

BUILT TO LAST:
NEW CONSTRUCTION IN THE WEST FRASERLANDS

by

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Abstract

This project explores the sustainable landscape design at the residential scale. Landscape architecture at the residential scale often sacrifices sustainable building and design principles for an aesthetic that, under many current construction practices, requires huge amounts of energy inputs to maintain and often display a limited lifespan. These landscapes often do not work to enhance passive energy gains, are water wasters and do not address habitat issues. In addition, many residential landscapes do not integrate with the surrounding community context.

Research into sustainable landscape theories shows that energy inputs, built-form lifespan and ecological function have the greatest impact on a residential project's contribution to sustainability or lack thereof. Designing with local materials, building easily maintained forms, handling wastewater on-site and creating site specific and regionally appropriate habitat patches and links will lead to a more sustainable condition, regardless of the design form. Discovering the character of the surrounding community and addressing this through design is essential.

Analysis at the regional, community and site scale provided a base from which to create a design that: 1. treats energy, water, and material flows in a sustainable manner, 2. creates habitat patches and linkages that are site specific and appropriate to the parcel's position in the region and 3. integrates the development into the existing character and fabric of the community.

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Chapter One

The Project: Overview

1.1 Statement of Intent

Working in the landscape construction field since my mid-teens has given me the opportunity to be involved in some amazing projects; the type of project where the aesthetic end-product overrules all other considerations. Budget, sourcing of materials, ecological function and contribution to the surrounding neighbourhood are secondary. My time at UBC has opened my eyes to the impossibility of continuing to build in this manner.

An unfortunate reality of working in near-budgetless projects is the attitude that money can buy anything. Dealing with clients that do not have an innate understanding of sustainable building principles creates a scenario where the look of a landscape is more important than the way it functions and rebuilding a landscape 15 years after initial construction is acceptable.

"The building sector generates about half of all greenhouse-gas emissions annually—as much as transportation and industry combined (Mazria 2006)."

Our patterns of development have roots in historical land uses and patterning. Industrial development has been primarily positioned along waterways for transportation, which, in turn, spawned residential development and a host of subsidiary enterprises to support the growing community. This development pattern is resulting in some of the nation's most

ecologically sensitive land being developed, by lateral growth of cities. A growing awareness of the importance of preserving ecological function, natural areas and biodiversity has lead to the “sustainability movement.”

In 1987, the World Commission on Environment and Development published *Our Common Future* in which the term “sustainability” was introduced. The United Nations Division for Sustainable Development defines sustainability as “meeting the needs of the present generation without compromising the ability of future generations to meet their needs” (2006).

The current model of sustainability dictates that land has a single use; preserving biodiversity and ecological function comes in the form of land-preserves. The success of compartmentalization, as this theory is known, is being threatened by the necessity to expand cities to accommodate a global population explosion. We must begin to incorporate both basic and complex ecological functions into our developments if sustainable development is to become a reality.

“The landscape ecological model suggests that we can no longer afford the luxury of biologically nonvital areas and that our productive forest and farming landscapes must not sacrifice broad measures of functions for food and fibre production. (Mooney 2004).”

I intend to explore the relationship between sustainable landscapes and aesthetics at the residential scale. More specifically, I will demonstrate that a sustainable landscape can look as formal and “showy” as one built with unsustainable methods.

1.2 Project Goal

This project attempts to display a more sustainable solution to residential design that doesn't preclude a certain form. As such, the following objectives have been created:

1. Design a residential development parcel in such a way that energy, water, and material flows are treated in a sustainable manner;
2. Create habitat patches and linkages that are site specific and appropriate to the parcel's position in the region;
3. Integrate the development into the existing character and fabric of the community.

1.3 Site Introduction

The Celtic Shipyards are located in South Vancouver in a neighbourhood known as “Southlands.” The site is along the edge of the Fraser River, South of Southwest Marine Drive and between MacDonald and Blenheim Streets. The parcel is approximately 8 acres and sits adjacent to the McCleery golf course. Plans are to develop the location to be “high end” residential housing.

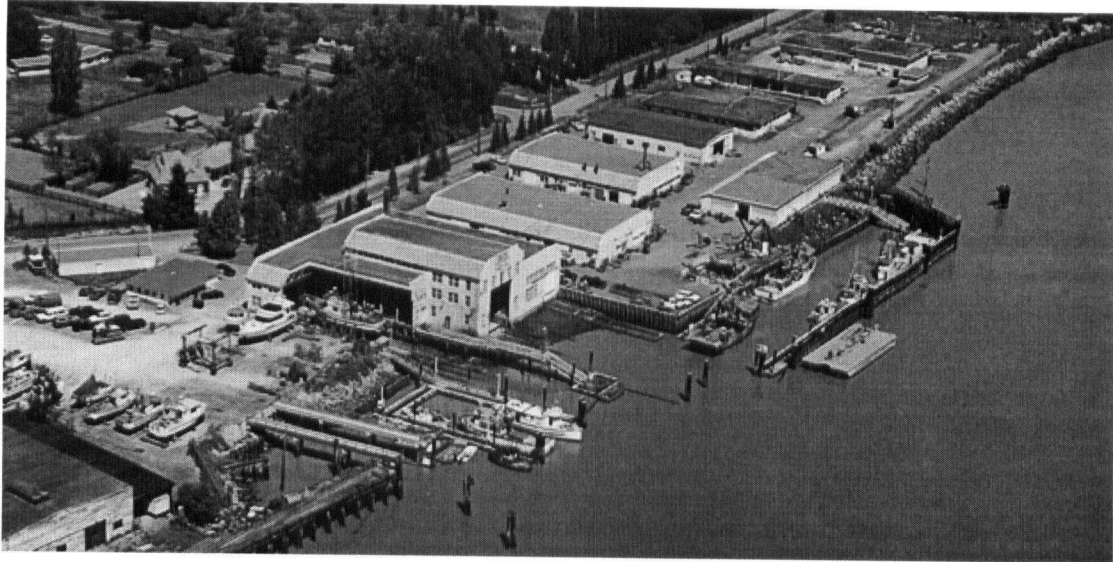


Fig. 1: The Celtic Shipyards prior to demolition.

The study site occupies some of Vancouver's oldest commercial land, established in the 1800's as a ship construction center. More recently it has been used as a mixed-commercial space. Local artists have set up shops for their trade. Trade and craftspeople rented spaces for storage and a center to run operations from, and native fishermen used the wharf to dock their boats (Save The Celtic Shipyards 2005).

Fifteen years ago this parcel of land was purchased by the Musqueam Native Band in the hopes of restoring it to its' former glory as a boat building facility. This move was made to provide employment to the native community. These dreams weren't achieved so, in conjunction with Progressive Developments, the land is being developed as high-end single family residences (Woolley 2005).

1.4 Site Context

Regional

The study site is positioned in the Lower Mainland of southwestern British Columbia, in the Fraser Lowland. This is Canada's third largest urban region and contains half of British Columbia's population. Much of the area covered by the Fraser Lowland has been developed as industrial and residential properties, and experts predict population will reach 2.6 million people by the year 2021 (Groulx et al. 2004). Development pressure has caused building to be pushed to geographically hazardous parcels. Where does this leave us with respect to habitat creation?

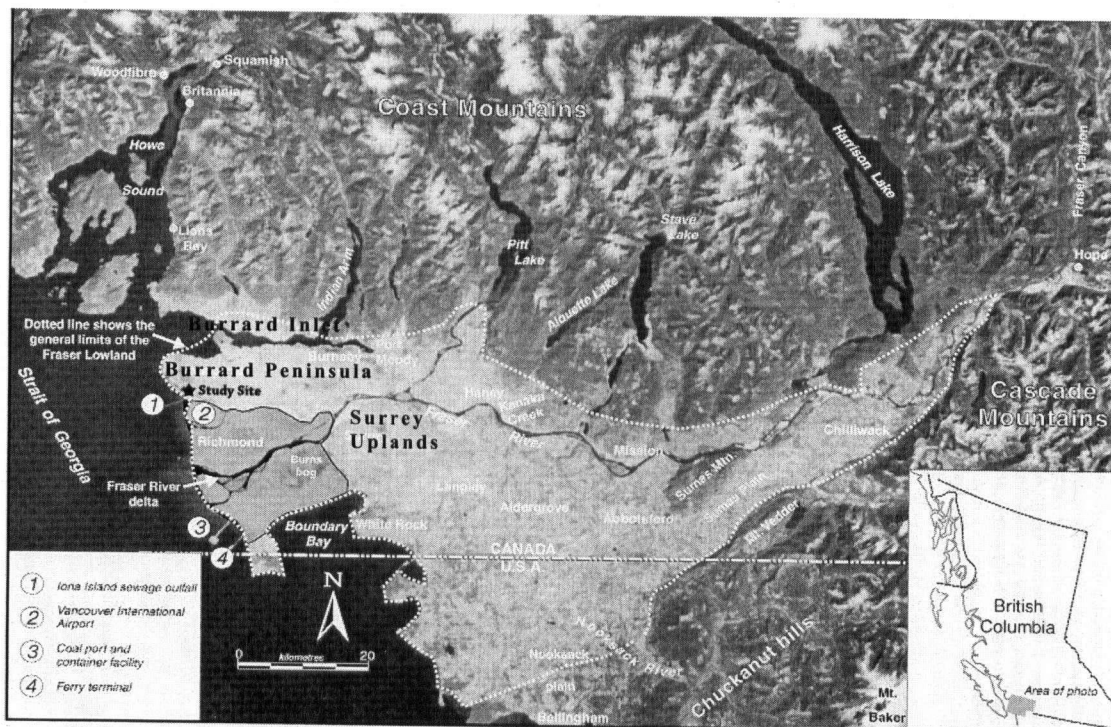


Fig. 2: Location map showing the position of the study site within the Fraser Lowland. The extent of the Fraser Lowland is outlined by white dots. The Fraser River delta is highlighted in grey (Groulx et al. 2004).

The Fraser River ecosystems consist of marshes, old fields, riparian corridors, bogs and agricultural lands. There is a symbiotic connection between habitat types and patches of habitat, and a regional connection to the marine ecosystems of the Burrard Inlet and Boundary Bay exists, as well as, the terrestrial ecosystems of the Burrard Peninsula and the Surrey Uplands. The water passing by the study site on the North Arm of the Fraser enters the Strait of Georgia, which connects to the Fraser River Delta. This area is one of the regions major players for maintaining biodiversity and contributing to ecological integrity. It functions as a stopover for migrating birds in the Pacific Flyway and serves as the entry to the river for one of the region's largest salmon runs (Schaefer 2004).

The climate in the Fraser Lowland is characterized by warm and wet winters, with extended dry periods in the summer, as compared to the rest of Canada's climate. Winter precipitation, occurring mostly as rain, is higher than national averages, while summers are generally low in precipitation. Temperatures are higher than the rest of the nation in the winter, and lower in the summer. Humidity is relatively low in the summers, and this season is seldom hot (Jackson 2004).

Position in the City

The study site is at the southern end of Vancouver and sits on the North Shore of the North arm of the Fraser River which separates the municipalities of Vancouver and Richmond. It sits on the border of two communities – Southlands and Kerrisdale.

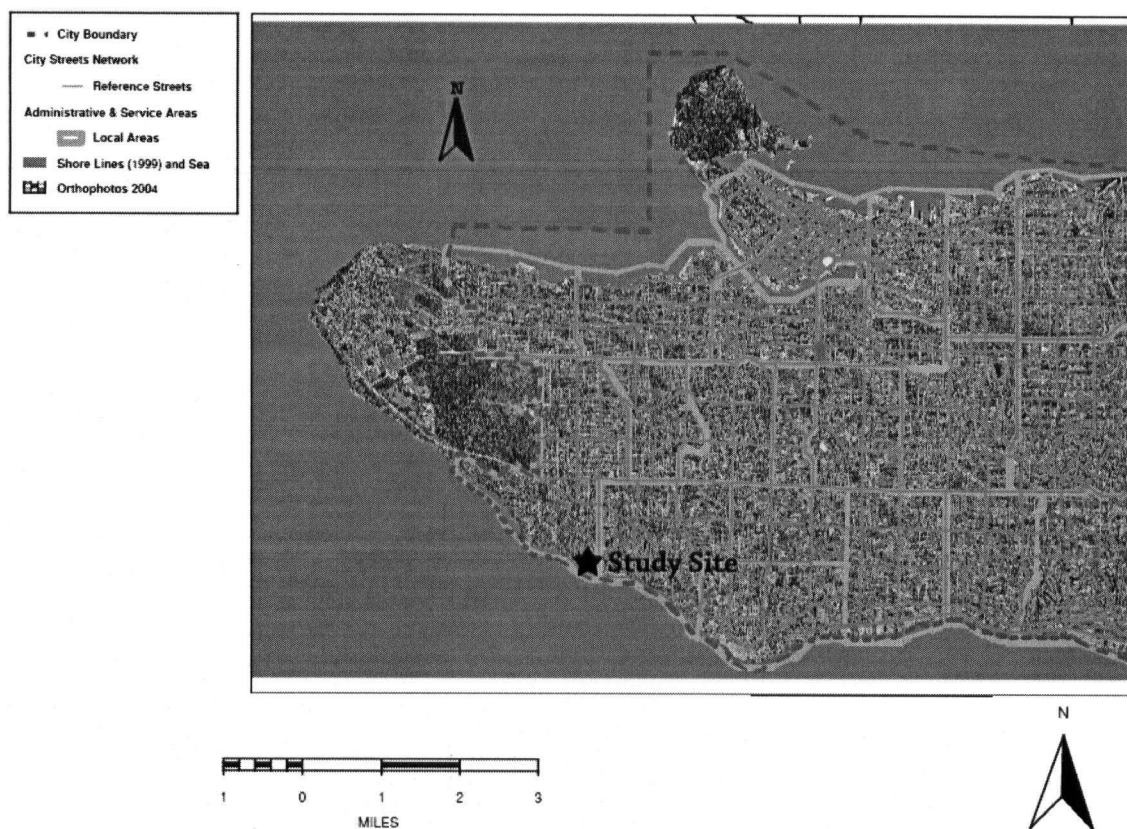


Fig. 3: The position of the study site within the context of Vancouver.

Community

Although this parcel of land crosses the line between two administrative and service areas as defined by the City of Vancouver, it is locally considered to be a part of the Southlands neighbourhood.

Income in Southlands is above average for the city of Vancouver, which sits at \$48 087, which, in turn, is above the provincial average (UBC Urban Studio 2002). This economic data tells us that there may be a higher budget devoted to private residential landscaping in this neighbourhood than others.

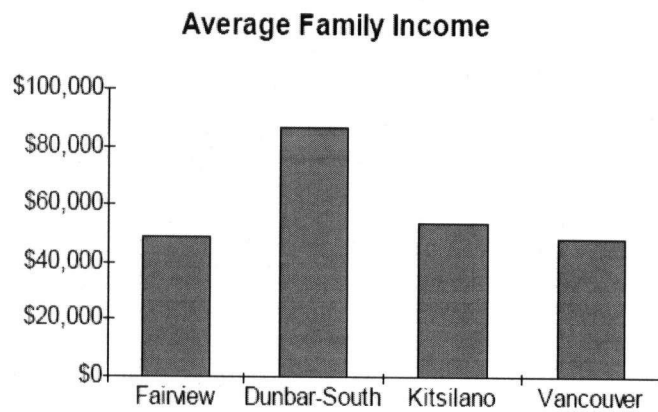


Fig. 4: Avg income by neighbourhood (UBC Urban Studio 2002).

Within the community of Southlands, there is one designated park, two golf courses and two officially designated trails. Deering Island Park (0.74ha) is the only designated

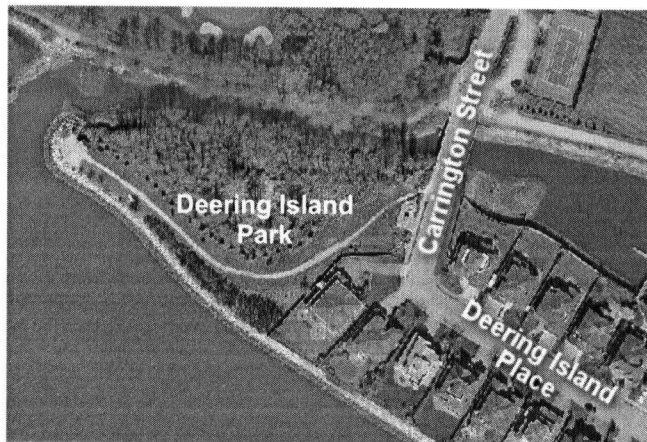


Fig. 5: Deering Island Park

park space within Southlands. It sits at the tip of Deering Island and overlooks the Fraser River, and a manmade marsh (Deering Island Park 2006).

Other private greenspaces in the area include agricultural fields, mostly dedicated to equestrian pasturing and an equestrian center called Southlands Riding Club. The greenspace in Southlands is characterized by patches of dense vegetation, and show potential for habitat linkages.

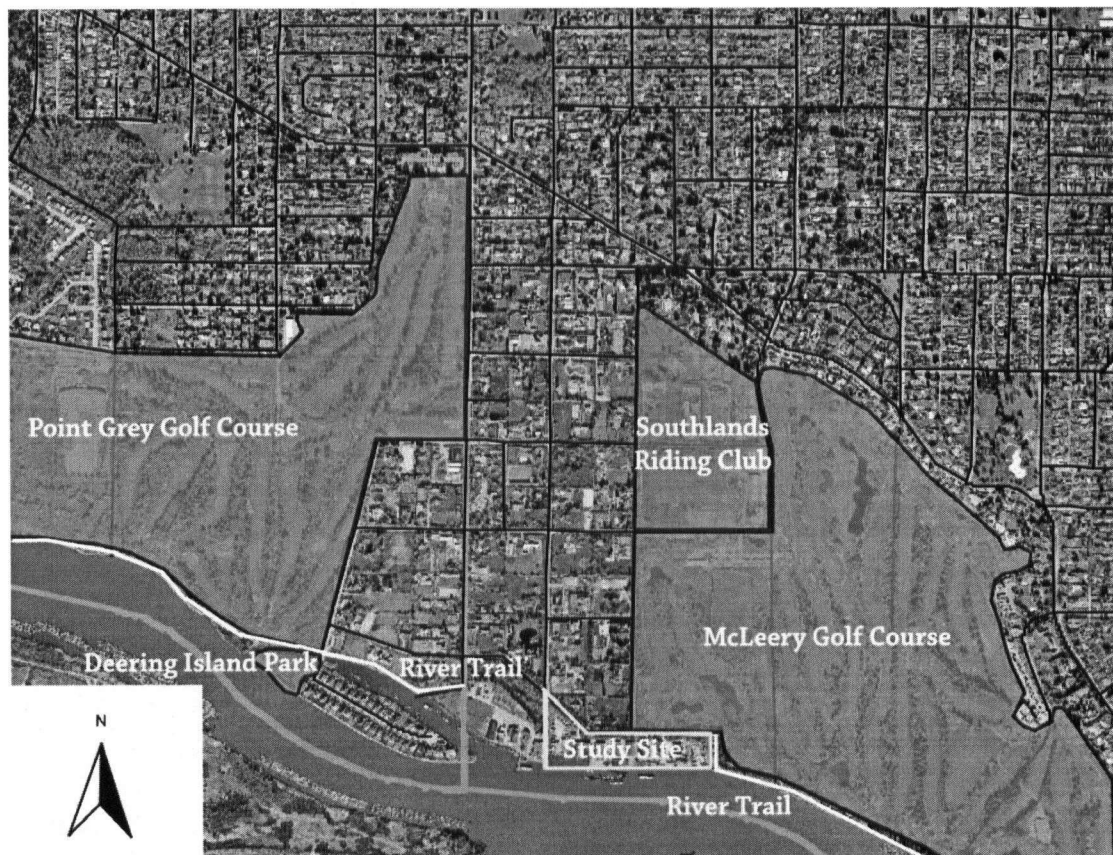


Fig. 6: Major greenspace in Southlands.

Chapter 2: Study Approach and Methods

2.1: Literature Review

Looking at residential design through a filter of sustainability allows us to consider a higher level of functionality than a purely human-scope landscape. Integrating effective stormwater management, creating habitat and dealing with energy flows on-site are steps toward a sustainable condition. The problem many designers are having with the integration of sustainable ideals at the site scale is one of functional vs aesthetic considerations. This graduation project demonstrates that a high level of ecological function can be incorporated into site scale design without a sacrifice in aesthetic.

Regenerative Design

Regenerative Design for Sustainable Development - John Tillman Lyle, 1994

Lyle's approach to landscape planning is one where energy flows are the most important consideration to a successful and sustainable design. He prefaces the book with an overview of landscape development beginning in the earliest days of human settlement. In a natural system, elements are assimilated from the earth, turned into biomass which gets returned to the earth in a state of entropy where it gets broken down into its individual components and reassimilated. Industrial processes have been quickening this process to the point that so much material is being removed, assembled and returned that natural processes cannot disassemble the material quickly enough for this to continue unchecked endlessly.

“...the one-way throughput system, like most human inventions but unlike nature’s recycling material flows, has a linear time dimension built in with a descending curve: Eventually a one-way system destroys the landscapes on which it depends.” (Lyle 1994 p.5)

Lyle’s theory on landscape design offers solutions to this scenario; he calls it “regenerative design.” The implication to residential design in this book is one of “input vs output.” Lyle refers to this as “Sources and Sinks.” Sources are places that supply energy and materials. Farms that assimilate nutrients held in the soil are sources. This assimilated energy is taken up by cities that consume the farm’s products. The resultant waste and byproducts are routed to a sink and broken back down into elemental components, ready to be reassimilated. The problem comes when our input into the sinks is more than they can process.

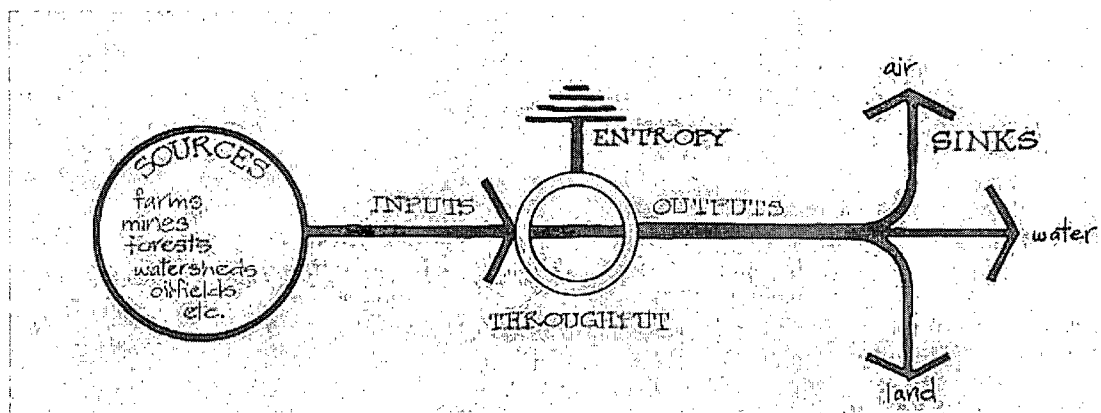


Fig. 7: Energy flows in a non-regenerative landscape.

In an ideal regenerative landscape, the landscape acts as both a source and a sink. In a scenario where this is not possible, the landscape processes the byproducts of energy and material use. A situation like this results in waste being returned to the earth in a less obtrusive manner; a more usable state.



Fig. 8: Energy flows in a regenerative landscape.

Urban Ecology
City Form And Natural Process - Michael Hough, 1989

Hough makes the point that a manicured landscape is not as supportive of habitat as one that replicates the form of natural areas but he also states that these areas can co-exist with more naturalized areas quite successfully.

On residential habitat creation: "Planting to provide a diverse vegetation structure and an adequate food and cover supply on private property could greatly enhance the diversity of wildlife in the city and is a creative alternative to horticultural methods of gardening. Tall trees attract other species of the intermediate canopy preferring this habitat, including such birds as vireos, tangers and orioles. Smaller trees attract other

species of the intermediate canopy. Ground cover and shrubs provide places for species preferring habitats closer to the ground such as song sparrows. Food sources may be provided by planting fruit and berry-bearing shrubs and trees, patches of wild or cultivated flowers that are a source of food for seed eaters in the fall and winter. Cover and water supply should also be provided to create a varied and useful habitat that will attract a large number of animal and bird species at different times of the year (Hough 1989 p.190)."

On habitat creation in sewage treatment plants: "The potential of sewage treatment lagoons would be enhanced by simple management practices. Nesting boxes would encourage birds to breed. Planting low shrubs below lagoon dykes would provide cover for land birds. Well sited look-out points, blinds and trails would permit observation of birds without disturbance and control access and movement. Interpretive signs and pictures of birds that may be seen would enhance visitor experience (Hough 1989 p.175)."

On wildlife in parks: "Disturbance...from people and domestic pets has been minimized by incorporating simple fences between the footpaths and nesting sites along the lake edge (Hough 1989 p.196)."

Hough's work is a useful one in that he acknowledges the reality of cities being here to stay. His approach is not to condemn city form, but to explore how the form of a city can house ecological function at the same time as fulfilling human need.

Grouping Function
The Concise Townscape – Gordon Cullen, 1976

Cullen's work deals with the intricacies of landscape design at the town/community scale. He takes a pattern approach to design, specifying a number of characteristics of good community design. Although this book is aimed at the town scale, many of the guidelines and patterns are transferable to smaller scale design work.

Designing for sustainability at the site scale does not mean that we turn our back to community planning and pretend the site is isolated. There are some very real benefits to considering the surrounding sites.

“There are advantages to be gained from the gathering together of people to form a town. A single family living in the country can scarcely hope to drop into a theatre, have a meal out or browse a library, whereas the same family living in a town can enjoy these amenities (Cullen 1976 p. 9).”

In a design problem such as we are faced with in the West Fraserlands, a grouping of a dozen or so homes along the water, we can begin to propose groupings of functions. A playground shared between neighbours allows a more elaborate build of equipment because of cost sharing. Food production can be a neighbourhood effort, as we see in Village Homes, Davis California. Infrastructure aimed at stormwater handling and sewage treatment can be built at the block, neighbourhood, street scale.

Sense of Place
***The Concise Townscape* – Gordon Cullen, 1976**

Townscape is defined by Cullen as "...the art of giving visual coherence and organization to the jumble of buildings, streets and spaces that make up the urban environment..." The purpose of a properly executed townscape is to "...take all the elements that go to create the environment...and weave them together in such a way that drama is released."

Qualities of Townscape that Create a Sense of Place

- a. enclosure/outdoor room
- b. gateways: here and there
- c. change of level: here and there
- d. closed vista
- e. deflection
- f. incident
- g. punctuation
- h. narrowing
- i. fluctuation (roof-line)
- j. projection/recession (building line)

Although it was Cullen's intent that his work address a number of problems exposed by disjoint planning and design exercises applied to a larger scale, these same principles can be applied to a single yard or grouping of homes. These guidelines are inherently scaleable.

The Living Systems Approach *Gray World, Green Heart* – Robert Thayer

Thayer divides a sustainable landscape into twelve “points of attachment” that humans have to the ecosystem in which we all survive. The categories are very real, and very malleable by landscape architects.

By thinking of these systems as a “give and take” we can begin to quantify our impact on the larger

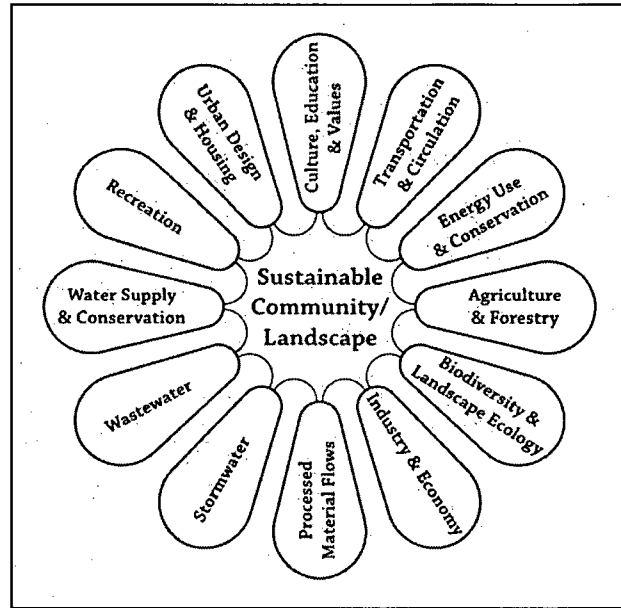


Fig. 9: Thayer's 12 components of a living system.

ecosystem. Regarding the earth's resources as savings in a bank, taking potable water and returning it in a contaminated state, for example, is a characteristic of unsustainability. The state our “borrowed resources” are returned to the earth is what we need to address through design.

Sensitive Greywater Handling *Planning Guide For On-Site Greywater Disposal Systems For Recreational and Administrative Sites* – USDA Forest Service, 1995

This publication takes a look at greywater recycling and handling at the site scale. It is aimed at recreational sites (parks, campgrounds) but many of the methods used can be applied to a residential site. It makes the caveat that the manual is not intended to provide definitive design information, rather acquaint its users with alternative methods of

greywater treatment and information supplied must be sized to fit each individual application. This manual proposes that greywater be handled on-site through dispersion and re-use. The following figure displays a cycle for greywater from use to reuse.

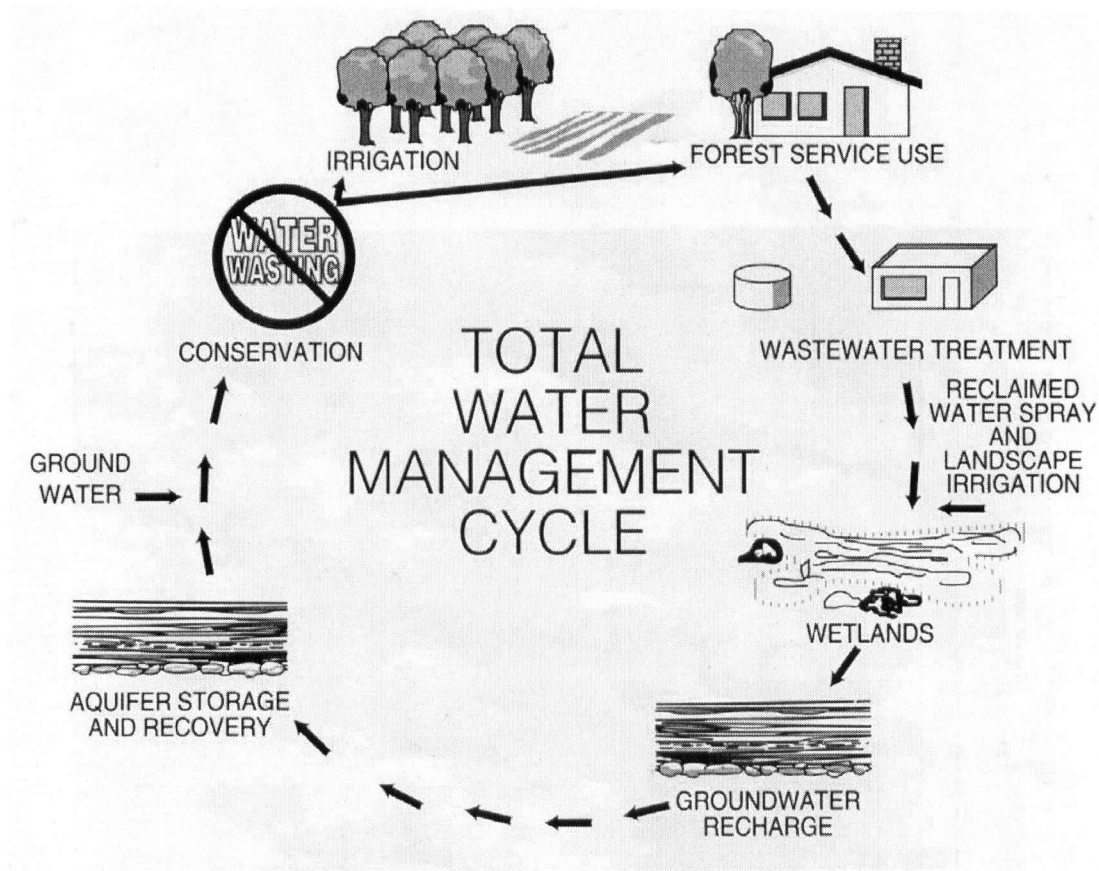


Fig. 10: Ideal wastewater management cycle.

Ten treatments for greywater are discussed. When dealing with the site/multiple residence scales, there are some options that can be immediately excluded because of space requirements. For the purpose of this graduation project, size-appropriate options are outlined below.

A) Septic tanks: “A septic tank is an anaerobic system; it separates settleable and floatable materials from wastewater, and stores and digests these materials in the same tank (USDA Forest Service 1995 p.6).” Effluent leaving the tank is dispersed underground into the soil, if soil conditions favor percolation, or into a buried sand bed if percolation rate is lower than the amount of water discharged from the tank.

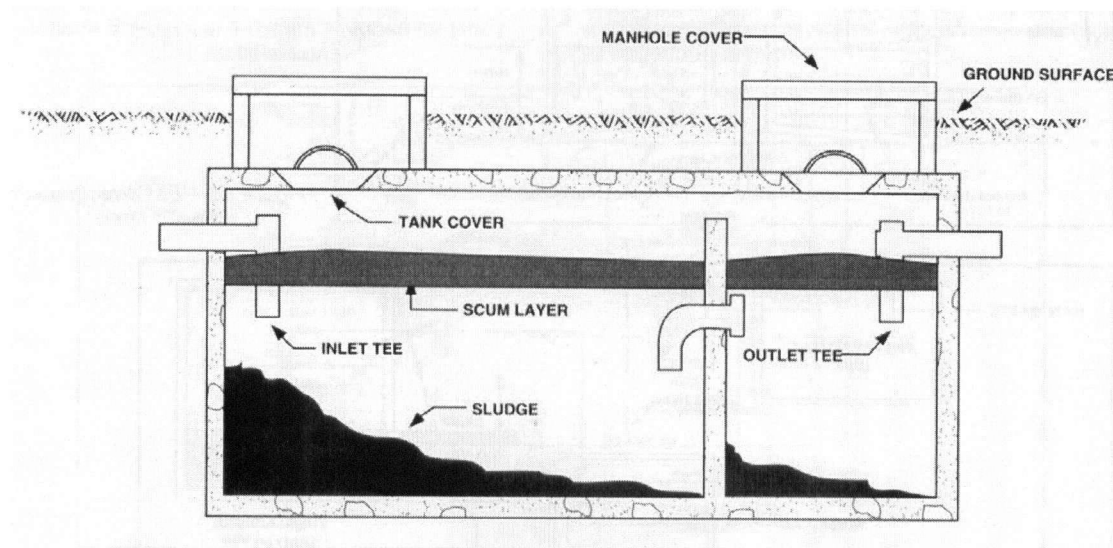


Fig. 11: Septic tank.

B) Natural or Constructed Wetlands: “Wetlands are lands where the water surface is near the ground surface for enough of the year to maintain saturated soil conditions and promote related vegetation. Constructed wetlands are similar systems specifically designed for wastewater treatment (USDA Forest Service 1995 p.8).”

A wetland at most residential sites is unfeasible due to space requirements, but if a percentage of all lots in a given grouping were used for the creating of a small but functional wetland it becomes a possibility. A wetland is an excellent treatment option for

effluent from greywater septic tanks. There are two types of wetlands being created - open water and subsurface flow. An open water wetland is the typical example, whereas subsurface flow wetlands use coarse gravel to keep water below ground. Vegetation grows through the gravel.

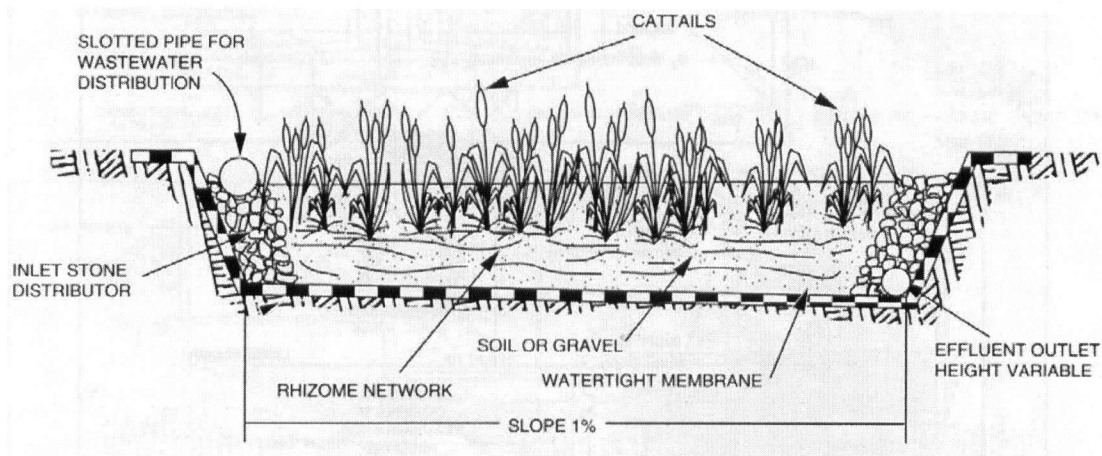


Fig. 12: Diagrammatic constructed wetland.

C) Solar Aquatic System: Solar aquatics is a process developed to mimic the natural purification processes that occur in wetlands. A typical SAS consists of several aeration tanks, followed by tanks planted with water hyacinths and willows. UV light treatment is the final stage before water is released. The process occurs in a greenhouse which overcomes the problems associated with outdoor greywater treatment in wet climates.

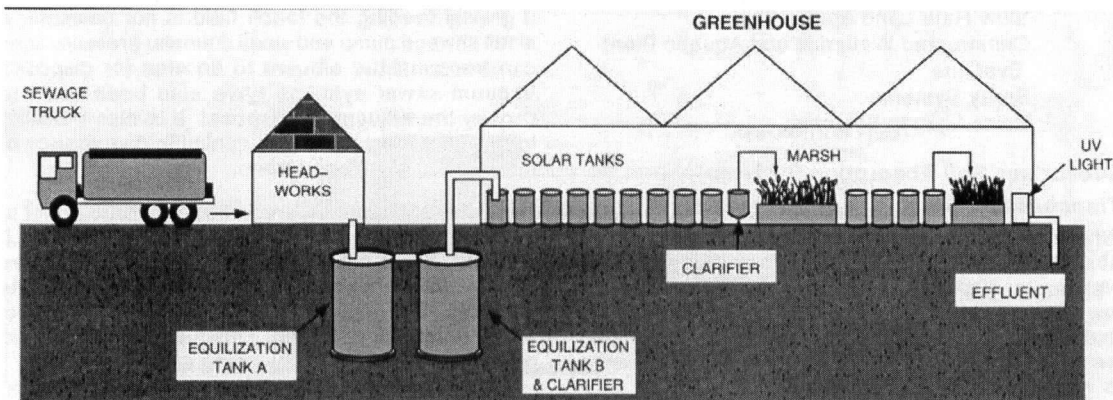


Fig. 13: Solar aquatics.

2.2: A Living Systems Approach to Residential Design

The following diagrams represent a study in how Thayer's twelve points of attachment to a sustainable landscape could be realized in form at the residential scale.

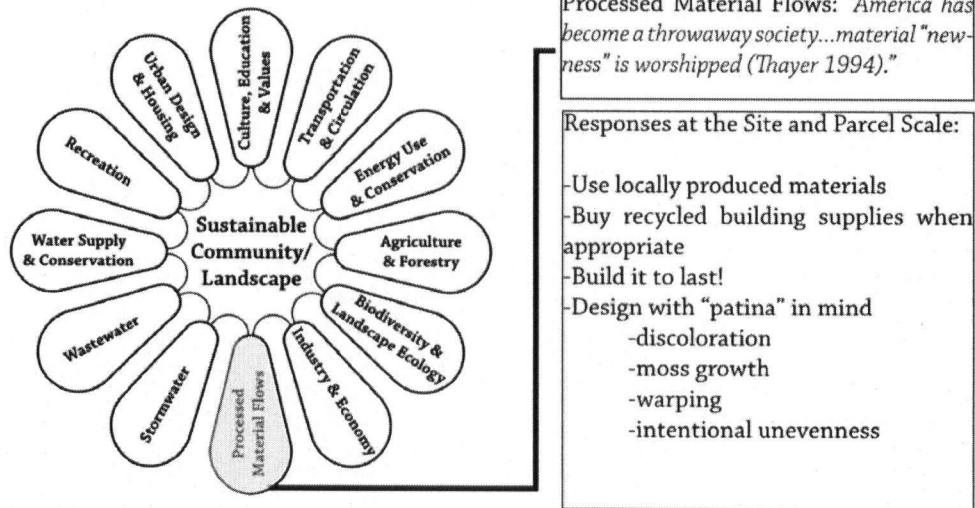


Fig 14: Processed Material Flows

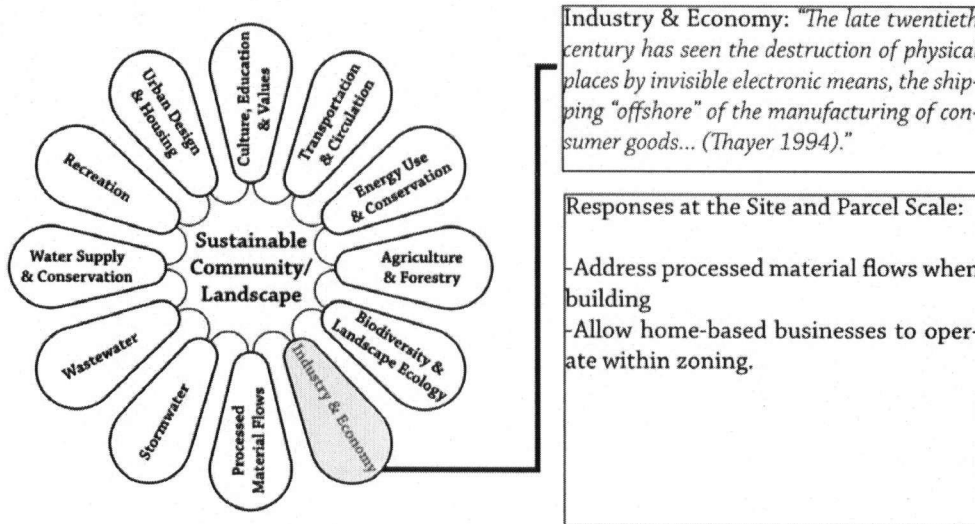


Fig 15: Industry & Economy



Biodiversity & Landscape Ecology: "We don't need more habitat preserves in the context of urban development; we need more "developer preserves" in the overall context of habitat for biodiversity (Thayer 1994)."

Application at the Site and Parcel Scale:

- Create linked habitat patches and corridors appropriate to site
- create connections to the larger context
- shoreline treatment/aquatic habitat
- stratified planting layers
- plant for wildlife feeding

Fig 16: Biodiversity & Landscape Ecology

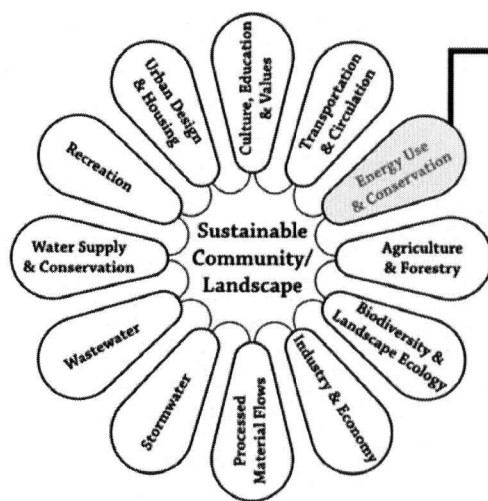


Agriculture & Forestry: "...agriculture has largely traded small scale stewardship and labor-intensive practices for megascale, mechanized operations with high inputs of chemical pesticides, herbicides, and fertilizers (Thayer 1994)."

Application at the Site and Parcel Scale:

- Produce local food
- provide "flex garden"
- green waste recycling
- Build with sustainably harvested/recycled wood

Fig 17.: Agriculture & Forestry

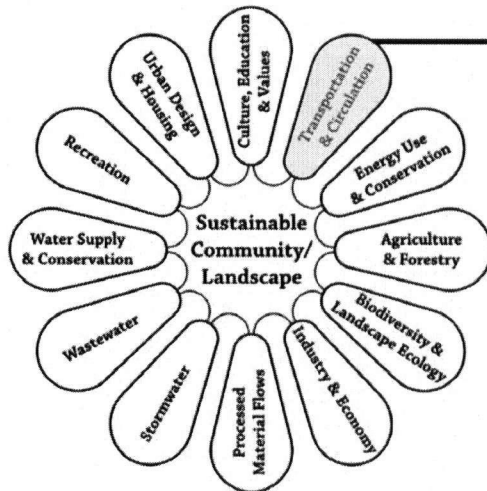


Energy Use & Conservation: "Our current addiction to vertical, nonrenewable energy is, of necessity, only temporary (Thayer 1994)."

Application at the Site and Parcel Scale:

- Situating landscape forms to allow passive heating/cooling
 - Directed windflows
 - Block/allow sun
- Utilize on-site energy capture
 - Solar panels
 - Thermal masses
 - Wind

Fig 18: Energy Use & Conservation



Transportation & Circulation: "...[North] Americans have structured their current landscape around the automobile...it has allowed us each to create our own vast, decentralized network of home, job, social activity, shopping, recreation and worship (Thayer 1994)."

Application at the Site and Parcel Scale:

- Recognize local walking/cycling routes and incorporate
 - Designated and unofficial

Fig 19: Transportation & Circulation

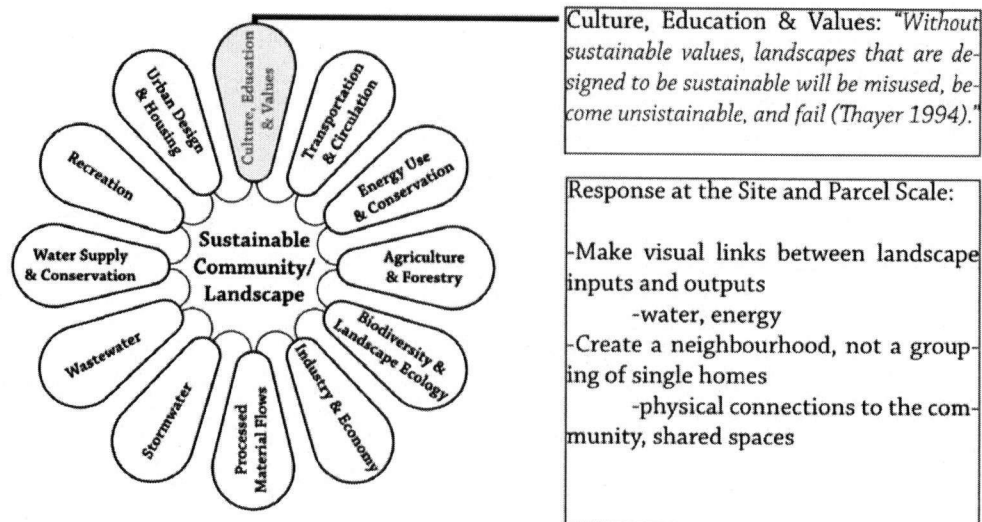


Fig 20: Culture, Education & Values

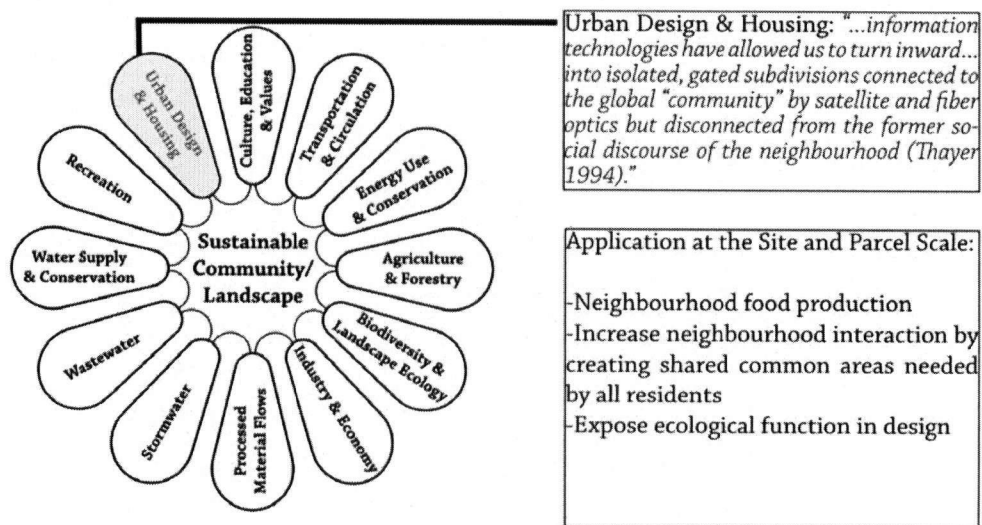
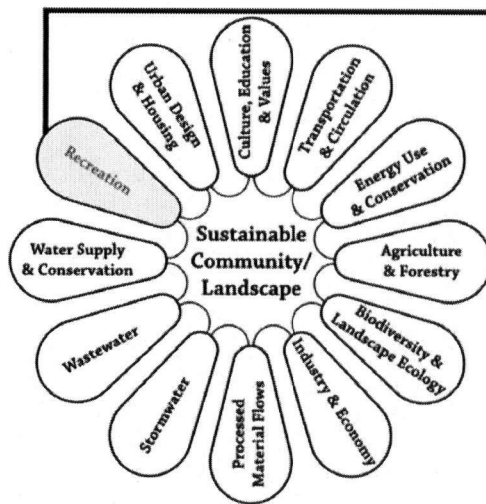


Fig 21: Urban Design & Housing

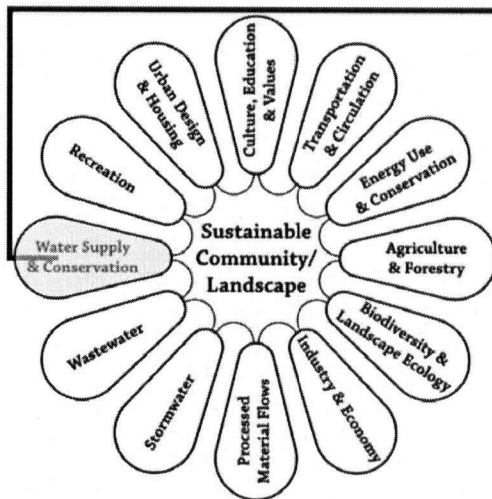


Recreation: "By recreating in these [energy consumptive] ways, we are consuming some of the earth's "body" to feed our "heads." (Thayer 1994)"

Responses at the Site and Parcel Scale:

-garden, wildlife, sleep, climb, dig, golf, sun, read, play, grow, eat, watch, grow, cycle, nature, pets, sports, swim, throw, catch, hide, wash, cook, sing, family, fire, sand, walk, build, stretch, dance, write, talk, communicate, picnic, adventure...

Fig 22: Recreation

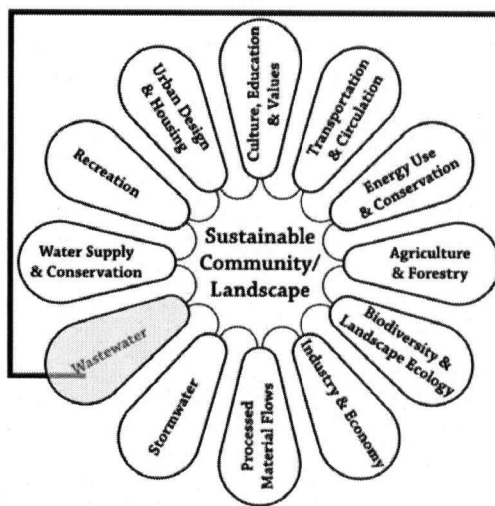


Water Supply & Conservation: "Of the water used by urban development, more than half is spent on irrigating ornamental landscapes...(Thayer 1994)"

Application at the Site and Parcel Scale:

-Irrigate with greywater!
-Infiltrate storm and wastewater on-site
-Design with a drought-tolerant plant palette
-Use efficient irrigation - drip & underground application
-Capture stormwater for re-use
-Implement a heirarchical water system

Fig 23: Water Supply & Conservation

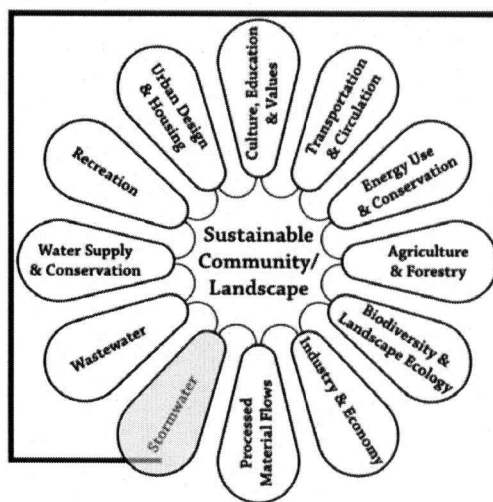


Wastewater: *"The typical technology of urban water supply and wastewater treatment take water from surface or ground sources, purify and chlorinate it to potable quality... use it inefficiently (i.e. once)...return it to sanitary sewers and process it by energy consuming means (Thayer 1994)."*

Responses at the Site and Parcel Scale:

- Filter greywater on site with septic systems, reed beds, wetlands, intermittent sand beds
- Dispose of filtered waste water through infiltration, direct discharge or interior or exterior re-us
- Reduce/eliminate chemical fertilization and pest control to improve quality of landscape runoff

Fig 24: Wastewater



Stormwater: *"The path this water takes has grave consequences, both for the ecological function of the land and for the environmental awareness and perception of the urban dweller (Thayer 1994)."*

Application at the Site and Parcel Scale:

- Reduce volume of stormwater generated by reducing hard surfaces
- Provide on-site filtration through wetlands, sand beds or reed beds
- Retain peak volumes, discharge slowly

Fig 25: Stormwater

2.3: Precedent Study: *Restrained Sustainability*

This study takes a look at a landscape in Charlotte, North Carolina which was the recipient of ASLA Merit Award in 2004. This project takes a drastically different approach to residential design than the development that surrounds this neighbourhood, located about 25 minutes from downtown Charlotte.



Fig 26: A wild backdrop behind a built landscape.

Project Profile

Landscape type: Single family residential.

Parcel size: 5 acres

Designers: Collaborative between McDonough & Partners Architects and Nelson Byrd Woltz Landscape Architects, both based in Charlottesville, Virginia.

Design Principles: Retain/enhance existing habitat.

Manage all stormwater on site, except for in extreme storm instances.

Create a trail suitable for the active owners' exercise regime.

Reduce hard/impermeable surfaces.

Blend house and landscape architecture with surrounding landscape.

Plant with a palette of native plants when possible, and non-invasive non-natives when a different aesthetic was desired.

Design Elements: Native existing landscape – left as undisturbed as possible during the construction phase.

Trail system winding through wooded portion of property.

Fern meadow.

Pea-gravel entry court, gravel drive.

Swimming pool.

Accent wall – built from the same native stone as is the house foundation.

This project was successful in building a human-inhabited landscape that treads lightly. They were able to accomplish most of their design goals. One concession that was made was stormwater processing – they were successful in all but extreme storm events. The decision to allow a certain amount of runoff was made to avoid building detention ponds and disturbing the existing vegetation. The materials palette was mostly native, and amenities for exercise were incorporated. This landscape displays a restrained approach to sustainability: human aimed elements were built around ecological function.

2.4: Design Evaluation Criteria

The intent of this thesis project is to compare a traditional approach to high-budget residential design against one that adopts the same design aesthetic, but builds with the intent of creating a sustainable condition. Evaluation will be on a comparative basis – both quantitative and qualitative.

The following factors will be compared from the standpoint that we are attempting to achieve a landscape that reduces environmental impact, increases ecological function and provides a built form appropriate to the neighbourhood and scale of project.

- 1) Impermeable Surface – Amount comparatively.
- 2) Habitat Patch Creation – Presence and amount.
- 3) Habitat Corridor Linkages – Presence.
- 4) Stormwater Filtration – Presence & description.
- 5) Greywater Purification/Reuse – Presence and amount generated vs. amount handled on-site.
- 6) Passive Heating/Cooling – Presence and description.
- 7) Materials – Source and lifespan.
- 8) Construction Techniques – Energy required to rebuild.
- 9) Green Waste/Manure – On site composting facilities/potential to use.
- 10) Potable Water Use – Amount.

Chapter 3

Site Inventory & Analysis

3.1 General

This site is approximately an eight acre parcel which has been subdivided into twelve lots. None of the previously existing buildings or landforms have been saved – the site is to be completely demolished and rebuilt. As such we can make some key assumptions:

- Soil conditions will be changed to allow the landscape plants to grow.
Remediation has already been completed on the site – contamination is not an issue.
- Any previously existing wildlife populations have been displaced.
- Hydrology has been disturbed.

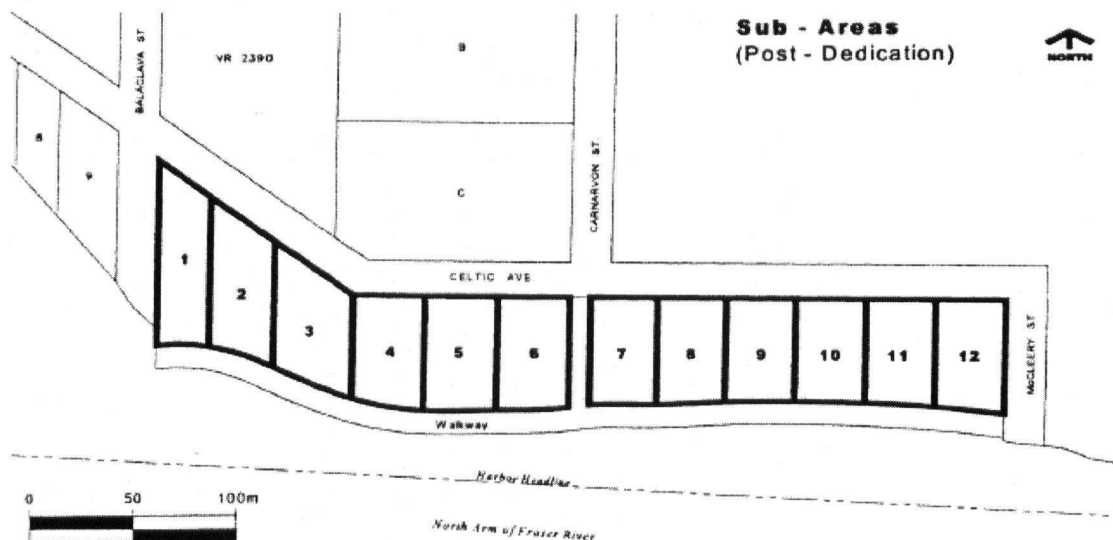


Fig 27: Subdivision of lot post-approval.

3.2 Adjacencies & Connections to the Community

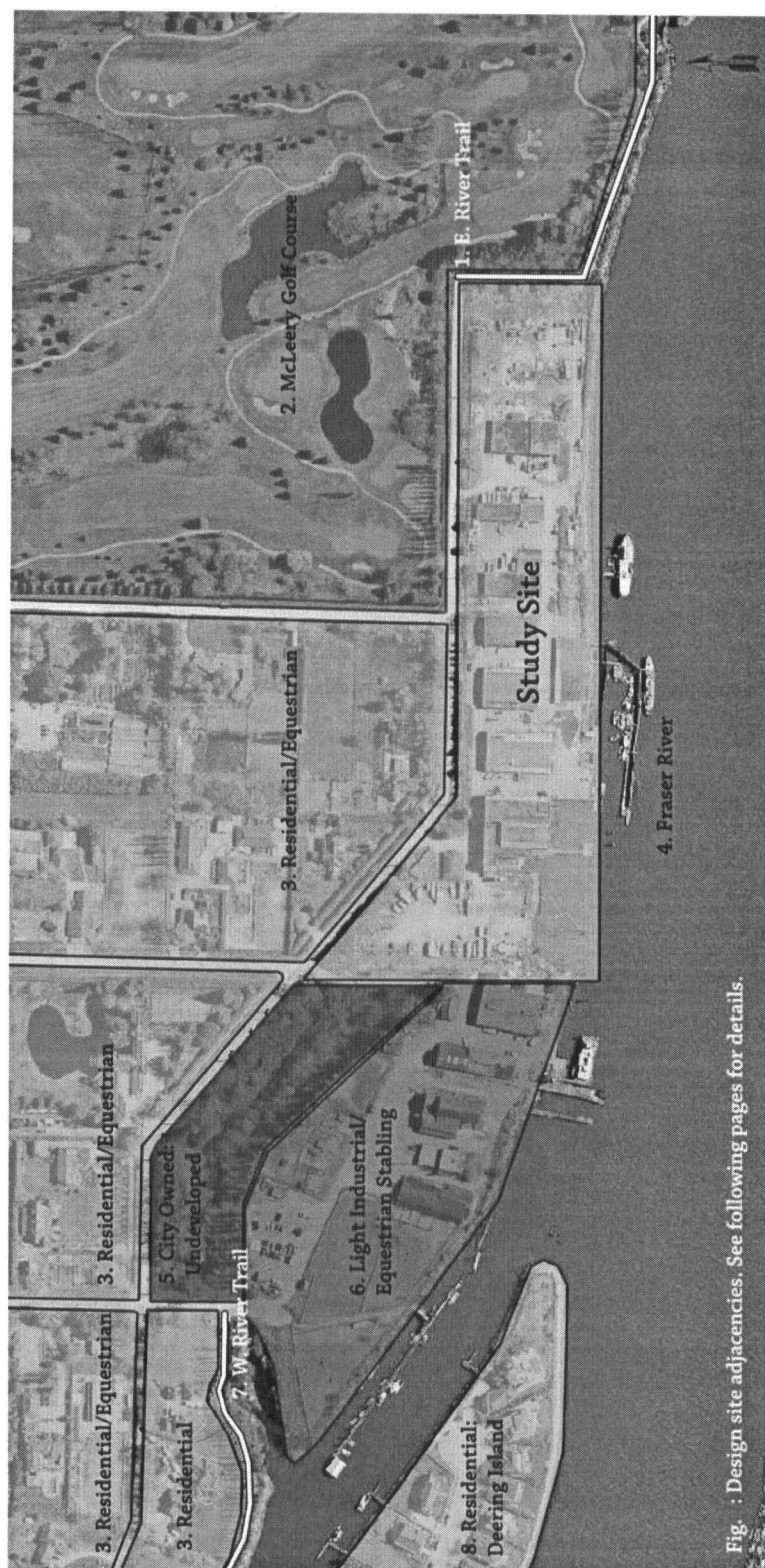


Fig. : Design site adjacencies. See following pages for details.

Fig. 28: Design site adjacencies.

1. East River Trail



Fig. 29: The East River Trail entrance.



Fig. 30: An existing marsh.

There are two trail systems in Southlands – the East and the West River Trails. The East Trail begins at the eastern-most edge of the site, in a narrow strip of land that separates the design site from the McCleery Golf

Course. This trail begins at the

end of Celtic Avenue, although with the proposed development, the trail will continue along the Fraser River. The entrance to the trail is poorly marked, and the trail itself comes to a dead end a few hundred feet in. The study site will provide a vital piece in linking the East with the West Trail systems.

This site shows potential for hedgerow and other linear type habitat patches, and could function as a corridor. There is an existing small marsh separating the trail entrance from the design site.

2. McCleery Golf Course

Separated from the design site by Celtic Avenue and a row of Lombardy Poplars, this course accounts approximately 200 acres of open space in Southlands.



Fig. 31: McCleery Golf Course.

Habitat value is severely compromised, but there is potential to enrich the edges and some interior spaces. Working with the edges of the design site, this may become a piece of a larger Southlands habitat network.

3. Private Residences with Equestrian Facilities

Southlands is recognized as Vancouver's Equestrian Center. It is zoned RA-1, which is primarily a single-family residential zoning, but makes allowances for small-scale agricultural operations, including nursery based businesses, and equestrian stabling and locally-aimed tack



Fig. 32: "Farandaway Farm." Agricultural/Residential development in Southlands is the norm.

shops (Southlands RA-1 Guidelines 1992).

“The major intent of the guidelines is to ensure that new development will maintain and enhance the prevailing semi-rural character. As redevelopment occurs, it is essential that this character is not compromised. Semi-rural character is created by an assemblage of design elements such as expansive vistas, equestrian functions, open pastures and informal landscaping along the side edges (Southlands RA-1 Guidelines 1992 p.1).”

The character of local developments has adopted these guidelines. The buildings are reminiscent of rural farmhouses with a modern twist, with one exception, which is heavily screened from the road. Most houses have large expanses of open land, devoted to equestrian activities. The neighbourhood has many open ditches; there are no curbs and hedging walls are uncommon.

4. The North Arm of the Fraser River

As mentioned in Chapter 1.4 – Regional Context, The Fraser River is an essential piece of the ecological function of the Lower Mainland. Development along this waterway has the potential affect much more than local fish, bird, and plant species. The implication of the site of having such a waterway, immediately at the site border, include incredible habitat creation and enhancement options, water discharge options, predicable wind flows (see section 3.3) and recreation alternatives.



Fig. 33: The Fraser River as seen from the East River Trail.

5. City Owned Land Parcel

This piece of land is divided into 8 lots but is currently undeveloped. There is an underground, piped connection to the Fraser River that was once an unobstructed slough. As such, there is a dead-end water channel on this land. Habitat potential is high here, although there are well-established populations of non-native invasive plants, such as



Fig. 34: Undeveloped city-owned land parcel.

English Ivy, Japanese Knotweed and Blackberry. Even in its degraded state, visits to this site have always included hearing and seeing more birds here than anywhere else in the local area. There is an unofficial path beaten through the middle of this parcel.

This site has huge potential to be a key piece in the connection of the two disjoint trails systems in Southlands. With the development proposing a river-front trail connecting to the East River Trail along the site, this tract of land makes perfect sense to become an official woodland walk. Officially designating this land as part of the trail system may increase the community's sense of ownership, thus fostering a sense of stewardship.

6. Light Industrial/ Equestrian Stabling

Immediately adjacent to the site is a mixed-use complex. Former boat-building facilities have been taken over by local craftspeople and currently house a custom furniture builder, among other unmarked shops. On the north edge of this parcel is a horse stable and some



Fig. 35: One of the shops operating from this site.

exercise fields. Acquisition of a small piece of this site would be a required for the connection of the East and West River Trails.



Fig. 36: Horse stables/exercise paddocks

7. West River Trail

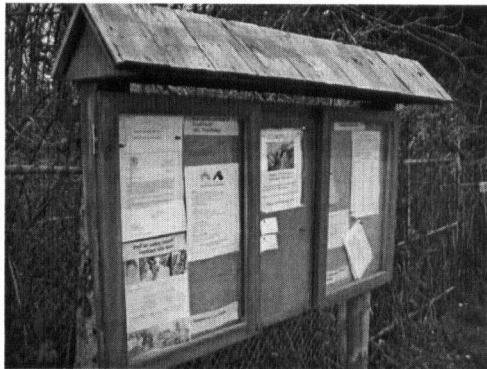


Fig. 37: A community bulletin board at the entrance to the West River Trail

This is the second of two trail systems in Southlands. It begins at the foot of Blenheim Street and travels eastward along the edge of the Fraser River and skirts the south edge of the Point Grey Golf Course.

8. Deering Island Place

Deering Island is an example of the type of development the Southlands Community has collectively decided is inappropriate for their neighbourhood. Small lots, short setbacks and high density characterize the homes built on this small protrusion of land. There are no provisions for agricultural land use or



Fig. 38: Looking toward Deering Island from the site.

equestrian activities. Deering Island Place is, for all intents and purposes, a gated community. The shoreline has been reinforced with rock and concrete and holds little to no habitat value. The westernmost tip of this landmass, however, hosts a manmade marsh that has been touted as being well-built and ecologically sound.

The design site exchanges views with Deering Island. The views from the site to the island are not offensive, but do look upon the homes and small yards of the development. There are few implications of the proximity of this housing development on the design site save for it exemplifying what the surrounding community does not want. Filtering and/or screening views to Deering Island from the study site will be considered in the design.

3.3 The Site

Exposure

The site is south-facing. As such it receives full sunlight. Shade will be expected on the north-sides of buildings, structures, and significant plant masses. The following diagrams display solar angles for a typical day mid-summer (July 24) and mid-winter (January 21). This data allows a design to be created that accounts for allowing passive solar gains during the cold season and blocking unwanted solar rays in the summer. The implications on energy use in the residence are significant.

Sunrise July 24: 5:33am	Sunset July 24: 9:04pm
Sunrise Jan 21: 7:57am	Sunset Jan21: 4:50pm (Thorson, 2005)

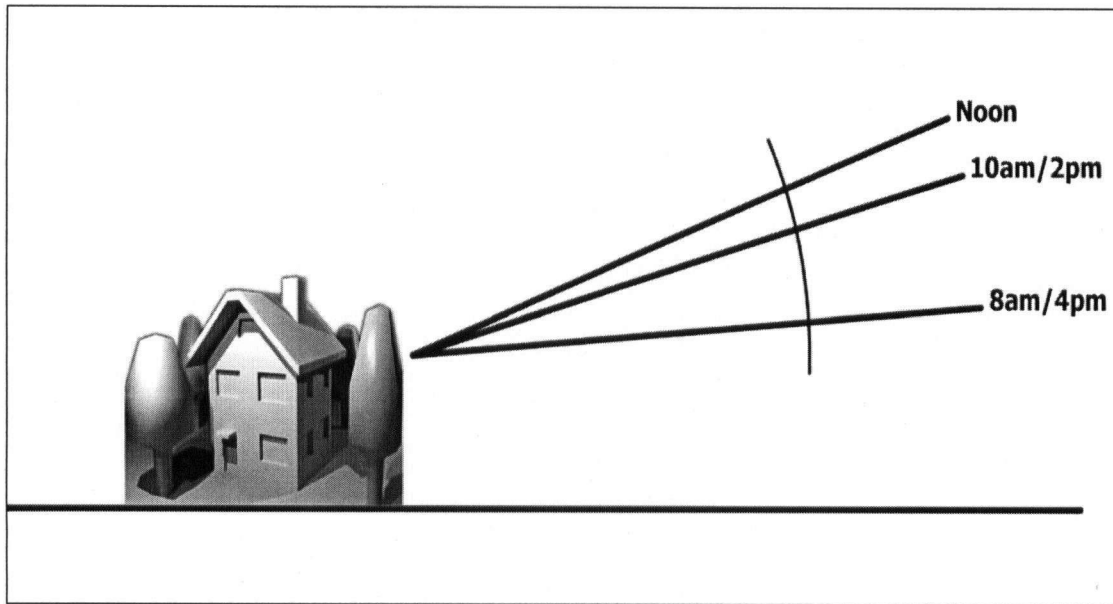


Fig. 39: Sun angles mid-winter (January 21) in Vancouver

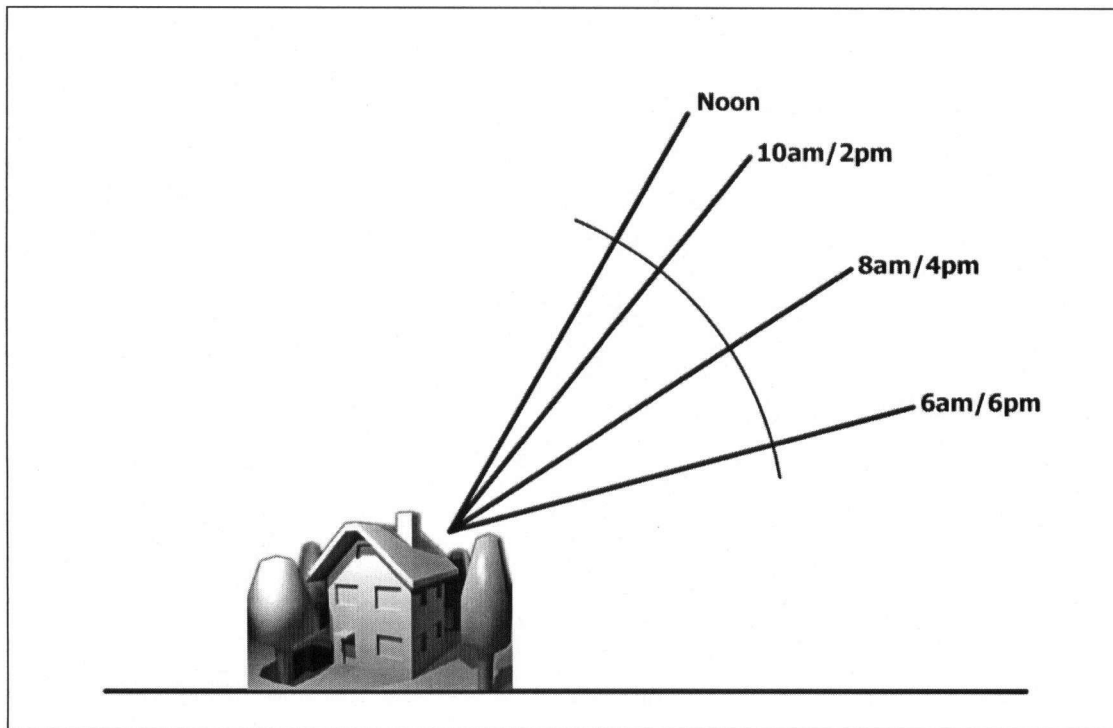


Fig. 40: Sun angles mid-summer (July 24) in Vancouver.

Site Zoning

Unlike the surrounding land parcels, the study site is zoned CD-1 which is unique to the Celtic Avenue development parcel. Zoning regulations are similar to RA-1 and allow equestrian activities, but not other agricultural uses. Setbacks are clearly defined, as are building envelopes and floor space ratio limits (464.5 m² per dwelling). Stabling is allowed, with a maximum of four stalls per lot. *See attached appendix CD-1 (448) City of Vancouver Zoning and Development By-Law for a complete description of CD-1 zoning.*

Wind Trends

By having knowledge of wind flows at this site we can begin to design accordingly. Passive cooling can be enhanced by directing flows to the building, while heat-robbing winter winds can be denied access to the home's exterior. Outdoors, strong winds can be redirected and lessened so patio spaces have a gentle cooling breeze.

Along this the Fraser River, summer winds generally travel upstream during the day and downstream during the night due to different gradients between ocean water and land temperatures. At the site scale, this equates to westerly winds in the daytime and easterly at night. Wintertime trends are predominantly cold easterly windflows. This effect is caused by cold Alaskan air moving into Central British Columbia, which then exits to the ocean through valleys and fiords, the Fraser River Valley being one of those (Jackson 2004).

Precipitation

The following chart displays yearly precipitation levels for the Vancouver International Airport. Given the proximity to the airport, it is assumed that precipitation levels are similar to those at the design site.

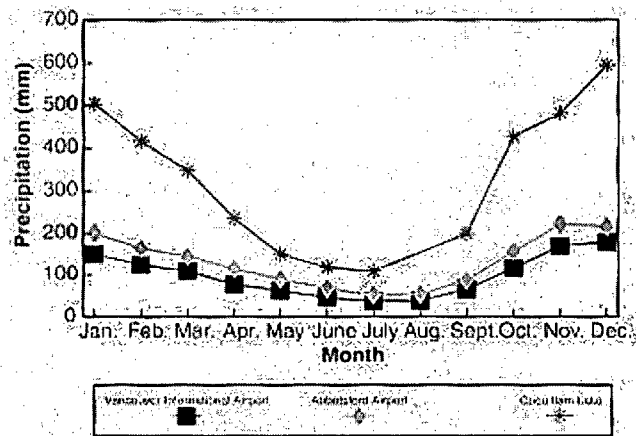


Fig. 41 (above): Monthly average precipitation (1961-1990) at Vancouver International Airport represented by black squares (Jackson 2004).

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
mm	145.7	121.4	102.3	69.2	55.8	47.1	31.3	37.0	59.6
inch	5.7	4.8	4.0	2.7	2.2	1.9	1.2	1.5	2.3
	Oct	Nov	Dec	Year					
mm	116.3	154.6	171.5	1107					
inch	4.6	6.1	6.8	43.6					

Table 1 (above): Monthly average precipitation (1937-1990) measured at Vancouver International Airport in mm and inches (Hoare 2005).

3.4 Developer's Proposal Inventory

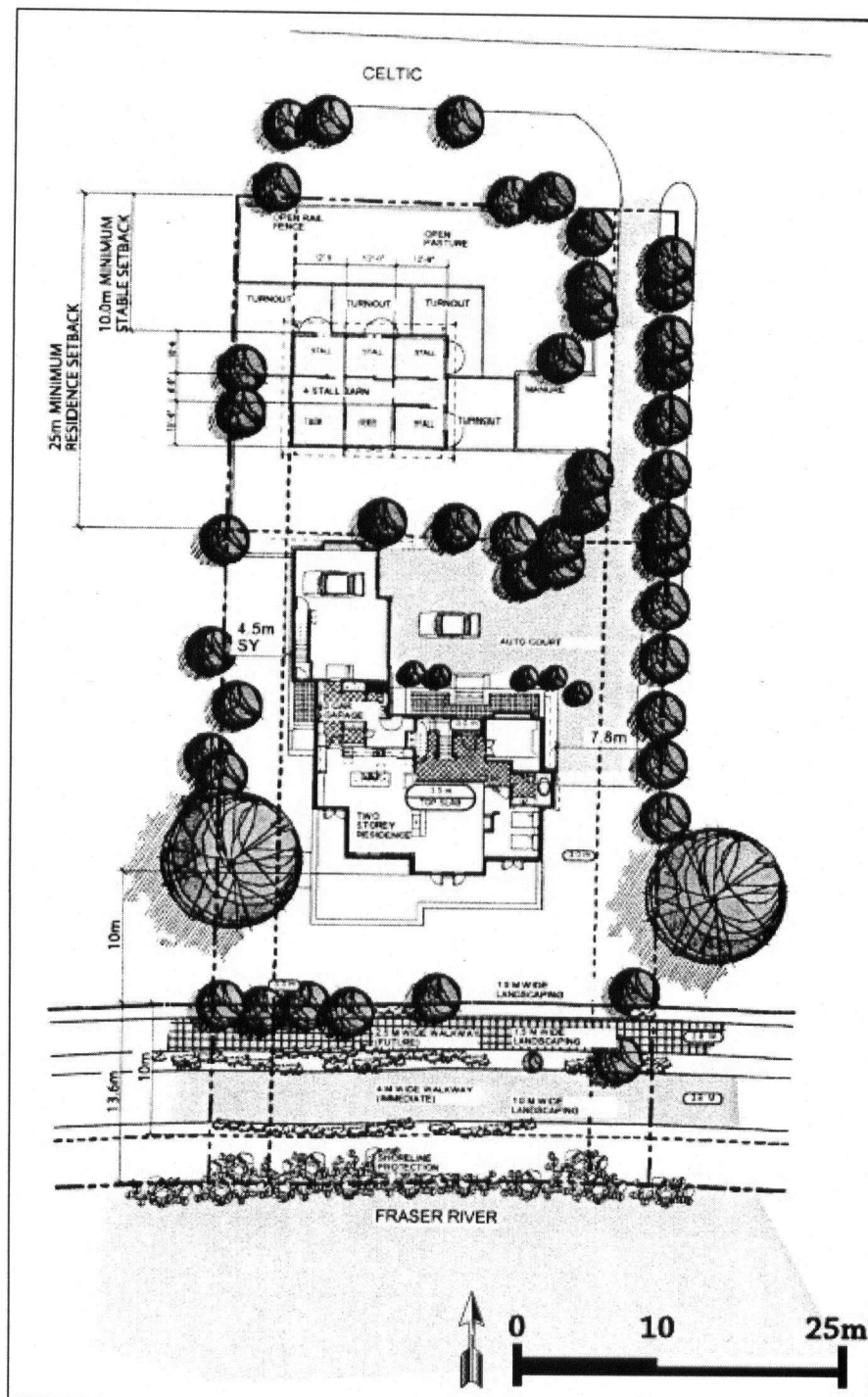


Fig. 42: Typical site plan illustrating building footprints, yard setbacks, and pedestrian/equestrian pathway.

To successfully compare and contrast the design solution proposed in this graduation project against the plans of the developer, goals and objectives are needed. Achieving the goals outlined in section 1.2 require evaluation criteria (section 2.4) and data that can be used in the comparison of the project design solution vs. the plans of the developer. The following is the baseline data required to compare these two designs:

Lot Size: 2450m²

Building Footprints: 300m² House
98m² stable
Total 398m² – 16% site coverage

Hard Surface*: 143m² stable turnouts/manure storage
87m² patios
375m² driveway + turnaround
200m² Immediate and Future walkway space on public pathway
Total: 805m² – 33% site coverage
**Hard surface is defined as a surface treatment that allows little or no infiltration (concrete, pavers, compacted road-base type gravel).*

Public Land Donation: 435m²/Lot – 18% site coverage
Includes shoreline treatment, an immediate walkway installation, a future walkway and “landscaping.”

Habitat Types Represented On Site: “Shoreline Treatment”

Habitat Area: 155m² – 6% site coverage

Equestrian Uses: 535 m²/Lot – 22% site coverage

Unpaved Area: 1203 m² – 49% site coverage

Greywater processed on-site: None

Chapter 4 Design Solutions

4.1 Design Alternatives

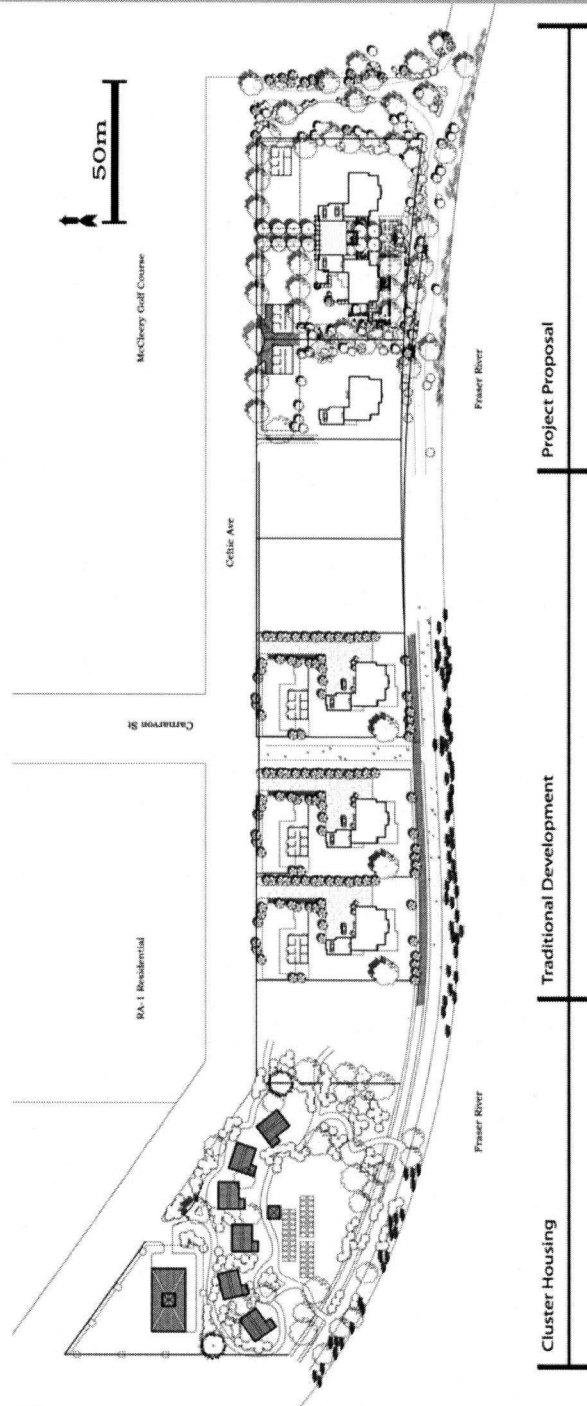


Fig. 43: Three approaches to land development.

Three alternatives were examined for this site:

Cluster Housing: These developments are characterized by shared greenspace, homes oriented off-the-grid, smaller yards and pedestrian-aimed streets. The most famous example of cluster development was completed in 1981 - Village Homes in Davis California. Village Homes has fewer vehicles, a higher resale value and longer ownership rates than the surrounding neighbourhoods. It consists of 242 dwellings on sixty acres with energy efficient homes planned around public productive greenspace (Francis, 2003).



Fig. 44: Village Homes, Davis, California.

Although cluster development offers many benefits, it is not an appropriate choice for this project. The Southlands community has collectively decided through public process what is and is not fitting character for new development in their neighbourhood (see zoning appendices). This type of development does not follow zoning requirements for the development parcel and does not meet the requirements for character of place as decided by the residents Southlands.

Traditional Development: The second option explored is the traditional treatment for a development like this. Figure 43 illustrates, in fact, the plan the city of Vancouver has approved for this site.

Traditional landscape treatment is exactly what this project is taking a stand against – landscapes that are characterized by resource overuse and a complete ignorance of ecological function.

Project Proposal: This third scenario is a real-world situation in which the landscape architect is brought on-board after the zoning has occurred, the architecture designed and construction started. This option works mostly within the zoning proposed for the site and makes no major changes to the building architecture. The intent of this design is to show that through intelligent design, a sustainable landscape can take any form – even a very formal one.

4.2 Site Plan

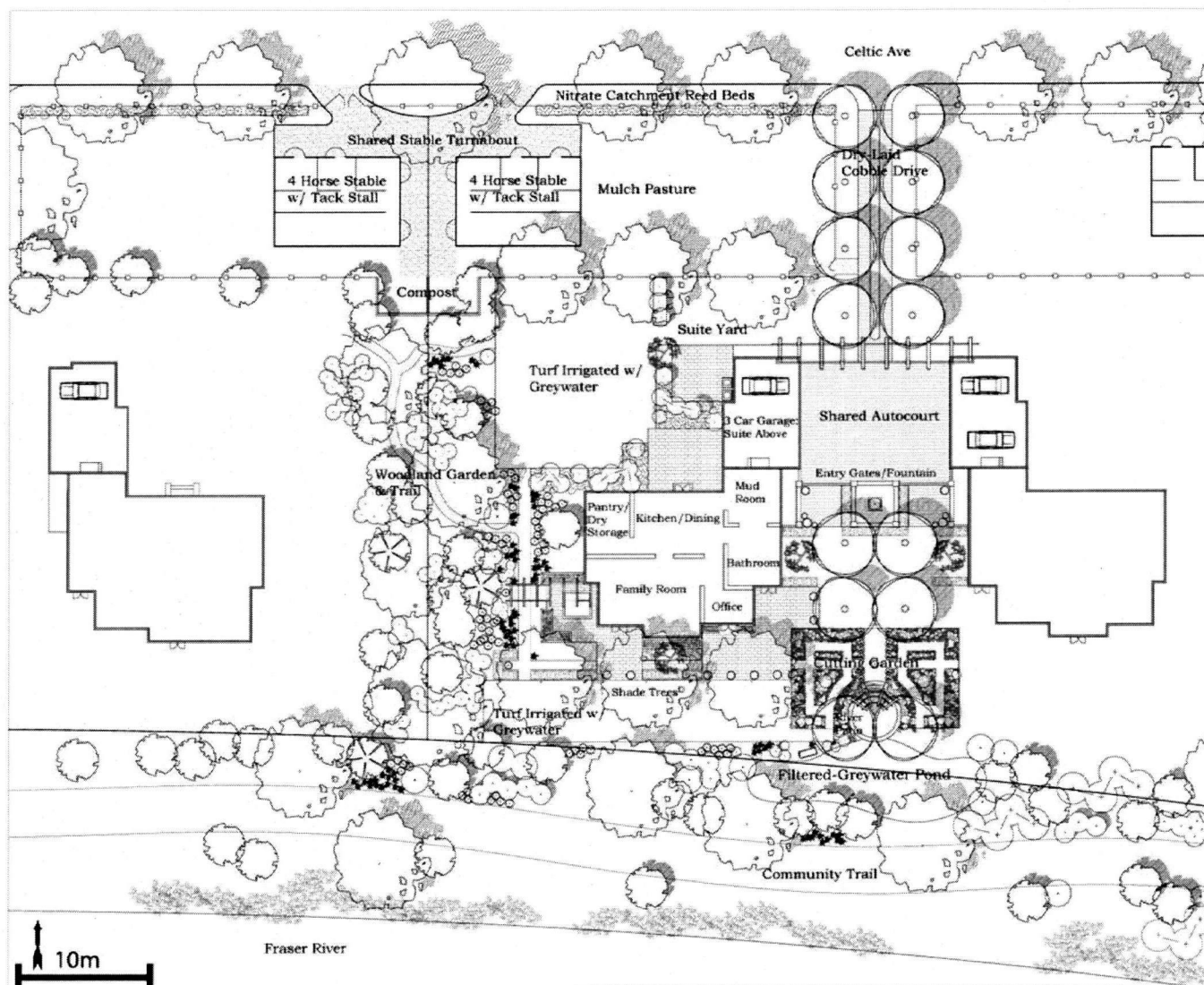


Fig. 45: Site plan.

This design demonstrates improvement over traditional design in six major areas:

1. Hardscape Reduction & Improvement: Hard surfaces are the most energy-intensive elements of a residential design. To reduce hardscape in the study site landscape, a grouping of function is proposed, allowing one landscape feature to service two lots.

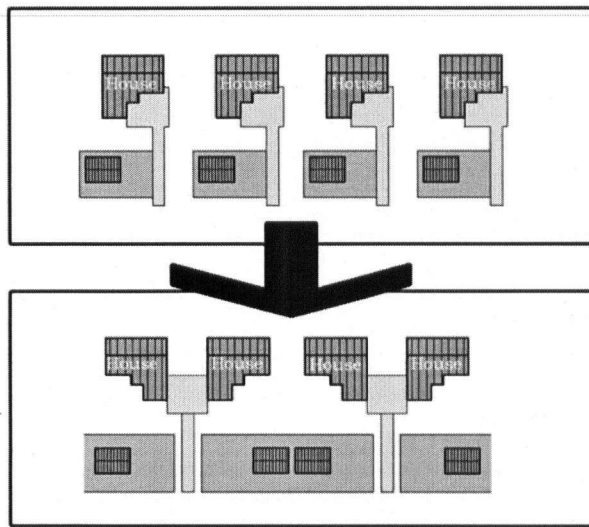


Fig. 46: Lot layouts. Developer's proposal above, project proposal below.

This design proposes one driveway and autocourt be shared between two residences. For this to work, every second residence would be mirrored along the North-South axis so the garage doors face each other (Fig. 46). This move alone reduces auto-oriented hard surface by 50%. An additional benefit is the

appearance of fewer entry points from Celtic Avenue – a move that will surely be appreciated by the community.

This grouping of function creates a consolidated pasture space around two adjacent stables with room for a shared two-chamber compost system along the property line.

Where hard surfaces are desired, a simple shift in materials and construction practices makes a substantial difference in its impact on sustainability. Natural stone represents a material that literally lasts a lifetime in the landscape. Installing stone pavers and cobbles

on an aggregate bed instead of mortared on a concrete slab accomplishes two things: 1) Maintenance is simple – in the case of heaving or settling, a landscape professional can lift and re-set the stones with a small investment of material and time. When concrete heaves, the only solution is to remove and reinstall. 2) Stormwater is allowed to infiltrate – especially in dry-laid cobbles due to the .25-.5” gap left between cobbles. Specifying local stone means energy involved in transportation is significantly reduced as compared to imported material.

When concrete is necessary, as in the case of footings and pilings, recycled concrete has been specified. Concrete is 70-80% aggregate by volume. Using crushed recycled concrete *as* the aggregate means this material is diverted from the landscape and no additional mining of finite materials (gravel) is necessary. The fine aggregate (sand) used in concrete can be replaced with glass that is not recyclable—windows and fluorescent light tubes.

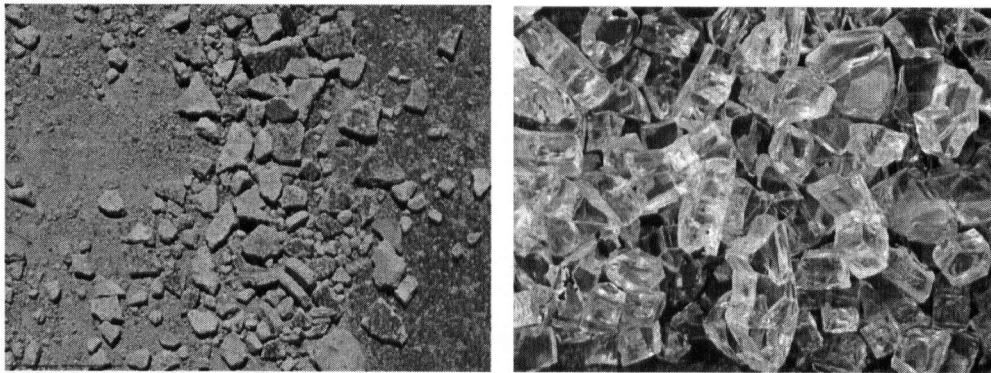


Fig. 47: Recycled concrete & glass replace up to 80% volume of new concrete.

Materials Palette: Hard materials were selected to not only do effectively do the job they were specified for, but for longevity, reusability and locality. The palette was created with visual unity in mind—few material types, many variations of form.

Paving and wall stones are a combination of basalt and granite. These are both quarried locally, readily available, and look great together. These are available from Northwest Stone and Landscape Supply in Burnaby, British Columbia.

Lumber is primarily cedar. Reclaimed beams from the demolition of the original structures on the study site are available in Port Coquitlam at Litchfield Demolition and sustainably harvested lumber from the eco-lumber co-op in Richmond, British Columbia have been specified. Cedar was chosen for its local availability and natural rot-resistance.

Concrete unit-pavers have been used in utility areas. Concrete pavers represent an intelligent answer to the problem of concrete heaving and cracking. These pavers are installed with the same construction practices as natural stone pavers. They are reusable, easily maintained and locally produced.

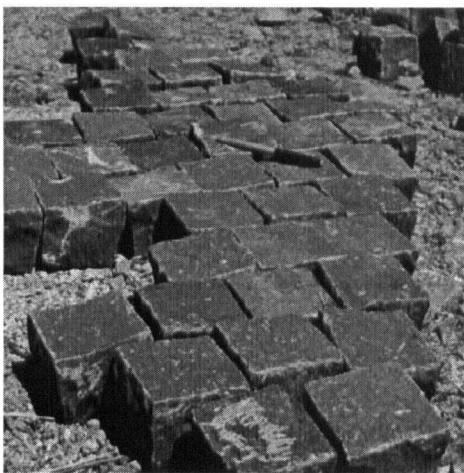


Fig. 48: Basalt.



Fig. 49: Recycled timbers.



Fig. 50: Granite.



Fig. 51: Concrete unit pavers.

Storm and Greywater: This design boasts 100% on-site handling of storm and greywater. The study site's proximity to the Fraser River, combined with a naturally high water table in Southlands, means the greatest challenge in water handling is filtration.

Greywater passes through five stages, beginning with generation within the home. Water from sinks, showers and laundry machines is routed into exterior reed-beds. These beds are raised planters, granite block capped with basalt, positioned at the edges of patio spaces. Impurities are biologically filtered from the water, which are largely of an organic nature to begin with. These reed-beds discharge to an underground septic tank where further anaerobic decomposition of contaminants occurs. This sump is used to maintain the level of the pond, located at the southernmost edge of the property. During the summer months, water is drawn from this pond to irrigate the ornamental landscape. A simultaneous recharge from the underground sump maintains the water level in the pond.

In the winter months when the landscape plants are dormant, purified greywater is slowly discharged from the pond into the Fraser River.

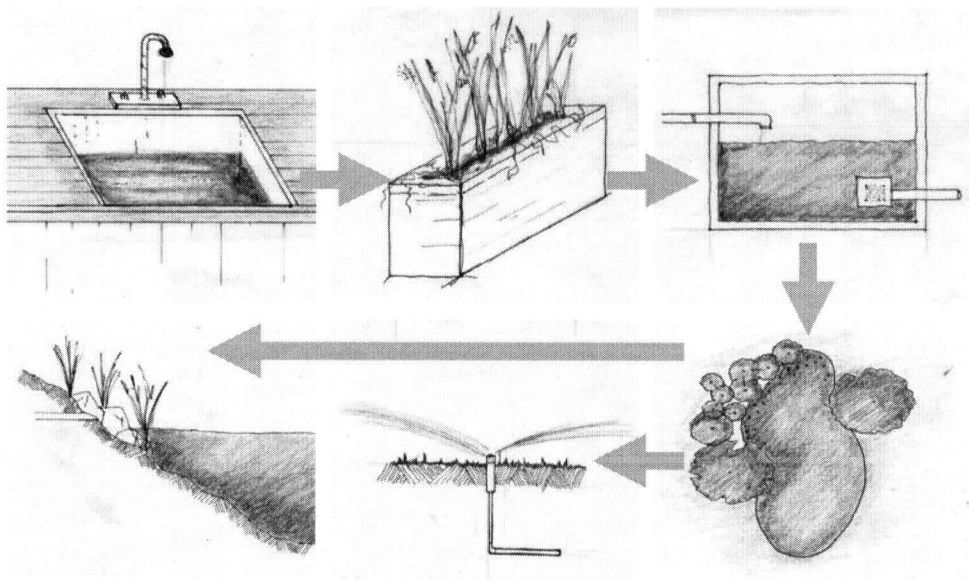


Fig. 52: Greywater cycle.

In an equestrian community such as Southlands, nitrate contamination of groundwater

from horse waste poses a challenge.

The solution to this problem is three-fold in the proposed design.

Nitrogen can be prevented from leaching by being held in a substrate high in carbon. Wood chips provide an excellent pasture surface, are a by-product of wood-milling, are readily compostable

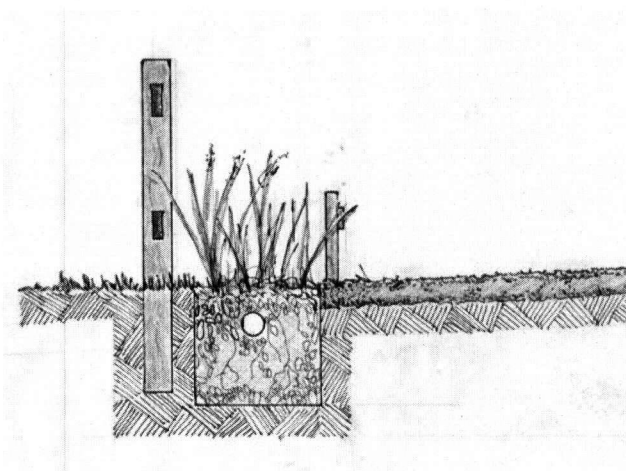


Fig. 53: Nitrate catchment.

and are nearly completely carbon. In long rainfall events, some runoff from the pastures may still contain elevated levels of nitrogen. This rainfall is caught in a channel at the

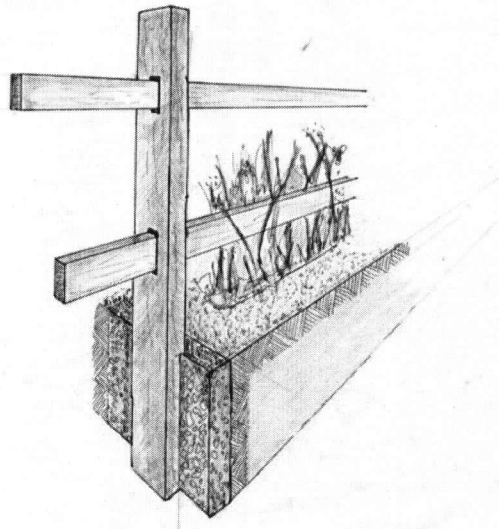


Fig. 54: Fence construction.

pasture/street interface and is filtered by native grasses. These channels discharge to an existing marsh at the east end of the development parcel. This marsh discharges to the open drainage ditches already existing in Southlands and, eventually, to the Fraser River. The fence that borders the pasture is constructed from sustainable yield cedar set in a base of broken concrete aggregate.

Passive Heating/Cooling: There are two major moves in the landscape that can have a positive impact on energy use within the house: solar manipulation and windflow

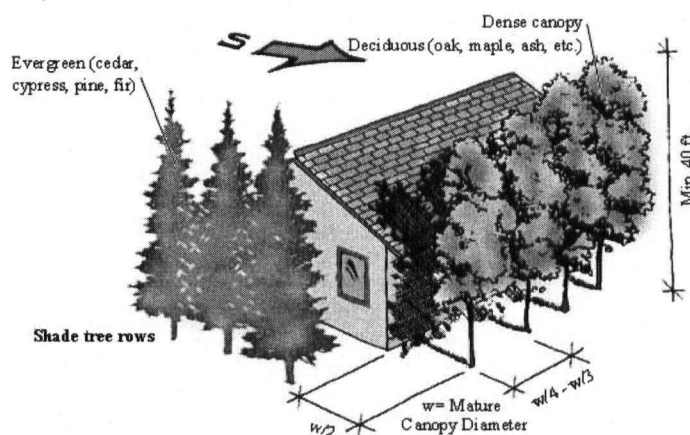


Fig. 55: Passive solar design (USDE 2000).

directing. Using deciduous, broad-canopy trees, creates a situation where hot summer sun rays are intercepted by the foliage, and warming rays are permitted to pass to the house in the winter when

the tree has dropped its leaves. In the project proposal, a line of shade trees across the south-facing portion of the house accomplishes this.

Considering windflow in design allows us to create a landscape that not only makes outdoor spaces less or more windy, but to direct cooling breezes into the home in the summer and divert cold wind in the winter. Wind currents along the Fraser River generally travel upstream (west at the study site) during the summer, and downstream (east) during the winter (refer to section 3.3). The study site acknowledges this site-specific wind trend and addresses it through plant massing along the river shore. Plants are placed at an angle to catch cooling summer winds and direct them inshore, while redirecting cold winter winds coming from the east.

Habitat Connectivity & Creation: The study site sits between two major greenspaces (McCleery and Point Grey Golf Courses), faces numerous smaller greenspaces (hedgerows at field perimetry) and fronts on the Fraser River. This design proposes a linear habitat linkage along the community trail. An opportunity to create habitat patches on the design site presents itself along the property lines. A woodland garden creates separation between adjacent properties, gives a regionally appropriate planting scheme and offers shelter to the hundreds of thousands of birds that use the Pacific Flyway.

The planting scheme in the woodland garden and along the community trail has been adapted from the climax plant association normally occurring on this site; Black Cottonwood Forest.

Community Fit: The design parcel offers the chance to connect Southland's two disjoint trail systems: the East and West River Trails. The project proposal follows the designer's lead and incorporates the waterfront as a community trail. Access to this trail occurs at the east and west ends of the parcel, as well as a right of way through the center as an extension of Carnarvon Street.

Character of development has been carefully considered to match surrounding agricultural-themed landscapes. A split-rail cedar fence defines the edges of equestrian pasture, just behind a row of trees lining the street. No curbs have been used, stormwater is directed to the existing open ditches after being filtered, and open front-yard vistas have been created.

4.3 Design Details

Details, in this instance, illustrate an attention to landscape design as it relates to sustainability. Details were chosen for their relation to water handling, habitat creation, passive solar gains, and aesthetic appeal.

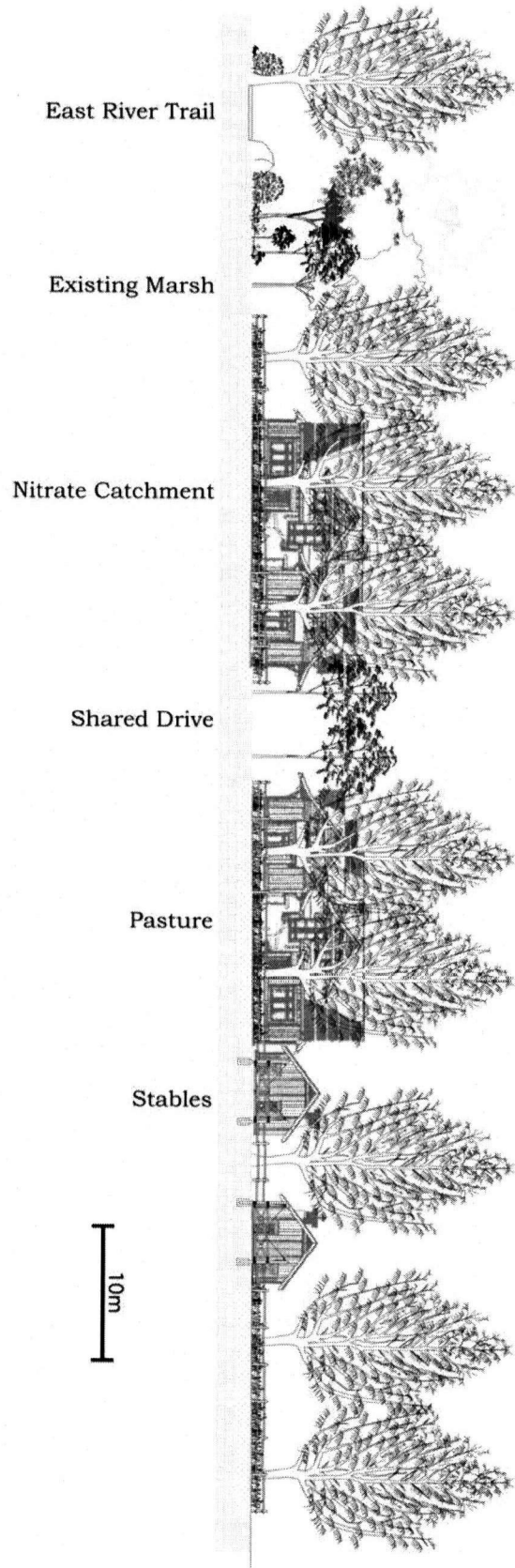


Fig. 56: East-West property elevation from Celtic Ave. looking South

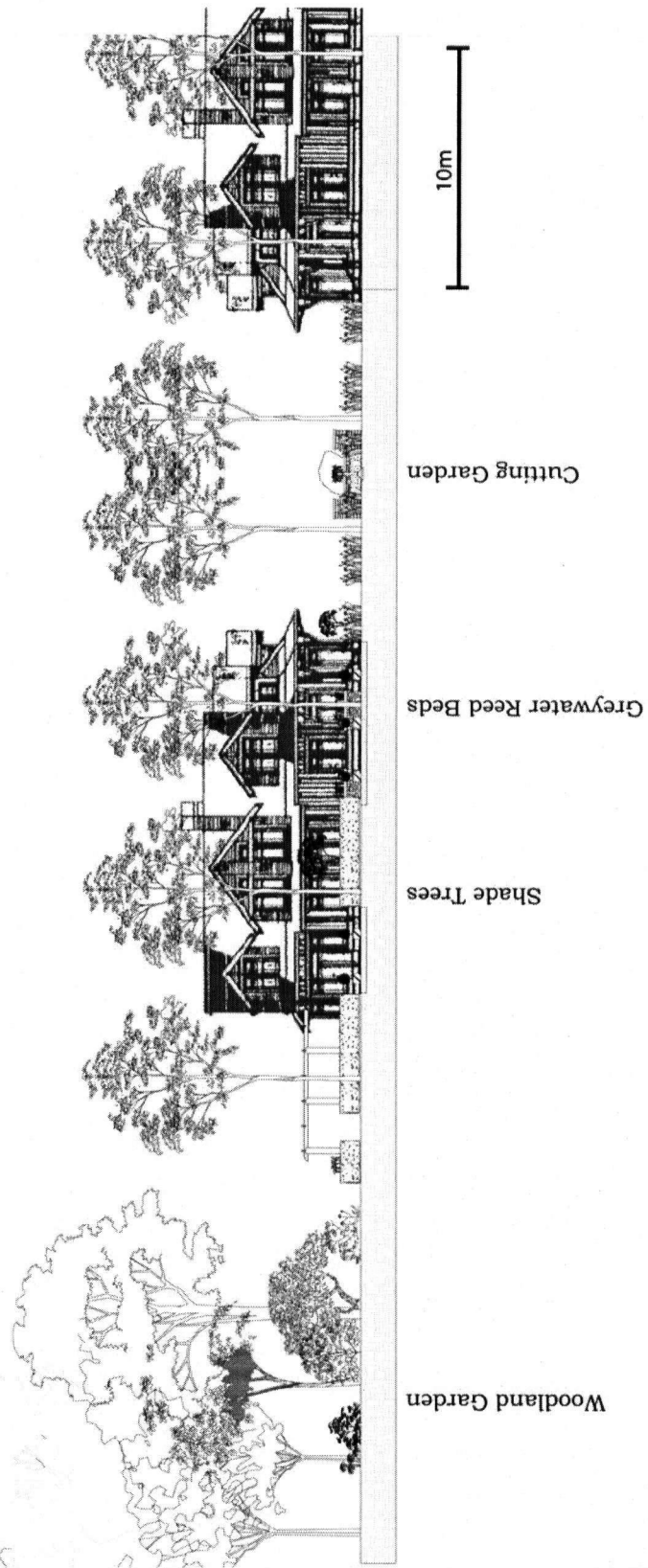


Fig. 57: East-West elevation from front yard looking North.

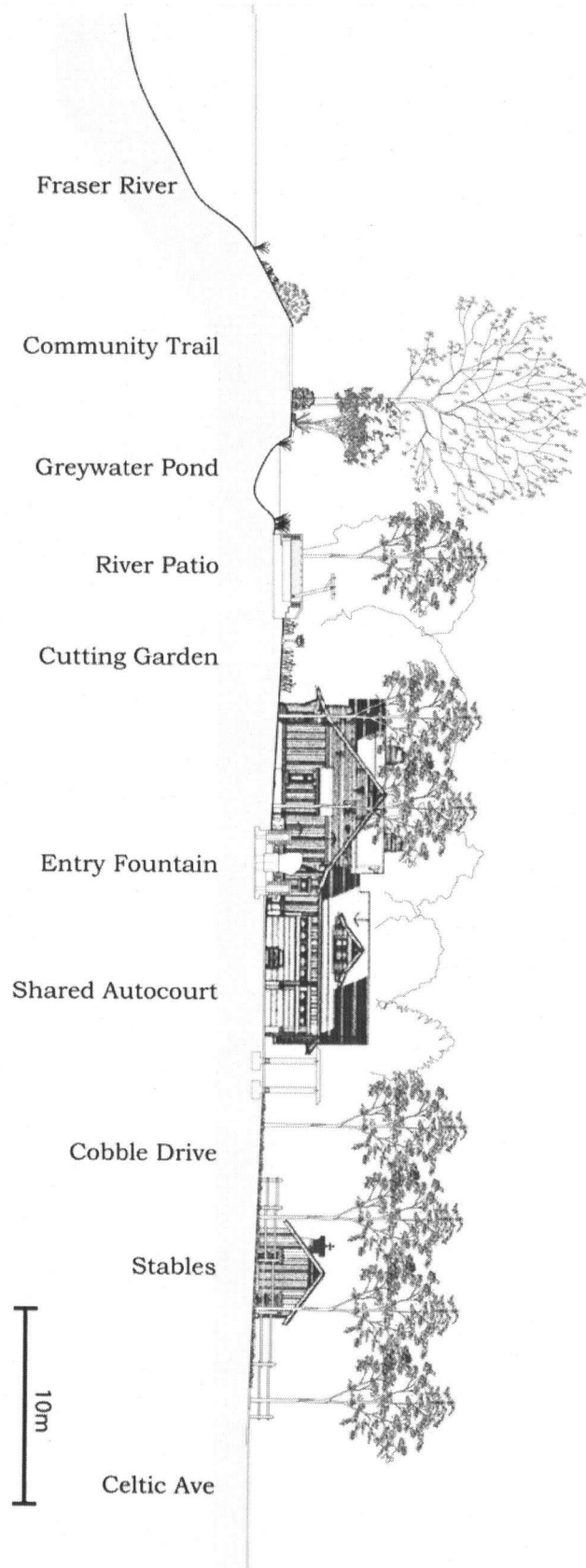


Fig. 58: North-South elevation along property line looking West.

Woodland Garden Plant Palette

Trees:

- Black Cottonwood – *Populus balsamifera* ssp. *Trichocarpa*
- Red Alder – *Alnus rubra*

Shrubs:

- Highbush-cranberry – *Viburnum edule*
- Nootka Rose – *Rosa nutkana*
- Salmonberry – *Rubus spectabilis*
- Scouler's Willow – *Salix scouleriana*
- Red Osier Dogwood – *Cornus sericea*

Groundcovers:

- Sword Fern – *Polystichum munitum*
- Western Trillium – *Trillium ovatum*
- Stream Violet – *Viola glabella*

The Cutting Garden



Fig. 59: A cutting garden (Verey 1993).

This landscape element is shared between adjacent properties. It is a collection of flowering perennials, annuals and low woody shrubs. To prevent potential conflict between neighbours, this particular cutting garden is symmetrical across the property line with yew hedging creating two sub-gardens.



Reed Beds

Reed beds are an integral part of the greywater recycling system mentioned above. This design utilizes raised planter-style beds, made from granite (walls) and basalt (caps).

Fig 60 (left): Reed bed section/elevation

Entry Fountain

This fountain breaks up the axis created by the allée of trees skirting the property lines. It consists of granite blocks for the walls and a cored basalt boulder for the fountain. Water is recirculated through the feature.

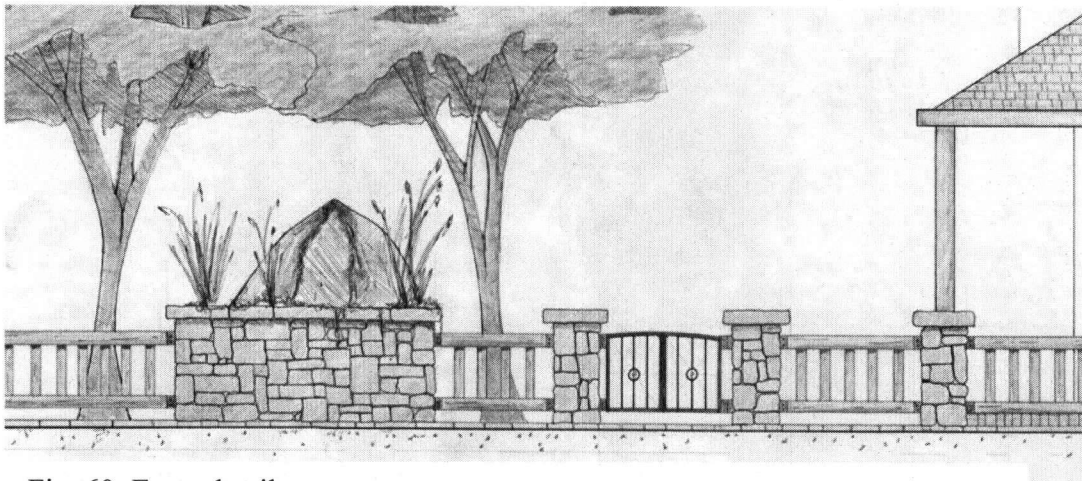


Fig. 60: Entry detail.

Cobble Drive

This driveway is made from granite cobbles, installed on an aggregate base of crushed concrete. In the case of heaving or settling, resetting the cobbles will not disturb tree roots, and could be performed in 3-5 days for the entire autocourt/drive. A grass strip is left in the middle and kept irrigated by the greywater recycling system onsite.

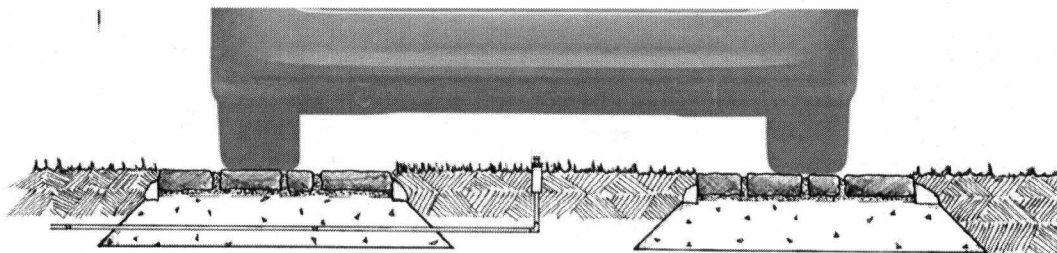
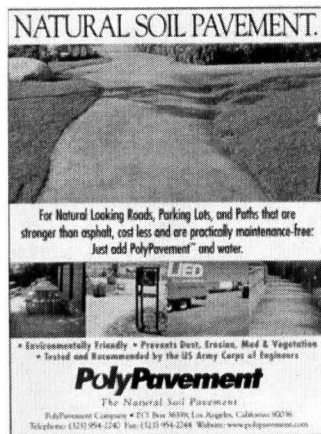


Fig. 61: Cobble driveway w/ grass strip

Community Trail

The community trail creates two critical linkages in Southlands - the first being the two existing trail systems – East and West River trails. The second connection is between greenspaces that are currently unconnected patches.



“Soil cement” has been specified as a surfacing on the trail. This product is a polymer that binds existing soil together and displays a strength rivaling concrete. It has a long lifespan – upwards of 20 years under moderate foot traffic, and requires no extra material be brought onsite aside from the polymer itself.

Fig. 61: Pathway surfacing.

Chapter 5

Design Comparison & Evaluation

5.1 Comparison

Evaluation Factor	Performance	
	Project Proposal	Developer's Proposal
Hard Surface (not including buildings)	489m ² – 19% site coverage	805m ² – 33% site coverage
Permeable Hard Surface	78m ² – 16% of hard surface	absent
Habitat Area	575m ² - 24% site coverage	155m ² – 6% site coverage
Habitat Corridor Linkages	Present	absent
Stormwater Filtration	Reed bed, existing wetland	absent
Greywater Purification/Reuse	100% of greywater generated on site handled on site	Greywater piped offsite
Passive Heating/Cooling	Shade trees, Directed windflows	absent
Material Source	Local, recycled where possible	Not specified
Material lifespan	Long	Medium
Hardscape Maintenance	Repair possible	Replacement necessary
Green Waste/Manure Handling	On-site	Trucked offsite
Potable Water Use	None.	All irrigation is connected to city water supply.

Table 2: Design Comparison.

5.2 Discussion

This thesis project looked at traditional development and proposed a solution to the problems associated with energy-consumptive landscapes. The project proposal creates nearly half the hard surface as the developer's proposal. No patio space was removed; the savings are in driveway and stable-related hard surfaces. Of the hard surface created, 16% is permeable compared to no permeable hard surfaces in the traditional development.

The city-approved development for the site proposes a shoreline treatment which may function as habitat. The project proposal maintains this shoreline habitat, but creates a linear linkage along the community trail and into the properties. The project landscape offers 24% site coverage of habitat areas—nearly five times that of the planned development.

Stormwater is not piped offsite in either case, but the project proposal has included mechanisms to filter and purify runoff before it is released. The development, as being built, will pipe greywater offsite with blackwater. In the project proposal, greywater passes through a four-stage biological purification system before being applied as irrigation water to the ornamental landscape. This results in no potable water being used for irrigation.

To reduce heating and cooling costs in the residence, the project proposal uses plant masses to block strong summer sun rays and allow warming winter rays to enter.

Windflows are deflected from the home in the winter, while cooling breezes from the Fraser River are directed inland in the summer.

A two chamber composting system serving two lots is proposed adjacent to the stables. It is large enough to compost horse manure, which can be used in place of chemical fertilizers. The city-approved development requires equestrian waste be trucked offsite to an external waste disposal site.

The design guidelines for the Celtic Avenue development do not specify material sources, meaning the likelihood of importing materials is high. Locally produced materials are specified as a blanket rule in the project proposal. Where possible, recycled materials are used. These materials are assembled in a way that lends itself to longevity—repair is possible whereas the forms specified in the developer's proposal require replacement as they age. These moves lead to a landscape that has a much lower embodied energy than the traditional alternative.

5.3 Conclusions

Forward planning in the design stage allows us to make a subtle shift that makes a huge impact on a project's sustainability. Paying close attention to energy flows and ecological function are the most important aspects of creating a sustainable landscape—much more important than the form it takes.

This thesis has demonstrated significant improvements in landscape longevity, embodied energy and ecological function with similar form to the proposal put forth by the Celtic Avenue development team. As landscape architects we have an immediate impact on the landscape both at the site and regional scale. As such we have a responsibility to design beyond the boundaries of our current projects. Buy local, be integrative, build it to last.

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CD-1 (448)

(Being a By-law to Amend By-law 3575, being the Zoning and Development By-law)

1 [Section I is not reprinted here. It contains a standard clause amending Schedule D (Zoning District Plan) to reflect this rezoning to CD-1.]

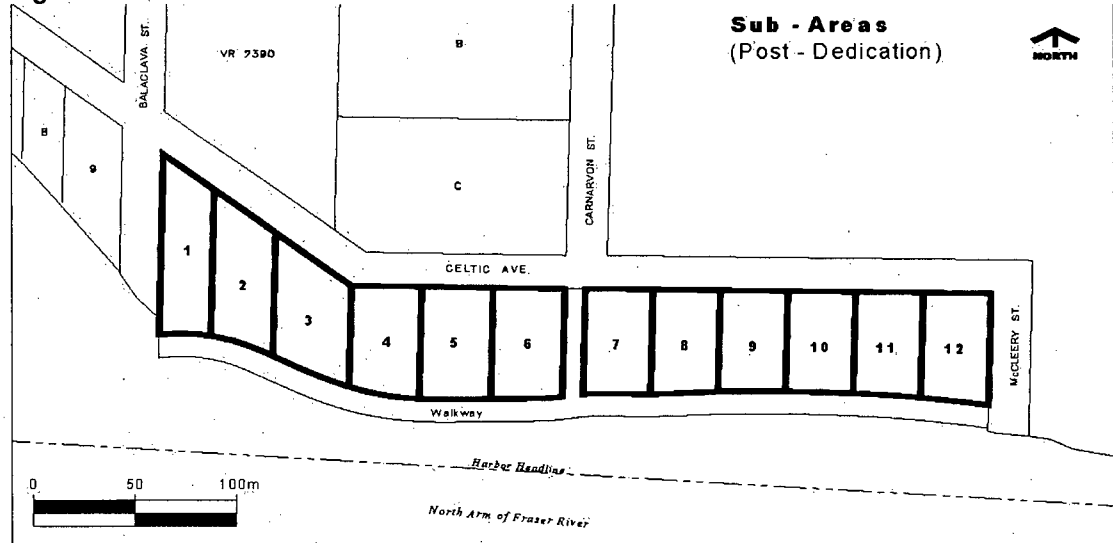
Words in this By-law have the meanings given to them in the Zoning and Development By-law except that Figure 1, which shows the site after the contemplated consolidation of a portion of McCleery Street and subdivision of dedicated walkway, indicates the geodetic elevation points for determination of Base Surface.

[illegible]

3 Sub-areas

After the consolidation and subdivision referred to in section 2, the site is to consist of the 12 sub-areas illustrated in Figure 2.

Figure 2: Sub-areas



4 Uses

4.1 The description of the site shown within the heavy black outline on Schedule A is CD-1 (448).

4.2 Subject to approval by Council of the form of development, to all conditions, guidelines and policies adopted by Council, and to the conditions set out in this By-law or in a development permit, the only uses permitted within CD-1 (448) and the only uses for which the Director of Planning or Development Permit Board will issue development permits are:

- (a) Dwelling Uses, limited to One-Family Dwelling and One-Family Dwelling with Secondary Suite;
- (b) Agricultural Uses, limited to Stable;
- (c) deposition or extraction of material so as to alter the configuration of the land; and
- (d) Accessory Uses, customarily ancillary to Dwelling Uses or Stable.

5 Conditions of Use

In approving any use or development, the Director of Planning must first consider all applicable policies and guidelines adopted by Council and the submission of any advisory group, property owner, or tenant.

6 Dwelling Use Calculations

For the purpose of calculating floor space ratio, site coverage, or building width, dwelling use includes garages, covered swimming pools, covered tennis courts, and other accessory buildings to the dwelling use.

7 Density

7.1 A sub-area must contain not more than one dwelling use and not more than one stable whether a principal or accessory use.

7.2 The floor area of a dwelling must not exceed 464.5 m², of which:

- (a) the floor area of any attached or detached garage must not exceed 60 m²;
- (b) the floor space ratio of other accessory buildings must not exceed 0.015; and
- (c) in respect of a one-family dwelling with secondary suite, the floor area of the secondary suite must not exceed 70 m².

7.3 The floor space ratio of a stable must not exceed 0.04.

7.4 A stable may house not more than four horses.

7.5 Computation of floor space ratio and floor area in each sub-area must include:

- (a) all floors, including earthen floor, to be measured to the extreme outer limits of the building; and
- (b) stairways, fire escapes, elevator shafts, and other features which the Director of Planning considers similar, to be measured by their gross cross-sectional areas and included in the measurements for each floor at which they are located.

7.6 Computation of floor space ratio and floor area in each sub-area must exclude:

- (a) open residential balconies or sun decks and any other appurtenances which, in the opinion of the Director of Planning, are similar to the foregoing;
- (b) patios and roof gardens if the Director of Planning first approves the design of sunroofs and walls;
- (c) areas of undeveloped floors located:
 - (i) above the highest storey or half-storey, and to which there is no permanent means of access other than a hatch, or
 - (ii) adjacent to a storey or half-storey with a ceiling height of less than 1.2 m;
- (d) floor located at or below finished grade with a ceiling height of less than 1.2 m; and
- (e) where a Building Envelope Professional as defined in the Building By-law has recommended exterior walls greater than 152 mm in thickness, the area of the walls exceeding 152 mm, but to a maximum exclusion of 152 mm thickness, except that this clause does not apply to walls in existence prior to March 14, 2000.

8 Height

8.1 The height of a dwelling must be at least 1.5 storeys but must not exceed 9.1 m and 1.75 storeys, measured from 3.5 geodetic (flood construction level).

8.2 The height of a stable must not exceed 7.6 m above base surface and one storey.

8.3 The height of a garage or other accessory building must not exceed 5.2 m above base surface.

9 External Design

- 9.1 The external design of a dwelling roof must be gable, hip, or gambrel.
- 9.2 Except for the first storey, the slope of a dwelling roof must be at least 7:12.
- 9.3 The slope of a dwelling roof dormer must be at least 4:12.
- 9.4 The slope of a stable roof must be at least 4:12.

10 Setbacks

- 10.1 The setback from the property line adjacent to Celtic Avenue for a:
 - (a) dwelling and any accessory building to a dwelling must be at least 25 m; and
 - (b) stable and any accessory building to a stable must be at least 10 m, and must not exceed 25 m.
- 10.2 The setback from the side property lines of all sub-areas for a building must be at least 4.5 m.
- 10.3 The setback from the south property line for a building must be at least 10 m except that the setback for any accessory building to a dwelling must be at least five m.

11 Building Width

The aggregate building width in each sub-area of all stables, accessory buildings to stables, and accessory buildings to dwellings, viewed from and projected upon the front property line of the sub-area, must not exceed 45% of the width of the sub-area.

12 Site Coverage

- 12.1 The sub-area site coverage for a dwelling use must not exceed 344 m².
- 12.2 The sub-area site coverage for stable use must not exceed 4%.
- 12.3 The area of impermeable materials, including building coverage, must not exceed 40% of a sub-area.
- 12.4 Impermeable materials include asphalt, concrete, brick, stone, wood, and the projected areas of the outside of the outermost walls of all buildings including carports, covered porches, and entries but do not include gravel, river rock less than 5 cm in size, wood chips, bark mulch, and other materials which, in the opinion of the Director of Planning, have fully permeable characteristics when in place installed on grade with no associated layer of impermeable material, such as plastic sheeting, that would impede the movement of water directly into the soil below.

13 Finished Grades

The maximum finished grades of each sub-area must comply with the base surface plan

(Figure 1), except that:

- (a) the Director of Planning, in consultation with the General Manager of Engineering Services, may relax finished grades by not more than 0.3 m to address requirements for storm drainage;
- (b) the Director of Planning, in consultation with the General Manager of Engineering Services, may relax finished grades for the purpose of construction pre-loading of sites on a temporary basis under a time limited permit; and
- (c) a drainage and finished grades plan is to form part of the development permit approval and finished grades are to be consistent with this plan, prior to issuance of occupancy permit.

14 Driveways

14.1 A sub-area must include no more than one driveway.

14.2 Except for manoeuvring areas adjacent to parking spaces, driveway width must not exceed 4 m.

14.3 In each of sub-areas 1, 3, 5, 7, 9 and 11, the setback of the east edge of the driveway must be 1.5 m from the east boundary of the sub-area for a distance of 25 m measured from the Celtic Avenue property line to a point 25 m south of that property line.

14.4 In each of sub-areas 2, 4, 6, 8, 10, and 12, the setback of the west edge of the driveway must be 1.5 m from the west boundary of the sub-area for a distance of 25 m measured from the Celtic Avenue property line to a point 25 m south of that property line.

15 Parking

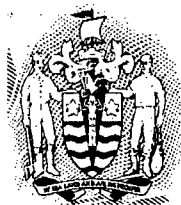
Any development or use of the site requires the provision, development, and maintenance, in accordance with the requirements of, and relaxation and exemptions in, the Parking By-law; of off-street parking, except that:

- (a) the number of parking spaces provided for a principal dwelling must not exceed three, and the number of parking spaces provided for a secondary suite must not exceed one;
- (b) there must be one parking space provided for a stable accessory to a dwelling use; and
- (c) there must be one parking space for each two horses provided for a stable that is a principal use.

16 Severability

A decision by a court that any part of this By-law is illegal, void, or unenforceable is not to affect the balance of the By-law.

17 *[Section 17 is not reprinted here. It contains a standard clause including the Mayor and City Clerk's signature to pass the by-law and certify the by-law number and date of enactment.]*



City of Vancouver *Land Use and Development*

Policies and Guidelines

Community Services, 453 W. 12th Ave Vancouver, BC V5Y 1V4 F 604.873.7344 fax 873.7060
planning@city.vancouver.bc.ca

SOUTHLANDS RA-1 GUIDELINES

Adopted by City Council October 20, 1987
Amended February 4, 1992



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1 Application and Intent

These guidelines are to be used in conjunction with the RA-1 District Schedule of the **Zoning and Development By-law** for developments in the Southlands area. The guidelines indicate design opportunities to help applicants in the design of projects, as well as assist City staff in their evaluation. The guidelines should be consulted in seeking approval for conditional uses or the relaxation of regulations as may be permitted by the District Schedule. They will be most applicable to the Blenheim Flats area of the RA-1 District where the majority of the residential and equestrian development occurs.

The Health Department's guidelines for on-site sanitary sewage disposal and stabling in the RA-1 District should also be consulted.

2 General Design Consideration

2.1 Neighbourhood Character

The major intent of the guidelines is to ensure that new development will maintain and enhance the prevailing semi-rural character. As redevelopment occurs, it is essential that this character is not compromised. Semi-rural character is created by an assemblage of design elements such as expansive vistas, equestrian functions, open pastures and informal landscaping along the side edges.

Objective:

New development should maintain and enhance the existing semi-rural character, and ensure that the prevailing development pattern is not compromised.

Figure 1. Representative Semi-Rural Character



Street Character

The character of the streets in the area contributes significantly to the overall image. The street edge is the most visible part of any development and assists in establishing a cohesive character. It is important that as redevelopment occurs, the treatment of private property

adjacent to the street does not compromise or clash with the existing street character. Streets in the area are characterized by their informal edges. The lack of curbs, the presence of ditches and the gradual visual transition from the public to private domain contributes to the semi-rural image. Solid walls or hedges along the property line abruptly terminate the street edge, severely limit visual transition from public to private property, restrict views through the site and result in a more urban street image which is inconsistent with the established character.

Objective:

New development should provide a gradual visual transition from the public domain along the road to the private development site in order to maintain the semi-rural character and not disrupt the cohesiveness of the existing street pattern.

This can be achieved by:

- (a) Using informal planting materials along the perimeter of the site;
- (b) Limiting hedges to those which are low, not solid, and informal in character; and
- (c) Using only low fencing which is open and allows for views through from the street.

Figure 2. New Development Providing A Characteristic Street Treatment

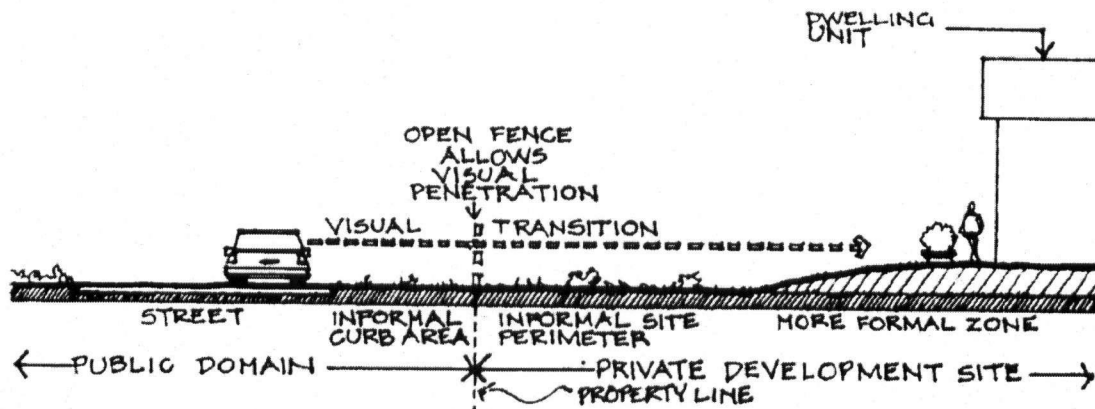
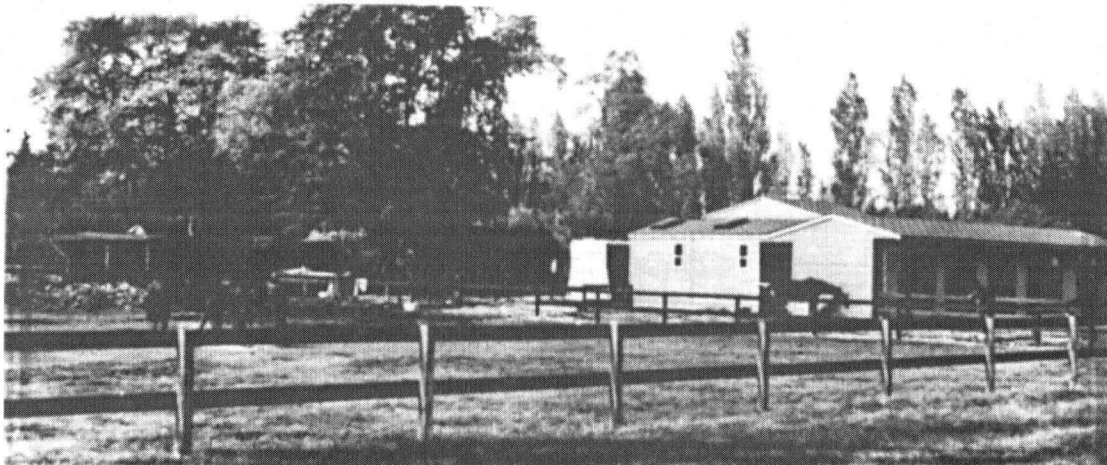


Figure 3. Characteristic Fencing



- 2.2.1 **Site Character** The area is characterized by related, individual building components being grouped together on the site. These components can include the main house, infill unit, caretaker's unit, garage, stable, and accessory buildings. The smaller incremental scale of these components allows them to blend into the site in a less conspicuous manner and open up views through to adjacent properties. Large, isolated single building forms that appear out of scale and visually dominate the site are not appropriate. Clustering buildings together can free up areas that may be developed as pasture. The site planning of adjacent properties should be recognized and opportunities for grouping similar functions together explored. Particular importance should be paid to the inconspicuous siting and scale of caretaker's and infill units.

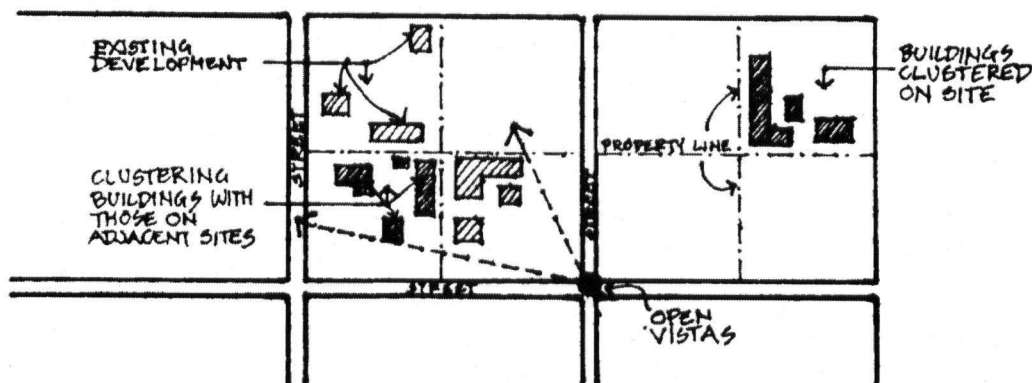
Objective:

New development should reinforce the prevailing site planning pattern.

This can be achieved by:

- (a) Clustering buildings on site; and
- (b) Clustering buildings with those on adjacent sites where there is no conflict of use.

Figure 4. Preferred Site Planning



- 2.2.2 **Building Character** In the RA-1 area landscaping and open space are visually dominant in creating the overall character and image rather than the actual built form. Buildings are clearly set into the landscape. This is reinforced by the predominance of elements such as pitched roof forms, wood finishes and earth tone colours. Extensive use of stucco, concrete and bright colours is inappropriate. A variety of building styles can be compatible with the area character as long as they maintain this secondary image. An important relationship will be between the principal house and any infill or caretaker's units. These units should be subordinate to and compatible in character with the principal house.

Objective:

Residential buildings should be secondary to and fit unobtrusively into the existing semi-rural context primarily created by the overall landscaping, site planning and edge treatment.

This can be achieved by:

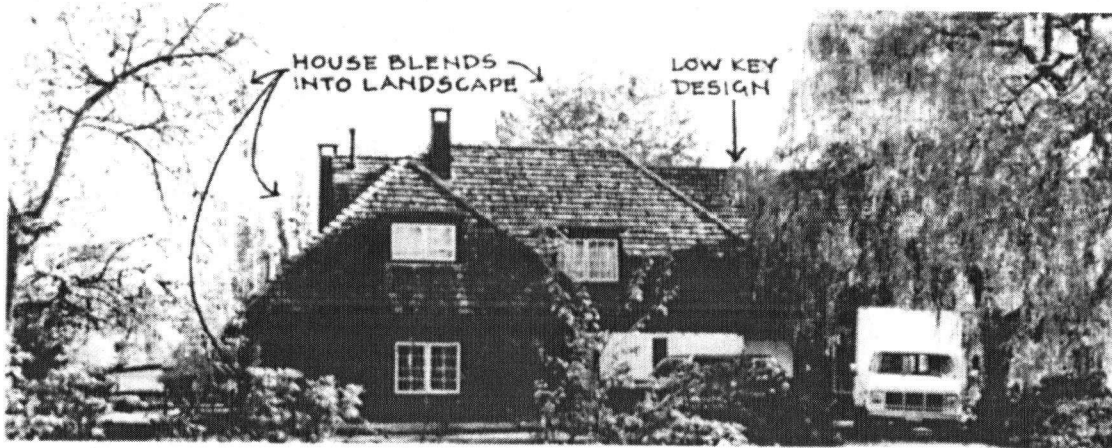
- (a) Giving more prominence to landscaping than to buildings; and
- (b) Using low-scale, semi-rural building forms which blend into the landscape.

Objective:

Infill and caretaker's units should be compatible and subordinate to the principal house.

This can be achieved by ensuring that infill units do not create so strong an identity to imply a separate and subdivided lot.

Figure 5. Representative Building Character



3 Uses

3.1 Caretaker's Quarters

Caretaker's quarters are found on a number of sites in the Blenheim Flats area. In most cases, the sites are large and include equestrian facilities. The keeping of horses often results in the need for ongoing care and supervision, thus justifying the caretaker's quarters.

Objective:

Caretaker's units should be occupied by bona fide caretakers of the subject site. Caretaker's units may be permitted only if the following conditions are met.

- (a) The registered owner (or registered owner under agreement) of the subject site must submit together with the development permit application a written explanation to include;
 - (i) The reasons why the site or dwelling requires a full-time caretaker; and
 - (b) Prior to the issuance of a development permit for caretaker's quarters, arrangements are to be made to the satisfaction of the Director of Legal Services for:
 - (i) A covenant under Section 215 of the Land Title Act to be registered to ensure that the dwelling unit will be occupied and maintained only as caretaker's quarters for a person whose occupation is full-time caretaker on the subject site;
 - (ii) Statutory right-of-way allowing the City of Vancouver to demolish the caretaker's quarters unless such quarters are vacant or occupied by a person whose occupation is full-time caretaker on the subject site. The right-of-way shall include a covenant to indemnify the City of Vancouver against demolition costs.
 - (iii) An equitable charge to secure the City of Vancouver's cost of demolition.

The above-noted charges must have priority over existing charges on the subject site.

3.2 Retail Uses

The RA-1 schedule allows for limited retail functions in conjunction with nurseries and stables.

Objective:

Limited retail functions, if provided, should present a low-key image.

This can be achieved by integrating any retail functions into the principle stable or greenhouse building.

4 Guidelines Pertaining to the Regulations of the Zoning and Development By-law

4.3 Height

Houses in the area are generally two storeys or less in height, and fit unobtrusively into the low-lying topography of the area. The maximum height set by the RA-1 schedule reinforces this general height. Height is measured from the base surface and includes all fill required for floodproofing. Base surface is measured from the existing grades certified by a B.C. Land Surveyor at the four corners of the site. Existing grades of adjoining sites measured 3.1 m from the common property lines should be included in the survey plan. The schedule allows the height to be increased where it does not adversely affect adjacent properties. For example, if the front and side yards are generously increased beyond the minimum prescribed by the schedule, the greater distance of the house from the road and adjacent sites would render the increase in height less noticeable.

Objective:

New development should be compatible with the prevailing height of existing built form and should fit unobtrusively into the existing low-lying landscape. Increases in height should only be considered in cases where it would not adversely impact an adjacent site, and where the increases would facilitate other design objectives to be achieved.

This can be achieved by:

- (a) Ensuring that an increase in height will not result in significant view blockage or increased shadowing of adjacent properties;
- (b) Significantly increasing the setback from the street and the side property lines to diminish the visual impact of the increase in height; and
- (c) Employing pitched roof forms which reduce the apparent height of development.

Figure 6. Height Relaxation: Side Yard Situation

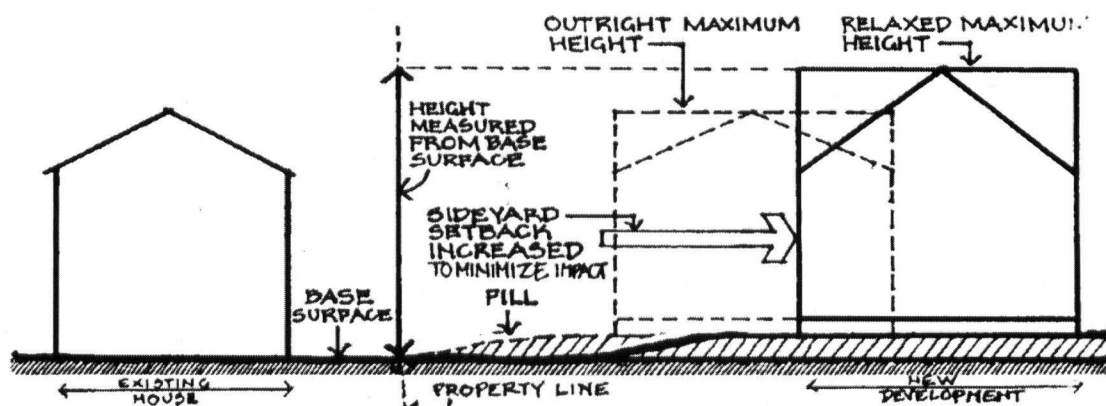
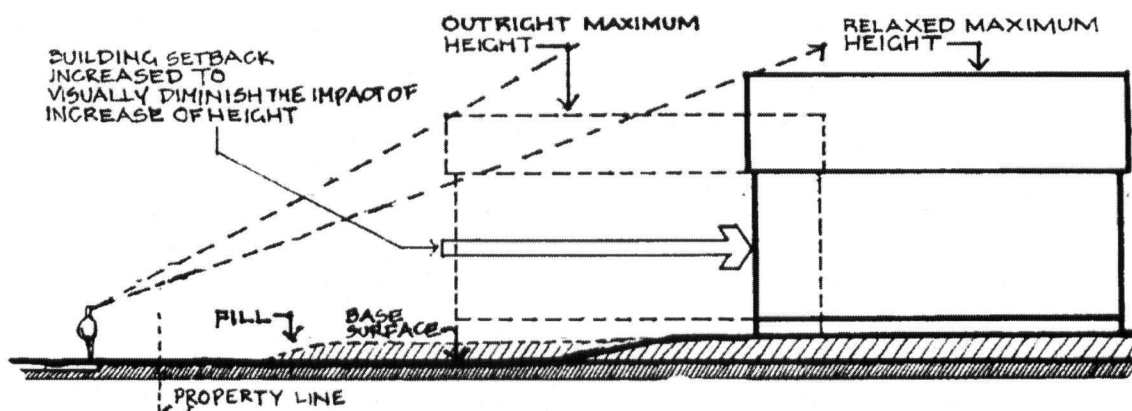


Figure 7. Height Relaxation: Front Yard Situation



4.4 - 4.6 Front, Rear and Side Yard

Most lots in the RA-1 District are substantially larger than the standard city lot, allowing a greater flexibility in site planning and resulting in much larger front, rear and side yards. Generally, the yards exceed the requirements of the RA-1 schedule. These setbacks should be considered as the minimum in most circumstances as the creation of open space is a major objective. Relaxations permitted in the RA-1 schedule should only be considered when such relaxations do not adversely affect adjacent properties or compromise other design objectives. In some cases, such as narrow lots, relaxations may be desirable.

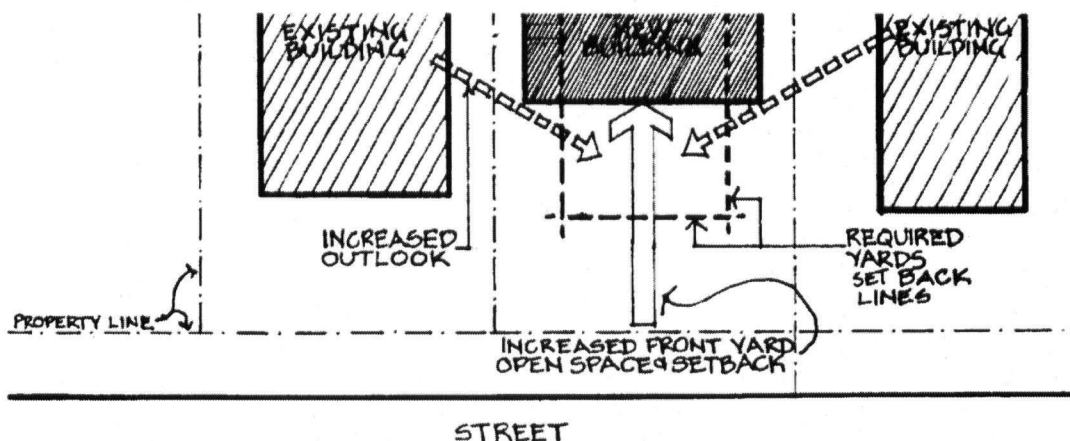
Objective:

New development should maximize front and side yards to emphasize semi-rural character and contiguous open space. Relaxations should only be considered in circumstances where it can be demonstrated that such relaxations will not compromise the semi-rural character nor adversely impact adjacent properties.

This can be achieved by:

- (a) Ensuring that a relaxation of a side yard will be accompanied by an increase in the front yard setback; and
- (b) Ensuring that the relaxation of any side or rear yard does not affect the privacy of an adjacent property and the visual outlook from the neighbouring house is enhanced.

Figure 8. Relaxation of Side Yards



Off-Street Parking and Loading

In addition to residential uses, many sites will be developed to include equestrian or nursery facilities. These facilities will require an additional number of parking stalls beyond those required for residential use. If the parking areas are prominently visible from the road, the objective of creating a pastoral semi-rural character could be compromised.

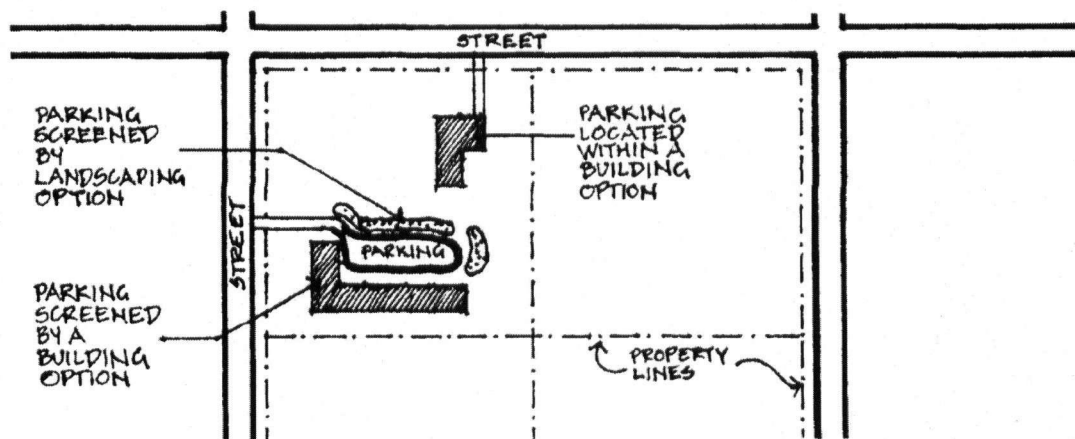
Objective:

New development should minimize the impact of parking areas to maintain a semi-rural character.

This can be achieved by:

- (a) Providing some intervening screening between any parking areas and the street and adjacent sites;
- (b) Locating parking areas behind buildings to make them less visible from the street; and
- (c) Locating residential parking within a building, or ensuring it is appropriately screened.

Figure 9. Preferred Parking Location and Treatment



4.16 Building Width and Depth

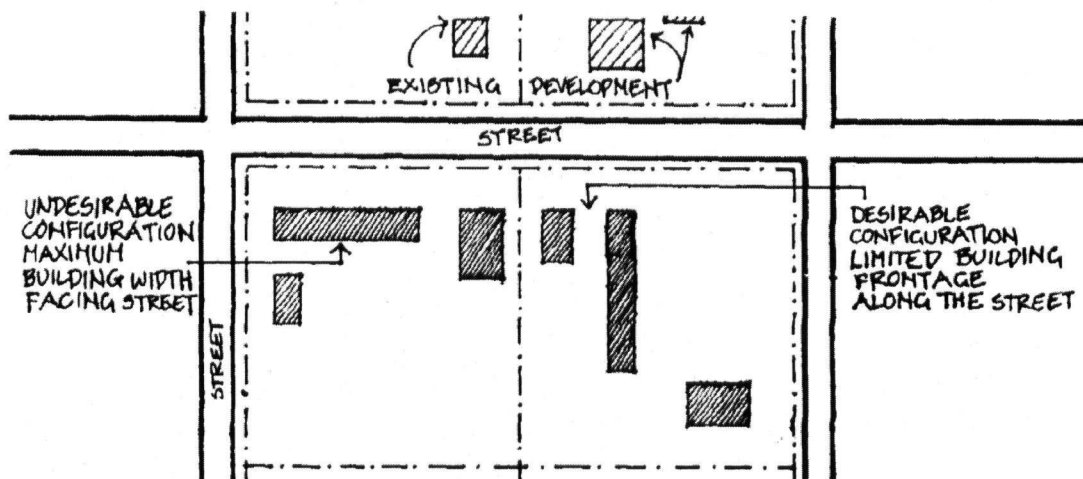
Most existing buildings in the area have a depth and width that is an appropriate scale for the size of the site, and contributes to semi-rural character. Buildings which are overly deep and wide create an obtrusive image and limit views through the site. Section 4.16 of the RA-1 schedule prescribes the maximum width and depth of buildings used for dwelling uses and accessory to dwelling uses. Buildings used for equestrian and other purposes should also not appear out of scale and be overly dominant.

Objective:

New development should be compatible with the prevailing built form in width and depth.

This can be achieved by:

- (a) Ensuring that buildings are not sited or configured so as to create a wall along the street edge; and
- (b) Locating indoor riding rings well back from the street edge and by using other intervening buildings of a more compatible scale to screen and reduce visual impact. Riding rings should also be sited so as not to adversely impact any adjacent sites.



Open Space

Open space is a key component in maintaining and creating semi-rural character in the RA-1 area. Generally, existing development consists of buildings sited in a manner which maximizes contiguous open green space in conjunction with equestrian functions. These large expanses of open space allow for vistas through the site, decrease the visual scale of buildings and establish a unique image for the area. Smaller lots are limited in potential for providing characteristically large open space. However, the available open space can be consolidated to provide a compatible image.

Objective:

New development should maintain or create significant, visible and contiguous green areas or equestrian related open space.

This can be achieved by:

- (a) Locating buildings on the site to create single, large open space areas, rather than a series of isolated, smaller and less visible ones;
- (b) Locating open space areas along the street edges and especially at intersections;
- (c) Having smaller lots consolidate their open space areas at the street edge rather than at the rear of the site where it is less visible.

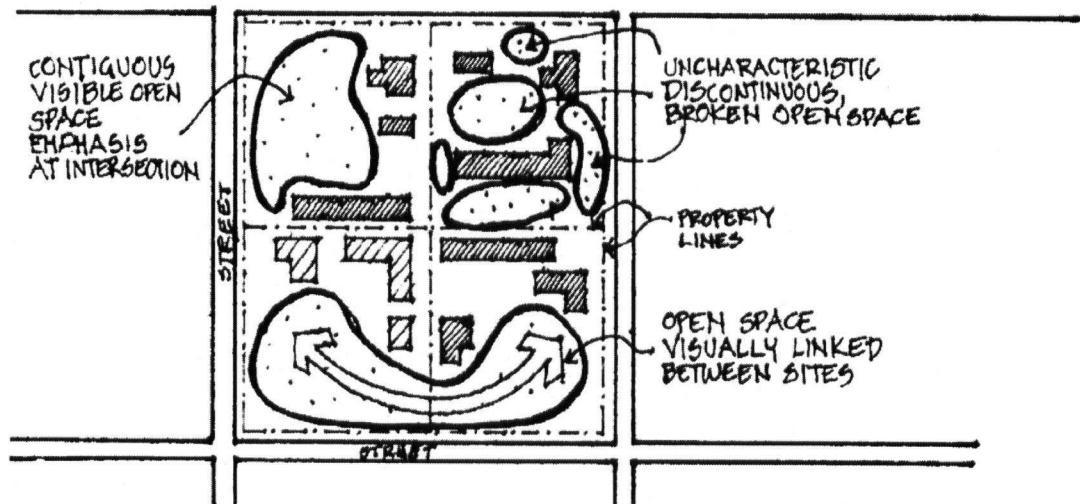
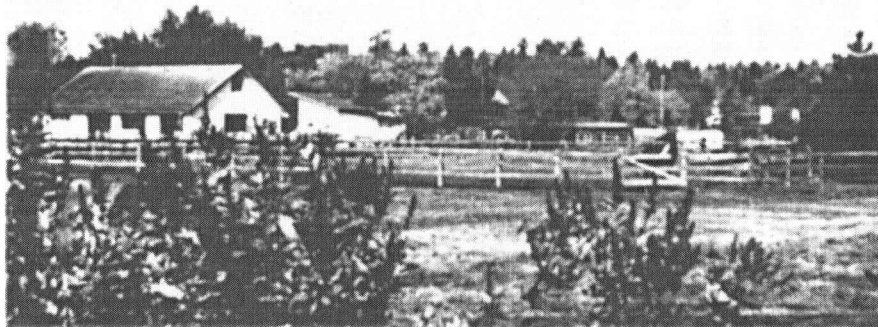


Figure 12. Representative Open Space



Private Open Space

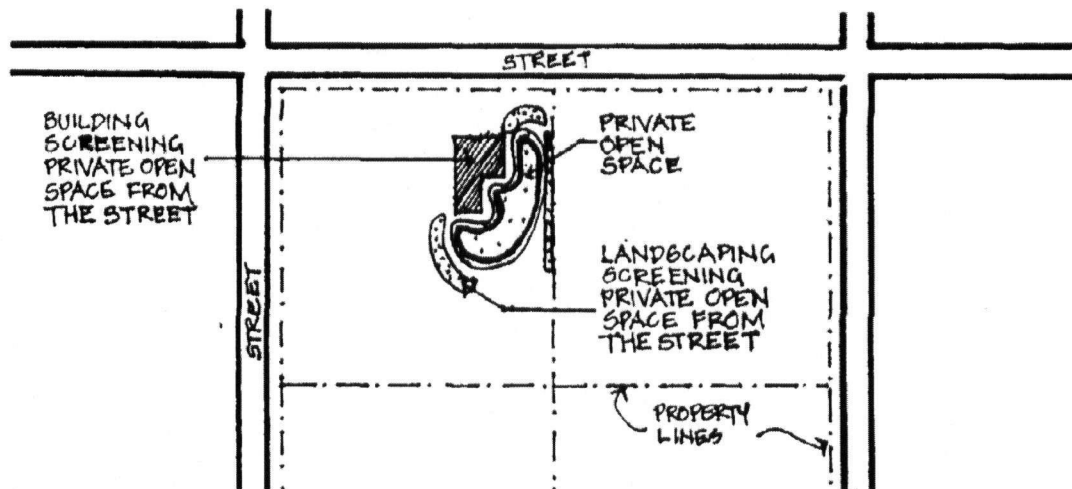
In some cases, new development will include private open space and areas for uses that are visually incompatible with semi-rural character such as swimming pools and tennis courts. Solid walls or hedges along the property line are not appropriate. While this treatment ensures privacy, it also results in an uncharacteristic and inhospitable image. Through sensitive design, perforated screening for private open space can be provided that allows some visual penetration through the site. Uses that require privacy or are not compatible with semi-rural character should not be visually dominant, and should for instance, be located adjacent to the main house, well away from the street edge.

Objective:

New development should minimize the visual impact of private open space, swimming pools, tennis courts and any other uses incompatible with semi-rural character.

This can be achieved by:

- (a) Ensuring that private open space and uses incompatible with semi-rural character are not located in the required front yard, or are conspicuously visible from the street;
- (b) Using buildings and appropriate landscaping to screen private open space and uses incompatible with semi-rural character from the street; and
- (c) Clustering private open space areas and uses incompatible with semi-rural character adjacent to dwelling units.

**Landscaping**

Landscaping plays a major part in establishing semi-rural character. The word semi-rural evokes images of soft, informal greenery, as is found in the area, as opposed to hard, impervious surfaces and formal landscape treatment. Some incompatible landscaping in the form of the excessive use of hard surfaces, berms, dense trimmed hedges, solid fences and screens of trees that block views through the site and create inhospitable edges has been used in the area. Landscaping in conjunction with infill and caretaker's units should visually integrate them into the overall pattern of the site rather than creating an image that severs the units from the site.

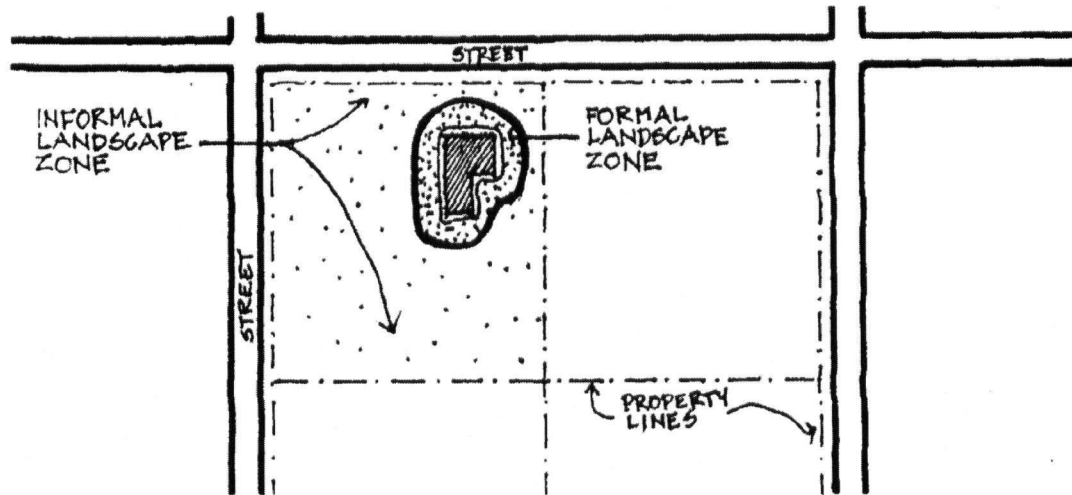
Objective:

New development should maintain and enhance the cohesive, characteristic landscaping treatment that emphasizes a soft, informal, green image.

This can be achieved by:

- (a) Ensuring that all developments provide a landscape plan that clearly notes the mature size and type of plant species;
- (b) Restricting formal plantings and gardens to the private open space zones around the dwelling units;
- (c) Employing informal landscaping in any area not used as private open space; and
- (d) Ensuring that fencing used in any area except the private open space zone is low, open and allows

views through the site.



Filling and Drainage

Filling and drainage are critical aspects of new development in the area. Some filling will be employed below and immediately around the house. This floodproofing fill should be strictly limited and not detract from the prevailing low-lying landscape. Hard impervious surfaces, while visually incompatible with the prevailing landscaping are also detrimental to drainage, and should be minimized. Local water run-off will need to be handled on-site with appropriate perimeter drainage treatment to protect adjacent properties from flooding.

Objective:

All floodproofing fill and impervious surfaces should be inconspicuously integrated into the prevailing topography and landscaping, and not have a detrimental impact on adjacent properties.

This can be achieved by ensuring that:

- (a) Fill other than that required for floodproofing purposes is limited to a maximum height of .6 m above the base surface (measured from the existing grades certified by a B.C. Land Surveyor at the four corners of the site);
- (b) Impervious surfaces are strictly limited;
- (c) The floodproofing apron is directly beneath and adjacent to the dwelling unit and does not extend beyond 4.6 m from the dwelling unit;
- (d) Floodproofing fill does not exceed elevation 30.5 m city datum;
- (e) The apron letdown merges inconspicuously into the prevailing landscape;
- (f) The letdown has a constant slope rather than a series of steps;
- (g) The slope of the letdown does not exceed 20%;
- (h) In the case of narrow side yard conditions, the apron size is reduced or floodproofing is achieved by structural means;
- (i) There are no abrupt changes in grade at property lines;
- (j) Driveways, parking areas and other non-habitable uses are located below the flood construction level;
- (k) Raised septic fields are integrated inconspicuously into the floodproofing apron and designed to

minimize filled area;

(l) In the case of:

(i) New infill dwelling units or caretaker's units adjacent to existing principal dwelling units; and

(ii) Minor first-storey additions to existing dwelling units;

The first-storey elevation may correspond to the first-storey elevation of the existing principal dwelling unit;

(m) A filling and drainage plan, prepared by a professional Engineer in the Province of B.C., to the satisfaction of the City Engineer, is provided that clearly indicates:

(i) existing grades of the subject site;

(ii) existing grades of the adjoining sites measured 3.1 m from the common property line;

(iii) proposed grades; and

(iv) drainage treatment;

(n) The drainage and filling plan indicates run-off from the site, including impervious and filled areas, is directed to the City ditch system and not to adjacent lands.

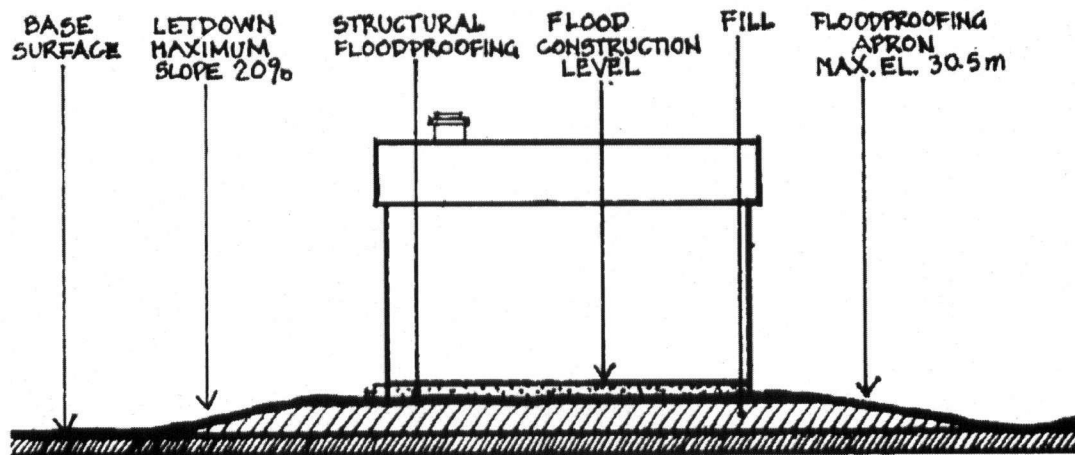
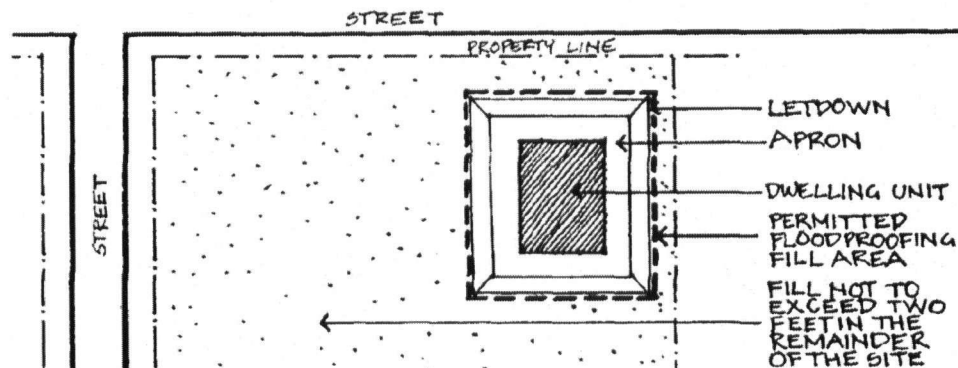


Figure 16. Floodproofing Treatment: Plan View



Fraser River and Celtic Island Area

Most of the land flanking the Fraser River foreshore in Southlands is zoned RA-1 and is

presently in park and golf course use. In addition to retaining the semi-rural character of these lands, it is essential that new development respond to the sensitive environment and to the opportunities for improved recreational access. In the redevelopment of the RA-1 foreshore lands, the City will be seeking opportunities to secure access for a continuous waterfront trail. In addition, easements or dedications for the building of a standard dyke may be required.

City objectives for this area include:

- (a) Create significant public waterfront access along the waterfront and through the Celtic Island area;
- (b) Protect and enhance the semi-rural and equestrian character;
- (c) Exploit rare opportunities to secure unique park environments;
- (d) Retain opportunities for employment in the fishing and related industries; and
- (e) Protect and enhance the fish and wildlife habitat of the area.

A.3

MOTION

Celtic Avenue CD-1 (#____) Design Guidelines

MOVED BY:

SECONDED BY:

THAT the document entitled "Celtic Avenue CD-1 (#____) Design Guidelines" be adopted by Council for use by applicants and staff for development applications at 2950 Celtic Avenue.



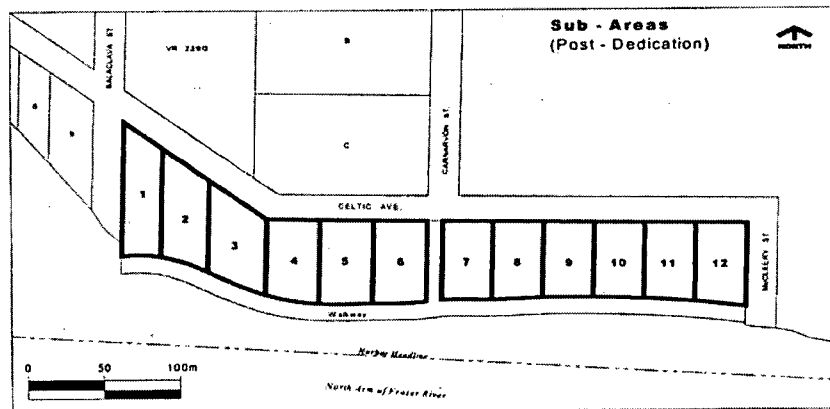
City of Vancouver *Land Use and Development Policies and Guidelines*

Community Services, 453 W. 12th Ave Vancouver, BC V5Y 1V4 ☎ 604.873.7344 fax 604.873.7060
planning@vancouver.ca



CELTIC AVENUE CD-1 (#_____) DESIGN GUIDELINES

Adopted by City Council on November _____, 2005



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Note: *An Explanation of the Numbering Sequence*

The above headings follow a standardized format that provides a comprehensive list of subject matter organized in numerical sequence. Please note subcategories, which are not applicable to the guidelines, are not included in the index and this is reflected in the numbering sequence.

1 Application and Intent

These guidelines are to be used in conjunction with the CD-1 District Schedule of the Zoning and Development By-law for development permit applications in the Celtic Avenue area.

The intent of the guidelines is to insure high standards of development in the Celtic Avenue CD-1 area that are compatible with the established patterns of development in nearby Southlands and with the public amenity of the pedestrian/equestrian pathway along the Fraser River.

These guidelines also address the issues of environmentally-sensitive, sustainable development, or "green" development. In addition to existing environmental regulatory requirements, the applicant is encouraged to explore approaches that minimize water and energy consumption, reduce solid waste, treat storm water effectively and develop a high-quality indoor environment for the future occupants. Wherever possible, suggestions for minimizing water/ energy consumption are provided for applicants to consider in developing their design.

2 General Design Considerations

2.1 Neighbourhood Character

The neighbourhood character of the Celtic Avenue CD-1 area is influenced by its close proximity to Southlands RA-1 District and to the Fraser River. Shared characteristics with Southlands include a low lying topography, informal landscaping, equestrian uses and a sense of openness that define the semi rural character of the area. Maintaining these common characteristics with Southlands is an important objective of the Celtic Avenue CD-1 guidelines.

Celtic Avenue CD-1 is also distinguished from the rest of Southlands by its waterfront orientation to the Fraser River and a ten metre wide dedication for a public amenity in the form of a pedestrian/equestrian pathway. The natural and historic working marine environment further enriches the special character of the Celtic Avenue CD-1 area.

2.3 Orientation

Building sites in the Celtic Avenue CD-1 By-law have a dual orientation with the front yard facing Celtic Avenue and the rear yard towards the Fraser River. The main entry to the house should be orientated towards Celtic Avenue, while the rear yard faces the Fraser River and the pedestrian/equestrian pathway.

2.5 Topography

The natural topography is low lying with little variation in grade. The grades slope gradually from 3.8 geodetic at the waterfront pedestrian/equestrian pathway down to Celtic Avenue. Finish grades match the base surface plan, Figure 1, in the CD-1 District Schedule.

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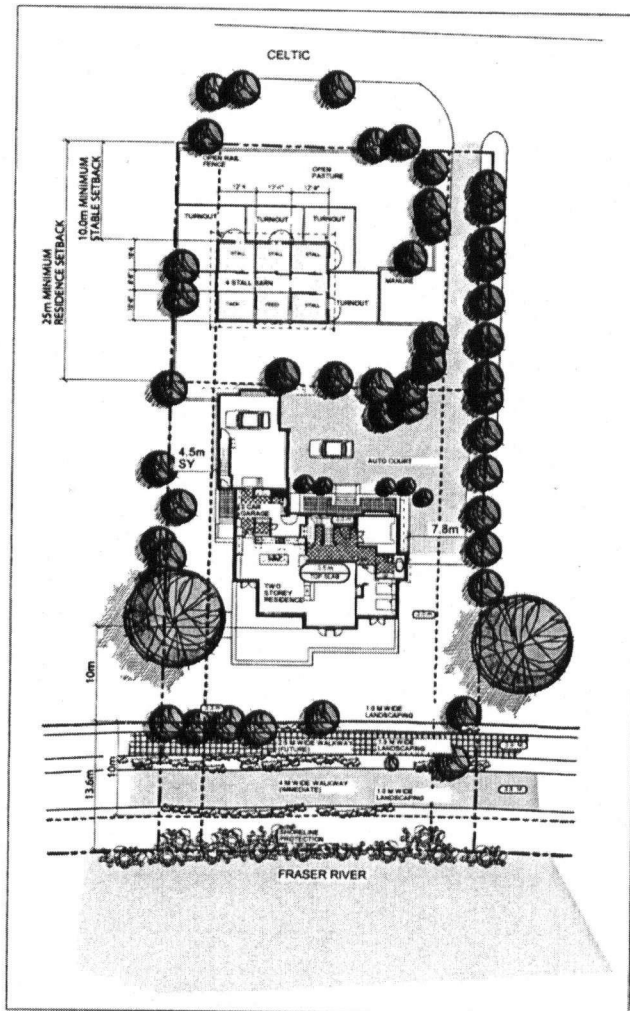
A drainage and finished grades plan, prepared by a professional Engineer in the Province of B.C. is a requirement for a development permit. The drainage and finished grades plan should be consistent with the CD-1 area storm water management plan (required as a condition of rezoning) and indicate run-off from the site, including impervious and filled areas, to the City ditch system and not to adjacent sites. This plan should include:

- To maintain a consistent grade between properties drainage swales along property boundaries should be buried. This may necessitate alternative drainage and water retention systems. Water detention systems if required should be identified on the site plan.

Driveway access is paired to maximize frontages between lots. The 1.5 m (5 ft.) set back from the side property line should be maintained to the street edge and not joined together with the adjacent driveway to form a double wide street access.

City of Vancouver
Celtic Avenue CD-1 (# _____) Design Guidelines

November 2005
Page 2



Typical Site Plan Illustrating Building Footprints, Yard Setbacks and Pedestrian/Equestrian Pathway

Note: This is intended for illustrative purposes only and does not suggest a preferred solution. Numerous other alternatives are possible within the limitations of the CD-1 regulations. For example, the stables could be reoriented closer to the house or turned so that the narrow dimension faced the streets, reducing the overall building width as seen from the street. Other solutions may opt not to have a stable, preferring to leave the front yard as open pasture.

3 Uses

3.5 Dwelling Use

The principal use of Celtic Avenue CD-1 is single family residential. Secondary suites are a permitted use within the building envelope of the principal dwelling. Exterior entrances to secondary suites, if necessary, should be discretely placed so as not to detract from the single family character of the principal dwelling. Secondary suites may be located over garages which are attached to the principal dwelling but not if the garage is detached from the principal dwelling.

3.6 Stabling and Equestrian Uses

Equestrian uses are a permitted and encouraged use, up to a maximum of four horses per site. The stable zone is located between 10 m (32.8 ft.) and 25 m (82 ft.) from the property line on Celtic Avenue. Space standards and user requirements should conform to the RA-1 Stable Administration Bulletin.

Applicants are advised that building such as garages, stables and other accessory buildings should be designed to reflect their intended use and not be adaptable to uses otherwise not permitted in the CD -1 By-law. For further information please refer to the Administration Bulletin Illegal Occupancy - RA-1 District.

4 Guidelines Pertaining to the Regulations of the CD-1 By-law

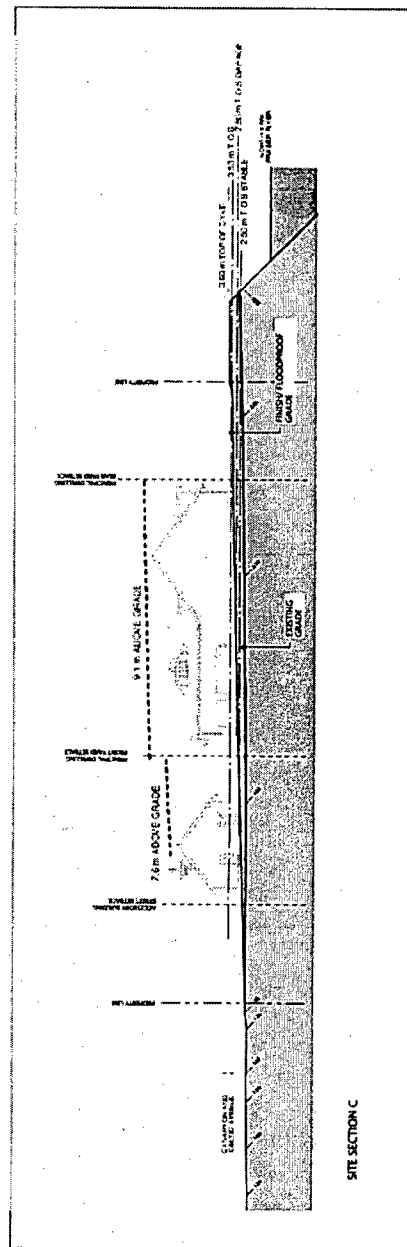
4.3 Height

Residential buildings have a minimum height of one and a half storeys and a maximum height of one and three quarter storeys and 9.1 m (29.9 ft.) measured from the established flood proof elevation.

Garages are limited to a maximum height of 5.2 m (17.06 ft.) measured to the roof ridge and should have a sloping roof form that is compatible with the house. Attached garages with residential floor area above may have a height equal to the maximum height permitted for a house.

Stables are limited to a maximum height of 7.6 m (25 ft.) and should have a sloped roof form. Because the stable zone does not require flood proofing, the stables will be located at a lower elevation relative to the house. The allowable height will be determined by an interpolative average of base surface elevations located within the stable zone.

The ground floor of the house will be higher than the street elevation because of the flood proofing requirements. Applicants are therefore advised to keep the massing of the building as low as possible and horizontal in form to minimize the apparent height as seen from the street. The upper floor should be integrated into the primary roof form, using secondary dormer elements as is appropriate.



Typical Site Section Illustrating Building Grades and Heights

4.4 Front Yard (and Setbacks)

Front yard setbacks for houses are 25 m (82 ft.) from the front property line in order to preserve the sense of openness from the street. The front setback should be compatible with the position of the houses on neighbouring sites in the CD-1 area and not be well forward or back of their neighbours.

Stables and related accessory buildings are located closer to the street, between a minimum front yard setback of 10 m (32.8 ft.) and 25 m (82 ft.). This is to encourage equestrian functions to be positioned closer to the street and to make use of the deep front yard for pasture and turn out functions related to equestrian uses, while at the same time separating equestrian functions from residential use.

Variation in stables front yard setbacks between neighbours is encouraged so as not to create a sense of continuous street wall and to reinforce the informal qualities of the street character.

4.5 Side Yard (and Setbacks)

Side yards setbacks are 4.5 m (14.75 ft.) and are the same for all buildings. Side yards should allow for adequate separation between neighbouring buildings and for site transparency and views through from the street.

The location of neighbouring buildings and impact on site planning should be evaluated early during the design stage. Compatibility of uses and privacy issues related to window location and overlook from adjacent properties are important considerations.

4.6 Rear Yard (and Setbacks)

The house has a rear yard setback of 10 m (32.9 ft.), orientated towards the Fraser River and the pedestrian/equestrian pathway. The rear property line should be treated in a manner similar to the front yard; edges should be softly defined with informal planting and be semi transparent, allowing views into and out of the site. High hedges or solid fencing at the property line are not appropriate.

4.9 Off-Street Parking and Loading

Off street parking should be provided within an enclosed parking garage or screened by landscaping or buildings.

The presence of the automobile on the site should be minimized where possible and not detract from the prevailing site character. Garages, if located in front of the house should be turned so that the garage doors do not directly face the street. Building massing, roof form, materials and detail should be consistent with the house.

4.16 Building Width

The CD-1 District Schedule limits the building width of stables and accessory buildings including garages to a maximum 45 percent of the total site width when viewed from the street. This is to maintain transparency into and through the site and to allow for visibility of the house. It is also intended to discourage a "street wall" pattern of development.

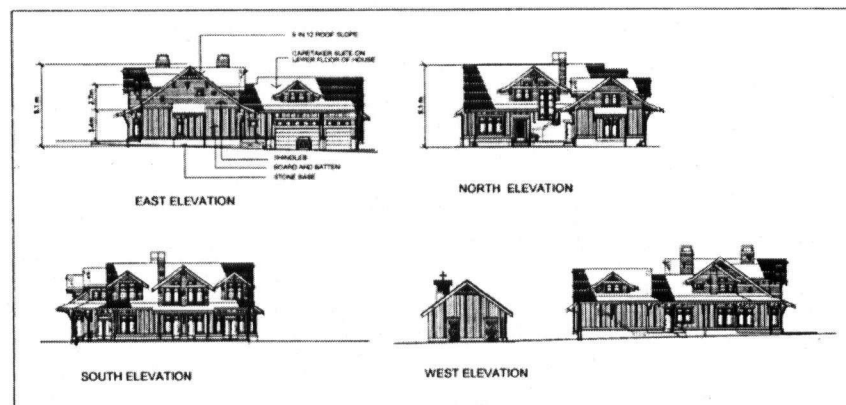
Orientating the narrow dimension of the stables and accessory buildings to the street and layering buildings so their frontages overlap will help to reduce the total building frontage.

4.17 External Design

Building character should reinforce the semi rural character of the surrounding neighbourhood. Buildings should visually blend into the landscape and preserve the sense of openness. To maximize open space, accessory uses should be attached or in close proximity to the principal buildings. Building massing should be horizontal to match the prevailing low lying topography.

Sightlines and vistas through the site from the street should be considered in the site planning. The house should retain some visible presence from the street and not be completely hidden behind the stable or accessory buildings.

Emphasis is placed on good neighbourly interface, respecting existing building setbacks, sightlines and compatible uses. Applicants are also encouraged to consider the principles of environmentally-sensitive and sustainable development in the design and construction of the building.



Typical Building Elevations Illustrating Building Massing, Roof Form and Materials

5 Architectural Components

Architecture should reinforce the semi rural character of the neighbourhood and the low lying topography. Building massing should be horizontal and fit well into the landscape. Compatibility with neighbouring buildings in terms of scale, massing and architectural expression is desirable.

5.1 Roofs and Chimneys

The roof form should be prominent and steeply pitched with a minimum slope of 7:12. The top floor should be integrated into the roof form with secondary dormers having a minimum slope of 4:12. Dormers should be small relative to the principal roof and not detract from the principal roof form.

Stables and accessory building should have a roof form that is consistent with the overall character of the site.

Chimneys if required, should have a mass, scale and height consistent with traditional chimneys, with a solid foundation and clad either with masonry or stone. Boxed out flues with exposed mechanical vents are not appropriate.

Environmentally-sensitive and sustainable development design considerations:

- (a) Consider the use of solar panels. Solar panel if proposed should be visually integrated into the overall roof form and not visible from the street.
- (b) Consider the roof shape to allow optimal sun exposure for solar panels, with ridges running in an east/west direction. Roofs should maintain a steeply pitched profile.
- (c) Consider deep roof overhangs that maximize solar access during the winter and minimize exposure in the summer are encouraged.
- (d) Consider rain water collection systems for recycling rainwater that can be used during the dry season for watering plants. Collection systems should be visually unobtrusive and made part of the landscaping. Note: Water collection systems are to be compliant with the Vancouver Building By-Law.
- (e) Consider heat recovery and ventilation exhaust systems should be integrated with the overall roof form and not visible from the street.

5.2 Windows and Skylights

Windows should be wide profile with truly divided lights and preferably constructed of wood. Windows on the second storey should be proportionally smaller than the windows below.

Pre-manufactured skylights that visually interrupt the roof form and detract from the building character and are discouraged. Skylights should be architecturally integrated with the roof form, and discretely placed so they are not visually dominated.

Environmentally-sensitive and sustainable development design considerations:

- (a) Consider window size, location and orientation for passive solar gain.
Note: Larger, more expansive windows on the south facing Fraser River frontage may be appropriate.
- (b) Consider using sun shading devices such as trellises and retractable awnings.
- (c) Consider adding windows on more than one wall that will increase natural daylight access, reducing the need for artificial light & provide enhanced ventilation/ cooling performance.
- (d) Consider the use of high performance glazing systems such as triple glazed units and low E glass. Note: Mirrored or reflective glass is not appropriate.
- (e) Consider operable skylight will greatly improve natural ventilation in the building.
- (f) Consider the use of solar panels (refer to comments under 5.1 Roofs and Chimneys for design considerations).

5.3 Entrances, Stairs and Porches

Entrances, stairs and porches are important character defining elements. The main entry should be prominent and orientated towards Celtic Avenue. Visibility or partial visibility of the main entry from the street is desirable. Entrances should be consistent with the semi rural character of the architecture and site and not be overly formal or "grand" in scale. The entry level should be higher than adjacent building grade with a raised stoop or porch and be protected from the weather, either by a recessed wall, canopy or porch roof. Porches should be a minimum 1.5 m (5 ft.) in depth.

Environmentally-sensitive and sustainable development design considerations:

- (a) Consider deep porches with midday and afternoon sun exposures that reduce heat gain on southerly and westerly building exposures and contribute solar shading and cooling of adjacent interior spaces.

- (b) Consider the use of enclosed entry vestibules and porch elements that help to prevent heat gain or loss.

5.4 Balconies

The Celtic Avenue CD-1 area provides panoramic views from the dwellings toward and across the Fraser River. These views may be partially obscured at ground level because of grade conditions and landscape treatment. To allow for the view amenity, upper floor balconies are therefore acceptable on the river facing side of the house.

Balconies should be modest in scale to the rest of the building and not overwhelm the building facade. They should be well detailed in a manner consistent with the detail and materials of the building. Balconies incorporated into the roof level should be recessed into the roof form and unobtrusively placed, so that the roof form remains continuous and visually dominant. Roof level balconies should not exceed more than twenty percent of the roof width. Large upper floor or roof "decks" are not appropriate.

Neighbouring privacy and potential for overlook are key considerations in evaluating the appropriateness of the location, size and detail of the balcony.

5.5 Exterior Walls and Finishing

Building materials should reflect the semi rural character the area. Wood is the preferred material choice for exterior wall finish; either horizontal siding, vertical board and batten or shingle style. Rough textured stone work is suitable for base and chimney treatment. Heavy textured (stone dashed) stucco is also acceptable in limited areas.

The preferred roofing material is cedar shakes, although asphalt shingles and flat profile concrete tile may also be acceptable. Round profile concrete tile and metal roofing is not appropriate.

Architectural detailing should be in wood and robust in profile. Synthetic materials such as plastics and styrofoam mouldings are not appropriate.

Colours should be muted and in the range of earth tones that blend visually with the landscape.

Environmentally-sensitive and sustainable development design considerations:

- (a) Consider the material mass of building components: Materials with high mass, such as stone, brick and concrete (and wood to a lesser degree) absorb and store heat, modulating temperature differences in both summer & winter. Locate such materials close to heat sources, such as large windows.
- (b) Consider the use of interior finishes and materials which are low in volatile organic compounds (VOC's) and have low emissivity or "off gassing".
- (c) Consider the use of recycled building materials and/or which are locally derived.

7 Open Space

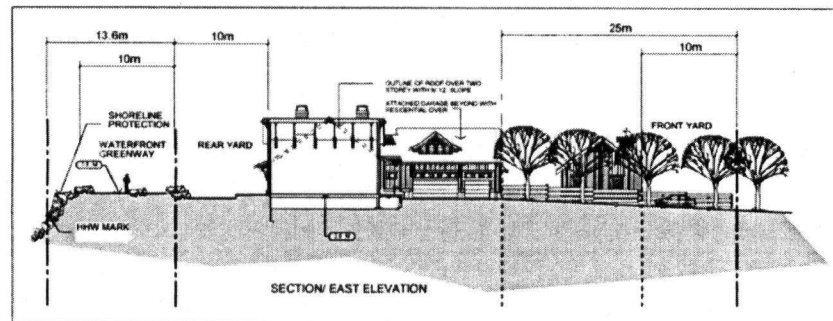
Open space is a character defining element of Southlands and remains an important attribute of the Celtic Avenue CD-1 area. New development should maximize open space where possible through clustering of buildings to allow views through the site.

7.2 Semi-Private Open Space

Semi-private open space may be located in the front yard facing Celtic Avenue as well as the rear yard which is orientated towards the pedestrian/ equestrian pathway. Both should allow for a gradual transition between the public realm of the street and pathway, and the private area of the site.

The front yard is intended for equestrian uses, stables, small related accessory buildings, turn out areas and pasture. The buildings should be placed to maximize site openness and views from the street.

The semi-private open space of the rear yard should allow for a gradual transition between the public amenity of the pedestrian/ equestrian pathway and private open space closer to the house.



Typical Site Section Illustrating Front and Rear Yards

7.3 Private Open Space

Private open space should not detract from the neighbourhood characteristics of openness and semi rural character. Non-transparent enclosures such as solid fencing or high hedging around the property boundaries are inappropriate.

Open private space should be located close to the principal buildings and be intimate in scale relative to the rest of the site. Landscaping can provide visual buffering and semi-enclose these areas. Building shape and clustering may further be used to define private outdoor space.

Special uses such as swimming pools, which are private in nature and require safety fencing, should be located away from the site's rear property line. This is to allow for site transparency and a gradual visual transition from the public realm of the pedestrian/ equestrian pathway to the private open space of the site.

8 Landscaping

Landscaping should reinforce the semi-rural character, be informal in organization, soft edged and allow transparency through the site.

The street edge should be informally treated and transparent across the site. Fences if necessary should be moderate in height, transparent and rural in character. It is important there is a sense of continuity along the street edge and de-emphasize the lot width pattern, where possible. For this reason, the immediate landscape context either side of the site, should be used as a reference for an appropriate response.

Side yards landscape treatment between the house and the street edge likewise should be transparent to allow for a sense of contiguous open space as seen from the street. Dense hedging or planting that creates a visual barrier between the front yards is discouraged. Fencing as required for the keeping of horses should be as transparent as possible.

Environmentally-sensitive and sustainable development design considerations:

- (a) Consider using drought resistant planting during the dry season.
- (b) Consider using planting and trees that absorb a high degree of water during the wet season.
- (c) Consider the use of planting which is natural to the local habitat, noting the proximity to the Fraser River and foreshore wetlands.
- (d) Consider the re-use of rain water for irrigation. Note: Rain water harvesting and storage facilities must comply with the Health Authority provisions of the Vancouver Building By-law.
- (e) Consider high- efficiency irrigation systems.

10 Environmental Regulations

The following is a list of existing legislative requirements providing regulatory control and standards for the protection and enhancement of the environment as well energy conservation and building performance.

- (a) Provincial Regulations
 - (i) FREMP, Fraser River Estuary Management Plan,

FREMP coordinates the environmental management of the Fraser River estuary reviews proposals for shoreline development and other activities in these marine ecosystems. Note: The Celtic Avenue CD-1 site has been reviewed by FREMP for compliance with Provincial standards, including the following:

- Water Quality and Drainage Control
- Foreshore and Fraser River Remediation
- Erosion Protection
- Soil remediation
- Fish Habitats

Web Address: <http://www.bieapfremf.org>

- (ii) Provincial Floodproofing Standards

Floodproofing is defined as the alteration of land or a building either physically or in use to reduce or eliminate flood hazard. It include the use of building setbacks from water bodies to allow for floodways and potential soil erosion and establishes minimum building elevations for habitable buildings. City Council adopted these standards April 15, 1986 and administers them in accordance with Section 2.3.6 (Buildings on Land Subject to Flooding), of the Vancouver Building By-law.

- (iii) Soil Remediation: Environmental Management Act, Part 4, Contaminated Site Remediation

- (b) Municipal Regulations, City of Vancouver:
- (i) Flood Management
 - Floodproofing Policies, By-law Administration Bulletin, (based on the Provincial Floodproofing standards)
 - Vancouver Building By-law; Buildings on Land Subject to Flooding Provisions
 - (ii) Storm Water Management Plan
 - The Celtic Avenue CD-1 By-law requires a storm water management plan, prepared by a certified professional engineer.
 - Reference: Celtic Avenue CD-1 Design Guidelines, 2.5 Topography
 - (iii) Drainage Management Plan
 - The Celtic Avenue CD-1 By-law requires a drainage management plan, prepared by a certified professional engineer. The drainage management plan considers run off during peak and normal periods.
 - Reference: Celtic Avenue CD-1 Design Guidelines, 2.5 Topography
 - (iv) Soil Permeability
 - The Celtic Avenue CD-1 By-law limits impervious surfaces to a maximum of 40% of the site area.
 - Reference: Celtic Avenue CD-1 By-law
 - (v) Soil Remediation
 - The previous use of the Celtic Avenue property was industrial and a soil analysis and remediation strategy was in place at the time of the rezoning.
 - (vi) Soil Preloading
 - The existing soil conditions of the Celtic Avenue site are subject to low bearing capacity and potential liquefaction. Preloading in combination with good drainage management reduces these hazards.
 - Vancouver Building By-law; Part 4, Structural Design Provisions
 - (vii) Tree Retention and Replacement
 - Tree By-law, Replacement Trees, Schedule A
 - Tree Retention, Relocation and Replacement Guidelines
 - (viii) Urban Food Production
 - City of Vancouver Policy for Sustainable Food System
 - (ix) Energy Building Performance Standards
 - Vancouver Building By-Law, Part 5, Environmental Separation Provisions and Part 6, Heating, Ventilating and Air-Conditioning Provisions
 - (x) Waste Management
 - Vancouver Building By-law, Part 8, Waste Material Provisions

Web Address: www.vancouver.ca

Energy Conservation and Sustainable Development Agencies and Programs

The following is a list of some of the other programs the applicant may wish to consider in the design and construction of development which is environmentally sensitive and sustainable.

- (a) R2000 Natural Resources Canada
R-2000 is a voluntary federal program for energy efficiency and environmental responsibility. The R-2000 Standard is a series of technical requirements for new home performance that go way beyond building codes. Every R-2000 home is built and certified to this standard.
Web address: <http://r2000.chba.ca>
- (b) Canadian Home Builders' Association
The Canadian Home Builders' Association works with Natural Resources Canada's Office of Energy Efficiency which manages R-2000 on behalf of the federal government in support of R-2000 technology, builders and consumers.
Web address: www.chba.ca
- (c) EnerGuide Natural Resources Canada, Office of Energy Efficiency
Natural Resources Canada's Office of Energy Efficiency (OEE) offers a wide range of programs and services to improve energy efficiency. The OEE offers financial incentives and other resources, including workshops, data interpretation and free publications, to help Canadians save energy and reduce greenhouse gas emissions that contribute to climate change.
Web address: <http://oee.nrcan.gc.ca/corporate/programs>
- (d) Canada Green Building Council
The Canada Green Building Council exists to accelerate the design and construction of Green Buildings across Canada. The Council is a broad-based coalition from different segments of the design and building industry.
Web address: <http://www.cagbc.org>
- (e) LEED
The LEED (Leadership in Energy and Environmental Design) Green Building Rating System® is a voluntary, consensus-based national standard for developing high-performance, sustainable buildings.
Web address: <http://www.usgbc.org>
- (f) LEED, Canada
LEED Canada is based on the US LEED model but with an emphasis on the Canadian climate. It is administered by the Canada Green Building Council.
Web address: http://www.cagbc.org/building_rating_systems/leed_rating_system