CHAPTER 3
SERVICE AREA

INTRODUCTION

The stormwater service area for Gig Harbor is the current (2009) City limits. There may be areas just outside the City limits that the City maintains periodically to ensure that there are no backwater effects to the City system. Physical and demographic characteristics of the service area determine the stormwater runoff flows, volume and water quality. Physical characteristics of the service area such as the topography, soils and critical areas are presented in this chapter. The demographic characteristics such as population, employment and revenue projections are also presented.

LOCATION AND OVERVIEW

The City of Gig Harbor is located on the Gig Harbor Peninsula at the southern end of Puget Sound in Pierce County. Figure 3-1 is a vicinity map for showing Gig Harbor relative to Western Washington. The corporate limits and Urban Growth Area of Gig Harbor is approximately 10 square miles in size, and is located approximately five miles northwest of Tacoma, on the west side of the Tacoma Narrows Bridge. Gig Harbor is bordered by Henderson Bay to the northwest, unincorporated Pierce County to the west, south and north, and Puget Sound to the east. Access is provided by State Route 16 (SR 16), the primary route that runs from Tacoma to the heart of Kitsap Peninsula.

The City was incorporated in 1946 and has grown from a small fishing and boat building community to a regional center for commercial activities and services. Waterfront activities include a marina, commercial vessel moorage facilities, and boat maintenance shops. In recent years, commercial activities have developed along the SR 16 corridor that intersects the City. The City has annexed several areas to the north and south, including existing subdivisions and developed commercial properties along SR 16. The 2008 population is estimated at 6,910, and approximately 7,464 were employed within the City limits in 2006.

STUDY AREA

The study area of this Plan consists of the current City corporate limits and urban growth area (UGA). The UGA is defined in the *2004 City of Gig Harbor Comprehensive Land Use Plan* (hereinafter referred to as the *Land Use Plan*). The UGA comprises approximately 6,594 acres, of which 3,156 acres are within the Gig Harbor corporate limits. Several annexations to the City limits that were approved prior to the publication of this Plan were also included in the study area, and the City limits combined with these annexations make up a total of 3,792 acres. The

corporate limits encompass nearly two-thirds (64%) of the Gig Harbor UGA. The current UGA boundary and corporate limits are shown in Figure 3-2.

PHYSICAL DESCRIPTION

Topography

The ground slope and natural drainage features within the City play a significant role in the analysis, planning, and design of the stormwater drainage system. Ground surface elevations within Gig Harbor range from near sea level at Puget Sound to approximately 360 feet within the upland portion of the UGA. The elevation at the intersection of Point Fosdick Road and 56th Street NW is 350 feet. The shore directly bordering Puget Sound rises steeply to bluffs, while the shore around Gig Harbor Bay rises more gradually. Within the UGA, the north central portion of the area drains into Gig Harbor via North/Donkey Creeks, Crescent Creek, and other local drainage features; the northwest portion drains into Henderson Bay via Gooch/McCormick Creeks; the southeast portion drains directly into the Narrows of the Puget Sound; and the southwest portion drains into Wollochet Bay via Bitter Creek and Garr Creek. The ravine walls near these creeks are steep and forested. The topography of the City and surrounding areas is included in the storm system map in Appendix B.

Geology

The Gig Harbor Peninsula lies within the southern half of the Puget Sound Lowland between the central Cascade Range to the east and the Olympic Mountains to the west. The Puget Sound Lowland is part of a large glacial drift plain formed by multiple glaciations that occurred in the region. A complex sequence of unconsolidated and partially consolidated sediments beneath the study area was created by a series of glacial advances and recessions and fluvial and lacustrine deposits stemming from past interglacial periods. The thickness of the glacial and interglacial deposits is not known, but is estimated to be at least 2,000 feet. Consolidated rock formations have not been encountered in any ground water wells drilled within the study area, nor any outcrops encountered within a radius of approximately 25 miles. The deepest wells in the area penetrate to over 1,000 feet below ground surface.

The typical glacial sequence consists of the following units, which are listed from the youngest (top) to the oldest (bottom):

- Recessional outwash (well-graded loose sand and gravel, becomes finer upward within the unit),
- Till (poorly sorted, compacted silty sand and gravel), and
- Advance outwash (well-graded sand and gravel, becomes finer with depth).

Soils

Within the City of Gig Harbor's Urban Growth Area, soils consist primarily of gravelly sandy loam, with slopes from 0 to 6 percent (16B) and 6 to 15 percent (16C), as shown in Figure 3-3. These soils are moderately deep, moderately well drained, occur on broad uplands, and were formed in sandy materials deposited by glaciers. Typically, the surface layer consists of dark yellowish brown gravelly sandy loam about 5 inches thick. The subsoil is dark brown, brown, and yellowish brown gravelly sandy loam between the depths of 5 and 31 inches. Between depths of 31 inches and 60 inches, the substratum is compact glacial till that is weakly cemented in places. Depth to bedrock is greater than 60 inches. Available water capacity is low. Water moves slowly through this soil. At higher elevations, water flows laterally above the substratum and appears on the surface as seeps at the bottom of slopes.

To a minor extent, other soils consist of Kitsap silt loam (20B through D), Indianola loamy sand (18C and E), Dupont muck (12A), and Neilton gravelly loamy sand (24D). (USDA Natural Resource Conservation Service, 1974 soil maps and legend).

Due to the relatively thin soil layers and impermeable subsurface materials, most areas in the Gig Harbor region are poorly suited for infiltrating stormwater. Those areas that contain subsurface materials classified with "moderate rates of infiltration" are typically located in the steep slopes adjacent to creeks or marine waters.

According to a report prepared by the Washington State Department of Natural Resources in 1976, few areas in the Gig Harbor Peninsula are well-suited for infiltration of stormwater runoff.[1] The purpose of the report was to evaluate the area's soils for sanitary landfills and septic drain fields, but provides excellent data with regards to infiltration rates. According to the report, a large majority of the area within the UGA boundary for Gig Harbor is underlain by glacial till, with very poor infiltration.

Other areas have a mixture of glacial materials with moderate infiltration rates. However, these areas are typically located along the valley walls above the creeks and may pose a landslide hazard risk if too much water is present. The valley floors typically contain flood plain alluvium, on very flat slopes, with moderate infiltration rates. These areas along the stream banks may be well suited for infiltration, but are located within the most sensitive stream riparian corridors and therefore, would have to be disturbed to install such a system. In general, most areas within Gig Harbor are not suited for infiltration of stormwater. It may be possible, however, to evaluate individual sites for potential for infiltration.

[1] *Geologic Factors Affecting Waste Disposal Practices, Gig Harbor Peninsula, Pierce County, Washington,* State of Washington Department of Natural Resources, Division of Geology and Earth Resources. Prepared in cooperation with the USGS and Pierce County by Mackey Smith, 1976, Geologic Map GM-19.

Surface Waters

Surface waters within the UGA consist of fresh and marine waters. The primary marine waters located near the UGA boundary are Gig Harbor, Henderson Bay, Colvos Passage, Wollochet Bay, and the Puget Sound Narrows. Burley Lagoon is a saltwater lagoon attached to Henderson Bay on Puget Sound. Gig Harbor is located at the north end of the Puget Sound Narrows, west of Point Defiance. A small estuary located in Puget Sound's main basin, the harbor is guarded by a shallow and narrow sill at the mouth, and includes several stream inputs, as well as the Gig Harbor Wastewater Treatment Plant outfall pipe. The harbor extends just over a mile southeast from its entrance in the northwest, and it gradually increases in width to about one-half miles. The maximum depth of Gig Harbor is about 28 feet MLLW. Tides are diurnal with two highs and two lows each day. Mean and diurnal tide ranges are 8.2 feet and 11.8 feet, respectively. At the harbor entrance, maximum ebb and flood currents are 1.2 knots and 0.2 knots, respectively. A spit that protects the harbor entrance limits exchange with the Narrows and Colvos Passage.

Fresh water bodies within the study area consist of ponds, wetlands and creeks. While most creek systems drain into the harbor, some creeks drain directly into Puget Sound or Henderson Bay. The creek systems include Crescent Creek, North/Donkey Creek, Gooch Creek, McCormick Creek, Bitter Creek, and Garr Creek. The basins associated with these surface water features are discussed in Chapter 4 and shown in Figure 4-1.

The creeks all eventually discharge into different marine sublets of Puget Sound, and there is generally less than three miles to their headwaters with steep descents over short distances. For these reasons, the *Gig Harbor Peninsula Ground Water Management Plan* characterized these creeks as "flashy" due to their typical high peak flows over short durations. The creeks in the city of Gig Harbor are "losing" streams, and during periods of low flows in the dry season (June – October), much of the water in the upper portions of the creeks seeps into the ground before reaching the harbor. This is caused by the ground water table being lower in elevation than the base of the creek bed.

Climate

The Gig Harbor area is characterized by a moist, cool maritime climate. Average winter temperatures are generally above freezing, and typical daytime summer temperatures are less than 85º F. Over the past eight years, the area has received approximately 37 inches of precipitation per year (according to the Tacoma Narrows Airport Weather Station), mostly in the form of rain. Approximately 70 percent of the precipitation falls between October and May. Estimated evapotranspiration rates for the area are between 18 and 24 inches per year, leaving 13 to 19 inches of rainfall to discharge into surface waters as runoff or recharge to groundwater by means of percolation.

Vegetation

The dominant tree species on the Gig Harbor Peninsula include conifers such as Douglas Fir, Western Red Cedar, and Western Hemlock. Pacific Red Alder, Big Leaf Maple, and other deciduous trees make up a significant portion of the second and third growth forests along with native conifer species. Dense brush grows on unstable and stable areas alike and consists predominantly of blackberries, huckleberries, salal, and various fern species. The dense forest and brush cover mediates runoff and provides for substantial uptake of water. On individual residential lots, the vegetation varies from dense forest on larger lots to grassed lawns and landscaping with shrubs and ornamental trees.

Critical Areas

The Gig Harbor Municipal Code identifies the following Critical Areas, defined in general as those lands which are subject to natural hazards, contain important or significant natural resources or which have a high capability of supporting important natural resources, and more specifically as:

- Hillsides - geologic features with slopes of 15 percent or greater.
- Ravine sidewalls - steep slope (typically 25%, but may be as shallow as 15%) which abuts and rises from the valley floor of a stream and which was created by the erosive action of the stream.
- Bluffs - a steeply rising, near vertical slope that abuts and rises from the Puget Sound shoreline.
- Landslide hazard areas - those areas that are susceptible to risk of mass movement due to a combination of geologic, topographic and hydrologic factors.
- Erosion hazard areas - those areas that are vulnerable to erosion due to natural characteristics including vegetative cover, soil texture, slope gradient or which have been induced by human activity.
- Seismic hazard areas - those areas that are susceptible from severe damage from earthquakes as a result of ground shaking, slope failure, settlement or soil liquefaction.
- Flood hazard areas - those areas identified as being in the 100-year flood plain are defined and identified on the FEMA flood insurance rate maps.
- Fish and wildlife habitat areas - those areas identified as being of critical importance in the maintenance and preservation of fish, wildlife and natural vegetation including waters of the State, and as further defined in GHMC 18.12.090.

- Aquifer recharge areas - those areas that serve as critical ground water recharge areas and which are highly vulnerable to contamination from intensive land uses within these areas.

Steep slopes and wetlands are shown in Figure 3-4. The critical areas shown were delineated as of December 31, 2008. The Municipal Code further identifies rules and regulations for identifying, developing and regulating these critical areas. These regulations are presented in detail in Chapter 2. Specific details of each, as it impacts stormwater management, follow:

Critical Fish and Wildlife Habitat Areas

Any proposed activity in these areas or within 300 feet of these areas requires that a habitat assessment be prepared. This assessment is circulated to the appropriate authoritative agencies (local, state and federal) for review. After review, a Habitat Management Plan may be required to address the project's impacts, provide background information of specific species and recommend protection and mitigation measures for those species.

After implementation, an assessment and evaluation of the success of those measures is required. This plan is again circulated to the appropriate agencies for review. Minimum buffers from the critical habitat area may be required. As the two main water courses in the Gig Harbor area, the water quality in Donkey Creek, McCormick Creek and Crescent Creek is of particular concern and must be specifically addressed if a project is proposed within these drainage basins.

Wetlands

Specific buffers and allowed alterations apply to wetland areas, as well as requirements for special studies and determinations. The City does not allow impacts to regulated wetlands, however, if such impacts from approved activities are unavoidable, then mitigation measures are required. With respect to stormwater management, wetlands typically provide some amount of natural peak flow attenuation and water quality treatment, and therefore, should be preserved where possible. It is also noted-that wetlands provide special habitat for plants and animals and the routing of stormwater through wetlands for the purposes of retention and treatment should be avoided. The impacts of discharging increased amounts of polluted stormwater to the wetlands could be detrimental to naturally occurring ecosystems.

Hillsides, Ravine Sidewalls and Bluffs

Specific buffers and building setbacks apply to any development that abuts or contains these areas. Buffers are established to provide a conservative safe distance for development activity, but may be reduced on an individual basis if special studies demonstrate it is safe to do so. With respect to stormwater runoff and quality, these development regulations can affect the amount of buildable area (and therefore,

impervious surface) and/or reduce the potential risk for landslides and mass wasting that could impact natural or manmade conveyance systems and natural resources.

Seismic Hazard Areas

Seismic hazard areas are regulated mainly with respect to public safety and with the exception of potential mass wasting due to an earthquake, these hazard areas do not impact stormwater facilities or natural resources. However, should an earthquake occur, there could be considerable damage to stormwater facilities in areas that may experience soil exposure and heavy sediments deposition caused by ground shift.

Flood Hazard Areas

Construction of buildings and other development in these areas is regulated in accordance with the City's flood hazard construction standards. Typically, construction in flood hazard areas is not allowed or is limited to specific activities. Allowed activities include mining or gravel extraction, recreational uses, repair to existing structures, utility and road construction or uses dependent upon water such as docks, wharves, and boating activities. Any activity that decreases the storage or conveyance capacity of a channel or would present a risk to life, health or nearby property is prohibited. Although current development regulations regarding stormwater runoff control attempt to restrict runoff to existing rates, there is concern that these controls may fall short of that goal. Impacts of development on flood hazard areas typically result in increased erosion (and deposition in the stormwater conveyance systems) during construction and higher peak flows during storm events than prior to the development. This can create a situation of exacerbating an existing flooding problem or by altering the channel's morphology, shifting the problem to another location.

Aquifer Recharge

The geographic recharge areas of the upper and the sea level aquifers correspond to ground elevations. Maximum aquifer recharge occurs during the seasonally wet winter months (October through May). Significantly less recharge occurs during the remaining months due to reduced rainfall and increased evapotranspiration. Therefore, groundwater zones recharged from precipitation typically show the highest elevations in spring and lowest elevations in late autumn.

Pierce County has identified multiple aquifer recharge areas within Gig Harbor and the surrounding UGA. Most of the natural surface water in Gig Harbor is fed by surface water runoff and therefore, is minimally impacted by groundwater. Special care is required to control stormwater in such a way that it preserves these natural resources and maintains a stormwater drainage system that functions adequately.

Erosion and Landslide Hazard Areas

Specific buffers and building setbacks apply to any development that abuts or contains these areas. The buffers may be reduced based on special studies. All activities

proposed within these areas require submittal of a geotechnical engineering report. With respect to stormwater runoff and quality, these development regulations can affect the amount of buildable area (and therefore, impervious surface). With proposed clearing and grading operations, erosion control measures must be implemented and maintained in order to reduce the impacts due to surface erosion. Unfortunately, any land disturbance will be accompanied by some erosion and discharge of sediment-laden water and also many projects fall short at implementing even basic erosion control measures. Erosion control is specifically addressed in Chapter 6.

LAND USE AND ZONING

The City's 2004 Comprehensive Plan, which was revised in December, 2008, identifies eight generalized land use categories which serve as the basis for more detailed zoning code designations. These land use categories, which are described below, include residential, public/institutional, employment centers, commercial/business, waterfront, planned community development, mixed use, and preservation areas. Densities and impervious coverage percentages, as dictated by City zoning and future land use, are important with respect to stormwater runoff in that higher densities and greater impervious coverage results in higher runoff and greater degradation of runoff water quality.

Table 3-1 shows the various zoning code designations used by the City. Zoning codes have been consolidated into land use classifications for the purpose of modeling a build-out scenario of the stormwater system. The build-out scenario features the maximum allowed impervious surface for each drainage basin within the City limits and UGA for Gig Harbor. The maximum impervious surface percentages shown in Table 3-1 represent the assumptions used for stormwater modeling purposes, and do not necessarily correspond with the zoning code specifications. For instance, the Planned Community Development Low Density Residential Zone (RLD) has a maximum allowable coverage of impervious surfaces set at forty-five percent. However, the zoning for these areas do not include sidewalks and driveways in the overall calculation for impervious surface coverage. To account for this variation in coding, and for the purpose of modeling the City's stormwater facilities, an additional ten percent of impervious surface was included to allow for sidewalks and driveways. This ten percent allowance was added to all Planned Community Development zoned areas, as well as to the Mixed Use zoned areas.

Table 3-1: Zoning, Land Use, and Impervious Surface Requirements

Zoning	Minimum lot area (square feet)	Land Use Classification	Maximum impervious lot coverage
Single-Family Residential (R-1)	7,200	Residential Use - Low	40%
Planned Community Development Low Density Residential (RLD)	10,000	Planned Community Development Residential Use - Low	55%[1]
Medium-Density Residential (R-2)	7,000 / unit	Residential Use – Medium	60%
Planned Community Development Medium Density Residential (RMD)	None	Planned Community Development Residential Use – Medium	75%[1]
Multiple-Family Residential (R-3)	5,400 / unit	Residential Use – Medium	60%
Residential and Business District (RB-1)	7,200	Residential Use – Medium	60%
Residential and Business District (RB-2)	12,000	Residential Use – Medium and/or Commercial / Business	70%[2]
Downtown Business District (DB)	6,000	Commercial / Business	80%
Neighborhood Commercial District	5,000	Commercial / Business	80%
General Business District (B-2)	None	Commercial / Business	70%
Commercial District (C-1)	6,000	Commercial / Business	80%
Planned Community Development Commercial (PCD-C)	None	Commercial / Business	80%[3]
Employment District (ED)	None	Employment Center	80%[3]
Waterfront Residential (WR)	7,000	Waterfront	40% - 50%
Waterfront Millville (WM)	6,000	Waterfront	50% - 70%
Waterfront Commercial (WC)	6,000	Waterfront	50% - 70%
Planned Community Development Business Park District (PCD-BP)	None	Commercial / Business	80%[3]
Planned Community Development Neighborhood Business District (PCD-NB)	None	Commercial / Business	80%[3]
Public-Institutional District (PI)	None	Public / Institutional	70%
Mixed Use District Overlay (MUD)	None	Mixed Use	55%[1]

Notes:

1 – 10% allowance for impervious sidewalks and driveways included. See discussion on Land Use and Zoning.
2 – Assumes maximum allowable coverage under conditional development (Zoning Code 17.30.060(B)).
3 – Assumed maximum coverage for system modeling. Zoning code does not state a maximum coverage requirement.

Figure 3-2 shows the land use designations for the City of Gig Harbor. Table 3-2 shows the different types of land use acreage for each of the Drainage Basins within the City, and Table 3-3 shows land use acreage within the UGA.

Table 3-2: Land Use Acreage by Drainage Basin within City Limits

Land Use	Crescent	Donkey Creek	Gig Harbor	Gooch Creek	Henderson Bay	McCormick Creek	Puget Sound	Wollochet Bay	Total
Commercial / Business	3.4	64.6	27.8	7.9		191.7	44.8	255.5	595.7
Employment Center		104.6			1.6	80.4		140.1	326.6
Mixed Use		88.9				80.5			169.4
Parks and Open Space		14.5				0.0			14.5
Public Institutional	5.5	32.8	16.7			24.8	1.1	44.8	125.8
Residential Use – Low[1]	112.3	545.9	223.5	22.4	0.2	143.6	76.7	492.5	1617.2
Residential Use – Medium[2]		58.3	74.2	8.3		55.4	70.5	63.6	330.3
Waterfront			20.4						20.4
Other (no zoning)	0.0		0.0		11.8	3.5			15.3
Total	**121.3**	**909.6**	**362.6**	**38.7**	**13.6**	**579.9**	**193.1**	**996.4**	**3215.2**

Notes: 1 – Residential Use – Low Land Use Classification includes areas zoned as R-1 and RLD.
2 – Residential Use – Medium Land Use Classification includes areas zoned as R-2, R-3, RMD, and RB-1.

Table 3-3: Land Use Acreage by Drainage Basin within the UGA

Land Use	Arton-dale	Crescent	Donkey Creek	East Gig Harbor	Gig Harbor	Gooch Creek	Hender-son Bay	McCormick Creek	Point Richmond	Puget Sound	Purdy Creek	Wollo-chet Bay	Total
Commercial / Business		3.5	64.6		27.8	8.0		191.7		44.8	13.7	255.5	609.5
Employment Center			108.0			36.5	1.6	80.7			55.4	140.1	422.2
Mixed Use			88.9					80.5					169.4
Parks and Open Space			14.5					0.0					14.5
Public Institutional		5.5	48.7		16.7	2.8		134.6		1.1	60.3	44.8	314.7
Residential Use - Low	4.6	310.1	736.7	201.4	223.5	375.3	0.2	688.7	4.1	410.1	0.5	885.0	3840.1
Residential Use - Medium		9.5	59.7		74.2	8.3		60.9		70.5		63.7	346.8
Waterfront					20.5								20.5
Other (no zoning)		0.0			0.0		11.8	3.5				13.0	28.3
Total	**4.6**	**328.6**	**1121.1**	**201.4**	**362.7**	**430.9**	**13.6**	**1240.5**	**4.1**	**526.6**	**129.9**	**1402.1**	**5766.0**

Notes: 1 – Residential Use – Low Land Use Classification includes areas zoned as R-1 and RLD.
2 – Residential Use – Medium Land Use Classification includes areas zoned as R-2, R-3, RMD, and RB-1.

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Land Use and zoning is critical to understanding how the land is likely to be developed, and as such, each land use type contains separate guidelines for development. A discussion of each type of land use is provided in the following paragraphs.

Residential Use

The Residential land use category (R-1, R-2, R-3, RLD, and RMD) provides for residential uses and neighborhoods. The actual density of residential developments varies considerably based on the roadway widths, allowable lot size, critical areas, and other items that may provide a density credit. Residential zones were classified into two types of density for modeling simplicity; Residential Use - Low allows for impervious surface to cover a maximum of 45% of the total lot size and Residential Use – Medium allows for 60% in most cases. Planned community development designated for medium residential use (RMD zone) is the exception, with parcels located in this zone allowing up to 65% coverage.

Public / Institutional

The Public / Institutional land use category (PI) provides for "a variety of large scale public facilities which serves a region or several communities." Large-scale public facilities include schools; local, state, and federal government facilities; corrections centers, and the essential public facilities outlined in the City's Comprehensive Plan. Large-scale public facilities are those that consist of 10 or more acres.

This type of land use typically consists of large areas of impervious surfaces, through the construction of large buildings and parking lots, and large areas of relatively flat, grassed lawns, used for recreational purposes. Based on the use, the maximum impervious surface for the PI zone is between 60% and 70%.

Employment Districts

Employment Districts (ED) are a broadly defined category "intended to meet long-term employment needs of the community." Employment Districts include, but are not limited to wholesale distribution facilities, manufacturing and assembly, warehousing/storage, business offices/business complexes, medical facilities/hospitals, telecommunication services, and transportation services and facilities.

This type of land use typically consists of buildings and parking areas with some landscaping around the perimeter to screen the adjoining properties and streets. While there is no maximum impervious surface requirement for Employment Districts, in the past the City has allowed these areas to have as much as ninety 90% impervious covering. For modeling purposes, as discussed further in Section 5 of this Plan, an impervious surface percentage of 80% was used for Employment Centers.

Commercial / Business

The Commercial / Business (B-1, B-2, C-1, and DB) category includes primarily retail and wholesale facilities. The Commercial / Business category consists of retail sales and services, business and professional offices, and mini-warehousing.

This type of land use typically consists of many different types of businesses with small, medium, and large buildings and parking areas. The City allows these areas to have as much as 80% impervious covering.

Waterfront

The Waterfront category (WR, WM, and WC) allows for a range of mixed uses that are allowed under the City's Shoreline Master Program and zoning code. In general, lower intensity waterfront areas would favor residential and marinas while the more intense use waterfront area would provide for higher density residential and commercial/retail uses.

This type of land use typically consists of higher amounts of impervious surfaces than other residential areas, but not as much as other commercial or business areas. This is due to the fact that waterfront property is limited in availability and access to the water - either public or private - is generally encouraged and provided. Pervious areas typically come in the form of lawns, landscaping or vegetation of nearshore areas in the case of residential uses. The City allows these areas to have as much as 50% impervious surface coverage for residential uses and 70% for other uses.

Planned Community Development

A Planned Community Development (PCD-C, PCD-BP, and PCD-NB) "incorporates all of the other land use designations into a site development without prescribing a specific land use or zoning designation on a parcel(s) or site(s)." A PCD is to be compatible with the community's planning goals, design standards, and adopted design guidelines. A PCD must consist of the following levels of designated land use:

- Minimum area must be 100 acres;
- Land use should be allocated as follows:
    - Residential 45% minimum
    - Commercial 10% maximum
    - Employment 25% minimum
    - Parks/open space 10% minimum
    - Schools 10% minimum

Impervious coverage in this category cannot be generalized as in other categories due to the various types of uses that are not homogenous to a particular site. Typically, the various land uses will be located to provide the best service and least disturbance to the citizens living in those areas. For example, small businesses will be located near intersections or along arterials, with landscaping, parks, or schools providing a buffer between these businesses and the single-family dwellings. The City allows as much as 80% impervious coverage for the commercial and business areas and between 40% - 65% for residential type uses.

Mixed use

Mixed Use is an area of commercial/employment, office and multifamily residential use located along principal collector routes which link the downtown area with SR 16. The allocation of land use is designated as follows:

- Commercial/Employment 45% maximum
- Professional Office 30% maximum
- Multifamily 25% minimum

Mixed Use area properties of ten acres or greater may use the defined allocation regardless of the underlying zoning of the property. Properties less than ten acres are limited to the uses as defined by the City zoning code.

Mixed Use designated areas are typically located along major travel routes into the City and are allowed to have as much as 45% impervious coverage, excluding driveways, private walkways and similar impervious surfaces.

Preservation Areas

According to the City's Land Use Plan, Preservation Areas are defined as "natural features or systems which possess physical limitations or environmental constraints to development or construction and which require review under the City's Wetland Ordinance or Critical Area Ordinance." Preservation areas can be open space or parks as part of a development approval, easement or outright purchase by the City. These areas typically provide a high amount of naturally pervious surface that minimizes stormwater runoff and provides for recharge to underground aquifers.

POPULATION AND EMPLOYMENT

Historic and Existing Population

The City of Gig Harbor was incorporated in 1946 and had a census population of 803 residents in 1950. The City has developed as a residential community through the years with some associated commercial and light industrial growth as well. City limit populations for the years 1980, 1990, and 2000 were approximately 2,429, and 3,236, and 6,465 residents, respectively. These increases reflect the City's growing population base as well as increases in the City's incorporated area through annexation. In 1998, after the City completed the annexation of the Gig Harbor North and Olympic Mall areas, the City population increased to 6,350 people, and land area encompassed by the new corporate limits increased to 2,618 acres. In 2009, the City approved several more annexations totaling approximately 636 acres.

Existing population and employment were estimated as part of the City's demographic forecasting analysis conducted in the City's 2007 Comprehensive Sewer System Plan Update (Sewer Plan). The Sewer Plan used baseline data obtained from PSRC and the Pierce County Buildable Lands Report (2007) to project current and future population and employment. Currently (2008) within the City's UGA, there is an estimated 6,360 housing units. Of the 6,360 housing units, 4,120 are single family units (65%), and 2,240 were multi-family units or mobile homes (35%). An analysis of designated land use in the areas inside and outside the City boundary shows that a majority of commercial/business and multi-family development exists inside the City boundary, and the majority (87%) of the area outside of the City limits is zoned for single family residential use.

To estimate population, 2007 PSRC Census Tract data was utilized to determine the average household size in the City, estimated to be approximately 2.46 persons. This figure is slightly lower than Pierce County's average of 2.6 persons per residential unit. For multi-family units, an estimated 2.0 persons per household was assumed, also based on PSRC data. Baseline data established by the State's Office of Finance and Management (OFM) office estimated Gig Harbor's population in 2008 to be approximately 6,910. Land use analysis results show a current (2009) population within the City is estimated to be approximately 9,020 people. This higher figure includes the annexed areas that have been approved by City Council as of November 1, 2008. Table 3-4 shows estimated population in the City for 2008 and 2009,as well as estimated population and employment for the years 2015 and 2030. These figures were estimated as part of the City's 2007 Comprehensive Sewer Plan.

TABLE 3-4: Projected Population and Employment

Year	City Limits		Urban Growth Area	
	Population	Employment	Population	Employment
2008	6,910	20,318	13,935	23,678
2009	9,020	21,163	14,413	24,662
2015	14,757	28,731	17,284	30,565
2030	22,528	41,451	22,528	41,451
Build-out	24,366	45,647	24,366	45,647

When the City reaches its capacity under a build-out scenario, it is estimated there will be 7,600 single family units and 3,600 multifamily units within the City limits. For the purposes of stormwater planning, it was assumed that the City limits will have expanded to include the entire area within the existing (2008) UGA boundary by 2030. This would include an additional 2,550 acres of land, 2,220 of which is currently zoned for single family residential use.

Projections regarding the population in Gig Harbor are not specifically critical to planning for stormwater facilities. However, the general growth rate in population can be utilized as a tool for predicting the growth in the revenue generated by the stormwater utility. The projected growth rate for the City is 3.0% annually for the next 22 years, based on a UGA 2008 population of 13,935 and a projected 2030 population of 22,528. The growth in population is expected to correlate to the growth in Equivalent Billing Units.

Equivalent Billing Units

The Gig Harbor Municipal Code established a stormwater utility for the purposes of collecting revenue, performing studies, implementing capital improvements and enforcing stormwater regulations. Additional details of the utility are provided in Chapter 2, however revenue is collected based on Equivalent Billing Units (EBUs). Each single family residence is defined to be one EBU, duplexes are 1.5 EBUs, and all other property calculates the number of EBUs based on the amount of impervious surface, with one EBU equivalent to 2,200 square feet of impervious surface. Based on these definitions, and the population growth projected in the above section, Table 3-5 illustrates the growth in population, EBUs, and revenue over the next 22 years.

Additional information on calculating EBUs is provided in Appendix C.

Table 3-5: Projected Equivalent Billing Units

Year	Population	Annual Growth Rate	EBUs	Revenue
2009	9,020	-	4,884	$ 651,800
2010	9,961	3%	5,309	$ 708,400
2015	14,757	10%	7,667	$ 1,023,000
2020	18,209	5%	9,502	$ 1,268,000
2025	20,619	3%	10,605	$ 1,415,200
2030	22,528	2%	11,868	$ 1,583,700

Based on a rate of $11.12 per EBU per month, rounded to nearest $100 increment.