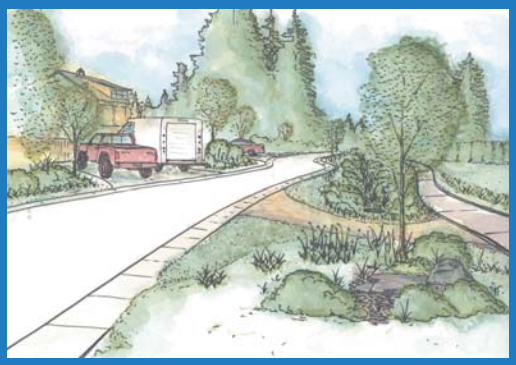
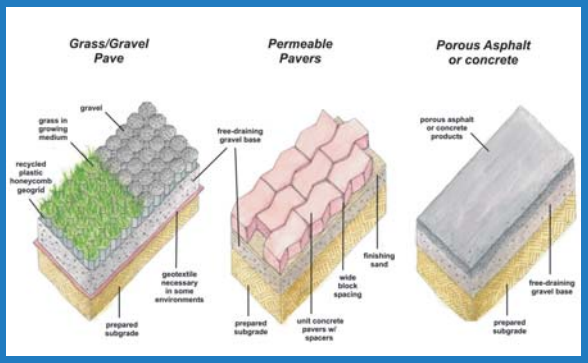
AN ECONOMIC RATIONALE FOR

INTEGRATED STORMWATER MANAGEMENT

5.3 Chesterman Beach

A Resource for Urban and Rural Land Development in BC





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5.3 Chesterman Beach – Tofino, BC

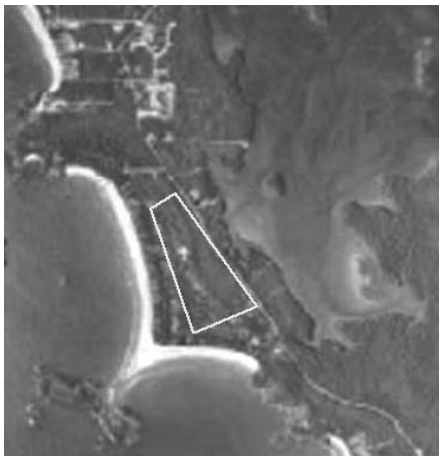

Figure 1 Aerial Photo of Study Area at Chesterman Beach

Chesterman Beach is a residential development located outside of Tofino on Vancouver Island. The existing development consists of 130 developed lots on either side of a road that winds roughly parallel to the beach. An additional 55 acres of undeveloped land adjacent to the existing community and bounded by the Pacific Rim Highway are available for development (Figure 1). As in the East Clayton and Cumbria Woods case studies, two designs for the new residential development at Chesterman Beach are compared for infrastructure costs. The first is a conventional suburban development, and the second is a green infrastructure alternative. Once again, the comparison, focussing on street pattern, stormwater infrastructure, and parks and open space, reveals that considerable savings are achievable by designing a neighbourhood that relies on green infrastructure for stormwater management. In this case, more than $1.25 million is saved in using the green infrastructure pattern.

CONVENTIONAL PATTERN

Street Pattern

The conventional street pattern consists of the branching hierarchy that typifies the traditional North American suburban landscape. Primary access is on a two lane, two way road off the Pacific Rim Highway that intersects the middle of the eastern boundary of the site. A second entrance to the site already exists along its northern boundary as Howard Road extends south of Lynn Road (see Figure 2). Local residential streets branch off these main access roads forming a series of dead ends. Rights-of-way are 16.5 metres, with 8.5 metres of paved surface.

Figure 2 Conventional Plan for Chesterman Beach

Stormwater Infrastructure

Stormwater is handled in a sub-surface pipe system. Run-off from roads is captured and channelled by curbs and gutters, and roof run-off is directed to the system through tie-ins attached to downspouts. Eventually, all runoff is conveyed to a single out-fall into a stream off site.

Parks and Open Space

Almost 30% of the total site area (16 acres) has been dedicated as open space. Of this, 4 acres are designated as a greenway covenant, not accessible to the public. This exists in the form of a 10 metre wide buffer for residential lots along the Highway. The remaining 12 acres is allocated as public park space and pedestrian right-of-way. Neither park nor open space has a functional role in stormwater management.

PEDESTRIAN ORIENTED GREEN INFRASTRUCTURE PATTERN

Street Pattern

The main access road entering the site from the Highway remains, though its 20-metre right-of-way drops to a 15-metre right-of-way upon reaching the development site. This main road extends westward to a central commercial node. A second right of way Ridge Road (which becomes Loop Road) provides access to the north and south of the site. The rights-of-way in the green infrastructure pattern consist of a 6-metre wide, two way paved travel lane, with drainage swales and pedestrian paths on either side.

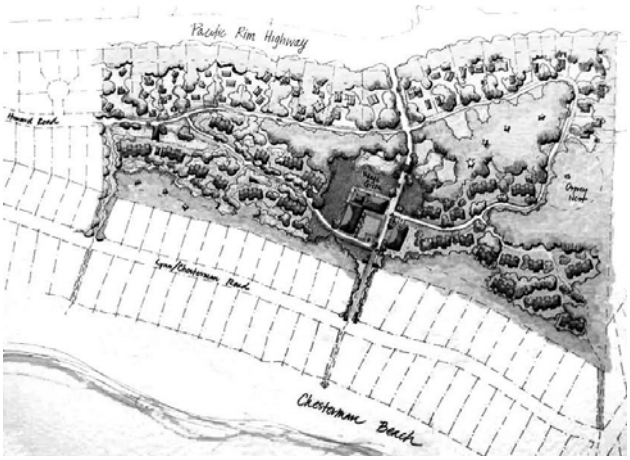

Figure 3 Pedestrian Oriented Green Infrastructure Plan for Chesterman Beach

The street network is arranged so that there is a continuous route through the site, and so there are no dead ends. Integrated pedestrian and vehicular routes facilitate both driving and walking within the site. It is intended that walking be the preferred mode of moving through the site, and to the beach, though it is recognized that the residents will remain reliant on the automobile as a result of their distance from the larger commercial areas in Tofino, Ucluelet, and Port Alberni.

Stormwater Infrastructure

Figure 4 Alternative Road System with Swales

Stormwater is managed through a naturalized surface drainage system. Extremely high soil infiltration rates eliminate the need to convey stormwater run-off away from the development. Instead, gravel roadside verges capture and infiltrate road and roof run-off continuously throughout the site. During heavy storms, overflow is directed through the roadside swales to the open space and central neighbourhood park, where water is detained and slowly released back into the soil. This green infrastructure approach capitalizes on existing wetlands and woodland soils to manage stormwater runoff.

Parks and Open Space

In this plan, more than 30 of the total 55 acres are dedicated to open space. Included in this is a 2 acre central neighbourhood park is connected by pedestrian right-of-way to 17 acres of public open space, as well as more than 7 acres of dedicated environmental buffer, held in protective covenants on private lots and clusters adjacent to the road or neighbouring development. The parks and open space are designed as an integrated network. Sidewalks, public paths, and park trails provide residents of Chesterman Beach, as well as people from neighbouring Tofino, with pedestrian and bicycle access to the beach and other greenway systems. They also perform an important detention and infiltration function for the naturalized surface storm system. This in turn protects existing streams and ground water quality on and off the site.

Conclusion

The green infrastructure concept at Chesterman Beach is founded on a soft approach to stormwater management. This approach replaces costly infrastructure like curbs, gutters, piping and extensively paved road surfaces with swales and gravel verges. Capitalizing on the sandy site allows water to be infiltrated everywhere, whether on lots or in an interconnected system of parks and open space. Within the context of small towns, this approach is particularly valuable because it encourages the downscaling of development schemes, thereby making street, stormwater, and pedestrian systems less expensive and more consistent with traditional small town landscapes. In this case study, infrastructure costs for the entire site using the green infrastructure pattern are 58% less than the costs involved in the status quo pattern – resulting in a savings of $1,225,824.00 for the whole site, or more than $8,000 per unit. The costs are highlighted in Tables 1 and 2 below.

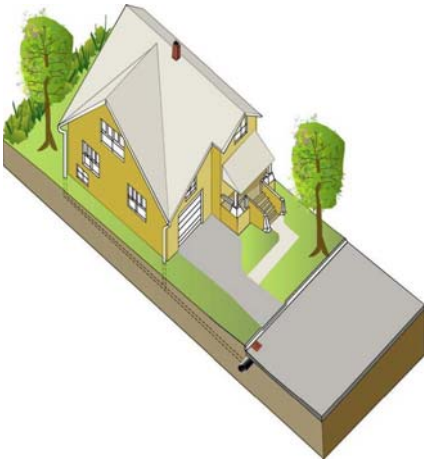

Table 1 Infrastructure Costs for Conventional Proposal at Chesterman Beach

Infrastructure		Infrastructure Cost
Asphalt Paving		$277,933
Sub-base gravel		$83,380
Base gravel		$74,116
Curb and Gutter		$141,692
Storm sewer and Catch Basins		$392,377
Excavation, Cut and Fill		$87,195
Sidewalk and Pedestrian Paths		$152,591
Water Main and Services		$348,779
Sanitary Sewers and Services		$326,981
Utility Services and Street Lighting		$305,182
Total Infrastructure Costs	Entire Site	**$2,190,224**
	Per Hectare	**$98,703**
	Per Unit	**$13,355**

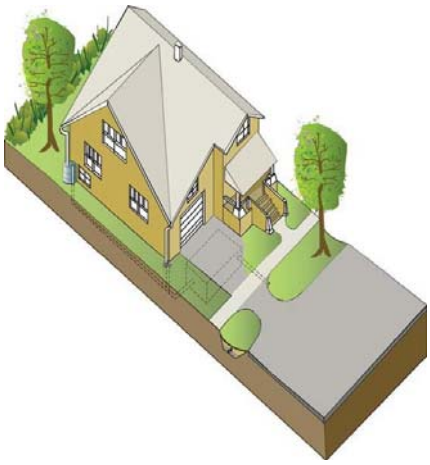

Table 2 Infrastructure Costs for Pedestrian Oriented Green Infrastructure Proposal at Chesterman Beach

Infrastructure		Infrastructure Cost
Asphalt Paving		$159,750
Sub-base gravel		$47,925
Base gravel		$42,600
Curb and Gutter		n/a
Storm sewer and Catch Basins		n/a
Excavation, Cut and Fill		$47,000
Swale		$41,125
Sidewalk and Pedestrian Paths		$82,250
Water Main and Services		$188,000
Sanitary Sewers and Services		$176,250
Utility Services and Street Lighting		$164,500
Street Trees		$15,000
Total Infrastructure Costs	Entire Site	**$964,400**
	Per Hectare	**$43,461**
	Per Unit	**$5,023**