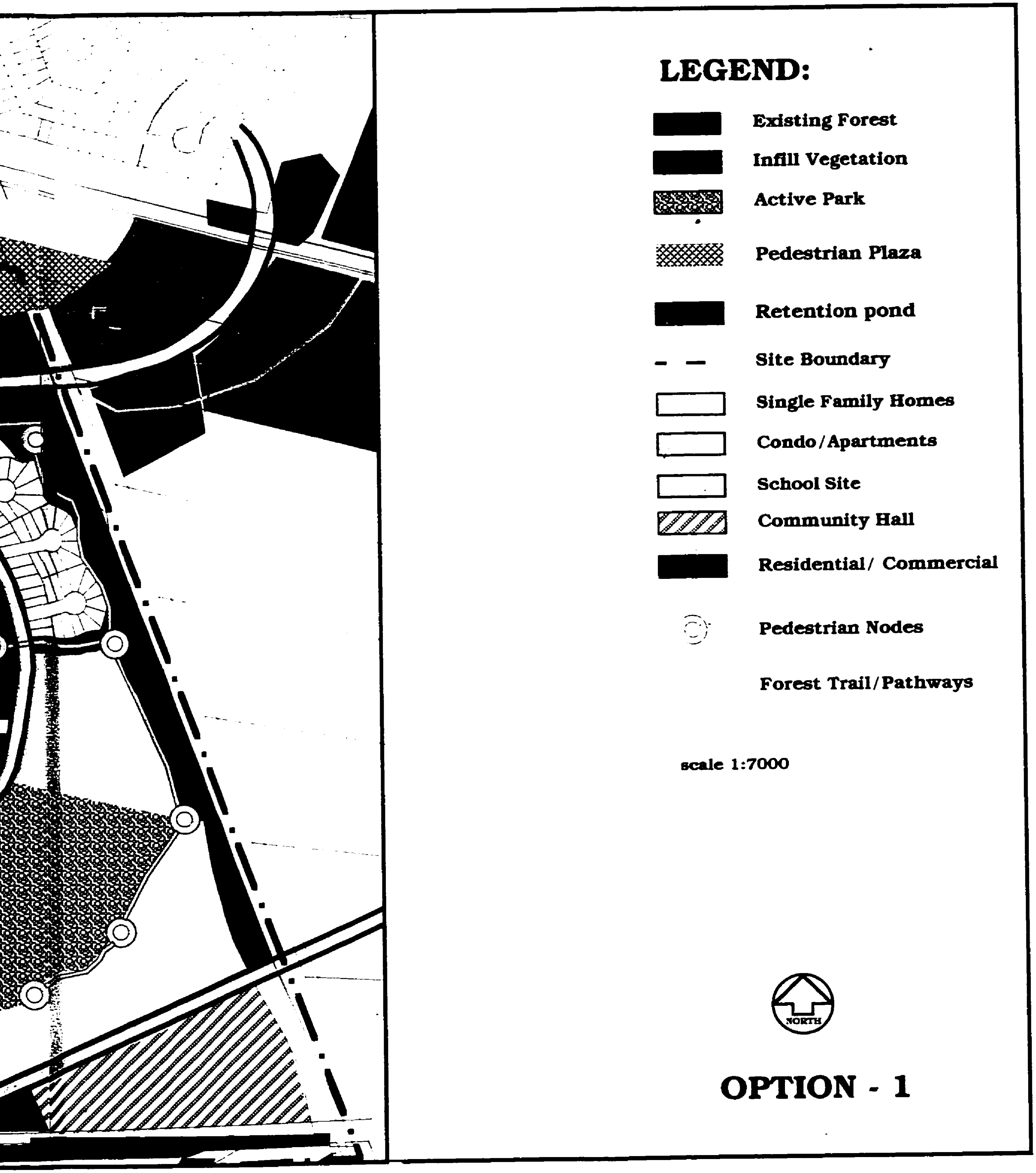
SCALE 1:2500

OPTIONAL RESIDENTIAL / COMMERCIAL DEVELOPMENT (DESIGN OPTIONS ONE & TWO)


SEINE RIVER
EXISTING FOREST
LUXURY CONDOS
LOCAL ROAD
GARDEN HOMES


LEGEND:
Existing Forest
Infill Forest
Grassland Patch
Forest Strips
Pedestrian Plaza
Active Park
Retention ponds
Site Boundary
Single Family Homes
Apartments
Townhouses
School Site
Community Hall
Residential/ Commercial
Forest Trail
scale 1:7000
NORTH
OPTION - 2


GARDEN HOMES
COMMUNITY PLAZA
LOCAL ROAD
SCHOOL
RECREATION
POND
RAILWAYS


LEGEND:
Existing Forest
Infill Vegetation
Active Park
Pedestrian Plaza
Retention pond
Site Boundary
Single Family Homes
Condo/Apartments
School Site
Community Hall
Residential/ Commercial
Pedestrian Nodes
Forest Trail/Pathways
scale 1:7000
NORTH

OPTION - 1

APPENDIX B
AREA CALCULATIONS

Area Calculation-Option.1

	A	B	C
1	Single Detached		
◇ 2		4127442.85sq. ft	95.40acre
2.1		132353.02sq. ft	3.06acre
2.2		150350.28sq. ft	3.48acre
2.3		75261.25sq. ft	1.74acre
2.4		774635.56sq. ft	17.90acre
2.5		677717.33sq. ft	15.66acre
2.6		597676.81sq. ft	13.81acre
2.7		772655.01sq. ft	17.86acre
2.8		660021.49sq. ft	15.26acre
2.9		286772.10sq. ft	6.63acre
3			
4	Multi Family/Condo		
◇ 5		769845.73 sq. ft	17.79acre
5.1		231036.58 sq. ft	5.34acre
5.2		376004.99 sq. ft	8.69acre
5.3		162804.16 sq. ft	3.76acre
6			
7	Business/High Res		
◇ 8		910755.71 sq. ft	21.05acre
8.1		31495.22 sq. ft	0.73acre
8.2		84507.47 sq. ft	1.95acre
8.3		36317.43 sq. ft	0.84acre
8.4		26775.23 sq. ft	0.62acre
8.5		67632.34 sq. ft	1.56acre
8.6		78447.38 sq. ft	1.81acre
8.7		50052.19 sq. ft	1.16acre
8.8		469524.16 sq. ft	10.85acre
8.9		66004.30 sq. ft	1.53acre
9			
10	Community Centre		
◇ 11		543658.22 sq. ft	12.57acre
11.1		543658.22 sq. ft	12.57acre
12			
13	School Zone		
◇ 14		370413.04 sq. ft	8.56acre
14.1		370413.04 sq. ft	8.56acre
15			
16			
17			
18			
19			
20			

Area Calculation-Option.1

	A	B	C	D
1	Ative Park			
◇ 2		726429.45sq. ft	16.79acre	
2.1		726429.45sq. ft	16.79acre	
3				
4	Infill Forest			
◇ 5		168584.39 sq. ft	3.90acre	
5.1		168584.39 sq. ft	3.90acre	
6				
7	Business Plaza			
◇ 8		317363.12 sq. ft	7.34 acre	
8.1		317363.12 sq. ft	7.34 acre	
9				
10				

Area Calculation-Option.1

	A	B	C	D
1	Pond			
◇ 2		78690.68 sq. ft	1.82 acre	
2.1		78690.68 sq. ft	1.82 acre	
3				
4	Existing Forest			
◇ 5		3820226.18sq. ft	88.30acre	
5.1		3545719.53sq. ft	81.96acre	
5.2		81805.78sq. ft	1.89acre	
5.3		192700.88sq. ft	4.45acre	
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				

Area Calculation- option.2

	A	B	C
1	Single Datached	Area	
◇ 2		3135298.35sq. ft	72.47acre
2.1		401558.46sq. ft	9.28acre
2.2		408361.23sq. ft	9.44acre
2.3		167351.88sq. ft	3.87acre
2.4		115066.19sq. ft	2.66acre
2.5		136281.89sq. ft	3.15acre
2.6		49110.32sq. ft	1.14acre
2.7		97187.33sq. ft	2.25acre
2.8		69809.33sq. ft	1.61acre
2.9		34449.91sq. ft	0.80acre
2.10		33707.19sq. ft	0.78acre
2.11		24229.58sq. ft	0.56acre
2.12		28007.69sq. ft	0.65acre
2.13		68038.68sq. ft	1.57acre
2.14		44062.06sq. ft	1.02acre
2.15		28911.86sq. ft	0.67acre
2.16		45170.75sq. ft	1.04acre
2.17		54965.91sq. ft	1.27acre
2.18		147349.86sq. ft	3.41acre
2.19		68915.93sq. ft	1.59acre
2.20		27700.93sq. ft	0.64acre
2.21		78490.44sq. ft	1.81acre
2.22		97806.27sq. ft	2.26acre
2.23		72677.92sq. ft	1.68acre
2.24		137837.27sq. ft	3.19acre
2.25		347351.36sq. ft	8.03acre
2.26		175774.70sq. ft	4.06acre
2.27		108387.15sq. ft	2.51acre
2.28		66736.25sq. ft	1.54acre
3			
4	Single Attached	Area	
◇ 5		435120.33Sq. Ft	10.06acre
5.1		85508.53Sq. Ft	1.98acre
5.2		256310.21Sq. Ft	5.92acre
5.3		93301.59Sq. Ft	2.16acre
6			
7	Multi Family/Condo		
◇ 8		693934.61sq. ft	16.04acre
8.1		41742.43sq. ft	0.96acre
8.2		35499.37sq. ft	0.82acre
8.3		36080.63sq. ft	0.83acre
8.4		49557.04sq. ft	1.15acre
8.5		98920.33sq. ft	2.29acre
8.6		231036.58sq. ft	5.34acre

Area Calculation- option.2

	A	B	C
8.7		72612.42sq. ft	1.68acre
8.8		128485.80sq. ft	2.97acre
9			
10			

Area Calculation - Option.2

	A	B	C
1	Business/Comm/High Res.		
◇ 2		469524.16Sq. Ft	10.85acre
2.1		469524.16Sq. Ft	10.85acre
3			
4	Community Centre	Area	
◇ 5		344897.24acre	7.97acre
5.1		344897.24acre	7.97acre
6			
7	School Zone		
◇ 8		169273.25sq. Ft	3.91acre
8.1		169273.25sq. Ft	3.91acre
9		C8	
10			

Area Calculation- Option.2

	A	B	C
1	Active Park	Area	
◇ 2		405971.66Sq. Ft	9.38acre
2.1		405971.66Sq. Ft	9.38acre
3			
4	Infill Forest Patches		
◇ 5		231316.41Sq. Ft	5.35acre
5.1		231316.41Sq. Ft	5.35acre
6			
7	Infill Vegetation		
◇ 8		1121306.77sq. ft	25.92acre
8.1		90137.02sq. ft	2.08acre
8.2		42953.41sq. ft	0.99acre
8.3		103738.96sq. ft	2.40acre
8.4		361129.16sq. ft	8.35acre
8.5		30085.13sq. ft	0.70acre
8.6		19025.20sq. ft	0.44acre
8.7		70003.08sq. ft	1.62acre
8.8		66499.43sq. ft	1.54acre
8.9		86541.83sq. ft	2.00acre
8.10		180271.15sq. ft	4.17acre
8.11		28641.72sq. ft	0.66acre
8.12		42280.66sq. ft	0.98acre
9	Existing Vgetation		
◇ 10		4197548.65Sq. Ft	97.02acre
10.1		3672785.71Sq. Ft	84.89acre
10.2		142282.77Sq. Ft	3.29acre
10.3		117009.07Sq. Ft	2.70acre
10.4		265471.10Sq. Ft	6.14acre
11	Business Park Plaza		
◇ 12		317363.12Sq. Ft	7.34acre
12.1		317363.12Sq. Ft	7.34acre
13	Residential Plaza		
◇ 14		182969.65Sq. Ft	4.23acre
14.1		78437.62Sq. Ft	1.81acre
14.2		104532.02Sq. Ft	2.42acre
15	Pond	194468.40Sq. Ft	4.49acre

APPENDIX C
RECOMMENDED SPECIES LIST

(SOURCE: "AN ASSESSMENT OF VEGETATION AND WILDLIFE HABITAT QUALITY FOR THE SEINE RIVER PARKWAY"
PREPARED BY ANDREW COWAN
FOR THE ENVIRONMENTAL SERVICES,
PARKS AND RECREATION DEPARTMENT,
CITY OF WINNIPEG)

Suggested Species

Trees:
Manitoba Maple (Acer negundo L.)
Basswood (Tilia americana L.)
Green Ash (Fraxinus pennsylvanica var. lancelata (Birkh.) Sarg.)
Cottonwood (Populus deltoides var occidentalis Rydb. 'Siouxland')
Balsam Poplar (Populus balsamifera L.)
Peachleaf Willow (Salix amygaloides Anderss.)
American Elm (Ulmus americana L.)

Shrubs:
Red Osier Dogwood (Cornus stolonifera)
Willow (Salix sp.)
High Bush Cranberry (Vibrum trilobum Marsh)
Downy Arrowwood (Vibrum rafinesquanum Schultes)
Beaked Hazelnut (Corylus cornuta Marsh)
American Hazelnut (Corylus americana Walt.)
Saskatoon (Amelanchier alnifolia Nutt.)
Hawthorn (Crataegus chrysocarpa Ashe.)
Indigo Bush (Amorpha fruticosa)
Wild Red Raspberry (Rubus idaeus L. var. strigosus (Michx.) Maxim)

Forbes (Flowers) and Herbs:
Western Canada Violet Or Wood Violet (Viola rugulosa Greene)
SnakeRoot (Sanicula marilandica L.)
Wild Strawberry (Fragaria glauca (S. Watts.) Rydb.)
Wild Lilly of the Valley (Maianthemum canadense Desf. var. interius Fern.)
Sweet Scented Bedstraw (Galium trilorum Michx.)
Yarrow (Achillea millefolium L.)
Canada Goldenrod (Solidago canadensis L.)
Smooth Aster (Aster laevis L.)
Northern Bedstraw (Galium boreale L.)
Sarsaparila (Aralia nudicaulis L.)
Yellow Avens (Geum aleppicum Jacq.)
Wild Mint (Mentha arvensis L.)
Giant Hyssop (Agastache foenicum (Pursh) Ktze.)

Grasses:
Indian Grass(Sorgastum nutans (L.) Nash)
Switch Grass (Panicum vrigatum L.)
Wild Rye (Elymus canadensis L.)
Common Reed Grass (Phragmites communis Trin.)
Prarie Cord Grass (Spartina pectinata Link.)

APPENDIX D
SPECIES LIST OF STUDY AREA

(SOURCE: "AN ASSESSMENT OF VEGETATION AND WILDLIFE HABITAT QUALITY FOR THE SEINE RIVER PARKWAY"
PREPARED BY ANDREW COWAN
FOR THE ENVIRONMENTAL SERVICES,
PARKS AND RECREATION DEPARTMENT,
CITY OF WINNIPEG)

Plant Observations • Native Forb Species

Common Name	*Family*	*Genus*	*Species*
Ostrich Fern	Polypodiaceae (Fern)	Matteuccia	struthiopteris (L.) Tod.
Common Cattail	Typhaceae(Cattail)	Typha	lattifolia
Narrow-Leaved Cattail		Typha	angustifolia
Narrow Leaved Water Plantain	Alismaceae (Water Plantain)	Alisma	gramineum
Poison Ivy	Anacardiaceae	Rhus	radicans
Indian Hemp	Apocynaceae	Apocynum	cannabinum
Sweet Flag	Aracea (Arum)	Acorus	calamus L.
Wild Sarsparilla	Araliaceae (Ginseng)	Aralia	nudicaulis
Dwarf Milkweed	Asclepiadaceae	Asclepias	ovalifolia
Common Milkweed		Asclepias	syriaca
Harebell	Campanulaceae	Campanula	rotundifolia
Common Yarrow	Compositae	Achillea	millefolium
Giant Ragweed		Ambrosia	trifida L.
Ragweed		Ambrosia	psilostachya
Prairie Sage		Artemisia	ludoviciana
Aster Species		Aster	sp.
Many Flowered Aster		Aster	ericoides
Smooth Aster		Aster	laevis
Lindley's Aster		Aster	ciliolatus Lindl.
White Upland Aster		Aster	ptarmicoides
Floodman's Thistle		Cirsium	floodmanii
Gumweed		Grindelia	squarrosa
Rhombic Leaved Sunflower		Helianthus	laetiflorus
Narrow-Leaved Sunflower		Helianthus	maximalianii Schrad.
Canada Hawkweed		Hieracium	canadanse
Blue Lettuce		Lactuca	tatarica
Meadow Blazingstar		Liatris	ligulistyllus
Arrow-leaved Colt's Foot		Petasites	sagittatus
Canada Goldenrod		Solidago	canadensis
Stiff Goldenrod		Solidago	rigida
Cocklebur		Xanthium	strumarium L.
Wild Morning-Glory (BindWeed)	Convolvulaceae	Convolvulus	sepium L.
Wild Cucumber	Cucurbitaceae (Gourd)	Echinocystis	lobata (Michx.) T. & G.
Common Horsetail	Equisetaceae (Horsetail)	Equisetum	arvense L.
Spiked-Water Milfoil	Haloragaceae	Myrophyllum	spicatum L.
Blue Flag	Iridaceae(Iris)	Iris	versicolor L.
Common Blue-Eyed Grass		Sisyrinchium	montanum Greene.
Obedient Plant(American Dragonhead)	Labiatae (Mint)	Dracocephalum	parviflorum Nutt.
Giant Hyssop		Agastache	foeniculum (Pursh) Ktze
Field (Wild) Mint		Mentha	arvensis L. var.villosa (Benth.)S.R.Stewart

Common Name	Family	Genus	Species
Purple Milk-vetch	Leguminosae (Pea)	Astragalus	danicus Retz.
Canadian Milk-vetch		**Astragalus**	**canadensis L.**
Wild Licorice		Hedysarum	lepidota (Nutt.) Pursh.
Wild Peavine		**Lathyrus**	**venosus Muhl.**
Hog peanut		Amphicarpa	bracteata (L). Fern.
American Milk- vetch		**Astragalus**	**fridgidus (L).Gray.**
Lesser Duckweed	Lemnaceae (Duckweed)	Lemna	minor L.
Prairie Onion	**Liliaceae (Lily)**	**Allium**	**textile Nels. & Macbre.**
Wood Lily/ Prairie Lily		Lilium	philadelphicum L.
Wild Lily of the Valley		**Maianthemum**	**canadense Desf. var. interius Fern.**
Common Solomon's Seal		Polygonatum	canaliculatum (Muhl.) Pursh
False Solomon's Seal		**Smilacina**	**stellata (L.) Desf.**
Carrion Flower		Smilax	herbacea L. var. lasioneura (Hook) D.C.
Trillium (Noding Wakerobin)		**Trillium**	**cernuum L. var. macranthum Eam. & Weig.**
Moonseed	Menispermum (Moonseed)	Menispermum	canadense L.
Indian Pipe	**Monotropaceae (Indian Pipe)**	**Monotropa**	**uniflora L.**
Yellow Pond-Lily	Nymphaeaceae (Water-lily)	Nuphar	variegatum Engelm.
Yellow Evening-Primrose	**Onagraceae (Evening Primrose)**	**Oenothera**	**biennis L. var. canescens Torr. & Gray var. hirsutissima**
Large Yellow Lady's Slipper	Orchidaceae (Orchis)	Cypripedium	calceolus var. pubescens (Willd.) Correll
Yellow Wood-Sorrel	**Oxalidaceae (Wood-sorrel)**	**Oxalis**	**stricta L.**
Downy Plox	Polemoniaceae (Plox)	Plox	pilosa L.
Swamp Smartweed	**Polygonaceae (Buckwheat)**	**Polygonum**	**coccineum Muhl.**
Water Smartweed		Polygonum	amphibium L.
Western Dock		**Rumex**	**occidentallis S. Wats**
Fringed Loosestrife	Primulaceae (Primrose)	Lysimachia	ciliata L.
Whorlrd Loosestrife		**Lysimachia**	**quadrifolia L.**
Red Baneberry	Ranunculaceae (Crowfoot)	Actaea	rurbra (Ait.) Willd.
White Baneberry		**Actaea**	**rubra forma neglecta (Gilman) Robins**
Canada Anemone		Anemone	canadensis L.
Wood Anemone		**Anemone**	**nemorosa L. var. bifolia (Farwell) Biov.**
Thimbleweed		Anemone	cylindrica A. Gray
Smooth Leaved Buttercup		**Ranunculus**	**abortivus L.**
Seaside Buttercup		Ranunculus	cymbalaria Pursh
Wild Columbine		**Aquilegia**	**canadensis L.**
Marsh (Swamp) Buttercup		Ranunculus	septentrionalis Poir.

Common Name	*Family*	*Genus*	*Species*
Tall Meadow-Rue		Thalictrum	dasycarpum Fisch. & Lall.
Veiny Meadow-Rue		**Thalictrum**	**venulosum Trel.**
Smooth Wild Strawberry	Rosaceae (Rose)	Fragaria	virginiana Dcne.
Silverweed		**Potentilla**	**anserina L.**
Yellow Avens		Geum	apleppicum Jacq.
Northern Bedstraw	**Rubiaceae**	**Galium**	**palustre L.**
Sweet Scented Bedstraw		Galium	triflorum Michx.
Pale Comandra	**Santalaceae**	**Comandra**	**var. angustifolia (DC.) Torr.**
Blue Monkey Flower	Scrophulariaceae (Figwort)	Mimulus	ringens L.
Common Mullen		**Verbascum**	**thapsus L.**
Bittersweet/climbimg Nightshade	Solanaceae (Potatoe)	Solanum	dulcamara L.
Water Hemlock	**Umbelliferae (Parsley)**	**Cicuta**	**maculata L. var. angustifolia**
Cow Parsnip		Heracleum	lanatum Michx
Smooth Sweet Cicely		**Osmorhiza**	**aristata (Thunb.) Mak & Yabe**
Black Snakeroot		Sanicula	marilandica L.
Golden Alexander		**Zizia**	**aurea (L.) Koch**
Stinging Nettle	Urticaceae (Nettle)	Utrica	dioica L. var. procera (Muhl.)
Wood Nettle		**Laportea**	**canadensis (L.) Gaud.**
Early Blue Violet	Violaceae (Violet)	Viola	adunca J.E. Smith.
Crowfoot Violet		**Viola**	**pedatifida**
Downy Yellow Violet		Viola	pubescens Ait.
Western Canada Violet		**Viola**	**selkirkii Pursh**
Wild Grape	Vitaceae (Grape)	Vitis	riparia Michx.

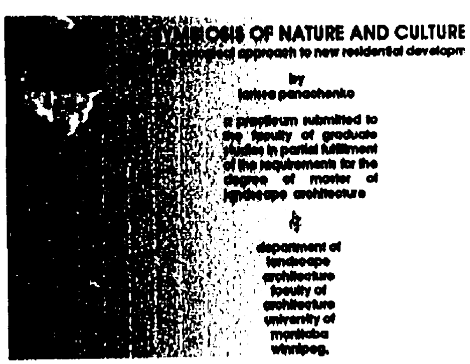
Plant Observations
Native Shrubs & Trees

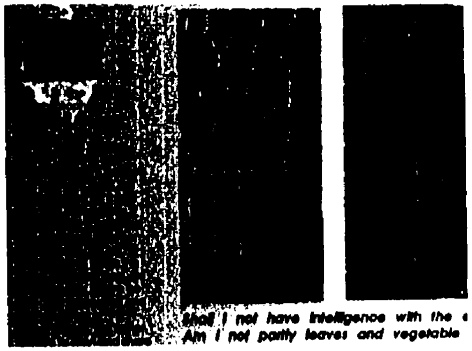
Common Name	*Family*	*Genus*	*Species*
Manitoba Maple	Aceraceae (Maple)	Acer	negundo L. var. interius (Britt) Sarg.
American Hazelnut	**Betulaceae (Birch)**	**Corylus**	**americana Walt.**
Beaked Hazelnut		Corylus	cornuta
Twining Honeysuckle	**Caprifoliaceae (Honeysuckle)**	**Lonicera**	**diocia L. var glaucescens (Rybd.)** Butt.
Western Snowberry		**Symphoricarpos**	**occidentalis Hook.**
High Bush-Cranberry		**Viburnum**	**opulus L. var. americanum** (Mill) Ait.
Downy Arrowwood		Viburnum	rafinesquianum **Schultes**
Climbing Bittersweet	Celastraceae (Staff-tree)	Celastrus	scandens L.
Red Osier Dogwood	**Cornaceae (Dogwood)**	**Cornus**	**alba L.**
Wolf Willow/Silverberry	Elaeagnaceae (Oleaster)	Elaegnus	commutata Bernh.
Bur Oak	**Fagaceae (Beech)**	**Quercus**	**macrocarpa Michx.**
Green Ash	**Oleaceae (Olive)**	**Fraxinus**	**pennsylvanica Marsh.** var. austinnii Fern
Saskatoon Berry	**Rosaceae (Rose)**	**Amelanchier**	**alnifolia Nutt.**
Round Leaved Hawthorn		Crataegus	rotundifolia Moench.
Wild Plum		**Prunus**	**americana Marsh.**
Canada Plum		Prunus	nigra Ait.
Choke Cherry		Prunus	virginiana L. var. **melanocarpa (A. Nels)Sarg.**
Prickley Rose		Rosa	acicularis Lindl.
Wood's Rose		**Rosa**	**woodsii Lindl.**
Rose species		Rosa	sp.
Red Raspberry		Rubus	idaeus L. var. aculeatissimus **Regel & Tiling**
Narrow Leaved Meadowsweet		**Spirea**	**alba Du Roi**
Balsam Poplar	**Salicacea (Willow)**	**Populus**	**balsamifera L.**
Cottonwood		Populus	detiodes Marsh.
Trembling Aspen		**Populus**	**tremuloides Michx.**
Pussy Willow/ Diamond Willow		**Salix**	**duscolor Muhl.**
Peach-Leaved Willow		**Salix**	**amygdaloides Anderss.**
Wild Black Currant	Saxifragaceae (Saxifrage)	Ribes	americanum Mill.
Northern Gooseberry		Ribes	oxyacanthoides L. var. **oxyacanthoides**

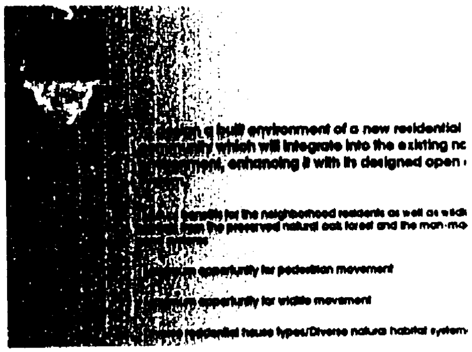
Plant Observations
Native Sedges, Grasses & Rushes

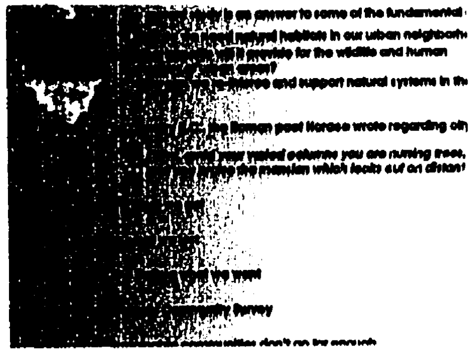
Common Name	Family	Genus	Species
American Elm	Ulmaceae	Ulmus	americana L.
Sedge	Cyperaceae	Carex Spp.	
Slender Wheat Grass	Gramineae	Agropyron	trachycaulum (Link) Malte
Tickle Grass (Rough Hair Grass)		Agrostis	scabra Willd.
Big Bluestem		Andropogon	gerardi Vitman
Slough Grass		Beckmania	syzigachne (Steud.) Fern.
Northern Reed Grass		Calamagrostis	inexpansa A. Gray
Nodding Wild Rye (Canada Wild Rye)		Elymus	canadensis L.
Mat Muhly		Muhlenbergia	richardsonis (Trin) Rydb.
Witch Grass		Panicum	capillare L.
Switch Grass		Panicum	virgatum L.
Reed Canary Grass		Phalaris	arundinacea
Alkali Chord Grass		Spartina	gracilis Trin.
Prairie Chord Grass		Spartina	pectinata Link.
Prairie Dropseed		Sporobolus	heterolepsis A. Gray
Rush	Juncaceae	Juncus Spp.	

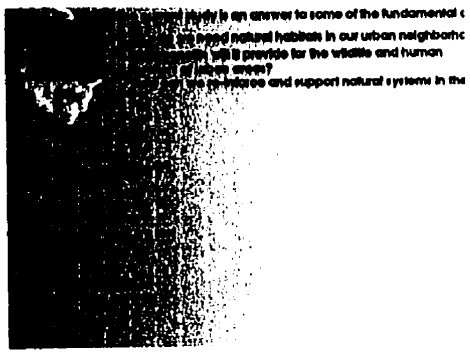
APPENDIX E
SLIDE PRESENTATION

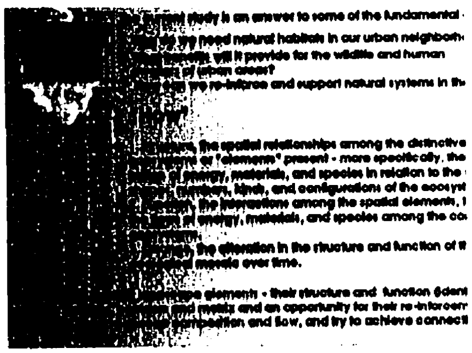

SYMBIOSIS OF NATURE AND CULTURE
approach to new residential developm
by
larissa panachenko
a practicum submitted to the faculty of graduate studies in partial fulfillment of the requirements for the degree of master of landscape architecture
department of landscape architecture faculty of architecture university of manitoba winnipeg.


Shall I not have intelligence with the
Am I not partly leaves and vegetable


built environment of a new residential
which will integrate into the existing
enhancing it with its designed open
benefits for the neighborhood residents as well as wildl
the preserved natural oak forest and the man-ma
opportunity for pedestrian movement
opportunity for wildlife movement
residential house types/Diverse natural habitat system


study is an answer to some of the fundamental
natural habitats in our urban neighborh
will it provide for the wildlife and human
and support natural systems in th
the Roman poet Horace wrote regarding cit
your varied columns you are nursing trees,
the mansion which looks out on distant


study is an answer to some of the fundamental
need natural habitats in our urban neighborhc
will it provide for the wildlife and human
and support natural systems in the


study is an answer to some of the fundamental
we need natural habitats in our urban neighborh
will it provide for the wildlife and human
of urban areas?
we re-inforce and support natural systems in th
the spatial relationships among the distinctive
present - more specifically, the
of energy, materials, and species in relation to the
and configurations of the ecosys
the interactions among the spatial elements,
of energy, materials, and species among the co
the alteration in the structure and function of
mosaic over time.
elements - their structure and function iden
and an opportunity for their re-introdu
and flow, and try to achieve connect

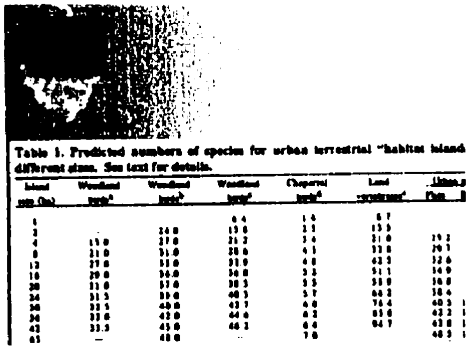
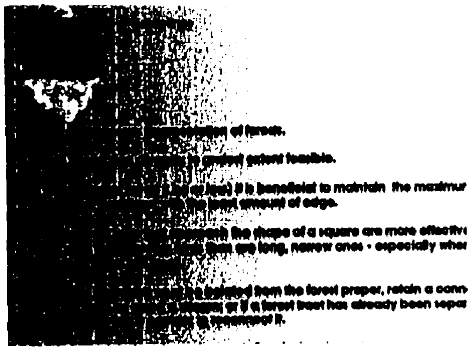
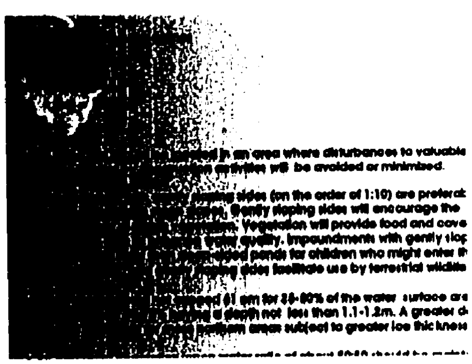
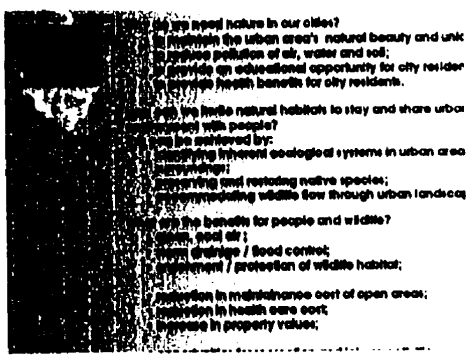
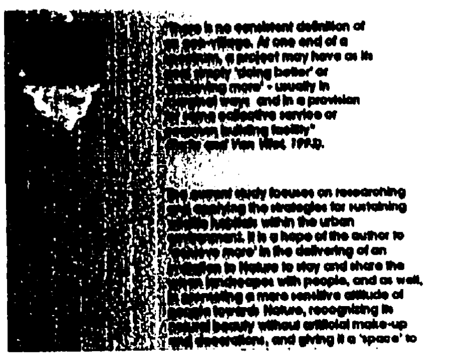


Table 1. Predicted numbers of species for urban terrestrial "habitat island
different sizes. See text for details.

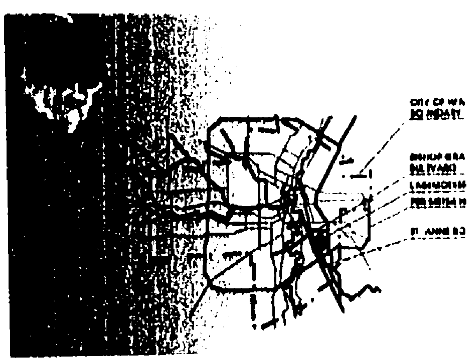

of forest.
extent feasible.
it is beneficial to maintain the maximu
amount of edge.
the shape of a square are more effectiv
are long, narrow ones - especially whe
from the forest proper, retain a conn
if a forest tract has already been sepa


in an area where disturbances to valuable
will be avoided or minimized.
sides (on the order of 1:10) are prefera
Gently sloping sides will encourage the
Vegetation will provide food and cove
quality. Impoundments with gently slop
ponds for children who might enter t
sides facilitate use by terrestrial wildlif
of 25-50% of the water surface are
depth not less than 1.1-1.2m. A greater d
areas subject to greater ice thicknes

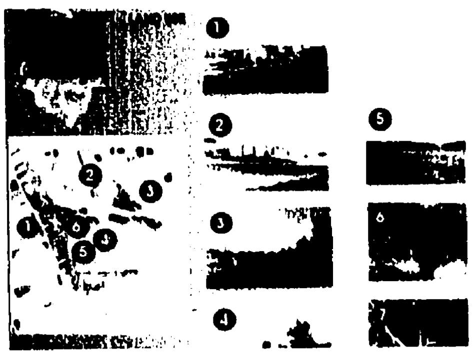

we need nature in our cities?
the urban area's natural beauty and uni
pollution of air, water and soil;
an educational opportunity for city reside
health benefits for city residents.
the little natural habitats to stay and share urba
with people?
be achieved by:
inherent ecological systems in urban are
and restoring native species;
wildlife flow through urban landsca
the benefits for people and wildlife?
drainage / flood control;
protection of wildlife habitat;
in maintainance cost of open areas;
in health care cost;
in property values;


There is no consistent definition of
At one end of a
project may have as its
doing better' or
and in a provision
collective service or
Van Wel, 1992.
study focuses on researching
the strategies for sustaining
habitats within the urban
It is a hope of the author to
in the delivering of an
to Nature to stay and share the
landscapes with people, and as well,
a more sensitive attitude of
towards Nature, recognizing its
beauty without artificial make-up
and decorations, and giving it a 'space' to


1994

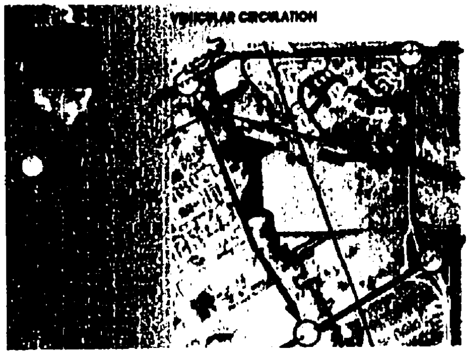

CITY OF WI
ST. ANNE'S


LAND USE

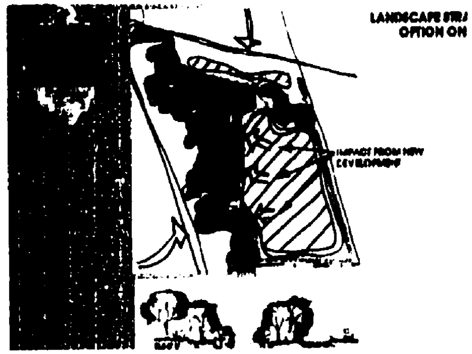

LAND USE
1
2
3
4
5
6
7

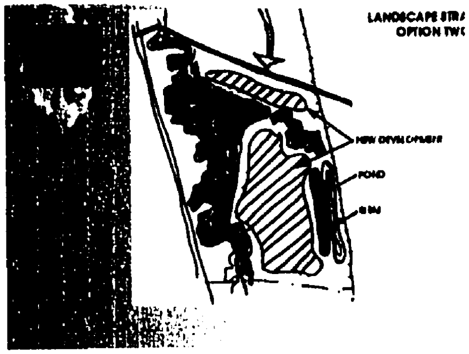

WILDLIFE CIRCULATION TRIANGLE
AGRICULTURE

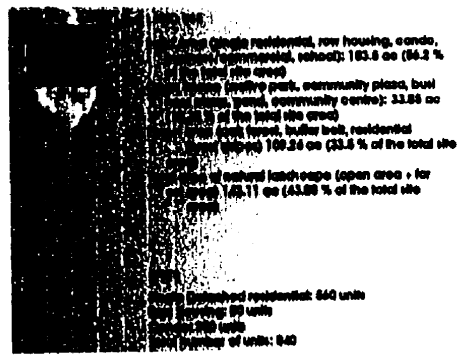

INVENTORY & CLASSIFICATION

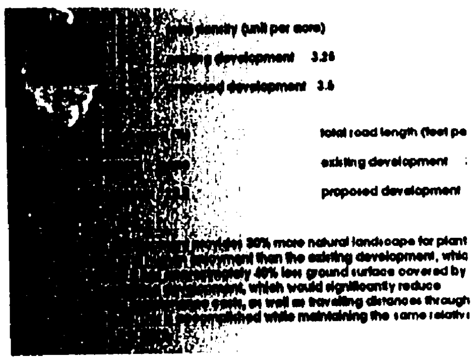

VEHICULAR CIRCULATION


LANDSCAPE STRATEGY


LANDSCAPE STRA
OPTION ON
IMPACT FROM NEW
DEVELOPMENT


LANDSCAPE STRA
OPTION TWO
NEW DEVELOPMENT
POND


residential, row housing, condo,
commercial, school): 103.8 ac (56.2 %
park, community plaza, busi
community centre): 33.85 ac
buffer belt, residential
100.24 ac (33.5 % of the total site
natural landscape (open area + for
143.11 ac (43.88 % of the total site
detached residential: 560 units
number of units: 840


density (unit per acre)
development 3.25
development 3.5
total road length (feet pe
existing development
proposed development
30% more natural landscape for plant
than the existing development, whic
40% less ground surface covered by
which would significantly reduce
as well as travelling distances through
while maintaining the same relativ

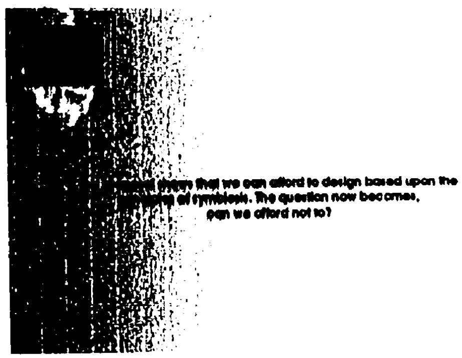

that we can afford to design based upon the
of symbiosis. The question now becomes,
can we afford not to?

IMAGE EVALUATION TEST TARGET (QA-3)

150mm

6"

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