THE UNIVERSITY OF MANITOBA

LAKE ORIENTED SUBDIVISIONS
A RECREATION/OPEN SPACE ORIENTED HOUSING DEVELOPMENT IN WINNIPEG

by

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PREFACE

A RECREATION/OPEN SPACE ORIENTED HOUSING DEVELOPMENT IN WINNIPEG

In 1971, 76.1% of all Canadians lived in cities and towns. By the year 2,000 nearly 94% of all Canadians will live in urban centers.[1] *This population influx will bring great pressure to bear on existing urban environments and the quality of life of those living in them. There will be increased demands made upon the services and facilities found in urban centers. Among these services are housing and recreation.*

Family housing in the conventional single family detached house form is generally segregated from recreation facilities within the neighbourhood context. Houses are built on individual lots laid out on rigid street patterns in an attempt in part to maximize the efficiency of service systems. Recreation facilities on the other hand are often confined to small rectangular "left over" plots of open space that have to conform to a rigid street pattern and lot lines. The lack of integration of housing and recreation is perpetuated and encouraged today by the various groups and procedures involved in the development process.

Single family housing is said to be desirable because it offers ownership, a sense of identity and privacy. At the neighbourhood and community levels, the benefits are not so widely acclaimed. A new home buyer may become a member of a "community" with all the standard facilities and services of a new housing area, including the community center and its recreation activities. The programmes provided by community centers include organized sports such as baseball, football, basketball, hockey, etc., catering more often to the younger generation. But there is often very little thought given to providing for more passive forms of recreation or natural open spaces on the local level

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1. Time Magazine, October 15, 1973, Vol. 102 No. 16 P. 11.

since it is assumed that surrounding parks and outlying areas are readily available by car. Ultimately, the development receives a rustic title such as Linwood Heights or Cedar Glen in memory of natural site attractions destroyed long ago.

It is however becoming more obvious today that the conventional form of family housing developments have many inadequacies that are eroding the quality of life. Houses and private open space may not be private; individuality is reduced to the choice of facades; and ownership becomes a financial burden rather than an investment. Already the single family detached house is beyond 50% of the total population of Winnipeg, an increase of 17 1/2% since 1971.[1] *By 1981 it is predicted that all new housing will be in the form of apartments.*[2] *The reasons for declining standards of housing cannot be blamed on any one group.*

The developer for instance is being caught in a tighter and tighter market situation where house prices are rising with increased land, building and material costs while the number of buyers is decreasing due to the proportional lessening of available income for housing.[3]

At the community level local governments are finding it more difficult to obtain funds for developing schools, community centers and other community services. The immediate priorities of development are on storm drainage and road building, etc., rather than less urgent areas of concern such as recreation.

These problems of home ownership, standards and declining funds for community services are some of the areas where housing fails to meet the needs of the

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1. *Winnipeg Free Press, March 1974*
2. *Ibid*
3. *Interview, Mr. B. Shrake, Heritage Homes, Winnipeg, April, 1974.*

modern resident. Further, these needs are expanding with the increasing sophistication and demands being made by urban populations on housing areas.

This is particularly true of recreation. With increased leisure time the needs for recreation outlets are increasing and changing. The range of these recreation activities includes not only the standard organized sports, but other interests such as bike riding, jogging, nature study trails, picnicking, and water oriented sports such as canoeing, fishing, etc.

The majority of present day housing developments offer few resources for enjoying recreation activities outside of the centralized community center areas. A more appropriate setting would be an open space system, linking various housing and community facilities together, with recreation activities forming nodes within the system. Many housing developments in the United States have successfully exploited recreation amenities within an open space context, not only as a development theme, but as a way of improving the quality of environment offered to residents without increasing housing costs. These developments known as "open space communities" or sometimes "planned unit developments" consist of carefully planned and executed housing developments where shops, schools, swimming pools, playgrounds and other facilities for outdoor recreation are close to one another and to housing. Pedestrian and vehicular traffic are separated and grade separations are provided where streets and walkways must cross. Cluster housing units are surrounded by open land which is used for parks, recreation and play spaces, and where natural elements such as trees, streams, or lakes are preserved or created as integral design elements of the housing environment.

Because of the need for an integrated design approach, the landscape architect is often involved in the design and execution of new housing developments, and as such can be instrumental in bringing about change. To be effective, he must

be aware of the needs and requirements of the group for whom he is working and for whom the development is intended. He has a responsibility to the developer to insure that any development proposal put forward is realistic and attainable within the constraints of current economic and development practices. Only with a thorough understanding of this background will it be feasible to modify current development practices in single family housing. Critical in the understanding of development practices are the developer's process, his market and the housing form they help create.

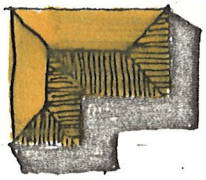
It is also the responsibility of the landscape architect when proposing a plan to have a firm grasp on both the larger city-wide and local implications of his proposals. This could include considering the relationship between his proposal and transportation networks, city-wide recreation systems, and adjacent land uses. Of critical importance are the city authorities' controls on building, servicing, etc., and the acceptance of a proposed development by local citizens' committees.

The landscape architect also has a responsibility to residents for the quality of life being provided in a housing development. This responsibility is often lost or overlooked in the lengthy design and development processes. Care must be taken so that the residents do not take second place to development interests.

A housing development based on recreation amenities, within an open space system, offers one opportunity to improve the quality of life presently found in most urban areas. To do so realistically, it must accommodate people's needs, (housing and recreation) recognizing current development practice and city controls.

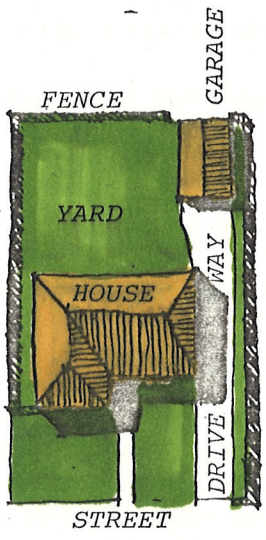
ELEMENTS OF HOUSING , OPEN SPACE STRUCTURE
CONVENTIONAL SINGLE FAMILY DETACHED

SINGLE UNIT



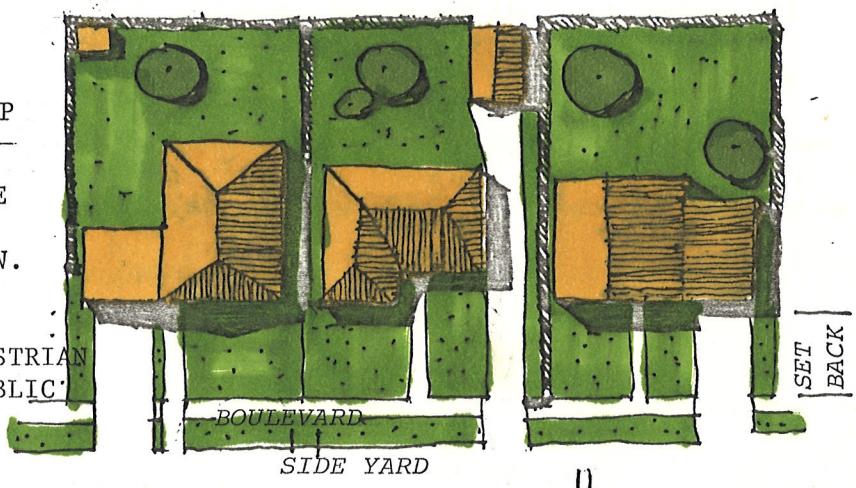
HOME

SINGLE UNIT
2 CAR PARK
PRIVATE
OPEN SPACE



STREET GROUP

3.8 D.U./ACRE
MAXIMUM ROAD
MAXIMUM R.O.W.
SETBACKS
BOULEVARDS
LIMITED PEDESTRIAN
ACCESS TO PUBLIC
OPEN SPACE



NEIGHBORHOOD

MAXIMUM SITE IMPACT
MAXIMUM ROADWAY
ROADS SERVE AS PEDESTRIAN
ACCESS TO PUBLIC OPEN SPACE
IN CENTRAL LOCATION
ROADS EQUAL TO 30-35 % OF
TOTAL DEVELOPED AREA

Figure 1

PART 1

INTRODUCTION

Chapter 1

Statement of Study Topic, Discussion and Summary of Objectives

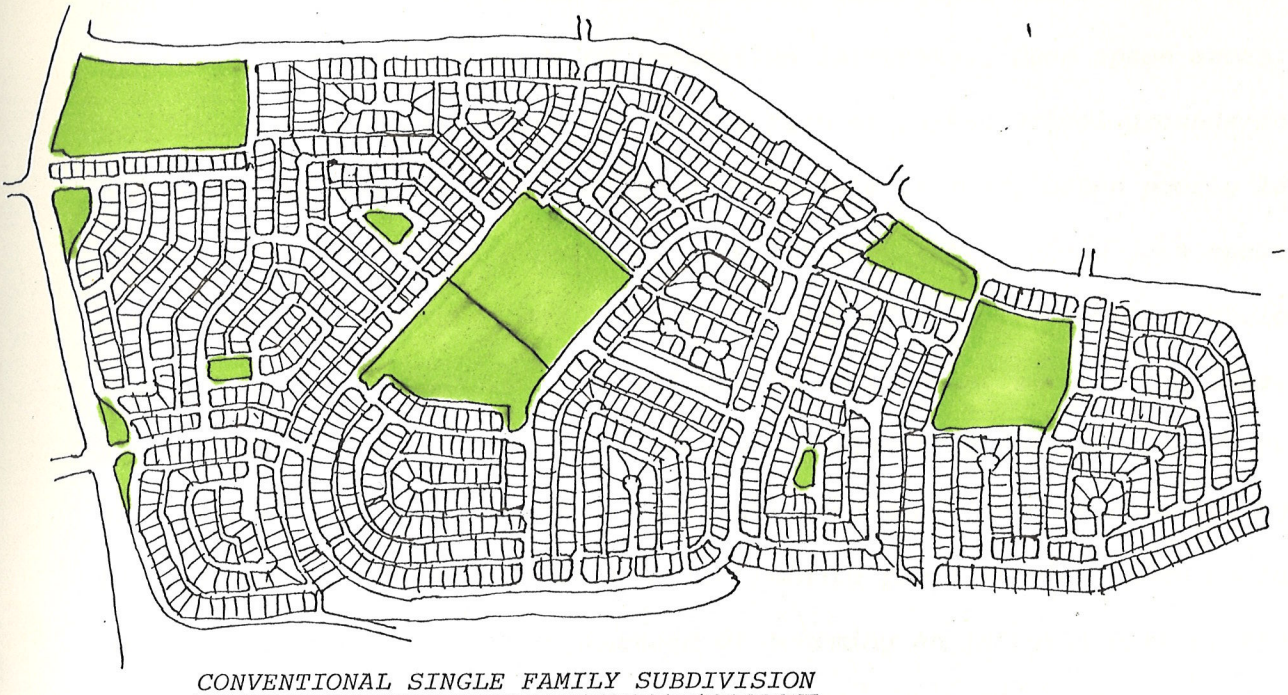
1.1 Statement of Study Topic

This study is concerned with the development of an Open Space Community in Winnipeg as an alternative housing form to the traditional single family detached subdivision. Housing and recreation are two key components in the application and organization of the community. Public Open Space is the framework in which housing and recreation occur while an artificial lake used as a storm water holding pond is the feature around which recreation is structured.

A primary function of housing is to provide shelter from the natural elements and unwanted disturbances such as noise. It must also accommodate the daily functions and activities of the people living within it. The traditional single family detached house has proved to be one of the most successful forms of housing in this regard. It consists of two components; an area of land or a "lot" and a house situated on the lot. In combination, these components have characteristics and qualities that make them more desirable to live in than other housing forms such as apartments or rowhouses.

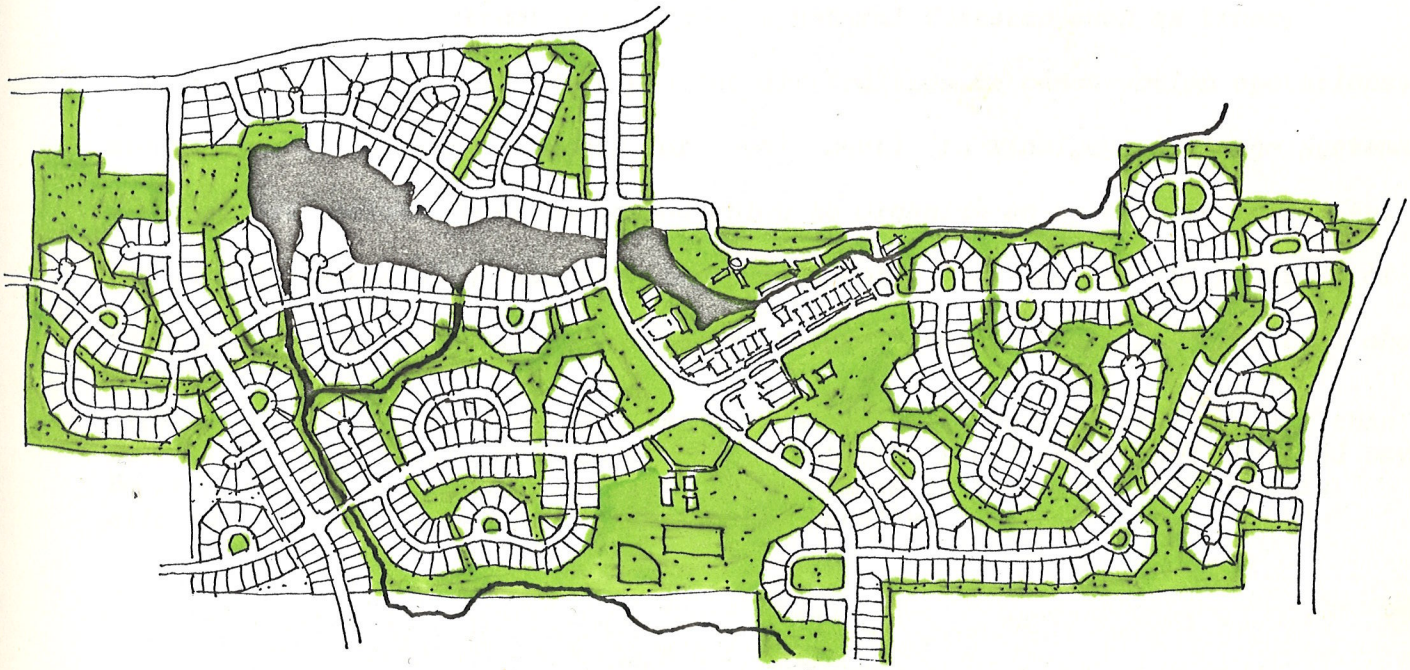
This study is concerned then with maintaining, as much as possible, these essential qualities and characteristics of the single family detached home, while upgrading the level of recreation and open space development in the community. From the outset, the basic objective of this study has been to ensure that any improvements suggested on the community level should not

CONVENTIONAL DEVELOPMENTS VERSUS OPEN SPACE COMMUNITIES



CONVENTIONAL SINGLE FAMILY SUBDIVISION

- -MAXIMUM UNITS OVER ENTIRE SITE
- -LARGE LOTS
- -MAXIMUM ROADWAY
- -ISOLATED OPEN SPACE AREA
- -MAXIMUM SITE DISTRUCTION WITH CONSTRUCTION



TYPICAL SINGLE FAMILY OPEN SPACE DEVELOPMENT

- - NO OF LOTS RELATED TO PRIME BUILDABLE AREAS
- - SMALLER LOTS
- - MINIMUM ROADWAY AND DESTRUCTION OF SITE FEATURES
- - CONTINIOUS OPEN SPACE NETWORK UTILIZING OPEN SPACE FEATURES

Figure 2

The City of Winnipeg's open space standards determining the size and development of these open space areas are generally inadequate and are poorly related to the changing needs of recreation interests. Open space areas in compliance with the standards are in the form of parks, school grounds and community centers, located on disjointed parcels of land, often poorly landscaped with a minimum of amenities. Few, if any, vehicle-free open space connections exist between one open space area and another, creating obvious conflicts to recreation users, particularly children at street crossings. (see Appendix 1, Section A for current open space standards for Winnipeg.) Present standards result in monomotonous residential communities characterized by tract housing, excessive roadways, and indiscriminate plots of open space conforming to the subdivision structure, instead of becoming an integral part of the urban fabric closely relating to natural site features (see Figure 2).

Open space communities, on the other hand, are characterized by common areas of open land running through the entire project giving a structure to housing, roads and recreation features, that relate to the natural capabilities of the site. There are several unique features around which open space communities can be organized and structured. Usually natural features such as trees, streams, slopes or lakes, which present difficulties to construction operations, are used as structuring elements for development. In Winnipeg, drainage systems are the most obvious features around which to organize an open space community. The land is essentially flat with impervious soils, and has had the majority of the trees removed for agricultural purposes. Natural drainage patterns have been channel-*

**Open space is preserved by permitting a developer to develop smaller lots than specified in the zoning ordinance coupled with the requirement that the land saved be reserved for permanent open space. No increase in the number of units is allowed, thus retaining the original zoned density.*

ized and directed to central drainage ditches to speed and control storm drainage runoff and to improve agricultural productivity. When these agricultural areas are converted to residential uses, drainage problems are intensified as a result of increased runoff, usually from impervious surfaces. These storm drainage problems are usually solved by the installation of large, expensive underground pipes leading to major river outfalls.

Recently, however, another storm drainage solution has made its appearance in Winnipeg. This entails using artificial lakes or holding ponds to collect surface runoff in peak periods with slower releases occurring through smaller pipes over longer periods of time. (See Appendix 2, Section A for the use of artificial lakes in subdivisions.)

When these various local drainage systems are maintained above ground and connected as a regional drainage system, many of the natural characteristics of building sites can be maintained and form the spine of a regional recreation and open space network.

1.3 Summary of Objectives

This study then is concerned with a method for increasing open space area within residential developments, providing funds for the development of that open space using an artificial lake system as a structuring element for open space and housing organization.

To summarize, the specific objectives of this study are:

1. To provide additional recreation facilities over and above those provided by the City of Winnipeg in residential subdivisions.

2. *To provide increased amounts of open space area as a recreation resource in itself and as a setting for recreation facilities in residential subdivisions in Winnipeg.*

3. *To provide and develop both increased recreation facilities and open space areas at no additional capital cost to the city authorities, private developer or new resident.*

4. *To provide and develop both increased recreation facilities and open space areas without significantly decreasing the level or quality of services provided by the single-family detached home in Winnipeg.*

5. *To use open space development as a major structuring element in the site planning and layout of single family detached housing in Winnipeg, and particularly to employ artificial lakes in the form of storm water retention ponds, as the organizing feature of that open space.*

To arrive at an innovative solution which fulfills these objectives and which is also realistic in Winnipeg, it is necessary to explore the concerns of both the resident, land developer and city authorities. Thus, the resident and his housing needs, the developer with his development procedure, costs, and profit requirements and the city's development controls, etc., were all studied in an attempt to isolate the critical aspects of the development process and understand their influence on present day subdivisions. An alternate development form was then tested against present developments with the intent of exploring how innovation in open space and recreation development were affected by the conventional land development process. The result of this study is a case study application where the above recreation and open space objectives are illustrated in the Winnipeg area. Presented in the appendices as part of the information-gathering process are studies of housing developments in Calgary and Winnipeg, and a recent

study on the recreation desires of an urban population along with the existing recreation standards in Winnipeg, lake design criteria for Winnipeg, City development controls and detailed information on the case study, etc. These appendices are the background information on which this report is based and are referred to throughout the report where necessary.

Chapter 2 The Housing Market

To be able to fully understand the potential of Open Space developments in Winnipeg, it is necessary to examine all the factors influencing the single family detached form of housing. In addition to the political structure within which all developments take place (i.e., city controls of zoning, density, building and infrastructure regulations) and developers' responses to these controls, attention must be paid to the current market situation. This involves a consideration of what presently exists in the housing market and the attitudes of residents living in these homes.

A market analysis to determine these attitudes was not conducted as part of this study. It was also impossible to find any current information on attitudes of single family detached residents towards their housing for the City of Winnipeg. Instead, information was gleaned from interviews, general discussion with persons involved in housing, housing texts in general, studies conducted in other cities, and the limited knowledge of the writer on this subject. This information is summarized in the following sections.

2.1 Market Characteristics and Attitudes

Winnipeg's housing industry has to date been characterized by a propogation of past successes[1], that is residential units which have sold well in the past are being reproduced today and would appear to encompass what is in store in the immediate future of housing. It would seem that the housing industry has been geared to a static market, one that is characterized by

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1. Interview, Mr. Brian Shrake, Heritage Homes, Winnipeg, 1974.

an appeal to a buyer in a certain stage of the life cycle.[1] At this time, this market is mainly young married couples earning between $12,000 - $20,000 per year and having approximately two children (see Appendix 4 Section A). No other housing type caters so well to this groups needs and desires as the single family dwelling with its individual house set on a separate lot. Following is a brief review of the desirable qualities of this housing type.

2.1.1 Investment

One of the major (though not necessarily most important) qualities of the single family detached home is the security it ensures in the way of investment.[2] It not only provides valuable living services (privacy and shelter, etc. with the convenience of utilities, roads, waste disposal, fire and police protection, etc.) but represents a means of building equity in resale value.

Thus, factors such as the neighbourhood location, accessibility to transportation and employment, the appearance of the house, street and surrounding residences, etc. all are important characteristics of this housing type which may affect its value as an investment. The single family detached house with its large tree lined boulevards, house setbacks and side yards, etc. is more successful at maintaining a more attractive setting than other housing types and is thus more sought after. These factors of location and aesthetics associated with the investment nature of this housing form are however, not the major concern of this study. Of more importance is the quality of life provided by the single family detached home.

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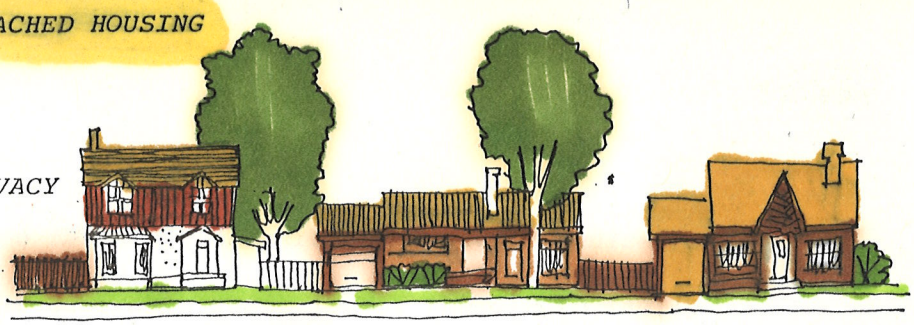
1. Interview, Mr. Brian Shrake, Heritage Homes, Winnipeg, 1974.

2. Interview, Manfred Kiel, Principal Economist, Lombard North Group, Calgary, September, 1975.

QUALITIES OF SINGLE FAMILY DETACHED HOUSING



- VISUAL AND ACCOUSTIC PRIVACY BY PHYSICAL SEPARATION
- IDENTITY BY FACADE
- DIVERSITY OF HOUSING BY SHAPE, SIZE AND COLOR
- ADAPTABILITY TO INDIVIDUAL TASTES

- CHARACTER OF STREETSCAPE
- CONVENIENCE OF ACCESS BY VEHICLES
- CLEAR DESIGNATION OF STREET FUNCTIONS (PUBLIC, SEMI-PRIVATE AND PRIVATE)
- HIGH LEVEL OF SERVICES & UTILITIES.

- CHARACTERISTICS OF LOT
- ON SITE PARKING (GARAGE)
- OUTDOOR STORAGE AREA
- PRIVATE BACK YARD
- REAR RESIDENTIAL ACCESS
- SECURE AREA FOR SMALL CHILDREN

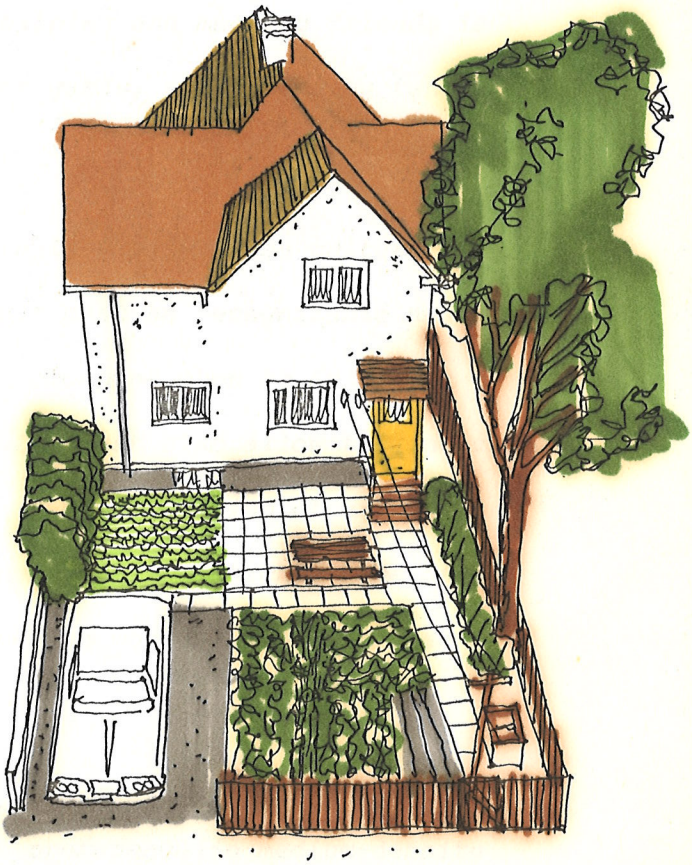


Figure 3

2.1.2 Quality of Life

There are several key factors which are generally recognized as representing the most desirable qualities of the single family detached home. The three attributes: privacy, identity and convenience[1], outlined in the following paragraphs, are by no means a complete list, but represent the area of concern of this study with regard to Open Space communities.

1. Privacy

Privacy, both visual and acoustic, is a most important criterion of housing which the detached home fulfills best of all housing types.[2] The physical separation of units allows a family to function normally without hearing, being heard, or observed by neighbours. Privacy of interior functions is maintained by setback, and side yards while outdoor space sufficient for family daytime activities, entertaining and meeting friends is away from the busy streets in rear yards, surrounded by fences.

2. Identity

"North America is traditionally single-family-house culture. It would appear that the dwelling unit must be recognizable and definable from the outside by the occupant when he is in its immediate vicinity. The unit design must also allow the individual to adapt and change the dwelling as an expression of his own prestige and ownership".[3] The single family detached home of all the housing types would seem to be the most flexible in this regard.

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1. Moshe Safdie, Beyond Habitat, MIT Press, Cambridge, Mass., 1970.
2. "The Housing Game", A survey of consumer preference in medium-density housing in the greater Vancouver region; "Social Policy & Research Department, United Way of Greater Vancouver, July, 1974.
3. Moshe Safdie, Beyond Habitat, MIT Press, Bambridge, Mass., 1970

3. *Convenience*

The single family detached home would also appear to be the most convenient of all housing forms. The private yard is close at hand and can function as an adequate play area for children, access to the house is directly from the outside and creates the "ideal arrangement for the North American family of any income group which is to be able to drive into the kitchen." [1] *And lastly the single family home provides more area for storage in the form of basements and yard space that most other forms.*

2.2 Summary

To summarize, the single family detached house form is attractive to families today because it best responds to their needs of privacy, identity and convenience. Though other more innovative housing types might also respond to these needs, few are initiated due to the conservative nature of home buyers and the reluctance of developers to invest in unproven concepts. [2] *It is for these reasons that the single family detached home is maintained as the housing unit in this study.*

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1. *Moshe Safdie, Beyond Habitat, MIT Press, Cambridge, Mass., 1970*

2. *Interview, Mr. B. Shrake, Heritage Homes, Winnipeg, 1974.*

Chapter 3 The Land Development Process

"The development of unimproved land into subdivision housing is a complex process involving many individual, organizational and institutional actions of a private and public nature."[1] This sequence of actions, resulting in the final housing environment, is referred to as the development process.

The various component processes of land subdivision and development have a variety of influences on the layout, design and organization of the finished housing area. It is therefore important to look at the major participants and their role in creating new housing.

3.1 The Developer

The primary individual involved in the land development process is the developer. A developer, for the purposes of this study, is defined as an individual or corporation which acts as the central agent in the land development process and is involved in all aspects of development including land acquisition, servicing and house building. Not only does he determine when land is suitable for residential use, but also what and when site improvements will be made. He is responsible for developing and selling a complete residential "package" which includes the house, serviced lot and other subdivision services and amenities. He is affected by other persons in the development process such as land owners or consumers in that they influence his decision of where to locate and what to build.

Other individuals, such as realtors and financial intermediaries though indispensible in assembling land parcels and providing financial backing, are of secondary importance for the purpose of this study.

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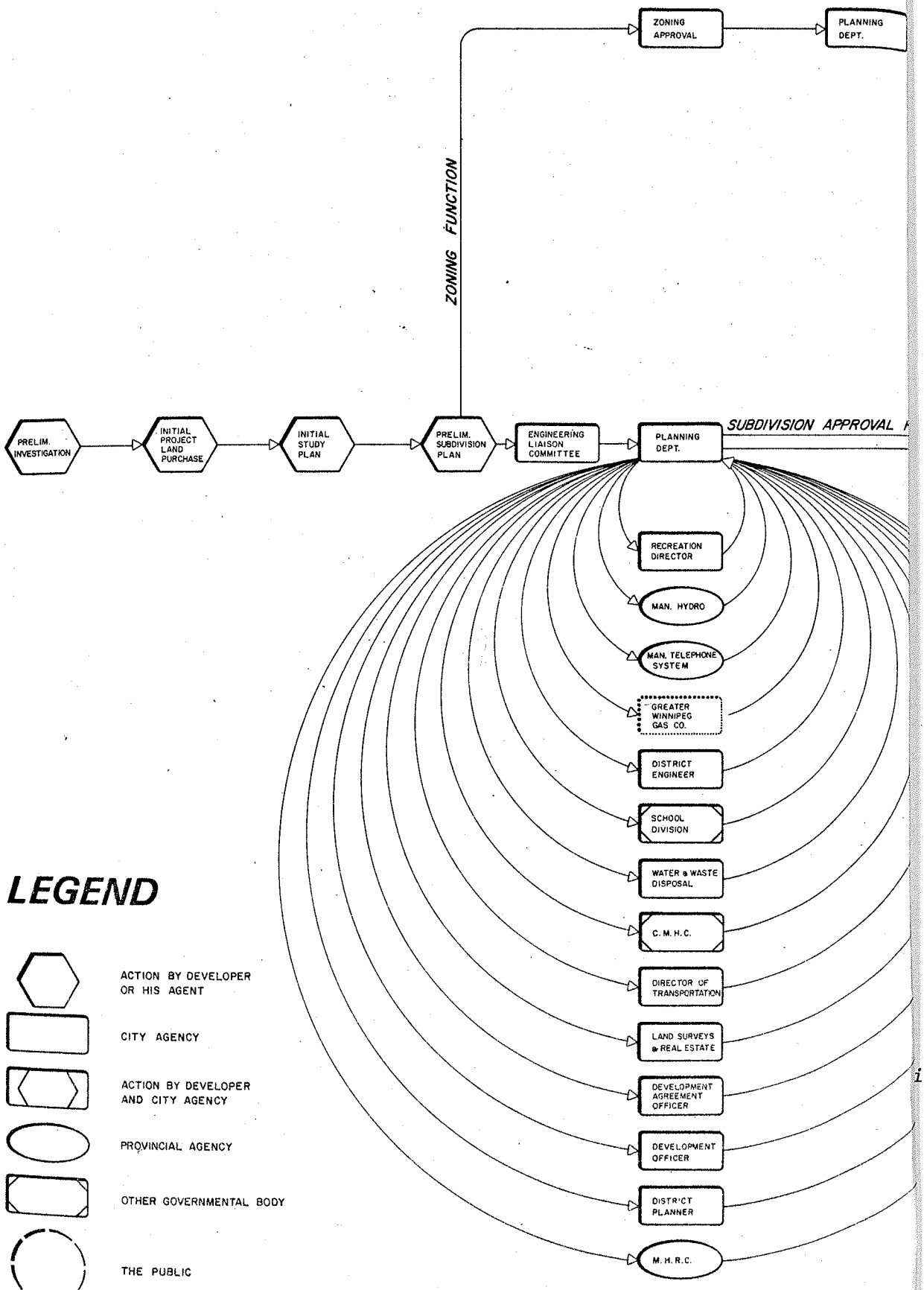
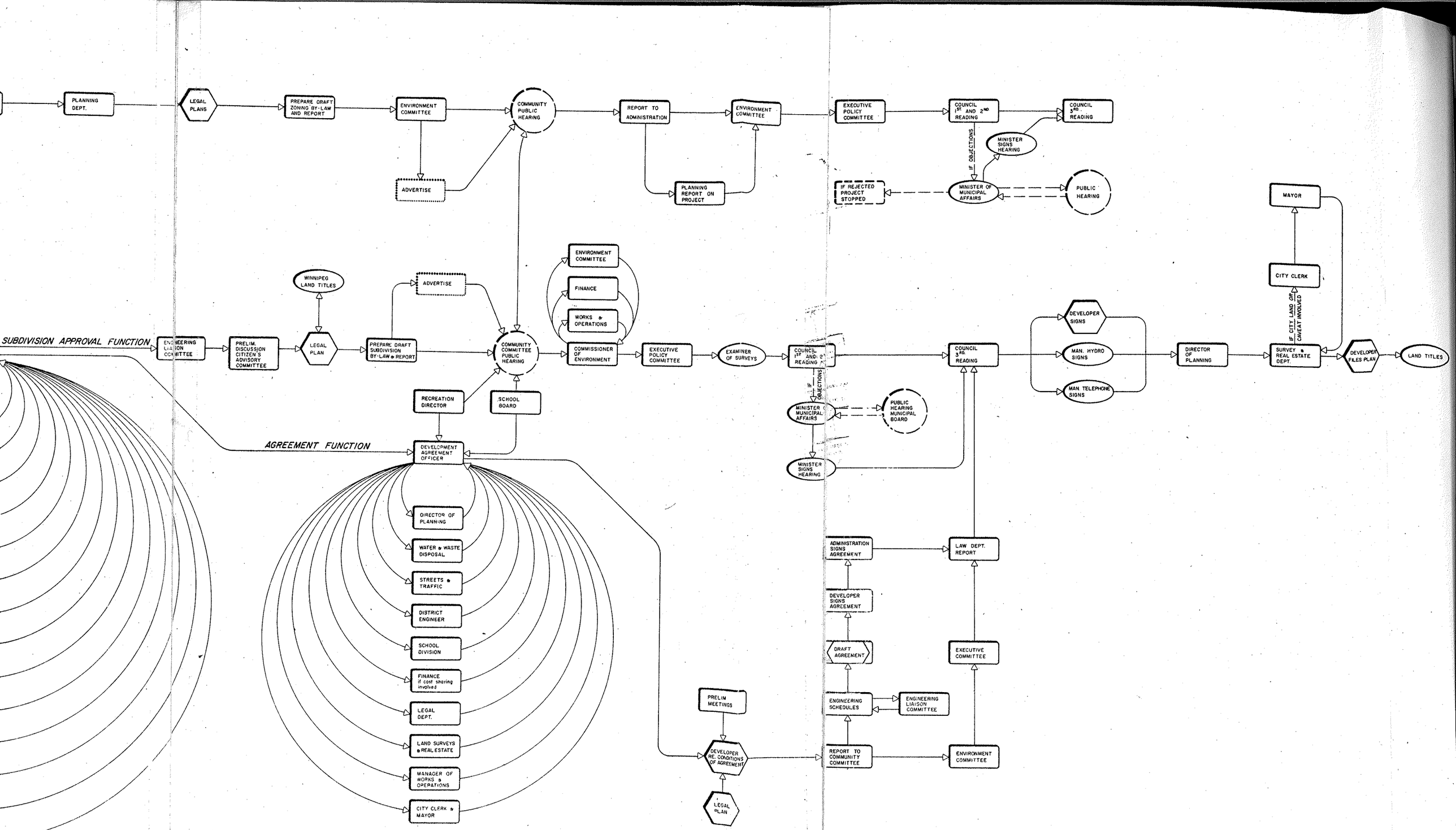
1. Raymond J. Burby, III, Lake-Oriented Subdivisions in North Carolina, Chapel Hill, North Carolina, 1967. p. 10.


ZONING APPROVAL
PLANNING DEPT.
ZONING FUNCTION
PRELIM. INVESTIGATION
INITIAL PROJECT LAND PURCHASE
INITIAL STUDY PLAN
PRELIM. SUBDIVISION PLAN
ENGINEERING LIAISON COMMITTEE
PLANNING DEPT.
SUBDIVISION APPROVAL
RECREATION DIRECTOR
MAN. HYDRO
MAN. TELEPHONE SYSTEM
GREATER WINNIPEG GAS CO.
DISTRICT ENGINEER
SCHOOL DIVISION
WATER & WASTE DISPOSAL
C. M. H. C.
DIRECTOR OF TRANSPORTATION
LAND SURVEYS & REAL ESTATE
DEVELOPMENT AGREEMENT OFFICER
DEVELOPMENT OFFICER
DISTRICT PLANNER
M. H. R. C.
LEGEND
ACTION BY DEVELOPER OR HIS AGENT
CITY AGENCY
ACTION BY DEVELOPER AND CITY AGENCY
PROVINCIAL AGENCY
OTHER GOVERNMENTAL BODY
THE PUBLIC
PRIVATE AGENCY



LAND DEVELOPMENT PROCESS

FIGURE 4

3.2 The Development Process

Briefly, the development process is as follows:

1. A developer will analyse market conditions to determine the need for and the proper timing for a proposed development.
2. Once he is satisfied that his market exists and that he has enough lead time, he will begin his search for a parcel of land that suits the type of housing development he wishes to build. This step is part of a continuing land assembling process and may be initiated several years before the housing is to be sold on the market. These potential development sites are usually confined to the periferal areas of the city which have been designated by city authorities as residential reserves. The developer may employ a realtor or deal directly with the land owners themselves when assembling land parcels for his future developments.
3. Often the land will be zoned agricultural and a developer will only acquire an "option" or the right to buy the land. Only when the developer is certain that rezoning will occur when he wants to develop, will he make the final purchase transaction. By this time he will have made initial agreements with the city authorities to determine time tables for trunk servicing and major roads, etc.
4. The developer's next step will be to employ professional consultants to analyze the principal features of the selected site and develop preliminary plans and designs.
5. He will then purchase the site, establish a means of financing, and proceed with a preliminary detailed design of the development, locating major facilities and determining the relationship between public and private lands and their uses, i.e., dedication, etc.

6. *The developer will then present his preliminary subdivision plan to the city authorities for discussion, suggestions and eventual approval.*

3.2.1 The Approval Process

Gaining city approval involves three separate procedures. (See Figure 4). The first is that of rezoning the land. Under this process, the zoning application is submitted to the various planning departments and agencies involved in drawing up zoning changes. A preliminary draft zoning change is produced and presented to the community at public hearings. The request for a zoning change may subsequently be approved or disapproved by the city council depending on the public acceptance and the various functional aspects of the project. If the zoning change is not approved and appeals are rejected, the developer has no alternative but to cease development and possibly sell the land.

Occurring at the same time as the zoning change are the subdivision approval and development agreement procedures. During the subdivision application the subdivision plan is circulated to the various public and private city agencies for their initial suggestions and approval. If there are no major disagreements, a subdivision bylaw and draft are produced and presented to the Community Committee at a public hearing.

Also during this period, a development agreement has been formulated and reviewed by various city departments. The purpose of most development agreements is to establish the rules whereby the developer is required to pay his full share of service costs in cash, dedicate property for open space use as schools, parks and recreation area, and to provide all necessary rights-of-way and controls on development.

If no major changes are suggested by either the city agencies or Community Committee, the subdivision plan and development agreement proceed through various legal and administrative steps until final approval is given by city council. The final step in the approval process involves the developer filing his subdivision plan with the city authorities.

Obviously the above description represents only a summary of the entire approval process. In fact the receipt of approval from city authorities for a subdivision development involves ninety different steps and may at present require from two to four years to complete.[1]

3.2.2 Development Controls

The principal means of development controls utilized by the city authorities for new subdivisions in Winnipeg is known as the development agreement. The development agreement provides guidelines and regulations governing the installation of a full range of services for varying types of development. In residential subdivisions the purpose of development agreements is to establish the rules whereby the developer is required to pay his full share of servicing costs, in cash, dedicate property for open space use for schools, parks and recreation and to provide all necessary rights-of-way. Through subdivision controls, the agreement enables the city and the developer both to establish all rules prior to the commencment of the project. Thus the city is able to plan for capital budgetary requirements in advance, the developer is able to proceed with a well planned, orderly development with all the rules established by the agreement with respect to services and other commitments in the community. The development agreement has proved to be very valuable both prior to and after the execution of the agreement, in that city council policy and requirements are clearly established in

1. *Winnipeg Free Press, March, 1974.*

one document. The agreements provide protection for the city by way of posting bonds, guaranteeing completion of servicing of the subdivision and ensuring a uniform service to all future home owners in the subdivision. It also is a means of regulating the rate of residential development to enable the school boards to plan for the influx of new students. The agreements also include schedules with provisions for service specifications, grade control, subdivision control, the developer's role in financing construction, pavements and open spaces. The development agreement enabled the former municipalities to control scattered development and ensure orderly and well planned development, including financial commitments to the public.

The land developers prefer the use of development agreements also, in that it enables their companies to complete their financial planning when they are fully aware of development commitments with respect to servicing, open space and other associated matters, prior to the commencement of the initial development (for detailed development controls see Appendix 3, Section B).

3.2.3 The Implementation Process

1. The implementation status of the development process begins with the installation of the service infrastructure. This includes storm water sewers, sanitary sewers, water lines, street and lane pavements, boulevards, street signs and lighting. Other utilities such as hydro, gas, and telephone may involve cost sharing with the agency responsible depending on the location of lines, etc. Cost sharing is also involved between the city and the developer, where services have to be "oversized" to accommodate adjacent developments. In all cases the developer is responsible for maintenance for a one to two year period.[1]

1. Underwood-McLellan & Assoc., "Report of the Technical Advisory Group on Development Agreements, Winnipeg, 1974.

2. While the developer is installing the various services and utilities, he is also building and selling houses on individual lots. In this way he can be receiving a continual return on his investment without having to lay out all the initial capital for roads, services, etc. This procedure also allows him to phase the development over a number of years, thus relating the number of homes he is producing to the housing absorption rate.[1]

3. During the early stages of development the city will commence building schools, if none are available in nearby districts to accommodate the new pupils. Elementary schools are usually built first with junior and senior high schools built in the later years of the subdivision development. Community clubs, recreation facilities, and open space areas are usually only developed after a majority of the new residents have occupied their homes, often several years after the first stages of development. Major commercial facilities may be delayed for many years until the surrounding areas have increased enough in population to support such facilities.[2]

3.3 Development Costs

Development costs are a most significant component of the development process. Development Costs are all the costs involved in the land development process. These include land costs, service costs, interest charges on capital, taxes on

1. Interview, B. Shrake, Heritage Homes, Winnipeg, March, 1974.
2. Interview, G. Adams, Real Estate Manager, Southwood Green, Winnipeg, January, 1974.

AN EXAMPLE of DEVELOPMENT COSTS *

LAND	350 ACRES IN SOUTH WINNIPEG
1. Purchase Price	$7,500.00/acre
2. Accumulated Interest	@ yr.2 $1,500.00/acre
3. Accumulated Taxes	@ yr.2 $ 350.00/acre **
4. Cost Raw Land/Acre	@ yr.2 $9,500.00/acre
5. Cost Raw Land/Lot	@ 3.8 du/ac.$2,027.00/lot

LAND DEVELOPMENT	59x100 FT. LOT
1. Service Cost/Lot	@$85.00/ff.=$5,015.00/lot
2. Overhead/Lot	@$33.00/ff.=$1,947.00/lot **
3. Total Development Cost/Lot	@118.00/ff.=$6,962.00/lot
4. Cost Raw Land/Lot	@$35.00/ff.=$2,027.00/lot
5. Developers Markup/Lot	@$20.00/ff.=$1,180.00/lot **
6. Selling Price of Serviced Lot	@$173.00/ff=$10,168.00/lot

HOUSE PRODUCTION	1446 SQ. FT. 3 BDRM.
1. Materials & Labour	@$ 23.00/sq'=$33,718.00/house
2. Overhead & Markup	@$ 7.00/sq'=$10,262.00/house **
3. House Selling Price	@$30.00/sq'=$43,980.00/house
4. Serviced Lot	=$10,168.00/serviced lot
5. Total Selling Price of Home (lot & house)	=$54,148.00/home

* Imformation on costs derived from personal interviews with Mr.B.Shrake,Heritage Homes Winnipeg,Mr.D.Pentland,City Planning Dept.,Mr.B.Freisen,Qualico Development Ltd., Mr.E.Hansen,Underwood Mclellan&assoc.,Winnipeg,Mr.D.Birch,C.M.H.C,Winnipeg

** Estimates based on interviews.

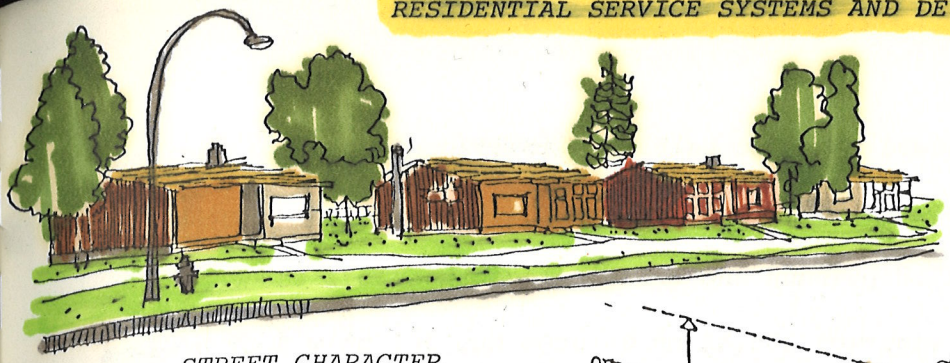
Figure 5

land and various overheads of land development which contribute to the final selling price of the home. The majority of these costs are known as front end costs or money that must be supplied by the developer at the beginning of a development before he is making a return by selling houses. A moderately sized housing project can represent enormous capital value and high front end costs. For example, a 100-acre project with 300 houses priced at $35,000 each is worth more than $10,000,000.[1] Even a major developer must borrow most of the money necessary to undertake such a project. Usually, however, money can be borrowed only for the actual construction of the housing. The land and first phases of the development must be paid for out of the developer's capital. The size of the project a developer can undertake and the amenities he can provide before he builds his houses are determined chiefly by the amount of capital at his command.

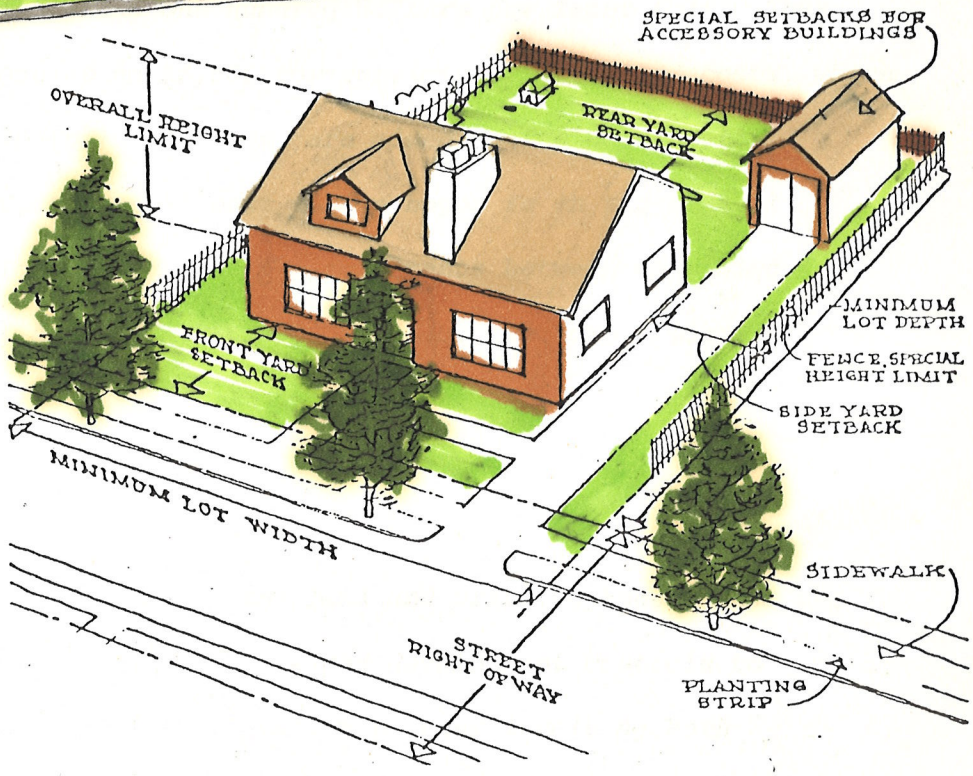
3.3.1 Service Costs

Of particular emphasis in this study are the service cost aspects of development costs, i.e., the cost of providing sanitary sewer, water, storm drainage, roads, sidewalks, boulevards, and street lighting. Since the provision of services is a major component of the overall land development cost (approx. 50% of the selling price of each lot, figure 5) efficient layout of services is a critical factor in subdivision design. The developer assumes the major share of the service costs. Exceptions occur where utilities are to be shared by neighbouring areas, in which the city will pick up part of the cost until it can be recovered from the neighbouring development. (See Appendix 3, Section B for responsibility for service costs.) Service costs are calculated on the basis of "front footage". Front footage refers to the linear run or length of utility at the street side of the lot. A typical lot sixty feet wide by one hundred feet deep has a frontage of sixty feet on which costs may be calculated. The

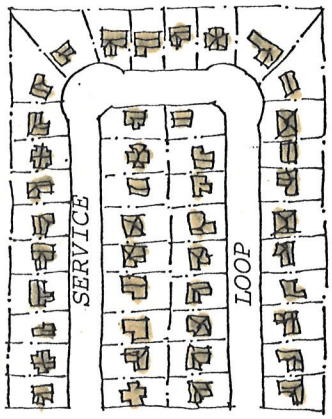
1. Interview, Mr. B. Shrake, Heritage Homes, Winnipeg, April, 1974



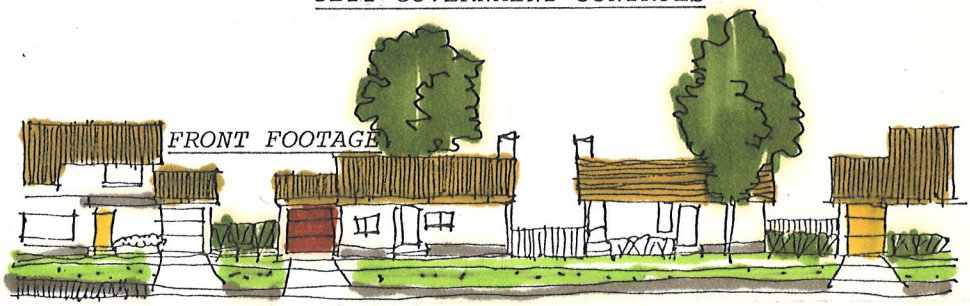
STREET CHARACTER

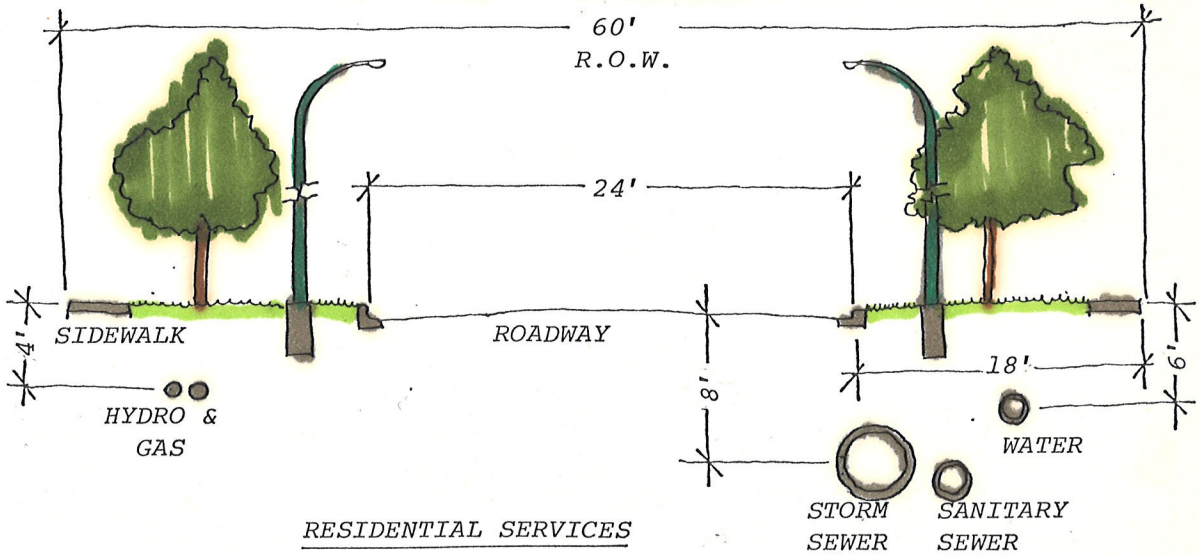


* CITY GOVERNMENT CONTROLS



TYPICAL STREET LAYOUT





RESIDENTIAL SERVICES

Figure 6

*SOURCE: "ZONING FOR SMALL TOWNS AND COUNTIES", U.S. DEPT. OF COMMERCE, WASHINGTON, D.C. 1970.

combined individual costs of providing sanitary sewer, water, storm drainage, etc. equals the total cost per front foot (see Figure 6). At 1974 Winnipeg rates, service costs are between eighty and one hundred dollars per front foot. Thus a sixty foot wide lot can cost up to $6,000 for servicing. When land costs, which includes interest on the principal and taxes, are added to the developer's various overheads and profit, the total cost to the buyer is in the area of $10,000 to $15,000 per serviced lot. This sum represents between one-third and one-quarter of the total cost of a $54,000, 1466 sq. ft. home. (See Figure 5 for cost breakdown.)

3.4 Summary

The developer and his activities in acquiring land and bringing houses into the housing market, the city, its approval process and development controls to maintain quality standards and the implementation process involving both parties, all have great bearing on development costs. A prime component of development costs are service costs, or the cost of providing sanitary, storm and water, etc. to houses within the development. Efficient layout of these services is necessary to minimize development costs and thus becomes a critical factor in subdivision design.

More than any other factor, it is the developer's response to the various facets of the land development process as discussed earlier which determined the final form a housing subdivision takes. His approach is influenced by a number of criteria; the land parcel (its size, location, characteristics, etc.), its purchase price, market demand, and a host of other considerations. There are other, often limiting, restraints: zoning and control bylaws regulating the number, placement, orientation, as well as the overall dimensions of buildings, plus the widths, setbacks, and general patterns of streets.

This chapter, is concerned with the major aspects of the development process influencing the planning of new subdivisions in Winnipeg. Specifically, it explores the ways in which this process affects the development of open space and recreation features.

4.1 Significant Form/Planning Factors

Three major factors have subtle, but nonetheless significant, form/planning implications on open space/recreation development in new subdivisions: 1) the housing market; 2) the regulatory and production controls imposed on new housing by the city authorities; and 3) the characteristics of the individual site. Each can influence development in either of two ways. The first may be to increase servicing costs, as well as that of unit construction. (Compliance with city standards and site characteristics, which may render this more difficult, are the main determinants.) The second may be to increase land costs.

4.1.1 Market Demand

A developer's "product" must remain competitive. Market demand, plus mandatory city controls ensuring quality is not sacrificed in meeting

this demand, determines the minimum or "base lot price" in a subdivision. For this base lot price, a home buyer can expect to purchase a single family detached house, with certain basic features (for example, private outdoor space, off-street parking, full servicing, paved roadways, etc.) within easy reach of facilities such as schools, playgrounds, parks, community centres, and the like, at a reasonable price.

4.1.2 City Controls

Production and regulatory controls, imposed on new housing developments by city authorities, are another influence of which developers are keenly aware. Criteria include not only standards for design and installation of services, but also: housing densities, the location and size of parcels a developer must reserve for parks, schools and community centres; coordination with existing facilities, and the like. Design and location of such areas closely involves street layout, organization of housing, and placement of schools , community centres, parks and playgrounds, etc.

The city authority's concern is that the above requirements are adequately met, both at present and long after the developer has completed the development. Thus, high development standards initially, minimize long-term maintenance costs. Complying with these standards is expensive, financially and in terms of land area. For instance, the most popular form of house in Winnipeg, the bungalow, maximizes street frontage -- frontage on which land development costs are assessed.[1]

1. Interview, Mr. B. Shrake, Heritage Homes, Winnipeg, April, 1974.

Front yard setbacks (20' min. from R.O.W.) and sideyards (5' min.) increase the total cost by adding to the land required for each house, as do driveways and garages, and large rear yard areas. Not only does this absorb land which might be put to better use -- such as open space -- but it also substantially increases the price of each house.

Utility layouts strongly affect development costs and thus subdivision layout, since the plan of utilities below ground is repeated by streets above. Typical is the "grid" street pattern in which houses parallel the street, row upon row, in an attempt to use both land and utility systems efficiently and economically. The curvilinear street pattern, currently used in Winnipeg, is more ideally suited to rolling terrain, where it can provide for more useable lots than does the grid. However, the curvilinear layout has been adopted in most situations, since it usually offers a more visually interesting street.[1] Including walkways and boulevards, residential street rights-of-way may be 60 feet in width. When these areas required for lanes, utility easements, setbacks for major roads and intersections, etc. are added, the total cost in land may be from 20 - 30 percent of the total land development cost.[2]

4.1.3 Site Characteristics

Particularly important determinants of subdivision planning are the characteristics of the site, of which there are two main categories: physical and locational.

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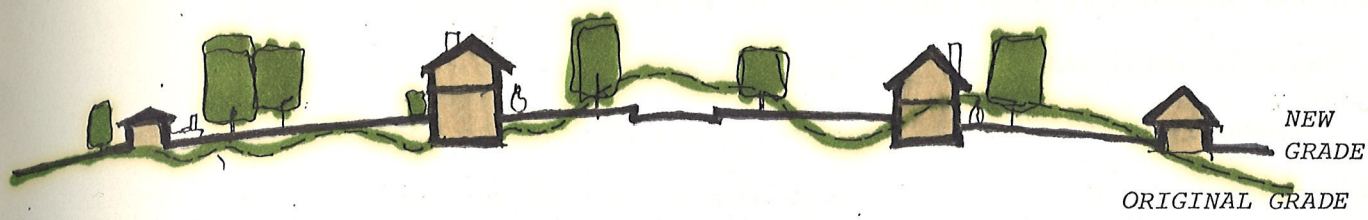
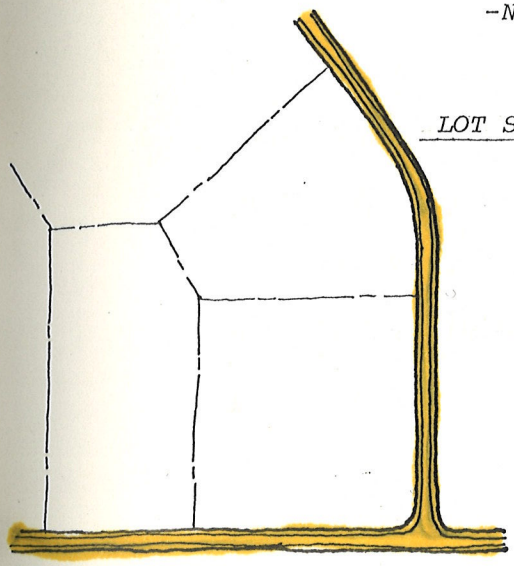
1. *The National Association of Home Builders, "Land Development Manual" National Housing Center, Washington, D.C.*
2. *Ibid.*

SITE CHARACTERISTICS AS LIMITING FACTORS TO THE DEVELOPMENT OF SINGLE FAMILY DETACHED HOUSING.



DRAINAGE

- -TOTAL REGRADING OF SITE TO FACILITATE RUNOFF
- -ELIMINATES NATURAL AREAS, DESTROYS SITE FEATURES
- -INCREASES LAND DEVELOPMENT COSTS
- -NECESSITATES MAXIMUM LOT YIELD



LOT SIZE, SHAPE AND SITE CONFIGURATION

- -IRREGULAR SHAPE OF SITE MAY RESULT IN AREAS THAT ARE HARD TO SUBDIVIDE
- -RESULTS CAN BE UNEEDED LENGTH OR WIDTH OF LOTS
- -REDUCES OVERALL LOT YIELD, INCREASES BASE PRICE OF LOT
- -REDUCTION IN SERVICE EFFICIENCY
- -MAY NECESSITATE REDUCTION OF OPEN SPACE AREA TO INCREASE LOT YIELD

LOCATION

- -PRIME LOCATIONS OF SITE (SCHOOLS, COMMERCIAL, EMPLOYMENT ETC.) ARE MOST ATTRACTIVE FOR DEVELOPMENT
- -ENTAIL HIGHER LAND COSTS
- -DEVELOPER MUST MAXIMIZE LOT YIELD TO REDUCE LAND AND SERVICING COSTS PER UNIT TO REMAIN COMPETATIVE

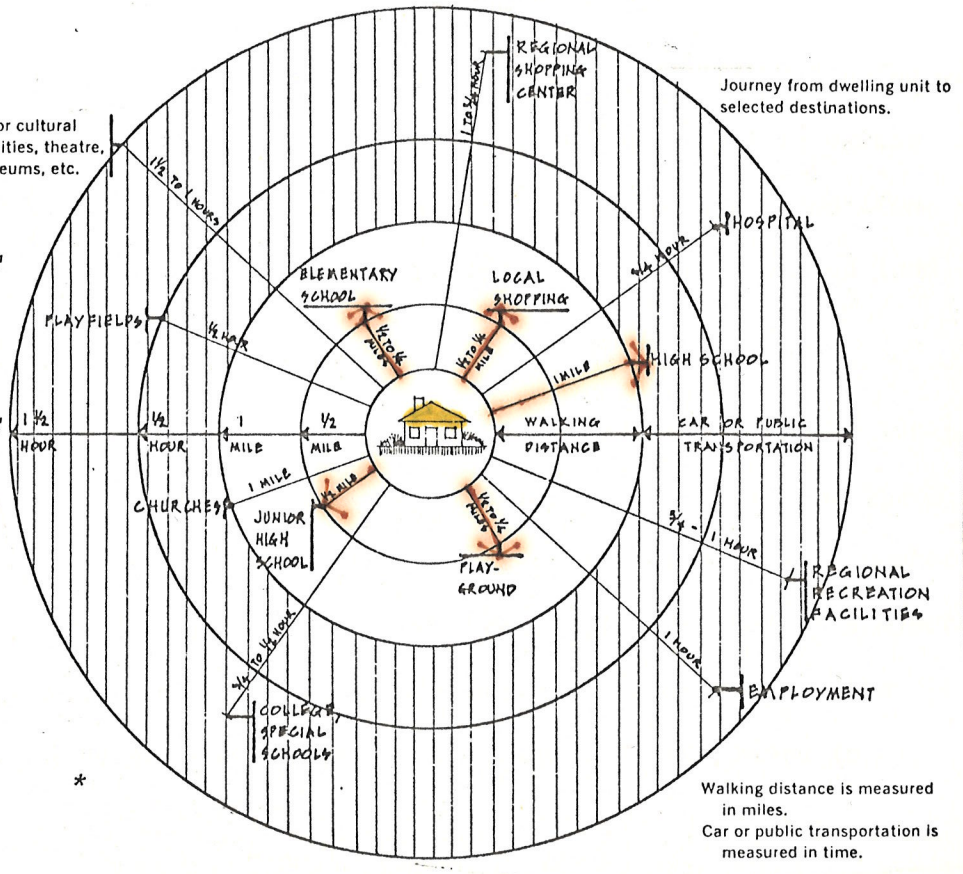


Figure 7

SOURCE: PLANNING DESIGN CRITERIA, DECHIARA AND KOPPELMAN, LITTON EDUCATIONAL PUBLISHING, INC.

Physical characteristics refer to topography, natural features (such as treed areas, etc.) types of soils, drainage, even the total size and configuration of the land parcel. These can influence development either by presenting obstacles to development (thus increasing servicing costs) or by limiting the area which can be profitably developed (thereby increasing overall land cost).

Of prime importance in Winnipeg is the lack of topography; the very flat land combined with the area's water-retaining soils creates drainage problems. Since almost all drainage flows by gravity, draining flat land may require one of a number of costly alternatives: construction of drainage ditches; installation of large underground pipes; building of holding ponds; or cut and fill operations to create high and low drainage points. This last solution not only increases development costs by necessitating greater site preparation, but it also destroys any natural features such as trees, sloughs, streams, etc. (see Figure 7).

Both the size and the shape of the land parcel affect the form/planning of new residential developments. Site configurations may result in excess land after subdivision, which can only be absorbed through the addition of unneeded width (increasing servicing costs) or depth (increasing land costs) to lots.

Size may determine what extra cost a developer can add to his basic lot price to finance a community extra such as recreation facilities or open space. In large developments, ammortization spreads this cost over a greater number of units and usually long periods of time. Facilities in smaller projects necessitate more added cost per house over shorter periods (since the developer's interests are short-term). Thus, small developments in

Winnipeg have a very limited range of amenities.[1]

Locational characteristics refer to the location of the site, not only with regard to market demand, but also in relation to employment areas, schools, access to public transportation, commercial facilities, etc. A developer may be less inclined to provide any amenities to interest home buyers should a subdivision's location alone render units saleable. For a development in a less desirable area, he may include extra community features (particularly recreation and open space) both to make his subdivision more enticing and to offset any negative image due to its surroundings.[2]

Another primary influence of location on new subdivisions is in the form of initial land cost. These land costs are strongly affected by the density (zoning of a particular area) allowed by planning regulations. Higher densities are usually permitted in prime locations, due to proximity to places of employment and shopping areas, transportation, etc. The greater the allowable density, the higher the cost of land. With single family detached housing, a developer can only remain competitive by building efficiently on as many lots as possible, thus reducing both his land and development costs per lot.

4.1.4 Summary - Lot Yield

The development process discussed affects the form/planning of new developments by regulating the number of lots a developer can obtain from a given tract of land. A site's "lot yield" ultimately affects the land and servicing cost per lot, the cost of the entire development, and any amenities to be provided. City regulations of lot dimensions,

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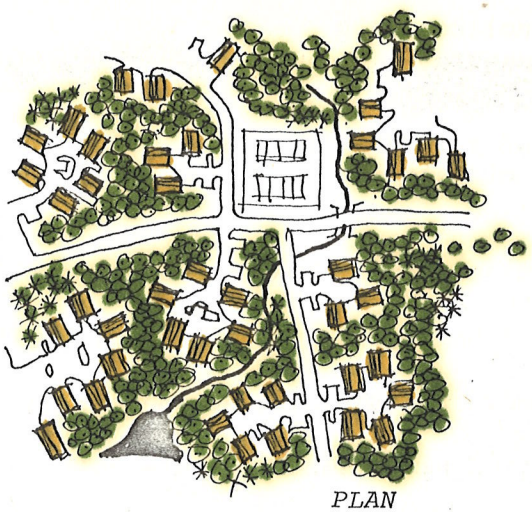
1. Interview, Mr. B. Shrake, Heritage Homes, Winnipeg, April, 1974.
2. Interview, Mr. Wieb, Ladco Developments, Winnipeg, March, 1974.

setbacks, rights-of-way, road configurations, and service layouts, etc. increase development costs, encouraging conformance to rigid look-alike housing patterns. Economic pressures of reduced lot yields and high service costs forces the developer to subdivide his parcel of land into as many lots as possible, to gain a fair return on his investment through full utilization of the land and efficient use as possible of utility systems. Large lots, road rights-of-way, rear lanes, park areas, and unused utility frontage, etc. lowers the "lot yield", decrease the servicing efficiency and thus increasing development costs per lot and the selling price of each house. Thus the "lot yield" and development cost determine the amount of open space which can be set aside, and the amount of money that can be spent to develop it. The developer cannot reserve or develop additional areas for parks, buffer strips, pedestrian circulation, or added recreation facilities if the cost per lot (land and servicing) is already too high. The problem is economic: more open space, fewer lots, greater development costs per lot, less profit.



PLAN

TYPICAL CLUSTER ARRANGEMENT

STREET CHARACTER

Figure 8

Part III

A Recreation/Open Space Community As An Alternative Development Form

Chapter 5

Cluster - An Alternative Housing Organization

This study up until this point has looked at conventional single family housing subdivisions, explored their planning, organization and implementation as it affects open space and recreation development. There are other development alternatives which offer similar benefits in housing and level of service, yet greatly increase the potential for recreation enjoyment within an open space context. This chapter will look closely at one alternative, cluster housing, and examine its application in a Recreation/Open Space Community.

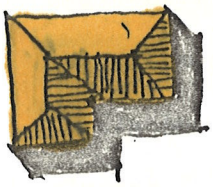
5.1 Characteristics of Cluster Housing

In the United States, many communities have been planned and executed, successfully exploiting recreation amenities within an open space context. These developments, known as "open space communities" and sometimes "planned unit developments"*, consist of carefully planned and implemented housing developments where shops, schools, swimming pools, playgrounds, and other facilities for outdoor recreation are linked to one another and to housing. The links between these various facilities and housing are provided by open space areas which also serve as recreation areas and give an almost "rural" quality to the housing community.

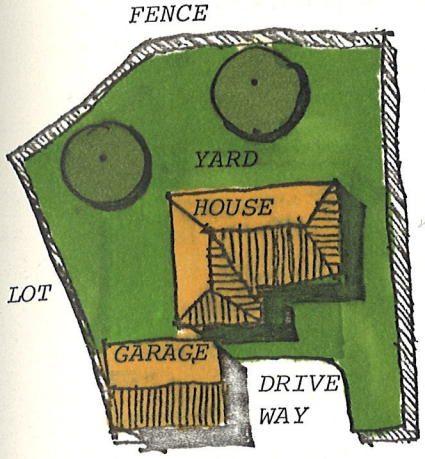
A method of organizing houses, known as clustering, is commonly used to increase the efficiency and provide flexibility of housing layout in these developments. Houses organized in tight groupings or "clusters" can maintain many of the desirable characteristics of the single family home, while reducing service costs and conserving open space area for recreation development (see Figure 9).

*Planned Unit Developments most commonly means a large scale development that includes commercial and public facilities and sometimes industrial development as well as housing. PUD may incorporate the open space concept in its design but its uses are larger in scope. PUD also generally involves densities higher than permitted by existing zoning usually in the form of multi-family housing.

ELEMENTS OF CLUSTER HOUSING

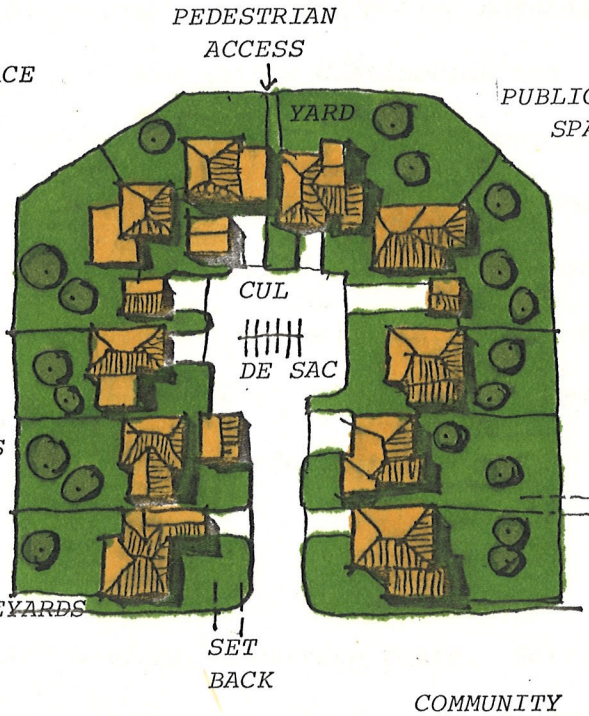


SINGLE UNIT



HOME

SINGLE UNIT
2 CAR PARKING
PRIVATE OPEN SPACE
INDIVIDUAL LOT
STORAGE AREA
ACCESS



TYPICAL CLUSTER

REDUCED UTILITY LENGTHS
3-5 D.U.'S /ACRE
CUL DE SAC
PEDESTRIAN ACCESS TO PUBLIC OPEN SPACE
MINIMUM SETBACKS & SIDEYARDS

COMMUNITY

OPEN SPACE SETTING
RECREATION FACILITIES
INTERNAL CIRCULATION
LAND USE BUFFERS
DISTINCTIVE NEIGHBOURHOOD AREAS
CONCERVE NATURAL SITE FEATURES

Figure 9

5.1.1 Residential Qualities

Besides maintaining many of the desirable qualities of the single family home, (see figure 9 for characteristics of cluster housing) cluster development may also encourage a stronger sense of community than found in conventional developments in areas such as physical structure and operational organization. The various neighbourhoods within the larger community are usually organized around the distinctive natural qualities of their respective sites and thus gain a distinction and recognition not commonly found in conventional developments. Responsibility for maintenance of the open space and recreation facilities afforded in these communities is often handled by local community associations or other organizations that encourage the participation of residents. These factors can create a stronger identity of the individuals' place in a community and may lead to a more responsible attitude towards community life.

5.1.2 Development Costs

Clustering is a principal method for savings in service costs. Service costs are reduced because the distance between houses is reduced (frontage) along with the lengths of pipe, roads and other required utilities. Comparatively short sections of road, utilities, etc., can serve a larger number of houses than in conventional developments. These savings may total as much as $1,000 per house.[1]

5.1.3 Open Space Area

Under the cluster housing concept, sideyards, setbacks, and even rear yards can be narrowed, eliminated or reorganized to the minimum possible, thus conserving large areas of open space when combined. The additional

1. Whyte, William, Cluster Housing, American Conservation Association, Woodhaven Press Assoc. Corp., New York. 1967. p. 17.

open space when consolidated can be used as buffers between housing and roadway or rail lines or woven among the cluster units and used for parks, recreation and play spaces. In such spaces existing natural features such as trees, streams or lakes can be preserved and incorporated into the design of the housing environment. Thus only those areas of a site which are ideally suited for housing are utilized. The open space often associated with cluster housing can also encourage a wider and more abundant range of parks, open space and recreation facilities that can cater more specifically to residents' desires than conventional subdivisions. These activities often include bike and walking trails, cross country ski trails, picnic areas and even fishing and boating where lakes and streams are part of the development.

5.1.4 Summary

To summarize, the cluster form of development is a housing alternative that can improve on many of the inefficiencies of conventional subdivision design. Not only does it save in development costs through greater flexibility in site planning (circulation systems, site utilization, community facilities, etc.) but it also provides a better living environment in the form of more open space for recreation and leisure time activities.

5.2 Limitations of Cluster Housing as a Development Form in Winnipeg

While cluster housing in the form of planned unit developments has been used quite extensively in the United States, it has yet to make any significant appearance in western Canada. There are, however, several innovative open space developments based on the conventional subdivision which illustrate the limitations of the existing development form and suggest some of the prob-

lems involved with the use of the cluster concept in Winnipeg.

Two of these developments, Lake Bonavista in Calgary and Lakeside Villages in Winnipeg, were closely examined and compared with this in mind (see Appendix 4 for case study comparisons). These two case studies, though far from representing an open space community with cluster housing, illustrate the inherent problems of providing additional recreation or open space amenities. The case studies found that the factors working against a recreation/open space form of community in conventional developments would probably be the same factors preventing cluster developments. The housing market, the city authorities' controls over development and the characteristics of the housing site were the factors that tended to work against open space community development in Winnipeg by influencing the developer's decision of what he is able to build economically (i.e., lot yield vs. land and servicing costs).

5.2.1 Market Demand as a Limiting Factor

From the case studies it is apparent that market demand was very significant in determining what developers would build. If the buying public are high income earners and willing to pay extra for open space and recreation amenities, then the developer is only too willing to capitalize on this market. This is especially true in Calgary where a large portion of the population is in the upper end of the income bracket as compared to Winnipeg.[1] The majority of the potential home owners in Winnipeg earn between $12,000 and $20,000 per year and are unable to afford the more expensive housing where a developer's profit margins are greater. Additional capital costs for privately-owned recreation and open space features in the community seem to be more readily accepted by home buyers in Calgary.[2]

1. Interview with Mr. Bob Kemoff, Kelwood Corp., Calgary, Alberta, May, 1974 and Mr. B. Shrake, Heritage Homes, Winnipeg, March, 1974.

2. Ibid

5.2.2 City Authority's Controls

The City of Winnipeg presently lacks any comprehensive policy or legislation which would encourage open space-oriented developments that utilize cluster housing.[1] Current administrative attitudes regarding innovative ideas in housing must be resolved if a change in development thinking is to occur. City engineering and design standards governing lot sizes, setbacks, sideyards, street configurations, rights-of-way and service designs, etc. are examples of areas that must be examined with flexibility in mind instead of minimum specification applied across the board.

These standards for development invariably determine the level of amenity that the developer can provide by determining his lot yield and thus his house selling price. (see Chapter 4). One example of an adverse effect on a developer's lot yield due to city policy concerns open space dedication (10% of total development area) and the use of artificial lakes in subdivisions. These lakes which are often required for storm drainage control as holding ponds (see appendix 2) require large areas of developable land and offer an excellent opportunity for recreation development. However, water or shore forms of recreation activity do not conform to the city's current concepts of recreation activity with the result that no part of the lake area may comprise part of the required 10% dedicated area. Leaving both parks and lakes as open area lowers the developer's total site lot yield for development and thus restricts the funds and area available for open space and recreation development.

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1. Interview with Mr. D. Pentland, City Planning Dept., Winnipeg, March, 1974.

5.2.3 Physical Site Characteristics - A Limiting Factor

The physical characteristics of a housing site in Winnipeg have also worked against the development of open space communities utilizing cluster housing. These characteristics include not only size and location of a housing site, but the cost of land as well. Single family developments in Winnipeg tend to be of small size (under 500 acres)[1], located near existing service systems on very expensive land ($7,000 - $10,000 per acre).[2] This combined with minimal restricting site conditions for development (storm drainage being the only serious restriction) makes it feasible for developers to utilize all the land possible for housing. Larger sized developments (1,000 acres or greater)[3] would allow additional open space and recreation expenditures to be spread over a larger number of lots with less effect on the housing prices.

5.3 Summary - Affects on Lot Yield

The affect on the developers' lot yield and subsequent house prices seems to be the major key to the realization of an Open Space Community in Winnipeg. Conventional subdivisions developments cannot provide additional recreation and open space development without increasing house prices. Greater open space reduces the developable area, lot yield, and thus increases house prices. Additional recreation facilities mean added expense. Additional cost would have to be added onto the basic house price to pay for a minimum of recreation amenities over and above the facilities currently provided by the city (see Appendix 1 for city recreation standards and costs). This is presently not acceptable to developers or potential home buyers in Winnipeg.[5]

1. Raymond J. Burke III. Lake-Oriented Subdivisions in North Carolina, Chapel Hill, North Carolina, 1967; plus interview, Mr. B. Shrake, Heritage Homes, Winnipeg, April, 1974. Interview, Mr. B. Kemoff, Kelwood Corp, Calgary, May, 1974.
2. Interview, Mr. B. Shrake, Heritage Homes, Winnipeg, April, 1974.
3. Raymond J. Burke III. Lake-Oriented Subdivisions in North Carolina, Chapel Hill, North Carolina, 1967; plus interview Mr B. Shrake, Heritage Homes, Winnipeg, April, 1974. Interview, Mr. B. Kemoff, Kelwood Corp, Calgary, May, 1974.
4. Ibid. 5. Ibid.

In cluster developments in the United States, the average savings in service costs are between $500 - $1,000 per house.[1] *These savings may aid the developer in providing recreation facilities and developing the additional open space area saved by clustering. In Canada and Winnipeg specifically, with its small size developments, similar savings in service cost through clustering of houses would not provide sufficient funds to allow development of both recreation facilities and increased open space area. The primary reasons are greater land cost, service and construction costs resulting in higher house selling prices on Canadian markets.*[2]

This then is the problem to which this study is directed: How to provide more open space and recreation facilities without increasing the overall development costs to the developer (i.e., maintain total lot yield of site) without increasing the city's initial financial commitment or increasing the house selling price to the resident, while maintaining, as much as possible, the existing standards and qualities of the single family detached home.

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1. *Whyte, William, "Cluster Development", Woodhaven Press Assoc. Corp., New York, 1967. Page 17.*
2. *Interview, Mr. B. Shrake, Heritage Homes, Winnipeg, April, 1974 and Mr. Bob Kemoff, Kelwood Corporation, Calgary, May, 1974.*

GROSS AND NET DENSITY COMPARASIN

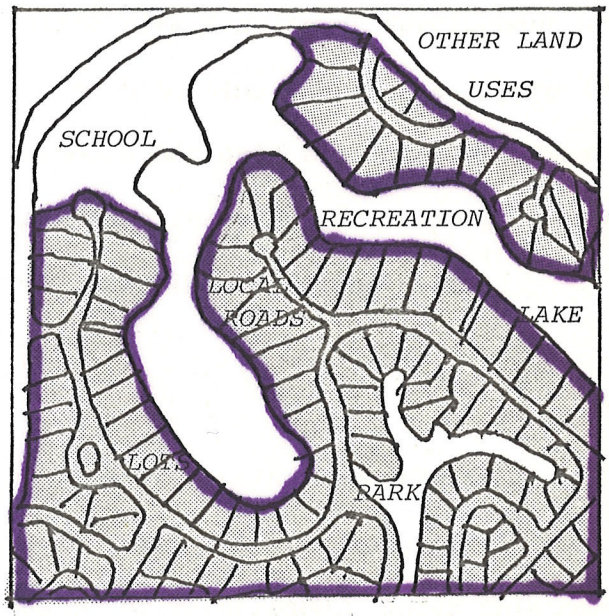
GROSS SITE DENSITY

- comprises total site area divided by total number of dwelling units.
- includes schools,parks,roads and all other land uses.

$$\frac{88 \text{ DWELLING UNITS}}{35 \text{ ACRES}} = 2.5 \text{ du/ac.}$$

NET SITE DENSITY

- comprised of specific site area divided by number of dwelling units within that area.
- includes only single family dwelling lots and local roads.



$$\frac{88 \text{ DWELLING UNITS}}{20 \text{ ACRES}} = 4.4 \text{ du/ac.}$$

Figure 10

It is possible to increase open space area and provide additional recreation facilities (i.e., create an open space community) by increasing the density of development. If the density of development is increased without changing the total number of dwelling units on the site (i.e., maintain a constant total lot yield) less area will be required for housing. This increase in density of development or "net density" (as opposed to gross density, see figure 10) leaves additional area as open space for parks, buffers and open space link areas, etc. It also reduces the length of utility runs or frontage on which service costs are calculated. These savings on service costs represent a source of revenue to the developer for the development of open space and recreation facilities in addition to those provided by the city authorities.

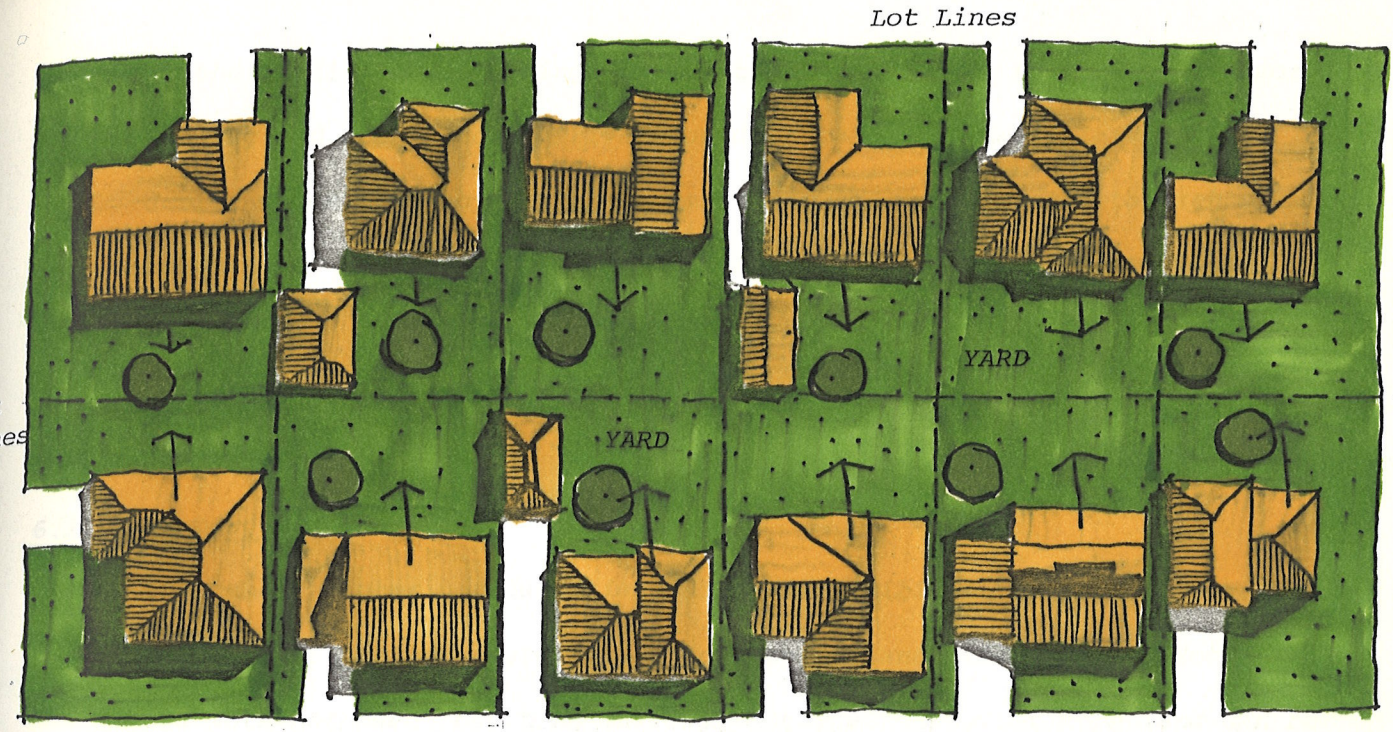
6.1 Increased Net Density

The term net density refers to the specific site density of development or the number of dwelling units per acre within each housing group (see figure 10). Net density does not include parks or schools but only the immediate area being developed. Increasing net density means increased efficiency in the layout, design and utilization of local utilities, services and land use.

6.1.1 Zero Lot Line Zoning

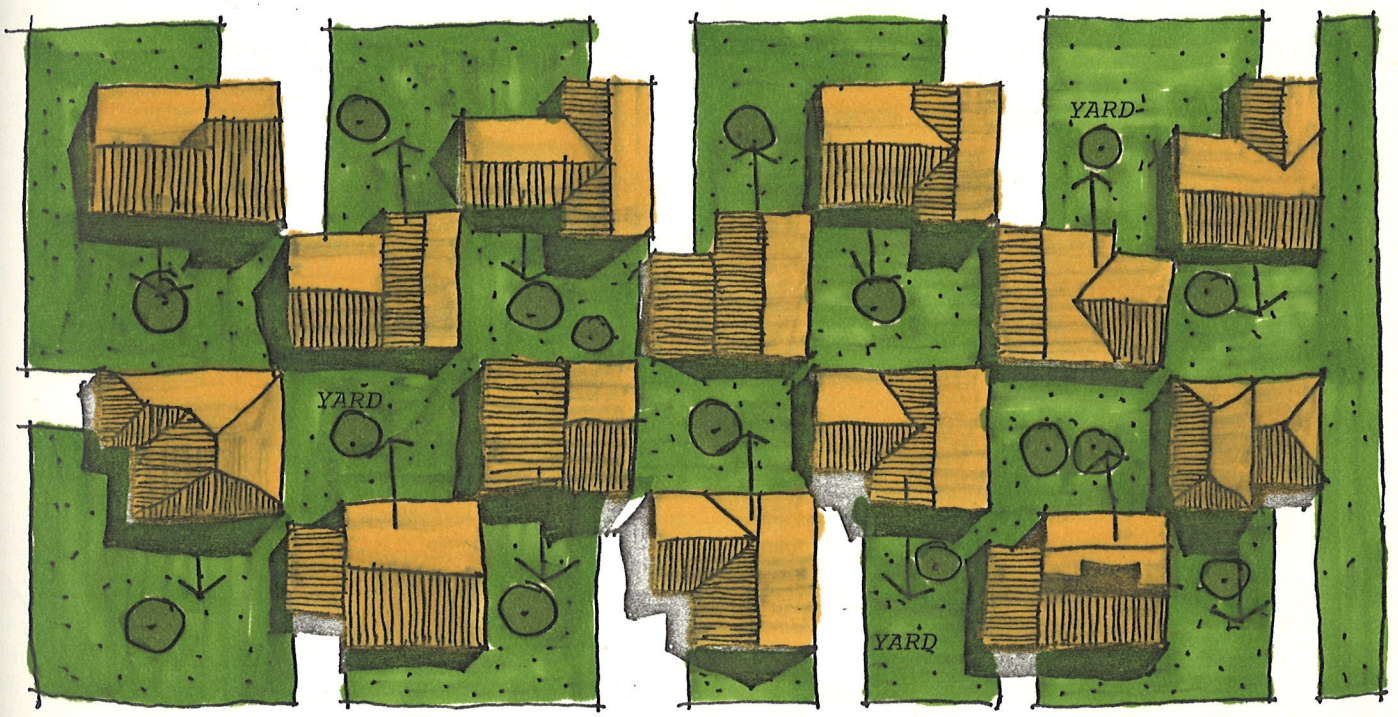
"Zero lot line" zoning is a technique of housing layout/site planning useful for increasing net densities while allowing many of the desirable qualities of conventional housing to be maintained. Under this concept as in cluster housing (see Chapter 5), more useable land for housing is obtained by eliminating requirements for house setbacks, sideyards, and even lot lines initially. Houses can be sited at the front, back or side

ZERO LOT LINE ZONING CONCEPT



CONVENTIONAL SUBDIVISION LAYOUT

Houses placed on 50'x100' lots.
Minimum setbacks of 20',side yards of 5'.
Parking possible either in garages at back of property or under house.
Large back yards utilizing fences to gain privacy.



ZERO LOT LINE ZONING LAYOUT

Elimination of sideyards,setbacks & lot lines initially.
Allows flexibility of locating houses at front,back or side of lots.
Outdoor private area related to design of the house.
House design relates to locations of surrounding outdoor private areas.
Allows greater density of houses and thus lower service costs.
Can free up more area for open space on the community level.

Figure 11

of the traditional building areas with the land thus saved used for more housing and open space. Private outdoor space is then related to the design of each house and the houses themselves are related to each other so that the privacy of each individual home owner is maximized (see figure 11). Only after foundations are laid, are the final lot lines drawn up and incorporated into the zoning.[1]

6.1.2 Summary

The use of higher net densities based on flexibility in siting houses is a way of achieving greater efficiency of land utilization. Not only are lots narrowed resulting in lower service costs, but more land can be freed up to be used for more open space development.

Traditionally, zero lot line zoning has only been applied in conventional subdivision developments where its advantages are limited by rigid street, lot and servicing configurations. A much more efficient use would be in the cluster form of housing mentioned earlier where the best of both organizational efficiencies could be maximized (see figure 12).

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1. *"Building Development Periodical", October, 1972, page 39.*

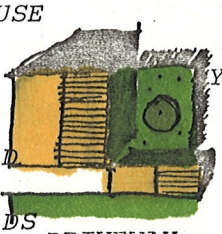
ELEMENTS OF CLUSTER HOUSING AND ZERO LOT LINE COMBINED

SINGLE UNIT

HOUSE

HOME

SINGLE UNIT
2 CAR PARK
PRIVATE YARD
NO SETBACKS
NO SIDE YARDS

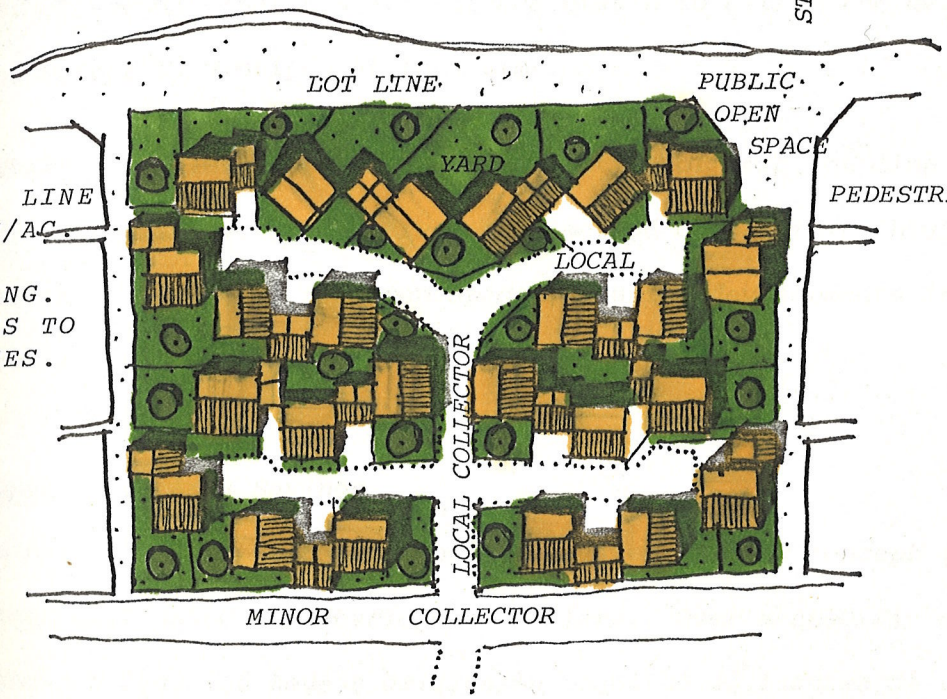


YARD

GARAGE

DRIVEWAY

STREET



LOT LINE

PUBLIC OPEN SPACE

YARD

PEDESTRIAN ACCESS

LOCAL

COLLECTOR

LOCAL

MINOR

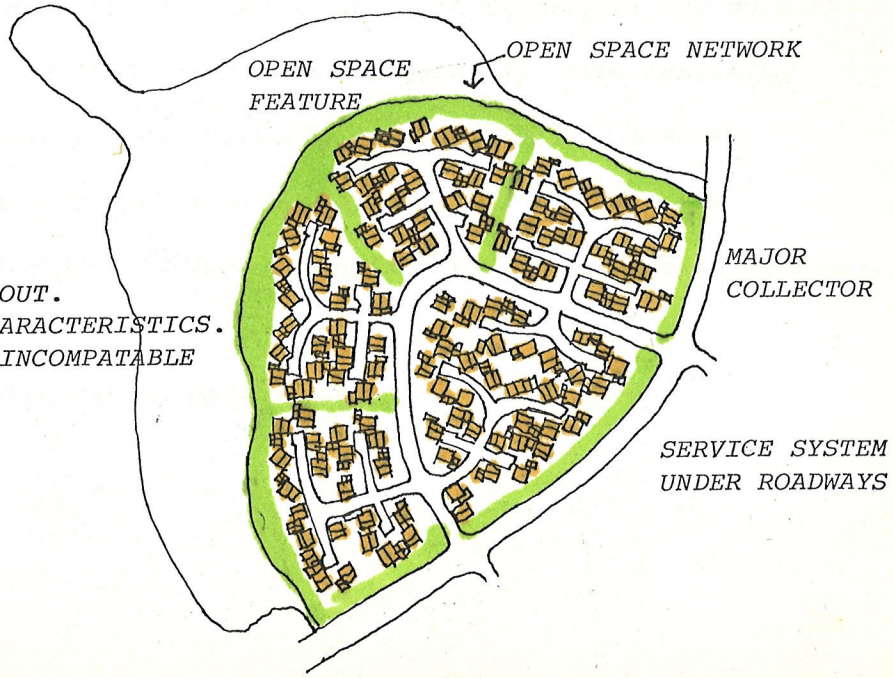
COLLECTOR

CLUSTER

LUSTER, ZERO LOT LINE
4 UNITS/10.5 DU/AC.
AD HIERARCHY.
WS COURT HOUSING.
EDESTRIAN ACCESS TO
BLIC OPEN SPACES.

SUPER CLUSTER

COMMUNITY LEVEL WITH CLUSTER & ZERO LOT LINE COMBINED.
24 UNITS/CLUSTER, 130 UNITS/GROUP
NET DENSITY 10.51 DU./ACRE
MAXIMUM EFFICIENCY OF SERVICE SYSTEMS.
MAXIMUM SAVINGS IN OPEN SPACE AREA.
VEHICLE FREE PEDESTRIAN LINKS THROUGH-OUT.
ALLOWS PRESERVATION OF NATURAL SITE CHARACTERISTICS.
MAINTAINS BUFFERS BETWEEN HOUSING AND INCOMPATABLE LAND USES.



OPEN SPACE NETWORK

OPEN SPACE FEATURE

MAJOR COLLECTOR

SERVICE SYSTEM UNDER ROADWAYS

Figure 12

Chapter 7

The C.O.R.D. Alternative* for Open Space Community Development in Winnipeg

One of the major reasons for the lack of development of Open Space Communities in Winnipeg is the inability of the developer to finance additional recreation development or leave undeveloped, greater areas of open space for recreation purposes. Under current development practices, such additional open space and recreation development would adversely affect the "lot yield" of the development site and be reflected in higher house prices or lowering the developer's profit. These alternatives are not acceptable to either the developer or the housing market in Winnipeg at this time.

This chapter will explore using a combination of zero lot line and cluster housing (the C.O.R.D. alternative) as a method of obtaining higher net densities (to maintain lot yield) for open space community developments in Winnipeg (see figure 12).

7.1 Open Space Area Savings

A combination of the zero lot line and cluster housing concept (C.O.R.D.) can save both open space and development dollars. Over a specific site this might mean that whereas 100 houses originally required 23.1 acres at a net density of 4.3 du/acre, they would only require 13.7 acres at a net density of 7.3 du/acre or 9.5 acres at a net density of 10.5 du/acre (see figure 13). The resulting savings in open space area would be approximately 9.2 acres and 13.5 acres respectively with the total number of houses being placed on the site the same, i.e., the same gross site density (see appendix 5 for detailed calculations).

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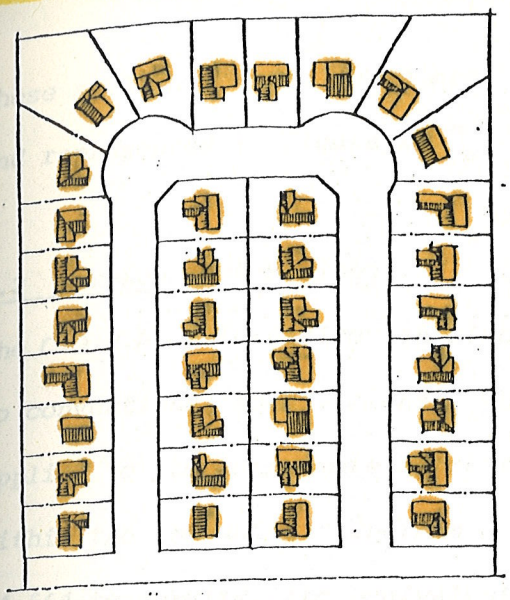
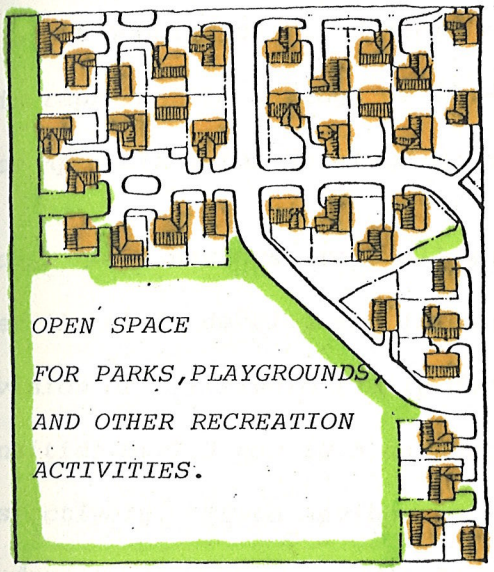
* Concept for Open Space and Recreation Development

OPEN SPACE AND SERVICE COST SAVINGS WITH INCREASED NET DENSITY (C.O.R.D.)



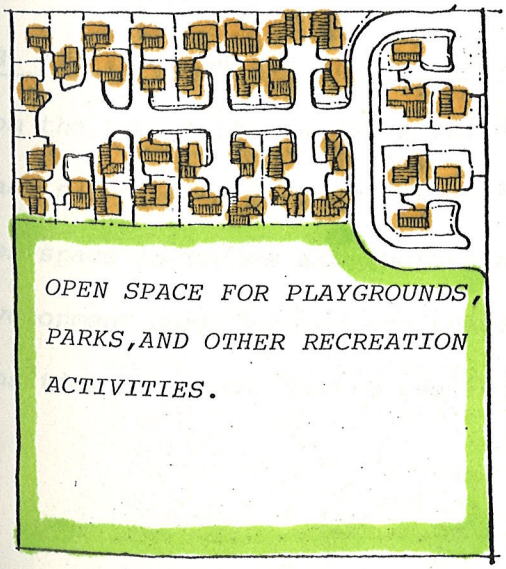
CONVENTION SINGLE FAMILY DETACHED

- 36 DWELLING UNITS
- 4.3 DWELLING UNITS/ACRE
- 8.3 ACRES OF RESIDENTIAL AREA
- NO PUBLIC OPEN SPACE AREA
- $4,564. PER DWELLING UNIT SERVICE COST



MEDIUM DENSITY C.O.R.D. ALTERNATE

- 36 DWELLING UNITS
- 7.3 DWELLING UNITS/ACRE
- 4.9 ACRES OF RESIDENTIAL AREA
- 3.4 ACRES OF PUBLIC OPEN SPACE
- $2,701.PER DWELLING UNIT SERVICE COST



HIGH DENSITY C.O.R.D. ALTERNATE

- 36 DWELLING UNITS
- 10.5 DWELLING UNITS/ACRE
- 3.4 ACRES OF RESIDENTIAL AREA
- 4.9 ACRES OF PUBLIC OPEN SPACE
- $2,852.PER DWELLING UNIT SERVICE COST

Figure 13

These savings in open space area can be plotted as a function of density 00 and represented in figure 20.

7.2 Service Cost Savings

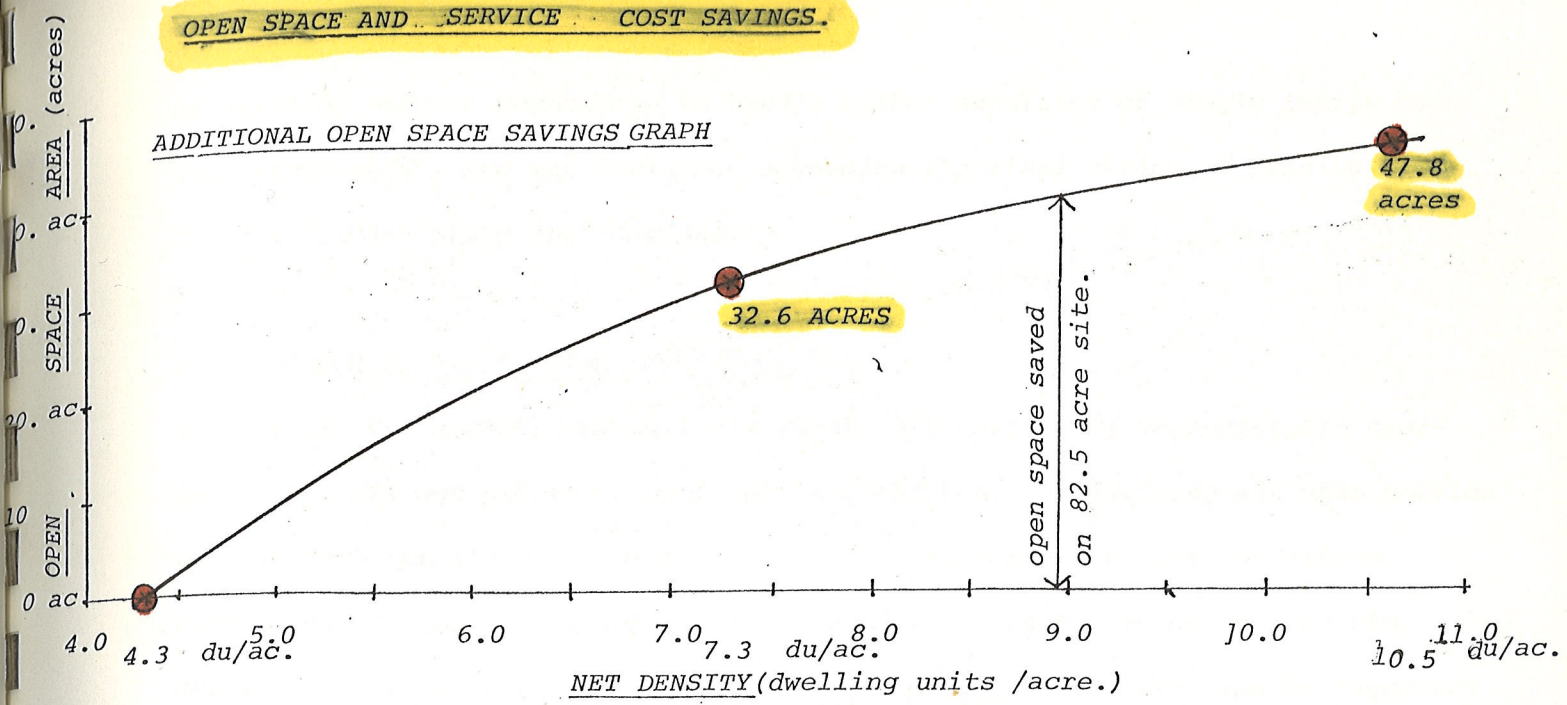
The C.O.R.D. Alternative can also reduce the cost of servicing when compared to conventional subdivisions. These savings on service costs can then be applied to providing more recreation facilities and landscaping the open space within the community. Whereas a house in a conventional subdivision might cost $4,564 to service, its equivalent in a C.O.R.D. development would only cost $2,701 at a net density of 7.3 du/acre or $2,852 at a net density of 10.5 du/acre. This represents a savings of $1,863 and $1,712 per unit for these two net densities (see Appendix 5 for detailed calculations).

Though these savings are small when considered individually the total amount over the whole development is considerable. Compared to a conventional subdivision of 367 single family dwelling units, the savings with higher net densities of 7.3 and 10.5 du/acre would equal approximately $683,721 and $628,304 respectively. These savings in service cost can be plotted as a function of density as represented in figure 14.

7.3 The Relationship Between Service Savings and Open Space Savings

From the two graphs opposite (figure 16) it becomes apparent that both open space savings and development cost savings are not increasing at the same rate. Open space increases are increasing proportionately to net density while development cost savings are tending to level off or decrease at higher densities of single family housing. This state is a result of the limitations

OPEN SPACE AND SERVICE COST SAVINGS.



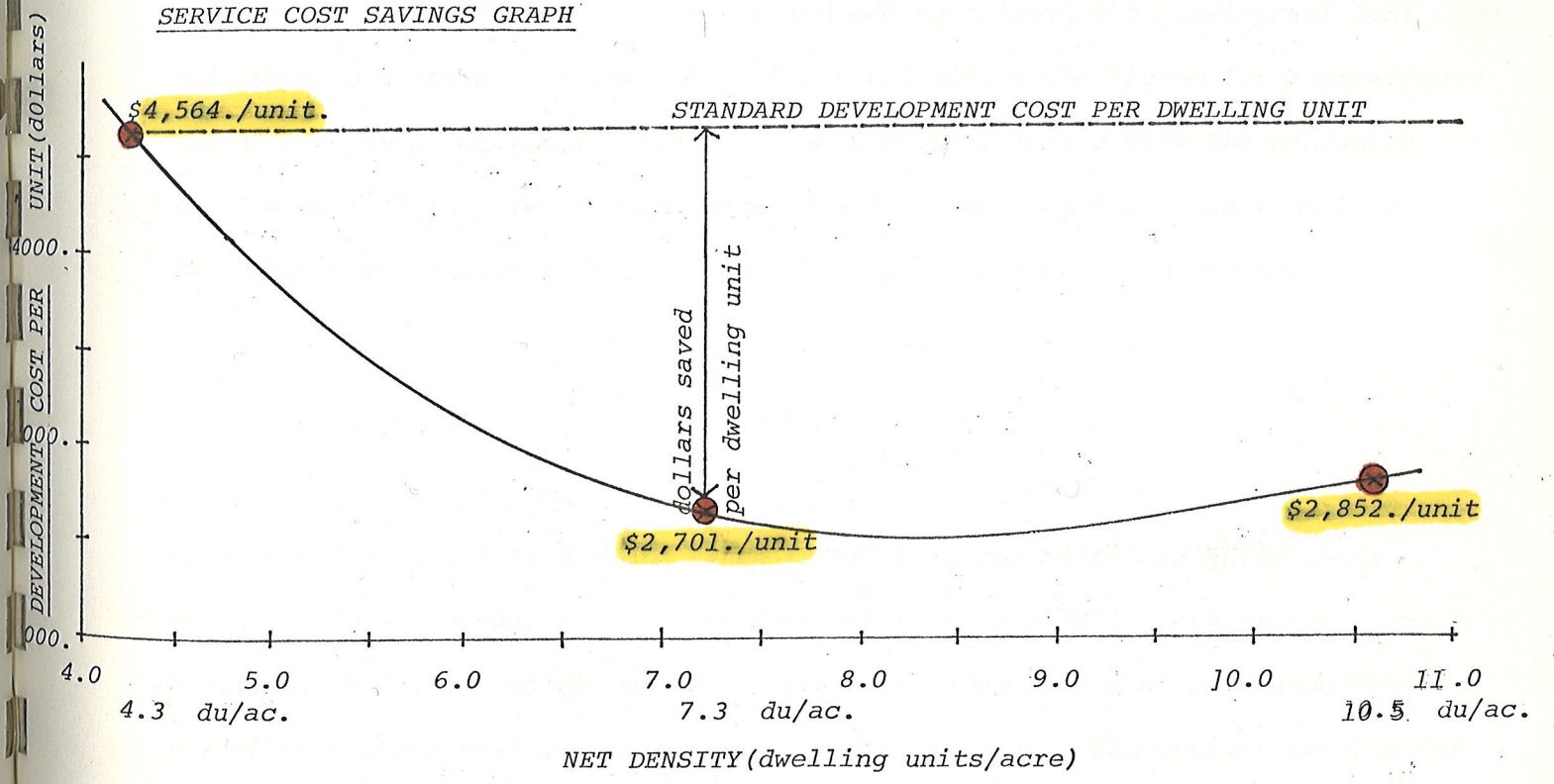


Figure 14

of existing service technology to handle higher densities of single family housing efficiently*, and may influence a developer's final choice of density (see Chapter 8, Case Study Application).

7.3.1 C.O.R.D. Application

The art of land development with its rough cost estimates, unpredictable overheads, etc. is not precise enough to allow the cost of servicing and thus service savings to be predicted accurately. These costs depend on site conditions, such as soils, drainage problems, the location of trunk service lines, etc. However, development range of net densities for a specific site can be suggested where the opportunity is greatest for developing an open space community based on recreation amenities. The developer can utilize this range by totaling up the projected recreation expenditures and adding a landscape development cost for the open space area to determine his total site expenditures for recreation and open space development. This sum can then be compared with the projected service cost savings (estimated for that site by engineering consultants) to determine the relative feasibility of developing an open space community.

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*For example: As the 10 du/acre range is reached, the units are quite close together, lots are shorter and therefore street intersections are closer together. Utilities which follow the roadways, must make a greater number of direction changes utilizing more manholes and fittings. The optimum spacing for manholes is 350', any thing smaller than this distance is inefficient and costs extra.

7.3.2 C.O.R.D. Utilization of Existing Site Features

Existing site features, besides affecting land development costs, can also influence recreation/open space development expenditures. Features such as trees, lakes, streams, topography, etc. can become assets to open space developments by enhancing the open spaces and reducing the expenditures on landscaping, etc. These features require little additional development in an open space setting and are thus inexpensive alternatives to the grading, filling, planting, etc. of conventional development policies. Minimal expenditures for cleaning pathways, building sand beaches, or mowing existing pastures may be all that is required to develop large areas of open space and thus reduce the overall cost of recreation and open space development to the developer. This in turn may help establish the most desirable net density at which to develop by reducing the area for development (and thus increasing the net density). The key to maximizing the benefits of C.O.R.D. lies in efficient use of existing site features.

Chapter 8

Case Study Application

A Lake Oriented Open Space Community for Winnipeg

As has been stated, new residential subdivisions require better developed open space areas that not only increase recreation potential, but reduce car/pedestrian conflicts and give structure and organization to the entire community. There are several natural features around which open space communities can be organized. In Winnipeg, drainage is the most obvious feature. The land is flat with impervious soils which, when developed, require expensive large diameter pipes to handle storm drainage runoff. Recently, however, another more economical solution to storm drainage problems has made its appearance in Winnipeg. This solution entails using artificial lakes or holding ponds to collect surface runoff in peak periods and then releases it through smaller pipes over longer periods of time. Thus an artificial lake system built for storm drainage purposes can provide structure and linkage between various local and community schools, parks, and housing areas, increase the potential for a wider range of recreation activities such as biking, walking, and water-oriented sports and minimize the conflicts between pedestrians and vehicles where the two must cross.

This chapter then will explore the C.O.R.D.* alternative on a specific housing site in Winnipeg using artificial lakes as the structuring and organizational feature of a recreation/open space-oriented community.

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*Concept for Open Space and Recreation Development

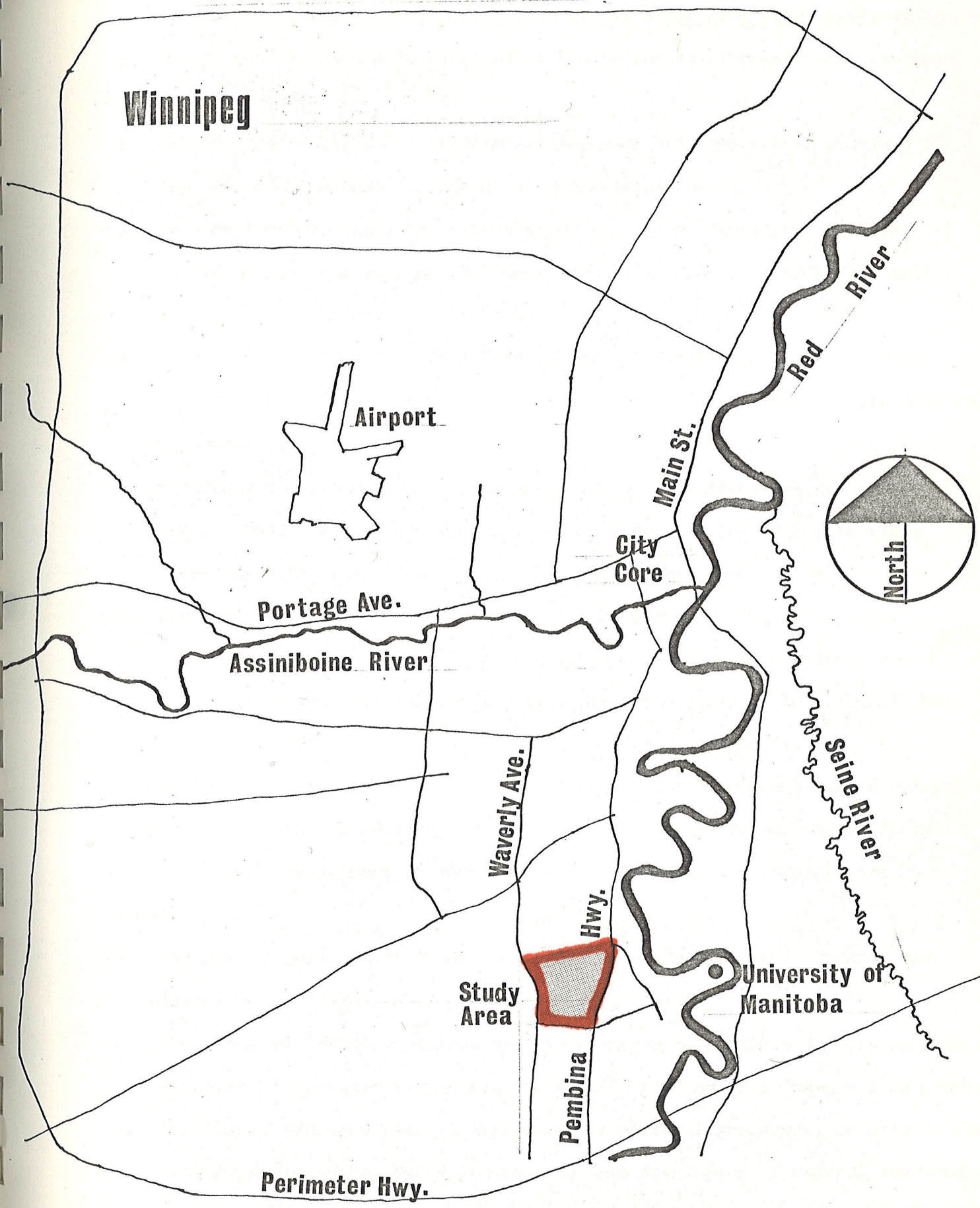


Figure 15 Site Location

8.1 Statement of Objectives, Conclusions Criteria for Case Study Application

To satisfy the objectives as outlined at the beginning of this study, the case study must:

1. Provide additional recreation facilities over and above those provided by the City of Winnipeg in residential subdivisions.
2. Provide increased amounts of open space area as a recreation resource in itself and as a setting for recreation facilities in residential subdivisions in Winnipeg.
3. Provide and develop both increased recreation facilities and open space areas at no additional capital cost to the city authorities, private developer or new resident.
4. Provide and develop both increased recreation facilities and open space areas without significantly decreasing the level or quality of services provided by the single family detached home in Winnipeg.
5. Use open space development as a major structuring element in the site planning and layout of single family detached housing in Winnipeg, and particularly to employ artificial lakes as the organizing features of that open space (detail design and planning criteria see Appendix 6).

It was found that the proposed C.O.R.D. alternative to a conventional development as presented in this case study could satisfy these objectives. However, for any innovative development to become a reality in Winnipeg, three things must occur.

1. The general public must become more tolerant to new ideas in housing and demand better living environments from developers.
2. The developer must become less profit-oriented, more willing to try new ideas, and develop a greater responsibility for the housing environments they create.
3. The City of Winnipeg must streamline their approval procedure, be more receptive to new housing ideas, build flexibility into development standards and controls and provide positive incentives for innovative developments.

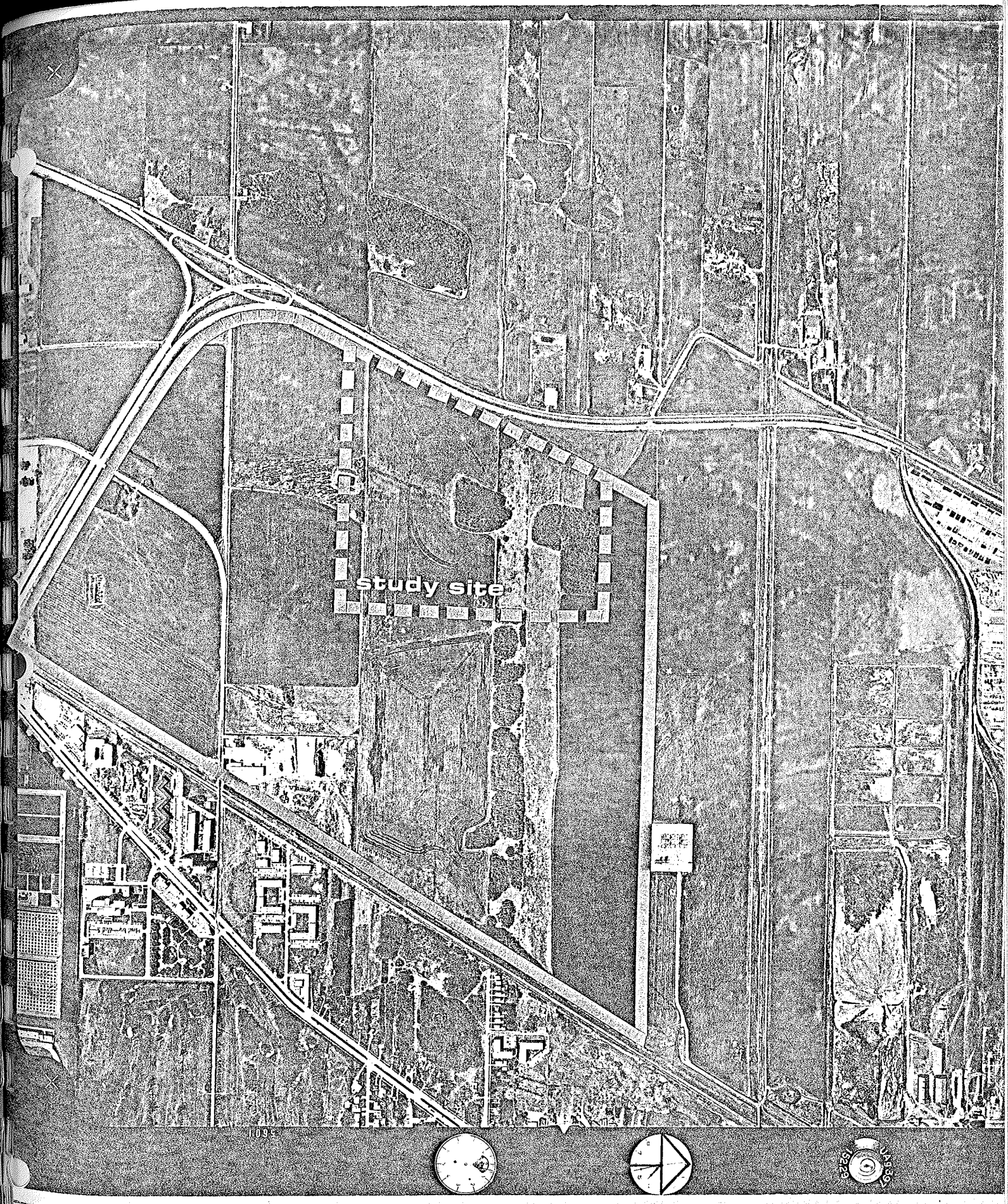


Figure 16

8.2 Case Study Site

The site chosen from the applied case study is a 98 acre section of an 382.5 acre tract of land currently under development in the southern most section of the city of Winnipeg. (Waverly Heights, Lakeside Village) The entire area is bounded on the north by a proposed inner city beltway, a hydro transmission right-of-way and a regional drainage ditch draining approximately 30 square miles of adjacent agricultural land. On the south and west is an existing four lane arterial road while the eastern side is bounded by the Canadian National Railway mainline to the south. The surrounding area is largely flat agricultural land with several large isolated clumps of aspen and oak.

The case study site itself has less than two feet of topography change over the entire 98 acres. It has 12 acres of aspen (of a total of 37 acres over the larger site) twenty to thirty feet in height situated in clumps on the north side and another 10 acres in pasture. The rest of the site is cultivated agricultural land with shallow drainage ditches along abandoned road rights-of-way.

The soils are the heavy clay, poorly drained type, typical of the Winnipeg region. Topsoil depths are approximately 12 inches over the entire site.

The total 382.5 acre site is currently owned by two individual land developers who are developing a total of 1,362 single family dwelling units on the site. This equals a gross site density of 3.5 du/acre. The applied case study will consider the first phase of development totaling 367 dwelling units on 82.5 acres of land for a total net density of 4.5 du/acre. The total cost of development per lot including landscaping of boulevards, sidewalks, street lighting, etc. totals $4,564**. This represents the base development cost against which development savings on alternative designs can be calculated for this site.

**Information obtained from Underwood McLellan and Associates, see Appendix 5, Section A


Waverly Avenue
Commercial
Multifamily
existing trees
Tennice
Picnic Area
existing trees
Lake
Trails
Tennice
Lakeside Park
existing trees
Trails
Junior and Senior High School
Picnic Area
existing trees
Elementary School
LAKESIDE VILLAGE
A C.O.R.D. ALTERNATIVE PROPOSAL
MASTERS PRACTICUM
DEPARTMENT OF LANDSCAPE ARCHITECTURE
UNIVERSITY OF MANITOBA 1976
NORTH

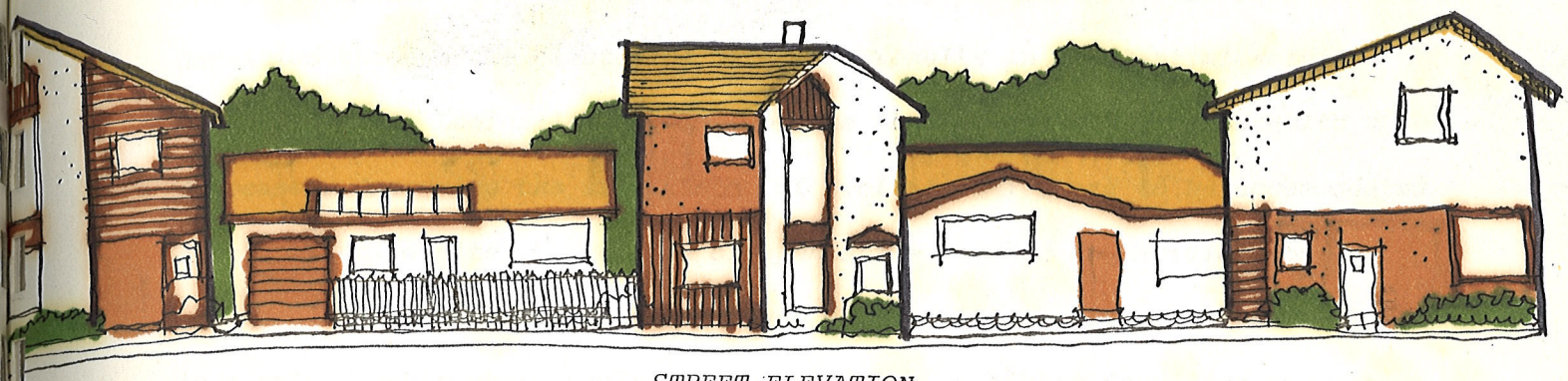
Figure 18

LAKESIDE VILLAGE

A C.O.R.D ALTERNATIVE PROPOSAL – MASTERS PRACTICUM
DEPARTMENT OF LANDSCAPE ARCHITECTURE
UNIVERSITY OF MANITOBA 1976

Figure 19

TYPICAL C.O.R.D. ALTERNATIVE AT 7.0 DWELLING UNITS PER ACRE.



STREET ELEVATION

STREET CHARACTER

Figure 20

8.3 The C.O.R.D. Alternative

The C.O.R.D. alternative is based on the assumption that the use of higher densities through the clustering of houses results in substantial service cost savings.* Logically, open space area is also conserved if density increases, (assuming the same number of dwelling units are to be accommodated over the entire site). The rate of open space savings and service cost savings, however, are not the same (see Chapter 7.1, 7.2). This results in a relationship where savings from servicing at higher densities are not adequate to develop all of the open space area saved at that density or any additional recreation facilities that may be desired. A lower density on the other hand might provide fewer service cost savings but also have fewer acres of open space area to develop, possibly to a higher level (see Appendix 1, Section C for open space development costs).

The C.O.R.D. alternative is intended to illustrate the above relationship between density, open space area and service cost savings and show how on a specific site these three might be manipulated to develop an open space oriented residential development.

There are three basic steps in developing the C.O.R.D. alternative.

1. Project the average number of dwelling units and subsequent service costs for a conventional development.
2. Project the minimum density level required to conserve natural site features and estimate the resultant service costs.

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*The work the author has done in this regard is further substantiated by a similar study entitled "South St. Boniface", Leaf Rapids Housing Corporation, Winnipeg, Manitoba, June, 1975.

3. *Compare total service cost savings, open space savings and desired recreation development to determine the best design desntiy at which to develop the site.*

8.3.1 The Site as a Conventional Development

One of the important requirements of the C.O.R.D. alternative is the ability to predict beforehand the area of housing, open space area, the number of dwelling units and potential service costs for a conventional development. These figures allow comparisons to be drawn for any alternative housing density suggested. Opposite is a chart (Figure 21) projecting these areas, and explaining their derivation as outlined in stage one of the case study application (see Appendix 6, Section B for details).

8.3.2 Determining Minimum Design Density in the C.O.R.D. Alternative

Often a development site will have existing natural site features in the form of treed areas, grassland and sloughs. These features under traditional development practices are often regarded as obstacles to an efficient and thus economical conventional subdivision.

This study contends that a more desirable housing development can be produced at lower servicing cost by conserving natural feature areas at the outset and adjusting net density to maintain lot yield. The money saved on servicing cost can then be applied to development of the open space area and additional recreation facilities. Thus, in the C.O.R.D. alternative, treed areas would determine the minimum design density. Step 2 (Figure 22) projects the treed area, the net area of development, the minimum design density and resultant service costs.

8.3.3 Determining Specific Design Density in the C.O.R.D. Alternative

A basic premise of the C.O.R.D. alternative as already stated, is that

THE C.O.R.D. ALTERNATIVE

Outline

AREA	SIZE	DERIVATION
STEP 1		
1. Gross Site Area	98.1 acres	Measurement of site
2. Lake Area required	2.9 acres	Based on engineering projection of site requirements for storm water holding pond (see Artificial Lake Design, Appendix 2, Section C).
3. New Gross Site Area	95.2 acres	Original gross area minus lake area (lake area not eligible as dedication).
4. Open Space Area	9.8 acres	10% of gross site area as required by city open space standards (see Appendix 3, Section B).
5. Net Developable Area	80.9 acres	Net area equals 85% of new gross site area (see Average Density by Zoning District, Appendix 3, Section C).
6. Other Land Use Area (commercial and multi-family)	4.5 acres	The difference between gross density and net density minus the required lake area and dedication area.
7. Number of Dwelling Units to be developed on site.	367.0 acres	Net area x Net density @ 4.5* du/acre Density/Zoning District Standards (see Appendix 3, Section C).
8. Service cost per dwelling unit	$4,564	Standard 55' x 100' lot x development cost of $83. per front foot (see Appendix 5, Section A).

*4.5 du/ac was chosen out of a range of 4-5 du/ac as it best corresponded to the known development density of the first phase of Waverly Heights and thus made cost comparisons more simplified and accurate.

Figure 21

AREA	SIZE	DERIVATION
STEP 2		
1. Natural Site Features	12.0 acres	Measurement of treed area
2. New Net Development Area	68.8 acres	Net Development Area - Natural Site Feature Area
3. New Net Density	5.3 du/ac	Number of Dwelling Units ÷ New Net Area
4. Service Cost	$3,750/du	Projected from Service Cost Savings Graph Chapter 7, Figure
5. Service Cost Savings	$814 / du	Cost of servicing conventional development - service cost @ 5.3 du/ac
6. Additional Open Space @ 5.3 du/ac	12.5 acres	Projected from Open Space Savings Graph, Chapter 7, Figure
STEP 3		
1. Additional Open Space required	17.5 acres	As per recreation development program (see Figure)
2. Net Developable Area	52.0 acres	New Net Development Area - Additional Open Space required
3. Final Design Density	± 7.0 du/ac	Number of dwelling units ÷ Net Development Area

Figure 22

efficient layout of housing by the use of the cluster principal can save substantially on service costs which can then be applied to the development of open space area and recreation facilities. Since development of these amenities is expensive (see Appendix 1, Section C) the more money saved on service costs the better. However, at higher densities (8-10 du/ac) it was found that for development on this site, the savings per dwelling unit were not increasing as rapidly but actually levelling off. On the other hand open space area saved by tighter clustering of the units was still increasing rapidly as density increased (see Chapter 7, Figure 13). It was possible to locate the range where there was a maximum amount of savings to be spent on an acre of open space development. For example, at a net or design density of 6.0 dwelling units per acre there would be a saving of approximately $1,312 per lot or a total savings of $481,504.00 over the 82.5 acre study area (see Figure 23). This design density also saves by tighter groupings on additional 20 acres of open space area. Therefore there are approximately $24,075.00 per acre of open space for recreation and open space development. (The total service cost savings for the site divided by the total open space savings.) At a net or design density of 7.0 dwelling units per acre there is a savings of $1,764.00 per lot for a total of $647,388.00 which must be spread over a total of 30 acres of open space area. This represents only $21,579.00 per acre for open space development or less than the amount at 6.0 du/ac. These figures suggest that for this site, with its specific development constraints (soils, topography, etc.) that the net density at which to develop for the greatest area of open space developed to the highest level is at the 6 du/acre range.

*SERVICE COST AND OPEN SPACE SAVINGS (Range of Densities)
FOR 367 DWELLING UNITS ON 82.5 NET ACRE SITE

SERVICE COST APPLICABLE TO SPECIFIC SITE CONDITIONS OF STUDY AREA

DESIGN DENSITY	SERVICE COST PER UNIT	COST SAVING PER UNIT	TOTAL SAVINGS FOR SITE	OPEN SPACE SAVINGS	$/ACRE FOR OPEN SPACE & RECREATION DEVELOPMENT
4.3	$4,564	NIL	NIL	NIL	NIL
5.0	4,000	$ 564	$206,988	9.5 ac.	$21,788
5.3	3,750	814	298,738	12.5 ac.	23,899
5.5	3,600	964	353,788	14.5 ac.	24,399
6.0	3,252	1,312	481,504	20.0 ac.	24,075
6.5	2,980	1,584	581,328	24.5 ac.	23,727
6.8	2,850	1,714	629,038	27.5 ac.	22,874
7.0	2,800	1,764	647,388	30.0 ac.	21,579
7.3	2,701	1,863	683,721	32.6 ac.	29,973
7.5	2,675	1,889	693,263	34.5 ac.	20,094
8.0	2,600	1,964	720,788	37.5 ac.	19,221
8.5	2,575	1,989	729,963	40.0 ac.	18,249
9.0	2,600	1,964	720,788	42.5 ac.	16,959
9.5	2,655	1,909	700,603	45.5 ac.	15,568
10.0	2,750	1,814	665,738	46.5	14,316
10.5	2,852	1,712	628,304	47.8	13,144

*Derived from Service Cost Savings and Open Space Savings Graph

Figure 23

However, other considerations influence the developer's decision concerning net density of development for this site. One of the most important will be the extent of recreation and open space development he wishes to provide.

8.3.4 Recreation and Open Space Development for C.O.R.D. Alternative

The degree of recreation and open space development undertaken by a developer on this site will influence the density at which he can build. A higher design density is necessary not only to maintain the overall site lot yield (and conserve the treed areas) but to pay in the form of service cost savings for the extra amenities as well. Figure 25 is one such program for recreation and open space development for this site. This program of recreation/open space development consists of adding another 2.5 acres of lake to connect the proposed storm water holding lakes together and thus increase their recreation potential. This additional lake area plus landscaping and developing the shore line of all the lakes would cost approximately $289,887. Further recreation developments such as totlots, tennis courts, bike and walking paths, lake docks, lake to lake underpasses at roads, lake wells for water circulation, parking lots and picnic areas, etc. would require a further $234,000 bringing the total expenditure thus far to $523,887 (see figure18). Additional landscaping of the remaining additional open space, links, buffers, etc. would cost approximately another $50,000. This sum brings the total expenditure to $573,887. The projected service cost savings at 5.3 du/ac (the minimum design density with site features conserved) does not generate enough revenue to cover all these additional site expenditures. Consideration

Amenity Package for Case Study Application
Recreation and Open Space Development Costs

1.	Additional 2.59 acres lake @ $16,250/acre	$ 42,087
2.	5,200' x 100' of shoreline landscaping 11 acres @ $15,000/acre	165,000
3.	Lake park 4.14 acres @ $20,000/acre	82,800
4.	2 lake underpass @ $15,000/each	30,000
5.	2 road underpasses @ $10,000/each	20,000
6.	1 lake well for recirculation (fountain)	10,000
7.	4 tennis courts @ $8,000/court	32,000
8.	7 totlots @ $7,000/t.l.	42,000
9.	2 docks @ $1,000/dock	2,000
10.	3 parking lots of 20 cars @ $5,000/lot	15,000
11.	2 mile shale hiking and bike trails @ $8,000/mile	16,000
12.	2 picnic areas (tables, fire pits, & w.c.) @ $30,000/area	60,000
13.	Additional landscaping of remaining open space areas, links, buffers, etc.	50,000
	TOTAL COST	$573,887

Figure 25

of the service cost savings at higher design densities indicates that at a density of 6.8 - 7.0 du/ac, there would be enough funds to cover expenditures. A density of approximately 7.0 du/ac was chosen in this instance to allow sufficient funds for development ($647,388) plus a contingency or unallocated fund of $123,500. At a density of 7.0 du/acre therefore, there was approximately 2.9 acres of lake area required for storm drainage purposes, 9.8 acres as dedicated land to be developed by the City of Winnipeg for city parks and other community facilities, 4.5 acres for other land uses such as schools, multi-family housing and commercial, and additional open space of 30 acres comprised of 2.5 acres additional lake for recreation purposes, 4.0 acres intensively developed lake park, 12 acres of existing treed area requiring no landscape development expenditures (other than trails) and 11 acres of open space as lakeshore area, buffers and connecting links. This represents but one program of open space and recreation development for this site. Variations will depend on recreation trends and the image the developer wishes his development to project to attract home buyers.

8.4 Operation and Maintenance

The cost of operating and maintaining open space and recreation facilities is one of the greatest drawbacks of an open space community. Both the City of Winnipeg's Parks and Recreation Department and the developers proposing the development are unwilling to assume any large maintenance responsibility. This will help determine the nature of open space and recreation development.

In the C.O.R.D. case study the use of artificial lakes as open space features eliminates much of the maintenance associated with traditional parks. A

second major proportion of the site consists of native tree stands which are intended to be preserved in their natural form. This leaves approximately only 15 acres of intensively landscaped open space which must be pruned, the grass cut, etc. The City of Winnipeg currently spends $475/acre/year for maintenance of open space area. The 15 additional acres of open space in this development would probably have to be maintained to a higher level, approximately $600/acre or a total of $10,000 per year. In fairness this sum should probably be payed for by the local residents who use the area the most. This mandatory charge would amount to approximately $30 per household which is well below similar sums applied in other developments (see Appendix A, Section C of Case Study Comparison).

The type of additional recreation facilities proposed also have low operating and maintenance costs once the initial capital investment is completed. Totlots, picnic areas, parking lots, tennis courts and hiking trails are low maintenance areas that can be designed to minimize long term operating cost. These costs might be covered by an additional charge of $30 against area residents (bringing the total yearly sum to $60/household) or by dedicating the facilities to the City of Winnipeg Parks and Recreation Department.

8.5 Summary of C.O.R.D. Alternative

To summarize, the concept for Open Space and Recreation Development (C.O.R.D.) suggests a way of achieving a lake-oriented residential development in Winnipeg, based on recreation and open space amenities as illustrated in this case study. This alternative is not intended as a means of reducing house prices, changing the existing process of housing development or altering methods of development approval. Instead, it suggests an alternate concept to the traditiinal subdivision form by exploring the relationship

between density, service cost and open space development as a means of improving the quality of living environments in and surrounding our communities. Integral to this concept is the conservation of natural site features which are fast disappearing in urban areas.

There are undoubtably other, probably better, methods for achieving these objectives, particular in the use of mixed housing types, combined with the single family housing unit. However, until the attitudes of home buyers, developers, and city governments become more flexible regarding change, innovations in housing such as this will only occur in studies such as this.

Appendix 1 Recreation and Open Space Development in Urban Communities

Section A Existing Open Space Standards

Section B Urban Recreation Trends

Section C Open Space Development Costs

APPENDIX 1

RECREATION & OPEN SPACE DEVELOPMENT IN URBAN COMMUNITIES

Section A

Existing Open Space Standards

Recreation and open space development are the responsibility of both the city and municipal departments of parks and recreation in Winnipeg. This responsibility includes not only financing and maintaining of recreation facilities and public open space, but also the setting of standards for recreation developments. The standards used by the City of Winnipeg are based on the generally accepted mean for North America.[1] There are five major categories of recreation and open space development. They are: 1) Totlots, 2) Parkettes or Vest Pocket Parks, 3) Neighbourhood Parks, 4) Community Parks, and 5) City Parks. In practice, these categories are often combined and some facilities are frequently included in school grounds.

- Totlots are for preschool children and consist of small scale climbing and playing apparatus, sand pits, etc. They are not often found in older developments but are becoming more popular in newer communities (for detailed standards see opposite).

- Parkettes or Vest Pocket Parks are passive recreation-oriented areas, one half acre in size with a landscape treatment of trees, shrubs, ground covers, walks, and benches. This type of open space facility is increasingly being combined with all other types of parks and recreation areas as part of an increasing emphasis on using plant materials in recreation areas.

- Neighbourhood parks are recreation areas approximately six acres in size, often associated with elementary schools and consisting of a major playground, organized sports fields and park-like areas.

1. Interview, Mr. B. Richards, Landscape Architect, City of Winnipeg Parks Dept. October, 1974.

TYPES OF RECREATION AND OPEN SPACE FACILITIES COMMONLY FOUND IN NEW SUBDIVISIONS **

OPEN SPACE TYPE	FACILITIES	USE	SIZE	SERVICE AREA POPULATION	SERVICE AREA RADIUS	COST *
TOT LOT	chair.swings sand box slide climbing device misc.	preschool under 6 yrs.	range .06-2.0 ac. average .5 ac. combined wth Nbhd. or Comm. park	1 per 500-2000 people .25-.50 ac. per 1000 population	1/8-1/4 mile	$±5000.landscaping $±2000.equipment $±7000.TOTAL
VEST POCKET PARK	trees shrubs sod path(asphalt) benches	all ages	range .06-1.0 ac. average .5 ac. combined with all types	1 per 1000 people .5 ac. per 1000 pop.	1/8-1/4 mile	$±12,000./acre for landscaping
NEIGHBOURHOOD PARK&PLAYGROUND	totlot 2 tennis cts. hockey rink baseball field soccer&football change bldg. grading&landsc.	school age children	range .23-20. ac. average 6 ac. near elementary school	1 per 5000 people 1-2 ac. per 1000 pop.	1/4-1/2 mile	$±. 7,000. $±16,000. $±15,000. $± 750. $± 800. $±64,000. $±56,000. $±160,000. TOTAL (for 15 ac. site)
COMMUNITY PARK	totlot 3 tennis cts. 2 hockey rinks 2 baseball fields soccer&football community club bldg. parking for 25-30 cars landscaping	all ages	range 4-100 ac. average 8 ac. near or in conjunction with high school sports area	1 per 15000 - 20000 people 1-2 ac. per 1000 pop.	1/2-3 miles	$± 7000. $± 24,000. $± 30,000. $± 1500. $± 800. $±492,000. $± 7000. $± 60,000. $±622,300. TOTAL (for 10 ac. site)

* All costs based on 1974 estimates.

** Information gathered from interviews with Mr.B.Richards,Landscape Architect,City of Winnipeg Parks Dept., Mr.A.Langrish,Recreation Planner,Municipality of Fort Garry,and Mr.B.Hana,Recreation Director,Municipality of Fort Garry,Winnipeg.

- *Community parks are from eight to twenty-five acres, usually associated with high schools and have a range of facilities that include hockey pens, tennis courts, football, baseball fields, various other organized sports and a community center building. If the park is also a Community District Center it may have more elaborate facilities such as a swimming pool or enclosed ice arena.*

- *City parks can be from twenty-five to one hundred acres, include major recreation and open space facilities and are intended for use by all residents of the city. Assiniboine Park is an example of this type of park.*

- *Obviously, many of these categories of park overlap one another as recreation needs and development circumstances may tend to combine facilities and open space area.*

The City of Winnipeg is below the above mentioned standards of open space area and recreation facilities on a per capita basis.[1] *This is true in many other North American cities as well. It is not within the terms of reference of this study to explore the reasons for this deficit or question the standards being followed today.*

Section B *Urban Recreation Trends*

"Participation in outdoor recreation activities is generally increasing. This is evidenced not only by increases in incidence of participation but also by increases in frequency of participation."[2]

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1. *Interview, Mr. B. Richards, Landscape Architect, City of Winnipeg Parks Dept., October, 1974.*

2. *Parks Canada, Trends in Participation in Outdoor Recreation Activities. Outdoor Recreation Research Section, National and Historic Parks Branch, Parks Canada, August, 1973.*

THE SECOND OF TWO REPORTS

* CALGARIANS DO CARE!

31,700 of you have said how you feel about Fish Creek Provincial Park in an overwhelming public response.

Here are the tabulated results from those 31,700 questionnaires.

Please note that questions requiring only one response may not add to 100% due to rounding. In the cases of multiple responses, the total will logically add to more than 100%.

Approximately 59% of the questionnaires had letters attached or suggestions made on the folder.

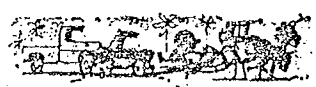
1. How do you think Fish Creek Provincial Park should be planned: (check the appropriate blank)

6% A. As a fully developed park with a wide range of recreational facilities
82% B. As a park with some developed recreational areas and some undeveloped natural setting areas
12% C. As a totally undeveloped park retaining its natural settings.

2. Perimeter parking will be allowed for automobiles and other forms of transportation. What provisions should be made WITHIN the park for:

A Automobiles and other motorized vehicles (check appropriate blank)
8% 1. Develop roads and parking facilities throughout the park
58% 2. Maintain limited number of access roads and parking to shorten walking distances
35% 3. Do not allow automobiles and other motorized vehicles within the park

B. Snowmobiles and all-terrain vehicles (check appropriate blank)
2% 1. Provide areas throughout the park for operating snowmobiles and all-terrain vehicles
20% 2. Provide limited areas in the park for operating snowmobiles and all-terrain vehicles
75% 3. Do not allow snowmobiles and all-terrain vehicles within park



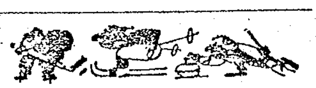
3. If Fish Creek Provincial Park could offer educational programs where park users could learn outdoor skills—what courses would you like to see offered.

A Summer 54% requested specific summer courses
B Winter 51% requested specific winter courses

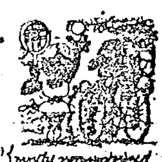
4. We have already received many suggestions for Fish Creek Provincial Park. Please tell us the facilities that you think you would use and enjoy the most. Check only the number indicated under each category.

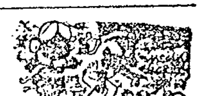
A. GENERAL INTEREST
(Check only FOUR)
88% 1. Picnic areas with outdoor cooking facilities
30% 2. Refreshment centre
36% 3. Open-air band shell for concerts, theatre, speakers, etc
53% 4. Natural amphitheatre
9% 5. Outdoor non-denominational chapel
32% 6. Overnight campsites
81% 7. Animal and wildlife preservation areas with natural water settings
49% 8. Play areas with sand boxes, wading pool, creative playgrounds
2% 9. Other (please specify)

B. WINTER FACILITIES
(Check only THREE)
75% 1. Skating rink
9% 2. Hockey rink
82% 3. Cross country ski trails, snowshoe trails
70% 4. Toboggan runs
25% 5. Ski hills
11% 6. Curling
5% 7. Other (please specify)



C SUMMER FACILITIES
(Check only FIVE)
16% 1. Football and soccer fields
24% 2. Baseball diamonds
34% 3. Tennis courts
7% 4. Basketball courts
89% 5. Hiking trails
45% 6. Horseriding trails
71% 7. Bicycle trails
55% 8. Fishing holes
43% 9. Boating - (please specify) {mostly non-motorized boating
68% 10. Swimming hole
5% 11. Other (please specify)





D SENIOR CITIZENS
(Check only TWO)
9% 1. Checkers
43% 2. Lawn bowling
34% 3. Horseshoe pits
59% 4. Special recreational facilities for senior citizens and handicapped.
4% 5. Other (please specify)

5. Do you have any suggestions for the park that could be included under the following categories (use extra paper and attach if needed):

A. Service Facilities (i.e. refreshment centre, restrooms, security, lighting, etc.)
29% made suggestions
B. Entertainment, Recreational and Sports Facilities
15% made suggestions
C. Picnicing, Camping, Playgrounds and Trails
21% made suggestions
D. Horticulture and Nature Developments
20% made suggestions
E. Other (please specify)
11% made suggestions

6. Are there any facilities, structures, activities, etc. that you do NOT want in Fish Creek Provincial Park? Please list them (use extra paper if needed):
61% listed facilities, structures, activities, etc.

Please check the appropriate categories:

7. Is your age between:
14% A. under 20
59% B. 21 - 35
5% C. 35 - 50
16% D. 51 - 64
6% E. 65 and over

8. How many are in your household:
7% A. One
26% B. Two
19% C. Three
24% D. Four
25% E. Five and over

9. Where do you live:
61% A. South half of Calgary (S.W. and S.E.)
34% B. North half of Calgary (N.W. and N.E.)
5% C. Other (please specify)

* Calgary Herald 1974

This participation is increasingly taking the form of unstructured recreation activities such as hiking, cross country skiing, snowshoeing, skating, bicycling, picnicking, and canoeing, etc. Opposite are the results of a questionnaire circulated to residents of Calgary, Alberta, regarding a proposed urban park and its use. Out of 31,700 responses, 88% wanted picnic areas with outdoor cooking facilities, 75% wanted skating areas, 82% cross country ski trails and snowshoe trails, 89% hiking trails, 71% bicycle trails, etc. (see opposite). These responses, when compared to the desire for traditional recreation forms in Calgary, (football and soccer fields 16%, baseball diamonds 24%, tennis courts 34%, basketball courts 7%) clearly indicate a desire and need for less intensive forms of recreation that could also be applicable to the Winnipeg situation.

One problem significant today in new residential developments is the developer's inability to absorb the high cost of landscaping open space areas. These costs include tree and shrub planting, sodding or seeding lawn areas, building footpaths, bicycle trails, berms, benches and installing lighting. If open space is to be conceived and developed as the C.O.R.E. concept suggests, close attention must be paid to these costs. With this in mind, a guide to unit prices for the preparation of Estimates for Landscape Construction follows. * Opposite this guide is a graphic representation of landscape development costs proceeding from low cost minimal development to expensive more intensive landscape work.

A GUIDE TO UNIT PRICES
For the Preparation of Estimates
For Landscape Construction - 1974

A. SOIL AND AGGREGATE

Fill	Supplied	per cu.yd.	$ .50 - .75
Fill	Supplied & Placed	"	2.00 - 2.50
Unscreened top soil	Supplied	"	2.60 - 2.75
Screened top soil	Supplied & Placed	"	2.85 - 4.00
Rough manure	Supplied	"	3.25 - 3.50
Screened manure	Supplied	"	3.50 - 3.75
Potting soil (flowerbed mix)	Supplied	"	3.25 - 3.50
Torpedo sand	Supplied	"	4.10 - 4.30
Limestone dust	Supplied	"	3.10 - 3.30
Crushed limestone	Supplied	"	4.10 - 4.30

LANDSCAPE DEVELOPMENT COSTS

MINOR EARTHWORK, NURSERY SOD,
SMALL TREES (1"CAL); SMALL SHRUBS,
AND ASPHALT WALKS.
$8,000-$12,000. PER ACRE.

MINOR EARTHWORK, NURSERY SOD,
LARGE TREES (3"CAL), LARGE SHRUBS,
AND ASPHALT WALKS.
$12,000-$15,000. PER ACRE.

MAJOR EARTHWORK, NURSERY SOD,
MORE LARGE TREES AND SHRUBS,
ROCKWORK AND ASPHALT WALKS.
$15,000-$25,000. PER ACRE.

MAJOR EARTHWORK, NURSERY SOD,
MORE LARGE TREES AND SHRUBS,
ROCKWORK, LIGHTING, BENCHES AND
BRICK WALKS.
$25,000 + PER ACRE.

B. LAWN CONSTRUCTION

Sodding with prairie sod (prep. incl.)	per sq.yd.	$ .75 - 1.00
Sodding with nursery sod " "	"	1.50 - 2.00
Seeding " "	"	.80 - 1.00

C. PREPARATION OF PLANTING AREAS

Preparation of shrub beds (soil incl.)	per sq.yd.	$ 1.50 - 2.20
in new development in existing lawn	"	2.50 - 4.00
Preparation of flower beds (soil incl.)	"	1.75 - 3.50
in new development in existing lawn	"	3.50 - 6.00

D. PLANT MATERIAL

Shrubs supplied & planted in lawn (allow 30-40 sq.ft. per shrub)	each	$ 5.50 - 6.25
Small shrubs supplied and planted as hedge	"	2.50 - 3.50
Medium shrubs supplied & planted as hedge	"	10.00 - 12.00
Low evergreens supplied & planted (Juniper)	"	12.00 - 14.00
Small deciduous trees supplied & planted (6" cal)	"	10.00 - 22.00
Medium deciduous trees supplied & planted (3-4" cal)	"	100.00 -150.00
Coniferous trees supplied & planted (spruce, pine 3'-4')	"	60.00 - 70.00
Perennials supplied & planted	"	1.50 - 2.25
Geraniums supplied & planted	"	1.50 - 2.25
Annuals supplied & planted (6 doz. per flat)	flat	9.50 - 15.00

E. WALKWAY CONSTRUCTION

Tyndall stepping stones laid in lawn	each	$ 1.75 - 2.25
Tyndall stone suppl. & laid as patio or walk	per sq.ft.	1.50 - 2.00
Precast conc. slabs (Hydra-press) 2'x2'x2'	per sq.yd.	13.50 - 18.00
Supplied & laid as stepping stones in lawn	each	3.00 - 3.50
Precast conc. slabs (same as above) Supplied & laid as patio or walk, including excavation and sand base	each	3.75 - 5.50
Precast concrete slabs (same as above) in colour extra	"	.25
Cutting of precast conc. slabs to fit	"	3.00 - 3.50
Bricks supplied and laid flat as patio or walk, incl. excavation & sand base 4 1/2 bricks per sq.ft.)	per sq.ft.	2.00 - 2.50
40 1/2 bricks per sq.yd.)	per sq.yd.	18.00 - 22.50
Concrete paving, broom finish Supplied & installed, incl. excavation and sub-base	" "	8.00 - 12.00
Concrete paving, exposed aggregate finish Supplied & installed incl. excavation and sub base	" "	15.00 - 20.00

Asphalt paving (for walk or drive) Supplied & installed, incl. 6" sub-base and 2" asphalt	*per sq.yd.*	*$ 4.00 - 4.50*
Crushed limestone driveway (6" thick) Supplied and installed	*"*	*1.50 - 2.10*
Sanded area for playgrounds (Area graded and covered evenly with 1" of Torpedo sand) Supplied and placed	*"*	*.60 - .90*
Crushed limestone walk (5" thick) Supplied and installed	*"*	*1.20 - 1.80*
Wood chips 8" thick	*"*	*.50*

F. *STONE WORK AND WALLS*

Rock garden constructed of Stony Mountain limestone, incl. material	*per sq. yd.*	*$ 6.00 - 12.00*
Retaining (dry) wall constructed of Stony Mountain limestone, incl. material	*face sq.ft.*	*2.25 - 3.00*
Stony Mountain limestone boulders Approx. 18"x30"x10" thick) Supplied and placed	*each*	*9.00 - 16.00*
Limestone riprap, supplied & placed	*per cu.yd.*	*28.00 - 34.00*
Reinforced concrete wall, 2' high, 6" thick, material supplied and installed	*face sq.ft.*	*4.50 - 5.00*
Reinforced concrete wall Material supplied and installed	*per cu.yd.*	*210.00 - 250.00*
Post and chain fence	*per lin.ft.*	*4.00*

G. *PARK FURNITURE AND WOODEN STRUCTURES*

Concrete end bench, installed	*each*	*$ 50.00*
Metal frame bench, installed	*each*	*60.00*
Bench (Broadway type) installed	*each*	*200.00*
Waste receptacle (Broadway type) installed	*each*	*40.00*
Bench (Port-a-Park type with canopy installed	*each*	*300.00*
8" Ø pressure treated pine posts supplied	*per lin.ft.*	*.50 - .60*
8" Ø pine posts installed vertically at different heights, including staining	*per lin.ft.*	*.40 - .50*

* *Information for landscape construction costs and subsequent graphic representations based on interviews and projects developed or proposed to be developed with Mr. B. Richards, Landscape Architect, Parks and Recreation Department, City of Winnipeg, 1974; Mr. Gary Hilderman, Gary Hilderman Associates, Landscape Architect and Planner, 1974; Mr. Doug Paterson, Lombard North Group, Landscape Architects and Planners, Winnipeg, 1974; Mr. Al Rattray, Department Head, School of Landscape Architecture, University of Manitoba, Winnipeg, Manitoba, 1974.*

Projects studied in this regard included:

Donwood Park, East Kildonan, Keenleyside Park, East Kildonan, Landscape

improvements east of Dunkirk Drive between Nicol Avenue and Glenview Avenue, Ducharme Avenue Park, Fort Garry, Tranquility Cove Park, East Kildonan, Alex Bridge Park, Fort Garry, St. Norbert Community Club Park, Fort Garry, Boeing of Canada Ltd., St. James-Assiniboia, Sony distribution terminal, Fort Garry, West University Centre landscape development, University of Manitoba, and the landscape development of the storm water impoundment, North Waverly Heights, Fort Garry, Winnipeg.

Appendix 2 The Use of Artificial Lakes in Subdivisions

Section A Storm Water Management and Recreation Development

Section B City of Winnipeg Policy Position Regarding Artificial Lakes

Section C Physical Design of Storm Water Impoundments

Appendix 2

The Use of Artificial Lakes in Subdivisions

Section A

Storm Water Management and Recreation Development

There have been two main concepts involved in the use of artificial lakes for new subdivision design in Winnipeg. The first has been the concept of managing storm water by the use of holding ponds. The second concept has involved using artificial lakes solely for recreation purposes to attract home buyers. The most common use is a combination of both concepts, whereby the positive features of storm drainage and recreation are combined in lake design.

Storm Water Management

The concept of managing storm water up until lately has been to "direct" such waters as quickly as possible to the river system by the use of open channels and large diameter closed conduit systems. The limitations of open channel systems along with the excavating costs of large diameter conduits, has prompted a review of alternative systems, one of which is "on-site" detention or storage. Under this concept local storm water is directed to impoundments where it is retained for ultimate release to the regional drainage system, using smaller and less expensive pipes.[1]

Recreation Development

Many large subdivision layouts in the United States have employed artificial lakes largely for their recreation potential. Reston, Virginia and Columbia, Maryland are two such developments where

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1. "Storm Water Management by the Use of Impoundments", Works and Operations Department, Waterworks, Waste and Disposal Division, City of Winnipeg, July, 1974.

emphasis was placed on using lakes as the major orientation of housing, open space and movement systems, etc.

The forms of recreation taking place on these lakes depended on their site, location and layout but generally included water-oriented sports such as canoeing, fishing, sailing and swimming. Park and open space systems were usually an integral part of the lake development and included facilities for cycling, hiking, picnicking, playgrounds, tennis and winter activities where appropriate. A major intent of these large developments was to sell houses on the theme of a choice of recreation activities.

History

Artificial lakes in the form of storm water retention ponds are not a new phenomenon in Winnipeg. They have been utilized in one form or another since the late 1960's. However, their full potential as recreation amenities and organizational elements in community and open space design have been largely ignored. The Southdale subdivision, a residential area of approximately 700 acres in the southeast portion of Winnipeg is one such example where the developer had a "lake" theme in mind. However, in reality, the emphasis appears to be more towards a storm water solution for residential development, rather than using the lakes as a recreation and open space feature.

The next several years will see a large increase in the use of artificial lakes for drainage purposes in residential subdivisions in Winnipeg. Minimal topography, poorly drained soils and ready access to outlets

in the form of rivers guarantee minimal development costs for this facility when compared to conventional alternatives. Five residential areas totalling over four thousand acres[1] *may be developed in this fashion in the next ten years. There is unlimited potential for lake-oriented subdivisions where recreation combined with storm drainage becomes the major theme.*

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1. *Interview, Dan Witchar, Underwood McLellan & Associates Ltd., Winnipeg, April, 1973.*

Section B

City of Winnipeg Policy Position Regarding Artificial Lakes

Artificial lakes in the form of storm water management schemes have been implemented by various developers in the Winnipeg area, largely on the basis of economics, with varied emphasis attached on the recreational, aesthetic, and standard of safety provided.[1]

Since the responsibility for the maintenance, appearance and operation of the retention system is ultimately passed onto the city, it is only logical that the city provide some general guidelines and standards for these systems.

The City of Winnipeg therefore intends to review each impoundment on an individual basis, giving appropriate consideration to the capital, operating and maintenance costs as compared to the conventional system. Following are a list of recommendations[2] that encourage the use of artificial lakes not only as an economic and efficient storm water management tool, but as a social benefit to the community as well.

- that impoundment systems be of the permanent lake type, having not less than five (5) acres of water surface;

- that the slope of the land subject to inundation and thirty (30) feet into the water be at least 7:1 to provide a degree of safety, with normal safety features to be observed and incorporated.

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1. Waterworks, Waste and Disposal Division, Works and Operations Division "Stormwater Management by Use of Impoundments", City of Winnipeg, July, 1974.
2. Ibid.

- *that where residential and park areas abut an impoundment, the design for water rise in lake level be four (4) feet, with a six (6) foot maximum rise design where parks only abut;*

- *that at least twenty-five (25) percent of the shoreline of an impoundment be reserved for public open space, with a greater percentage where in linear format;*

- *that development adjacent to an impoundment be private property to the edge of the normal water level;*

- *that no portion of an impoundment be considered part of the usual ten (10) percent land dedication, excepting that portion above the area subject to inundation by a four (4) foot rise in lake level;*

- *that the ten (10) percent dedication be based on the property remaining after the impoundment area has been deducted;*

- *that the developer share with the city on a prorated basis, the cost of all necessary lands, excavations and control structures of the impoundment systems;*

- *that a Caveat be registered by the developer on behalf of the city, which will prohibit the placement of any structure on the area normally flooded by a four (4) foot rise in water level, and further, no permanent structures permitted at an elevation of less than six (6) feet above the normal water level;*

- *that all slopes surrounding an impoundment be grassed, with sodding of that area inundated by a four (4) foot rise in lake level to be the responsibility of the city;*

- *that a minimum water depth of four (4) feet be provided for in the lake, and that a supplementary water supply be incorporated to assure this level during dry weather periods;*

- *that no impoundment having less than six (6) feet of permanent water depth be stocked with fish.*

Appendix 2

Section C

Physical Design of Storm Water Impoundments

The basis of any water system is the hydrologic cycle. The natural hydrologic cycle is a complex mechanism affected by weather, slope, soils, vegetation, geology and surface drainage. The changing of land from rural to urban use is merely a manipulation of watershed management methods, still operating within the hydrologic cycle. The extent to which these methods conform to the natural system, the more likely it is that problems of drainage systems can be avoided. These problems may include erosion, siltation and flooding. Thus, in one sense good planning within the natural hydrologic cycle may be a measure of conservation of the natural environment.

Man's manipulation of rural landscapes to urban ones is accomplished by changes in land use and geomorphology. From changes in these two parameters all other watershed modifications can be traced. Geomorphic changes center around the alterations to the watershed geometry; surficial cover and drainage area of the urbanizing process. The geometric transformation of the watershed comes about by the grading practices which are utilized in developing roads and building sites. Slopes are changed both in magnitude and spatial position within the watershed with the result that patterns of overland flow are often completely different after grading. Stream basing may be completely removed by cut and fill methods of development and replaced with underground conduit systems.

The nature of this urban development with the increase of impervious surfaces and the efficient servicing of conduit systems combines to create an overall drainage efficiency that may be six times as great as that of the natural system. This of course has immense implications for storm water management systems.

Artificial lakes are one method of water management. They may allow conservation of natural site features by conservation to some degree of the natural drainage system. They are based on the principal of impounding water temporarily and allowing the resultant outflow to continue over a longer period of time, thereby reducing peak flows and thus minimizing conduit sizes.

The factors involved in the physical design of lakes are extremely important to their functioning as holding ponds. They are also important if any recreation use of the lake is to be enjoyed. Following is the step by step process for the design of artificial lakes as holding ponds.

DESIGN METHOD

MASS DIAGRAM FOR LAKES

1. Total drainage area (2,100 acres)
2. % of the total area for lakes (5% = .05 x 2100 = 105 acres)
3. Find runoff for design storm
   a) Take 5 year storm and find R.O. for 2100 acres - data obtained from Atlas and Rainfall Intensity - D.O.T.

5 YEAR

Duration	Mass Rainfall (Cummulative) In.	Runoff Coeff.	Runoff Inches	Runoff for 2100 Acres/Acre ft.
20 min	.9	.2	.18	31.25
30 min	1.0	.25	.25	43.75
1 hr	1.2	.30	.36	63.0
2 hrs	1.52	.35	.53	92.75
6 hrs	2.10	.40	.84	147.00
12 hrs	2.50	.45	1.13	197.75
24 hrs	2.80	.50	1.40	245.0

1. Mass rainfall duration.- from Atlas
2. Runoff coeff.- Increases with time - ground becomes saturated, surface depressions become filled.
3. Runoff.- Mass rainfall x runoff coeff. = .9 x .2 = .18"
4. Runoff for 2100 acres = runoff x area =

$$\frac{.18 \times 2100}{12 \text{ (inches/ft)}} = 31.25 \text{ acre ft.}$$

   b) Take 25 year sotrm and increase runoff as shown in calculations following:

25 YEAR STORM

Duration	Mass Rainfall Inches	Runoff Coeff. (Calculated)	Runoff Inches	Runoff for 2100 acres acre ft
20 min	1.3	.37	.48	84.0
30 min	1.55	.43	.66	115.5
1 hr	1.75	.44	.77	134.75
2 hrs	2.1	.46	.965	168.9
6 hrs	3.0	.51	1.515	265.1
12 hrs.	3.5	.55	1.93	337.75
24 hrs.	3.9	.57	2.225	385.5

1. Duration.- rainfall relationship given in Atlas.
2. Runoff calculated as follows:
   After 20 min in 5 year storm rainfall = .9"
   After 20 min in 25 year storm rainfall = 1.3"
   Difference = .4" - allow for a little increased infiltration say 25% ∴ .75 of this .4" should runoff ∴ .75 x .4 = .3" extra runoff.
   ∴ runoff after 20 min in 25 year storm = runoff from 5 year storm and extra runoff from a 25 year intensity storm
   = .18 + .3 = .48

   R.O. for 2,100 acres = $\frac{.48 \times 2100}{12}$ = 84.0 acre ft.

3. Another example.- Say at 6 hours.

$$[(3.0 - \frac{2.10)\ (.75)}{12} + (.84)] \times 2100 = [.9\ \frac{(.75)}{12} + .84] \times 2100 = 265.1 \text{ acre ft.}$$

The runoff coeff = $\frac{1.515}{30}$ = .51

If the mass runoff figures are plotted against time, a mass diagram as shown in figure No. 3 results (mass runoff - 25 year)
To obtain the mass inflow curve plot a line exactly the same as the mass runoff curve but displace it 20 minutes to allow for time of concentration of 20 minutes. This curve gives the mass inflow into the lake.

Out Fall Design

Design an out fall (weir,etc.,) and set up a rating curve for the outlet as shown in Figure No. 1 for a box inlet weir, width = 7', depth = 4' . This rating curve denotes how outflow varies with head.

Storage In Lake

Set up a Lake storage rating curve to show storage in lake versus elevation of lake this is shown in figure No. 2.

Mass Out Flow

As shown in the following table, the rise in lake level and mass out flow are determined. An example is given for the period from 2 to 3 hours.

1. At t = 180 minutes (3 hours) mass inflow = 188 acre ft. (from Figure No. 3 - Mass in Flow)
2. Mass volume retained = Mass inflow minus the previous mass out flow.

   188.0 - 5.48 = 5.48 = 168.75 acre ft.
3. Using mass volume retained in lake find the rise in lake elevation from Figure No. 2. (Rise of 1.55' when 168.75 acre ft retained)
4. From weir rating curve Figure No. 1 determine out flow rate at the head given.

   (Out flow = 80 c.f.s. when weir is at a head of 1.55')
5. Find the volume of out flow at that rate over that period of time.

   $\frac{80\ ft^3}{sec} \times 60\ \frac{min}{hr} \times \frac{60\ sec}{min} \times 1\ hr \times \frac{1\ acre}{43560\ ft^2} = 6.61$ acre ft.

   Add this to previous mass out flow to get new mass out flow;

   6.61 + 5.48 = 12.09
6. Continue as before at least until lime lake level begins to go down; 8 to 11 hours in this case.
7. Plot mass out flow on same graph as mass runoff and mass inflow curves, Fig. No. 3.
8. Plot lake elevation versus time; as in Fig. No. 4.
9. Check to make sure lake doesn't go above aceeptable limits.

TIME MINUTES (HOURS)	MASS INFLOW ACRE FT.	MASS VOL. RETAINED ACRE FT.	AVER. VOL. RETAINED ACRE FT.	RISE IN LAKE ELEV. FT.	OUTFLOW RATE C.F.S.	VOLUME OF OUTFLOW ACRE FT.	MASS OUTFLOW ACRE FT.
0	0	0					
			0	0	0	0	0
20	0	0					
			25.0	.24	4.5	.06	.06
30	50	50					
			76.97	.72	23.5	.97	1.03
60 (1)	104	103.94					
			129.45	1.20	53.8	4.45	5.48
120 (2)	156	154.97					
			168.75	1.55	86	6.61	12.09
180 (3)	188	182.52					
			192.21	1.76	98.5	8.14	20.23
240 (4)	214	201.91					
			208.84	1.90	112.0	9.25	29.48
300 (5)	236	215.77					
			221.65	2.00	121.5	10.04	39.52
360 (6)	257	227.52					
			231.0	2.08	130.0	10.74	50.26
420 (7)	274	234.48					
			237.21	2.14	135.0	11.15	61.42
480 (8)	290.2	239.94					
			242.46	2.20	141.5	11.69	73.11
540 (9)	306	244.58					
			244.73	2.20	141.5	11.69	84.80
600 (10)	318	244.89					
			244.05	2.20	141.5	11.69	96.79
660 (11)	328	243.20					
			241.2	2.17	138.5	1145	108.24
720 (12)	336	239.21					
			236.48	2.14	135.0	11.16	

UNDERWOOD McLELLAN AND ASSOCIATES LIMITED
ENGINEERING AND PLANNING CONSULTANTS
LOCATED IN MAJOR CITIES ACROSS CANADA

MASS DIAGRAM

JOB No.
DATE JAN. 2/74
PROJECT
DWN. BY D.W.WEHAR
SPEC DWG No.

TIME MINUTES (HOURS)	MASS INFLOW ACRE FT.	MASS VOL. RETAINED ACRE FT.	AVER. VOL. RETAINED ACRE FT.	RISE IN LAKE ELEV. FT.	OUTFLOW RATE C.F.S.	VOLUME OF OUTFLOW ACRE FT.	MASS OUTFLOW ACRE FT.
720 (12)	336	239.21					108.24
			236.48	2.14	135.0	11.16	
780 (13)	342	233.76					119.40
			234.70	2.12	133.5	22.07	
900 (15)	355	235.60					141.47
			232.07	2.10	131.5	32.60	
1080 (18)	370	228.53					174.07
			219.00	1.98	120.0	29.75	
1260 (21)	380	205.93					203.82
			196.05	1.80	102.5	25.41	
END OF STORM							
1440 (24)	390	186.18					229.23
			173.48	1.60	85.0	42.15	
1800 (30)	390	160.77					271.38
			139.70	1.30	61.0	30.25	
2160 (36)	390	118.62					301.63
			103.5	.98	39.0	19.34	
2400 (40)	390	88.37					320.97
			78.70	.72	23.5	11.65	
2760 (46)	390	69.03					332.62
			63.20	.60	18.0	2.98	
2880 (48)	390	57.38					335.60

UNDERWOOD McLELLAN AND ASSOCIATES LIMITED
ENGINEERING AND PLANNING CONSULTANTS
LOCATED IN MAJOR CITIES ACROSS CANADA

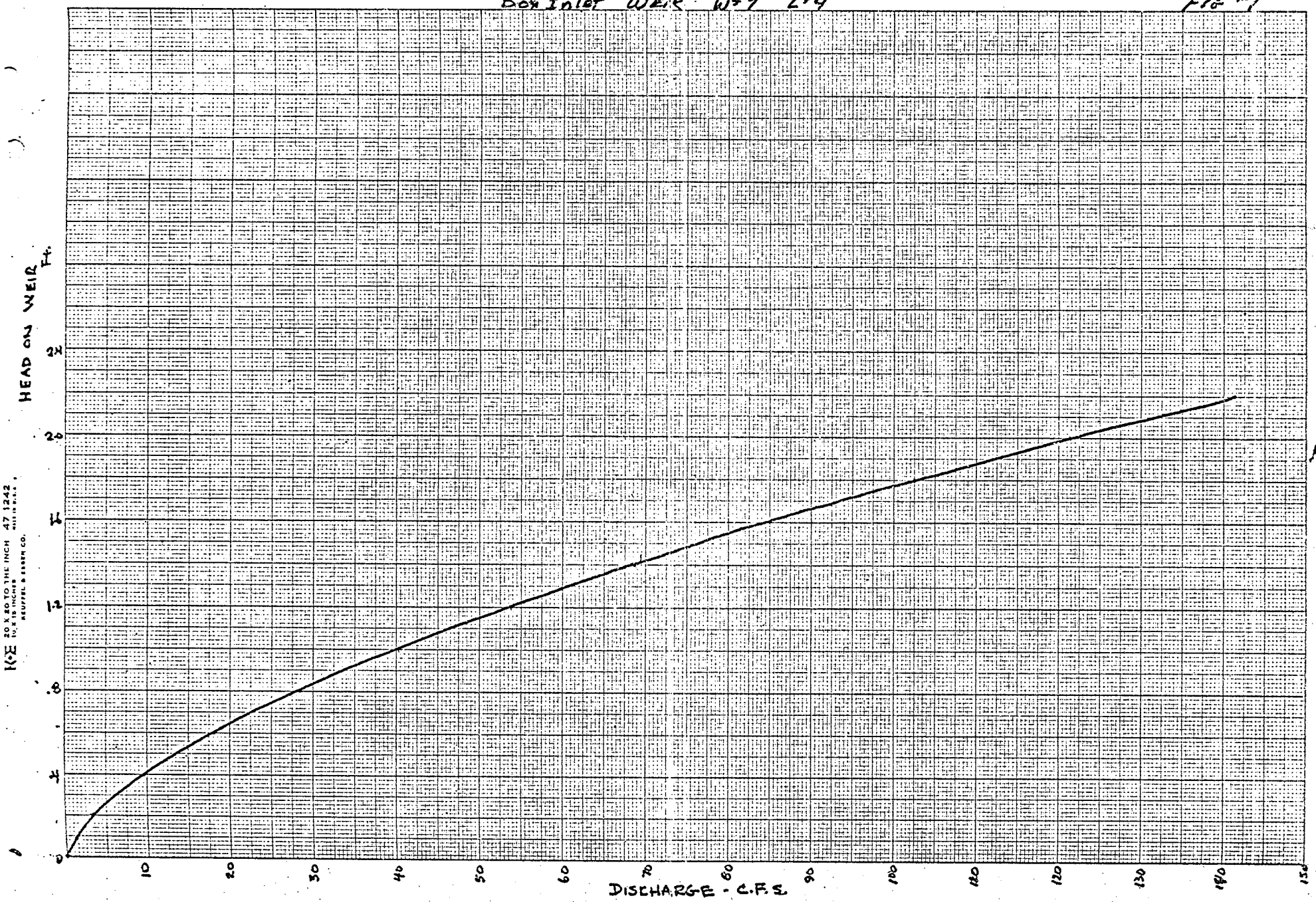
MASS DIAGRAM

JOB No. | DATE JAN. 3/74
PROJECT
DRAWN BY D.W. | CHECKED

RATING CURVE

Box Inlet Weir W=7' L=4'

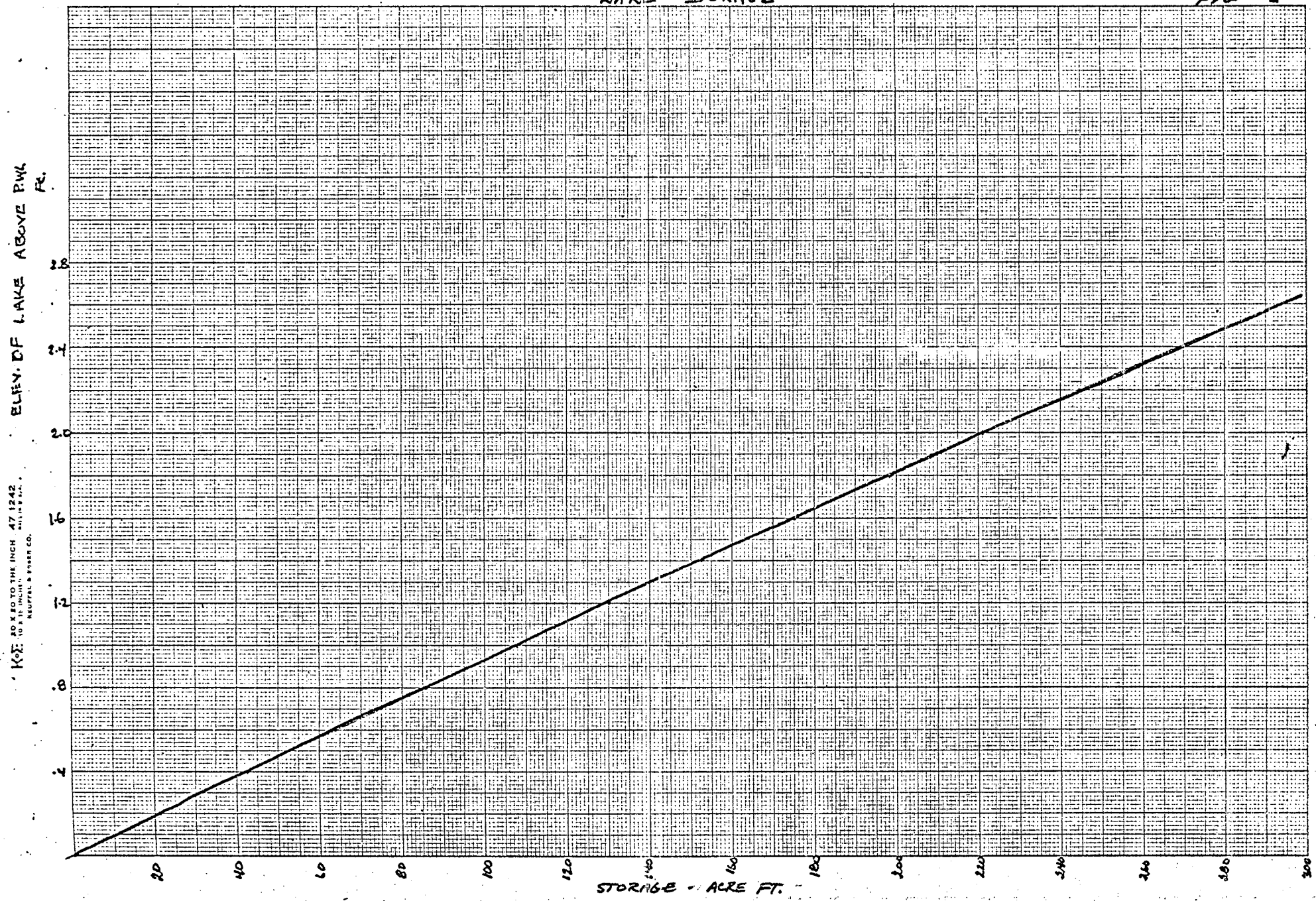
Fig #1



KE 20 X 20 TO THE INCH 47 1242
10 X 10 INCHES
KEUFFEL & ESSER CO.

LAKE STORAGE

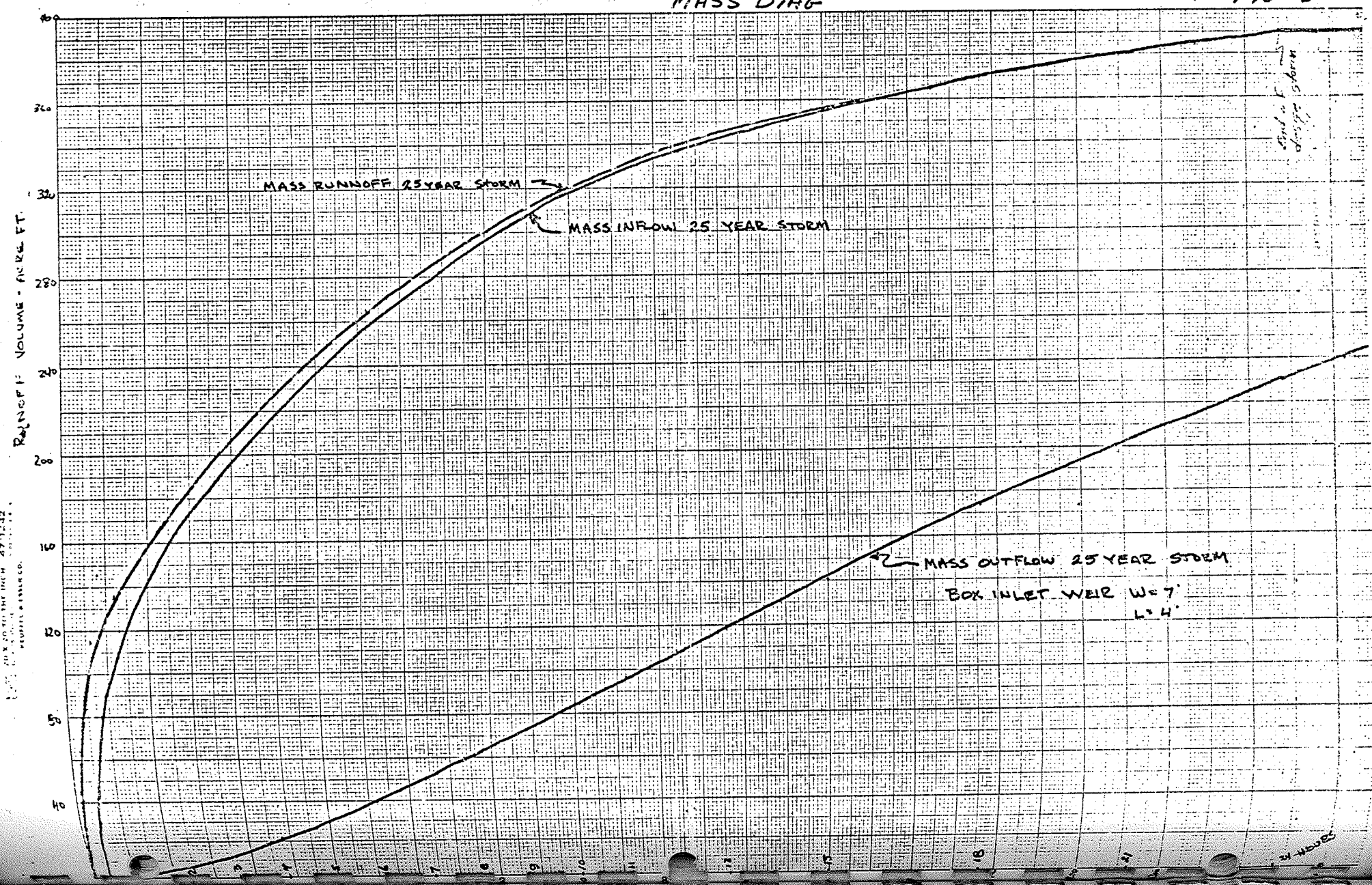
Fig #2



KOE 20 X 20 TO THE INCH 47 1242
10 X 15 INCHES
KEUFFEL & ESSER CO.

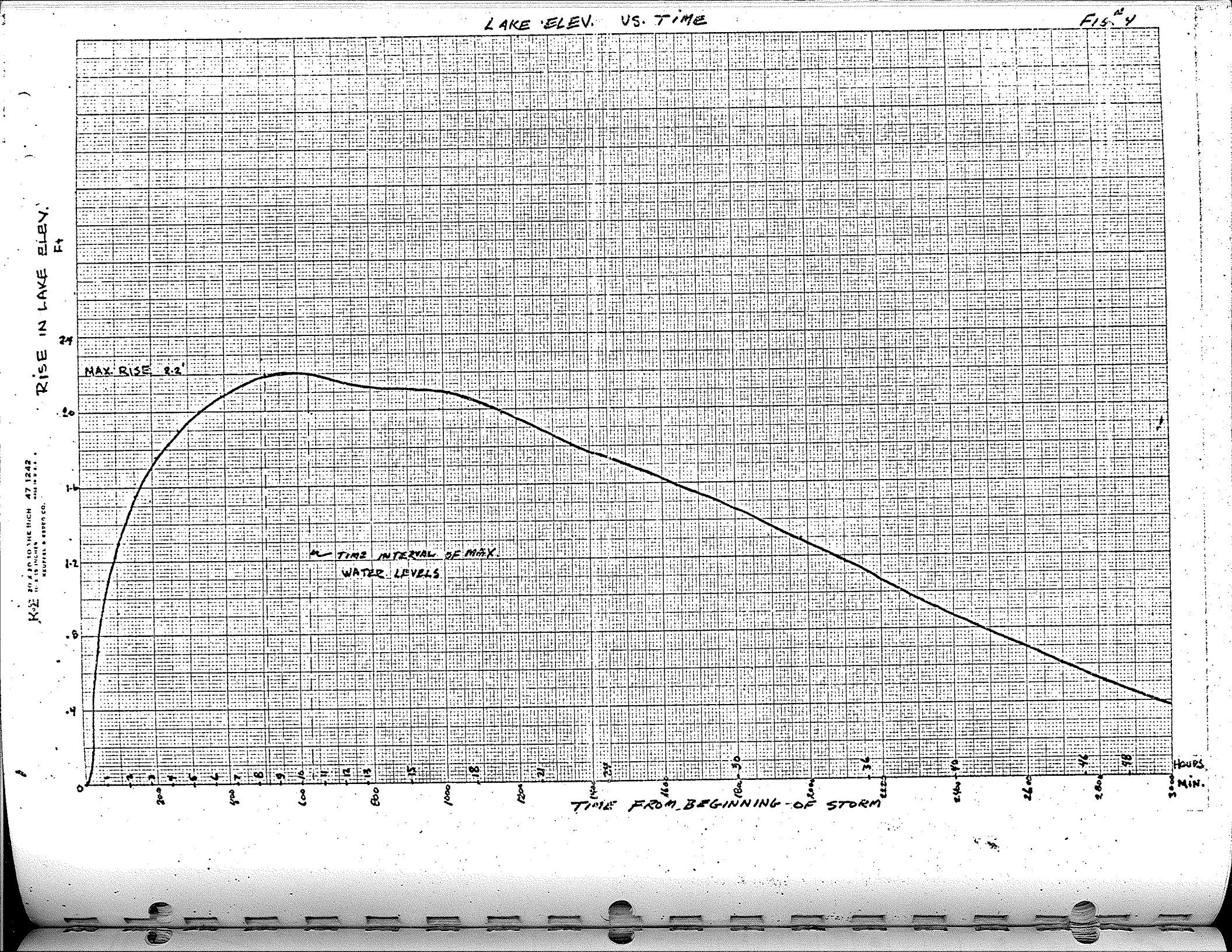
MASS DIAG

FIG # 3



LAKE ELEV. VS. TIME

Fig. No 4



Appendix 3 Land Development Controls

Section A Development Approval Procedure

Section B The Developer's and City of Winnipeg's Role in Cost Sharing for Residential Services

Section C Conveyance of Land for Public Uses

Appendix 3 — *Land Development Controls*

Section A — *Development Approval Procedure*

Development procedures currently in practice in the City of Winnipeg involve processing applications for subdivision, zoning and draft of development agreements all occurring simultaneously. Community Committees, city council, & the administration are in a much better position to evaluate the impact of the development proposal on the community and to determine school, park and recreation requirements when land use, subdivision and development agreement conditions are all considered at the same time. The Board of Commissioners employs the following procedures for processing subdivision, zoning and development agreements.[1]

- *The Developer submits an informal plan or proposal to the Director of Planning.*

- *The Director of Planning circulates the informal proposal to the Subdivision Officer, Zoning Officer, Development Agreement Officer, Hydro, Area Engineer, Streets and Transit, Water and Waste; all to report back within 30 days, to the Director of Planning.*

- *An informal meeting is held with the following attending: Appropriate Administrative Officers, Community Committee and other parties in attendance if necessary, for consideration of the Subdivision and/or Zoning together with development Agreement requirements.*

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1. *Report of the Technical Advisory on Development Agreements. Underwood McLellan & Associates Limited, Winnipeg, 1974, p.6.*

- *If City expenditures are required for local improvements emanating from the development agreement, same to be referred to the Board of Commissioners for budgetary consideration.*

- *If City owned property is affected, refer to the Director of Land Surveys and Real Estate.*

- *The Developer files Subdivision Application, Zoning Application and a Legal Plan showing boundaries, with Development Officer.*

- *The Development Officer obtains a draft subdivision bylaw, draft zoning bylaw, draft development agreement and draft zoning agreement from the Legal Department.*

The Development Officer then refers the application, draft bylaws and draft agreements to the Community Committee and arranges for advertising and posting.

The Community Committee holds a Publuc Hearing at which time subdivision and/or draft zoning bylaw and development agreement are all considered; Community Committee then reports to Committee on Environment.

Committee on Environment considers zoning bylaw, subdivision bylaw, draft development agreement and zoning agreement, where applicable. The agreement is signed by the Developer and the recommendations of the Committee on Environment are submitted to the Executive Policy Committee.

Executive Policy Committee then recommends to Council who consider the draft subdivision bylaw, zoning bylaw, development agreement, zoning agreement and final legal plan attested to by the Examiner of Surveys.

Council: (a) If no objectors may reject or enact bylaws and authorize execution of development agreement(s).

(b) If objections to either bylaw may reject bylaws or give both bylaws second reading and refer to the Minister.

The Municipal Board considers any objections to either or both subdivision and zoning bylaws and makes an Order in council.

The council may reject the bylaws or enact in accordance with the Board Order.

The development agreement and the zoning agreement are then executed by the City and any necessary caveats regarding specific interests in land will be registered.

The legal plan of the subdivision is revised if necessary and approved by Council as revised, signed on behalf of the City and registered by the Developer.

Section B

The Developer's and City of Winnipeg's Role in Cost Sharing for Residential Services

Following is an in depth list of cost sharing for residential services as outlined by the City of Winnipeg.[1]

Waste Water Sewers

The Developer shall at no expense to the City, construct and install all waste water sewers complete with manhole and other accessories required to serve the planned area, including boundary lanes and roads except in the case when the City requires waste water sewer lines to be larger than necessary to serve the planned area, then the City shall pay the cost of the additional capacities at a price agreed upon. Such oversize waste water sewer lines shall be designated at the time of approval of plans by the Commissioner of Works and Operations and no payment for oversize to be made by the City unless the line has been established as oversize at that time. However, the City shall not be liable to pay for oversize of the installation of waste water sewer pipes of 12 inches internal diameter or less.

Land Drainage Sewers

The developer shall, at no expense to the City, install and construct all land drainage sewers and ancillaries thereto within the planned area including subsurface drainage as required by the Commissioner of Works and Operations, except in the case when the City requires a land drainage sewer to be larger than necessary to service the developer owned land, then the City shall pay the additional cost of installing additional capacity at prices agreed upon by the Commissioner of Works and Operations, except when the land drainage sewer has an internal diameter greater than 48 inches, in which case the City shall pay the difference in cost between the larger

1. Report of the Technical Advisory Committee on Development Agreements. Underwood McLellan & Associates Limited, Winnipeg, 1974.

size sewer and a 48" internal diameter sewer. In addition, the Developer shall, at no expense to the City, install land drainage sewer lines from the land drainage sewer to the property line for all commercial church, park, recreation and multiple housing sites within the planned area. (Note: All land drainage sewers with an internal diameter greater than 48 inches is normally assessed 'City at large' in Greater Winnipeg).

The Developer shall, at no expense to the City, arrange for disposal of all storm water in and from the plan of subdivision which may be cut off from it's natural drainage course by the development, satisfactory to the Commissioner of Works and Operations.

Water

The developer shall, at no expense to the City, install and construct all watermains and ancillaries thereto required to serve the plan of subdivision and adjacent areas, together with boundary roads, or lanes, except in the case when the City requires a watermain larger than necessary to serve the planned area, in which case the City shall pay the additional cost of constructing such larger pipes and ancillaries thereto at the price agreed upon by the Commissioner of Works and Operations at the time of approval of the agreement, but in no event shall the City be liable to pay oversize on a pipe with an internal diameter of 10 inches or less.

The Developer shall install, at no expense to the City, one service line up to 2 inches in diameter from the watermain to the property line of each park, playground and recreation site, etc., within the planned area: the location and size of such service to be to the satisfaction of the Commissioner of Works and Operations.

Building Services

The developer shall construct and install waste water sewer and water domestic services from the main to the lot line in all single family and two family residential sites within the subdivision, with an internal diameter to be approved by the Commissioner of Works and Operations.

In cases where multiple development of 15 or more residential units is proposed, then the developer shall install two water services, separated by a watermain valve in such a manner that an alternative water supply can be provided at all times; size and location to be approved by the Commissioner of Works and Operations.

Street Pavements

The Developer shall, at no expense to the City, construct a Portland Cement concrete, or equivalent, as agreed upon, 25' in width, 6" in thickness, overlaying a base course and sub-base of such width and depth and density as the Commissioner of Works and Operations may designate. Where a pavement of greater width and depth is required by the City, to serve other areas then the cost of such additional width and/or depth shall be borne by the City and the City shall pay the Developer the cost of such additional width and depth at the prices agreed to by the Commissioner of Works and Operations and the Developer and attached as an addendum to the agreement, except in the case where the developer is of such nature that traffic requirements generated from the Developer's commercial or multiple residential development requires additional width and/or thickness of pavement.

The Developer shall adequately maintain all access roads into the development during the course of construction; said access roads to be maintained to the satisfaction of the Commissioner of Works and Operations.

Lanes

The Developer shall, where applicable, at no expense to the city, construct Portland Cement concrete pavement with a minimum width of 16' or 4' less than the right-of-way whichever is greater; 6 inches in thickness on all lanes within the development area; the base course and sub-base treatment to the satisfaction of the Commissioner of Works and Operations.

Walkways

The Developer shall, at no expense to the City, construct Portland Cement or similar walkways 5 feet in width, 4 inches in thickness, throughout the development area, except in those cases where the walkway is to be crossed by vehicular traffic, then the thickness of the said walkway shall be 6 inches. The minimum right-of-way width for walkways shall be as specified by the Commissioner of Works and Operations and in any case the width of the right-of-way shall be sufficient to enable the efficient removal of snow. The Developer shall install chain link fencing along the boundaries of all public walkways fronting or abutting on privately owned property; the chain link fence to be constructed to the satisfaction of the Commissioner of Works and Operations.

Sidewalks

The Developer shall construct and install Portland Cement concrete sidewalks 5 feet in width, 4 inches in thickness except in areas travelled over by vehicular traffic, in which case, the thickness shall be 6 inches (e.g., where private approaches and lanes intersect with sidewalks). Sidewalks shall be constructed along all streets providing direct pedestrian access to schools and on all collector routes within the development as designated by the Commissioner of Works and Operations.

Boulevards

The developer shall, at no expense to the City, plant boulevard trees satisfactory to the City, and grade and sod all boulevards fronting on developer owned land in the development area, from the curb to the front property line. The developer shall cause sodding to take place at the time of occupation of the residence on which the sod fronts, or as soon as weather permits, to the satisfaction of the Commissioner of Works and Operations.

Street Signs and Special Signs

The Developer shall, at no expense to the City, erect City standard permanent street name signs at each intersection in the development area, bearing street names approved by City Council.

The Developer shall, in the case of erection of special entrance ways, monuments or development area signs, pay the cost of all the construction, lighting and maintenance in perpetuity; said conditions to be included in the development agreement and registered as a caveat against the land.

Underground Services

All electrical and telephone services are to be installed underground except where the appropriate public authority determines otherwise, or where it is impossible to do so because of existing overhead services.

Street Rights-of-Way

The developer shall dedicate, where required, street rights-of-way 60, 66 and 80 feet in width as designated by the Commissioner of Environment, but shall not be required to provide rights-of-way of additional width to serve other areas or limited access highways. The minimum width of

street right-of-way in all City approved subdivisions shall not be less than 60 feet.

Lane Rights-of-Way

The Developer shall dedicate to the City at no cost, lane rights-of-way with a minimum width of 20 feet for all lanes serving residential development only; minimum width for all lanes serving commercial areas shall be 24 feet; lane rights-of-way shall be provided in all subdivisions separating multiple family and commercial use areas and large blocks of multiple family use areas, commercial areas and at the rear of all properties fronting on arterial or collector routes as designated by the Commissioner of Environment.

Private Approaches

The Developer shall not be required to install or construct private approaches; this is the home owner's and the builder's responsibility in that the builder or home owner is required to make an application to the City, in accordance with the Private Approach Bylaw, for approaches where required and the owner is required to maintain the approach to the satisfaction of the City during the lifetime of the approach.

Easements

The Developer, at no cost to the City, shall provide easements for the installation of Hydro and Telephone lines together with easements for all necessary City purposes, the width and location to the satisfaction of the Commissioner of Works and Operations, and form to the satisfaction of the City Solicitor, and caveats will be filed in the W.L.T.O. for these purposes only as per development agreement.

Maintenance

The developer shall maintain the following improvements to the satisfaction of the Commissioner of Works and Operations for the periods listed below:

Watermain	*1 year*
Land Drainage Sewer	*1 year*
Waste Water Sewer	*1 year*
Street Lane Pavement	*1 year*
Sidewalks and Walkways	*1 year*
Building Services	*2 years**

**after water has been turned on for domestic use.*

Boulevards	*2 years***

***or until the home is occupied, whichever occurs sooner.*

Oversize Services and Services Fronting on Privately Owned Land

The Developer shall be paid by the City for installation of oversize services and authorized improvements fronting on privately owned land at the schedule of prices agreed to by the City and the Developer prior to the commencement of the work, and the Developer shall be permitted to include in such instances 5 percent overhead and 5 percent engineering fees.

Installation of Services Benefiting Other than the Developer

In the case where the City is unable to provide financing for the installation of oversize services or in the case where private property owners other than the Developer successfully petition against the installation of certain improvements, the developer may install such services at his own expense and the City will agree to pay the cost of installation of the said services in cash at some future date or in the case where the improvements are petitioned against, the City agrees to endeavour within its powers to recover payment

from the property owners and to pay the same over to the developer prior to permitting connection to improvements by the private property owners.

Bonds

The developer shall place with the City a 100 percent performance bond providing for guarantee of construction maintenance and labour for all services as specified to the satisfaction of the Commissioner of Works and Operations. However, the City may, at its discretion, accept a letter of credit guaranteeing the 100 percent of the cost of the installations, construction and maintenance of the said services to the satisfaction of the City. The obligation for any improvement will be progressively released on the issuing of a Final Acceptance Certificate.

Payment of Certain Costs by the Developer

a) The Developer shall pay the cost of all surveys and the preparation of subdivision plans.

b) The cost of all lot grading plans to be approved by the City and attached to the Agreement as a Schedule.

c) The Developer shall have the right to select the engineer for all necessary preliminary engineering studies, design and preparation of engineering plans and specifications, and the City shall have the sole right to approve all work prepared by the said engineer. The City shall have the right to approve the engineer selected by the Developer, and the engineer, jointly approved, shall be named on the signing of the Agreement. The Developer shall pay to the City the cost of all the above-mentioned engineering services.

The City shall have the right to appoint the engineer and inspectors for all field inspection, preparation of progress estimates and all other

engineering services related to the installation, construction, and maintenance of improvements specified in the Development Agreement and the Developer shall pay the full cost of such engineering and inspection.

d) That the developer pay a minimum fee of 2 percent of the cost of installing all improvements to the City to defer the cost of legal and other administrative costs incurred by the City in administrating the development.

Land Drainage

The developer shall construct and install a land drainage sewer or provide in his site grading drainage, swails to provide efficient drainage on multiple housing and commercial sites as designated by the Commissioner of Works and Operations.

Construction Completion Certificates

The City shall issue to the developer a Construction Completion Certificate after the services have been installed in a subdivision to the satisfaction of the Commissioner of Works and Operations; the said Construction Completion Certificate to require the developer to be responsible for any and all repairs and replacements to any utility or improvement which may be necessary from any cause whatsoever up to the end of the maintenance period, to the satisfaction of the Commissioner of Works and Operations.

Final Acceptance Certificate

The City will issue a Final Acceptance Certificate to the Developer on the expiration of the maintenance period for each improvement, subject to a final inspection and acceptance by the City to the satisfaction of the Commissioner of Works and Operations.

Prior to the issuing of a final acceptance certificate, the developer shall pay for and cause to be prepared, a certificate attested to by a Manitoba Land Surveyor stating that all survey monuments with respect to the subdivision are properly located, and certificates to be to the satisfaction of the Director of Land Surveys and Real Estate.

Survey Monuments

The developer shall maintain at his own cost all survey monuments within the development area, to the satisfaction of the Director of Land Surveys and Real Estate, and in cases where the survey monuments have been disturbed, moved, covered or mutilated in any way, or destroyed, the developer shall cause the monuments to be replaced at his expense by a Manitoba Land Surveyor to the satisfaction of the Director of Land Surveys and Real Estate.

Street Lights

The developer shall pay the cost of installing ornamental street lights on all public streets within the development area to the satisfaction of the Commissioner of Works and Operations except on those streets where a major Hydro Transmission line exists.*

**(Steel Standard Mercury Vapour)*

Permits and Approvals

The Developer shall take all necessary steps to obtain all required permits and approv. L from the City, Province and Federal authorities to expediently fulfill the requirements of the development agreement.

Land Dedication

The developer shall dedicate, at no cost to the City, a minimum of 10 percent of the gross area within a plan of subdivision. The 10 percent dedication allows sufficient public open space to service a subdivision of average

density which in the City of Winnipeg is 22 persons per gross acre. Where the weighted land use density is greater than the average, the area dedication, in order to account for increased services required by the higher densities, shall be adjusted on a per capita standard basis.

Where rezonings occur subsequent to subdivision approval and the new zoning district allows an increase over the original density, the weighted differential increase in density becomes the basis for the increased public open space requirements. In order to calculate the new open space requirement, the weighted density in conjunction with the per capita standard shall be employed.

It is recommended that the City should take land for open space dedication in all new subdivisions where physically possible but in cases where it is not practical to locate parks and recreational areas because of limited size of subdivision the City should require that the developer dedicate the necessary open space weighted to density, to the nearest fully serviced lot.

In cases where neither of the above-mentioned situations are practical, then the City should require the developer to pay cash in lieu of open space dedication based on current market values of the land within the subdivision. Monies received by the City in lieu of open space dedication should be deposited in a fund for the purchase of land for recreation, parks and community use within the district.

In cases where the development plan, local school board, Department of Education of the Province of Manitoba require an elementary shcool site, junior high school site or a senior high school site, then the developer shall, in addition to the required open space, sell the required property to the School Board at a price mutually agreed upon for value of the land, subject to the School

Board paying the cost of installing all the required improvements fronting or abutting the school site.

The maximum frontage improvements to be paid for by the developer fronting on dedicated public open space in a subdivision shall be based on the following formula:

a) *Payment by the developer of all required improvements on the basis of 50' frontage on all or any portion of the first acre of dedicated property.*

b) *For each additional acre, the developer shall pay for the improvements on the basis of 30' frontage for each acre of dedicated property.*

The City shall pay the developer for any additional improvements frontage at the prices agreed to by the Commissioner of Works and Operations and the developer, and attached as an addendum to the agreement.

APPENDIX 3

Section C

CONVEYANCE OF LAND FOR PUBLIC USES *

The most common method for acquiring land for public use has required that the developer supply a certain portion of his land before he can proceed with the development of his land. This dedication of land, primarily for schools and open space uses has been in the form of a percentage of the area being developed. However, the public use of land particularly for schools, parks and recreation areas is closely related to the number of persons who will locate in the area. Therefore, because the amount of land required is directly related to the number of people who are going to use it, the basic standards for acquiring the land must be related to population rather than upon the area concerned.

One of the major problems where the public open space dedication is based on a percentage of the area concerned is that this method does not make allowance for multiple family developments. In order to overcome this problem, different space requirements would be required from different densities. This means that proposed subdivisions must show clearly the expected uses, the total expected population and the general character of that population. The fact that each different type of residential use produces a certain expected density and type of population is the basis for projecting the total public space requirements. The variety of uses and the general character and location of the development will dictate the various amounts of land required for public uses. In other words, every proposed subdivision is considered unique in character and therefore each one has to be examined and evaluated as a separate development as well as relating it to the overall development of the whole area.

*This section taken from Report of the Technical Advisory Committee on Development Agreements. Underwood McLellan & Associates Limited, Winnipeg, 1974.

The establishment of a basic standard for the provision of public open space should be based on the average type of neighbourhood development in the city. However, as this standard is based on density, it is necessary to make special provision for lower density areas in order to satisfy future public space requirements. Sufficient land must be set aside in appropriate locations so that in the future, when the density increases, there would be enough land to accommodate the increased needs. Thus, in areas where the proposed density falls below the average a percentage reserve minimum should be applied. The per capita standard for deciding on the amount of open space required would then be applied to areas where the above average density occurs. The reason for these two standards is that the per capita standard makes allowance for open space usage where densities are above average and the percentage standard makes sure the areas with lower densities are adequately covered in the future.

In the City of Winnipeg the average neighborhood development consists of 503 acres within a usage radius of 1/2 mile. This area has a population of 11,000 persons and an average density of 22 persons per gross acre. The minimum requirements for this area in terms of public open space is 10 per cent of the area or 50 acres which is considered adequate to fulfill the public open space requirements. The basic requirement to service the 11,000 persons is 50 acres which means that 4.6 acres of public open space are required for each 1,000 persons. Thus, the per capita standard for public open space is 4.6 acres/1,000 persons based on the minimum space dedication requirement at an average development density.*

**The per capita standard for public open space is based on the analysis in the Metropolitan Winnipeg Parks Systems and Standards Study - 1969.*

Where the density of a development is greater than the average the per capita standard of 4.6 acres/1,000 persons should be applied to establish the additional open space required. For example, if the density of a proposed subdivision was 26 persons per gross acre then the required public open space would be 26/10 x 4.6 = 11.96% of the area or 1.96 per cent greater than the average open space requirement of 10 per cent.

Also for small subdivisions below a certain area, the requirement for land dedication is often not feasible, therefore there should be a rate per average sized lot established in lieu of land dedication. A minimum of around four single-family lots or 1/2 acre is suggested, however, this requirement could be extended to an area with more lots depending on the subdivision in question. The charge per lot for small area subdivisions should be a flat fee per lot.

Each proposed subdivision must be related to the overall neighborhood in which it is located. This allows the open space requirements to be correlated with existing development as well as expected future development. Further care should be taken to avoid the occurrence of substandard facilities due to increased densities that may result from rezoning subsequent to subdivision approval. Thus, any rezonong where applicable should only be considered where some form of agreement supplies the city with either land or money in lieu of land so that adequate public open space can be made available to satisfy any expected future increase in densities.

The method of calculating the space requirements where rezonings occur that increase the density beyond the average or beyond what was previously

allocated for a particular site is based on the fact that each use category or zoning district will have a value and expected density which will act as a guide in determining the amount of public land required. Thus, if the site density was originally 22 persons per acre and the rezoning allowed an increase to 44 persons per acre then the public open space requirement under the new density would be 44/10 x 4.6 = 20 per cent. This new area dedication of 2 acres (20% of 10 acres) however, must be adjusted to account for only the differential increase in density and this is done by subtracing the original public dedication of 1 acre. Therefore, under this rezoning only one more acre of the original 10 acres of land or its equivalent would be required.

Where money is required in lieu of land the market price of the additional 2.4 acres would be the amount levied. The market price would be based on the assessed value adjusted by a factor to bring the assessed value to the market value in order to keep the levy on a uniform basis.

The procedure for arriving at expected densities should be done from actual counts where the building plans are available. In many cases, however, this is not possible and where this occurs the average densities as set out in the table on Average Densities by Zoning Districts should be utilized. The table sets out the average number of persons per acre that each zoning district is expected to produce. The preferable approach of using the actual plans as a basis for the density calculations makes allowance for the weighting of different types of developments.

For example, if the proposed building plan had mainly one bedroom and studio suites then the expected overall density of this particular apartment would be lower than the average. This fact would be accounted for

in calculating the space requirements by taking a lower figure for the number of persons per dwelling unit. The figure of 2.5 persons per dwelling unit represents the average number of persons per multiple family dwelling unit but where the type of suites are known such as studios and one bedroom suites these dwelling units can be ascribed densities related to their size. In the case of studios and one bedroom units the average densities would be 1 and 1.5 persons per dwelling unit respectively. If the apartment had an above average number of two and three bedroom suites the above average density would be accounted for by ascribing an increased average number of persons per dwelling unit for the larger suites. The figures derived in this manner would be considered weighted densities and would in most cases be expected to deviate from the average densities.

With respect to the table on Average Densities by Zoning Districts, the density standards for the different uses are based on what is likely to occur in any given area. The number of persons per dwelling unit varies between type of dwelling and location in the city, however, for suburban development which is the case with most new subdivisions, the following averages will be applied. Single-family and duplexes have on the average 4 persons per dwelling unit. Townhouses and other similar low density developments are expected to average about 3 persons per dwelling unit. The remaining residential districts are all some form of multiple-family dwellings and the average for these is 2.5 persons per dwelling unit in the suburbs. In the case of multiple-family uses in the central city, the average drops to about 2 persons per dwelling unit. As more information becomes available through a continuing research program, these average densities should be updated and adjusted to reflect any changes or new trends. However, for the purpose of developing open space requirements at this time, these average densities will be applied.

For each zoning district, the average number of dwelling units that can be expected upon completion of the development has been established. The site area dictates the maximum number of dwelling units in single-family and duplex areas. In the other multiple-family categories, the site area dictates the maximum floor area allowable. Using an average gross floor area of 1,000 sq. ft. per dwelling unit, the range of allowable dwelling units can be set out for each category. From this range the average number of dwelling units per site acre is calculated. In order to arrive at a development density comparable to the open space standard density, the site density must be adjusted to a gross acreage** density. This calculation is based on the fact that for an average subdivision the residential site area is around 68% of the gross area. Thus, a density of 20 dwelling units per site acre is equivalent to 13 dwelling units per gross acres. Once the dwelling unit density has been established for the gross acre, this figure can be translated into the number of persons per gross acre by multiplying the average number of persons expected per dwelling unit by the number of dwelling units per acre.*

* *Site Acre - The area of this lot or lots in the development.*

** *Net Acreage - The developed land and internal roads only. In a residential subdivision this would include the internal roads but exclude all commercial sites, arterial roads and community reserve.*

Gross Acre The total developable acreage of the site in question including those areas which will be used for arterial roads, parks, schools, interchanges, commercial and industrial sites.

AVERAGE DENSITIES IN ZONING DISTRICTS

Zoning District	Range of Dwelling Units Per Site Acre	Average No. of Dwelling Units	Dwelling Units Per Net Acre	Dwelling Units Gross Acre	Average No.** of persons per d.u.	Persons per Gross Acre
R-1	1-5	4.5	4-5	3.5-4	4.0	16
R-2*	5-9	9	7	6	4.0	24
R-3	9-33	21	17	14	2.5	35
R-4	9-55	32	25	22	2.5	48
R3B "L"	17	17	14	12	3.0	3.6
R3B ONE (RM-1)	33-55	44	35	30	2.5	75
R3B TWO (RM-2)	33-65	49	39	33	2.5	82
R3B THREE (RM-3)	55-109	57	45	39	2.5	98
R3B FOUR (RM-4)	77-142	76	60	51	2.0	102
R3B FIVE (RM-5)	109-218	114	91	78	2.0	156

* Based on lot size of 5,500 sq. ft.

** Persons per dwelling unit based on average counts taken at random throughout the suburbs.

For purposes of developing this table the areas involved are assumed to relate as follows:

gross acreage = 100%
net acreage = 85% of gross acreage
site acreage is taken as 80% of net acreage

(A factor relating site area and net area for any subdivision should be calculated from actual measurement of the area.)

Appendix 4 Case Study Comparison

Section A Case Study Outline

Section B Development Features

Section C Development Costs

Section D Operational Considerations

Appendix 4 — Case Study Comparison

Section A — Case Study Outline

Two lake-oriented subdivisions were studied in an attempt to understand the mechanics of development using an artificial lake as a focus. Of specific concern were developer's cost, procedures, housing markets and various limiting factors such as density, size of development, development regulations and how these contributed to the level of recreation amenities provided as part of the development. It was hoped that these case studies would indicate whether an innovative housing development, based on recreation amenities and utilizing an artificial lake as the focus, would prove feasible in the City of Winnipeg.

The first case study was a privately owned residential lake-oriented subdivision of 1,000 acres in the southeast section of Calgary. This single-family detached subdivision, called Lake Bonavista, employs a wide range of recreation amenities as part of the development proposal. Facilities provided include playgrounds, picnic and barbeque areas, boating, fishing and swimming facilities, tennis and basketball courts, skating and tobogganing areas and a community center for other indoor activities and various back-up facilities. All these facilities are in the proximity of artificial lakes and form a focal point for recreation activity in the community (see plan). The artificial lakes of 107 acres total have no storm drainage function but are purely recreational, their size and nature acting as an organizational feature for all other recreation facilities.

Various mandatory conditions concerning house types, landscaping, etc. were imposed throughout the development as part of the total development proposal.

LAKE BONAVISTA

waverley heights

land use conceptual

underwood mclellan & associates limited

The second case study is a lake-oriented subdivision of 350 acres in a southern suburb of Winnipeg, presently under construction. This single family detached subdivision called Lakeside Village and Waverly Heights, represents the typical new housing area in Winnipeg, employing few recreation amenities as part of the development proposal. Fish in the lake and playground facilities, plus minimal landscaping around the lake, are to be the only amenities supplied by the developer. The unique feature of this subdivision is the use of artificial lakes as a cost reducing factor for storm water drainage. (see Appendix 2)

Three major areas were looked at in the case study. The first area, called development features, involved a close look at the market, location, zoning, size, landscape features, and community facilities which made up the development. The second area of study was entitled development costs and was a detailed survey of land development and house production cost in the two subdivisions. It should be understood that many of these costs are "ball park" estimates by developers and not detail itemized costs of the development process. The confidential nature of many of these cost factors and, more specifically, the complex interrelation that exists between the many varied aspects of development, makes it impossible to obtain exact figures. The figures proposed however are generally representative of present day development.

The third area of study involved the operational considerations of lake-oriented subdivisions. Factors such as maintenance, legal liability and handling of public open space, responsibilities, and costs were looked at under this heading. This represented the area of hidden cost and as such may have implications in the overall development process.

Development Features *

Of the development features studied, the developer's market, subdivision location, procedures and initial zoning were all similar. The only difference in the buying market occurred in Calgary where the upper end of the house buying market ($100,000 - $200,000) is much larger than in Winnipeg. This would appear to be an important factor in the amortization of recreation costs in this sort of development. Projected periods for construction are proportionately similar to size of development.

Subdivision approval processes and dedication requirements are similar in each city. The Calgary subdivision provides almost twice as much open space as required as part of its recreation orientation.

There would appear to be two important development features that have implications for development costs in the subdivisions studied. The first is the size of the parcel of land being developed. The 1,000 acres of the Lake Bonavista development allows the cost of the recreation amenities to be spread over a much larger home owner base over longer period of construction time than is the case of the Winnipeg subdivision with its 350 acres. The second factor involved is the size of the residential lots. In the Lake Bonavista case study the standard lot is only 55' x 100' while in Lakeside Village, Waverley Heights, the city requires lots of 59' x 100'. Lot sizes have large implications for overall development density and thus development costs. By developing 3,000 lots at 55' frontages instead of Winnipeg's 59 feet, the developer was able to maintain a comparable density to Winnipeg's and at the same time provide an extra 90 acres of open space for recreation purposes. In the Lakeside Village/Waverley Heights subdivision, with only 1,250 lots at 59' x 100', this could not be done without being reflected in higher house prices.

*Development Features refer to all the components that directly or indirectly affect the final housing package, i.e., house lot and community amenities.

DEVELOPMENT FEATURES

	CASE STUDY 1 LAKE BONAVISTA	CASE STUDY 2 LAKESIDE VILLAGE
MARKET		
1. Status	Young marrieds, professionals White collar	Young marrieds, professionals White collar
2. Income	$12,000 min/year	$12,000-$20,000
3. Children	2.3/family	2.4/family
4. Cars	2	2
LOCATION		
1. Proximity	Suburb, Southeast Calgary	Suburb, South Winnipeg
2. Transportation	On 4 lane arterial	On 4 lane arterial
ZONING		
1. Previous zoning	agricultural	agricultural
2. Length of Development	1968-78	1973-78
SIZE		
1. Subdivision	1,000 acres	350 acres
2. Lots	3,000 lots 55x100	1,250 lots 59x100
3. Lake	107 acres	18 acres
LANDSCAPE FEATURES (Installed by Developer)		
1. Trees	Yes	Yes
2. Rocks	Yes	Yes (public area only)
3. Grass	Yes (sod)	Yes (seed public area)
4. Paths	Yes (asphalt)	Yes (asphalt)
5. Streets and Lanes	Gravel lanes	Concrete lanes
6. Lighting	City standard, special for recreation	City standard
COMMUNITY FACILITIES (Provided by Developer)		
1. Playground	Yes	Yes
2. Picnic & Barbeque	Yes	No
3. Boating	Yes	No
4. Swimming	Yes	No
5. Fishing	Yes	Yes
6. Tennis	Yes	No
7. Basketball	Yes	No
8. Skating	Yes	No
9. Tobogganing	Yes	No
10. Community Center	Yes	No
11. Shopping Center	Yes	No
12. Restaurant	Yes	No
13. Schools	Yes	No
DEDICATION		
Parks and Open Space	10% 190 acres	10% 50 acres
Streets & Boulevards	30%	30%

Section C

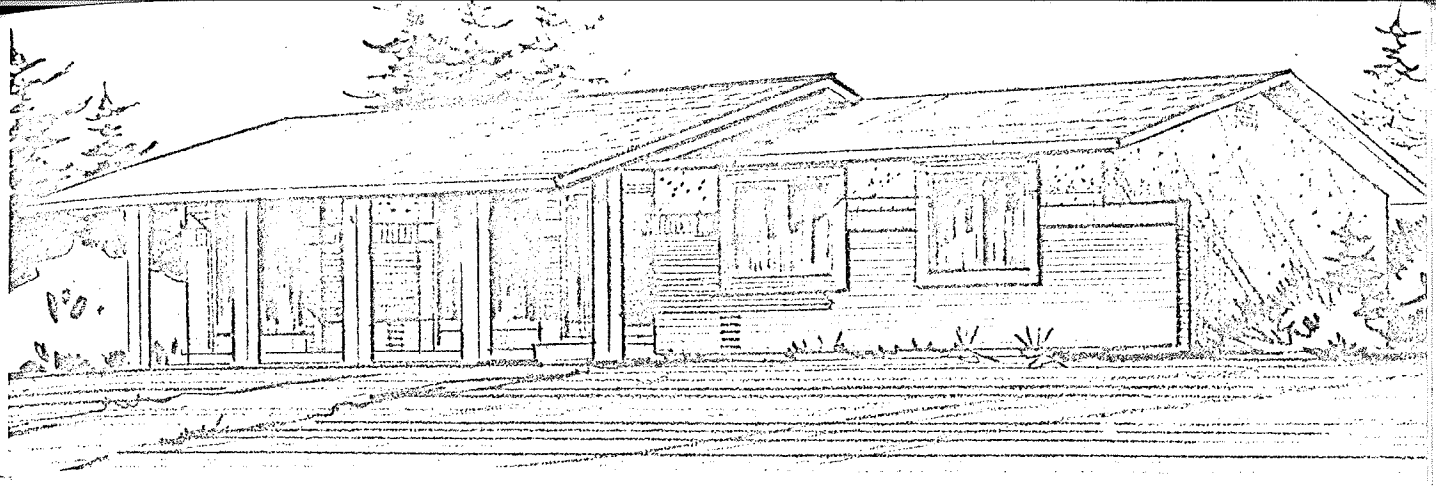
Development Costs

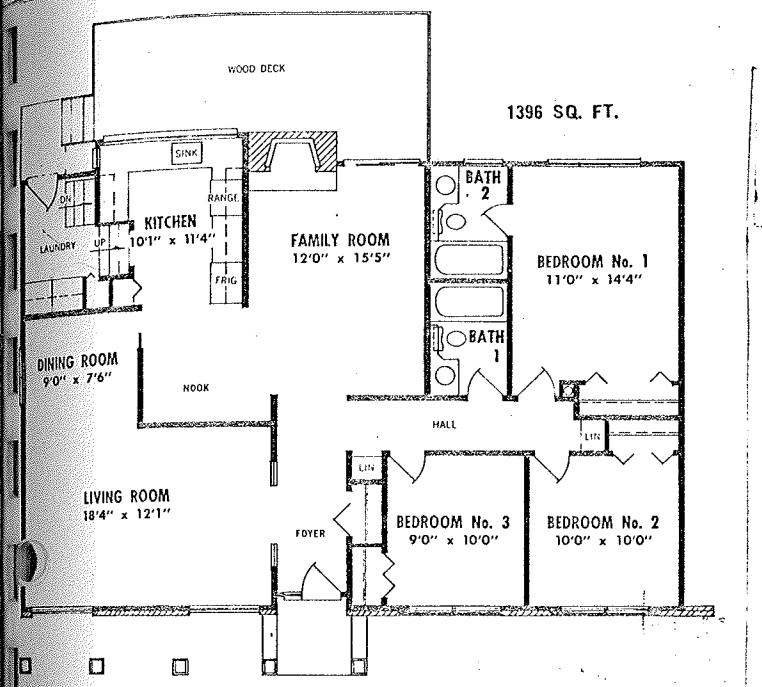
There are two major areas involved in the total development costs of most subdivisions. These are land development and house production. Large development companies usually operate in both areas. This is true of both case studies. Land development costs are made up of raw land costs, servicing costs and the various overhead and fixed costs of the development business. The final selling price of a serviced lot is the sum of these costs plus the developer's profit.

In both Winnipeg and Calgary the selling price of the serviced lot was approximately the same.

Servicing costs in Winnipeg were reduced by artificial lakes used for storm water impoundment. These lower service costs combined with higher raw land costs equal a selling price comparable to that of Calgary.

House production cost differed significantly in Winnipeg and Calgary. In Calgary a 1,396 square foot, three bedroom bungalow costs approximately $28,000.00 to produce while in Winnipeg, the almost identical house (see floor plan) of 1,466 square feet costs $33,718.00. The majority of this cost difference (compensating for area difference) is a result of soil and drainage factors, material costs, and the ability of a large developer to establish a very efficient production process for large numbers of houses. Long term developments involving large numbers of houses also act as a stabilizing factor on house prices and can encourage developers to keep profits to a minimum especially if there is a competitive industry. In Winnipeg, short term development involving small development parcels makes it much easier to adjust profits to fluctuations in the housing market. A large developer usually has more concern for his long term image and thus, future sales.





M 130D

Parkview

LAKE BONAVISTA

3 BEDROOMS

2 BATHROOMS

LIVING/DINING ROOM

FAMILY ROOM

1396 SQ. FT.

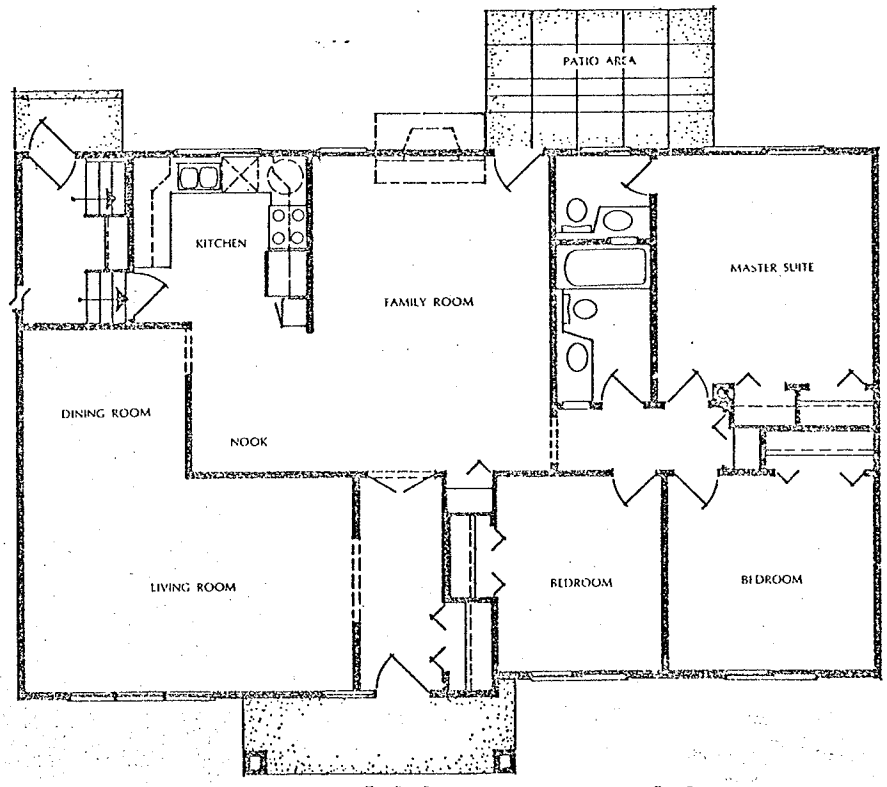
$46,000.00

The Chateau

BUNGALOW

WAVERLEY HEIGHTS, LAKESIDE VILLAGE

3 bedrooms
1½ bathrooms
Living/dining room
Family room
Exterior dimensions: 48′ x 31′
Area: 1,466 sq. ft.
$54,600.00



A 10 Year Warranty Home

* 10 Year Warranty applies only in Calgary, Edmonton, Vancouver and Kamloops

DEVELOPMENT COSTS*

	LAKE BONAVISTA CASE STUDY 1	LAKESIDE VILLAGE CASE STUDY 2
LAND		
1. Purchase Price	$2,500/acre	$7,500/acre
2. Accumulated Interest	@ year 6/$975/acre	@ year 2/$1,500/acre
3. Accumulated Taxes	@ year 6/$625/acre	@ year 2/$350/acre
4. Cost Raw Land/Acre	@ year 6/$4,100/acre	@ year 2/$9,500/acre
5. Cost Raw Land/Lot	@ 3.6 DU/acre/$1,138/lot	@ 3.8 DU/acre/$2,027/lot
LAND DEVELOPMENT**		
1. Service Cost/Lot	55 FF @ $100/FF = $5,500/lot	59 FF @ $85/FF = $5,015/lot
2. Overhead/Lot	@ $59/FF = $3,245/lot	@ $33/FF = $1,947/lot
3. Development Cost/Lot	@ $159/FF = $8,745/lot	@ $118/FF = $6,962/lot
4. Developer's Markup/Lot	@ $20/FF = $1,100/lot	@ $20/FF = $1,180/lot
5. Cost Raw Land/Lot	@ $21/FF = $1,138/lot	@ $35/FF = $2,027/lot
6. Selling Price of Serviced Lot	@ $200/FF = $10,983	@ $173/FF = $10,168/lot
HOUSE PRODUCTION		
1. Materials & Labour	@ $20/sf = $28,037	@ $23/sf = $33,718
2. Overhead & Markup	@ $5/sf = $6,980	@ $7/sf = $10,262
3. House Selling Price**	@ $25/sf = $35,017	@ $30/sf = $43,980
4. Serviced Lot	- $10,983	$10,168
5. Total Selling Price of Home (Lot & House)	$46,000	$54,148

* Information on costs derived from personal interviews with Mr. Birch, CMHC Housing, Mr. B. Shrake, Heritage Homes, Winnipeg, and Mr. B. Kemoff, Kelwood Corporation, Calgary, Alberta.

** All $ values calculated at 1974 prices.

*** Includes $300/house amenity charge.

The serviced lot price and house selling price combine in a total home selling price of approximately $46,000.00 in Calgary as opposed to $54,600.00 in Winnipeg. Included in the house selling price of Lake Bonavista in Calgary is a $300.00 per house amenity charge to cover the one million dollar cost of providing the recreation amenities. Obviously, the value per dollar for housing in this Calgary subdivision is much greater than for a similar house in Winnipeg. This is reflected not only in house prices but in the provision of recreation opportunities.

There are other important factors that determine the nature of recreation amenities that may be provided in lake-oriented subdivisions. Operational considerations are one such factor. In the Lake Bonavista development the developer is responsible for all the recreation facilities, etc. within the recreation area for the life of his involvement in the development. After this ten year period these same responsibilities will be turned over to a community association. Presently a $60.00 per house, per year operating and maintaining charge is levied against each household to raise $180,000.00 per year.

On the other hand, the developer's involvement in the Lakeside Village/ Waverly Heights subdivision assumes no responsibility for maintenance of either recreation facilities or other general subdivision maintenance (roads, service, etc.) after the first several years. The city assumes this reponsibility for existing facilities and it is usually several years later before additional facilities are developed. In very few cases do these public facilities ever match those of good private development.

The legal liability coverage necessary for artificial lakes in case of accidents is another responsibility that Winnipeg developers are unwilling to assume. The Lake Bonavista development firm has a legal liability policy in the area of $1,000,000.00, an added cost which Winnipeg developers would sooner have the city pick up at no expense to themselves. The City of

OPERATIONAL CONSIDERATIONS

	CASE STUDY 1 LAKE BONAVISTA	CASE STUDY 2 LAKESIDE VILLAGE
MAINTENANCE OF SUBDIVISION		
1. Responsibility	Surface services and utilities are developer's responsibility for two years, underground services for one year. Boulevards, trees, landscaping, etc. are developer's responsibility for 10 year development period.	Developer responsible for all services, utilities, landscaping for 1 year. City takes over responsibility from there on. City also responsible for trees, grass cutting, landscape maintenance for all public areas from there on.
2. Cost	Mandatory levee of $60/house/year or $180/year operating and maintenance capital.	Total maintenance cost to developer for first year approximately $1,600/year.
LEGAL LIABILITY FOR LAKES		
1. Extent	Developer not liable for accidents on lakes unless proven negligent.	City not liable if there is no proof of negligence.
2. Cost	$1,000,000 liability insurance policy.	Liability insurance policy.
PUBLIC OPEN SPACE		
1. Access	Open space area (park) on one side of lake fenced and access restricted to residents of subdivision.	Access to one side of lake between road right of way and lake. This buffer area not fenced and is open to the general public.
2. Responsibility	Operated and maintained for 10 year development period by developer, then turned over to community committee.	Operated and maintained by city. City responsible for buffer between low water level of lake and road right of way. Residents responsible for area between their property and low water level on lake.

Winnipeg has a comparable policy to cover accidents where it can be proven that the city was negligent. The one drowning that has occurred thus far was never brought to court, and it would appear that properly designed lakes are not hazardous.

Operational considerations have another major influence on the quality and quantity of recreation amenities that may be provided in a lake-oriented subdivision. In both the Calgary and Winnipeg case studies, the artificial lake is a unique and attractive feature to home buyers. Thus, lake frontage lots in both developments have a higher selling price than those away from the shore. On the Lake Bonavista shoreline, homes are in the $100,000.00 to $200,000.00 price range while in portions of Waverley Heights/Lakeside Village, they will average around $80,000.00 to $90,000.00. An obvious conflict arises between using this shoreline for very desirable recreation open space and as selling feature to reap large profits on lot sales. In a private development, the developer makes the decision where the trade-off between profit and open space lies. In the second phase of the Lake Bonavista development there is practically no open space planned along the lakeshore.

On the other hand, in a public development the developer may be required to locate part of his dedication along the shoreline and perhaps even develop a linear recreation system utilizing the lakes as part of a much larger city system. This would entail opening the development up to the general public and not simply one specific group as is the case with the private fenced lake and recreation amenities of Lake Bonavista. In the Lakeside Village/ Waverley Heights subdivision, the general public will be admitted to the recreation facilities along one side of the lake, while the other side will be private property.

To summarize, there are obvious benefits to both developers and residents in the privately operated Lake Bonavista development in Calgary. These benefits include the immediate provision of a wide range of recreation amenities and services for subdivision residents for a small additional cost. It also gives the development a strong image which increases sales and assures a market over a longer period of time. These features, combined with lower house production costs, make the dollar value of this housing in Calgary much more attractive than can be found anywhere in Winnipeg. The major drawback would appear to be in the exclusiveness that this development encourages and thus the lack of consideration for its overall place in the larger city community.

Appendix 5 Open Space and Service Cost Savings Calculations

Section A Design and Estimation of Service Systems for 7.3 and 10.5 du/acre

Section B Derivation of Open Space and Service Cost Savings Graph

Appendix 5

Open Space and Service Cost Savings Calculations

Section A

Design and Estimation of Service Systems for 7.3 and 10.5 du/acre

The basic service cost per dwelling unit was taken from the Underwood McLellan and Associates Limited letter of November 19, 1974 and represents the actual service costs involved in development of 367 residential lots on the Waverly Heights site (see following letter). This figure representing 4.3 du/ac formed the basic service cost against which all other cost at various densities were compared to arrive at the service cost savings per dwelling unit. A description of the type of service hardware and unit prices follows under the title "service unit prices and descriptions".

Two other design densities, 7.3 and 10.5 dwelling units per acre were designed and costed out using these same unit prices (see "Quantity Tabulations" and Design Density Drawings for calculations and configurations).

Underwood McLellan & Associates Limited

1479 Buffalo Place, Winnipeg, Manitoba R3T 1L7 Telephone (204) 284-0580

November 19, 1974 Our File No. 41 02 869 43 01

Mr. Fred Wilton
Department of Landscape
Architecture
City of Winnipeg
902 Home Street
Winnipeg, Manitoba

Dear Sir:

As per your request we have summarized the development cost of residential lots on a unit cost per lot. The development we refer to for this estimate is the Waverley Heights Subdivision in the Community of Fort Garry.

The cost breakdown is as follows:

Total construction cost	$ 1,400,000.00 * *SEE NOTE*
Planning	19,000.00
Engineering	150,000.00
Registration	25,000.00
City Administration - 2%	28,000.00
Total Basic Cost	$ 1,722,000.00

In this particular subdivision there are 367 residential lots which produce a unit cost per lot for basic servicing of $4,692.10. Additional to this basic cost the developer must include in his final costs such things as street lighting, hydro and telephone servicing, boulevard sodding and driveway approaches to the property line. This would increase the unit price per lot by approximately $750 for a total of $5,442.

This cost estimate is based on asphalt roadways as constructed in the Waverley Heights Subdivision. If a concrete roadway system had been used, again this would have cost an additional $700 per lot or a total of $6,142 per unit.

**NOTE: THE DEVELOPMENT COST WAS DIVIDED BY THE NUMBER OF DWELLING UNITS AND THE LANDSCAPE COST OF $750. WAS ADDED TO GIVE THE BASE SERVICE COST PER DWELLING UNIT ie:* $\frac{\$1,400,000.}{367} + \$750. = \$4,564./du.$

(Cont'd)

Lake systems for storm water retention were used in this sub-division which, in this case, was more economic than a conventional storm system. This subdivision is therefore not entirely typical in this respect and in the use of asphaltic pavement.

We are presently estimating a conventional subdivision with Portland cement concrete pavement and our estimated costs are approximately $9,000 per lot without boulevard grading, driveways or underground wiring.

All figures given in the above information were based on 1974 prices and will likely increase a fair amount in 1975. We hope the figures and information will be sufficient for your use.

Yours truly,

UNDERWOOD MCLELLAN & ASSOCIATES LIMITED

E. H. Hanson, P. Eng.
Director - Environmental Services Division

EHH:ph

A. Watermains

Item	Description	Approximate Quantity	Unit Price	Extension
1.	6" C.I. or A.C. Watermain Supplied & installed complete			
*	a) in open trench	7,400 lin.ft.	$ 6	$ 44,400
	b) in auger hole	100 lin.ft.	11	1,100
2.	8" C.I. or A.C. Watermains Supplied & installed complete			
*	a) in open trench	40 lin.ft.	7	280
	b) in auger hole	40 lin.ft.	13	520
3.	10" C.I. or A.C. Watermains Supplied & installed complete			
*	a) in open trench	400 lin.ft.	9	3,600
	b) in auger hole	40 lin.ft.	13	520
4.	12" C.I. or A.C. Watermains Supplied & installed complete			
*	a) in open trench	2,560 lin.ft.	10	25,600
	b) in auger hole	50 lin.ft.	15	750
	c) inside existing 24" C.M.P. Conduit	60 lin.ft.	10	600
5.	6" gate valves supplied & installed complete	37 units	275	10,175
6.	8" gate valves supplied & installed complete	1 unit	350	350
7.	10" gate valves supplied & installed complete	1 unit	525	525
8.	12" gate valves supplied & installed complete	4 units	700	2,800
9.	Hydrants supplied & installed complete	21 units	800	16,800
10.	Hydrant drains supplied & installed complete			
	a) in open trench with Class 2 backfill	400 lin.ft.	4.50	1,800
	b) in open trench with Class 1 backfill	600 lin.ft.	7.50	4,500

11.	Connections to existing 20" A.C. Watermain at C.N.R. right-of-way	Lump Sum	$2,500	$ 2,500
12.	Extra for Class 1 Backfill of all watermain trenches	600 lin.ft.	3	1,800
	TOTAL FOR WATERMAINS			$118,620

B. Sanitary Sewers

1.	10" sanitary sewer supplied and installed complete in open trench			
	a) 7'-9' deep	1,270 lin.ft.	$ 5	$ 6,350
	b) 9'-11' deep	3,500 lin.ft.	5.50	17,250
	c) 11'-13' deep	1,720 lin.ft.	6	10,320
	d) 13'-15' deep	915 lin.ft.	7	6,405
	e) 15'-17' deep	650 lin.ft.	8	5,200
	f) 17'-19' deep	750 lin.ft.	9	6,750
	g) 10'-21' deep	1,425 lin.ft.	10	14,250
2.	10" sanitary sewer supplied & installed complete			
	a) auger hole	50 lin.ft.	13	650
	b) existing 18" C.M.P. conduit	60 lin.ft.	10	600
3.	12" sanitary sewer supplied & installed complete			
*	a) in open trench 19'-21' deep	40 lin.ft.	12	480
	b) in auger hole	30 lin.ft.	15	450
*4.	Standard Manholes	550 vt.ft.	35	19,250
5.	Standard drop sections supplied & installed complete	50 vt.ft.	30	1,500
6.	6" risers supplied & installed complete	300 vt.ft.	10	3,000
7.	Extra for Class 1 backfill of all sanitary sewer trenches	850 lin.ft.	3	2,550
	TOTAL FOR SANITARY SEWERS			$ 97,005

C. Storm Sewers

1.	12" Storm Sewers supplied & installed in open trench			
*	a) 7'-9' deep	1,985 lin.ft.	$ 6	$ 11,910
	b) 9'-11' deep	975 lin.ft.	7	6,825

2.	15" storm sewer supplied & installed in open trench			
*	a) 7'-9' deep	780 lin.ft.	$ 6.50	$ 5,070
	b) 9'-11' deep	200 lin.ft.	7.50	1,500
3.	18" storm sewer supplied & installed complete in open trench			
	a) 7'-9' deep	300 lin.ft.	8	2,400
*	b) 9'-11' deep	435 lin.ft.	9	3,915
	c) 11'-13' deep	300 lin.ft.	10	3,000
	d) 17'-19' deep	280 lin.ft.	12	3,360
4.	24" storm sewer supplied & installed complete in open trench 13'-15' deep	995 lin.ft.	13	12,935
5.	30" storm sewer supplied & installed complete in open trench			
	a) 9'-11' deep	245 lin.ft.	15	3,675
*	b) 11'-13' deep	250 lin.ft.	16	4,000
	c) 13'-15' deep	545 lin.ft.	17	9,265
	d) 15'-17' deep	285 lin.ft.	18	5,130
6.	30" C.M.P., 14" gauge, storm sewer outfalls supplied & installed complete all depths in open trench	405 lin.ft.	13	5,265
*7.	Standard manholes supplied & installed complete on sewers 24" diameter and smaller	250 vt.ft.	35	8,750
8.	Standard manholes supplied & installed on sewers greater than 24" diameter	35 vt.ft.	52	1,820
9.	Special 66" diameter manholes supplied and installed complete			
	a) manhole S2	Lump Sum	1,200	1,200
	b) manhole S11	Lump Sum	1,200	1,200
	c) manhole S14	Lump Sum	1,200	1,200
10.	Special weir manholes supplied and installed complete			
	a) manhole S1	Lump Sum	1,400	1,400
	b) manhole S10	Lump Sum	1,400	1,400
	c) manhole S24	Lump Sum	1,400	1,400
11.	Standard 6' catchbasins supplied and installed complete	34 units	325	11,050
12.	8" catchbasin leads supplied and installed complete in open trench with			
	a) Class 2 backfill	350 lin.ft.	6	2,100
	b) Class 1 backfill	1,075 lin.ft.	9	9,675

13.	10" catchbasin leads supplied & installed complete in open trench with			
	a) Class 2 backfill	50 lin.ft.	$ 6.50	$ 325
*	b) Class 1 backfill	180 lin.ft.	9.50	1,710
14.	6" thick reinforced concrete storm sewer outfall pads supplied and installed complete	90 sq.ft.	4	360
15.	Rip rap supplied & installed complete around outfall pads as specified	10 sq.yd.	10	100
16.	Extra for Class 1 backfill of all storm sewer trenches	700 lin.ft.	3	2,100
	TOTAL FOR STORM SEWERS			$124,040

D. Building Services

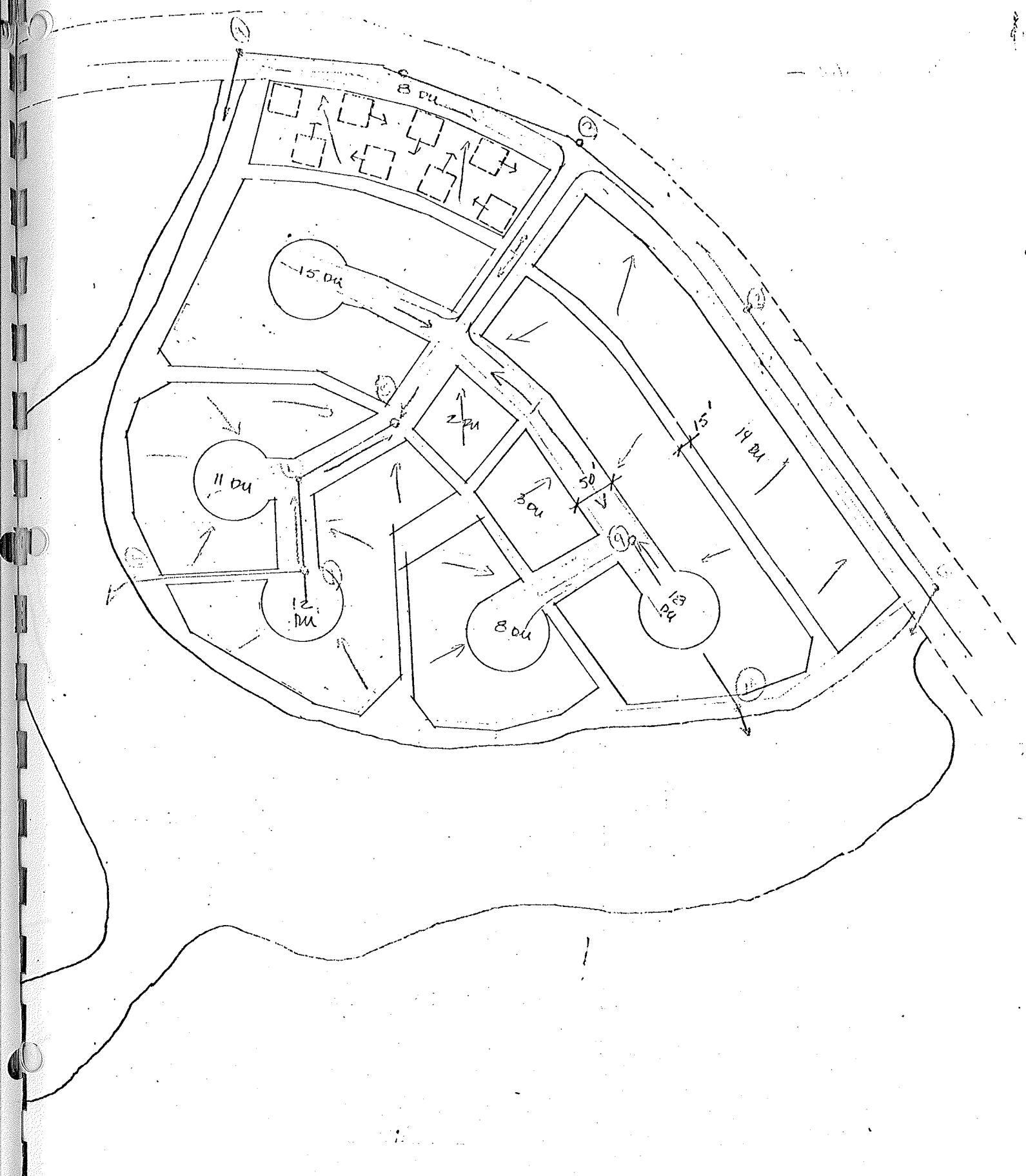
1.	6" sewer services supplied & installed complete			
*	a) in open trench	4,500 lin.ft.	$ 5	$ 22,500
	b) in auger hole	3,500 lin.ft.	8	28,000
2.	3/4" water service supplied & installed complete			
*	a) in separate open trench	2,500 lin.ft.	4.50	11,250
	b) in common open trench with sewer services	2,200 lin.ft.	2	4,400
	c) in separate auger hole	2,750 lin.ft.	5	13,750
	d) in common auger hole with sewer service	1,100 lin.ft.	2	2,200
*3.	3/4" corporation cocks supplied & installed complete	225 units	15	3,375
*4.	3/4" curb stops supplied & installed complete	225 units	35	7,875
5.	Wooden 2"x4" markers supplied & installed complete	225 units	5	1,125
6.	Extra for Class 1 backfill	600 lin.ft.	3	1,800
	TOTAL FOR BUILDING SERVICES			$ 96,275

E. Roads

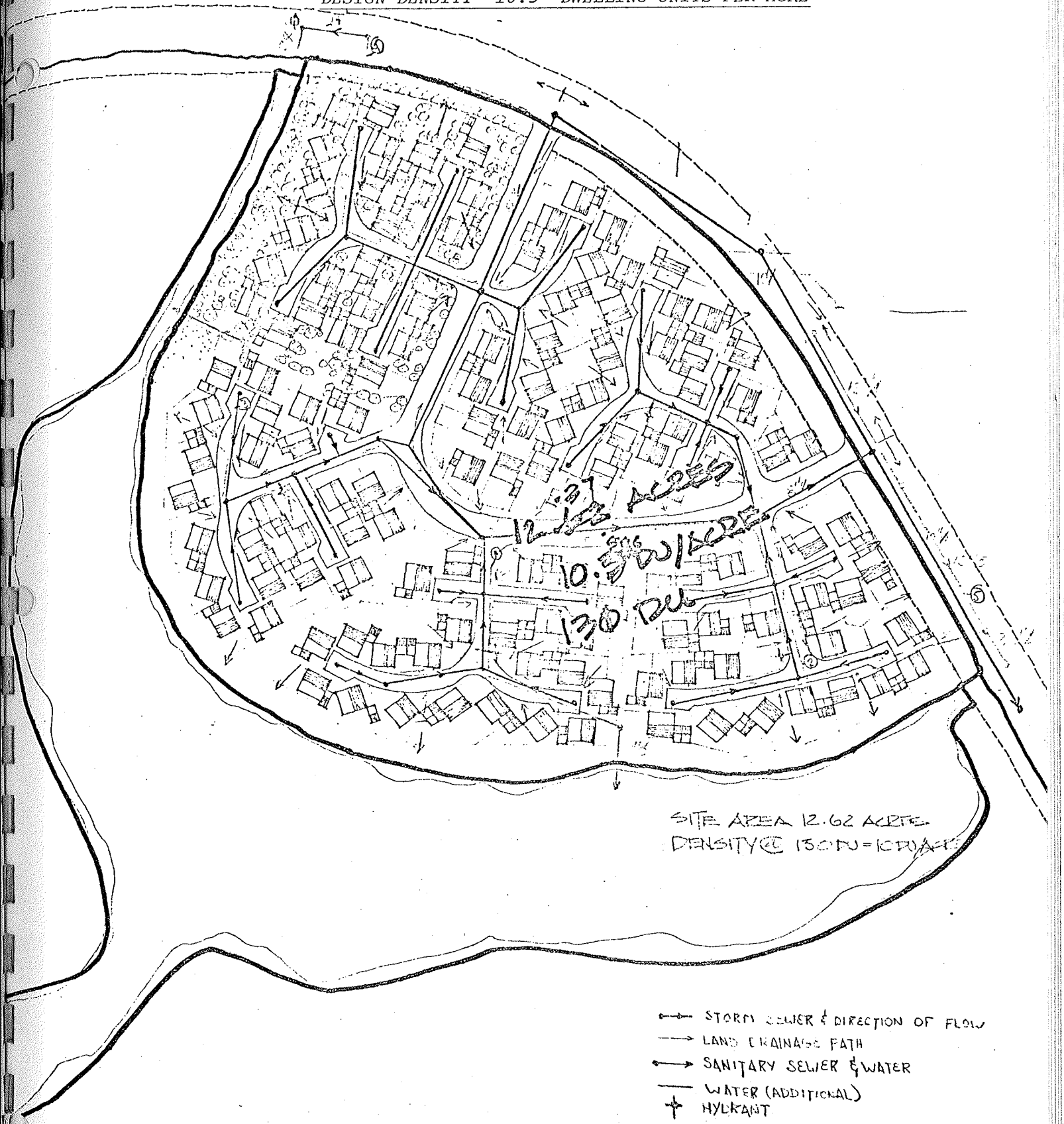
1.	1" crushed limestone for lime stabilized sub base supplied & installed complete	4,135 tons	$ 3.75	$ 15,506.25
*2.	Granular base course material 6" thick supplied & installed complete	34,400 sq.yd.	1.22	41,968.00
3.	Granular base course material 3" thick supplied and installed complete	5,100 sq.yd.	.65	3,315.00
4.	Pulverization, mixing and compaction of subgrade as specified	39,400 sq.yd.	.40	15,760.00
5.	Quicklime supplied & installed complete	512 tons	40.00	20,480.00
*6.	Bituminous prime coat primer SS-1 supplied & installed complete	15,800 gal.	.40	6,320.00
*7.	Asphalt primer MC-O supplied & installed complete	11,400 gal.	.40	4,560.00
*8.	Hot mix asphaltic concrete 3" thick supplied & installed complete	28,500 sq.yd.	2.15	61,275.00
9.	Hot mix asphaltic concrete 1" thick for sidewalk edges supplied & installed complete	370 sq.yd.	5.00	1,850.00
10.	Reinforced concrete pavement 6" thick supplied & installed complete	4,400 sq.yd.	9.15	40,260.00
11.	Adjustment of manhole covers in boulevards complete	5 units	24.25	121.25
12.	Adjustment of manhole covers in pavement complete	10 units	50.00	500.00
13.	Adjustment of valve boxes complete	10 units	24.40	244.00
14.	Compaction of utility trenches complete	300 lin.ft.	1.00	300.00
15.	4" concrete sidewalks supplied & installed complete	26,230 sq.ft.	.85	22,295.50

16.	Concrete barrier curb and gutter supplied & installed complete	7,400 lin.ft.	$ 3.74	$ 27,676.00
17.	Concrete rolled curb and gutter supplied & installed complete	13,410 lin.ft.	3.40	45,594.00
*18.	3' curb inlets supplied & installed complete	19 units	250.00	4,750.00
19.	1' curb inlets supplied & installed complete	32 units	230.00	7,360.00
*20.	8" curb inlet lead supplied & installed complete	550 lin.ft.	7.00	3,850.00
	TOTAL FOR ROADS			$323,985.00
F.	Miscellaneous Items			
1.	Sand or gravel fill supplied & installed complete	500 cu.yd.	$ 6.00	$ 3,000.00
2.	Unshrinkable fill supplied & installed complete	100 cu.yd.	10.00	1,000.00
	TOTAL FOR MISCELLANEOUS ITEMS			$ 4,000.00
G.	Earthwork - Lakes, Berms & Hills			
1.	Common excavation	250,000 cu.yd.	$ .32	$ 80,000.00
	TOTAL FOR EARTHWORK			$ 80,000.00
H.	Miscellaneous			
1.	Rock excavation	25 cu.yd.	$ 10.00	$ 250.00
2.	Supply & place sand or gravel fill	300 tons	4.40	1,320.00

DESIGN DENSITY 7.3 DWELLING UNITS PER ACRE



DESIGN DENSITY 10.5 DWELLING UNITS PER ACRE



	Quantity Tabulation	*7.3 du/ac*
A.	*Watermain*	
	1,150' of 10'/sq.ft. @ $9 (1/2 for devel.)	*$ 5,175.00*
	1,200' of 8"/sq.ft. @ $7	*8,400.00*
	1,310' of 6"/sq.ft. @ $6	*7,860.00*
	Fittings 3,660' @ $4/ft.	*14,640.00*
	91 main stops @ $15	*1,365.00*
	91 curb stops & box @ $35	*3,185.00*
	Connective pipe 91 @ 25' @ $4.50	*10,237.50*
	**TOTAL*	*$ 50,862.50*
B.	*Sanitary Sewer*	
	1,150' of 15'/sq.ft. @ $7.50 (1/2 for devel.)	*$ 4,312.50*
	1,770' of 10'/sq.ft. @ $5.50	*9,735.00*
	15 MH f & c @	*5.00*
	15 MH v.f. @ 10 v.f. @ $35	*5,250.00*
	91 saddle tees @	
	91 service conn. @ 25' @ $5	*11,375.00*
	**TOTAL*	*$ 30,672.50*
C.	*Storm Sewers*	
	840' of 15'/sq.ft. @ $6.50	*$ 5,460.00*
	250' of 18'/sq.ft. @ $9.00	*2,250.00*
	740' of 24'/sq.ft. @ $13.00	*9,620.00*
	20 G.T.'s @ $250	*5,000.00*

C. Continued...

10 C.B.'s @ $325	$ 3,250.00
10 MH f & c @	
10 MH v.f. @ 8' @ $35	2,800.00
4 lake outfalls @ $1,000	4,000.00
GI conn. pipe 10 x 12 @ $7	840.00
CB conn. pipe 10 x 15 @ $9.50	1,425.00
*TOTAL	$ 30,645.00

D. Pavement Cost

(1,770' x 21 ÷ 9) sq.yds. @ $2.53	$ 10,448.90
Cul-de-sac 24 x 80 x 4 ÷ 9 @ $2.53	2,159.00
Curb & gutter 4,690' @ $3.74	17,540.60
Main road 16' x 1,150 ÷ 9 @ $2.53	51,724.00
12" bare course 7,027 yds.^{2} @ $2.44	17,145.88
	$ 52,466.82
Aprons, turnouts, etc. 10%	$ 5,246.68
*TOTAL	$ 57,713.50

E. Lake Construction Cost

$\frac{0.48}{10}$ acres @ 32¢	$ 7,680.00
Total Construction Cost	$ 177,573.50
Cost per dwelling unit $\frac{\$177,573.50}{91 (du)}$	$ 1,951.00
Landscape cost (boulevards, sidewalks, lighting, etc.)	$ 750.00/du
Total serving cost per dwelling unit	$ 2,701.00

Quantity Tabulation	10.5 du/ac
A. Watermain	
920' of 15"/sq.ft. (1/2 for development) @ $9	$ 4,140.00
1,050' of 8"/sq.ft. @ $7	7,350.00
3,710' of 6"/sq.ft. @ $6	22,260.00
Fittings @ $4/ft. for 5,680'	22,720.00
130 main stops @ $15	1,950.00
130 curb stop & box @ $35	4,550.00
connection pipe 130 @ 9' @ $4.50	5,265.00
*TOTAL	$ 68,235.00
B. Sanitary Sewers	
920' of 15"/sq.ft. (1/2 for development) @ $7.50	$ 3,450.00
4,560' of 10"/sq.ft. @ $5.50	25,080.00
44 MH f & c @	
44 MH @ 10 v.f. @ $35	15,400.00
130 saddle tees @	
130 service conn. @ 9' @ $5	5,850.00
*TOTAL	$ 49,780.00
C. Storm Sewers	
390' of 12"/sq.ft. @ $6	$ 2,340.00
700' of 15"/sq.ft. @ $6.50	4,550.00
420' of 18"/sq.ft. @ $9	3,780.00
38 G.I. @ $250	9,500.00
19 CB's @ $325	6,175.00

C. Continued....

GI pipe 22' x 15' @ $7		$ 2,310.00
CB conn pipe 19' x 11' @ $9.50		1,985.50
610' of 24"/sq.ft. @ $13		7,930.00
130' of 30'/sq.ft. @ $16		2,080.00
15 MH f & c @		
15 MH v.f. @ 8 v.f. @ $35		4,200.00
4 lake outfalls @ $1,000		4,000.00
	*TOTAL	$ 48,850.50

D. Pavement Cost @ 3" depth

(1,050' x 27' ÷ 9) sq.yds. @ $2.53		$ 7,969.50
(3,600 x 16' ÷ 9) sq.yds. @ $2.53		16,192.00
Curb and gutter 10,220 l.f. @ $3.74		38,222.80
Main road (asphalt) $\frac{16 \times 920}{4}$ @ $2.53		4,137.95
12" base course 11,185 sq.yds. @ $2.44		27,291.40
	Subtotal	$ 93,813.65
	Aprons, turnouts, etc. 10%	$ 9,381.36
	*TOTAL	$ 103,195.00

E. Lake Construction Cost

0.6 acre lake = $\frac{0.6}{10}$ x 500,000 @ 32¢	$ 9,600.00
Total Construction Cost	$ 279,660.50
Cost per dwelling unit $\frac{\$279,660.50}{91 \text{ (du)}}$	$ 2,151.00
Landscape cost (boulevards, lighting, sidewalks, etc.)	$ 750.00
Total servicing cost per dwelling unit	$ 2,901.00

Section B

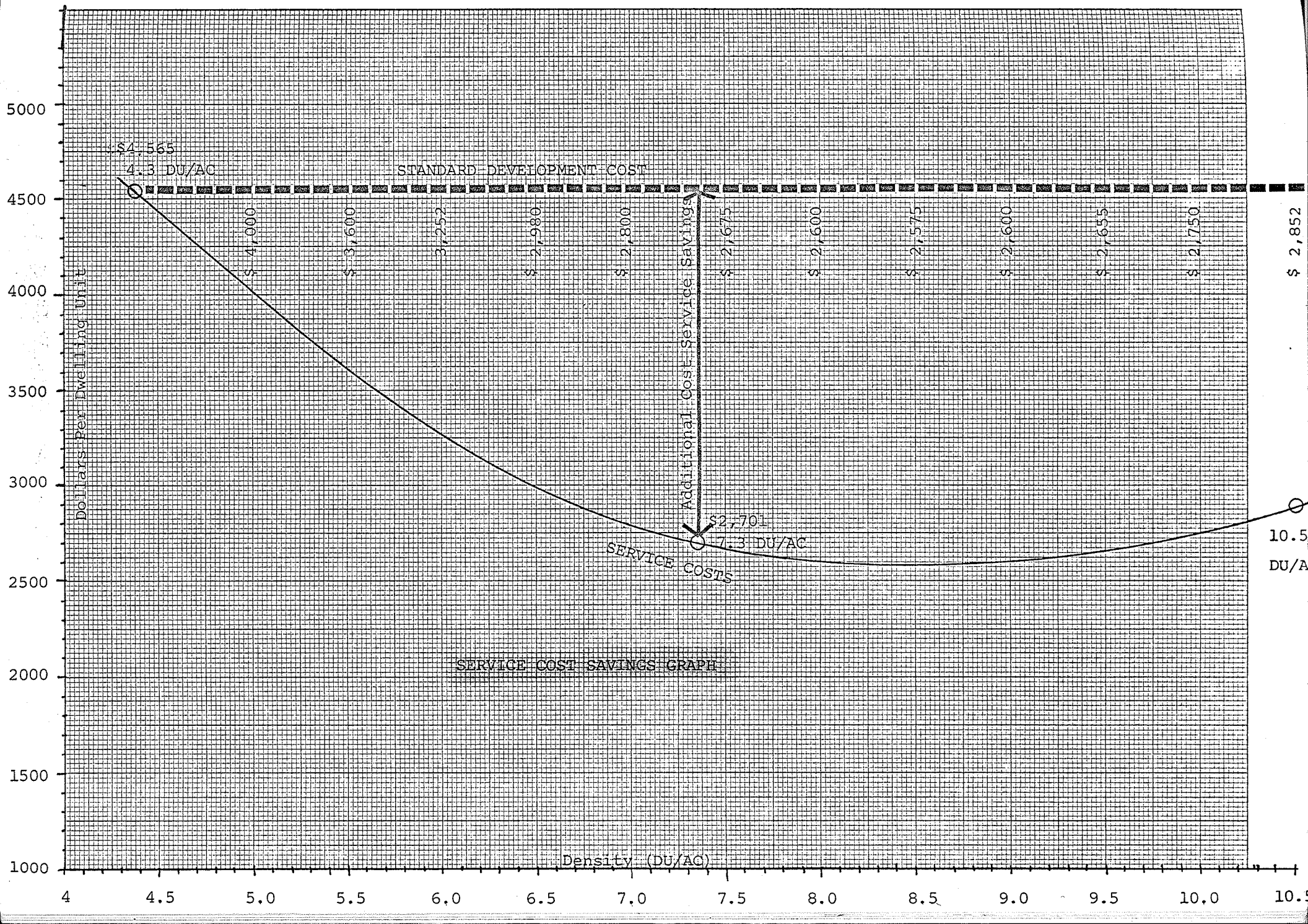
Derivation of Open Space and Service Cost Savings Graphs

Both the service cost savings graph and open space savings graph were derived by plotting the service cost and open space savings at the three net densities studied.

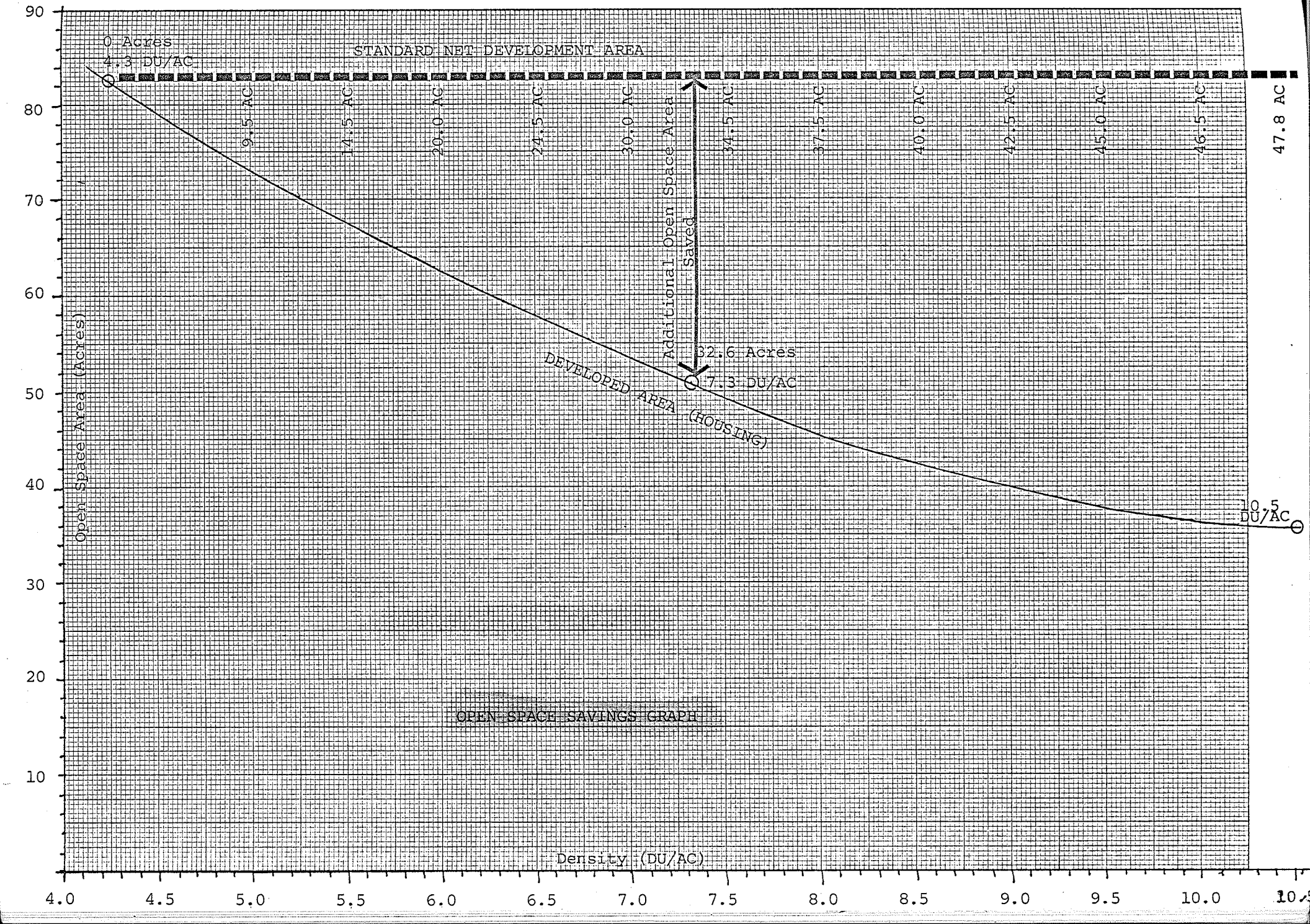
For the open space savings graph, the area saved was based on the Design Density Drawings. At 7.3 dwelling units/acre there were 91 du's occupying a 12.3 acre site while at 10.5 acres there were 131 du's on the same site This meant that each dwelling unit occupied approximately $\frac{12.37}{91}$ = .135 acres at 7.3 du/ac and $\frac{12.37}{131}$ = .094 acres at 10.5 du/ac. The area required for the total 367 dwelling units therefore would be 367 x .135 = 49.5 acres at 7.3 du/ac and 367 x .094 = 34.5 acres at 10.5 du/acre. The total net developable area (as derived from site measurement) for this site is 82.5 acres. Therefore there are approximately 82.5 - 49.5 = 32.6 acres of additional open space at 7.3 du/ac and 8.25 - 34.5 = 47.8 acres of additional open space at 10.5 du/ac. There are also no acres of additional open space at the conventional density of 4.3 du/ac.

When these three points are plotted on a graph combining density and area, the resultant line is a curve. Any point on this line represents the difference in open space area between the conventional density and the proposed net density. The "Service Cost and Open Space Savings" Table lists, under the Open Space Savings column, the open space savings at each net density between 4.3 and 10.5 du/ac.

The service cost savings graph was derived by plotting the three service cost points at 4.3 du/ac, 7.3 du/ac and 10.5 du/ac and joining them with a curved line. From this line service cost for any net density between 4.3 and 10.5 du/ac could be projected and subtracted from the base service cost of



SERVICE COST SAVINGS GRAPH



$4,564 at the conventional density of 4.3 du/ac to give the approximate service cost savings. The service cost and service cost savings for this site are projected at the various densities on the "Service Cost and Open Space Savings" Table. This table lists all the service cost, service cost savings, total savings for 367 dwelling units and the dollars per acre for open space and recreation development. This last category represents the total savings for the entire site or 367 dwelling units at a net density divided by the total open space area at that net density. This sum is helpful in predicting the amount of money that a developer will have available to spend on open space and recreation development and is perhaps the first level at which the feasibility of a C.O.R.D. development can be assessed.

Both Open Space and Service Cost Savings predicted in this format were the basis for many of the other computations. It is recognized that these figures, especially service costs, are approximations and therefore can have great bearings on other elements of the C.O.R.D. proposal. However, it is felt that the principle is valid as other studies have confirmed this approximate range of service cost savings. Further experience by engineers in estimating service costs in this intermediate density range will allow more accurate predictions to be developed in the future.

Appendix 6 Case Study Application

Section A Site Inventory and Analysis Maps

Section B C.O.R.D. Alternative Derivation

Section C Recreation and Open Space Amenity Package

Appendix 6 *Case Study Application*

Section A *Site Inventory and Analysis Maps*

There are three site inventory maps, three analysis maps and two detailed design maps which demonstrate the C.O.R.D. alternative proposal as applied to this site. Following is a listing and description of each map.

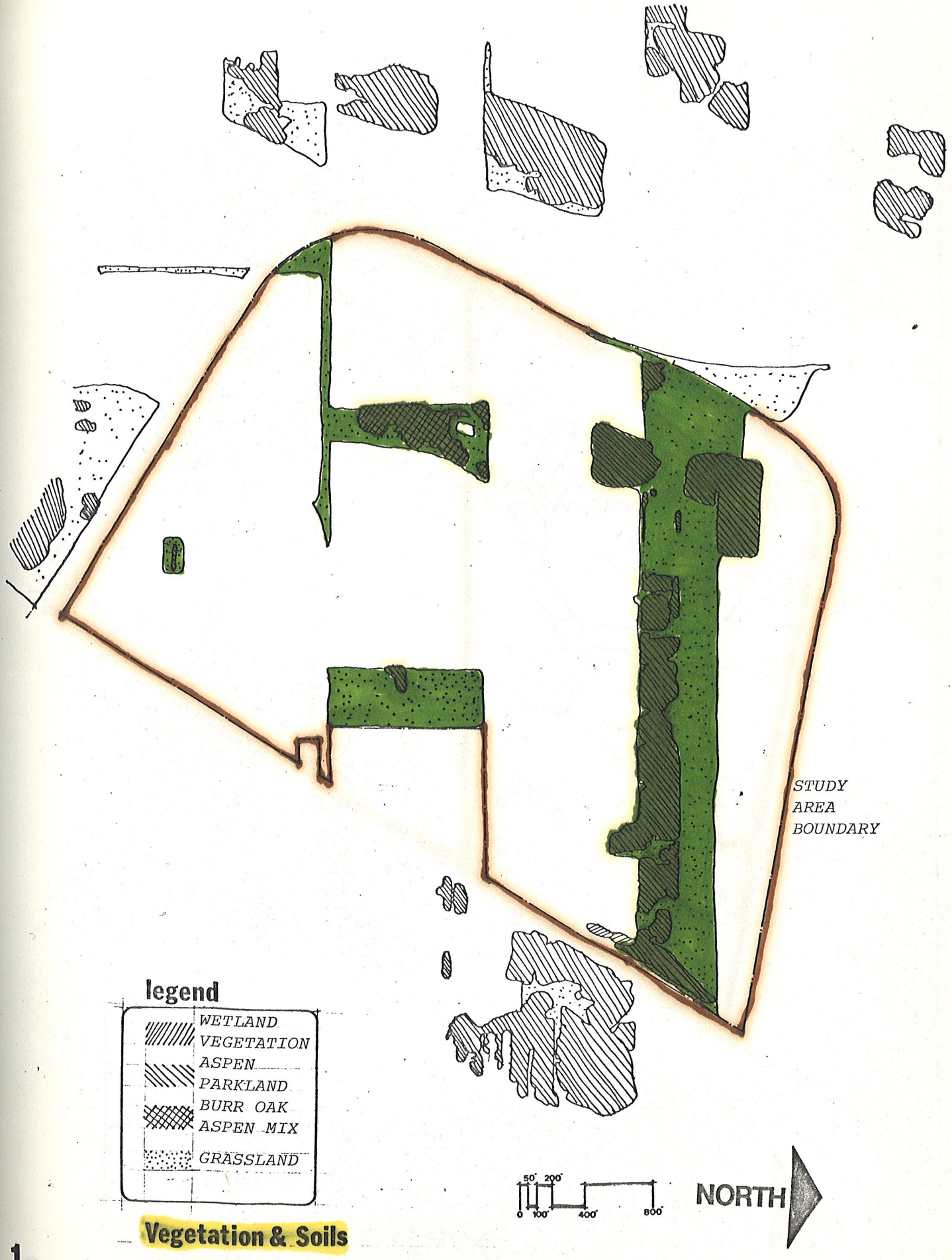
1. *Vegetation and Soils (see map 1)*

   The site is predominantly unvegetated. At present, its primary cover being agricultural crops. There are also 19 acres of aspen 20-30' in height, 3 acres of Burr oak and aspen mixed and approximately 34 acres of exotic and native grassland. There is also a small wetland area or slough in the northeast corner of the site, a result of drainage being impeded by the railway embankment. Soils on the site are uniform throughout, consisting of 18" topsoil undertaken by lacustrine deposits as is typical of the entire region.

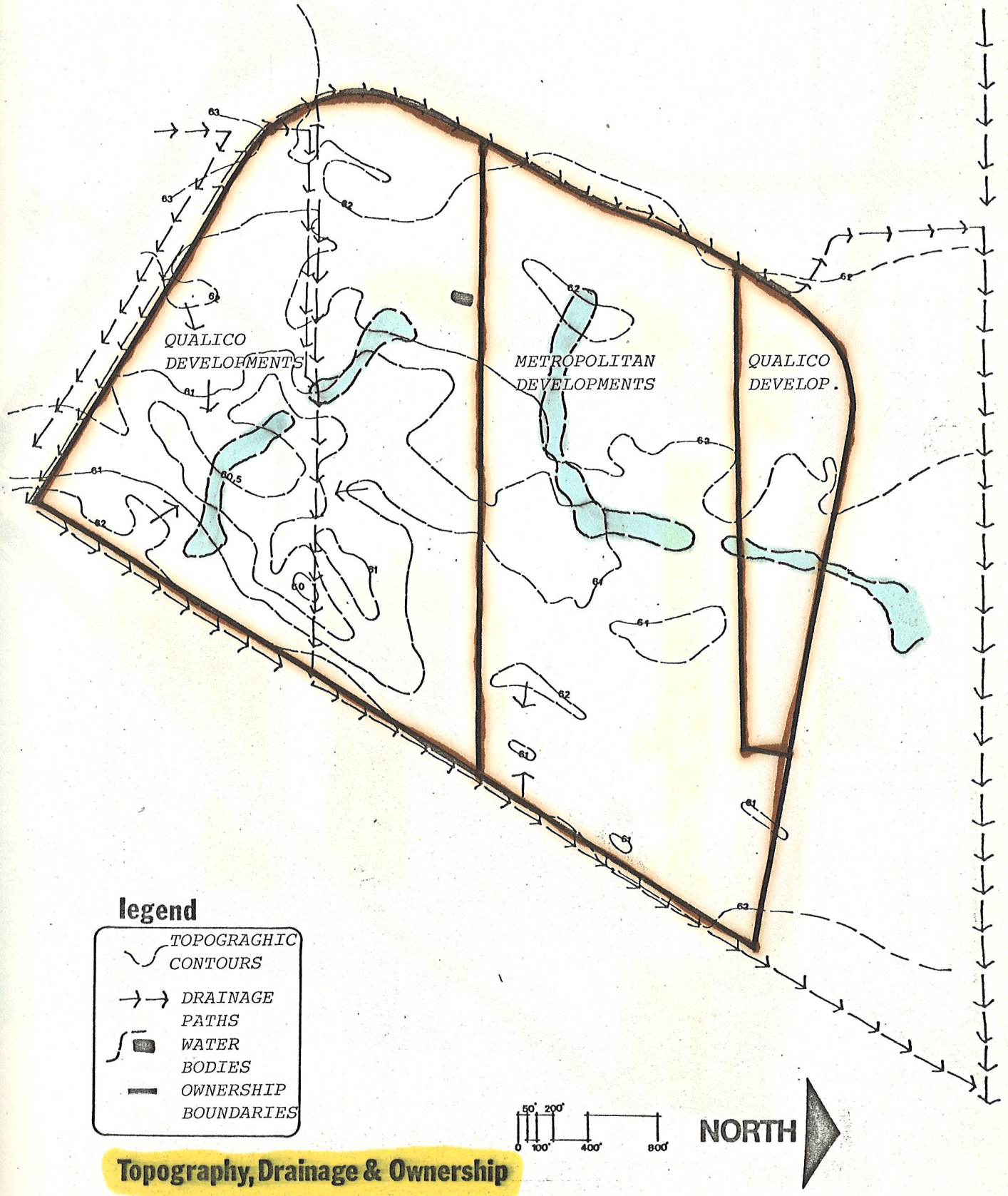
2. *Topography,Drainage and Ownership*

   The topography of the site is virtually flat with approximately two feet of topographic difference over the entire site. The site is poorly drained, water draining to two or three slightly lower spots or is intercepted by several old road ditches that bisect the site or run along its periphery. This site falls within an area of the city which is designated for storm water management by the use of holding ponds. The presence of the lot 16 drain nearby makes this a most economical alternative to underground conduit.

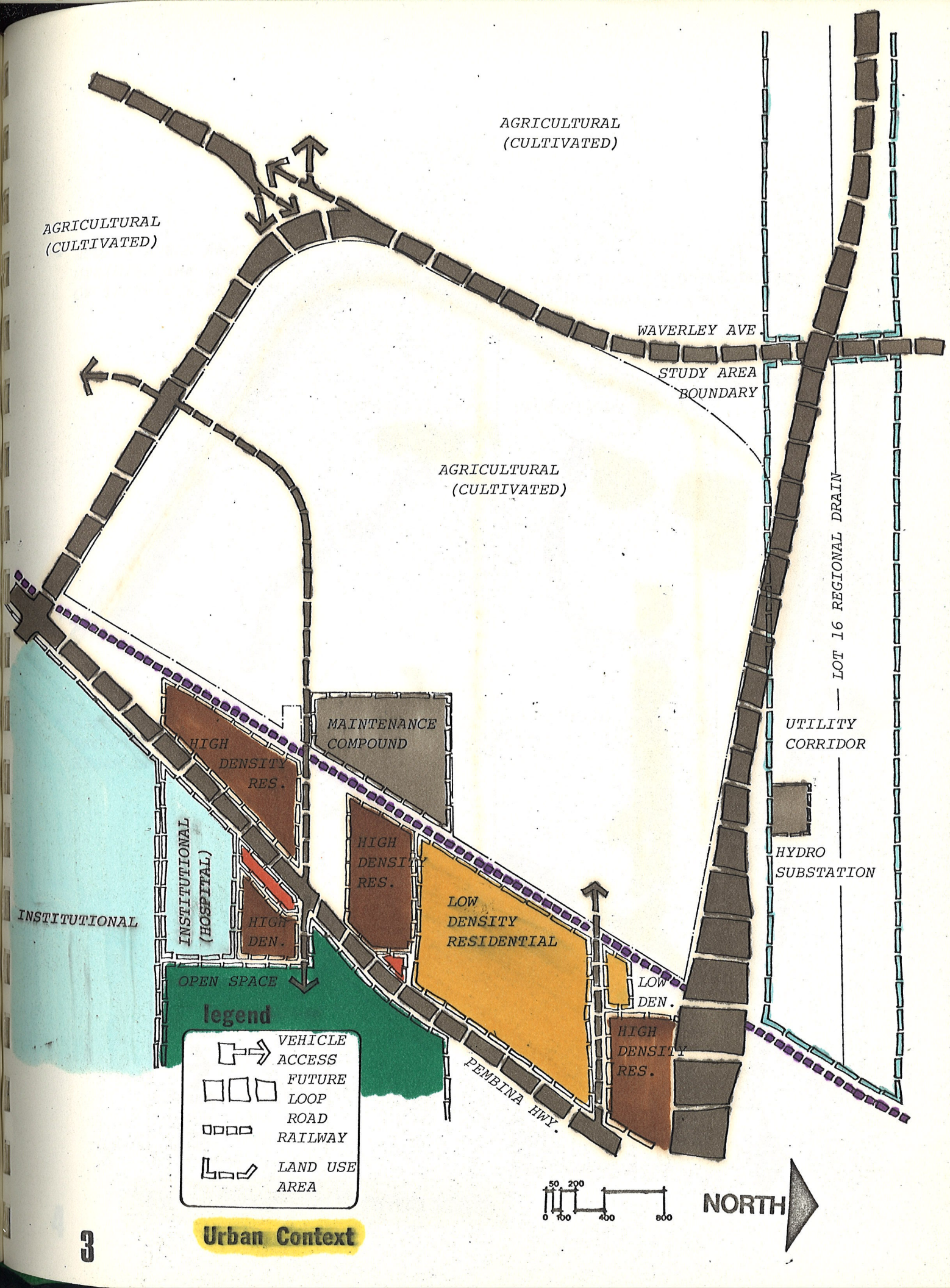
   The site is currently owned by two development firms, Qualico and Metropolitan Properties who are interested in developing single family detached housing over the entire area.



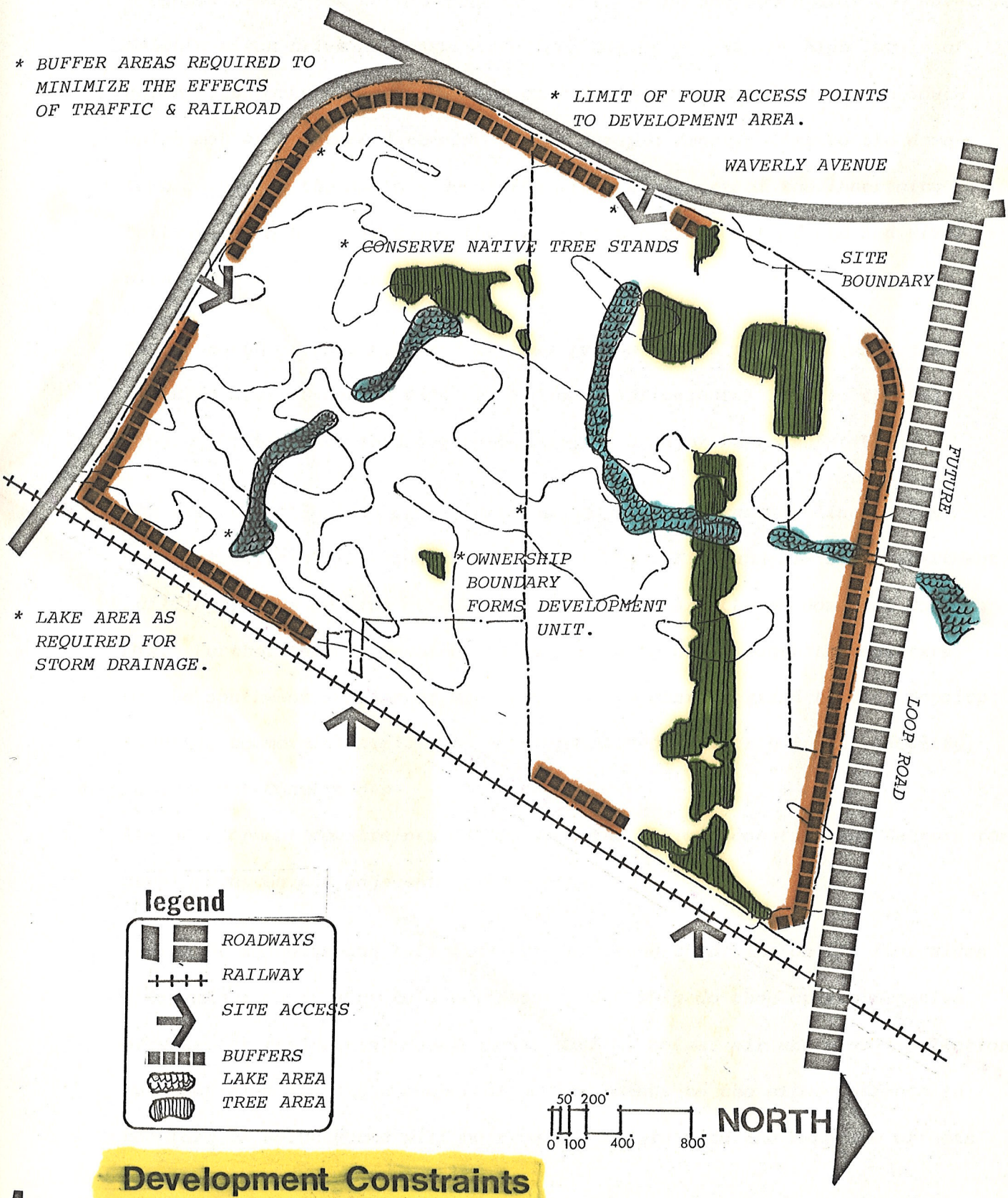
Vegetation & Soils



Topography, Drainage & Ownership



Urban Context



Development Constraints

3. *Urban Context*

The site is primarily agricultural in nature with various existing or proposed urban uses surrounding it. On the west and south side the Waverly Heights Bison Drive expressway provides direct access for high levels of university bound traffic. To the east is the C.N. mainline to the south which may at a future date also become a rapid transit link to the down-town core. On the north side of the site, a segment of the inner city beltway is to be built tying the areas of the city east of the Red River with those on the west.

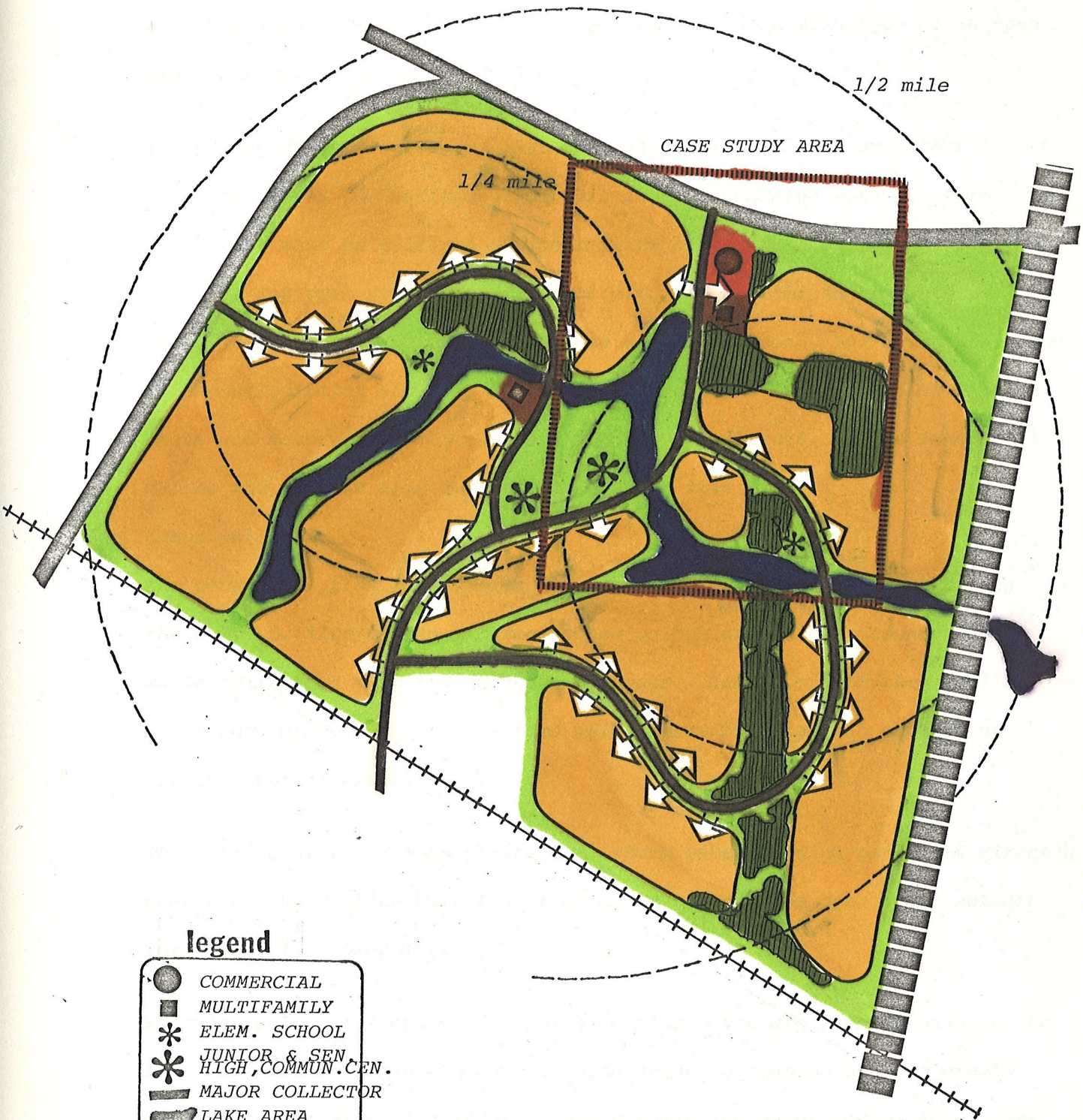
To the north of this proposed beltway is the lot 16 drain, a large ditch draining over 30 square miles of adjacent agricultural land to the Red River. Within this corridor there is also a major hydro substation.

The area directly east of the site adjacent to the railway line is the only intensively urbanized area at this time. Five and six story apartment buildings, plus an area of large acreage lots, are the predominant housing mix. Further east is Pembina Highway, a major north-south thoroughfare of the southwest section of Winnipeg. It is characterized by high density housing, commercial strip type development and a major hospital facility.

4. *Development Constraints*

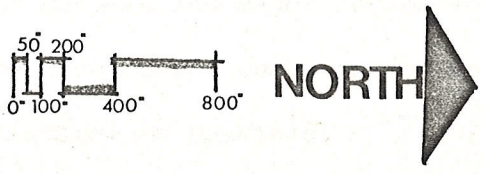
The development constraints map locates the various constraining factors for development on and adjacent to the site.

The major roadways and rail line that surround this site on all four sides are a major constraint to development. Not only do they create negative effects for residential developments such as noise, air and visual pollution, but they also limit the number of access points to the site. Buffers in the form of earth berms will be required to minimize the negative effects



legend

- COMMERCIAL
- MULTIFAMILY
- ELEM. SCHOOL
- JUNIOR & SEN. HIGH, COMMUN. CEN.
- MAJOR COLLECTOR
- LAKE AREA
- HOUSING



Conceptual Plan

of road and railway. The existing treed areas form a third constraint to development as it is the intent of this study to conserve these areas wherever possible. These areas will help form the basic structure of an open space system.

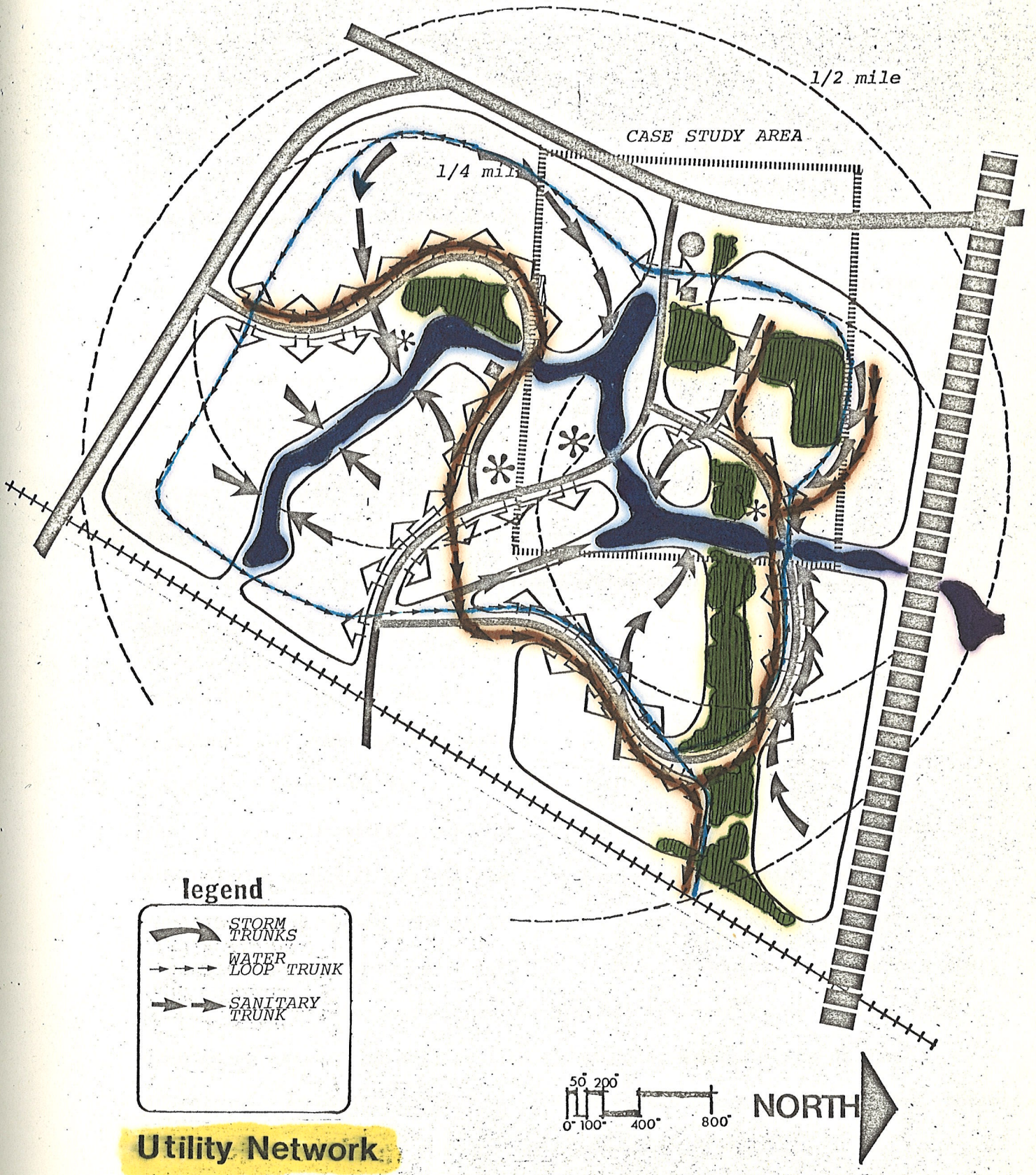
The poorly drained soils and flat topography of this site are other important constraints to development of this land. A careful plan of storm water management must be utilized to control and direct runoff from the developed areas during peak storm periods. The city has determined that storm water shall be managed through the use of holding ponds for this site. The lake configuration shown is the design agreed upon by the City of Winnipeg Waste and Waterworks Plant and engineering consultants. These lakes will define the minimum area for the purposes of this study.

5. Coneptual Plan

The conceptual plan illustrates the proposed development plan utilizing the C.O.R.D. alternative. Three access points are used to connect the major collectors with the adjacent roadways. Access off of these collectors is in the form of local collectors which distribute traffic throughout the residential areas.

The artificial lake areas utilized as storm water holding ponds are directly connected and combine with the treed areas to form the open space network for the entire community.

Schools, commercial and multi-family housing sites are located adjacent to these open space links and combine with other recreation uses to create activity nodes along its length. The schools and major recreation center are also located at the center of the development encompassing as much of the user population within walking distance as possible.



Utility Network

6. *Utility Network*

The utility network conceptually illustrates the methods of providing servicing within the development. Storm trunks are either in the form of small size conduits or landscaped open drainage swails wherever possible. Both will follow proposed roadways or easements and empty directly into the storm water holding ponds. This in turn empties into the lot 16 drain and from there into the Red River.

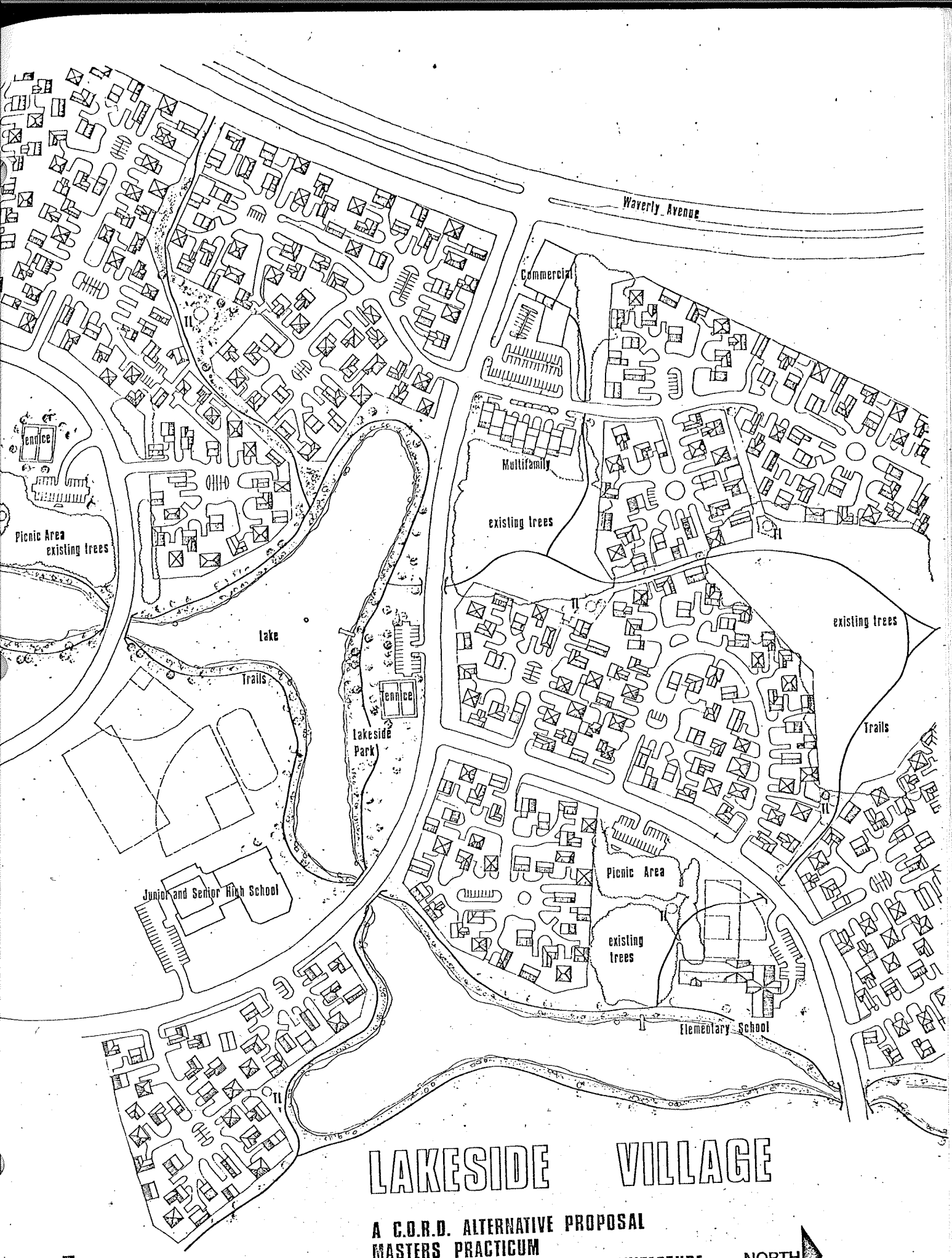
The major water line as shown is a trunk line that loops through the site to maintain pressure. Laterals off of the trunk will also run down road rights-of-way or easements as required, exiting at the northeast corner of the site.

The sanitary trunk follows the major collectors for the most part, deviating where necessary for reasons of efficiency. Lesser lines will follow the same routes as storm lines where possible so that the same grades and easements may be utilized.

Power, cable T.V. and gas will be underground utilizing the proposed easements and roadways as required.

7. *C.O.R.D. Alternative Map*

The C.O.R.D. alternative map demonstrates the elements of the C.O.R.D. alternative proposal (see Chapter 7 & 8). The residential areas are developed at a higher density (7.0 du/acre) so that existing treed areas are conserved and open space links developed. Schools, a community center, multi-family housing and stores are located to function as part of this open space network as well as from a vehicular access point of view. Additional recreation facilities such as tennis courts, picnic areas, totlots,



LAKESIDE VILLAGE

A C.O.R.D. ALTERNATIVE PROPOSAL
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NORTH

and landscaped parkland, etc. are developed adjacent to the artificial lakes, in the treed areas and along the open space links. These facilities are over and above those provided by the City of Winnipeg's Parks and Recreation Department and are paid for entirely by the developer from service cost savings incurred by the use of cluster housing at high densities.

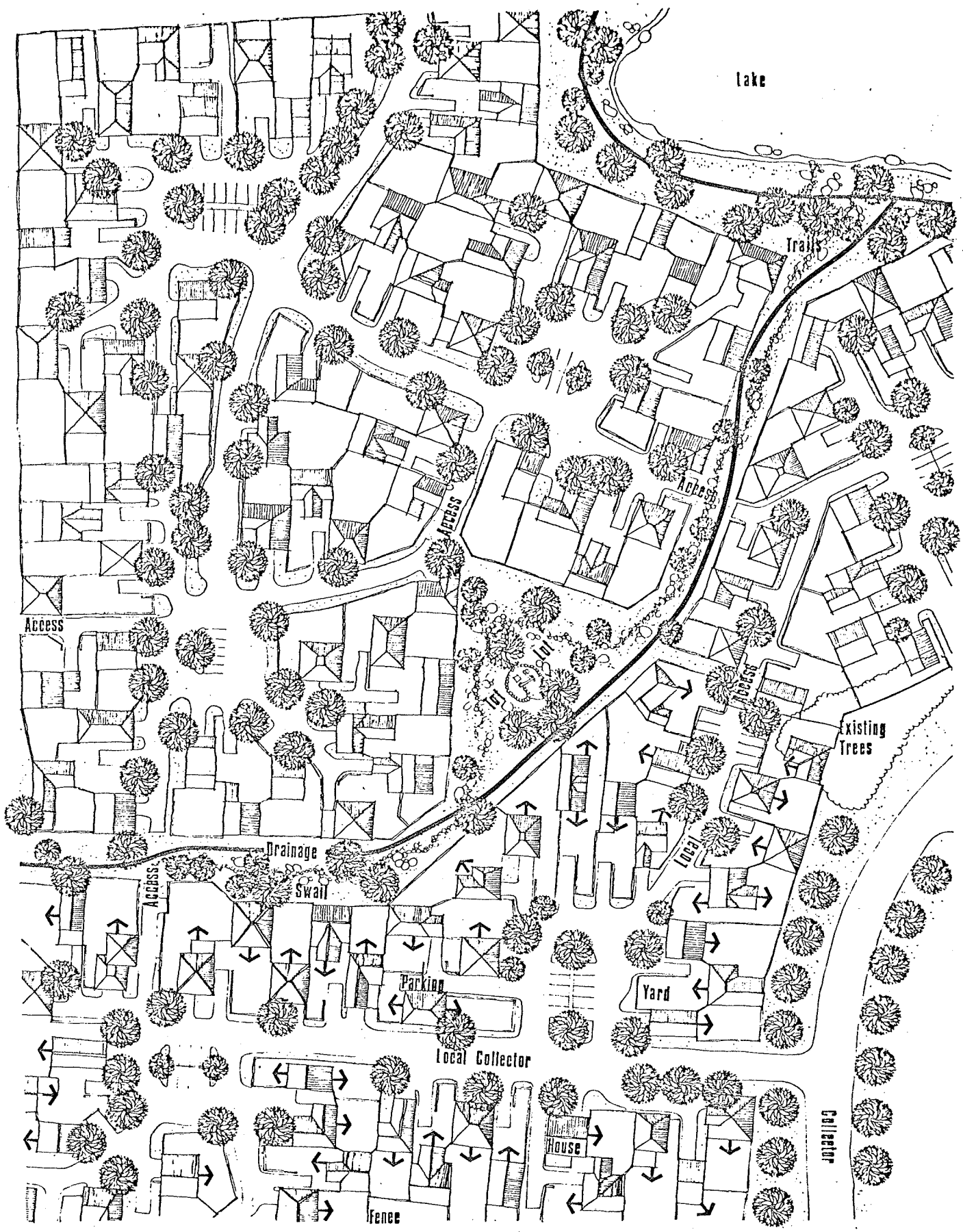
Following is a list of various design and development criteria utilized in the application of the C.O.R.D. alternative:

1. Housing

- single family detached housing, 1,100 - 1,500 sq.ft. average
- average lot size 3,500 sq.ft.
- parking minimum 200%
- identity, privacy and convenience and convenience for each house (see chapter 2)
- utilize cluster form of housing organization
- collector roads 40', local collector roads 25', local 18'
- cul de sacs, 100 radius 750' maximum length with secondary access

2. Open Space and Recreation

- development of an open space network that avoids pedestrian vehicular conflicts where possible.
- open space areas act as links conencting various land uses within the community
- development of extensive forms of recreation such as hiking and bike trails, picnicking, canoeing, etc.
- organization of community around appropriate open space feature



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3. *Other Land Uses (Commercial, Multi-family, Institutional)*

- *maintain proposed acreages of other land uses as proposed in the conventional subdivision plan or required by city standards*
- *maintain where possible optimum distances to schools, etc.*

4. *Development*

- *strive for efficiency of layout in housing services, etc.*
- *minimal disruption of natural site features*
- *maintain total lot yield over 98 acre site as in a conventional development*
- *assume engineering size and location for holding pond design as minimum allowable (the same as for a conventional development)*
- **maintain the developer's responsibility as far as cost sharing and level of servicing is concerned.*
- *maintain the City of Winnipeg's responsibility in relation to the above*

8. *Detail Housing Area*

The detailed housing area map illustrates a typical area of the C.O.R.D. Alternative proposal. Shown in detail are the housing units, fenced private open space, the house's relationship to that space and car access to each housing site. It is assumed that each housing unit is specifically designed to relate to its specific site (i.e., houses are designed so that rooms do not look out over other people's private open space, etc.). It

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** Flexibility of existing controls regarding setbacks, sideyards, and other development controls are assumed as part of the innovative nature of this development.*

is felt that with this provision, these housing units can be more private than the traditional house lot arrangement. The road system illustrates the principle of utilizing various sizes and scales of street to handle various intensities of traffic. The local collector accommodates vehicular traffic from local roads and the housing backing onto it. Pedestrian circulation occurs on sidewalks along this level of roadway.

The local street functions as both a pedestrian and vehicular roadway with conflicts minimized due to the limited number and low speed of vehicles using it.

Access for both pedestrians and emergency vehicles, snow clearing, garbage collection, etc. is provided at the ends of these streets where necessary. Visitor parking is accommodated in driveways, parking bays or islands in the middle of the turnabouts.

Servicing occurs under roadways, in access areas and along easements.

All roadways, boulevard areas and turnabouts are landscaped at a level consistent with current city policy and in a form which emphasizes the urban form of this housing.

All the additional public open space areas, including the storm drainage swails and lake shores are landscaped more intensively but with less structure to create a highly desirable park-like atmosphere.

Section B

Summary of C.O.R.D. Alternative Steps from Chapter 8

Step One

Steps Involved in Determining Number of Dwelling Units and Service Costs in Conventional Developments

1. Determine Total Site Area (Gross Area)
2. Calculate Total Lake Area needed to service storm drainage requirements of site. (see Appendix 2 Section C)
3. Subtract lake area from Total Site Area to arrive at New Gross Area.
4. Calculate Net Development Area from city Average Densities by Zoning Districts chart. Use New Gross Area. (see Appendix B Section C)
5. Calculate open space area based on city requirements of percent dedication of gross Area (does not include lake area).
6. Using Average Density chart by Zoning District, calculate number of dwelling units that might be developed on site of conventional development. This gives a maximum number of dwelling units that could possibly be developed on the site under conventional development practices.
7. Estimate service cost by multiplying linear foot/acre of roadway by improvement cost or by referring to service cost graph (see Appendix 5).

Step Two

Steps Involved in Determining Minimum Design Density in C.O.R.D. Alternative

1. Define and calculate area of all natural site features that are desirable to save. This involves a qualitative measurement based on environmental

assessment of site features, i.e., what features are unique or worth saving in comparison to surrounding areas.

2. Calculate New Net Development Area by subtracting area of natural site features from estimated Net Area in stage 1, step 4.
3. Calculated Net Density with this smaller area, assuming the predicted number of dwelling units on site from stage 1. This gives the minimum allowable density on the site.
4. Determine predicted service cost from cost/density graph to determine total savings over entire development (see Appendix 5).

Step Three

Steps Involved in Determining Specific Design Density of C.O.R.D. Alternative

1. From open space savings graph (Appendix 5) determine open space area saved at design density projected in step 2.
2. Calculate dollars per acre of open space development by dividing total amount saved on service costs for the entire site by open space area saved. This gives the minimum amount of money available for open space development per acre of open space area at that design density.
3. Compare the dollars per acre at various densities for open space and recreation development (service cost savings for the site divided by total open space area) against the desired program of open space and recreation development to determine the desired net density of development.

Section C

1. PROPOSED CITY OF WINNIPEG CAPITAL PROJECTS FOR WAVERLY HEIGHTS, LAKESIDE VILLAGE

1975 Budget

Total - $655,000

Community Centre - Chancellor Drive

Clubhouse - 8,014 sq. ft. @ $43.00 + 15% $492,000

Rooms Required:

1. Six dressing rooms: size 12' x 20' each

   Dressing rooms to include benches and coat hooks. Hallway or passage-way to service dressing rooms should be of a minimum width of 5'. Washrooms to be provided to service dressing room area only, but not necessary for each dressing room. Should be male and female washrooms. Need for six dressing rooms based on expanded hockey programs requiring at least four and sometimes six rooms, in addition to a requirement for male and female dressing rooms for indoor activities such as adult physical fitness programs.

2. Public Skate Change Area: size 20' x 40'

   Benches to be provided. Washrooms to be provided to service public skate area only.

3. Multipurpose Room: size 20' x 20'

   To service unorganized games such as table tennis, in addition to meetings, etc.

4. Office or Control Area: size 12' x 20'

5. *Canteen Area: size 12' x 20'*

   Canteen storage area to include refrigerator, stove, shelves, cupboards and 3 compartment sink.

6. *Canteen Storage Area: size 12' x 12'*

   Canteen storage area to include shelves, and be adjacent to canteen proper.

7. *Recreation Hall: size 50' x 60' - ceiling height of 18 feet*

   Insulated Ceiling. Washrooms to be provided to service recreation hall only, to accommodate social activities with liquor permits. Storage room off hall for tables, chairs, etc.

8. *Multipurpose Room - adjacent to recreation hall: size 20' x 20'*

   To service cultural activities and also serve as a cloak room for the hall.

9. *Ice Equipment and Tool Storage Area: size 12' x 20'. To include work benches and shelves and laundry sink. To include a direct outside entrance with doors wide enough to permit entry of snow blowers, lawn mowers, etc.*

10. *Mechanical room or rooms, separate from other rooms.*

11. *Three Storage Rooms for sports and program equipment: size 16' x 20' each*

    Rooms to include shelves and racks

General Comments

Friction pile floor.

All walls and partitions shall be of concrete block, insulated.

All exterior walls shall be waterproofed.

Doors and door frames shall be metal.

Water supply shall be 2".

All lights shall be recessed with proper guards.

The recreation hall should be segregated from the remaining activity areas of the building, permitting the remainder of the building to be locked off during socials with liquor, so that other activities can still use the building.

The building should be designed to allow for minimum supervision of all areas of the building.

Windows should be kept at a bare minimum and eliminated if possible.
If they are required they should be high above ground.

Flooring

Asphalt planking or equivalent for the following areas:

a. Dressing rooms and its washrooms and hallway

b. skate change area and its washrooms

c. three storage rooms

1/8" vinyl asbestos tiles for the following areas:

a. recreation hall

b. cloak room

c. office

d. canteen and storage area

The ice equipment and mechanical room to have a painted concrete floor.

Public address system to be installed.

Drinking fountain in skate change area.

Adequate floor drains.

Hockey Pens (2) *$28,000*

- *35' x 200'*
- *Adequate lighting*
- *Shale base*
- *Drainage*

Parking Lot *$ 7,000*

- *Accommodate 25-30 cars*
- *Asphalt preferred*
- *Drainage*
- *Fenced*

Tennis Courts (3) *120' x 105'* *$15,000*

- *Asphalt*
- *Fenced*
- *Drainage*
- *Length to run North and South*

Landscaping *$90,000 + 15%*

- *Area to be grassed*
- *Trees and shrubs planted to camouflage hockey pens and parking lot*
- *Also some cost-sharing of athletic fields with school board (see attached site plan)*

CAPITAL PROJECTS
1976 Budget
Total - $160,000

Grade and landscape 15 acre park site, install soccer nets, baseball diamond and tot lot equipment.

2. *The recreation and open space amenities suggested for this development were chosen because of their low cost and low maintenance nature (see Appendix 1 Section A). They were also chosen because it was felt that they could best augment the types of recreation facilities already being supplied by the City of Winnipeg's Parks and Recreation Department (see Part 1 of this section). Totlots, tennis courts, trails and landscaped parks and picnic areas in natural surroundings or adjacent to lakes were all activities that are inadequate or totally absent in today's developments. Other facilities such as road and lake underpasses, canoe docks, lake fountain and additional lake area are all required to assure the proper function and continuity of the open space network, and enhance its desirability.*

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