

# RESEARCH REPORT



## West Hills Subdivision Sustainable Design Charrette



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**WEST HILLS SUBDIVISION  
SUSTAINABLE DESIGN CHARRETTE**

**FREDERICTON, NEW BRUNSWICK 2004**

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**RESEARCH REPORT**

**September 2005**

Many thanks must be given to the participants of this project including Hill Bros. Realty & Investments Ltd. and the City of Fredericton. Without their support and technical assistance, this project would not have been possible. In addition, the charrette participants' generosity in giving their time and sharing their expertise is most appreciated.

Report Prepared for Canada Mortgage and Housing Corporation  
By  
Jacques Whitford Limited

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## West Hills Subdivision Sustainable Development Charrette

### INTRODUCTION

The West Hills residential development in Fredericton, New Brunswick, responds to market demands of active seniors and young families and the growing interest in energy-efficient housing within the community — an interest shared by the developer, Hill Bros. Realty & Investments Ltd.

Hill Bros. was interested in exploring energy efficiency further and in developing more sustainable residential subdivisions. At the time, the City of Fredericton was reviewing its municipal development plan and was interested in learning more about environmental practices that can be integrated into urban design.

The City recognized the potential for an urban design charrette to provide new ideas about sustainable development practices that could influence its municipal planning policies. For Hill Bros., a charrette was an opportunity to explore planning and design options that could be used in West Hills and in future developments.

Hill Bros. was in the early stages of designing the West Hills subdivision, with a golf course at the core of the development. The development was intended to include energy-efficient housing, building on previous successes by Hill Bros. in this area (apartments, homes).

### CHARRETTE PLANNING

Held in July 2004, the charrette brought together more than 20 local, regional and national experts for two-and-a-half days. Participants were grouped into three design teams, each led by a facilitator with experience in sustainable design issues. Participants included

representatives of Hill Bros., the City of Fredericton, the New Brunswick government and CMHC.

Expertise included landscape architecture; engineering; alternative energy systems; stormwater management; urban and community planning; environmental planning and protection; solar energy and golf course design.

Before the charrette, participants received a design brief with information about the West Hills subdivision, charrette goals and objectives and benchmarking points. Hill Bros provided a preliminary master plan of the West Hills subdivision as the starting point for each team to develop its vision of sustainable development of this land.

Through a website, participants had access to relevant information about the project and other sustainable community projects. Web references and drawings and maps to be used as base information for the charrette were also posted on this site.

### CHARRETTE EVENT

During the first evening of the charrette, city planners provided demographic information about Fredericton and the City's municipal plan, the housing market and current and anticipated future issues. Hill Bros. gave a history of the West Hills subdivision, described the landscape features and the site's preliminary master plan. A bus tour showed participants highlights of the area, amenities, transportation corridors and developments around West Hills.

On the second day, participants were introduced to the structure of the charrette for the remaining two days. They were given presentations about options for energy efficiency and stormwater management. Each team was assigned a work area and given a package of planning information and tools, and principles to consider, which are given below.

At the end of the charrette, each team presented the results of their work.

### Principles to consider

The three teams were provided with a list of benchmarks as guidelines for the integration of sustainable development principles into their designs. These were:

- 1. General:** Design and management to support community services and recreational activities; a maintained and preserved natural environment; a golf course as central focus for site planning.
- 2. Housing:** Include seniors and family homes, low-energy and renewable-energy use, low-maintenance lawns and front gardens, orientation to facilitate solar energy, strategies to reduce potable water consumption.
- 3. Movement:** Traffic designs to reduce car use and speed and facilitate transit to surrounding areas; pedestrian and bicycle trails central to movement schemes.
- 4. Golf course:** Develop towards community needs; community stormwater management integrated in golf course design; golf course shares infrastructure with recreational activities and community services.
- 5. Stormwater:** Integrate within golf course, low-maintenance landscaping, permeable surfaces, reduced use of chemicals and protection of watercourses.

The Team recommended applying a recognized environmental management and conservation program to “green” the golf course to protect the natural environment, including the stream that runs through the site. The golf course footprint is as small as possible without compromising normal course standards.

Other Green Team recommendations included:

- serpentine turns on long streets to reduce vehicle speed;
- pedestrian access designed to reduce the use of cars and encourage alternative forms of transportation to reduce air and noise pollution;
- live–work opportunities for the community;
- houses oriented to take advantage of solar energy for heating;
- recreational facilities, including community services, integrated in golf course clubhouse buildings to enhance community interactions;
- access to playgrounds and the golf course so they could be used for winter community activities;
- space for community gardens.

The Team suggested a number of operational strategies for the community design. To reduce “heat islands” the Team recommended gravel parking lots, which would allow infiltration rather than run-off of water. Dual-flush toilets and capturing rainwater for irrigation systems and xeriscaping would encourage water conservation. The Team recommended designing the golf course clubhouse to incorporate community facilities and suggested that the golf course could be used to assist with stormwater management of the developed site.

The Team suggested using measures during construction to prevent soil erosion and compaction, to minimize water and air pollution and to protect a selection of trees.

In addition, the Team recommended monitoring and follow-up programs to determine if strategies were effective.

## CHARRETTE RESULTS

### Green Team

The Green Team’s master plan incorporated several key design elements to achieve the charrette’s sustainable development principles. The team identified the natural environmental features of the West Hills site and the golf course as two elements with the greatest influence on planning considerations.

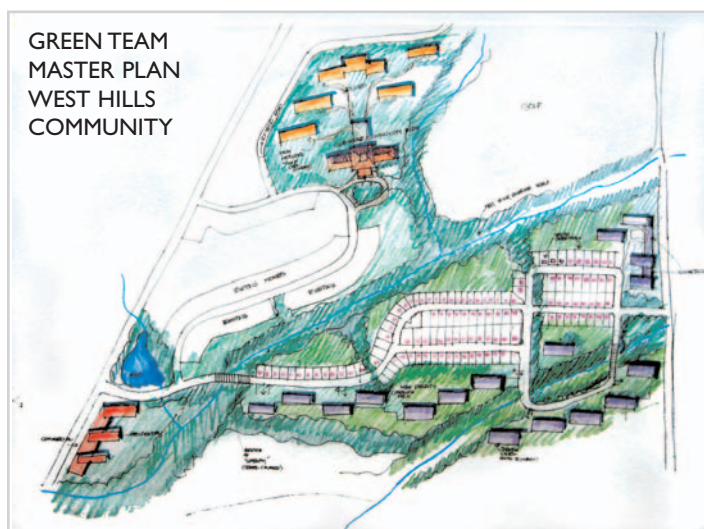


Figure 1 Green Team Master Plan

## Red Team

The Red Team used the following vision statement to guide creation of its master plan:

The goal of this two-and-a-half day design workshop is to create a visual and narrative image for West Hills; a mixed-use, intergenerational neighbourhood designed around natural features that demonstrate sustainable practices in its development and operation, with an emphasis on recreation and active transportation linkages to the rest of the City.

The combined community centre and clubhouse located to the east of the residential areas was the central focus of the Red Team's master plan. A bus route passing through the higher density residential area with a stop at the community centre would facilitate access to the centre. Multi-use trails would connect the residential areas to the community centre and allow for through-connections from Brookside Drive to St. Mary's Drive, two major roads which border the subdivision.

Other Red Team proposals included:

- orienting houses on the southeast corner to allow southern exposure;
- orienting single-family houses along a natural ridge on the site to provide a view of the golf course;

- using geothermal heating for the community centre and some of the surrounding homes as a renewable source of energy and to reduce operating costs;
- establishing a pedestrian path network around the golf course and within the course boundaries to avoid conflict with motorized vehicles;
- placing bike racks at entrances of all destination sites within the West Hills development;
- using permeable surfaces, such as gravel or brick, on driveways and parking areas to retain stormwater run-off through natural infiltration;
- narrowing pavement width as much as possible to reduce impermeable surface areas;
- maintaining natural slopes and groundwater recharge areas so they continue their water management functions;

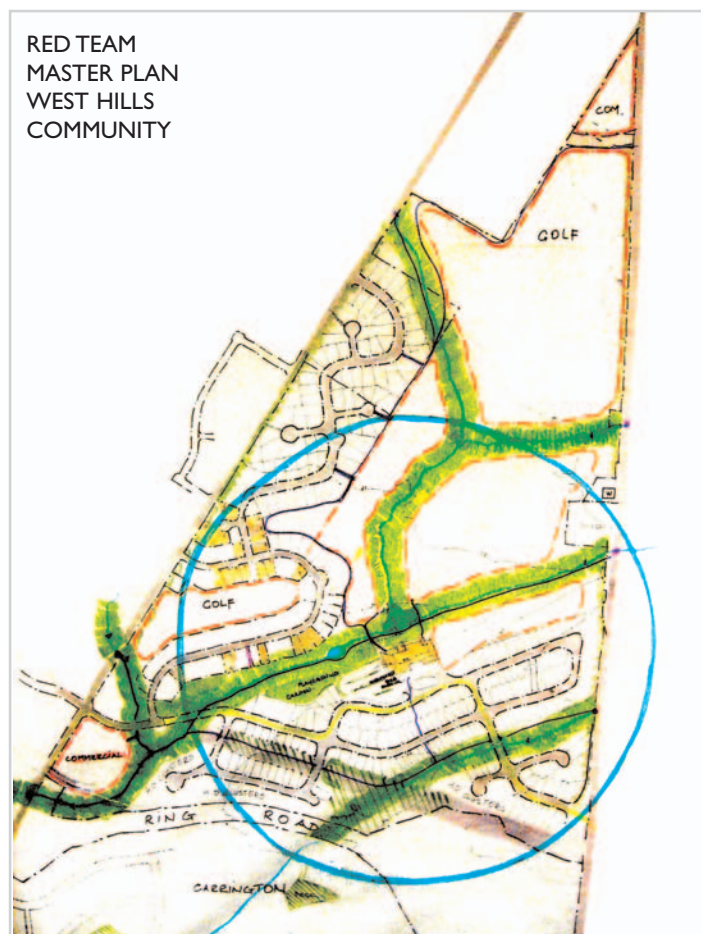


Figure 2 Red Team Master Plan

- exploring alternatives to grass lawns;
- developing a community garden to collect and use organic wastes.

### Blue Team

The Blue Team outlined five important elements as the focus of its master plan:

1. Housing and lot forms;
2. Golf course design and role;
3. Clubhouse design and role;
4. Transportation and movement;
5. Infrastructure systems.

The Team agreed that the golf course would be important as a recreational service area and as green space. For the Blue Team, the concept of a golf course was pivotal to the development.

The Blue Team's recommendations include:

- building houses slab-on-grade to eliminate potential mold problems with basements;
- incorporating hydronic heating in the slab floors;
- designing terraced housing designs, with house fronts facing the golf course;
- sharing driveways at the rear of the terraced houses to save space;
- making response to market demand easier by using flexible zoning;
- using a recognized environmental management and conservation program for the golf course, focusing on reduced pesticide use, environmental sustainability, water conservation and wildlife protection.

The master plan included plans for stormwater drainage, water treatment, "green" construction of the clubhouse and shared community facilities to reduce costs.

The Team included a number of other strategies that were not visible on its master plan but contributed to its sustainable development plan. They included:

- using geothermal energy to encourage energy efficiency;

- powering golf carts with solar energy;
- placing walking paths on the outer edge of the golf course and along greenways outside the golf course;
- sloping streets so stormwater would drain towards the southern part of the site;
- designing streetscapes to encourage pedestrian use;
- designing residential areas with narrower streets and fewer facades to allow interaction among residents and bring "eyes to the street;"
- reducing the size of front lawns to encourage more gardens.

For children and seniors, the Blue Team envisioned a safe recreational environment. Playgrounds, exercise and rest areas would be located along a trail system or linear park within the development. The design of the linear park would encourage recreational use in summer (walking, running) and winter (cross-country skiing) and link to a trail network the City is establishing to the north of the West Hills site.

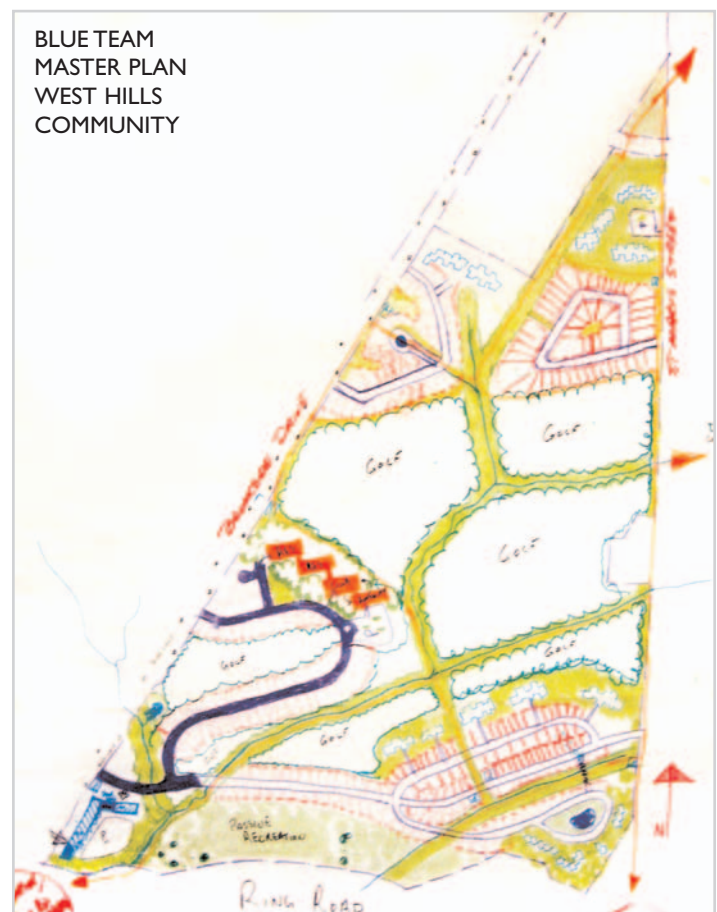


Figure 3 Blue Team Master Plan

## NEXT STEPS

The charrette gave participants the opportunity to actively contribute to a sustainable development and design process. The three Teams' master plans provided the City of Fredericton and Hill Bros. with practical and realistic options for integrating sustainable development strategies into a community design.

Feedback from the City of Fredericton and Hill Bros. reinforce the success of the charrette. For the City, the West Hills subdivision is a great example of a developer leading the way to a more environmentally sustainable development that appeals to the public. For Hill Bros., the charrette provided new ideas for the design of the West Hills subdivision.

Since the charrette, green spaces and natural features have been integrated into the stormwater management plan and Hill Bros. is considering implementing other ideas from the charrette in the development.

## Research Highlight

West Hills Subdivision Sustainable Development Charrette

**CMHC Project Manager:** Cynthia Rattle

**Consultant:** Mary Murdoch, Jacques Whitford Limited.

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## Charrette sur l'aménagement durable du lotissement résidentiel West Hills

### INTRODUCTION

L'aménagement résidentiel West Hills situé à Fredericton, au Nouveau-Brunswick, répond aux demandes de logements des aînés actifs et des jeunes familles et fait suite à l'intérêt croissant manifesté par la collectivité pour les logements éconergétiques, un intérêt que partage d'ailleurs le promoteur, Hill Bros. Realty & Investments Ltd.

Hill Bros. souhaitait pousser plus loin l'efficacité énergétique et aménager des lotissements résidentiels plus durables. À cette époque, la ville de Fredericton examinait son plan d'aménagement municipal et cherchait de l'information sur les pratiques environnementales pouvant être intégrées à l'aménagement urbain.

La ville a reconnu le potentiel qu'offrait une charrette sur l'aménagement urbain pour la formulation de nouvelles idées sur les pratiques de développement durable qui pourraient avoir une incidence sur ses politiques en matière d'urbanisme. Pour Hill Bros., une charrette offrait l'occasion d'examiner des options d'urbanisme et de conception qui pourraient être utilisées à West Hills et dans des aménagements futurs.

Hill Bros. a participé dès les premières étapes de la conception du lotissement West Hills, qui prévoyait un terrain de golf au centre de l'aménagement et la construction de logements éconergétiques, en tirant profit des réussites antérieures de Hill Bros. dans ce domaine (appartements, maisons).

### PLANIFICATION DE LA CHARRETTE

Tenue en juillet 2004, la charrette a réuni plus de 20 spécialistes locaux, régionaux et nationaux pendant deux jours et demi. Les participants ont été regroupés en trois équipes de conception, chacune dirigée par un animateur expérimenté en aménagement durable. Des représentants de Hill Bros., de la ville de Fredericton, du gouvernement du Nouveau-Brunswick et de la SCHL y participaient.

On y trouvait entre autres des spécialistes en architecture paysagère; en génie; en systèmes énergétiques de remplacement; en gestion des eaux pluviales; en planification urbaine et communautaire; en planification et en protection de l'environnement; en énergie solaire et en conception de terrain de golf.

Les participants ont reçu, avant la charrette, un énoncé de conception contenant des renseignements sur le lotissement West Hills, les buts et objectifs de la charrette et les dates repères. Hill Bros. a fourni un plan directeur préliminaire du lotissement West Hills comme point de départ pour permettre à chaque équipe d'élaborer sa propre vision de l'aménagement durable de ces terrains.

Grâce à un site Web, les participants avaient accès aux renseignements pertinents sur le projet et sur d'autres collectivités durables. Des références tirées du Web ainsi que les dessins et les cartes devant être utilisées comme renseignements de base pour la charrette ont aussi été affichés sur ce site.

## LA CHARRETTE

Au cours de la première soirée, des urbanistes ont fourni des renseignements démographiques sur Fredericton et le plan municipal, sur le marché de l'habitation et sur les problèmes actuels et anticipés. Hill Bros. a donné un bref historique du lotissement West Hills et a décrit les caractéristiques du paysage et du plan d'ensemble préliminaire du site. Une visite guidée en autobus a permis de montrer aux participants les éléments principaux du secteur, les commodités, les voies de communication et les quartiers entourant West Hills.

Le deuxième jour, on a expliqué aux participants la structure de la charrette pour les deux jours restants. Ils ont eu droit à des exposés sur les options pour l'efficacité énergétique et la gestion des eaux pluviales. On a attribué à chaque équipe un secteur de travail et on leur a remis de l'information et des outils de planification ainsi que les principes à prendre en considération (énumérés ci-dessous).

À la fin de la charrette, chaque équipe a présenté les résultats de son travail.

### Principes à prendre en considération

On a remis aux trois équipes une liste de repères à titre indicatif pour l'intégration des principes de développement durable dans leurs concepts. Ces repères sont les suivants :

- 1. Généralités :** Une conception et une gestion favorisant les services communautaires et les activités récréatives; un environnement naturel entretenu et préservé; un terrain de golf au cœur de la planification du site.
- 2. Habitation :** Inclure des logements pour les aînés et les familles; faible consommation d'énergie et utilisation d'énergie renouvelable; pelouses et jardins avant demandant peu d'entretien; orientation de manière à favoriser l'utilisation de l'énergie solaire; stratégies pour réduire la consommation de l'eau potable.
- 3. Déplacements :** Conception de voies de circulation afin de réduire l'utilisation de l'automobile et la vitesse et de faciliter le transport en commun dans les secteurs environnants; sentiers pédestres et pistes cyclables au centre des plans de déplacement.
- 4. Terrain de golf :** Élaborer en fonction des besoins de la collectivité; gestion des eaux pluviales de la collectivité intégrée à la conception du terrain de golf; terrain de golf qui partage l'infrastructure avec les activités récréatives et les services communautaires.
- 5. Eaux pluviales :** Intégrer au terrain de golf, aménagement paysager exigeant peu d'entretien; surfaces perméables; utilisation réduite des produits chimiques et protection des cours d'eau.

## RÉSULTATS DE LA CHARRETTE

### Équipe verte

Le plan directeur de l'équipe verte comportait plusieurs éléments conceptuels clés afin d'appliquer les principes de développement durable établis pour la charrette. L'équipe a déterminé que les caractéristiques environnementales naturelles du site de West Hills et le terrain de golf étaient les deux éléments ayant la plus grande incidence sur la planification.

L'équipe a recommandé le recours à un programme reconnu de gestion et de conservation de l'environnement pour « écologiser » le terrain de golf afin de protéger le milieu naturel, notamment le ruisseau qui parcourt le site. L'empreinte du terrain de golf est maintenue au minimum acceptable pour que le terrain soit considéré comme normal.

Voici d'autres recommandations formulées par l'équipe verte :

- tracés en serpentins pour les rues longues afin de réduire la vitesse des véhicules;
- accès aux piétons favorisant une utilisation réduite des automobiles et le recours à d'autres moyens de transport pour diminuer la pollution aérienne et sonore;
- possibilités de travail sur place pour les habitants;
- maisons orientées afin de tirer avantage de l'énergie solaire pour le chauffage;
- installations récréatives, incluant des services communautaires, intégrées au chalet du terrain de golf afin d'améliorer les interactions entre les gens;
- accès aux aires de jeux et au terrain de golf pour qu'ils puissent être utilisés par la population pour des activités hivernales;
- espace pour des jardins communautaires.

L'équipe a suggéré quelques stratégies pour la conception du lotissement. Dans le but de réduire les « îlots thermiques », l'équipe a recommandé que les parcs de stationnement soient recouverts de gravier, ce qui permettrait à l'eau de s'infiltrer plutôt que de ruisseler. Les toilettes à double chasse, la collecte des eaux pluviales pour les systèmes

d'irrigation et le xéropaysagisme favoriseraient la conservation de l'eau. L'équipe a recommandé que le chalet du terrain de golf soit conçu de manière à y intégrer des installations communautaires et que le terrain de golf soit utilisé pour aider à la gestion des eaux pluviales une fois le site aménagé.

L'équipe a aussi suggéré d'avoir recours, pendant la construction, à des mesures destinées à prévenir l'érosion et le compactage du sol, à réduire la pollution de l'eau et de l'air et à protéger certains arbres.

De plus, l'équipe a recommandé la mise en place de programmes de contrôle et de suivi afin d'établir si les stratégies sont efficaces.

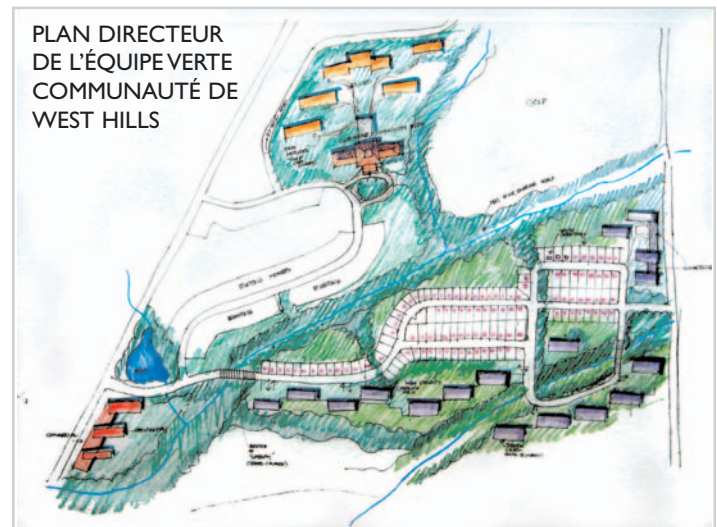


Figure 1 Plan directeur de l'équipe verte

### L'équipe rouge

L'équipe rouge s'est servie de l'énoncé de vision suivant pour guider la création de son plan directeur :

Le but de cet atelier de conception de deux jours et demi est de créer des images visuelles et descriptives de West Hills; un quartier intergénérationnel à usages mixtes, conçu autour de caractéristiques naturelles, qui met en évidence les pratiques durables de par son aménagement et son exploitation, l'accent étant mis sur le loisir et des liens de transport dynamiques avec le reste de la ville.

Le bâtiment réunissant le centre communautaire et le chalet du golf, situé à l'est des secteurs résidentiels, était le point central du plan directeur de l'équipe rouge. Un circuit d'autobus traversant le secteur résidentiel le plus dense, avec un arrêt au centre communautaire, faciliterait l'accès au centre. Des sentiers à usages multiples relieraient les secteurs résidentiels au centre communautaire et permettraient de passer directement du chemin Brookside au chemin St. Mary's, deux artères principales qui bordent le lotissement.

Voici d'autres propositions de l'équipe rouge :

- orientation des maisons vers l'angle sud-est afin d'offrir une exposition au sud;
- orientation des maisons individuelles le long d'une crête naturelle située sur le site afin d'offrir une vue sur le terrain de golf;
- chauffage géothermique (source d'énergie renouvelable) pour le centre communautaire et certaines maisons environnantes pour réduire les coûts d'occupation;
- création d'un réseau de sentiers pédestres autour et dans les limites du terrain de golf de manière à éviter tout conflit avec les véhicules motorisés;
- installation de supports à bicyclettes aux entrées de toutes les destinations situées dans le lotissement de West Hills;
- utilisation de surfaces perméables, par exemple du gravier ou des briques, sur les voies d'accès et les parcs de stationnement afin de restreindre le ruissellement des eaux pluviales grâce à l'infiltration naturelle;
- réduction maximale de la largeur des voies asphaltées afin de diminuer la superficie des surfaces imperméables;
- conservation des pentes naturelles et des zones de recharge de la nappe d'eau afin qu'elles maintiennent leurs fonctions de gestion des eaux;
- examen de solutions de recharge aux pelouses;
- aménagement d'un jardin communautaire pour recueillir et utiliser les déchets organiques.

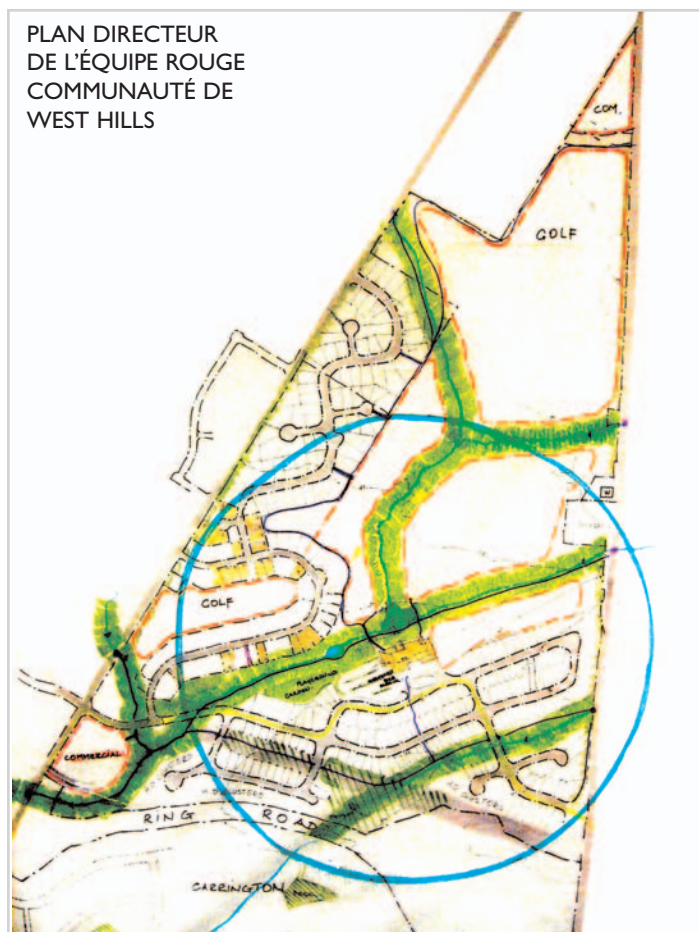


Figure 2 Plan directeur de l'équipe rouge

### Équipe bleue

L'équipe bleue a décrit cinq éléments importants de son plan directeur :

1. les habitations et la forme des terrains;
2. la conception et le rôle du terrain de golf;
3. la conception et le rôle du chalet du golf;
4. le transport et les déplacements;
5. les infrastructures.

L'équipe a convenu que le terrain de golf jouerait un rôle important à titre de zone récréative et d'espace vert. Pour l'équipe bleue, le concept du terrain de golf était au cœur de l'aménagement.

Voici certaines des recommandations formulées par l'équipe bleue :

- recours à des fondations à dalle sur terre-plein pour les maisons afin d'éliminer les problèmes de moisissure associés aux sous-sols;
- intégration d'une installation de chauffage à eau chaude dans les dalles;
- conception de maisons en rangée dont la façade donnerait sur le terrain de golf;
- partage des voies d'accès situées à l'arrière des maisons en rangée afin d'économiser de l'espace;
- zonage souple permettant de répondre à la demande du marché;
- recours à un programme de gestion et de conservation de l'environnement pour le terrain de golf axé sur la réduction des pesticides, la durabilité environnementale, la conservation de l'eau et la protection de la faune.

Le plan directeur comprenait des plans pour le drainage des eaux pluviales, le traitement de l'eau, la construction « écologique » du chalet et des installations communautaires partagées afin de réduire les coûts.

L'équipe a inclus d'autres stratégies qui n'étaient pas apparentes dans le plan directeur mais qui contribuaient à son plan d'aménagement durable. En voici quelques-unes :

- recours à l'énergie géothermique afin de favoriser l'efficacité énergétique;
- voiturettes de golf alimentées à l'énergie solaire;
- sentiers pédestres aménagés sur le pourtour du terrain de golf et le long des verts, à l'extérieur du parcours;
- tracés de rue en pente afin que les eaux pluviales puissent s'écouler vers la partie sud du site;
- conception des rues de manière à faciliter le déplacement des piétons;

- conception des zones résidentielles avec des rues plus étroites et des façades moins grandes afin de permettre une interaction entre les résidents et favoriser la surveillance de quartier;
- réduction de la taille des pelouses avant afin d'encourager les gens à mettre l'accent sur les jardins.

Pour les enfants et les personnes âgées, l'équipe bleue a prévu un environnement sûr pour les loisirs. Des terrains de jeu et des aires d'exercice et de repos seraient situés le long d'un réseau de sentiers ou d'un parc linéaire intégré à l'aménagement. Le parc linéaire favoriserait les activités récréatives en été (la marche, la course) comme en hiver (ski de fond) et serait relié à un réseau de sentiers que la ville est en train de créer au nord de West Hills.

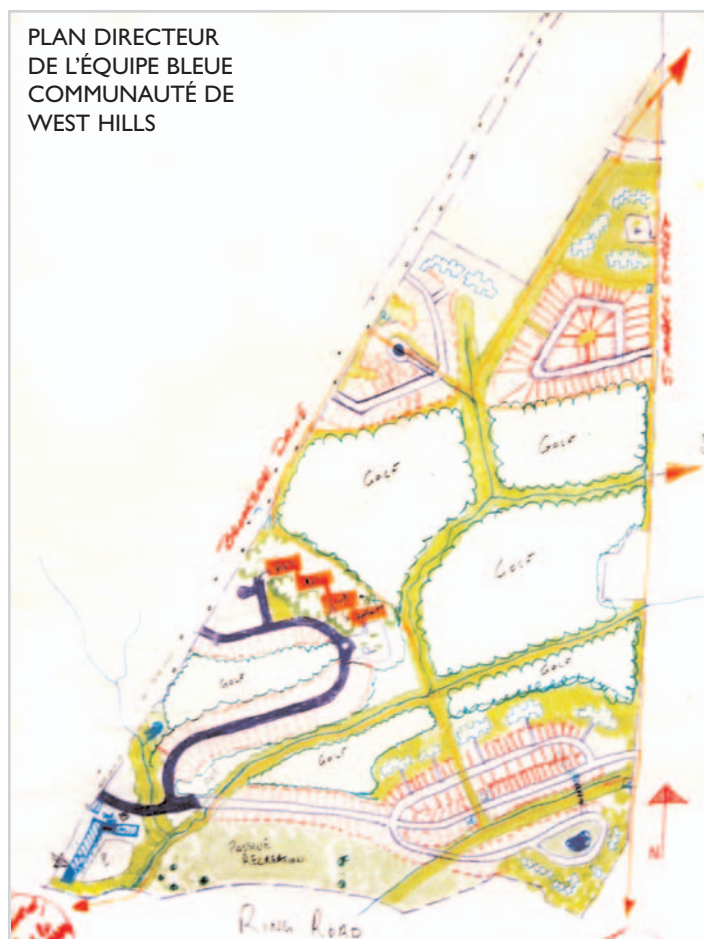


Figure 3 Plan directeur de l'équipe bleue

### PROCHAINES ÉTAPES

La charrette a offert aux participants l'occasion de contribuer activement à l'aménagement durable d'un lotissement et au processus de conception. Grâce aux plans directeurs des trois équipes, la ville de Fredericton et Hill Bros. disposaient de solutions pratiques et réalistes pour l'intégration de stratégies de développement durable dans un concept axé sur la collectivité.

La rétroaction de la ville de Fredericton et de Hill Bros. ne fait que confirmer davantage la réussite de la charrette. Pour la ville, le lotissement West Hills constitue un exemple formidable d'un promoteur qui trace la voie à un aménagement plus écologique qui plaît au public. Pour Hill Bros., la charrette a permis de générer de nouvelles idées pour la conception du lotissement West Hills.

Depuis la tenue de la charrette, des espaces verts et des caractéristiques naturelles ont été intégrés au plan de gestion des eaux de ruissellement et Hills Bros. songe à appliquer à l'aménagement d'autres idées tirées de la charrette.

**Directeur de projet à la SCHL :** Cynthia Rattle

**Consultants pour le projet de recherche :** Mary Murdoch, Jacques Whitford Limited.

#### Recherche sur le logement à la SCHL

Aux termes de la partie IX de la *Loi nationale sur l'habitation*, le gouvernement du Canada verse des fonds à la SCHL afin de lui permettre de faire de la recherche sur les aspects socio-économiques et techniques du logement et des domaines connexes, et d'en publier et d'en diffuser les résultats.

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## Why West Hills

The West Hills subdivision project in Fredericton New Brunswick responds to the perceived market demand of active seniors and young families and the growing interest in energy efficient housing within the community and by the Hill Bros. Realty & Investment Ltd. ("Hill Bros.") Canada Mortgage and Housing Corporation (CMHC) was aware of the Hill Bros.' interest in constructing energy efficient housing, including its previous energy efficient developments. Hill Bros. expressed an interest in exploring energy efficiency further and the development of more sustainable residential subdivisions. At the same time, the City was midway through reviewing its municipal development plan and showed an interest in participating in a sustainable development planning process to learn more about how environmental practices can be integrated into urban design.

The West Hills Project was therefore a great opportunity for these stakeholders to explore concepts on how a residential neighbourhood can promote sustainable development and sustainable living through practical and readily-accessible strategies. The vision that was put forth for participants in the West Hills Project includes, but was not limited to, a neighbourhood that includes the following principles:

- Environmental protection and enhancement
- Reduce the reliance on cars, with walkable links within the neighbourhood and to neighbouring communities
- Energy efficiency
- Economic viability and marketability
- Financial accountability
- Listen to every voice in the design process, including input from neighbouring areas
- Quality of life: noise, safety, connectedness, access to daily needs.

The overall concept for the West Hills Project was initially based on reducing the environmental impacts of the subdivision and promoting sustainable development principles in the urban planning process.

## Background

The City of Fredericton is experiencing a strong demand for both new single-family and multi-unit dwellings. In 2003, the percentage ratio of sales versus listed units was 68% which is considered as a relevant indicator of a high demand for housing. In terms of population, the City of Fredericton is one of only two areas in Atlantic Canada (the other being Moncton) that is steadily growing with migration from inside and outside the province. The province of New Brunswick has 40% of its population living in rural areas near urban centres and Fredericton is no exception.

One of the questions raised by the City in response to this issue is how Fredericton can accommodate growth within City limits while reducing the environmental impacts of development. Hill Bros. Realty Ltd. and CMHC, in conjunction with the City of Fredericton, initiated the West Hills Project Charrette as an opportunity to create subdivision planning guidelines in answering this question.

## Sustainable Development Approach

There are a variety of perspectives on the meaning of *sustainable development*. However, most would agree that sustainable development aims for balance between environmental, social and economic concerns <sup>(1)</sup>. The Bruntland Commission defined sustainable development as "development that meets the needs of the present without compromising the ability of the future to meet its own needs" (WCED). A practical approach to integrate sustainable development into a planning process starts by gathering experts and stakeholders together to identify and evaluate the environmental and economic issues in the community. Development strategies and planning guidelines can grow from an understanding of these issues from the social, economic and environmental perspectives of the planning participants.

The West Hills Project is one of several north peripheral areas in Fredericton being developed by private promoters. The West Hills Project was an opportunity for Hill Bros. Realty Ltd. and the City of Fredericton to participate in a *Sustainable Design Charrette* using the West Hills subdivision as the subject of the exercise. Working together, CMHC and Hill Bros. with the City of Fredericton developed an integrated design charrette to explore sustainable planning and building design issues using the West Hills subdivision site.

<sup>(1)</sup>*The principles of sustainability. Simon Dresner, Earthscan. 2002.*  
WCED : World Commission on Environment and Development, 1987

## Purpose of the Charrette

A design charrette is an illustrated brainstorm involving diverse groups of experts and interested parties. It is meant to provide participants and the broader community with feasible, creative solutions to pressing urban design problems. The problems and issues addressed can vary from a small scale building to neighbourhoods, cities and bioregions. The charrette process combines methods and approaches which help people visualize design solution alternatives and discuss and evaluate options. (CMHC – Sustainable Community Planning and Development: Design Charrette Planning Guide)



*Green Team discussing water management*

The purpose of this Integrated Design Charrette was to create visual and narrative images for the West Hills subdivision that demonstrate the potential for designing a sustainable residential subdivision. This process was intended to be practical experience for stakeholders to link their expertise to sustainable development principles and the creation of concrete development options for the site. The charrette outcomes could test and change the Official City Plan policies. In addition, the charrette could provide Hill Bros. with a range of planning options and directions to be used in their future built projects.

## Charrette Event

Three charrette design teams were structured to include a broad cross-section of background and expertise so that a range of opinions and ideas would be contributed to the planning process and participants could learn from each other's experiences. Each team was led by a facilitator with experience in sustainability design issues. The teams included individuals with expertise in landscape architecture, engineering, alternative energy systems, storm water management, and urban planning, permitting discussion on a broad range of important issues. Solar energy and golf course design experts visited the three teams to provide information on relevant technology applications. Representatives from the Fredericton Planning Department, the subdivision developer, the Hill Bros, and CMHC completed the teams. Mary Murdoch and Jean-François Lepage of Jacques Whitford, provided logistical support for the event.. All of these experts were actively involved in the detailed table discussions throughout the two and a half day charrette process.

The first evening of the charrette was held at Carrington House, one of many Hill Bros. Enerplan buildings. The charrette commenced with an introduction by Fredericton's planners, Alex Forbes and Frank Flanagan. They surveyed City highlights, issues and the new municipal development plan to be adopted. CHMC presented the charrette framework and objectives. This introduction set the tone of the charrette and demonstrated to all participants the political and administrative support for the process. These presentations were followed by a short

history of the West Hills subdivision project and a bus tour of Fredericton's north side as well as the West Hills subdivision site and neighbouring areas. The City hosted the tour providing details of City history and anticipated developments. The bus tour was invaluable as many participants were not familiar with the City prior to the charrette.

After the bus tour, participants joined with their team members and shared comments on the information presented. The following two days of the charrette were held at the Maritime College of Forest Technology in Fredericton.

The first full day started with a general introduction, daily schedules and presentations on sustainable development strategies applied in various projects. T. Jeanine Paul, Doug Pollard and Don Roscoe presented their past experiences in sustainable projects showing a clear demonstration that the charrette process could effectively change standard practices and translate sustainable development principles into concrete realizations.



*Guest speaker Doug Pollard presenting*



*Alex Forbes presenting City history highlights on bus tour*

The group then divided into the work teams and were provided a set of instructions outlined on the following pages, to guide them in their work. The three teams developed their sustainable guidelines and concepts during the following day and half. Presentations of the teams' findings and master plan concepts concluded the charrette.

### Team Instructions

A *Participant Package* was provided to all participants prior to the charrette. General introduction, goals and objectives, charrette agenda and benchmarking points were included in the package kit (Appendix A).

### Master Plan

Hill Bros. provided a generic Master Plan of the West Hills subdivision to participants prior to the charrette. This Master Plan was used as the starting point for each team to develop their vision and illustrate sustainable development of this land.



*West Hills Master Plan*

### Material Provided

An FTP web site was set up to provide participants with relevant information on the project prior to the charrette. The web site posted numerous documents and relevant information on sustainable community projects. Through the web site, instructions and previous CMHC sustainable community projects were provided so that participants would be familiar with the objectives and relevant projects. Web references, drawings and maps to be used as base information to develop the new Master Plan guidelines were also posted on the FTP site. In addition, several information packages were individually emailed as \*.PDF files to participants in advance in response to their requests.

## CHARRETTE RESULTS

### Principles Common to all Designs

The three teams were provided with a list of benchmarks as guidelines for the integration of sustainable development principles into their designs. All teams considered a number of planning options to structure their sustainable development design strategies. Principal strategies studied by participants included:

- transportation strategies to reduce use of cars without compromising links to surrounding areas
- planning of safe environment for families and seniors
- community comfort
- harmonisation of the built environment with natural systems
- storm water management
- reducing energy and water use
- optimisation of use of solar and renewable energy sources

<b>General</b>	Design and management to community services and recreational activities. Maintained and preserved natural environment. A golf course was central focus for site planning.
<b>Housing</b>	Included senior and family homes, low energy and renewable energy use, low maintenance lawn and front gardens, orientation to facilitate solar energy, strategies to reduce potable water consumption.
<b>Movement</b>	Traffic design strategies reduced car use and speed and facilitated transit to surrounding areas. Pedestrian and bicycle trails were central in movement schemes.
<b>Golf course</b>	Golf course developed towards community needs. Community storm water management is integrated within golf course design. Golf course project shared infrastructures with recreational activities and community services.
<b>Storm water</b>	Integrated within golf course, low maintenance landscaping, permeable surfaces, reduced use of chemicals, protection of watercourses

## Team 1 – Green Team

### Charrette Process

In this group, participants were mostly engineers and were looking forward to working on pragmatic strategies. They began by sharing their visions of what the sustainable development guidelines should be and discussing the project benchmarks checklist which had been provided. The Team reviewed the existing built and natural elements such as roads and vegetated areas and constraints of the site and looked over the current planning maps provided by the City. The Team quickly reached a common vision based on the project benchmarks checklist. As the Charrette proceeded, presentations were made to the Team by Jeannine Paul (wastewater management case study), Don Roscoe (solar technologies) and Yannick Pilon (golf course design). Questions that were raised regarding the general planning included:

- How to keep the project guidelines in accordance with the competitive markets reality?
- What technologies were available without increasing the initial housing costs?
- How could the planning integrate existing elements and promote sustainable development?



*Don Roscoe presents to the Green Team*

The Team was influenced by municipal planners and the developer who clearly stated that the golf course would be a good marketing tool for the project.

Based on the discussions, the natural environmental features of the site and the golf course were identified as two elements with the greatest influence on planning considerations. The Team used the benchmarks provided in advance of the charrette to structure the following set of basic design objectives with predominance given to the storm water management and interactions between golf course and the community:

- Minimise golf course environmental impacts (green golf course);
- Integrate golf course operations with community needs;
- Walkable paths, family and senior oriented community;
- Links with surrounding areas;
- Design with competitive market considerations;
- Preserve natural environment assets;
- Manage run-off water on site; and
- Promote renewable energy use.

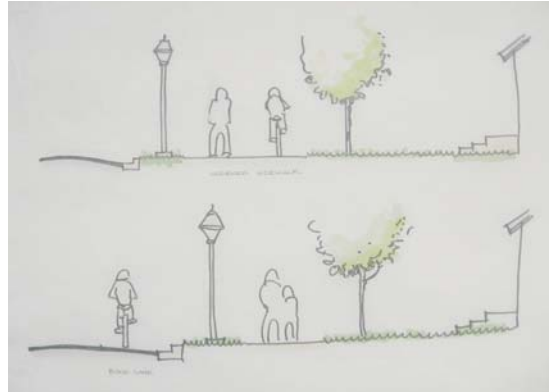
### Highlights

The Team decided that the final Master Plan should include the golf course because of promises made to buyers and owners. The Team recommended applying the Audubon

International® and TerraChoice® programs to "green" the golf course because of potential significant negative impacts on the natural environment including the protected stream present on site. The golf course footprint was set to be as small as possible without compromising normal length standards.

Existing lots were resized to accommodate the golf course for flexibility and practical reasons. The Developer confirmed that all residential units would comply with R-2000 program requirements. The Green Team proposed several strategies to meet benchmarks and integrate sustainable development principles such as:

- Serpentine turns on long streets to reduce car speed;
- Orientation of houses to facilitate the use of passive solar energy;
- Pedestrian access designed to reduce the use of cars and encourage other alternative forms of transportation to prevent air and noise pollution;
- Recreational facilities including community services integrated in golf clubhouse buildings to enhance community interactions; and
- Playgrounds and golf course accessibility for winter community activities and community gardens.



*Green Team Street Cross Sections*

Participants also suggested operational strategies such as: to create live-work opportunities, increase the use of gravel parking lots to reduce heat islands and run-off water problems, encourage water conservation by promoting the use of dual-flush toilets, rainwater for irrigation systems and xeriscaping (e.g., gardens only in the front yard leaving the existing woods in the back), implementation of monitoring/follow-up (e.g., internet connection for residents to learn about golf course environmental monitoring), public use of club house/community facility/ tennis courts, golf course to help with storm



*Green Team Master Plan*

water management in the area, and measures during construction to prevent soil erosion and compaction, water, air pollution and protect a selection of trees.

## Team 2 – Red Team

### Charrette Process

Each participant began by suggesting three elements that they felt were project assets and three elements that should be changed. Six goals were outlined from their discussions:

- All residential units within a 15-minute walk to the Community Centre;
- Community linked to outside destinations through active transportation and public transit corridors;
- Community designed around natural features;
- House and lot design for resource conservation (e.g., energy, water, waste);
- Quality of life promoted through mixed uses and interaction between generations; and
- Sustainable operation procedures for communal areas and during construction.

Participants then agreed on a vision statement as follows: *"The goal of this two and a half day design workshop is to create a visual and narrative image for West Hills; a mixed-use, intergenerational neighbourhood designed around natural features that demonstrates sustainable practices in its development and operation, with an emphasis on recreation and active transportation linkages to the rest of the City."* The Team then worked on strategies to support these goals.

### Highlights

The central focus of the design was the combined community centre and Club house located to the east of the residential areas. The team acknowledged that the orientation of the community centre is not ideal, as it has a predominant north facing display side overlooking the golf course. However, the central location made up for this disadvantage. The access to the community centre was to be facilitated through a bus transit route stopping in front and passing through the higher density residential area. Multi-use trails also connect the residential areas to the Community Centre internally, and allow for through connections from Brookside Drive to St. Mary's Drive. For safety reasons, the trail system does not pass through the golf course.



*Red Team prepares presentation last details*

The Team recommended that another piece of property on the western side of the property be purchased to add to the site, but it is not critical. The residential lots in the southeast corner were orientated to allow a southern exposure, as well as to provide golf course views for single family homes along the ridge. Geothermal heating was suggested for the community centre and some of the surrounding homes as a renewable source of energy and as a strategy to reduce operation cost. It was estimated that adding a geothermal energy to individual homes would add about \$10,000 to \$5,000 to the cost of the home. Microturbines were another possibility presented by the Red Team to provide heating, but not cooling, for homes.



*Red Team discusses lot orientations*

Red Team also proposed several strategies to achieve their goals such as:



*Red Team Community Centre Concept*

- a pathway network without any conflict with cars or motorised vehicles
- bike racks located at entrances of all destination sites
- reduction of pavement width
- maintain natural slopes and ground water recharge areas

- retention of storm water run-off through natural filtration
- proposed alternatives to grass lawns
- mandating of permeable pavement
- development of a community garden that collects and uses organic waste
- prevent houses from being oriented parallel to the road.



*Red Team Master Plan*

### Team 3 – Blue Team

#### Charrette Process

Participants first reviewed project information presented by the City, the developer and CMHC. Blue Team then discussed whether the golf course would remain in the long-term and it was accepted that this would be the case. Participants outlined five important elements to focus their design on:

- Housing and lot forms
- Golf course design and role
- Clubhouse design and role
- Transportation and movement
- Infrastructure systems

Considering the development plan for Fredericton around the site project, participants agreed that the golf course would likely assume an important role, as a recreational service area and a green space. The golf course community concept was pivotal to the development for the Blue Team.

#### Highlights

Blue Team proposed numerous strategies including:

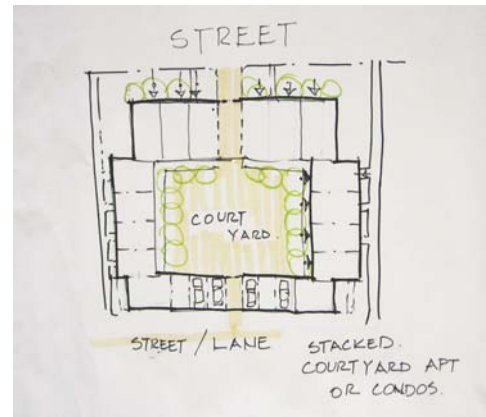
- Homes without a basement. Slabs on grade would eliminate mould problems, necessity to transport fill and lowering of



*Blue Team discussion on lots size*

the water table (which can kill trees). Slabs on grade can also incorporate hydronic heating which provides a very warm comfortable space.

- Demonstration project could be built as part of the clubhouse or as a separate flex home\*. The provision of an unfinished attic was also part of the team's design to reduce initial construction cost and provides a more adaptable space.
- Terraced house designs in the southern area with drive-in parking in the back of house (the front of the house faces the golf course). The access to driveways is designed to be shared to save frontage space. Shared driveways could be in permeable pavers (grass grows through/between the stones) helping with water collection.



*Blue Team – Garden Homes with Shared Drive and Stacked Courtyard Apartments or Condominiums*

- Flexible zoning approach that would permit the developer to respond to market demand without rezoning.
- TerraChoice® and Audubon International® environmental programs should also be integrated into the golf course construction and management to incorporate best management practices, focusing on pesticide use, environmental sustainability, and water and wildlife conservation. Storm water would be dealt with on site via greenways or vegetated gulleys. The golf course design integrates water features with greenways/water treatment for this development. The clubhouse is designed for staged expansion, setting a benchmark in green construction (use of healthy materials, biological waste water systems, use of renewable energy sources, etc.) Participants suggested a shared facilities approach to reduce operating costs with senior housing or retirement residences and the club house.

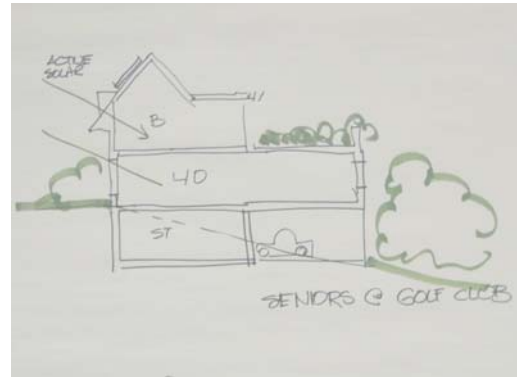
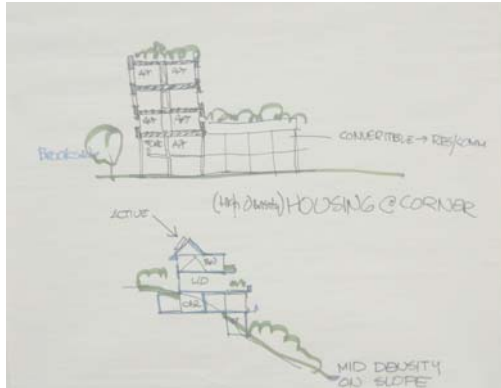
Blue Team also presented several strategies not visible on plans such as;

- geothermal energy for heating
- walking paths into the periphery of the golf course or directly within the course boundaries
- solar powered electric golf carts
- streets and the natural grade of the slope to drain the southern section of the site

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\* FlexHousing™ is a concept in housing that incorporates, at the design and construction stage, the ability to make future changes easily and with minimum expense, to meet the evolving needs of its occupants.

- greenways as a walking trails
- streetscapes to be pedestrian friendly
- less front lawn (more front gardens)
- narrower streets and garages and less facades to allow residents to see and speak to each other across the street.



*Blue Team House Sections*

A safe environment for children and seniors was also envisioned by the Blue Team. A playground was proposed for residents within a trail system/linear park. The linear park aimed to be geared towards multiple uses: cross-country skiing in the winter, walking and running in the summer, with small integrated exercise/play areas and interpretive stations just off the trails.



*Blue Team Master Plan*

## Next Steps

This charrette provided Hill Bros., the City of Fredericton and the other participants the opportunity to take part in and contribute to a sustainable design process. The charrette was an educational exercise on how to apply sustainable development approaches to urban design planning and provided practical and realistic strategies for West Hills subdivision design.

According to Alex Forbes, Assistant Director of Development Services for the City of Fredericton:

“The City of Fredericton welcomes any and all innovative development proposals. West Hills is a great example of a developer leading the way to a more environmentally sustainable development that will be appealing to the public. In the fullness of time, their example may advance the public’s expectations of development, and this may drive changes to municipal planning policies.”

Scott Hill of Hill Bros. notes the following:

“As the design engineer for the West Hills developer, Hill Bros., participation in this charrette provided me with new ideas for developing our Master Plan for West Hills. In particular, I gained some valuable insights for storm water management and have researched these further. As a result, we have integrated the use of green spaces and natural features in our storm water management plan to control water quality, water quantity and sediment erosion. We are much more aware of the concept of maintaining post-development storm water discharge volumes to pre-development volumes. For example, we are looking at arranging town houses in clusters with central green spaces that handle storm water on site through the use of soakaway pits and sand filters. Additionally, discharges to any streams will be handled with vegetative filter strips and/or bioretention filters for treatment. We have also included a storm water attenuation pond as part of the golf course as a natural feature. There is also a naturalized area in the middle of the golf course.

We believe that managing storm water on site is not only environmentally responsible, but also provides a very attractive natural surrounding and will make West Hills a more desirable place for people to live. Some parts of the Master Plan for West Hills are still in development, and we look forward to considering some of the other ideas presented in the charrette as we move forward in planning.”

## Participants

Name	Affiliation	Email	Team	Role
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## **List of Appendices**

### **Appendix 01**

**Goals and objectives for the sustainable design charrette**

### **Appendix 02**

**Benchmarking**

**Appendix 01**  
**Goals and objectives for the sustainable design charrette**

## **GOALS AND OBJECTIVES FOR THE WEST HILLS SUBDIVISION URBAN DESIGN CHARRETTE**

### **GOAL**

The goal of this two and a half design workshop is to create a visual and narrative image for the West Hills subdivision that demonstrates the potential for designing a sustainable, small residential subdivision. The results of the charrette will provide an example for development elsewhere, and encourage the planning and design of sustainable communities in general. The workshop participants will come from varied backgrounds and technical knowledge. The combination of their expertise in the integrated design charrette will produce new ideas which reflect the site under consideration.

### **PRINCIPLES OF SUSTAINABLE COMMUNITIES**

- Environmental protection and enhancement
- Reduce the reliance on cars, with walkable links within the neighbourhood and to neighbouring communities
- Energy efficiency
- Economic viability/marketability/Life cycle costs
- Financial accountability
- Listen to every voice in the design process, including neighbouring areas.
- Quality of life: noise, safety, connectedness, access to daily needs

### **OBJECTIVES OF THE CHARRETTE**

Develop sustainable community plans that apply the principles stated above which may be used as the West Hill development progresses.

Participants will be asked to consider the following issues and to set benchmarks that promote sustainable design principles.

- How can we reduce the use of cars and encourage the use of alternative modes of transportation, such as walking, cycling, transit, and allow access for residents who cannot drive to daily activities on their own. Considerations could include the provision of live-work opportunities, walking and bicycling paths, access to daily shopping, alternative road standards that reduce the emphasis on cars and provide other

- How can the subdivision be designed to create strong links with the surrounding area, including Phase 1 of West Hills, nearby retail services, schools, the City's trail system and Killarney Lake?
- How can a streetscape be created, which is pedestrian in scale, promotes walking and other alternative forms of transportation, and social interaction while enhancing the ecosystems?
- How can the subdivision be designed to provide a safe environment for children and seniors? E.g., 'eyes on the street', away from heavy traffic.
- How can the subdivision be designed to work in harmony with natural systems; to respect, maintain and optimize the natural functioning of the landscape? (More environmentally friendly, respecting stream systems and aquatic habitat, water table replenishment and reduction of storm water runoff) e.g., innovative development standards such as green infrastructure and buildings, natural drainage systems, permeable surfaces for trails and roadways.
- How can the subdivision be designed to minimize energy use and maximize energy efficiency? What alternative forms of energy and energy conservation measures can be integrated into the buildings and design of the subdivision? Considerations include community based geothermal energy, district energy, passive solar orientation of houses and other buildings, time of use power meters.
- What measures can best encourage the community and individuals to conserve resources? Water, waste, energy, etc. Can the community achieve a 50% reduction in water use? What environmental guidelines could be proposed to the community as an operational guide, e.g., xeriscaping, plant selection, alternative control of pests?
- How can the subdivision and the dwellings be designed to meet the life cycle needs of the community, so that residents can live in the same community throughout their life. Consider the implications for housing design, connections with schools, seniors' residences, etc.)
- How can the planned golf course be designed and managed to enhance its sustainability and to provide connections with the community? Consider potential to use abandoned city well for irrigation, implications of maintaining the greens for watercourses on site and community ground source heating.

- How can the subdivision be designed to preserve, protect and enhance the natural environment, during construction and post-construction. (grading, topsoil retention, retention and protection of natural features, including trees, watercourses, minimizing soil erosion, dust, minimizing run-off water)
- How can storm water run-off be minimized or eliminated? Waste water? What alternative storm water management approaches are possible for this subdivision? Considerations could include interconnected greenways to enhance biological performance, minimizing amount of impervious surfaces, a storm water retention pond, a grey water system.
- How can the elements of the subdivision be designed to serve multiple functions? Consider the add-on opportunities for each community element to increase ecological activity and reduce resource use.

#### **FOUR QUESTIONS TO GUIDE PARTICIPANTS**

Does the feature meet its intended function?

Does it enhance the environment and the overall ecology?

Does it minimize immediate and long-term resource use?

Does it create a pleasant and functional living environment for people?

## **Appendix 02 Benchmarking**

## BENCHMARKING

Goal	Actual	Strategy	Measures	Benefits/costs
Reduce use of cars	Cars are used by most families to go to work. New subdivisions do not integrate business or commercial opportunities except on main access roads. Schools are located within.	Provide live-work opportunities. Provide alternatives to cars. Ensure that retail stores and elem.schools are within 15 walking. Bike paths separated from cars. Bike lockups in strategic locations. Showers at destinations. Friendly streetscape to promote walking.		City: reduced traffic and infrastructure. More buses req'd
Link to surrounding area	Separation by major traffic artery for schools, retail	Safe under- or overpass for pedestrians pas these barriers Satellite community services, retail time-sharing of common facility		
Safe environment for families and seniors	Garage and cars dominate new housing?	Eyes on the street. Design to goals of fused grid.	Front porches for people to sit and watch the street Walkways separated from cars.	
Community comfort	Acoustical privacy, visual privacy			
Harmonize with natural systems.	New subdivisions plow under woodland. Setback req'd from creek of xx m for roads and buildings and disturbance.  Existing infrastructure standards to be	Select development areas to minimize disturbance of natural features, woods, drainage patterns. Provide wildlife corridors, continuous along creek. Eliminate need for	Design restricted to areas which least disturb natural environment. Utility runs to avoid woods. Avoid roads by creek  Contract with purchasers and golf	

	provided by city. Parking dominates appearance of shopping areas, adds to heat island effect.	pesticides, herbicide.	course shareholders to eliminate pest- and herbicides. Provide a chemical free maintenance plan.	
Eliminate need for stormwater sewers. Increase flow into groundwater.	Stormwater is diverted to sewers.	Eliminate stormwater runoff from built up sites. Reduce pollution of ground water & stream by golfcourse.	Alternative stormwater greenways	
Minimize energy use	R2000 building standard for custom housing.. New subdivision is to use gas for heating. Appliances?	Compact housing forms. Orient for best solar. Tune windows according to orientation. Reduce heating req'ts by 50%. Reduce elect. use by 50%. Reduce hot water req't by 50% Reduce construction waste Select materials which optimize embodied energy, are durable & flexible.	Construction waste plan. Engineered design. Seek out recyclers. Review material selection for potential high embodied energy. Durable materials (50years+) Time of use metering.	
Minimize water use	Fredericton av. family water use is 1000 l/day. NB average is 415 l/day.			
Maximize use solar and renewable energy Reduce non-renewable energy use by 30%	Deciduous trees to south of houses, evergreens to north	Est. orientation & solar design guidelines to max. solar use, while avoiding overheating and glare. Determine which options provide most benefit: geothermal, solar, etc.		
Retain Air Quality				

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