Vashon-Maury Island Watershed Plan

June 6, 2005

King County

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DISCLAIMERS, LIMITATIONS, AND QUALIFIERS

This Plan is a stand-alone sub-area plan, developed under provisions of the Watershed Planning Management Act (Chapter 90.82 RCW), and only addresses state-issued water rights and does not address federal or tribal-based water rights except to acknowledge that in most cases they are likely to be senior to specific State water rights.

Nothing in this sub-area plan shall be construed by the State as solely providing grounds for issuing water rights under provisions related to "overriding consideration of the public interest," nor may this sub-area plan be used solely to determine what constitutes "detrimental to the public welfare" in processing water right applications.

The adoption of this sub-area plan does not create any specific legal or programmatic obligation on the part of any entity, unless clearly stated in the recommendations. The implementation of the sub-area plan is subject to budgetary constraints and it is acknowledged that no entity is obligated to implement a prescribed action in this sub-area plan unless adequate authority and funding is available to do so.

ACKNOWLEDGEMENTS

The Vashon-Maury Island Watershed Plan is an initiative of the Island Ground Water Protection Committee, participating in a broader planning process under the State Watershed Management Act. Jeremy Pratt represented Island citizens and Susan Oxholm and Joanna Richey represented King County at the WRIA 15 planning unit (see Section 3 for a description of the planning process).

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1. EXECUTIVE SUMMARY

OVERVIEW

Vashon-Maury Island is a 37-square-mile area with a population of about 10,100 that is served by the Island's water resources. Low-density residential development covers much of the Island, with higher density residential areas concentrated in small towns and along parts of the shoreline. About 75 percent of Island water use is for municipal and domestic purposes, and one quarter is estimated to be used for agriculture. Commercial and industrial water use comprises only a small portion of Island water use.

Island ground and surface water provide all of the water used on the Island. The Vashon-Maury Island Ground Water Management Area was designated a Sole Source Aquifer by the federal Environmental Protection Agency in June 1994, and an Island Sole Source Aquifer by King County in 2005. While the singular term "aquifer" is used, groundwater resources actually occur in many discrete and discontinuous locations. Data indicates that aquifers underlying Vashon-Maury Island are not connected to off-Island sources; all water used on the Island comes from precipitation. According to the WRIA 9 Habitat Limiting Factors and Reconnaissance Assessment Report (2000), Washington Trout (2002), the King County Salmon Watchers Program and recent field observations, the Island has about 19 documented salmonid-bearing streams, all of them occupied by sea-run cutthroat trout, three by steelhead, five by coho salmon, and three by chum salmon.

WATER RESOURCES AND USE – WATER QUANTITY AND QUALITY

Twenty two Group A public water systems (15 or more connections) and more than 100 Group B public water systems (2 to 14 connections) serve about 70 percent of the Island households. The larger public water systems generally serve more densely developed areas, in service areas that are not necessarily adjacent to one another. Water sources include groundwater, rainwater and surface drainages, springs, and seeps. Over 50 percent of Islanders obtain their water from shallow water sources, which are more vulnerable to contamination.

Exempt wells (wells that are exempt from state water right permitting) are often the only alternative for water supply on much of Vashon-Maury Island (Island) and serve about 1,000 Island households. A growing number of exempt wells have been drilled over the past 10-15 years, some of them within the service areas of public water systems. Exempt wells can affect both water quantity and water quality; they provide potential access for contamination of the groundwater and withdraw an unknown amount of water, potentially affecting springs, streamflow, and overall water supply.

A Water Resource Evaluation for Island is currently underway. As part of this Evaluation, wells are being monitored to provide information on water levels and water quality. Data from the monitoring program also provides information on the relationship between ground and surface water, delineation of aquifers underlying the Island, and groundwater flow. The Water Resource Evaluation will use monitoring data to estimate a water balance for the Island – an estimate of available water, and the amount of water use that can be sustained without diminishing either water supply or water quality.

There appears to be an abundance of water physically present in Island groundwater. Water levels in wells are stable, indicating that present levels of development are not over-appropriating the groundwater supply. However, water availability is limited in some areas.

Because of problems with water availability in some areas, most large public water systems are not accepting new connections and have waiting lists. Some have dug deep wells that failed to produce or have not been viable because they have influenced stream flows or been unsuitable because of silt. Some systems are facing problems with insufficient water rights and lack of financial resources needed for relatively small systems to expand or afford the cost of treatment, where it is required.

Although water quality is currently good in most Island water sources, there are some localized problems. Saltwater intrusion has been noted in a few wells along the shoreline. Nitrates have been increasing for the past 15 years, and in some areas nitrates are up three-fold, but still within the state water quality standard. By some estimates, the number of people that could be supported by the water supply is more limited by the ability of Island soils to recover from nitrate contamination than by the available water supply.

WATERSHED PLANNING

While in many areas of the Island there is not a current problem with water quality and quantity, planning and preparation to secure and protect Island water resources is warranted. The principal reasons for preparing a watershed plan now are that there is uncertainty about the amount and availability of groundwater, a local trend showing increasing nitrates in some wells, potential for degradation of Island streams and potential for contamination of the Island sole source aquifer.

This watershed plan intends to protect and assure the water supply, by making and implementing specific recommendations on water quantity and quality issues affecting the Island . This watershed plan has been guided by nine principles that have been used in the long history of water resource planning by the community, and are listed in Section 2.

For the past 25 years, through several community planning processes, the Island community has been proactive in protecting its water supply. There is broad recognition of the shared responsibility for this common resource, and recognition that each water use can affect the quantity and quality of the water supply of others.

After a ten-year Island-based effort, the Vashon-Maury Island Groundwater Management Plan was completed in 1998. In 2001, King County appointed a Ground Water Protection Committee (GWPC), consisting of Islanders, to implement the Plan and work with county agencies on issues relating to water resources. Previously, the 1990 Vashon Coordinated Water System Plan (CWSP) also made recommendations to manage the groundwater supply. The Vashon CWSP intended to define regional deficiencies associated with water supply and consider possible remedial measures. Resolution of water availability issues were deferred to the 1998 Ground Water Management Plan (GWMP). GWPC has participated in the watershed planning effort to develop this Plan under the Washington Watershed Management Act through WRIA 15, one of 62 Watershed Resource Inventory Areas in the state. (Island salmon habitat is being addressed concurrently, through WRIA 9.) GWPC initiated this watershed planning process because of its commitment to be proactive in protecting water resources, and to ensure that this protection is determined by those affected by it. WRIA 15 recognized GWPC as a citizen caucus representing the Island, and a subcommittee was formed by GWPC at its June 23, 2004

meeting. Subcommittee meetings were open to the public, as it met over seven months to develop a draft Vashon Watershed Plan. After the Plan was drafted, public comment was received in two public meetings and in response to articles and an insert in local newspapers. The final Plan incorporates both public and state and county agency comment. It will be submitted to WRIA 15 as a sub-area plan in the overall WRIA 15 document, and then to the King County Council.

RECOMMENDATIONS

The Vashon Watershed Plan provides a description of water quantity and quality issues for which recommendations have been made. It is intended that recommendations provide broad guidance and should be implemented in close coordination with ongoing programs and mandates of state and local jurisdictions.

Goals

The recommendations, compiled in Sections 2 and 5, have been developed in order to achieve the following goals:

Water Rights: to indicate availability of water rights up to the sustainable supply capacity of the resource.

Water Use and Conservation: to use water within the sustainable supply capacity of the resource, to coordinate and update water resources management and planning, to conserve water, to educate the Island community about water use, conservation, water resources, and to explore future water supply strategies.

Public Water Service: to improve the coordination of public water service; to provide public water service from stable, safe and reliable systems, to provide a policy preference for water supply from public water systems wherever feasible.

Exempt Wells: to recognize the appropriate use and need for exempt wells; to develop data on water use, and to educate well users about risks of aquifer contamination.

Stream Flows: to recognize the connection between surface and ground waters and the need to protect Island hydrology.

Fuel Storage Tanks: to ensure that underground storage tanks do not adversely affect water quality and that incentives are in place to prevent contamination.

Septic Systems: to reduce the likelihood of pollution from malfunctioning septic systems through education, proper maintenance, and use of proved alternative systems, where appropriate.

Stormwater Management: to manage stormwater flows to maximize the protection of surface and groundwater quality, optimize aquifer recharge, protect receiving waters, and preserve or mimic natural hydrology.

Pesticide, Fertilizer and Herbicide Use: to educate the Island community on use of organic, nontoxic, and short-lived pesticides, herbicides and fertilizers.

Priority Action Items

Of the recommendations, seven have been identified as the highest priority action items:

- An ongoing Island-wide education program should be developed to inform Islanders about groundwater resources, how drinking water is supplied, water availability, and water quality issues. The education program should include alternative water supply choices such as water retention, rain water harvesting, use of gray water, deepening of wells, groundwater recharge, water rationing in emergencies, reclaimed water, and desalinization. Funding should be sought for this effort.
- A representative sample of Vashon-Maury Island exempt wells should be monitored for water use. Volunteers should be solicited to participate in this study.
- An education program should be developed and implemented that informs exempt well owners of the risks of aquifer contamination, and actions they can take to minimize the risk of contamination of their wells. King County and the Vashon-Maury Island GWPC should collaboratively seek funding to implement this effort.
- King County shall seek funding and work with the State agencies to encourage removal of old or failing residential fuel storage tanks.
- King County should encourage the use of demonstrated new and alternative on-site septic treatment technologies on Vashon-Maury Island.
- Continue to implement and seek funding to expand the Seattle-King County Public Health septic education program to inform property owners about septic system failures and steps they may take to ensure effective maintenance and operation of their system.
- King County and GWPC should collaborate to develop an education program on pesticide and fertilizer use.

ANTICIPATED EFFECTS ON PROPERTY OWNERS

The Vashon-Maury Island watershed plan encourages the long term sustainable use of water resources and triggers that could be invoked to prevent the degradation of water quality or over-appropriation of water resources. It is anticipated that the plan would have the following effects on landowners:

- Illegal use of water may have to stop.
- Over-appropriation of water resources would not be allowed.
- Available water supplies may be identified more easily.
- The option to drill an exempt well would be protected where connection to a public water system is not available or cost effective.
- New development in existing public water system service areas would be required to seek public water service before drilling a well.

- New development would be directed to use groundwater rather than surface water.
- Septic systems would need to be maintained in properly functioning condition.
- New stormwater management techniques would be encouraged.
- Educational opportunities on the availability, protection, and use of water resources would be improved.

2. PLANNING PRINCIPLES AND FULL SUMMARY OF RECOMMENDATIONS

This section provides the principles used to guide development of the Vashon-Maury Island Watershed Plan and summarizes the recommendations that are fully discussed in Section 5. This recommendations summary highlights the seven key recommendations.

2.1 PLANNING PRINCIPLES

Several principles guided the development of this plan. Many of these principles have been applied in community planning efforts since the adoption of the 1981 Vashon Community Plan.

- Use water sustainably so that our supply of drinking water from our groundwater resources can be sustained indefinitely without diminishing its quantity or degrading its quality.
- Preserve natural hydrologic function. Ensure that properly functioning conditions of the complex hydrologic system of surface and ground water is restored and preserved. In more urban areas, where it may not be possible to restore and preserve natural hydrology, the goal should be to mimic a site's natural hydrologic function.
- Be proactive, not reactive. Anticipate problems and possible solutions, recognizing that, once damaged, it may be impossible or extremely expensive to restore the quality and quantity of drinking water and natural hydrologic functions.
- Accommodate growth in a thoughtful, careful, creative way within the bounds of sustainable development. Look for innovative solutions.
- Use the precautionary principle, recognizing that natural systems are interrelated and in balance, and that damage to one part of the system can affect another. This principle recognizes that, once damaged, the health and function of these systems can be impossible or extremely expensive to retrieve.
- Use the best available science to determine standards and actions that may be taken to ensure the sustainability of water supply.
- Ensure that the larger Vashon community is educated about water issues and is involved in planning that affects them.
- Keep in mind the need for implementing rules, ordinances and legislation, and identify these in our recommendations.
- Water is a common property resource, for which we all share a stewardship responsibility.

2.2 FULL SUMMARY OF RECOMMENDATIONS

Recommendations are fully discussed in Section 5. Key recommendations – those considered the highest priority for implementation – are shown in bold text.

VASHON WATERSHED PLAN RECOMMENDATIONS	PRIORITY
Water Rights	
1. The Washington Department of Ecology (DOE) shall endeavor to update its database to provide a best estimate of the claimed quantities for Vashon water claims.	*MEDIUM*
2. DOE shall work with owners of paper water rights and forfeited claims that have become invalid through non-use to secure their relinquishment outside formal adjudication.	*HIGH 3*
3. New water rights may be issued to the extent groundwater is available for appropriation on a sustainable basis and meets public health standards for safe and reliable supplies.	*MEDIUM*
Water Use and Conservation	
1. Revise King County Comprehensive Plan Policy CP-1227 to read: The quantity and quality of Vashon-Maury Island's groundwater supply should be monitored, along with building permit and subdivision data, to determine if planned densities can be achieved. If the County's ongoing water monitoring program indicates the groundwater supply is projected to be used beyond its sustainable capacity, the County shall take immediate steps to ensure new development does not impair the groundwater supply.	*HIGH*
2. Revise King County Comprehensive Plan Policy CP-1214 to read: Special consideration should be given to the impacts of new development on the Island's groundwater resources. This should apply to major developments, development in high groundwater recharge areas, or development near public water supplies, or withdrawal of ground water beyond the sustainable supply capacity of the Island sole-source aquifer.	*HIGH*
3. Planned use of the Vashon-Maury sole-source aquifer shall be sustainable as a future water supply strategy.	*HIGH*
4. GWPC shall consider the results of King County's Water Resource Evaluation in identifying and setting groundwater protection and management priorities and coordinate with Island water purveyors and King County in their planning and permitting.	*MEDIUM*
5. An ongoing Island-wide education program should be developed to inform Islanders about groundwater resources, how drinking water is supplied, water availability, and water quality issues. The education program should include alternative water supply choices such as water retention, rain water harvesting, use of gray water, deepening of wells, groundwater recharge, water rationing in emergencies, reclaimed water, and desalinization. Funding should be sought for this effort.	***HIGHEST***
6. An Island-wide assessment of the potential for water conservation should be conducted by state agencies, King County, and Island water systems. Funding should be sought for this effort.	*MEDIUM*
7. An Island water conservation education program should be developed and implemented as a joint effort of participating public water systems, private well owners, state agencies, and King County. Funding should be sought for this effort, and incentives should be considered.	*MEDIUM*

8. GWPC should work with Island Group A water purveyors, state agencies and King County to assess options for providing an Island water availability clearinghouse, to identify the availability of public water supplies for Island landowners.	*LOW*
9. Seek funding for education and incentives to support appropriate gray and reclaimed water use, consistent with the Washington State Department of Health Recommended Standards and Guidance for Water Conserving Systems.	*LOW*
10. Support revisions to state and King County regulations to eliminate disincentives to residential rainwater harvesting for potable and nonpotable uses.	*LOW*
Public Water Service	
1. Group A public water systems have a duty to serve all customers in their approved service areas and should expand to serve wherever they can provide a cost-effective, timely, reasonable, safe, and reliable supply, within their water rights, and consistent with local plans and policies. Service options could include remote service, satellite management and other interim service arrangements, consistent with the King County Comprehensive Plan.	*HIGH*
2. The water systems participating in Coordinated Water System Planning should update the 1990 Coordinated Water System Plan as part of a countywide water supply planning process and then implement the updated plan.	*MEDIUM*
3. Island Group A public water systems should coordinate with one another to make the most effective use of existing water sources to meet Island water needs.	*MEDIUM*
4. Vashon Group A water systems should implement affordable interties for temporary use only to improve fire flows or provide continuous service in emergency situations. Washington State Department of Health should provide guidance to Vashon water systems on intertie terms and conditions.	*MEDIUM*
5. Island public water systems should continue ongoing monitoring and consider the outcomes of the King County Water Resource Evaluation as they review planning policies and develop water system plans.	*MEDIUM*
6. All Vashon-Maury Island public water systems should share responsibility for the stewardship and husbanding of sole-source Island water resources. New connections shall be provided to the extent groundwater is available on a sustainable basis.	*HIGH*
7. GWPC should include a representative from a Vashon Group B water system.	*MEDIUM*
8. King County should meet annually with GWPC, Island water purveyors, the Washington State Department of Health, Seattle King County Department of Health (DOH), and DOE to discuss and coordinate the protection of Island water supplies and implementation of future water supply strategies in the context of this watershed plan.	*MEDIUM*
9. Island public water systems that provide reliable, high-quality water service and are financially stable shall not be forced to consolidate.	*HIGH*
Exempt Wells	
1. A representative sample of Vashon-Maury exempt wells should be monitored for water use. Volunteers should be solicited to participate in this study.	***HIGHEST***
2. King County shall approve building permits served by exempt wells only if public water service cannot provide cost-effective, timely, reasonable, safe, and reliable water service, within their water rights, and consistent with local plans and policies. If new development lies within or less than one mile from the boundaries of the service area of a public water system, that public water system should have been contacted and requested to provide service.	*MEDIUM*

3.	"Consolidation" of exempt wells by utilities into public water rights and service from existing Group A systems is encouraged where feasible. An application to "consolidate" exempt wells into a water right shall be filed with DOE.	*LOW*
4.	Seek funding for DOH and Washington State Department of Health (DOH) to conduct a survey of source protection for individual exempt wells and Group B exempt wells on Vashon Island, and recommend measures to correct any deficiencies that entail a risk to the quality of the Island sole-source aquifer.	*MEDIUM*
5.	**An education program should be developed and implemented that informs exempt well owners of the risks of aquifer contamination, and actions they can take to minimize the risk of contamination of their wells. King County and GWPC should collaboratively seek funding to implement this effort.**	***HIGHEST***
6.	King County should maintain a record of new exempt wells associated with approved building permits on the Island for consideration in the Water Resources Evaluation and ongoing monitoring efforts.	*MEDIUM*
7.	King County should consider a local grant matching program for home owners to help buy down the cost of properly decommissioning private wells that are no longer in use.	*MEDIUM*
	Stream Flows	
1.	In order to preserve Island hydrology and the riparian and riverine ecosystems of Island streams, new surface water rights should not be issued for Island salmonid-bearing streams and should be discouraged for other Vashon streams.	*HIGH*
2.	As normative flow analyses and other studies are completed, implement strategies to protect/enhance stream ecology: <u>Data Collection</u>: Install devices to track stream flows in priority fish-bearing streams of Vashon-Maury Island. Seek funding to expand the existing volunteer program managed by the King County Basin Steward that monitors salmonid adult spawners and begin monitoring juveniles at emergence from gravels Seek funding to monitor benthic invertebrates and/or other indicators of stream health. Use King County's normative flow study results when assessing the relationship between stream flow and biology on the Island. <u>Education/Incentives</u>: Educate Vashon-Maury Island residents about stream flows, the importance of balancing the needs of people with the proper functioning of the Island's natural hydrology, and the role of water conservation in ensuring the protection of the water supply. <u>Adaptive Watershed Management</u>: Consult with other watershed resource managers on best watershed management practices and adaptive management. Coordinate salmon recovery with WRIA 9 Forum and Steering Committee or their successors and support actions within the WRIA 9 recovery plan that address water as a limiting factor. Look for ways to delay the onset of summer low flows, and sustain minimum flows through late summer and early fall.	*MEDIUM*

3.	Use best available science to account for instream flow needs for fish in coordinated Group A water planning.	*HIGH*
	Fuel Storage Tanks	
1.	**King County shall seek funding and work with state agencies to encourage removal of old or failing residential fuel storage tanks.**	***HIGHEST***
2.	GWPC, Island water purveyors and King County shall encourage the elimination of old or failing residential fuel storage tanks through replacement or the use of heating systems that are not reliant on old or failing tanks.	*MEDIUM*
3.	Unused underground fuel storage tanks that are old or failing should be removed or filled in place.	*HIGH*
4.	GWPC and King County should seek a funding source to provide incentives for the elimination of old or failing residential fuel storage tanks. A direct grant program for homeowners to decommission old or failing fuel storage tanks should be explored by King County.	*MEDIUM*
5.	GWPC should consider the effectiveness of commercial fuel storage regulations to safeguard Vashon groundwater.	*LOW*
6.	GWPC should publicize the program of State of Washington Pollution Liability Insurance Agency with the goal of registering all Vashon heating oil tanks.	*HIGH-MEDIUM*
	Septic Systems	
1.	Maintain King County/ GWPC's regular groundwater monitoring program for nitrates and other potential septic system contaminants, and develop policies on their control.	*HIGH*
2.	**King County should encourage the use of demonstrated new and alternative on-site septic treatment technologies on Vashon-Maury Island.**	***HIGHEST***
3.	Seattle-King County Public Health (SKCPH) should work with the Vashon-Maury Island Community Council Septic Solutions Committee's effort to determine the feasibility of a Public Utility District or like organization to manage septic issues locally for the Island, including inspection of systems.	*MEDIUM*
4.	**Continue to implement and seek funding to expand the SKCPH septic education program to inform property owners about septic system failures and steps they may take to ensure effective maintenance and operation of their system.**	***HIGHEST***
5.	Assess the potential use of septic system waste as fuel for power generation as part of an alternative energy generation program.	*LOW*
6.	Seek funding or other financial incentives to encourage low income homeowners to fix failing or failed septic systems.	*HIGH*
	Stormwater Management	
1.	New roads or road improvements required for new development in the town of Vashon should use a rural road section when possible, consistent with the King County Road Standards. Although the roadway section within the Vashon Town Center typically includes curb, gutter, and sidewalk, the residential roadway section throughout the Island should generally be rural in character with shoulders and an open ditch/swale on both sides of the roadway. When a roadway project exceeds the thresholds identified in Section 1.1.1 of the County's Surface Water Design Manual, flow control and treatment facilities should mitigate the impacts generated by surface and stormwater runoff. Swales should be used when ecologically appropriate to treat runoff.	*HIGH*

2. Provide incentives, considering those offered through the existing Seattle Public Utilities program, for property owners to use flow control Best Management Practices (BMPs) in excess of minimum requirements for all projects on Vashon-Maury Island. King County Water and Land Resources Division should provide technical assistance in using these BMPs to meet flow control requirements.	*HIGH*
3. The County should lead by example by implementing Low Impact Development (LID) technologies for county-sponsored projects (e.g., roads, buildings).	*MEDIUM*
Pesticide, Fertilizer and Herbicide Use	
1. King County and GWPC should collaborate to develop an education program on pesticide and fertilizer use that includes: Information for retailers to post concerning preferred control measures for ordinary pests and point of sale warnings and information for each measure. Workshops about the hazards of toxic pesticides, herbicides, and fertilizers, and the alternatives available. King Conservation District's "Livestock Management" classes held on Vashon. A series of articles for *The Loop, The Beachcomber,* and Vashon Audubon's *Island Wings.* Handouts available through the Land Trust, Audubon, Sustainable Vashon, Vashon Garden Club, Vashon Library, and other organizations. Encouragement for schools, Vashon Park District, Vashon Library, King County Road Services Division, the Vashon Island Golf and Country Club, local landscapers, businesses, and farms to practice IPM, reduce use of toxic materials, and find alternatives through handouts and invitations to workshops. For non-county roadside maintenance, KC DNR and the Island Groundwater Stewardship Committee encouraging nonchemical methods of maintenance for roads and rights of way. Funding source for this education program.	***HIGHEST***
2. Prioritize the regular monitoring of streams and groundwater for traces of pesticides, herbicides, and fertilizers in King County's groundwater monitoring program. Two or three major streams should be monitored as part of GWPC data gathering.	*HIGH-MEDIUM*
3. The Washington State Legislature should require labeling of heavy metals and toxic chemicals contents on fertilizer labels.	*LOW*
Governance and Implementation	
1. GWPC should work with King County and state agencies to explore options for providing local, Island-wide water resources management.	*MEDIUM*
2. King County should develop a process for referring proposals on water resources management, policy, and regulation for Island concurrence to GWPC.	*MEDIUM*
3. GWPC shall work with King County and state agencies to define sustainability criteria to use in implementing this plan.	*HIGH*

4. If the County's ongoing water monitoring program indicates the groundwater supply is projected to be used beyond its sustainable capacity, King County Department of Natural Resources and Parks (DNRP) shall recommend to SKCPH and Department of Development and Environmental Services that immediate steps be taken to ensure that new development does not impair the groundwater supply. GWPC may also petition DNRP to evaluate monitoring data and determine whether immediate steps are necessary. DNRP's recommendations would be appealable to the King County Hearing Examiner.	*HIGH*
5. To ensure implementation of this Watershed Plan, GWPC shall work with King County and state agencies to develop a work plan and assess the success of the prior work plan every two years. GWPC and County and state agencies shall rely on the best available science, such as the information provided by the King County Water Resources Evaluation, to adaptively manage implementation of this Plan.	*HIGH*
6. King County and state agencies shall fulfill implementation obligations, as defined in Chapter 90.82 RCW.	HIGH

3. VASHON-MAURY ISLAND WATERSHED PLANNING PROCESS

Vashon-Maury Island is participating in watershed planning through Water Resource Inventory Area (WRIA) 15, one of 62 WRIAs in the state, encompasses all or portions of Pierce, Mason, King and Kitsap Counties and the cities of Bremerton, Bainbridge Island, Poulsbo, Gig Harbor and Port Orchard. The WRIA 15 Planning Unit includes representatives from these jurisdictions in addition to representatives of affected water districts and Indian Tribes. In addition, there are six stakeholder caucuses representing Business, Citizens at Large, Environmental, Fisheries, Property Rights, and Recreational interests.

Watershed planning is conducted under Washington's Watershed Management Act (Chapter 90.82 RCW). The Act requires watershed plans to address water quantity. Plans also may address water quality, instream flows, and habitat, although this is not required. Habitat considerations for the Island are being addressed through a watershed planning process focused on salmon recovery in WRIA 9. Vashon's participation in the WRIA 15 watershed plan focuses on water supply issues. These planning elements reflect the need to protect and assure the future water supply and to steward the environment and natural resources responsibly.

For the past 25 years, through several community planning processes, the Island community has been proactive in protecting its water supply. After a ten-year Island-based effort, the Vashon-Maury Island Groundwater Protection Plan was completed in 1998. In 2001, King County appointed a GWPC, consisting of Islanders, to implement the Plan and work with County agencies on issues relating to water resources. GWPC initiated this watershed planning process because of its commitment to be proactive in protecting water resources, and to ensure that this protection is determined by those affected by it.

WRIA 15 recognized GWPC as a citizen caucus representing the Island. GWPC approved the creation of a Vashon Watershed Planning Committee at its June 23, 2004 meeting to develop a draft Vashon-Maury Island Watershed Plan for consideration by GWPC and King County. Subcommittee meetings were open to the public, as it met in 2004 and 2005 to develop a draft Vashon Watershed Plan. After the Plan was drafted, public comment was received in two public meetings, at GWPC meetings, and in response to articles and an insert in local newspapers. The final Plan incorporates both public and state and county agency comment.

The Vashon-Maury Island Plan is included as a component of the WRIA 15 Plan, but is to be implemented as a separate and stand-alone unit. As agreed upon by the WRIA 15 Planning Unit, Vashon-Maury Island (King County) independently developed a sub-area plan with separate, specific recommendations for water resource management on the Island. The Vashon-Maury Plan was not reviewed by nor was it approved, disapproved, or endorsed by the Planning Unit. The Vashon-Maury Plan has no applicability to the other sub-areas within WRIA 15 or to the other general terms of the WRIA 15 Plan. The Planning Unit does favor using Phase 4 State funds to financially support selected actions specified in the Vashon-Maury Island Sub-area Plan. See Appendix A for DOE planning requirements and a description of how this Plan meets those requirements.

Plan recommendations have been developed in order to achieve the following goals:

Water Rights: to indicate availability of water rights up to the sustainable supply capacity of the resource.

Water Use and Conservation: to use water within the sustainable supply capacity of the resource, to coordinate and update water resources management and planning, to conserve water, to educate the Island community about water use and water resources, and to explore future water supply strategies.

Public Water Service: to improve the coordination of public water service; to provide public water service from stable, safe and reliable systems, to provide a policy preference for water supply from public water systems wherever feasible.

Exempt Wells: to recognize the appropriate use and need for exempt wells; to develop data on water use, and to educate well users about risks of aquifer contamination.

Stream Flows: to recognize the connection between surface and ground waters and the need to protect Island hydrology.

Fuel Storage Tanks: to ensure that underground storage tanks do not adversely affect water quality and that incentives are in place to prevent contamination.

Septic Systems: to reduce the likelihood of pollution from malfunctioning septic systems through education, proper maintenance, and use of proved alternative systems, where appropriate.

Stormwater Management: to manage stormwater flows to maximize the protection of surface and groundwater quality, optimize aquifer recharge, protect receiving waters, and preserve or mimic natural hydrology.

Pesticide, Fertilizer and Herbicide Use: to educate the Island community on use of organic, nontoxic, and short-lived pesticides, herbicides and fertilizers.

3.1 WATER QUANTITY ELEMENT

Water quantity, including future water supply strategies, is a mandatory element of watershed planning. Island ground and surface water provide all of the water used on the Island. The Island Ground Water Management Area was designated a Sole Source Aquifer by the federal Environmental Protection Agency in June, 1994, and an Island Sole Source Aquifer by King County in 2005. While the singular term “aquifer” is used, groundwater resources actually occur in many discrete and discontinuous locations. Data indicates that aquifers underlying Vashon-Maury Island are not connected to off-Island sources; all water used on the Island comes from precipitation. Water sources include groundwater, surface drainages, springs, and seeps. Over 50 percent of Islanders obtain their water from shallow water sources, which are more vulnerable to contamination.

A Water Resource Evaluation for the Island is currently underway. As part of this Evaluation, wells are being monitored to provide information on water levels and water quality. Data from the monitoring program also provides information on the relationship between ground and surface water, delineation of aquifers underlying the Island, and groundwater flow. The Water Resource Evaluation will use monitoring data to estimate a water balance for the Island – an estimate of

available water, and the amount of water use that can be sustained without diminishing either water supply or water quality.

Based on current data, there appears to be an abundance of water physically present in Island groundwater. Water levels in wells are stable, indicating that present levels of development are not over-appropriating the groundwater supply. However, water availability is limited in some areas. Because of problems with water availability in some areas, most large public water systems are not accepting new connections and have waiting lists.

3.1.1 Requirements for the Water Quantity Element

Future water supply strategies typically address such areas as surface and ground water management, instream flows, water conservation, public water service, water storage, water reuse, monitoring, education, funding, and related topics. DOE requires that the following be addressed in the water quantity element of a watershed plan:

- Water supply and water use, including:
  - Estimate of surface and groundwater present and available
  - Estimate of water represented by claims, permits, certificates, instream flows, and federally reserved rights
  - Estimate of water being used
- Identification of recharge areas
- Estimate of water available for future appropriation taking into account instream flows
- Strategies for future use of water
- Strategies to increase water supply to meet objectives of:
  - Satisfying minimum instream flows for fish
  - Providing water for future out-of-stream use
  - Ensuring adequate supply for agriculture, energy production, population growth and economic growth as required in the Washington State Growth Management Act

Some of these requirements, such as estimates of surface and ground water available and identification of recharge areas, are addressed in King County and Vashon-Maury Island existing technical programs and planning documents, including the Water Resources Evaluation that is currently being conducted. Existing plans include discussion of how Island water resources should be coordinated and protected to meet future water supply needs and of sustainable supply capacity of the sole-source Island aquifer. Conclusions lead us to balancing the desire for future consumptive water use with the responsibility to steward the Island's natural resources and protect the environment.

3.1.2 Approach to Water Quantity Element

Key pieces needed to address Vashon water quantity are in place: the 1998 GWMP, the 1990 CWSP, and the water-related policies in the King County Comprehensive Plan, including the Vashon Section of the Community Plans Chapter. The GWMP and the Vashon CWSP are the two primary documents guiding water management and planning on Vashon-Maury Island.

However, full implementation of the recommendations within these two documents has not been achieved. Alignment and integration of these two plans would be a guide to protecting Vashon-Maury Island's water future and critical water resources.

The Vashon-Maury Island Watershed Plan addresses water quantity in Sections 4 and 5, considering water rights, water use and conservation, public water systems, and exempt wells.

3.2 WATER QUALITY ELEMENT

Water quality is a discretionary element of watershed planning. It is often said that water quality is water quantity. Good groundwater management assures sustainable quantity by protecting water quality, guarding against such effects as drawdown, saltwater intrusion, and loss of supply due to contamination. Insuring water quality protects public health and assures that the common resource is not degraded or overused.

Although water quality is currently good in most Island water sources, there are some localized problems. Saltwater intrusion has been noted in a few wells along the shoreline. Nitrates have been increasing for the past 15 years, and in some areas nitrates are up three-fold, but still within the state water quality standard. This is of particular concern, since over 50 percent of Islanders obtain their water from shallow water sources, which are more vulnerable to contamination. Carr 1983 estimates that the number of people that could be supported by the water supply is more limited by the ability of Island soils to recover from nitrate contamination than by the available water supply.

GWPC has worked extensively with King County to develop the monitoring program that provides data for the Water Resource Evaluation. The program will provide more data and analysis of water resources than many watershed plans achieve, and provide an in-depth background to the water quality element of the watershed plan.

The Vashon-Maury Island Watershed Plan addresses water quality in sections 4 and 5, considering septic systems, stormwater, underground storage tanks and fertilizer, pesticide and herbicide use.

3.3 STREAM FLOWS ELEMENT

Instream flow-setting (in general, a process to determine the stream flow levels required to provide properly functioning conditions) is a discretionary element of watershed planning. Although WRIA 15 had indicated it would not address this element, the Vashon-Maury Island Watershed Plan addresses instream flows in Sections 4 and 5.

4. VASHON-MAURY ISLAND WATER RESOURCES: OVERVIEW

This section of the document provides an overview of physical and community elements of Vashon-Maury Island. An overview of historic efforts in assessing the water resources of Vashon-Maury Island completes this section.

4.1 ASSESSMENT OF VASHON-MAURY ISLAND

Vashon-Maury Island is an island that lies in the Puget Lowland within the boundaries of King County. According to delineations conducted by DOE, Vashon-Maury Island lies within the boundary of WRIA 15, known as the Kitsap Peninsula and Islands Watershed.

4.1.1 Geography

Vashon-Maury Island encompass approximately 37 square miles of which 29.7 square miles are on Vashon Island and 7.0 square miles on Maury Island. The two islands are linked by a narrow isthmus and are not, therefore, truly independent islands. Vashon-Maury Island is bordered on the west by Colvos Passage from the Kitsap Peninsula, on the south by Dalco Passage from Tacoma, on the East by Puget Sound and King County, and on the north by Puget Sound (Figure 1). Vashon Island is about 13 miles long (north to south) and 4 miles across (east to west) in the widest areas. Maury Island is about 5 miles long (northeast to southwest) and about 1 mile across (northwest to southeast). The Island is included in WRIA 15 for the purposes of water quantity planning (the Island is included in WRIA 9 for nearshore habitat planning – see Section 3 of this plan for further discussion of planning).

4.1.2 Topography

The topography of Vashon-Maury Island varies from sea level to elevations in excess of 460 feet based on U.S. Geological Survey topographic maps. New LiDAR (Light Detecting And Ranging) data has improved the accuracy of the surface topography data. The maximum elevation on the Island is just over 500 feet at Maury Island Marine Park. The shoreline extent of Vashon-Maury Island is just over 58 miles most of which lies beneath steep, slide-prone slopes. The Island has numerous (>70) stream basins and two of these are larger with subbasins, Judd Creek and Shinglemill Creek. All of these stream basins drain into Puget Sound.

4.1.3 Geology

The geology of Vashon-Maury Island has recently been updated with a new geologic map. In 2004, GeoMap NW, formerly known as University of Washington Seattle-Area Mapping Project, completed a detailed analysis of field data and data compiled from well logs for King County as part of the Water Resources Evaluation Project. The Island is composed of glacial derived sediments deposited during several glacial episodes. The predominant geology on Vashon-Maury Island is glacial till. This unit (as well as other till-like units) covers approximately 68 percent of the Island and helps define the topography. The remaining 32 percent of the Island is made of glacial outwash and alluvial deposits.

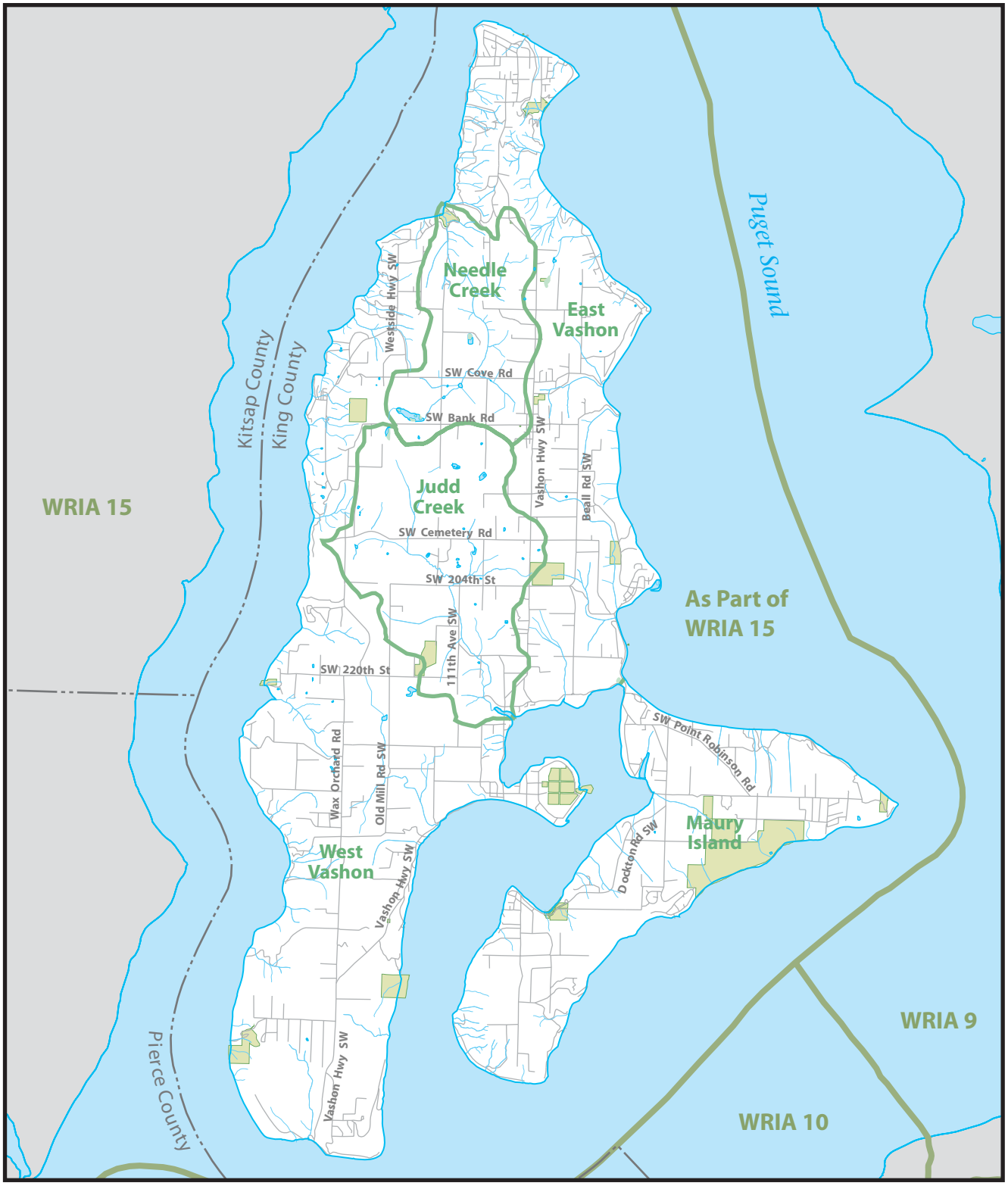

Figure 1
Vashon-Maury Island Location Map

- WRIA Boundary
- Basin Boundary
- Roads
- Lake/Puget Sound
- Wetland
- Park

N

0 1 2 Miles

May 2005

King County

Department of Natural Resources and Parks
Water and Land Resources Division

Data Sources:
King County GIS coverages

File name: 0505vmi_fig1.ai wgab

In addition to the geologic mapping, GeoMap NW updated the susceptibility mapping on Vashon-Maury Island. This work was done by compiling the new geologic map and newly gathered depth to water information obtained by GeoMap NW. The updated susceptibility mapping is the foundation for the revised Critical Aquifer Recharge Area (CARA) map on Vashon-Maury Island.

4.1.4 Precipitation

Precipitation can vary greatly across Vashon-Maury Island. According to the Carr report published in 1983, the variation measured was 18 inches from east to west on the Island. National Oceanic and Atmospheric Administration (NOAA) has average precipitation zones mapped for the Puget Sound area. Vashon-Maury Island has three zones (at 5-inch intervals) across the Island, 45inches per year to 35 inches per year. In 2004, additional precipitation gauges were installed by King County Department of Natural Resources and Parks to help determine the variation in precipitation across the Island.

4.1.5 Population

The population of Vashon-Maury Island continues to grow. The 2000 Census population for the Island is about 10,100. This growth is almost a 9 percent increase from the previous census in 1990 (9,309). The greatest growth, since 1970, occurred between 1980-90, a 26 percent increase from 7,377 to 9,309. The population of Vashon-Maury Island in 1970 was 6,516. The number of occupied households on Vashon-Maury Island also increased (3,703 to 4,193) during the period 1990 to 2000. This is a 13 percent increase. The difference between the population increase and the number of households is based on the decreasing size of the average household. In 2000, this value was estimated to be 2.4 people per household, down from 2.5 in 1990.

4.1.6 Water Use

Vashon-Maury Island ground and surface waters provide all of the water needed for residential, commercial, and agricultural needs. All drinking water sources on the Island (springs, surface water, and groundwater) are supplied by local precipitation. Vashon-Maury Island was designated a Sole Source Aquifer by the United States Environmental Protection Agency in June 1994. Water quality on Vashon-Maury Island is generally good.

The majority of the residents of Vashon-Maury Island get their drinking water from public water systems. Large public water systems are classified by DOH as Group A systems if they serve 15 or more connections. The other (smaller) public system classification is called Group B and this type serves 2-14 connections. The seven largest water systems serve more than 50 percent of the Island population (see Figure 2). The seven Group A systems with water service areas are designated and labeled (Burton, Dockton, Gold Beach, Heights, Maury Mutual, Water District 19, Westside). The sources for all public systems are shown as Group A or Group B. Vashon-Maury Island's sewer district service area is shown for the Town of Vashon. Residents who are not connected to public water systems obtain their water from exempt wells.

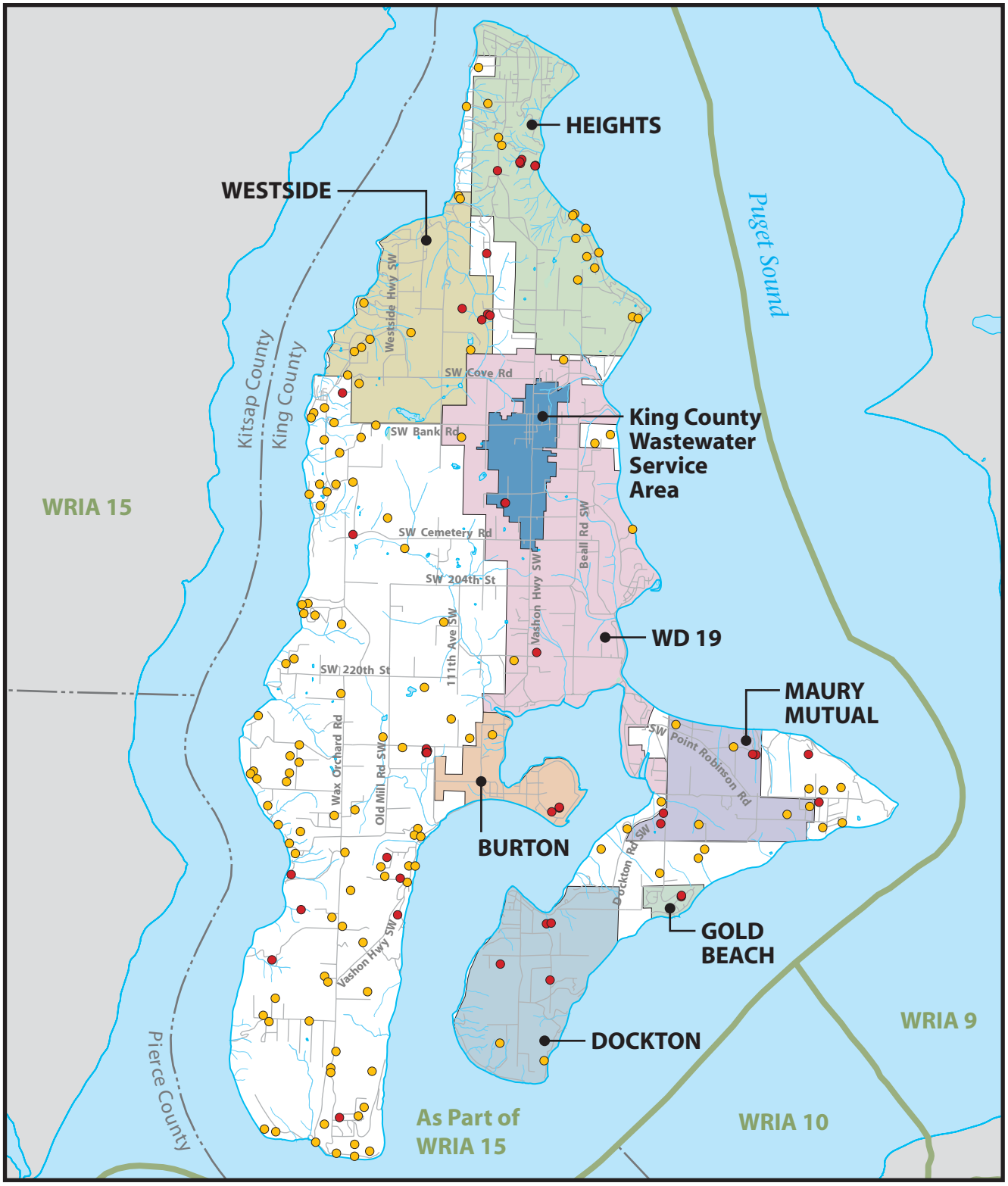

Figure 2
Public Water Systems of Vashon-Maury Island

- Group A Sources
- Group B Sources
- King County Wastewater Service Area
- WRIA Boundary
- Roads

N

0 1 2 Miles

May 2005

King County

Department of Natural Resources and Parks
Water and Land Resources Division

Data Sources:
King County GIS coverages

File name: 0505vmi_fig2.ai wgab

4.1.7 Land Use/Land Cover

All of Vashon-Maury Island is designated as rural and as such is outside the urban growth boundary. Low-density residential development covers much of the Island with zoning of one home per five and ten acres. Higher density residential areas are concentrated in the Vashon Town Center, Vashon Heights, Burton, Dockton, and along parts of the shoreline. Multifamily, commercial and industrial uses are presently concentrated in the unincorporated town of Vashon and adjacent areas where sewer and other urban services are available. The predominant land covers for Vashon-Maury Island are forested areas. The percentage of forested land is ~73 percent when compiled into three broad categories of forest, non-forest and developed land. The other two categories, non-forest and developed land, have percentages of 16 percent and 11 percent respectively, Figure 3. The data in Figure 3 is compiled into three broad categories: Forest, non-forest, and developed Land, from Landsat 2001 imagery.

4.2 HISTORIC ASSESSMENT OF WATER RESOURCES

This section provides an overview on Island water rights, water use, public water systems and wells. Existing conditions are summarized briefly in Section 5. Greater detail may be found in the GWMP and other documents referenced in the bibliography attached to the Plan. Also, a more detailed position paper was adopted by GWPC as part of its consideration of King County's proposed update of Critical Aquifer Recharge Areas (GWPC September 23, 2003). That paper summarizes:

- History of efforts to preserve Island water resources (Attachment A to position paper)
- The relationship of ground and surface water
- Water quality and water quantity issues, including past Island water budgets that have been developed
- The (un)availability of alternative water sources
- Recharge, protection areas of varying susceptibility, and risk tolerance

The reader is referred to this recent, more detailed paper for background on these areas and to the source documents listed in the references cited for this paper for the existing literature on Vashon water resources and water use.

Figure 3
Land Cover for Vashon-Maury Island

Developed Land
Forest
Non-Forest Vegetation
WRIA Boundary
Road

N
0 1 2 Miles
May 2005

King County
Department of Natural Resources and Parks
Water and Land Resources Division

Data Sources:
King County GIS coverages

File name: 0505vmi_fig3.ai wgab

4.2.1 Sources of Sustainable Water Supply

Water Supply

While surface water currently meets a portion of Vashon-Maury Island water demand, groundwater is expected to be the primary source of the Islands' future water supply. Island streams, although tapped by a number of Islanders, are too small to sustain much use. Springs and shallow wells are used by many Island water systems. All of these – streams, springs, and aquifers – form an integral hydrologic system.

The King County Water Resources Evaluation Project estimates that the Island receives 80,040 acre feet (af) per year in precipitation, of which approximately 32 percent is groundwater recharge, 24 percent is surface runoff, and 44 percent is lost to evapotranspiration.

There is interest in knowing whether the groundwater resource can provide a safe, sustainable source of supply to meet forecasted population growth and future water demand, while protecting Island ecosystems. In 1983, the Vashon-Maury Island Water Resources Study (Carr 1983) estimated that the groundwater supply might meet the needs of a population of about the existing size.

The 1998 Vashon-Maury Island Groundwater Management Plan replaced Carr's ground water supply estimate with a range, setting the Carr 1983 estimate as the lower boundary and providing a new estimate of the upper boundary, 930 af from Carr 1983 to 12,895 af from the GWMP. However, the GWMP did not provide clear guidance as to how much groundwater is available for consumption. Although GWMP estimated a much larger amount of groundwater than Carr, nearly 14 times as much, it declined to state whether this groundwater supply is available for consumption. The GWMP expresses concern that lower stream flows, a lower water table, and increased seawater intrusion could result if "too much water" is withdrawn, but provides no supporting analysis. As a result, Vashon is left with an apparently large estimate of the potential groundwater resource, but is cautioned against relying on that estimate.

The GWMP points out that in the 1990s several Island water systems were experiencing shortages, and that deeper wells or further stream flow reductions "are not considered solutions because they could lead to unsustainable water use." Carr 1983 estimated a recharge rate 6,000 gallons per minute (gpm) to Island aquifers and rejected the hypothesis of an off-island source of recharge. The 1998 Groundwater Management Plan does not report the recharge rate on which its estimate of groundwater availability is based.

King County has been monitoring groundwater quality and water levels on Vashon-Maury Island since 2001. In 2003, King County began the Vashon-Maury Island Water Resources Evaluation to prepare a sound, scientific assessment of water resources on the Island, and to prepare a computer model to allow for the assessment of possible future scenarios (King County 2003). The Water Resources Evaluation includes monitoring of streamflow, precipitation, groundwater levels, and water quality. See Appendix C for preliminary stream flow data and a map of Island creek basins. In addition, updated geological maps were produced in cooperation with researches from the University of Washington. Finally, computer models of surface and groundwater are under development and will be calibrated to the collected data. Once developed, the computer models will allow for an assessment of impacts on water resources of various land use and climate change possibilities. The Water Resources Evaluation will be completed in several phases, with the final phase completed in 2010.

Planning Policies

The GWMP lists Countywide Planning Policies 2004 (Ordinance 114446, July 19, 1994) that directly address groundwater quantity:

> CA-6: Land use actions should take into account the potential impacts on aquifers determined to serve as water supplies. The depletion and degradation of aquifers needed for potable water supplies should be avoided or mitigated; otherwise a proven, feasible replacement source of water supply should be planned and developed to compensate for potential lost supplies.

This policy intends to avoid the depletion of the aquifers or provide some feasible alternative supply. However, the County recognizes in the Vashon chapter of its King County Comprehensive Plan (KCCP) that there is no realistic alternative source of supply to Vashon:

> CP-1209: Island water resources should continue to be the sole water-supply source in the future. The plan discourages importing water for domestic uses from off the Island. (The same recommendation appears in the Vashon Community Plan as V-52.)

The Vashon CWSP also made recommendations expressing concern about the future groundwater supply. The Vashon CWSP set a goal to "Determine regional deficiencies associated with water supply and consider possible remedial measures." It also stated "The availability of source water has been identified as a major concern for the CWSSA." The resolution of these concerns was deferred to the Vashon GWMP: "The GWMP is …intended to identify and assess the capabilities of the area's aquifers." Pertinent recommendations of the Vashon CWSP include:

> To analyze the existing capabilities of existing groundwater sources and determine viable options for future groundwater supply and protection, all purveyors are encouraged to provide whatever support and assistance necessary for the development and implementation of the Vashon Groundwater Management Plan.
>
> Additional information is required to assess the future potential of groundwater supplies on Vashon. The Vashon Groundwater Management Plan should address (concerns are listed in Part VIII B.4 of CWSP).

However, the GWMP does not provide clear guidance as to how much groundwater is available for consumption. Although it estimates a much larger amount of groundwater than Carr, nearly 14 times as much, it declines to state that this groundwater supply is available for consumption. The GWMP defines a range, setting the Carr 1983 estimate as the lower boundary and the new estimate as the higher boundary. It then expresses concern that lower stream flows, a lower water table, and increased seawater intrusion could result if "too much water" is withdrawn, but does not support these cautions with analysis. As a result, Vashon is left with an apparently large estimate of the potential groundwater resource, but an undocumented caution against relying on that estimate.4.2.2 Source Protection

4.2.2 Source Protection

GWPC has been deeply involved with groundwater protection on many fronts, including advising the County on delineating and protecting CARAs, a topic that is addressed at length in

the King County Comprehensive Plan, CARA subsection of the King County Critical Area Ordinance, Vashon Community Plan, and Vashon Coordinated Water Supply Plan.

Carr 1983 estimated that potential limits imposed by water quality (related to the ability of the land to recover from septic discharge) may be somewhat more restrictive on the size of population the Island can support than the quantity of groundwater available.

Shallow sources of drinking water are more vulnerable to contamination. The Vashon Groundwater Management Plan (1998) states that "69 percent of the Group A systems and 50-75 percent of Group B and individual wells draw water that is 25 feet or less below the surface of the ground." This statement is based on 1990-91 water use and based in part on surface water including springs. An analysis of the distribution of Vashon exempt wells by depth follows a fairly bell-shaped curved, clustered around the 100–150-foot depth with 2 percent of the depths at 25 feet or less. Group B systems have about one-quarter of their wells (26 percent) in the shallow category, representing about 90 connections (based on SKCPH data). Group A systems are more concentrated in shallow depths with 41 percent of their sources at 25 feet or less.

In using groundwater for public supply, source protection is safeguarded by the 1987 amendments to the Safe Drinking Water Act, which established a Well Head Protection Program (USEPA, 1987). While some Vashon-Maury public water systems do not exercise the full zone of control around their wells, the GWMP noted that by 1998 the seven major systems had begun planning for wellhead protection. Wellhead protection by the established larger Group A water systems on Vashon-Maury Island is reviewed by the DOX. Group A wellhead protection normally meets established guidelines, although some systems have wells that may be of concern.

4.2.3 Water Rights

Water right data for Vashon-Maury Island is from the DOE Water Rights Application Tracking System is presented in Table 1. The total annual volume (total acre feet per year) of water in water rights certificates and permits is 3,271 af. The amount of surface water outlined in the water rights is 1,106 af and the remaining, 2166 af, is derived from groundwater sources. The data presented in Table 2 sorts the water rights into three broad categories (Domestic/Municipal, Agricultural, Other) based on primary purpose of use. Of the surface water rights on the Island, 68 percent is used for domestic/municipal purposes, 31 percent is used for agriculture, and 1 percent is used for other purposes. Of the ground water rights, 60 percent is used for domestic/municipal purposes, 10 percent is used for agriculture, and 30 percent is used for other purposes. Surface and ground water rights are nearly equal in terms of instantaneous pumping rights. Converting flow from cubic feet per second (cfs) to gpm, surface and ground water rights can be directly compared: Vashon has about 5,249 gpm in surface water certificates and permits, and 6,558 gpm in groundwater certificates and permits.

The water rights of Vashon-Maury Island Group A public water systems in Critical Water Supply Service Area (CWSSA) are presented in Table 3. Some of the larger Vashon-Maury Island Group A water systems have exhausted their water rights and have established moratoria on new connections. These water systems have not been accepting new connections, either because they do not have the water rights to serve them, or because of operational or financial constraints in meeting DOH requirements to put their water rights to use. (These are discussed in the Public Water Service section below.) The Vashon CWSP recommended that the "King County Board of Health should pass a resolution requiring that a water right be obtained for all

public water sources developed on Vashon Island." The Gold Beach Water System water rights have not been resolved. Burton Water Company continues to operate under a water claim, which is not a preferred status for public water supply.

The amount of Vashon "water claims" remains unquantified and the amount of water actually taken under claims is completely unknown. Claims are claims for water rights existing before the surface and ground water codes established the water rights system – people may go on using water in amounts and for purposes that existed before the codes were passed into law, but must register a formal "claim." It could be that there is a substantial amount of unaccounted water being withdrawn under claims, and this is not calculated in the estimate of Vashon water use. However, the two major purposes for water use on Vashon are for domestic use and irrigation, and there is no indication that any large commercial/industrial water user is taking water through a claim. Irrigation is no longer a large water use on Vashon. If a portion of Vashon irrigation water is being taken under water claims, it is likely to be small. Vashon domestic water use is fairly well understood. Where public water systems are not providing service, people are taking water from exempt wells, so domestic use under water claims is very likely minor.

Few of the named Vashon streams have any surface water appropriated as the streams on Vashon are small and cannot support much use. Appendix C provides preliminary stream flow data from the King County Water Resources Evaluation Project and a map of Island creek basins. Judd Creek, Christensen Creek, Fisher Creek, and Shinglemill Creek have already been closed to new surface water appropriation by DOE under Chapter 173.515.040 WAC.

Table 1. Vashon-Maury Island Water Rights by Water.

SURFACE WATER					
	Source	Number	Qi (cfs)	Qa (af)	Irr Acres
Certificates	BEALL Creek	2	0.97	17.0	0
	CORNELL SPRINGS	1	0.03	6.0	2.0
	ELLIS Creek	1	0.15	0	1.0
	FITZPATRICK SPRING	2	0.10	0	0
	GREEN VALLEY Creek	2	0.06	0	4.0
	JUDD Creek	4	0.30	10.0	34.0
	NAHAHO Creek	1	0.01	1.0	0
	NORTON Creek	1	0.02	3.0	1.0
	SHINGLEMILL/NEEDLE Creek	3	0.27	0	8.0
	TAHLEQUAH Creek	3	0.03	0	0
	UNNAMED LAKE/POND	2	0.14	8.0	4.0
	UNNAMED SOURCE	3	0.20	0	17.0
	UNNAMED SPRING	116	4.57	781.1	135.4
	UNNAMED STREAM	64	4.41	202.9	184.9
	Subtotal	205	11.26	1028.9	391.2
Permits	SHINGLEMILL/NEEDLE Creek	1	0.43	78	0
	Subtotal	1	0.43	78	0
Applications	BEALL CREEK	1	0.90	0	0
	PUGET SOUND	1	0.05	0	0
	SAFE HARBOR SPRING	1	0.02	0	0.5
	UNNAMED SOURCE	1	0.02	0	0
	UNNAMED SPRING	4	0.84	0	255
	Subtotal	8	1.83	0	255.5
Claims	UNQUANTIFIED	271	0	0	0
	MAURY MUTUAL WATER Co.	1	0	0	0
	Subtotal	272	0	0	0
	TOTAL SURFACE WATER		13.52	1106.9	646.7

GROUND WATER					
		Number	Qi (gpm)	Qa (af)	Irr Acres
Certificates		65	2867.1	1903.4	174.5
	Subtotal	65	2867.1	1903.4	174.5
Permits		11	463.6	188.4	2.0
	Subtotal	11	463.6	188.4	2.0
Applications		14	3227.5	0	310.0
	Subtotal	14	3227.5	0	310.0
Claims	UNQUANTIFIED	466	0	0	0
	BURTON WATER Co.	1	200.0	74.3	0
	Subtotal	467	200.0	74.3	0.0
	TOTAL GROUND WATER		6758.2	2166.1	486.5

Surface/Ground Water GRAND TOTAL	3273.0	1133.2

NOTES: Qi = Discharge "instantaneous" in units of cfs (cubic feet per second) or gpm (gallons per minute)
Qa = Discharge "annual" in units of af (acre feet - per year)
Irr Acres = Number of acres that are irrigated

Table 2. Vashon-Maury Island Water Rights by Primary Purpose of Use.

		Domestic/Municipal			Agricultural			Other		
		Qi (cfs)	Qa (af)	Irr Acres	Qi (cfs)	Qa (af)	Irr Acres	Qi (cfs)	Qa (af)	Irr Acres
Surface Water	Certificates	6.79	1452.4	0	4.56	664.6	368.2	1.91	32	31
	Permits	0	0	0	0	0	0	0	0	0
	Applications	1.53	0	0.5	0.3	0	255	0	0	0
	Claims	0	0	0	0	0	0	0	0	0

		Domestic/Municipal			Agricultural			Other		
		Qi (gpm)	Qa (af)	Irr Acres	Qi (gpm)	Qa (af)	Irr Acres	Qi (gpm)	Qa (af)	Irr Acres
Ground Water	Certificates	2105.1	1218.5	0	452	218.6	171.5	495	702.3	3
	Permits	166.1	100.4	0	37.5	10	2	0	0	0
	Applications	2803	0	0	415	0	304	10	0	6
	Claims	200	74.3	0	0	0	0	0	0	0

Notes: Domestic/Municipal includes DS, DM, MU
Agricultural includes IR, ST
Other includse CL, FR, FS, PO, RE, WL

Table 3. Water Rights of Group A Public Water Systems with Service Areas in CWSSA.

	Surface Water				Ground Water			
	Certificates	Permits	Applications	Claims	Certificates	Permits	Applications	Claims
Water District 19	1.4 cfs 1012 AF	0.4 cfs 289 AF	0.5 cfs	--	250 gpm 300 AF	--	1340 gpm 445 AF	--
Heights Water Association	0.41 cfs 274 AFY	--	--	--	185 gpm* 236 AF*	42 gpm 47 AF	--	--
Burton Water Company	0.1 cfs	--	--	--	--	--	150 gpm	200 gpm
Dockton Water Association	0.39 cfs 41 AF	--	--	--	100 gpm 48 AF	--	--	--
Westside Water Association	0.05	2.0 cfs*	--	--	--	--	260 gpm 78 AF	--
Gold Beach Water Company	--	--	--	--	75 gpm 35 AF	--	500 gpm (2 wells)	--
Maury Mutual Water Company	0.334 cfs 100 AF	--	--	0.25 cfs	--	50 gpm 100 AF **	--	--

NOTES:
cfs = cubic feet per second
AF = acre feet
gpm = gallons per minute
* = Supplement water supply
** = Supplement water supply (total annual limit for all water rights)
-- = Not Applicable

The range of available groundwater for appropriation varies from 930 af from Carr 1983 to 12,895 af from the GWMP. On the low end of the range, the amount of groundwater available is over-appropriated. This is based on total groundwater certificates and permits which translates to having already appropriated 233 percent of the resource. At the higher end of the range, only 17 percent of the resource has been appropriated. The King County Water Resource Evaluation project is designed to address water availability by using a water budget based modeling. The project is scheduled to be completed in 2010. Until a better estimate of water supply is available, Vashon-Maury Island residents may wish to take a conservative approach to groundwater appropriation.

Typically, a fair proportion of the water rights shown in DOE's database are no longer valid (except for municipal purveyors and a few other special cases, generally if water rights are not used for a five-year period the right is forfeited; sometimes actions taken by the owner of a water right effectively abandons it). The amount of these are so-called "paper" rights (as distinct from "wet" rights) on Vashon is unknown. A large part (perhaps 40 percent) of Vashon surface water rights are for agricultural purposes. Given the trend toward reduced agriculture on Vashon, some of these water rights may have been relinquished for non-use. There is no indication that illegal water use is a big problem on Vashon.

Water Rights and Public Water Systems

In 2003, the State Legislature passed the Municipal Water Law (2E2SHB 1338), a bill providing additional certainty for municipal water rights and clarifying that although the number of connections or population to be served may be specified in a water right, that information does not limit water service so long as the purveyor has a water system plan approved by DOH or has the approval of DOH to serve more connections. The effect of DOH approval of a document that describes a purveyor's service area (such as the Vashon CWSP) is to extend the water rights of the water system to the entire service area – and to the service areas of other water systems if interties exist (so long as this is consistent with land use plans, comprehensive plans and watershed plans). This is an important piece of legislation because it provides a legal basis for Island water systems to share their water supplies. Inchoate water rights may also be transferred under this legislation so long as the purveyor meets certain criteria

4.2.4 Water Use and Conservation

Water use is described in terms of both the purpose of use and the amount of water used for each purpose. The major use of water on Vashon is for municipal and domestic purposes. Lesser uses include agriculture and commercial purposes.

Water use for municipal and domestic purposes depends upon the number of residences and population size. The census, done in 2000, reported a population of about 10,100 on the Island, an average household size of 2.4 persons, and a total of 4,867 residential units (US Census, 2000). Of these about 521 are seasonally occupied (11 percent) and 153 are vacant year-round (3 percent). Future growth for the Island based on King County building permit trends is roughly 1 percent per year.

There are 4,042 total connections (residential and nonresidential) reported to be served by public water systems on Vashon (combined data from DOH and SKCHD), of which 3,880 are residential. A total of 802 exempt wells are recorded on the Island in the DOE well database and they serve an estimated 1,000 residences. It is known that some of these exempt wells serve small water systems connecting several residential units. To estimate the possible

number of residences served by exempt wells, the number of residential connections (3,880) is subtracted from the total residences (4,867) yielding an estimated 987 residences. Regional data indicate that residences on exempt wells tend to use somewhat more water than those on public service, about 26 percent more. Using these values, the existing domestic/municipal water demand on Vashon-Maury Island is estimated to be approximately 375 million gallons per year (mgy). The breakdown of municipal verses domestic is 282 mgy for residences served by public water systems and 73 mgy for residences served by exempt wells. About 20 mgy is used by commercial connections.

Based on a windshield survey done by King County in 2003, there are an estimated 1,761 acres of land on Vashon in use for livestock and about 613 acres in other agricultural use. About 391 acres are considered to be in various horticultural uses that may require irrigation. King Conservation District estimates that about one-third of this is under tillage and requires about 1.2 acre-feet of water per acre. Combining potential irrigation for pasture and crops, agriculture uses an estimated of 118 mgy of water per year on Vashon, or about one-third as much as municipal/domestic use.

Conservation

It is estimated that Vashon-Maury Island users could cost effectively reduce their water use by 15 percent or more. A recent study of users in California estimated an opportunity for 34 percent reduction. This estimate for Vashon is not based on any solid data for the Island, because water audits have not been carried out here.

Low-flush toilets, low water use washing machines, efficient residential and commercial dishwashers, efficient commercial washing machines, commercial pre-rinse spray valves, automatic timers for irrigation systems, fixing leaks, better turf maintenance, turf reduction, mulching, adding compost, greater use of soaker hoses and drip irrigation, greater use of drought tolerant plants, and other technologies and practices have a well proven track record of cost effectively saving water in Western Washington and around the country.

There are other savings associated with saving water. Many water saving measures save energy, some reduce stormwater runoff problems, many reduce wastewater production, and some help create a healthier landscape.

Many jurisdictions, including Seattle Public Utilities, have investigated whether meeting future water demand through conservation would be cheaper than developing new sources. Through detailed economic studies such as Seattle Public Utilities' Water Conservation Potential Assessment, these utilities have determined that water conservation is often less expensive than new water supply.

This may be true for Vashon as well, but at present the conservation resource is not well defined; an Island-wide assessment of conservation potential would be very helpful for watershed planning. Although it is likely that most Vashon residents strongly support conservation, many cost-effective water conservation opportunities are believed to remain on the Island. A recent national study of home water use found that while more than 20 percent of homes have leaking toilets, most homeowners were unaware of the leaks. Most people are not aware that, when they replace the flapper on a low-flush toilet, unless the flapper is properly adjusted the toilet will likely use more water than intended (Maximum Performance Testing of Popular Toilet Models, William Gauley and John Koeller, 2003). Similarly, most people do not

know how to minimize water use in maintaining their landscape and many are unaware of either the water savings or rebates available for water-efficient residential washing machines.

Controversy surrounds water conservation on the Island. Some worry that conserving water will make it easier to develop. Strategies to reduce this concern could include setting aside a portion of conserved water for in-stream flows, aquifer protection, summer drought backup, and fire fighting needs.

Water conservation on Vashon faces several obstacles. Water conservation primarily reduces the variable costs of providing water. However, for most Vashon water purveyors fixed costs are high relative to variable costs. The primary opportunities for cost savings are in pumping energy, reduced treatment chemical costs, and such hard-to-quantify benefits as the reliability of water supply during a drought. In addition, conservation may affect certain fixed costs, by allowing pumps and some pipes to be downsized either upon their scheduled replacement or during system expansion. Because the variable costs are relatively small, savings from sponsoring a water conservation program are likely to be small as well. A Vashon water purveyor would need to manage a water conservation program carefully to ensure that the costs of the program (both direct costs and reduced revenue from reduced sales) do not exceed the savings that can be realized through the program. Alternatively, water conservation costs could be rolled into the water rate base. It is difficult for small Vashon water purveyors to analyze these economic tradeoffs.

The benefits of water conservation from a water cycle perspective translates into water staying the natural system. This means water that was not diverted for consumption can discharge naturally into streams or Puget Sound.

Additional consideration of water conservation includes the septic and sewer side of the equation. It is commonly estimated that septic systems return about 70 percent of residential water use to ground water recharge. However, Island households in shoreline communities likely return less than 70 percent to groundwater as they rely on alternative septic system designs. Wastewater and sewer savings associated with water conservation measures are hard to quantify. Some counties allow a homeowner to downsize their septic system if they install an approved compost toilet, which could reduce the cost of new construction.

Global Climate Change

An issue of growing concern is the impact of global climate change on future Island water use. These impacts could be in several ways such as saltwater intrusion, increased water usage, and/or reduced recharge. More than 2,000 scientists from more than 100 countries around the world have agreed that global climate change is real and has been caused by humans. Ocean levels are rising; theoretically, this could lead to increased saltwater intrusion into the Island aquifer. In 1999, the Pacific Northwest Regional Assessment Group for the U.S. Global Change Research Program forecasted substantial temperature increases by 2020 together with wetter winters and drier summers. Hotter, drier summer weather may lead to greater lawn and agricultural irrigation demand during the period when many Island systems are already stretched close to their limit. Recharge to the groundwater system of Vashon-Maury Island will be affected by changes to precipitation patterns. Less total annual rainfall would lead to less groundwater recharge while increased rainfall may lead to more surface water discharge than groundwater recharge Any assessment of future water needs for Vashon needs to include some consideration of potential climate change impacts and leave a margin of safety to help address the uncertainty that remains.

4.2.5 Public Water Systems

The Vashon CWSP, King County Comprehensive Plan, and Vashon Community Plan all give preference to public water service. Wherever law or policy state a preference for public water service, the duty to serve is conditioned by the availability of a timely, reasonable, safe, and reliable supply, within water rights, and consistent with plans. These conditions relieve water systems of the impossible demand that they serve where water is not available or cannot be prudently provided.

About 22 Group A public water systems and 106 Group B public water systems serve Vashon-Maury Island (Table 4). The Group A water systems serve about 3,458 residential connections, or roughly 71 percent of Vashon households, and the Group B systems serve an additional 422 residences (about 10 percent of the population). The Group A water systems serve about 3,458 residential connections, or roughly 71 percent of Vashon households, and the Group B systems serve an additional 422 residences (about 10 percent of the population).

Table 4. Vashon-Maury Island Public Water System by Group Type and Population Served.

	Group A systems	Group B systems	Total Public systems
Number of each type	**22**	**106**	**128**
Number of residential connections	**3,458**	**422**	**3,880**
Number of non-residential connections	**187**	**0**	**187**
Average number of residents per connection	**2.38**	**2.57**	**2.40**
Resident Population served	**8,237**	**1,083**	**9,320**

Note: Group A systems serve 15 or more connections and Group B systems serve 2-14 connections.

Coordinated Water Supply Planning

A “critical water supply” situation led to the initiation of Coordinated Water Supply Planning on Vashon-Maury Island nearly 20 years ago. King County Council Motion No. 6407 (December 16, 1985) adopted a Preliminary Assessment of Water Supply and Fire Protection, declared Vashon-Maury Island a Critical Water Supply Service Area (CWSSA), and initiated Coordinated Water System Planning under Chapter 246-293 WAC (Water System Coordination Act). The data for the seven large Group A systems within the Vashon Coordinated Water System Plan area are summarized in Table 6 and Table 6.

Table 5. Group A Water Systems with Service Areas in CWSSA: Overview.

Water System	Most Recent Plan	Number of Connections			Population Served			Interties
		Residential	Commercial	Institutional	Current	Buildout	Growth Rate	
Water District 19	2000	Single: 1079 Multifamily: 47 (317 units) Waiting List: 403	154 Waiting List: 10	Schools 7 Churches 6 *additional 200 ERUs obligated or held in reserve by WD19*	3405 3.0 pers/cxn	7500		Heights
Heights Water Association	1997	Current 738 Buildout: 1191 (839 ERUs allowed) Unused Shares: 44	0	0	1815 2.46 pers/cxn *plan projects this to decline to 2.36*	*2811* *plan identifies 120 lots served by other systems*	Current 0.975% near-term 0.22% long-term 0.31%	Water District 19
Burton Water Company	2001*	Single: 368 Multifamily: 19 units per plan: 415 ERU Unused Shares: 18 Waiting List: 50	9	Schools 1 (unused)	1040 2.69 pers/cxn	1184 per plan: 440 ERU	not reported	None
Dockton Water Association	2002	368 *approved for 485 cxns* Unused Shares: 90 Waiting List: 22	2 0.06 ERU	Park 1 4.7 ERU	851 2.3 pers/cxn	1115 (2020)	not reported	None
Westside Water Association	1997*	226 Unused Shares: 7 *Buildout:* 260	0	0	531 2.35 pers/cxn	611	not reported	None
Gold Beach Water Company	1998*	*Current* 180 *Buildout* 238	0	Pool (70,000 gal) 1	414 Assuming 2.3 pers/cxn	548 Assuming 2.3 pers/cxn	not reported	None
Maury Mutual Water Company	1996*	100 Waiting List 21	0	0	209 Assuming 2.3 pers/cxn		not reported	None

* Small water system plan

Table 6. Group A Water Systems with Service Areas in CWSSA: Water Use.

Water System	Pumping Capacity (GPM)		Storage (gal)	GPD (per unit)	ADD (GPD) / Total Annual Use	Peak	Lost/ Unaccounted Water
	Surface	Ground					
Water District 19	629	250	1,725,000	Single family 206 Multifamily 91 Schools 2918 Church 157 Comm 479	ADD 400,000 (2003) Annual (1998) 145.8 MG	890,000 (2003) 2.6 – 2.9 MG	1.4% - 10.8% *Reported conservation since 1990: 28%*
Heights Water Association	184 *plan notes available flow limited to 122.7 gpm at springs*	252	930,000	166 (1997)	ADD 164,227 Annual (2003) 59.9 MG	318,955 (2003)	22%
Burton Water Company		223 gpm *available flow* 150-200 gpm *artesian flow* 109 gpm	270,000	167 (1999-2000)	ADD 66,329 Annual (99-2000) 24.2 MG	168,000 (1999-2000)	5% *(higher spring/fall losses due to artesian overflow)*
Dockton Water Association	54-69 source flow 85 pump	100 source flow 105 pump	359,400	198 (2003)	ADD 76,192 Annual (1998) 27.8 MG	173,865 (1998)	17% (2003)
Westside Water Association	47-52 gpm *(springs, wellpoints)*	67 gpm *(new well)*	253,000	230 (2003)	ADD 52,000 Annual (2003) 19.0 MG)	104,000 *(estimated 2003)*	6.47% (2003) Reported conservation since 1991: 42.6%
Gold Beach Water Company		520	58,600	277 (2002-2003)	49,000 (2003-2004)	122,500 (est 2003-2004)	not reported
Maury Mutual Water Company		75 gpm	148,000	164-188 (2002-2003)	18,600 (2003)	46,500 (estimated 2003)	11.8% (1995)

King County's action was based on its Preliminary Assessment, including the following key findings (some are paraphrased):

- A management program is needed to preserve and protect limited groundwater resources.
- King County needs to develop a comprehensive strategy to coordinate to the extent of its powers the present and future use of the County's limited groundwater resources.
- King County should encourage Class 1 (Group A) water systems to make service available to small water systems within their Comprehensive Plan area.
- King County code should be amended to require that plats with more than four lots connect to existing public water supply systems if the plat is located in their logical service areas.
- New developments should be required to become part of an existing purveyor's system when they are within the purveyor's logical service area.
- Vashon is facing an immediate water supply problem and three purveyors at that time (Burton, Dockton, Heights) did not have adequate water supply to meet estimated peak demand.
- Island peak day demand will soon exceed supply.
- Many Island purveyors have experienced summer water shortages.
- Vashon needs to develop new water sources, or import water, and conserve water or reduce future demand.
- King County needs to further regulate future land development to make it compatible with water supply limitations.
- There is no off-Island water source, groundwater recharge areas should be protected, and population growth and water use should be carefully managed.
- The Island's population should be limited to prevent depletion of the groundwater and prevent water quality problems (based on the Carr 1983)

The Water System Coordination Act allows a CWSSA to be designated where warranted by inadequate water quality, unreliable service, or lack of coordinated planning. The establishment of a CWSSA has the effect of limiting and regulating the formation of new public water systems within its boundaries, and also directs the source and manner in which water service will be provided to meet new demands. New land development must first request water service from nearby purveyors. If service cannot be provided in a "timely and reasonable manner," new public water service may be developed. (King County recently added these provisions to policy in its 2004 Amendments KCCP, Policies F-227 and F-227a, which implement much of the hierarchy of priorities for public water service established in the Water System Coordination Act and Vashon CWSP.)

The Island's seven largest Group A water systems established a Water Utility Coordinating Committee (WUCC) and completed the Vashon CWSP in 1990 (Horton Dennis 1990). A Coordinated Water System Plan integrates and coordinates public water system facilities consistent with local land use and growth management plans. Water purveyors within a CWSSA continue to prepare water system plans, together with an "Areawide Supplement" that addresses joint-use or shared water system facilities and common water-related challenges. Among the intents listed in the Vashon CWSP are:

- Coordinate water system development with land use plans/policies
- Determine the most efficient means of provided adequate water service throughout the CWSSA
- Identify options for cooperative development of water facilities

The Vashon CWSP recommends that "Proliferation of new public water systems within the Vashon CWSSA should be restricted." An update was recommended "at least every five years" and the plan states "future updates should consider the Vashon Ground Water Management Plan." However, there have been no updates and no integration with the Ground Water Management Plan (GWMP). Meanwhile, the population forecast used in the Vashon CWSP has been well exceeded by actual events. Key recommendations include:

- Agreement on water service area boundaries.
- Review procedures for new water systems and utility service.
- Design standards, planning criteria, and system improvements.
- Interties among Vashon Group A water systems.
- Future sources and groundwater management.
- Protection of groundwater quality.
- Water conservation and water shortage response planning.
- Plan updates and a continuing role for the WUCC.

Public Water Service Preference and Duty to Serve

The King County Comprehensive Plan (November 2003 update) and Vashon Coordinated Water System Plan (Horton Dennis, 1990) both state a preference for public water service on Vashon. The 1986 Vashon Community Plan establishes the entire Vashon-Maury Island Groundwater Management Area as a Water Service Area, in which public water service is permitted. The Vashon CWSP Utility Service Review Procedures are intended to identify an existing water purveyor willing and able to provide water supply facilities and to include the new development within its service area.

The Vashon CWSP implementing Agreement for Establishing Water Utility Service Area Boundaries as Identified by the Vashon CWSP includes in its preamble: "WHEREAS, Definite service areas will facilitate efficient planning for, and provision of, water system improvements to accommodate future development." This is appropriately limited: "It is understood by the undersigned utility that it may decline to provide service within its designated service area boundary, but in this case, an applicant may be referred to other adjacent utilities, to a prequalified Satellite System Management Agency or that a new utility may be created and the original service area boundary adjusted accordingly."

House Bill 1338, which passed the legislature during the 2003 special session, establishes a duty to serve for municipal purveyors. The statute conditions this duty with the usual considerations where public policy and planning documents state a preference for public water service: that water service be available in a timely and reasonable manner (which is generally understood to include a standard of economic reasonableness as well); within water rights; is

within system capacity for a safe and reliable supply; and is consistent with land use and other plans.

4.2.6 Exempt Wells

Exempt Well Trends

According to DOE's well database, there are 802 exempt wells[1] on Vashon-Maury Island. Note that the well database does not have any wells completed before 1949 and approximately 170 wells have no completed date. Some of the exempt wells would serve more than one residence (up to six). Based on U.S. Census data and the number of Vashon households not served by public water systems, about 1,000 residences appear to be using exempt wells for their water supply.

Exempt wells are proliferating on Vashon-Maury Island as the Group A public water systems take on less of the new demand. During the 20 year period from 1949 to 1969, about 2 new wells were drilled per year. The number has jumped in each decade since 1970 (Table 7), growing to nearly 40 per year during the 1990s. Pre-1990 well drilling records are likely influenced by incomplete data.

Table 7. Trends in Well Drilling and Residential Building Permits.

Decade	New Wells/Year	New Residential Permits/Year
1949 – 1969	1.8	Unknown
1970s	8.5	Unknown
1980s	18.1	66.9
1990s	39.7	101.6

The number of new wells drilled sharply increased during the decade of the 1990s, reflecting an increasing number of building permits issued in the late 1980s and early 1990s, (See Table 7). This trend continued through 2001. The upsurge in well drilling also coincides with the onset of Coordinated Water System Planning and declaration of a Critical Water Supply Service Area on Vashon (CWSP adopted 1990). During this time several Vashon public water systems experienced shortages and placed moratoria on new connections. As less of the new demand could be served by Group A systems, more people were left with no choice but to drill a well. Because public water systems were not able serve the new demand, well drilling tracks new building permits fairly well. (An apparent short lag reflects the likelihood that the well would be drilled some time after the permit.) During the decade of the 1980s, roughly one well was drilled

[1] "Exempt well" is shorthand for groundwater withdrawals that are exempt from the water right permitting process through the Washington State Department of Ecology (but not exempt from regulation in the same manner as other water withdrawals – the exemption extends only to the paperwork of permitting). Specific exemptions include: withdrawal of groundwater for stock watering, irrigation of a lawn or non-commercial garden not exceeding one-half acre in size, single or group domestic purposes in amounts less than 5000 gallons per day, or industrial purposes in an amount less than 5000 gallons per day. Exempt wells may serve individual dwellings or Group B systems of up to six connections.

for every 3.7 residential units permitted, but during the 1990s, the ratio changed to one well was drilled for every 2.6 residential permits – the rate at which new residential development was served by exempt wells appears to have nearly doubled in the 1990s. Well drilling appears to be down since 2001 (although not to the pre-1987 level). Data entry may not be complete for recent years in DOE's well database, so these years are not included in the Figure 4.

The distribution of depths for 763 wells on Vashon-Maury Island which depth data is available yields a median depth in the range of 100 to 150 feet, Table 8. The overall distribution is a fairly regular distribution of well depth around this point, from shallow to deep. Island well density is approximately 22 wells per square mile, or 29 acres per well, Table 8.

Table 8. Vashon-Maury Island Well Depth and Density.

Wells Density		Distribution of Well Depths								
		0-25'	26-50'	51-100'	101-150'	151-200'	201-250'	251-300'	301-500'	500-755'
22	wells/sq mile	14	37	137	180	130	79	70	101	15
29	acres/well	2%	5%	18%	24%	17%	10%	9%	13%	2%

Water Quality and Water Quantity Concerns

The proliferation of exempt wells is a concern for reasons of both water quantity and water quality. Each exempt well withdraws an unknown amount from the sole-source aquifer, potentially affecting Island streams and springs as well as the aquifer. DOE's well database identifies 212 Vashon exempt wells drilled in closed basins (Figure 4). Each exempt well is also a potential means of access for contamination of the sole-source aquifer. In many rural areas where public water systems have not extended infrastructure, exempt wells are the only alternative for domestic water supply, and their continued development and use in these areas is not as great a concern. A much greater concern is the proliferation of exempt wells in areas where public water service could be extended, but is not. According to DOE's well database, 218 exempt wells have been drilled within the boundaries of Vashon Group A water systems (Figure 5).

The 2004 Amendments to the King County Comprehensive Plan 2000 (2004 Amendments KCCP) underscore the groundwater protection concerns associated with exempt wells, stating:

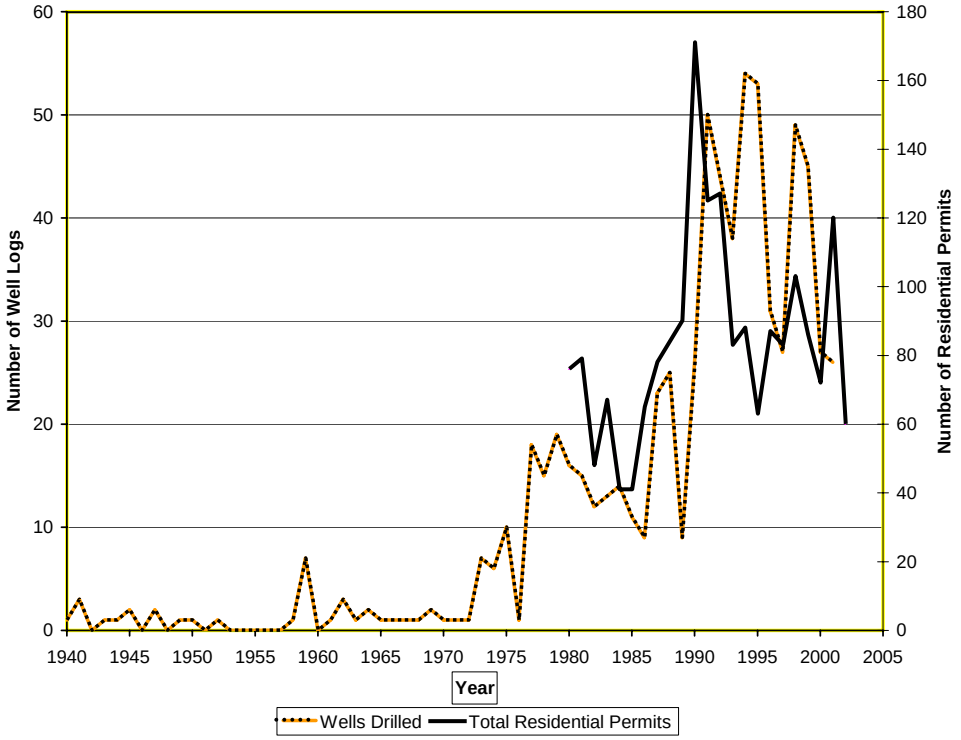

Figure 4. History of Well Drilling on Vashon-Maury Island.

The installation and use of wells that are exempt from DOE's water rights permitting process may further harm those rivers and streams when the wells are withdrawing groundwater that is directly connected to the water in the stream. The installation of new exempt wells may also create health and safety problems by interfering with the water supplied by existing wells, and by creating more holes in the ground that can lead to contamination of entire aquifers.

The 2004 King County Comprehensive Plan Amendments implement existing law in stating that exempt wells may not serve more than six lots. The amendments limit such developments to a single well unless more are needed to meet flow requirements (policy F-227b). King County also committed to work with the state agencies to ensure that provisions for measuring water withdrawals or diversions are fully implemented, and requires any new or expanding Group B water system (2 to 14 connections) to install a source meter and make meter information available to the County (Policy F-227c).

Earlier, when King County adopted "Fire Flow Planning Criteria in Critical Water Supply Service Areas" (November 1989), the County Council stated an intent to use Coordinated Water System Planning to limit exempt well proliferation, finding "the random construction of wells in area aquifers to be problematic. Upon full implementation of the CWSPs, new development will be expected to be served in most cases by existing purveyors."

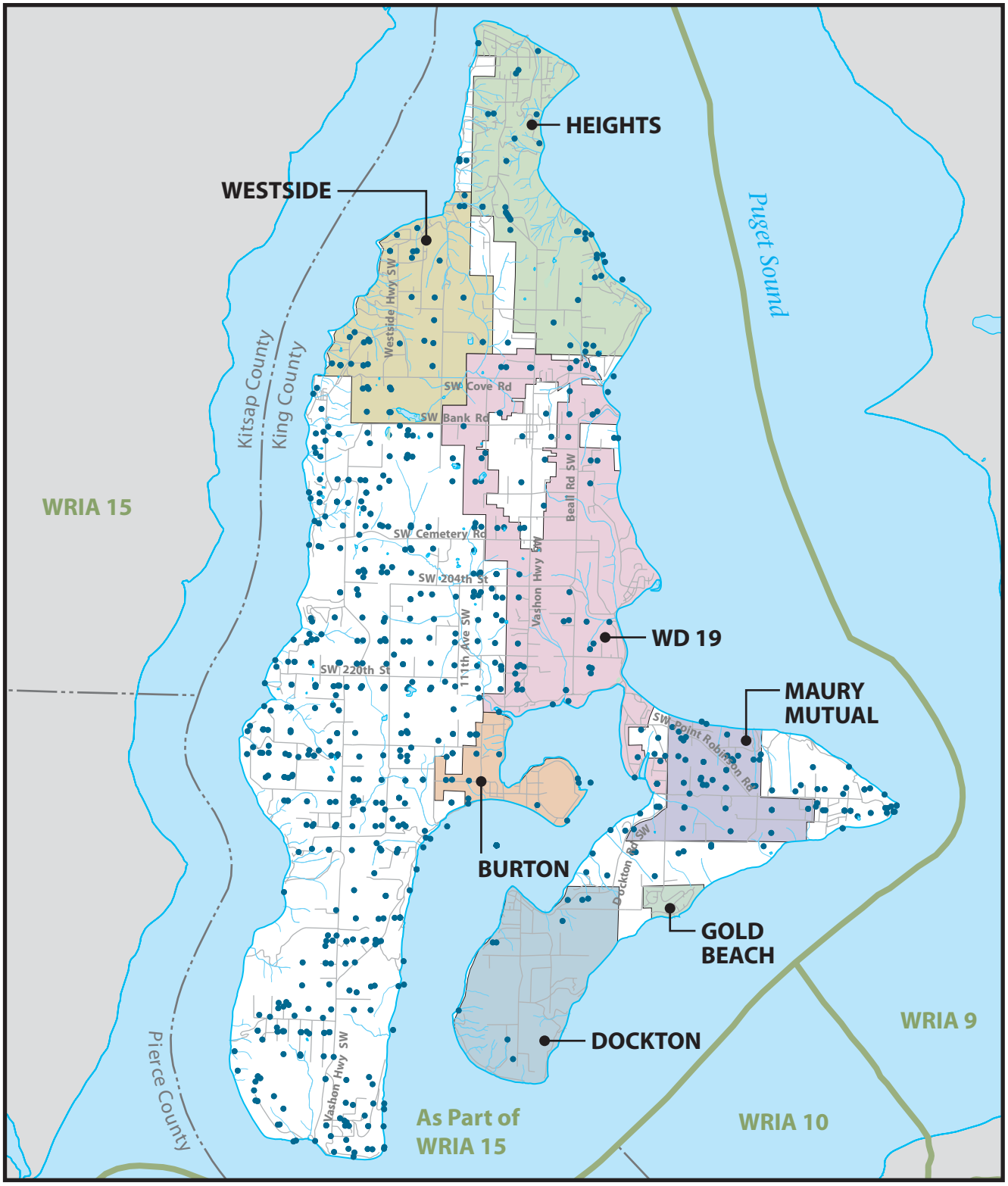

Figure 5
Location of Exempt Wells and Public Water Systems on Vashon-Maury Island

Exempt Wells
WRIA Boundary
Roads

N

0 1 2 Miles

May 2005

King County

Department of Natural Resources and Parks
Water and Land Resources Division

Data Sources:
King County GIS coverages

File name: 0505vmi_fig5.ai wgab

In 2003, the Washington State Department of Health published its Group B Project Report Safe Drinking Water for Small Communities. The report presents the results of a statewide survey of Group B water systems. High incidences (approaching or exceeding 50 percent of all systems surveyed) were found for contamination risks through lack of properly constructed and screened well vents, inadequate water quality monitoring, and unprotected openings on storage reservoirs. Nearly one-third of all systems had biological and chemical contaminants within 100 feet of the source and lacked proper sampling taps at the wellhead. One-fifth lacked sealed well caps. These deficiencies reflect and illustrate the risk of contamination to groundwater from wells maintained by small systems and inexperienced operators. Individual exempt wells cannot be presumed to be better managed or protected than these small system wells.

Policy and Procedure for Permitting Exempt Wells

Exempt wells are exempt from the requirements of water right permitting, but not from other state or local regulation of water supplies. In the Coordinated Water System Plan public water system service areas, land developers are required to request water service from the water system. An exempt well may be drilled only if service cannot be provided in a timely and reasonable manner. King County Board of Health Code Chapter 12.32 extends the same requirement to all parcels of five acres or less that are in a public water system service area, whether or not they lie within a Coordinated Water System Plan Critical Water Supply Service Area.

Within a Critical Water Supply Service Area (as exists Vashon-Maury Island), the ability to drill an exempt well is limited by "Utility Service Review Procedures" under the Public Water System Coordination Act (Chapter 246-293-190 WAC). The Act establishes a prioritized sequence for water service. The Vashon CWSP (1990) follows this sequence, first directing new applicants for private wells within to the water system designated by the Vashon CWSP to serve that area. If the water system cannot provide service in a "timely and reasonable" manner, the second choice is to allow development of a new public water system. The Water System Coordination Act does not address whether an exempt well may be drilled as a third choice. The Vashon CWSP outlines a procedure for reviewing development applications consistent with this sequence. Applications which propose to use a private well or spring to supply a single connection (via SKCPH) may be denied construction if a health hazard would result, but the procedure defined in the Vashon CWSP does not otherwise regulate exempt wells.

The Vashon CWSP handed off the issue of exempt well regulation to the GWMP, recommending:

- Alternatives for restriction of new private water systems (one connection) should be examined by the Vashon Groundwater Management Program, King County, and the State of Washington.
- Because this CWSP is limited to authority over public water systems it does not address the continued proliferation of private water sources (those with only one connection). It is therefore recommended that the GWMP address options for limiting the proliferation of private wells in areas that could be served by existing water systems.

However, the GWMP did little with the issue beyond supporting the State Minimum Standards for Construction and Maintenance of Wells (Chapter 173-160 WAC) and recommending enforcement through well identification and a well construction and decommissioning program. The GWMP does not address extending public water service where possible to avoid proliferation of exempt wells.

Under Washington law, a county may require connection to an existing public water system: "the county or city may impose conditions on building permits requiring connection to an existing public water system where the existing system is willing and able to provide safe and reliable potable water to the applicant with reasonable economy and efficiency" (Chapter 19.27.097 RCW). The Water System Coordination Act does not address whether an exempt well may be drilled as a third choice.). King County does require connection for lots less than 5 acres: "all lots created by a subdivision, short subdivision, rezone or lot line adjustment which are less than 5 acres in size and were created after May 18,1972 must be served by an approved public water system" (Chapter 12.32 of King County Code). However this chapter allows lots greater than 5 acres to use private wells with documentation of lot size and the condition that the well meets minimum production requirements. In either case, if the public water system is not willing or able to provide service in a timely and reasonable manner, there is no requirement for the system to provide a connection and an exempt well may be drilled (unless disallowed for some other reason).

Finally, powers of DOE defined in Chapter 18.104.040 RCW allow the Department to impose "limitations on well construction in areas identified by the department as requiring intensive control of withdrawals in the interests of sound management of the ground water resource."

4.2.7 Growth Management

Growth management is a high-priority concern of the Vashon community. The principle that growth management should not allow sustainable water supply to be exceeded is well recognized in King County policy. Local government is responsible for growth management through Comprehensive Planning. Water systems must deal with growth within their service areas through Comprehensive Water System Planning and Coordinated Water System Planning.

The Vashon CWSP states "A general philosophy of CWSP is that water service should not dictate growth patterns. On the contrary, land use policies should establish growth trends within the water utility service areas to permit the water utility management program to be responsive to, and provide service commensurate with applicable land use policies." The Vashon CWSP asserts that "Water utility planning and facility design in rural area must seek a minimum level of service that is consistent with appropriate land use documents" (e.g., large scale facilities may not be justified) and that "Water System Plans must address the water system facilities required to accommodate growth. This growth is projected to occur within each utility's service area, based upon the KCCP and Vashon Community Plan." King County's perspective on the Vashon CWSP appears to be consistent with this philosophy; the County's State Environmental Policy Act Checklist completed for the Vashon CWSP states "Plan will allow planned growth to proceed in an orderly manner consistent with existing zoning and land use plans." These statements lack an explicit recognition that growth trends may be constrained by the availability of water supply.

Most of the water systems designating service areas within the CWSSA under the Vashon CWSP Agreement are not taking on new connections, yet growth is occurring. The issue of reconciling water supply policy with growth management is considered and addressed in the community and comprehensive planning policies that have been written for Vashon-Maury Islands.

The King County Comprehensive Plan (KCCP) states "The Vashon Community Planning Area requires additional attention to plan for growth because its water supply is derived from a sole

source aquifer." Land use policies in the KCCP that specifically address Vashon-Maury Island include:

> R-205A: For Vashon-Maury Island, a residential density of one home per 10 acres:
>
> a. shall be maintained on existing areas as applied through area zoning to help protect community character and reduce adverse impacts on the Island's infrastructure; and
>
> b. may be applied to areas identified as highly susceptible to groundwater contamination or reduced recharge in a groundwater management plan with which King County has concurred.
>
> NE-302: Development should occur in a manner that supports continued ecological and hydrological functioning of water resources. Development should not have a significant adverse impact on water quality or water quantity. On Vashon Island, development should maintain base flows, natural water level fluctuations, groundwater recharge in Critical Aquifer Recharge Areas and fish and wildlife habitat.

The Vashon Groundwater Advisory Committee recommended supplementation of these policies due to the shallow aquifer and limited supply, the rate of population increase, the rapid rate of population increase, and the potential increase in dwelling units. The Vashon Community Plan (1986) also stated a number of pertinent policies, several of which are repeated in the Vashon Chapter of the KCCP, which adopted the 1996 Vashon Town Plan as a sub-area plan and made it therefore a part of the KCCP under the Growth Management Act:

> V-53: Land uses and development densities should be planned so that demands on the Island's groundwater resources do not exceed its capacity to provide adequate supplies without deterioration of quality. (CP-1210)
>
> V-59: As an additional requirement for the Comprehensive Plans of public water systems on Vashon Island, the County shall ask that information be included assessing the ability of existing and potential water sources to meet anticipated population growth. Planned expansion of the water system should be prohibited if the analysis reveals a risk to the adequacy of service including quality of water being provided to current users. (CP-1213)
>
> V-60 King County should give special attention when reviewing building permits, short plats, subdivisions, planned unit developments and rezones to ensure that extension of water service to new customers will not reduce service to existing customers below minimum State and County standards. (Se also CP-1227)
>
> V-61 Special consideration should be given to the impacts of new development on the Island's groundwater resources. This should apply to major developments, development in high groundwater recharge areas, or development near public water supplies. (CP-1214)
>
> V-63 Permit development of new public water sources only if it can be demonstrated that development of these sources will not adversely affect existing water sources. (Note that this more stringent policy does not appear to have been incorporated in the KCCP.)

The Vashon CWSP states "Because of the unique rural character of Vashon… a "Vashon Island Rural" classification is established for determining level of water service," and this is consistent with the KCCP:

> CP-1201: All of Vashon-Maury Island is recognized for its unique ecological functions as a Puget Sound Island, and is designated in this plan as a rural area. Development activities should protect the entire ecological system, including the Puget Sound shoreline, island habitat areas, and ground and surface water resources. (V-1)

The KCCP also ties land use policies and regulations directly to CARAs. For example:

> CP-1202: All land use policies and regulations for Vashon shall reflect the overriding importance of the fact that the whole Island is the recharge area for a single-source aquifer. All of Vashon Island shall therefore be considered a groundwater recharge area. Within the Island, based largely on soil types, there are areas of relatively high medium and low susceptibility to ground water contamination. Areas deemed highly susceptible to contamination in the KCCP should receive extra protection. (V-3)
>
> CP-1211: Protection of the groundwater aquifer is of primary importance to Vashon Island. Further water quality degradation which would interfere with or become injurious to existing or planned uses should not be allowed. (V-54)
>
> CP-1212: To protect domestic water resources, areas deemed highly susceptible to ground water contamination and watersheds should be maintained in residential or similarly nonintensive uses at low densities. (V-57)

Finally, the KCCP provides for monitoring and taking action to ensure that new development does not impair the groundwater supply:

> CP-1227: The quantity and quality of Vashon-Maury Island's groundwater supply should be monitored, along with building permit and subdivision data, to determine if planned densities can be achieved. If new information indicates the groundwater supply is endangered, the County shall take immediate steps to ensure that new development does not impair the groundwater supply.

These policies provide a framework for managing growth in relation to water supply. Confronting growth has become inescapable for water systems with watershed planning. New legislation amending the Watershed Management Act now requires that "The timelines and interim milestones in a detailed implementation plan…must address the planned future use of existing water rights for municipal water supply purposes, as defined in Chapter 90.03.015 RCW, that are inchoate, including how these rights will be used to meet the projected future needs identified in the watershed plan, and how the use of these rights will be addressed when implementing instream flow strategies identified in the detailed implementation plan." Inchoate rights are those water rights owned by a municipal purveyor that have not yet been put to beneficial use. The 2003 Municipal Water Law (2ESHB 1338) clarified that these rights are not relinquished or reduced to permit status, but this watershed legislation means that water purveyors will have to work with watershed planning units and disclose how their as yet unperfected (inchoate) rights will be put to use in meeting the demands of future growth.

Growth Management Act and Comprehensive Land Use Planning

In 1990, Washington State's Growth Management Act (GMA), Chapter 36.70A RCW, provided for comprehensive planning with local control, with the intent of encouraging conservation, responsible use of lands and resources, and sustainable economic development. The GMA required the adoption of comprehensive land use plans to designate urban growth areas for concentrated development and growth. This concentrated growth also provides a structure such that increasing populations in urban areas are served by a regulated water source rather than an exempt (from water right requirements) Group B system or individual well.

The GMA requires reassessment of land use if probable infrastructure funding falls short of meeting existing needs and to ensure that the land use element, capital facilities plan element, and financing plan within the capital facilities plan element are coordinated and consistent (Chapter 36.70A.070(3)(e) RCW). If this coordination effort is combined with watershed planning to address actual water availability, long-term decisions can be managed incrementally and locally to provide for the best use of water and land resources. By integrating watershed planning with other land use and resource use decision-making, entities in the watershed may adopt a combined conservation and management approach.

5. VASHON-MAURY ISLAND WATERSHED PLAN

The Vashon-Maury Island Watershed Plan addresses both the quality and quantity of the water supply. Section 4 provides a more detailed discussion of these issues. The discussion below provides an overview of issues, existing conditions, and current actions for each issue area. Topics include: 5.1 Water Rights; 5.2 Water Use and Conservation; 5.3 Public Water Service; 5.4 Exempt Wells; 5.5 Stream Flows; 5.6 Underground Fuel Storage Tanks; 5.7 Septic Systems; 5.8 Stormwater Management; 5.9 Pesticide, Fertilizer and Herbicide Use; and 5.10 Governance and Implementation. Each topic includes desired outcomes and recommendations.

5.1 WATER RIGHTS

Issue

Watershed planning must be based on an accurate accounting of water rights. Key issues include new water rights for Island water systems with waiting lists, and interties among water systems, allowing those with available water to sell to those who need water.

Existing Conditions and Current Actions

The Watershed Management Act provides that watershed plans cannot reallocate water rights, change or impair anyone's existing water right, or change state water law.

Groundwater accounts for about two-thirds of annual volume appropriated in Vashon water rights. Surface and ground water rights are more nearly equal in terms of instantaneous pumping rights. Few of the named Vashon streams have any surface water appropriated. Based on limited data on low flows, it appears that Beall Creek and Ellis Creek may be over-appropriated. Other Vashon streams do not appear to be over-appropriated; however, the streams on Vashon are small and cannot support much use. Judd Creek and Shinglemill Creek, the largest streams, are already closed, as are several others. A third source of water that is little used at present is rainwater harvesting. Rainwater harvesting typically consists of collecting runoff from a roof and storing the water for later potable or nonpotable use. Bills have been introduced in the state legislature in the last three years that would exempt rainwater harvesting from the requirement to get a water right.

The amount of groundwater actually available for appropriation is still very uncertain. Studies of the resource have reported a wide range of groundwater potentially available. Carr 1983 and the Groundwater Management Plan (1998) indicated that Vashon groundwater is either over-appropriated or greatly under-appropriated. In order to more accurately assess both quality and quantity of groundwater resources, a Water Resource Evaluation is currently underway, using Island well log data and data collected from a long-term monitoring program that measures water levels in wells and tests water quality parameters.

The amount of Vashon "water claims" remains unquantified and the amount of water actually taken under claims is unknown.

The two major purposes for water use on Vashon are for domestic use and irrigation. Irrigation is no longer as large a water use on Vashon as it once was. Where larger public water systems are not providing service under water rights, small water systems and individuals are drawing

water from exempt wells (wells providing groundwater that is exempt from water right permitting). Some of the larger Vashon-Maury Island Group A water systems have exhausted their water rights and have not been accepting new connections. Section 4 provides a more detailed review of Vashon water rights.

Recently, the State Legislature passed a bill providing additional certainty for municipal water rights and clarifying that a water purveyor may extend their water rights to the service areas of other water systems if interties exist.

Desired Outcomes

Water rights certificates, claims and exempt wells are in balance with known, available sustainable supply; new water rights do not impair existing uses or users (Chapter 90.03.280 and 90.44.0600 RCW). Transfers of water rights do not damage properly functioning conditions in Island surface water ecosystems. Island public water systems have adequate water right certificates to serve demand consistent with sustainable Island land use and growth management plans, policies, and regulations. Water claims are quantified. Paper water rights and forfeited claims are formally relinquished.

Recommendations

1. DOE shall endeavor to update its database to provide a best estimate of the claimed quantities for Vashon water claims.
2. DOE shall work with owners of paper water rights and forfeited claims that have become invalid through non-use to secure their relinquishment outside formal adjudication.
3. New water rights may be issued to the extent groundwater is available for appropriation on a sustainable basis and meets public health standards for safe and reliable supplies.

5.2 WATER USE AND CONSERVATION

Issue

Watershed planning must also be based on an accurate accounting of water use. This information will help guide how much water is required to maintain properly functioning conditions in streams, how much can be consumed, how close the consumption level is to supply limits, and future water supply strategies. To estimate how much can be used, a better understanding of current use is required. Vashon currently has incomplete information about water use. It is a priority to conserve and wisely use existing water supplies in order to extend surface and ground water supplies, protect instream values, and reduce uncertainties regarding future growth in demand for water.

Existing Conditions and Current Actions

Water use on Vashon Island is derived exclusively from rainfall, with no evidence of off-Island groundwater sources. As such, the overall water supply on Vashon Island can be expressed as a balance between the volume of rainfall that lands on the Island weighted against the volume that returns to the atmosphere via evaporation and transpiration, the volume that runs off the surface to Puget Sound, the volume that enters Puget Sound from groundwater seeps and springs, and the volume that is discharged to Puget Sound as treated wastewater. Excessive use of groundwater and surface water on the Island can impact the water balance, by potentially

lowering groundwater tables, decreasing stream flows, or causing saltwater intrusion to wells near Puget Sound. In addition, changes in land use can potentially result in decreased water quality in groundwater and streams. King County is currently conducting a scientific assessment of the water resources on the Island: the Vashon-Maury Island Water Resources Evaluation. This long-term evaluation consists of extensive water quality and quantity monitoring and modeling to gain a better understanding of the water resources available. Completion of this project will allow for assessment of the impacts on water resources of various land use and climate change possibilities. The major human use of water on Vashon is for municipal and domestic purposes. Lesser uses include agriculture and commercial purposes. The Island has a population of about 10,100, an average household size of 2.4 persons, and a total of 4,867 residential units (Census 2000). About 11 percent of these are seasonally occupied and 3 percent are vacant. Public water systems serve more than 4,000 connections on Vashon, and there are an estimated 800 exempt wells on the Island. Residences on exempt wells tend to use more water than those on public service (according to an analysis conducted for WRIA 15 by Golder). Existing municipal and domestic water demand on Vashon is estimated to be approximately 375 mgy, 80 percent of the demand is met by public water systems. Agriculture is estimated to use about 118 mgy of water on Vashon, or about one-third as much as municipal and domestic use.

It is estimated that Vashon users could reduce their water; however, the potential for conservation on the Island has not been estimated. An Island-wide assessment of conservation potential would be very helpful for watershed planning. Water conservation on Vashon faces several obstacles. Private well users do not pay for water and therefore have no financial incentive to conserve. Conservation by users of public water systems may be impeded by lack of information on how to conserve water, expenses associated with conservation – such as installing water efficient appliances, and unwillingness to voluntarily change consumptive behavior.

Conservation strategies can include consideration of setting aside a portion of conserved water for in-stream flows and other nonconsumptive benefits. They also can include consideration of septic and sewer use. It is commonly estimated that septic systems return about 70 percent of residential water use to groundwater recharge, although Island households in shoreline communities likely return less than 70 percent to groundwater as they rely on alternative septic system designs. Any assessment of future water needs for Vashon needs to include some consideration of potential climate change impacts and leave a margin of safety to help address the uncertainty that remains. Section 4 provides a more detailed review of Vashon water use and conservation.

Desired Outcomes

The Island will manage its water resources to maintain a sustainable water balance that continues to serve its residents and ecosystems into the future. A sustainable water balance protects against decreased streamflows and groundwater capacity associated with overuse and also protects against degradation of water quality. An unsustainable water balance would be characterized by a statistically significant decrease in streamflows or groundwater levels, or statistically significant decrease in water quality.

Island water users are educated about water conservation opportunities. Improved water use information is readily available to Island residents and water managers, including information on groundwater levels, metering data from wells. Island private well owners have economic

incentives to conserve. Regulatory agencies reward conservation (rather than requiring that conserved water be relinquished from water rights).

Water is used as efficiently as possible, recognizing effects on other people and the Island environment. Land use and growth management policies maintain Island water use within sustainable supply capacity, considering needs for both people and Island ecosystems. Water is allocated and used conservatively in the absence of good knowledge about ground water supply. A contingency buffer is built into water plans.

An updated Ground Water Management Plan recognizes changes in Island population growth, geologic mapping, and groundwater resource evaluations conducted by King County. Island future water supply strategies are consistent with maintenance of a safe, sustainable supply; high water quality; reliable public water service; Island lifestyle goals; findings of existing and ongoing studies; the history of Island water planning and management; and local plans and policies (including this watershed plan).

Recommendations

1. Revise King County Comprehensive Plan Policy CP-1227 to read:

   The quantity and quality of Vashon-Maury Island's groundwater supply should be monitored, along with building permit and subdivision data, to determine if planned densities can be achieved. If the County's ongoing water monitoring program indicates the groundwater supply is projected to be used beyond its sustainable capacity, the County shall take immediate steps to ensure new development does not impair the groundwater supply

2. Revise King County Comprehensive Plan Policy CP-1214 to read:

   Special consideration should be given to the impacts of new development on the Island's groundwater resources. This should apply to major developments, development in high groundwater recharge areas, development near public water supplies, or withdrawal of ground water beyond the sustainable supply capacity of the Island sole-source aquifer.

3. Planned use of the Vashon-Maury sole-source aquifer shall be sustainable as a future water supply strategy.

4. GWPC shall consider the results of King County's Water Resource Evaluation in identifying and setting groundwater protection and management priorities and coordinate with Island water purveyors and King County in their planning and permitting.

5. An on-going Island-wide education program should be developed to inform Islanders about groundwater resources, how drinking water is supplied, water availability, and water quality issues. The education program should include alternative water supply choices such as water retention, rain water harvesting, use of gray water, deepening of wells, groundwater recharge, water rationing in emergencies, reclaimed water, and desalinization. Funding should be sought for this effort.

6. An Island-wide assessment of the potential for water conservation shall be conducted by State agencies, King County and Island water systems. Funding should be sought for this effort.

7. An Island water conservation education program shall be developed and implemented as a joint effort of participating public water systems, private well owners, sate agencies, and

King County. Funding should be sought for this effort, and incentives should be considered.

8. GWPC shall work with Island Group A water purveyors, state agencies, and King County to assess options for providing an Island water availability clearinghouse, to identify the availability of public water supplies for Island landowners.
9. Seek funding for education and incentives to support appropriate gray and reclaimed water use, consistent with DOH Recommended Standards and Guidance for Water Conserving Systems.
10. Support revisions to state and King County regulations to eliminate disincentives to residential rainwater harvesting for potable and nonpotable uses.

5.3 PUBLIC WATER SERVICE

Issue

In 1998, the Vashon Ground Water Management Plan noted that during the 1990s several Island water systems were experiencing shortages. Currently, some of the larger Vashon Group A water systems have exhausted their water rights and have established moratoria on new connections. A CWSP was prepared by these seven Group A water systems in 1990, but has been largely unimplemented. Because Island public water system services areas are not always contiguous to one another, coordination or intertie may not always be cost-effective. Uncertainty regarding legal obligations associated with interties also have deterred their implementation.

Existing Conditions and Current Actions

The 22 Group A public water systems and 106 Group B public water systems serve Vashon-Maury Island. The Group A water systems serve about 3,100 residential connections, or roughly 63 percent of Vashon households, and the Group B systems serve an additional 422 residences (about 9 percent of Vashon households). Several of the larger Group A water systems have waiting lists and no shares available. Other systems have unused water shares.

The CWSP, King County Comprehensive Plan, and 1986 Vashon Community Plan all give preference to public water service. Wherever law or policy states a preference for public water service, the duty to serve is conditioned by the availability of a timely, reasonable, safe, and reliable supply, within water rights, and consistent with plans. These conditions relieve water systems of the impossible demand that they serve where water is not available or cannot be prudently provided.

A Group A public water system must be contacted before a new Group B well site may be established within its service area, as part of ongoing administrative practices by DOH. Short plats and lot line revisions are allowed only with an approved water source. For a subdivision, according to the 2004 King County Comprehensive Plan, water service for a subdivision over six lots can only be provided by a Group A source with appropriate water rights.

A “critical water supply” situation led to the initiation of Coordinated Water System Planning on Vashon-Maury Island nearly 20 years ago under the Public Water System Coordination Act. A Critical Water Supply Service Area (CWSSA) was defined to include the entire geographic area of Vashon-Maury Island. New public water systems may not be formed within CWSSA boundaries without the agreement of the existing purveyors, and new land development must

request water service from nearby purveyors before taking any other action to develop a water supply. The seven Vashon water systems with service areas in the CWSSA established a WUCC and completed the Vashon CWSP in 1990. The Vashon CWSP is intended to integrate and coordinate public water system facilities consistent with local land use and growth management plans. Section 4 provides a more detailed review of Vashon public water systems.

Desired Outcomes

Coordination and cost-effective, economically desirable connection among Island public water systems occurs and is in accordance with an updated Coordinated Water System Plan, for shared stewardship of resources, fire protection, and reliable supply. A safe, reliable Island public water supply meets current and future Island needs from financially stable, operationally sound Island public water systems in those areas suited to public water service. Group B systems are consolidated as needed for financial stability, sound management, and safe operations. Coordinated Island-wide water management is considered. A water supply emergency plan is in place for the Island. All Island public water system wells are metered.

Recommendations

1. Group A public water systems have a duty to serve all customers in their approved service areas and should expand to serve wherever they can provide a cost-effective, timely, reasonable, safe, and reliable supply, within their water rights, and consistent with local plans and policies. Service options could include remote service, satellite management and other interim service arrangements, consistent with the King County Comprehensive Plan.
2. The water systems participating in Coordinated Water System Planning should update the 1990 Coordinated Water System Plan as part of a countywide planning process and then implement the updated plan.
3. Island Group A public water systems should coordinate with one another to make the most effective use of existing water sources to meet Island water needs.
4. Vashon Group A water systems should implement affordable interties for temporary use only where they improve fire flows or provide continual service in emergency situations. DOH should provide guidance to Vashon water systems on intertie terms and conditions.
5. Island public water systems should continue ongoing monitoring and consider the outcomes of the King County Water Resource Evaluation as they review planning policies and develop water system plans.
6. All Vashon-Maury Island public water systems are encouraged to share responsibility for the stewardship and husbanding of sole-source Island water resources. New connections shall be provided to the extent groundwater is available on a sustainable basis.
7. GWPC should be expanded to include a representative from a Vashon Group B water system.
8. King County should meet annually with GWPC, Island water purveyors, DOH, DOE, and SKCPH to discuss and coordinate the protection of Island water supplies and implementation of future water supply strategies in the context of this watershed plan.
9. Island public water systems that provide reliable, high-quality water service and are financially stable shall not be forced to consolidate.

5.4 EXEMPT WELLS

Issue

A growing number of exempt wells (wells exempt from state water right permitting) have been drilled on Vashon-Maury Island over the past 10-15 years, paralleling an increase in building activity. Exempt wells are often the only alternative for domestic water supply in rural areas. However, a number of exempt wells have been drilled within the service areas of existing Island public water systems, as some of the Island's Group A water systems face difficulties in extending public service and meeting demand. This is occurring even though King County has a stated policy preference for public water service. Existing SKCPH administrative practice requires that those proposing new Group B systems be referred to Group A water systems first. The 2004 Comprehensive Plan requires that new plats use existing or new public water systems as their source of supply. Exempt wells pose both water quality and water quantity concerns.

Existing Conditions and Current Actions

About 1,000 residences on Vashon appear to be using exempt wells for their water supply. Some of these are small (Group B) public water systems, typically serving several residences, and some are individual homes. New exempt wells are being established on Vashon-Maury Island as the Group A public water systems take on less of the new demand. During the 20-year period from 1949 to 1969, about 2 new wells were drilled per year. The number has jumped in each decade since 1970, growing to nearly 40 per year during the 1990s. Pre-1990 well drilling records are likely influenced by incomplete data. The median depth of wells on the Island is in the range of 100 to 150 feet. Island well density is approximately 22 wells per square mile, or an average of 29 acres per well (see Table 8).

The installation of exempt wells is a concern for reasons of both water quantity and water quality. Each exempt well is a potential means of access for contamination to the Island sole-source aquifer, and withdraws an unknown amount from that source, potentially affecting springs, low flows in small streams, and overall water supply. Chapter 19.27.097 RCW provides that a County or City may impose conditions on building permits requiring connection to an existing public water system where the existing system is willing and able to provide safe and reliable potable water to the applicant with reasonable economy and efficiency. Chapter 18.104.040 RCW gives DOH and DOE joint authority to limit well construction in areas requiring intensive control of withdrawals. Chapter 90.44.105 RCW allows public water systems to consolidate exempt wells within existing water system service areas to their water rights.

DOH recently (2003) surveyed small water systems across Washington State and found a high incidence of serious contamination risks, through such deficiencies as lack of properly constructed and screened well vents, inadequate water quality monitoring, and unprotected openings, proximity of biological and chemical contaminants to wellhead, and a lack of sealed well caps. These deficiencies reflect and illustrate the risk of contamination to groundwater from wells maintained by small systems and inexperienced operators. Individual exempt wells cannot be presumed to be better managed or protected than these small system wells. Section 4 provides a more detailed review of Vashon exempt wells.

Desired Outcomes

Exempt wells are not developed within Island public water system service areas unless service cannot be provided on a timely, reasonable basis. Wellhead protection is required for all Island exempt wells, with regular inspection.

Recommendations

1. A representative sample of Vashon-Maury exempt wells should be monitored for water use. Volunteers should be solicited to participate in this study.
2. King County shall approve building permits served by exempt wells only if public water service cannot provide cost-effective, timely, reasonable, safe, and reliable water service, within their water rights, and consistent with local plans and policies. If new development lies within or less than one mile from the boundaries of the service area of a public water system, that public water system should have been contacted and requested to provide service.
3. "Consolidation" of exempt wells by utilities into public water rights and service from existing Group A systems is encouraged where feasible. And an application to "consolidate" exempt wells into a water right shall be filed with DOE.
4. Seek funding for SKCPH and DOH to conduct a survey of source protection for individual exempt wells and Group B exempt wells on Vashon Island, and recommend measures to correct any deficiencies that entail a risk to the quality of the Island sole-source aquifer.
5. An education program should be developed and implemented that informs exempt well owners of the risks of aquifer contamination, and actions they can take to minimize the risk of contamination of their wells. King County and GWPC should collaboratively seek funding to implement this effort.
6. King County should maintain a record of new exempt wells associated with approved building permits on the Island for consideration in the Water Resources Evaluation and ongoing monitoring efforts.
7. King County should consider a local grant matching program for home owners to help buy down the cost of properly decommissioning private wells that are no longer in use.

5.5 STREAM FLOWS

Issue

Island streams are too small to sustain much out-of-stream use. Streams, springs, and aquifers interact and are part of an integral hydrologic system. Human alterations to the drainage system have also affected hydrology. Springs and shallow wells are used by many Island water systems, affecting flows in some streams and during some seasons.

Normative flows are needed in streams to meet the life requirements of aquatic life, from benthic invertebrate populations to salmonids. Normative flows maintain the key aspects of natural stream flow cycles needed for healthy riparian ecology, especially for salmonid survival. While minimum flows are needed, they are not the only focus. Seasonally higher flows are needed at appropriate times of the year; peak flows must not be so high that they scour streambeds and salmon redds; summer low flows should not begin too early and harm riparian life; base flows should not decline below certain levels during the late summer low-flow season. With increased

modifications of the landscape, such as the conversion of forests to impervious surfaces, maintaining normative flows requires management actions that help mimic natural conditions.

Existing Conditions and Current Actions

A variety of changes over the past 125 years has altered stream flow patterns. Land clearing and paving speed surface water runoff and decrease recharge of the shallow aquifers that feed streams. Storms create faster, higher peak flows that cause more scouring of streambeds, and more frequent slides along riparian slopes, which in turn lead to higher sediment loads. This may be illustrated in the Shinglemill Creek watershed. The King County Water and Land Resources Division observed that multiple slides following large storm events caused salmon redds to be scoured by high flows or smothered by sediment in recent years. Unpublished data from King County Water and Land Resources Division also shows that flow levels drop earlier in the summer, reach lower base levels in late summer and fall, and remain at low levels for longer periods. Well withdrawals may reduce local water table levels that in turn influence the seeps and springs tied to nearby stream flows. These lower flow levels reduce the habitat needed by juvenile salmonids that need 3-12 months to rear within the protection of the streams. These are problems which afflict all King County streams and rivers to some extent, but the small watersheds, such as those of Vashon, are “flashier” than large watersheds because their recharge areas are so much more limited.

Only a few streams have been closed to further in-stream withdrawals (see Section 4), and minimum flows are set only where downstream water rights are involved, as is the case with Beall Creek. According to the WRIA 9 Habitat Limiting Factors and Reconnaissance Assessment Report (2000), Washington Trout (2002), the King County Salmon Watchers Program, and recent field observations, the Island has about 19 documented salmonid-bearing streams, all of them occupied by sea-run cutthroat trout, three by steelhead, five by coho salmon, and three by chum salmon.

King County is currently conducting normative flow studies to enhance understanding of the relationship between river and stream flow patterns with ecological parameters. This understanding will be used to develop a stream assessment methodology and analytical tools that will help King County to evaluate the effects of management actions (such as water reuse, stormwater management, and flood hazard management) in protecting or restoring a flow regime that supports ecosystem health and salmon. One of the County’s listed objectives is to provide analytical tools to WRIAs and other interested parties for consideration and use as needed to fill gaps in technical programs.

Desired Outcomes

Island streams are protected from future diversion under new water rights. Vashon streams are prioritized in terms of their ecological value, chiefly their capacity to support salmonids. Studies, monitoring, and a variety of regulatory and restorative actions restore and protect normative flows in Vashon streams. Normative flow protection is extended to Vashon salmonid-bearing streams.

Recommendations

1. In order to preserve Island hydrology and the riparian and riverine ecosystems of Island streams, new surface water rights should not be issued for Island salmonid-bearing streams and should be discouraged for other Vashon streams.

2. As normative flow analyses and other studies are completed, implement strategies to protect/enhance stream ecology:

   Data Collection:

   - Install devices to track stream flows in priority fish-bearing streams of Vashon-Maury Island.
   - Seek funding to expand the existing volunteer program managed by the King County Basin Steward that monitors salmonid adult spawners and begin monitoring juveniles at emergence from gravels.
   - Seek funding to monitor benthic invertebrates and/or other indicators of stream health.
   - Use King County's normative flow studies results when assessing the relationship between stream flow and biology on the Islands.

   Education/Incentives:

   - Educate Vashon-Maury Island residents about stream flows, the importance of balancing the needs of people with the proper functioning of the Island's natural hydrology, and the role of water conservation in ensuring the protection of the water supply.

   Adaptive Watershed Management:

   - Consult with other watershed resource managers on best watershed management practices and adaptive management.
   - Coordinate salmon recovery with WRIA 9 Forum and Steering Committee or their successors and support actions within the WRIA 9 recovery plan that address water as a limiting factor.
   - Look for ways to delay the onset of summer low flows, and sustain minimum flows through late summer and early fall.

3. Use best available science to account for instream flow needs for fish in coordinated Group A water planning.

5.6 FUEL STORAGE TANKS

Issue

Leaking residential and commercial fuel storage tanks present a threat to groundwater quality. Many homes are heating with and storing fuel oil on the Island. Older fuel storage tanks are likely to be bare steel tanks without rust protection.

Existing Conditions and Current Actions

The GWMP reported that DOE listed 28 commercial tanks in use in 1998, and estimated that there were more than 700 residential storage tanks in use on the Island. It is estimated that about 50 percent of tanks are above ground and 50 percent are underground. The GWMP reported that seven sites had contaminated groundwater on the Island, six of which had been remediated. Six strategies for wellhead protection from leaking underground storage tanks were included in the GWMP.

In May 2005, the Washington Pollution Liability Insurance Agency reported that 507 homes were insured on Vashon-Maury Island and 60,000 homes were insured statewide. The agency investigates about 150 to 170 cases of leaking tanks statewide each year; homes with leaking tanks amount to about one quarter of one percent of the total number of homes insured in Washington. The Agency's insurance program provides up to $60,000 for cleanup of leaks from actively used residential oil tanks. Costs are borne by oil dealer fees, based on the number of gallons sold. This program has been very successful, and has resulted in 540 cleanups statewide through 2004. To receive application information, underground tank owners may visit the PLIA website at www.plia.wa.gov.

The King County Fire Marshall now accepts above-ground fuel storage (as long as the tanks and installation are in accordance with county, state, and international building codes) due to recent state and county fire code changes and because new tanks are typically double-walled. Until recently, only Washington State regulations governed the installation of underground tanks. Residential tanks were generally exempted from regulation, but commercial tanks have been and continue to be state regulated.

Residential tanks are addressed in the CARA section of King County's updated Critical Areas Ordinance. The Ordinance (No. 15051) became effective January 1, 2005. The provisions of the ordinance relating to residential tanks will apply only after these provisions have been submitted to and approved by DOE. The effect of the Ordinance, as interpreted by King County, is that new underground tanks will be held to higher state standards but are not absolutely prohibited. The new restrictions may have the effect of homeowners choosing to install above-ground tanks (protected with primary and secondary containment and a spill plan) to avoid the added expense and monitoring effort associated with new underground fuel tanks. Whether they choose above-ground storage tanks or they choose to install new underground tanks, a new level of protection of the aquifer will be achieved.

Desired Outcomes

New and existing residential fuel storage tanks do not contaminate Island groundwater. Commercial fuel storage tanks are adequately regulated. The CARA section of the updated King County Critical Area Ordinance is successfully implemented, and state approval of fuel storage provisions is completed as soon as possible.

Recommendations

In accordance with county, state, and international building codes:

1. King County shall seek funding and work with state agencies to encourage removal of old or failing residential fuel storage tanks.
2. GWPC, Island water purveyors, and King County shall encourage the elimination of old or failing residential fuel storage tanks through replacement or the use of heating systems that are not reliant on old or failing tanks.
3. Unused underground fuel storage tanks that are old or failing should be removed or filled in place.
4. GWPC and King County should seek a funding source to provide incentives for the elimination of old or failing residential fuel storage tanks. A direct grant program for

homeowners to decommission old or failing fuel storage tanks should be explored by King County.

5. GWPC should consider the effectiveness of commercial fuel storage tank regulations to safeguard Vashon groundwater.
6. GWPC should publicize the program of State of Washington Pollution Liability Insurance Agency with the goal of registering all Vashon heating oil tanks.

5.7 SEPTIC SYSTEMS

Issue

Septic systems are a major potential source of contamination in Vashon's soils and groundwater. According to Carr 1983, the number of people that could be supported on the Island is limited by the ability of Island soils to recover from septic discharge. Carr 1983 suggests that this would present a more restrictive boundary on growth than the Island water supply.

Existing Conditions and Current Actions

There is widespread awareness among homeowners, business people, and regulators that failed and failing septic systems are a common problem on Vashon Island. Typically, residential septic system failure occurs when the septic tanks are not maintained and solids are released from the tank to the drain field. Failure can also occur when the volume of effluent entering a drain field exceeds the acceptance capacity of the surrounding soils, resulting in the release of sewage effluent to the ground water or the backup of sewage into the building's plumbing. Problems with septic systems can also result from improper siting or the use of garbage disposals, which produce fine matter that can limit the effectiveness of the drain field.

On-site sewage systems can also fail to provide adequate treatment before effluent reaches underlying groundwater. This form of failure is extremely difficult to detect on an individual basis because, unlike failures where sewage comes to the surface, there are usually no visible or olfactory manifestations of the problem (detection generally occurs through an overall deterioration of ground or surface water quality that results from the cumulative effects of many on-site sewage system malfunctions).

Domestic on-site sewage effluent can involve a number of contaminants, including nitrate, bacteria, viruses, and trace organic chemical compounds. Nitrate is often considered the most significant contaminant associated with domestic wastewater because it is not removed by the soil. While higher levels of nitrates are associated with on-site sewage systems, in fact, fertilizer use is often the primary source.

Commercial, industrial, and institutional (e.g., schools) use of on-site sewage disposal systems can present two types of problems. First, some commercial, industrial, and institutional facilities generate large volumes of wastewater typically discharged to one or more large, on-site sewage systems. As with residential community systems, concentration of wastewater in one discrete area can have a significant impact on the quality of underlying groundwater in the immediate vicinity of the on-site sewage system. Second, commercial on-site systems can pose a threat to groundwater because of their relatively high concentration of nitrogen loading. In addition to the contaminants normally found in domestic wastewater, effluent from on-site sewage systems

serving commercial, industrial, and institutional facilities can contain significant levels of volatile and semivolatile organic compounds.

When on-site sewage disposal systems are properly designed and constructed (e.g., with suitable soils, reasonable densities, proper materials) and regularly maintained, they can provide satisfactory treatment of domestic (residential or equivalent) sewage with little or no impact on water quality and some benefit to water quantity via return flows. Proper septic systems are also natural treatment processes that result in groundwater being recycled near the source rather than mined and dumped as occurs with conventional collection and treatment technologies. However, if the septic systems are improperly designed or constructed or are not maintained, they can adversely impact surface and groundwater quality as well as public health.

Water quality along the shorelines of the Island is known to reflect the effects of septic failures. While existing data on groundwater seems to indicate no serious effects, the data lacks the comprehensive analysis needed to ensure that failures are not taking place. Once groundwater is seriously polluted, efforts to clean it are difficult and expensive. Nitrates are increasing in 10 of the 21 wells in the Island's monitoring program. Nitrates have increased in general since l989-90, with some samples indicating a three-fold increase. This trend is of concern, and indicates the importance of insuring that septic failures are avoided. It also suggests the importance of considering the use of demonstrated new and alternative systems, already in use in other jurisdictions.

Large scale efforts have been undertaken to solve local clusters of failing systems. In particular, the Beulah Park and Bunker Trail efforts have recently been completed. The results of these efforts have proven very expensive and time consuming. In addition, a major public concern is currently the failing systems on Quartermaster Harbor and Spring Beach where the consequences are particularly acute for marine life. A local community group has been working with King County to address the problem, but no solution has yet emerged.

Board of Health Code 13.60.010 requires that alternative septic systems be inspected annually by a licensed specialist. Past educational efforts have included public seminars and distribution of informative materials from the County. However, existing educational and regulatory efforts have not ensured that homeowners keep their septic systems in good working order or identified and corrected major failures. Gaining the support of people not committed to protecting their environment and/or not willing or able to make the necessary expenditures to fix a failing or failed septic system has proven to be difficult.

GWPC is seeking support to provide additional educational materials to specifically target residents whose septic systems are not in compliance with current codes. In addition, the Septic Solutions Committee of the Vashon-Maury Island Community Council is exploring the possibility of a Public Utility District or other organization to manage septic issues locally for the Island.

Desired Outcomes

Pollution from malfunctioning septic systems into the groundwater, surface water, and shorelines is eliminated. Funding is available to identify and repair septic systems to ensure that homeowners are not forced to sell their homes due to septic failures and the high cost of replacing failed systems. Regulations are in place to make available proven, safe, and technically feasible alternative septic systems. Public awareness and motivation are increased to solve septic system problems and protect the water supply. Organizational structures are

created (such as a Public Utility District or like organization) to help facilitate local control, implement septic solutions and protect water supply. Homeowners are educated to maintain their septic systems properly.

Recommendations

1. Maintain GWPC 's regular groundwater monitoring program for nitrates and other potential septic system contaminants, and develop policies on their control.
2. King County should encourage the use of demonstrated new and alternative on-site septic treatment technologies on Vashon-Maury Island.
3. SKCPH should work with the Vashon-Maury Island Community Council Septic Solutions Committee's effort to determine the feasibility of a Public Utility District or like organization to manage septic issues locally for the Island, including inspection of systems.
4. Continue to implement and seek funding to expand the SKCPH septic education program to inform property owners about septic system failures and steps they may take to ensure effective maintenance and operation of their system.
5. Assess the potential use of septic system waste as fuel for power generation as part of an alternative energy generation program.
6. Seek funding or other financial incentives to encourage low income homeowners to fix failing or failed septic systems.

5.8 STORMWATER MANAGEMENT

Issue

Standard development results in removal of vegetation, soil compaction, and the installation of impervious surface, altering the natural hydrology. Without stormwater controls, runoff enters streams and other waterways, where it causes flooding, erosion, changes in stream morphology, and reduces the amount of water that recharges the aquifer. Standard stormwater control facilities collect runoff in pipes, treat stormwater in engineered facilities, store runoff and release it at controlled rates. Unless soils on the development site drain well, less water enters the soil, groundwater recharge is reduced, and surface runoff volume increases.

Natural Drainage Systems (NDS), also referred to as Low Impact Development (LID), are design technologies that aim to infiltrate, slow and filter stormwater. NDS include reduced impervious surface, grading techniques, use of swales for infiltration and conveyance, planting strips with enhanced soils and vegetation, underground rock and pipe infiltration galleries, and porous pavement, among other strategies. NDS provide water quality benefits, maximize aquifer recharge and base streamflow, seeking to preserve, restore, or mimic a site's natural hydrologic function.

Existing Conditions and Current Actions

There are concentrations of impervious surface in the towns of Vashon, Burton, and Dockton, and in the area of Vashon High School, Sound Food, and the park and ride lot in that area. There are also isolated concentrations of impervious surface elsewhere on the Island. Some examples are at the north and south end parking lots, and at the Vashon airport, which is not

regulated by the county and is therefore not required to provide infiltration or detention when development occurs.

Projected development is expected to create other concentrations of impervious surface. The E. Fork Judd Creek area is projected, at build-out, to be a large future effective impervious area (EIA) (Vashon Rapid Rural Reconnaissance, 2004). EIA in this area is projected to increase almost four-fold over the current level to 13.8 percent. In one subbasin of the Shinglemill watershed, which includes a portion of Vashon town center, the Rapid Rural Reconnaissance projects, at build-out, a tripling of impervious surface to 9.9 percent. Overall EIA is projected to increase from 2.2 to 7.5 percent in Judd and from 2.0 to 6.9 percent in Shinglemill.

Impervious surface is most concentrated in the town of Vashon, where runoff enters pipes that discharge into roadside ditches. These carry the runoff to Gorsuch, Judd, and Shinglemill Creeks. A small fraction of surface water runoff enters the sewer system that serves the town. Infiltration through leaks in the sewer pipes collects a substantial amount of subsurface flow (Vashon Island Wastewater Treatment Plant Facilities Plan Sewer System Evaluation Survey, 2002).

An estimated 14 of the 130 developed properties within Vashon have flow control facilities that detain and slowly release stormwater runoff; fewer also have treatment facilities to remove some pollutants before stormwater is discharged. Many of the flow control facilities were installed 20-25 years ago, and "do little to mitigate the stormwater impacts from the developed area." (Draft Vashon Town Center Stormwater Study, Steve Foley, Water and Land Resources Division, King County, October 8, 2002)

County regulations affecting stormwater runoff are found in the Surface Water Design Manual and the King County Road Standards (Sections 2.01, 2.02 and 2.03). The county will be implementing some NDS requirements in January 2005.

Desired Outcomes

In site design for new and redevelopment, NDS measures are in place to limit impervious surfaces and manage stormwater flows to maximize the protection of surface and ground water quality and quantity, optimize base stream flows, protect receiving waters, and preserve or mimic a site's natural predevelopment hydrology. Islanders know about, and choose to do NDS in commercial, industrial, and residential development, beyond regulatory requirements. There are no surface water flows into the sewer system in the town of Vashon, and infiltration into the sewer system is reduced. Runoff from land in agricultural use is managed under a farm plan using BMPS and NDS technologies. No roadside ditches are lost to highway improvements or new development. The Island retains roadway design standards that are appropriate for rural communities and developments.

Recommendations

1. New roads or road improvements required for new development in the town of Vashon should use a rural road section when possible, consistent with the King county Road Standards. Although the roadway section within the Vashon Town Center typically includes curb, gutter, and sidewalk, the residential roadway section throughout the Island should generally be rural in character with shoulders and an open ditch/swale on both sides of the roadway. When a roadway project exceeds the thresholds identified in Section 1.1.1 of the County Surface Water Design Manual, flow control and treatment

facilities should mitigate the impacts generated by surface and stormwater runoff. Swales should be used when ecologically appropriate to treat runoff.

2. Provide incentives, considering those offered through the existing Seattle Public Utilities program, for property owners to use flow control Best Management Practices (BMPs)2 in excess of minimum requirements for all projects on Vashon-Maury Island. King County Water and Land Resources Division should provide technical assistance in using these BMPs to meet flow control requirements.
3. The County should lead by example by implementing LID technologies for county-sponsored projects (e.g., roads, buildings).

5.9 PESTICIDE, FERTILIZER, AND HERBICIDE USE

Issue

Pesticides, herbicides, and fertilizers are used by homeowners; public organizations such as the library and parks; the golf course; farms; King County road crews from Renton; and commercial and industrial businesses to eliminate unwanted plants and insects, and to foster the growth of agricultural crops, gardens, and landscapes. These substances have chemicals in them which run off into streams and/or percolate into the aquifer, and which can harm both aquatic biota and human health. Endocrine disruptors, carcinogens, and other toxins can poison salmonids, amphibians, and their invertebrate prey, and pose hazards to people who ingest them through their water supply.

Existing Conditions and Current Actions

Many public agencies, including Vashon Park District, Vashon Library, and the Vashon School District have largely phased out the use of toxic chemicals and use safe alternatives for landscape maintenance, Vashon Library uses Integrated Pest Management methods, and local King County Roads crews cut to maintain road edges, rather than spray. Although forestry on state lands has employed small scale herbicides, the Vashon parcels have recently passed into county hands. However, the many small forest owners, small farms, businesses, homes, and commercial landscape services use a broad range of substances and methods.

Desired Outcomes

Commercial businesses apply pesticides, herbicides, and fertilizers on the Island safely, using BMPs, and offer their customers the option of using organic and nontoxic pesticides, herbicides, fertilizers, and IPM methods. Retailers advocate for and provide information on preferred and short lived pesticides, herbicides, and fertilizers. Stream buffers are observed on Vashon to prevent use of herbicides, pesticides, or chemicals application. No pesticides, herbicides, fertilizers are used on the Island that endanger human health or ecosystems.

Vashon citizens are well educated on the possible and real dangers from the use of these chemicals and know safe but effective organic and nontoxic alternatives. There is reduced usage of these chemicals on the Island. Islanders substitute safe alternatives, widely use IPM Management methods, use only slow release fertilizers, follow instructions and do not exceed recommended rates, and use fertilizers whose components are best suited to the type of plant

[2] See Appendix C of the Surface Water Design Manual.

that they are growing. Accurate information is made available on effective controls for usual pests on Vashon including assessment of environmental risks for each.

Recommendations

1. King County and GWPC should collaborate to develop an education program on pesticide and fertilizer use that includes:

   Information for retailers to post concerning preferred control measures for ordinary pests and point of sale warnings and information for each measure.

   Workshops about the hazards of toxic pesticides, herbicides, and fertilizers, and the alternatives available.

   King Conservation District's "Livestock Management" classes held on Vashon

   A series of articles for The Loop, The Beachcomber, and Vashon Audubon's Island Wings

   Handouts available through the Land Trust, Audubon, Sustainable Vashon, Vashon Garden Club, Vashon Library, and other organizations.

   Encouragement for schools, Vashon Park District, Vashon Library, King County Road Department, the Vashon Island Golf and Country Club, local landscapers, businesses, and farms to practice IPM, reduce use of toxic materials, and find alternatives through handouts and invitations to workshops.

   Non-county roadside maintenance, with DNRP and the Groundwater Stewardship Committee encouraging nonchemical methods of maintenance for roads and rights of way.

   Funding sources for this education program.

2. Prioritize the regular monitoring of streams and groundwater for traces of pesticides, herbicides and fertilizers in King County's groundwater monitoring program. Two or three major streams should be monitored as part of GWPC data gathering.
3. The Washington State Legislature should require labeling of heavy metals and toxic chemicals contents on fertilizer labels.

5.10 GOVERNANCE AND IMPLEMENTATION

Issue

This section is included to define implementation tasks and responsibilities to ensure that the Vashon–Maury Island Watershed Plan successfully achieves its goals and desired outcomes. The recommendations in this section are intended to provide for the ongoing evaluation and adaptive management of Island water resources according to this Plan.

Under Chapter 90.82 RCW, an approved watershed plan creates implementation obligations:

> (a) For agencies of state government, the agencies shall adopt by rule the obligations of both state and county governments and rules implementing the sate obligations, the obligations on state agencies are binding upon adoption of the obligations into rule, and the agencies shall take other actions to fulfill their obligations as soon as possible; or

(b) For counties, the obligations are binding on the counties and the counties shall adopt any necessary implementing ordinances and take other actions to fulfill their obligations as soon as possible.

Existing Conditions and Current Actions

GWPC, King County agencies, DOH, and DOE currently work together to plan for water resources protection and program implementation. Section 3 describes the process that was used to complete this Plan. Section 5 defines the recommended actions.

Desired Outcomes

The Vashon-Maury Island Watershed Plan is fully implemented and its goals and desired outcomes are successfully achieved.

Recommendations

1. GWPC should work with King County and State agencies to explore options for providing local, Island-wide water resources management.
2. King County should develop a process for referring proposals on water resources management, policy, and regulation for Island concurrence to GWPC.
3. GWPC shall work with King County and State agencies to define sustainability criteria to use in implementing this plan.
4. If the County's ongoing water monitoring program indicates the groundwater supply is projected to be used beyond its sustainable capacity, King County DNRP shall recommend to SKCPH and Department of Development and Environmental Services that immediate steps be taken to ensure that new development does not impair the groundwater supply. GWPC may also petition DNRP to evaluate monitoring data and determine whether immediate steps are necessary. DNRP's recommendations would be appealable to the King County Hearing Examiner.
5. To ensure implementation of this Watershed Plan, GWPC shall work with King County and state agencies to develop a work plan and assess the success of the prior work plan every two years. GWPC and county and state agencies shall rely on the best available science, such as the information provided by the King County Water Resources Evaluation, to adaptively manage implementation of this Plan.
6. King County and state agencies shall fulfill implementation obligations, as defined in Chapter 90.82 RCW.

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APPENDIX A. LEGISLATIVE REQUIREMENTS FOR WATERSHED PLANS

The Watershed Planning Act (Chapter 90.82 RCW) set forth specific requirements for watershed plans that had to be met before a Watershed Plan could be approved. These requirements are listed below, along with a description of how the Vashon-Maury Island Ground Water Protection Committee addresses each requirement.

State Requirement[1]	Vashon-Maury Island GWPC Response
Water Quantity	
Estimate of the surface and ground water present in the management area.	Physical water balances for Vashon-Maury Island was completed by King County Water and Land Resources Division (WLRD) Water Resources Evaluation Project. The Island receives approximately 80,040 acre-feet per year from precipitation each year of which approximately 32 percent is groundwater recharge and 24 percent is runoff (surface and interflow). The remaining percentage of precipitation is lost to evapotranspiration.
Estimate of the surface and ground water available in the management area, taking into account seasonal and other variations.	The King County WLRD Water Resources Evaluation Project attempts to quantify the water balance and the amount of water that flows into streams and recharges the Island aquifers. Seasonal variations associated with stormwater runoff in the watershed will be addressed in the Phase II modeling portion of the project, scheduled for late 2005/early 2006. Low flows are addressed in in-stream flow studies and planned modeling scenarios.
Estimate of the water in the management area represented by claims in the water rights claims registry, water use permits, certificated rights, existing minimum instream flow rules, federally reserved rights, and any other rights to water.	The Watershed Plan provides most of these estimates. Water right certificates, permits and claims total 3,273 acre-feet per year (af/yr).
Estimate of the surface and ground water actually being used in the management area.	The Watershed Plan estimates domestic/municipal water use on the Island to be 1,150 af/yr and total agricultural water use to be 362 af/yr.
Estimate of the water needed in the future for use in the management area.	If population increases to 11,674 in 2015, an increase of 1,139 af/yr of water will be necessary to meet this demand as compared to 2000 population of approximately 10,100.
Identification of the location of areas where aquifers are known to recharge surface bodies of water and areas known to provide for the recharge of aquifers from the surface.	Significant hydraulic continuity between surface and ground waters exists on Vashon-Maury Island. The entire Island recharges the Island aquifers. The majority (68%) of the surface geology is till (or till like units) which accounts for ~ 53% of the Island's recharge [albeit slower than the outwash/alluvium geologic units].

State Requirement[1]	Vashon-Maury Island GWPC Response
Water Quantity	
Estimate of the surface and ground water available for further appropriation, taking into account the minimum instream flows adopted by rule or to be adopted by rule under this chapter for streams in the management area including the data necessary to evaluate necessary flows for fish.	Since the surface water bodies are closed to new water rights, future water uses will be met primarily through groundwater. The Watershed Plan concludes that additional water appropriations should focus on sustainability of the water resources on the Island. This concept can be made via strategies such as conservation, water sharing, and better stormwater management.
Strategies for increasing water supplies in the management area.	The Watershed Plan provides many strategies and recommendations for increasing water supply including through conservation and better stormwater management.
Examination, based on existing studies . . . of the degree to which legally established water quality standards are being met in the management area.	Water quality standards are being met on the Island at almost all locations of water withdrawal. A few Group B Public Water Systems will have difficulty meeting the new Arsenic standards in 2006.
Examination based on existing studies …of the causes of water quality violations in the management area, including an examination of information regarding pollutants, point and nonpoint sources of pollution, and pollution-carrying capacities of water bodies in the management area. The analysis shall take into account seasonal stream flow or level variations, natural events, and pollution from natural sources that occurs independent of human activities.	Nitrates from septic systems and chloride from saline intrusion represent the primary water quality impairments in the management area for ground water. The King County Water Resources Evaluation is monitoring nitrates in groundwater on the Island.
Examination of the legally established characteristic uses of each of the nonmarine bodies of water in the management area.	Characteristic uses include: water supply (domestic, municipal and agricultural); stock watering; fish and shellfish: salmonid migration, rearing, spawning, and harvesting, other fish migration, rearing, spawning, and harvesting, shellfish spawning, rearing and harvesting; wildlife habitat; recreation (primary contact recreation, sport fishing, boating, and aesthetic enjoyment).
Examination of any Total Maximum Daily Load (TMDL) established for nonmarine bodies of water in the management area, unless a TMDL process has begun in the management area as of the date the watershed planning process is initiated under Chapter 90.82.060 RCW.	TMDLs have not been established for nonmarine bodies of water on the Island; nonmarine bodies have not been listed as impaired as of 1998. The Watershed Plan does not address this issue.

State Requirement[1]	Vashon-Maury Island GWPC Response
Water Quantity	
Examination of existing data related to the impact of fresh water on marine water quality.	The most significant terrestrial impact to marine water quality on Vashon-Maury Island is associated with the discharge of wastewater systems to marine waters; these discharges are being evaluated and addressed by Seattle-KC Public Health and King County Department of Natural Resources and Parks-Wastewater Treatment Division. The Watershed Plan includes recommendations to improve wastewater management.
Recommended approach for implementing the total maximum daily load established for achieving compliance with water quality standards for the nonmarine bodies of water in the management area, unless a Total Maximum Daily Load process has begun in the management areas of the date the watershed planning process is initiated under Chapter 90.82.060 RCW.	TMDLs have not been established for nonmarine bodies of water on the Island; nonmarine bodies on the Island have not been listed as impaired as of 1998. This Watershed Plan does not address this issue.
Recommended means of monitoring by appropriate government agencies whether actions taken to implement the approach to bring about improvements in water quality are sufficient to achieve compliance with water quality standards.	The Watershed Plan provides recommendations for monitoring effectiveness of water quality corrective actions.

Habitat	
The Watershed Plan shall be coordinated or developed to protect or enhance fish habitat in the management area. Such planning must rely on existing laws, rules, or ordinances created for the purpose of protecting, restoring, or enhancing fish habitat, …Planning established under this section shall be integrated with strategies developed under other processes to respond to potential and actual listings of salmon and other fish species as being threatened or endangered under the federal endangered species act, 16 U.S.C. Sec. 1531 et seq. Where habitat restoration activities are being developed under chapter 2496, Laws of 1998, such activities shall be relied on as the primary nonregulatory habitat component for fish habitat under this chapter.	The Watershed Plan does not address salmonid habitat issues relating to VMI. The WRIA 9 habitat conservation plan includes recommendations to address nearshore salmonid habitat around Vashon-Maury Island and the existing King County Rural Drainage Program addresses habitat in the upland and freshwater systems on the Island.
Instream Flows	
Develop instream flows recommendations if none exist for the WRIA.	The Watershed Plan does address instream flow issues even though the WRIA 15 planning unit chose not to amend the existing instream resources protection plan Chapter 173-515 WAC. The plan focuses on maintaining the Island hydraulic continuity between surface and ground waters through data collection, education/incentives and Adaptive watershed management efforts.

Requirements excerpted from the Watershed Management Act (Chapter 90.82 RCW)

APPENDIX B. GLOSSARY

Acre Foot (AF). A unit to measure the volume of water, is equal to the quantity of water required to cover one acre to a depth of 1 foot and is equal to 43,560 cubic feet of 325,851 gallons. The term is commonly used in measuring volumes of water used or stored.

Adaptive Management. Reliance on scientific methods to test the results of actions taken so that the management and related policy can be changed promptly and appropriately.

Appropriation. The process of legally acquiring the right to specific amounts of the water resource for specific beneficial uses.

Alluvial. Relating to mud and/or sand and gravel deposited by flowing water, e.g., ancient river beds. See also ALLUVIUM.

Alluvium. A general term for clay, silt, sand, gravel, or similar unconsolidated material deposited during comparatively recent geologic time by a stream or other body of running water as a sorted or semi-sorted sediment in the bed of the stream or on its floodplain or delta, or as a cone or fan at the base of a mountain slope. See also ALLUVIAL.

Aquifer. Natural underground layer of porous, water-bearing materials (sand, gravel) usually capable of yielding a usable amount or supply of water.

Aquifer (Confined). Aquifer bounded above and below by beds of distinctly lower permeability than that of the aquifer itself and that contains ground water under sufficient pressure for the water to rise above the upper confining layer when penetrated by a well.

Aquifer (Unconfined). Aquifer not bounded above by a bed of distinctly lower permeability than that of the aquifer itself and containing ground water under pressure approximately equal to that of the atmosphere. This term is synonymous with the terms “water table aquifer.”

Aquifer (Perched). Ground water in a saturated zone is separated from the main (deeper) body of ground water by unsaturated material.

Aquifer System. A body of permeable and relatively impermeable materials that functions regionally as a water-yielding unit. It comprises two or more permeable units separate at least locally by confining units that impede groundwater movement but do not greatly affect the regional hydraulic continuity of the system. The permeable materials can include both saturated and unsaturated sections.

Aquifer Test. A test involving the withdrawal of measured quantities of water from or addition of water to a well, and the measurement of resulting changes in head in the aquifer both during and after the period of discharge or addition, e.g., a bailer or pump test. (These are withdrawal tests).

Arsenic. A naturally-occurring metallic element which, in sufficient concentrations, can be hazardous to human health. Arsenic can also accumulate in the tissues of aquatic organisms. Consumption of the organism, such as fish or shellfish, can cause acute illness in humans and other mammals.

Artesian. An adjective referring to ground water confined under sufficient pressure to flow from a well at ground surface. See also AQUIFER (CONFINED), ARTESIAN WELL.

Artesian Well. A well deriving its water from a confined aquifer in which the hydraulic water level stands above the ground surface; synonymous with flowing artesian well.

Artificial Recharge. A process where potable or reclaimed water is put into ground water storage using surface-water spreading basins, infiltration galleries, or ground water injection wells.

Base Flow. The amount of flow in a stream derived solely from ground water discharge. Base flow is dependent on the geology of the stream basin and varies according to water level in the supplying aquifer.

Beneficial Use. The purpose (necessary condition) for obtaining a water right. Includes, among others, domestic, stock watering, industrial, commercial, agricultural, irrigation, hydroelectric power production, mining, fish and wildlife, stream flow maintenance and enhancement, recreation, municipal, and preservation of environmental and aesthetic values.

Benthic Invertebrates. Animals without backbones that are larger than ½ millimeter and who live on rocks, logs, sediment, debris and aquatic plants during some period in their life. The benthos include crustaceans such as crayfish, mollusks such as clams and snails, aquatic worms and the immature forms of aquatic insects such as stonefly and mayfly nymphs.

Best Management Practices (BMPs). Structural, non-structural and managerial techniques that are recognized to be the most effective and practical means to achieve intended outcomes yet are compatible with the productive use of the resource to which they are applied.

BMP. Best management practice(s).

CARA. See Critical Aquifer Recharge Area.

CFS. Cubic feet per second.

Chloride. A compound of chlorine with one other positive element or radical (sodium chloride is commonly known as table salt); an indicator parameter for seawater contamination of ground water.

Clay. A rock or mineral particle in the soil, having a diameter less than 0.002 millimeters (2 microns) and generally of different mineralogy than coarser materials.

Contamination. The degradation of natural water quality as a result of anthropogenic activities.

Contaminant. Any physical, chemical, biological, or radiological substance or matter not naturally occurring in the environment or present in amounts that can, in sufficient concentration, adversely affect human health or the environment.

Critical Aquifer Recharge Area. Area determined to have a critical recharging effect on aquifers used as a source for potable water, and are vulnerable to contamination from recharge.

Cubic Feet Per Second (CFS). A rate of discharge used for stream flow measurement equal to the quantity in cubic feet of water flowing past a certain point each second.

CWSP. Coordinated Water Supply Plan.

CWSSA. Critical Water Supply Service Area.

Depletion. The withdrawal of water from surface- or ground water reservoirs at a rate greater than that of replenishment.

Depth to Water. The vertical distance from a specified datum (usually ground surface) to the top of a body of water.

Desalinization. The removal of dissolved salts from water by natural means (leaching, boiling) or by specific water treatment processes.

Discharge. The volume of water that passes a given location within a given period of time, usually expressed in cubic feet per second (surface flow) or gallons per minute (ground water).

Dissolved Oxygen (DO). Measure of free oxygen dissolved in water.

DNRP. King County Department of Natural Resources and Parks.

DOE. Washington State Department of Ecology.

DOH. Washington State Department of Health.

Domestic Water Use. Water used for household purposes, such as drinking, food preparation, bathing, washing, flushing toilets, and irrigation of lawns and gardens.

Drawdown. A lowering of the ground-water level caused by pumping. Drawdown in a water well is the difference between the pumping water level and the static (non-pumping) water level.

Effluent. Water or some other liquid—raw, partially or completely treated—flowing from a reservoir, basin, treatment process or treatment plant.

EIA. Effective Impervious Area.

Equivalent Residential Unit (ERU). Amount of water used (indoors and outdoors) by a typical household in a given period of time.

Erosion. The process by which a material is worn away by a stream of liquid (water) or air.

Estuary. A place where fresh and salt water mix, such as a bay, salt marsh, or where a river enters an ocean.

Evaporation. The process by which liquid water becomes water vapor, including vaporization from water surfaces, land areas, and all other moist surfaces.

Evapotranspiration. The combined processes of evaporation and transpiration. It can be defined as the sum of water used by vegetation and water lost by evaporation.

Exempt Wells. Wells exempt from the requirement to obtain a water right permit from DOE. These are usually wells for single-family domestic use that consume less than 5,000 gallons per day. By Department of Health practices, an exempt well serves six or fewer homes.

Flood. Any relatively high stream flow overtopping the natural or artificial banks in any reach of a stream.

Fire Flow. The rate of water delivery needed for the sole purpose of fighting fires. The fire flow volume shall be in addition to the requirements of the water system for domestic demand.

Flow Rate. The volume of flow per time (e.g., gallons per minute).

Fresh Water. Water that generally contains less than 1,000 milligrams-per-liter of dissolved solids.

Geology. The study of the planet Earth, the materials of which it is made, the processes that act on these materials, the products formed, and the history of the planet and its life forms since its origin, especially as recorded in rocks.

Geologic Map. A map showing the aerial distribution of geologic units and the altitude or structure of those units.

Geological Log. A detailed description of all underground features discovered during the drilling of a well (depth, thickness and type of formations). Also known as well log or well driller's report.

Glacial. Of or relating to the presence and activities of ice or glaciers. Pertaining to distinctive features and materials produced by or derived from glaciers and ice sheets.

Glacial. Pertaining to the meltwater streams flowing from melting glacier ice and especially to the deposits and land forms produced by such streams.

gpd. gallons per day.

gpm. gallons per minute.

Gravel. An unconsolidated, natural accumulation of rounded rock fragments resulting from erosion, consisting predominantly of particles larger than sand (diameter greater than 1 millimeter, or 1/2 inch), such as boulders, cobbles, pebbles, granules, or any combination of these fragments.

Gray Water. Wastewater other than sewage, such as sink drainage or washing machine discharge.

Ground Water. Water in the ground that is in the zone of saturation, from which wells, springs, and ground-water runoff are supplied.

Ground Water Model. A simplified conceptual or mathematical image of a ground water system, describing the feature essential to the purpose for which the model was developed and including various assumptions pertinent to the system. Mathematical ground water models can include numerical and analytical models.

Ground Water Table. The surface between the saturated zone and the vadose zone; the surface of an unconfined aquifer.

Ground Water Recharge. Inflow of water to a ground water aquifer from the surface. Infiltration of precipitation and its movement to the water table is one form of natural recharge. Also, the volume of water added by this process. See also RECHARGE.

Group A Water System. A public water system that serves 15 or more connections or provides a non-residential population of 25 or more people for at least 60 days per year.

Group B Water System. A public water system that serves fewer than 15 connections

GWMP. Groundwater Management Plan.

GWPC. Ground Water Protection Committee.

Hydraulic Continuity. The interconnection between ground water (aquifer) and surface water bodies.

Hydraulic Head. The height of the free surface of a body of water above a given subsurface point.

Hydrology. The science encompassing the behavior of water as it occurs in the atmosphere, on the surface of the ground, and underground.

Impermeable Layer. A layer of dense material, such as rock or clay, that does not allow appreciable quantities of water to pass vertically through. Also known as AQUITARD.

Inchoate Right. The authorized portion of a water right that has yet to be put to a beneficial use. For municipal water rights, an inchoate right might be embodied in a water right certificate, for other water rights, an inchoate right is the unused, portion of a permit.

Infiltration. The downward entry of water into the immediate surface of soil. See also Recharge.

Instream Flow. The quantity of water flow in a stream. Instream flows sustain multiple uses, such as: fisheries and wildlife, channel stability and maintenance, riparian habitat maintenance, navigation, recreation, and aesthetics. Instream flow also refers to regulatory values set in rule under Chapter 173-500 WAC, Water Resources Management Program (established pursuant to the Water Resources Act of 1971).

Instream Uses. Water uses that can be carried out without removing the water from its source, as in navigation and recreation.

Interflow. Lateral movement of water in the upper layer of soil.

Intertie. A physical connection between individual water systems which allows water supply to be transferred in one or both directions. An intertie can be established as a primary source, secondary or peaking supply, or emergency supply. Ordinarily, the use of an intertie is governed by a written agreement or contract between the utilities. A modification to water rights issued by DOE may also be required.

Island. Vashon-Maury Island.

KCCP. See King County Comprehensive Plan.

King County Comprehensive Plan. The county's long-range, county-wide, comprehensive land use plan was published in 1985 and is updated annually. It establishes policies for ground water management throughout King County, including Vashon-Maury Island.

Land Use. The way land is developed and used (e.g., agriculture, residences, industries, etc.). Certain types of pollution problems are often associated with particular land-use practices.

Laminated. The layering or thin bedding in sedimentary rocks.

Level of Service. Operational features, such as pressure, flow, reliability, etc., provided to the customer by a water system.

LID. Low impact development.

Mean. Same as average; the sum of a list of values divided by the number of items on the list.

Metals. A class of elements characterized as malleable, lustrous, and good conductors of heat and electricity. Metals, often found in rocks and minerals, are naturally released to the environment by erosion as well as generated by human activities. Certain metals, such as mercury, lead, arsenic, zinc, and cadmium, are of environmental concern because they are released to the environment in excessive amounts by human activity. They are generally toxic to life at certain concentrations. Since metals are elements, they do not break down in the environment over time and can be incorporated into plant and animal tissue.

mgd. million gallons per day.

mgy. million gallons per year.

Migration. A broad term applied to the movement of organisms and chemical constituents from one place to another over long periods of time.

Minimum Flows. The flow rate in a stream that is considered "necessary to provide for preservation of wildlife, fish, scenic, aesthetic and other environmental values, and navigational values." Withdrawals (new water rights) that would drive streamflows below these levels are to be authorized "only in those situations where it is clear that overriding considerations of the public interest will be served" (Chapter 90.54.020 RCW).

Mitigate. To take measures to reduce the adverse impacts to the environment.

Modeling. Use of mathematical equations to simulate and predict real events and processes.

Monitor. To systematically and repeatedly measure conditions to track changes. For example, dissolved oxygen in a bay might be monitored over a period of several years to identify trends in concentration.

Mulch. Any substance spread or allowed to remain on the soil surface to conserve soil moisture and shield soil particles from the erosive forces of raindrops and runoff.

Municipal Water System. A public water system that has at least fifteen service connections or that regularly serves 25 individuals for 60 days. See also GROUP A WATER SYSTEM.

NDS. Natural drainage system.

Nonpoint Source (NPS) Pollution. Pollution discharged over a wide land area, not from one specific location. These are forms of diffuse pollution caused by sediment, nutrients, organic and toxic substances that originate from land-use activities. As surface water runoff from rainwater, snowmelt, or irrigation washes over plowed fields, city streets, highways, or suburban backyards, it picks up soil particles and pollutants, such as nutrients and pesticides, along the way and deposits them in lakes, streams and rivers.

Normative Flow. Normative flow – a stream flow pattern that resembles the natural flow regime sufficiently to sustain all life stages of a diverse suite of native species, including salmonid populations. A normative flow approach is based on the theory that the better a stream mimics its historic flow regime, the better off native species will be, because they evolved successfully within that flow regime.

Nutrient. Any substance that is assimilated (taken in) by organisms and promotes growth. Nitrogen and phosphorous are nutrients which promote the growth of algae. There are other essential and trace elements which are also considered nutrients.

Outfall. The place where an effluent is discharged into receiving waters.

Outwash. Stratified sand and gravel removed or washed out from a glacier by meltwater streams and deposited in front of or beyond the end moraine or the margin of an active glacier. The coarser material is deposited nearer to the ice.

Outwash Plain. A broad, gently sloping sheet of outwash.

Overdraft. The pumping of water from a ground water basin or aquifer in excess of the supply flowing into the basin. This pumping results in a depletion or "mining" of the ground water in the basin.

Parameter. Any of a set of physical properties whose values determine the characteristics or behavior of a system. For example, height, weight, sex, and hair color are all parameters that can be determined for humans. Water quality parameters include temperature, pH, salinity, dissolved oxygen concentration, and many others.

Parcel. A tract or plot of land.

Pathogenic. Capable of causing disease.

Peak Flow. The maximum instantaneous discharge of a stream or river at a given location. It usually occurs at or near the time of maximum stage.

Perched Zone. An area of unconfined ground water separated from an underlying main body of Ground Water By An Unsaturated Zone. See Also Aquifer (Perched).

Percolate. The act of water seeping or filtering through soil without a defined channel.

Permeability. The ability of a material to allow the passage of water. Permeable materials such as gravel and sand allow water to move quickly through them; impermeable materials such as clay do not allow water to flow freely.

Pesticide. A general term used to describe chemical substances used to destroy or control pest organisms. Pesticides include herbicides, insecticides, algicides, fungicides, and others. Many of these substances are manufactured and are not naturally found in the environment. Others, such as pyrethrum, are natural toxins which are extracted from plants or animals.

pH. An expression of the intensity of the basic or acid condition of a liquid. Generally, pH ranges from 0 to 14, where 0 is very acid, 14 very basic, and 7 neutral. Natural waters usually have a pH between 6.5 and 8.5.

Plat. A diagram drawn to scale, showing boundaries and subdivisions of a tract of land as determined by survey, together with all essential data required for accurate identification and description of the various units shown and including one or more certificates indicating due approval.

PLIA. Pollution Liability Insurance Agency.

Pollutant. A substance introduced into the environment that adversely alters the physical, chemical, or biological properties of the environment.

Pollution. The presence of a substance whose nature, location, or quantity produces undesirable environmental effects.

Potable Water. Water that is safe and satisfactory for drinking and cooking.

Primary Treatment. A wastewater treatment method that uses settling, skimming, and (usually) chlorination to remove solids, floating materials, and pathogens from wastewater. Primary treatment typically removes about 30 percent of biological oxygen demand and less than half of the metals and toxic organic substances.

Private Well. A well that provides drinking water for consumption by a particular person or group.

Properly Functioning Conditions. "The sustained presence of a watershed's habitat-forming processes that are necessary for the long-term survival of salmonids through the full range of environmental variation" (50 CFR Section 223.203(b)(12)(iii)). The concept of properly functioning conditions recognizes the fact that essential ecological functions may be different in spawning and rearing habitats often found in forested environments, for instance, than in migratory corridors. The habitat functions and values that constitute properly conditions may differ within and between watersheds.

Public Water System. Any water system that provides piped water for human consumption, excluding systems that supply fewer than three single-family residences or fewer than five residences on a single farm. Public water systems may be operated by general purpose governments such as counties or cities, special purpose districts such as water districts or public utility districts, community groups, or private purveyors. Public water systems can supply water for a wide variety of purposes in addition to domestic uses.

RCW. See Revised Code of Washington.

Receiving Waters. All distinct bodies of surface water that receive runoff or wastewater discharges, such as streams, rivers, ponds, lakes, and estuaries.

Recessional Outwash. Outwash deposited during a time interval marked by the backward displacement or general decrease in the volume of a glacier. Generally younger (shallower in soil column) than advance outwash. See OUTWASH.

Recharge. (1) Water that seeps into the ground and moves past the root (vadose) zone of plants. Recharge may pass to aquifers, reemerge as stream base flows, or be discharged to salt water through marine springs. (2) Process by which rainwater (precipitation) seeps into the ground-water system.

Recharge Area. Generally, an area connected with the underground aquifer(s) by a permeable soil or rock layer. Water entering a recharge area may travel for miles underground.

Reclaim. To reuse water that would otherwise be wasted. This is accomplished by restoring wastewater quality by artificial or natural treatment processes.

Regulation. An authoritative rule or order having the force of law issued by an executive authority of a government.

Residential. Restricted to or occupied by dwellings used for living.

Returned Flow. That part of irrigation/industrial/domestic water not consumed, (e.g., by evapotranspiration) and that returns to its source or another body of water.

Revised Code of Washington (RCW). The compilation of the laws of the state of Washington published by the Statute Law Committee.

Rezone. To alter the zoning of.

Riparian. Pertaining to the banks of a stream.

Runoff (Direct or Initial). The runoff entering stream channels promptly after rainfall or snowmelt.

Runoff (Surface). The flow of rainwater or snowmelt over the land surface, through stream channels and out to sea.

Runoff (Base or Ground Water). Rainwater or snowmelt that infiltrates into the ground then flows into a stream or other surface water body over time.

Salinity. (1) The relative concentration of dissolved salts, usually sodium chloride, in a given water. (2) A measure of the concentration of dissolved mineral substances in water.

Sand. A rock fragment smaller than a granule and larger than a coarse silt grain, having a diameter in the range of 1/16 to 2 millimeters.

Satellite System. A smaller public water system that is managed by a larger nearby system.

Seawater Intrusion. The entry of seawater into a fresh water aquifer.

Sediment. Material suspended in or settling to the bottom of a liquid, such as the sand and mud that make up much of the shorelines and bottom of Puget Sound.

Seep. A place where ground water discharges naturally onto the land surface in quantities insufficient to form a stream of flowing water. See also SPRING.

Seepage. (1) The slow movement of water through small cracks, pores, and interstices, of a material into or out of a body of surface or subsurface water. (2) The loss of water by infiltration into the soil from a canal, ditches, laterals, watercourse, reservoir, storage facilities, or other body of water, or from a field.

Septic System. An onsite system designed to treat and dispose of domestic sewage; a typical septic system consists of a tank that receives wastes from a residence or business and an infiltration system for disposal of the liquid effluent that remains after decomposition of the solids by bacteria in the tank and in the drain field.

Service Area. A geographical area assigned to a water purveyor for the purpose of providing both current and future public water service. Boundaries are defined by agreements among adjacent utilities and are recorded on a set of maps on file with King County Department of Environmental Services and the utilities. Water service provided within designated service areas must be consistent with local land use plans.

Shellfish. An aquatic organism, such as a mollusk (clam or snail) or crustacean (crab or shrimp), having a shell or shell-like exoskeleton.

Silt. A rock fragment or particle smaller than a very fine sand grain and larger than coarse clay minerals, having a diameter in the range of 1/256 to 1/16 millimeters.

SKCPH. Seattle-King County Public Health.

Slope. The inclined surface of any part of the Earth's surface, as a hillslope.

Sole Source Aquifer. An aquifer that supplies 50 percent or more of the drinking water of an area. The Environmental Protection Agency designates sole source aquifers under the Safe Drinking Water Act.

Spring. A place where ground water discharges naturally onto the land surface in quantities sufficient to form a stream of flowing water. See also, SEEP.

Static Water Level. That water level of a well that is not being affected by withdrawal of ground water.

Storage. Water artificially impounded in surface or underground reservoirs for future use.

Stormwater. The water that runs off surfaces such as rooftops, paved streets, highways, and parking lots. It can also come from hard grassy surfaces like lawns, play fields, and from graveled roads and parking lots.

Stream Base Flow. See Base Flow.

Streamflow. The water discharge that occurs in a natural channel.

Surface Water. All water naturally open to the atmosphere (rivers, lakes, reservoirs, streams, impoundments, seas, wetlands, estuaries, springs etc.).

Sustainable. Water use rate at which neither water quality nor available quantity is perceptibly diminished over the long term.

Till. Predominantly unsorted and unstratified drift, generally unconsolidated, deposited directly by and underneath a glacier without subsequent reworking by meltwater, and consisting of a heterogeneous mixture of clay, silt, sand, gravel, and boulders ranging widely in size and shape. Generally a low permeability material (aquitard).

Topography. The general configuration of a land surface or any part of the Earth's surface, including its relief and the position of its natural and man-made features.

Topographic. Pertaining to the general configuration of a land surface.

Total Maximum Daily Load (TMDL). A calculation of the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards, and an allocation of that amount to the pollutant's sources.

Toxic. Poisonous, carcinogenic, or otherwise directly harmful to living organisms.

Transpiration. The process by which water vapor escapes from the living plant, principally the leaves, and enters the atmosphere. It does not include soil evaporation.

Unsaturated Zone. The zone below the land surface where the pores contain both water and air, but are not totally saturated with water. These zones differ from an aquifer, where the pores are saturated with water. Also known as the vadose zone.

Vadose Zone. The zone containing water under pressure less than that of the atmosphere, including soil water, intermediate vadose water, and capillary water. This zone lies between the land surface (on top) and the surface of the zone of saturation (the water table, below).

WAC. See Washington Administrative Code

Washington Administrative Code (WAC). The compilation of all state regulations adopted by state agencies through the rule-making process. For example, Chapter 173-201A WAC contains surface water quality standards.

Wastewater. Used water and solids from a community (including used water from industrial processes) that flow to a treatment plant. Stormwater, surface water, and ground water infiltration also may be included in the wastewater that enters a wastewater treatment plant. The term sewage usually refers to household wastes, but this word is being replaced by the term wastewater.

Wastewater Treatment Plant. Facility that receives wastewaters (and sometimes runoff) from domestic and/or industrial sources, and by a combination of physical, chemical, and biological processes reduces (treats) the wastewaters to less harmful byproducts.

Water Budget. An accounting of inputs, outputs, and net changes to a particular water resource system over a fixed period. Components of the water budget include precipitation, recharge, runoff, and evapotranspiration.

Water Claim. A legal filing that a person has a right to a certain use of water, generally one whose use predates the state water rights law (1917 for surface water, 1945 for groundwater). These are considered valid until the water rights are adjudicated, at which point they will have to be proven legally.

Water Cycle. The circulation of water from the sea, through the atmosphere, to the land; and thence, with many delays, back to the sea by overland and subterranean routes, and in part by way of the atmosphere; also the many short circuits of the water that is returned to the atmosphere without reaching the sea.

Water Flow. The movement of water and the moving water itself; also, the rate of movement.

Water Level. The vertical distance from a datum to the water table.

Water Share. An allocation of a Public Water System's limited available number of connections. Having a water share even without having a physical connection to the system would allow a property owner to build a house and be assured of being hooked up to the water system when the house is actually built. A property owner who has applied but doesn't yet have a water share is considered on the "waiting list" for the water system.

Watershed. (1) A Water Resource Inventory Area (WRIA) as defined in Chapter 173-500 WAC. (2) The land area that drains into a common body of water. An area of land that contributes runoff to one specific delivery point; large watersheds may be composed of several smaller tributary watersheds, each of which contributes runoff to different locations that ultimately combine at a common delivery point.

(Comprehensive) Watershed Management Planning Act 2514 (Chapter 90.82 RCW). With this act, the state established a framework for developing local solutions to water issues on a watershed basis. The comprehensive watershed planning process is based on watersheds known as Water Resources Inventory Areas (WRIAs). This process is optional and allows local governments to collaborate and join with citizens and tribes to form watershed management planning units to develop watershed management plans.

Water Table. The upper surface of a zone of saturation (unconfined aquifer). This level can be very near the surface of the ground or far below it.

Water Right. A legal authorization to make a beneficial use of public waters of the state.

Wellhead. The immediate area around the top of a well. Contamination of the aquifer may occur from surface water if the wellhead is not sealed to prevent flow down the well casing.

Well Log. A record of the geologic and aquifer conditions encountered by a driller during drilling of a water supply well. The State of Washington requires that a log be completed for each well.

Well Point. A screening device, equipped with a point on one end that is meant to be driven into the ground.

Withdrawal. Water removed from a ground water source for use. Water removed from a surface water source for use is called a diversion.

WRIA. Water Resource Inventory Area.

WRIA 9. The Green/Duwamish watershed.

WRIA 15. The Kitsap Peninsula and Vashon-Maury Island watersheds.

WUCC. Water Utility Coordinating Committee.

Zoning. To designate by ordinance areas of land reserved and regulated for different land uses.

APPENDIX C. PRELIMINARY STEAM FLOW DATA AND CREEK BASINS

The Water Resources Evaluation Project, King County Department of Natural Resources and Parks (DNRP), expanded the existing stream gage network on Vashon-Maury Island from 2 to 5 continuous recording sites. Additional stream flow data is being collected bi-annually at about 20 stream locations across the island, see table below. These locations are being sampled at the end of the wet and dry season to help provide an island-wide assessment of the interaction between groundwater and surface water.

Stream No.	Stream Name	4/6/2004 Q (cfs)	8/18/2004 Q (cfs)	2/23-25/2005 Q (cfs)
10	McCormick Creek	0.38	0.25	0.32
unk	Shinglemill Trib. at Homestead	0.25	--	--
12	**Shingle Mill Creek**	2.31	1.70	2.00
12a	Shingle Mill at Cove Rd	--	--	0.00
12b	East Fork Shingle Mill at Cove Rd	--	--	0.00
12c	Shingle Mill above Needle Creek	--	--	1.55
12d	Needle Creek	--	--	0.27
20	Robinwood Creek	--	0.50	0.69
21	**Green Valley Creek**	0.58	0.49	0.47
23	Christensen Creek	1.02	0.58	0.80
30	Bates Creek	0.12	0.10	0.10
37	**Tahlequah Creek**	0.60	0.22	0.48
38	Chen Creek	0.06	--	--
41	**Fisher Creek**	1.61	0.57	1.12
42a	Judd Creek at SW 204th	1.05	0.34	--
42b	East Fork Judd Creek at SW 204th	0.44	0.00	0.29
42	**Judd Creek near Mouth**	3.68	1.30	2.82
42c	Judd Creek at Singer Rd	--	--	0.95
42d	Judd at 111th SW	--	--	1.62
42e	Judd at 107th SW	--	--	2.82
43	Tsugwalla Creek	0.12	0.02	0.06
44	Raab's Creek	0.12	--	0.05
45	Mileta Creek	0.05	--	0.02
62	Ellis Creek	0.72	0.58	0.49
63	Ellisport Creek	0.37	0.28	0.35
64	Beall Creek, upstream of withdrawl	--	0.70 E	0.68
65	Gorsuch Creek	0.14	0.07	0.05
66	Dilworth Creek	0.33	0.03	0.15
67	Glen Acre Creek	0.08	0.02	0.05

Stream names in BOLD refers to sites with continuous gauging equipment

Q (cfs) : Stream Discharge measured in cubic feet per second

-- : Not Measured

E : Estimated Value

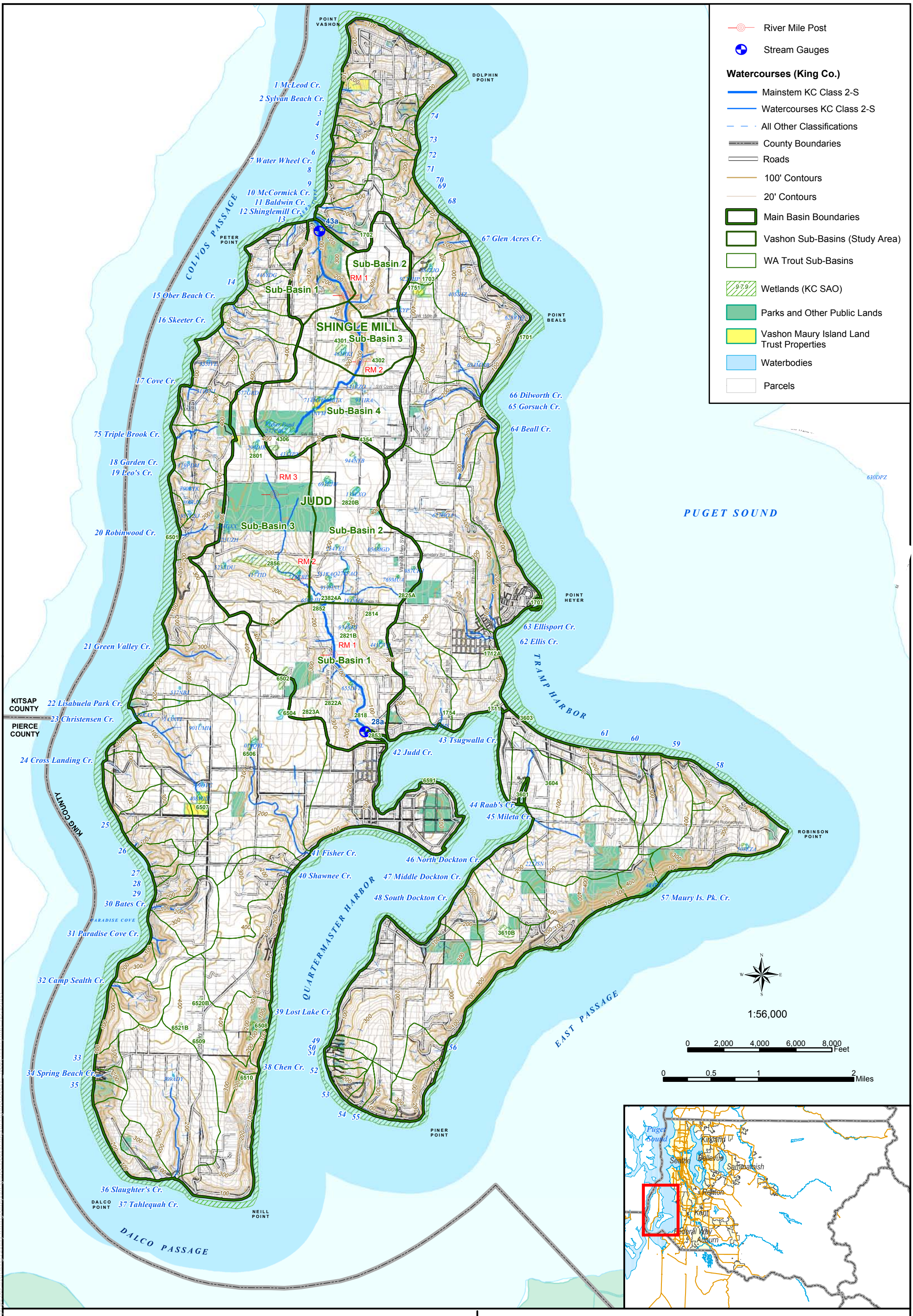
unk : Unknown - no stream no. in RRR report figure.

The following map, excerpted from the Vashon-Maury Island Rapid Rural Reconnaissance (July 2004), shows the boundaries and names of all creek basins on the Island. The basin numbers correspond to the stream flow table above, in this Appendix.

VASHON ISLAND - CREEK BASINS DELINEATIONS

KING COUNTY RAPID RURAL RECONNAISSANCE

Figure 1-1



King County
Department of Natural Resources and Parks
Water and Land Resources Division

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Source: King County GIS, 2002; WDNR: WA Trout, 2002; WA Trout stream types 2 and 3 (WAS 222-16-031) shown as King County Class 2 with salmonids (KCC 21A.06.1240).

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