2.3.3 Groundwater

2.3.3 GROUNDWATER

2.3.3.1 Status of Groundwater in the Clean Water District

The purpose of the Stillaguamish CWD includes a water quality restoration and water quantity management program, with specific provision for groundwater recharge as described in the Snohomish County Code (Sections 25A.05.010(1) and (3). Various SWM projects and programs in the Stillaguamish Watershed affect and protect groundwater and are funded by Stillaguamish Clean Water District fees.

In addition to the work performed under the county code, the county began developing a Groundwater Management Plan in the mid-1990s, working with the State Department of Ecology, the United States Geological Survey (USGS), and a broad-spectrum advisory group. The County established a Groundwater Management Area, which defined the study area for two important documents: *The Ground-water System and Ground-water quality in Western Snohomish County, Washington* (Thomas et al. 1997), and *The Geohydrology Memorandum: Snohomish County Groundwater Management Program* (Golder and Associates 1996). The Groundwater Management Area includes a significant portion of the Stillaguamish Watershed, and is shown in Figure 2.3.3-1.

The Snohomish County Council adopted the Groundwater Management Plan in 1999 (Snohomish County Public Works 1999), and in 2000 assigned SWM the responsibility of managing and implementing a County Groundwater Management Program, to be funded at the county level with money from the General Fund. The top three recommendations of the plan were:

(1) Develop a county-wide water well database containing data on groundwater quality, well water levels, and geologic information recorded in well logs
(2) Prepare a detailed groundwater investigation in an area to be selected
(3) Assess groundwater regulations in Snohomish County to formulate revisions to the County's Comprehensive Plan

The database was developed in 2001, and is accessible on the internet at http://www1.co.snohomish.wa.us/Departments/Public_Works/Divisions/SWM/Work_Areas/Water_Quality/Groundwater/. It includes the ability to search for data using an interactive map interface. The groundwater regulations assessment was completed in 2003 and submitted to Snohomish County Department of Planning and Development Services for use in the Comprehensive Plan update process. In 2006, SWM published the *Getchell Plateau Groundwater Investigation*, the study area of which includes a small portion of the Clean Water District.

Groundwater Regulations

Groundwater Quality

Groundwater quality is regulated directly and indirectly within Snohomish County by the following federal, state, and local laws and regulations. These laws and regulations are summarized below, and are discussed more fully in SWM's regulatory assessment (Snohomish County Public Works 2003).

Federal Laws and Regulations

Clean Water Act

- provides authority for EPA to regulate groundwater quality
- most regulations pursuant to this Act pertain to surface water

Safe Drinking Water Act

- protects drinking water quality
- authorizes the EPA to set drinking water standards for maximum contaminant levels
- regulates the underground disposal of waste (Underground Injection Control Program)
- designates areas that rely on a single aquifer for potable water supply (Sole Source Aquifer Program)
- establishes a nationwide program to encourage states to develop programs to protect public water supply wells (Wellhead Protection Program and Source Water Assessment Program, implemented by the Washington State Department of Health)

Resource Conservation and Recovery Act

- gives EPA the authority to control generation, transportation, treatment, storage, and disposal of hazardous waste

Comprehensive Environmental Response, Compensation, and Liability Act (commonly known as "Superfund")

- provides federal funding to clean up contamination caused by chemical spills or hazardous waste sites releasing contaminants into the environment

Stormwater discharges are regulated by the Clean Water Act and the Safe Drinking Water Act, depending on whether the discharge is to a surface water body or to groundwater. The Clean Water Act regulates stormwater discharges through a regulation known as the National Pollutant Discharge Elimination System, or NPDES. Snohomish County has what is known as a Phase 1 NPDES Municipal Stormwater Permit. The EPA has delegated authority for the Clean Water Act and the Safe Drinking Water Act to Washington State, which administers this authority through the Department of Ecology.

State laws and regulations

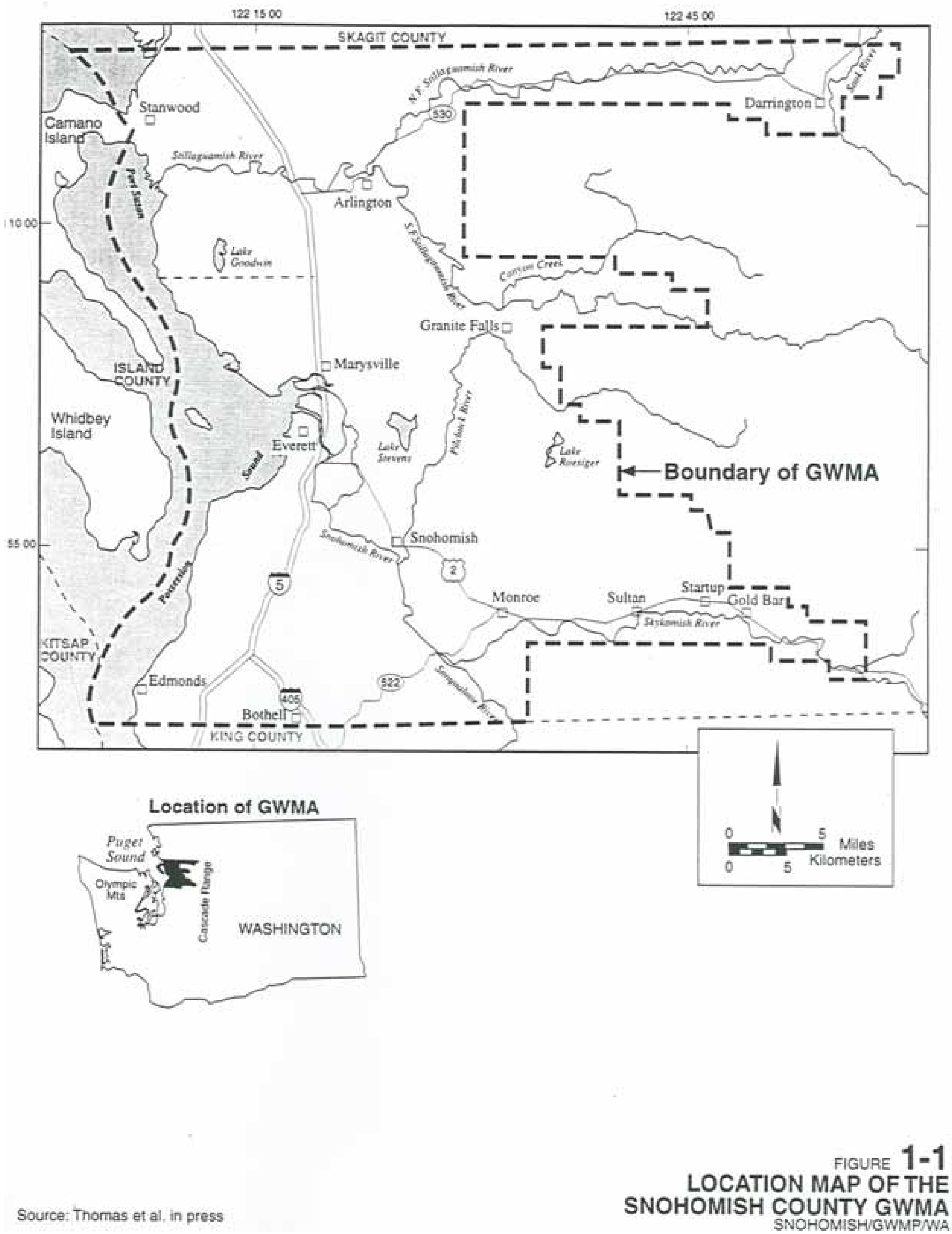
Growth Management Act

- requires county growth management plans to protect the quality and quantity of groundwater used for public water supplies;
- requires municipalities regulated by this Act to define Critical Aquifer Recharge Areas and pass ordinances to protect them.
- implemented by Chapter 173-200 WAC (Water Quality Standards for Ground Waters of the State of Washington) and Chapter 173-218 WAC (Underground Injection Control Program)

Water Resources Act of 1971 (Chapter 90.54 RCW)

- outlines the responsibility of the state to ensure an adequate and clean water resource for its citizens through management and planning of water resources

Figure 2.3.3-1 Snohomish County Groundwater Management Area



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- directs Ecology to develop a comprehensive water resource data program and provides for the protection of sole source aquifers
- implemented by Chapter 173-200 WAC

Public Water System Coordination Act of 1977 (Chapter 70.116 RCW)
- requires water purveyors to prepare and implement Coordinated Water System Plans

Public Water Systems (Chapter 70.119A RCW)
- contains the state's drinking water regulations
- describes compliance standards for public water systems
- requires the inclusion of wellhead protection plans in a utility's water system plans
- implemented by Chapters 246-290 and 246-291 WAC

Snohomish County Codes Addressing Groundwater

Title 7.53 - Water Pollution Control
- prohibits discharge of pollution to groundwater

Title 25 - Storm and Surface Water Management, and Title 25A - Water Quality Restoration and Water Quantity Management
- authorize the collection of utility fees in specific areas of the County
- authorize the expenditure of these funds for a variety of purposes, including providing for groundwater recharge

Title 30 - Unified Development Code
- provides standards and procedures to regulate building and land development within unincorporated Snohomish County
- provides minimum groundwater protection standards for certain uses (S.C.C. 30.64)

Groundwater Use

Groundwater use in Snohomish County is regulated by the State Department of Ecology and by the Snohomish Health District. The Department of Ecology administers state water rights laws, and thus regulates the quantity and location of both groundwater and surface water withdrawals. The Stillaguamish instream flow rule (Chapter 173-505 WAC), which is discussed in detail below, establishes a water right for the Stillaguamish River. Chapter 90.44 RCW contains an exemption for domestic water supply wells that withdraw less than 5,000 gallons per day. Such wells, however, cannot impair uses with legal water rights, even those established after an exempt well came into use. While Ecology does not issue water rights for exempt wells, it regulates well construction and is responsible for allowing licensed well drillers to drill wells.

The Snohomish Health District is not a Snohomish County government agency, but rather a special district which serves as the local public health agency for unincorporated Snohomish County plus a number of cities in the County. The District is responsible for determining that well water withdrawn for potable use meets water quality standards and is available in adequate amounts. A well driller must submit a report of the flow rate into a well and a laboratory report with analyses for various contaminants. The Health District verifies that water quality standards are not violated and that the flow rate is adequate.

An applicant for a development project in Snohomish County must provide proof to the county of adequate water supply for the development. This requirement can be met by providing documentation of water availability from a municipal or other public water supply, or documentation from the Snohomish Health District of well approval. While the county does not regulate groundwater use directly, it exerts a significant indirect effect through various aspects of Comprehensive Planning under the State Growth Management Act. For example, the county is required to consider potable water availability in establishing zoning and Urban Growth Area boundaries, inside which potable water becomes provided by municipal or public water systems with associated water rights.

Groundwater Conditions

Geology and Hydrogeology

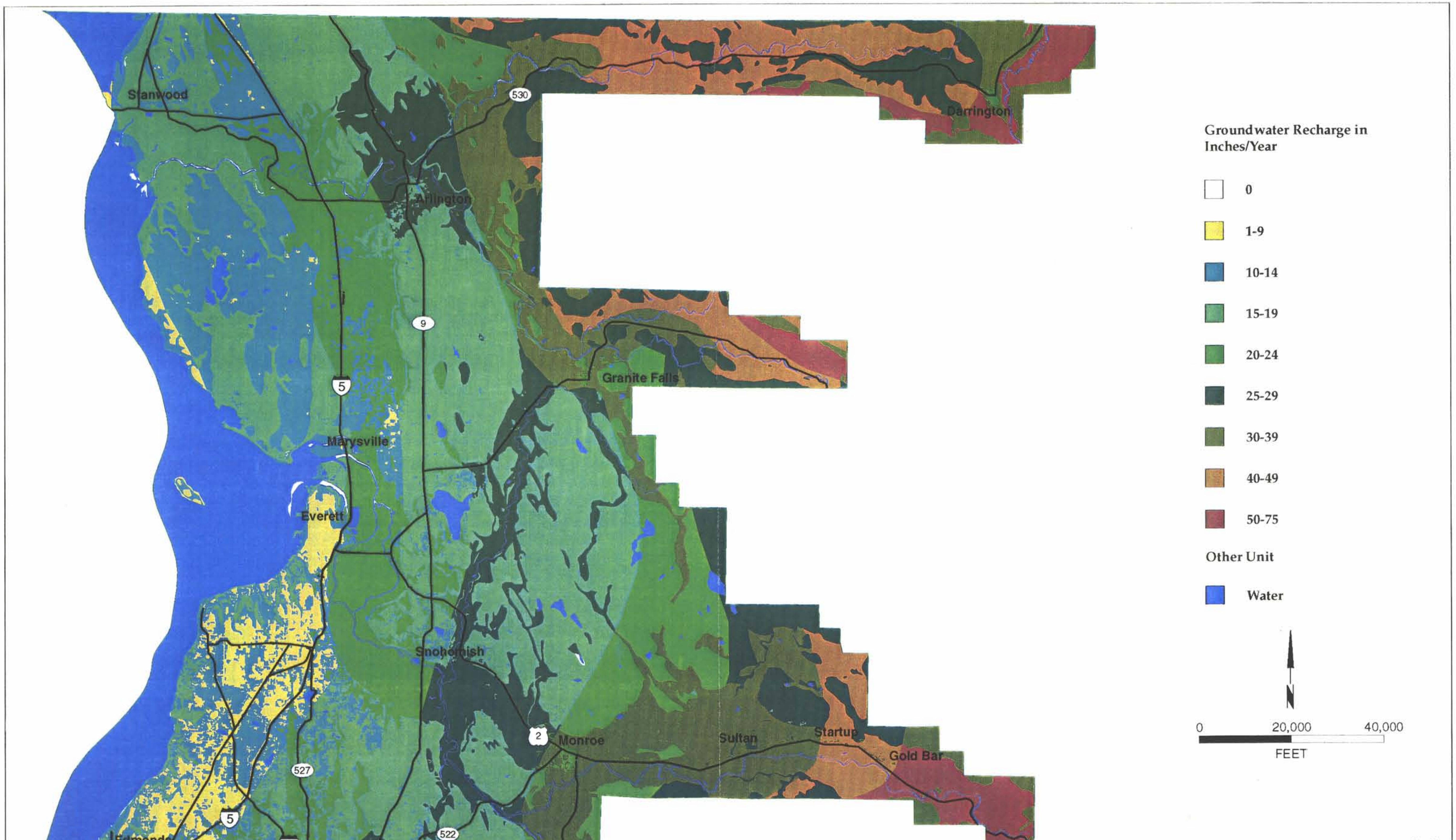
The primary water-bearing geologic formations (aquifers) in the Stillaguamish Watershed used for potable or agricultural water supply are the surface alluvium and several glacially-deposited formations (Vashon till, Vashon recessional outwash, and Vashon advance outwash). The till, while it is much less permeable than the outwash units on the whole and often acts as a barrier to groundwater flow, allows enough groundwater flow in some places to serve wells. Older undifferentiated sediments and bedrock also supply some water.

In the North Fork Basin, the alluvium, recessional outwash, and advance outwash are hydraulically connected, and groundwater flows freely between them. The till, where it exists, is usually on the ground surface, and acts as a barrier to infiltration of precipitation (Thomas et al. 1997).

Groundwater Recharge, Discharge, and Flow Patterns

Groundwater recharge in the Stillaguamish Watershed occurs primarily through infiltration of precipitation. Thomas et al. (1997) estimated the average annual precipitation for the Snohomish County Groundwater Management Area as 46 inches, and the recharge by precipitation as 24 inches. The annual precipitation varies significantly in the Stillaguamish Watershed, from about 30 inches near Puget Sound to more than 100 inches at the crest of the Cascade Mountains. The North Fork and South Fork basins receive more than 100 inches per year of precipitation, and the average annual flow of these rivers is more than 80 percent of the average annual precipitation (Thomas et al. 1997). Figure 2.3.3- 2 shows the aerial distribution of groundwater recharge within the Snohomish County Groundwater Management Area.

Groundwater in the North Fork basin flows from east to west, with water exchange between the river and groundwater. Comparisons of well water levels and river water levels indicate groundwater discharge to the river near Darrington and Arlington (Thomas et al. 1997). The same type of comparison indicates discharge to the South Fork of the Stillaguamish River at Granite Falls and Arlington (Thomas et al. 1997; Snohomish County Public Works 2006). Groundwater in the Marysville trough has the same general flow pattern as surface water, with a north-south flow divide between Marysville and Arlington (Thomas et al. 1997).



Source: Thomas et al. in press

FIGURE **3-4**
AREAL DISTRIBUTION OF GROUNDWATER RECHARGE
SNOHOMISH/GWMP/WA

PROJECT NO. 963 1326.303 DRAWING NO. 65908 DATE 11/21/96 DRAWN BY CB

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Groundwater Quality

According to Thomas et al. (1997) groundwater quality is generally good in the Stillaguamish Watershed, with no appreciable widespread groundwater contamination. The most common and widespread existing problems are from natural causes.

Arsenic contamination in well water poses the most significant human health threat from groundwater contamination. Arsenic contamination is discussed in three recent reports: a study focused on potable well water contamination in the Granite Falls area (Davies et al. 1991), the 1997 USGS study (Thomas et al. 1997), and the Getchell Plateau Groundwater Investigation (Snohomish County Public Works 2006). The current federal drinking water standard for arsenic is 10 micrograms per liter (ug/l), reduced from 50 ug/l in the early 2000s. The Snohomish Health District requires treatment systems for new wells if the standard is exceeded.

Arsenic concentrations between 2 ug/l and 49 ug/l were found in many wells in the USGS study area (Thomas et al. 1997). Water from five wells in that study had arsenic concentrations of 50 ug/l or higher, and these wells are in a line trending roughly north-south extending along the Cascade foothills from west of Granite Falls to east of Arlington. Arsenic is found throughout the glacially-derived hydrogeologic units that form the primary aquifer systems of the County, and is also present in the igneous bedrock of the region. Metallic ore minerals, including arsenic, gold, silver, copper, zinc, and lead were mined throughout the Stillaguamish Watershed, and arsenic ore is present in mines near Granite Falls (Huntting 1956).

Chloride concentrations in groundwater were elevated in the South Fork Stillaguamish Basin and near its mouth (Thomas et al. 1997). Possible sources include natural chloride concentrations in bedrock, septage, and seawater intrusion. Seawater intrusion was documented in one well near the river mouth, but otherwise there was no evidence of widespread human-caused chloride contamination. Many of the highest chloride concentrations were in wells drilled to bedrock or marine origin, and the chloride is attributed to seepage from the bedrock.

Ammonia concentrations were elevated in the Mainstem basin, with the highest concentrations tending to occur in water from wells drilled to bedrock or to the deeper and older undifferentiated sediments (Thomas et al. 1997). Ammonia in these geologic units is unlikely to be from human activity.

Septage-related compounds were detected in the North Fork and South Fork valleys (Thomas et al. 1997). This determination was based on “relatively high” concentrations of two or more of the following: boron, dissolved organic carbon, nitrate, or ammonia, or a detection of methyl-blue-activated substances (MBAS), a component of detergents.

Vulnerability of Aquifers to Contamination

The vulnerability of Stillaguamish Watershed aquifers to become contaminated was determined by Thomas et al. (1997). A map depicting the results of this work on aquifer vulnerability is shown in Figure 2.3.3-3. This aquifer vulnerability map provided the technical basis to create the Snohomish County Critical Aquifer Recharge Area (CARA) map, which is the basis for CARA regulations under the County’s critical areas regulations in the Snohomish County Code

(30.63). This map is available on the internet at http://www.co.snohomish.wa.us/documents/Departments/ pds/ gis_maps/wellprotect.pdf.

The aquifer vulnerability assessment by Thomas et al. (1997) was reviewed by SWM in 2003 to better inform the county's revisions to their critical areas regulations. Several shortcomings of that assessment were identified by Snohomish County Public Works (2003), including:

- use of only two of seven parameters (depth to water table (D) and rate of annual recharge (R)) contained in a seven parameter EPA model known as DRASTIC (Aller et al. 1987)
- uncertainty in the adequacy of estimates of values for recharge rate (R), given the soil and climate of Snohomish County
- potential bias in the DRASTIC model results due to modifications to the method introduced by Thomas et al. (1997)
- inaccuracies in the method used to translate DRASTIC model results into aquifer vulnerability rankings of low, medium, and high

SWM proposed a set of alternative methods to determine aquifer vulnerability and to translate the determinations into administrative processes (Snohomish County Public Works 2003). Since the current and proposed critical area regulations are based on the Critical Aquifer Recharge Area map, these alternatives could be implemented without the need for code revisions.

Groundwater Use

Groundwater withdrawals of different types in the Stillaguamish Watershed are discussed below.

Municipal Water Supply

The cities of Marysville, Arlington, and Stanwood withdraw water from wells for municipal water supply. Water for the City of Granite Falls is supplied by Snohomish County PUD No.1 through three pressure reducing valve stations constructed in 1995 and 1996. As of 1996, the City had three active wells (Wells 2, 5 and 6) with a combined capacity of 540 gallons per minute, but their use was discontinued because Wells 2 and 5 exceeded Washington State Department of Health standards for iron and manganese and Well 6 had high concentrations of arsenic (City of Granite Falls 1996).

The City of Stanwood withdraws water from three wells within the Church Creek subbasin and one groundwater-fed spring several miles outside the subbasin. The average daily water demand in 1999 was 642 gallons per minute (1.43 cfs), with 18 percent of water use "unaccounted for" (Snohomish County Planning and Development Services 2005). Factoring in the apparent leakage from the system, the average groundwater water withdrawn would be equal to 1.69 cfs.

The City of Marysville withdraws groundwater from three wells in the Stillaguamish Watershed: a ranney collector (a horizontal-shaft well placed adjacent to or under a body of water) which is located directly adjacent to the Stillaguamish River near the City of Arlington, the Lake Goodwin well located at the north end of the lake, and the Edwards Spring well located east of Lake Ki (Snohomish County Planning and Development Services 2005). The latter two wells are in locations for which Thomas et al. (1997) indicated that groundwater flows north towards the Stillaguamish River.

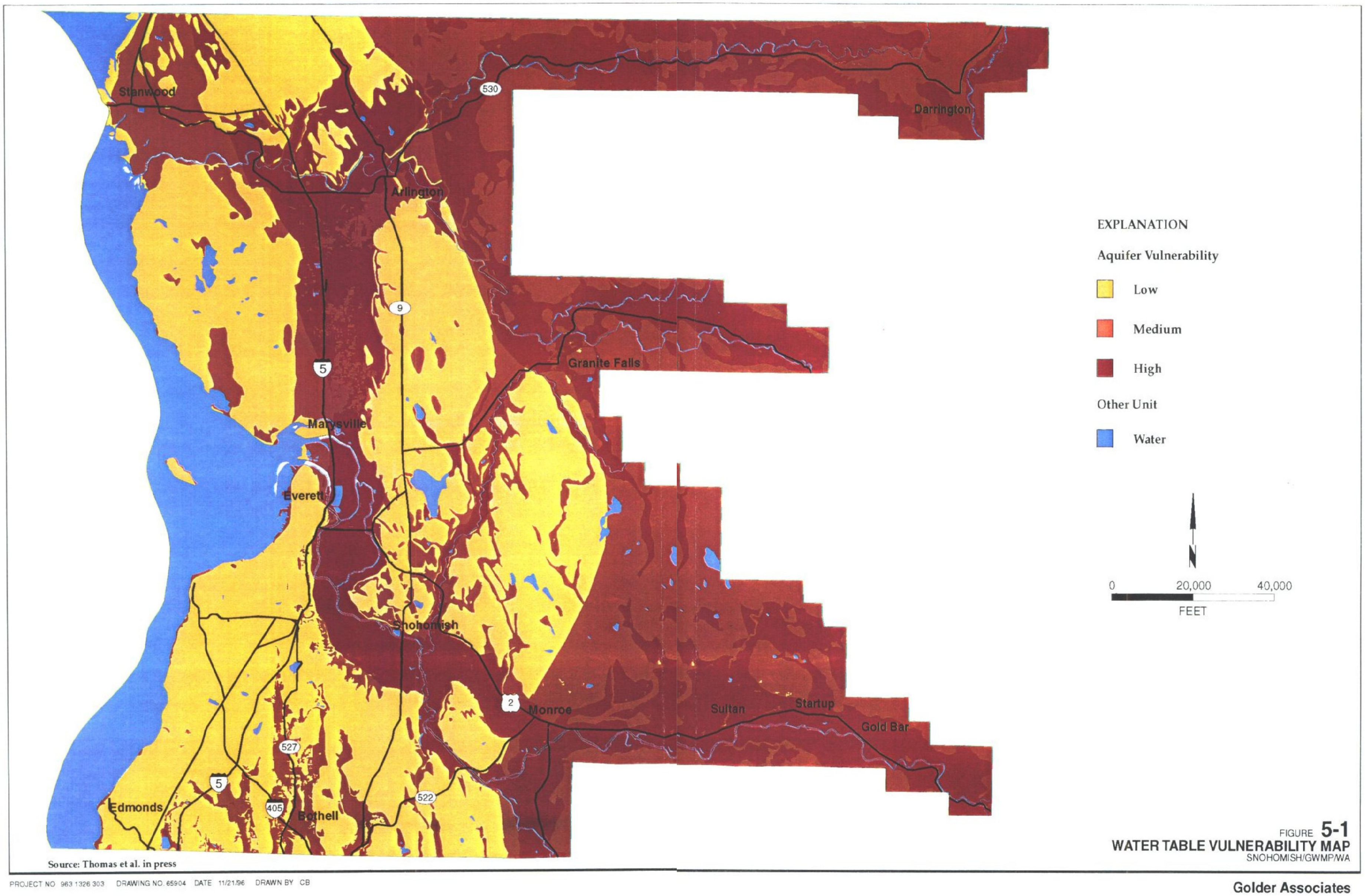

Figure 2.3.3-3 Aquifer Vulnerability Map

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The Stillaguamish ranney collector has a capacity and water right for 3.2 MGD (4.95 cfs); the Edwards Spring well has a capacity of 2.5 MGD (3.87 cfs) and a water right for 2.0 MGD (3.09 cfs); and the Lake Goodwin well has a capacity of 0.5 MGD (0.77 cfs) and a water right for 0.8 MGD (1.24 cfs) (Snohomish County, 2005).

The City of Arlington withdraws water from aquifers in the Stillaguamish River basin. The primary source is the Haller Park Well Field, with an average withdrawal capacity of 1.2 million gallons per day (MGD), or 1.86 cfs. A fourth well just east of the airport has a capacity of 0.91 MGD (1.40 cfs). The water rights for this field are 1344 acre-feet per year (1.86 cfs). The city also operates a well at the Arlington airport with a pumping capacity of about 0.9 MGD (1.38 cfs) with water rights of 320 acre-feet per year (0.44 cfs). The state has approved a "supplemental right" of 696 acre-feet per year (0.96 cfs) for this well. A limited emergency source is provided through an intertie with the City of Marysville transmission main which would allow delivery of water from the ranney collector at the Stillaguamish River. This restricted source gives Arlington an additional 0.1 MGD of backup supply capacity (Snohomish County Planning and Development Services 2005).

Non-Municipal Public Water Supply

Non-municipal public water supplies include those provided by water districts and private associations. Water wells operated by such groups need water rights. Currently, SWM does not have a comprehensive analysis of the total number of these systems in the Stillaguamish River basin, their water rights, or the amount of water withdrawn. There are, however, some data about such systems in the Pilchuck Creek and Church Creek subasins, which were the focus of a report prepared for Shared Strategy for Puget Sound by Northwest Hydraulic Consultants (2005). This report is available on the internet at http://www.sharedsalmonstrategy.org/files/waterquantity/IFAPP_Part_2.pdf. Particular attention was paid in that report to the City of Stanwood's water system (discussed above) and to the Tatoosh Water Company, which withdraws water from wells in the Pilchuck Creek subbasin.

The Tatoosh Water Company operates a water system that includes land in both Snohomish and Skagit counties south of Lake McMurray and east of I-5. The system was originally planned to serve a major, high density residential/recreational planned development with as many as 1200 customers (Snohomish County Planning and Development Services 2005). As of 2005, the system served 223 people with 103 connections (Northwest Hydraulic Consultants 2005). The system draws supply from two wells having a combined capacity of 1100 gallons per minute (2.45 cfs) (Snohomish County Planning and Development Services 2005). Northwest Hydraulics Consultants concluded, from review of other reports, that groundwater withdrawals by Tatoosh Water Company could reduce streamflows in streams tributary to Pilchuck Creek (Northwest Hydraulic Consultants 2005).

Water-Rights-Exempt Domestic Supply Wells

Chapter 90.44.050 RCW exempts groundwater withdrawals of 5,000 gallons per day for single or group domestic use from the requirement to obtain a water right for that water. Currently, Snohomish County does not have a comprehensive analysis of the amount of water withdrawn by water-rights-exempt domestic wells. Northwest Hydraulic Consultants (2005) estimated such withdrawals in the Church Creek Subbasin at 63 million gallons per year (0.11 cfs), and estimated such withdrawals in the Pilchuck Creek Subbasin at 169 million gallons per year (0.30 cfs).

Agricultural and Other Uses

Currently, Snohomish County does not have a comprehensive analysis of the amount of groundwater withdrawn for agricultural uses or other uses. Water rights information from the Washington State Department of Ecology indicate total water rights for agricul-turally-zoned lands in the Stillaguamish River basin at between 19,578 acre-feet and 58,737 acre-feet. These values include rights for both surface withdrawals and groundwater withdrawals. The lower value is based on average annual withdrawal rates, and the higher value is based on maximum instantaneous withdrawal rates; in some cases, only one of the two values was listed in the water rights documentation. These values do not reflect measurements of actual use on these properties, water used for agriculture in non-agricultural zoning, or water withdrawn for agriculture without a water right.

Northwest Hydraulic Consultants (2005) reported water rights certificates excluding public supplies total 224 acre-feet per year (0.31 cfs) for the Pilchuck Creek subbasin, from which the Tatoosh Water Company withdraws water. Such water rights total 143 acre-feet per year (0.19 cfs) in the Church Creek subbasin, from which the City of Stanwood withdraws groundwater (Northwest Hydraulic Consultants 2005).

Human Groundwater Utilization

Groundwater is withdrawn by wells for public water supply (both municipal and non-municipal), domestic supply wells exempt from water rights, agriculture, and mining (Thomas et al. 1997). While SWM does not have an analysis of actual groundwater use in the Stillaguamish River basin, Pelletier and Bilhimer (2004) presented a summary, for watersheds in the basin, of consumptive surface water withdrawals for which water rights existed at that time (see Table 2.3.3-2). The summary was based on information from Department of Ecology's Water Rights Application Tracking database system. Possible undocumented or illegal withdrawals are not considered in this analysis.

The total water rights for consumptive use withdrawals of surface water was about 81 cfs, and the water rights for consumptive use withdrawals of groundwater was about 56 cfs. These are the instantaneous flow limits on the rate of withdrawal or diversion. Limits may also be placed on annual amount withdrawal or diversion. Irrigation represented the majority of the consumptive withdrawal from surface waters. Pelletier and Bilhimer (2004) asserted that actual consumptive withdrawals are probably significantly less than the listed water rights, but did not provide justification for this assertion.

Golder and Associates (1996) estimated consumptive use of groundwater as a percentage of groundwater recharge within various subbasins. Figure 2.3.3-4, *Consumptive Use as a Percentage of Groundwater Recharge*, was taken from that document, which also contained specific values presented in a table. Consumptive groundwater use was estimated to be less than five percent of recharge in most of the Stillaguamish River basin, but consumptive use estimates were above five percent in the following basins:

Table 2.3.3-2. Summary of Consumptive Water rights in the Stillaguamish Watershed

Stillaguamish Watershed Surface Water Rights	Cubic Feet Per Second
Alder Brook	4.06
Armstrong Creek	0.84
Bulson Creek	0.02
Canyon Creek	0.12
Edwards Creek	3.93
Fish Creek	3.68
French Creek	0.02
Hat Slough	15.52
Jim Creek	0.64
Lake Cavanaugh	0.05
Lake Creek	0.39
Lake Martha	0.01
March Creek	1.23
Miller Creek	0.01
NF Stillaguamish River	26.43
Pilchuck Creek	0.54
Port Susan	1.10
Portage Creek	1.33
SF Stillaguamish River	7.64
South Pass	1.00
South Slough	5.80
Stillaguamish River	0.30
Other	6.62
Total surface water rights	81.27
Total groundwater rights	**56.40**

Source: Pelletier and Bilhimer 2004

- Burn Hill Ridge subbasin (approximately 6 percent)
- Arlington Area subbasin (approximately 7 percent)
- Church Creek subbasin (approximately 7 percent)
- Portage Creek subbasin (approximately 12 percent)
- Douglas Creek subbasin (approximately 26 percent)

The higher values correspond to subbasins with significant groundwater withdrawals by municipal water supply wells, with the exception of Douglas Creek, which does not appear to have any significant wells, and for which Golder and Associates (1996) does not specify the reason for the high value.

Reduced Groundwater Recharge

Thomas et al. (1997) reports that there is no widespread reduction in groundwater levels in Snohomish County, a statement that would also apply to the Stillaguamish Watershed. However, there are widespread observations and anecdotal reports of local reductions in summer stream-flows over time, and movement downstream of the typical 'highest upstream location of perennial flow'. These observations are often attributed to reduced groundwater recharge, which in turn is often attributed to increased impervious surface, wetland filling, increased groundwater use, etc. A more detailed analysis would be needed to determine the localized extent and effect of reduced groundwater recharge on groundwater availability.

The Stillaguamish Instream Flow Rule

On August 26, 2005, Ecology adopted Chapter 173-505 WAC, the Stillaguamish Instream Resources Protection And Water Resources Program, commonly known as the Stillaguamish instream flow rule. This rule has a profound effect on the use and availability of both surface water and groundwater in the Stillaguamish River basin. The rule establishes a water right for the river in the form of minimum flows that must be met at various times of the year at each of 33 locations in the Stillaguamish River and its tributaries. The priority date for this water right is August 26, 2005. Water uses with rights senior to that date, i.e., established before that date, are not subject to the provisions of the rule, except if those rights include a provision that water use would be subject to a future instream flow rule. Water rights junior to August 26, 2005 shall be exercised only when flow conditions provide enough water to satisfy senior rights, including the instream flows set in the rule (Chapter 173-505-050 WAC).

The rule also declares that all groundwater in the Stillaguamish River basin is hydraulically connected with surface waters of the basin (173-505-010). This has the effect of tying all junior water rights for both surface water and groundwater to the streamflow rights in the instream flow rule. Future water uses may be allowed if the applicant demonstrates that the use will be nonconsumptive, will be mitigated in accordance with an approved plan, or will not impair existing water rights (Chapter 173-505-110). A hydrogeologic study demonstrating that groundwater in a certain location is not hydraulically connected to surface water in the basin would presumably meet this test.

Finally, the rule states that that, based on historical and current low flows and uses, no water is available for additional year-round appropriation from the streams and tributaries in the Stillaguamish River basin. Therefore, all rivers and streams in the Stillaguamish River basin are closed to any further appropriations, including groundwater hydraulically connected to surface waters, the withdrawal of which will have an effect on the flow or level of the rivers and streams.

The provisions described above would halt development for which water cannot be obtained under an existing water right. In order to allow some future development, Ecology included two “reservations” of water for future uses: one cfs of surface water and twenty acre-feet/year (about 0.028 cfs) of groundwater for future stock watering, and five cfs of permit-exempt groundwater (i.e., water from water-rights-exempt wells) for future domestic use. At an assumed rate of 350 gallons per day per single-family residence, the domestic use reservation would allow approximately 9,200 additional residences. Snohomish County Department of Planning and Development Services determined that this would be adequate to serve development on currently undeveloped parcels zoned for residential development outside the Urban Growth Area boundaries. Future residential development inside those boundaries must be provided by municipal or public water systems which by necessity have associated water rights.

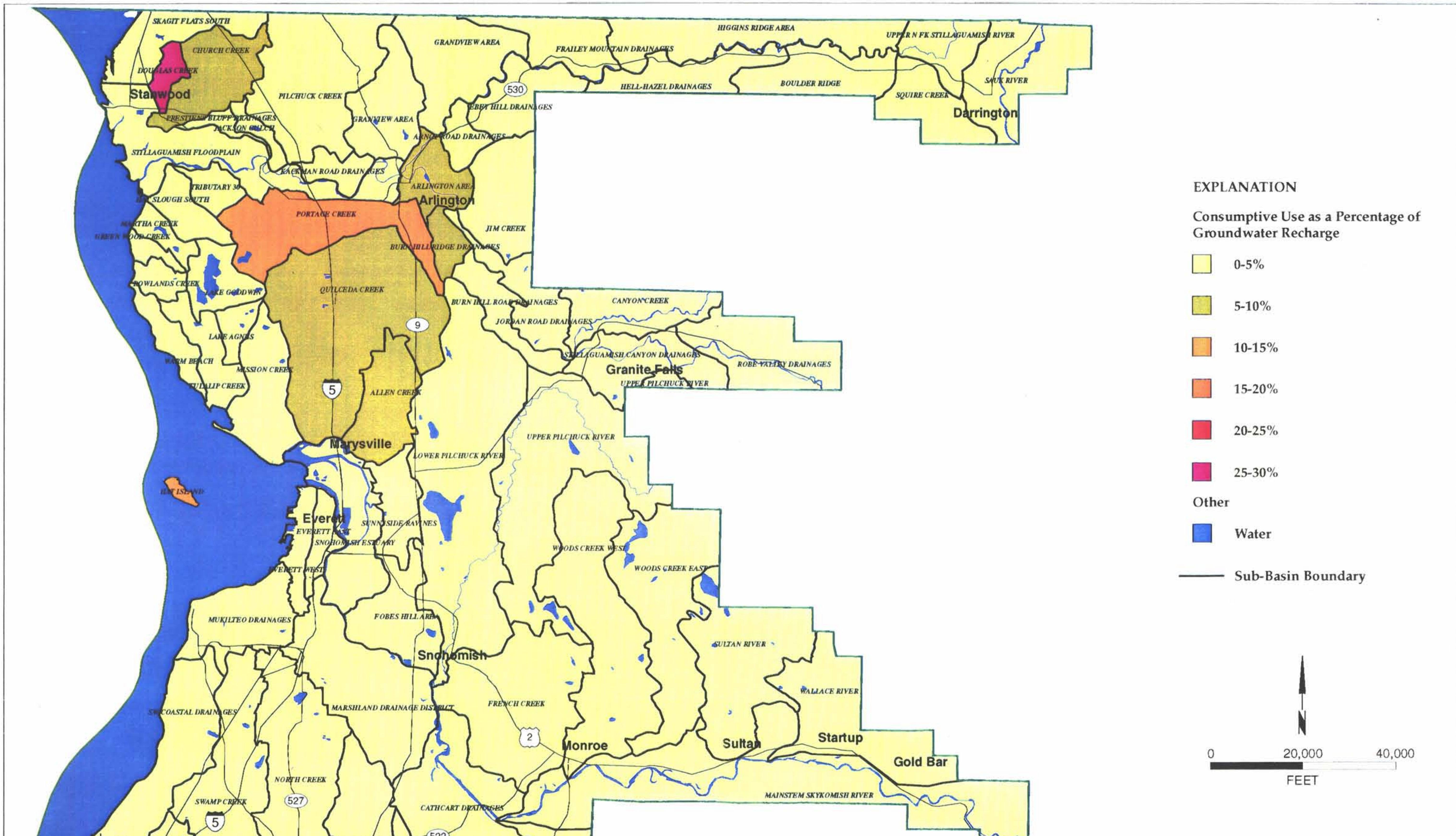

FIGURE **4-2**
CONSUMPTIVE USE AS A PERCENTAGE OF GROUNDWATER RECHARGE
SNOHOMISH/GWMP/WA

PROJECT NO. 963 1326.303 DRAWING NO. 65922 DATE 11/21/96 DRAWN BY CB

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2.3.1.2 Trends in Groundwater

Groundwater Quality

With the exception of contamination specifically indicated by septage-related compounds and seawater intrusion, there is no widespread contamination that is not due at least in large part to natural conditions. However, some of the contamination is due to human activity, and as the human population in the river basin increases through time there may be increased groundwater contamination. More detailed information about trends is not obtainable with the existing data. However, the current problems are not alarming in and of themselves, and the management actions set forth in existing planning documents plus those discussed below are likely to address the problems adequately.

Groundwater Quantity

Thomas et al. (1997) wrote the following about groundwater quantity in Western Snohomish County, and the information is applicable to the Stillaguamish Watershed today:

> "The amount of ground-water withdrawal in 1992 was only about two percent of the total ground-water recharge. In addition, there was no evidence of widespread large declines in ground-water levels in the past few decades...So, it appears that historical withdrawals did not have an appreciable effect on the ground-water system in the study area.
>
> "This minimal historical effect, however, does not mean that additional water can be withdrawn with little or no effect on the system. A simple comparison between ground-water recharge and withdrawals (historical and projected) is not a good indicator of the amount of water that is potentially available for ground-water development. Any additional withdrawal superimposed on a previously stable system must be balanced by an increase in recharge, a decrease in discharge, a loss of storage in the system (reflected by lower water levels), of a combination of these factors.
>
> "Considering the ground-water system of western Snohomish County in particular, the possibility of increased natural recharge on a long-term basis seems remote. In fact, the trend of increased residential development and centralized sewers will most likely result in decreased recharge. Additional withdrawals therefore, will probably result in a loss of storage (with an attendant decline in water levels) or a decrease in natural discharge.
>
> "The magnitude of sustainable ground-water development, therefore, depends on the acceptable amount of water-level declines or decreased natural discharge. A small decline in water levels is probably acceptable, but as the decline becomes larger, pumps would have to be lowered, and more wells would go dry. Some beneficial uses of ground-water discharge that would have to be considered include maintenance of streamflow during low flow periods, public water supply from springs and streams, prevention of salt-water intrusion near the coast, recreation, and so forth."

2.3.2.3 Problems and Gaps

Explained below are the existing problems regarding groundwater and surface water, as well as any gaps in data or analysis, and gaps in SWM's programs regarding groundwater and surface water management.

Water Rights Analysis Needed

An analysis of water rights for different uses in different watersheds within the basin will indicate whether the rights correspond to current and proposed future uses. Since the basin is closed to future water rights issuance, water rights are now a potentially valuable commodity. However, they are a commodity that is attached to a small geographic area and a specific use. The proposed water rights analysis would aid in determining the extent of the actual market for water rights, and also in determining whether the County may want to propose state legislation allowing that would facilitate transfer of water rights from one use to another.

Determine Actual Water Use

This would be a companion study to the water rights analysis described above, and would aid in determining the true market for water under water rights in the basin.

Assess Hydraulic Continuity between Groundwater and Surface Water

The Stillaguamish instream flow rule asserts hydraulic continuity between groundwater and surface water as the default condition in the basin. While this is probably a more logical default conclusion than its opposite, there may be areas in the basin where groundwater and surface water are not in continuity, at least to the extent that effects on surface water are not geographically close to a groundwater withdrawal. Such an assessment would aid in determining where new water rights might be issued or new exempt withdrawals might be allowed without impairing existing water rights. This assessment would also serve to protect holders of existing water rights (both surface water and groundwater) by determining effects from withdrawals that might seem too far away to have such effects. The Stillaguamish Tribe is currently planning to assess hydraulic continuity in selected areas to be determined in the near future.

Study Effects of Land Use on Groundwater Recharge

There is no comprehensive or detailed study on the current effects of land use on groundwater recharge and the effects on surface streamflow. Such an assessment would provide a more detailed and scientific basis for land use regulation, and would serve to protect the environment and holders of existing water rights while allowing uses of property where impacts to groundwater and surface water are not likely.

Reconsider Aquifer Vulnerability Determination

There is a need for reassessing aquifer vulnerability to contamination by use of one of the methods set forth in Snohomish County (2003). This would provide a more accurate and scientific basis for the County's regulation of land use.

Develop a County-Wide Groundwater Monitoring Program

Implementation of a County-wide program for monitoring well water quality and water levels is needed. There are thousands of private wells in the County that would be suitable for this purpose, a number far greater than is required to collect usable data. Such a program would be based on citizens voluntarily granting County staff access to their properties in order to collect water samples and possibly to install simple water depth measuring equipment. The data would give information about the quality and levels of well water at key locations in the County, and would also allow detection of trends through time. In addition, the program would educate citizens about wells, groundwater use, and groundwater quality.

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