SECTION 7
WATER RESOURCE PROTECTION

7.1 OVERVIEW

Previous sections of this plan have presented an overview of the demographics of the service area and existing facilities in place to meet the requirements of the current and projected population within the retail water service area. This section is dedicated to the specific requirements associated with protection of the public water supply in accordance with the requirements of the Safe Drinking Water Act and myriad of regulations and requirements of the US EPA as administered by the State of Washington Department of Health. These requirements encompass source water quantity, quality and reliability and in essence are the foundation of determining the District's ability to provide a sustainable, high quality source of potable water at a reasonable cost. This section provides an overview of Water District 19's current watershed and wellhead protection plans. Water District 19's water quality monitoring, cross connection and coliform monitoring programs are summarized in Section 8.

This section describes the precautions and steps the District is taking to protect its customers from the contamination of the District's groundwater. This plan includes the steps for prevention as well as plans in case the groundwater does become contaminated. Following that is a brief discussion of the steps the Water Purveyors of Vashon are taking in order to meet the State's requirements for watershed planning. During development of this Plan, the District retained the services of Landau Associates to document existing conditions and protection measures for the Water District 19 watersheds around Beall and Ellis Creeks. This report is contained in the Appendix.

7.2 WELLHEAD PROTECTION PROGRAM OVERVIEW

Water from underground aquifers, commonly referred to as groundwater, forms the primary source of drinking water for an estimated 65 percent of Washington state residents. Water District 19 relies on groundwater for supplemental and emergency supply. The District has two wells, located together near the District's 1 MG and 0.625 MG storage reservoirs near the corner of 103rd Ave SW and SW 188th St. To protect groundwater supplies, the Environmental Protection Agency (EPA) and the Department of Health (DOH) now require public water utilities to develop a wellhead protection program as a component of their water system comprehensive plans.

The purpose of a wellhead protection program is to provide local utilities with a proactive program for preventing groundwater contamination. A successful wellhead protection program consists of a number of components which must be developed before the plan

can be fully implemented. The major components of the plan are described below and form the basis of the following chapter.

A Susceptibility Assessment determining the susceptibility to contamination.

A delineated wellhead protection area, based on all reasonably available hydrogeologic information, including the Susceptibility Assessment.

An inventory within each wellhead protection area of potential sources of contamination.

A spill response plan for each wellhead protection area containing documentation for coordination with local first responders.

Contingency plans for providing alternate sources of drinking water in the event that contamination does occur and management recommendations to reduce the likelihood that potential contaminant sources will pollute the drinking water supply.

7.3 SUSCEPTIBILITY ASSESSMENT

Separate susceptibility assessments for the District's two active wells were completed and submitted to the Department of Health in 1994. Susceptibility assessments are an important initial step in selecting appropriate delineation methods to define the wellhead protection area boundaries. Drinking water supplies vary in their susceptibility to contaminants discharged at the surface. Wells that have been poorly constructed or have been improperly cased have an increased susceptibility. Additionally, wells located in an unconfined aquifer with no confining layer (layer of low permeability) between the aquifer and surface have a much higher susceptibility than those drawing water from confined aquifers deep below the ground surface.

After review of the susceptibility assessments, Well No. 1 and Well No. 2 were both given high susceptibility ratings by the Department of Health.

7.4 WELLHEAD PROTECTION AREA DELINEATIONS

The first step in developing a wellhead protection program is to establish the land areas around each well from which ground water may be flowing to the well. These areas which most likely contribute pollutants to the groundwater and are referred to as zones of contribution. Zones of contribution require proper land use management to minimize the possibility of contaminants entering the ground water system. The most commonly accepted tools for delineating wellhead protection zones are the calculated fixed radius method, analytical models, and numerical models. These methods are discussed below.

7.5 METHODS OF DELINEATION

7.5.1 CALCULATED FIXED RADIUS METHOD

The simplest groundwater model is the Calculated Fixed Radius (CFR) method. In this method, zones of contribution are delineated by concentric areas around each

well, usually 100 feet or more. In the Calculated Fixed Radius method, the delineation's are calculated based on pumping data and known or assumed aquifer characteristics.

7.5.2 ANALYTICAL MODELS

The analytical model requires the incorporation of basic hydrological information and certain physical characteristics of the aquifer and well. Major assumptions and simplifications to the hydrogeologic regime occur in analytical modeling, but the incorporation of the hydraulic gradient and hydrogeologic boundaries allows for a more realistic representation of the ground water flow regime than in the calculated fixed radius method.

The Numeric method requires significantly more data. In numeric modeling, a grid is superimposed over the study area. Each square in the grid, called a cell, is characterized by physical parameters which are estimated from data collected from a variety of sources.

The sources may include well logs, geologic and hydrogeologic maps, geophysical data, groundwater elevation data, stream flow discharge and meteorological data.

The Numeric method generates more accurate results than the Fixed Radius or Analytical methods. However, Numeric models are very costly to develop. Consequently, Numeric models are more commonly used by large utilities with complex aquifers who have the resources to collect the extensive model input required.

7.6 ANALYSIS

The Calculated Fixed Radius Method was used to analyze the wellhead protection area zones of contribution for the District's wells. Through the use of the DOH susceptibility analysis packet, wellhead protection area for Well No. 1 for 1 year, 5 years and 10 years were estimated. Well No. 1 was analyzed due to the fact that both wells are located in close proximity to each other, and will have similar zones of contribution. A withdrawal rate of 186 gpm was used to reflect the maximum yearly withdrawal rate allowed by existing water rights of 300 acre-ft. During 1996 and 1997, the wells only produced 40 gpm and 17 gpm respectively. The zones of contribution for Well No. 1 were calculated using the equation provided in the DOH's Wellhead Protection Program Guidance Document. Radii values calculated for the various times of travel are presented in Table 7-1 below. Figure 7-1 presents the delineation's of the one, five, and ten year zones of contribution. Calculations for these delineation's are included in Appendix I.

TABLE 7-1
WATER DISTRICT 19
WELLHEAD PROTECTION ZONES OF CONTRIBUTION (CFR METHOD)

Time of Travel	Well No. 1 Zone of Contribution Radius (feet) [1]
1 year	794
5 years	1,775
10 years	2,511

[1] The zone of contribution for Well No. 1 was determined by using the maximum annual withdrawal water right of 300 acre-ft.

7.7 CONTAMINANT SOURCE INVENTORY

An essential element of wellhead protection is an inventory of all potential sources of groundwater contamination in and around the delineated wellhead protection areas. The purpose of the inventory is to identify past, present and proposed activities that may pose a threat to the well or surrounding area. The inventory can also help to plan management strategies and establish a mailing list to notify businesses located within the wellhead protection areas.

7.7.1 POTENTIAL CONTAMINANT SOURCES

Within a wellhead protection zone, there are many diverse activities which may contaminate an aquifer, thereby impacting the water supply. A discussion of these activities, their potential effects on groundwater, and the regulatory requirements which may apply are included in the following sections. Locations of potential contaminant sources within the wellhead protection area for the District's wells are shown on Figure 7-1. The names and types of the sources are listed in Table 7-2. The District will attempt to notify businesses which are potential contaminant sources for the District's wells.

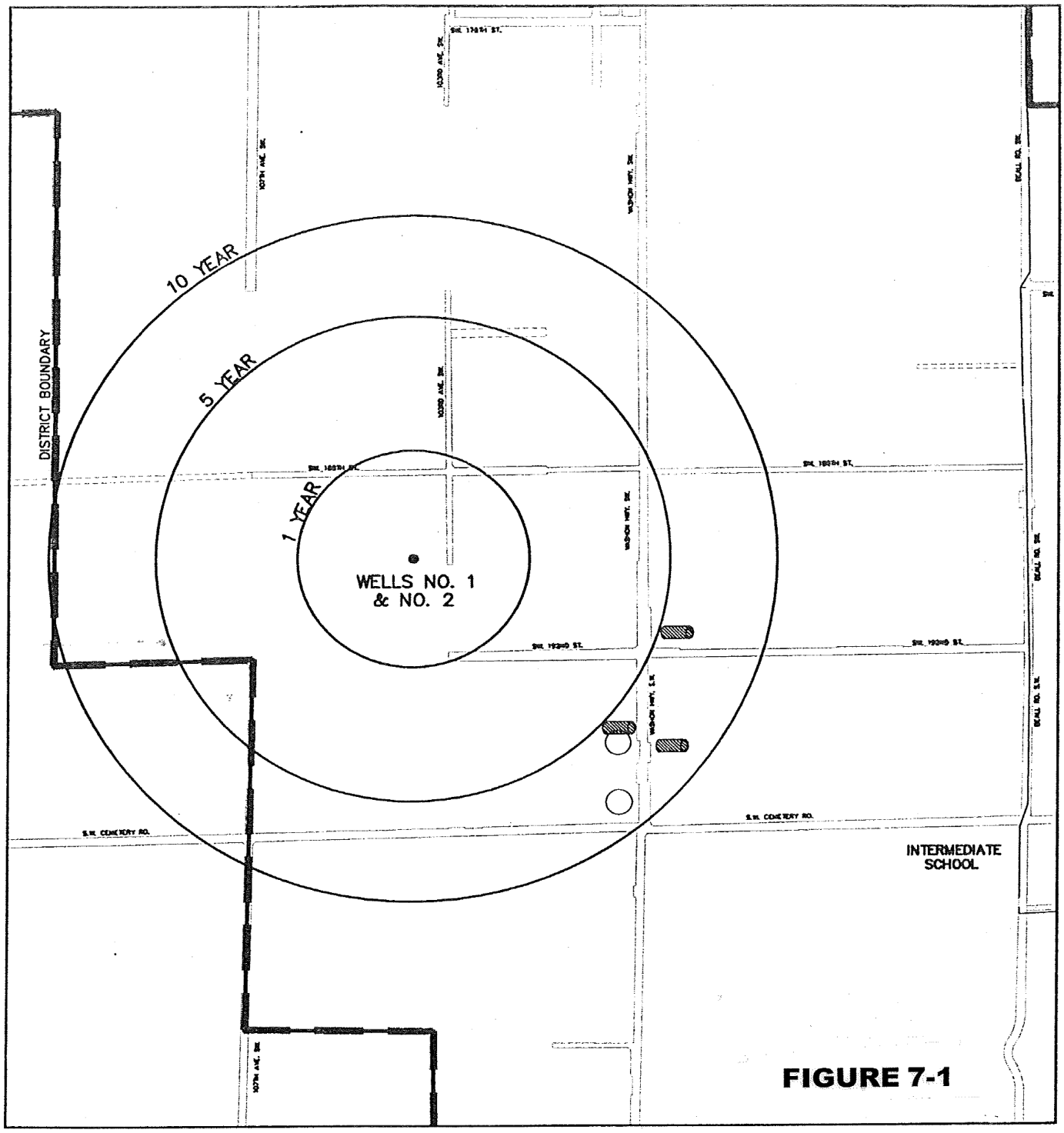

FIGURE 7-1

Underground Storage Tank
RCRA Generators

SCALE 1"=1,000'

KING COUNTY WATER DISTRICT NO. 19

WELLHEAD PROTECTION AREA

Gray & Osborne, Inc.
CONSULTING ENGINEERS

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TABLE 7-2
WATER DISTRICT 19
POTENTIAL CONTAMINANT SOURCES

Location (See Figure 7-1)	Potential Contaminant Source	Name of Business	Notes
One Year Zone of Contribution			
none			
Five Year Zone of Contribution			
none			
Ten Year Zone of Contribution			
1	UST, RCRA	K2	- 3 USTs. Three tanks used for heating fuel. The three tanks are made of steel and are no longer in operation. RCRA Level 1 Generator
2	UST	Mom's Deli & Grocery	-5 USTs. One tank contains diesel and four tanks contain unleaded gasoline. Each tank is made of steel. The tanks are still in operation.
3	UST	Williams Heating, Inc.	-5 USTs. One tank contains unleaded gasoline, one tank contains kerosene, and the other three tanks contents are unknown. The unleaded tank is made from steel, the others are made from concrete. The tanks are still in operation.
4	RCRA	WDOE NRO Central Storage Drug Lab	-Non-generating notifier

Notes: UST = Underground Storage Tank, LUST = Leaking Underground Storage Tank
RCRA = Dangerous Waste and Materials Generators which are regulated by DOE under RCRA.
CSCS = Confirmed or Suspected Contaminated Sites

7.7.2 LANDFILLS

A landfill is a disposal facility in which solid waste is permanently placed. Minimum functional standards for solid waste hauling are regulated by the Washington State Department of Ecology under WAC 173-304. These regulations set siting and closure criteria, performance standards, and operating requirements for landfills. Abandoned and improperly maintained landfills and dump sites are often a major source of groundwater contamination. Leachate from landfills poses a threat to groundwater quality should it migrate to the water table. The Department of Ecology is responsible for mitigating dump site cleanup when potentially hazardous leachates are present.

There are no active landfills within the wellhead protection area zones of contribution of the District's wells.

7.7.3 COMMERCIAL AND INDUSTRIAL ACTIVITY

Areas of commercial and industrial land use are located within most wellhead protection boundaries. Businesses that may contribute contaminants to the groundwater include dry cleaners, gas stations and other businesses with fuel storage tanks, auto repair shops, metal plating facilities, asphalt and concrete facilities, and machine shops. Wastes generated at these businesses include substances such a petroleum products, solvents, surfactants, heavy metals, and other organic materials. These wastes can potentially enter the groundwater system through inadequate disposal practices or accidental spills. Table 7-3 presents typical commercial and industrial activities and the potentially hazardous chemicals that may be associated with them.

TABLE 7-3
CHEMICALS ASSOCIATED WITH COMMERCIAL AND INDUSTRIAL ACTIVITIES

Commercial/Industrial Activity	Contaminants
Automobile/Truck Service	waste oils, solvents, acids, paints, soaps
Dry Cleaners	solvents (perchloroethelyene, petroleum solvents, Freon) spotting chemicals (trichloroethane, methylchloroform, ammonia, peroxides, hydrochloric acid, rust removers, amyl acetate)
Cemeteries	fertilizers, pesticides
Country Clubs/Golf Courses	fertilizers, herbicides, pesticides, swimming pool chemicals, automotive wastes
Electric/Electronic Equipment Manufacturers	nitric, hydrochloric and sulfuric acid, heavy metal sludges, ammonium persulfate, cutting oil and degreasing solvent, corrosive soldering flux, waste plating solution, cyanide, methylene chloride, perchloroetheylene, trichloroethane, acetone methanol
Furniture/Wood Manufacturing	paints, solvents, degreasing and solvent recovery sludge
Metal Plating Shops	sodium and hydrogen cyanide, metallic salts, alkaline solutions, acids, solvents, heavy metal contaminated wastewater/sludge
Lawns and Gardens	fertilizers, herbicides, pesticides
Painters, Publishers	solvents, inks, dyes, oils, miscellaneous organics, photographic chemicals
Sand and Gravel Mining	diesel fuel, motor oil, hydraulic fluids
Scrap, Salvage and Junkyards	used oil, gasoline, antifreeze, PCB contaminated oils, lead acid batteries

The siting and operation of facilities which treat, store, or dispose of hazardous waste are subject to the requirements of the Resource Conservation and Recovery

Act (RCRA), subtitle C. In Washington State, the Department of Ecology regulates facilities which generate more than 220 pounds of hazardous waste per month under WAC 173-303, Dangerous Waste Regulations. The regulations are significant in that they establish a number of requirements for these facilities including surveillance and monitoring, record keeping, performance and design criteria, and siting and closure procedures. Ecology divides the facilities into three levels of hazardous waste accumulation: Level 1 facilities generate 2,200 pounds of waste per month or more; level 2 facilities generate between 220 and 2,200 pounds per month; and level 3 facilities generate less than 200 pounds. Level 3 generators are exempt from the regulations. All level 1 and 2 facilities must initially file a report of their activities with Ecology and update those activities annually. A summary of those activities are published by Ecology, thereby allowing water purveyors the opportunity to determine the types of activities present within their wellhead protection area.

The District's wellhead protection area encompasses one level 1 generator and one non-generating notifiers. The locations of these generators are shown in Figure 7-1, and are listed in Table 7-2.

7.7.4 UNDERGROUND STORAGE TANKS

Underground storage tanks (USTs) and leaking underground storage tanks (LUSTs) can be a major threat to groundwater quality. Petroleum products which may contain impurities that are mobile in the groundwater system are the most commonly stored substances in USTs. The EPA estimates that 35 percent of all USTs could be leaking. The most common causes of leaks are structural failure, corrosion, improper fittings, and improper installation.

Ecology regulates underground storage tanks in Washington State under WAC 173-360. The regulations require that owners and operators of underground storage tanks comply with the following sections of the regulations:

Notification, reporting, and record keeping

Performance standards and operating closure requirements

Registration and licensing

Financial responsibility

As of July 1, 1991, owners and operators of all existing nonexempt underground storage tanks must have a permit from Ecology. A valid permit is a requirement for delivery of regulated substances. The permit must be updated annually.

Underground storage tank inspections are performed by Ecology primarily through the information developed in the permitting process. Ecology maintains a file on all permitted USTs in Washington State, as required by RCRA, Subtitle 1. The file provides the site name and address, tank identification number, date of installation, size, tank status, and the substance stored at the site.

The District wellhead protection area encompasses ten underground storage tanks. The locations of the tanks are shown on Figure 7-1 and they are listed in Table 7-2.

7.7.5 SEPTIC SYSTEMS

King County is responsible for regulating and permitting residential and small commercial on site sewage disposal systems within the county, excluding federal facilities. A list of the septic systems is being compiled and will be included in the Appendix. Contaminants associated with septic tank effluent include pathogenic organisms, toxic substances, and nitrogen compounds. Ammonia and nitrate nitrogen are highly soluble in water.

7.7.6 IMPROPERLY SEALED OR SECURED WELLS

Improperly sealed or secured wells can act as direct conduits for contaminants to reach groundwater. There are two wells located in the area surrounding the existing District wells which are no longer used. While both wells have been filled with bentonite to 18 feet, the District will recognize these wells as possible conduits to the groundwater

7.7.7 ACCIDENTAL SPILLS

Accidental spills or releases of contaminants can potentially impact groundwater supplies. Potential sources of spills and leaks include underground storage tanks, accidents and poor disposal practices. Vashon Highway, which passes through the District's ten year wellhead protection area, is a location where accidental spills can occur. The Washington State Patrol is the first responder for hazardous material spills on Vashon Island. The State Patrol then notifies the DOE, who in turn authorizes an independent contractor to clean up the spill.

7.7.8 CONFIRMED OR SUSPECTED CONTAMINATION SITES

Under the Model Toxics Control Act Cleanup, WAC 173-340, the Department of Ecology is responsible for ensuring all hazardous waste site are properly remediated. This includes confirmed and suspected sites of contamination as well as LUSTs. A separate inventory for each, which includes the status of cleanup efforts, is maintained by Ecology. Ecology conducts an initial site investigation within 90 days of learning of a potentially contaminated site. If this investigation shows that remediation action is required, the site will appear on the Confirmed

and Suspected Contaminated Sites Report. The sites are also given a Washington Ranking Mode BIN number between 1 and 5. A rank of 1 indicates the greatest assessed risk to human health and the environment. The contaminant type and the affected media, such as groundwater, is also noted. Once the remedial action has been completed, Ecology's Toxics Cleanup Program determines if the site can be removed from the list.

There are no Confirmed and Suspected Contaminated Sites within the wellhead protection area of the District's wells.

7.8 INVENTORY DATA SOURCES

The inventory of potential contaminant sources was compiled using various data sources. Agencies such as Ecology and EPA maintain contaminant databases which list businesses that handle and store potential contaminants. In addition to the documents discussed previously, the following databases were used to create the inventory for the District's wellhead protection area:

Underground Storage Tank Report, September 1998. The most recent version of the Underground Storage Tanks Report was obtained from Ecology's Toxics Cleanup Program. This list was used to locate the facilities that contain underground storage tanks and verify facilities located by field surveys of the wellhead protection areas. These facilities are summarized in the inventories and located on the maps.

Leaking Underground Storage Tank Report, September 1998. The most recent Leaking Underground Storage Tank (LUST) Report was also obtained from Ecology Toxics Cleanup Program. This report was used to locate the leaking underground storage tanks on the wellhead protection area maps and note the status of remedial action at the site. The LUST report lists the site name, address, age, volume, and status of sites that contain leaking underground storage tanks.

Dangerous Waste and Materials Generators, This program, the EPA's RCRA program, has been taken over by Ecology within the State of Washington and is regulated under the Dangerous Waste Regulations (173-303 WAC).

Title III Facilities, -Title III facilities are identified as those which generate, treat, store or dispose of hazardous materials in sufficient quantity to pose a threat to the community. There are several different types of Title III facilities depending upon the amount of and the nature of the material handled. All of these companies must report to the County on an annual basis. This reporting was a result of the 1986 Superfund Amendments and Reauthorization Act. Title III was subsequently renamed to the Emergency Planning and Community Right to Know Act (EPCRA).

Confirmed and Suspected Contaminated Sites Report, May 1998. Ecology maintains the Confirmed and Suspected Contamination Sites Report. The list is updated continuously as new information becomes available. Each site is given a site status code indicating the status of the cleanup process.

Septic Systems. King County issue permits for all septic systems within the counties, except those on federal facilities.

Zoning and Land Use. Zoning designations were obtained from KCWD No. 19.

7.9 SPILL/INCIDENT RESPONSE PROGRAM

Spill response planning is an important aspect of both an emergency management plan and a wellhead protection program. Specific response procedures for wellhead protection areas must be determined prior to the occurrence of a contamination incident. The information obtained as a result of the susceptibility assessment and the wellhead protection area inventory can be used to determine what types of spill response measures are necessary for the protection of drinking water sources. In order to be accepted by local emergency responders, spill response procedures for wellhead protection areas will be realistic and easily implemented.

In order for spill response procedures to be effectively executed, coordination, cooperation, and communication among the responding agencies, organizations, and individuals is imperative. Depending on the magnitude and type of the release, any of the following organizations may be involved in a spill response for a wellhead protection area in Washington State.

Department of Ecology (DOE): The Spill Response Team is responsible for determining the source and cause of the release, and responsible party. If the responsible party is unknown, DOE will investigate to determine who is responsible and ensure that containment, clean-up, and disposal proceedings begin. The DOE's 24 Hour Spill Response can be contacted at (360) 753-2353.

Department of Health (DOH): The Department of Health is developing a set of standard operating procedures, in conjunction with organizations such as DOE's Spill Operations Section and the Association of Fire Chiefs, that first responders can use in wellhead protection areas, critical aquifer recharge areas, and other sensitive groundwater areas. DOH also provides assistance through laboratory support and services if necessary to the clean-up effort.

Department of Transportation (DOT): The Washington State DOT can provide spill response assistance through traffic control, equipment, and personnel for non-hazardous clean-up activities on state and interstate highways.

State Patrol: The state patrol is responsible for managing spills on interstate and state highways.

King County Fire District No. 13: Initial response to a hazardous spill will most likely be from the island fire department. The Fire Department will be notified of the wellhead protection area boundaries. The District will be working with the Fire Department to put an effective plan in place.

7.10 CONTINGENCY PLANNING

Contingency planning is an important component of a wellhead protection program. In the event that one or both wells need to be taken off line due to contamination, a contingency plan provides immediate mitigation. A properly prepared and updated contingency plan helps ensure the water system, and local officials, are prepared to respond to emergency situations. Contingency planning also includes provision of alternative sources of drinking water. The following steps are necessary for the development of an effective contingency plan:

Identify maximum capacities of the existing system as to source, distribution system and water rights restrictions. Assume loss of well and reevaluate.

Evaluate the expansion options of the existing system's capacities relative to existing water rights.

Identify existing or potential interties with other public water systems.

Evaluate current procedures and make recommendations on contingency plans for emergency events.

Contingency planning is an on-going effort with the District and more specific contingency plans will be developed.

7.11 RECOMMENDATIONS

In order for the District to protect its existing wells from contamination, the District will take the following steps.

Notify commercial businesses and Hazardous Waste Generators of their presence within the District's wellhead protection area.

The District will ensure that businesses that could potentially contaminate the District's wells be aware they lie within the District's wellhead protection areas. At a minimum, notification letters and wellhead protection inventory maps will be sent to the owners/operators of potential contaminant sources and the Department of Ecology.

Monitor for nitrates annually.

Contaminants associated with septic tank effluent include pathogenic organisms, toxic substances, and nitrogen compounds. With the use of on-site sewage disposal systems within the District, the District will not only be aware of non-compliance with MCLs for

nitrates, but also trends of increased nitrate levels over a period of time. Increasing nitrate levels could be an indication of source contamination.

Contingency Plan for contamination of groundwater.

- Contact the appropriate agency to deal with the spill as noted on Page 6-9.
- Use the District's surface water sources.
- Inform District customers through use of local media.
- Impose outdoor watering restrictions if required.

7.12 WATERSHED PROTECTION PROGRAM OVERVIEW

The Vashon-Maury Island Watershed Plan was completed in 2005 and can be viewed at http://dnr.metrokc.gov/wlr/watersheds/puget/vashon-mi-watershed-plan.htm. The District participated in the development of the Plan and supports its recommendations Regulatory requirements for watershed protection are presented below. The District's recent Watershed Protection Plan, completed during development of this Plan, is presented in the Appendices.

REGULATORY REQUIREMENTS/PROGRAM OVERVIEW

Watershed control requirements apply to all Group A systems using surface water. A watershed control program is an integral part of a purveyor's overall strategy to ensure public health protection. The term "watershed" refers to the hydrologic drainage upstream of a utility's surface water intake. The watershed affects the physical, chemical, and microbiological quality of the source. The watershed control program must address, at a minimum, the following elements:

Watershed Description/Characteristics

Identification of Activities/Land Uses Detrimental to Water Quality

Watershed Management and Control Measures

Monitoring Program

System Operations