What We Found

What We See

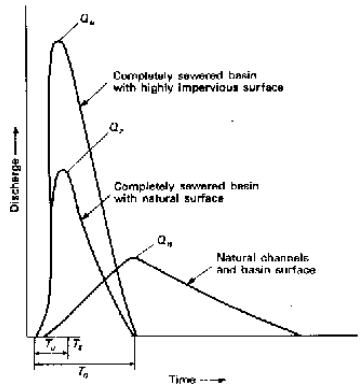
D-2 DRAINAGE SYSTEM

The town of Gibsons and its environs is situated within three local watersheds, Chaster Creek, Charman Creek and Gibsons Creek. Since our focus is on the town of Gibsons, which lies mainly within the Charman Creek watershed, this discussion will focus on the Charman Creek drainage area.

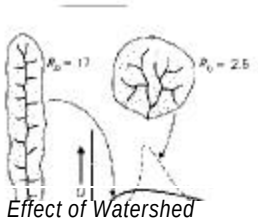
D-2.1 Charman Creek Watershed and Drainage System[1]

The Charman Creek Watershed currently covers an area of approximately 160 hectares. Of that, two-thirds is considered woodlot or rural. The remaining third is high density, consisting of a combination of urban residential, institutional, commercial and light industrial. The majority of this high density development occurs on either side of the Sunshine Coast Highway. The current drainage system consists predominantly of a closed system north of the Sunshine Coast Highway. A few roadside ditches and swales exist, but for the most part, the area is serviced by storm drains and underground infrastructure. South of the highway, the drainage system is comprised of a combination of roadside ditches, storm drains, and overland flow, draining into the Charman Creek channel.

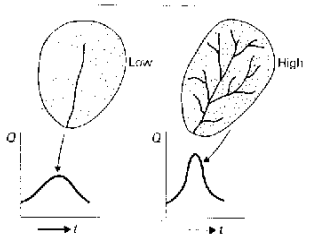
The future primary growth area for the town of Gibsons is slated to occur in Upper Gibsons, in the upper portion of the Charman Creek basin. The currently existing storm sewer system within upper Gibsons is considered to be sufficient to service future developments. The greatest risks associated with increased development are erosion and flooding along the creek channel. What is required is peak flow attenuation to reduce release rates into the creek. Presently, peak design flow rates are approximately 50% higher than those from pre-development. It is estimated that future development will more than double the flow rates from pre-development levels. Currently there is a detention pond located within the Town Park . However, it has little significant retention ability and is expected to readily overflow during a less frequent storm event. It is apparent that retention ponds are now required in Gibsons, given the sensitivity of the Creek to erosion and flooding as well as in preparation for increased run-off associated with further urban development. Current Ministry of Envrionment guidelines requires that 1:2 year post-develoment flow rates be reduced to a 1:2 year pre-development level. However, it is proposed in the 1998 drainage master plan to design the detention facilities based on 1:10 year post and pre-development flow rates as well as to provide some kind of flow path for an emergency (1:100 year storm). The constraint in the town of Gibsons, however, is its topography. Therefore, consideration of the type and location of the retention facility is fundamental.



Effects of urban development and increased drainage infrastructure on stream peak flows



Effect of Watershed Shape on Flow



Effect of Drainage Density on Flow

[1] Charman Creek Master Drainage Plan Final Report. Urban Systems. December 1998.

What We Found **What We See**

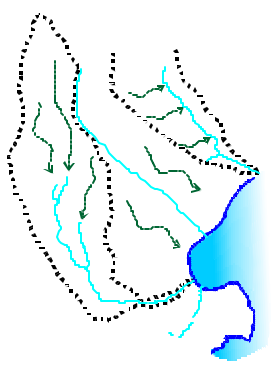
D-2.2 The Weird and the Wonderful

Herein lies a great opportunity to take a fundamental and basic service requirement of a growing urban community and turn it into something that both the community and the environment will benefit from.

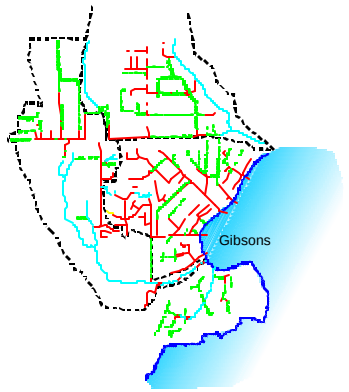
The following is a comparison between the existing streams, ditches and stormdrains within the Gibsons area and estimates of the predevelopment watershed drainage characteristics. Natural drainage networks have a characteristic branched stream pattern, much like the Chaster Creek drainage network. Water enters the main channels via overland, subsurface and ground water flow. Flowing water follows the natural contours of the landform, is slowed down by small depressions within the landscape and gradually makes its way to the stream at the valley bottom. The historical channel was sinuous and never flowed at right angles. It either cascaded down the prominent slopes of Gibsons or meandered through the flat gravelly deposits of the Chaster Creek valley bottom. These watershed processes are illustrated in the historical drainage network figure to the right.

The existing drainage map (far right) illustrates the present day, watershed drainage pattern. The channel length within the watershed is about an order of magnitude greater than predevelopment conditions. Information was not available for the Chaster Creek watershed but it was noted that channel density has also increased significantly. A significant change has been in the actually watershed areas of these drainages. Ditches and stormdrains have intercepted flows and redirected them into Gibsons and Charman Creeks. At one point an entire stream is diverted into a ditches and stormdrains before emptying into Gibsons Creek. This stream probably flowed through Gibsons or into Charman Creek before being redirected into its present day channel. The Charman Creek watershed has actually decreased in size by about five percent. Several areas were added in the lower watershed while a large portion of the upper watershed was diverted into Chaster and Gibsons Creeks. More significantly, the lower portion of the Gibsons Creek watershed has grown by 90%! The Sunshine Coast highway intercepts a large portion of the overland flow that is then redirected via ditches and stormdrains into Gibsons Creek. Many ditches and stormdrains flow at right angles to the slope as they follow the new grading of many of the roadways.

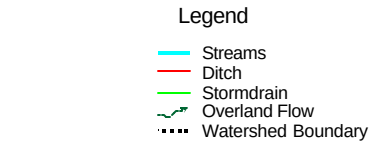
One of the big surprises for us was the change in the size of the watershed as a result of ditching and piping stormwater between watersheds. In the case of Gibsons Creek the lower watershed has increased by over 90 %. Associated with this drainage area increase is increased channel length (both ditch and stormdrain) by close to an order of magnitude. In addition, much of the mid and upper watersheds are slowly becoming more impervious which combined with increased stream connectivity will undoubtedly contribute to larger, more frequent flood events and lower summer low flow events (See graphs on previous page). Natural flow patterns are becoming less apparent within the watershed. In one example the lower half of one stream has been relocated to a ditch (The Lost Stream of Gibsons). It is encouraging to see so many roads in an urban context that are drained by ditches. It is evident that the residents cherish the saltwater of Gibsons but that little thought has been given to the stormwater generated by the town and surrounding areas. In this regard Gibsons has the same problem as many urban centres. The question remains, how do communities deal with stormwater and stream habitat in an urbanizing area?

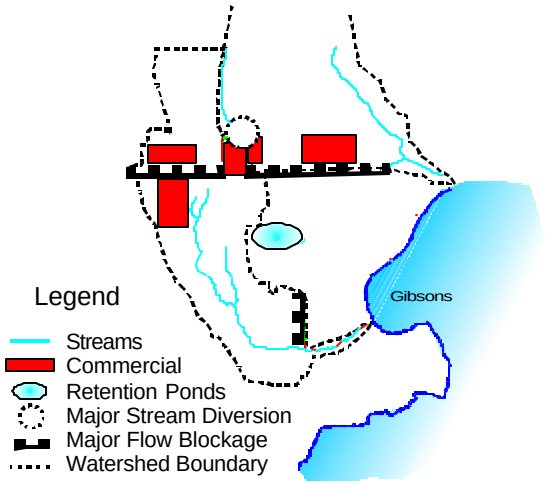


Historical Drainage Network: Pre-Development



Existing Drainage Infrastructure 2000





What We Found

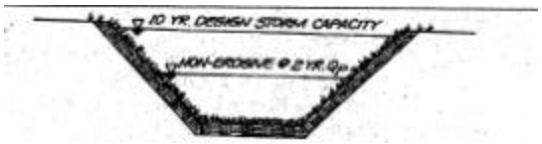
D-2.3 Traditional Drainage Systems

Conventional approaches to stormwater management focus on conveyance-the removal of stormwater as quickly as possible. Urban runoff is collected and concentrated through a network of impervious gutters, drainage structures and underground pipes. Typically designed and planned for efficiency and economy, the conventional system does not incorporate ecological, recreational or aesthetic values and tends to impact negatively on urban streams. High levels of imperviousness, associated with conventional stormwater systems may impact stream hydrology, morphology, water quality and stream ecology.

D-2.4 Alternative Drainage Systems

Alternative drainage systems focus on infiltration and treat stormwater as part of the hydrologic cycle, enhancing aquatic and terrestrial habitats. Natural processes are incorporated into larger urban open-space structures as Best Management Practices are chosen for their specific function and suitability to a particular site.

Open channels or ditches are one of the most common alternative infiltration techniques used in Gibsons. Rural channel systems have no curbs and gutters, and include a gravel shoulder permitting infiltration along their lengths. Channels are typically designed to convey the 10 year storm event. The channels handle peak discharges, minimize erosion and trap coarse sediment before it is delivered downstream. Ditches also allow for infiltration to the soil below, however, they only provide runoff pre-treatment and are not designed to treat runoff from more frequent events. As a result, they provide only partial water quality benefits.



Above: Section- typical drainage channel in Gibsons

Opportunities exist in Gibsons to further explore best management practices for managing stormwater in urban, suburban and rural areas. Best management practices could be incorporated to minimise the removal and transfer of pollutants to local receiving waters by retaining or detaining stormwater runoff. These techniques could also reduce the volume of stormwater reaching receiving waters and provide wildlife habitat and recreational amenities.

What We See

Conventional curb and gutter system

Typical drainage ditch

Examples of Best Management Practices

- Detention techniques- wet and dry basins
- Infiltration techniques- dry, wet, ephemeral, underground basins
- Open channels- ditches, grassed channels, dry and wet swales

Wet and dry detention basins