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Residential Greenways in Transition: Four Decades of Experience in Waterloo

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Residential Greenways in Transition: Four Decades of Experience in Waterloo

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June 2001

This project was carried out with the assistance of a financial contribution from Canada Mortgage and Housing Corporation under the terms of the External Research Program. The views expressed are those of the author and do not represent the official views of CMHC.

Acknowledgements

I would like to acknowledge with gratitude all those stakeholders in the Waterloo Community who gave generously of their time to contribute to this research project. Waterloo municipal staff, elected officials, members of the land development community and residents of the neighbourhoods all welcomed and encouraged me in my work. I hope that participants accept this report as a small token of my repayment for your kindness and insights. I want to offer a special thanks to the many anonymous persons who, by chance, encountered me during my walks through the greenways in rain, snow and sunshine. Your waves, smiles and impromptu conversations made my task a pleasure. Finally, I would like to thank CMHC for giving me the opportunity to pursue this most satisfying project. I accept responsibility for any errors or omissions resulting from my research

Table of Contents Page

Executive Summary

This research examines and assesses a planned residential greenway system evolving in the City of Waterloo over the past four decades. It has been a key feature of the Beechwood concept; a neighbourhood design first introduced to the City in the early 1960's and an abiding influence on residential planning in Waterloo Waterloo is selected for study because of its long experience with an extensive greenway system and its commitment to environmentally sensitive planning. The original Beechwood concept and its more recent manifestations provide clear templates against which to measure the changing attitudes of municipal planners and various stakeholder groups to notions of residential amenity and environmental responsibility

In Waterloo, the greenway concept has evolved to serve five principal planning objectives. Early objectives included the provision of pedestrian walkways linking focal points within neighbourhoods and communities, the physical separation of neighbourhoods, and the provision of visual amenity associated with green open spaces. More recently, greenways have been employed to protect natural features and resources and to support ecological processes and functions, key elements of landscape ecology

This Report documents and interprets the Beechwood Greenway System experience for all persons who are interested in residential and open space planning in Canadian cities. While the topic is location-specific to the City of Waterloo, the author believes that the ideas and experiences have generic value. Waterloo's experience should provide useful lessons for other municipalities that currently employ, or wish to employ, the greenway as a key component of environmentally and socially responsible residential planning. This Report makes Waterloo's experience available to other municipalities wanting to initiate greenway programs or wanting to improve the role of existing greenway programs within the planning mandate.

This research describes Waterloo's Beechwood greenway system during its four decades of change in conjunction with municipal policies for urban residential development. It examines the types of greenway issues and conflicts that have occurred and reviews means for resolving them. It documents and assesses major stakeholders' satisfaction with greenway planning objectives and outcomes. Finally, it assesses the current and potential contributions of greenways in achieving measures of urban sustainability.

Research methods include the collection and analysis of primary and secondary information. Primary information is collected through interviews with key stakeholders including: 25 municipal staff and elected officials; 17 people from the private and non-profit sectors; and 50 residents living adjacent to, or near, Beechwood greenways Secondary information is collected from relevant municipal sources including official and district plans; planning, engineering and parks department reports to council; and minutes of council meetings; as well as consultants' reports prepared for stakeholder clients; newspaper files; and academic research reports

Measured by normal planning standards, the Beechwood Greenway System has been relatively free of major conflicts over its four decades of existence. However, if conflict is

largely a by-product of change, then considerable conflict should be anticipated. Change, or the threat of it, has triggered debate within the Beechwood community during the past few years The catalyst for change has three origins: demographics, resident values and attitudes, and Municipal policies

The development community has continued to express guarded satisfaction with the greenway system as a major urban design component of Beechwood developments. Residents, real estate agents and developers share complementary interests in the greenway system's impact on the housing market. The presence of greenways has been a positive factor in attracting residents to the Beechwood developments and in maintaining property values Planners, engineers, ecologists and other professionals in the development industry with an interest in good practice have regarded the Beechwood development experience as a means to advance the state of the science and art. Independent environmental advocates have also found many opportunities to pursue their interests within the Beechwood study area by challenging the evolving wisdom of planning and engineering practice regarding stream, wetland and woodlot preservation, rehabilitation and restoration. For the most part municipal professional staff and some elected officials have experienced a congruence of purpose. Over the past decades there has been strong support on Municipal Council for parks, open space and environmental protection

The study identifies potential contributions of greenways in achieving measures of urban sustainability. These measures reflect concepts of ecological integrity and social cohesion. Ecological integrity is assessed according to the City of Waterloo's ability to respond to ecological limits and environmental impacts in the Beechwood residential developments. Social cohesion is assessed according to the City's ability to respond to residents' desire for humane living environments with a high quality of life and a strong sense of community.

Layout of Waterloo greenways today is no longer determined solely by aesthetic and recreational need criteria. It reflects strongly the need to satisfy ecological requirements established by watershed and sub-watershed management planning. Today's "green template" approach removes environmentally sensitive land and land needed for environmental services during development negotiations before land development begins. This approach serves as the principal link to bring together the natural and built environments and to balance human needs and the needs of the natural environment. Throughout the Beechwood experience the greenway system has served as an important locus for the playing out of urban environmental policy, linking together issues over time in an evolving environmental tapestry. Residents and developers, key players in the residential development drama, have indicated an increasing willingness to pay for ecological integrity if it can also deliver amenity.

While the Beechwood greenway system has been adaptable it has not overcome certain limitations. It never liberated residents, in any meaningful way, from the automobile. Due to the rigor of Canadian winters and recent safety concerns of parents, many children are driven to and from school. With the aging of the resident population in the Beechwood districts elementary school populations are in decline, redundant school sites have been sold and some students must commute by school bus. Recent student population projections produced for the school board for Beechwood and Beechwood West Districts indicate this trend will accelerate over the next sixteen years.

Greenways were originally designed to provide physical separation and definition between residential sectors and neighbourhoods. Planners and designers believed this physical separation would encourage neighbourliness among residents within the individual sectors and assist in fostering community pride This design objective may have succeeded to a fault. Some residents noted that they were acquainted with families throughout their residential sector and neighbourhood but less acquainted with residents living on the other side of the greenway

With stakeholder cooperation greenway policy changes have occurred incrementally beginning as informal staff experiments that prove to be successful and, therefore, worthy of political endorsement and formalization. Interdepartmental cooperation and communication with residents are essential requirements Highly motivated residents have sought support of municipal staff and equipment to carry out greenway cleanups and undertake private naturalization projects. Indeed, actions to achieve greenway objectives have been "piggybacked" on to standard municipal engineering and parks and recreation activities without fuss

What does the future hold for the Beechwood greenway system? The greenway system may be held hostage to unrealistic expectations. Some observers have spoken of its key role in achieving residential sustainability Yet the Beechwood greenway system has a varied and limited impact on residents' daily lives. Most residents do not have direct access to it and organize their time for daily activities occurring outside the neighbourhood and are dependent on the use of their automobile Some residents with access to homes association-managed recreation facilities have installed private swimming pools Greenways, per se, have a limited ability to reduce harmful outputs in residential areas· most notably, the harmful chemical residues derived from lawn and garden care and automobile emissions In a very limited way they can contribute to healthy social environments But most social interactions of daily life do not occur on greenways

A major challenge to planners and other professionals, committed to fostering the Beechwood greenway system, is to sustain responsible urban development for current and future generations However, it is extremely difficult to convince elected officials and the business community to support goals that require postponed gratification.
The main role of the Beechwood greenway system has shifted over the years from primarily one of ornamentation to one that attempts to seek a balance between human needs and the needs of nature. Residential housing and neighbourhoods will age and the Beechwood districts will take on an inner city character. If infill, redevelopment and higher residential densities occur adjacent to, or near, the greenway system, great care will need to be taken not to impair ecological processes and functions.

Planners and politicians have never been very successful in predicting the long-term evolution of cities It would be folly to attempt to predict the future of the Beechwood greenways as a single element contributing to the complex structure and functioning of the City. Nevertheless, one assertion can be made without hesitation. The greenway system will remain a strategic land reserve waiting to respond to a variety of challenges we can not yet foresee. In the future, citizens will bless those of the past who had the imagination, energy and ability to create this oasis of green amidst concrete and asphalt.

Résumé

La présente étude vise à examiner et à évaluer un système de couloirs de verdure aménagé dans une expansion domiciliaire, qui évolue depuis quatre décennies dans la ville de Waterloo Ce système a été une caractéristique clé du concept de Beechwood, une conception de quartier introduite pour la première fois dans la ville au début des années soixante et une influence incontournable de l'aménagement résidentiel à Waterloo. Cette ville a été choisie en vue de l'étude en raison de sa longue expérience d'un système de couloirs de verdure extensif et de son engagement à l'égard de l'urbanisation écologiquement sensible Le concept original de Beechwood et ses manifestations plus récentes fournissent des modèles évidents permettant de mesurer le changement de l'attitude des urbanistes municipaux et des divers groupes d'intervenants envers les notions d'aménagement résidentiel et de responsabilité environnementale.

À Waterloo, le concept de couloirs de verdure a évolué afin de servir cinq grands objectifs en matière d'aménagement Parmi les premiers objectifs, mentionnons la création d'allées piétonnes reliant des points de convergence au sein des quartiers et des collectivités, la séparation physique des quartiers, et la fourniture d'installations visuelles liées aux aires de verdure libres. Dernièrement, on a utilisé les couloirs de verdure pour protéger les particularités et les ressources naturelles, et favoriser les processus et les fonctions écologiques, qui sont des éléments déterminants de l'écologie du paysage.

Dans le présent rapport, nous documentons et interprétons l'expérience du système de couloirs de verdure de Beechwood pour toutes les personnes qui s'intéressent à l'aménagement des quartiers résidentiels et des aires libres dans les villes canadiennes. S'il est vrai que le sujet est propre à la ville de Waterloo, l'auteur croit que les idées et l'expérience ont une valeur générique L'expérience de Waterloo devrait fournir des enseignements utiles aux autres municipalités qui recourent ou souhaitent recourir aux couloirs de verdure en tant que composante essentielle de l'aménagement résidentiel responsable sur les plans environnemental et social Grâce au présent rapport, l'expérience de Waterloo est disponible aux autres municipalités qui souhaitent lancer des programmes de couloirs de verdure ou élargir le rôle des programmes de couloirs de verdure en vigueur dans le cadre de leur mandat en matière d'aménagement.

La présente étude décrit le système de couloirs de verdure de Beechwood, à Waterloo, au cours de ses quatre décennies d'évolution, conjointement avec les politiques municipales en matière d'expansion domiciliaire urbaine. Elle passe en revue les genres de problèmes et de conflits relatifs aux couloirs de verdure qui se sont posés et examine les moyens mis en oeuvre pour les résoudre Elle documente et évalue la satisfaction des principaux intervenants à l'égard des objectifs et des résultats de l'aménagement des couloirs de verdure. Enfin, elle évalue les contributions actuelles et éventuelles des couloirs de verdure afin d'atteindre des mesures de viabilité urbaine

Parmi les méthodes d'étude utilisées, mentionnons la collecte et l'analyse des informations principales et accessoires Les premières sont recueillies grâce à des entrevues avec les principaux intervenants, notamment 25 employés municipaux et représentants élus, 17 personnes membres des secteurs privé et à but non lucratif; et 50 résidents vivant à côté ou à proximité des couloirs de verdure de Beechwood Les secondes sont recueillies auprès des sources municipales compétentes, notamment les plans officiels et de district, les rapports techniques et du département des parcs au conseil municipal; et les procès-verbaux des réunions du conseil municipal, ainsi que les rapports d'experts-conseils aux clients intervenants, les collections des journaux, et les rapports de recherche universitaire

Mesuré à l'aune des normes standards d'aménagement, le système de couloirs de verdure de Beechwood a provoqué relativement peu de conflits importants au cours de ses quatre décennies d'existence. Toutefois, si les conflits sont dans une grande mesure un produit dérivé du changement, des conflits majeurs sont alors à prévoir Le changement, ou la menace du changement, a déclenché des débats au sein de la collectivité de Beechwood ces dernières années. Le catalyseur du changement a trois origines · la démographie, les valeurs et les comportements des résidents et les politiques municipales

Le monde de l'aménagement a continué d'exprimer une satisfaction qui n'engage à rien à l'égard du système de couloirs de verdure en tant que grande composante de l'aménagement urbain de l'expansion domiciliaire de Beechwood Les résidents, les agents immobiliers et les promoteurs immobiliers ont des intérêts complémentaires dans l'incidence du système de couloirs de verdure sur le marché immobilier. Les couloirs de verdure ont été un facteur positif qui ont attiré les résidents dans l'expansion domiciliaire de Beechwood et ont maintenu la valeur des propriétés Les urbanistes, les ingénieurs, les écologistes et d'autres professionnels de l'aménagement qui s'intéressent aux pratiques exemplaires considèrent que l'expérience de l'aménagement de Beechwood représente un moyen de faire avancer l'état de la science et de l'art. En outre, les défenseurs de l'environnement indépendants ont trouvé de nombreuses possibilités d'approfondir leurs intérêts dans le secteur d'études de Beechwood en remettant en question la sagesse évolutive des pratiques d'urbanisme et de génie concernant la préservation, la réhabilitation et la restauration des ruisseaux, des marécages et des terres à bois. Pour la plupart, le point de vue des employés professionnels municipaux et de certains représentants élus converge Au cours des dernières décennies, des membres du conseil municipal ont été fortement en faveur de parcs, d'aires libres et de la protection de l'environnement

L'étude définit les contributions éventuelles des couloirs de verdure en vue d'atteindre des mesures de viabilité urbaine Ces mesures tiennent compte des concepts d'intégrité écologique et de cohésion sociale. On évalue l'intégrité

écologique en fonction de la capacité de la ville de Waterloo de réagir aux limites écologiques et aux impacts environnementaux dans les expansions domiciliaires de Beechwood On évalue la cohésion sociale en fonction de la capacité de la ville de réagir au souhait des résidents d'obtenir un cadre de vie humain assorti d'une haute qualité de vie et d'un fort sentiment d'appartenance

Aujourd'hui, le tracé des couloirs de verdure à Waterloo n'est plus déterminé uniquement par des critères d'esthétique et de besoins récréatifs. Il tient grandement compte du besoin de satisfaire les exigences écologiques établies par la planification de la gestion des bassins hydrographiques principaux et secondaires L'approche actuelle concernant les « modèles écologiques » enlève les terres érodables et les terres dont on a besoin pour les services environnementaux des négociations sur l'aménagement avant que ne commence l'aménagement des terrains Cette approche fait office de lien principal afin d'amalgamer les environnements naturels et bâtis, et de trouver un équilibre entre les besoins humains et les besoins de l'environnement naturel. Tout au long de l'expérience de Beechwood, le système de couloirs de verdure a servi de lieu géométrique important où mettre en jeu la politique environnementale urbaine permettant d'établir des liens entre les enjeux au fil des ans dans un tableau environnemental en évolution Les résidents et les promoteurs immobiliers, qui sont des intervenants clés dans le drame de l'expansion résidentielle, ont indiqué qu'ils souhaitent de plus en plus payer pour obtenir l'intégrité écologique, si celle-ci peut également apporter des agréments.

S'il est vrai que le système de couloirs de verdure de Beechwood est adaptable, il n'a pas surmonté certaines limites Il n'a jamais libéré les résidents de manière significative de la dépendance à l'égard de l'automobile En raison de la rigueur des hivers canadiens et des préoccupations récentes des parents en matière de sécurité, de nombreux enfants vont à l'école et en reviennent en voiture. Par suite du vieillissement des résidents des districts de Beechwood, le nombre d'élèves fréquentant l'école primaire baisse, et des écoles surnuméraires ont été vendues et certains élèves doivent aller à l'école en autobus. Il ressort des projections récentes du nombre d'élèves produites pour le conseil scolaire de Beechwood et des districts de l'Ouest de Beechwood que cette tendance s'accélérera au cours des seize prochaines années.

À l'origine, les couloirs de verdure ont été conçus afin d'offrir une séparation physique et une définition entre les secteurs résidentiels et les quartiers. Les urbanistes et les concepteurs croyaient que cette séparation physique encourageraient les résidents à participer à la vie du quartier au sein de secteurs individuels et aiderait à favoriser la fierté de la collectivité Cet objectif de la conception a peut-être produit une faille. Certains résidents ont fait remarquer qu'ils connaissaient des familles dans leur secteur résidentiel et leur quartier, mais qu'ils connaissaient moins les résidents qui vivent de l'autre côté des couloirs de verdure.

Avec la collaboration des intervenants, la politique sur les couloirs de verdure a été progressivement modifiée en commençant par des expériences informelles par le personnel, qui se sont révélées des réussites, et justifient donc une approbation et une formalisation politiques La collaboration interdépartementale et la communication avec les résidents sont des conditions essentielles. Des résidents très motivés ont cherché l'aide du personnel municipal et du matériel pour effectuer des nettoyages des couloirs de verdure et entreprendre des projets privés de restitution du caractère naturel En effet, des mesures visant à atteindre les objectifs des couloirs de verdure ont été « jumelées » sans difficulté aux activités municipales normales relatives au génie, aux parcs et aux loisirs.

Quel sera l'avenir du système de couloirs de verdure de Beechwood? Le système de couloirs de verdure peut être pris en otage par des attentes peu réalistes. Certains observateurs ont fait valoir son rôle essentiel afin d'atteindre la viabilité résidentielle. Cependant, le système de couloirs de verdure de Beechwood a une incidence diverse et limitée sur la vie de tous les jours des résidents La plupart des résidents n'y ont pas un accès direct et organisent leur temps afin de participer à des activités quotidiennes qui ont lieu à l'extérieur du quartier, et dépendent de leur automobile Certains résidents qui ont accès aux installations récréatives gérées par des associations ont installé des piscines privées. Les couloirs de verdure, en soi, ont une capacité restreinte de réduire les produits nuisibles dans les secteurs résidentiels, en particulier, les résidus chimiques nuisibles provenant du traitement des pelouses et des jardins, et les émissions de gaz d'échappement. Ils peuvent de manière très limitée contribuer à l'assainissement de l'environnement social, mais la majeure partie des interactions sociales de la vie quotidienne a lieu hors des couloirs de verdure.

La poursuite de l'aménagement urbain responsable pour les générations actuelle et future pose un défi de taille aux urbanistes et aux autres professionnels, qui sont engagés à promouvoir le système de couloirs de verdure de Beechwood. Toutefois, il est extrêmement difficile de convaincre les représentants élus et le monde des affaires de soutenir des objectifs dont les retombées se font jour plus tard Le rôle principal du système de couloirs de verdure de Beechwood a évolué au fil des ans, passant principalement d'un rôle de décoration à un rôle qui tente de trouver un équilibre entre les besoins humains et ceux de la nature Les logements résidentiels et les quartiers vieilliront et les districts de Beechwood auront les caractéristiques d'un centre-ville. Si l'érection d'édifices sur les terrains intercalaires, la reconstruction des cadres urbains anciens et les densités résidentielles plus élevées ont lieu à côté ou à proximité du système de couloirs de verdure, il faudra faire très attention de ne pas perturber les processus et les fonctions écologiques

Les urbanistes et les politiciens n'ont jamais très bien réussi à prévoir l'évolution à long terme des villes Ce serait une folie que d'essayer de prévoir l'avenir des couloirs de verdure de Beechwood en tant qu'élément unique contribuant à la structure complexe et au fonctionnement de la ville Néanmoins, nous pouvons

faire une affirmation sans aucune hésitation Le système de couloirs de verdure demeurera une réserve foncière stratégique qui attend de réagir à divers défis que nous ne pouvons encore pas prévoir À l'avenir, les citoyens béniront ceux qui, dans le passé, ont eu l'idée, l'énergie et la capacité de créer cet oasis de verdure au milieu du béton et du bitume

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1 Introduction

1.1 Introduction

This research examines and assesses a planned residential greenway system evolving in the City of Waterloo over the past four decades This greenway system has been a key feature of the Beechwood concept; a neighbourhood design first introduced to the City in the early 1960's and an abiding influence on residential planning in Waterloo. Waterloo is selected for study because of its long experience with an extensive greenway system and its commitment to environmentally sensitive planning. The original Beechwood concept and its more recent manifestations provide clear templates against which to measure the changing attitudes of municipal planners and various stakeholder groups to notions of residential amenity and environmental responsibility. Waterloo's experience can provide useful lessons for other municipalities that presently employ, or wish to employ, greenways as a key component of environmentally responsible residential planning

In Waterloo, the greenway concept has evolved to serve five principal planning objectives. Early objectives included the provision of pedestrian walkways linking focal points within neighbourhoods and communities, the physical separation of neighbourhoods, and the provision of visual amenity associated with green open spaces. More recently, greenways have been employed to protect natural features and resources and to support ecological processes and functions, key elements of landscape ecology.

The importance of these objectives has changed over four decades in conjunction with shifts in residential planning and housing policies. For example, lot layout, local street design and storm water management standards have evolved considerably. In the early phases of Beechwood "loops and lollipops" local street patterns and hard-engineered storm water management practices prevailed In the most recent West Side District phase of residential development neotraditional street patterns and soft-engineered or green storm water management practices are in place

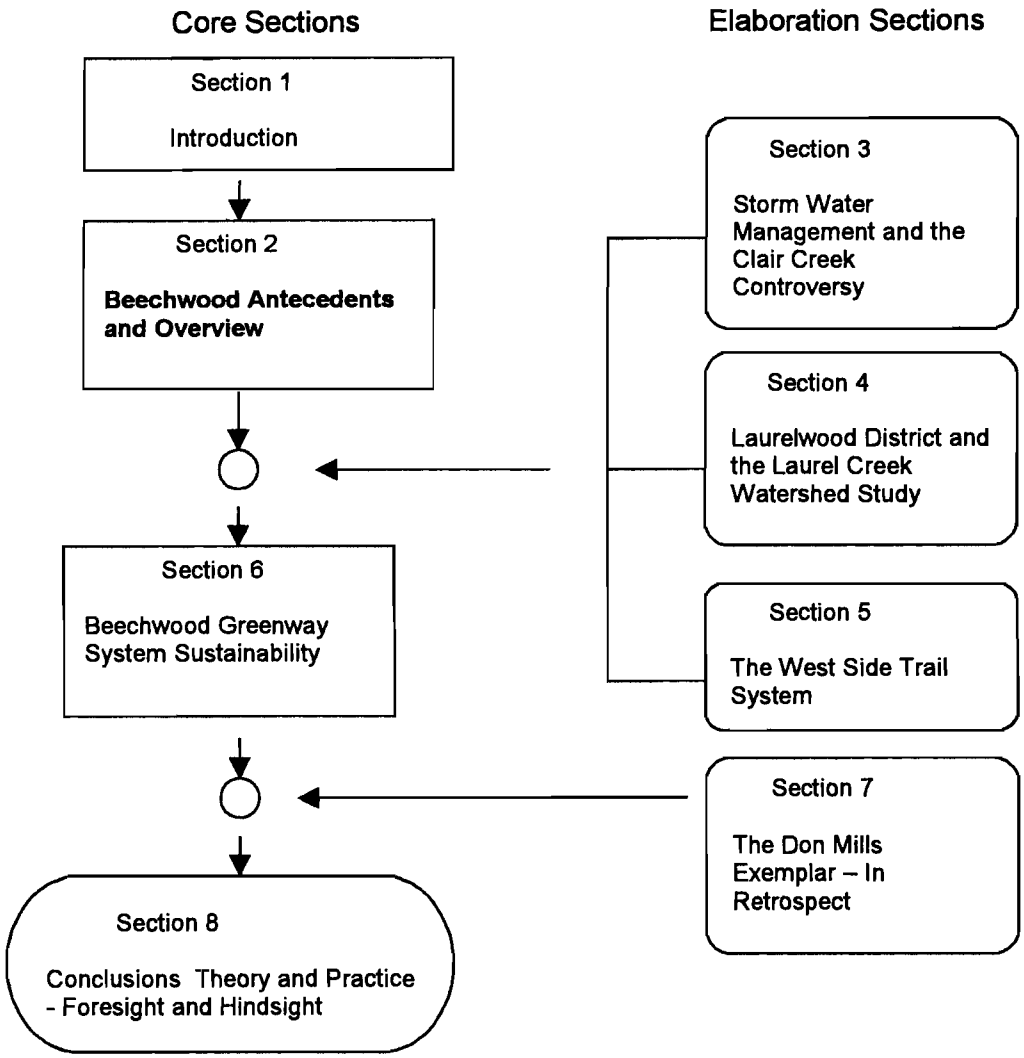
A changing relationship between municipal planners and other major stakeholders in the residential development process has also influenced greenway objectives. Stakeholders include land developers and their technical advisors (including consulting planners, engineers, ecologists and landscape architects), local residents, real estate interests, environmentalists, municipal professional staff and elected officials. There has been a shift from token stakeholder involvement at plan review stage to stakeholder involvement throughout the residential development process Most recently, partnerships between City and Regional governments, the Grand River Conservation Authority (GRCA), and the Provincial Environment and Natural Resources Ministries have contributed to what is called a "single-voice public approval sector approach"

Over time the Beechwood greenway system has experienced conflicts. Developers have expressed concern over lost revenues due to mandated land dedications – particularly at times of weak housing markets. Residents have debated maintenance cost and safety issues with the City and disagreed with environmentalists over competing recreation and conservation uses Undeveloped private sites adjacent to greenways have caused dismay among local residents and environmentalists when these sites are eventually developed

This Report documents and interprets the Beechwood Greenway System experience for all persons who are interested in residential and open space planning in Canadian cities. While the topic is location-specific to the City of Waterloo, the author believes that the ideas and experiences have generic value. Readers who wish to bypass the detailed presentation of local issues that define the Beechwood experience in time and place should turn to Diagram 1, Reader's Guide. Sections 3,4,5 and 7 may be skimmed or set aside for reading later as interest and time permits. Everyone should read the Report's core sections (Sections 1,2, 6 and 8).

Diagram 1

Reader's Guide



1.2 Scope and Objectives of Study

This research examines the evolution and assesses the merits of residential greenways employed in the Beechwood developments of the City of Waterloo over the past four decades. The history of the Waterloo greenway system is one of imagination, challenge, mistakes, successes and promise The system's history stretches from the application of deterministic physical design principles of the 1960's to an environmentally sophisticated program for promoting ecologically sound land use planning today. Waterloo is selected for study because of its extensive experience with greenways and its strong commitment to sustainable development through environmentally sensitive planning. Waterloo's experience should provide useful lessons for other municipalities that currently employ, or wish to employ, the greenway as a key component of environmentally and socially responsible residential planning. This Report makes Waterloo's experience available to other municipalities wanting to initiate greenway programs or wanting to improve the role of existing greenway programs within the planning mandate. The research objectives are to:

a) Describe Waterloo's Beechwood greenway system during its four decades of change in conjunction with municipal policies for urban residential development Greenways are examined within the context of the three phases of the Beechwood-type residential concept. The greenway system is assessed according to its ability to achieve planning objectives and to adjust to changing needs and interests over time Early objectives included the provision of pedestrian walkways linking focal points within neighbourhoods and communities, the separation of neighbourhoods, and the provision of visual amenity associated with green open spaces. The latter two objectives have been linked to the implicit wish of some stakeholders to enhance property values More recently, greenways have been employed to protect natural features and resources and to support ecological processes and functions.

b) Examine the types of greenway issues and conflicts and review means for resolving them. Issues and conflicts include: active versus passive uses; single versus multiple uses; low level maintenance versus high level maintenance, formal versus natural landscaping and naturalization, physical design versus personal and public safety; vandalism; homes association ownership and maintenance costs, local versus community use; private encroachment and appropriation of use; and human needs versus ecological integrity.

c) Document and assess major stakeholders' satisfaction with greenway planning objectives and outcomes. Stakeholders include land developers and their technical advisors (including consulting planners, engineers, professional environmentalist and landscape architects); local residents; residential real estate interests; environmental advocates, elected municipal officials, and municipal professional staff.

d) Assess the current and potential contributions of greenways in achieving measures of urban sustainability These measures reflect concepts of

ecological integrity and social cohesion. In this study ecological integrity is assessed according to the greenway system's ability to respond to ecological limits and environmental impacts in the Beechwood residential developments. Social cohesion is assessed according to the greenway system's ability to respond to residents' desire for humane living environments with a high quality of life and a strong sense of community.

1.3 Research Plan and Method

The research plan consisted of nine steps·

1 Secondary information collection – Define the study concepts based on the academic literature and local professional usage as expressed in professional documents. Residential planning process, greenways and their planning objectives, and sustainable residential development are key concepts Describe residential land use and design characteristics of sustainable residential development as presented in the current literature Organize these characteristics according to ecological integrity and social cohesion themes.

2. Define the study area on the West Side of Waterloo for the forty-year period of study and collect secondary historical and current planning documents that describe the area and planning activities in the study area. Record pertinent information on residential planning process, greenway objectives, stakeholder interactions, problems and issues, and municipal policy initiatives and responses.

3. Primary information collection – Meet with key current and former municipal planners to identify the specific greenway objectives for each of the three phases of the Beechwood development and confirm the identity of stakeholder groups involved in each phase of residential development.

4 Meet with a small group of key actors (municipal planners, land developers and consultants, environmentalist, elected officials and real estate agents) to identify potential interviewees. Also meet with presidents of Beechwood homes associations to discuss selection of residents for interview.

5. Prepare interview guides.

6. Conduct interviews with residents.

7. Analyze and synthesize information from secondary and primary information sources.

8. Evaluate greenways according to the achievement of municipal greenway objectives, the contribution of greenways toward residential sustainability characteristics and the resolution of problems and issues raised by stakeholder groups.

9. Prepare report

Research methods include the collection and analysis of primary and secondary information Primary information is collected through interviews with key stakeholders. Secondary information is collected from relevant municipal sources including official and district plans; planning, engineering and parks department reports to council, and minutes of council meetings, as well as consultants' reports prepared for stakeholder clients, newspaper files, and academic research reports.

There are Provincial, Regional and Municipal laws, regulations and policy guidelines that affect the Waterloo greenway system. They range from the Ontario Provincial Planning Act and Provincial Policy Statements to the City of Waterloo Official Plan and Zoning By-laws The City of Waterloo regulations and by-laws that have emerged from the Laurel Creek Watershed and Sub-watershed Studies are especially interesting and are being used to improve the environmental quality of residential land use planning. All relevant regulations and legislation are identified and examined with respect to the development of Waterloo greenways

Interviewees included twenty-five municipal planning, engineering and parks staff and members of municipal council An additional seventeen interviews were conducted with key actors in the private and not-for-profit sectors. These included developers and consultants, real estate agents and environmentalists Key actor interviewees were identified through snowball sampling. By consulting with current and former municipal planning staff who participated in one or more of the three Beechwood development phases it was possible to identify the interconnected network of key actors participating in the development process.

Interviews were also conducted with a sample of fifty residents living adjacent to or near Beechwood greenways Residents were selected both purposively and randomly to ensure that there was appropriate temporal and geographic representation. A purposive sample of thirty residents was determined after receiving advice from a small group of key actors and Homes Association presidents For the random sample twenty respondents were approached and interviewed on the greenways within the study area.

The researcher employed a general interview guide containing a list of open-ended questions In this approach interaction between the interviewer and interviewee was focused allowing unanticipated responses to emerge and facilitating the clarification and qualification of complex issues Questions were sequenced starting with descriptive, factual non-controversial questions followed by questions seeking opinions and feelings about experiences The researcher maintained the role of a detached but interested listener seeking the advice of the interviewee, who was treated as an expert by virtue of his or her experience with greenways The Office of Research Ethics, the University of Waterloo's ethics overseer, approved this research method.

The researcher has not referenced any Waterloo interview sources by name in the text nor has he provided a list of those interviewed in the Appendix This was done to maintain the confidentiality of sources. In a relatively small, tightly knit development community such as that found in Waterloo a linking of job title together with issue is usually sufficient to identify the respondent

The following general questions arising from the greenway objectives provided a starting point for the preparation of a separate, detailed interview guide for each of the six

stakeholder groups (Examples of the residential interview guide and the municipal employee and real estate agent guides are provided in Appendix 1)

- What has been the interviewee's association with the greenway system?
- How has the greenway system evolved over time?
- What has influenced change?
- How successful has the greenway system been in supporting municipal planning objectives and sustainable residential development objectives?
- What strengths and weaknesses have stakeholders identified in the greenway system? Strengths and weaknesses were assessed according to criteria that include planning and design, financing, maintenance, flexibility and change, sustainability, stakeholder participation, and resident satisfaction.
- How have municipal planners and others mediated various stakeholders' objectives and concerns?
- Have public participation and partnership processes assisted in this mediation?
- What roles have other public agencies played in supporting and challenging greenways planning?
- How does the conventional greenway system accommodate new principles of landscape ecology and residential design?
- How must greenways adapt to these new principles?
- What has been the contribution of greenways in heightening awareness of environmental planning and sustainable residential development within the community?
- How might and should the greenway system evolve in the future?

Evaluation of the success of greenways was be based on three criteria:

- Achievement of the specific greenways objectives set by municipal planners, and the ability of greenways to adapt to new planning objectives over time,
- Satisfaction of stakeholders with greenways planning outcomes, and
- Contribution of greenways to residential sustainability, measured by progress in ecological integrity and social cohesion.

2 Beechwood Antecedents and Overview

In this Section we review the origins and setting of the Beechwood greenway system and provide an overview of its almost four decades of evolution. The overview is presented as three separate development phases: the Beechwood Residential District, the Beechwood West Residential District and the West Side Residential District. Each District is examined from its initiation till its present state. The Beechwood Residential District was initiated in the early 1960's and was completed by the mid-1980's. The Beechwood West Residential Development was initiated in the mid- 1970's and completed in the early 1990's The West Side District began in the early 1990's and is ongoing today. In Sections 4,5 and 6 we return to these Districts to examine, in detail, the most significant issue or theme that has defined each District's development.

2.1 Origins of the Urban Greenway Concept

Urban greenways – sometimes called greenbelts, green spaces, linear open spaces or parkways – have been an enduring planning concept in North American cities for much of the twentieth century Ebenezer Howard's Garden City Movement in Britain at the beginning of the twentieth century brought respectability in North America to the notion that greeenbelts contributed to the quality of urban life and were financially feasible. The land set aside for public open space could be financed from the proceeds of development. The Radburn concept of Clarence Stein introduced greenways into residential areas where they defined housing clusters and provided pedestrians auto-free access to schools and shopping.

E.P. Taylor's Don Mills development firmly established the greenway as an element of residential design in Canada (Sewell, 1993). Don Mills was a community suffused with green space. Development avoided ravines and mature stands of trees. An internal walkway system framed with green vegetation provided pedestrian access throughout the community protected from the disruptive automobile Green open space comprised twenty percent of the entire development. Don Mills became a major success and received much attention throughout North America in subsequent years and elements of the Don Mills concept are to be found in residential developments across Canada. Waterloo's Beechwood development – particularly its greenway system – strongly reflects the early Don Mills experience. (The more recent Don Mills experience and outcome is quite different from that of Beechwood. This divergence is discussed in Section 7)

Urban greenways have attracted a great deal of support in North American cities during the past several decades (Little, 1990). Cities have initiated greenway projects to connect isolated open spaces, to accommodate recreation activities such as walking and cycling, to protect natural features from development, and to provide visual amenity for local residents (Searns,1995). Urban greenways have received very little critical evaluation despite their recent popularity (Fabos, 1995). Their long-term contribution to sustainable communities remains unclear.

2.2 Beechwood Setting: Clair Creek Watershed

Because of the intimate physical association between Clair Creek and the Beechwood development history we describe the characteristics of the watershed and note land use issues on the eve of its urbanization

The Beechwood story unfolds within the Clair Creek watershed, a major tributary of Laurel Creek on the west side of the City of Waterloo (Map 1). Water from the fan shaped Clair Creek watershed flows into Laurel Creek before it enters the Grand River several kilometers to the east. Together, the North and South Branches of Clair Creek trace about five kilometers of permanent stream flow and drain a watershed of 15 square kilometers. The area lies within the Waterloo moraine and is moderately rolling with a characteristic knob and kettle topography related to its glacial origins. Pervious sands and silts are interspersed with less pervious silty clay tills throughout the basin. Alluvial soils are found within the flood plain of Clair Creek. Wetlands adjacent to the Creek flood plain are areas of permanently higher water table and provide storage for stream base flow. To a greater extent than many other Canadian cities the careful management of water – reducing the threat of flood and preserving the ground water resource as the principal source of water for human consumption – has defined the challenge of urban development in Waterloo.

In the early 1960's the Clair Creek watershed was predominantly in rural land uses. Westmount Road marked the western extent of urban development. Land cover included early successional agricultural lands and temporary pasture awaiting imminent urban development closer to Westmount Road and row crops, pasture, woodlots, and wetlands further to the west. Non-farm residences were thinly scattered along the rural roads of the watershed. Creek stream flow and water quality were greatly reduced due to cropping pressure on the margins of wetlands, wood lot grazing and stream bank slumping due to cattle accessing the creek. However, sections of the Creek still supported a cold water fishery

2.3 The Beechwood Development

Abe Weibe, a Waterloo businessman, who astutely anticipated the rapid growth of Waterloo, initiated the Beechwood development. In the 1950's he began assembling land in the northwest quadrant of the City and had sold a large block to the newly established University of Waterloo. In 1962 his development company, Major Holdings and Developments Ltd (henceforth "Major Holdings"), controlled 400 hectares of land in the Erb St. – Hallman Road area. By 1976 the Company had expanded its land assembly to 800 hectares. With this he set out to build a succession of high quality residential developments to meet the need of a population projected to expand rapidly. M.H. Kilpatrick Associates Ltd. of Toronto was hired to develop the Beechwood concept and to provide planning consulting services.

2.3.1 Beechwood Concept

The Beechwood concept was derived from earlier work done by Kilpatrick in Glen Cairn, a London, Ontario residential district in 1960 and in Kanata, outside the National Capital Commission's Greenbelt in Ottawa in 1962 The unmistakable "fingerprint" of E.P. Taylor's Don Mills is also evident in the concept but has never been explicitly acknowledged by those involved in Beechwood.

Kilpatrick described his concept as providing a form allowing a very flexible land use pattern with the following characteristics:
- discrete developments complete in themselves to be realized over a long period of time,
- capable of absorbing small land holdings into the overall land use pattern,
- reasonable separation of vehicular and pedestrian traffic,
- a pedestrian system linking the focal points of the neighbourhood and community,
- convenient access to the arterial road system without encouraging non-local traffic to use residential roads,
- convenient, pedestrian access to the neighbourhood school and active park.

Kilpatrick retained the traditional neighbourhood unit concept, first promoted by Clarence Perry (Perry, 1939) in the 1920's, because he believed that the basic relationship between the neighbourhood and the local primary school was enduring. Kilpatrick also wished to draw a clear line between, as he put it, "the brutality of the automobile and civilized living". Through traffic was to be prevented from entering residential areas and restricted to boundary roads. This notion led to conflict among residents in the Beechwood neighbourhoods and ultimately to Kilpatrick's disappointment.

The conceptual form that evolved consisted of a residential neighbourhood comprised of four residential sectors connected to the arterial roads by sector collectors but not to each other except by pedestrian ways that "preserve human scale". (See Diagram 2) The sectors were separated from each other by open space greenways incorporating the primary pedestrian ways, an integral part of the transportation system. The pedestrian underpasses at the arterial roads in Diagram 2, suggesting a Radburn nostalgia, were never achieved in Beechwood

Hallman Road was selected as the traffic spine of the concept and was to receive the main commercial node and principal community buildings. Residential neighbourhoods were to be fitted around this node and connected by a system of collector streets and pedestrian ways.

In 1963 the original concept assumed a two-tier school system – public elementary school and high school. By 1973 a three-tier school system – public, senior public and high schools – was in place. The effect of this was to reduce the number of neighbourhoods to two in Beechwood West, west of Hallman Road.

When construction began this innovative residential design attracted much interest in the Kitchener-Waterloo area and beyond. In 1966 Premier John Robarts, on behalf of the Ontario Urban Development Institute, presented Abe Wiebe, President of Major Holdings, the award of best subdivision developer of Ontario. A blue ribbon panel of judges for the competition noted the "unusual park system" radiating from schools "like spokes of a wheel" (Kitchener-Waterloo Record, 1966) They also noted that the design permitted "a maximum number of homes to overlook the parkland".

2.3.2 Beechwood Homes Associations

In 1965 Major Holdings established the Beechwood Park Homes Association Inc., the first of twelve non-profit corporations empowered to levy fees and deliver certain municipal services to the residents of the Beechwood subdivisions. In general the homes associations manage common use areas such as recreation centres, provide services such as swimming and tennis instruction, host community events and regulate a limited number of residents' actions through legal covenant signed at the time of home purchase In certain respects these homes associations can be regarded as quasi-local governments because they assume functions that would otherwise be provided by the local government. The Beechwood homes associations are managed by locally elected boards of directors. Each board has the authority to deal with violations of the covenant by residents and to lobby local municipal council on behalf of the homes association membership. Waterloo City Hall has looked favourably upon the efforts of boards to represent their members. These boards have had the potential for enhancing two-way communication between residents and their local government.

The Beechwood homes associations remain a Canadian anomaly. While extremely popular in the United States and providing an alternative local government for millions of Americans these associations (also known as homeowner, residential community or residential neighbourhood associations) are little known among owners of single detached homes in Canada. (Dilger, 1992) In Canada, beyond Waterloo, homeowner associations are normally associated with condominium and cooperative housing ventures

Beechwood homes associations have created some concerns. The cost to developers of providing the land and infrastructure for establishing homes associations facilities was a deterrent in the later phases of the Beechwood developments. More recently boards of directors for some associations have worried that members may be reluctant to renew covenants as they expire over the next 25 years. City officials have quietly worried that failed homes associations may leave unattended responsibilities at the City's doorstep.

2.4 Beechwood Community Development Phases

A plan for the Beechwood Community was first prepared by Major Holdings in 1963 to inform the City of the company's aspirations for its 405 hectare land assembly. Five principles guided the plan.

1 Development would take place within the Clair Creek Sub-Watershed.
2 Natural feature would be retained as far as possible.
3 The community would be pedestrian oriented.
4 Footpaths would be established, as far as possible, along Laurel Creek and its tributary, Clair Creek, between Silver Lake in the city centre and Laurel Creek Conservation Area.
5 There would be a variety of housing types.

The design that evolved from the principles showed five residential neighbourhoods focused on a community core to be sited on the west side of Hallman Road. Two residential neighbourhoods were to be located east of Hallman Road in the Beechwood Residential District and three residential neigbourhoods were to be located west of Hallman Road. In addition to a shopping centre and multiple family dwellings the community core would be the centre of cultural and recreational activities in the Beechwood Community In the next two sections we will examine the two Beechwood Residential Districts that comprise the community. We have identified them as Phase 1 and Phase 2 in this study. Phase 3, the West Side District, is located immediately to the west of the Beechwood Community and is not part of the original Major Holdings land assembly. Nevertheless, it connects, physically and conceptually, to the Beechwood development experience, particularly with respect to the greenway system.

Because of the cyclical nature of housing markets our attempt to identifying discrete phases in land development can be somewhat arbitrary and debatable. Construction will slow down or halt when a local housing market weakens and plans of subdivision may be modified. Land development firms can fail and development agreements unravel. All of these factors have been part of the Beechwood experience. They complicate, but do not invalidate, our attempt to identify an order and progression to land development in the study area.

In the following sub-sections we will provide a brief overview of land development with an emphasis on the development of the greenway component of the Beechwood neighbourhoods. In subsequent Sections 3,4 and 5 we will take an in-depth look at major issue from each phase that altered stakeholders' perceptions of local greenways and significantly altered the existing greenway system.

2.4.1 Phase 1 – Beechwood Residential District

Phase 1 began in 1963 with groundbreaking for the award-winning Beechwood Park and came to an end with the approval of the controversial Freure Homes Ltd preliminary plan of subdivision east of Fischer-Hallman road on Clair Creek in 1977. In this period the land between Westmount Road and Fischer-Hallman Road (formerly Hallman Road) was subdivided and home construction largely completed.[1] Major Holdings carried out most of the land development and sold the lots to a list of preferred builders including Vintage Homes, its own subsidiary home builder

Beechwood Residential District includes the land bounded on the east by Westmount Avenue and University Avenue Extension, on the west by Fischer-Hallman Road and on the north by Columbia Street (See Map 2) Within the district there are subdivisions that are commonly referred to as "neighbourhoods" and known by their original subdivision name or their homes association names As an example, the subdivision west of the Beechwood Park subdivision is called Beechwood Glen but its homes association name is Beechwood II and encompasses three subdivisions. Both the subdivision and the homes association for Beechwood Park share a common name and have near coterminous boundaries

While Major Holdings staff were preoccupied with the complex task of conducting a very large land development program during a booming housing market municipal staff and Council wrestled with the challenge of adapting planning and development policy to rapid growth. Their central concern with respect to the newly emerging greenway system, highlighted by the greenway component of Major Holdings' Beechwood concept, was how to deal with Clair Creek. Standard municipal engineering practice of the time, invariably, was to control streams by channelizing and encasing them in a hard liner of concrete, pipes or boulder-filled gabion baskets in the city centres. In residential areas streams were both channelized and hardened or left in a modified natural state depending on the local conditions. These practices were known as "stream improvements".

Because private residences backed on streams and ponds City engineers required landowner permission to gain access to watercourses to carry out maintenance. Often, permission was not forthcoming. As the City expanded surface runoff and flooding becoming more destructive and the need to address this watercourse maintenance problem became more pressing

In June 1969, the Waterloo Planning Department produced a report recommending that watercourses in urbanized areas receive a multi-purpose management approach that integrated stream valley preservation, water quality conservation and flood control. Linear parks and easements along the flood plain would serve as walkways linking larger open areas and residential areas would be more attractive and desirable due to the higher quality environment provided by the parks. The planning department indicated its intention to apply the principles of creek valley preservation to Clair Creek in Beechwood.

Two information sources informed the planners' report. The multi-purpose management approach was influenced by advice from Kilborn Engineering Ltd., consultant to the Grand River Conservation Authority (GRCA) regarding flooding due to urbanization. Kilborn identified the likelihood of increased urban flooding as the City expanded into the

rural area The consultant recommended that the City "channelize the various reaches of the streams... acquire through easements, those lands required for the watercourse... and protect them by zoning by-law designating them as green belt or flood plains." The recommendation to channelize streams in residential areas appears to contradict the spirit of the city planners' recommendations for the urban valley lands. However, municipal engineers supported channelization at the time and Municipal Council and citizens agreed that it was a good way to get rid of excess water. The notion of linear parks along the flood plain making residential areas more attractive and desirable was supported by quantified empirical evidence developed for an MA planning thesis by Ian MacNaughton (1969)

In its 1969 Official Plan the City of Waterloo confirmed that it would require watercourse easements in new subdivisions where the developer owned to the watercourse edge. These easements "shall not necessarily be acceptable under the 5% dedication under the Planning Act." (City of Waterloo, 1969) If Major Holdings was troubled that it would be required to give up land along Clair Creek in addition to the standard 5% dedication for parkland it could draw comfort from the MacNaughton study indicating that new home buyers were willing to pay more for houses with greenway amenity.

During this first Phase of development the groundwork for future controversy was established. In a section on Open Space Areas the Waterloo Official Plan cautioned that privately owned land designated as open space "will [not] necessarily remain as open space indefinitely Nor shall it be construed as implying that open space areas are free and open to the general public or will be purchased by the City". (City of Waterloo, 1969,11) With so much open space created by the Beechwood greenway system numerous privately owned open spaces became unofficially appropriated as part of the public linear greenway system by local residents. Years later infill development of redundant school sites and remnant private open spaces would dismay local residents unaware, or unwilling to accept, that even the Beechwood public greenway was finite.

A second controversy related to an early challenge of a basic principal of the Beechwood concept. that individual residential sectors comprising a neighbourhood should be connected to arterial roads but not to each other. This principal helped to reinforce the role of the greenway as a pedestrian access link. When the Beechwood Glen sector was under construction in the early 1970's a temporary road connection was established with a neighbouring sector to facilitate construction traffic Residents of Beechwood Glen insisted the short street remain because it provided the shortest route, at that time, to convenience shopping. Residents of the adjacent sector were equally insistent that due to the heavier traffic created on local streets the connector street should be removed. Old Post Crossing remained and became a precedent for other similar decisions in Beechwood West during the next decade.

The third and most serious controversy erupted toward the end of the first Phase of development The recommendation in the 1969 Kilborn Report to channelize streams in residential areas was adhered to by municipal engineers in the Clair Creek watershed but not without growing concern that continued urban development within the watershed would lead to flooding in some subdivisions and in the City's downtown. At the same time environmentalists challenged the destruction of natural habitat resulting from diverting streams into straight channels and storm sewers and draining wetland patches on the Creek's floodplain. Environmentalist argued that channelization was merely a justification for maximizing the number of building lots. A proposal by Freure Homes Ltd.

requiring the relocation and channelization of a section of Clair Creek led to a vigorous protest by Beechwood residents that culminated in fundamental changes in stormwater management policies and practice in Waterloo and changed the form and function of the Beechwood greenway system. This pivotal protest will be addressed in section 3 of this report.

2.4.2 Phase 2 – Beechwood West Residential District

Phase 2 began in 1978 with Waterloo Council's approval of the Beechwood West Residential District Plan It came to an end in 1993 with the approval by the Ontario Municipal Board of the Plan of Subdivision and zoning amendment for Neighbourhood IV or Laurelwood, the last neighbourhood of the Beechwood West Residential District to be developed. (See Map 3) The Beechwood West experience is of special interest in this study of greenways for several reasons First, the Beechwood concept achieved a level of refinement not achieved in earlier neighbourhoods. Major Holdings had benefited greatly from its previous experience with large-scale residential land development east of Fischer – Hallman Road. The developer had developed an excellent working relationship with the City planners and this allowed for constructive dialogue particularly at the draft plan of subdivision stage. Second, Beechwood West was the first opportunity to integrate the greenway system with new municipal storm water management policies. Third, the Beechwood West plan was subjected to the pressures and vagaries of a volatile housing market that contributed to the bankruptcy of Major Holdings. Finally, in 1993 the Laurelwood neighbourhood, the last of the Beechwood West developments, was the first subdivision required to submit to the recommendations of the precedent-setting Laurel Creek Watershed Study. These recommendations were incorporated as requirements in the Waterloo Official Plan as Amendment No. 16. (City of Waterloo, November, 1994)

Major Holdings first "floated" the Beechwood West concept plan informally to Waterloo municipal planners and the development community in October, 1973. Its report described the Beechwood concept and its application to an area bounded by Fischer–Hallman Road to the east, Erb Street to the south, Erbsville Road to the west and the Clair Creek watershed boundary between Clair and Laurel Creeks about 800 metres north of Columbia Street to the north. (Major Holdings and Development Ltd., 1973) The report depicted eight alternative physical layouts for neighbourhoods 1 and 2. The greenway system was highlighted in considerable detail showing its relationship to the hierarchy of streets, playgrounds, parks, schools, pedestrian ways and the community core at Keats Way and Fischer – Hallman Road.

By 1978 this multitude of alternatives was reduced to a single preferred alternative. The concept plan (Diagram 3) revealed several changes. Neighbourhood 3, north of Columbia Street was included. The community core area, consisting of commercial, institutional and high density residential land uses, was shifted from the intersection of Keats Way and Fischer – Hallman , where was centrally located for Beechwood and Beechwood West Districts, to a peripheral location at the intersection of Fischer – Hallman Road and Erb Street at the southeast extremity of the Beechwood West Residential District Each of the three neighbourhoods contained two or more residential sectors. Collector streets in each residential sector connected directly to arterial roads on the periphery of the District – not to other residential sectors This was consistent with the original Beechwood concept - if not with the application of this concept earlier in the

Beechwood District As a result the pedestrian access links and greenway system remained separated from the automobile. Reflecting the new municipal storm water management policies Diagram 3 depicts eight storm water detention ponds incorporated into the greenway system

An examination of Map 3 showing Beechwood West greenway system reveals that some residential sectors were provided with less accessible greenways than other sectors. Several factors account for these differences City planners began to question the Beechwood sector approach and its promotion of pedestrianized greenways. In particular, greenways were not viewed as a practical means for children to get to school in the winter. Also, poor sight lines along greenway segments raised the issue of personal safety. The sector approach played havoc with the layout of bus routes, particularly when transit planning in the 1980's was treated as an afterthought in subdivision design.

Another factor affecting the prominence of greenways is less tangible but nonetheless important. Municipal planners developed a unique relationship with each of the developers in the Beechwood West District Where that relationship was positive and co-operative the City was able to obtain generous open space dedications. When the relationship was less positive negotiations produced less open space. A former municipal planner asserts that local developers, generally, were more generous in the dedication of land for greenways. This generosity was related to a wish for a good long-term relationship. On the other hand, out-of-town developers who had an "in and out" perspective brought a recalcitrant attitude to the negotiating table

In 1984 Major Holdings filed for bankruptcy. The company had borrowed heavily to acquire Freure Homes Ltd. land just at a time when the housing market entered recession. The Bank of Nova Scotia acquired title to most of the Beechwood West land assembly and sought buyers within the local development community. Trillium Estates, a privately owned land development company operated by Paul Gareau, was formed in 1984 to develop 283 hectares of land purchased from the Mercantile Bank, a receiver of part of the Major Holdings Land Assembly.

Trillium's first subdivision, the Upper Beechwood sector, is a fine example of the traditional Beechwood concept adapted to a particular site during a buoyant, upper middle income housing market (see Map 3).[2] Gareau began with the premise that land reserved for open space (including difficult terrain, environmentally sensitive land, and rights-of-way) should be maximized and set apart at the beginning of the design process. All open space should be connected by the greenway system. Housing lots were placed on the residual land. He believed that the design should facilitate pedestrian movement and control the automobile. Cul-de-sacs led directly into the collector streets (Clair Creek Boulevard and Branston Drive) at right angled T-intersections. Trillium persuaded municipal engineers, against their conventional wisdom, to allow the bending of the collector streets. Crescent streets were excluded by the developer's preference. In the original design the Upper Beechwood sector was connected only to Columbia Street, an arterial road to the north. This was consistent with Kilpatrick's original Beechwood design. However, City planners had concerns for access to the sector for fire and ambulance vehicles and wanted to rationalize bus routes so that, according to one municipal planner "school kids and cleaning ladies had bus service to the neighbourhood". Reluctantly, the developer added three connector streets to adjacent residential sectors.

Gareau had a keen appreciation of his market He was one of the few local developers to obtain professional marketing advice prior to initiating development. From discussions with Beechwood residents he concluded that homeowners wanted a disjointed street network and direct access to the greenway Although he attempted, unsuccessfully, to locate all his residential lots on the greenway, he was able to provide a remarkable 80 percent of the 214 households direct greenway access. Another 5 percent of households were one lot removed from direct greenway access.

In retrospect, this success in bringing the greenway system to the back of most homes carried with it the basis for a pernicious problem apparently not anticipated at the time. Examination of Map 3 reveals many narrow, interconnected greenway corridors between houses. A few residents began appropriating public open space by extending gardens and placing lawn furniture and utility sheds beyond their property lines. In subsequent years, the municipal Parks and Recreation Service would be required to demonstrate ingenuity and firmness to reduce the contagion of private encroachments on public land.

Not only did Trillium Estates have a keen sense of client preferences, it also benefited from good market timing. The single family housing market was extremely active with many existing homeowners in the Region ready to move up-market. One planner has described housing in Waterloo at that time as "the technology stocks of the 1980's". Many home buyers in the Beechwood West Residential District and the Upper Beechwood sector in particular, arrived from the original Beechwood Residential District bringing with them their affection for the Beechwood concept and the greenway system in particular

Upper Beechwood with its "loops and lollipops" local street pattern and its well-tamed and manicured greenways evokes a nostalgia for good residential design based on providing residents immediate access to open space, isolated as much as possible from the automobile. However, it also reflects the end of an era. Neo-traditional or new urbanism residential design would soon establish a foothold in Beechwood. The "loops and lollipops" local street patterns and large setbacks of house footprints from streets would be challenged as would the conventional dominance of "man over nature" in the greenway system

In 1993 the Laurelwood development (Neighbourhood Four of Beechwood West) was the first to encounter the stringent recommendations of the ground breaking Laurel Creek Watershed Study (LCWS)(Grand River Conservation Authority, 1992). Ecosystem-based watershed recommendations are built into the Laurelwood District Implementation Plan (Schedule 'F1' of the Waterloo Official Plan) Central to this attempt at environmentally sensitive planning is the establishment of constraint areas. Constraint Level 1 Area is a preservation area that protects the District's environmental form and functions and maintains and enhances ecological processes, biological diversity and life support systems. Constraint Level 1 Areas include flood plains, riparian buffers, Environmentally Sensitive Policy Areas (ESPA's), Greenspace Core and Primary Supporting Areas, and Primary Links. No development is permitted in Constraint Level 1 Areas. Development adjacent to Constraint Level 1 Areas is subject to an environmental study in conjunction with a mandatory sub-watershed study. In addition to policies for land use and development the Plan presents performance criteria and measures on the basis of standards and environmental quality targets set out in the Laurel Creek Watershed Study. Performance measures pertaining to the following:

- Flood Plains and Watercourses - streambank rehabilitation, temperature control, phosphorus discharge and bacteria control, environmental buffer setbacks, rehabilitation of water impoundments and wildlife habitat protection
- Erosion and Sedimentation – streambank erosion and sediment control.
- Stormwater Management – peak flow, runoff, temperature, and erosion controls.
- Recharge Areas and Groundwater Resources – infiltration control

Advanced Stormwater management technology has been adapted to Laurelwood. Connected detention ponds treat surface runoff using sedimentation and natural aquatic vegetation. Storm water from building lots is directed to perforated pipes buried under residential streets for dispersal Storm water is monitored before release to Laurel Lake. We will examine the impact of the LCWS on the Laurelwood development in much greater detail in Section 4

The evolution of the Beechwood greenway system during Phase 2 was influenced by many factors, some more evident than others. The role of good, innovative residential design and ground breaking public environmental policy have already been highlighted. Other factors made important contributions but may have been much less visible to the general public. Two of the less visible factors deserve attention here. the Urban Valleylands Study and the Environment First Policy.

The Urban Valleylands Study was initiated in 1978 by Professor Robert Dorney and his graduate students at the University of Waterloo with the financial support of an Experience '78 grant from the Ontario Ministry of the Environment (Dorney et al.,1978). The study consisted of two parts. First, it developed a methodology for resource analysis and planning in the riparian zone of waterways Then it applied this methodology to catalogue and map the cultural/aesthetic, biotic and abiotic features of all stream valleys in the City of Waterloo. These stream valleys were urbanized or undergoing urbanization and supported, in most cases, the remaining fragments of natural features in the City. Central to the study is a set of 46 maps at the scale of 1.4800 detailing physical and natural features and constraints to development and recreation. Detailed field survey notes accompanied the maps. The published report accomplished two tasks rather well. It identified the current natural resource base, diminishing due to rapid urbanization and inappropriate planning and development practices Subsequently, it has served as a lament for lost opportunities and a challenge, today, to all participants in land development to not let other opportunities slip away.

Clair Creek, the central spine of the Beechwood greenway system, was inventoried throughout its entire length and information was recorded on three sets of maps, addressing cultural/recreational, biotic and abiotic features. This information is an invaluable resource that provides a baseline for illuminating the hectic pace of residential development that has unfolded in the Beechwood study area over the past twenty years.

It is difficult to document the overall influence of the Urban Valleylands Study. Certainly, the general public has been unaware of, or indifferent to, its existence One environmental consultant noted that the Report was complex and difficult to read. Furthermore, there was no one at City Hall designated to officially receive the Report. Yet a cohort of University students (some who found professional employment in Waterloo) and municipal planning staff and local consultants who tutored the students,

have carried this experience forward into daily practice. A former Waterloo planning director observed that the Urban Valleylands Study was prominent on planners' shelves in the late 1980's Another municipal planner remarked recently that when he and colleagues review draft plans of subdivision or work on planning policies for greenway riparian zones the Urban Valleylands Study offers a cautionary pause. They are encouraged to seize opportunities now for preservation and rehabilitation of the valleyland component of the greenway system rather than wait until tomorrow. The importance of the Keats Way remnant woodlot and the Environmentally Sensitive Policy Areas on the West Side were reinforced by the Study Both areas are ecological "anchors" in the greenway system.

In 1989 Mayor Brian Turnbull asked City staff how the City could improve the natural environment through its daily operations. From this basic question the Environment First Policy evolved. Interpreted simply the Policy stated that the City will consider the environmental impacts of all City services and programs before making decisions. Staff was asked to consider what they could do to improve the environment before they take any action. A casual observer might be excused if he or she interpreted the "Environment First" slogan as political rhetoric In fact the idea runs quite deep in the psyche of many line staff. Positive implications for the Beechwood greenway system were both direct and indirect regarding creek maintenance and rehabilitation, open space acquisition and maintenance, reduced grass cutting, plant health care, and construction and maintenance of storm water detention ponds. In the words of one municipal engineer the Mayor transformed a concept into a movement that staff bought into. One environmental consultant involved in land development noted the importance of the Policy in breaking down departmental territoriality and the streamlining of development applications. A municipal planner observed that "Environment First" reflected a pivotal shift from a tradition of focusing on the greenways for human needs to greenways in the service of environmental needs. Perhaps most important of all "Environment First" cultivated a municipal staff mindset that was able to embrace and work with the profound changes initiated by the Laurel Creek Watershed Study three years hence.

In Section 4 we examine the application of the Laurel Creek Watershed Study recommendations to the Laurelwood development – Waterloo's initial and imaginative effort to apply broad, ecosystem-based watershed planning principles to residential development.

2.4.3 Phase 3 – The West Side District

By the early 1990's rural to urban land conversion in Beechwood West south of Columbia Street was near completion and development of the smaller Laurelwood extension north of Columbia Street was well under way. The end of the original Beechwood era was approaching. This era had begun with a simple yet compelling concept of a neighbourhood design that recognized the importance of greenways as an aesthetic and social amenity. Quite coincidentally the greenway component of the Beechwood design also facilitated the incorporation and protection of natural drainage systems: But principally to allow riparian zone protection and maintenance to serve flood protection objectives

Three decades of development in the Clair Creek watershed witnessed significant changes to the original Beechwood design in response to the growing concern for environmental protection. There was a subtle shift from environmental cautions applied to the built environment solely for the benefit of humans to a belated concern for the protection of nature as a co-inhabitant of our residential subdivisions. This shift in thinking is reflected in the City of Waterloo's attempt to apply the recommendations of the Laurel Creek Watershed to the Laurelwood development.

It was clear to municipal planners that the original Beechwood concept and its modifications required rethinking as they turned their attention to the West Side, a 491 hectare tract of land between Erbsville Road and the western limit of the City. Developers were impatient to move into this last remaining block of undeveloped land. But environmentalist and anti-growth groups in the Region were equally interested in constraining development in this area.

The especially attractive character of the physical site fuelled the debate over the future of the West Side. Its rolling hills of morainic origin are partially wooded and offer a commanding view of the Cities of Waterloo and Kitchener. Much of the woodland is designated as the Forested Hills Environmentally Sensitive Policy Area (ESPA) # 19 in the Regional and City Official Plans. In addition to containing a rich variety of flora and fauna, the area contains the headwaters of Clair Creek and Laurel Creek and an important source of groundwater recharge to the local and regional aquifers.

To address the conflicting concerns for the future of the West Side District the City initiated a broadly based public discussion with all the stakeholders The West Side Vision was first articulated in 1993 and remains a bridge between the noteworthy development of the Beechwood era and new development imperatives The Vision follows:

> Against a backdrop of natural woodlands, attractively designed homes of various types rise up with the rolling topography. Smaller neighbourhood pockets are created by the landscape and the placement of built features including other uses and landscaping. Open spaces, pedestrian and cyclist opportunities are readily apparent and provide an obvious focus to higher density, higher rise mixed use centres which are visibly noticeable and feel within easy access. Streets are different – fewer cars, more people. No curbs and gutter and houses are closer to the street.
>
> P&W/PG 93-77

Encoded in this statement are three key elements for guiding future development on the West Side· 1) the subwatershed approach to determining environmental sensitivity and protection, 2) community design as expressed by the new urbanism, and 3) new standards for community development. Achievement of the Vision is predicated on the continuing involvement of developers, other stakeholders and the public at large in workshops, open houses and informal public meetings for the preparation of District Plans.

The greenway system in the West Side District is largely determined by these three key elements But the watershed approach provides the template for guiding the other

elements of community design and community development standards in shaping the character of the greenway system. The watershed approach identifies natural features and ecological functions to be preserved and enhanced Community design and development standards determine how humans will relate spatially and functionally to natural features and ecological functions

Environmental preserves, consisting of woodlots, wetlands, ESPA's, streams, swales, buffers, hedgerows, steep slopes and groundwater recharge and stormwater management areas define the greenway system at the district or macro scale. Community design concepts reflecting new urbanism (or neo-traditional design) and development standards applied to parkland, residential form and densities, schools and so forth contribute to the detailed articulation of the greenway system at the neighbourhood and residential subdivision level One macro scale development feature, the West Side Trails System, is the principal link that ties the natural and the built landscapes together into a unified whole. In Section 5 we will examine the West Side Trails System in some detail.

In Section 2.4.2 we examined the application of the Laurel Creek Watershed Study recommendations to the Laurelwood Development or Neighbourhood Four of Beechwood West. While a few measures had crept into practice earlier in the Beechwood West District, Laurelwood was the first, comprehensive, testing ground for these innovative and controversial recommendations.

Testing, elaboration and application of watershed and subwatershed recommendations approach their full potential on the West Side. Subwatershed management plans are very detailed providing comprehensive environmental guidance for urban planning. In partnership with other public approval agencies (Ministry of Natural Resources, Grand River Conservation Authority and Regional Municipality of Waterloo) and the development industry the City has carefully assessed, refined and applied watershed recommendations taking care to understand the planning, ecological, aesthetic, recreational, engineering and financial implications of actions. This approach is much more comprehensive than the earlier approach employed in the later stages of Beechwood West. Planning in the West Side District has focused on several issues that directly influence the greenway system: groundwater protection and maximum impervious cover values, location and width of stream, wetland and woodland protection buffer set-backs, ownership of buffers, and compensation for land dedicated to buffers.

Ecosystem-based watershed policies have fundamentally changed the physical form and function of greenways in the West Side District by emphasizing environmental needs rather than human-based preferences for aesthetics and social interaction But other policies such as the new urbanism have also changed the greenways. The Vision for the West Side, as interpreted by the planners encourages residential design that is nostalgic for the past – compact streetscapes, front porches and rear lanes, separate garages and mixed housing types. Streets play a key role in this residential design. "Loops and lollipop" local streets are rejected and reduced-width grid pattern streets are back in favour. Swales replace curbs and gutters and services are located under the road surface (rather than in off-road easements). Recent plans of subdivision reveal that the greenway system is a by-product of land reserved for environmental features and stormwater management requirements. Most residents do not have direct access to greenways. Instead, they are served by numerous, small, discontinuous parkettes. (Map 4) or by linear parkettes that are segmented by the grid street system (Map 5). The draft

plan of subdivision for Clair Hills (Map 5) displays an unusual greenway feature – a segmented linear park that visually connects Keates Way collector street with Columbia Street, an important arterial. One can be excused for wondering if this is an attempt to resurrect elements of French Renaissance design as reflected in the open space plans of Daniel Burnham and his followers at the end of the nineteenth century

The West Side District is very much a work in progress. Families are moving into the new neighbourhoods even while construction continues. The greenway system is vestigial and will not be complete for several years. With so many new concepts being tested conflict and discordance are bound to appear. Nevertheless, stakeholders, aware of the originality of the endeavor, are keen to participate in this experimental approach to residential open space

The West Side District is also a landmark event in Canadian planning and provides a template for ecologically sensitive urban development, not only in the Waterloo Region, but also elsewhere in Canada. In Section 5 we will examine the West Side Trail System, the centrepiece of current greenways planning in Waterloo

3 Storm Water Management and the Clair Creek Controversy

3.1 Origin of the Controversy

In May 1976 Freure Homes Ltd. sought approval from Waterloo Council for a proposal to build 104 residential units on a remnant parcel of 29 acres east of Hallman Road and north of Craigleith Drive. The applicant sought permission to relocate and channelize a section of Clair Creek adjacent to Hallman Road. Earth fill would be applied to a low , damp location at the site. Mr. Hugh Lemon, a resident of Beechwood Glen spoke against the proposal and asked that 40 percent of the site be preserved as an ecologically sensitive area. He argued that the proposal was contrary to the Beechwood approach to valley lands protection downstream where Clair Creek was part of a broader greenway system and its flood plain was off- limits to development. Lemon pointed out that relocation and channelization of the Creek would disrupt cool water springs that fed the Creek, raise water temperature and degrade Clair Lake downstream. He also stated that channelization projects require continued maintenance at taxpayers' expense.

In response to Lemon, Freuer's consultant indicated that a great increase in stream flow was anticipated through the site as development progressed upstream west of Hallman Road. Channelization would move more water through the development site faster and reduce the threat of flood.

A few visitors to Council Chambers expressed concern that vehicles from the proposed subdivision would be routed to Craigleith Drive, a local sector collector, rather than directly to Hallman Road, a District arterial road. Other residents complained that these vehicles would travel to the Westmount Avenue arterial via Old Post Crossing, the nominally "temporary" connection between sector collectors. Kilpatrick, the planning consultant for Major Holdings, had previously criticized this "temporary" connection because it violated a key principle of the Beechwood concept: the separation of residential sectors

Mindful of the 125 local residents overflowing Council Chamber into the hall, Council asked the developer, City planners, and residents to meet for discussion and return to

Council with a compromise solution. A solution was not forthcoming. In December, 1976 Council was split on a vote to rezone the site and accept a draft plan of subdivision Thus, the proposal suffered a technical defeat.
In January 1977 Council decided on a two-step procedure to resolve the issue. M.M. Dillon Consulting Engineers and Planners was hired to report on the hydrogeology of the north branch of Clair Creek. Based on the findings the consultant was asked to recommend methods for ensuring greater flow during low flow periods, maintaining an aesthetically pleasing stream channel, ensuring an acceptable level of water quality and design a stream channel and run-off system to accommodate peak flows. Council hoped that the knowledge gained would be applied as a city policy for urbanization of waterways to other watersheds in the City A seemingly parochial neighbourhood planning issue had now assumed large proportions that would lead to fundamental changes in the City's accommodation of storm water runoff in valley lands and, perhaps, introduce new elements into the Beechwood greenway system.

Recognizing that Council support for its proposal was weak and that the findings and recommendations of the M M Dillon report was not likely to strengthen its position Freure Homes agreed to most of the neighbourhood's demands. The Creek remained essentially in its existing alignment except for a slight straightening at the north end of the site to accommodate several houses on a cul-de-sac street. Cool water springs feeding the Creek remained protected from development. The revised proposal was circulated to the local homes association for comment then passed on to Council for approval in February 1977.

3.2 Modern Stormwater Management Policy

In June, 1977 the M.M. Dillon report was released. It presented a very disturbing picture of the future watershed if development continued without safeguards. The concerns of the Beechwood residents were supported. Ultimate watershed development would increase peak flow by a factor of ten and total watershed channelization would be required to accommodate the increase. To avoid flooding Waterloo needed a well-defined storm drainage policy Dillon offered 14 general and 10 specific recommendations. Leading the recommendations was the need to create "a well defined urban storm drainage policy covering the entire municipality...to guarantee orderly urban growth. (Dillon, 1977) This recommendation was approved in principle in June, 1978 and an urban storm drainage policy was approved by Council in December, 1979.

This policy had an immediate, fundamental impact on land development in Waterloo and introduced new considerations for retrofitting and extending the greenway system. The main elements of the policy that applied to subdivision development were:

- Control of stripping and grading on construction sites by use of dykes, interceptor swales, grade stabilization and sediment basins.
- Employ the major – minor drainage system concept. The minor drainage system minimizes disruption created by more frequent, less destructive five-year return frequency storms. The major drainage system is designed to accommodate peak flows and to prevent uncontrolled flooding, major property damage and loss of life associated with the one hundred-year return frequency storm.
- House foundation drains will be disconnected from storm sewers They must discharge to the ground surface or a dry well,

- Post – development peak storm water runoff from the one hundred-year storm will not exceed pre – development peak runoff from the same storm. Parking lots and retention/detention ponds will be used to reduce post development runoff. Where a pond would serve a number of lots created by one developer the land shall be dedicated to the City. The developer shall bear the cost of construction and the City should bear the cost of maintenance. Land dedicated for ponds will not be considered as part of the 5 percent land dedication for park purposes.
- Construction activity along creeks, flood plains, watercourses and environmentally sensitive areas will be restricted. Creek channelization will be restricted.
- Where the maintenance of a base or minimum flow in a receiving watercourse is determined engineering studies will determine the appropriate development measures and evaluate the impact of such measures.
- Engineers will determine the pre – development pollution loading in a receiving watercourse, the effect of urbanization on the pollution loading, the impact of such pollution loading on the environment of the receiving watercourse, and the measures available to mitigate the impact.
- Development will not be permitted below the post – development flood lines of the one hundred-year return frequency storm except as approved by the GRCA.
- City of Waterloo will prepare a Master Drainage Plan for each developing watershed and will supervise the preparation of each Stormwater Management Plan for residential and industrial subdivisions.

It would be incorrect to suggest that this new policy marked a fundamental change in municipal practice. Bits and pieces of the new policy had informally entered local professional practice. The policy brought together the bits and pieces and added missing elements to provide overall coherence. Council approval added public legitimacy. Finally, there was a willingness of members of the local development industry to comply with the spirit of the policy

The new stormwater drainage policy had a large impact on the Beechwood greenway system It signaled a broadening of greenway planning objectives. Originally the planning objectives reflected human-centred desires related to aesthetics, recreation and movement between residential sectors and schools and parks. The stormwater drainage policy enabled the greenway to serve the important residential infrastructure objective of collecting and controlling storm water. Some of the stormwater policy elements added support to environmental interests and laid the groundwork for a more deeply rooted environmental planning of the 1980's and the strong ecologically sensitive planning of the 1990's

3.3 Lessons Learned

There are several lessons to be learned from the Clair Creek Controversy. First, citizens who bought into the Beechwood concept by purchasing homes were likely to resist nearby developments that threatened the concept. Preservation of the Clair Creek valley lands was integral to the Beechwood greenway system component of this concept. The Freure Homes proposal was unacceptable to residents because it threatened the Clair Creek valley lands downstream. Furthermore, Beechwood residents were concerned that a decrease of water quality and quantity downstream might adversely impact property values

The controversy showed that highly motivated and resourceful residents could successfully challenge the credibility of a developer's professional advisors. The developer claimed that the threat to water quality and quantity in Clair Creek came from future activities upstream. Beechwood resident, Hugh Lemon, and his neighbours measured water temperature where the Creek entered the development site and where the water left the site. They found that the water temperature decreased significantly indicating the Creek was receiving cold water flow from springs on the east side of the site. The developer's proposal to shift the Creek and place earth fill in the vicinity of springs was inconsistent with his publicly stated claims that threats to water quality and quantity came from off-site and upstream.[3]

Occasionally, small, seemingly parochial issues can take on a much larger importance. Municipal engineers in Waterloo had been wrestling – piecemeal - with storm water management issues. The Clair Creek Controversy brought concerns to centre stage where they could be addressed holistically resulting in comprehensive municipal policy.

Finally, favourable outcomes often serve as catalysts for new, unexpected opportunities. The Freure Homes Ltd. development was approved and construction began. The Soulis', one of the first families to move into a single-family home east of the Creek, was charmed by the beauty of the location. It included a small meander of Clair Creek backing onto a wetland patch containing a remnant stand of tamarack. The family initiated and led a small naturalization project in the neighbourhood. This project has since spread south along Clair Creek toward Clair Lake and to a nearby elementary schoolyard. It is quite remarkable that a private project of limited resources has since served as an inspiration for the much larger Roxton and Regency Park rehabilitation projects on Clair Creek west of Fisher – Hallman Road.

4 The Laurel Creek Watershed Study and the Laurelwood Neighbourhood

4.1 Introduction

Watershed planning emerged in Ontario in the early 1980's usually focusing on single issues such as flood or erosion control. Master drainage plans were the preferred planning tool for controlling urban runoff. While these planning activities reflected the need to meet broader environmental objectives they were focused on controlling the quantity of urban runoff to reduce flooding and erosion. By mid to late 1980's interest in the quality of urban runoff reflected a fundamental change of focus within the responsible Provincial agencies. Concern for protection of the aquatic environment, initially for fisheries, expanded to encompass a wider range of issues including stream baseflow maintenance, water temperature, terrestrial habitat and ground water systems. Milestone reports such as those of the Crombie Commission (Royal Commission on the Future of the Toronto Waterfront, 1992), the Greater Toronto Greenlands Strategy (Kanter, 1990) and reports from the Provincial Ministries of Natural Resources and the Environment led to the emergence of subwatershed plans. These documents reflect an ecosystem- based resource management strategy and promote the use of watershed boundaries for land use planning.[4]

The Laurel Creek Watershed Study (LCWS), an ecosystem- based resource management strategy based on this broadened interest in water management was initiated in January 1991 and completed in April 1993. The 74 square kilometre Laurel

Creek watershed drains almost all of the City of Waterloo, a small portion of northwest Kitchener and portions of three adjoining Townships to the north and west of the City. Clair Creek is an important tributary of Laurel Creek and its 15 square kilometre watershed has borne the brunt of urbanization on the west side of Waterloo. This section examines the Laurel Creek Watershed Study and the application of its recommendations as requirements for the Laurelwood Neighbourhood greenway in Beechwood West. This was the first residential subdivision to proceed through plan of subdivision approval under these new environmental requirements.

4.2 The Laurel Creek Watershed Study

Pressure for continued urban development on the west side of the City of Waterloo raised serious concern for flooding in the downtown among residents of Waterloo. Because of this concern the downtown was designated a Special Policy Area. This designation required that further development on the west side of the City could only occur after completion of a watershed study. In addition to their concern for potential flooding, residents of the City expressed growing concern that urbanization and agricultural practices were impacting negatively on natural resources in the Laurel Creek watershed. Groundwater, the principal source of potable water for the Region, was high on the list of natural resources in the minds of residents. With broad community support the City and the GRCA took the lead in promoting the study and eventually gaining the support of five other local municipalities and two ministries of the Provincial Government. The Study began in January, 1991 and ended in April, 1993 At a cost of 840,000 dollars, shared 55:45 between Provincial and local governments, it is one of the more expensive and influential watershed studies to be completed in Ontario

4.2.1 Organization of the Study

Two study committees were established to carry out the study – a Technical Committee and a Steering Committee. The purpose of the Technical Committee was to advise on, report, investigate and interpret technical findings. The Steering Committee, a multi-stakeholder advisory committee, was commonly referred to as the Round Table Group. Its purpose was to provide overall coordination for the project as well as control the timing of tasks, select consultants and enhance the quality of public participation. The Technical Committee reported to the Steering Committee.

The Watershed Study Report was organized according to the four stages comprising the study:

• Background review:
Develop the information base concerning watershed conditions, constraints and opportunities in the face of future urban and rural changes. Summarize key ecological issues, develop a public participation program for defining concerns and issues and refine watershed goals and objectives.

• Watershed analysis and impact analysis:
Carry out detailed watershed analysis to understand current processes and conditions that influence existing water resources and environmental conditions. Determine flood and erosion risk as impacted by land use change. Identify possible land use needs and

their likely impact on the watershed ecosystem Identify means of enhancing the environmental resources in the watershed. Establish watershed goals and targets

• Evaluation of Watershed management options.
Evaluate options by looking at their effectiveness, feasibility and ease of implementation.

• Recommended Watershed plan:
Develop recommended plan and implementation strategy to serve as a framework for future land use planning and development. Provide long range monitoring and evaluation program to track the plan's progress.

4.2.2 Ecological Issues Addressed in the Study

Concerns for the natural resources of the Watershed were related to rapid, persistent urbanization and increasingly destructive agricultural practices in the shrinking rural segment.[5] Six issues were addressed by the study:

• Flooding: If more urban development increases the risk of flooding how might this risk be reduced?
• Stream bank erosion How can stream bank erosion be curtailed in the face of more urban development?
• Surface erosion and sedimentation: Do current urban development and farming practices contribute to surface erosion and sedimentation? If so, how can these destructive processes be contained?
• Water quality: Must urban growth continue to degrade stream water quality? How do the reservoirs impact water quality? Can water quality and fish habitat be improved?
• Groundwater: How can groundwater quality and quantity be protected in the face of forecasted increases of use?
• Natural resources. How can terrestrial and aquatic natural resources, such as wetlands, woodlots, and fisheries, be protected and improved despite continued urban development?

4.2.3 Mission Statement and Goals

The overall purpose of the study was to develop a resource management plan to guide local municipalities in planning for future land use development while protecting and enhancing the environment of the Watershed. Five goals were articulated for the Study (GRCA, 1992, 1 2-1.6):

Goal 1 – To minimize the threat to life and the destruction of property and natural resources from flooding, and preserve or re-establish natural floodplain hydrologic functions.

Goals 2 – To protect, restore and enhance water quality and associated aquatic resources and water supply

Goal 3 – To conserve, protect and restore the natural resources of the Laurel Creek Watershed (land, water, forest and wildlife).

Goal 4 – To protect, restore, develop and enhance the ecological, historic, cultural, recreational and visual amenities of rural and urban areas within the Watershed and particularly along stream corridors.

Goals 5 – To protect, restore and enhance groundwater quantity and quality.

4.2.4 Study Findings

The Study concluded that the Laurel Creek stream system was "on the edge". Its degraded environmental condition resulted from adverse impacts of past agricultural and urban activities Findings are summarized under four topics; surface water quality, flooding, groundwater, and terrestrial resources.

Surface water quality was degraded and aquatic organisms showed signs of stress. Degraded surface water quality was linked to inappropriate uses of land, inadequate stormwater management, and physical processes such as erosion. High bacterial counts were due to farm animals accessing the Creek and an excessive waterfowl population, mainly on ponds and reservoirs. Four existing shallow water reservoirs contributed to thermal pollution High sediment loads and suspended particles restricted groundwater flows and contributed to reduced baseflow. Turbidity reduced aesthetic character and degraded fish habitat. Elevated phosphorus levels from the washout of fertilizers led to algae blooms and further aesthetic degradation.

Current high flood risk was due to the past practice of building on the floodplain and to increased flows caused by previous development without adequate stormwater management. The existing reservoirs, contributing negatively to water quality through thermal pollution, play a positive role in controlling floodwater. Most importantly, new development in the City's West Side District and in the rural townships will exacerbate flooding unless runoff flows, volumes and peak-flow timing are controlled.

Groundwater problems are of concern to the Waterloo Region because of dependence on groundwater for municipal water supply. Research demonstrated the strong linkage between water infiltration, groundwater levels and baseflow to streams in the Watershed. Coincidentally, the undeveloped portion of the City's West Side District contains important groundwater recharge areas. Therefore, urban development must not impair nor reduce the size of area of infiltration sites.

Natural and managed green spaces (greenways) in the Watershed are relatively well connected. But these green spaces are under intense pressure from urban development and agriculture. Many of these green spaces play a critical role in preserving natural resource functions and features such as wetlands and aquatic resources. Green spaces must be preserved and enhanced.

4.2.5 Recommendations of the LCWS

The LCWS recommendations emerge from the five study goals presented earlier and are summarized here (GRCA, 1992, sec. 8):

1.To limit flood risk, structural and non-structural measures are suggested with an emphasis on measures that will also enhance fisheries habitat and form part of an overall stream rehabilitation approach. No new development should be permitted in

areas subject to flood damage More detailed subwatershed studies and stormwater management plans should be conducted to set watershed flow targets for peak, volume and timing for proposed land development Development flows must not cause increased flooding in flood prone areas. Infiltration practices are to be incorporated in storm water management plans for new development and for retrofit in existing developments At-source control and infiltration should be stressed for new developments.

2 To address water quality and aquatic resources, measures are proposed to control rural and urban erosion. Specific works will address stream bank erosion in high priority areas. To control for temperature, temperature targets must be set for various stream reaches Relatively warm storm water is to be detained on site and infiltrated below ground for cooling Best management practices are to be adopted to achieve phosphorus targets and will lead to reductions in algae and aquatic plants as well as improved oxygen levels New developments are to be monitored for elevated fecal bacteria counts. Stream rehabilitation and monitoring is proposed for key stream segments. Finally, recommendations are made for the improvement of four reservoirs in the Watershed. Several options are suggested to provide owners with a choice of actions.

3. To conserve, protect and restore the natural resources of the Watershed municipalities are urged to adopt a green space (greenway) system and protect components of this system by designating levels of constraint. Corridors are to be established to provide continuous linkages between green space system components Riparian buffers are to be established along all perennial and intermittent streams.

4. The green space system recommended for goal 3 would have the added benefit of protecting and enhancing the ecological and visual amenities of the Watershed.

5. Groundwater quantity is to be protected by best management practices directed to source infiltration controls Ground water quality is to be protected by carefully limiting development in groundwater recharge areas identified in constraint mapping

4.2.6 Means of Implementation

Regional and local municipalities were encouraged to adopt the recommendations in their official planning processes (GRCA, 1992,8.18-8.27). It was suggested that the Regional Municipality do the following:

- incorporate objectives to protect the Regional groundwater recharge system,
- continue to identify environmentally sensitive policy areas for protection,
- recognize watershed and subwatershed planning as integral to the Regional and municipal planning process,
- incorporate implementation policies in the Regional Official Plan.

The local municipalities were encouraged to .

- adopt and incorporate environmental goals and objectives from the LCWS,
- identify environmental constraint areas on mapping in the local official plans, and describe these constraint areas in the text,

• establish and incorporate performance criteria and measures that apply to constraint levels,
• establish a municipal environmental evaluation strategy for approving land use changes.

It was also recommended that an Implementation Advisory Committee be formed to assist municipalities and agencies in implementing the Study recommendations

The success of the LCWS is being determined not by the technical elegance of the Study but by the success of municipal planners in implementing the Report's recommendations. Employing this measure of success we can state that the Study has been remarkably successful. The new Regional Municipality of Waterloo Official Policies Plan (1994) requires the completion of watershed studies before the approval of local municipal official plan amendments or local municipal implementation plans to permit new development or major redevelopment within the watershed. However, the clearest evidence of implementation intent and action is to be found in the City of Waterloo, the municipality containing most of the Laurel Creek watershed. We can consider means of implementation according to the following three actions:

1) formation of the Laurel Creek Watershed Implementation Advisory Committee,
2) amendment of the official plan, and
3) preparation of subwatershed plans and implementation plans

Chaired by a member of Waterloo Municipal Council and with the Waterloo senior environmental planner as assistant to the Chair, the Implementation Advisory Committee's principal purpose was to facilitate and expedite implementation of the Study recommendations. Committee membership was drawn from the public agencies and stakeholder groups that participated in the LCWS. The Committee addressed conflict among members and sought consensus on implementation measures before these measures were brought to municipal council for discussion.[6]

Official Plan Amendment Number 16 to the Official Plan of the City of Waterloo Planning Area incorporates Watershed goals, objectives and policies to guide future development and protect the environment within the City's portion of the Laurel Creek Watershed. Watershed and subwatershed planning are declared integral to the municipal planning process. Watershed policies will be implemented by Council employing subdivision agreements, site plan agreements, conditions for municipal approval, design and performance guidelines, restrictive covenants, public acquisitions and environmental warnings to landowners. Subwatershed studies will be undertaken during the preparation of new district plans under the direction of the City of Waterloo. Environmental Constraint Area Policies will apply to all lands within the non-urban portion of the Watershed within the City. Environmental Constraint Area Policies are classified according to the level of constraint ranging from no development to limited development. Other policies dealing with storm water management and erosion/sedimentation management, and ecological buffers are identified. Finally, watershed performance criteria and measures as well as monitoring and review functions are mandated.

4.3 Implementing the LCWS Recommendations in Laurelwood

4.3.1 Laurelwood District Implementation Plan

We can appreciate the extent to which the LCWS recommendations have impacted local level planning by examining the Laurelwood District Implementation Plan (City of Waterloo, 1993) [7] In particular we want to understand how these recommendations have impacted the Beechwood greenway. The implementation plan defines and describes the area protected from development and the area to which a land developer is restricted. Map 6 is a concept plan for permitted land uses. Map 7 depicts the environmental constraint areas consisting of wetland complexes and primary links Constraint levels one and two define areas of protection and conservation and are intended to protect sensitive areas of the watershed in order to "maintain and enhance important ecological processes and watershed characteristics including ground water infiltration, water quality and natural areas" (City of Waterloo, 1993)

The Implementation Plan describes Constraint Level One areas consisting of regulatory flood plains, 30 and 15 meter riparian buffers, 7 to 30 meter woodland buffers, 10 to 30 meter wetland buffers, Environmentally Sensitive Policy Areas (ESPA's), greenspace core and primary supporting areas, primary links, and a provincially significant wetland complex. These are locations where development is prohibited. Constraint Level Two areas contain groundwater recharge areas, 15 meter riparian buffers bordering intermittent streams, isolated wetlands, greenspace secondary supporting areas and links, rehabilitation areas, and urban green areas.

Performance measures are identified for floodplain and watercourses, areas of erosion and sedimentation, areas of stormwater management, groundwater resource and recharge areas, and natural areas. These performance measures include flow targets for peak, volume and timing; temperature control; phosphorus discharge and bacteria controls; vegetative buffers; erosion, sediment, runoff and infiltration controls. Specific targets for performance criteria are set out in a schedule accompanying the Implementation Plan.

4.3.2 From Concept to Development

The Laurelwood District Implementation Plan is an ecologically focused conceptual framework or a "green template" that specifies, in general, where and under what conditions development may take place. Not surprisingly, many challenges appeared in the development approval phase when precise lines were placed on draft plans of subdivision and when new environmental technologies were employed to support ecosystem-based requirements.

The developer of Laurelwood, Trillium Estates, is a privately owned company formed in 1984 to develop 283 hectares of land purchased from the Mercantile Bank, a receiver of part of the Major Holdings Land Assembly. Upper Beechwood, the developer's previous development and an example of the evolving classic Beechwood greenway system, was approved before the completion of the Laurel Creek Watershed Study. Laurelwood, the final phase of the Beechwood West Residential District, was the first application of an ecologically focused District Implementation Plan to residential development in Waterloo.

The terrain and environmental features of the site challenged the residential design for Laurelwood. A height of land with moderately steep slopes runs north and south adjacent to Erbsville Road. This necessitated north-south local streets to avoid steep grades and minimize grading Of necessity, twenty-one percent of the site was reserved

as passive open space for environmental purposes Much of this reserved land was deemed hazardous and included floodplain and wetlands, steep wooded seepage slopes and pockets of deep marsh wetland soil. A cattail meadow /swale linking natural areas and a mature upland forest and open space links comprised the balance of the reserved land. The required parkland dedication was also removed from development

A system of five stormwater detention facilities was designed to address targets for water quality, erosion, sedimentation, peak and base flow , and run-off volumes. These facilities represent a technologically innovative approach to stormwater management. This is the first Beechwood development requiring the developer to monitor stormwater One of the five stormwater detention facilities is located off-site on GRCA land. In addition to controlling storm flows from Phase 1 of the development, the facility is used by the GRCA for educational purposes. The facility is guided by a monitoring plan. Monitoring tests for achievement of watershed targets and the effectiveness of best management practices in duplicating the pre-development natural flow regime. The findings of this first monitoring activity are being incorporated into the design of the other four facilities in later phases of the development.

The difficulty of the site resulting in the reduction of developable land and the pervasiveness of the LCWS guidelines were bound to create friction between public planners and the private land development team In a word, Trillium was caught in the "transition" between old policies and new policies. Disagreement arose over the precise location of Constraint Level 1 boundaries. For example, the drip line formula for determining the width of buffers around woodlots was increased by the City from x 1 to x 1 5 for all new developments after considerable public consultation and support. This offended the developer whose development team was aware of a lack of consensus in the technical literature Also, debate ensued over the legitimacy of constructing wetland to replace lost natural wetlands. To resolve an impasse Trillium Estates Ltd took the City of Waterloo to the Ontario Municipal Board to seek approval of the draft plan of subdivision and zone change application At the urging of the OMB the parties agreed to enter minutes of settlement which adjourned the Hearing. The parties were able to reach agreement and avoid the costly delays of a full hearing.

Honed by the Laurelwood experience an altered form of public/private negotiations is evolving. The following examples illustrate new approaches The GRCA began using a pre-consultation meeting attended by all parties to a development proposal. At this meeting the interests of all parties are placed on the table for consideration Cooperation between City and Regional governments, the GRCA, and the Provincial Environment and Natural Resources ministries have contributed to what is called a "single-voice public approval sector approach" Many stakeholders believe that this approach speeds up the review process – but consensus is lacking.

4.4 Assessment of Watershed Planning for Laurelwood

Assessments of ecosystem-based watershed planning in Ontario are beginning to appear in the literature (Environment Canada et al 1994, Hardy et al 1994, Gransaull, 1997, Flores, 1998). Watershed studies in Ontario are relatively new and are, for the most part, untested. Thus, any assessments must be regarded as tentative. Received in early 1993 the LCWS Report has been a very influential document Regional and local official plans have been amended to incorporate the Study's recommendations All land development in the Watershed must satisfy these amended official plans.

The more detailed sub-watershed studies, such as Subwatershed studies 309 and 310 that apply to the Laurelwood District, were funded by the land-owning developers and distributed to stakeholders before applications for draft plans of subdivision and zoning amendments were submitted for government approval.

As we learn more about the complex relationships between terrestrial and aquatic ecosystems and the impact of urban and agricultural development on these relationships the use of an ecosystem approach within watersheds is compelling. By working together members of the multi-disciplinary Technical Committee of the LCWS learned much that might have been missed or ignored had they worked apart. Watershed and subwatershed studies have led to the integration of engineering services with environmental and land use planning.[8] The ecosystem approach has been a powerful influence for passive or soft engineering solutions in place of traditional structural solutions.

The use of a multi-stakeholder Roundtable with the power to lead the study proved to be a major success. Conflicting interests within the Roundtable were resolved through extensive discussion. The flow of technical information from the Technical Committee was mediated by the values and goals clarified by the Roundtable and reinforced by citizens attending workshops, design charettes, open houses, site visits and neighbourhood meetings. The Region and the City of Waterloo adopted the recommendations in their respective official plans without appeal to the Ontario Municipal Board. Developers are now completing subwatershed management plans for the Laurel Creek Watershed. These documents give specific directions to district plans, local development plans, zoning bylaws and other land development implementation tools.

Proponents (including municipal planners and watershed planning consultants) claim that long term cost savings will result from watershed and subwatershed studies. Much of the data collected for the studies can be used for subsequent local studies. The Silver Lake Class Environmental Assessment at the lower end of Laurel Creek has made extensive use of data gathered for the LCWS and has benefited from a reduction of study time and cost. However, planners and municipal councils appear to have an insatiable curiosity that invariably leads to a demand for further information.

It is too early to claim that watershed planning is achieving all its objectives. Only the passage of time will prove that the quality of the watershed environment is improving. It is difficult for planners to convince others that they should participate in such an uncertain venture when the costs in time and money are high but the promised benefits have yet to be fully demonstrated.

Meanwhile, significant problems must be addressed. The financing of watershed studies is ad hoc and vulnerable to national, provincial and municipal fiscal exigencies. Subwatershed studies are financed by landowners - particularly those who wish to develop their land in the near future. In some instances some major institutional landowners have been unable or unwilling to pay their share of the cost of a study. Unfortunately, banks will not advance loans to developers for subwatershed studies.

Monitoring is an essential part of watershed planning and consists of low level background monitoring (conducted by the City before and after development) and

development monitoring carried out by the developer The developer must conduct post-development monitoring for two years after his work is ninety percent complete. Post-development monitoring will continue if problems are detected and remediation will be required. The current arrangement for the City to continue background monitoring is reassuring. But will the City have the ability to detect and respond to future problems? Is there a need for a new municipal service for environmental monitoring, management and maintenance? What if the City, at some future date, decides that it lacks the resources to fulfill this duty?

The Laurelwood development illustrates the powerful impact of ecosystem-based watershed studies on the Beechwood greenway system. In previous Beechwood developments greenway design was driven by the aesthetic and recreational needs of residents. Greenways were also market driven. Thus, greenways were more extensive and accessible in higher priced single-family neighbourhoods. The Laurelwood greenway breaks with this past. It is designed with ecosystem protection and enhancement as a priority For those components of the greenway – wetlands, buffers, woodlots – that are fragile there is a beginning effort to control human access through the strategic placement of paths and naturalization plots. This concern for nature receives even greater attention as residential development moves across Erbsville Road to the West Side District.

4.5 Conclusions

Municipal planners and developers have entered into a new relationship based on watershed and subwatershed planning. Much experimentation and innovation is occurring in Waterloo and elsewhere throughout the Province but it is too early to suggest the outcome. The experience with the LCWS and its subwatershed studies in Waterloo has been very encouraging. The land development process has been changed in a fundamental way that promises greater protection for the natural environment and reduced costs to taxpayers for environmental rehabilitation and remediation. The greenway system, a major target for watershed recommendations, is undergoing considerable change as a result. But unresolved problems of financing and monitoring at this early stage may, along with other problems not yet well defined, constrain the potential of this new approach to planning.

5 The West Side Trails System

The Beechwood Plan was a simple yet compelling concept of a neighbourhood design that recognized the importance of greenways as an aesthetic and social amenity. We have seen how environmental concerns, over three decades, shifted the greenway system from one that served human needs, almost exclusively, to one that attempts to balance human needs with the separate needs of the natural environment. The West Side Trails System is the principal link for bringing together the natural and the built landscapes to form a more complementary whole while reducing the potentially-negative impact of urban development on environmentally sensitive lands.

The West Side Trails System concept emerged from municipal discussion in the early 1990's on the future of the West Side Lands. In a 1993 Discussion Paper (City of Waterloo, 1993) prepared by the Planning Group of the City of Waterloo several objectives established a direction of thinking that would support the Trails System initiative. There was a need to balance the preservation of the natural environment with

the needs and aspirations of future residents. It was important to protect environmentally sensitive areas and resources from the negative impacts of land development to maintain essential ecological processes and genetic diversity. Stream corridors would be rehabilitated and transformed as attractive community assets by linking with the existing municipal open space system and other historical, recreational, visual or cultural amenities.

In 1996 Waterloo Council approved Terms of Reference and budget for the West Side Trail System Master Plan. The unique character of the resulting trail system was anticipated by several of the ten key objectives in the Terms of Reference:
1) provide a method of directing public access into and around the ESPA and away from sensitive and unique environmental areas;
2) encourage passive recreational use and exclude motorized vehicles;
3) promote outdoor education so that a healthier, better-informed and appreciated human/environmental relationship results;
4) use the trail system to physically connect West Side District neighbourhoods to each other and adjacent greenway systems in the Beechwood West and Laurelwood neighbourhoods. The Report recommended that the Trail System be planned and constructed before the commencement of West Side development. This recommendation implicitly acknowledges the risk of initiating the construction of community trails after residents have arrived on the scene.

In July of 1997 Waterloo Council received from the consultants the West Side Trail System Master Plan Final Recommendations. The Plan works to achieve the following vision:

> A community trail plan that protects and enhances the natural environment first and meets a range of non-motorized user recreational needs. The community trail is to be planned amongst 607 hectares (1500 acres) of rolling woodlands, creek valleys and throughout future residential neighbourhood parks/parkettes, commercial and school areas on Waterloo's West Side. This system will also be linked with existing and planned community trails elsewhere in Waterloo, Kitchener and beyond.

It attempts to balance community interests for environmental protection and rehabilitation with the need for a four-season, passive recreational, non-motorized community trail system Support for the plan was gained from the general public and affected West Side District landowners and developers through an extensive public consultation, education and participation process. Fifty-three kilometers of trail are recommended consisting of 29 kilometers within and around environmental areas and 24 kilometers within future subdivisions. The latter will include parks and parkettes, pedestrian walkway links, road rights-of-ways, certain designated sidewalks, through stormwater management facilities, and along Clair Creek valley lands. (Map 8 illustrates the master plan) The master plan provides detailed instructions for design guidelines, requirements within subdivisions, access restrictions and liability, trail construction, closures and rehabilitation, priorities for construction, maintenance and monitoring, and community participation and stewardship. The trail system is estimated to cost one and three-quarter million dollars and will be funded by applicant developers through the land subdivision process and from the City's annual Capital Budget.

The Plan recognizes the importance of gaining and retaining the support of residents in the new neighbourhoods To that end it recommends several programs to foster

participation and a sense of stewardship. Programs include adopt-a-trail, citizens' patrols, encouragement of media coverage, hosting meetings and workshops on topics such as environmental monitoring and by-laws enforcement. The consultants also suggest that an information package be prepared for new homeowners Two participants in planning for the West Side, Brian Trushinski and Elizabeth Leedham, volunteered to prepare an information guide "Living with Nature in West Side Waterloo". Its subtitle, "A good Neighbour's Guide" suggests that this is more than simply a promotional aid. Indeed, it is a primer for new residents inviting them to become partners and gently informing them of their obligations as new residents in this unique, innovative community. Developers engaged in the West Side District have financially supported the printing of this document

The Guide addresses a wide range of topics – groundwater recharge, stormwater management, naturalized buffer areas, living fences, the woodlands and valley lands, wildlife and, of course, the Community Trails The Community Trails system is given a special presence within the Guide. And so it should – because these trails provide the means for residents to leave their neighbourhoods to explore the entire District on foot or bicycle. A Trail user's code provides a list of "do's and don'ts" and assumes a fairly high level of personal responsibility of readers As an example, users are asked to avoid trails closed to promote regeneration of vegetation. They are also requested to not stray from marked trails to avoid damaging vegetation and stream banks. Finally, users are asked to "help educate others about these 'rules of the trail'".

If earlier experience within the Beechwood developments is instructive the West Side District will have its share of conflicts. Some residents will mean well but end up doing wrong. They will feed the ducks and geese. Children and adults will go off- trail with their mountain bikes. Storm water management ponds will be criticized as a danger to children. Back yards will encroach on public open space. Despite the risk of mistakes, the City and an enlightened development community have initiated an innovative approach to greenway systems that builds upon the earlier Beechwood experience.

6 Beechwood Greenway System Sustainability

The concept, "planning for sustainability", has had a very large presence in the thinking of urban professionals. But, because of the impreciseness of the concept there has been considerable debate regarding the nature of urban sustainability and the means of achieving it. In many cases the debate has resulted in little more than the indiscriminant attachment of a "sustainability" label to conventional practice. Given the confusion over sustainability it is important that we identify instances where urban planning and development practice achieves progress toward sustainability. In this section we assess the greenway system's contribution to sustainability first by examining the issues and conflicts generated. Then we report on stakeholder satisfaction with greenways. Finally, we relate concepts of ecological integrity and social cohesion, as hallmarks of sustainability, to specific accomplishments of greenway planning.

6.1 Current Issues and Conflicts in the Greenway System

Measured by normal planning standards, the Beechwood Greenway System has been relatively free of major conflicts over its four decades of existence. However, if conflict is largely a by-product of change, then considerable conflict should be anticipated due to

recent changes Change, or the threat of it, has triggered debate within the Beechwood community over the past few years. The catalyst for change has three origins: demographics, resident values and attitudes, and Municipal policies. Indeed, an attempt to trace the origins of conflicts reveals the close inter-relationship of these catalysts Changes in the demographic structure in the Beechwood neighbourhoods result from residents moving through their life cycle and household turnover. As the resident population ages and turns over, values and attitudes shift. Municipal planning and development policies are adjusted to reflect changes in the expressed desires of the electorate and the new directions of professional practice. We will discuss the current issues and conflicts with the three origins in mind. But we acknowledge the inter-connections among them.

6.1.1 Homes Associations

In Section 2.3.2 we described the Beechwood Homes Associations as an unusual Canadian experiment in informal local government with responsibility for operating recreational facilities and delivering recreational and some greenway maintenance services to their memberships. There are twelve legally incorporated homes associations in the Beechwood and Beechwood West Districts delivering recreational services to about 2,000 households. Each homes association is managed by an elected board of directors and regulated by a covenant attached to deed of ownership. As originally conceived all homeowners have been required to be members and pay an annual membership fee that currently ranges from 220 dollars to 360 dollars per year. Over time, most members have been satisfied with this arrangement. When a few members have failed to pay their membership dues the associations have placed liens on the owners' properties. Due to the loss of clear title to their homes and an impediment to mortgage renewal, offending owners have been quick to settle their accounts. With turnover of home ownership as a result of job relocation or the decision to downsize an increasing number of new residents are expressing dissatisfaction with mandatory membership fees

When the homes associations were formed most covenants were given a finite life with expiration occurring between 1992 and 2025 Boards of directors now fear, as covenants expire, that many homeowners will refuse to pay their annual membership fee and the viability of the associations will be threatened. When the Beechwood North Homes Association Covenant expired in 1992 membership dropped from 165 homeowners to about100. The Board of Directors has experimented with an associate membership category for households who want access to the recreation facilities and services but live outside the association boundary. The Board has also entered into a cost sharing agreement with the Beechwood Bridlegate Homes Association. Bulk joint purchases of maintenance supplies and coordinated staggered operating hours for the two swimming pools have achieved economies of scale and reduced costs.

The covenant for the Beechwood Park Homes Association, the original Beechwood subdivision, will expire in 2003 Of its 157 household memberships 137 are legally required to maintain their membership. The balance of memberships are voluntary or associate. Voluntary members live within the community but are not required to hold membership due to historical anomalies. Associate members live beyond the community but pay the 360 dollars annual fee for access to the facilities and recreation programs.

Associate members do not have voting privileges. The Board believes that many households will withhold payment of dues when the covenant expires.

With this concern facing the Board it has decided to mount a campaign to explain the benefits of the Association with regard to the services provided. The Board points to the intangible sense of community that is created among neighbours who participate in collective recreation activities and social events and who enjoy the local greenway for passive and active uses under the vigilant surveillance of friendly neighbours.

The City of Waterloo has been all but silent with regard to this potential crisis. It does not want these useful associations to fall out of favor. Boards of directors have been useful neighbourhood intermediaries and screening groups when issues have arisen between a neighbourhood and City Hall Furthermore, elected officials and staff worry that if homes associations fail the City may be pressured to assume responsibility for current facilities and services.

Will the Beechwood homes associations continue to thrive after the expiration of the covenants? They have played an important role of maintenance and above standard service delivery It is not well recognized that some homes associations have played an important watchdog role by informing members of matters of importance beyond the neighbourhood. The associations also contribute to the development of a sense of community Social events, such as dinner-dances and trash collection and tree and shrub planting on the greenway, help to bring neighbours of all ages together to enjoy and appreciate their community. It is unfortunate that developers for the recent subdivisions in Laurelwood and in the West Side District have declined to establish homes associations because of the cost to them and a belief that these associations are no longer in fashion.

6.1.2 Encroachment and Appropriation of Use

A casual stroll through the Beechwood greenways will provide many examples of private encroachment on public land. It may appear as innocuous lawn cutting or establishment of gardens, statuary and shrubbery beyond the property line. At worst, swimming pools, tennis courts and high barrier fences may extend into public space creating an unfriendly environment for users of the greenway. Other forms of encroachment include the dumping of garden waste into backing woodlots and ravines and the damaging of vegetation and habitat by the destructive activities of local residents – for example, construction of children's' tree forts and the inappropriate use of mountain bikes and motorized off- road vehicles.

The City has recognized the encroachment problem since the 1980's and has previously addressed it in an ad hoc manner. In 1996 the lead municipal agency, Parks Services Group, recommended to Council a comprehensive approach to the problem The Group concluded that a zero tolerance approach would fail Instead, they decided on a flexible three-pronged approach to encroachment:

a) Allow existing encroachment but place the property owner on notice and document it legally so that prospective purchasers are alerted to the illegal encroachment
b) If undue hardship will not result, then the City takes legal action to gain compliance

c) Operate a public awareness campaign with particular attention paid to new homebuyers

The public awareness campaign is especially promising. The rear property boundaries of all new residential lots on greenways are demarcated with cedar bollards or stone monuments. Cleverly, the stone monuments contain the statement "private property" to alert the property owner, as well as the public, of the boundary position. Municipally planted trees and shrubs forming a living fence on the greenway adjacent to the property line are also employed. Literature is distributed by Parks staff to new residents and they are given a telephone number to call if they observe infractions. Recognizing that it is easier to address the encroachment problem before it occurs the Parks Services Group are hopeful that public awareness and community spirit will reduce the need for the other two approaches.

Similarly to the encroachment issue, the appropriation of use issue involves a conflict over land use and ownership In this instance we refer to residents becoming habituated to using open space that is intended for future development. Redundant school sites offer a classic example in the Beechwood greenway system. Two controversies in the Beechwood District have received much attention recently. In one instance (the Beechlawn Drive/Old Post Road site) the Waterloo School Board sold a land parcel of 3.2 hectares that had been held for twenty years in anticipation of construction of an elementary school. Over the years this property had become informally included into the greenway For children, it became a low maintenance extension of an adjacent playground. For adults, it became a large amenity resource for walking pets and taking pedestrian shortcuts. For the dozen or more property owners who abutted the site, directly, it became a large, tax-free extension to their property. When the School Board sold the land to a developer, who intended to construct a thirty-house subdivision, many residents became incensed. Negotiations for a land swap between the City and the developer to rationalize housing lots and greenway access added to the issue and divided membership within the two neighbouring homeowners associations.

In the second controversy a 5 hectare property owned by a University of Waterloo church-affiliated college for 35 years had provided residents of 26 single family homes and 20 condominium town houses with a large open space that connected them to the Beechwood greenway system In addition to being hilly and offering commanding views of North Waterloo the site had provided additional space and privacy for some of the larger and more expensive properties in the Beechwood District. Announcement that the land was to be sold for development of 48 single family residents shocked the neighbourhood and raised the specter of legal actions against the developer and the City

In both instances the controversies have been resolved to the satisfaction of a majority of the parties involved. City staff have played an important role in facilitating discussions over application and interpretation of subdivision and zoning standards and land parcel trades. The City's effort to maintain the continuity of the greenway system has been essential to resolving the controversy.

6.1.3 Safety and Privacy

Living in a house that backs on a greenway involves a curious irony. When asked why they have chosen to live adjacent to public open space resident invariably identify the benefit of not having neighbours behind them and their direct access to the greenway system. Homeowners and real estate agents acknowledge that one expects to pay a premium for these benefits At the same time, when asked about what they dislike about the greenway many residents express a concern for personal safety, especially after sunset Residents are very sensitive to voices and movement in the greenway in darkness Pleasurable views into the greenway from residents' houses during the day contrasts with the anxiety of being observed by strangers after dark.

Another irony concerns the physical design of the greenways. Originally, the greenway system was designed to separate neighbourhoods and provide a pedestrian alternative to streets made dangerous by vehicular traffic By using a greenway adults could visit friends and children could walk to school while limiting contact with streets As vegetation has matured in greenways and on private property, sight lines have decreased creating a sense of unease for some residents. Some residents indicated their preference for walking sections of the greenway with a friend rather than alone. Many parents prefer to drive their children to elementary school rather than have them use the greenway Both perceived safety and difficult winter footing are reasons for using an automobile.

The greenway system in the Beechwood Districts is connected to the local street system by way of infrequently spaced pedestrian paths that run between residential lots (These paths also serve as utility corridors and channels to direct stormwater flows to stormwater sewers and management ponds) Neighbours adjacent to these paths complain of pedestrian traffic after dark. Pedestrians and cyclists on the greenways frequently trespass on private property to get back and forth between the street and the greenway if there is no nearby-dedicated pedestrian path The occurrence of trespass has sensitized residents on the greenway to any City proposals that encourage widespread use of the local greenway systems by visitors from outside the local neighbourhood

These conflicting attitudes of residents adjacent to the greenway system have fostered debate among residents and with the City regarding the City's Community Trails Program This Trails Program promotes the notion of linking all greenways within the City so residents living anywhere in the City have an opportunity to walk extensively, away from auto-dominated streets. As part of the promotion, the City has attempted to upgrade paths on selected greenway segments and place signage to guide visitors unfamiliar with the local area

In 1996 a controversy erupted among residents along the greenway segment extending north from Clair Lake to Old Post Crossing and serving as a contact zone between Beechwood Park and Beechwood Glen subdivisions The City's Parks Services announced its wish to install a stone dust trail with signage as part of the Community Trails Program expansion Reaction of residents on both sides of the greenway was swift and blunt. They wanted no trail improvements. Underlying their opposition - as indicated from a survey of all affected residents by two of the homeowners – was the concern that greenway upgrading would attract strangers from beyond the local neighbourhoods and increase local concerns for safety. Local residents not living immediately adjacent to the greenway were also included in the survey. But opposition to the Parks Service proposal was much weaker among this latter group.

6.1.4 Naturalization of Vegetation

Permitting or facilitating the regeneration of native local species of vegetation on public land is not a new practice in Waterloo Secluded pockets of naturalization have been established on public land by City staff for more than twenty years. But residents have not had a clear appreciation for the nature and purpose of naturalization.

Initial discussion of naturalization in the Beechwood neighbourhoods generated considerable concern among residents. Some residents associated naturalization with the reduced level of greenway maintenance experience in the late 1970's when the City assumed responsibility for grass cutting from the homes associations The City's large mowers were not able to attend to the tight corners on the greenways. The resulting patches of "wild" vegetation were a source of complaints from nearby residents who disliked the appearance and worried that weeds would spread on to their property. For other residents the concept of naturalization conflicted with their image of a greenway as a well-maintained, formal open space akin to the traditional urban park.

Since the completion of the Laurel Creek Watershed Study, naturalization has been an explicit policy of the City. Naturalization is part of ecologically sound environmental practice and it saves money from reduced cost of greenway and stream bank maintenance

Publicly initiated naturalization efforts in the Beechwood and West Side greenways have been largely limited to the riparian zone of Clair Creek, on steep slopes, as buffers at the edge of remnant woodlots, and at storm water management ponds There are a few examples of private naturalization efforts – most notably along Clair Creek in the Beechwood District and at the Mary Johnston elementary school in Beechwood West.

The Clair Creek/ Roxton Park rehabilitation and naturalization project referred to in Section 3.3 is the best known project within the Beechwood greenway system. Constructed in the Beechwood West District on Clair Creek between Fischer-Hallman Road and Columbia Street, it offered the opportunity to re-vegetate a severely degraded agricultural landscape Environmental design, ordering of vegetation and organization of community volunteers for planting day was led by the City's Planning Department. The project was supported by both municipal staff and elected officials seeking to demonstrate environmental commitment in the early 1990s. It was funded by a twenty thousand dollar Green Fund grant.

The goal of the project was to create a natural vegetative buffer along Clair Creek promoting improved water quality and wetland habitat by restoring the elements of a natural riparian ecosystem. Five objectives were identified:
- Improve the hydrological cycle and fish habitat.
- Establish a natural riparian plant community through managed succession.
- Restore wildlife habitat.
- Provide human recreation and education.
- Foster community stewardship and long-term commitment to monitor the site for encroachments and vandalism.

One particularly interesting site in the larger restoration project is the Regency Park site, a 4100 metre swale that feeds storm water into Clair Creek Its interest to students of naturalization derives from its shared boundary with twenty-six single family residences. Undertaken by City parks and engineering staff, it contains a stone dust trail bordered by shrub beds, deciduous and coniferous groves, and various experimental test plots set in a field of unmowed indigenous grass. This is a setting where negative reaction to naturalization is most likely to occur.

Almost a decade of rehabilitation has turned the Regency Park/Roxton Park/Clair Creek restoration from a wasteland into an ecologically rich and aesthetically satisfying suburban natural oasis. (See Diagrams 4 and 5.) But the project has not been without its local critics. Some residents bordering the Regency Park section have complained that the site looks messy and is a source of weeds that spread on to private property. Several residents expressed concern for an increase of small mammal pests in the area and have attributed this to restoration activities. These critics would tend to favor a formal park landscaping in the long tradition of Ontario urban parks. But this type of complaint has decreased as suburban residents become more comfortable with the natural look.

All West Side woodlands, wetlands and Clair Creek are protected from urban development by surrounding naturalized buffer areas of planted grasses, wildflowers, shrubs and trees that are indigenous to the Waterloo Region. The Parks and Recreation Service does not cultivate, mow, trim, or apply pesticides and herbicides on these lands. The City hopes that new residents in the West Side District will accept and support these in-place practices as part of a contract with nature that differentiates the West Side from all previous Beechwood developments.

6.1.5 Passive and Active Uses

The original Beechwood concept implied a passive use of the greenway system. This included purposeful walking to the local recreation centre or school and casual recreational walking, use as a meeting place for neighbours and a place for informal children's play. More active uses such as team and individual sports (e.g. football, group cycling and golf) were expected to occur in parks, playgrounds, schoolyards and on the streets. The use of the greenway system has expanded to include a wider variety of uses, some of which are regarded as incompatible with the original concept. Young children and older adults may feel threatened by fast travelling cyclists. Construction of, and improvements in, hard surface paths can bring conflicting uses into closer, potentially dangerous contact.

It was noted in the Safety and Privacy section that residents have concern for the City's Community Trails System. A few residents have also expressed concern that the Community Trails System may bring larger numbers of visitors into the local neighbourhoods contributing to congestion and disturbance of the tranquillity that they associate with the greenway system. These concerns point to a need to investigate the potential holding capacity of the greenways before they experience overuse.

6.2 Stakeholder Satisfaction

Six groups of stakeholders – developers and their team of consultants, residents, real estate agents, environmentalists, elected officials, and municipal professional staff -

have played key roles in the development and evolution of the Beechwood Greenway System. It is informative to reflect on stakeholder satisfaction with greenway planning objectives and outcomes Individual satisfaction can be an ephemeral condition changing from day to day or from one location to another. Like election polling, surveying stakeholders for satisfaction is also subject to sampling error. Nevertheless, we attempt here to reflect on the satisfaction expressed by representatives of the stakeholder groups.

The findings in this section are drawn from the ninety-two interviews described more fully in Section 1.3. This included a sample of fifty residents living adjacent to, or near, Beechwood greenways, twenty-five municipal staff and elected officials and seventeen persons drawn from the private and not-for-profits sectors.

The development community has continued to express guarded satisfaction with the greenway system as a major urban design component of Beechwood developments. Abe Weibe, president of Major Holdings and the key development player in the Beechwood District, was extremely pleased with the favourable reviews received by his early neighbourhoods. The greenways were given prominent attention in marketing campaigns. When Major Holdings left the scene during the development of Beechwood West subsequent developers were prepared to perpetuate the greenway They believed – at least during periods of strong housing markets – that greenways paid for themselves. The cost of land set aside for greenways was recouped due to enhanced lot prices. As the environmental agenda gained prominence greenways were promoted as a supportive response by developers. Developers viewed greenways as a means of bringing open space closer to houses on modestly sized lots. The constellation of professionals who provide consulting services to developers have also played an important role in the evolution of the greenway system They have provided innovative solutions in storm water management and ecosystem-based watershed planning as experienced in the Laurelwood development and in the West Side District

Residents' satisfaction with the Beechwood greenway system is quite evident from comments expressed during interviews. Indeed, residents and real estate agents share a congruent interest in the greenway system's impact on the housing market. The presence of greenways was a positive factor in attracting residents to the Beechwood developments Their preferred proximity to open space and willingness to pay the greenway premium on house price influenced house selection. Homeowners in the Beechwood District who decided to obtain newer homes within the Waterloo region often purchased properties in Beechwood West. Their familiarity with the greenway system has been an important factor in their decision. It is too early to know how the greenway features in the West Side District will influence the market for housing.

However, some greenway characteristics can detract from house prices. Properties located close to recreation centres are less desirable due to the noise and bright lights associated with tennis courts and swimming pools. Properties adjacent to walkways connecting streets with greenways and greenways containing hydro transmission lines are also negatively impacted.

A few real estate agents have developed a large segment of their business on the sale and resale of Beechwood properties. As a result they have become very knowledgeable of this housing market. They voice strong support for the greenway system because it

satisfies a continuing demand and contributes to the long-term value of Beechwood housing

Professional environmentalist – environmental planners and engineers, ecologists and other professionals in the development industry with an interest in good environmental practice - have regarded the Beechwood development experience with considerable satisfaction It has provided opportunities to advance the state of the art and science. The Laurel Creek Watershed Study was the single most important project. It and subsequent subwatershed studies have fundamentally changed residential development planning in Waterloo. Professionals have been able to carry this experience beyond Waterloo and have advanced their careers in doing so.

Non-professional environmentalist have also found many opportunities to pursue their interests within the Beechwood study area Over the years they have successfully challenged the evolving wisdom of planning and engineering practice regarding stream, wetland and woodlot preservation. They have also been a driving force in supporting and undertaking the rehabilitation and restoration of degraded habitat Annually, the Beechwood greenway system has hosted groups of students from the local universities undertaking field research and reconnaissance.

In municipal planning and development affairs it is sometimes difficult to separate the contributions of elected officials and municipal professional staff. This is particularly true when there is congruence of purpose. Over the past decades there has been strong support on Municipal Council for parks, open space and environmental protection. Some mayors have made environmental issues a major item in their agenda We have noted the strong leadership role of Mayor Turnbull and his Environment First Program Professional staff acknowledged that this Program was inspirational and served as a moral compass during difficult and challenging times. The Beechwood Districts and the West Side District have been a major focus for growth. Thus, many of the challenges associated with open space in residential development played out in the Beechwood Greenway system One of those challenges was the completion of the Laurel Creek Watershed Study and the implementation of its recommendations It should be understood that these recommendations led Council into uncharted waters. Mayors BrianTurnbull and Joan Mckinnon were staunch supporters of the Study and provided critical support to professional staff along the way.

6.3 Greenway System Sustainability

In this study we have attempted to assess the current and potential contributions of greenways in achieving measures of urban sustainability These measures reflect concepts of ecological integrity and social cohesion. Ecological integrity is assessed according to the City of Waterloo's ability to respond to ecological limits and environmental impacts in the Beechwood residential developments. Social cohesion is assessed according to the City's ability to respond to residents' desire for humane living environments with a high quality of life and a strong sense of community.

Ecological integrity in greenway planning has evolved over time as the degree of ecological sophistication among participants has increased In the early days of Municipal greenways policy measures such as increased amount of open space and accessibility of local residents to that space either via walkways or lines of sight, success in woodlot preservation, and protection of steep slopes and stream banks from erosion

were primary measures of success. The Beechwood greenway system provided a modest alternative to the automobile by enabling children to walk or cycle to primary schools and adults to walk to local convenience stores. The aging of families and the reorganizing of elementary schools now require fewer students to either walk further or travel by motorized vehicles. Offsetting this loss, redundant school sites have been sold for infill residential development resulting in higher residential densities and a slightly more compact urban form. Adults have never found the greenways useful for pedestrian access to grocery stores due to the difficulty of carrying groceries any distance.

The Environment First Policy initiated in 1989 prepared Waterloo for significant advances in ecological integrity in the 1990's led by the recommendations of the Laurel Creek Watershed Study and the array of subwatershed studies that ensued. Watershed recommendations apply to new greenway planning - addressing wildlife habitat protection and restoration, storm water management practices that meet water quantity and quality targets, and protection of ground water infiltration sites. Other recommendations attempt to retrofit current best management practices to older segments of the greenway system through naturalization, restoration and public education.

Greenways are also linked to residential sustainability through an important element of economic development; the ability of the local land development industry to provide a choice of housing to different segments of the market while, at the same time, minimize its impact on the environment. Developers have dedicated land for greenways and complied with strict Municipal environmental requirements. Success can be measured by the ability of developers to satisfy these requirements and remain in business.

The contribution of greenways to residential sustainability must include consideration of social cohesion. Actual and perceived accessibility of all socio-economic groups to the greenway system is one measure of success. There are contradictory interests at play. The City of Waterloo is promoting a community trail system in which greenways play an integral part. The assumption is that greenways belong to everyone in the larger community. On the other hand residents adjacent to the greenway system are taking a stronger proprietary interest in this community feature and are encroaching upon public land. This behaviour has been fostered by a strong sense of local community interest and more recently by concerns for personal safety. Another measure of success is the change over time in the socio-economic mix in neighbourhoods as measured by the presence of lower income and rental housing and a wider range of age cohorts as residents move through the life cycle. Housing mix and public open space connectivity is such that all residents have access to the greenway system.

Although it is premature to judge at this time, land development in the West Side District has great potential for fostering social cohesion. Linked to residential neighbourhoods and mixed land use nodes by way of local parks and parkettes, the West Side Trail system is a major feature for promoting walkability, human scale and dynamic civic spaces. At the same time the Trail plays a key role in promoting ecological sustainability.

Creation of the Beechwood Park Homes Association by Abe Weibe and the spread of the idea to other neighbourhoods were significant influences for social cohesion. It is unfortunate that the idea has fallen out of favor among developers. Perhaps the current threat to the homes association concept from alienated residents will be resolved by

adaptation of its structure and promotion of its value If not, residents will be poorer for its demise.

7 The Don Mills Exemplar In Retrospect

Familiarity does not usually breed contempt but it can contribute to oversight. Having lived with the Beechwood concept for almost four decades and observed its spread to the western boundary of their City, residents and planners of Waterloo can be excused for any failure to recognize and appreciate its unique character and its contribution to greenway planning theory and practice. Some residents, newly arrived in the Beechwood Districts from other cities, have commented on their familiarity with greenways in their previous communities. As a result of this familiarity they were attracted to Waterloo neighbourhoods served by greenways But very few, if any, residential greenway systems elsewhere in Canada offer four decades of evolving experience and have embraced so strongly an ecologically-sensitive approach to urban residential development.

Don Mills, the genesis of greenway planning in Canada, should be recognized for its important influence on Beechwood and other greenway communities. But its potential to inform and inspire other communities was reduced when the rapidly expanding City of Toronto encapsulated it. By 1963 residential development ended and no other developers were prepared to carry E P. Taylor's expansive greenway experiment into neighbouring developments Lacking undeveloped residential land Don Mills planners over the past three decades have been limited to a slow, piecemeal retrofitting of newer ideas Nevertheless, our exploration of the Beechwood experience can be enhanced by returning to this seminal influence on the work of Matt Kilpatrick, Beechwood's author.

Ecosystem sensitivity and biodiversity are not explicitly recognized in the Don Mills tableland greenways This is unfortunate because these greenways could provide local microclimatic benefits and connecting corridors between the West Branch and East Branch of the Don River, the two major natural river valleys that frame the Don Mills tableland (Hough et al 1997). A lack of original woodlots limits the potential ecological role of greenways as connecting links in Don Mills. There are no plans to increase the ecological role of the Don Mills greenways. Perhaps the division of planning responsibilities accounts for this. In the past City of North York planners viewed their role as providing active recreational green space, naturalization was the responsibility of Metropolitan Toronto planners. The two branches of the Don River outside of Central Don Mills have become a focus for, and dominate interest in, ecosystem-based watershed planning

The Don Mills greenways move storm water directly into the storm sewer system providing no opportunity to improve surface water quality However, the Works and Emergency Services Department now requires that redevelopment must not result in increase in total storm water runoff. Any increase must be retained on site and released gradually. Space for future storm water management ponds in Don Mills is very limited.

Central Don Mills does not offer the equivalent of the Waterloo West Side's Community Trail System or the pre-development connecting greenway links between planning districts. Don Mills greenways are more focused on local usage All greenways have a central paved path for persons using the greenway as a travel route. Ample space is

provided off the path for passive uses such as picnicking Tables and benches – but no washrooms – are provided at many locations.

Residents in Don Mills have expressed little or no concern that greenways threaten personal safety. A survey conducted in 1987 did not explicitly address the subject yet there was ample opportunity for residents to introduce concerns to the survey (Long Range Planning, 1987). The current President of the Don Mills Residents Association believes that Don Mills is an exceptionally safe community. This is supported by police data showing that break-in rates are lower than most other areas of the City (Dunsmore, 2000) Indeed, residents have expressed a desire to have Central Don Mills greenways and trails more directly connected to the larger Metropolitan trail system by penetrating the surrounding arterial road barriers with over and underpasses (North York, 1988).

In retrospect the Beechwood greenways have had advantages not available to Central Don Mills Beechwood development has continued on the edge of the built city and has expanded westward in-step with the growth of the metropolitan area. The newly arrived resident population has been receptive to new ideas. There has always been space and newly arrived families on which to test new ideas and improve older ideas. As noted previously, Central Don Mills was encapsulated by the onrush of urban expansion and became an admired anomaly within an otherwise undifferentiated suburbia.

In this most recent decade, in particular, the Beechwood greenway system has benefited from the presence of Clair Creek, a tributary of Laurel Creek and part of the Laurel Creek Watershed and its ground breaking study. The greenway system has served as a test bed for watershed and subwatershed study recommendations On the other hand, Central Don Mills greenway, positioned on a tableland between the west and east branches of the Don River, has remained relatively isolated geographically and jurisdictionally from the efforts of the Regional Conservation Authority to bring ecosystem-based watershed planning to the Don But it is reasonable to assume that the tremendous excitement and energy that has infused the "Bring Back the Don" movement will be reflected in the greenways planning for a mature Don Mills and that this planned community will yet serve again as an exemplar for other Canadian communities.

8 Conclusions: Theory and Practice - Foresight and Hindsight

In this final section we review the contributions of the Beechwood greenways to theory and practice and speculate on possible future outcomes for the continuing Beechwood experience.

Layout of Waterloo greenways today is no longer determined solely by aesthetic and recreational criteria It reflects strongly the need to satisfy ecological requirements established by watershed and sub-watershed management planning. Today's "green template" approach removes environmentally sensitive land and land needed for environmental services during development negotiations before land development begins. Greenways and storm water management facilities are installed before residents arrive in the subdivision. This approach was first applied in Laurelwood The West Side Trail System serves as the principal link to bring together the natural and built environments and to balance human needs and the needs of the natural environment. Throughout the Beechwood experience the greenway system has served as an important locus for the playing out of urban environmental policy, linking together issues over time in an evolving environmental tapestry. Residents and developers, key players

in the residential development drama, have indicated an increasing willingness to pay for ecological integrity if it can also deliver amenity.

While the Beechwood greenway system has been adaptable it has not overcome certain limitations. It never liberated residents, in any meaningful way, from the automobile. Originally, it was believed that children would walk to school on the paths, safe from the auto. Due to the rigor of Canadian winters and recent safety concerns of parents, many children are driven to and from school. With the aging of the resident population in the Beechwood districts elementary school populations are in decline, redundant school sites have been sold and some students must commute by school bus. Recent student population projections produced for the school board for Beechwood and Beechwood West Districts indicate this trend will accelerate over the next sixteen years.

Even if the Waterloo Regional School Board could rearrange school districts to increase student populations Provincial Government policy, in establishing a twenty-five acre site as a minimum size for funding in the older suburbs, mitigates against a resurgence of the "walk to school" design principle.

Greenways were originally designed to provide physical separation and definition between residential sectors and neighbourhoods. Planners and designers believed this physical separation would encourage neighbourliness among residents within the individual sectors and assist in fostering community pride. Local homes associations would reinforce this sense of solidarity. This design objective may have succeeded to a fault. Some residents noted that they were acquainted with families throughout their residential sector and neighbourhood but less acquainted with residents living on the other side of the greenway. This barrier effect of the greenway is exacerbated by average house price differences often present in adjacent neighbourhoods. The separation effect of greenways may also apply to multiple family dwellings more often located on collector streets close to arterial streets at locations less accessible to the greenway system.

Many changes and adaptations in the Beechwood greenway system are the result of stakeholder cooperation. Cooperation between municipal professional staff and neighbourhood residents is most important because of the potential long term continuing association between the two groups. An equally important cooperation is required among staff of the various municipal departments having responsibility for the greenway system. We identified the "Environment First" policy for its success in creating a compelling vision for municipal staff. From that ensued cooperative greenway maintenance and environmentally sensitive cost cutting programs such as plant health care (reduced use of chemicals in turf care), partners in parks (volunteer maintenance of turf, plantings and buffers) and park and greenway patrol by citizen volunteers.

With stakeholder cooperation greenway policy changes have occurred incrementally beginning as informal staff experiments that prove to be successful and, therefore, worthy of political endorsement and formalization. Interdepartmental cooperation and communication with residents are essential requirements. Highly motivated residents have sought support of municipal staff and equipment to carry out greenway cleanups and undertake private naturalization projects. Indeed, actions to achieve greenway objectives have been "piggybacked" on standard municipal engineering and parks and recreation activities without fuss.

What does the future hold for the Beechwood greenway system? We can obtain some clues to the future from past occurrences, but invariably, our speculations are as likely to be off target as accurate. Greenway conflicts are probably inevitable considering the widely varying expectations of users. But experience indicates that many conflicts, such as conflicting uses, can be resolved through education and fairness of resolution. A few conflicts, such as encroachment and vandalism, require strict enforcement.

The greenway system may be held hostage to unrealistic expectations. Some observers have spoken of its key role in achieving residential sustainability. Yet the Beechwood greenway system has a varied and limited impact on residents' daily lives. Most residents do not have direct access to it and organize their time for daily activities occurring outside the neighbourhood and are dependent on the use of their automobile. Some residents with homes association-managed recreation facilities have installed private swimming pools Greenways, per se, have a limited ability to reduce an array of harmful outputs in residential areas associated with the consumer society: Most notably, the harmful chemical residues derived from lawn and garden care and the automobile. But in a limited way they can contribute to healthy social environments.

A major challenge to planners and other professionals, committed to fostering the Beechwood greenway system, is to sustain the West Side Vision. This Vision reflects responsible urban development for current and future generations. However, it is extremely difficult to convince elected officials and the business community to support goals that require postponed gratification Greenways are only one component of efficient urban structuring The mixed-use activity node concept of the West Side District fosters an increased density of population accessible to open space, transit and choice of housing. But the supporting roots of this concept do not run deep in Waterloo.

The main role of the Beechwood greenway system has shifted over the years from primarily one of ornamentation to one that attempts to seek a balance between human needs and the needs of nature Residential housing and neighbourhoods will age and the Beechwood districts will take on an inner city character. If infill, redevelopment and higher residential densities occur adjacent to, or near, the greenway system great care will need to be taken not to impair ecological processes and functions. With a better understanding of the needs of threatened nature concerned stakeholders may argue for a more controlled access of humans to greenways and an expansion of greenways' protective and rehabilitative functions.

Planners and politicians have never been very successful in predicting the long-term evolution of cities. It would be folly to attempt to predict the future of the Beechwood greenways as a single element contributing to the complex structure and functioning of the City Nevertheless, one assertion can be made without hesitation The greenway system will remain a strategic land reserve waiting to respond to a variety of challenges we can not yet foresee. In the future, citizens will bless those in the past that had the imagination, energy and ability to create this oasis of green amidst concrete and asphalt.

Endnotes

[1] A few remnant land parcels remained for later development but the focus and energies of Major Holdings and Waterloo municipal staff and elected council had shifted to the

250 hectare undeveloped tract of land designated as Beechwood West, immediately west of Fischer-Hallman Road.

[2] Originally, the developer had hoped to create a golf course community on the site. However, the land parcel was too small to allow for both the golf course and a sufficient number of residential lots to provide an adequate economic return.

[3] Is it not illuminating that several households in the vicinity of the springs have since been troubled with wet basements? Had the Creek been shifted to the west and the released land received fill and more housing, damp basements may have become an important post-development issue.

[4] In current Ontario planning usage, the distinction between the terms "watershed" and "subwatershed" planning is based on the level of detail addressed in the plan rather than the order of a stream in the drainage hierarchy Thus, a plan for a watershed lying within a larger watershed that has its own plan would be named a subwatershed plan.

[5] Developers, owning much of the land in private ownership on the West Side, were waiting their turn for development approval. This land was leased to local farmers with short-term interest who "mined" the topsoil by practicing corn monoculture.

[6] The Implementation Advisory Committee functioned for about one year then fell into disuse. LCWS recommendations, derivative subwatershed studies and the accelerated pace of land development, together, generated too much work to implement with too few City staff. One municipal planner noted " . it was a sad way to end an inspirational and energetic process."

[7] The Laurelwood development was initiated two years before the LCWS Recommendations were released. The developer's concept for Laurelwood already reflected some of the anticipated environmental measures that would subsequently be required. For example, Constraint Level 1 areas had been removed from proposed development. Nevertheless, the LCWS Recommendations provided a comprehensive, consistent and systematic approach to environmental planning for urban development projects that was lacking previously in Waterloo

[8] Watershed planning is not solely responsible for this integration. The Ontario Development Charges Act of 1989 provided an integrative spatial and temporal framework for land development. It required land developers to consider the financial implications of their actions not just for their own land holdings but throughout an entire subwatershed within a twenty-year time frame.

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Appendix

Interview Guides

This Appendix provides three examples of interview guides employed in the field surveys. These specific guides were developed from the generic interview guide presented in Section 1.3. These and the interview guides for other key actors were sometimes modified to recognize special conditions. For example, a respondent may have played more than one role in Beechwood's history or the respondent's association with Beechwood may not have extended to the present time.

Residents Interview Guide

> Describe for the respondent the term "greenway" as we employ it in this study – a linear open space feature owned and maintained by the city. It may include parks and playgrounds, outdoor recreation facilities such as pools and tennis courts, remnant wood lots, and aquatic features including streams, ponds and wetland. Most of a greenway is covered by vegetation such as grass, shrubs and trees.

1. How many years have you lived in this neighbourhood?

2. Did the greenway influence your decision to locate here? If yes, why did it influence you?

3. Did you pay a house price premium to live near the greenway?

4. Does the presence of the greenway increase or decrease the present value of your property? Why does the greenway influence the value of your property?

5. Have you had experience with greenways at former places of residence? If yes, where? What was your experience?

6. How many persons are there in your household?

7. How do members of your household normally gain access to the greenway? Is this access convenient for you?

8. Who in your household (including children) use the greenway? How does your household usage of the greenway vary:

a) during the day,
b) throughout the week, and
c) through the four seasons?

9. If children have lived at home in the past, but are no longer at home, how did they use the greenway?

10. Has your household use of the greenway changed over time? If yes, please explain how use has changed and the reason for this change.

11. What do you think are the most appropriate purposes or uses of the greenway?

(After giving the interviewee an opportunity to express his or her views review with the interviewee these original and current planning objectives and ask for his or her comments. In your notes separate the respondent's initial, volunteered comments from the subsequent, prompted comments.)

Original planning objectives:
Provide pedestrian walkways connecting focal points (schools, recreation facilities) in the neighbourhood and community. Separate neighbourhoods.
Separate vehicular and pedestrian movement.
Provide visual amenity.

Recent planning objectives:
Collect and process storm waters.
Protect natural features and resources.
Support ecological processes (e.g., ground water recharge and spread of plants, birds and small animals along corridors). Encourage more interaction among community residents.

12. What are the benefits of having a greenway in your neighbourhood? How might these benefits be improved?

13. Do you have any concerns about the greenway? How might these concerns be alleviated?

14. Have you attended any neighbourhood or municipal meetings that included discussion of the greenway? If yes, describe the reason(s) for the discussion(s). What was the outcome of the discussion(s).

15. Have you received any printed material regarding the greenway? If yes, what was the source of the distributed material? Was the material useful to you? What type of greenway information would you like to receive?

16. Is there a need for residents of the neighbourhood to meet and discuss municipal greenway matters? If yes, who should organize the meetings and where should they occur? Which of the following groups and individuals should be involved: the Homes Association, Ward Council Member, Municipal Council, or others?

17. Various individuals and groups have ideas that they believe will improve the greenway system. What is your attitude toward the following ideas?
    a) Community trails (linking of local greenways with citywide and regional trail systems).
    b) More substantial paths such as stone dust trails and boardwalks to more clearly define walking paths, to keep feet dry in wet weather and to encourage people to avoid walking on vulnerable vegetation and private property.
    c) Signage to give users information on their location and to help them interpret surrounding natural and cultural features.
    d) Naturalization programs that construct patches of native grasses, shrubs and trees for the purpose of improving natural habitat for plants, insects, birds and small mammals.
    e) Rehabilitation of degraded wood lots, slopes, streams, ponds and wetlands to improve water quality and habitat for plants and animals.
    f) Flood prevention and drinking water protection through improved ground water recharge and storm water management. This is achieved by protecting ground water recharge areas and by constructing storm water detention ponds within greenways.
    g) Protecting land and water resources by designating some development land as part of the greenway system. It may be necessary to permit developers to build at higher densities to compensate them for their loss of land.
    h) Reducing waste by composting rather than dumping yard waste on the greenway or into streams. Walking or cycling on the greenway trails rather than using an automobile for trips within or between adjacent neighbourhoods.
    i) Fostering local public participation and healthy social environments by meeting with neighbours to discuss and act on neighbourhood concerns. Provide opportunities for residents of other neighbourhoods in Waterloo and the Region to visit your neighbourhood via the greenway system.

20. What is the current role of your Neighbourhood or Homes Association? Has this role changed over time? What do you think the Association's role should be?

21. Has your Homes Association participated in greenway issues or served as an intermediary between residents and the City of Waterloo when issues have arisen?

22. How successful has your Association been in contributing to understanding and fostering change?

23. How would you like the greenway to evolve over the next five to ten years?

Waterloo Municipal Employee* Interview Guide

***The "Employee" designation includes professional staff in the Departments of Development Services, Recreation and Leisure Services, and Public Works.**

Describe for the respondent the term "greenway" as we employ it in this study – a linear open space feature owned and maintained by the city. It may include parks and playgrounds, outdoor recreation facilities such as pools and tennis courts, remnant wood

lots, and aquatic features including streams, ponds and wetland. Most of a greenway is covered by vegetation such as grass, shrubs and trees.

1 Describe the type of work you perform for the City of Waterloo as a member of staff. For how many years have you worked for the City?

2 (Describe for the respondent the term "greenways" as I employ it in this study.)

3 (Refer the respondent to a map of the City of Waterloo.) What has been your association with the planning and development of the Waterloo greenways system? Please indicate on the map Beechwood community locations where you have participated in the design and development of greenways. When did you work at each of these locations?

4 What have been the objectives of municipal greenways during your employment with the City? Have these objectives changed over time? If yes, in what ways? Have any conflicts appeared among objectives? How have you attempted to resolve these conflicts?

5 Let us consider the development of each Beechwood community in which you participated. Describe the negotiation process between the City and the developer with respect to the design and implementation of the community greenways. What were the important issues that required resolution? Please address issues of physical design (location, shape, size and aesthetics), economics, engineering, ecology, and social and community values. How was resolution of issues achieved?

6 There are a number of issues associated with greenways today. Issues include: physical design vs. social impacts, intensive vs. passive use, low maintenance vs. high maintenance, natural vs. manicured appearance, single vs. multiple purpose and use, accessibility, public and personal safety, ownership and attribution of costs, private encroachment and appropriation, and local vs. community use. As municipal planners please identify your concerns with respect to these issues.

7 In the "West Side" development greenway policy has been considerably influenced by policies for ESPA's, ecosystem-based watershed planning, and community trails and new urbanism. Please comment on your experience with the greenway component of residential development under these policies.

8 What is the role of the Neighbourhood or Homes Associations? Has this role changed over time?

9 Have any Associations participated in implementing greenway policy and serving as an intermediary between residents and the City when issues have arisen? How successful have these Associations been in contributing to understanding and fostering change? How might the role of the Associations change to reflect current needs?

10 **From your professional perspective how will Waterloo greenways likely evolve in the future? How would you hope they evolve?**

Real Estate Agent Interview Guide

Describe for the respondent the term "greenway" as we employ it in this study – a linear open space feature owned and maintained by the city. It may include parks and playgrounds, outdoor recreation facilities such as pools and tennis courts, remnant wood lots, and aquatic features including streams, ponds and wetland. Most of a greenway is covered by vegetation such as grass, shrubs and trees.

6 How many years have you worked as an agent in the K-W housing market?

7 (Place a map of Waterloo before the interviewee and locate the various Beechwood residential developments.) Please indicate on this map Beechwood communities where you have sold new houses and resale houses. Indicate the proximity of your house sales to greenways.

8 What amenities do prospective homebuyers in the Beechwood neighbourhoods look for external to the house and its lot? How would you rank those amenities in order of importance?

9 How important for your clients is accessibility to a greenway in the house selection decision? Has this importance changed over time?

10 What specific uses do your clients intend to make of greenways? (I will classify these uses according to passive and active uses.)

11 Does the presence of a greenway adjacent to or near a residence add to house sale price? Do you know if any real estate agents or others have collected house sales data that compare sale price of houses adjacent to greenways with similar houses not adjacent to greenways? Where might I find this type of information?

12 Does a "near but not too near" factor ever apply to sale price of houses adjacent to greenways? In other words have you met clients who want a house near but not adjacent to a greenway? Why might they hold that view? (E.g. noise from playing children, invasion of privacy, threat of break and entry.)

13 According to your clients, what are the benefits of a nearby greenway?

14 Do these benefits appear to vary according to family status (age of adults, employment status of adults, number and age of children, pets, other factors?

15 According to your clients what are the disadvantages of a nearby greenway?

16 Do these benefits appear to vary according to family status (age of adults, employment status of adults, number and age of children, pets, other factors?

17 Do prospective homebuyers indicate concern regarding a mandatory homes association fee? Have any homebuyers expressed an interest in the expiration of homeowner covenants?

18 Have you detected any differences in client attitudes toward Beechwood greenways over time or over space? (e.g. comparing a Beechwood neighbourhood over time

and comparing one Beechwood neighbourhood with another in the same time period)

19 How have clients responded to recent changes in the greenways system? (Refer to formal paths (hard surface), community/regional trails, signage, naturalization, ecosystem planning (wood lot preservation, corridors, ground water recharge and storm water management), encroachment on public land.

20 Can you suggest other real estate agents that I might interview?

21 I am interested in finding some empirical evidence that indicates, other factors being equal, that houses adjacent to a greenway sell for more than identical houses removed from the greenway but in the same neighbourhood. Would you be willing to identify a few paired comparisons in the Beechwood neighbourhoods and give me a brief description of the houses, their general location by neighbourhood, and their selling price: Perhaps a pair of houses in Beechwood Park, Beechwood Glen or Downs, Upper Beechwood and Beechwood West?

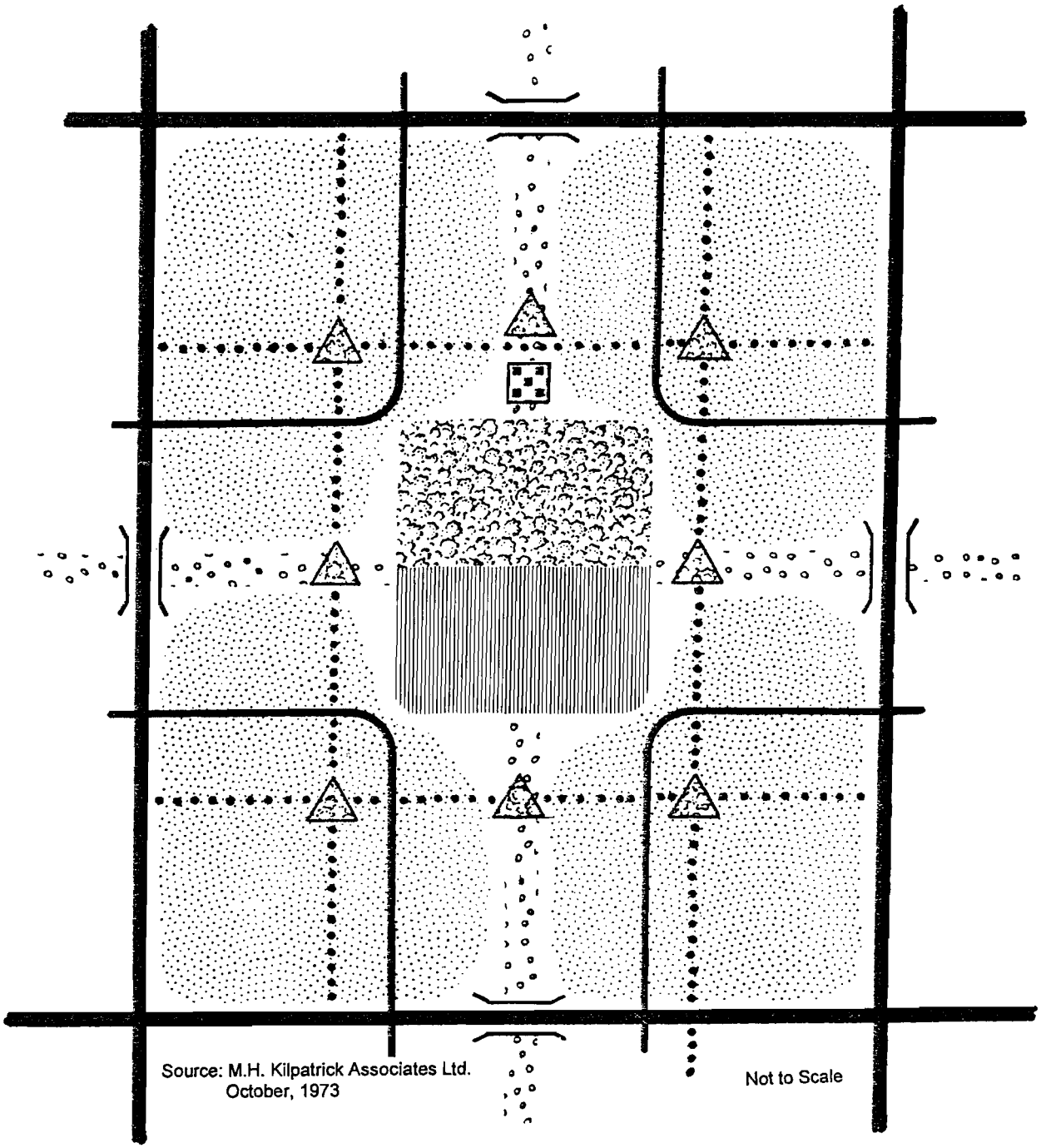
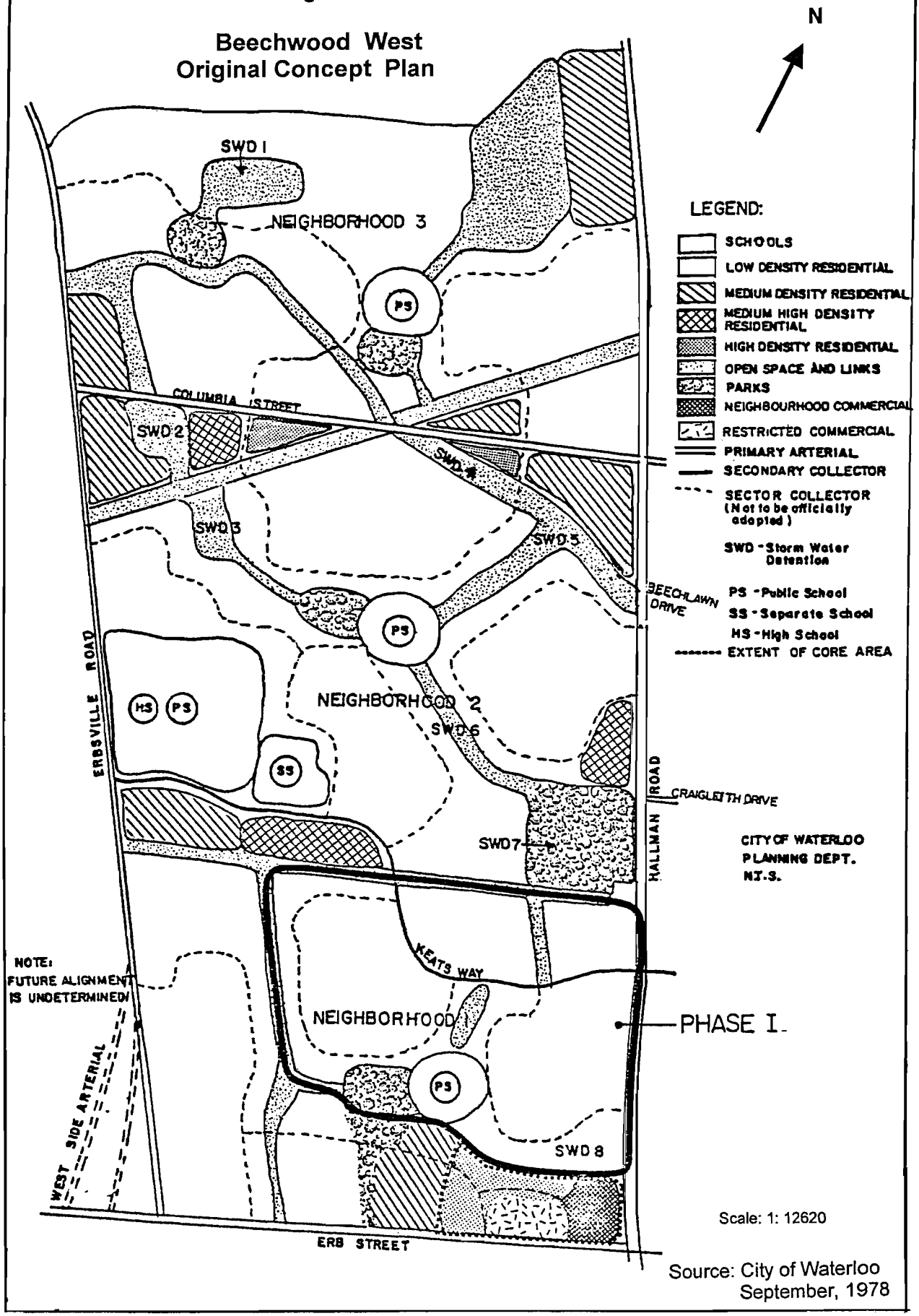


Diagram 2

Beechwood Concept

Diagram 3

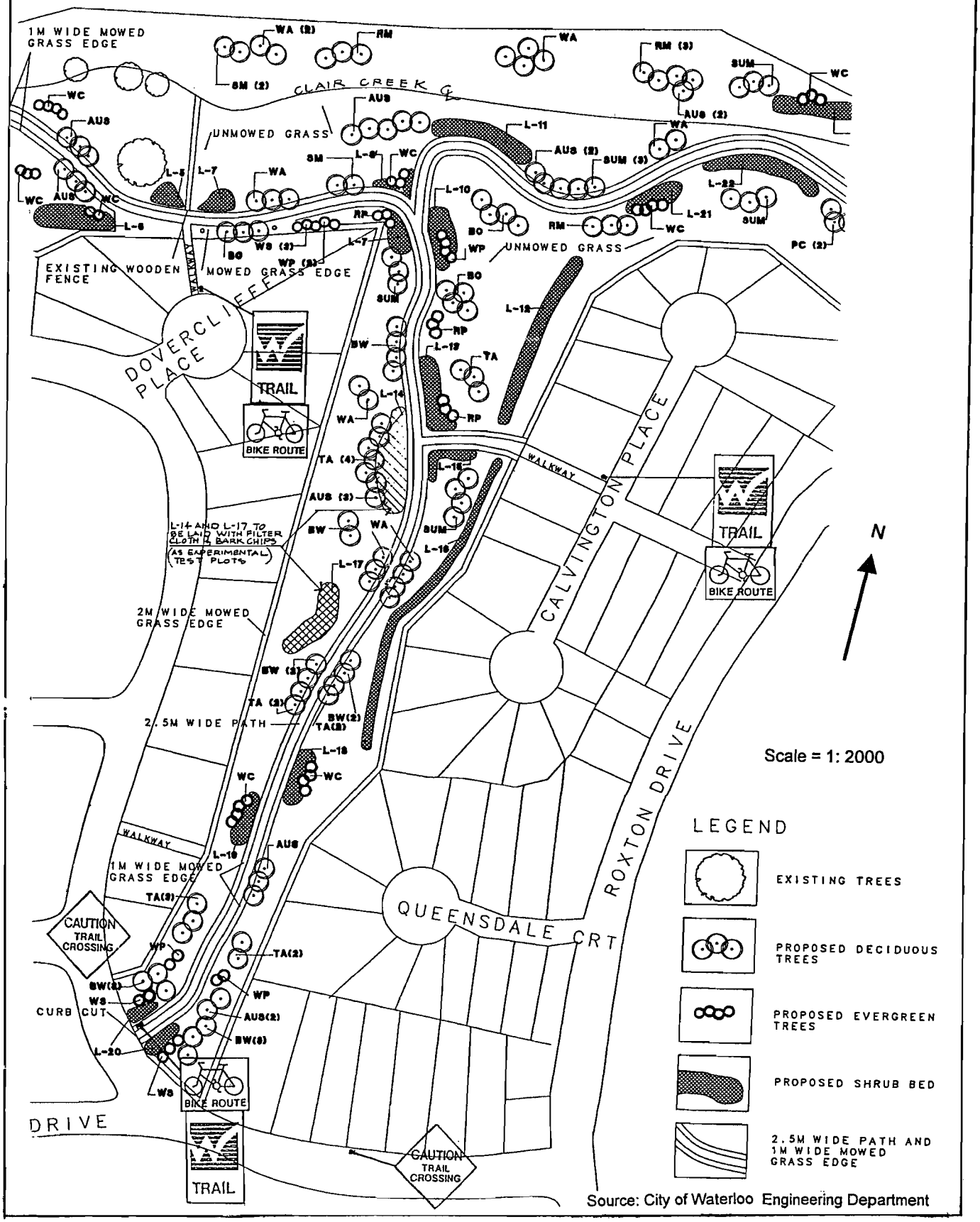
Beechwood West
Original Concept Plan



Source: City of Waterloo
September, 1978

Diagram 4

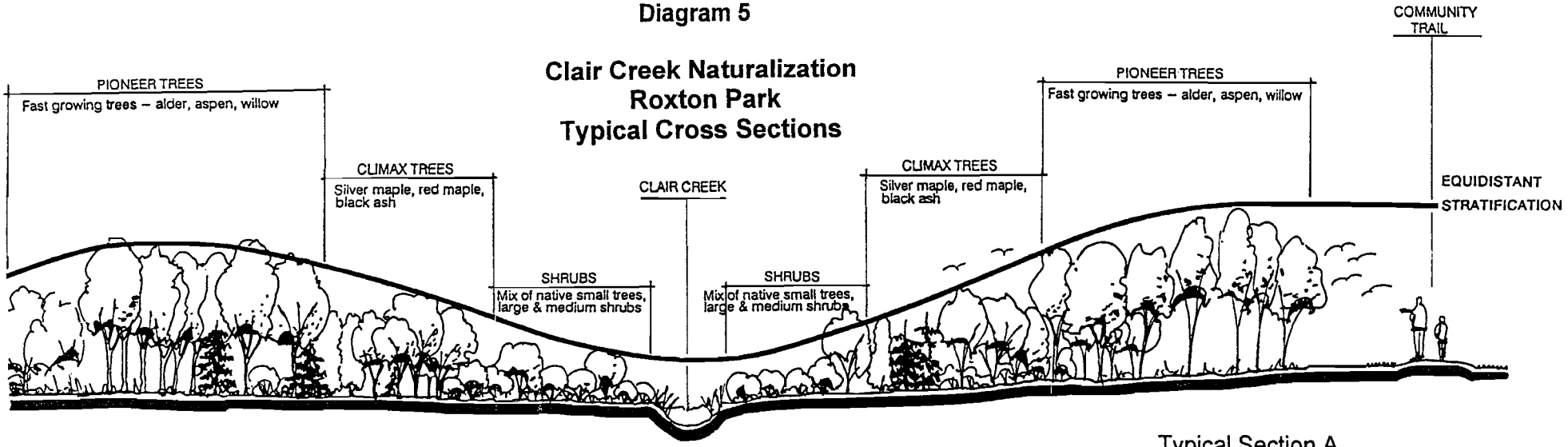
Regency / Roxton Parks Naturalization



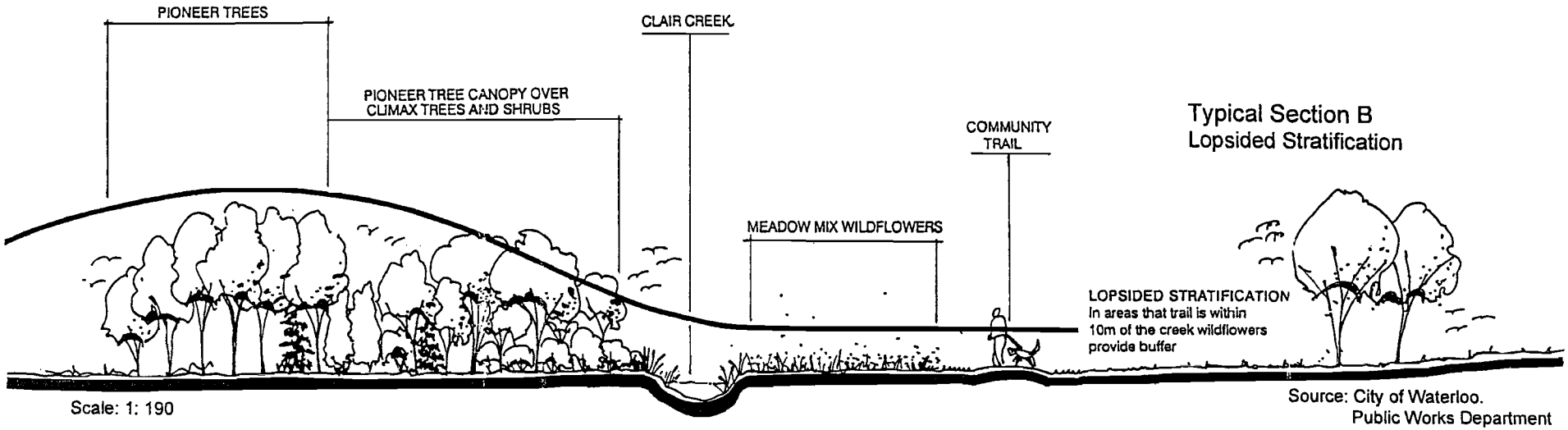
Source: City of Waterloo Engineering Department

Diagram 5

Clair Creek Naturalization
Roxton Park
Typical Cross Sections



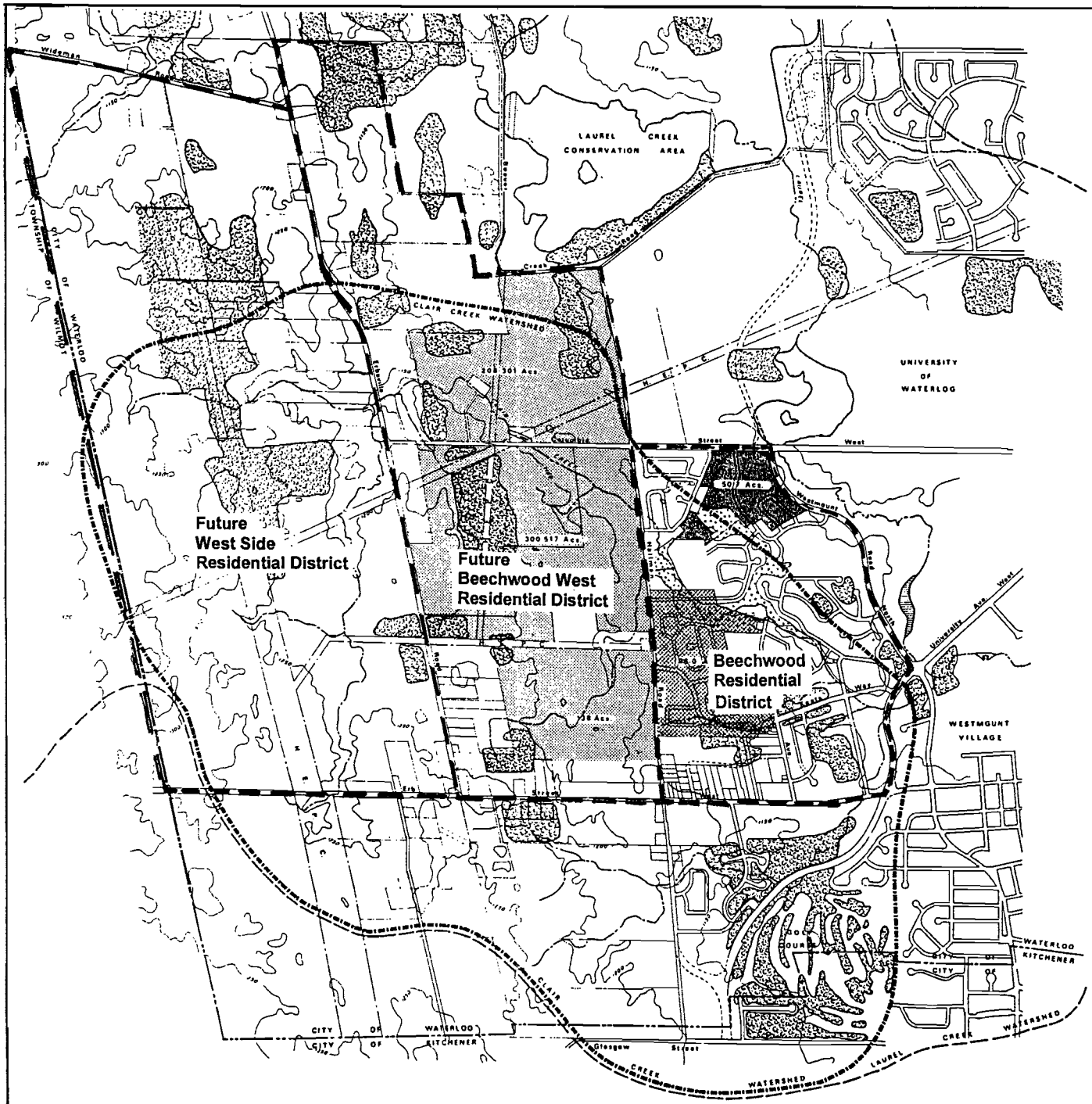
Typical Section A
Equadistant Stratification



Typical Section B
Lopsided Stratification

Scale: 1: 190

Source: City of Waterloo.
Public Works Department



LEGEND

- UNDEVELOPED LANDS CONTROLLED BY MAJOR HOLDINGS & DEVELOPMENTS LTD
- PLANS APPROVED
- PLANS SUBMITTED
- OPEN SPACE

MAP 1

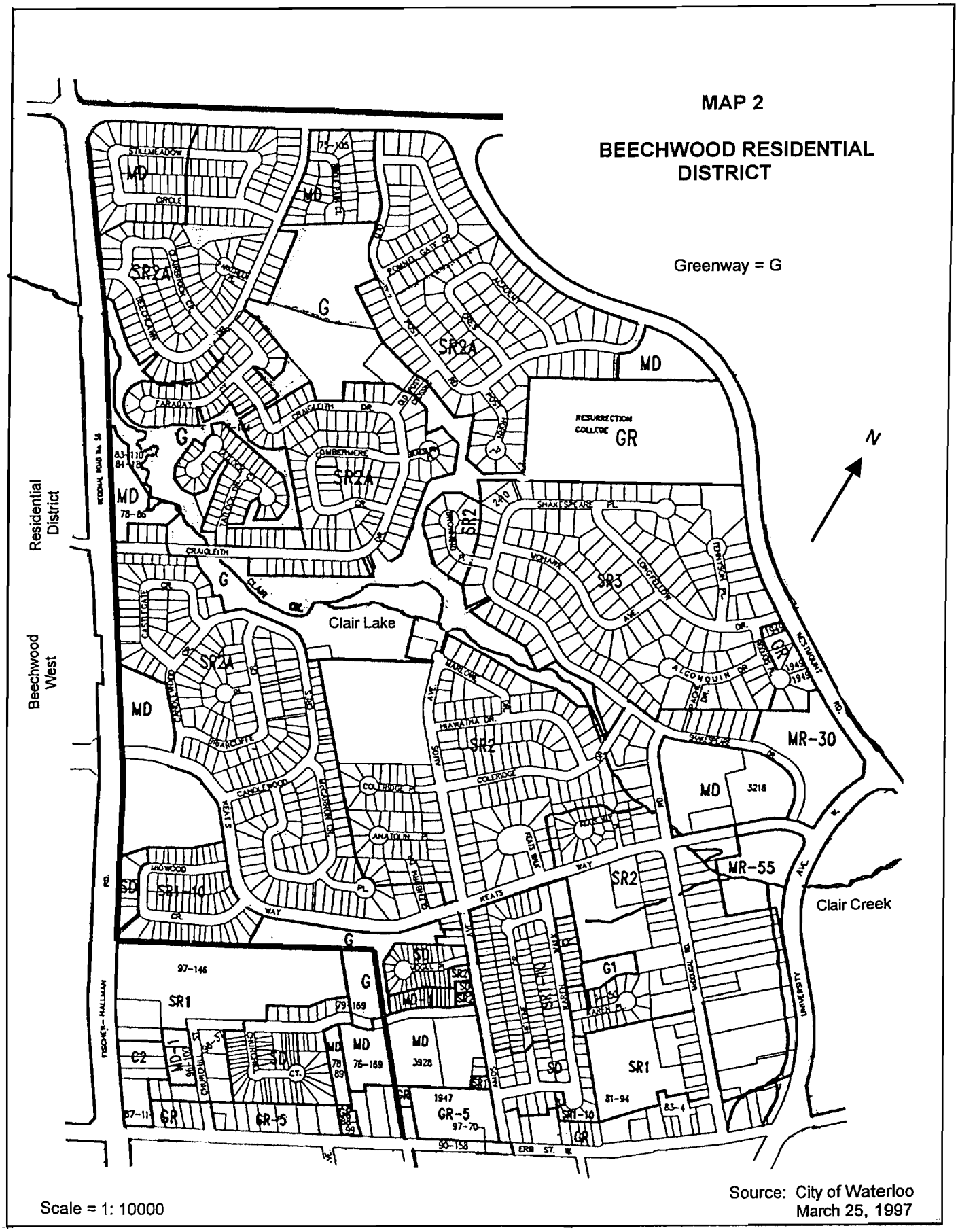
LAND DEVELOPMENT IN THE CLAIR CREEK WATERSHED 1973

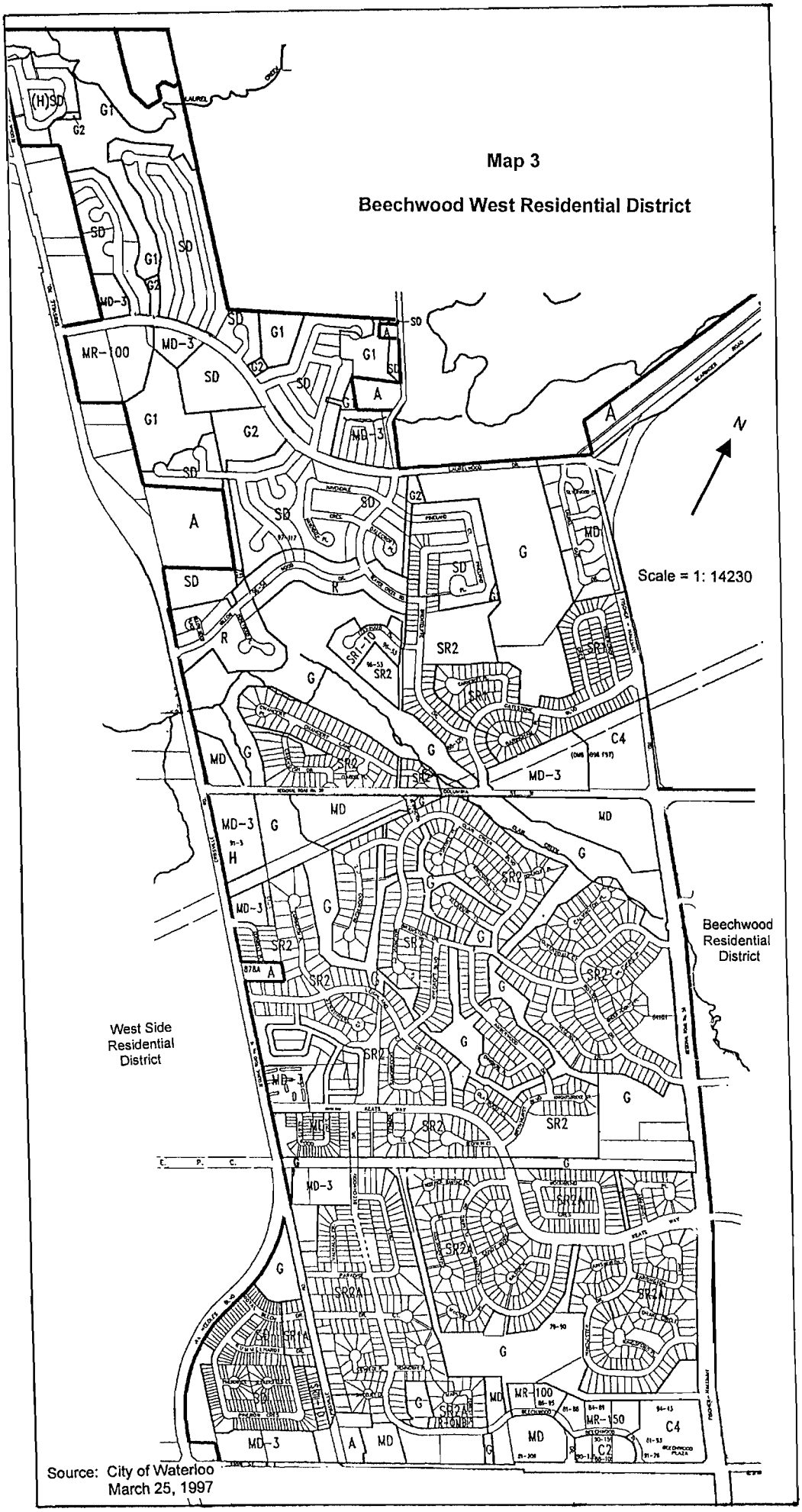
District Boundary

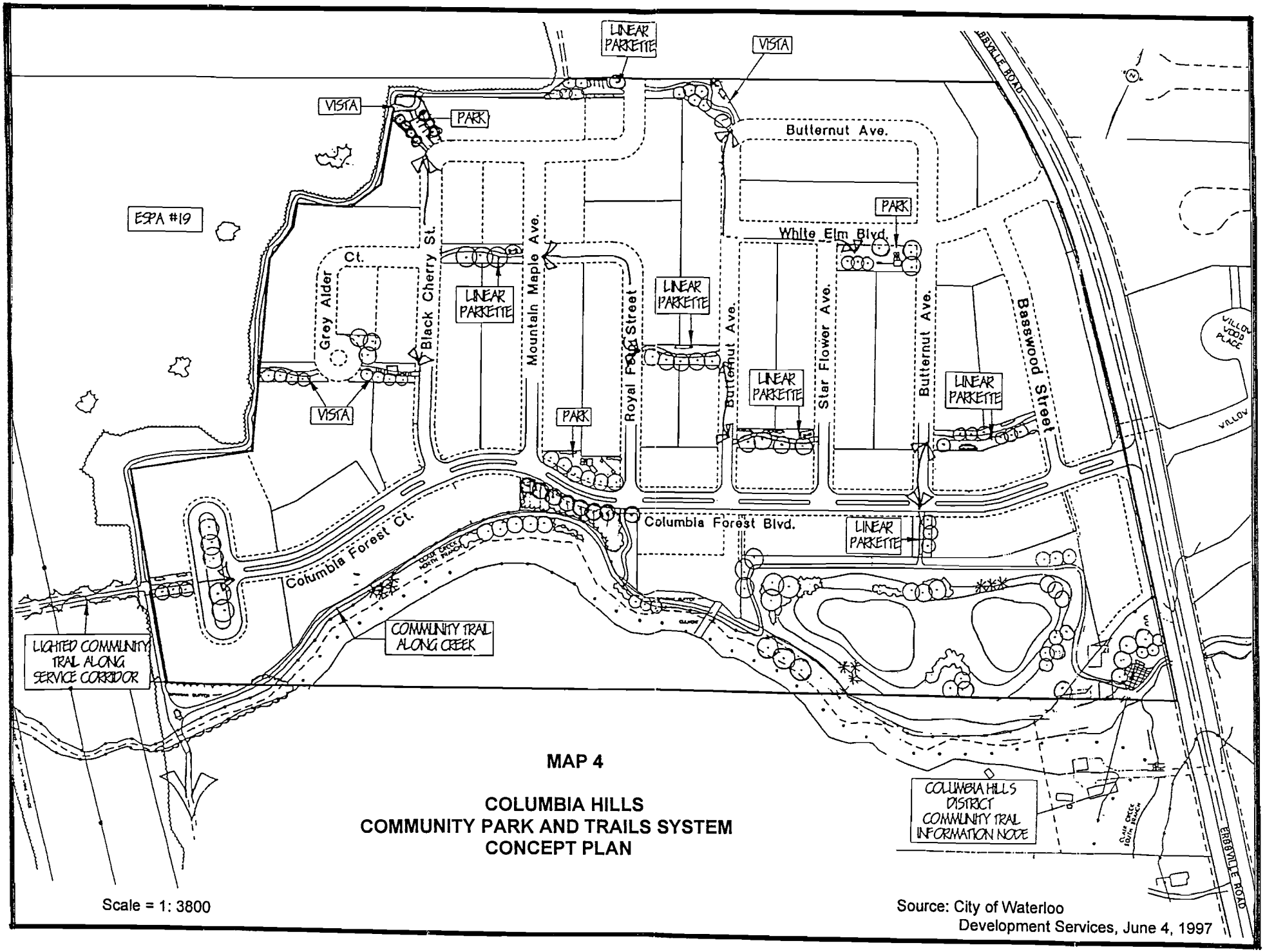
Scale in feet

N

Source: M.H. Kilpatrick Associates, 1973


MAP 2
BEECHWOOD RESIDENTIAL DISTRICT
Greenway = G
N
Residential District
Beechwood West
Clair Lake
Clair Creek
RESURRECTION COLLEGE
GR
MD
SR2A
SR2
SR3
MR-30
MR-55
SR1
GR-5
C2
SD
G
G1
Scale = 1: 10000
Source: City of Waterloo
March 25, 1997


Map 3
Beechwood West Residential District
Scale = 1: 14230
N
Beechwood Residential District
West Side Residential District
Source: City of Waterloo
March 25, 1997

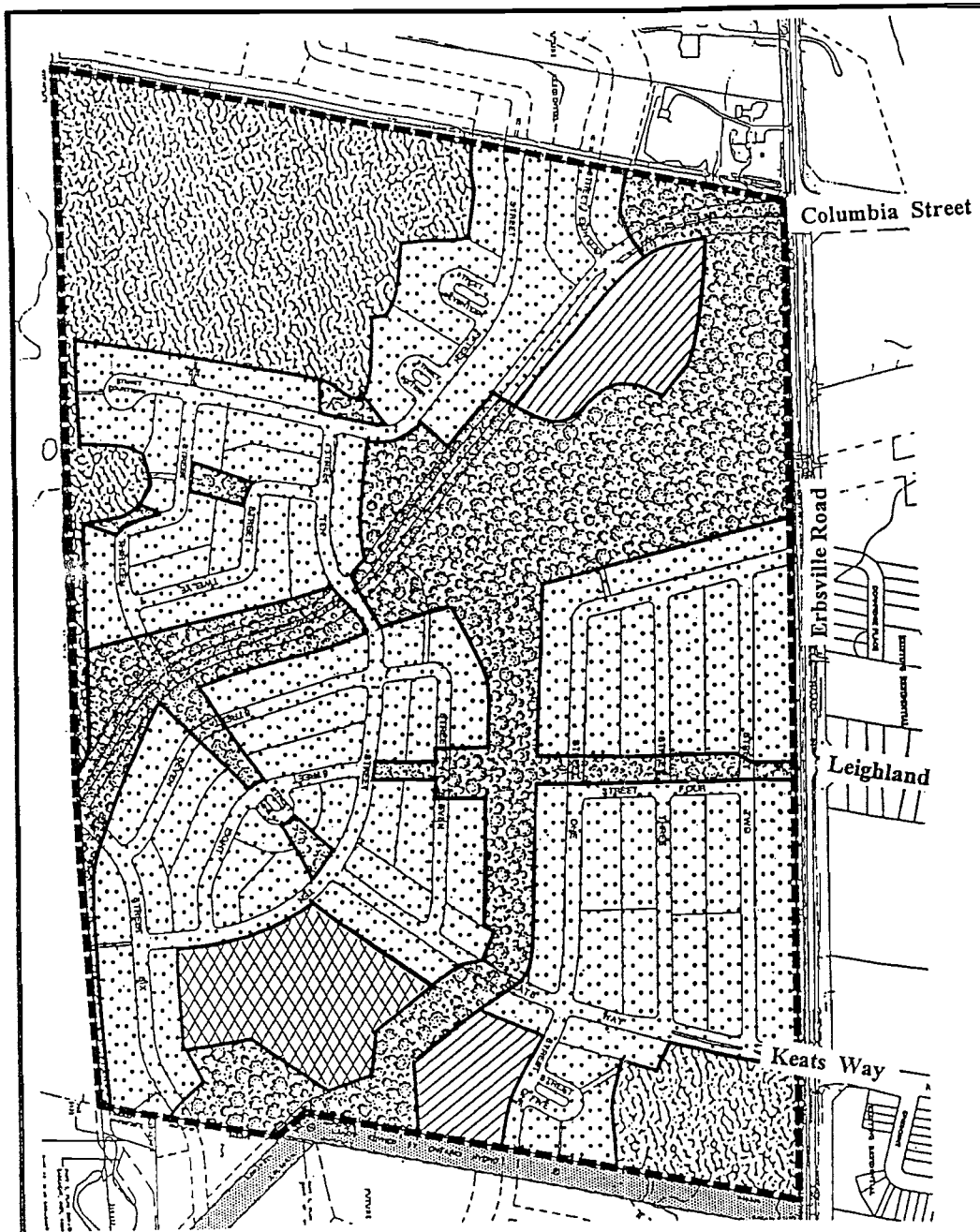


MAP 4

COLUMBIA HILLS
COMMUNITY PARK AND TRAILS SYSTEM
CONCEPT PLAN

Scale = 1: 3800

Source: City of Waterloo
Development Services, June 4, 1997



Flexible Residential 'FR'

Flexible Residential 'FR' and Multiple Residence Forty 'MR-40'

Flexible Residential 'FR' with School Institution

Green One 'G1'

Green Two 'G2'

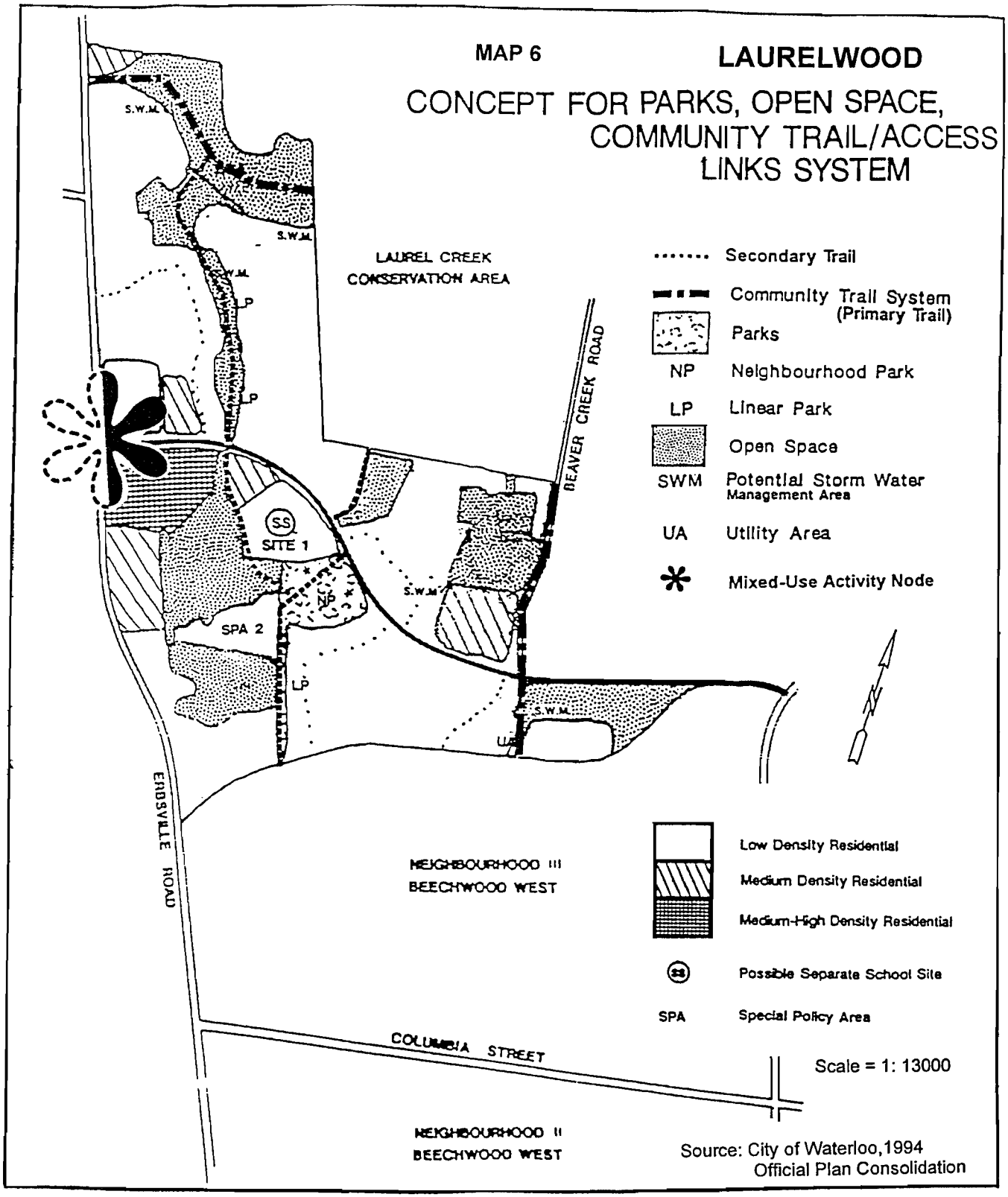
MAP 5

CLAIR HILLS DEVELOPMENT ZONING

N

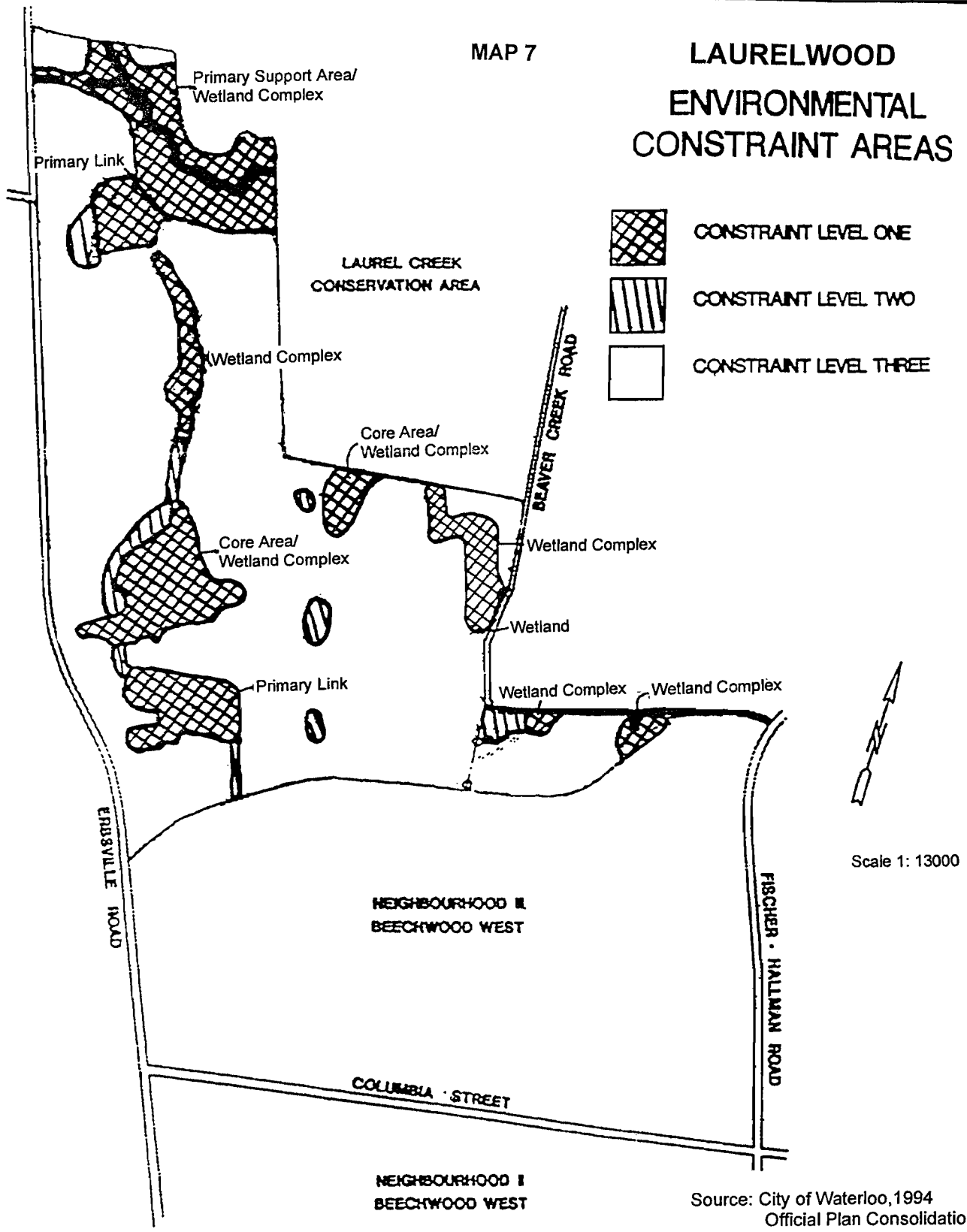
Scale = 1: 7750

Source: City of Waterloo
Development Services, May 12, 1998


MAP 6
LAURELWOOD
CONCEPT FOR PARKS, OPEN SPACE, COMMUNITY TRAIL/ACCESS LINKS SYSTEM
LAUREL CREEK CONSERVATION AREA
BEAVER CREEK ROAD
ERBSVILLE ROAD
COLUMBIA STREET
SITE 1
SPA 2
NEIGHBOURHOOD III BEECHWOOD WEST
NEIGHBOURHOOD II BEECHWOOD WEST
S.W.M.
NP
LP
UA
Secondary Trail
Community Trail System (Primary Trail)
Parks
Neighbourhood Park
Linear Park
Open Space
SWM Potential Storm Water Management Area
UA Utility Area
Mixed-Use Activity Node
Low Density Residential
Medium Density Residential
Medium-High Density Residential
Possible Separate School Site
SPA Special Policy Area
Scale = 1: 13000
Source: City of Waterloo, 1994 Official Plan Consolidation

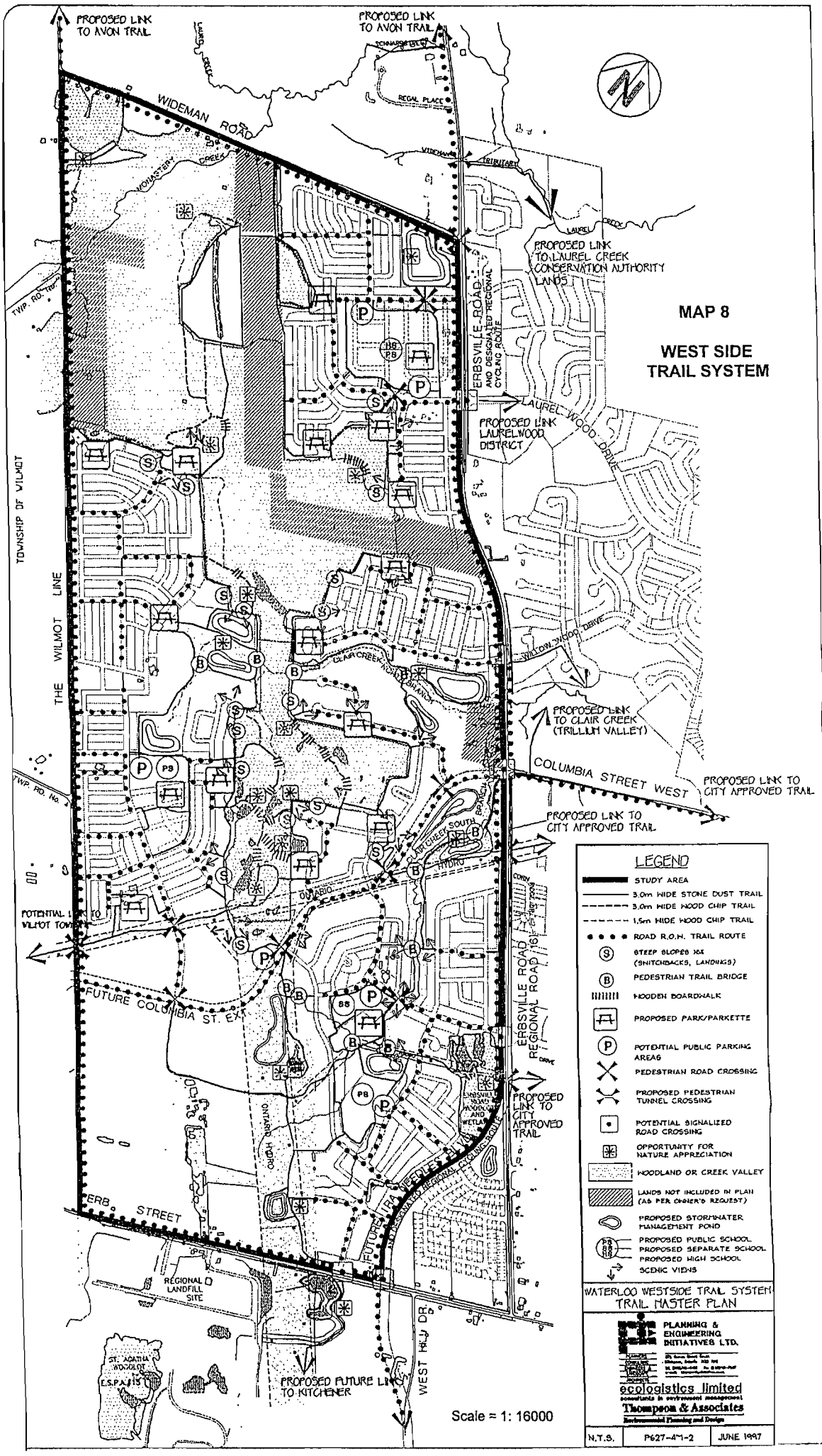
MAP 7

LAURELWOOD ENVIRONMENTAL CONSTRAINT AREAS



Scale 1: 13000

Source: City of Waterloo, 1994
Official Plan Consolidation


MAP 8
WEST SIDE TRAIL SYSTEM
PROPOSED LINK TO AVON TRAIL
PROPOSED LINK TO AVON TRAIL
WIDEMAN ROAD
REGAL PLACE
WOOLWICH CREEK
LAUREL CREEK
PROPOSED LINK TO LAUREL CREEK CONSERVATION AUTHORITY LANDS
ERBSVILLE ROAD AND DESIGNATED REGIONAL CYCLING ROUTE
PROPOSED LINK LAURELWOOD DISTRICT
LAUREL WOOD DRIVE
WILLOW WOOD DRIVE
TOWNSHIP OF WILMOT
THE WILMOT LINE
TWP. RD. 100
TWP. RD. 104
CLAIR CREEK
PROPOSED LINK TO CLAIR CREEK (TRILLIUM VALLEY)
COLUMBIA STREET WEST
PROPOSED LINK TO CITY APPROVED TRAIL
PROPOSED LINK TO CITY APPROVED TRAIL
FLETCHER CREEK SOUTH
ONTARIO HYDRO
FUTURE COLUMBIA ST. EXT.
ERBSVILLE ROAD REGIONAL ROAD 16
PROPOSED LINK TO CITY APPROVED TRAIL
FUTURE TRAIL ALONG ERBSVILLE ROAD REGIONAL CYCLING ROUTE
ERB STREET
REGIONAL LANDFILL SITE
WEST HWY DR
PROPOSED FUTURE LINK TO KITCHENER
ST. AGATHA WOODLOT E.S.P.A. 15
Scale = 1: 16000
LEGEND
STUDY AREA
3.0m WIDE STONE DUST TRAIL
3.0m WIDE WOOD CHIP TRAIL
1.5m WIDE WOOD CHIP TRAIL
ROAD R.O.W. TRAIL ROUTE
STEEP SLOPES >6% (SWITCHBACKS, LANDINGS)
PEDESTRIAN TRAIL BRIDGE
WOODEN BOARDWALK
PROPOSED PARK/PARKETTE
POTENTIAL PUBLIC PARKING AREAS
PEDESTRIAN ROAD CROSSING
PROPOSED PEDESTRIAN TUNNEL CROSSING
POTENTIAL SIGNALIZED ROAD CROSSING
OPPORTUNITY FOR NATURE APPRECIATION
WOODLAND OR CREEK VALLEY
LANDS NOT INCLUDED IN PLAN (AS PER OWNER'S REQUEST)
PROPOSED STORMWATER MANAGEMENT POND
PROPOSED PUBLIC SCHOOL
PROPOSED SEPARATE SCHOOL
PROPOSED HIGH SCHOOL
SCENIC VIEWS
WATERLOO WESTSIDE TRAIL SYSTEM
TRAIL MASTER PLAN
PLANNING & ENGINEERING INITIATIVES LTD.
ecologistics limited
consultants in environment management
Thompson & Associates
Environmental Planning and Design
N.T.S.
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JUNE 1997