

**NATURALIZED STREETSAPES:
A CASE STUDY OF CROWN STREET, VANCOUVER**

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As part of a Sustainable Region Initiative, on January 17, 2002, the Greater Vancouver Regional District held a conference to consider and evaluate progress toward the overall regional aim of sustainable development of urban infrastructure. Recently, the City of Vancouver adopted a set of principles for sustainability as an initiative to advance the economic, social and ecological sustainability of the city and its neighbourhoods. The report states that, “Ultimately, the City’s objective should be to incorporate enhanced sustainability into all the City operations as a ‘way of doing business’.”¹ Indeed, at both a municipal and regional scale, a framework based on the principles of sustainability, causes a paradigm shift in the way we approach urban design. This paper considers the City of Vancouver’s implementation of its goals by taking up a case study of Crown Street in Vancouver south.

Policy Framework

In the Streets Division of Engineering Services at the City of Vancouver, innovative street treatments explore means of answering the call to improve environmental sustainability. Research conducted on urban landscapes shows that street design has the capacity to greatly effect ecological functioning. The recent publication *Sustainable Urban Landscapes: Site Design Manual for BC Communities* observes that, “Blocks function as living space and define transportation corridors, and they can also play an important role in the ecological function of the neighbourhood...The best place to mitigate the bulk of stormwater consequences of urbanization is at the source – in the yards and on the streets...Collect, store, and infiltrate as much stormwater as possible on each block...”² Similarly, a report prepared for the Greater Vancouver Sewerage and Drainage District, posits that stormwater source control on streets has significant benefits: “The purpose of *stormwater source control* is to capture rainfall at the source (on building lot or within road right-of-ways) and return it to the natural hydrologic pathways – infiltration and evapotranspiration – or reuse it at the source [italics original].”³ It goes on to say that, “It is also important to realize that maintaining or restoring the ecological health of a watershed will also reduce the source of flooding risk and improve water quality.”⁴ Planning, designing and constructing streets as “living corridors” produce environmental benefits at the block, community and regional scale – linked by hydrology within a particular watershed. The Streets Division is trying to design streetscapes in innovative or *green* ways. That is, they are making efforts to deal with stormwater more responsibly than traditional curb and gutter streets.

A branch of the City of Vancouver Streets Division, called Greenways, made up of both Engineering and Planning personnel, was established to address, among other things, the *greening* of Vancouver streets. Greenways are *green* paths for pedestrians and cyclists in the heart of the city. Their purpose is to expand the opportunities for urban recreation, to provide alternate ways to move through the city, and to enhance the experience of nature

and city life.^a One of Greenways' primary objectives is to *green* streets – *green* defined both literally in the sense of adding more vegetation, and also symbolically, meaning creating more environmentally sustainable streets.

Another branch of the City of Vancouver Streets Division, called Streets Design, is responsible for developing a plan that ensures the efficient delivery of the Street's Capital Reconstruction Program, as well as providing property owners the opportunity to upgrade curbs, gutters, street trees and sidewalks through the Local Improvement process. This branch has been involved with a number of best management practices that include re-use of waste asphalt grindings and installation of infiltrating catch basins.

To address its ecological objective, Greenways works with Streets Design to develop a number of ways to *green* streets. These techniques include: narrowing hard road surfaces and increasing grassy boulevard area; planting medians, traffic circles (Fig. 1) and corner curb bulges with drought tolerant species; directing street runoff into what we call "infiltration bulges" (portions of boulevard that bulge into the street and allow water to infiltrate the soil before being directed into elevated catch basins) (Fig. 2); planting more trees; providing residents the opportunity to reconstruct back lanes as

Figure 1 – Traffic circle



Figure 2 – Infiltration bulge, before planting



Figure 3 – Country lane



^a (The inspiration for Greenways in Vancouver came from the work of the Mayor's Urban Landscape Task Force, appointed by Council in 1991, and chaired by Landscape Architect Moura Quayle. Subsequent to citywide public consultation, Council approved the Vancouver Greenways Plan in July 1995.)

“country lanes” with permeable surface treatments instead of a standard asphalt pavement treatment (Fig. 3); and, creating roadside biofiltration swales. The ecological effects of these techniques are numerous and valuable. By increasing permeable surfaces, more runoff infiltrates into the ground, replenishing groundwater and filtering pollutants before reaching local water bodies. Stormwater runoff is also significantly reduced, thereby decreasing combined sewer overflows. Increased planting provides wildlife habitat, covers over soils susceptible to erosion and compaction, and decreases carbon dioxide found in the air. The list of benefits can be endless.

Naturalized Streetscapes Case Study

The most ambitious project to date for a complete redesign of a Vancouver city street, utilizing many of the above mentioned techniques, is *Naturalized Streetscapes*, an approach to street design integrating issues of traffic calming, aesthetics and stormwater management. *Naturalized Streetscapes* draws influence from a similar project in Seattle. The City of Seattle’s Street Edge Alternatives concept, also known as the SEA Streets, was visited by both Greenways and Streets Design staff last year. SEA Streets visibly improves the urban environment by managing stormwater, minimizing impervious surface, calming traffic and adding green through attractive landscaping. The street design consists of a meandering 4.6 metre wide road flanked on either side by landscaped swales (Fig. 4).

Figure 4 – Seattle’s SEA Street



Their website notes that, “The drainage design represents a unique hybrid, combining hydraulic engineering with soil science and botany to create a more natural system,”⁵ thereby involving street residents, landscape architects and staff at Seattle Public Utilities.⁶ Similarly, in Vancouver, Greenways’ and Streets’ staff have been closely working with the residents to come up with a *Naturalized Streetscapes* pilot project that will act as an alternative to conventional curb and gutter streets in the Local Improvement process and present a more environmentally friendly model street for Vancouverites, and a wider population.

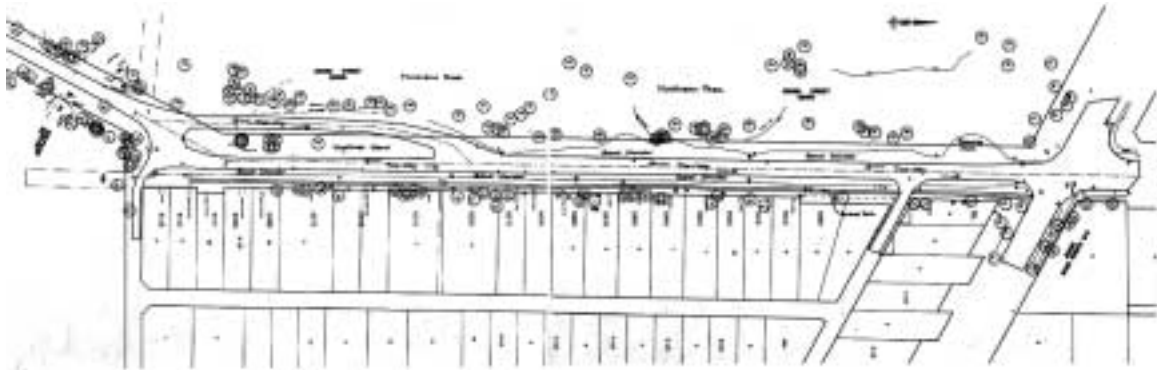
Thus, this paper primarily considers a case study of this *Naturalized Streetscapes* concept (which is currently underway and scheduled to commence construction in early 2003). The paper discusses project context and initiation. Second, it outlines the public process and highlights obstacles to overcome in a pilot project while considering the role the public plays in design generation. Third, details of the design focus on traffic calming, aesthetics, stormwater management and maintenance. The paper concludes with a discussion of the

pros and cons of *Naturalized Streetscapes*, both in the short and long-term, and how this design may or may not be applied in other residential neighbourhoods.

Project Context and Initiation

The project context is the street considered in this case study, Crown Street, a single-family residential block that is unusually long - 330 metres in length - housing twenty-one lots on the east side of the street alone (Fig. 5). Park borders the west side and south end of the street. Parallel parking on largely impermeable gravel shoulders lines both sides of the street, while there are a few extra gravel parking spaces on the west side of the street for park visitors. For the most part, the park is used for passive recreation but ultimate frisbee teams periodically use a field in the park. It is not typically a destination park for drivers; most people walk to the park from nearby homes.

Figure 5 – Existing plan of Crown Street



The park is named “Musqueam” after the First Nations Reserve located directly south of Crown Street. A two-way road cuts through the southern portion of the park connecting the reserve to Crown Street, acting as one of three entryways/exits to the reserve. This connector road is unique because it passes over the only salmon-bearing stream remaining in Vancouver: Musqueam Creek. Another unique characteristic of Crown Street is that at the south end, the road splits in two – one side cutting through park property and the other remaining in the street – divided by a lens-shaped vegetated island (Fig. 6). Both of these roads are presently informally occupied by two-way traffic.

Crown Street is located within the special community of Southlands, known for its rural character - where horses are often observed trotting down the streets - in the southern extents of Vancouver. In Vancouver’s early years, Southlands was farmland located on part of the Fraser River floodplain. Although Southlands has changed over the years, the most recent community plan (1988) states, as one of its objectives, “to retain existing unpaved shoulders and ditches with no sidewalks or curbs and retain existing unopened lane configuration in West Southlands.”⁷ The objective responds to semi-rural character

Figure 6 – Photo looking south on Crown Street, with residences to the left, park to the right, and vegetated island in the distance.



and the present storm water drainage system in the area. Increasing impervious areas by way of street and lane construction could aggravate the present drainage system, which relies on the slow dispersal of runoff from the area into the North Arm of the Fraser River.

The *Naturalized Streetscapes* pilot project started because of a public complaint but appears to have developed with rather serendipitous results. A Vancouver resident, after visiting the area, complained to the Local Improvements Branch at the City of Vancouver, that Crown Street was in terrible condition and should be repaired immediately. Staff in the Local Improvements Branch explained to her that due to the Southlands Plan curb and gutters could not be installed, but the poor road surface could be repaved. A petition was then issued to Crown Street residents for new pavement. However, upon receipt of the petition, Crown Street residents decided they wanted something more than just a fresh layer of asphalt – they wanted curb and gutter as well. Thus, a number of the residents put another petition together to request exemption from the Southlands Plan. After investigating this potential project, Local Improvements staff believed Crown Street might be the perfect place to test the *Naturalized Streetscapes* model.

Public Process

The public process was extensive, involving three public meetings, four surveys and a great deal of feedback from Crown Street residents. The typical Local Improvement process in Vancouver requires two-thirds petitioned support from adjacent owners to proceed to a City Council Review at the Court of Revision. If Council approves the project the improvement proceeds to design and construction. Property owners pay a share of the construction costs of the street improvement. For a standard curb and gutter street, residents know exactly what they would be getting when they vote for their project at the Court of Revision. However, the Crown Street pilot project differs from a typical Local

Improvement process because, as a new concept in Vancouver, residents could not be sure of the final design, with no local prototype to view.

To address this concern, the project team presented the *Naturalized Streetscapes* concept to the residents at a well-attended public meeting in May of this year. Many residents showed immediate enthusiasm, while others were hesitant to support, and pay for a portion of, a street design they had not yet seen. This concern was overcome by City staff assuring them that they would have an opportunity to vote again on a developed conceptual design, once more requiring two-thirds support before proceeding to final design and construction. By providing residents a voice in the design, they felt more comfortable voting for the project. A month later, Council approved the concept for Crown Street and staff began to work with the neighbourhood on design ideas.

As mentioned, the Southlands Community Plan requires the maintenance of a semi-rural neighbourhood character, retaining unpaved shoulders and disallowing concrete sidewalks. The West Southland Ratepayers Association (WSRA) expressed some initial concern regarding the street upgrades on Crown Street. To address their concerns and provide project information, the Greenways Engineer presented the design concepts at their Annual General Meeting in May 2002. The WSRA passed a motion to support the initial project concept and also designated several members to represent the associations' interests and objectives throughout the design process. The motion was supported unanimously. Moreover, several members of the WSRA contacted City staff after the meeting to express interest in redesigning their own streets as *Naturalized Streetscapes*.

While City staff began working on concepts for the street design, a resident survey was taken, primarily focusing on parking requirements and boulevard landscaping preferences. On receipt of the surveys, the designers incorporated resident ideas into the plan. In July another neighbourhood meeting was scheduled to present the first concept plan. At the meeting, the Greenways Engineer gave a short presentation to explain the background of the project and design concept. Concept plans were also on display panels to be viewed by residents. Following the presentation, the floor was opened up for questions. Unfortunately, the plan did not seem to be well received by the community as a few opposing participants dominated the discussion. Most of the concerns pertained to perceived parking shortages and the idea that traffic would be increased at the south end of Crown Street if the design were to go ahead as planned (for reasons to be explained below). At the end of the meeting, another questionnaire was handed out to Crown Street residents, asking if they supported the Crown Street concept design, and what their general and specific comments were regarding the proposal.

Comments were mixed but primarily focused on these parking issues: concern that there was inadequate parking for large gatherings and for homes with renters; caution about the idea of sharing a parking spot with neighbours; and, distance from parking to homes in the case of deliveries. Other concerns mentioned were that the street improvement would somehow decrease property values, while others worried that street improvement would

increase property values and therefore increase property taxes. Others feared the proposed swales would be breeding grounds for mosquitoes and rats. However, over the next couple weeks, staff worked together to address the concerns and suggestions offered by residents. The street design began to feel like a very complicated puzzle with an elusive solution. Finally, after much back and forth with the residents, a revised plan was drawn up and another public open house was scheduled for August.

A similar format guided this meeting. Panels displayed the preliminary plan and the Greenways Engineer gave a short presentation to introduce the meeting. Because the last meeting had focused so much on parking issues, a staff person from the City's Parking Branch attended the meeting to field parking-related questions. However, to most everyone's surprise – staff and residents alike - parking was no longer a major issue at this meeting. The revised plan dealt with parking in a way that seemed acceptable to most in attendance and allayed previous concerns. At the end of this meeting, staff felt much more optimistic about the fate of Crown Street.

Once again, residents received a survey to either fill out on the spot, or to take home with them and send in by a given date. This survey was meant to constitute the official vote on whether or not the project would proceed to final design and construction, requiring two-thirds majority. The greater part of residents approved, some pending minor changes. A final survey was sent out in September accompanied by an altered plan, providing all property owners a chance to vote on the revised concept. No further public meetings were scheduled. However, as detailed design got underway, residents were contacted individually to mainly discuss landscaping on the boulevard in front of their homes.

At the south end of the street, the road connects to, and travels on, the Musqueam First Nation lands. Initial discussions with the Musqueam First Nation indicate that they are very supportive of the project. The proposed street improvements further the efforts that they have made on improving the water quality and habitat of Musqueam Creek. Staff will be meeting with them to discuss design ideas. Thus far they have indicated that they intend to contribute funds to continue street improvements onto their lands.

Design

The design addresses four main issues: traffic calming, aesthetics, stormwater management and maintenance. The *Naturalized Streetscapes* concept was an amalgamation of other Greenways and Streets Design initiatives, and influenced in form by Seattle's SEA Street model. Like the Seattle street, the Crown Street design essentially involves a narrow and meandering hard road surface, flanked by landscaped swales on both sides of the street (Fig. 7). It represents an integrated approach to street design by considering vehicular and pedestrian safety, aesthetics and ecological functioning holistically. One example of this integrated approach is the effect of a narrow road surface: narrowing the street reduces vehicular speeds, decreases impervious area and is more visually appealing, allowing for more green space and a greater buffer between cars, pedestrians and homes. It is

impossible to design the road without considering stormwater; moreover, landscaping must be considered in tandem with stormwater conveyance and treatment. That is, the design elements are synergistic. However, to discuss design considerations, the paper breaks the design into four components: traffic calming, aesthetics, stormwater management, and maintenance.

Figure 7 – Perspective sketch of the Crown Street’s *Naturalized Streetscapes* design.



Traffic Calming

Crown Street presents the designers with three primary traffic-related issues: traffic speeds, traffic patterns and parking. Presently, Crown Street is a relatively quiet residential street. Homes lining the east side of the street look onto a park on the west side and are bordered by park at the south end of the street. Consequently, there is not much local traffic, but a fair amount of Musqueam traffic uses Crown Street as an access in and out of the reserve. Traffic volumes are approximately 650 cars per day and 85th percentile speeds are within the 50 kilometres per hour limit. Infrequently vehicles race down the street, which causes residents to perceive that traffic speeds are very high. To address the concern of vehicle speeds, the design has only 3.6 metres of asphalt and 1 metre of concrete on either side, totaling 5.6 metres of hard road surface. Designers believe the narrowness of the black asphalt, edged with concrete strips gives the visual impression that the road is even narrower than it really is, and thus cause drivers to slow down. The meanders also work to reduce speeds by breaking up long sightlines with a planted swale that gently waves in and out of the typical street corridor (Figs. 8 and 9).

At the south end of Crown Street, existing roads travel on either side of the vegetated island, and are both informally used for two-way traffic, but cause some confusion for drivers. The road to the west of the island actually traverses through Park property and was never formalized for street use. In a typical Local Improvement process, anomalies such as this would be corrected by closing off the section of road through Park property,

Figure 8 – Plan of the *Naturalized Streetscapes* design, south end of Crown Street.

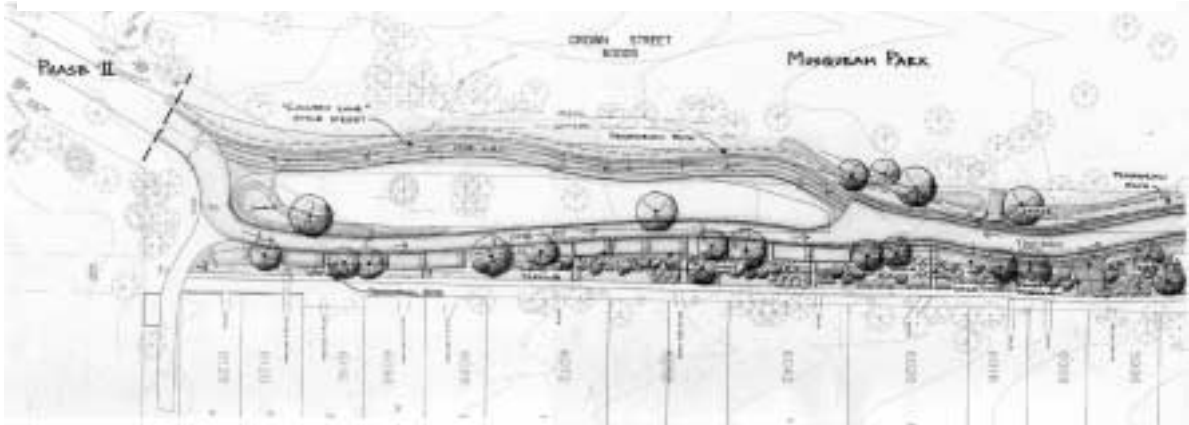


Figure 9 – Plan of the *Naturalized Streetscapes* design, north end of Crown Street.



with two-way traffic only on the east side. However, residents along this segment of street strongly opposed the idea, as the traffic would increase directly in front of their homes. Staff resolved this issue by negotiating with Parks to obtain a right-of-way over the west road through Park property, on the condition that the road surface was not widened and the street design was more sustainable than traditional curb and gutter streets.

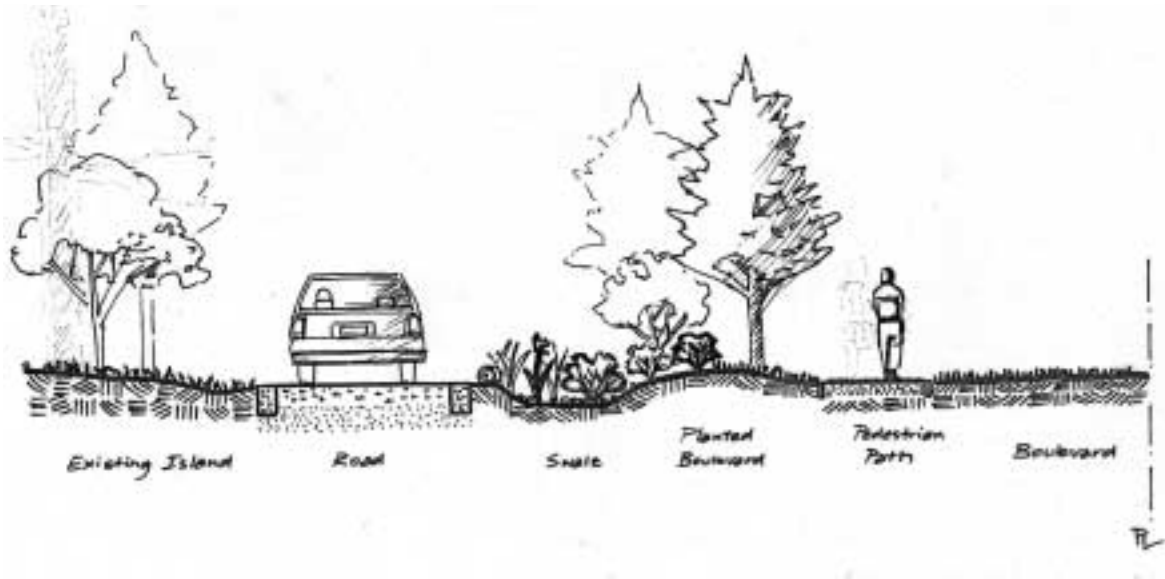
The existing roads on either side of the vegetated island are much narrower than City standards to support two-way traffic, although two-way traffic functions on both roads. Moreover, pedestrians, particularly children, from the Musqueam lands tend to walk on the west roadway. The concept design proposed one-way traffic on both roadways, and narrowed street widths around the island, greatly increasing safety and allowing space for a gravel pedestrian path on the street's west side.

Initially residents voiced concern about formalizing the two roads at the south end of the island to one-way each side, as traffic data showed about two-thirds of vehicles traveled on the west road, adjacent to the Park. Reconstructing these roads as one-ways would subtly increase traffic by about one car every fifteen minutes on the island's east side, adjacent to homes. However, the majority of residents in the south end supported the proposal, even with the slight increase in traffic volume, due to increased safety benefits. Designers are currently considering two options for the one-way roads: one with the roads narrowed to 3 metres, from 4.5 metres (Figs. 10 and 11), the other a country lane design with the wheel paths made of concrete and 0.9 metres of concrete in between. Both options narrow road

Figure 10 – Perspective sketch of proposed one-way street around vegetated island.



Figure 11 – Typical section of proposed one-way street.



widths are expected to slow traffic, while designed meanders should further reduce speed in the one-way segments.

Parking posed the greatest challenge. At the concept stage, angled parking spots were grouped in pods of two or three and typically placed on property lines (Fig. 12). The width of the road did not allow for parallel parking. Many residents were opposed to this parking configuration, for reasons including: the number, or lack thereof, allotted spaces; the difficulty involved in parking a car in an angled space; concern of others parking in front of their home; and issues involving vehicle lights shining in their windows and noise from parking cars. In response, the road width was widened from the original

Figure 12 – Plan detail of angled parking displayed at concept stage.

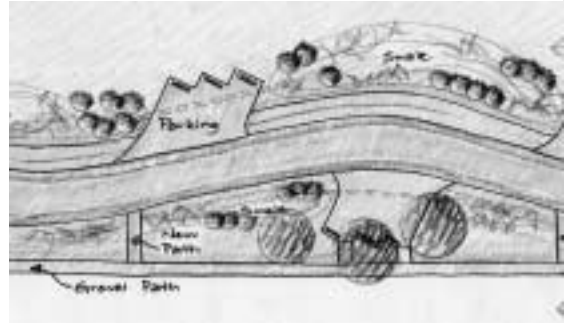


Figure 13 – Typical section of two-way street at concept stage. Road is 5 metres wide.

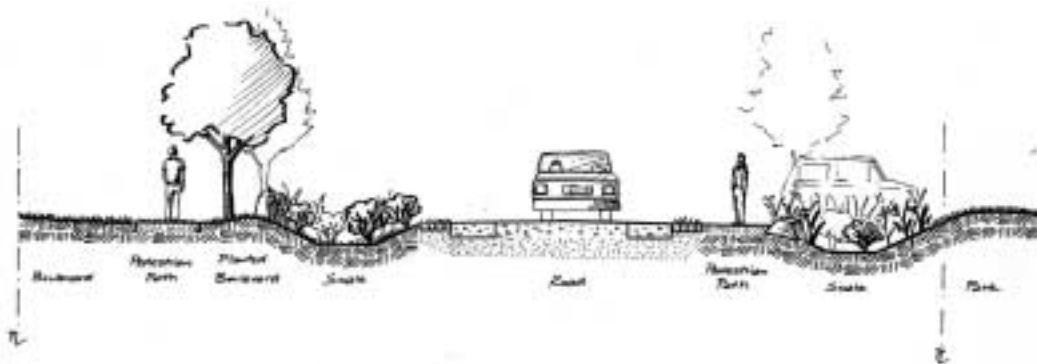
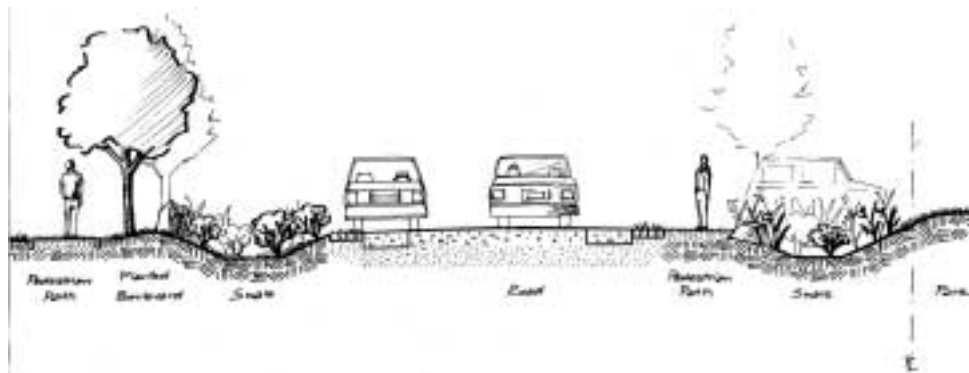


Figure 14 – Typical section of two-way street with revision. Road is 5.6 metres wide.



proposed width of 5 metres to 5.6 metres plus half a metre of structural grass on either side, totaling an effective drivable width of 6.6 metres (Figs. 13 and 14). At this width, cars can parallel park on one side of the street and moving vehicles still have room to manoeuvre around them. A few angled parking spots were retained in sections with greater parking needs and alongside the park. At the south end of Crown Street, the road width does not allow for roadside parallel parking so designated spots were placed according to resident input. Most residents were very appreciative of staff's attention to their concerns and looked upon this proposal favourably.

Aesthetics

The primary aesthetic objectives of the design are to contextualize the street within the semi-rural character of Southlands, and extend Musqueam Park across the street. To meet these objectives the street is designed with a picturesque quality, possessing features such as informal groupings of plants, meandering pedestrian paths, and natural drainage courses. Earthy tones and materials were used to blend in with the environment; for example, logs act as curb stops in some locations and granite boulders and cobbles define portions of the swales.

Predominantly native plant material blends in with the park context and helps to ensure survival in extreme street conditions. Grass forms a lush green carpet that underlies coniferous trees standing tall in Musqueam Park. Coniferous trees extend into the street where they mix with deciduous trees. The coniferous trees are mainly kept to the park side so they do not excessively shade the houses while boulevard underplantings tie in with the landscaping of the adjacent homes (Fig. 15). Most residents were happy to contribute ideas about the planting in front of their homes. In one of the surveys, residents were asked to comment on the level of maintenance they would be willing to contribute – from low to high - and what sort of landscaping they would prefer. At a later stage of design, residents

Figure 15 – Perspective sketch of proposed landscaped boulevards on Crown Street.



were individually contacted to discuss the landscape plan to ensure that they were satisfied with the proposal. Each resident was interested in something slightly different, so the challenge was to come up with a design that looked consistent along the entire street.

To address this challenge, a plant and materials palette was chosen to limit variety and yet allow flexibility in design. Turf provides the backdrop, as in the park, onto which all other landscape and plant materials are arranged. Turf lines both sides of the street, supported by load-bearing plastic rings that the grass grows in. Grass is also used as a groundcover on the boulevard and to line some of the swales where residents did not want to maintain other forms of landscaping. Groupings of groundcovers and shrubs wave through the turf mainly focused around and in the swales. Taller shrubs are limited to the middle of the boulevard space, and back from the street and pedestrian walk, to ensure sightlines.

Local granite boulders (salvaged from excavation rubble) and beached logs punctuate the plantings, highlighting certain areas and adding interest to the boulevard. These materials were chosen to mesh with their context. Currently throughout Southlands logs are used, either horizontally to block vehicle entry, or vertically to mark trail entrances, and granite boulders regularly edge boulevards or act as small retaining devices. By using local, recycled and reclaimed materials, and native plantings in an informal composition, *Naturalized Streetscapes* design connects with Musqueam Park and the surrounding community of Southlands.

Stormwater Management

The project site is directly upstream from the last natural salmon-bearing creek in Vancouver. There have been many efforts to enhance and restore the habitat value of Musqueam Creek by organizations and community groups such as the Musqueam First Nation, Fisheries and Oceans Canada, Pacific Spirit Park (Greater Vancouver Regional District), the City of Vancouver and the David Suzuki Foundation. Prior efforts include monitoring of stream flow and water quality, augmenting low summer water flows in the creek using a groundwater pump, and improving vegetation and stabilizing banks to protect the creek's habitat. The sewers on Crown Street are separated, and storm flow is directed to an existing engineered wetland just upstream from the creek.

Stormwater management, for the purposes of this project, promotes surface retention and groundwater recharge. Peak flows into Musqueam Creek will be reduced and storm runoff will be released at a more natural rate. In order to accomplish this, permeable surface area is maximized and infiltration encouraged by adding stormwater storage and retention facilities; thereby decreasing the volume, intensity, and duration of runoff, encouraging natural stormwater filtration, improving water quality, and increasing base flow in the nearby Musqueam Creek. In other areas of Vancouver with separated sewers, but without a nearby fish-bearing creek, this type of street treatment would also be beneficial due to improved runoff water quality, and lower peak volumes and flows of stormwater being discharged to downstream water bodies. While Vancouver is currently separating its combined sewer system, many combined sewers still exist. Benefits of this type of street

treatment in combined areas include reduced frequency and duration of combined sewer overflows, and decreased potential for flooding.

Traditional standard concrete sidewalks and curb and gutter street treatment for Crown Street would consist of an 8.5 metre pavement width, plus an additional 3 metres for sidewalks, resulting in a low time of concentration (approximately 10 minutes). The total impermeable area in this scenario would have significantly increased from the existing conditions, and could have further aggravated the flow problems in Musqueam Creek. On the other hand, the proposed road, parking and sidewalk design differs from traditional residential streets in Vancouver. A 5.6 metre road, as opposed to 8.5 metres, and permeable sidewalks and parking spaces, rather than impermeable surfaces, decreases the impermeable area by more than 60%. In addition, the use of swales, absorbent soils and infiltration areas increases the time of concentration. As a result, peak runoff rates and flows reduce, ground water levels recharge, and base flow increases in the nearby creek. This effort is also supported on the residential side through a City by-law restricting impervious area on all single-family lots to no more than 60%.

In the Crown Street design, swales located on either side of the road collect, convey and infiltrate stormwater. Orifices are located at the downstream ends of swales to allow stormwater to be slowly discharged, ensuring that standing water does not accumulate for long periods of time. Higher flow events are intended to be directed to the Musqueam Park on the west side of the street, allowing for additional infiltration and filtering of stormwater. Vegetation growing in and along the channel helps to reduce flow velocities and thereby, increase the time of concentration and reduce peak runoff rates. The roots of plants also stabilize the soil and prevent swale erosion, while the plant mass keeps rainwater from compacting the soil below. Moreover, vegetated swales efficiently remove heavy metals, total suspended solids, turbidity, and oil and grease.

Surface soil and vegetation also play a significant role in minimizing the volume and rate of runoff. *Naturalized Streetscapes* utilizes absorbent soils (soils with high organic content) and absorbent landscaping (plants that take up excess water through roots) to maintain and promote infiltration and evapotranspiration capacity. The Interim Report on *Effectiveness of Stormwater Source Control* states that, “runoff from pervious areas can be virtually eliminated by providing a *300mm layer of landscaped absorbent soil*, even where the hydraulic conductivity of the soil is low [italics original],”⁸ when planted with absorbent landscaping. On Crown Street, planting will immediately follow construction of the swales to prevent erosion and compaction of the absorbent soils installed.

In addition to the street treatments, the neighbourhood will be encouraged to install rain barrels from the City of Vancouver at a small cost. Rain barrels are connected to roof drains and retain stormwater for watering plants or grass. They cause people to think about how water is used and how they can personally be involved in water conservation. Most importantly, rain barrels foster best management practices, and ultimately, help to establish more sustainable ways of living.

One of the main storm water objectives for the *Naturalized Streetscapes* project is to limit the annual run off volume to no more than approximately 10% of annual rainfall, in order to maintain a healthy watershed. Stormwater management in the *Naturalized Streetscapes* model was not designed independently but holistically with the other design elements. Traffic calming, aesthetics, and stormwater management work together to create the most efficient and dynamic design. The success of this model is dependent on an integrated design approach and collaboration between residents, landscape architects, engineers and planners.

Maintenance

Maintenance of the boulevard plantings and stormwater drainage system in *Naturalized Streetscapes* is also a design consideration. Low maintenance plant species are chosen to keep maintenance to a minimum on the boulevard and in the swales. Residents are expected to care for the boulevard area adjacent to their homes, just as they would be responsible for a conventional boulevard, which will require occasional weeding to keep invasive species out. Extra operating funds will be allocated to Parks for maintenance on the park side of the street until plants are established (approximately three years). But Crown Street is unusual this way, in that half of the street is Park property. On a typical residential street homeowners, on both sides of the street, would be requested to maintain the landscaped area between the road and their property, thereby negating the need for extra landscape maintenance funding. Furthermore, the stormwater system is not expected to require greater maintenance than it does presently. So although demands may differ from a conventional street, total maintenance is not anticipated to increase.

Pros and Cons of *Naturalized Streetscapes*

There is a number of important reasons to consider *Naturalized Streetscapes* as a new method of street design. The design can: slow vehicle traffic by narrowing and meandering the road width; improve pedestrian comfort with increased plantings, more shade, less glare from hard surfaces and a greater buffer between vehicle and pedestrian traffic; increase street interest through planting; improve water quality by stormwater management techniques such as biofiltration swales and permeable surfaces, while reducing storm sewer volumes; and maximize other environmental benefits, including improved air quality, wildlife habitat and groundwater recharge.

Construction costs for *Naturalized Streetscapes* are projected to be comparable with traditional curb and gutter streets. However, this is the City of Vancouver's first attempt to showcase *Naturalized Streetscapes*, so cost may even be decreased, as design and construction processes are refined.

The primary hurdle of *Naturalized Streetscapes* pilot project was the long and thorough public process. A significant amount of time was required by City staff to discuss the

design with the public, especially pertaining to parking and landscaping, to come to a design that satisfied the majority. However, the next *Naturalized Streetscapes* process likely would be much less challenging and time-consuming, since Crown Street would become a showcase for prospective street residents to visit and designers to model. Nevertheless, as the *Naturalized Streetscapes* design is environmentally site-sensitive, some details must be determined on a site-by-site basis. This requires input from residents and landscape architects, as well as engineers, for each site, who could use Crown Street as a precedent and interpret its principles for each new project. By working together, the design integrates various interests and therefore creates a more satisfying and responsible result. In *Naturalized Streetscapes* the principles of sustainability guide design and moreover, come to fruition in the design of everyday streets.

¹City of Vancouver. April 2002. *Policy Report*. Vancouver, BC: City of Vancouver Corporate Management Team.

²Condon, Patrick, Joanne Proft, Jackie Teed, and Sara Muir. 2002. *Sustainable Urban Landscapes: Site Design Manual for BC Communities*. Vancouver: UBC James Taylor Chair in Landscape and Liveable Environments, p.30.

³CH2MHILL. March 2002. *Effectiveness of Stormwater Source Control*. Greater Vancouver Sewerage and Drainage District, p.1.

⁴CH2MHILL, p.1.

⁵“SEA Streets Design Details.” <http://www.ci.seattle.wa/util/SEAstreets/design.htm>.

⁶“SEA Streets Design Details.”

⁷City of Vancouver. March 1988. *Southlands Plan*. Vancouver, BC. City of Vancouver Planning Department, p.77.

⁸CH2MHILL, p.9.